

Source: TSG CN WG 1
Title: CR to R99 (with mirror CRs) on Work Item GSM/UMTS interworking towards 23.009
Agenda item: 7.6
Document for: APPROVAL

Introduction:

This document contains 3 CRs, **R99 to Work Item " GSM/UMTS interworking"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #20 for approval.

Spec	CR	Rev	Cat	Phase	Subject	Version-Current	Version-New	Meeting-2nd-Level	Doc-2nd-Level
23.009	094	2	F	R99	Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE	3.13.0	3.14.0	N1-30	N1-030906
23.009	095	2	A	Rel-4	Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE	4.7.0	4.8.0	N1-30	N1-030907
23.009	096	2	A	Rel-5	Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE	5.4.0	5.5.0	N1-30	N1-030908

CHANGE REQUEST

⌘ **23.009 CR 094** ⌘ rev **2** ⌘ Current version: **3.13.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: UICC apps ME Radio Access Network Core Network

Title:	⌘	Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE	
Source:	⌘	Nortel Networks	
Work item code:	⌘	GSM-UMTS Interworking	Date: ⌘ 05/12/2003
Category:	⌘	F	Release: ⌘ R99
		Use <u>one</u> of the following categories:	Use <u>one</u> of the following releases:
		F (correction)	2 (GSM Phase 2)
		A (corresponds to a correction in an earlier release)	R96 (Release 1996)
		B (addition of feature),	R97 (Release 1997)
		C (functional modification of feature)	R98 (Release 1998)
		D (editorial modification)	R99 (Release 1999)
		Detailed explanations of the above categories can be found in 3GPP TR 21.900 .	Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	⌘	There is a discrepancy between the text and SDLs which support the text on whether a connection to the MS shall be cleared in case of timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE. In some places in 23.009, the text states "in all cases the existing connection to the MS shall not be cleared". However, the SDLs show that the call is released in case of timer expiry.
Summary of change:	⌘	Correct the text to align with the SDLs.
Consequences if not approved:	⌘	Inconsistency within the specification on whether the call is supposed to remain up on the MSC or whether it should be released. If the call is not released then resources on the MSC will remain (hung resources) even if the connection to the mobile is lost.

Clauses affected:	⌘	6.1, 6.2.2, 6.2.3.1, 9.3, 11.3												
Other specs affected:	⌘	<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;">N</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table> Other core specifications ⌘ <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;">N</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table> Test specifications <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 20px;">Y</td> <td style="width: 20px;">N</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table> O&M Specifications	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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Other comments:	⌘													

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at <http://www.3gpp.org/specs/CR.htm>. Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

***** First Proposed Change *****

6.1 Procedure for Intra-MS Handovers

The procedure for a successful External Intra-MS handover is shown in figure 7. It is assumed that selection of a candidate MS has already taken place within the BSS based upon the criteria presented in clause 5. The exact algorithm, in the BSS, for determining a candidate MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figure 2 and figure 3. The procedure described in this subclause covers case i).

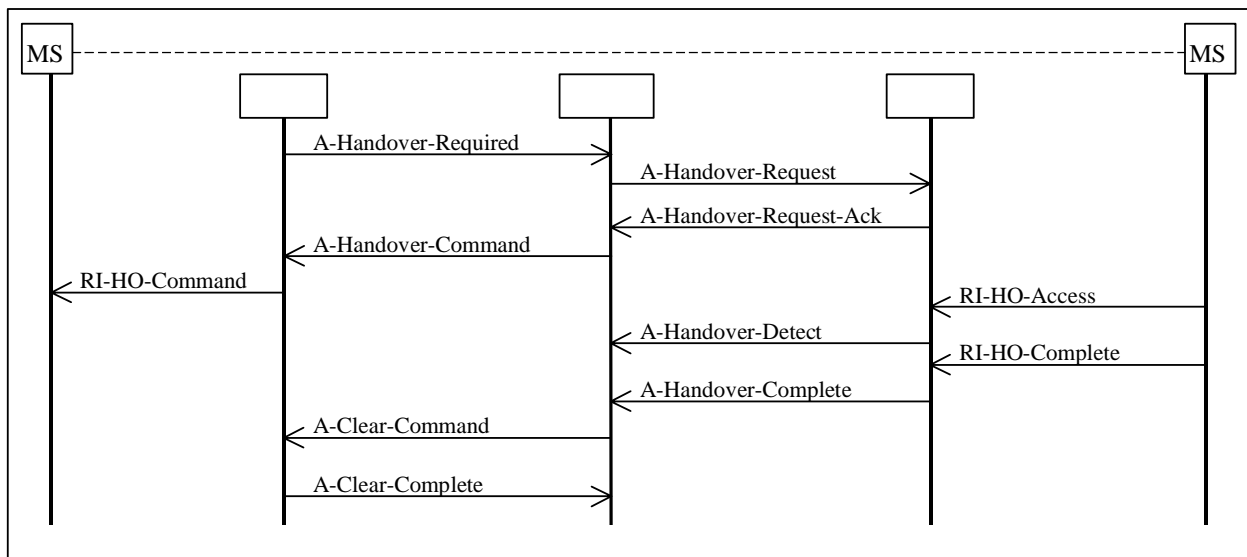


Figure 7: Basic External Intra-MS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the MS, determines that the MS requires to be handed over it will send an A-HANDOVER-REQUIRED message to the MSC (MSC-A). The A-HANDOVER-REQUIRED message shall contain a list of cells, or a single cell, to which the MS can be handed over. The list of cells shall be given in order of preference based upon operator determined criteria (These criteria are not addressed within the present document and are operator dependent). When the MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the MS to a new BSS (BSS-B). (NOTE: BSS-A and BSS-B maybe the same BSS). The MSC-A shall generate an A-HANDOVER-REQUEST message to the selected BSS (BSS-B). When BSS-B receives the A-HANDOVER-REQUEST message it shall take the necessary action to allow the MS to access the radio resource of BSS-B, this is detailed in 3GPP TS 08.58 [6] and in 3GPP TS 05.08 [4]. The switching of the radio resource through the necessary terrestrial resources is detailed in 3GPP TS 24.008 [10] and 3GPP TS 08.08 [5].

Once resource allocation has been completed by BSS-B it shall return an A-HANDOVER-REQUEST-ACK. to MSC-A. When this message is received by MSC-A it shall begin the process of instructing the MS to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND, containing a Handover Reference number previously allocated by BSS-B, to the MS. The MS will then access the new radio resource using the Handover Reference number contained in the RI-HANDOVER-ACCESS message. The number will be checked by BSS-B to ensure it is as expected and the correct MS has been captured. If this is the correct MS then the BSS-B shall send an A-HANDOVER-DETECT to MSC-A. When the MS is successfully communicating with the BSS-B a RI-HANDOVER-COMplete message will be sent by the MS to BSS-B. The BSS-B will then send an A-HANDOVER-COMplete message to MSC-A.

NOTE: The A-HANDOVER-REQUEST-ACK from BSS-B contains the complete Radio Interface message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, MSC-A transparently passes this radio interface message onto BSS-A.

After MSC-A has received the A-HANDOVER-COMPLETE message from BSS-B it shall begin to release the resources allocated on BSS-A. In figure 7 the resource is released by using the A-CLEAR-COMMAND sequence.

In the case of ongoing GSM voice group calls the clearing of resources on BSS-A shall not be used if the resources are still be used on the down link.

If a failure occurs during the handover attempt, for example A-HANDOVER-FAILURE returned from BSS-A or BSS-B, then MSC-A will terminate the handover to BSS-B. Under these conditions MSC-A may optionally take one of a number of actions:

- i) retry the handover to the same cell;
- ii) select the next cell from the list contained in the A-HANDOVER-REQUIRED message and attempt a handover to the new cell;
- iii) await the next A-HANDOVER-REQUIRED message;
- iv) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the MS shall not be cleared [except in the case of expiry of the timer for receipt of A-HANDOVER-COMPLETE](#).

During the period that the MS is not in communication with the network MSC-A shall queue all appropriate messages. All messages shall be delivered to the MS once communication is resumed. In the case of an Intra-MS handover on MSC-B then the messages shall be queued by MSC-B.

In the case of ongoing GSM voice group calls if a failure occurs when handing over a user on a dedicated channel then the procedures described above may optionally be applied.

***** Second Proposed Change *****

6.2.2 Intra-3G_MSC GSM to UMTS Handover

The procedure for a successful Intra-3G_MSC handover is shown in figure 9. It is assumed that selection of a candidate UE/MS has already taken place within the BSC based upon the criteria presented in clause 5. The exact algorithm, in the BSC, for determining a candidate UE/MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figures 4 and 6. The procedure described in this subclause covers case ii).

In case of subsequent handover the following applies. If 3G_MSC-B supports location reporting at change of Service Area and if encapsulated BSSAP signalling is used on the E-interface, 3G_MSC-B shall always initiate the Location Reporting Control procedure at change of Service Area towards the target RNS since no request for Location Reporting can be received from MSC-A. In that case, the Location Reporting Control procedure shall be initiated by 3G_MSC-B after the Relocation Resource Allocation procedure has been executed successfully.

The change of Service Area shall be reported to MSC-A within an A-HANDOVER-PERFORMED message.

In the case of ongoing voice group calls, the handover does not take place since voice group calls are not supported in UMTS.

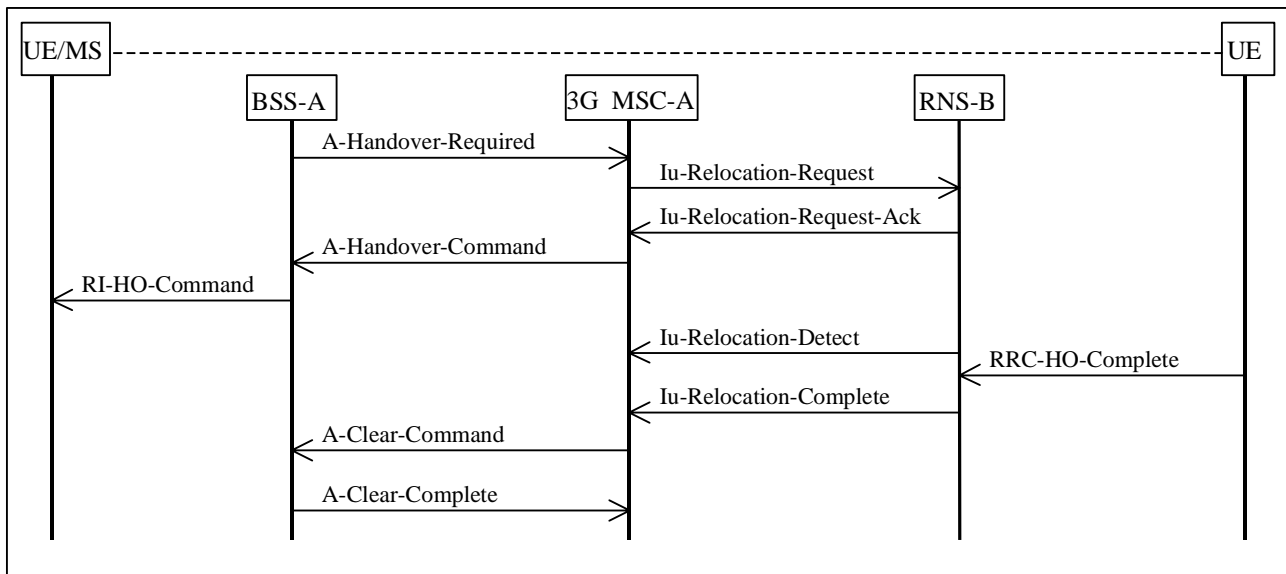


Figure 9: Basic External Intra-3G_MSC GSM to UMTS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the UE, determines that the UE requires to be handed over to UMTS it will send an A-HANDOVER-REQUIRED message to the 3G_MSC (3G_MSC-A). The A-HANDOVER-REQUIRED message shall contain a single cell, to which the UE can be handed over. When the 3G_MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the UE to a new RNS (RNS-B). The 3G_MSC-A shall generate an Iu-RELOCATION-REQUEST message to the selected RNS (RNS-B). When RNS-B receives the Iu-RELOCATION-REQUEST message it shall take the necessary action to allow the UE to access the radio resource of RNS-B, this is detailed in the 3GPP TS 25.300 series and the 3GPP TS 25.200 series of Technical Specifications. The switching of the radio resource through the necessary terrestrial resources is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B, it shall return an Iu-RELOCATION-REQUEST-ACK. to 3G_MSC-A. When this message is received by 3G_MSC-A it shall begin the process of instructing the UE to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the 3G_MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND. The UE will then access the new radio resource. On detection of the UE, the RNS-B shall send an Iu-RELOCATION-DETECT to 3G_MSC-A. When the UE is successfully communicating with the RNS-B an RRC-HANDOVER-COMplete message will be sent by the UE to RNS-B. The RNS-B will then send an Iu-RELOCATION-COMplete message to 3G_MSC-A.

NOTE: The Iu-RELOCATION-REQUEST-ACK from RNS-B contains the complete RRC message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, 3G_MSC-A transparently passes this radio interface message onto BSS-A.

After 3G_MSC-A has received the Iu-RELOCATION-COMplete message from RNS-B, it shall begin to release the resources allocated on BSS-A. In figure 9 the resource is released by using the A-CLEAR-COMMAND sequence.

If a failure occurs during the handover attempt, for example, A-HANDOVER-FAILURE returned from BSS-A or Iu-RELOCATION FAILURE returned from RNS-B, then 3G_MSC-A will terminate the handover to RNS-B. Under these conditions 3G_MSC-A may optionally take one of a number of actions:

- i) await the next A-HANDOVER-REQUIRED message;
- ii) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the UE shall not be cleared except in the case of expiry of the timer for receipt of Iu-RELOCATION-COMplete.

During the period that the UE is not in communication with the network 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC GSM to UMTS handover on 3G_MSC-B then the messages shall be queued by 3G_MSC-B.

***** Third Proposed Change *****

6.2.3.1 With no bearer or one bearer

The successful operation of the procedure is as follows. When the Serving RNS (RNS-A) makes the decision to perform the SRNS Relocation procedure it will send an IU-RELOCATION-REQUIRED message to the 3G_MSC (3G_MSC-A). The IU-RELOCATION-REQUIRED message shall contain the identifier of the target RNS to which the Relocation is to be performed. When the 3G_MSC-A receives the IU-RELOCATION-REQUIRED message it shall begin the process of relocating the serving RNS functionality to the new RNS (RNS-B). The 3G_MSC-A shall generate an IU-RELOCATION-REQUEST message to the selected RNS (RNS-B). When RNS-B receives the IU-RELOCATION-REQUEST message it shall take the necessary action to establish the new Iu transport bearers for each Radio Access Bearer related to 3G_MSC-A for the UE in question, this is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B it shall return an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-A. When this message is received by 3G_MSC-A, and 3G_MSC-A is ready for the move in Serving RNS functionality, it shall indicate the completion of the preparation phase on the core network side for the SRNS Relocation. An IU-RELOCATION-COMMAND message is sent by 3G_MSC-A to RNS-A. RNS-A acts as follows:

- i) if the procedure is a SRNS Relocation without change of radio resources, which means that the Iur interface between RNS-A and RNS-B can be used for the procedure, the RNS-A shall send IUR-SRNS-RELOCATION-COMMIT message to the RNS-B to trigger the Relocation execution. See figure 10.
- ii) if the procedure is a SRNS Relocation with change of radio resources, which means that the Iur interface between RNS-A and RNS-B is not used for the procedure, the RNS-A shall trigger the handover procedure on the air interface by sending the RRC-HANDOVER-COMMAND to the UE. The UE will then access the new radio resources. See figure 11.

NOTE: The IU-RELOCATION-REQUEST-ACKNOWLEDGE from RNS-B may optionally contain a transparent container, which is transferred by 3G_MSC-A to the RNS-A using the IU-RELOCATION-COMMAND message.

When the relocation execution trigger is received, RNS-B shall then take the necessary action to assume the role of Serving RNS and shall send an IU-RELOCATION-DETECT message to 3G_MSC-A. When the UE is successfully in communication with the RNS-B, then RNS-B shall send an IU-RELOCATION-COMplete message to 3G_MSC-A.

After 3G_MSC-A has received the IU-RELOCATION-COMplete message from RNS-B, it shall begin to release the resources associated to the RNS-A. In figures 10 and 11, the resources are released by using the IU-RELEASE-COMMAND sequence.

If a failure occurs during the SRNS Relocation attempt, then 3G_MSC-A will terminate the relocation to RNS-B. For example, if IU-RELOCATION-FAILURE is returned from RNS-B then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-PREPARATION-FAILURE to RNS-A. If IU-RELOCATION-CANCEL is returned from RNS-A, then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-CANCEL-ACKNOWLEDGE to RNS-A.

In all cases the existing connection to the UE shall not be cleared except in the case of expiry of the timer for receipt of [Iu-RELOCATION-COMplete](#).

During the period that the UE is not in communication with the network, 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC SRNS Relocation (with or without change of radio resources) on 3G_MSC-B, then the messages shall be queued by 3G_MSC-B.

***** Fourth Proposed Change *****

9.3 Handover control procedures MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 41. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message or 'I' for an ISDN/PSTN message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal A-HANDOVER-REQUIRED.

The diagram also includes queuing when there is no channel available. Calls for which handover has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover of calls within the area of MSC-A, i.e. handover case i). In this case MSC-A controls the procedures on both the previous and the new radio channel, using signals A-HANDOVER-REQUEST and A-HANDOVER-COMMAND. The handover procedure is completed when A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102](#)), the radio path and the connection on interface B' ~~are either~~ released ~~or the original connection is maintained~~.

In the case of ongoing GSM voice group calls for subsequent users of the VGCS channel uplink the original connection shall always be maintained.

For handover devices with three-party capabilities the handover device is first set up so that all interfaces A', A'' and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Handover Command is sent to the MS. The device is connected in its final position (i.e. A'' to B' for case ii)) (illustrated by the signal 'connect handover device') when A-HANDOVER-COMplete is received.

- iii) handover to MSC-B. This procedure is the one described in subclauses 7.1. and 7.2. For handover devices with three-party capabilities the handover device is set-up when MSC-A sends the Handover Command to the MS, i.e. the interfaces A', B' and B'' are then connected. The device is connected in its final position (i.e. B' to B'') when the successful procedure indication is received from functional unit 4.
- iv) subsequent handover to MSC-A. The procedure is described in subclauses 7.3. and 7.4. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMplete is received, the device is connected in its final position (i.e. B' to A').

If A-HANDOVER-COMplete is not received (expiry of timer T104), the handover device releases interface A' ~~and returns to a position where B' and B'' are connected~~.

- v) subsequent handover to a third MSC (MSC-B') . The procedure is described in subclauses 7.3. and 7.4. The handover device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent handover procedure fails.

Timers in MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail. The following timers are defined:

- T101: this timer supervises the queuing time for a free channel. If T101 expires, a no channel indication is generated, a retry procedure could be applied as described in subclause 6.1. T101 is set by O&M,
- T102: this timer supervises the time for handover completion for handover between BSSs in MSC-A. T102 is set by O&M,

- T103: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T103 expires, the handover procedure is terminated. T103 is set by O&M,
- T104: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T104 is set by O&M.

***** Fifth Proposed Change *****

11.3 Handover/Relocation control procedures 3G_MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 43. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message, 'I' for an ISDN/PSTN message or 'Iu' for an Iu-message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal Iu-RELOCATION-REQUIRED or A-HANDOVER-REQUIRED;

The diagram also includes queuing when there is no channel available. Calls for which handover/relocation has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover/relocation of calls within the area of 3G_MSC-A, i.e. handover/relocation case i);

In the handover/relocation from RNS-A/BSS-A to RNS-B/BSS-B 3G_MSC-A controls the procedures on both the previous and the new radio channel, using signals Iu-RELOCATION-REQUEST/A-HANDOVER-REQUEST and Iu-RELOCATION-COMMAND/A-HANDOVER-COMMAND. The handover/relocation procedure is completed when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102, T302, T502 or T702](#)), the radio path and the connection on interface B' ~~are either~~ [is released](#) ~~or the original connection is maintained~~.

For handover/relocation devices with three-party capabilities the device is first set up so that all interfaces Iu/'A', Iu/'A" and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Relocation Command is sent to serving RNS or Handover Command is sent to the serving BSS. The device is connected in its final position (i.e. Iu/'A" to B' for case ii)) (illustrated by the signal 'connect handover device') when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received.

- iii) relocation to 3G_MSC-B. This procedure is the one described in subclauses 8.3.1 and 8.3.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the UE, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- iv) UMTS to GSM handover to MSC-B. This procedure is the one described in subclauses 8.1.1 and 8.1.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the serving RNS, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- v) GSM to UMTS handover to 3G_MSC-B. This procedure is the one described in subclauses 8.2.1 and 8.2.2. For handover/relocation devices with three-party capabilities the device is set-up when MSC-A sends the Handover Command to the serving BSS, i.e. the interfaces A', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;

vi) subsequent relocation from 3G_MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.3.3.1 and 8.3.4.1. When a relocation to 3G_MSC-A indication is received from functional unit 4, the handover/relocation device is set up so that interfaces B', B'' and Iu' are connected (for devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T704), the handover/relocation device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

vii) subsequent GSM to UMTS handover from MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.2.3.1 and 8.2.4.1. When a handover to 3G_MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T504), the device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

viii) subsequent UMTS to GSM handover from 3G_MSC-B to MSC-A. The procedure is described in subclauses 8.1.3.1 and 8.1.4.1. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and Iu' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMPLETE is received, the device is connected in its final position (i.e. B' to A');

If A-HANDOVER-COMPLETE is not received (expiry of timer T304), the device releases interface A', ~~and returns to a position where B' and B'' are connected.~~

ix) subsequent relocation from 3G_MSC-B to a third 3G_MSC (3G_MSC-B'). The procedure is described in subclauses 8.3.4.2 and 8.3.5.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent relocation procedure fails;

x) subsequent UMTS to GSM handover from 3G_MSC-B to a third MSC (MSC-B'). The procedure is described in subclauses 8.1.3.2 and 8.1.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent UMTS to GSM handover procedure fails;

xi) subsequent GSM to UMTS handover from MSC-B to a third MSC (3G_MSC-B'). The procedure is described in subclauses 8.2.3.2 and 8.2.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent GSM to UMTS handover procedure fails.

Timers in 3G_MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail.

The following timers are defined for SRNS Relocation:

T701: this timer supervises the queuing time for a free channel for the relocation inside UMTS. If T701 expires, a no channel indication is generated and 3G_MSC-A will terminate the relocation as described in subclause 6.2.3. T701 is set by O&M;

- T702: this timer supervises the time for relocation completion for relocation between RNSs in 3G_MSC-A. T702 is set by O&M;
- T703: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T703 expires, the relocation procedure is terminated. T703 is set by O&M;
- T704: this timer supervises the time between sending of an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover/relocation device connection to 3G_MSC-B is maintained~~. T704 is set by O&M.

The following timers are defined for UMTS to GSM handover:

- T301: this timer supervises the queuing time for a free channel for the UMTS to GSM handover. If T301 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T301 is set by O&M;
- T302: this timer supervises the time for UMTS to GSM handover completion for handover from RNS to BSS in 3G_MSC-A. T302 is set by O&M;
- T303: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T303 expires, the UMTS to GSM handover procedure is terminated. T303 is set by O&M;
- T304: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T304 is set by O&M.

The following timers are defined for GSM to UMTS handover:

- T501: this timer supervises the queuing time for a free channel for the GSM to UMTS handover. If T501 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T501 is set by O&M;
- T502: this timer supervises the time for GSM to UMTS handover completion for handover from BSS to RNS in 3G_MSC-A. T502 is set by O&M;
- T503: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T503 expires, the GSM to UMTS handover procedure is terminated. T503 is set by O&M;
- T504: this timer supervises the time between sending of an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T504 is set by O&M.

***** Provided For Information *****

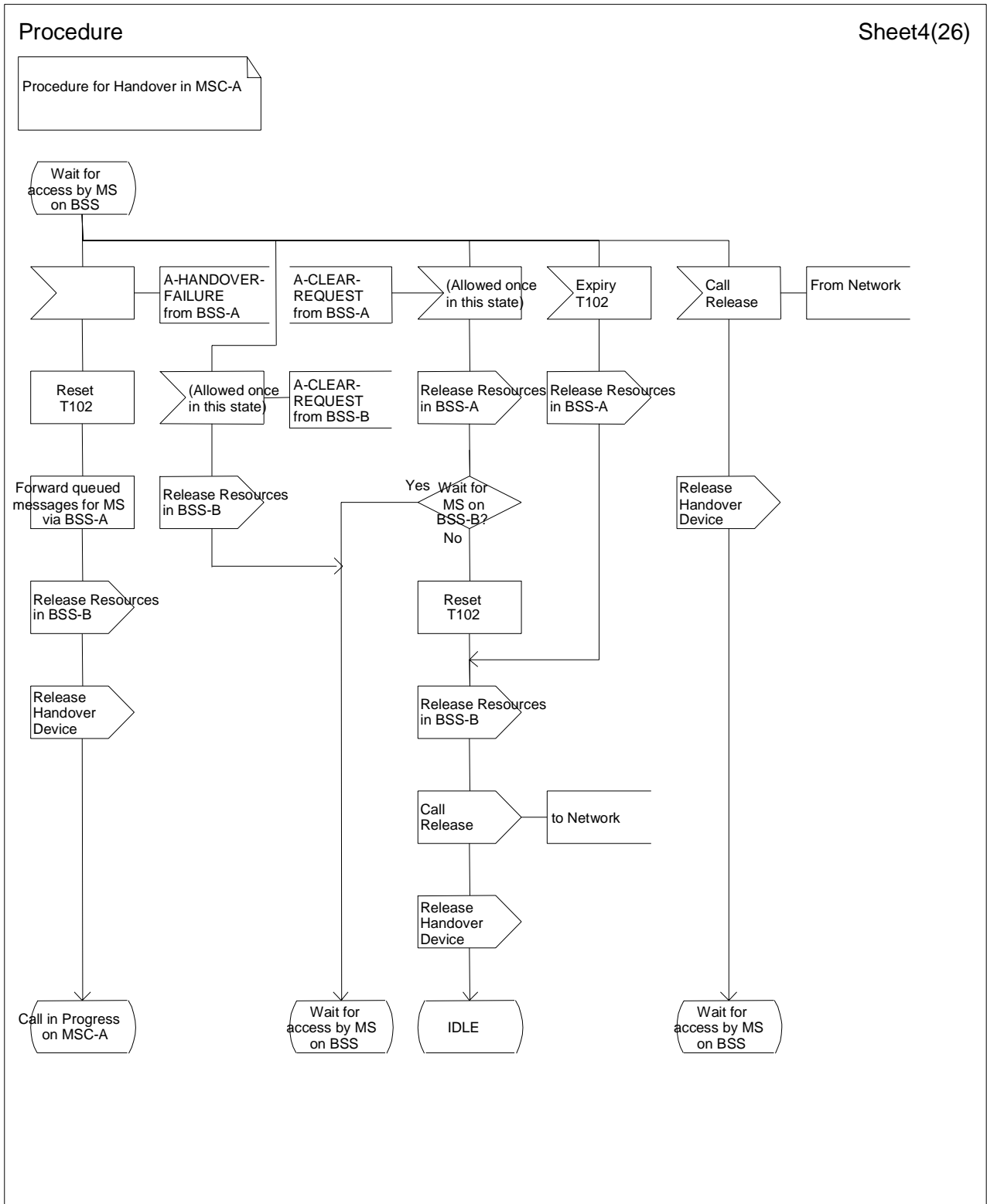


Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

Procedure for Handover in 3G_MSC-A

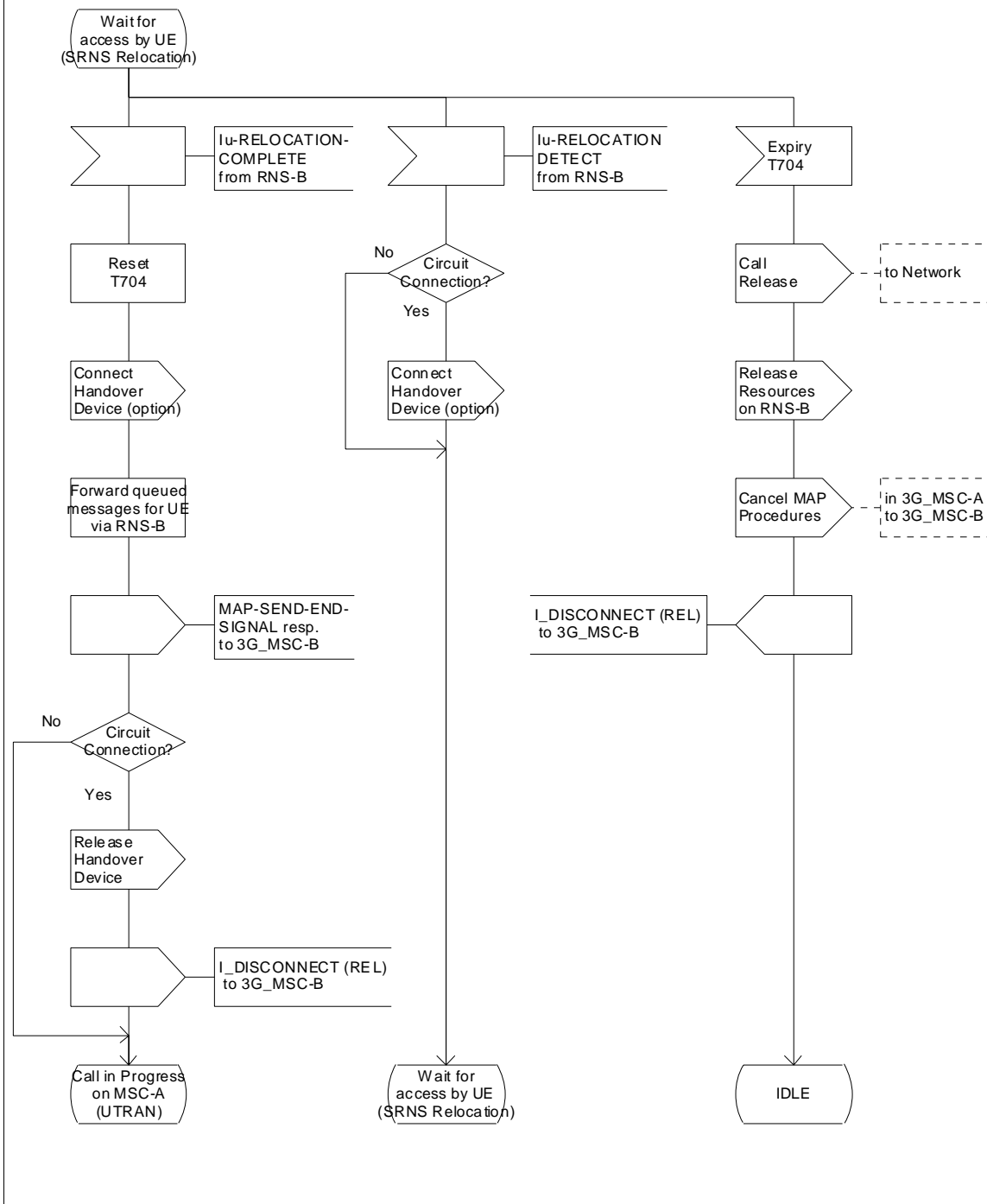


Figure 43 (sheet 64 of 78): Handover control procedure in 3G_MSC-A

CHANGE REQUEST

⌘ **23.009 CR 095** ⌘ rev **2** ⌘ Current version: **4.7.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: UICC apps ME Radio Access Network Core Network

Title:	⌘ Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE	
Source:	⌘ Nortel Networks	
Work item code:	⌘ GSM-UMTS Interworking	Date: ⌘ 05/12/2003
Category:	⌘ A Use <u>one</u> of the following categories: F (correction) A (corresponds to a correction in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .	Release: ⌘ Rel-4 Use <u>one</u> of the following releases: 2 (GSM Phase 2) R96 (Release 1996) R97 (Release 1997) R98 (Release 1998) R99 (Release 1999) Rel-4 (Release 4) Rel-5 (Release 5) Rel-6 (Release 6)

Reason for change:	⌘ There is a discrepancy between the text and SDLs which support the text on whether a connection to the MS shall be cleared in case of timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE. In some places in 23.009, the text states “in all cases the existing connection to the MS shall not be cleared”. However, the SDLs show that the call is released in case of timer expiry.
Summary of change:	⌘ Correct the text to align with the SDLs.
Consequences if not approved:	⌘ Inconsistency within the specification on whether the call is supposed to remain up on the MSC or whether it should be released. If the call is not released then resources on the MSC will remain (hung resources) even if the connection to the mobile is lost.

Clauses affected:	⌘ 6.1, 6.2.2, 6.2.3.1, 9.3, 11.3									
Other specs affected:	<table border="1"> <tr> <td>Y</td> <td>N</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	⌘ Other core specifications ⌘ Test specifications ⌘ O&M Specifications
Y	N									
<input type="checkbox"/>	<input checked="" type="checkbox"/>									
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<input type="checkbox"/>	<input checked="" type="checkbox"/>									
Other comments:	⌘									

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at <http://www.3gpp.org/specs/CR.htm>. Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

***** First Proposed Change *****

6.1 Procedure for Intra-MS Handovers

The procedure for a successful External Intra-MS handover is shown in figure 7. It is assumed that selection of a candidate MS has already taken place within the BSS based upon the criteria presented in clause 5. The exact algorithm, in the BSS, for determining a candidate MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figure 2 and figure 3. The procedure described in this subclause covers case i).

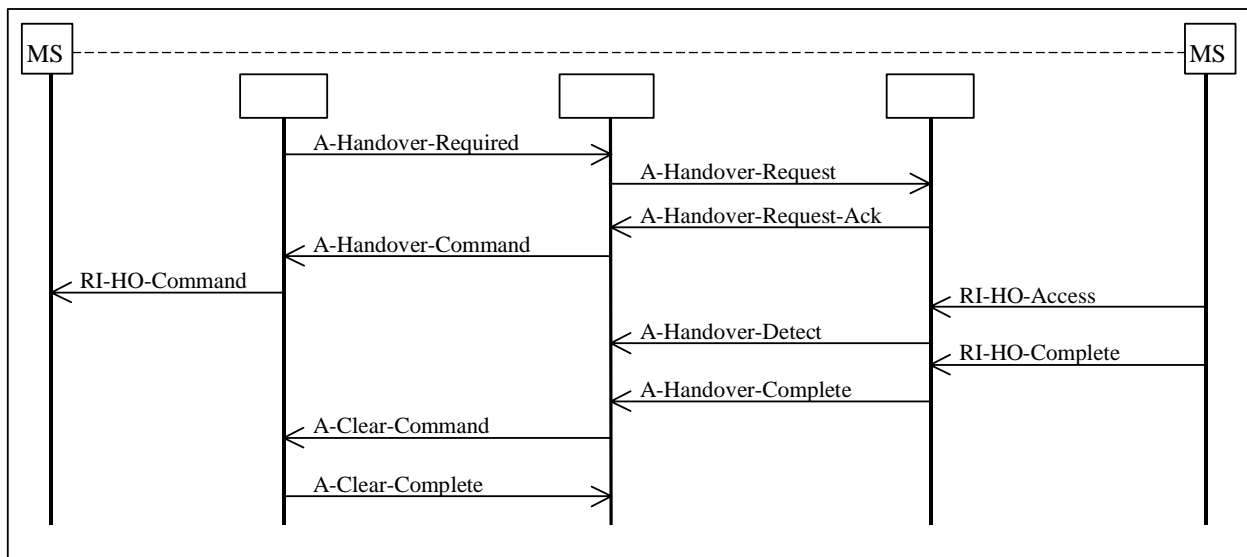


Figure 7: Basic External Intra-MS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the MS, determines that the MS requires to be handed over it will send an A-HANDOVER-REQUIRED message to the MSC (MSC-A). The A-HANDOVER-REQUIRED message shall contain a list of cells, or a single cell, to which the MS can be handed over. The list of cells shall be given in order of preference based upon operator determined criteria (These criteria are not addressed within the present document and are operator dependent). When the MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the MS to a new BSS (BSS-B). (NOTE: BSS-A and BSS-B maybe the same BSS). The MSC-A shall generate an A-HANDOVER-REQUEST message to the selected BSS (BSS-B). When BSS-B receives the A-HANDOVER-REQUEST message it shall take the necessary action to allow the MS to access the radio resource of BSS-B, this is detailed in 3GPP TS 08.58 [6] and in 3GPP TS 05.08 [4]. The switching of the radio resource through the necessary terrestrial resources is detailed in 3GPP TS 24.008 [10] and 3GPP TS 08.08 [5].

Once resource allocation has been completed by BSS-B it shall return an A-HANDOVER-REQUEST-ACK. to MSC-A. When this message is received by MSC-A it shall begin the process of instructing the MS to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND, containing a Handover Reference number previously allocated by BSS-B, to the MS. The MS will then access the new radio resource using the Handover Reference number contained in the RI-HANDOVER-ACCESS message. The number will be checked by BSS-B to ensure it is as expected and the correct MS has been captured. If this is the correct MS then the BSS-B shall send an A-HANDOVER-DETECT to MSC-A. When the MS is successfully communicating with the BSS-B a RI-HANDOVER-COMplete message will be sent by the MS to BSS-B. The BSS-B will then send an A-HANDOVER-COMplete message to MSC-A.

NOTE: The A-HANDOVER-REQUEST-ACK from BSS-B contains the complete Radio Interface message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, MSC-A transparently passes this radio interface message onto BSS-A.

After MSC-A has received the A-HANDOVER-COMPLETE message from BSS-B it shall begin to release the resources allocated on BSS-A. In figure 7 the resource is released by using the A-CLEAR-COMMAND sequence.

In the case of ongoing GSM voice group calls the clearing of resources on BSS-A shall not be used if the resources are still be used on the down link.

If a failure occurs during the handover attempt, for example A-HANDOVER-FAILURE returned from BSS-A or BSS-B, then MSC-A will terminate the handover to BSS-B. Under these conditions MSC-A may optionally take one of a number of actions:

- i) retry the handover to the same cell;
- ii) select the next cell from the list contained in the A-HANDOVER-REQUIRED message and attempt a handover to the new cell;
- iii) await the next A-HANDOVER-REQUIRED message;
- iv) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the MS shall not be cleared [except in the case of expiry of the timer for receipt of A-HANDOVER-COMPLETE](#).

During the period that the MS is not in communication with the network MSC-A shall queue all appropriate messages. All messages shall be delivered to the MS once communication is resumed. In the case of an Intra-MS handover on MSC-B then the messages shall be queued by MSC-B.

In the case of ongoing GSM voice group calls if a failure occurs when handing over a user on a dedicated channel then the procedures described above may optionally be applied.

***** Second Proposed Change *****

6.2.2 Intra-3G_MSC GSM to UMTS Handover

The procedure for a successful Intra-3G_MSC handover is shown in figure 9. It is assumed that selection of a candidate UE/MS has already taken place within the BSC based upon the criteria presented in clause 5. The exact algorithm, in the BSC, for determining a candidate UE/MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figures 4 and 6. The procedure described in this clause covers case ii).

In case of subsequent handover the following applies. If 3G_MSC-B supports location reporting at change of Service Area and if encapsulated BSSAP signalling is used on the E-interface, 3G_MSC-B shall always initiate the Location Reporting Control procedure at change of Service Area towards the target RNS since no request for Location Reporting can be received from MSC-A. In that case, the Location Reporting Control procedure shall be initiated by 3G_MSC-B after the Relocation Resource Allocation procedure has been executed successfully.

The change of Service Area shall be reported to MSC-A within an A-HANDOVER-PERFORMED message.

In the case of ongoing voice group calls, the handover does not take place since voice group calls are not supported in UMTS.

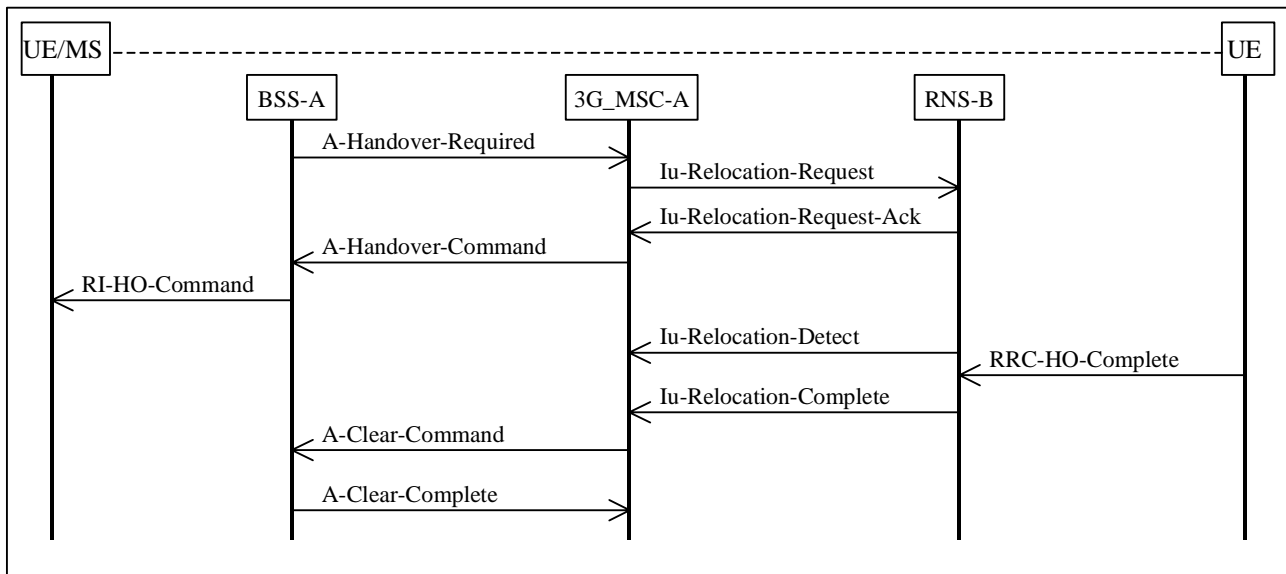


Figure 9: Basic External Intra-3G_MSC GSM to UMTS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the UE, determines that the UE requires to be handed over to UMTS it will send an A-HANDOVER-REQUIRED message to the 3G_MSC (3G_MSC-A). The A-HANDOVER-REQUIRED message shall contain a single cell, to which the UE can be handed over. When the 3G_MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the UE to a new RNS (RNS-B). The 3G_MSC-A shall generate an Iu-RELOCATION-REQUEST message to the selected RNS (RNS-B). When RNS-B receives the Iu-RELOCATION-REQUEST message it shall take the necessary action to allow the UE to access the radio resource of RNS-B, this is detailed in the 3GPP TS 25.300 series and the 3GPP TS 25.200 series of Technical Specifications. The switching of the radio resource through the necessary terrestrial resources is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B, it shall return an Iu-RELOCATION-REQUEST-ACK. to 3G_MSC-A. When this message is received by 3G_MSC-A it shall begin the process of instructing the UE to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the 3G_MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND. The UE will then access the new radio resource. On detection of the UE, the RNS-B shall send an Iu-RELOCATION-DETECT to 3G_MSC-A. When the UE is successfully communicating with the RNS-B an RRC-HANDOVER-COMplete message will be sent by the UE to RNS-B. The RNS-B will then send an Iu-RELOCATION-COMplete message to 3G_MSC-A.

NOTE: The Iu-RELOCATION-REQUEST-ACK from RNS-B contains the complete RRC message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, 3G_MSC-A transparently passes this radio interface message onto BSS-A.

After 3G_MSC-A has received the Iu-RELOCATION-COMplete message from RNS-B, it shall begin to release the resources allocated on BSS-A. In figure 9 the resource is released by using the A-CLEAR-COMMAND sequence.

If a failure occurs during the handover attempt, for example, A-HANDOVER-FAILURE returned from BSS-A or Iu-RELOCATION FAILURE returned from RNS-B, then 3G_MSC-A will terminate the handover to RNS-B. Under these conditions 3G_MSC-A may optionally take one of a number of actions:

- i) await the next A-HANDOVER-REQUIRED message;
- ii) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the UE shall not be cleared [except in the case of expiry of the timer for receipt of Iu-RELOCATION-COMplete](#).

During the period that the UE is not in communication with the network 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC GSM to UMTS handover on 3G_MSC-B then the messages shall be queued by 3G_MSC-B.

***** Third Proposed Change *****

6.2.3.1 With no bearer or one bearer

The successful operation of the procedure is as follows. When the Serving RNS (RNS-A) makes the decision to perform the SRNS Relocation procedure it will send an IU-RELOCATION-REQUIRED message to the 3G_MSC (3G_MSC-A). The IU-RELOCATION-REQUIRED message shall contain the identifier of the target RNS to which the Relocation is to be performed. When the 3G_MSC-A receives the IU-RELOCATION-REQUIRED message it shall begin the process of relocating the serving RNS functionality to the new RNS (RNS-B). The 3G_MSC-A shall generate an IU-RELOCATION-REQUEST message to the selected RNS (RNS-B). When RNS-B receives the IU-RELOCATION-REQUEST message it shall take the necessary action to establish the new Iu transport bearers for each Radio Access Bearer related to 3G_MSC-A for the UE in question, this is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B it shall return an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-A. When this message is received by 3G_MSC-A, and 3G_MSC-A is ready for the move in Serving RNS functionality, it shall indicate the completion of the preparation phase on the core network side for the SRNS Relocation. An IU-RELOCATION-COMMAND message is sent by 3G_MSC-A to RNS-A. RNS-A acts as follows:

- i) if the procedure is a SRNS Relocation without change of radio resources, which means that the Iur interface between RNS-A and RNS-B can be used for the procedure, the RNS-A shall send IUR-SRNS-RELOCATION-COMMIT message to the RNS-B to trigger the Relocation execution. See figure 10.
- ii) if the procedure is a SRNS Relocation with change of radio resources, which means that the Iur interface between RNS-A and RNS-B is not used for the procedure, the RNS-A shall trigger the handover procedure on the air interface by sending the RRC-HANDOVER-COMMAND to the UE. The UE will then access the new radio resources. See figure 11.

NOTE: The IU-RELOCATION-REQUEST-ACKNOWLEDGE from RNS-B may optionally contain a transparent container, which is transferred by 3G_MSC-A to the RNS-A using the IU-RELOCATION-COMMAND message.

When the relocation execution trigger is received, RNS-B shall then take the necessary action to assume the role of Serving RNS and shall send an IU-RELOCATION-DETECT message to 3G_MSC-A. When the UE is successfully in communication with the RNS-B, then RNS-B shall send an IU-RELOCATION-COMplete message to 3G_MSC-A.

After 3G_MSC-A has received the IU-RELOCATION-COMplete message from RNS-B, it shall begin to release the resources associated to the RNS-A. In figures 10 and 11, the resources are released by using the IU-RELEASE-COMMAND sequence.

If a failure occurs during the SRNS Relocation attempt, then 3G_MSC-A will terminate the relocation to RNS-B. For example, if IU-RELOCATION-FAILURE is returned from RNS-B then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-PREPARATION-FAILURE to RNS-A. If IU-RELOCATION-CANCEL is returned from RNS-A, then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-CANCEL-ACKNOWLEDGE to RNS-A.

In all cases the existing connection to the UE shall not be cleared [except in the case of expiry of the timer for receipt of Iu-RELOCATION-COMplete](#).

During the period that the UE is not in communication with the network, 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC SRNS Relocation (with or without change of radio resources) on 3G_MSC-B, then the messages shall be queued by 3G_MSC-B.

***** Fourth Proposed Change *****

9.3 Handover control procedures MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 41. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message or 'I' for an ISDN/PSTN message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal A-HANDOVER-REQUIRED.

The diagram also includes queuing when there is no channel available. Calls for which handover has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover of calls within the area of MSC-A, i.e. handover case i). In this case MSC-A controls the procedures on both the previous and the new radio channel, using signals A-HANDOVER-REQUEST and A-HANDOVER-COMMAND. The handover procedure is completed when A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102](#)), the radio path and the connection on interface B' ~~are either~~ released ~~or the original connection is maintained~~.

In the case of ongoing GSM voice group calls for subsequent users of the VGCS channel uplink the original connection shall always be maintained.

For handover devices with three-party capabilities the handover device is first set up so that all interfaces A', A'' and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Handover Command is sent to the MS. The device is connected in its final position (i.e. A'' to B' for case ii)) (illustrated by the signal 'connect handover device') when A-HANDOVER-COMplete is received.

- iii) handover to MSC-B. This procedure is the one described in subclauses 7.1. and 7.2. For handover devices with three-party capabilities the handover device is set-up when MSC-A sends the Handover Command to the MS, i.e. the interfaces A', B' and B'' are then connected. The device is connected in its final position (i.e. B' to B'') when the successful procedure indication is received from functional unit 4.
- iv) subsequent handover to MSC-A. The procedure is described in subclauses 7.3. and 7.4. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMplete is received, the device is connected in its final position (i.e. B' to A').

If A-HANDOVER-COMplete is not received (expiry of timer T104), the handover device releases interface A' ~~and returns to a position where B' and B'' are connected~~.

- v) subsequent handover to a third MSC (MSC-B'). The procedure is described in subclauses 7.3. and 7.4. The handover device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent handover procedure fails.

Timers in MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail. The following timers are defined:

- T101: this timer supervises the queuing time for a free channel. If T101 expires, a no channel indication is generated, a retry procedure could be applied as described in subclause 6.1. T101 is set by O&M,
- T102: this timer supervises the time for handover completion for handover between BSSs in MSC-A. T102 is set by O&M,

- T103: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T103 expires, the handover procedure is terminated. T103 is set by O&M,
- T104: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T104 is set by O&M.

***** Fifth Proposed Change *****

11.3 Handover/Relocation control procedures 3G_MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 43. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message, 'I' for an ISDN/PSTN message or 'Iu' for an Iu-message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal Iu-RELOCATION-REQUIRED or A-HANDOVER-REQUIRED;

The diagram also includes queuing when there is no channel available. Calls for which handover/relocation has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover/relocation of calls within the area of 3G_MSC-A, i.e. handover/relocation case i);

In the handover/relocation from RNS-A/BSS-A to RNS-B/BSS-B 3G_MSC-A controls the procedures on both the previous and the new radio channel, using signals Iu-RELOCATION-REQUEST/A-HANDOVER-REQUEST and Iu-RELOCATION-COMMAND/A-HANDOVER-COMMAND. The handover/relocation procedure is completed when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102, T302, T502 or T702](#)), the radio path and the connection on interface B' ~~are either~~ [is released](#) ~~or the original connection is maintained~~.

For handover/relocation devices with three-party capabilities the device is first set up so that all interfaces Iu/A', Iu"/A" and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Relocation Command is sent to serving RNS or Handover Command is sent to the serving BSS. The device is connected in its final position (i.e. Iu"/ A" to B' for case ii)) (illustrated by the signal 'connect handover device') when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received.

- iii) relocation to 3G_MSC-B. This procedure is the one described in subclauses 8.3.1 and 8.3.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the UE, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- iv) UMTS to GSM handover to MSC-B. This procedure is the one described in subclauses 8.1.1 and 8.1.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the serving RNS, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- v) GSM to UMTS handover to 3G_MSC-B. This procedure is the one described in subclauses 8.2.1 and 8.2.2. For handover/relocation devices with three-party capabilities the device is set-up when MSC-A sends the Handover Command to the serving BSS, i.e. the interfaces A', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;

vi) subsequent relocation from 3G_MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.3.3.1 and 8.3.4.1. When a relocation to 3G_MSC-A indication is received from functional unit 4, the handover/relocation device is set up so that interfaces B', B'' and Iu' are connected (for devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T704), the handover/relocation device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

vii) subsequent GSM to UMTS handover from MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.2.3.1 and 8.2.4.1. When a handover to 3G_MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T504), the device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

viii) subsequent UMTS to GSM handover from 3G_MSC-B to MSC-A. The procedure is described in subclauses 8.1.3.1 and 8.1.4.1. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and Iu' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMPLETE is received, the device is connected in its final position (i.e. B' to A');

If A-HANDOVER-COMPLETE is not received (expiry of timer T304), the device releases interface A', ~~and returns to a position where B' and B'' are connected.~~

ix) subsequent relocation from 3G_MSC-B to a third 3G_MSC (3G_MSC-B'). The procedure is described in subclauses 8.3.4.2 and 8.3.5.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent relocation procedure fails;

x) subsequent UMTS to GSM handover from 3G_MSC-B to a third MSC (MSC-B'). The procedure is described in subclauses 8.1.3.2 and 8.1.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent UMTS to GSM handover procedure fails;

xi) subsequent GSM to UMTS handover from MSC-B to a third MSC (3G_MSC-B'). The procedure is described in subclauses 8.2.3.2 and 8.2.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent GSM to UMTS handover procedure fails.

Timers in 3G_MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail.

The following timers are defined for SRNS Relocation:

T701: this timer supervises the queuing time for a free channel for the relocation inside UMTS. If T701 expires, a no channel indication is generated and 3G_MSC-A will terminate the relocation as described in subclause 6.2.3. T701 is set by O&M;

- T702: this timer supervises the time for relocation completion for relocation between RNSs in 3G_MSC-A. T702 is set by O&M;
- T703: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T703 expires, the relocation procedure is terminated. T703 is set by O&M;
- T704: this timer supervises the time between sending of an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover/relocation device connection to 3G_MSC-B is maintained~~. T704 is set by O&M.

The following timers are defined for UMTS to GSM handover:

- T301: this timer supervises the queuing time for a free channel for the UMTS to GSM handover. If T301 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T301 is set by O&M;
- T302: this timer supervises the time for UMTS to GSM handover completion for handover from RNS to BSS in 3G_MSC-A. T302 is set by O&M;
- T303: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T303 expires, the UMTS to GSM handover procedure is terminated. T303 is set by O&M;
- T304: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T304 is set by O&M.

The following timers are defined for GSM to UMTS handover:

- T501: this timer supervises the queuing time for a free channel for the GSM to UMTS handover. If T501 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T501 is set by O&M;
- T502: this timer supervises the time for GSM to UMTS handover completion for handover from BSS to RNS in 3G_MSC-A. T502 is set by O&M;
- T503: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T503 expires, the GSM to UMTS handover procedure is terminated. T503 is set by O&M;
- T504: this timer supervises the time between sending of an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T504 is set by O&M.

***** Provided For Information *****

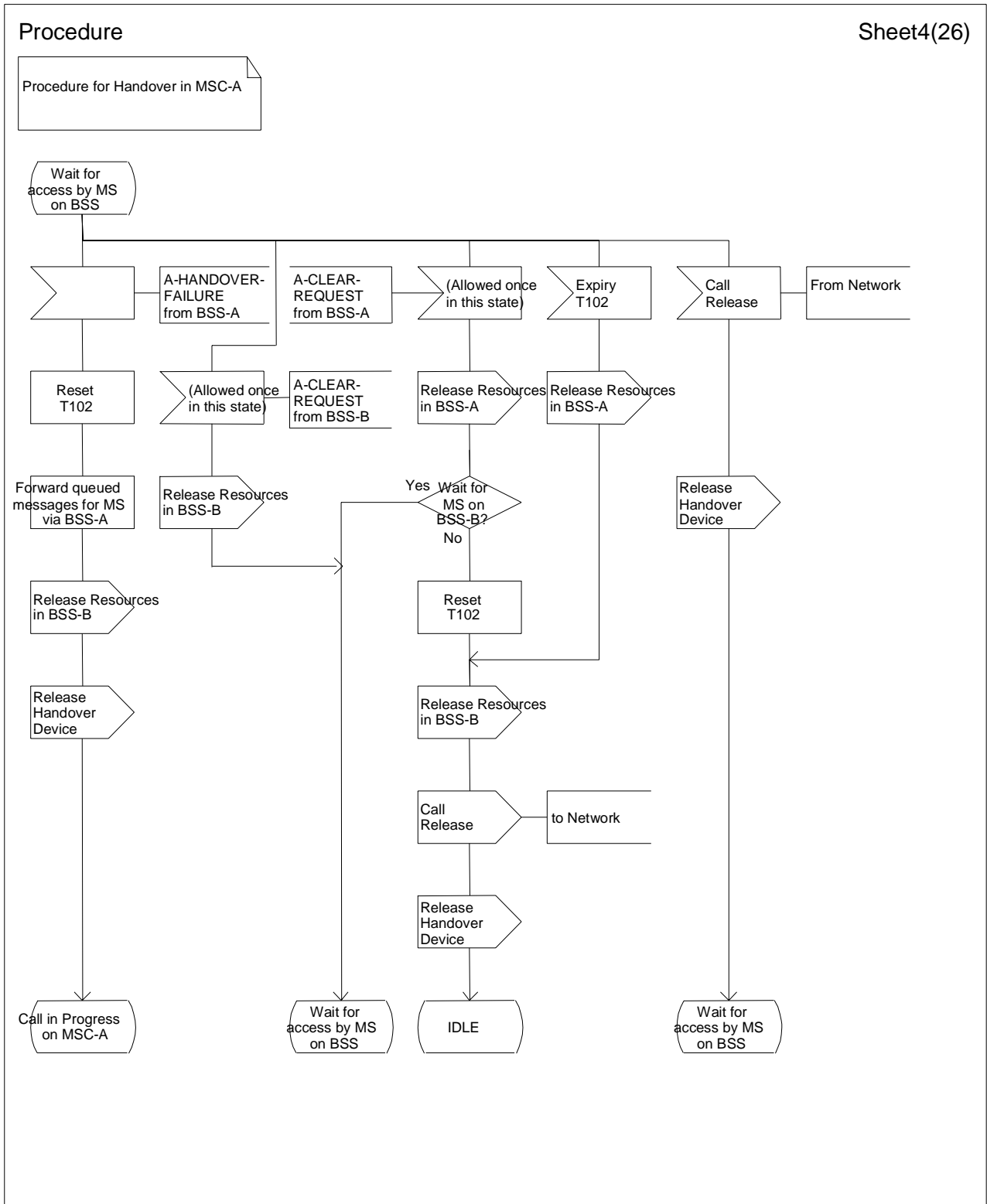


Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

Procedure for Handover in 3G_MSC-A

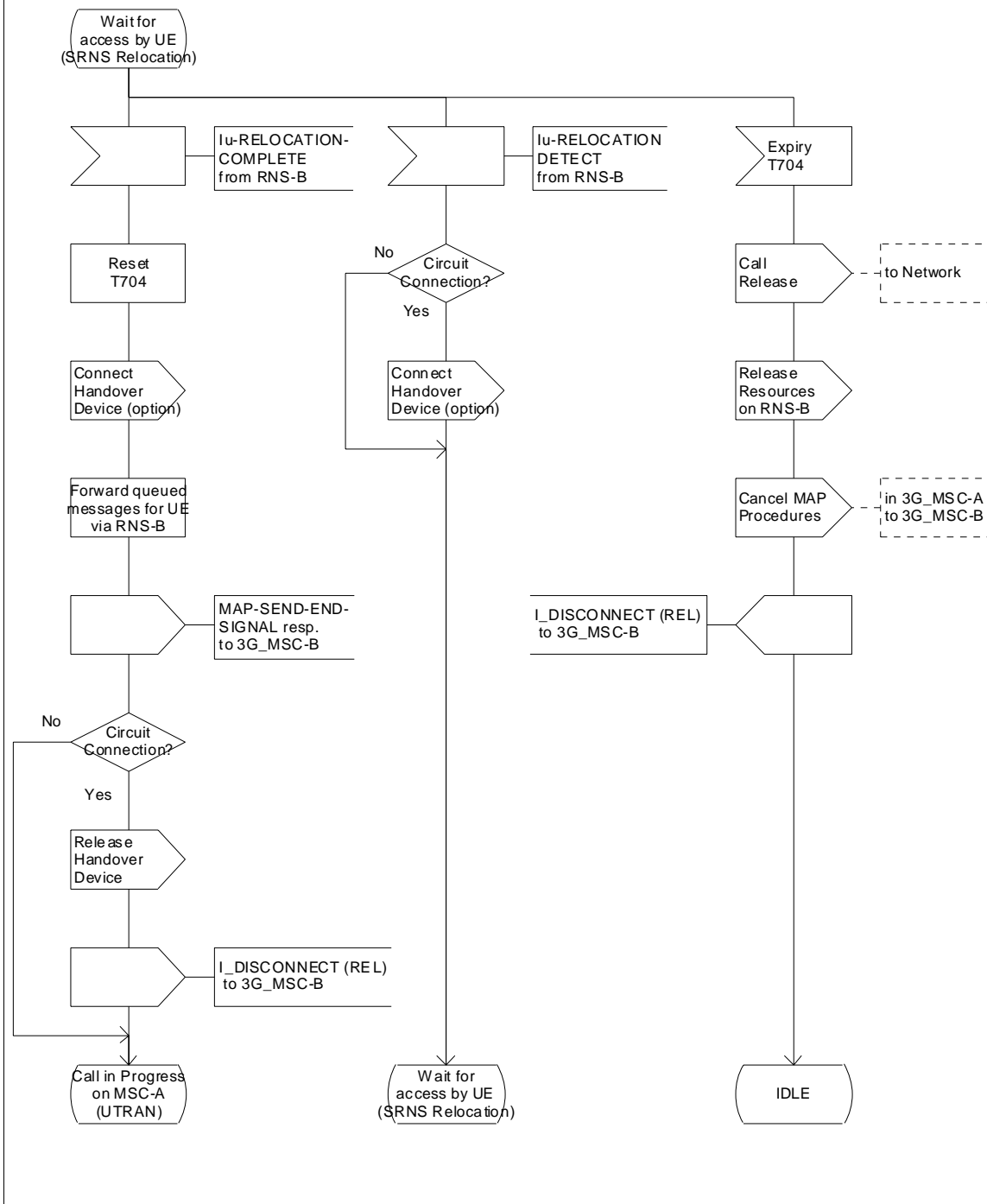


Figure 43 (sheet 64 of 78): Handover control procedure in 3G_MSC-A

CHANGE REQUEST

⌘ **23.009 CR 096** ⌘ rev **2** ⌘ Current version: **5.4.0** ⌘

For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.

Proposed change affects: UICC apps ME Radio Access Network Core Network

Title:	⌘	Correct text related to timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE
Source:	⌘	Nortel Networks
Work item code:	⌘	GSM-UMTS Interworking
		Date: ⌘ 05/12/2003
Category:	⌘	A
		Use <u>one</u> of the following categories:
		F (correction)
		A (corresponds to a correction in an earlier release)
		B (addition of feature),
		C (functional modification of feature)
		D (editorial modification)
		Detailed explanations of the above categories can be found in 3GPP TR 21.900 .
		Release: ⌘ Rel-5
		Use <u>one</u> of the following releases:
		2 (GSM Phase 2)
		R96 (Release 1996)
		R97 (Release 1997)
		R98 (Release 1998)
		R99 (Release 1999)
		Rel-4 (Release 4)
		Rel-5 (Release 5)
		Rel-6 (Release 6)

Reason for change:	⌘	There is a discrepancy between the text and SDLs which support the text on whether a connection to the MS shall be cleared in case of timer expiry for receipt of A-HANDOVER-COMPLETE / Iu-RELOCATION-COMPLETE. In some places in 23.009, the text states "in all cases the existing connection to the MS shall not be cleared". However, the SDLs show that the call is released in case of timer expiry.
Summary of change:	⌘	Correct the text to align with the SDLs.
Consequences if not approved:	⌘	Inconsistency within the specification on whether the call is supposed to remain up on the MSC or whether it should be released. If the call is not released then resources on the MSC will remain (hung resources) even if the connection to the mobile is lost.

Clauses affected:	⌘	6.1, 6.2.2, 6.2.3.1, 9.3, 11.3								
Other specs affected:	⌘	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; text-align: center;">Y</td> <td style="width: 20px; text-align: center;">N</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;">X</td> </tr> </table> Other core specifications ⌘ Test specifications ⌘ O&M Specifications ⌘	Y	N		X		X		X
Y	N									
	X									
	X									
	X									
Other comments:	⌘									

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at <http://www.3gpp.org/specs/CR.htm>. Below is a brief summary:

- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under <ftp://ftp.3gpp.org/specs/> For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
- 3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

***** First Proposed Change *****

6.1 Procedure for Intra-MS Handovers

The procedure for a successful External Intra-MS handover is shown in figure 7. It is assumed that selection of a candidate MS has already taken place within the BSS based upon the criteria presented in clause 5. The exact algorithm, in the BSS, for determining a candidate MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figure 2 and figure 3. The procedure described in this subclause covers case i).

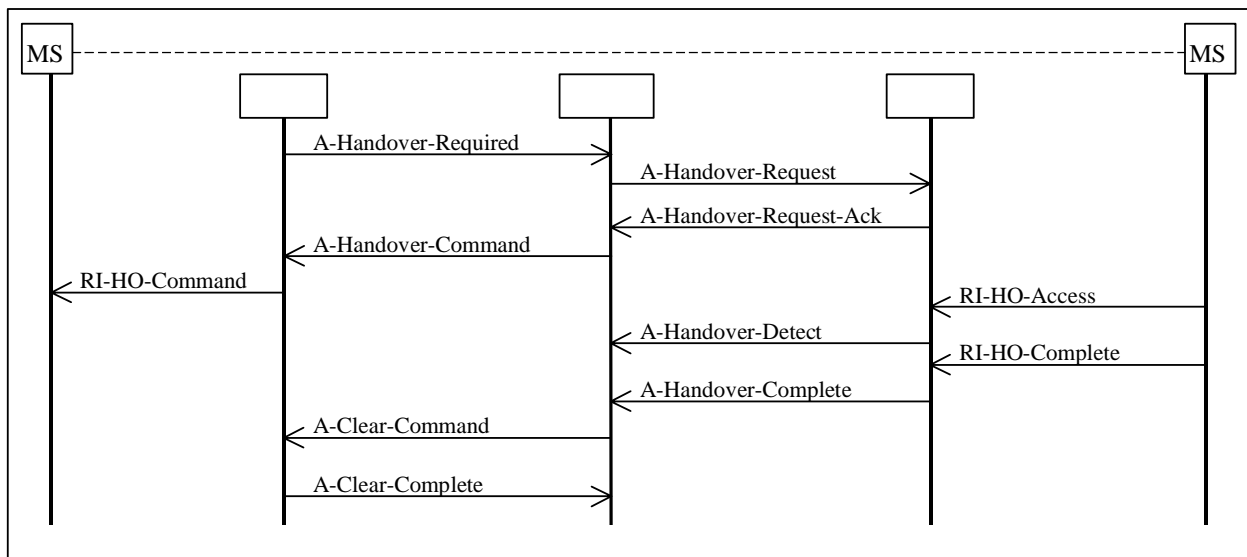


Figure 7: Basic External Intra-MS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the MS, determines that the MS requires to be handed over it will send an A-HANDOVER-REQUIRED message to the MSC (MSC-A). The A-HANDOVER-REQUIRED message shall contain a list of cells, or a single cell, to which the MS can be handed over. The list of cells shall be given in order of preference based upon operator determined criteria (These criteria are not addressed within the present document and are operator dependent). When the MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the MS to a new BSS (BSS-B). (NOTE: BSS-A and BSS-B maybe the same BSS). The MSC-A shall generate an A-HANDOVER-REQUEST message to the selected BSS (BSS-B). When BSS-B receives the A-HANDOVER-REQUEST message it shall take the necessary action to allow the MS to access the radio resource of BSS-B, this is detailed in 3GPP TS 08.58 [6] and in 3GPP TS 05.08 [4]. The switching of the radio resource through the necessary terrestrial resources is detailed in 3GPP TS 24.008 [10] and 3GPP TS 08.08 [5].

Once resource allocation has been completed by BSS-B it shall return an A-HANDOVER-REQUEST-ACK. to MSC-A. When this message is received by MSC-A it shall begin the process of instructing the MS to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND, containing a Handover Reference number previously allocated by BSS-B, to the MS. The MS will then access the new radio resource using the Handover Reference number contained in the RI-HANDOVER-ACCESS message. The number will be checked by BSS-B to ensure it is as expected and the correct MS has been captured. If this is the correct MS then the BSS-B shall send an A-HANDOVER-DETECT to MSC-A. When the MS is successfully communicating with the BSS-B a RI-HANDOVER-COMplete message will be sent by the MS to BSS-B. The BSS-B will then send an A-HANDOVER-COMplete message to MSC-A.

NOTE: The A-HANDOVER-REQUEST-ACK from BSS-B contains the complete Radio Interface message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, MSC-A transparently passes this radio interface message onto BSS-A.

After MSC-A has received the A-HANDOVER-COMPLETE message from BSS-B it shall begin to release the resources allocated on BSS-A. In figure 7 the resource is released by using the A-CLEAR-COMMAND sequence.

In the case of ongoing GSM voice group calls the clearing of resources on BSS-A shall not be used if the resources are still be used on the down link.

If a failure occurs during the handover attempt, for example A-HANDOVER-FAILURE returned from BSS-A or BSS-B, then MSC-A will terminate the handover to BSS-B. Under these conditions MSC-A may optionally take one of a number of actions:

- i) retry the handover to the same cell;
- ii) select the next cell from the list contained in the A-HANDOVER-REQUIRED message and attempt a handover to the new cell;
- iii) await the next A-HANDOVER-REQUIRED message;
- iv) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the MS shall not be cleared [except in the case of expiry of the timer for receipt of A-HANDOVER-COMPLETE](#).

During the period that the MS is not in communication with the network MSC-A shall queue all appropriate messages. All messages shall be delivered to the MS once communication is resumed. In the case of an Intra-MS handover on MSC-B then the messages shall be queued by MSC-B.

In the case of ongoing GSM voice group calls if a failure occurs when handing over a user on a dedicated channel then the procedures described above may optionally be applied.

***** Second Proposed Change *****

6.2.2 Intra-3G_MSC GSM to UMTS Handover

The procedure for a successful Intra-3G_MSC handover is shown in figure 9. It is assumed that selection of a candidate UE/MS has already taken place within the BSC based upon the criteria presented in clause 5. The exact algorithm, in the BSC, for determining a candidate UE/MS is not addressed in the present document. The procedures discussed do not make use of the Mobile Application Part (MAP), represented by signalling function 4 in figures 4 and 6. The procedure described in this clause covers case ii).

In case of subsequent handover the following applies. If 3G_MSC-B supports location reporting at change of Service Area and if encapsulated BSSAP signalling is used on the E-interface, 3G_MSC-B shall always initiate the Location Reporting Control procedure at change of Service Area towards the target RNS since no request for Location Reporting can be received from MSC-A. In that case, the Location Reporting Control procedure shall be initiated by 3G_MSC-B after the Relocation Resource Allocation procedure has been executed successfully.

The change of Service Area shall be reported to MSC-A within an A-HANDOVER-PERFORMED message.

In the case of ongoing voice group calls, the handover does not take place since voice group calls are not supported in UMTS.

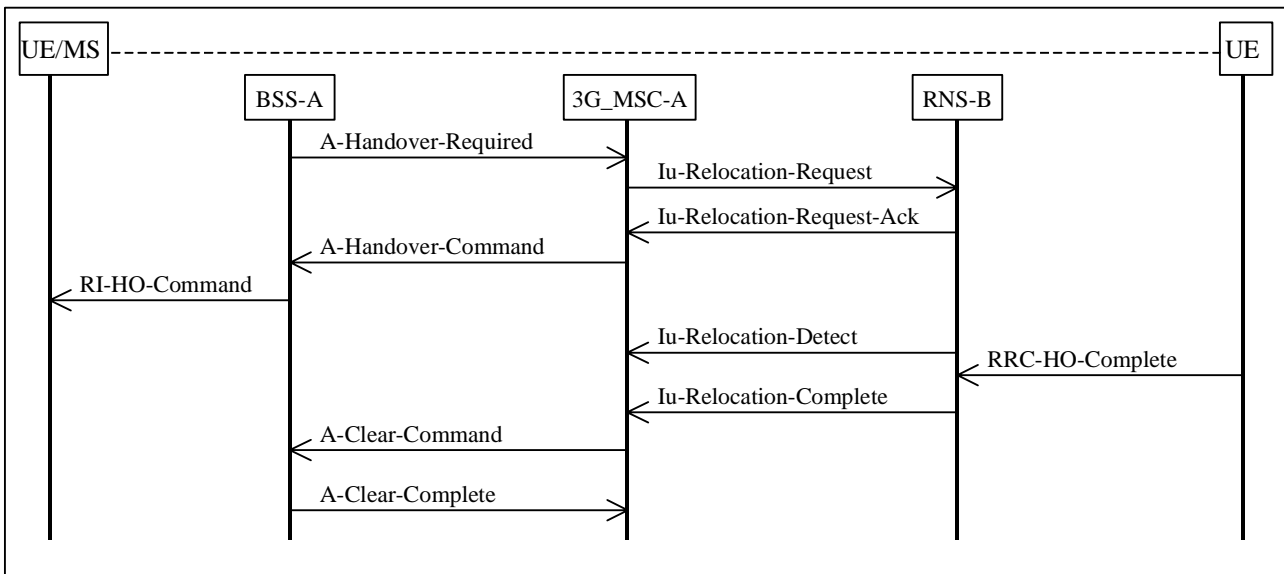


Figure 9: Basic External Intra-3G_MSC GSM to UMTS Handover Procedure

The successful operation of the procedure is as follows. When the BSS (BSS-A), currently supporting the UE, determines that the UE requires to be handed over to UMTS it will send an A-HANDOVER-REQUIRED message to the 3G_MSC (3G_MSC-A). The A-HANDOVER-REQUIRED message shall contain a single cell, to which the UE can be handed over. When the 3G_MSC-A receives the A-HANDOVER-REQUIRED message it shall begin the process of handing over the UE to a new RNS (RNS-B). The 3G_MSC-A shall generate an Iu-RELOCATION-REQUEST message to the selected RNS (RNS-B). For handover of a speech call to UTRAN Iu mode, 3G_MSC-A shall include a NAS Synch Indicator in the Iu-RELOCATION-REQUEST message. When RNS-B receives the Iu-RELOCATION-REQUEST message it shall take the necessary action to allow the UE to access the radio resource of RNS-B, this is detailed in the 3GPP TS 25.300 series and the 3GPP TS 25.200 series of Technical Specifications. The switching of the radio resource through the necessary terrestrial resources is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B, it shall return an Iu-RELOCATION-REQUEST-ACK. to 3G_MSC-A. When this message is received by 3G_MSC-A it shall begin the process of instructing the UE to tune to a new dedicated radio resource. An A-HANDOVER-COMMAND will be sent by the 3G_MSC-A to BSS-A. On receipt of the A-HANDOVER-COMMAND message BSS-A will send the radio interface message RI-HANDOVER-COMMAND. The UE will then access the new radio resource. On detection of the UE, the RNS-B shall send an Iu-RELOCATION-DETECT to 3G_MSC-A. When the UE is successfully communicating with the RNS-B an RRC-HANDOVER-COMplete message will be sent by the UE to RNS-B. The RNS-B will then send an Iu-RELOCATION-COMplete message to 3G_MSC-A.

NOTE: The Iu-RELOCATION-REQUEST-ACK from RNS-B contains the complete RRC message that shall be sent by BSS-A to the MS in the RI-HANDOVER-COMMAND, 3G_MSC-A transparently passes this radio interface message onto BSS-A.

After 3G_MSC-A has received the Iu-RELOCATION-COMplete message from RNS-B, it shall begin to release the resources allocated on BSS-A. In figure 9 the resource is released by using the A-CLEAR-COMMAND sequence.

If a failure occurs during the handover attempt, for example, A-HANDOVER-FAILURE returned from BSS-A or Iu-RELOCATION FAILURE returned from RNS-B, then 3G_MSC-A will terminate the handover to RNS-B. Under these conditions 3G_MSC-A may optionally take one of a number of actions:

- i) await the next A-HANDOVER-REQUIRED message;
- ii) send an A-HANDOVER-REQUIRED-REJECT to BSS-A, if an A-HANDOVER-COMMAND has not already been sent.

The exact action taken is dependent on whether the failure occurs before or after the A-HANDOVER-COMMAND has been sent.

In all cases the existing connection to the UE shall not be cleared [except in the case of expiry of the timer for receipt of Iu-RELOCATION-COMPLETE](#).

During the period that the UE is not in communication with the network 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC GSM to UMTS handover on 3G_MSC-B then the messages shall be queued by 3G_MSC-B.

***** Third Proposed Change *****

6.2.3.1 With no bearer or one bearer

The successful operation of the procedure is as follows. When the Serving RNS (RNS-A) makes the decision to perform the SRNS Relocation procedure it will send an IU-RELOCATION-REQUIRED message to the 3G_MSC (3G_MSC-A). The IU-RELOCATION-REQUIRED message shall contain the identifier of the target RNS to which the Relocation is to be performed. When the 3G_MSC-A receives the IU-RELOCATION-REQUIRED message it shall begin the process of relocating the serving RNS functionality to the new RNS (RNS-B). The 3G_MSC-A shall generate an IU-RELOCATION-REQUEST message to the selected RNS (RNS-B). For the relocation of a speech call to UTRAN Iu mode, 3G_MSC-A shall include the NAS Synch Indicator in the Iu-RELOCATION-REQUEST, if the codec to be used after the relocation is different from the currently used codec. When RNS-B receives the IU-RELOCATION-REQUEST message it shall take the necessary action to establish the new Iu transport bearers for each Radio Access Bearer related to 3G_MSC-A for the UE in question, this is detailed in the 3GPP TS 25.430 series and 3GPP TS 25.413 [11].

Once resource allocation has been completed by RNS-B it shall return an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-A. When this message is received by 3G_MSC-A, and 3G_MSC-A is ready for the move in Serving RNS functionality, it shall indicate the completion of the preparation phase on the core network side for the SRNS Relocation. An IU-RELOCATION-COMMAND message is sent by 3G_MSC-A to RNS-A. RNS-A acts as follows:

- i) if the procedure is a SRNS Relocation without change of radio resources, which means that the Iur interface between RNS-A and RNS-B can be used for the procedure, the RNS-A shall send IUR-SRNS-RELOCATION-COMMIT message to the RNS-B to trigger the Relocation execution. See figure 10.
- ii) if the procedure is a SRNS Relocation with change of radio resources, which means that the Iur interface between RNS-A and RNS-B is not used for the procedure, the RNS-A shall trigger the handover procedure on the air interface by sending the RRC-HANDOVER-COMMAND to the UE. The UE will then access the new radio resources. See figure 11.

NOTE: The IU-RELOCATION-REQUEST-ACKNOWLEDGE from RNS-B may optionally contain a transparent container, which is transferred by 3G_MSC-A to the RNS-A using the IU-RELOCATION-COMMAND message.

When the relocation execution trigger is received, RNS-B shall then take the necessary action to assume the role of Serving RNS and shall send an IU-RELOCATION-DETECT message to 3G_MSC-A. When the UE is successfully in communication with the RNS-B, then RNS-B shall send an IU-RELOCATION-COMPLETE message to 3G_MSC-A.

After 3G_MSC-A has received the IU-RELOCATION-COMPLETE message from RNS-B, it shall begin to release the resources associated to the RNS-A. In figures 10 and 11, the resources are released by using the IU-RELEASE-COMMAND sequence.

If a failure occurs during the SRNS Relocation attempt, then 3G_MSC-A will terminate the relocation to RNS-B. For example, if IU-RELOCATION-FAILURE is returned from RNS-B then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-PREPARATION-FAILURE to RNS-A. If IU-RELOCATION-CANCEL is returned from RNS-A, then 3G_MSC-A will terminate the relocation to RNS-B and send IU-RELOCATION-CANCEL-ACKNOWLEDGE to RNS-A.

In all cases the existing connection to the UE shall not be cleared [except in the case of expiry of the timer for receipt of Iu-RELOCATION-COMPLETE](#).

During the period that the UE is not in communication with the network, 3G_MSC-A shall queue all appropriate messages. All messages shall be delivered to the UE once communication is resumed. In the case of an Intra-3G_MSC

SRNS Relocation (with or without change of radio resources) on 3G_MSC-B, then the messages shall be queued by 3G_MSC-B.

***** Fourth Proposed Change *****

9.3 Handover control procedures MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 41. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message or 'I' for an ISDN/PSTN message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal A-HANDOVER-REQUIRED.

The diagram also includes queuing when there is no channel available. Calls for which handover has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover of calls within the area of MSC-A, i.e. handover case i). In this case MSC-A controls the procedures on both the previous and the new radio channel, using signals A-HANDOVER-REQUEST and A-HANDOVER-COMMAND. The handover procedure is completed when A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102](#)), the radio path and the connection on interface B' ~~are either~~ is released ~~or the original connection is maintained~~.

In the case of ongoing GSM voice group calls for subsequent users of the VGCS channel uplink the original connection shall always be maintained.

For handover devices with three-party capabilities the handover device is first set up so that all interfaces A', A'' and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Handover Command is sent to the MS. The device is connected in its final position (i.e. A'' to B' for case ii)) (illustrated by the signal 'connect handover device') when A-HANDOVER-COMplete is received.

- iii) handover to MSC-B. This procedure is the one described in subclauses 7.1. and 7.2. For handover devices with three-party capabilities the handover device is set-up when MSC-A sends the Handover Command to the MS, i.e. the interfaces A', B' and B'' are then connected. The device is connected in its final position (i.e. B' to B'') when the successful procedure indication is received from functional unit 4.
- iv) subsequent handover to MSC-A. The procedure is described in subclauses 7.3. and 7.4. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMplete is received, the device is connected in its final position (i.e. B' to A').

If A-HANDOVER-COMplete is not received (expiry of timer T104), the handover device releases interface A', ~~and returns to a position where B' and B'' are connected~~.

- v) subsequent handover to a third MSC (MSC-B'). The procedure is described in subclauses 7.3. and 7.4. The handover device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent handover procedure fails.

Timers in MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail. The following timers are defined:

- T101: this timer supervises the queuing time for a free channel. If T101 expires, a no channel indication is generated, a retry procedure could be applied as described in subclause 6.1. T101 is set by O&M,

- T102: this timer supervises the time for handover completion for handover between BSSs in MSC-A. T102 is set by O&M,
- T103: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T103 expires, the handover procedure is terminated. T103 is set by O&M,
- T104: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T104 is set by O&M.

***** Fifth Proposed Change *****

11.3 Handover/Relocation control procedures 3G_MSC-A (functional unit 3)

The procedures of functional unit 3 are given in terms of SDL diagrams in figure 43. To easily distinguish the interface concerned the messages received or sent from this unit are prefixed with either 'MAP' for a MAP message, 'A' for an A-Interface message, 'I' for an ISDN/PSTN message or 'Iu' for an Iu-message.

The procedures of functional unit 3 include:

- i) initiation. The initiation condition is shown by the signal Iu-RELOCATION-REQUIRED or A-HANDOVER-REQUIRED;

The diagram also includes queuing when there is no channel available. Calls for which handover/relocation has been initiated should be queued with priority higher than normal calls. They should have lower priority than emergency calls.

- ii) handover/relocation of calls within the area of 3G_MSC-A, i.e. handover/relocation case i);

In the handover/relocation from RNS-A/BSS-A to RNS-B/BSS-B 3G_MSC-A controls the procedures on both the previous and the new radio channel, using signals Iu-RELOCATION-REQUEST/A-HANDOVER-REQUEST and Iu-RELOCATION-COMMAND/A-HANDOVER-COMMAND. The handover/relocation procedure is completed when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received. If this signal is not received ([expiry of timer T102, T302, T502 or T702](#)), the radio path and the connection on interface B' ~~are either~~is released ~~or the original connection is maintained~~.

For handover/relocation devices with three-party capabilities the device is first set up so that all interfaces Iu'/A', Iu"/A" and B' are connected (illustrated by the signal 'set up handover device'). This is done when the Relocation Command is sent to serving RNS or Handover Command is sent to the serving BSS. The device is connected in its final position (i.e. Iu'/'A" to B' for case ii)) (illustrated by the signal 'connect handover device') when Iu-RELOCATION-COMplete/A-HANDOVER-COMplete is received.

- iii) relocation to 3G_MSC-B. This procedure is the one described in subclauses 8.3.1 and 8.3.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the UE, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- iv) UMTS to GSM handover to MSC-B. This procedure is the one described in subclauses 8.1.1 and 8.1.2. For handover/relocation devices with three-party capabilities the device is set-up when 3G_MSC-A sends the Relocation Command to the serving RNS, i.e. the interfaces Iu', B' and B" are then connected. The device is connected in its final position (i.e. B' to B") when the successful procedure indication is received from functional unit 4;
- v) GSM to UMTS handover to 3G_MSC-B. This procedure is the one described in subclauses 8.2.1 and 8.2.2. For handover/relocation devices with three-party capabilities the device is set-up when MSC-A sends the Handover

Command to the serving BSS, i.e. the interfaces A', B' and B'' are then connected. The device is connected in its final position (i.e. B' to B'') when the successful procedure indication is received from functional unit 4;

- vi) subsequent relocation from 3G_MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.3.3.1 and 8.3.4.1. When a relocation to 3G_MSC-A indication is received from functional unit 4, the handover/relocation device is set up so that interfaces B', B'' and Iu' are connected (for devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T704), the handover/relocation device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

- vii) subsequent GSM to UMTS handover from MSC-B to 3G_MSC-A. The procedure is described in subclauses 8.2.3.1 and 8.2.4.1. When a handover to 3G_MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and A' are connected (for handover devices with three-party capabilities). When Iu-RELOCATION-COMPLETE is received, the device is connected in its final position (i.e. B' to Iu');

If Iu-RELOCATION-COMPLETE is not received (expiry of timer T504), the device releases interface Iu', ~~and returns to a position where B' and B'' are connected.~~

- viii) subsequent UMTS to GSM handover from 3G_MSC-B to MSC-A. The procedure is described in subclauses 8.1.3.1 and 8.1.4.1. When a handover to MSC-A indication is received from functional unit 4, the handover device is set up so that interfaces B', B'' and Iu' are connected (for handover devices with three-party capabilities). When A-HANDOVER-COMPLETE is received, the device is connected in its final position (i.e. B' to A');

If A-HANDOVER-COMPLETE is not received (expiry of timer T304), the device releases interface A', ~~and returns to a position where B' and B'' are connected.~~

- ix) subsequent relocation from 3G_MSC-B to a third 3G_MSC (3G_MSC-B'). The procedure is described in subclauses 8.3.4.2 and 8.3.5.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent relocation procedure fails;
- x) subsequent UMTS to GSM handover from 3G_MSC-B to a third MSC (MSC-B'). The procedure is described in subclauses 8.1.3.2 and 8.1.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to MSC-B' has been established. 3G_MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. 3G_MSC-B is informed that all procedures in 3G_MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent UMTS to GSM handover procedure fails;
- xi) subsequent GSM to UMTS handover from MSC-B to a third MSC (3G_MSC-B'). The procedure is described in subclauses 8.2.3.2 and 8.2.4.2. The handover/relocation device is set up in its initial position, (i.e. interconnection of interfaces B', B'' and B''') when the connection to 3G_MSC-B' has been established. MSC-B is informed via functional unit 4 that the connection has been established and that the procedure on the radio path can be initiated. The device is connected in its final position (i.e. B' to B''') when a successful procedure indication is received from functional unit 4. MSC-B is informed that all procedures in MSC-B can be terminated (illustrated by the MAP-SEND-END-SIGNAL response). The device returns to the state where B' and B'' are connected if the subsequent GSM to UMTS handover procedure fails.

Timers in 3G_MSC-A.

The procedures are supervised by timers in order to avoid a deadlock when responses are not received or the procedures fail.

The following timers are defined for SRNS Relocation:

- T701: this timer supervises the queuing time for a free channel for the relocation inside UMTS. If T701 expires, a no channel indication is generated and 3G_MSC-A will terminate the relocation as described in subclause 6.2.3. T701 is set by O&M;
- T702: this timer supervises the time for relocation completion for relocation between RNSs in 3G_MSC-A. T702 is set by O&M;
- T703: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T703 expires, the relocation procedure is terminated. T703 is set by O&M;
- T704: this timer supervises the time between sending of an IU-RELOCATION-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover/relocation device connection to 3G_MSC-B is maintained~~. T704 is set by O&M.

The following timers are defined for UMTS to GSM handover:

- T301: this timer supervises the queuing time for a free channel for the UMTS to GSM handover. If T301 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T301 is set by O&M;
- T302: this timer supervises the time for UMTS to GSM handover completion for handover from RNS to BSS in 3G_MSC-A. T302 is set by O&M;
- T303: this timer supervises the time between issuing an Iu-RELOCATION-COMMAND from 3G_MSC-A and receiving a successful procedure indication from MSC-B. This timer also supervises the time between sending an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving a successful procedure indication from MSC-B'. If T303 expires, the UMTS to GSM handover procedure is terminated. T303 is set by O&M;
- T304: this timer supervises the time between sending of an A-HO-REQUEST-ACKNOWLEDGE to MSC-B and receiving the A-HANDOVER-COMplete from BSS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T304 is set by O&M.

The following timers are defined for GSM to UMTS handover:

- T501: this timer supervises the queuing time for a free channel for the GSM to UMTS handover. If T501 expires, a no channel indication is generated and 3G_MSC-A will terminate the handover as described in subclause 6.2.3. T501 is set by O&M;
- T502: this timer supervises the time for GSM to UMTS handover completion for handover from BSS to RNS in 3G_MSC-A. T502 is set by O&M;
- T503: this timer supervises the time between issuing an A-HANDOVER-COMMAND from MSC-A and receiving a successful procedure indication from 3G_MSC-B. This timer also supervises the time between sending an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving a successful procedure indication from 3G_MSC-B'. If T503 expires, the GSM to UMTS handover procedure is terminated. T503 is set by O&M;
- T504: this timer supervises the time between sending of an A-HANDOVER-REQUEST-ACKNOWLEDGE to 3G_MSC-B and receiving the Iu-RELOCATION-COMplete from RNS-B on 3G_MSC-A. If the timer expires, the new radio channel is released ~~and the existing handover device connection to MSC-B is maintained~~. T504 is set by O&M.

***** Provided For Information *****

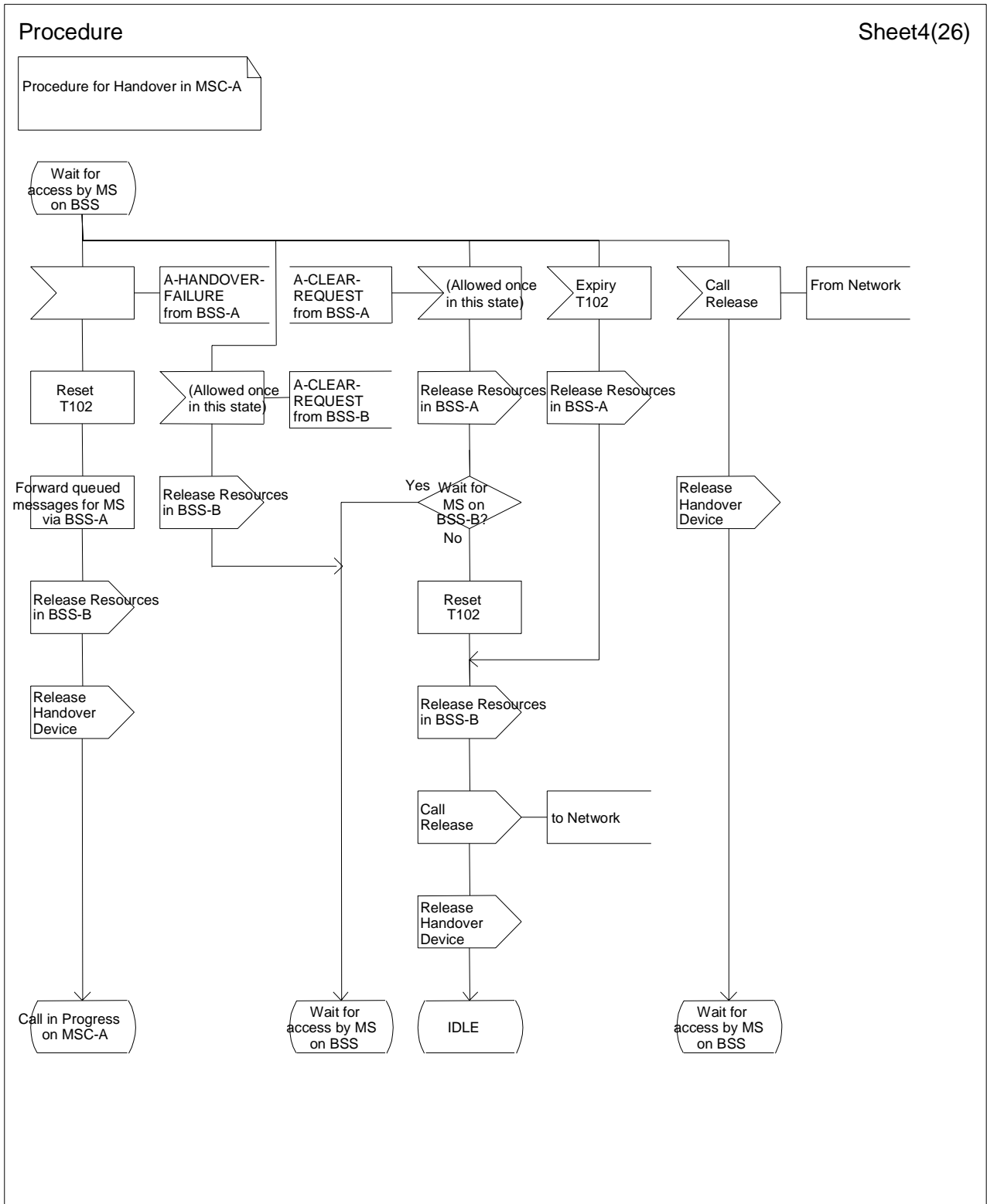


Figure 41 (Sheet 4 of 26): Handover control procedure in MSC-A

Procedure for Handover in 3G_MSC-A

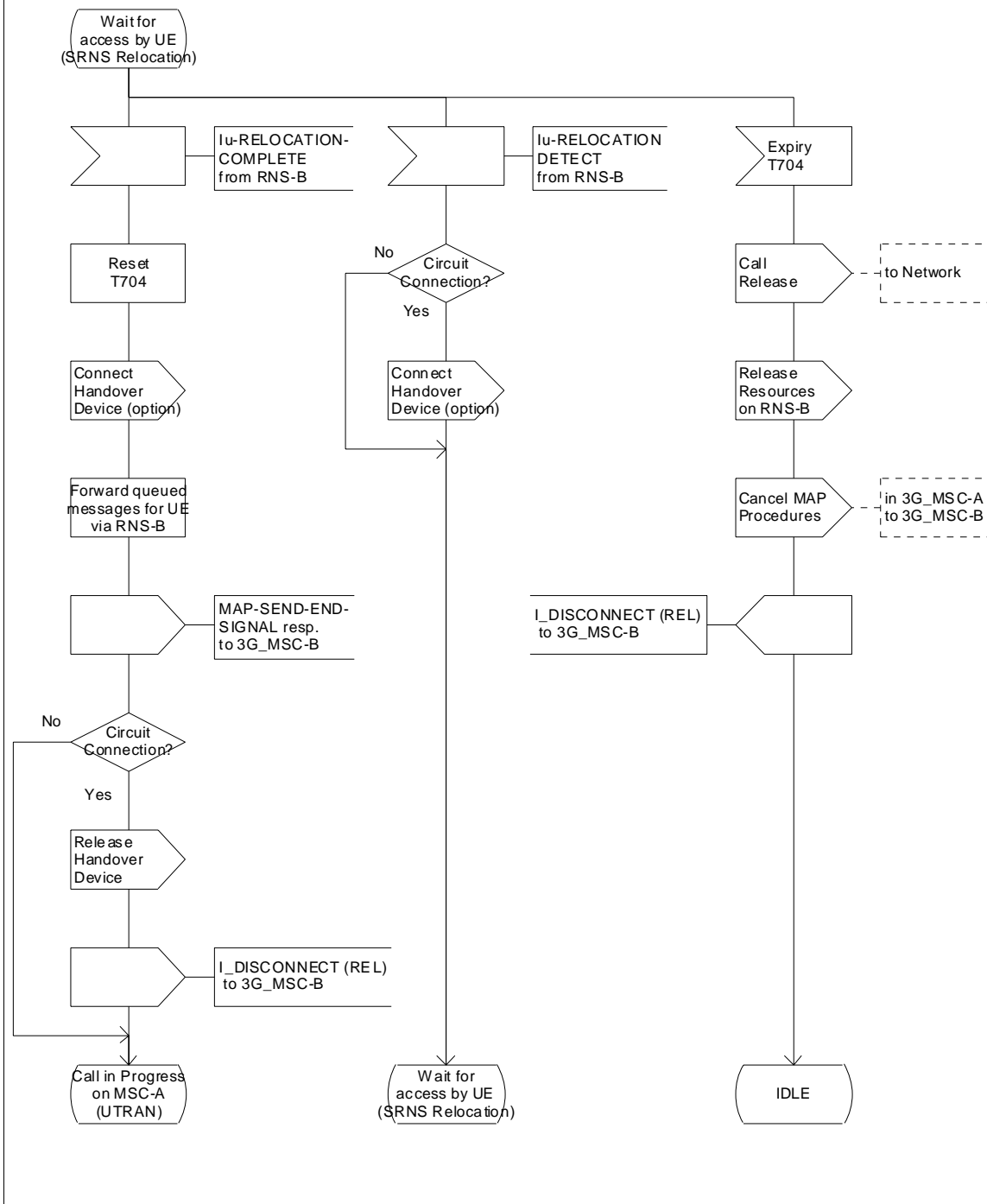


Figure 43 (sheet 64 of 78): Handover control procedure in 3G_MSC-A