

**Source:** TSG CN WG 1  
**Title:** CRs to Rel-4 (with mirror CR) and Rel-5 on Work Item TRFO-OOB towards 23.009  
**Agenda item:** 7.7  
**Document for:** APPROVAL

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**Introduction:**

This document contains 3 CRs, **Rel-5 and Rel-4 with mirror CR to Work Item " TRFO-OOB"**, that have been agreed by **TSG CN WG1**, and are forwarded to TSG CN Plenary meeting #18 for approval.

<b>Spec</b>	<b>CR #</b>	<b>Rev</b>	<b>CAT</b>	<b>Rel</b>	<b>Tdoc Title</b>	<b>Meeting</b>	<b>TDoc #</b>	<b>C_Version</b>
23.009	084	3	F	Rel-5	Inter-MSC relocation and intersystem handover for multiple codecs	N1-27	N1-022239	5.2.0
24.008	702	1	F	Rel-4	Clarification of the codec change procedure	N1-26	N1-022066	4.8.0
24.008	703	1	A	Rel-5	Clarification of the codec change procedure	N1-26	N1-022067	5.5.0

## CHANGE REQUEST

⌘ 23.009 CR 084 ⌘ rev 3 ⌘ Current version: 5.2.0 ⌘

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

<b>Title:</b>	⌘ Inter-MSC relocation and intersystem handover for multiple codecs		
<b>Source:</b>	⌘ Siemens AG		
<b>Work item code:</b>	⌘ TRFO-OOBTC	<b>Date:</b>	⌘ 30.10.2002
<b>Category:</b>	⌘ <b>F</b> Use <u>one</u> of the following categories: <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .	<b>Release:</b>	⌘ 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)

<b>Reason for change:</b>	⌘ Currently, in 23.009 there is no procedure to allow 3G_MSC-A to indicate to 3G_MSC-B the currently selected codec or available codecs, nor any means for 3G_MSC-B to select another codec and indicate this back to 3G_MSC-A. In REL5 AMR_WB is introduced which should be retained after inter-MSC handover rather than falling back to narrowband in the non-anchor if the non-anchor can support wideband. Further if for some reason the currently selected codec is not the preferred codec then it should be possible to change back to the preferred codec.  The 3G_MSC-B needs to know the set of allowed UMTS codecs due to potential subsequent intersystem handover to UMTS within 3G_MSC-B. MSC-A/3G_MSC-A needs to always know the currently used codec for subsequent relocation and charging purposes.
<b>Summary of change:</b>	⌘ In case of inter-MSC relocation/ intersystem handover, 3G_MSC-A/MSC-A shall provide 3G_MSC-B with a list of supported codecs (Available Codecs List) and the currently used codec. The first entry of the list is the “preferred” codec by the operator (this gives to the operator the flexibility to use preferred codecs whenever possible).  To allow interworking to pre-Rel-5 and Rel-5 implementations while the network is being upgraded, 3G_MSC-A shall configure the RANAP RAB parameters according to the default UMTS speech codec (UMTS AMR or UMTS AMR2). Alternatively, when interworking to a Rel-5 implementation known to support the use of the Available Codecs List, 3G_MSC-A may configure the RANAP RAB

parameters according to the preferred codec and indicate this to 3G\_MSC-B by including the new parameter RAB Configuration Indicator. The decision to use this option is based on internal configuration information in 3G\_MSC-A.

If 3G\_MSC-B supports the new MAP parameters Available Codecs List and the currently used codec, it shall select a codec from the Available Codecs List that is supported by 3G\_MSC-B and reconfigure the RANAP RAB parameters, if necessary, before sending the RANAP Relocation Request to the target RNC. If 3G\_MSC-B received the Available Codecs List from 3G\_MSC-A, then the selected codec in 3G\_MSC-B shall further be indicated back to 3G\_MSC-A in MAP-PREPARE-HANDOVER response and MAP-PROCESS-ACCESS-SIGNALING request, e.g. for possible subsequent relocation and charging purposes.

Additionally, one minor correction (in 13.4.1) is proposed related to transcoder insertion. Transcoding is always done in MSC-B, this working assumption was introduced to 23.009 in N1#13 (see Tdoc N1-000922), but somehow this chapter was not updated to reflect this decision.

For all changes, the necessary adaptations for the support of handover/relocation to GERAN lu-mode have been taken into account.

**Consequences if not approved:** ⌘ After Inter-MSC relocation only the default codec (UMTS AMR or UMTS AMR2) can be used in MSC-B.

**Clauses affected:** ⌘ 3.2, 4.4.1, 6.2.2, 6.2.3.1, 7.1, 8.1.1.1, 8.2.1, 8.3.1.1, 8.3.3.1.1, 8.3.3.2.1, 13.1, 13.2, 13.3, 13.4.1

<b>Other specs affected:</b>	⌘	<b>Y</b>	<b>N</b>	Other core specifications	⌘ 29.002
		<b>X</b>			
			<b>X</b>		
		<b>X</b>		O&M Specifications	

**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.

## 3.2 Definitions

The following terms are used in this Technical Specification:

**A/Gb mode:** mode of operation of the MS when connected to the Core Network via GERAN and the A and/or Gb interfaces. Throughout this specification the term GSM refers to GERAN A/Gb mode.

**Iu mode:** mode of operation of the MS when connected to the Core Network via GERAN or UTRAN and the Iu interface. Throughout this specification the term UMTS refers to UTRAN or GERAN Iu mode.

**Iur interface:** the logical interface between two UTRAN RNSs.

**Iur-g interface:** the logical interface between two BSSs or a BSC and an RNC and it is only considered in Iu mode.

**Currently used codec:** the codec used by the UE/MS before a handover or SRNS relocation.

**Selected codec:** the codec to be used by the UE/MS after the handover or SRNS relocation.

**Available Codecs List:** a list of codecs supported by the MS and by the core network, provided by MSC-A/3G MSC-A to 3G MSC-B during Inter-MSC handover/relocation. The Available Codecs List may contain separate list of codecs for UTRAN Iu mode and GERAN Iu mode. Within each list, the codecs are ordered in decreasing order of priority, the first entry in the list being the highest priority codec and the last entry the lowest priority codec.

**Default speech codec:** In UTRAN Iu mode the default speech codec is the UMTS AMR or UMTS AMR2 codec, dependent on the capabilities of the UE/MS. For a description of how the network determines the default UMTS speech codec, see [10], subclause 5.2.1.11. If necessary, 3G MSC-B shall use the Radio Resource Information instead of the GSM Bearer Capability, since the GSM Bearer Capability is not available in MSC-B.

In GERAN Iu mode the default speech codec is the AMR FR codec.

\*\*\* Next Modification \*\*\*

### 4.4.1 Role of 3G\_MSC-B

In the Intra-3G\_MSC handover/relocation case, the 3G\_MSC-B keeps the control of the whole Intra-3G\_MSC handover/relocation procedure. 3G\_MSC-B notifies MSC-A or 3G\_MSC-A of intra-3G\_MSC-B InterSystem handover and intra GSM handovers, by using the A-HANDOVER-PERFORMED message.

- If the security algorithms have been changed during an intra-3G MSC-B SRNS relocation; or
- if the selected codec type or codec modes have been changed during this relocation and the Available Codecs List was received by 3G\_MSC-B before,

then 3G\_MSC-B shall indicate the changed parameters, i.e. the selected UMTS algorithm(s) and/or the selected codec type and codec modes, to MSC-A or 3G\_MSC-A in the MAP-PROCESS-ACCESS-SIGNALLING request.

~~In case of intra 3G\_MSC B SRNS relocation, if security algorithms have been changed:~~Encapsulated in the MAP-PROCESS-ACCESS-SIGNALLING request 3G\_MSC-B shall send

- ~~a) an A-HANDOVER-PERFORMED message. W~~hen encapsulated BSSAP is used on the E interface; ~~or, the A-HANDOVER-PERFORMED message shall be sent.~~
- ~~b) an Iu-LOCATION-REPORT message. W~~hen encapsulated RANAP is used on the E interface, ~~the Iu-LOCATION-REPORT message shall be sent.~~

On reception of an order to perform location reporting at change of Service Area from 3G\_MSC-A, 3G\_MSC-B shall be responsible to re-issue the Iu-LOCATION-REPORTING-CONTROL message after subsequent Intra-3G\_MSC-B relocations/handovers. This shall be performed immediately after the successful completion of the Relocation Resource Allocation procedure.

~~In both cases, the selected UMTS algorithm(s) shall be indicated in the MAP-PROCESS-ACCESS-SIGNALLING request.~~

In a network implementing the "Flexible Iu interface for handover/relocation" option, in the Intra-3G\_MSC handover/relocation case, 3G\_MSC-B may optionally use a global title based on the Global RNC-Id for the addressing of the Iu interface messages towards the target RNC.

For subsequent inter-MSC handover/relocation to an area where "Intra Domain Connection of RAN Nodes to Multiple CN Nodes" is applied, 3G\_MSC-B can have multiple target CN nodes for each handover target in a pool-area as specified in 3GPP TS 23.236 [18].

The role of 3G\_MSC-B is also to provide transcoder resources. For speech calls in UMTS, 3G\_MSC-B shall select a codec from the Available Codecs List provided by MSC-A/3G\_MSC-A in the MAP-PREPARE-HANDOVER request. If the Available Codecs List was not received, 3G\_MSC-B shall select the appropriate default speech codec.

If an intra-3G\_MSC-B intersystem handover to UMTS is performed, and the Available Codecs List was received by 3G\_MSC-B during the basic inter MSC handover/relocation procedure, then 3G\_MSC-B shall indicate the selected codec to MSC-A or 3G\_MSC-A in MAP-PROCESS-ACCESS-SIGNALLING request.

In the Inter-3G\_MSC relocation case, the role of 3G\_MSC-B (3G\_MSC-B') is only to provide radio resources control within its area. This means that 3G\_MSC-B keeps control of the radio resources connection and release towards RNS-B. 3G\_MSC-B will do some processing on the RANAP information received on the E-interface or the RANAP information received on the Iu-interface whereas it will relay the Direct Transfer information transparently between Iu-interface and E-interface. 3G\_MSC-A initiates and drives RANAP procedures towards 3G\_MSC-B, while 3G\_MSC-B controls them towards its RNSs to the extent that 3G\_MSC-B is responsible for the connections of its RNSs. The release of the dedicated resources between 3G\_MSC-B and RNS-B is under the responsibility of 3G\_MSC-B and RNS-B, and is not directly controlled by 3G\_MSC-A. When clearing is to be performed due to information received from RNS-B, 3G\_MSC-B shall transfer this clearing indication to 3G\_MSC-A, to clear its connection with RNS-B, to terminate the dialogue with 3G\_MSC-A through the E-interface, and to release its circuit connection with 3G\_MSC-A, if any. In the same way, the release of the connection to its RNS-B, is initiated by 3G\_MSC-B, when the dialogue with 3G\_MSC-A ends normally and a release is received from the circuit connection with 3G\_MSC-A, if any, or when the dialogue with the 3G\_MSC-A ends abnormally.

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\*\*\* *Next Modification* \*\*\*

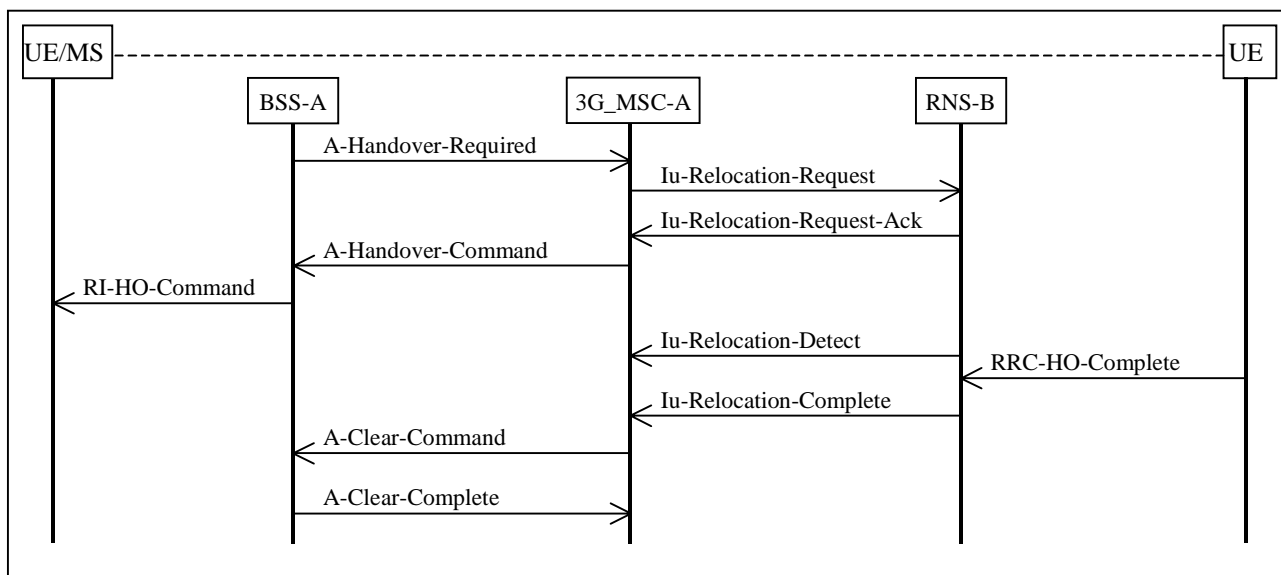
## 6.2.2 Intra-3G\_MSC GSM to UMTS Handover

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.

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.

### 6.2.3 Procedure for Intra-3G\_MSC SRNS Relocation

The procedure for a successful Intra-3G\_MSC SRNS Relocation is shown in figures 10 and 11. SRNS Relocation is used to relocate the serving RNS functionality from one RNS to another. The procedure may or may not involve change of the radio resources assigned for the corresponding UE. Whether or not the Relocation includes change of radio resources assigned for the UE does not affect the SRNS Relocation procedure in the Core Network.

In case of subsequent Intra-3G\_MSC-B SRNS relocation the following applies:

- If 3G\_MSC-B has previously received an order to perform location reporting at change of Service Area from 3G\_MSC-A and if 3G\_MSC-B also supports Location Reporting Control, it shall issue the Iu-LOCATION-REPORTING-CONTROL message towards the target RNS immediately after successful completion of relocation. Upon receipt of Iu-LOCATION-REPORT, 3G\_MSC-B shall forward it towards 3G\_MSC-A via E interface.

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.

It is assumed that selection of a candidate UE has already taken place within RNS based upon the criteria presenting in clause 5. The exact algorithm, in RNS, for determining a candidate UE is not addressed in the present document. The procedure discussed does 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).

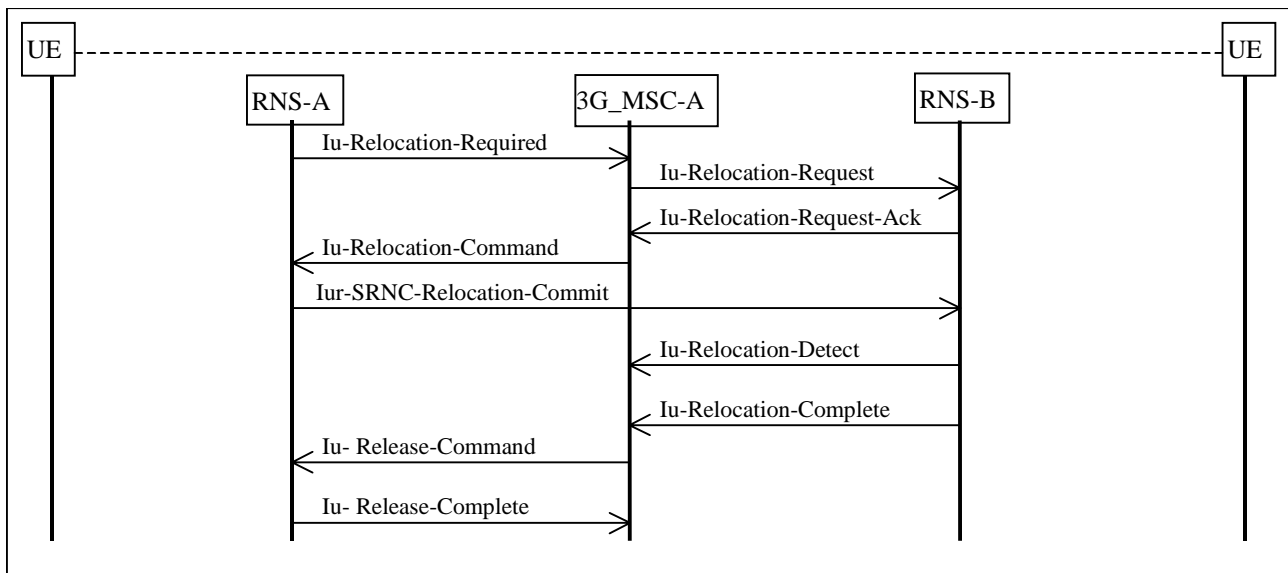
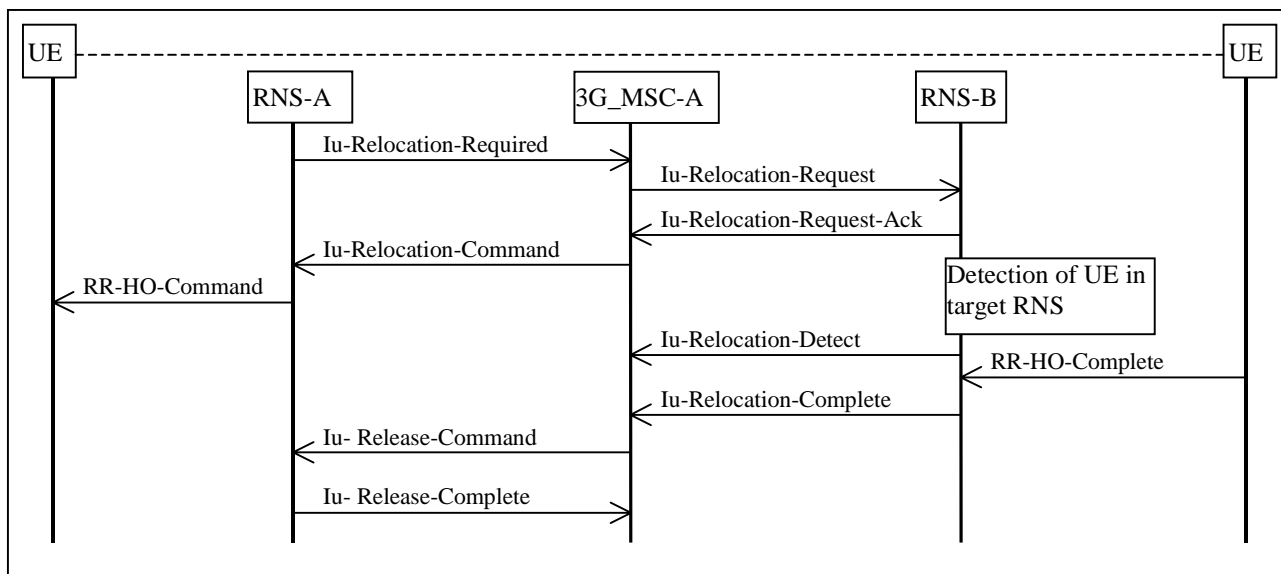


Figure 10 Basic intra-3G\_MSC SRNS Relocation Procedure



**Figure 11 Basic intra-3G\_MSC SRNS Relocation Procedure combined with hard change of radio resources (Hard Handover with switch in the Core Network)**

#### 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.

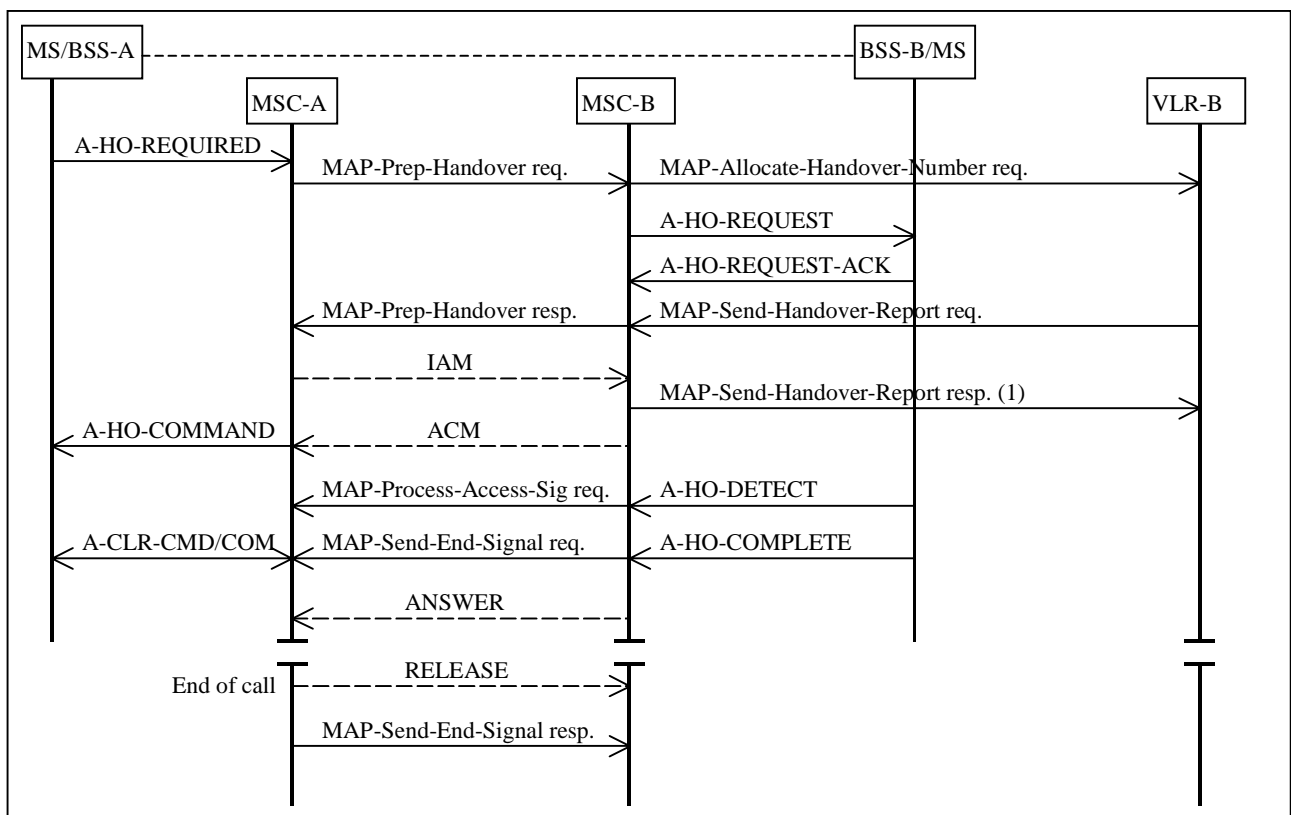
In all cases the existing connection to the UE shall not be cleared.

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.

\*\*\* *Next Modification* \*\*\*

## 7.1 Basic handover procedure requiring a circuit connection between MSC-A and MSC-B

The procedure used for successful Inter-MSC Handover is shown in figure 12. Initiation of the handover procedure is described in clause 5. The procedure described in this clause makes use of messages from the 3GPP TS 08.08 [5] and of the transport mechanism from the Mobile Application Part (MAP) (3GPP TS 29.002 [12]). After an Inter-MSC handover further Intra-MSC handovers may occur on MSC-B, these handovers will follow the procedures specified in the previous clause.



NOTE 1: Can be sent at any time after the reception of IAM.

Figure 12: Basic Handover Procedure requiring a circuit connection

The handover is initiated as described in clause 6.1. (This is represented by A-HO-REQUIRED in figure 12. Upon receipt of the A-HO-REQUIRED from BSS-A, MSC-A shall send a MAP-PREPARE-HANDOVER request to MSC-B including a complete A-HO-REQUEST message.

NOTE: MSC-A shall not send further MAP-PREPARE-HANDOVER requests while a MAP-PREPARE-HANDOVER response is pending or before any timeouts.

The MAP-PREPARE-HANDOVER request shall carry in the A-HO-REQUEST all information needed by MSC-B for allocating a radio channel, see 3GPP TS 08.08 [5]. For compatibility reasons, the MAP-PREPARE-HANDOVER request will also identify the cell to which the call is to be handed over. [For speech calls, MSC-A shall also include the Available Codecs List to be used by MSC-B for subsequent intra-MSC-B intersystem handover to UMTS and intra-MSC-B SRNS relocation.](#) MSC-B will return the MAP-PREPARE-HANDOVER response after having retrieved a Handover Number from its associated VLR (exchange of the messages MAP-allocate-handover-number request and MAP-send-handover-report request). The Handover Number shall be used for routing the connection of the call from MSC-A to MSC-B. If a traffic channel is available in MSC-B the MAP-PREPARE-HANDOVER response, sent to MSC-A will contain the complete A-HO-REQUEST-ACKNOWLEDGE message received from BSS-B, containing the radio resources definition to be sent by BSS-A to the MS and possible extra BSSMAP information, amended by MSC-B due to the possible interworking between the BSSMAP protocol carried on the E-interface and the BSSMAP protocol used on the A-interface. If the traffic channel allocation is queued by BSS-B, the A-QUEUING-INDICATION may optionally be sent back to MSC-A. The further traffic channel allocation result (A-HO-REQUEST-ACK or A-HO-FAILURE) will be transferred to MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. If the traffic channel allocation is not possible, the MAP-PREPARE-HANDOVER response containing an A-HO-FAILURE will be sent to MSC-A. MSC-B will do the same if a fault is detected on the identity of the cell where the call has to be handed over. MSC-B simply reports the events related to the dialogue. It is up to MSC-A to decide the action to perform if it receives negative responses or the operation fails due to the expiry of the MAP-PREPARE-HANDOVER timer.

If an error related to the TCAP dialogue or to the MAP-PREPARE-HANDOVER request is returned from MSC-B, this will be indicated to MSC-A and MSC-A will terminate the handover attempt. MSC-A may retry the handover attempt using the cell identity list, if provided, or may reject the handover attempt towards BSS-A. The existing connection to the MS shall not be cleared.

When the A-HO-REQUEST-ACKNOWLEDGE has been received, MSC-A shall establish a circuit between MSC-A and MSC-B by signalling procedures supported by the network. In figure 12 this is illustrated by the messages IAM (Initial Address Message) and ACM (Address Complete Message) of Signalling System no 7. MSC-B awaits the capturing of the MS (clause 6.1) on the radio path when the ACM is sent and MSC-A initiates the handover execution when ACM is received (illustrated by the A-HO-COMMAND and described in the clause 6.1).

MSC-B transfers to MSC-A the acknowledgement received from the correct MS (A-HO-DETECT/A-HO-COMplete). The A-HO-DETECT, if received, is transferred to MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. The A-HO-COMplete, when received from the correct MS, is included in the MAP-SEND-END-SIGNAL request and sent back to MSC-A. The circuit is through-connected in MSC-A when the A-HO-DETECT or the A-HO-COMplete is received from MSC-B. The old radio channel is released when the A-HO-COMplete message is received from MSC-B. The sending of the MAP-SEND-END-SIGNAL request starts the MAP supervision timer for the MAP dialogue between MSC-A and MSC-B. When the MAP-SEND-END-SIGNAL request including the A-HO-COMplete message is received in MSC-A the resources in BSS-A shall be cleared.

In order not to conflict with the PSTN/ISDN signalling system(s) used between MSC-A and MSC-B, MSC-B must generate an answer signal when A-HO-DETECT/COMPLETE is received.

MSC-B shall release the Handover Number when the circuit between MSC-A and MSC-B has been established.

If the circuit between MSC-A and MSC-B cannot be established (e.g. an unsuccessful backward message is received instead of ACM). MSC-A terminates the inter-MSC handover attempt by sending an appropriate MAP message, for example an ABORT. MSC-A may retry the handover at this point, see clause 6.1.

MSC-A shall retain overall call control until the call is cleared by the fixed subscriber or the MS and there is no further call control functions to be performed (e.g. servicing waiting calls, echo cancellers).

When MSC-A clears the call to the MS it also clears the call control functions in MSC-A and sends the MAP-SEND-END-SIGNAL response to release the MAP resources in MSC-B.

MSC-A may terminate the procedure at any time by sending an appropriate MAP message to MSC-B. If establishment of the circuit between MSC-A and MSC-B has been initiated, the circuit must also be cleared.

The handover will be aborted by MSC-A if it detects clearing or interruption of the radio path before the call has been established on MSC-B.

**\*\*\* Next Modification \*\*\***

#### 8.1.1.1 With one circuit connection

The UMTS to GSM handover is initiated as described in clause 6.2.1. (This is represented by Iu-RELOCATION-REQUIRED in figure 18). Upon receipt of the Iu-RELOCATION-REQUIRED from RNS-A, 3G\_MSC-A shall send a MAP-PREPARE-HANDOVER request to MSC-B including a complete A-HO-REQUEST message.

NOTE: 3G\_MSC-A shall not send further MAP-PREPARE-HANDOVER requests while a MAP-PREPARE-HANDOVER response is pending or before any timeouts.

The MAP-PREPARE-HANDOVER request shall carry in the A-HO-REQUEST all information needed by MSC-B for allocating a radio channel, see 3GPP TS 08.08. For compatibility reasons, the MAP-PREPARE-HANDOVER request will also identify the cell to which the call is to be handed over. [For speech calls, 3G\\_MSC-A shall also include the Available Codecs List to be used by MSC-B for subsequent intra-MSC-B intersystem handover to UMTS and intra-MSC-B SRNS relocation.](#) MSC-B will return the MAP-PREPARE-HANDOVER response after having retrieved a Handover Number from its associated VLR (exchange of the messages MAP-allocate-handover-number request and MAP-send-handover-report request). The Handover Number shall be used for routing the connection of the call from 3G\_MSC-A to MSC-B. If a traffic channel is available in MSC-B the MAP-PREPARE-HANDOVER response, sent to 3G\_MSC-A will contain the complete A-HO-REQUEST-ACKNOWLEDGE message received from BSS-B, containing the radio resources definition to be sent by RNS-A to the UE/MS and possible extra BSSMAP information, amended by MSC-B due to the possible interworking between the BSSMAP protocol carried on the E-interface and the BSSMAP protocol used on the A-interface. If the traffic channel allocation is queued by BSS-B, the A-QUEUING-INDICATION may optionally be sent back to 3G\_MSC-A. The further traffic channel allocation result (A-HO-REQUEST-ACK or A-HO-FAILURE) will be transferred to 3G\_MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. If the traffic channel allocation is not possible, the MAP-PREPARE-HANDOVER response containing an A-HO-FAILURE will be sent to 3G\_MSC-A. MSC-B will do the same if a fault is detected on the identity of the cell where the call has to be handed over. MSC-B simply reports the events related to the dialogue. It is up to 3G\_MSC-A to decide the action to perform if it receives negative responses or the operation fails due to the expiry of the MAP-PREPARE-HANDOVER timer.

If an error related to the TCAP dialogue or to the MAP-PREPARE-HANDOVER request is returned from MSC-B, this will be indicated to 3G\_MSC-A and 3G\_MSC-A will terminate the handover attempt. 3G\_MSC-A rejects the handover attempt towards RNS-A. The existing connection to the UE/MS shall not be cleared.

When the A-HO-REQUEST-ACKNOWLEDGE has been received, 3G\_MSC-A shall establish a circuit between 3G\_MSC-A and MSC-B by signalling procedures supported by the network. In figure 18 this is illustrated by the messages IAM (Initial Address Message) and ACM (Address Complete Message) of Signalling System no 7. MSC-B awaits the capturing of the UE/MS (clause 6.2.1) on the radio path when the ACM is sent and 3G\_MSC-A initiates the UMTS to GSM handover execution when ACM is received (illustrated by the Iu-RELOCATION-COMMAND and described in the clause 6.2.1). 3G\_MSC-A removes the transcoder from the path to the other party. As handover to GSM means that a transcoder is inserted in the BSS-B then G.711 [16] is assumed on the E-interface.

MSC-B transfers to 3G\_MSC-A the acknowledgement received from the correct UE/MS (A-HO-DETECT/A-HO-COMplete). The A-HO-DETECT, if received, is transferred to 3G\_MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. The A-HO-COMplete, when received from the correct UE/MS, is included in the MAP-SEND-END-SIGNAL request and sent back to 3G\_MSC-A. The circuit is through connected in 3G\_MSC-A when the A-HO-DETECT or the A-HO-COMplete is received from MSC-B. The old radio channel is released when the A-HO-COMplete message is received from MSC-B. The sending of the MAP-SEND-END-SIGNAL request starts the MAP supervision timer for the MAP dialogue between 3G\_MSC-A and MSC-B. When the MAP-SEND-END-SIGNAL request including the A-HO-COMplete message is received in 3G\_MSC-A, the resources in RNS-A shall be cleared.

In order not to conflict with the PSTN/ISDN signalling system(s) used between 3G\_MSC-A and MSC-B, MSC-B must generate an answer signal when A-HO-DETECT/COMPLETE is received.

MSC-B shall release the Handover Number when the circuit between 3G\_MSC-A and MSC-B has been established.

If the circuit between 3G\_MSC-A and MSC-B cannot be established, (e.g. an unsuccessful backward message is received instead of ACM), 3G\_MSC-A terminates the inter-3G\_MSC UMTS to GSM handover attempt by sending an appropriate MAP message, for example an ABORT.

3G\_MSC-A shall retain overall call control until the call is cleared by the fixed subscriber or the UE/MS and there is no further call control functions to be performed (e.g. servicing waiting calls, echo cancellers).

When 3G\_MSC-A clears the call to the UE/MS it also clears the call control functions in 3G\_MSC-A and sends the MAP-SEND-END-SIGNAL response to release the MAP resources in MSC-B.

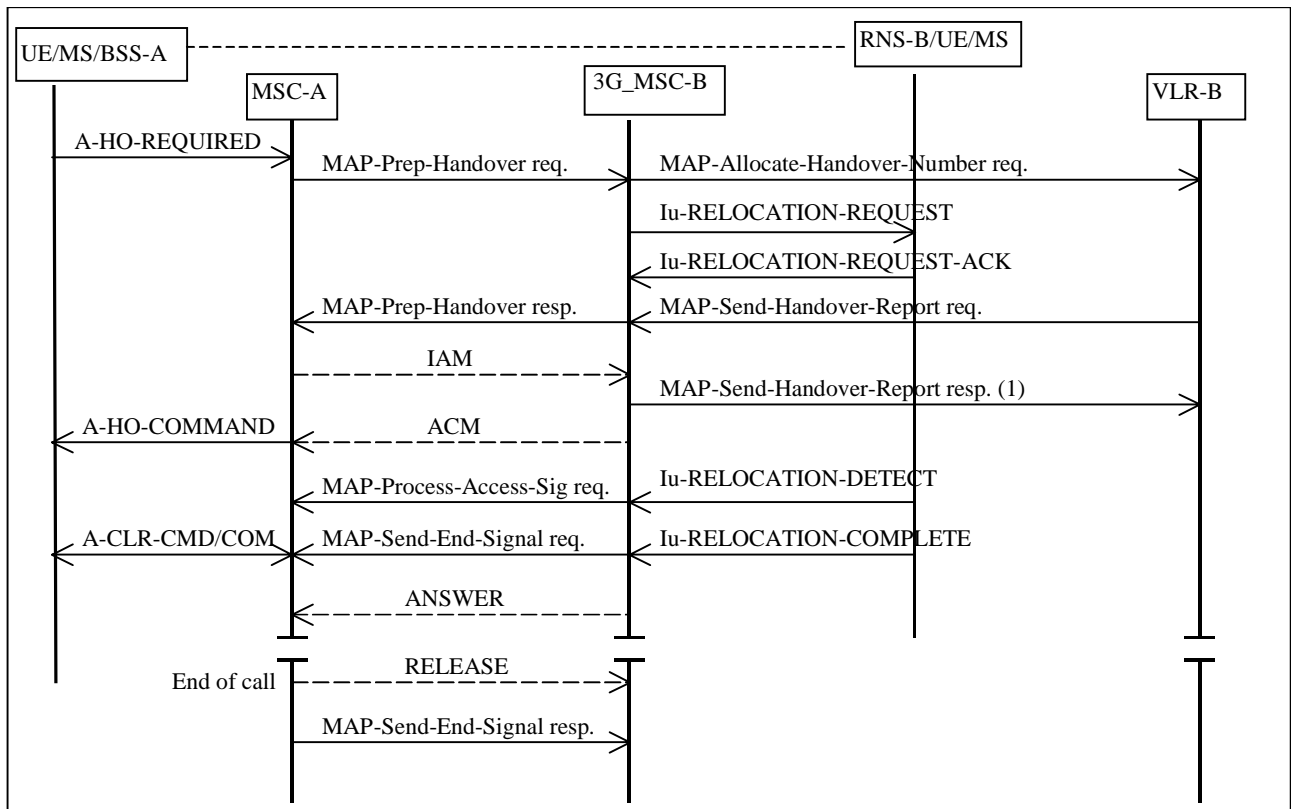
3G\_MSC-A may terminate the procedure at any time by sending an appropriate MAP message to MSC-B. If establishment of the circuit between 3G\_MSC-A and MSC-B has been initiated, the circuit must also be cleared.

The UMTS to GSM handover will be aborted by 3G\_MSC-A if it detects clearing or interruption of the radio path before the call has been established on MSC-B.

\*\*\* *Next Modification* \*\*\*

### 8.2.1 Basic Handover procedure requiring a circuit connection between MSC-A and 3G\_MSC-B

The procedure used for successful Inter-3G\_MSC Handover from GSM to UMTS is shown in figure 24. Initiation of the GSM to UMTS handover procedure is described in clause 5. The procedure described in this clause makes use of messages from the 3GPP TS 08.08 [5], 3GPP TS 25.413 [11] and of the transport mechanism from the Mobile Application Part (MAP) (3GPP TS 29.002 [12]). After an Inter-3G\_MSC handover further Intra-3G\_MSC handovers may occur on 3G\_MSC-B, these handovers will follow the procedures specified in the previous clauses.



NOTE 1: Can be sent at any time after the reception of IAM.

**Figure 24: Basic GSM to UMTS Handover Procedure requiring a circuit connection**

The GSM to UMTS handover is initiated as described in clause 6.2.2. (This is represented by A-HO-REQUIRED in figure 24). Upon receipt of the A-HO-REQUIRED from BSS-A, MSC-A shall send a MAP-PREPARE-HANDOVER request to 3G\_MSC-B including a complete A-HO-REQUEST message.

NOTE: MSC-A shall not send further MAP-PREPARE-HANDOVER requests while a MAP-PREPARE-HANDOVER response is pending or before any timeouts.

The MAP-PREPARE-HANDOVER request shall carry in the A-HO-REQUEST all information needed by 3G\_MSC-B for allocating radio resources in RNS-B, see 3GPP TS 08.08 [5].

The MAP-PREPARE-HANDOVER request shall also carry the identity of the target RNS to which the call is to be handed over, see 3GPP TS 29.002 [12]. 3G\_MSC-B will return the MAP-PREPARE-HANDOVER response after having retrieved a Handover Number from its associated VLR (exchange of the messages MAP-allocate-handover-number request and MAP-send-handover-report request). The Handover Number shall be used for routing the connection of the call from MSC-A to 3G\_MSC-B.

For speech calls, 3G\_MSC-B shall select a codec from the Available Codecs List, generate associated RAB parameters and connect a transcoder. ~~3G\_MSC-B inserts a transcoder as G711 is assumed between 2G\_MSC and 3G\_MSC-B. If the Available Codecs List was not received, 3G\_MSC-B shall select the appropriate default speech codec.~~

For handover to UTRAN Iu mode, 3G\_MSC-B shall also generate a NAS Synch Indicator for the Iu-RELOCATION-REQUEST message. If the Available Codecs List was received by 3G\_MSC-B, then the selected codec shall be indicated in the MAP-PREPARE-HANDOVER response, sent from 3G\_MSC-B to MSC-A.

If radio resources are available in RNS-B the MAP-PREPARE-HANDOVER response, ~~sent to MSC-A from 3G\_MSC-B~~ will contain the complete A-HO-REQUEST-ACK message generated from the Iu-RELOCATION-REQUEST-ACK received from RNS-B, containing the radio resources definition to be sent by BSS-A to the UE/MS. If the radio resource allocation is not possible, the MAP-PREPARE-HANDOVER response containing an A-HO-FAILURE will be sent to MSC-A. 3G\_MSC-B will do the same if a fault is detected on the identity of the cell where the call has to be handed over. 3G\_MSC-B simply reports the events related to the dialogue. It is up to MSC-A to decide the action to perform if it receives negative responses or the operation fails due to the expiry of the MAP-PREPARE-HANDOVER timer.

If an error related to the TCAP dialogue or to the MAP-PREPARE-HANDOVER request is returned from 3G\_MSC-B, this will be indicated to MSC-A and MSC-A will terminate the handover attempt. MSC-A shall reject the handover attempt towards BSS-A. The existing connection to the UE/MS shall not be cleared.

When the A-HO-REQUEST-ACK has been received, MSC-A shall establish a circuit between MSC-A and 3G\_MSC-B by signalling procedures supported by the network. In figure 24 this is illustrated by the messages IAM (Initial Address Message) and ACM (Address Complete Message) of Signalling System no 7. 3G\_MSC-B awaits the capturing of the UE/MS (clause 6.2.2) on the radio path when the ACM is sent and MSC-A initiates the handover execution when ACM is received (illustrated by the A-HO-COMMAND and described in the clause 6.2.2).

3G\_MSC-B transfers to MSC-A the acknowledgement received from the correct UE/MS (A-HO-DETECT/A-HO-COMplete). The Iu-RELOCATION-DETECT, if received, is converted to A-HO-DETECT and transferred to MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. The Iu-RELOCATION-COMplete, when received from the correct UE/MS, is converted to A-HO-COMplete and included in the MAP-SEND-END-SIGNAL request and sent back to MSC-A. The circuit is through-connected in MSC-A when the A-HO-DETECT or the A-HO-COMplete is received from 3G\_MSC-B. The old radio channel is released when the A-HO-COMplete message is received from 3G\_MSC-B. The sending of the MAP-SEND-END-SIGNAL request starts the MAP supervision timer for the MAP dialogue between MSC-A and 3G\_MSC-B. When the MAP-SEND-END-SIGNAL request including the A-HO-COMplete message is received in MSC-A the resources in BSS-A shall be cleared.

In order not to conflict with the PSTN/ISDN signalling system(s) used between MSC-A and 3G\_MSC-B, 3G\_MSC-B must generate an answer signal when Iu-RELOCATION-DETECT/COMplete is received.

3G\_MSC-B shall release the Handover Number when the circuit between MSC-A and 3G\_MSC-B has been established.

If the circuit between MSC-A and 3G\_MSC-B cannot be established (e.g. an unsuccessful backward message is received instead of ACM). MSC-A terminates the inter3G\_MSC handover attempt by sending an appropriate MAP message, for example an ABORT.

MSC-A shall retain overall call control until the call is cleared by the fixed subscriber or the UE/MS and there is no further call control functions to be performed (e.g. servicing waiting calls, echo cancellers).

When MSC-A clears the call to the UE/MS it also clears the call control functions in MSC-A and sends the MAP-SEND-END-SIGNAL response to release the MAP resources in 3G\_MSC-B.

MSC-A may terminate the procedure at any time by sending an appropriate MAP message to 3G\_MSC-B. If establishment of the circuit between MSC-A and 3G\_MSC-B has been initiated, the circuit must also be cleared.

The GSM to UMTS handover will be aborted by MSC-A if it detects clearing or interruption of the radio path before the call has been established on 3G\_MSC-B.

\*\*\* *Next Modification* \*\*\*

### 8.3.1.1 With one circuit connection

The relocation is initiated as described in clause 6.2.3. (This is represented by IU-RELOC-REQUIRED in figure 30). Upon receipt of the IU-RELOC-REQUIRED from RNS-A, 3G\_MSC-A shall send a MAP-PREPARE-HANDOVER request to 3G\_MSC-B including a complete IU-RELOC-REQUEST message. (NOTE: 3G\_MSC-A shall not send further MAP-PREPARE-HANDOVER requests while a MAP-PREPARE-HANDOVER response is pending or before any timeouts). The MAP-PREPARE-HANDOVER request shall carry in the IU-RELOC-REQUEST all information needed by 3G\_MSC-B for allocating radio resources in the case of SRNS relocation without Iur interface, see 3GPP TS 25.413 [11].

For speech calls, 3G\_MSC-A shall include the currently used codec and the Available Codecs List in the MAP-PREPARE-HANDOVER request. 3G\_MSC-A shall configure the RANAP RAB parameters according to the ~~current selected codec~~ appropriate default speech codec. For a relocation to UTRAN Iu mode, if this codec is different from the currently used codec, 3G\_MSC-A shall also include the NAS Synch Indicator for the default speech codec in the IU-RELOCATION-REQUEST.

Alternatively, if 3G\_MSC-B is known to support the use of the Available Codecs List, 3G\_MSC-A may configure the RANAP RAB parameters according to the preferred codec and indicate this to 3G\_MSC-B by including the RAB configuration indicator in the MAP-PREPARE-HANDOVER request. For a relocation to UTRAN Iu mode, if the preferred codec is different from the currently used codec, 3G\_MSC-A shall also include the NAS Synch Indicator for the preferred codec in the IU-RELOCATION-REQUEST. The decision to use this option is based on internal configuration information in 3G\_MSC-A.

MAP-PREPARE-HANDOVER request shall also carry the identity of the target RNS to which the call is to be relocated, see 3GPP TS 29.002. 3G\_MSC-B will return the MAP-PREPARE-HANDOVER response after having retrieved one or several Handover Numbers from its associated VLR (exchange of the messages MAP-allocate-handover-number request and MAP-send-handover-report request); ~~3G\_MSC-B shall connect a transcoder.~~ The Handover Numbers shall be used for routing the connections of the calls from 3G\_MSC-A to 3G\_MSC-B.

For speech calls, 3G\_MSC-B shall select a codec from the Available Codecs List and connect a transcoder. If the Available Codecs List was not received, 3G\_MSC-B shall select the appropriate default speech codec.

3G\_MSC-B shall reconfigure the RANAP RAB parameters according to the selected codec.

- if the RAB configuration indicator is included in the MAP-PREPARE-HANDOVER request and the codec selected by 3G\_MSC-B is different from the preferred codec; or
- if the RAB configuration indicator is not included in the MAP-PREPARE-HANDOVER request and the codec selected by 3G\_MSC-B is different from the appropriate default speech codec.

Additionally, for a relocation to UTRAN Iu mode, if the selected codec is different from the currently used codec, 3G\_MSC-B shall include the NAS Synch Indicator for the selected codec in the IU-RELOCATION-REQUEST. If the Available Codecs List was received by 3G\_MSC-B, then the selected codec shall be indicated in the MAP-PREPARE-HANDOVER response, sent from 3G\_MSC-B to 3G\_MSC-A.

If radio resources are available in 3G\_MSC-B, the MAP-PREPARE-HANDOVER response ~~sent to 3G\_MSC-A~~ will contain the complete IU-RELOC-REQUEST-ACKNOWLEDGE message received from RNS-B, containing the radio resources definition to be sent by RNS-A to the UE (in case of relocation without Iur interface) and possible extra RANAP information, amended by 3G\_MSC-B due to the possible interworking between the RANAP protocol carried on the E-interface and the RANAP protocol used on the Iu-interface. If the radio resource allocation is not possible, the MAP-PREPARE-HANDOVER response containing an IU-RELOCATION-FAILURE will be sent to 3G\_MSC-A. 3G\_MSC-B will do the same if a fault is detected on the identity of the RNS where the call has to be relocated. 3G\_MSC-B simply reports the events related to the dialogue. It is up to 3G\_MSC-A to decide the action to perform if it receives negative responses or the operation fails due to the expiry of the MAP-PREPARE-HANDOVER timer.

If an error related to the TCAP dialogue or to the MAP-PREPARE-HANDOVER request is returned from 3G\_MSC-B, this will be indicated to 3G\_MSC-A and 3G\_MSC-A will terminate the relocation attempt. The existing connection to the UE shall not be cleared.

When the IU-RELOC-REQUEST-ACKNOWLEDGE has been received, 3G\_MSC-A shall establish a circuit between 3G\_MSC-A and 3G\_MSC-B by signalling procedures supported by the network. In figure 30 this is illustrated by the messages IAM (Initial Address Message) and ACM (Address Complete Message) of Signalling System no 7. 3G\_MSC-B awaits the capturing of the UE (clause 6.2.3) on the radio path when the ACM is sent and 3G\_MSC-A initiates the relocation execution when ACM is received (illustrated by the IU-RELOC-COMMAND and described in the clause 6.2.3). 3G\_MSC-A shall remove the transcoder between the MSC and other party.

3G\_MSC-B transfers to 3G\_MSC-A the acknowledgement received from the correct UE (IU-RELOC-DETECT/IU-RELOC-COMLETE). The IU-RELOC-DETECT, if received, is transferred to 3G\_MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. The IU-RELOC-COMLETE, when received from the correct UE, is included in the MAP-SEND-END-SIGNAL request and sent back to 3G\_MSC-A. The circuit is through connected in 3G\_MSC-A when the IU-RELOC-DETECT or the IU-RELOC-COMLETE is received from 3G\_MSC-B. The old radio resources are released when the IU-RELOC-COMLETE message is received from 3G\_MSC-B. The sending of the MAP-SEND-END-SIGNAL request starts the MAP supervision timer for the MAP dialogue between 3G\_MSC-A and 3G\_MSC-B. When the MAP-SEND-END-SIGNAL request including the IU-RELOC-COMLETE message is received in 3G\_MSC-A, the resources in RNS-A shall be released.

In order not to conflict with the PSTN/ISDN signalling system(s) used between 3G\_MSC-A and 3G\_MSC-B, 3G\_MSC-B must generate an answer signal when IU-RELOC-DETECT/COMPLETE is received.

3G\_MSC-B shall release the Handover Number when the circuit between 3G\_MSC-A and 3G\_MSC-B has been established.

If the circuit between 3G\_MSC-A and 3G\_MSC-B cannot be established, (e.g. an unsuccessful backward message is received instead of ACM) 3G\_MSC-A terminates the inter-3G\_MSC relocation attempt by sending an appropriate MAP message, for example an ABORT.

3G\_MSC-A shall retain overall call control until the call is cleared by the fixed subscriber or the UE and there is no further call control functions to be performed (e.g. servicing waiting calls, echo cancellers).

When 3G\_MSC-A clears the call to the UE it also clears the call control functions in 3G\_MSC-A and sends the MAP-SEND-END-SIGNAL response to release the MAP resources in 3G\_MSC-B.

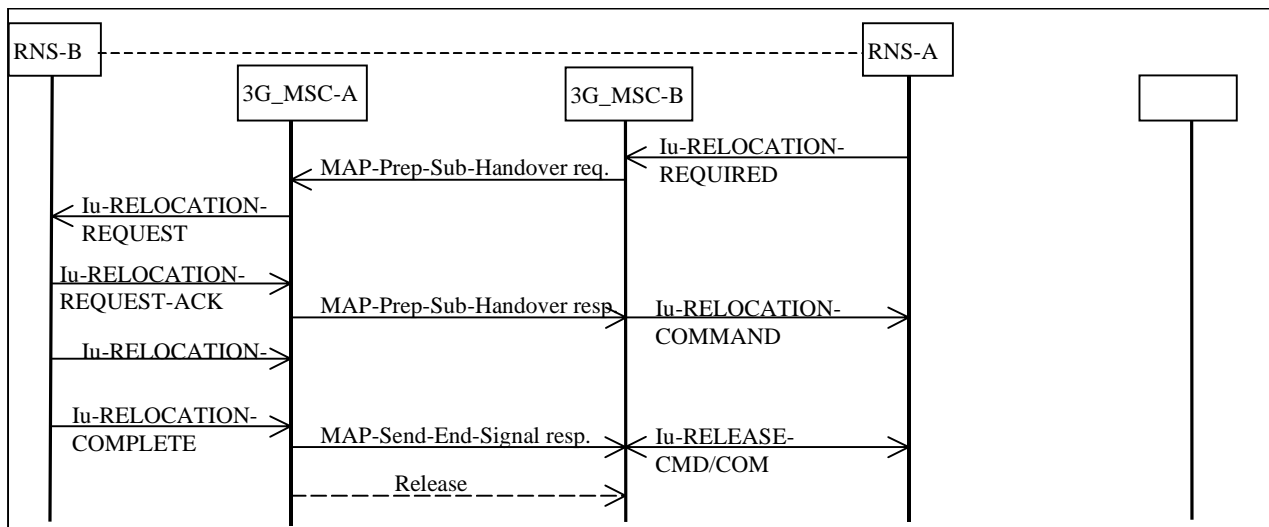
3G\_MSC-A may terminate the procedure at any time by sending an appropriate MAP message to 3G\_MSC-B. If establishment of the circuit between 3G\_MSC-A and 3G\_MSC-B has been initiated, the circuit must also be cleared.

The relocation will be aborted by 3G\_MSC-A if it detects release or interruption of the radio path before the call has been established on 3G\_MSC-B.

\*\*\* *Next Modification* \*\*\*

### 8.3.3.1 Description of subsequent relocation procedure i): 3G\_MSC-B to 3G\_MSC-A

The procedure for successful relocation from 3G\_MSC-B back to 3G\_MSC-A is shown in figure 32.



**Figure 32: Subsequent relocation procedure i) successful relocation from 3G\_MSC-B to 3G\_MSC-A using a circuit connection**

#### 8.3.3.1.1 With one circuit connection

The procedure is as follows.

3G\_MSC-B sends the MAP-PREPARE-SUBSEQUENT-HANDOVER request to 3G\_MSC-A indicating the new 3G\_MSC number (3G\_MSC-A number), indicating also the identity of the target RNS where the call has to be relocated and including a complete IU-RELOC-REQUEST message.

For speech calls, 3G\_MSC-B shall configure the RANAP RAB parameters according to the appropriate default speech codec. For a relocation to UTRAN Iu mode, if this codec is different from the currently used codec, 3G\_MSC-B shall also include the NAS Synch Indicator for the default speech codec in the Iu-RELOCATION-REQUEST.

Alternatively, if 3G\_MSC-A is known to support the use of the Available Codecs List, 3G\_MSC-B may configure the RANAP RAB parameters according to the preferred codec and indicate this to 3G\_MSC-A by including the RAB configuration indicator in the MAP-PREPARE-SUBSEQUENT-HANDOVER request. For a relocation to UTRAN Iu mode, if the preferred codec is different from the currently used codec, 3G\_MSC-B shall also include the NAS Synch Indicator for the preferred codec in the Iu-RELOCATION-REQUEST.

NOTE: 3G\_MSC-B shall not send further MAP-PREPARE-SUBSEQUENT-HANDOVER requests while a relocation attempt is pending or before any timeouts.

Since 3G\_MSC-A is the call controlling 3G\_MSC, this 3G\_MSC needs no Handover Number for routing purposes; 3G\_MSC-A can immediately initiate the relocation towards the target RNS.

For speech calls, 3G\_MSC-A shall select a codec and connect a transcoder.

3G\_MSC-A shall reconfigure the RANAP RAB parameters according to the selected codec.

- if the RAB configuration indicator is included in the MAP-PREPARE-SUBSEQUENT-HANDOVER request, and the codec selected by 3G\_MSC-A is different from the preferred codec; or
- if the RAB configuration indicator is not included in the MAP-PREPARE-SUBSEQUENT-HANDOVER request and the codec selected by 3G\_MSC-A is different from the appropriate default speech codec.

Additionally, for a relocation to UTRAN Iu mode, if the selected codec is different from the currently used codec, 3G\_MSC-A shall include the NAS Synch Indicator for the selected codec in the Iu-RELOCATION-REQUEST.



When relocation can be initiated, 3G\_MSC-A shall return in the MAP-PREPARE-SUBSEQUENT-HANDOVER response the complete IU-RELOC-REQUEST-ACKNOWLEDGE message received from the RNS-B and possible extra RANAP information, amended by 3G\_MSC-A due to the possible interworking between the RANAP protocol carried on the E-interface and the RANAP protocol used on the Iu-interface. If a radio resource cannot be assigned or if a fault is detected on the target RNS identity, or the target RNS identity in the IU-RELOC-REQUEST is not consistent with the target 3G\_MSC number, the MAP-PREPARE-SUBSEQUENT-HANDOVER response containing an IU-RELOC-FAILURE message shall be given to 3G\_MSC-B, in addition 3G\_MSC-B shall maintain the connection with the UE.

If the procedure in 3G\_MSC-A is successful then 3G\_MSC-B can request the UE to retune to the new RNS-B on 3G\_MSC-A in the case of relocation without Iur interface, or request RNS-B to become serving RNS in the case of relocation with Iur interface. This is illustrated in figure 32 by the IU-RELOC-COMMAND message. The operation is successfully completed when 3G\_MSC-A receives the IU-RELOC-COMplete message.

~~3G\_MSC-A shall insert a transcoder at successful subsequent relocation back to 3G\_MSC-A.~~

After relocation 3G\_MSC-A shall release the circuit to 3G\_MSC-B.

3G\_MSC-A must also terminate the MAP procedure for the basic relocation between 3G\_MSC-A and 3G\_MSC-B by sending an appropriate MAP message. 3G\_MSC-B will release the resources in RNS-A when the MAP-SEND-END-SIGNAL response is received.

#### 8.3.3.1.2 With multiple circuit connections (Optional functionality)

If 3G\_MSC-A and 3G\_MSC-B support the optional supplementary service Multicall (See 3GPP TS 23.135), 3G\_MSC-A and 3G\_MSC-B shall have the following functionality additionally to the description in clause 8.3.3.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A, 3G\_MSC-B generates IU-RELOCATION-REQUEST which may include several bearers and sends it to 3G\_MSC-A over MAP-PREPARE-SUBSEQUENT-HANDOVER request.

3G\_MSC-A sends IU-RELOCATION-REQUEST to RNS-B and receives IU-RELOCATION-REQUEST-ACK.

When MAP-PREPARE-SUBSEQUENT-HANDOVER response is received from 3G\_MSC-A, 3G\_MSC-B sends IU-RELOCATION-COMMAND, which indicates the bearers failed to set up in RNS-B as bearers to be released, to RNS-A.

After 3G\_MSC-A receives IU-RELOCATION-COMplete message from RNS-B, 3G\_MSC-A shall release calls via RNS-B, which has been carried by the bearers failed to set up in RNS-B, and then 3G\_MSC-A sends MAP-SEND-END-SIGNAL response to 3G\_MSC-B.

#### 8.3.3.2 Description of subsequent relocation procedure ii): 3G\_MSC-B to 3G\_MSC-B'

The procedure for successful relocation from 3G\_MSC-B to 3G\_MSC-B' is shown in figure 33.

The procedure consists of two parts:

- a subsequent relocation from 3G\_MSC-B back to 3G\_MSC-A as described in clause 8.3.3.1; and
- a basic relocation from 3G\_MSC-A to 3G\_MSC-B' as described in clause 8.3.1.

##### 8.3.3.2.1 With one circuit connection

3G\_MSC-B sends the MAP-PREPARE-SUBSEQUENT-HANDOVER request to 3G\_MSC-A indicating a new 3G\_MSC number (which is the identity of 3G\_MSC-B'), indicating also the target RNS identity and including a complete IU-RELOC-REQUEST, 3G\_MSC-A then starts a basic relocation procedure towards 3G\_MSC-B'.

For speech calls, 3G\_MSC-B shall configure the RANAP RAB parameters according to the appropriate default speech codec. For a relocation to UTRAN Iu mode, if this codec is different from the currently used codec, 3G\_MSC-B shall also include the NAS Synch Indicator for the default speech codec in the Iu-RELOCATION-REQUEST.

Alternatively, if 3G\_MSC-A and 3G\_MSC-B' are known to support the use of the Available Codecs List, 3G\_MSC-B may configure the RANAP RAB parameters according to the preferred codec and indicate this to 3G\_MSC-A by

[including the RAB configuration indicator in the MAP-PREPARE-SUBSEQUENT-HANDOVER request. For a relocation to UTRAN Iu mode, if the preferred codec is different from the currently used codec, 3G MSC-B shall also include the NAS Synch Indicator for the preferred codec in the Iu-RELOCATION-REQUEST. The decision to use this option is based on internal configuration information in 3G MSC-B.](#)

When 3G\_MSC-A receives the ACM from 3G\_MSC-B', 3G\_MSC-A informs 3G\_MSC-B that 3G\_MSC-B' has successfully allocated the radio resources on RNS-B' side by sending the MAP-PREPARE-SUBSEQUENT-HANDOVER response containing the complete IU-RELOC-REQUEST-ACKNOWLEDGE received from RNS-B' and possible extra RANAP information, amended by 3G\_MSC-A due to the possible interworking between the RANAP protocol carried on the E-interface between 3G\_MSC-A and 3G\_MSC-B' and the RANAP protocol carried on the E-interface between 3G\_MSC-A and 3G\_MSC-B. Now 3G\_MSC-B can start the procedure on the radio path if needed.

For 3G\_MSC-A the relocation is completed when it has received the MAP-SEND-END-SIGNAL REQUEST from 3G\_MSC-B' containing the IU-RELOC-COMplete received from the RNS-B'. The circuit between 3G\_MSC-A and 3G\_MSC-B is released. 3G\_MSC-A also sends the MAP-SEND-END-SIGNAL response to 3G\_MSC-B in order to terminate the original MAP dialogue between 3G\_MSC-A and 3G\_MSC-B. 3G\_MSC-B releases the radio resources when it receives this message.

If no radio resource can be allocated by 3G\_MSC-B' or no circuit between 3G\_MSC-A and 3G\_MSC-B' can be established or a fault is detected on the target RNS identity or the target RNS identity in the IU-RELOC-REQUEST is not consistent with the target 3G\_MSC number, 3G\_MSC-A informs 3G\_MSC-B by using the IU-RELOC-FAILURE message included in the MAP-PREPARE-SUBSEQUENT-HANDOVER response. 3G\_MSC-B shall maintain the existing connection with the UE.

When the subsequent relocation is completed, 3G\_MSC-B' is considered as 3G\_MSC-B. Any further inter-3G\_MSC relocation is handled as described above for a subsequent relocation.

\*\*\* *Next Modification* \*\*\*

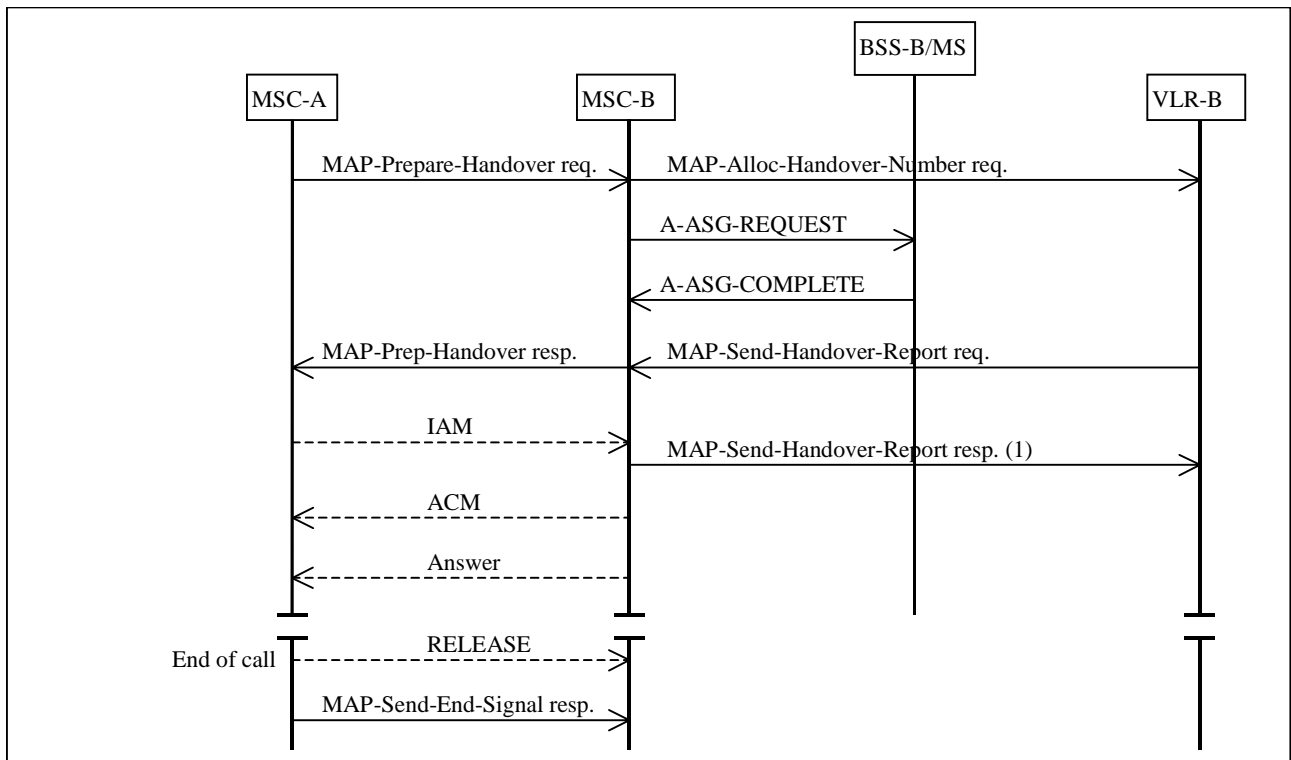
## 13 Subsequent channel assignment using a circuit connection between MSC-A and MSC-B

### 13.1 GSM handover

If a circuit connection has to be set up (for example for a Mobile Originated or Mobile Terminated Call Establishment) after an Inter-MSC handover without circuit connection, MSC-A shall request a Handover Number using a MAP-PREPARE-HANDOVER request, containing the A-ASSIGNMENT-REQUEST, on the established MAP connection. [For speech calls, MSC-A shall also include the Available Codecs List to be used by MSC-B for subsequent intra-MSC-B intersystem handover to UMTS and intra-MSC-B SRNS relocation.](#) If MSC-B indicates to MSC-B and to MSC-A that at least one of two procedures assignment or Handover Number allocation can not be completed, then MSC-A shall terminate the circuit establishment attempt. The existing connection to the MS shall be maintained, if possible.

Upon receipt of the MAP-PREPARE-HANDOVER request MSC-B shall perform the requested assignment operation towards the BSS. In addition it shall retrieve a Handover Number from VLR-B. If a failure occurs in the assignment or Handover Number allocation then it shall be reflected in the MAP-PREPARE-HANDOVER response that at least one of these two procedures has not been completed (i.e. either by a MAP-PREPARE-HANDOVER result with the assignment procedure outcome and the Handover Number allocation outcome or by a MAP-PREPARE-HANDOVER error).

When MSC-A receives a successful MAP-PREPARE-HANDOVER response it shall establish a circuit connection to MSC-B by using the appropriate network supported procedures. In figure 36 this is indicated by the IAM (Initial Address Message) and ACM (Address Complete Message). MSC-B shall also send the Answer message if appropriate to the signalling system. Upon receipt of the Answer MSC-A shall consider the circuit connection establishment phase complete. If a failure occurs during the circuit establishment phase then the existing connection to the MS shall be maintained, if possible.



NOTE: Can be sent at any time after the reception of IAM.

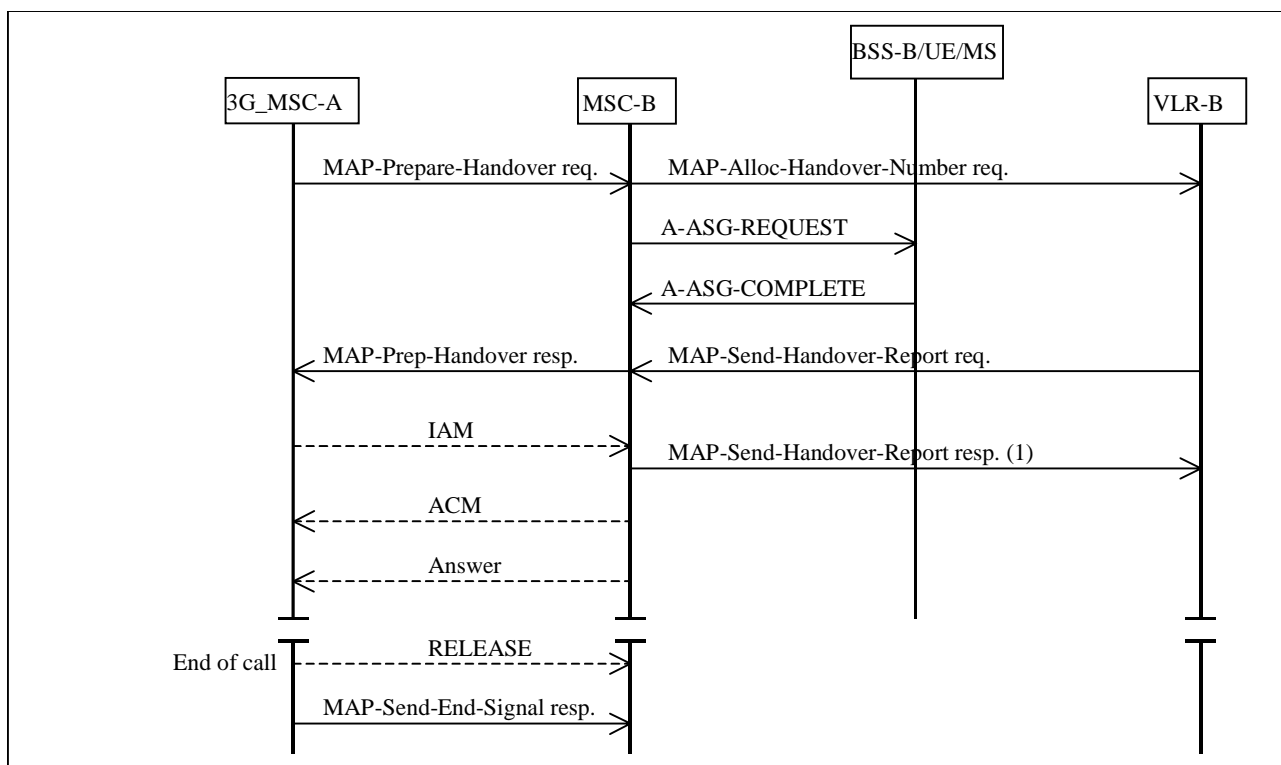
**Figure 36: Successful circuit-switched call establishment after a Basic Handover without circuit connection**

## 13.2 UMTS to GSM handover

If a circuit connection has to be set up (for example for a Mobile Originated or Mobile Terminated Call Establishment) after an Inter-3G\_MSC UMTS to GSM handover without circuit connection, 3G\_MSC-A shall request a Handover Number using a MAP-PREPARE-HANDOVER request, containing the A-ASSIGNMENT-REQUEST, on the established MAP connection. [For speech calls, 3G\\_MSC-A shall also include the Available Codecs List to be used by MSC-B for subsequent intra-MSC-B intersystem handover to UMTS and intra-MSC-B SRNS relocation.](#) If MSC-B indicates to MSC-B and to 3G\_MSC-A that at least one of two procedures assignment or Handover Number allocation can not be completed, then 3G\_MSC-A shall terminate the circuit establishment attempt. The existing connection to the UE/MS shall be maintained, if possible.

Upon receipt of the MAP-PREPARE-HANDOVER request MSC-B shall perform the requested assignment operation towards the BSS. In addition it shall retrieve a Handover Number from VLR-B. If a failure occurs in the assignment or Handover Number allocation then it shall be reflected in the MAP-PREPARE-HANDOVER response that at least one of these two procedures has not been completed (i.e. either by a MAP-PREPARE-HANDOVER result with the assignment procedure outcome and the Handover Number allocation outcome or by a MAP-PREPARE-HANDOVER error).

When 3G\_MSC-A receives a successful MAP-PREPARE-HANDOVER response, it shall establish a circuit connection to MSC-B by using the appropriate network supported procedures. In figure 37 this is indicated by the IAM (Initial Address Message) and ACM (Address Complete Message). MSC-B shall also send the Answer message if appropriate to the signalling system. Upon receipt of the Answer 3G\_MSC-A shall consider the circuit connection establishment phase complete. If a failure occurs during the circuit establishment phase then the existing connection to the UE/MS shall be maintained, if possible.



NOTE 1: Can be sent at any time after the reception of IAM.

**Figure 37: Successful circuit-switched call establishment after a Basic UMTS to GSM Handover without circuit connection**

### 13.3 GSM to UMTS handover

If a circuit connection has to be set up (for example for a Mobile Originated or Mobile Terminated Call Establishment) after an Inter-3G\_MSC GSM to UMTS handover without circuit connection, MSC-A shall request a Handover Number using a MAP-PREPARE-HANDOVER request, containing the A-ASSIGNMENT-REQUEST, on the established MAP connection. If 3G\_MSC-B indicates to 3G\_MSC-B and to MSC-A that at least one of two procedures assignment or Handover Number allocation can not be completed, then MSC-A shall terminate the circuit establishment attempt. The existing connection to the UE/MS shall be maintained, if possible.

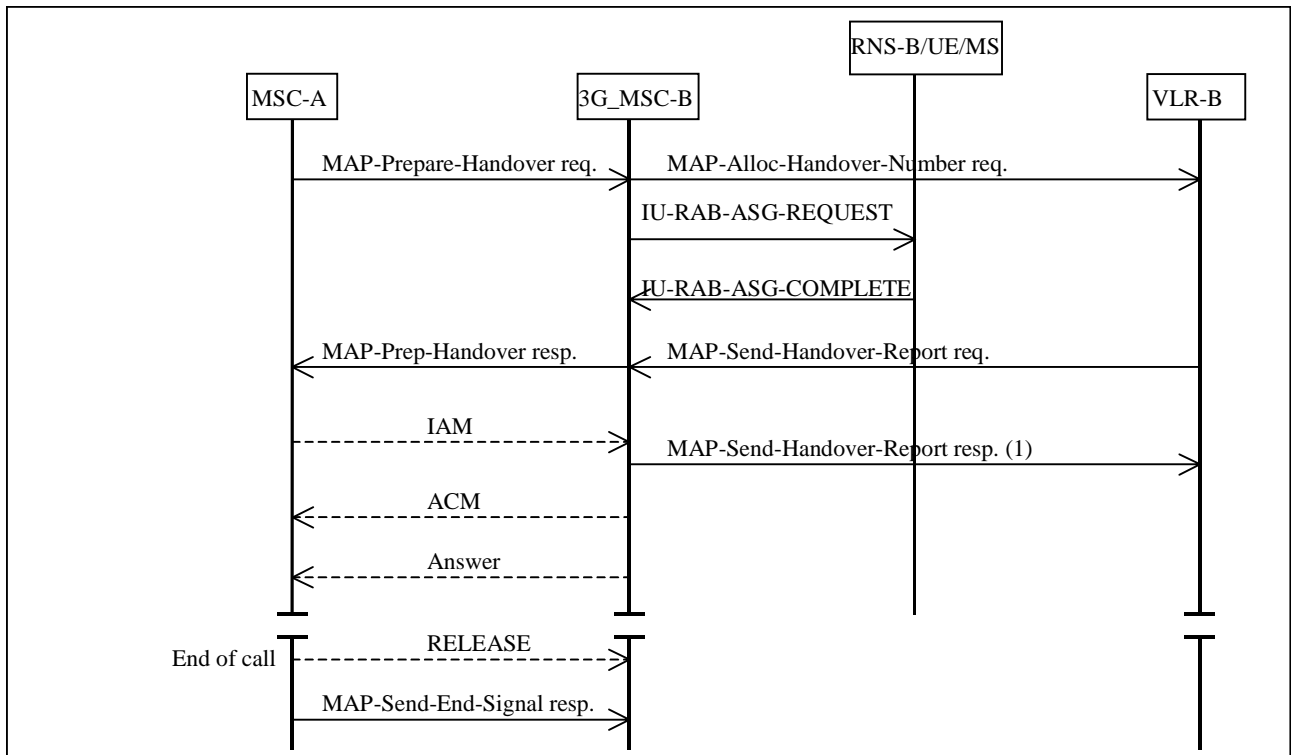
Upon receipt of the MAP-PREPARE-HANDOVER request 3G\_MSC-B shall perform the requested assignment operation towards the RNS. In addition it shall retrieve a Handover Number from VLR-B. If a failure occurs in the assignment or Handover Number allocation then it shall be reflected in the MAP-PREPARE-HANDOVER response that at least one of these two procedures has not been completed (i.e. either by a MAP-PREPARE-HANDOVER result with the assignment procedure outcome and the Handover Number allocation outcome or by a MAP-PREPARE-HANDOVER error). ~~3G\_MSC-B inserts the transcoder according to the information received from MSC-A.~~

For speech calls, 3G\_MSC-B shall select a codec from the Available Codecs List, generate associated RAB parameters and connect a transcoder. If the Available Codecs List was not received, 3G\_MSC-B shall select the appropriate default speech codec.

For an assignment in UTRAN Iu mode, 3G\_MSC-B shall also generate a NAS Synch Indicator for the Iu-RAB-ASSIGNMENT-REQUEST message. If the Available Codecs List was received by 3G\_MSC-B, then the selected codec shall be indicated in the MAP-PREPARE-HANDOVER response, sent from 3G\_MSC-B to MSC-A.

When MSC-A receives a successful MAP-PREPARE-HANDOVER response, it shall establish a circuit connection to 3G\_MSC-B by using the appropriate network supported procedures. In figure 38 this is indicated by the IAM (Initial Address Message) and ACM (Address Complete Message). 3G\_MSC-B shall also send the Answer message if appropriate to the signalling system. Upon receipt of the Answer MSC-A shall consider the circuit connection

establishment phase complete. If a failure occurs during the circuit establishment phase then the existing connection to the UE/MS shall be maintained, if possible.



NOTE 1: Can be sent at any time after the reception of IAM.

**Figure 38: Successful circuit-switched call establishment after a Basic GSM to UMTS Handover without circuit connection**

## 13.4 SRNS Relocation

### 13.4.1 Without circuit connection

If a circuit connection has to be set up (for example for a Mobile Originated or Mobile Terminated Call Establishment) after an Inter-3G\_MSC relocation without circuit connection, 3G\_MSC-A shall request a Handover Number using a MAP-PREPARE-HANDOVER request, containing the IU-RAB-ASSIGNMENT-REQUEST, on the established MAP connection.

For speech calls, 3G\_MSC-A shall include the Available Codecs List in the MAP-PREPARE-HANDOVER request. 3G\_MSC-A shall configure the RANAP RAB parameters according to the appropriate default speech codec.

Alternatively, if 3G\_MSC-B is known to support the use of the Available Codecs List, 3G\_MSC-A may configure the RANAP RAB parameters according to the preferred codec and indicate this to 3G\_MSC-B by including the RAB configuration indicator in the MAP-PREPARE-HANDOVER request. The decision to use this option is based on internal configuration information in 3G\_MSC-A.

For an assignment in UTRAN Iu mode, 3G\_MSC-A shall also include the NAS Synch Indicator in the Iu-RAB-ASSIGNMENT-REQUEST.

If 3G\_MSC-B indicates to 3G\_MSC-B and to 3G\_MSC-A that at least one of two procedures (RAB) assignment or Handover Number allocation can not be completed, then 3G\_MSC-A shall terminate the circuit establishment attempt. The existing connection to the UE shall be maintained, if possible.

Upon receipt of the MAP-PREPARE-HANDOVER request, 3G\_MSC-B shall perform the requested RAB assignment operation towards the RNS. In addition it shall retrieve a Handover Number from VLR-B. ~~and connect a transcoder in case of TDM networks.~~

For speech calls, 3G\_MSC-B shall select a codec from the Available Codecs List and connect a transcoder. If the Available Codecs List was not received, 3G\_MSC-B shall select the appropriate default speech codec.

3G\_MSC-B shall reconfigure the RANAP RAB parameters according to the selected codec.

- if the RAB configuration indicator is included in the MAP-PREPARE-HANDOVER request and the codec selected by 3G\_MSC-B is different from the preferred codec; or
- if the RAB configuration indicator is not included in the MAP-PREPARE-HANDOVER request and the codec selected by 3G\_MSC-B is different from the appropriate default speech codec.

Additionally, for an assignment in UTRAN Iu mode, 3G\_MSC-B shall include the NAS Synch Indicator for the selected codec in the Iu-RAB-ASSIGNMENT-REQUEST. If the Available Codecs List was received by 3G\_MSC-B, then the selected codec shall be indicated in the MAP-PREPARE-HANDOVER response, sent from 3G\_MSC-B to 3G\_MSC-A.

If a failure occurs in the RAB assignment or Handover Number allocation then it shall be reflected in the MAP-PREPARE-HANDOVER response that at least one of these two procedures has not been completed (i.e. either by a MAP-PREPARE-HANDOVER result with the RAB assignment procedure outcome and the Handover Number allocation outcome or by a MAP-PREPARE-HANDOVER error).

When 3G\_MSC-A receives a successful MAP-PREPARE-HANDOVER response, it shall establish a circuit connection to 3G\_MSC-B by using the appropriate network supported procedures. In figure 39 this is indicated by the IAM (Initial Address Message) and ACM (Address Complete Message). 3G\_MSC-B shall also send the Answer message if appropriate to the signalling system. Upon receipt of the Answer 3G\_MSC-A shall consider the circuit connection establishment phase complete. If a failure occurs during the circuit establishment phase then the existing connection to the UE shall be maintained, if possible.







### 5.2.1.11 Speech Codec Selection

For speech calls, a mobile station implementing this version of the protocol shall indicate all codecs that it supports for UMTS in the *Supported Codec List* information element. Codecs for GSM shall be indicated in the *Bearer Capability* information element, if this information element is included.

If the network does not receive a *Supported Codec List* information element then for speech calls in UMTS it shall select the default UMTS speech codec.

For speech calls in GSM, if the network does not receive a *Bearer Capability* information element, the network shall select GSM full rate speech version 1.

The network shall determine the default UMTS speech codec by the following:

- i) If no GSM Speech Version codepoints are received in octet 3a etc. of the *Bearer Capabilities* IE then a "UMTS only" terminal is assumed and the default UMTS speech codec shall be UMTS\_AMR.
- ii) If at least one GSM Speech Version codepoint is received in octet 3a etc. of the *Bearer Capabilities* IE then the ME supports GSM and UMTS and the default UMTS speech version shall be UMTS\_AMR\_2.

NOTE 1: In case (ii), if the call is set up in GSM by a R99 ME, call control in the core network may treat the ME as a "GSM only" ME. The default UMTS speech codec will only become relevant when an intersystem handover to UMTS is initiated by the radio access network, and can be determined when this procedure is started.

If the *Supported Codec List* IE is received, then the network shall use this list to select the codec for UMTS and indicate the selected codec to the ME via RANAP and RRC protocol in the NAS Synchronisation Indicator IE. See 3GPP TS 25.413 and 3GPP TS 25.331 [32c].

The NAS Synchronisation Indicator IE shall be coded as the 4 least significant bits of the selected codec type (CoID) defined in 3GPP TS 26.103 [83], subclause 6.3.

The network shall determine the preference for the selected codec type; codec type prioritisation is not provided by the ME.

The ME shall activate the codec type received in the NAS Synchronisation Indicator IE.

If the mobile station does not receive the NAS Synchronisation Indicator IE (RRC protocol)

- during setup of a speech call;
- during inter-system handover of a speech call from GSM to UMTS; or
- during an in-call modification from data to speech,

then it shall select the UMTS\_AMR\_2 speech codec.

NOTE 2: If the network does not support UMTS\_AMR\_2, it may activate the UMTS\_AMR codec and indicate to the mobile station that it shall select UMTS\_AMR\_2. According to 3GPP TS 26.103 [83], subclause 5.4, no interworking problem will occur in this case.

If the mobile station has selected a speech codec for UMTS, it shall keep this codec until

- a new codec is requested by the network by sending a NAS Synchronisation Indicator IE (RRC protocol);
- a new codec is requested by the network during inter-system handover from UMTS to GSM; or
- an in-call modification from speech to data is performed.

For adaptive multirate codec types no indication of subsets of modes is supported in this protocol, from the mobile station or to the mobile station. It is a pre-condition that the support of such codec types by the mobile station implicitly includes all modes defined for that codec type.

\*\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*\*

### 5.3.3 Codec Change Procedure

During a speech call in UMTS, if a mobile station supports more than one UMTS codec, the network can ~~change~~modify the UMTS codec ~~due to Out Of Band Transcoder Control~~ via RRC procedures. In order to request the mobile station to change the codec~~If this is the case~~, the network shall send at the new selected codec type in ~~RANAP~~the NAS Synchronisation Indicator IE (RRC protocol), ~~in order to inform the mobile station to change codec~~. See subclause 5.2.1.11.







### 5.2.1.11 Speech Codec Selection

For speech calls, a mobile station implementing this version of the protocol shall indicate all codecs that it supports for UMTS in the *Supported Codec List* information element. Codecs for GSM shall be indicated in the *Bearer Capability* information element, if this information element is included. Additionally, if the mobile station supports codecs for GSM and UMTS, it shall indicate the codecs for GSM also in the *Supported Codec List* information element.

If the network does not receive a *Supported Codec List* information element then for speech calls in UMTS it shall select the default UMTS speech codec.

For speech calls in GSM, if the network does not receive a *Supported Codec List* information element nor a *Bearer Capability* information element, the network shall select GSM full rate speech version 1.

The network shall determine the default UMTS speech codec by the following:

- i) If no GSM Speech Version codepoints are received in the *Supported Codec List* IE or in octet 3a etc. of the *Bearer Capabilities* IE then a "UMTS only" terminal is assumed and the default UMTS speech codec shall be UMTS\_AMR.
- ii) If at least one GSM Speech Version codepoint is received in the *Supported Codec List* IE or in octet 3a etc. of the *Bearer Capabilities* IE then the ME supports GSM and UMTS and the default UMTS speech codec shall be UMTS\_AMR\_2.

NOTE 1: In case (ii), if the call is set up in GSM by a R99 ME, call control in the core network may treat the ME as a "GSM only" ME. The default UMTS speech codec will only become relevant when an intersystem handover to UMTS is initiated by the radio access network, and can be determined when this procedure is started.

If the *Supported Codec List* IE is received, then the network shall use this list to select the codec for UMTS and indicate the selected codec to the ME via RANAP and RRC protocol in the NAS Synchronisation Indicator IE. See 3GPP TS 25.413 and 3GPP TS 25.331 [32c].

The NAS Synchronisation Indicator IE shall be coded as the 4 least significant bits of the selected codec type (CoID) defined in 3GPP TS 26.103 [83], subclause 6.3.

The network shall determine the preference for the selected codec type; codec type prioritisation is not provided by the ME.

The ME shall activate the codec type received in the NAS Synchronisation Indicator IE.

If the mobile station does not receive the NAS Synchronisation Indicator IE (RRC protocol)

- [during setup of a speech call;](#)
- [during inter-system handover of a speech call from GSM to UMTS; or](#)
- [during an in-call modification from data to speech.](#)

then it shall select the UMTS\_AMR\_2 speech codec.

NOTE 2: If the network does not support UMTS\_AMR\_2, it may activate the UMTS\_AMR codec and indicate to the mobile station that it shall select UMTS\_AMR\_2. According to 3GPP TS 26.103 [83], subclause 5.4, no interworking problem will occur in this case.

[If the mobile station has selected a speech codec for UMTS, it shall keep this codec until](#)

- [a new codec is requested by the network by sending a NAS Synchronisation Indicator IE \(RRC protocol\);](#)
- [a new codec is requested by the network during inter-system handover from UMTS to GSM; or](#)
- [an in-call modification from speech to data is performed.](#)

For adaptive multirate codec types no indication of subsets of modes is supported in this protocol, from the mobile station or to the mobile station. It is a pre-condition that the support of such codec types by the mobile station implicitly includes all modes defined for that codec type.

\*\*\*\*\* NEXT MODIFIED SECTION \*\*\*\*\*

### 5.3.3 Codec Change Procedure

During a speech call in UMTS, ~~if~~ a mobile station supports more than one UMTS codec, the network can ~~change~~<sup>modify</sup> the UMTS codec ~~due to Out Of Band Transcoder Control~~ via RRC procedures. In order to request the mobile station to change the codec~~if this is the case~~, the network shall send at the new selected codec type in ~~RANAP~~<sup>RANAP</sup> the NAS Synchronisation Indicator IE (RRC protocol), ~~in order to inform the mobile station to change codec~~. See subclause 5.2.1.11.