3GPP TSG_CN **Tdoc NP-000278**
Plenary Meeting #8, Dusseldorf, Germany
21st – 23rd June 2000.

Source: **TSG_N WG "1"**

Title: **CRs to 3G Work Item "Multicall"**

Agenda item: **6.19**

Document for: **APPROVAL**

Introduction:

This document contains **"1"** CRs on **Work Item "Multicall",** that have been agreed by **TSG_N WG "1",** and are forwarded to **TSG_N Plenary** meeting #8 for approval.

Tdoc	Spec	CR	Rev	CAT	Rel.	Old Ver	New Ver	Subject
N1-000638	23.009	CR002	4	B	R99	3.2.1	3.3.0	CR to 23.009 on Handover scenario for Multicall

3GPP TSG-CN1 meeting #12
Oahu/Hawaii, U.S.A., 22 - 26 May 2000

Document N1-000638
Revision of N2B000465

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

23.009	**CR**	**002r4**	Current Version:	3.2.1

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG-N #8 *list expected approval meeting # here ↑*

for approval [X] for information [ ]

strategic [ ] non-strategic [ ] *(for SMG use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [X]

Source: NTT COMWARE, Ericsson **Date:** 2000-05-15

Subject: CR to 23.009 on Handover scenario for Multicall

Work item: Multicall

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	X
C	Functional modification of feature	
D	Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: In current 23.009, handover procedures for only one or no bearer are specified. It is required to align handover procedures to Multicall requirement as an implementation option.

Clauses affected: 2, 6.2.1, 6.2.3, 8.1.1, 8.1.3, 8.3.1, 8.3.3

Other specs affected:

Other 3G core specifications	X	→ List of CRs: 29.002-xxx (selected rab id in MAP-PREP-SUB-HO req.)
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

- Clarification when to release residual RABs and calls, that has been raised in CN#7.
- Removal of the text in subclause 8.3.1 agreed in CN#7 (N2B000320/N1-000395) because this CR provides more detailed description in a dedicated subclause covering the original texts.
- Addition of text in subclause 8.1.3.1.2 and 8.1.3.2.2 which describes need for notifying Selected RAB ID to 3G_MSC-A from 3G_MSC-B in the subsequent handover from UMTS to GSM case.
- Some editorial improvement.


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First Change

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ITU-T Recommendation Q.118: "Special release arrangements".

[2] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2a] TS 21.905: "3G Vocabulary".

[3] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) - Stage 2".

[4] GSM 05.08: "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[5] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[6] GSM 08.58: "Digital cellular telecommunications system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[7] GSM 09.08: "Digital cellular telecommunications system (Phase 2+); Application of the Base Station System Application Part (BSSAP) on the E-interface".

[8] TS 29.010: "Information element mapping between Mobile Station - Base Station System (MS-BSS) and Base Station System - Mobile-services Switching Centre (BSS - MSC); Signalling procedures and the Mobile Application Part (MAP)".

[9] TS 22.129: "Handover Requirements between UMTS and GSM or other Radio Systems".

[10] TS 24.008: "Mobile radio interface layer 3 specification".

[11] TS 25.413: "UTRAN Iu interface RANAP signalling".

[12] TS 29.002: "Mobile Application Part (MAP) specification".

[13] TS 25.303: "Interlayer procedures in Connected Mode".

[14] TS 25.331: "RRC Protocol Specification".

[15] TS 29.108: "Application Part (RANAP) on the E-interface".

[16] ITU-T Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".

[17] TS 23.135: "Multicall supplementary service - Stage 2"

Next Change

4.3 3G_MSC-A

For roles and functional composition of the 3G_MSC-A working as pure GSM MSC, please see previous clause ("MSC-A").

4.3.1 Role of 3G_MSC-A

In the Intra-3G_MSC handover/relocation case, the 3G_MSC-A (simply termed 3G_MSC) controls the call, the mobility management and the radio resources before, during and after an Intra-3G_MSC handover/relocation. When RANAP or BSSMAP procedures have to be performed, they are initiated and driven by 3G_MSC-A.

In the case of an inter-system, intra-MSC handover of a speech call, 3G_MSC-A controls the transcoder in the core network. The 3G_MSC-A determines if a transcoder is required to be inserted or released in the CN.

In case of ATM network between 3G_MSC-A and 3G_MSC-B, 3G_MSC-A retains control of transcoder. In the case of TDM between 3G_MSC-A and 3G_MSC-B, 3G_MSC-A assumes G.711 [16] coding on the TDM E-interface. In case of UMTS to GSM handover, 3G_MSC-A assumes G.711 [16] coding on the ATM E-interface.

In the Inter-3G_MSC relocation case, 3G_MSC-A is the 3G_MSC that controls the call and the mobility management of the UE during the call, before, during and after a basic or subsequent relocation. When RANAP procedures related to dedicated resources have to be performed towards the UE, they are initiated and driven by 3G_MSC-A. The 3G_MSC-A - 3G_MSC-B interface works as a 3G_MSC - RNS interface for the RANAP procedures. The Direct Transfer signalling is relayed transparently by 3G_MSC-B between 3G_MSC-A and the UE.

During a basic relocation, 3G_MSC-A initiates and controls all the relocation procedure, from its initiation (reception of Relocation Required from RNS-A on Iu-interface) until its completion (reception of Relocation Complete from 3G_MSC-B on E-interface).

During a subsequent relocation back to 3G_MSC-A, 3G_MSC-A acts as an RNS towards 3G_MSC-B, which controls the relocation procedure until the termination in 3G_MSC-A of the handover radio resources allocation (sending of the Relocation Request Acknowledge to 3G_MSC-B from 3G_MSC-A). Then all relocation related messages shall terminate at 3G_MSC-A (e.g. Relocation Detect/Complete from RNS-B, Relocation Cancel from RNS-A).

During a subsequent relocation to a third 3G_MSC, 3G_MSC-A works towards 3G_MSC-B' as described above in the basic relocation paragraph and towards 3G_MSC-B as described above in subsequent relocation paragraph.

In the Inter-System, inter-3G_MSC handover case, 3G_MSC-A is the 3G_MSC which controls the call and the mobility management of the UE/MS during the call, before, during and after a basic or subsequent inter-system handover. When BSSAP procedures related to dedicated resources have to be performed towards the UE/MS, they are initiated and driven by 3G_MSC-A. The 3G_MSC-A – MSC-B interface works as a 3G_MSC – BSS interface for a subset of BSSMAP procedures. These BSSMAP procedures described in GSM 09 08 are those related to dedicated resources. The DTAP signalling is relayed transparently by MSC-B between 3G_MSC-A and the UE/MS.

During a basic inter-system UMTS to GSM handover, 3G_MSC-A initiates and controls all the handover procedure, from its initiation (reception of Relocation Required from RNS-A on Iu-interface) until its completion (reception of Handover Complete from MSC-B on E-interface).

During a subsequent inter-system UMTS to GSM handover back to 3G_MSC-A, 3G_MSC-A acts as a BSS towards 3G_MSC-B, which controls the handover procedure until the termination in 3G_MSC-A of the handover radio resources allocation (sending of the Handover Request Acknowledge to 3G_MSC-B from 3G_MSC-A). Then all handover related messages shall terminate at 3G_MSC-A (e.g. Handover Detect/Complete from BSS-B, Relocation Cancel from RNS-A).

During a subsequent inter-system UMTS to GSM handover to a third 3G_MSC, 3G_MSC-A works towards MSC-B' as described above in the basic inter-system handover paragraph and towards 3G_MSC-B as described above in subsequent inter-system handover paragraph.

During a basic inter-system GSM to UMTS handover, 3G_MSC-A initiates and controls all the handover procedure, from its initiation (reception of Handover Required from BSS-A on A-interface) until its completion (reception of Handover Complete from 3G_MSC-B on E-interface).

During a subsequent inter-system GSM to UMTS handover back to 3G_MSC-A, 3G_MSC-A acts as an RNS towards MSC-B, which controls the handover procedure until the termination in 3G_MSC-A of the handover radio resources allocation (sending of the Handover Request Acknowledge to MSC-B from 3G_MSC-A). Then all handover related messages shall terminate at 3G_MSC-A (e.g. Relocation Detect/Complete from RNS-B, Handover Failure from BSS-A).

During a subsequent inter-system GSM to UMTS handover to a third 3G_MSC, 3G_MSC-A works towards 3G_MSC-B' as described above in the basic inter-system handover paragraph and towards MSC-B as described above in subsequent inter-system handover paragraph.

If 3G_MSC-A supports the optional supplementary service Multicall (See TS 23.135) and UE is engaged with multiple bearers the following description applies;

- In the Intra-3G_MSC relocation case, the 3G-MSC-A tries to relocate all bearers to a new RNS.
- In the basic relocation case, the 3G-MSC-A tries to relocate all bearers to 3G_MSC-B. If 3G_MSC-A receives an indication that the 3G_MSC-B does not support multiple bearers, then 3G_MSC-A shall be able to select one bearer to be handed over according to the priority level defined as RAB parameters in TS 25.413 and tries again to relocate the selected bearer.
- In the subsequent relocation to a third 3G_MSC-B' case, the 3G-MSC-A tries to relocate all bearers to 3G_MSC-B'. If 3G_MSC-A receives an indication that the 3G_MSC-B' does not support multiple bearers, then 3G_MSC-A shall be able to select one bearer to be handed over according to the priority level defined as RAB parameters in TS 25.413 and tries again to relocate the selected bearer.
- In the Intra-3G_MSC inter-system UMTS to GSM handover case and the basic inter-system UMTS to GSM handover case, the 3G_MSC-A shall be able to select one bearer to be handed over according to the priority level defined as RAB parameters in TS 25.413 and tries to handover the selected bearer.
- In all cases described above, 3G_MSC-A shall release some calls which has been carried by the bearers failed to set up in new RNS or the bearers not to be handed over.

Next Change

4.4 3G_MSC-B

For roles and functional composition of the 3G_MSC-B working as pure GSM MSC, please see previous clause ("MSC-B").

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.

In case of TDM networks, the role of 3G_MSC-B is also to provide transcoderresources. In the case of ATM, 3G_MSC-B has no transcoder handling.

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.

When a release is received by 3G_MSC-B for the circuit connection with 3G_MSC-A then 3G_MSC-B shall release the circuit connection.

In the Inter-system UMTS to GSM Inter-3G_MSC handover 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 BSS-B. 3G_MSC-B will do some processing on the BSSMAP information received on the E-interface or the BSSMAP information received on the A-interface whereas it will relay the DTAP information transparently between A-interface and E-interface. 3G_MSC-A initiates and drives a subset of BSSMAP procedures towards 3G_MSC-B, while 3G_MSC-B controls them towards its BSSs to the extent that 3G_MSC-B is responsible for the connections of its BSSs. The release of the dedicated resources between 3G_MSC-B and BSS-B is under the responsibility of 3G_MSC-B and BSS-B, and is not directly controlled by 3G_MSC-A. When clearing is to be performed due to information received from BSS-B, 3G_MSC-B shall transfer this clearing indication to 3G_MSC-A, to clear its connection with BSS-B, to terminate the dialogue with 3G_MSC-A through the E-interface, and to release its circuit connection with MSC-A, if any. In the same way, the release of the connection to its BSS-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 MSC-A ends abnormally.

When a release is received by 3G_MSC-B for the circuit connection with 3G_MSC-A then 3G_MSC-B shall release the circuit connection.

In the Inter-system GSM to UMTS Inter-3G_MSC handover 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 BSSMAP 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. MSC-A initiates and drives a subset of BSSMAP 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 MSC-A. When clearing is to be performed due to information received from RNS-B, 3G_MSC-B shall transfer this clearing indication to MSC-A, to clear its connection with RNS-B, to terminate the dialogue with MSC-A through the E-interface, and to release its circuit connection with 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 MSC-A ends normally and a release is received from the circuit connection with MSC-A, if any, or when the dialogue with the MSC-A ends abnormally.

When a release is received by 3G_MSC-B for the circuit connection with MSC-A then 3G_MSC-B shall release the circuit connection.

If 3G_MSC-B does not support the optional supplementary service Mutlicall (See TS 23.135) and 3G_MSC-A requests to relocate multiple bearers, 3G_MSC-B shall indicate that it does not support multiple bearers to 3G_MSC-A.

If 3G_MSC-B supports the optional supplementary service Multicall (See TS 23.135) and UE is engaged with multiple bearers the following description applies;

- In the basic relocation case, the 3G_MSC-B shall be able to allocate an Handover Number for each bearer. The 3G-MSC-B shall also be able to select some bearers so that the number of bearers will fulfill the maximum number of bearers supported by the 3G_MSC-B.

- In the Intra-3G_MSC relocation case, the 3G-MSC-B tries to relocate all bearers to a new RNS.

- In the subsequent relocation back to the 3G_MSC-A or to a third 3G_MSC-B' case, the 3G-MSC-B tries to request to the 3G_MSC-A to relocate all bearers to the 3G_MSC-A or to the 3G_MSC-B'.

- In the Intra-3G_MSC inter-system UMTS to GSM handover case and the subsequent inter-system UMTS to GSM handover back to the 3G_MSC-A or to a third MSC-B' case, the 3G_MSC-B shall be able to select one bearer to be handed over according to the priority level defined as RAB parameters in TS 25.413 and tries to handover the selected bearer.

Next Change

6.2.1 Intra-3G_MSC Handover from UMTS to GSM

The procedure for a successful Intra-3G_MSC handover from UMTS to GSM is shown in figure 8. It is assumed that selection of a candidate UE/MS has already taken place within the RNS based upon the criteria presented in clause 5. The exact algorithm, in the RNS, 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).

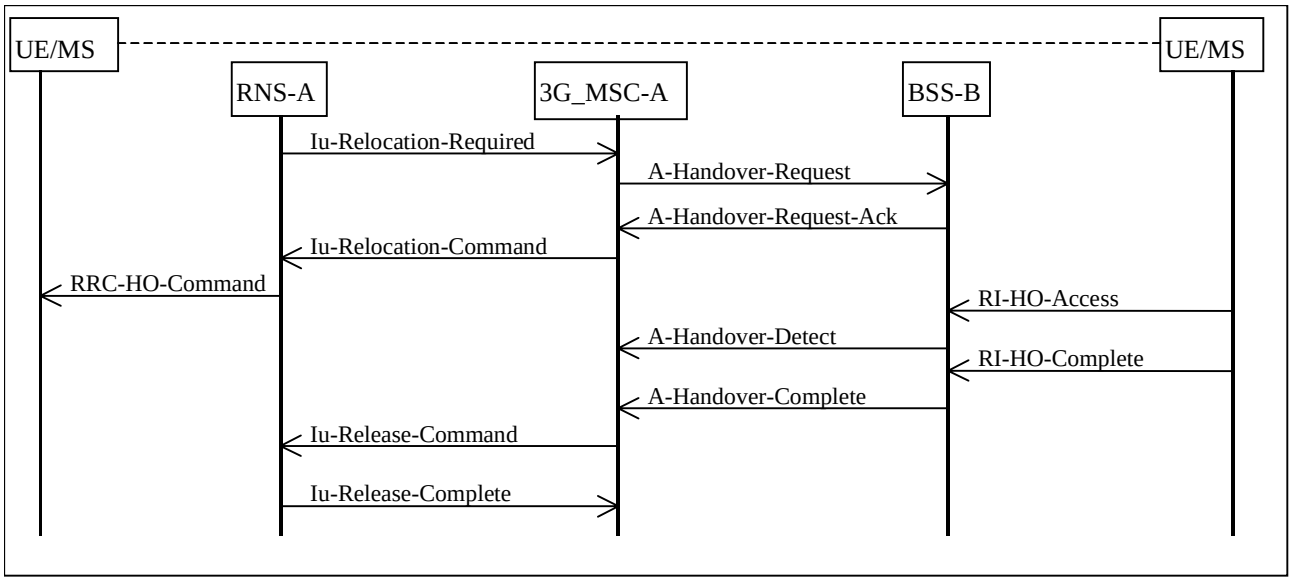

Figure 8: Basic Intra-3G_MSC Handover from UMTS to GSM Procedure

6.2.1.1 With no bearer or one bearer

The successful operation of the procedure is as follows. When the RNS (RNS-A), currently supporting the UE/MS, determines that the UE/MS requires to be handed over to GSM it will send an IU-RELOCATION-REQUIRED message to the 3G_MSC (3G_MSC-A). The IU-RELOCATION-REQUIRED message shall contain a single cell, to which the UE/MS can be handed over. When the 3G_MSC-A receives the IU-RELOCATION-REQUIRED message it shall begin the process of handing over the UE/MS to a BSS (BSS-B). The 3G_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 UE/MS to access the radio resource of BSS-B, this is detailed in GSM 08.58 [6] and in GSM 05.08 [4]. The switching of the radio resource through the necessary terrestrial resources is detailed in TS 24.008 [10] and GSM 08.08 [5].

Once resource allocation has been completed by BSS-B it shall return an A-HANDOVER-REQUEST-ACK. to 3G_MSC-A. When this message is received by 3G_MSC-A it shall begin the process of instructing the UE/MS to tune to a new dedicated radio resource. An IU-RELOCATION-COMMAND will be sent by the 3G_MSC-A to RNS-A. On receipt of the IU-RELOCATION-COMMAND message RNS-A will send the radio resource control message RRC-HANDOVER-COMMAND, containing a Handover Reference number previously allocated by BSS-B, to the UE/MS. The UE/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 UE/MS has been captured. If this is the correct UE/MS then the BSS-B shall send an A-HANDOVER-DETECT to 3G_MSC-A. When the UE/MS is successfully communicating with the BSS-B a RI-HANDOVER-COMPLETE message will be sent by the UE/MS to BSS-B. The BSS-B will then send an A-HANDOVER-COMPLETE message to 3G_MSC-A.

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

After 3G_MSC-A has received the A-HANDOVER-COMPLETE message from BSS-B it shall begin to release the resources allocated on RNS-A. In figure 8 the resource is released by using the IU-RELEASE-COMMAND sequence.

If a failure occurs during the handover attempt, for example A-HANDOVER-FAILURE returned from BSS-B, then 3G_MSC-A will terminate the handover to BSS-B and send an IU-RELOCATION-PREPARATION-FAILURE message to RNS-A.

If RNS-A has decided to cancel the handover, it sends IU-RELOCATION-CANCEL message to 3G_MSC-A. The 3G_MSC-A will then terminate the handover towards BSS-B (if initiated) and send IU-RELOCATION-CANCEL-ACKNOWLEDGE message to RNS-A.

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

6.2.1.2 With multiple bearers (Optional functionality)

If 3G_MSC-A supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A shall have the following functionality additionally to the description in section 6.2.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A 3G_MSC-A shall select one bearer to be handed over if the UE is engaged with multiple bearers. After that, 3G_MSC-A generates an A-HO-REQUEST message for the selected bearer to BSS-B.

When an A-HO-REQUEST-ACK is received from BSS-B, 3G_MSC-A sends IU-RELOCATION-COMMAND, which indicates the bearers not to be handed over as bearers to be released, to RNS-A.

After 3G_MSC-A receives A-HO-COMPLETE message from BSS-B, 3G_MSC-A shall release calls via BSS-B, which has been carried by the bearers not to be handed over, and then sends IU-RELEASE-COMMAND to RNS-A.

Next Change

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.

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 subclause covers case ii).

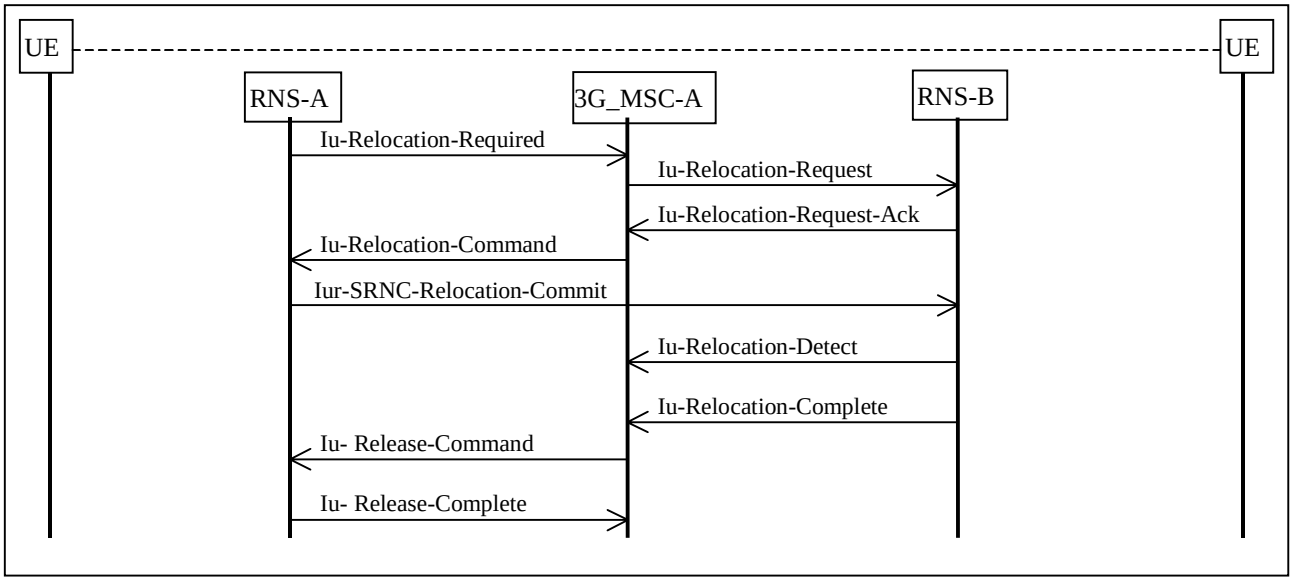

Figure 10 Basic intra-3G_MSC SRNS Relocation Procedure

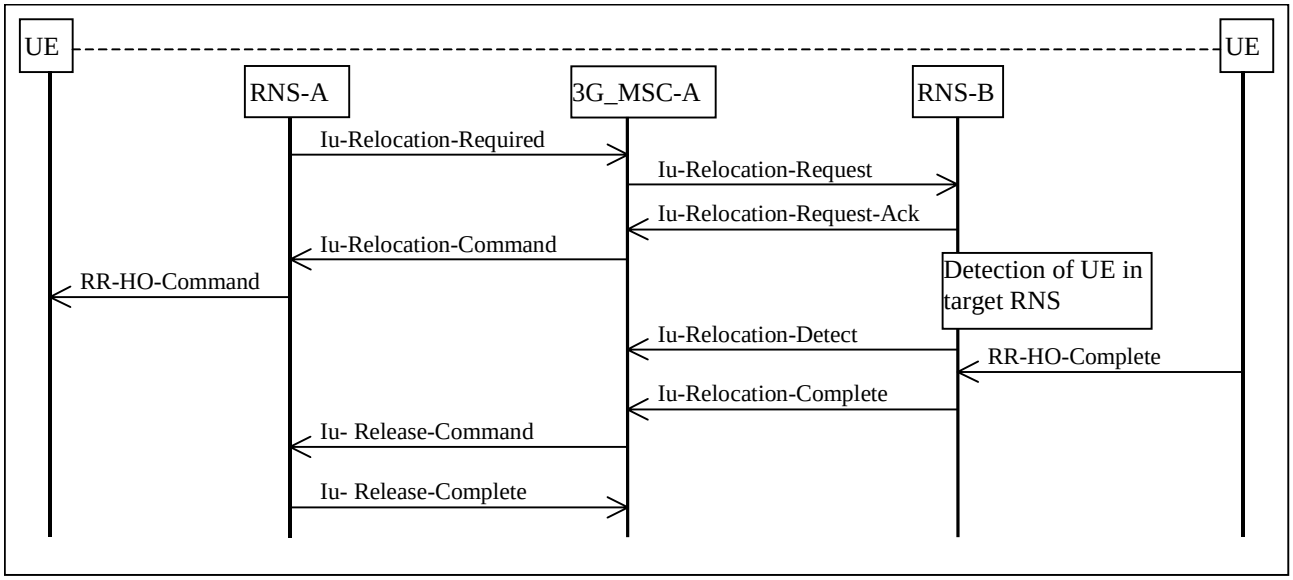

Figure 11 Basic intra-3G_MSC SRNS Relocation Procedure combined with hard change of radio resources (Hard Handover with switch in the Core Network)

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). 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 TS 25.430 series and TS 25.413 Technical Specification.

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.

6.2.3.2 With multiple bearers (Optional functionality)

If 3G_MSC-A supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A shall have the following functionality additionally to the description in section 6.2.3.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A, 3G_MSC-A generates an IU-RELOCATION-REQUEST message, which may include multiple bearers, to RNS-B.

When an IU-RELOCATION-REQUEST-ACK is received from RNS-B, 3G_MSC-A 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 sends IU-RELEASE-COMMAND to RNS-A.

Next Change

8.1.1 Basic Handover procedure requiring a circuit connection between 3G_MSC -A and MSC-B

The procedure used for successful Inter-3G_MSC UMTS to GSM Handover is shown in figure 18. Initiation of the UMTS to GSM handover procedure is described in clause 5. The procedure described in this subclause makes use of messages from the Technical Specification GSM 08.08 and of the transport mechanism from the Mobile Application Part (MAP) (Technical Specification GSM 29.002). After an Inter-3G_MSC relocation/handover, Intra-3G_MSC UMTS to GSM handover may occur on 3G_MSC -B, this handover will follow the procedures specified in a previous subclause.

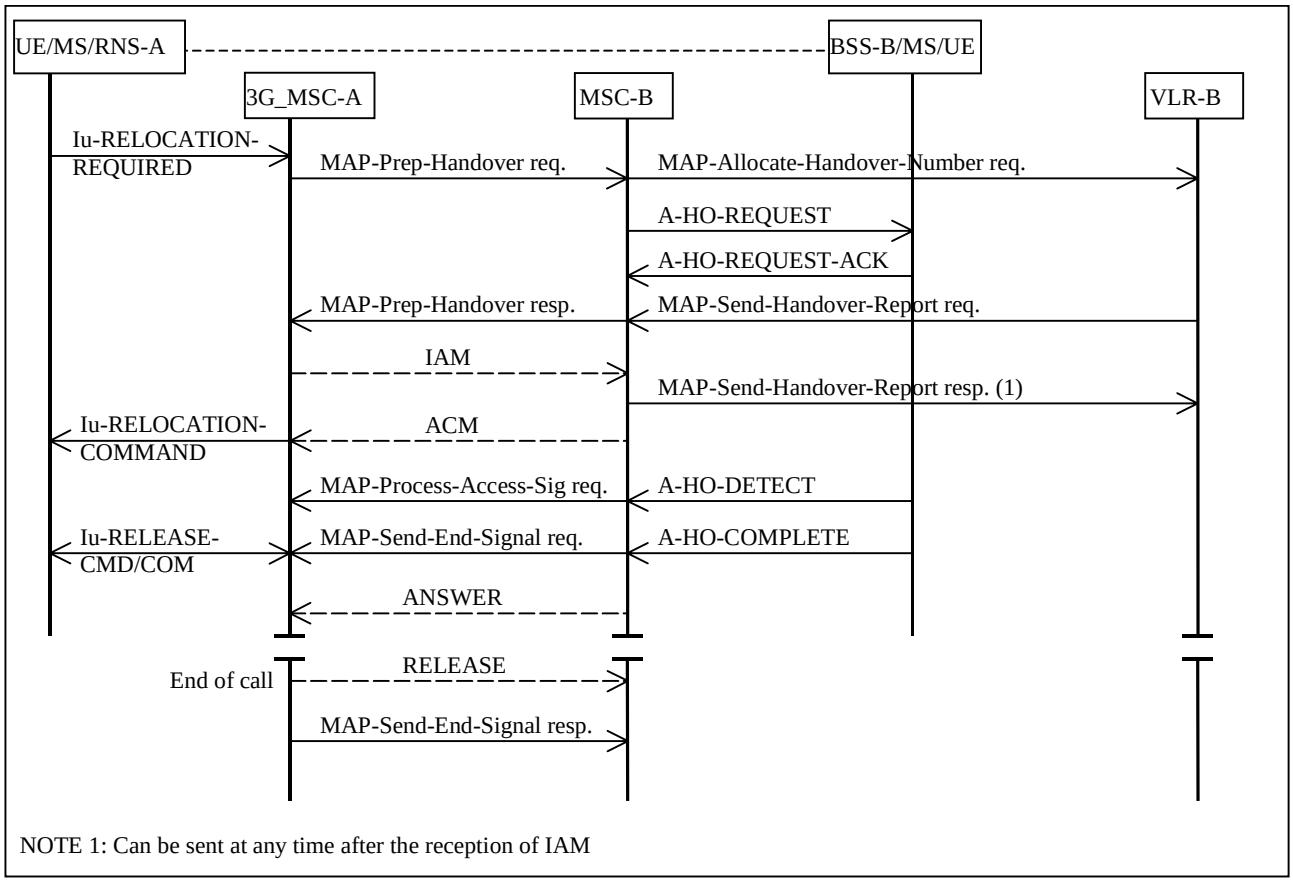

Figure 18: Basic UMTS to GSM Handover Procedure requiring a circuit connection

8.1.1.1 With one circuit connection

The UMTS to GSM handover is initiated as described in subclause 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 Technical Specification GSM 08.08. For compatibility reasons, the MAP-PREPARE-HANDOVER request will also identify the cell to which the call is to be handed over. 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 (subclause 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 subclause 6.2.1). 3G_MSC-A inserts or removes a transcoder in the path to the other party, depending on the type of connection. As handover to GSM means that a transcoder is inserted in the BSS-B then G.711 [16] is assumed on the E-interface. If the original connection is transcoder free then 3G_MSC-A shall insert a transcoder. If 3G_MSC-A had a transcoder in the original path then it shall remove it.

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.

8.1.1.2 With multiple circuit connections (Optional functionality)

If 3G_MSC-A supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A shall have the following functionality additionally to the description in section 8.1.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A 3G_MSC-A shall select one bearer to be handed over if the UE is engaged with multiple bearers. After that, the 3G_MSC-A generates an A-HO-REQUEST message for the selected bearer and sends it to MSC-B over MAP-PREPARE-HANDOVER request.

When MAP-PREPARE-HANDOVER response including an A-HO-REQUEST-ACK is received from MSC-B, 3G_MSC-A sends IU-RELOCATION-COMMAND, which indicates the bearers not to be handed over as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from MSC-B, 3G_MSC-A shall release calls via MSC-B, which has been carried by the bearers not to be handed over, and then 3G_MSC-A sends IU-RELEASE-COMMAND to RNS-A.

Next Change

8.1.3 Procedure for subsequent UMTS to GSM handover requiring a circuit connection between 3G_MSC-A and 3G_MSC-B

After the call has been handed over from 3G_MSC-A to 3G_MSC-B, if the UE/MS leaves the area of 3G_MSC-B during the same call and enters a GSM area, subsequent UMTS to GSM handover is necessary in order to continue the connection.

The following cases apply:

i) the UE/MS moves back to the area of MSC-A;

ii) the UE/MS moves into the area of a third MSC (MSC-B').

In both cases the call is switched in 3G_MSC-A; the circuit between 3G_MSC-A and MSC-B shall be released after a successful subsequent handover has been performed (remember that 3G_MSC-A can be a pure GSM MSC).

8.1.3.1 Description of subsequent UMTS to GSM handover procedure i): 3G_MSC-B to MSC-A

The procedure for successful UMTS to GSM handover from MSC-B back to 3G_MSC-A is shown in figure 20.

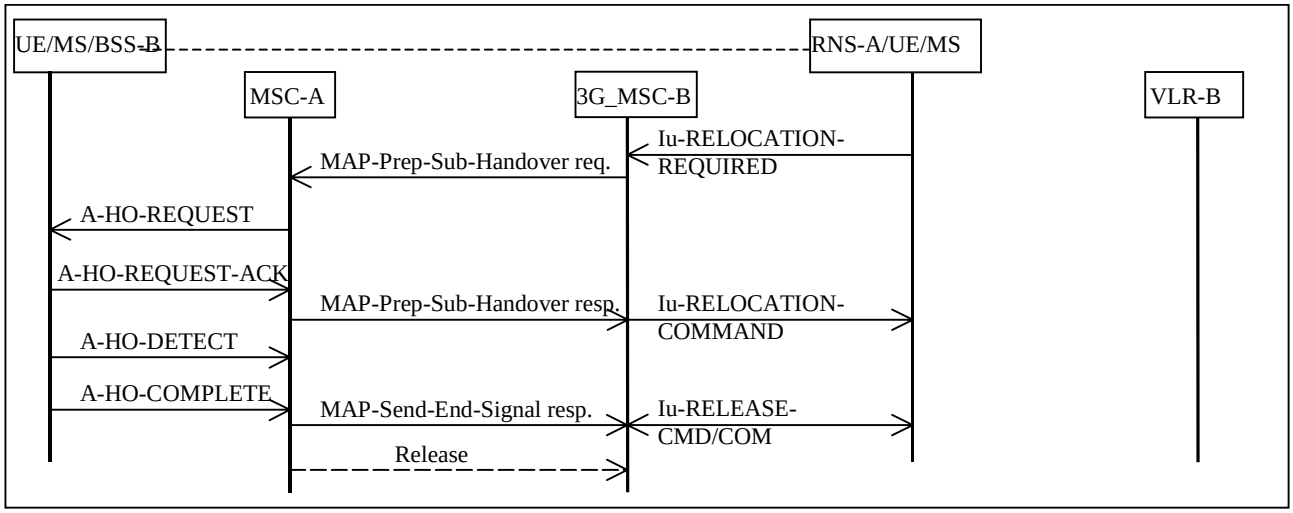

Figure 20: Subsequent UMTS to GSM handover procedure i): successful UMTS to GSM handover from 3G_MSC-B to MSC-A using a circuit connection

8.1.3.1.1 With one circuit connection

The procedure is as follows.

3G_MSC-B sends the MAP-PREPARE-SUBSEQUENT-HANDOVER request to MSC-A indicating the new MSC number (MSC-A number), indicating also the identity of the cell where the call has to be handed over and including a complete A-HO-REQUEST message. (NOTE: 3G_MSC-B shall not send further MAP-PREPARE-SUBSEQUENT-HANDOVER requests while a handover attempt is pending or before any timeouts). Since MSC-A is the call controlling MSC, this MSC needs no Handover Number for routing purposes; MSC-A can immediately initiate the search for a free radio channel.

When a radio channel can be assigned, MSC-A shall return in the MAP-PREPARE-SUBSEQUENT-HANDOVER response the complete A-HO-REQUEST-ACKNOWLEDGE message received from the BSS-B and possible extra BSSMAP information, amended by MSC-A 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-B. The further traffic channel allocation result (A-HO-REQUEST-ACK or A-HO-FAILURE) will be transferred to 3G_MSC-B using the MAP-FORWARD-ACCESS-SIGNALLING request. If a radio channel cannot be assigned or if a fault is detected on the target cell identity, or the target cell identity in the A-HO-REQUEST is not consistent with the target MSC number, the MAP-PREPARE-SUBSEQUENT-HANDOVER response containing an A-HO-FAILURE message shall be given to 3G_MSC-B, in addition 3G_MSC-B shall maintain the connection with the UE/MS.

If the procedure in MSC-A is successful then 3G_MSC-B can request the UE/MS to retune to the new BSS-B on MSC-A. This is illustrated in figure 20 by the Iu-RELOCATION-COMMAND message. The operation is successfully completed when MSC-A receives the A-HO-COMPLETE message.

After UMTS to GSM handover MSC-A shall release the circuit to 3G_MSC-B.

MSC-A must also terminate the MAP procedure for the basic UMTS to GSM handover between MSC-A and 3G_MSC-B by sending an appropriate MAP message. 3G_MSC-B will clear the resources in RNS-A when the MAP-SEND-END-SIGNAL response is received.

8.1.3.1.2 With multiple circuit connections (Optional functionality)

If 3G_MSC-B supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-B shall have the following functionality additionally to the description in section 8.1.3.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A which indicates the target is BSS, 3G_MSC-B shall select one bearer to be handed over if the UE is engaged with multiple bearers. After that, the 3G_MSC-B generates an A-HO-REQUEST message for the selected bearer and sends it to 3G_MSC-A over MAP-PREPARE-SUBSEQUENT-HANDOVER request with indication of RAB ID of the selected bearer.

When MAP-PREPARE-SUBSEQUENT-HANDOVER response including an A-HO-REQUEST-ACK is received from the 3G_MSC-A, 3G_MSC-B sends IU-RELOCATION-COMMAND, which indicates the bearers not to be handed over as bearers to be released, to RNS-A.

After 3G_MSC-A receives A-HO-COMPLETE message from BSS-B, 3G_MSC-A shall release calls via BSS-B, which has been carried by the bearers not to be handed over, and then 3G_MSC-A sends MAP-SEND-END-SIGNAL response to 3G_MSC-B.

8.1.3.2 Description of subsequent UMTS to GSM handover procedure ii): 3G_MSC-B to MSC-B'

The procedure for successful UMTS to GSM handover from 3G_MSC-B to MSC-B' is shown in figure 21.

The procedure consists of two parts:

- a subsequent UMTS to GSM handover from 3G_MSC-B back to 3G_MSC-A as described in subclause 8.1.3.1 (3G_MSC-A can also be a pure GSM MSC, the procedure is the same in both casess); and

- a basic handover from 3G_MSC-A to MSC-B' as described in subclause 7.1.

8.1.3.2.1 With one circuit connection

3G_MSC-B sends the MAP-PREPARE-SUBSEQUENT-HANDOVER request to 3G_MSC-A indicating a new MSC number (which is the identity of MSC-B'), indicating also the target cell identity and including a complete A-HO-REQUEST, 3G_MSC-A then starts a basic handover procedure towards MSC-B'.

When 3G_MSC-A receives the ACM from MSC-B', 3G_MSC-A informs 3G_MSC-B that MSC-B' has successfully allocated the radio resources on BSS-B' side by sending the MAP-PREPARE-SUBSEQUENT-HANDOVER response containing the complete A-HO-REQUEST-ACKNOWLEDGE received from BSS-B' and possible extra BSSMAP information, amended by 3G_MSC-A due to the possible interworking between the BSSMAP protocol carried on the E-interface between 3G_MSC-A and MSC-B' and the BSSMAP 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.

For 3G_MSC-A the UMTS to GSM handover is completed when it has received the MAP-SEND-END-SIGNAL REQUEST from MSC-B' containing the A-HO-COMPLETE received from the BSS-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 the traffic channel allocation is queued by the BSS-B', the A-QUEUING-INDICATION may optionally be sent back to 3G_MSC-B. If no radio channel can be allocated by MSC-B' or no circuit between 3G_MSC-A and MSC-B' can be established or a fault is detected on the target cell identity or the target cell identity in the A-HO-REQUEST is not consistent with the target MSC number, 3G_MSC-A informs 3G_MSC-B by using the A-HO-FAILURE message included in the MAP-PREPARE-SUBSEQUENT-HANDOVER response. 3G_MSC-B shall maintain the existing connection with the UE/MS.

When the subsequent UMTS to GSM handover is completed, MSC-B' is considered as MSC-B. Any further inter-MSC handover is handled as described earlier for a subsequent handover.

8.1.3.2.2 With multiple circuit connections (Optional functionality)

If 3G_MSC-B supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-B shall have the following functionality additionally to the description in section 8.1.3.2.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-B 3G_MSC-B shall select one bearer to be handed over if the UE is engaged with multiple bearers. After that, the 3G_MSC-B generates an A-HO-REQUEST message for the selected bearer and sends it to 3G_MSC-A over MAP-PREPARE-SUBSEQUENT-HANDOVER request with indication of RAB ID of the selected bearer.

Upon receipt of the MAP-PREPARE-SUBSEQUENT-HANDOVER request from 3G_MSC-B, 3G_MSC-A starts a basic handover procedure towards MSC-B'.

When 3G_MSC-A receives the ACM from MSC-B', 3G_MSC-A informs 3G_MSC-B that MSC-B' has successfully allocated the radio resources on BSS-B' side by sending the MAP-PREPARE-SUBSEQUENT-HANDOVER response containing the complete A-HO-REQUEST-ACK received from BSS-B' and possible extra BSSAP information, amended by 3G_MSC-A due to the possible interworking between the BSSMAP protocol carried on the E-interface between 3G_MSC-A and MSC-B' and the BSSMAP protocol carried on the E-interface between 3G_MSC-A and 3G_MSC-B.

When MAP-PREPARE-SUBSEQUENT-HANDOVER response including an A-HO-REQUEST-ACK is received from 3G_MSC-A, 3G_MSC-B sends IU-RELOCATION-COMMAND, which indicates the bearers not to be handed over as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from MSC-B', 3G_MSC-A shall release calls via MSC-B', which has been carried by the bearers not to be handed over, and then 3G_MSC-A sends MAP-SEND-END-SIGNAL response to 3G_MSC-B.

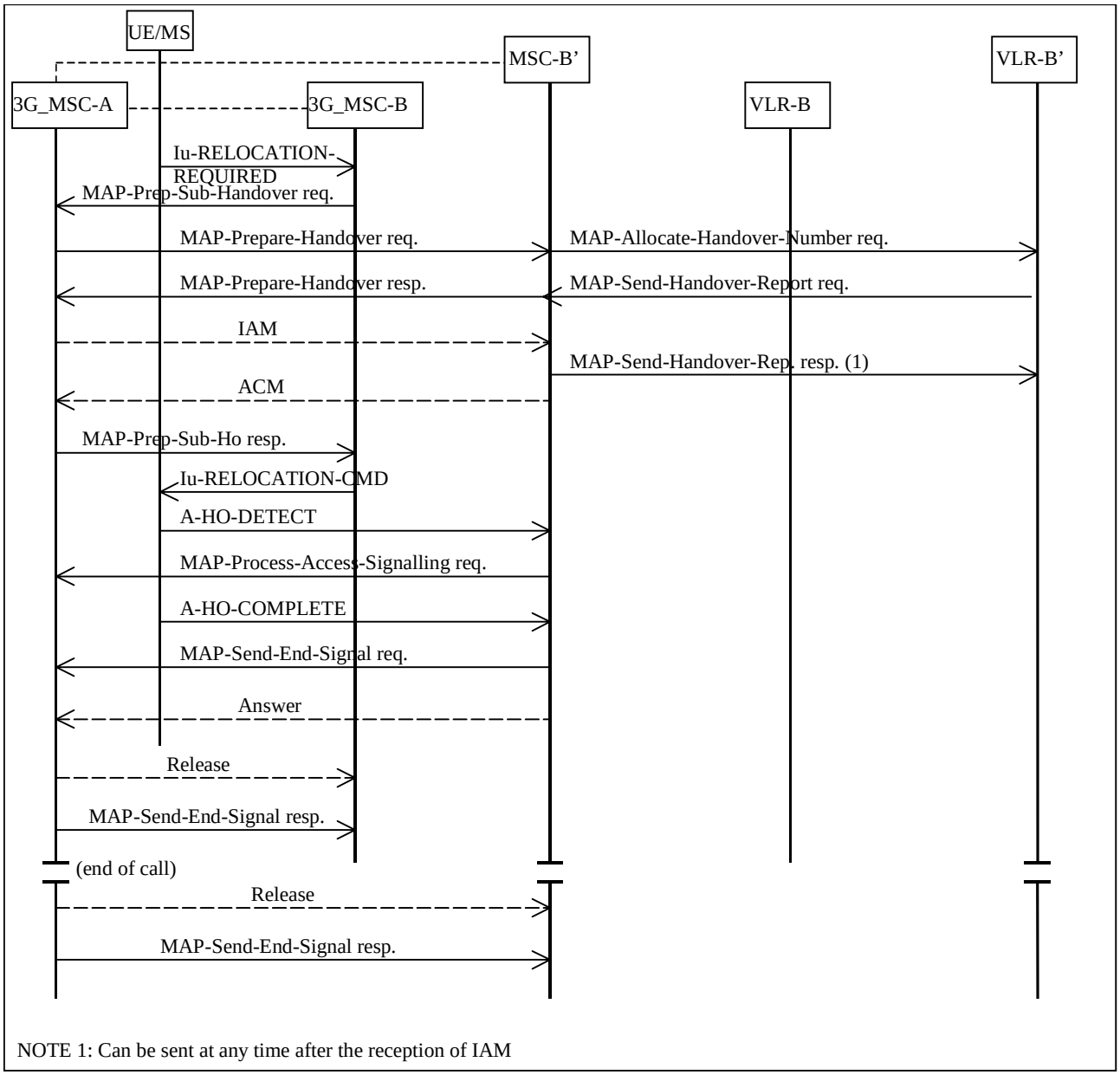

Figure 21: Subsequent handover procedure ii): Successful UMTS to GSM handover from 3G_MSC-B to MSC-B' requiring a circuit connection

Next Change

8.3.1 Basic relocation procedure requiring a circuit connection between 3G_MSC-A and 3G_MSC-B

The procedure used for successful Inter-3G_MSC SRNS relocation is shown in figure 30. Initiation of the relocation procedure is described in clause 5. The procedure described in this subclause makes use of messages from the TS 25.413 [11] and of the transport mechanism from the Mobile Application Part (MAP) (Technical Specification TS 29.002 [12]). After an Inter-3G_MSC SRNS relocation further Intra-3G_MSC relocations may occur on 3G_MSC-B, these relocations will follow the procedures specified in a previous clause.

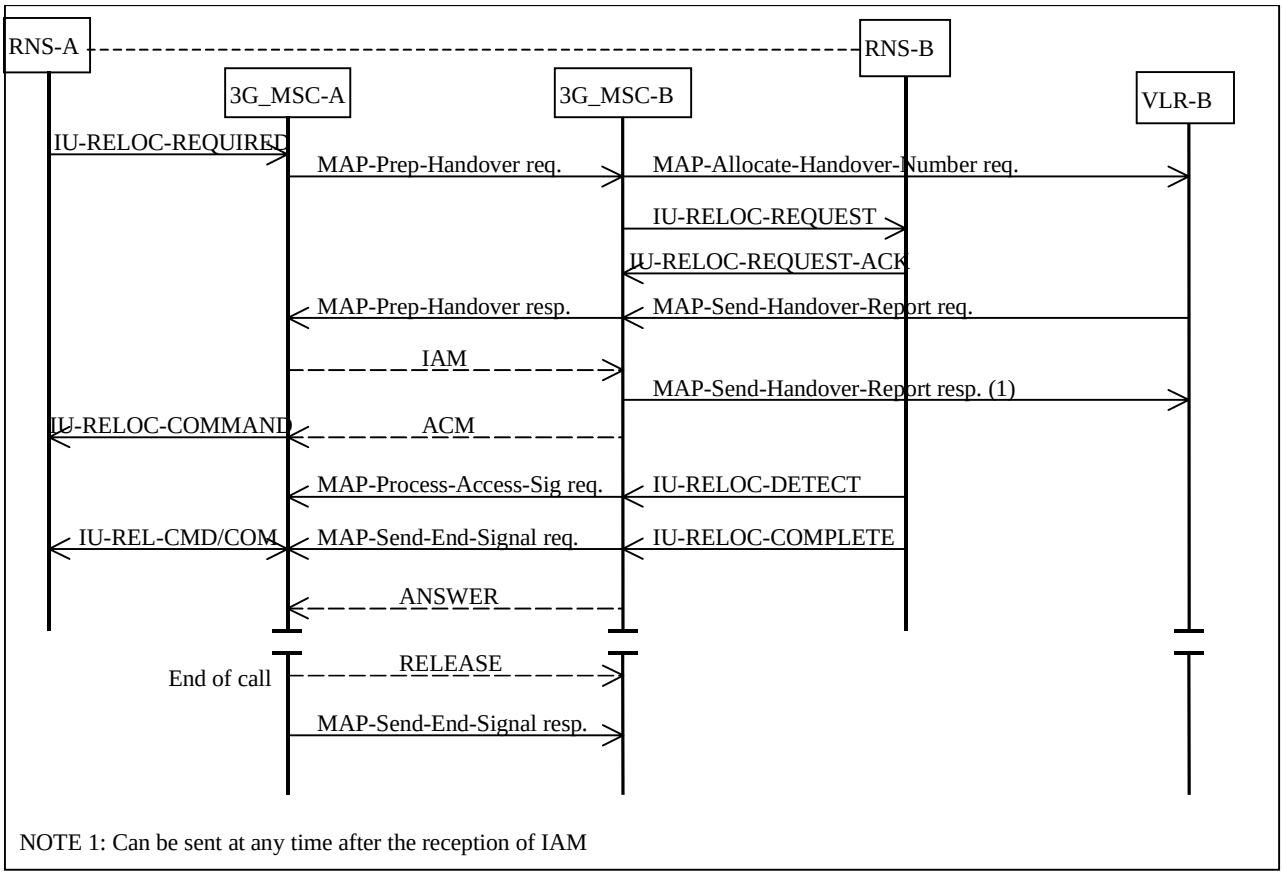

Figure 30: Basic SRNS Relocation Procedure requiring a circuit connection

8.3.1.1 With one circuit connection

The relocation is initiated as described in subclause 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 TS 25.413 [11].

3G_MSC-A shall configure the RANAP RAB parameters according to the current selected codec and shall indicate in MAP-PREPARE-HANDOVER to 3G_MSC-B if a transcoder is required to be inserted.

MAP-PREPARE-HANDOVER request shall also carry the identity of the target RNS to which the call is to be relocated, see 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), If requested to do so in the MAP procedure 3G_MSC-B shall connect a transcoder. ~~The number of handover numbers to be allocated by 3G_MSC-B depends on the number of radio access bearers (RABs) in use by 3G_MSC-A. The 3G_MSC-B shall extract the RAB identities from the IU-RELOC-REQUEST message. The RAB identities give the number of required handover numbers. 3G_MSC-B associates each RAB identity to a handover number and includes the information in the Relocation Number List of the MAP-PREPARE-HANDOVER response message. The 3G_MSC-A and 3G-MSC-B shall then use this list to match each circuit connection to the correct radio access bearer.~~ The Handover Number~~s~~ shall be used for routing the connection~~s~~ of the call~~s~~ from 3G_MSC-A to 3G_MSC-B. 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 (subclause 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 subclause 6.2.3). In case of TDM 3G_MSC-A shall insert or remove a transcoder between the MSC and other party, depending on the original connection.

3G_MSC-B transfers to 3G_MSC-A the acknowledgement received from the correct UE (IU-RELOC-DETECT/IU-RELOC-COMPLETE). The IU-RELOC-DETECT, if received, is transferred to 3G_MSC-A using the MAP-PROCESS-ACCESS-SIGNALLING request. The IU-RELOC-COMPLETE, 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-COMPLETE is received from 3G_MSC-B. The old radio resources are released when the IU-RELOC-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 3G_MSC-A and 3G_MSC-B. When the MAP-SEND-END-SIGNAL request including the IU-RELOC-COMPLETE 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.

8.3.1.2 With multiple circuit connections (Optional functionality)

8.3.1.2.1 3G_MSC-B does not support multiple bearers

If 3G_MSC-A supports the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A shall have the following functionality additionally to the description in section 8.3.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A, 3G_MSC-A generates IU-RELOCATION-REQUEST and sends a MAP-PREPARE-HANDOVER request to 3G_MSC-B including the IU-RELOCATION-REQUEST message, which may include multiple bearers. If 3G_MSC-A receives an indication that 3G_MSC-B does not support multiple bearers, 3G_MSC-A shall select one bearer to be handed over if the UE is engaged with multiple bearers. 3G_MSC-A reconstructs IU-RELOCATION-REQUEST and sends again a MAP-PREPARE-HANDOVER request to 3G_MSC-B including the IU-RELOCATION-REQUEST message, which includes only the selected bearer.

When MAP-PREPARE-HANDOVER response including an IU-RELOCATION-REQUEST-ACK is received from 3G_MSC-B, 3G_MSC-A sends IU-RELOCATION-COMMAND, which indicates the bearers not to be handed over as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from 3G_MSC-B, 3G_MSC-A shall release calls via 3G_MSC-B, which has been carried by the bearers not to be handed over, and then 3G_MSC-A sends IU-RELEASE-COMMAND to RNS-A.

8.3.1.2.2 3G_MSC-B supports multiple bearers

If 3G_MSC-A and 3G_MSC_B support the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A and 3G_MSC-B shall have the following functionality additionally to the description in section 8.3.1.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-A, 3G_MSC-A generates IU-RELOCATION-REQUEST and sends a MAP-PREPARE-HANDOVER request to 3G_MSC-B including the IU-RELOCATION-REQUEST message, which may include multiple bearers.

When MAP-PREPARE-HANDOVER request including an IU-RELOCATION-REQUEST message is received by the 3G_MSC-B and the number of bearers included in the IU-RELOCATION-REQUEST message has exceeded the maximum number of bearers supported by 3G_MSC-B, the 3G_MSC-B shall select several bearers so that the number of bearers will fulfil the range of 3G_MSC-B capability. In this case 3G_MSC-B shall reconstruct IU-RELOCATION-REQUEST message to cope with the capability of 3G_MSC-B. The 3G_MSC-B shall retrieve multiple Handover Numbers from its associated VLR (exchange of the messages MAP-allocate-handover-number request and MAP-send-handover-report request several times). The number of Handover Numbers depends on the number of RAB IDs in the reconstructed IU-RELOCATION-REQUEST.

After the completion of Handover Number allocation 3G_MSC-B may select several bearers and reconstruct IU-RELOCATION-REQUEST again if the number of successfully allocated Handover Numbers is less than the number of required bearers, and sends IU-RELOCATION-REQUEST to RNS-B.

After the reception of IU-RELOCATION-REQUEST-ACK from RNS-B, the 3G_MSC-B shall generate Relocation Number List, which includes couples of RAB ID (See TS 25.413) and Handover Number successfully allocated. Then the 3G_MSC-B sends MAP-PREPARE-HANDOVER response including Relocation Number List back to the 3G_MSC-A.

Upon receipt of the MAP-PREPARE-HANDOVER response 3G_MSC-A shall establish circuits between 3G_MSC-A and 3G_MSC-B by signalling procedures supported by the network according to the Relocation Number List. When 3G_MSC-A receives all the results from attempted circuits (the results may be successful ACM message or unsuccessful backward message for each attempt) and if at least one circuit has been successfully established, 3G_MSC-A sends IU-RELOCATION-COMMAND, which indicates the bearers failed to set up in RNS-B and the bearers associated with circuits which has failed to set up as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from 3G_MSC-B, 3G_MSC-A shall release calls via 3G_MSC-B, which has been carried by the bearers failed to set up in RNS-B and the bearers associated with circuits which has failed to set up, and then 3G_MSC-A sends IU-RELEASE-COMMAND to RNS-A.

If no circuit connection has been successfully established 3G_MSC-A terminates the inter-3G_MSC relocation attempt by sending an appropriate MAP massage, for example ABORT.

Next Change

8.3.3 Procedure for subsequent relocation requiring a circuit connection between 3G_MSC-A and 3G_MSC-B

After the call has been relocated from 3G_MSC-A to 3G_MSC-B, if the UE leaves the area of 3G_MSC-B during the same call, subsequent relocation is necessary in order to continue the connection when no Iur interface exists between the involved RNSs, or to optimise the transmission path when the Iur interface is used.

The following cases apply:

i) the UE moves back to the area of 3G_MSC-A;

ii) the UE moves into the area of a third 3G_MSC (3G_MSC-B').

In both cases the call is switched in 3G_MSC-A; the circuit between 3G_MSC-A and 3G_MSC-B shall be released after a successful subsequent relocation has been performed.

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.

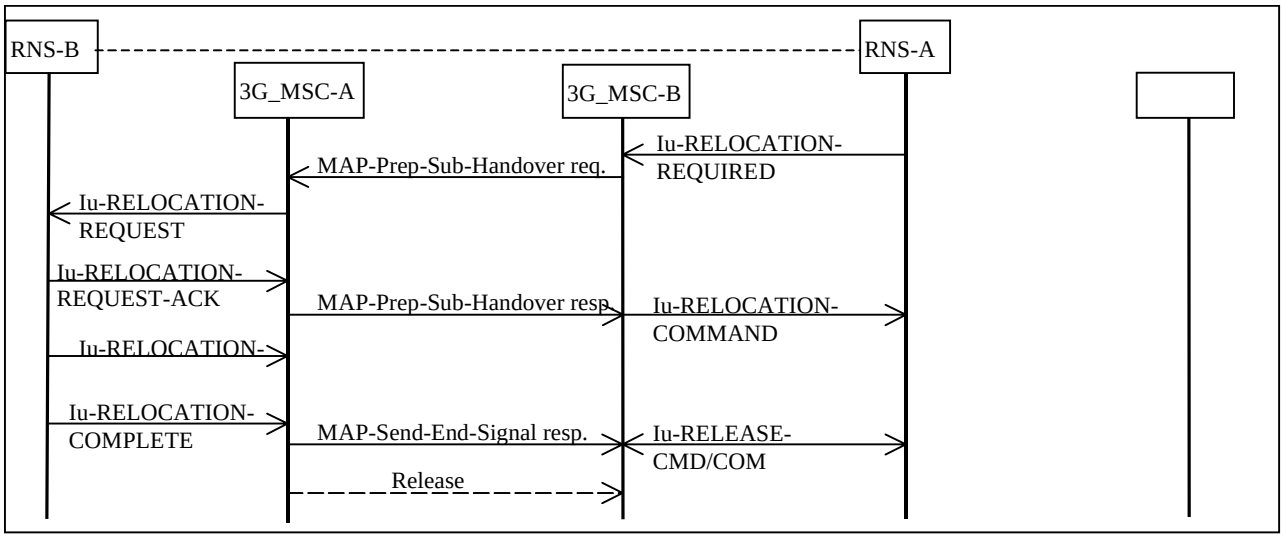

Figure 32: Subsequent relocation procedure i) successful relocation from 3G_MSC-B to 3G_MSC-A using a circuit connection

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.

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.

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.

If 3G_MSC-A inserted a transcoder at basic relocation then it shall remove it on successful subsequent relocation back to 3G_MSC-A. If it removed a transcoder at basic relocation then it 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 TS 23.135), 3G_MSC-A and 3G_MSC-B shall have the following functionality additionally to the description in section 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 subclause 8.3.3.1; and
- a basic relocation from 3G_MSC-A to 3G_MSC-B' as described in subclause 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'.

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.

8.3.3.2.2 With multiple circuit connections (Optional functionality)

If 3G_MSC-A and 3G_MSC-B support the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A and 3G_MSC-B shall have the following functionality additionally to the description in section 8.3.3.2.1.

Upon receipt of the IU-RELOCATION-REQUIRED from RNS-B 3G_MSC-B generates an IU-RELOCATION-REQUEST message which may include multiple bearer and sends it to 3G_MSC-A over MAP-PREPARE-SUBSEQUENT-HANDOVER request.

Upon receipt of the MAP-PREPARE-SUBSEQUENT-HANDOVER request from 3G_MSC-B, 3G_MSC-A starts a basic relocation procedure towards 3G_MSC-B'.

8.3.3.2.2.1 3G_MSC-B' does not support multiple bearers

If 3G_MSC-A receives an indication that 3G_MSC-B' does not support multiple bearers, 3G_MSC-A shall select one bearer to be handed over. 3G_MSC-A reconstructs IU-RELOCATION-REQUEST and sends again a MAP-PREPARE-HANDOVER request to 3G_MSC-B' including the IU-RELOCATION-REQUEST message, which includes only the selected bearer. Upon receipt of MAP-PREPARE-HANDOVER response from 3G_MSC-B', 3G_MSC-A shall reconstructs IU-RELOCATION-REQUEST-ACK to indicate the bearers not to be handed over as the bearers failed to set up in IU-RELOCATION-REQUEST-ACK and send it over MAP-PREPARE-SUBSEQUENT-HANDOVER response to 3G_MSC-B.

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 as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from 3G_MSC-B', 3G_MSC-A shall release calls via 3G_MSC-B', which has been carried by the bearers failed to set up, and then 3G_MSC-A sends MAP-SEND-END-SIGNAL response to 3G_MSC-B.

8.3.3.2.2.2 3G_MSC-B' supports multiple bearers

If some of circuit connections failed to set up between 3G_MSC-A and 3G_MSC-B', 3G_MSC-A shall reconstruct IU-RELOCATION-REQUEST-ACK message so that the IU-RELOCATION-REQUEST-ACK includes only the bearers which have successfully established circuit connection and sends it to 3G_MSC-B over MAP-PREPARE-SUBSEQUENT-HANDOVER response.

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 as bearers to be released, to RNS-A.

After 3G_MSC-A receives MAP-SEND-END-SIGNAL request from 3G_MSC-B', 3G_MSC-A shall release calls via 3G_MSC-B', which has been carried by the bearers failed to set up, and then 3G_MSC-A sends MAP-SEND-END-SIGNAL response to 3G_MSC-B.

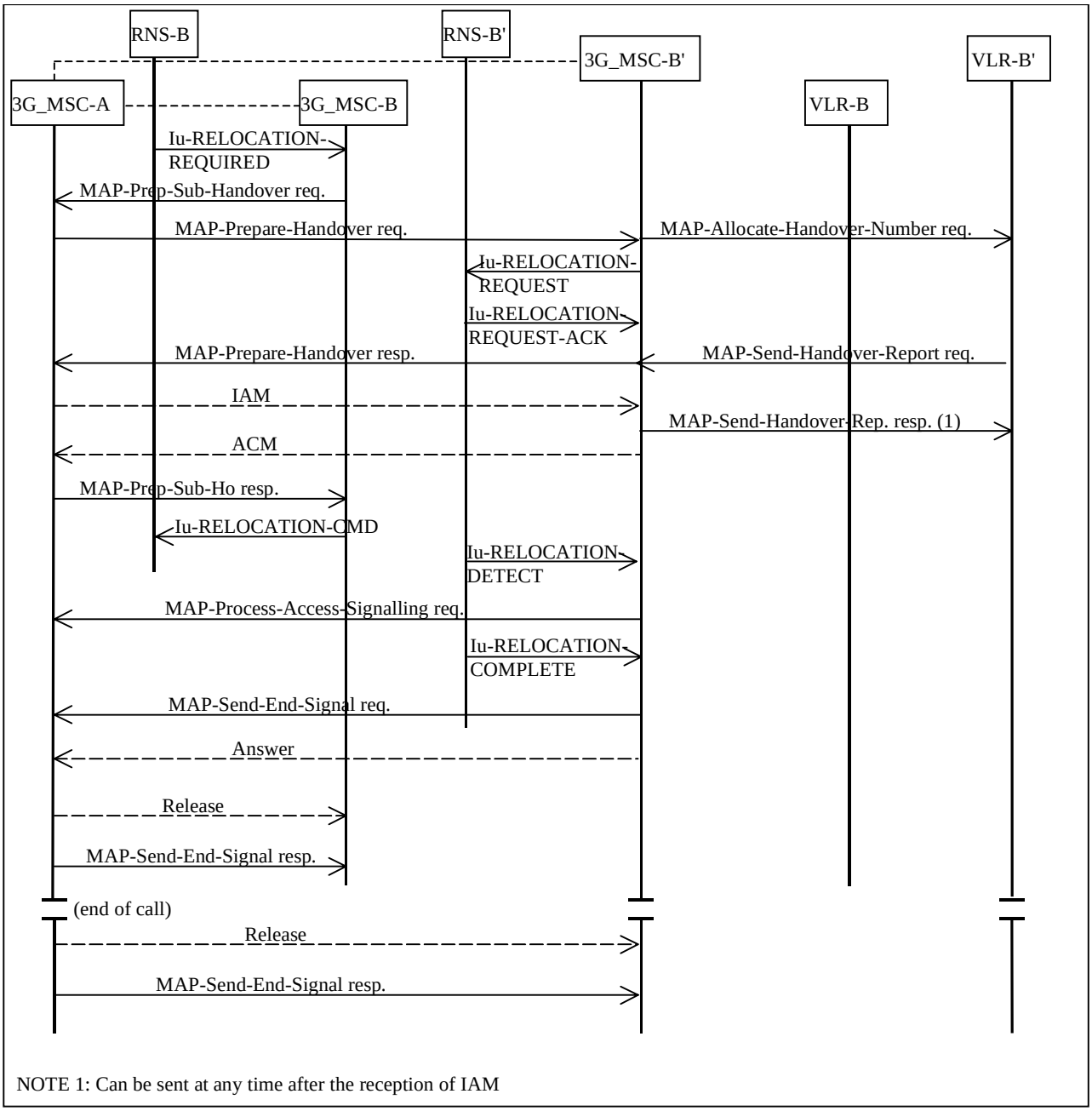

Figure 33: Subsequent relocation procedure ii) Successful SRNS relocation from 3G_MSC-B to 3G_MSC-B' requiring a circuit connection

Next Change

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

[Omitted]

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. 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. 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.

13.4.2 With circuit connection (Optional functionality)

If 3G_MSC-A and 3G_MSC-B support the optional supplementary service Multicall (See TS 23.135), 3G_MSC-A and 3G_MSC-B shall have the following functionality additionally to the description in section 13.4.1.

A new circuit connection shall be able to set up (for example for a new Mobile Originated or a new Mobile Terminated Call Establishment) after an Inter-3G_MSC relocation with one or several circuit connections. The procedures for the establishment of the additional circuit connection in 3G_MSC-A and 3G_MSC-B are the same as that described in section 13.4.1.

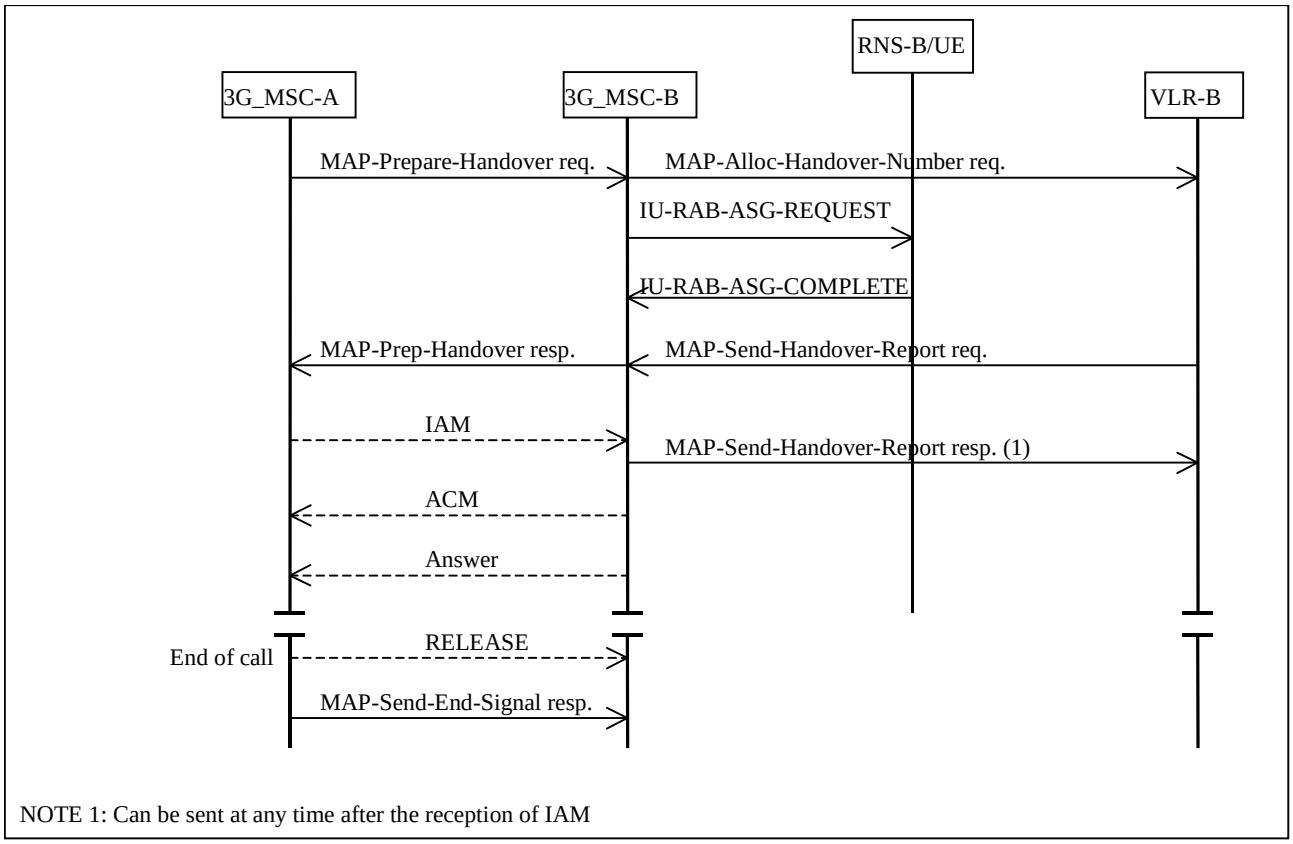

Figure 39: Successful circuit-switched call establishment after a Basic Relocation without circuit connection