Technical Specification Group Services and System Aspects *TSGS#7(00)0088*
Meeting #7, Madrid, Spain, 15-17 March 2000

Source: **TSG SA WG2**
Title: **CRs on 23.121 v.3.2.0**
Agenda Item: **5.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #7.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

CR on 23.121 v. 3.2.0

spec	CR #	Title	release	cat	S2 TDoc #
23.121	053r1	Tunnel Endpoint Identifier Revision of S2-000151.	R99	F	S2-000241
23.121	054	Inter 3G MSC SRNS relocation	R99	C	S2-000162
23.121	055	Change of the reference point name according to 23.002	R99	F	S2-000218
23.121	056	Deletion of SRNS relocation procedure from 23.121	R99	D	S2-000386
23.121	057r1	Removal of "FFS" items	R99	D	S2-000499
23.121	058	Removal of L3CE references	R99	D	S2-000486
23.121	059	removal of detailed text on handover	R99	D	S2-000487

3GPP TSG SA WG2 Meeting #11
Puerto Vallarta, Mexico, 24-28 Jan. 2000

***Document* S2-000241**
e.g. for 3GPP use the format TP-99xxx
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CHANGE REQUEST

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23.121	**CR**	**053r1**	Current Version: 3.2.0

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

For submission to:	3GPP TSG SA#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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:	Telia	**Date:**	
Subject:	Mobile IP		
Work item:			

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:	Tunnel Identifier (TID) should be changed to Tunnel Endpoint Identifier (TEID).
Clauses affected:	4.3.15.7, 4.10.1

Other specs affected:	Other 3G core specifications		→ List of CRs:	
	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:	

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<--------- double-click here for help and instructions on how to create a CR.

4.3.15.7 Combined location/routing area update where the previous LA/RA belonged to a 2 CN element

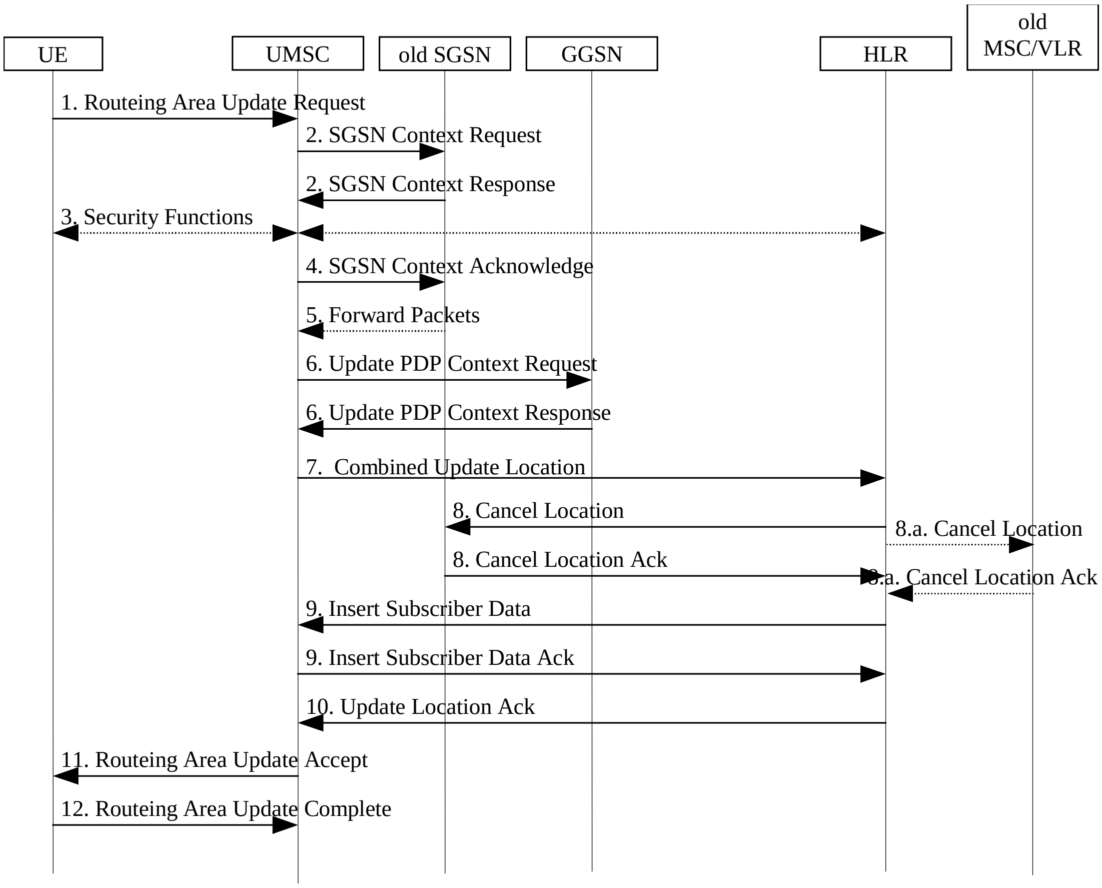

Figure 4-35 Combined LA/RA update when the MS moves from 2 CN element to UMSC

The UE sends a Routing Area Update Request (old RAI, old P-TMSI Signature, Update Type) to the new UMSC. Update Type example given here is for combined RA / LA update.

The new UMSC sends SGSN Context Request (old RAI, P-TMSI, old P-TMSI Signature, New UMSC Address) to the old SGSN to get the MM and PDP contexts for the UE. The old SGSN validates the old P-TMSI Signature and responds with an appropriate error cause if it does not match the value stored in the old SGSN. This should initiate the security functions in the new UMSC.

Security functions may be executed. These procedures are defined in subclause "Security Function".

If the user has at least one activated PDP context, then the new UMSC shall send an SGSN Context Acknowledge message to the old SGSN. This informs the old SGSN that the new UMSC is ready to receive data packets belonging to the activated PDP contexts.

The old SGSN starts tunnelling of buffered N-PDUs to the new UMSC.   However, the possibility of this happening is remote since the UE is in MM-idle indicating that it was not in active communication.

The new UMSC sends Update PDP Context Request to the GGSNs concerned. The GGSNs update their PDP context fields and return an Update PDP Context Response (TEID).

The new UMSC informs the HLR of the change of SGSN/MSC by sending Combined Update Location (UMSC Number, UMSC Address, IMSI) to the HLR.

The HLR sends Cancel Location (IMSI, Cancellation Type) to the old SGSN and MSC. The old SGSN acknowledges with Cancel Location Ack (IMSI).

The HLR sends Insert Subscriber Data (IMSI, PS and CS subscription data) to the new UMSC. The new UMSC validates the UE's presence in the (new) RA. If due to regional subscription the UE is rejected, the UMSC rejects the Attach Request with an appropriate cause and returns an Insert Subscriber Data Ack (IMSI, UMSC Area Restricted Due To Regional Subscription) message to the HLR. If all checks are successful then the UMSC constructs an MM context for the UE and returns an Insert Subscriber Data Ack (IMSI) message to the HLR.

The HLR acknowledges the Update Location by sending Update Location Ack (IMSI) to the new UMSC.

The new UMSC validates the UE's presence in the new RA. If due to regional, national or international restrictions the UE is not allowed to attach in the RA or subscription checking fails, then the UMSC rejects the routing area update with an appropriate cause. If all checks are successful then the new UMSC establishes MM and PDP contexts for the UE. The new UMSC responds to the UE with Routing Area Update Accept (P-TMSI, TMSI, P-TMSI Signature).

The UE confirms the reallocation of the TMSIs by sending Routing Area Update Complete to the UMSC.

Next change

****

4.10.1 Mobile IP for UMTS/GPRS End Users

A single generic mobility handling mechanism that allows roaming between all types of access networks would allow the user to conveniently move between fixed and mobile networks, between public and private as well as between PLMN's with different access technologies. The ongoing work in IETF Mobile IP working group [13] is targeted towards such a mechanism[1] and a set of standards are planned to be finalized during 1999. Thus, it is important to offer Mobile IP also to UMTS and GPRS users to allow them to roam to and from other access technologies while keeping ongoing data sessions, e.g. TCP or UDP. A typical UMTS network supporting Mobile IP is shown in Figure 4-46.

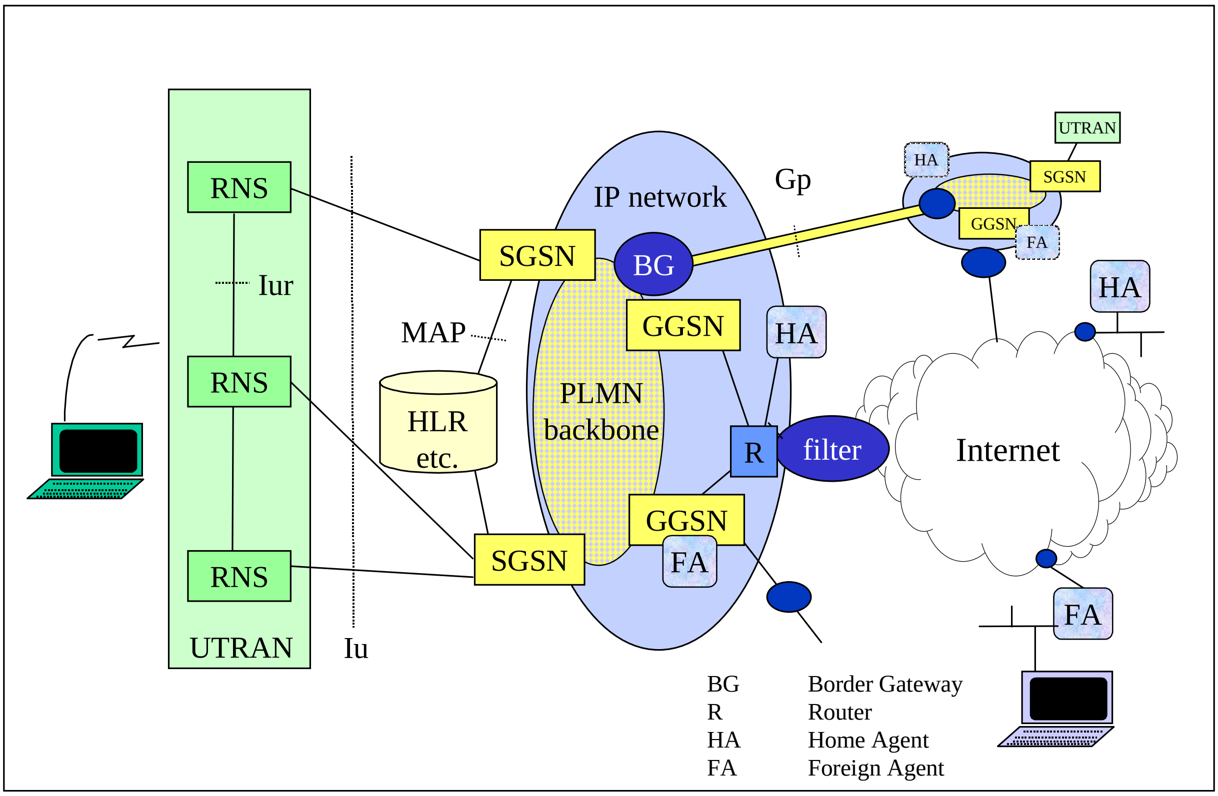

Figure 4-46. Core network architecture with GPRS MM within the PLMN's and Mobile IP MM between different types of systems.

As IP addresses in IPv4 are scarce, it has to be assumed that Mobile IPv4 preferably will be used with the Foreign Agent (FA) care-of addresses [10]. Compared to using co-located care-of addresses, FA care-of addresses does not only conserve IP addresses, it is also more efficient over the radio interface. We assume here that the MS keeps the same care-of address as long as the PDP context is activated, i.e. does not change GGSN/FA during a UMTS/GPRS session. It is further assumed that PDP type "IP" is used. It is, however, likely that PDP type" PPP" also could be used. Roaming between PLMN's can be realized with GPRS roaming or Mobile IP.

To offer Mobile IP with FA care-of addresses over the UMTS/GPRS network, some requirements need to be fulfilled. Some of these will cause changes to the current GPRS standards.

A signaling scheme, shown in figure 4-47, is described below. The PPP setup and the UMTS/GPRS attach procedures and "GGSN-Initiated PDP Context modification procedure" have been omitted for clarity.

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[1] Note that in this text, Mobile IP is used in a wide sense. It refers to [10] **and** the RFC's planed to be finalized this year.

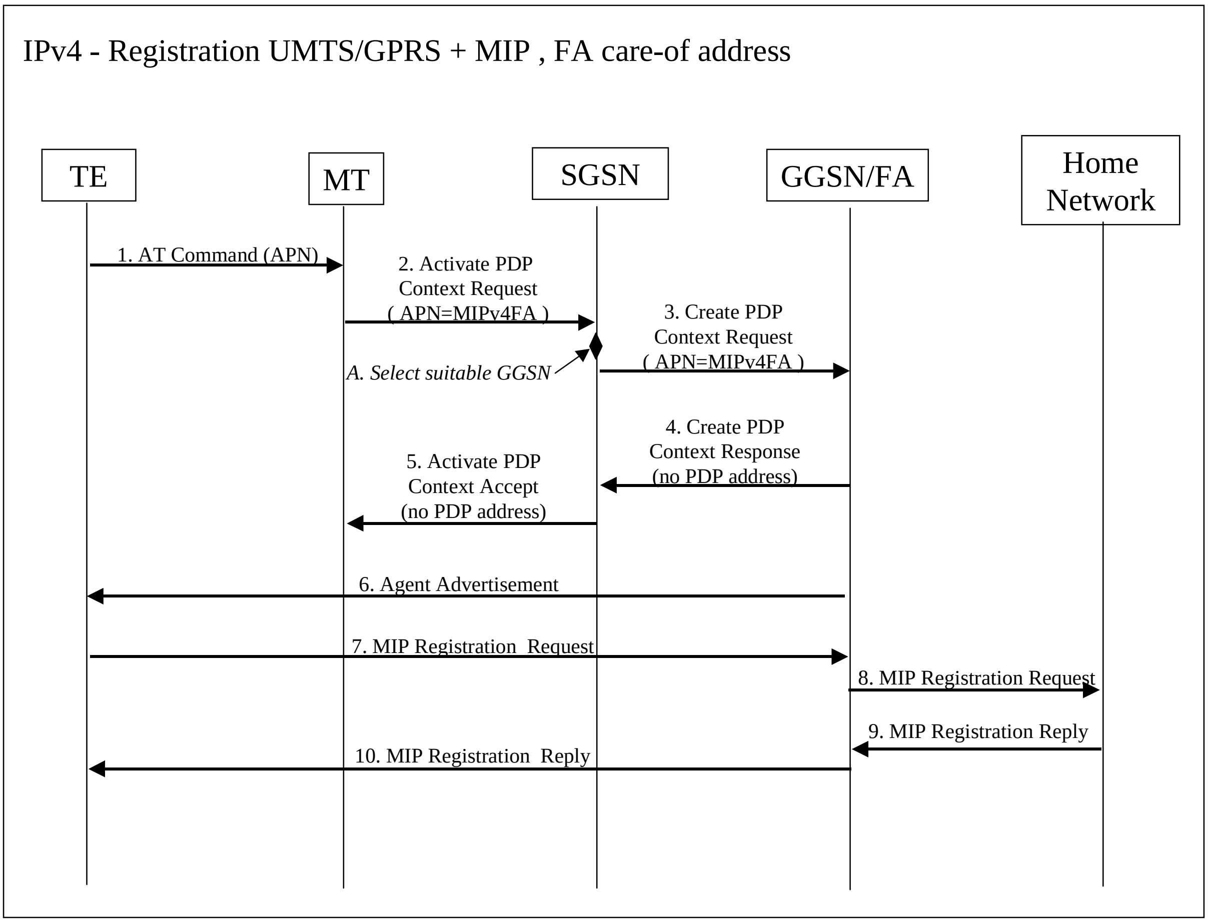

Figure 4-47. PDP Context activation with Mobile IP registration (the PPP setup and UMTS/GPRS attach procedures not included)

1. The AT command carries parameters that the MT needs to request the PDP Context Activation. The important parameter here, is the APN (Access Point Name), see section A below. The AT command is followed by a setup of the PPP connection between the MT and the TE, which are not included in the figure.

2. The MT sends the “Activate PDP Context Request” to the SGSN. The message includes various parameters of which the “APN” (Access Point Name) and the “Requested PDP Address” are of interest here. The MS may use APN to select a reference point to a certain external network and/or to select a service. APN is a logical name referring to the external packet data network and/or to a service that the subscriber wishes to connect to. The “Requested PDP Adress” should be omitted for all MS’s using Mobile IP. This is done irrespective of if the MT has a permanently assigned Mobile IP address from its Mobile IP home network, a previously assigned dynamic home address from its Mobile IP home network or if it wishes the Mobile IP home network to allocate a “new” dynamic home address.

A. The SGSN will base the choice of GGSN on the APN that is given by the MS.

The APN consists of two parts: the Network ID and the Operator ID. If no APN is given and PDP type is “IP”, the SGSN chooses a suitable GGSN according to operator’s configuration of the SGSN. Similarly, a Network ID of the format vvv (one label, no dots) can be used to specify any GGSN with a specific service (vvv), e.g. Internet access, gateway for voice over IP, Mobile IP FA. If the SGSN is not configured to identify the requested service it may try with a DNS interrogation for vvv.current-operator.current-country.gprs or, if that is not successful, with vvv.home-operator.home-country.gprs, where the home parameters are taken from the subscription data.

3. The SGSN requests the selected GGSN to set up a PDP Context for the MS. The PDP address and APN fields are the same as in the “Activate PDP Context Request” message.

4. A Create PDP Context Response is sent from the GGSN/FA to the SGSN. If the creation of PDP Context was successful, some parameters will be returned to the SGSN, if not, error code will be returned. If the GGSN has been configured by the operator to use a Foreign Agent for the requested APN, the PDP adress returned by the GGSN shall be set to 0.0.0.0. indicating that the PDP adress shall be negotiated by the MS with a Home Agent after the PDP context activation procedure.

5. The Activate PDP Context Accept message is sent by the SGSN to the MS and contains similar information as the Create PDP Context Response message.

6. The Agent Advertisement [10] is an ICMP (Internet Control Message Protocol) Router Advertisement message with a mobility agent advertisement extension. The latter part contains parameters of the FA that the mobile node needs, among those are one or more care-of addresses that the FA offers. This message should be sent, in the UMTS/GPRS user plane, as an IP limited broadcast message, i.e. destination address 255.255.255.255, however only on the TEID for the newly arrived MS to avoid broadcast over the radio interface.

7. The Mobile IP Registration Request is sent from the mobile node to the GGSN/FA across the GPRS/UMTS backbone as user traffic. The mobile node includes its (permanent) home address as a parameter [10]. Alternatively, it can request a temporary address assigned by the home network by including the Network Access Identifier (NAI) in a Mobile-Node-NAI Extension [12][11].

8. The FA forwards the Mobile IP Registration Request to the home network of the mobile node, where it get processed by a Home Agent (HA). Meanwhile, the GGSN/FA needs to store the home address of the mobile node or the NAI and the local link address of the MS, i.e. the TEID.

9. The Registration Reply is sent from the home network to the FA, which extracts the information it needs (e.g. the home address of the mobile node if allocated by the home network).

10. The FA forwards the message to the mobile node in the UMTS/GPRS user plane. As the FA/GGSN knows the TEID and the NAI or home address, it can pass it on to the correct MS. A home adress of the MS allocated by the home network is sent to the SGSN by means of the “GGSN-Initiated PDP Context modification procedure” described in [23.060]

3GPP_TSG_WG2 Meeting #11
Puerto Vallarta, Mexico, 24 - 28 January 2000

***Document* S2000162**
e.g. for 3GPP use the format TP-99xxx
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23.121	**CR**	**054**	Current Version:	3.1.0

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

For submission to:	SA#7	for approval	X	strategic	(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	

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

Source: Alcatel **Date:** 99/11/28

Subject: Inter 3G MSC SRNS relocation

Work item:

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	
C	Functional modification of feature	X
D	Editorial modification	

Release:

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

Reason for change:

The use of RANAP to carry the message sent by the source MSC to the target SRNC at Inter 3G MSC SRNS relocation has the following advantages:

- MAP-E, ... should be bearer independent and hence not depend on whether ATM or TDM are used as transport protocol between both MSC.
- Furthermore the source MSC may not know whether there are transit switches that may support or not support a particular transport technology.
- Using RANAP is far more logical because it is unlikely that BSSMAP will be able to carry **all** UMTS related parameters that the UMTS MSC needs to send to the target RNC. Use of RANAP is future proof (GSM access through GERAN may evolve to Iu and hence to RANAP)
- No useless protocol conversion is needed when RANAP is used: use of BSSMAP implies first to convert the RANAP message received from source RNC into a BSSMAP message encapsulated in MAP E and then to convert back this BSSMAP message
- No dependency between RANAP and BSSMAP :

Clauses affected: 5

Other specs affected:

Other 3G core specifications		→ List of CRs:
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 The approved CR 025 to 23.060 at the Bonn meeting triggers this CR.

comments:

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5 UMTS to UMTS handover for circuit switched services

For UMTS to UMTS Inter-MSC Hand-Oover / SRNS relocation the GSM MAP E interfacei/f transporting BSSAP RANAP messages with necessary modifications for GSM to UMTS Handover shall be used.

[Ed note: signaling flows are to be provided and be in line with "GSM to UMTS handover for circuit switched services"]

S2 meeting #11
Puerto Vallarta, Mexico
January 24-28, 2000

***Document* S2-000218**

3G CHANGE REQUEST

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23.121	**CR**	**055**	Current Version:	v.3.2.0
3G specification number ↑		*↑ CR number as allocated by 3G support team*		

For submision to TSG SA#7 — for approval **X** — for information

list TSG meeting no. here ↑ — *(only one box should be marked with an X)*

Form: 3G CR cover sheet, version 1.0 The latest version of this form is available from: ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf

Proposed change affects: USIM [ ] ME [ ] UTRAN [ ] Core Network [X]
(at least one should be marked with an X)

Source:	D2 Mannesmann	**Date:**	Jan. 25th, 2000
Subject:	Change of interface name according to 23.002		
3G Work item:			

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

F	Correction	X
A	Corresponds to a correction in a 2G specification	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	

Reason for change: To align the name of the RNC-CBC reference point with the approved CR 011 (S2-000207) against TS 23.002. The reference point name Bc is changed to IuBC in the text and in all figures.

Clauses affected: Sections 4.10

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other 2G 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:

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4.10 Cell Broadcast Service in UMTS

The *Cell Broadcast Service* (CBS) is defined as a UMTS R99 requirement to guarantee the continuity of the corresponding GSM services. It shall be provided seamlessly (as far as the user or the users terminal equipment is concerned) across the UMTS and GSM network.

4.10.1 Network Architecture

Figure 4-45a proposes a straight forward adoption of the GSM cell broadcast architecture in UMTS.

The basic network structure replaces the GSM BSS with the UTRAN containing the RNC and the Node B. The cell broadcast center (CBC) is part of the core network and connected via the IuBCe reference point to the RNC. On the logical interface between the CBC and the RNC a mandatory protocol shall be defined to meet the requirements defined in 3GPP TS 23.041. Based on this architecture and the current requirements for cell broadcast the core network elements like MSC, VLR, HLR etc are not involved for the service delivery.

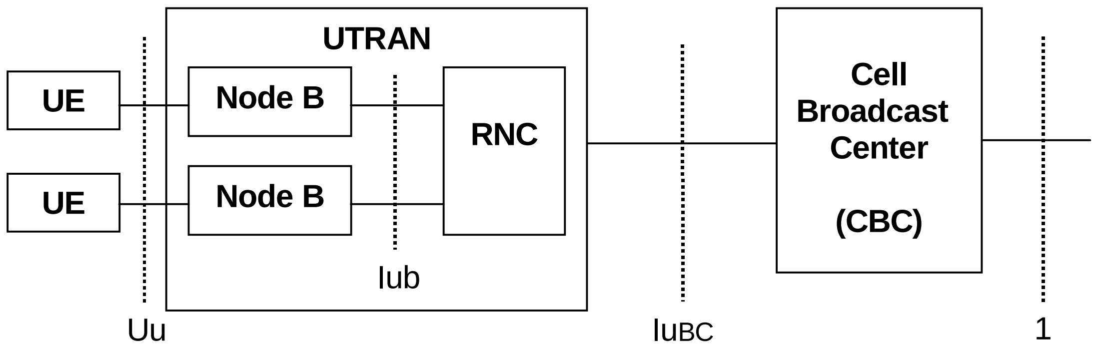

Figure 4-45a: Architecture for the Cell Broadcast Service in UMTS

IuBCe is the reference point between the CBC and the RNC. The protocol stack between the CBC and the RNC is given in figure 4-45b.

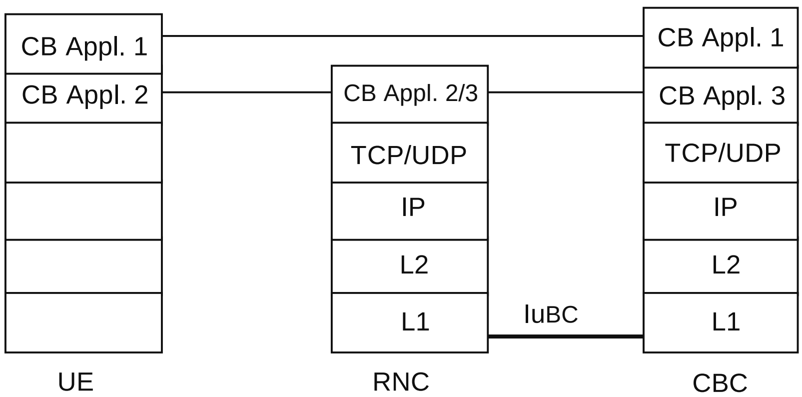

Figure 4-45b: Protocol architecture for the Cell Broadcast Service

CB Appl 1 provides the description of the information passed from the CBC to the UE at the highest layer. This is not changed by the RNC. CB Appl. 2 provides the lower level UE function and CB Appl 3 runs between the CBC and RNC. The protocol primitives of the CB application are described in TS23.041.

The Layer 4 between RNC and CBC (UDP or TCP) shall be selected depending on the requirements of the CB Application 3.

It should be possible for one CBC to reach every RNC of one PLMN. It should be possible that an RNC is connected to at least two CBC at the same time (the "normal" one as in GSM and a second one for LCS).

Note that even if CBS is supported by a separate protocol suite over the IuBC~~c~~ reference point it shall be possible to share the transport resources of the Iu interface (i.e. ATM/AAL5/IP) as shown in Figure 4-45c.

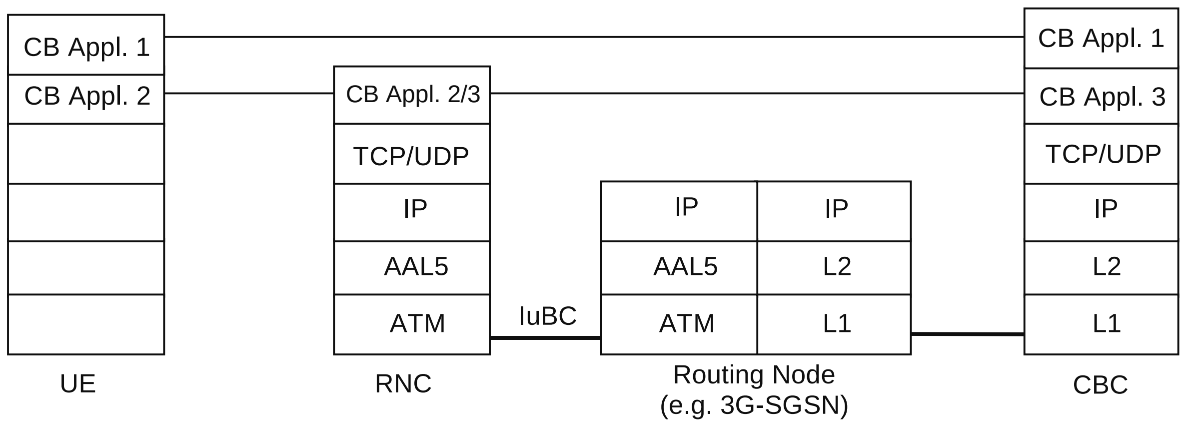

Figure 4-45c: Possible mapping of the IuBC~~c~~ reference point onto the transport resources of the Iu interface

3GPP TSG SA WG2 Meeting #12
Tokyo, 6– 9 March 2000

Document S2-000386
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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23.121	**CR**	**056**	Current Version:	3.2.0

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

For submission to:	SA#7	for approval	X	strategic	*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic	*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: (U)SIM [ ] ME [ ] UTRAN / Radio [ ] Core Network [ ]
(at least one should be marked with an X)

Source: Nokia **Date:** 2.3.2000

Subject: Deletion of SRNS relocation procedure and Removal of the TMSI signature from CS domain

Work item:

Category:

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

(only one category shall be marked with an X)

Reason for change:

Since at S2#11 the SRNS relocation signaling was included in 23.060, this CR proposes to remove this overlapping description from TS 23.121, in order to avoid any updating problems in the future.

Currently 23.121 defines that in the CS domain, TMSI signature is used in the IMSI attach procedure, IMSI detach procedure and during the location update procedure. It is proposed that this requirement is removed from 23.121, because it is not essential for CS-MM. Also this feature has not been standardised in the stage 3 and it will not be specified for the release 99, because there is no N1 meetings left for the R99.

Clauses affected: 4.3.14.2.3; 4.3.13

Other specs affected:

Other 3G core specifications		→ List of CRs:	
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:

4.3.14.2.3 4.3.14.2.3 SRNS relocation (UE connected to a single CN node, 3G_SGSN) followed by Location Registration in new Location Area

This is described in TS 23.060.

This example shows SRNS relocation when source RNC and target RNC are connected to different 3G_SGSN. Figure 4-25 and Figure 4-26 illustrate the situation before respective after the SRNS relocation and location registration. Figure 4-27 illustrates the signalling sequence where each step is explained in the following list.

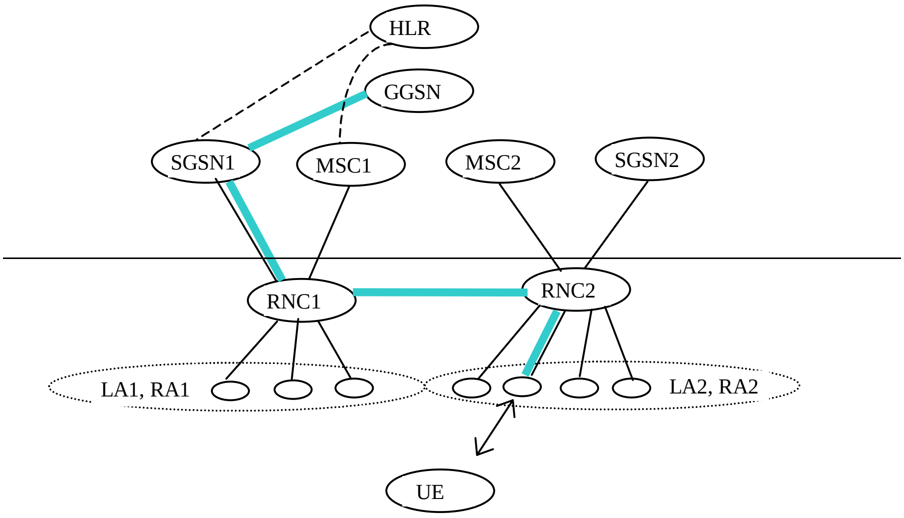


Figure 4-25 Before the SRNS relocation and location registration

Before the SRNS relocation and location registration the UE is registered in SGSN1 and in MSC1. The UE is in state MM connected towards the SGSN1 and in state MM idle towards the MSC1. The RNC1 is acting as SRNC and the RNC2 is acting as DRNC.

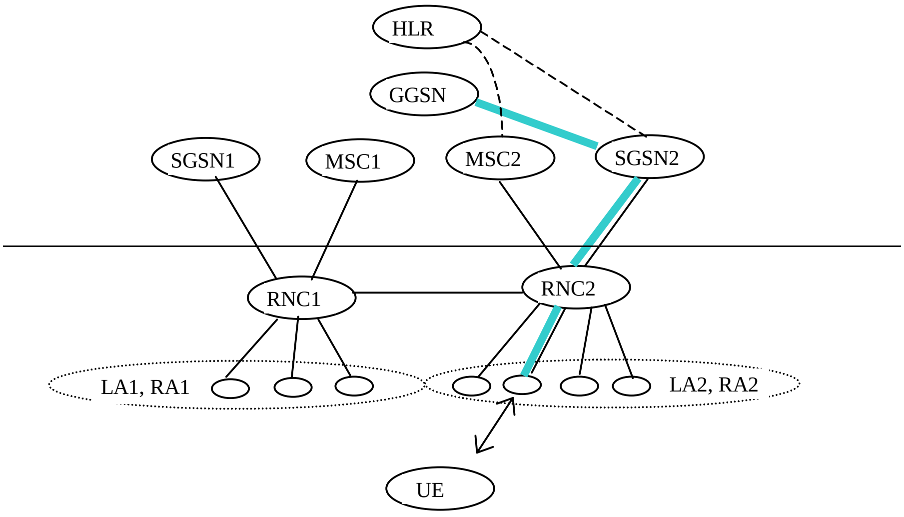


Figure 4-26 After the SRNS relocation and location registration

After the SRNS relocation and location registration the UE is registered in MSC2 and in SGSN2. The UE is in state MM connected towards the SGSN2 and in state MM idle towards the MSC2. The RNC2 is acting as SRNC.

At SRNS relocation:

The source and target SGSN exchange CN level information (CN classmark, list of established PDP contexts)

The source and target SRNC exchange UTRAN level information (UTRAN classmark,…) and information used to ensure that no user packet is lost nor duplicated during the SRNS relocation procedure

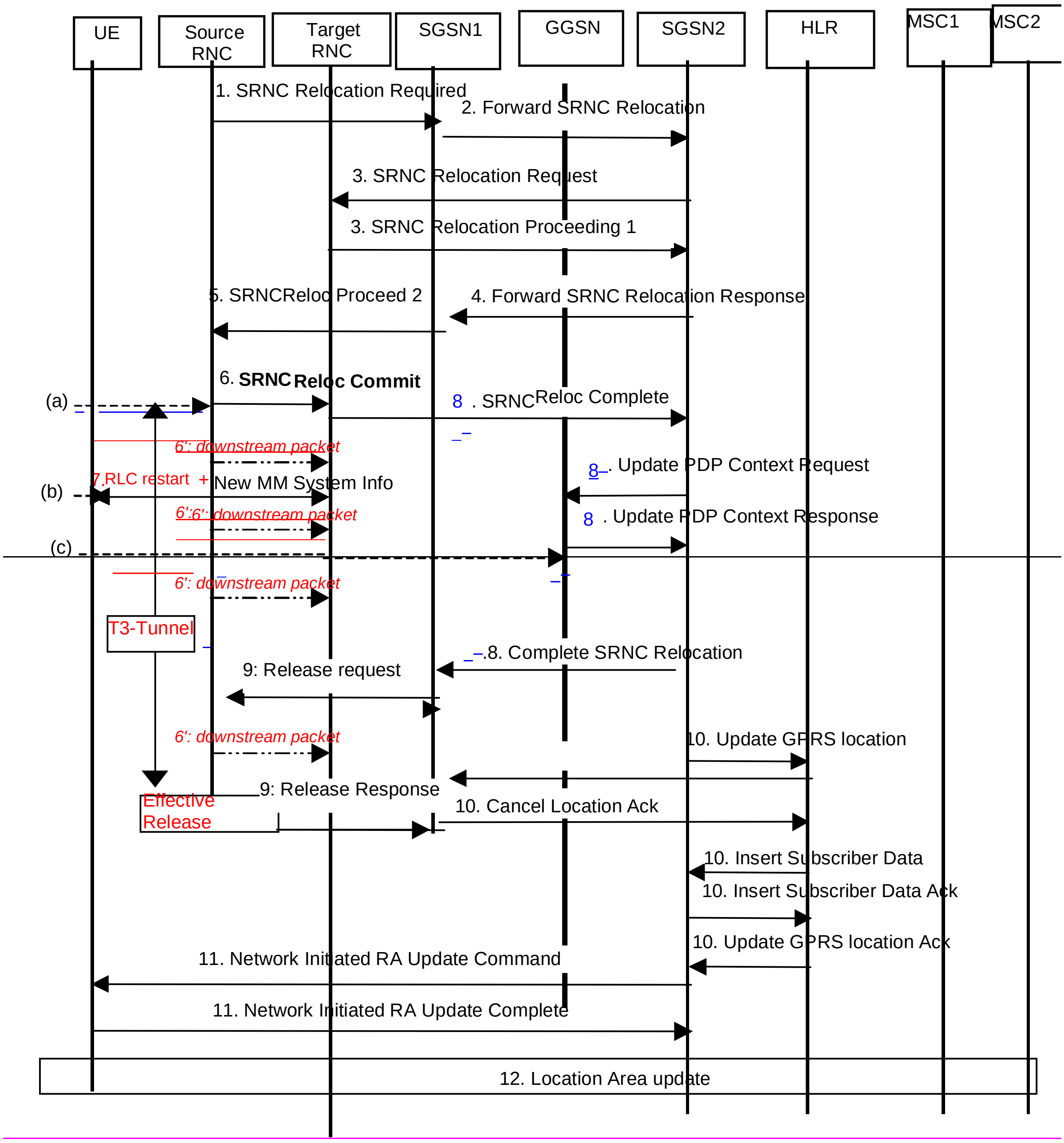


Figure 4-27: Interface information transfer for SRNS relocation update when changing SGSN area resulting in a change of registered location and followed by location registration in new Location Area.

"Resource reservation" Phase

During this phase, the transmission of packets between GGSN and UE through the source SRNC goes on.

1)UTRAN (source SRNC) makes the decision to perform the Serving RNC relocation procedure. This includes decision on into which RNC (Target RNC) the Serving RNC functionality is to be relocated. The source SRNC sends SRNC Relocation required messages to the SGSN1. This message includes parameters such as target RNC identifier and an information field that shall be passed transparently to the target RNC.

2)Upon reception of SRNC Relocation required message the SGSN1 determines from the received information that the SRNC relocation will (in this case) result in change of SGSN.
The SGSN will then send a Forward SRNC relocation request to the applicable SGSN, SGSN2, including the information received from the Source SRNC and necessary information for the change of SGSN (e.g. MM context, PDP context). The PDP context information contains the list of the PDP context (including PDP type, requested / negotiated QoS) currently established by the UE along with the address of the associated GGSN. It does not contain any information linked with packet transmission (sequence numbers) because such information is under the responsibility of the UTRAN

3)The SGSN2 sends a SRNC Relocation Request message to the target RNC. This message includes information for building up the SRNC context, transparently sent from Source SRNC (e.g. UE id., no of connected CN nodes, UE capability information), and directives for setting up Iu user plane transport bearers.
When the Iu user plane transport bearers have been established, and target RNC completed its preparation phase, SRNC Relocation Proceeding 1 message is sent to the SGSN2. *The SRNC Relocation Proceeding 1 message* contains the IP address(es) (possibly one address per PDP context) on which the target RNC is willing to receive these packets.

4)When the traffic resources between target RNC and SGSN2 has been allocated and the SGSN2 is ready for the SRNC move, then the Forward SRNC Relocation Response is sent from SGSN2 to SGSN1. This message indicates that necessary resources have been allocated for the SRNC relocation: SGSN2 / target RNC are ready to receive from source SRNC the downstream packets not yet acknowledged by UE. *The Forward SRNC Relocation Response message* contains the IP address(es) that were given in the SRNC Relocation Proceeding 1 message.

5)When the Forward SRNC Relocation Response has been received in the SGSN1, the SGSN1 indicates the completion of preparation phase at the CN PS domain side for the SRNC relocation by sending the SRNC Relocation Proceeding 2 message to the Source RNC. . This message contains the IP address(es) (possibly one address per PDP context) on which to send the downstream packets not yet acknowledged by UE.

"Actual hand-over of Serving RNC" Phase

6)When the source RNC has received the SRNC Relocation Proceeding 2 message, the source RNC sends a SRNC Relocation Commit message to the target RNC(list of (SNU, UP_RLC_ack, SND)). SND is the GTP sequence number for the next downlink packet received from the GGSN. SNU is the GTP sequence number for the next uplink packet to be tunnelled to the GGSN. UP_RLC_Ack contains the acknowledgements for upstream PDU received by the source SRNC on each Non Real Time RLC connection used by the UE (i.e. the Receive State Variable V(R) for all RLC SAPI in acknowledged mode). For Real Time connections (conversational and streaming QoS class), UP_RLC_ACK is not used. The source SRNC starts a timer T3-TUNNEL , stops the exchange of the packets with the UE (point (a)), and starts tunnelling the buffered downstream packets towards the target SRNC. The target RNC executes switch for all bearers at the earliest suitable time instance.

7)The target RNC starts acting as SRNC. The target SRNC :

- Restarts the RLC connections. This includes, for Non Real Time bearers, the exchange between the target SRNC and the UE of the UP_RLC_Ack and DOWN_RLC_ACK. DOWN_RLC_ACK confirms all mobile-terminated packets successfully transferred before the start of the relocation procedure. If DOWN_RLC_ACK confirms reception of packets that were forwarded from the source SRNC, then these packets shall be discarded by the target SRNC. UP_RLC Ack confirms all mobile-originated packets successfully transferred before the start of the relocation procedure. From now on the exchange of the packets with the UE can restart (point (b)). For bearers with header compression, the header compression entities renegotiate / restart between UE and target RNC. From now on the exchange of data between UE and network can restart.

- Sends New MM System Information to the UE indicating e.g. relevant Routing Area and Location Area. A new RAI triggers a routing area update procedure. Additional RRC information may then also be sent to the UE, e.g. new RNTI identity. This may trigger a location update procedure (see 9 and 12)

8)Immediately after a successful switch at RNC, target RNC (=SRNC) sends SRNC Relocation Detect message to the SGSN2. After sending out the New MM System Information, the target RNC sends SRNC Relocation Complete message to the SGSN2.

9)The UE sends a Routing area update request (old RAI; old P-TMSI; old PTMSI signature, Update type) to SGSN2 when the New MM System Information included a new RAI.

10)Upon reception of RAU request, the SGSN2 updates the GGSN(s) with a Update PDP Context Request including the new SGSN address. The GGSN(s) then update the PDP context and return Update PDP Context Response. The SGSN2 sends a Complete SRNC Relocation towards the SGSN1. The target RNC then receiving downstream packets from both the old path (source SRNC) and from the new path (SGSN2), may for RT bearers have too much packets in its queues. The way to discard these packets in excess is implementation dependant.

11)At reception of the Complete SRNC Relocation, SGSN1 will send a release indication towards the Source RNC. All resources allocated to this UE by the source RNC are released only when this message has been received and timer T3-TUNNEL has expired. Before timer T3-TUNNEL expires, all downstream packets received from the GGSN are sent towards the target SRNC.

12)The SGSN2 informs the HLR of the change of SGSN by sending Update GPRS location (IMSI, new SGSN address etc.) to the HLR. The HLR cancels the context in the old SGSN, SGSN1, by sending Cancel Location (IMSI). The SGSN1 removes the context and acknowledges with Cancel Location Ack. The HLR sends Insert subscriber data (IMSI, subscription data) to the SGSN2. The SGSN2 acknowledges with Insert Subscriber Data Ack. The HLR acknowledges the Update GPRS location by sending Update GPRS Location Ack to the SGSN2.

13)At reception of Insert subscriber data from HLR, the SGSN2 will initiate the update of MM information stored in the UE. This is done by sending Network Initiated Routing Area Update Command to the UE. This message will include new RAI, and possible also new P-TMSI. When the UE has made necessary updates it answers with Network Initiated Routing Area Update Complete.

14)When receiving new MM system information indicating a new Location Area, the UE will, in this case, initiate a Location Area update procedure towards the MSC2. This implies that the Location Area update will be performed in parallel to the above indicated activities related to the SGSN side of the Core Network.

It has to be noted that the sequence chart of Figure 4-27 may be further refined.

UE-GGSN Communication path during the SRNS relocation procedure

Before point (a), in Figure 4-27, the connection is established between UE and GGSN via Source SRNC and SGSN1.

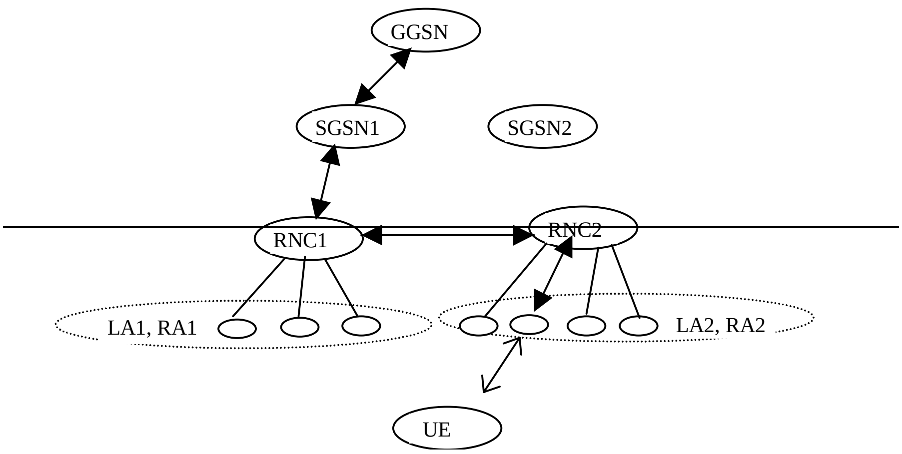


Figure 4-28:Data paths before the SRNS relocation has been actually committed (before point (a) in Figure 4-27)

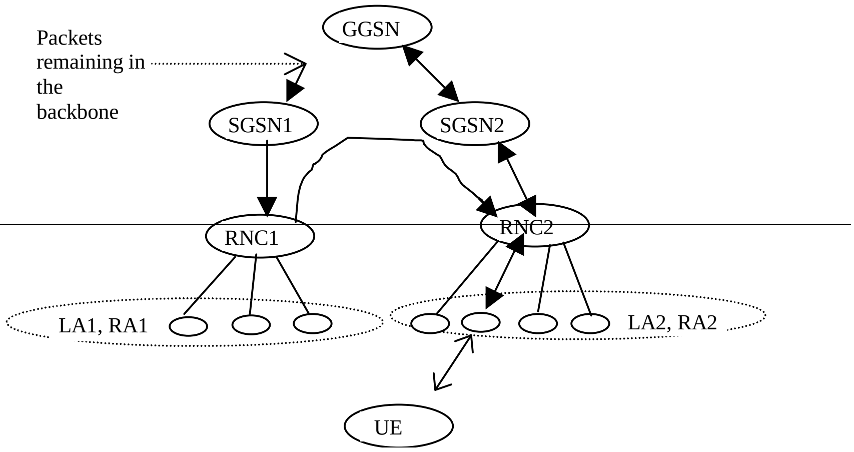
After transmission of the "SRNS relocation commit" to the target SRNC (after point (a) in figure 4-27), the source RNC cannot exchange data with the UE because its RLC should be frozen after the transmission of the RLC sequence numbers to the target RNC. Before the restart of the RLC between target SRNC and UE (before point (b) in Figure 4-27), data transfer cannot go on. All downstream packets received by the target SRNC during this phase are buffered until restart of the RLC between target SRNC and UE.

After point (b), in Figure 4-27, packet transfer between UE and network can restart. Upstream packets are sent to GGSN via SGSN2 while up to point (c) downstream packets are still sent to the UE via SGSN1, source RNC and target SRNC..

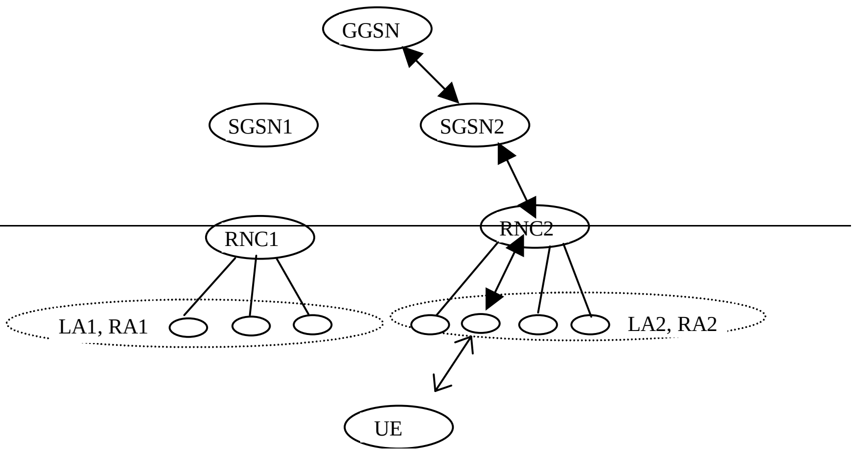
After point (c), in Figure 4-27, the connection is established between UE and GGSN via Target RNC and SGSN2.

~~For services requiring high reliability, during T3-Tunnel, the target SRNC listens to the two GTP tunnels at the same time and transfers to the UE packets coming from both paths. For RT services, if target SRNC has too much packets in its queues (e.g. queues not coherent with maximum transfer delay), the way to discard the packets in excess is implementation dependant.~~

~~Before resource release in source RNC (before T3-TUNNEL expiry), target SRNC may receive downstream packet from 2 paths. Packets remaining on the backbone are sent on the "old path" (via SGSN1 and RNC1) and forwarded by source RNC1 to target SRNC2 while packets received by the GGSN on its Gi interface are sent on the new path (via SGSN2) to target SRNC2.~~



~~Figure 4-29: Data paths after the GGSN update (after point (c) in Figure 4-27)~~



~~Figure 4-30: Data paths after the resource release in source RNC (after point (d) in Figure 4-27)~~

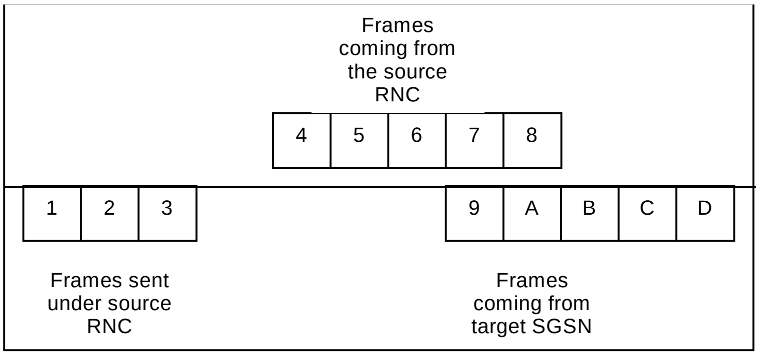
~~Advantage of this mechanism:~~

~~-A common mechanism works for both RT and NRT services. This mechanism works also for GPRS R97 <--> UMTS hand-over.~~

~~-The mechanism works for both SRNS relocation and Hand-Over impacting the CN: in the latter case there may be no time to prepare the Hand-Over and hence no possibility to request anything (e.g. to duplicate PDU for bi-casting) from the GGSN before the commit as e.g. when this Hand-Over impacting the CN corresponds in fact to a cell-update.~~

~~Drawbacks:~~

~~-There are two breaks in transmission (one when the data stream starts from source RNC to target RNC, and one when the data stream starts from GGSN via target SGSN) as described in the following figure: speech frames 4,5,6 sent from the source RNC may be delayed by a few tens of milliseconds, speech frames 7,8 are discarded by the target RNC since frames 9, 10 are coming from target SGSN at the same time. So, we have one blank and one frame slip.~~



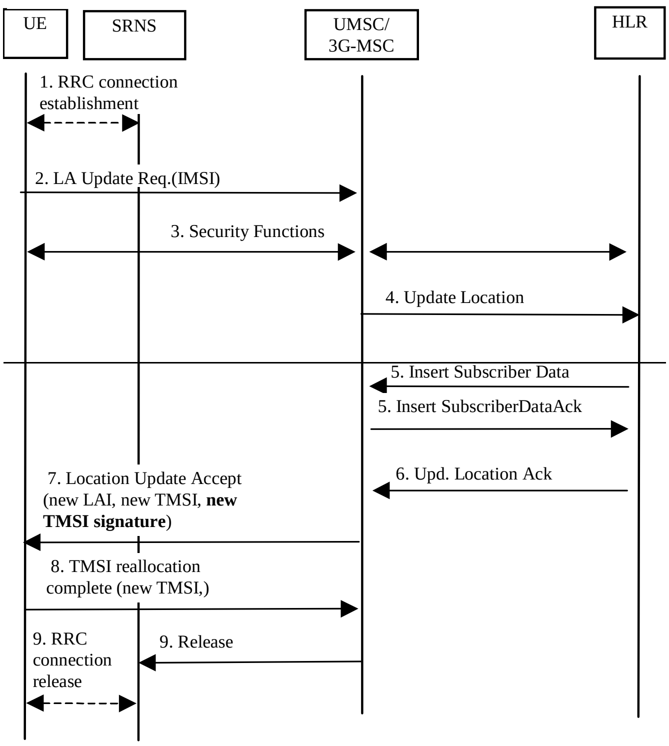
~~Note: concerns that this might not work properly for RT services have been raised. If the service interruption cannot meet service requirements, then a feasibility study could be made on alternative mechanisms to meet these requirements for R00 (e.g. bi-casting) .~~

~~4.3.13 Use of TMSI signature~~

~~The TMSI signature concept shall be used during the IMSI attach procedure, IMSI detach procedure and during the location update procedure. However, it may also be used in almost all cases when authentication is performed e.g. call setup. Note that if the TMSI is sent in the clear, then a new one should be issued. As the use of a P-TMSI signature is already defined within GPRS, only the modifications necessary for CS service domain shall be shown below.~~

~~4.3.13.1 IMSI attach~~

~~The figure bellow shows the signalling procedure for *a first time (IMSI based) attach (i.e. when no TMSI is available in the UE)*. The following list explains the relevant steps involved in the procedure.~~



~~**Figure 4-15: Attach Procedure using TMSI signature**~~

1). An RRC connection is established.

2). Upon the very first attach towards the network, the MS shall send a Location Area Update Request message towards the MSC/UMSC, indicating an IMSI attach, and identifying itself with IMSI.

2 – 6) The LA updating procedure shall be carried out as per normal within the network.

7). The MSC/UMSC shall optionally generate and send a TMSI signature within the Location Area Update Accept message to the MS, which will be stored by the MS.

8) The MS acknowledges the new TMSI.

9). The RRC connection may be released.

4.3.13.2 Location Area update

The figure bellow shows the signalling for a location update procedure involving change of 3G-MSC / UMSC. Note that when the authentication procedure using TMSI signature is successful, security functions using Ki are no longer required. The following list explains the relevant steps involved in the procedure.

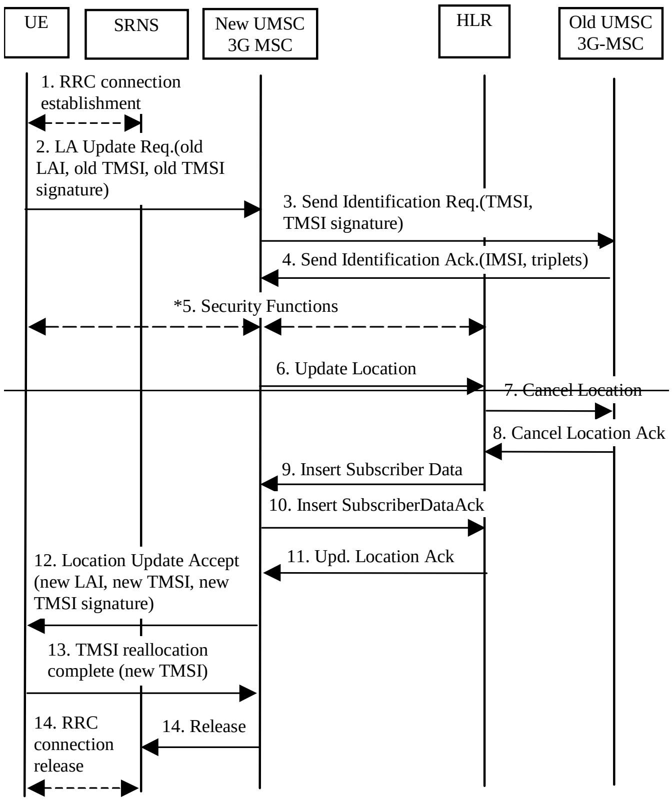


Figure 4-16: Location Update using TMSI signature

1) An RRC connection is established.

2) The UE shall send a Location Area Update Request (old LAI, old TMSI, old TMSI signature) towards the new UMSC/MSC.

3-5) The new UMSC/MSC shall send a Send Identification Request (TMSI, TMSI signature) to the old UMSC/MSC. The old UMSC validates the old TMSI signature and responds with an appropriate error cause if it does not match the value stored. This should initiate the security function in the new UMSC. Otherwise, the old UMSC responds with a Send Identification Acknowledge (IMSI, Authentication triplets).

6-11) The LA updating procedure shall be carried out as per normal within the network.

~~**12)** The new UMSC/MSC shall optionally generate and send a TMSI signature within the Location Area Update Accept message to the UE.~~

~~**13)** The UE acknowledges the new TMSI.~~

~~**14)** The RRC connection may be released.~~

4.3.13~~.3~~ MM System Information

The system information that is needed for the Mobility Management functionality contains parameters such as:

MCC, MNC, LAC, RAC, Periodic Location Area Update timer, and Periodic Routing Area Update timer.

In each UMTS cell (UTRAN cell) the network broadcasts MM system information on the broadcast channel. In RRC idle mode, when the UE camps on one cell, it receives all MM system information valid for this cell on the broadcast channel of the cell. The received MM system information is then the "current MM system information".

In RRC connected mode, it is the responsibility of the SRNS to control the current MM system information valid for the UE. At any changes, the established RRC connection is used for transferring the new MM system information to the UE. E.g. at SRNS relocation, the new SRNS shall have logic for sending applicable MM system information to the UE. This information is determined by e.g. the Location Areas and the Routing Areas handled by the respective CN node to which the SRNS can set up Iu signalling connections. At reception of new MM system information from the SRNC on the established RRC connection, the UE uses this new information as the "current MM system information". (Note that the MM system information need not necessarily be sent for every SRNSs relocation, nor does it prelude MM system information being sent on other occasions.)

At the RRC connection establishment, the UE uses the broadcasted MM system information of the cell where the establishment is made as the "current MM system information".

When the UE leaves the RRC connected mode and enters RRC idle mode, the UE uses the broadcasted MM system information of the chosen cell, which is determined by the UE idle mode cell selection/re-selection process that is then performed, as the "current MM system information".

The "current MM system information" is used by the MM functionality in the UE respecting the rules for the UE service state of the respective MM state machine, see ' 7.3.3 MM functionality in different UE service states ' and ' 7.3.6 Service registration and location update '.

~~4.3.13.4 IMSI detach procedure~~

~~When the UE performs the detach procedure, TMSI is included in the detach message. If the network has allocated the TMSI signature for the UE, e.g., in the previous location update or attach procedure, TMSI signature is included in the detach message for the verification purpose.~~

Document S2-000499

e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

23.121	CR	57rev1	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#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: Lucent Technologies **Date:** 25 Jan., 2000

Subject: Removal of FFS items in 23.121

Work item:

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	
C	Functional modification of feature	
D	Editorial modification	X

Release:

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

Reason for change:

In section 4.3.1.1 the ffs item has been resolved within N1 and S2, see 23.060.

Section 4.3.2.1.5, the nature of the timers referred to in this section have now been defined between RAN and S2. References have been added to the relevant specifications.

Section 4.3.14.1.1 and 4.3.14.1.2 are changed as agreed by RAN3/S2, see for example 23.060.

Section 4.3.14.1.5, behaviour is as defined.

Section 4.3.14.4 deleted.

- Detailed procedures for 2G to 3G handover are covered in 23.060.
- The logical/physical characteristics are specified within the RAN Iu set of documents. (25.410-25.415)
- Combined MAP procedures are not in R99

Section 6,

- a reference has been added to the S1 document on GSM-UMTS Interoperability.
- The case outlined in the last sentence is covered by the selective RAU procedure in 23.060.

Clauses affected: 4.3.1.1, 4.3.2.1.5, 4.3.14.1.1, 4.3.14.1.2, 4.3.14.1.5, 4.3.14.4, 6

Other specs affected:	Other 3G core specifications		→ List of CRs:	
	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:	

help.doc

<--------- double-click here for help and instructions on how to create a CR.

In RRC Idle mode it is the broadcasted MM system information (e.g. information about the present Location Area and present Routing Area) that determines when the UE initiates a location registration procedure towards the CN. An UE in state CS-IDLE will in RRC Idle mode, initiate Location Area update towards the CN when crossing LA border. An UE in state PS-IDLE will in RRC Idle mode initiate Routing Area update towards the CN when crossing RA border.

In RRC Connected mode, the UE receives the MM system information on the established RRC connection. (I.e. the broadcasted MM system information is not used by the UE in the RRC connected mode.) An UE in state CS-IDLE will, in RRC Connected mode, initiate Location Area update towards the CN when receiving information indicating a new Location Area. An UE in state PS-IDLE will, in RRC Connected mode, initiate Routing Area update towards the CN when receiving information indicating a new Routing Area. An UE in state CS-CONNECTED will, in RRC Connected mode, not initiate Location Area update towards the CN. An UE in state PS- CONNECTED will, in RRC Connected mode, not initiate Routing Area update towards the CN.

In CS-DETACHED mode the UE will not initiate any Location Area update and this independent of the RRC mode. In PS-DETACHED mode the UE will not initiate any Routing Area update and this independent of the RRC mode.

In additional to normal location registration when changing registration area, the UE may (network options) perform CS periodic registration when in CS-IDLE state and PS periodic registration when in PS-IDLE state. The respective periodic registration may be on/off on Location Area respective Routing Area level.

On the Mobility Management level, IMSI and CS related TMSI are used as UE identities in the CS service domain, and IMSI and PS related TMSI are used as UE identities in the PS service domain. The IMSI is the common UE identity for the two CN service domains.

A signalling connection between the UE and the CN refers to a logical connection consisting of an RRC connection between UE and UTRAN and an Iu signalling connection (“one RANAP instance”) between the UTRAN and the CN node. The CS service domain related signalling and PS service domain related signalling uses one common RRC connection and two Iu signalling connections (“two RANAP instances”), i.e. one Iu signalling connection for the CS service domain and one Iu signalling connection for the PS service domain.

4.3.1.1 Use of combined procedures for UMTS

The use of separated PS and CS mobility mechanisms within the UE and within the CN may lead to non-optimal usage of the radio resource (for example a UE in PS idle and CS idle state would perform both location updates (for the CS mechanism) and Routing area updates (for PS mechanisms)).

UMTS should optimise the use of radio resources., The use of combined updates (similar to the current GSM/GPRS Gs combined update mechanism) may enable this. To offer flexibility in the provision of mobility management for UMTS, it should be possible to use combined mechanisms for location management purposes as well as for attach/detach status purposes.

From the UE perspective it should be possible for the UE to perform combined update mechanisms (operator option). UMTS Phase 1 R99 terminals should support the use of both combined and separate mechanisms. The support of this feature by all UMTS mobiles will also ease evolution of UMTS MM in the future.

In the UMTS specifications the RAN will not co-ordinate mobility management procedures that are logically between the core network and the MS. This includes: location management, authentication, temporary identity management and equipment identity check.

~~The issues of security, temporary identifiers, CS and PS periodic registrations and PS DETACHED/CS DETACHED need to be studied.~~

4.3.2 Description of the Location Management and Mobility Management Concept

4.3.2.1 Area concepts

For the mobility functionality four different area concepts are used. Location Area and Routing Area in the CN as well as UTRAN Registration Area and Cell areas in the UTRAN.

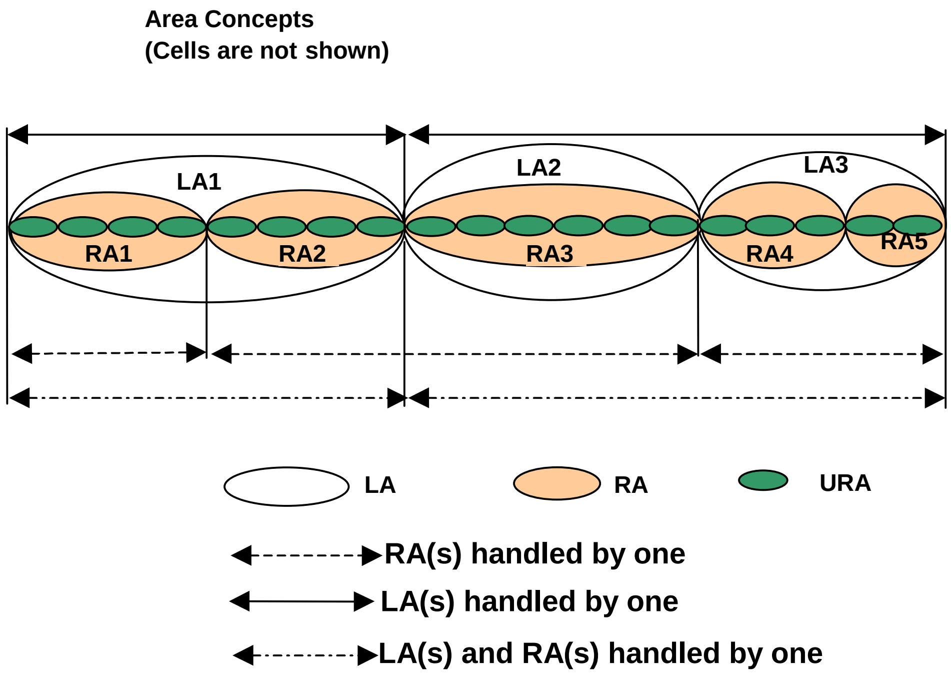


Figure 4-10: Relationship between different areas.

4.3.2.1.5 Hierarchical tracking concept

A packet UE (in RRC connected mode) is tracked at the cell level by RNC during an active connection.

A packet UE (in RRC connected mode) is tracked at the URA level by RNC when no data are actively transfer, and the probability of data transfer is quite high.

A packet UE (in PS-Idle state) is tracked at the Routing Area level by SGSN when no data is actively transfered and the probability of data transfer is quite low.The network operator should be able to optimise paging and updating load by controling the size of the different areas and the probability of data transfer (controlled by the RRC_connection_release timer). For example, one operator may decide that URA are small, and that RRC connection are released after a relatively short time of inactivity, so that most attached packet UE are tracked in the Routing Area level (optimum for packet UE mainly using client-server type of service).

Another operator may decide that URA are large, and that RRC connection are released only if RRC connection is lost, so that most attached packet UE are tracked at the URA level.

The procedure for the releasing of the RRC connection can be found in 23.060 under the Iu release procedure. The URA update procedures can be found in 25.331.

~~Different timer values are required for the URA Update Timer and for the RRC Connection Release Timer. It is for further study whether the duration of the RRC_Connection_Release timer is set on a per UE basis, or configurable by the operator to be the same for all UE.~~

4.3.3 Relationship between MM and SM states for an UE

When a UE is attached to PS service, it may have or not some PDP context established.

If the UE has no PDP context established (SM-Inactive), no radio access bearer are established for PS service. The UE is in RRC connected mode, only if the state is UMTS CS-CONNECTED state or UMTS PS-CONNECTED state (i.e. only a PS signaling connection is established).

If the UE has at least one PDP context established (SM-Active), the UE may be in UMTS PS-CONNECTED state or in UMTS PS-IDLE state.

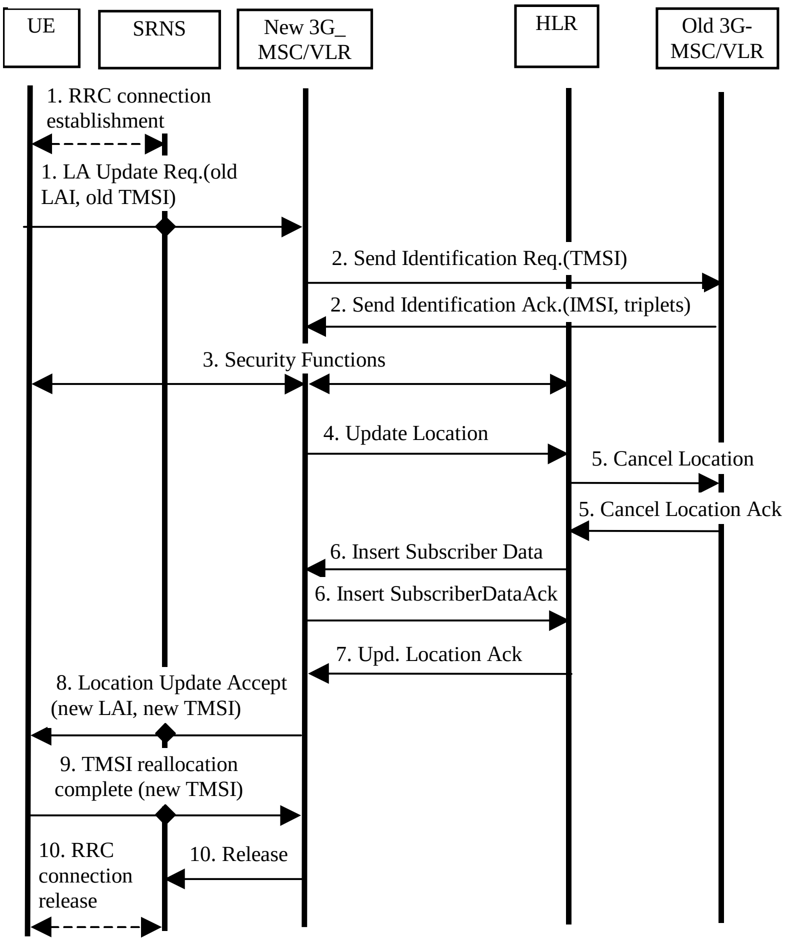


Figure 4-17: Interface information transfer for location update when changing VLR area

- The RRC connection is established, if not already done. The UE sends the initial message Location Area Update Request (old TMSI, old LAI, etc.) to the new 3G_MSC/VLR. The old TMSI and the old LAI are assigned data in UMTS. The SRNS transfers the message to the 3G_MSC/VLR. The sending of this message to 3G_MSC/VLR will also imply establishment of a signalling connection between SRNS and 3G_MSC/VLR for the concerned UE. ~~The 3G_MSC/VLR determines the new Location Area for the UE. Whether the 3G_MSC/VLR derives the new LAI from information supplied by the UE or by the SRNS is ffs.~~ The UTRAN shall add the RAC and the LAC of the cell where the message was received before passing the message to the MSC.

- The new 3G_MSC/VLR sends an Send Identification Request (old TMSI) to the old 3G_MSC/VLR to get the IMSI for the UE. (The old LAI received from UE is used to derive the old 3G_MSC/VLR identity/address.) The old 3G_MSC/VLR responds with Send Identification Ack. (IMSI and Authentication triplets).

- Security functions may be executed.

- The new 3G_MSC/VLR inform the HLR of the change of 3G_MSC/VLR by sending Update Location (IMSI, MSC address, VLR number) to the HLR.

- The HLR cancels the context in the old 3G_MSC/VLR by sending Cancel Location (IMSI). The old 3G_MSC/VLR removes the context and acknowledges with Cancel Location Ack .

- The HLR sends Insert Subscriber Data (IMSI, subscription data) to the new 3G_MSC/VLR. The new 3G_MSC/VLR acknowledges with Insert Subscriber Data Ack.

- The HLR acknowledges the Update Location by sending Update Location Ack. to the new 3G_MSC/VLR.

- The RRC connection is established, if not already done. The UE sends the initial message Routing Area Update Request (old P-TMSI, old RAI, etc.) to the new 3G_SGSN. The old P-TMSI and the old RAI are assigned data in UMTS. The SRNS transfers the message to the 3G_SGSN. The sending of this message to 3G_SGSN will also imply establishment of a signalling connection between SRNS and 3G_SGSN for the concerned UE. The UTRAN shall add the RAC and the LAC of the cell where the message was received before passing the message to the SGSN.

~~.The 3G_SGSN determines the new Routing Area for the UE. Whether the 3G_SGSN derives the new RAI from information supplied by the UE or by the SRNS is ffs.~~

- The new 3G_SGSN send an SGSN Context Request (old P-TMSI, old RAI) to the old 3G_SGSN to get the IMSI for the UE. (The old RAI received from UE is used to derive the old 3G_SGSN identity/address.) The old 3G_SGSN responds with SGSN Context Response (e.g. IMSI, PDP context information and Authentication triplets).
- Security functions may be executed.
- The new 3G_SGSN informs the HLR of the change of 3G_SGSN by sending Update GPRS Location (IMSI, SGSN number, SGSN address) to the HLR.
- The HLR cancels the context in the old 3G_SGSN by sending Cancel Location (IMSI). The old 3G_SGSN removes the context and acknowledges with Cancel Location Ack.
- The HLR sends Insert Subscriber Data (IMSI, subscription data) to the new 3G_SGSN. The new 3G_SGSN acknowledges with Insert Subscriber Data Ack.
- The HLR acknowledges the Update GPRS Location by sending Update GPRS Location Ack. to the new 3G_SGSN.
- The new 3G_SGSN validate the UEs presence in the new RA. If due to regional, national or international restrictions the UE is not allowed to attach in the RA or subscription checking fails, then the new 3G_SGSN rejects the Routing Area Update Request with an appropriate cause. If all checks are successful, then the new 3G_SGSN responds to the UE with Routing Area Update Accept (new P-TMSI, new RAI, etc.).
- The UE acknowledges the new P-TMSI with Routing Area Update Complete.
- When the location registration procedure is finished, the 3G_SGSN may release the signalling connection towards the SRNS for the concerned UE. The SRNS will then release the RRC connection if there is no signalling connection between 3G_MSC/VLR and SRNS for the UE.

4.3.14.1.3 Periodic Registration towards both CN nodes without use of Gs

This example shows Periodic Registration to both the 3G_MSC/VLR and the 3G-SGSN (i.e. no change of registration areas) when the UE is in MM idle state and registered in both the 3G_SGSN and the 3G_MSC/VLR.

The illustrated transfer of MM signalling to/from the UE uses an established RRC connection. This RRC connection will be established, is in this case, only for the two registration procedures towards the 3G_SGSN and 3G_MSC/VLR.

For each indicated MM message sent to/from UE, the CN discriminator indicates either 3G_ SGSN or 3G_MSC/VLR.

4.3.14.1.4 Periodic Registration with use of Gs/UMSC

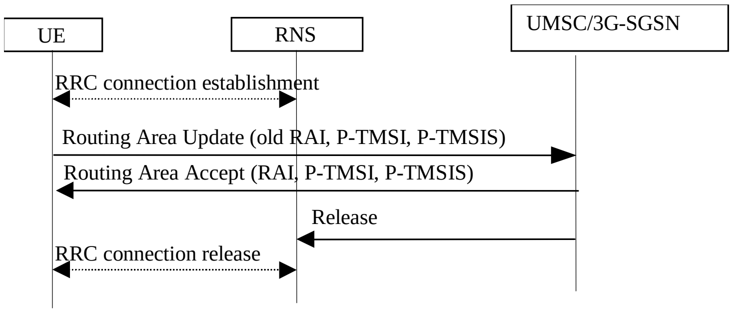


Figure 4-20: Periodic update procedure when the MS is attached for both CS and PS services

An RRC connection is established for the periodic registration. Note that this procedure is invoked only when the UE is in MM-idle state. The UE sends a Routing Area Update to the UMSC. The UMSC authenticates the P-TMSI signature. If the update is successful it sends a Routing Area Accept message. The RRC connection is then released.

4.3.14.1.5 UE initiated Combined Detach Procedure when using Gs/UMSC

The UE-Initiated Detach procedure when initiated by the UE is illustrated in Figure 4-21. Each step is explained in the following list.

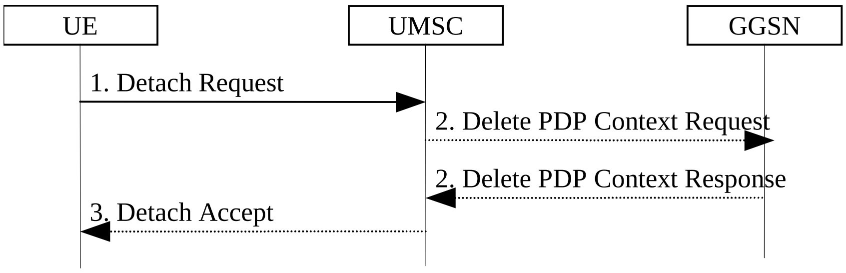


Figure 4-21: UE-Initiated Combined Detach Procedure (The procedure for combined detach when using Gs is as defined in GSM 03.60)

- 1) The UE detaches by sending Detach Request (Detach Type, Switch Off) to the UMSC. Detach Type indicates which type of detach that is to be performed, i.e., PS Detach only, CS Detach only or combined Detach. Switch Off indicates whether the detach is due to a switch off situation or not.
- If PS detach, any active PDP contexts in the GGSNs regarding this particular UE may be deactivated. ~~This is FFS~~
- If Switch Off indicates that the detach is not due to a switch off situation, the UMSC sends a Detach Accept to the UE.

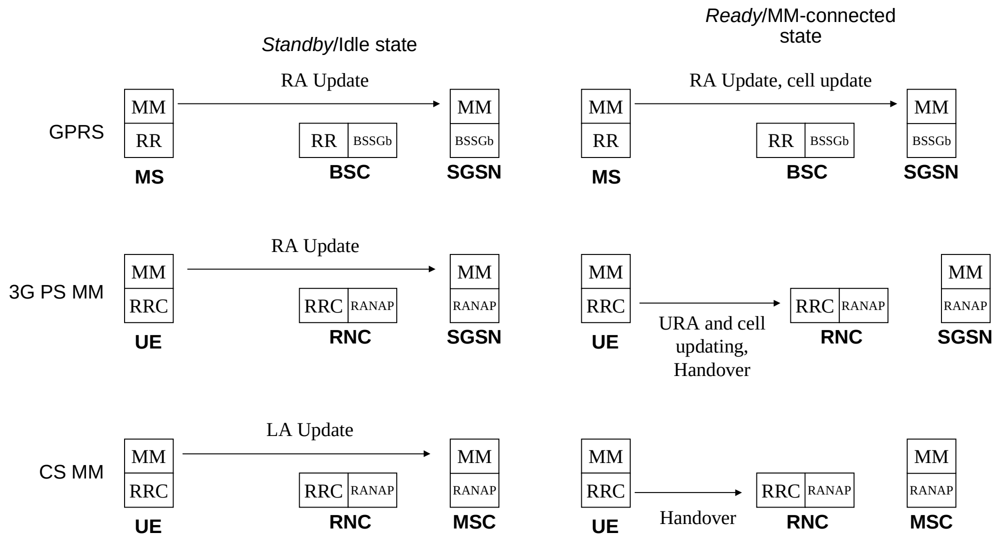


Figure 4-31 The states written in italics correspond to those defined in GSM with GPRS.

4.3.14.3.1 PS -idle state

The RA update procedure is utilised to update the whereabouts of the UE into SGSN. The updating into SGSN takes place irrespectively of the CS MM state in MSC.

4.3.14.3.2 PS -connected state

The URA and cell updating and handover procedures presented in Figure 4-31 are based on UMTS YY.03 [2]. In brief, the aim in [2] is to introduce functionality that caters for the same functionality as standby/ready in GPRS. The RRC shall be designed in such a fashion, which allows the state of the RRC connection to define the level of activity associated to a packet data connection. The key parameters of each state are the required activity and resources within the state and the required signalling prior to the packet transmission. The operator configurable RRC_connection_release timer can be used to release RRC connections in case of very low level of activity and in case the QoS requirements e.g. delay requirement allow the release of the RRC connection.

The cell update and URA update between UE and RNC are used when the UE is in RRC common channel state, i.e., when the above mentioned parameters allow to scale down the resources reserved for the UE (for a more detailed description on this, see [2]). For example, the purpose of the cell update procedure is to allow the UE to inform its current location in the corresponding RRC state. According to [2] the cell update procedure replaces handover in the corresponding RRC substate.

A significant deviation from GPRS is the introduction of the handover procedures for connections supporting traffic into IP domain (in RRC cell connected state, see [2]).

The UE moves to PS-IDLE state in case of expiry of RRC_connection_release timer or an RRC connection failure.

~~4.3.14.4 Issues for further study~~

~~List of issues that are for further study related to this chapter and is the following:~~

~~More details are required with regards to the differences with regards to the “IP-domain” MM compared to GPRS MM, especially considering roaming and handover to/from UMTS to GSM/GPRS.~~

~~More details should be provided with regards to the logical relations between UE-CN and UTRAN-CN, and how these relate to the physical interconnection between UTRAN and the CN nodes(s), namely whether one logical/physical Iu can be used to interconnect the UTRAN with the CN.~~

~~It should be clarified whether this approach allows for the possibility to use a common signalling connection from MSC and/or SGSN to the HLR.~~

4.3.15 Combined update towards the HLR for a combined 3G-(MSC/VLR+SGSN) configuration

Note: Combined location update procedures are not a high priority architectural requirement for UMTS R99.

4.3.15.1 Motivation

In order to optimise the signalling load within the network, reduce operating and maintenance costs and creating the possibility to combine cs and ps handover it is essential to open the door in the specifications for combined 3G-(MSC/VLR+SGSN) solutions.

4.3.15.2 Technical description

For the area concept discussed for the time being, four different cases have to be distinguished:

- change of UTRAN Registration Area (URA) within the same Routing Area (RA)
- change of URA and RA within the same Location Area (LA)
- change of URA, RA, or LA within the same node
- change of URA, RA, or LA, and node

For a combined 3G-(MSC/VLR+SGSN) node only in case 4 the UE's HLR has to be updated. If the UE is idle mode for the packet and circuit switched traffic a combined 3G-(MSC/VLR+SGSN) node will run the location update procedure jointly for the UE's CS and PS domain resulting in one combined location update message, see Figure 4-32.

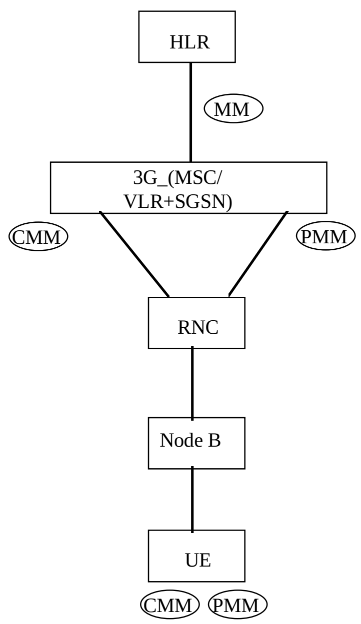


Figure 4-32 Combined MM Instance For a Combined 3G-(MSC/VLR+SGSN) Node

Split nodes may have to run one specific location update procedure for any of the two domains resulting in two separate location update messages, see Figure 4-33.

a) Networks which provide the functionality of CS Service Domain and PS Service Domain.

b) Networks which only provide the functionality of the CS Service Domain.

c) Networks which only provide the functionality of the PS Service Domain.

The following terminal configurations shall be allowed:

a) Terminals which are able to access both to the CS Domain and PS Domain.

b) Terminals which are only able to access to the PS Domain.

c) Terminals which are only able to access to the CS Domain.

It shall be noted that e.g. terminal which is only able to access to the PS Domain supports only mobility management, protocols etc. of that particular domain. The different configurations given above shall not prevent CS-type services from being delivered over the PS domain.

5 UMTS to UMTS handover for circuit switched services

For UMTS to UMTS Inter-MSC Handover the GSM E i/f transporting BSSAP messages with necessary modifications for GSM to UMTS Handover shall be used.

[Ed note: signaling flows are to be provided and be in line with "GSM to UMTS handover for circuit switched services"]

6 Interoperability between GSM and UMTS

The requirements for GSM - UMTS interoperability is defined in 22.129.

~~• Transparency [from a users perspective] of roaming and handover~~

~~• Re-use of existing subscription profiles~~

~~Note: This list is not exhaustive and is FFS.~~

~~This allows easier management and deployment of a new UMTS network.~~

UMTS is a system supporting handovers between GSM and UMTS in both directions. To support these handovers effectively, the following is required from a dual mode MS/UE supporting simultaneous ISDN/PSTN and packet service in GSM/UMTS:

Depending upon the solution adopted for GSM-UMTS handover, the MS/UE supporting simultaneous ISDN/PSTN and packet service may be required to perform appropriate update into CN depending on the activity of the UE once the handover between GSM and UMTS is completed. This update is needed to avoid any severe interruptions on the accessibility of packet services after the handover.

The nature of the update to be made after the handover in both direction, i.e., from GSM to UMTS and from UMTS to GSM, from MS/UE depends on the activity of the UE in the following way:

ISDN/PSTN connection: RA update only (if RA is changed)

Packet connection: LA and RA update (if RA and LA are changed)

Both ISDN/PSTN and packet connection: RA update only (if RA is changed)

~~If the RA, LA or both LA and RA are not changed the MS/UE behaviour is for further study~~

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***Document* S2-000486**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

23.121	**CR**	**58**	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#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: Lucent Technologies **Date:** 25 Jan., 2000

Subject: Replacement of the term L3CE

Work item:

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification	X		Release 99	X
					Release 00	

Reason for change: L3CE has been replaced by PDCP. Figure 4.43 does not exist and is not referenced, so it is proposed to delete the figure caption.

Clauses affected: 4.8.1

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	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:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

4.8 Location of the IP compression function in UMTS

4.8.1 Functional role of SNDCP / PDCPL3CE

Out of the functions devoted to SNDCP in 2G network, only header compression and XID negotiation functions need to be considered in UMTS. Hence the term L3CE Packet Data Convergence Protocol (PDCP) is introduced.

Figure 4-43bis: Compression Entity Functionality for UMTS

4.8.2 Position for header compression

RNC position for header compression is the best place because:

differential header compression algorithms work better if they are located in the place where packets are more likely to be discarded (after having discarded packets the compression algorithm can send a packet with full header[1]). This place is the RNC (where the queues for downstream packets waiting for radio resources are located).

The compression entity is as close as possible to the reliable link (as in 2G) which in this case is the RLC. Therefore it can be stated that a faster recovery of packets is possible after loss of packets in the radio interface and this solution will therefore minimize the amount of buffering in the UE and network.

the compression can be optimized for the used RAN.

It increases the possible data rates that can be achieved: Locating the compression function in the RAN defers the SGSN from the task of opening and processing packets

efficient inter-system hand-over can be supported

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e.g. for 3GPP use the format TP-99xxx
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23.121 CR 59 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#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

Source: Lucent Technologies **Date:** 25 Jan., 2000

Subject: Deletion of the handover descriptions that are covered in 23.009 and 23.060.

Work item:

Category:				**Release:**	
	F	Correction		Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification	X	Release 99	X
				Release 00	

Reason for change:

The text describing handover of circuit switched services between GSM and UMTS in sections 6.1.1 and 6.1.2 is also within 23.009. It is proposed to delete the description from 23.121.

The text describing handover between GSM GPRS and UMTS in sections 6.2.2.1 and 6.2.2.2 is also within 23.060. It is proposed to delete the description from 23.121.

Clauses affected: 6.1.1, 6.1.2, 6.2.2.1 and 6.2.2.2

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	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:

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<--------- double-click here for help and instructions on how to create a CR.

6.1 Circuit Switched Handover and Roaming Principles

Introduction of a UMTS Core Network necessitates the inter-connection with legacy systems to allow inter-PLMN roaming and handover.

For ease of convergence with the existing networks and the introduction of dual mode handsets, roaming and handover to/from UMTS should be performed in the simplest manner that requires as little change as possible to the legacy networks and standards, i.e. inter-MSC handover functionality.

These principles provide – from a user perspective – transparency of handover and roaming. In addition, operators providing UMTS services should also allow access to legacy networks using existing subscriber profiles and network interfaces.

Illustrated in Figure 6-1 shows the introduction of a UMTS Core Network for UMTS phase 1 network configuration. Notice that it leaves the current GSM specifications mainly untouched whereupon the UMTS core network acts towards the GSM MSC like a GSM MSC by providing for example MAP/E for handover purposes. Further, it should be observed that GSM subscriptions belong to the HLR whilst UMTS subscriptions exist in the HLR release 99..

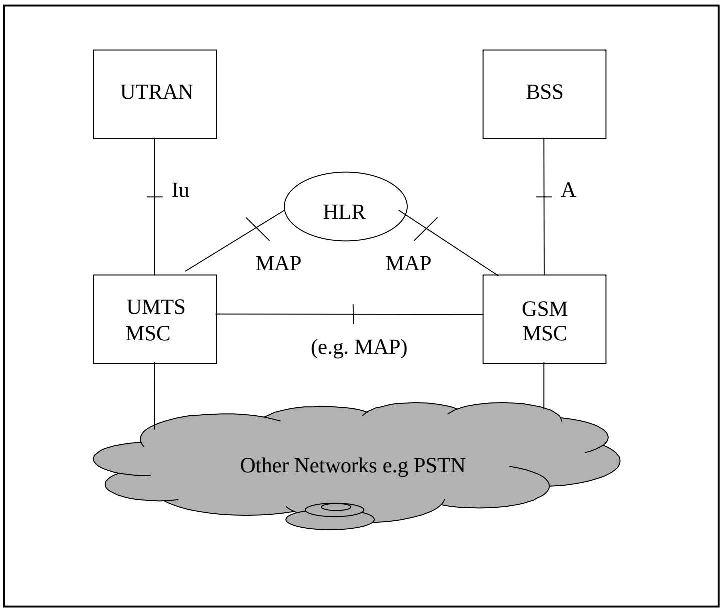


Figure 6-1 Inter-Operability between GSM and UMTS

Note: No physical implementation should be taken from the figure. As a further note, no interworking functions are shown to ease clarity, but however should not be precluded.

From Figure 6-1 it can be seen that the information exchanged over the Iu must provide the necessary parameters to enable the core networks to communicate via for example the MAP interface for handover purposes.

Also note that from the above diagram, existing interfaces are used towards the HLR to allow for subscription management based on today's principles using the already defined user profile, providing seamless roaming between the 2nd generation system and UMTS.

The existing GSM handover procedures should be re-used to minimise the effects on existing GSM equipment.

- The anchor concept in GSM for inter-MSC handover should be used for inter-system handover between UMTS and GSM.

- The signalling over the A-interface and over the MAP/E-interface should be the same as in GSM phase 2+ with possibly addition of some new or updated information elements in some messages.

- For the set up of the handover leg (user plane) standard ISUP/POTS should be used in line with the principles used in GSM.

- The control signalling over the Iu-interface at handover between UMTS and GSM should be based on the A-interface signalling at inter-MSC handover in GSM.

- The signalling over the Iu-interface at call set up to/from a dual mode UMTS/GSM mobile station, shall include GSM information elements needed for handover from UMTS to GSM.
  In the corresponding way the signalling over the A-interface at call set up to/from a dual mode UMTS/GSM mobile shall include UMTS elements needed for handover from GSM to UMTS.
  The data are needed to initiate the handover towards the new BSS/RNC.

- A target cell based on CGI is sent to the MSC from UTRAN at handover from UMTS to GSM. The CGI points out the target MSC and target BSC.

- A target cell based on CGI is sent to the MSC from the BSS at handover from GSM to UMTS. The CGI points out the target UMTS MSC and target RNC (UMTS MSC does the translation from CGI to RNC identity).

6.1.1 UMTS to GSM handover for circuit switched services

UMTS to GSM handover for circuit switched services is detailed in 23.009.

~~The signalling sequence in Figure 6-2 shows the case when the UMTS MSC (UMSC) and the GSM MSC are located in separate "physical" nodes.~~

~~If the UMSC and MSC are located within the same "physical" node, no MAP signalling and no ISUP signalling are needed between UMSC and MSC.~~

~~For release 99 it is expected that the codec is placed in the anchor or non-anchor UMSC (for the UE in UMTS mode), which will have no impact on the signalling.~~

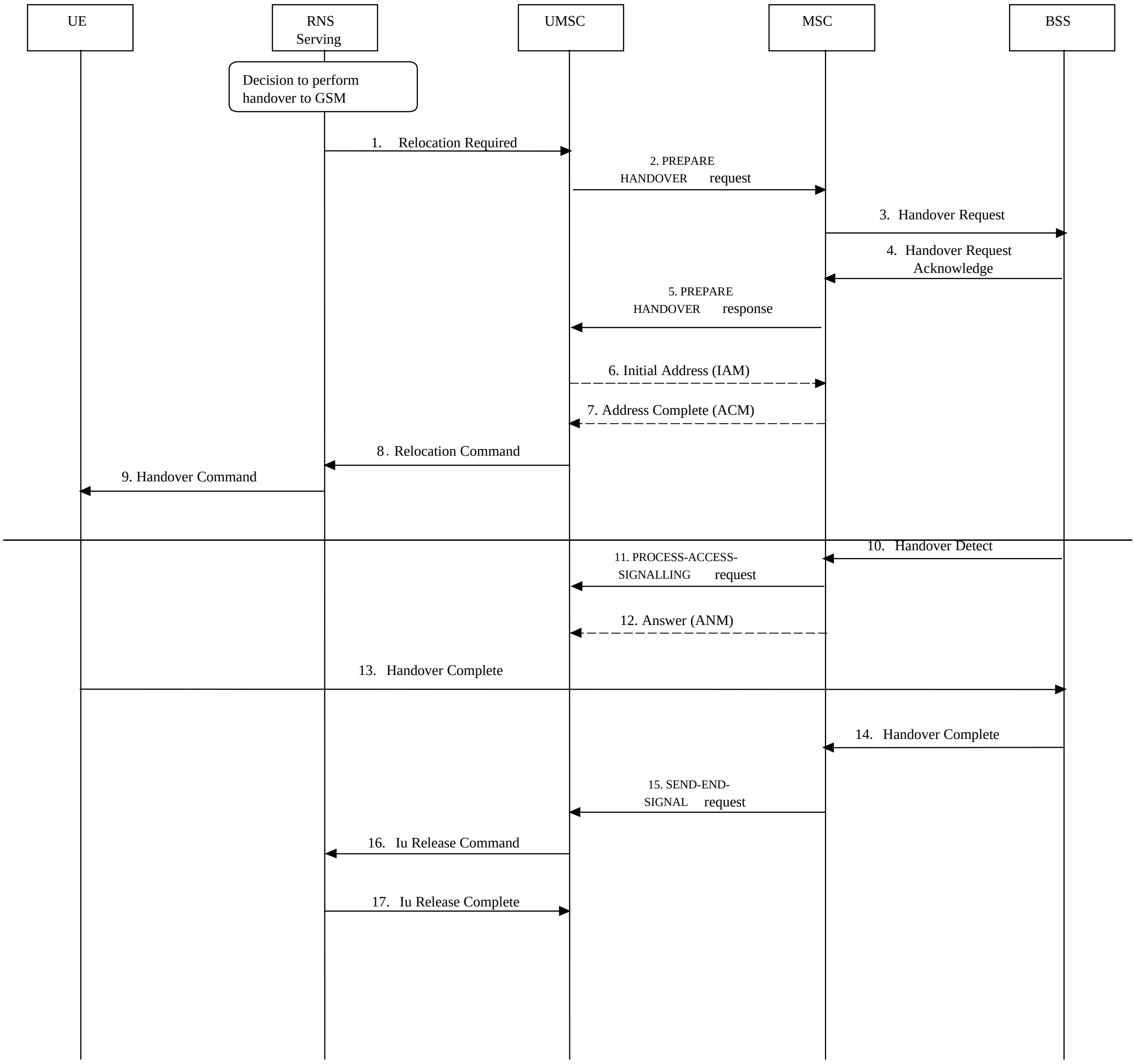


Figure 6-2. UMTS to GSM handover for circuit switched services e.g. voice

1)SRNS initiates the preparation of UMTS to GSM Handover by sending the RANAP message Relocation Required to UMSC. This message includes parameters such as Target cell identification and Serving cell identification, both in the form of CGI according to GSM.

2)UMSC requests MSC to prepare for UMTS to GSM Handover, by sending the MAP message PREPARE HANDOVER request. The message contains a BSSMAP message Handover Request, to be sent from MSC to BSS. It includes data such as Target and Serving CGI received from the Relocation Required message, and data stored in UMSC indicating type of radio resources required.

3)MSC sends the BSSMAP message Handover Request to BSS which then allocates necessary radio resources in BSS.

4)When BSS has allocated necessary radio resources it sends the BSSMAP message Handover Request Acknowledge. This message contains all radio-related information that the UE needs for handover, i.e. a complete GSM Handover Command message to be sent transparently via MSC, UMSC, and SRNS to UE.

5)MSC acknowledges handover preparation by sending the MAP message Prepare Handover Respons to UMSC, including a complete GSM Handover Command message.

6)UMSC sends the ISUP message IAM to MSC to establish a circuit ISUP connection between UMSC and MSC.

7)As acknowledgement to IAM, MSC sends the ISUP message ACM back to UMSC.

8)UMSC sends the RANAP message Relocation Command to SRNS, including a complete GSM Handover Command message to be sent to UE.

9)SRNS sends the RRC message Handover Command to UE, including a complete GSM handover Command message, to order the UE to start the execution of handover.

10)Upon detection of UE in BSS, (by reception of the Layer1 GSM message Handover Access from the UE), which indicates that the correct UE has successful accessed the radio resource in the target GSM cell, the BSSMAP message Handover Detect is sent from BSS to MSC. MSC may use this condition to switch the connection to the BSS.

11)MSC sends the MAP message PROCESS-ACCESS-SIGNALLING request to UMSC, including the BSSMAP message Handover Detect. UMSC may use this message as trigger point for switch of the connection to the MSC.

12)To complete the ISUP signalling the ISUP message ANM is sent from MSC to UMSC.

13)After Layer 1 and 2 connections are successfully established, the UE sends the GSM message Handover Complete to BSS.

14)After completed handover, BSS sends the BSSMAP message Handover Complete to MSC.

15)MSC sends the MAP message SEND-END-SIGNAL request to UMSC, including the BSSMAP message Handover Complete.

16)UMSC initiates release of resources allocated by the former SRNS.

17)1) SRNS acknowledges release of resources.

6.1.2 GSM to UMTS handover for circuit switched services

UMTS to GSM handover for circuit switched services is detailed in 23.009.The signalling sequence in figure 6-3 shows the case when the UMTS MSC (UMSC) and the GSM MSC are located in separate "physical" nodes.

If the UMSC and MSC are located within the same "physical" node, no MAP signalling and no ISUP signalling are needed between UMSC and MSC.

For release 99 it is expected that the codec is placed in the anchor or non-anchor UMSC (for the UE in UMTS mode), which will have no impact on the signalling.

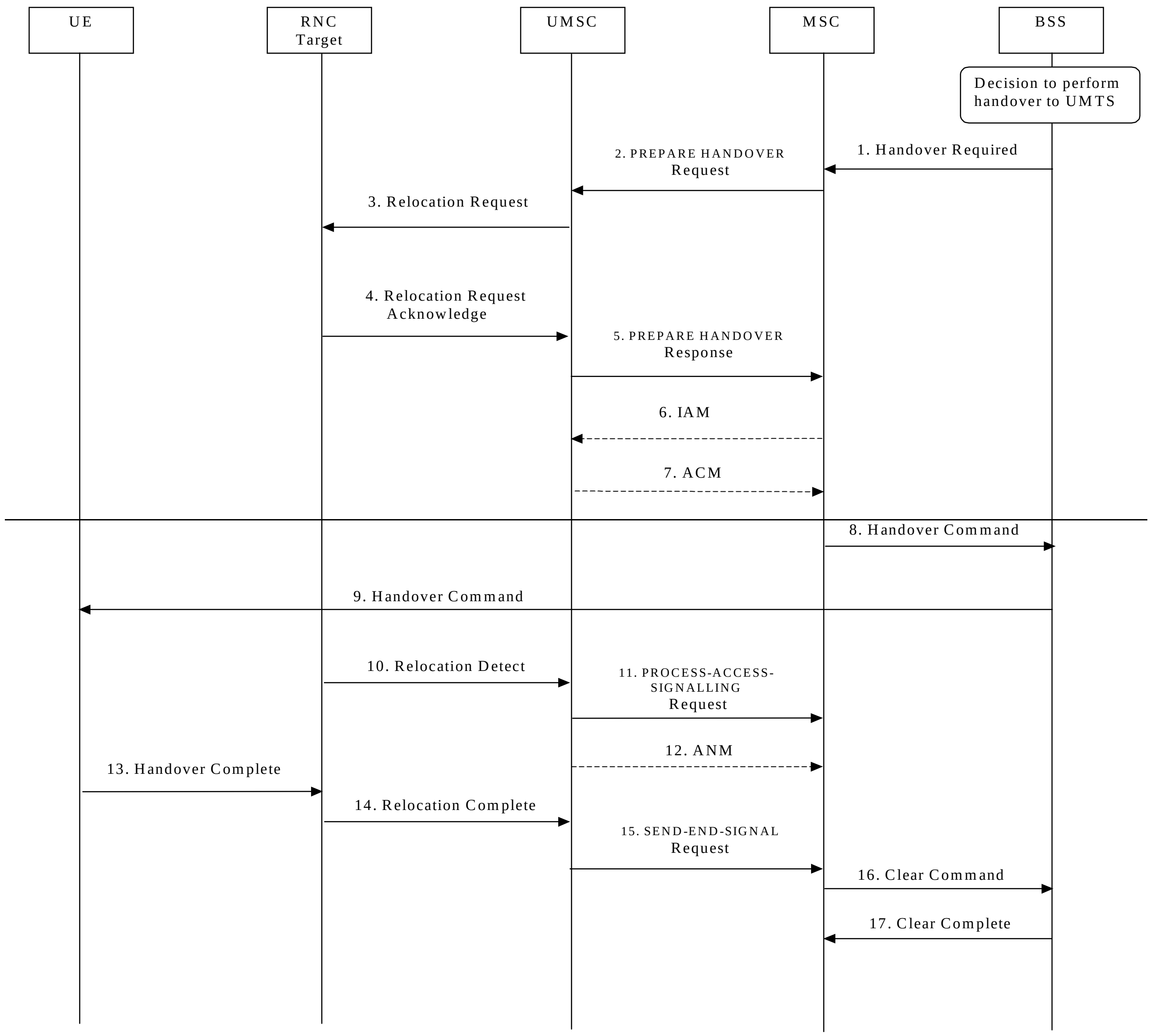


Figure 6-3. GSM to UMTS handover for circuit switched services e.g. voice

1.BSS initiates the preparation of GSM to UMTS Handover, by sending the BSSMAP message Handover Required to MSC. This message includes parameters such as Target cell identification as CGI, and information to be sent further transparent to Target RNC via MSC and UMSC.

2.MSC requests UMSC to prepare for GSM to UMTS Handover, by sending the MAP message PREPARE HANDOVER Request. This message includes parameters such as Target cell identification and Serving cell identification, both in the form of CGI, and information to be sent transparent to the Target RNC via UMSC.

3.UMSC requests Target RNC to prepare for GSM to UMTS Handover, by sending the RANAP message Relocation Request. UMSC translates the Target cell identification (CGI) received in the MAP message PREPARE HANDOVER Request, to a RNC pointer to address the Target RNC. This message includes parameters such as bearer related information, and information received in the MAP message Prepare Handover Request to be sent transparent to the Target RNC.

4.When Target RNC has allocated necessary radio resources it sends the RANAP message Relocation Request Acknowledge to UMSC. This message contains all radio-related information that the UE needs for handover, i.e. a complete RRC message to be sent transparently via UMSC, MSC and BSS to the UE.

5.UMSC sends the MAP message PREPARE HANDOVER Response to MSC including a complete

~~RRC message, to be sent transparent to UE via MSC and BSS.~~

~~6.MSC sends the ISUP message IAM to UMSC to establish a circuit ISUP connection between MSC and UMSC~~

~~7.As acknowledgement to IAM, UMSC sends the ISUP message ACM back to MSC.~~

~~8.MSC sends the BSSMAP message Handover Command to BSS, including a complete RRC message to be sent transparent to UE via BSS.~~

~~9.BSS sends the GSM message Handover Command to UE including a complete RRC message, to order the UE to start execution of handover.~~

~~10.Upon detection of the UE in Target RNC, Target RNC starts acting as SRNC for the UE, and the RANAP message Relocation Detect is sent from RNC to UMSC.~~

~~11.At reception of the RANAP message Relocation Detect, the UMSC sends the MAP message PROCESS-ACCESS SIGNALLING Request to MSC. MSC may use this message as trigger point for switch of the connection to the UMSC.~~

~~12.To complete the ISUP signalling the ISUP message ANM is sent from UMSC to MSC.~~

~~13.After completed handover, UE sends the RRC message Handover Complete to Target RNC.~~

~~14.Target RNC sends the RANAP message Relocation Complete to UMSC.~~

~~15.UMSC forwards the RANAP message Relocation Complete in the MAP message SEND END SIGNAL Request to MSC.~~

~~16.MSC initiates release of resources allocated by BSS.~~

~~BSS acknowledges release of resources.~~

6.2 Packet Switched Handover and Roaming Principles

The introduction of a UMTS core Network illustrates the requirement for inter-connection with the legacy GSM system to allow inter-PLMN roaming and handover.

Even though there is no current GPRS deployment, the operator may decide to deploy a GPRS network prior to the deployment of a UMTS network. Therefore, the introduction of a UMTS Core Network may require to be inter-connected to the legacy packet network.

As in the circuit switched case, roaming and handover to/from UMTS should be performed in the simplest manner that requires as little change as possible to the GPRS network and standards, i.e. inter-GSN handover functionality. In addition, access is provided to the GPRS network using the existing subscriber profiles and current network interfaces.

A similar figure to Figure 6-1 is illustrated in Figure 6-4. Notice that it also leaves the current GPRS specifications mainly untouched whereupon the UMTS core network acts towards the GSN like a GSN by providing for example Gn. Further, it should be observed that GPRS subscriptions belong to the HLR whilst UMTS subscriptions exist in the HLR release 99.

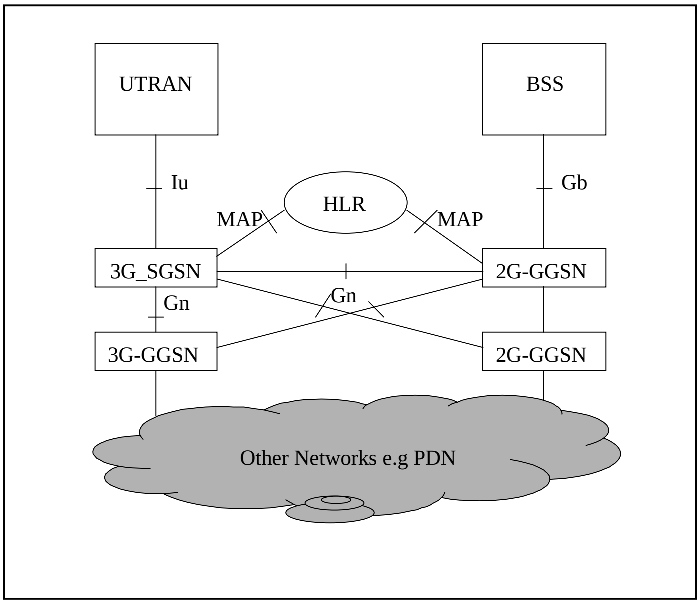


Figure 6-4: Inter-Operability between GSNs and UMTS

Note: No physical implementation should be taken from Figure 6-4. As a further note, no interworking functions are shown to ease clarity, but however should not be precluded.

From Figure 6-4 it can be seen that to provide inter-working between legacy packet switched and UMTS packet switched services, the information exchanged over the Iu must provide the necessary parameters to enable the core networks to communicate via for example the Gn interface for handover purposes.

Also note that from the above diagram, the same principles are used as in the circuit switched services to provide seamless roaming.

6.2.1 Implications

- The active PDP context resides in the same GGSN even after a handover between GSM and UMTS (both directions). This corresponds in principle to the anchor concept on the circuit switched side, but note that whereas packet sessions are long lived, the anchor MSC remains only for the duration of a CS call (typically much shorter than a packet session).
- Assuming an internal structure in UMTS CN that contains logical GGSN and SGSN nodes, the signalling over the inter-system GGSN-SGSN interface should be a joint evolution of Gn for the GSM system and UMTS. I.e., when Gn evolves in the sequence of GSM releases, Gn should include any new or updated information necessary for interoperation.
- The corresponding SGSN-SGSN inter-system interface (also Gn) should also be evolved together. However, in this case the changes relative to the current GPRS release may possibly be more profound.

6.2.2 Signalling procedures

The signalling procedures shows how handover UMTS <-> GSM GPRS can be done. The parameters carried by each message is not complete and shall be seen as examples of important information carried be the messages.

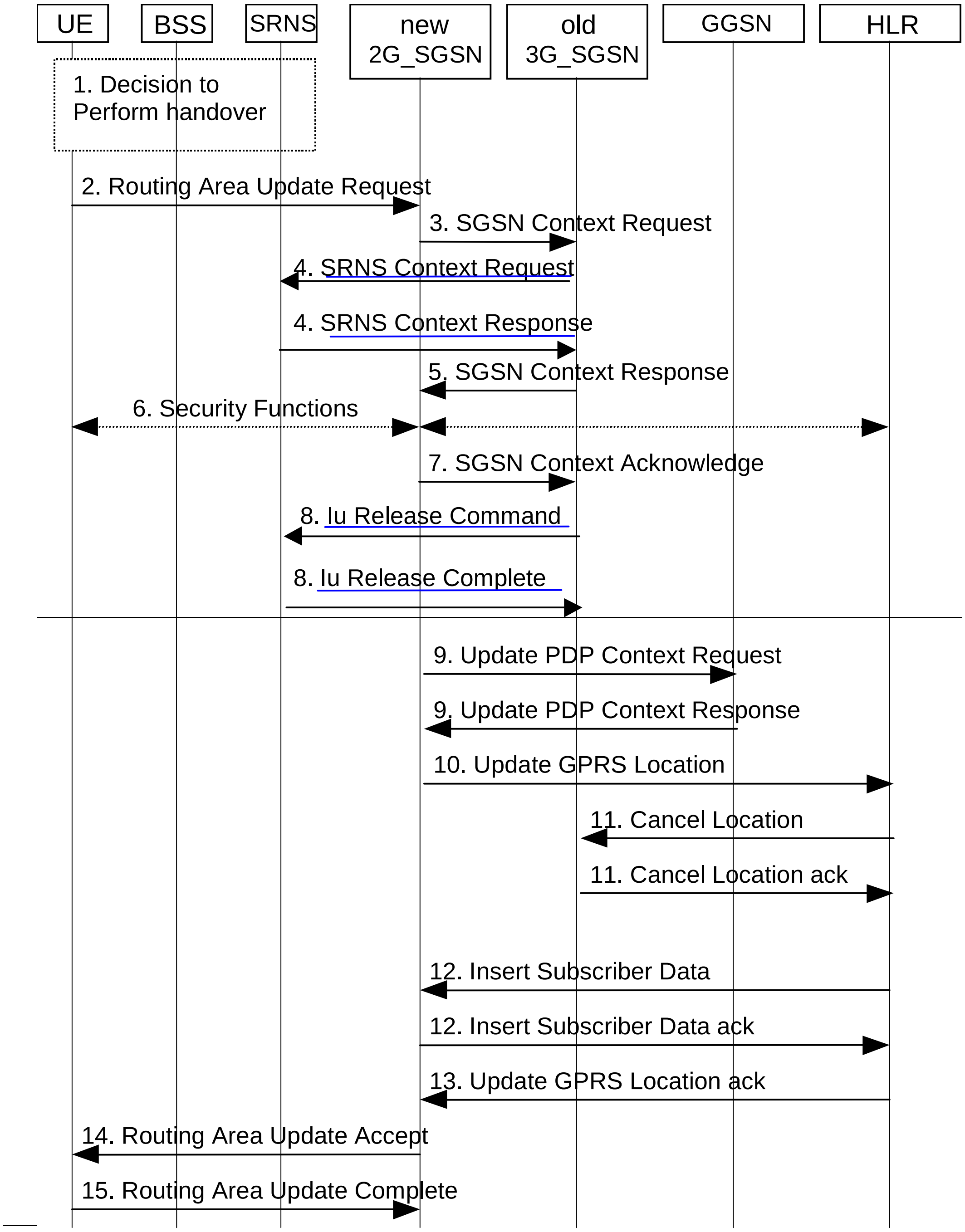
The signalling sequences shows the case when the UMTS 3G_SGSN and the GPRS 2G_SGSN are located in separate “physical” nodes.

If the 3G_SGSN and 2G_SGSN are located within the same "physical" node, no signalling are needed between 3G_SGSN and 2G_SGSN.

For handover in the UMTS to GSM GPRS direction the intention is to re-use the handover principles of GSM GPRS today in order to limit the changes in GSM GPRS and to take the changes if any on the UMTS side. The below specified messages is standard GSM 2+ messages (when applicable)

6.2.2.1 Handover from UMTS to GSM GPRS

Handover from UMTS to GSM GPRS is detailed in 23.060.



~~**Figure 6-5: UMTS to GSM GPRS, Inter SGSN Routing Area Update Procedure**~~

~~1)The UE [2] or UTRAN [2] decides to perform handover which leads to that the UE switch to the new cell under the new system.~~

~~2)The UE sends a Routing Area Update Request (old RAI, old P-TMSI) to the new 2G_SGSN. The BSS shall add the Cell Global Identity including the RAC and LAC of the cell where the message was received before passing the message to the 2G_SGSN.~~

~~3)The new 2G_SGSN sends SGSN Context Request (old RAI, old P-TMSI, New SGSN Address) to the old 3G_SGSN to get the MM and PDP contexts for the UE (The old RAI received from the UE is used to derive the old 3G_SGSN address).~~

~~4)Old 3G_SGSN sends SRNS Context Request to SRNS in order to receive the GTP-PDU sequence numbers of the GTP-PDUs to be next sent between UE and GGSN. SRNS responds with SRNS CONTEXT RESPONSE including the GTP_PDU sequence numbers and sequence numbers of last successfully received UL RLC-PDUs.~~

~~5)The old 3G_SGSN responds with SGSN Context Response (MM Context, e.g. IMSI, PDP Contexts, e.g. APN).~~

~~6)Security functions may be executed.~~

~~7)The new 2G_SGSN sends an SGSN Context Acknowledge message to the old 3G_SGSN. This informs the old 3G_SGSN that the new 2G_SGSN is ready to receive data packets belonging to the activated PDP contexts.~~

~~8)Old 3G_SGSN sends Iu Release Command to SRNS. In case of lossless handover this message indicates the IP address to be used to return the unsent DL GTP-PDUs. Upon reception of this message the SRNS starts to return GTP-PDUs to old 3G_SGSN. SRNS responds with Iu Release Complete.~~

~~9)The new 2G_SGSN sends Update PDP Context Request (new SGSN Address) to the GGSN concerned. The GGSN update their PDP context fields and return Update PDP Context Response.~~

~~10)The new 2G_SGSN informs the HLR of the change of SGSN by sending Update GPRS Location (SGSN Number, SGSN Address, IMSI) to the HLR.~~

~~11)The HLR sends Cancel Location (IMSI) to the old 3G_SGSN. The old 3G_SGSN removes the MM and PDP contexts.~~
~~The old 3G_SGSN acknowledges with Cancel Location Ack (IMSI).~~

~~12)The HLR sends Insert Subscriber Data (IMSI, GPRS subscription data) to the new 2G_SGSN. The 2G_SGSN constructs an MM context for the UE and returns an Insert Subscriber Data Ack (IMSI) message to the HLR.~~

~~13)The HLR acknowledges the Update Location by sending Update GPRS Location Ack (IMSI) to the new 2G_SGSN.~~

~~14)The new 2G_SGSN validates the UE's presence in the new RA. The new 2G_SGSN constructs MM and PDP contexts for the UE. A logical link is established between the new 2G_SGSN and the UE. To avoid data duplication the sequence numbers of the RLC link that was used before the handover may be used to initialise the logical link. The new 2G_SGSN responds to the UE with Routeing Area Update Accept (P-TMSI).~~

~~15)The UE acknowledges the new P-TMSI with a Routing Area Update Complete (P-TMSI).~~

6.2.2.2 Handover from GSM GPRS to UMTS

Handover from GSM GPRS to UMTS is detailed in 23.060.

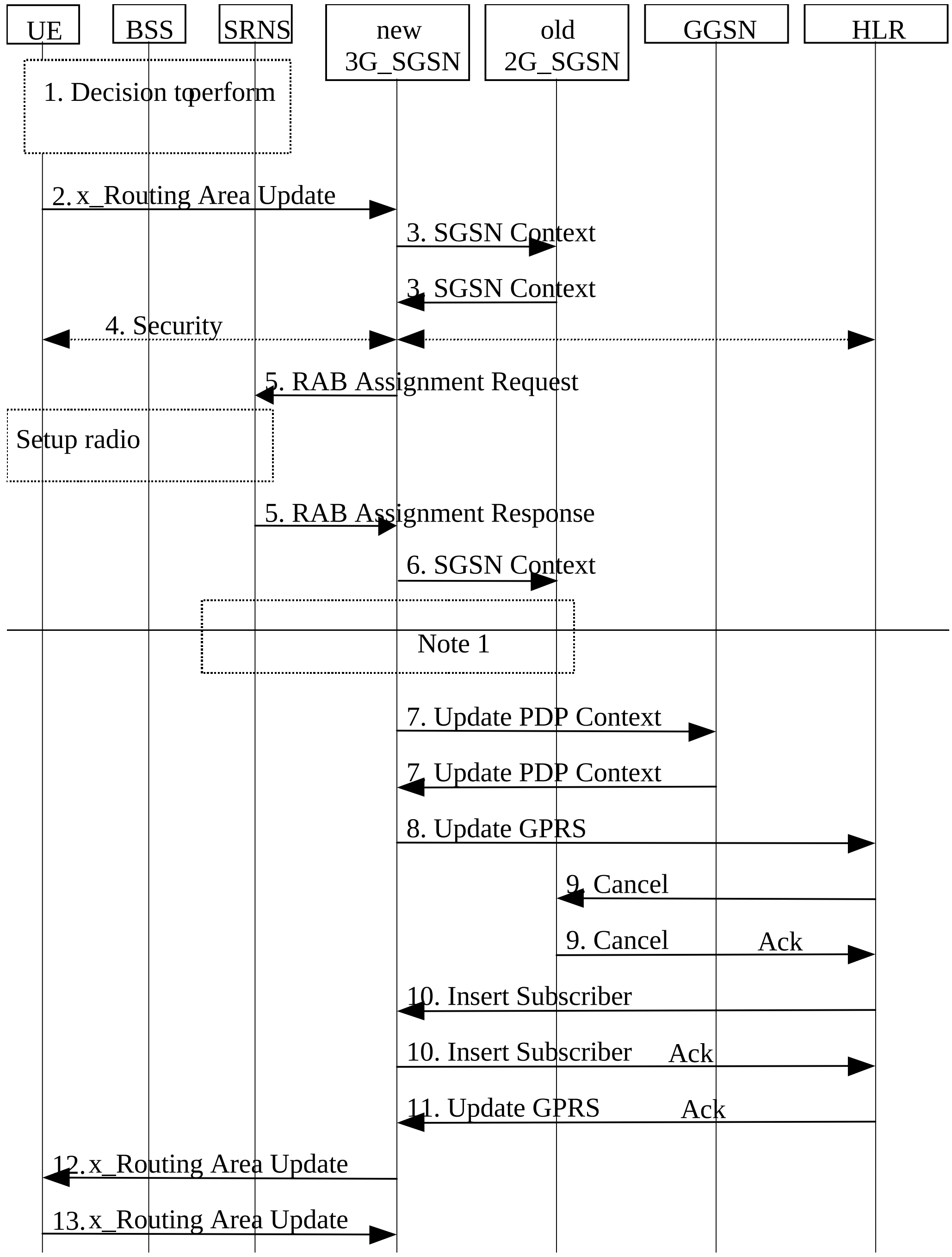


Figure 6-6: GSM GPRS to UMTS, Inter SGSN Routing Area Update Procedure

1) The UE/network decides to perform handover which leads to that the UE switch to the new cell, details for this is FFS.

2) The UE sends a x_Routing Area Update Request (old RAI, old P-TMSI) to the new 3G_SGSN. The SRNS shall add an identifier of the area where the message was received before passing the message to the 3G_SGSN.

3) The new 3G_SGSN sends SGSN Context Request (old RAI, old P-TMSI, New SGSN Address) to the old 2G_SGSN to get the MM and PDP contexts for the UE (The old RAI received from the UE is used to derive the old 2G_SGSN address). The old 2G_SGSN responds with SGSN Context Response (MM Context, e.g. IMSI, PDP Contexts, e.g. APN).

4) Security functions may be executed.

5)The new 3G_SGSN request the SRNS to establish of a radio access bearer by sending RAB Assignment Request to the SRNS. The SRNS responds with RAB Assignment Response.

6)The new 3G_SGSN sends an SGSN Context Acknowledge message to the old 2G_SGSN. This informs the old 2G_SGSN that the new 3G_SGSN is ready to receive data packets belonging to the activated PDP contexts.

7)The new 3G_SGSN sends Update PDP Context Request (new SGSN Address) to the GGSN concerned. The GGSN update their PDP context fields and return Update PDP Context Response.

8)The new 3G_SGSN informs the HLR of the change of SGSN by sending Update GPRS Location (SGSN Number, SGSN Address, IMSI) to the HLR.

9)The HLR sends Cancel Location (IMSI) to the old 2G_SGSN. The old 2G_SGSN removes the MM and PDP contexts.
The old 2G_SGSN acknowledges with Cancel Location Ack (IMSI).

10)The HLR sends Insert Subscriber Data (IMSI, GPRS subscription data) to the new 3G_SGSN. The 3G_SGSN constructs an MM context for the UE and returns an Insert Subscriber Data Ack (IMSI) message to the HLR.

11)The HLR acknowledges the Update GPRS Location by sending Update Location Ack (IMSI) to the new 3G_SGSN.

12)The new 3G_SGSN validates the UE's presence in the new RA. The new 3G_SGSN constructs MM and PDP contexts for the UE. A logical link is established between the new SGSN and the UE. The new 3G_SGSN responds to the UE with x_Routing Area Update Accept (P-TMSI).

13)The UE acknowledges the new P-TMSI with a x_Routing Area Update Complete (P-TMSI).

Note 1: The functionality for forward of packets and handling of GTP sequence numbers (within the box) is a subject fore more investigation, i.e. FFS. The GPRS principles should apply.

Annex A (Informative)Reduction of UMTS signalling

A.1.1 GLR Concept

The benefit of the Gateway Location Register (GLR) is the reduction in signalling traffic between networks. GLR is an optional network element which shall not affect the MAP protocol.

A.1.1.1 Overview of the GLR Concept

The GLR is a node between the VLR and the HLR, which may be used to optimise the handling of subscriber location data across network boundaries.

In Figure 1, the GLR interacts with HLRa and VLRb for roamers on Network B. The GLR is part of the roaming subscriber's Home Environment. When a subscriber to HLRa is roaming on Network B the GLR plays the role of an HLR towards VLRb and the role of a VLR towards HLRa. The GLR handles any location change between different VLR service areas in the visited network without involving HLRa.