**3GPP - TSG SA #5** **Tdoc SP-99400**
**11-13 October, 1999**
**Kyongju, Korea**

**List of CRs on 23.121 v.3.0.0**

CRs approved by SA2, presented to SA#5
All these CRs concern the WI "Architecture of the GSM-UMTS Platform"

| TDoc # | Source | CR # | Title | Conclusion at S2 | cat |
|---|---|---|---|---|---|
| S2-99606 | S2 | 001r2 | Architecture for multimedia | Approved. | B |
| S2-99608 | Telia, Ericsson, Lucent, Nokia | 003r1 | Mobile IP in R99 | Approved. | MISSING! |
| S2-99612 | Siemens | 006r1 | Iu network service for the packet domain | Approved. | D |
| S2-99518 | Nokia | 008 | Clarification to MM procedures | Approved. | F |
| S2-99616 | Nokia | 009r1 | Allowed network and terminal implementation configurations in UMTS | Approved. | B |
| S2-99770 | Nokia | 012r2 | Hierarchical tracking concept, recovery of temporarily lost mobiles, and MM and SM relation – Revised version | Approved. | C |
| S2-99530 | NTT communicationware corp. | 016 | LAI addition for combined area update procedure | Approved. | C |
| S2-99567 | Alcatel | 019 | Clarifications on Iu_ps control plane | Approved. | D |
| S2-99776 | Nokia | 023r2 | Description of UTRAN coordination | Approved. | B |
| S2-99873 | Nokia | 024r3 | SRNC relocation in relation with SGSN change | Approved. | C |
| S2-99751 | Ericsson | 025 | LA/RA – URA relationship | Approved. | C |
| S2-99775 | NTT DoCoMo, Siemens | 026 | Procedures for volume based charging | Approved. | C |
| S2-99998 | Siemens | 027r2 | Combined location procedures | Approved. | C |
| S2-99836 | Ericsson | 029 | Mapping of LA/RA to cells | Approved. | C |
| S2-99916 | Nokia + Ericsson | 030r1 | UMTS - GSM handover | Approved. | B |
| S2-99839 | Ericsson | 031 | GSM to UMTS HO for CS services | Approved. | B |
| S2-99944 | Alcatel | 035r1 | GTP tunnel termination point in SRNS relocation for PS domain | Approved. | C |
| S2-99917 | Siemens | 036 | Inter 3G-MSC HO | Approved. | C |
| S2-99906 | Motorola | 037 | Specification of the UMTS Multimedia Call Control Model | Approved. | C |
| S2-99994 | Nokia | 041r1 | Change to the current UMTS area concept | Approved. | C |

Not approved CRs

| TDoc # | Source | CR # | Title | Conclusion at S2 | cat |
|---|---|---|---|---|---|
| S2-99511 | Siemens | 005 | Volume charging data collection at SRNC change | This contribution shall be taken into account when elaborating S2-99611. | C |
| S2-99707 | Siemens | 007r1 | Registration Area Concept | 717 and 751 to be seen first. | C |
| S2-99506 | NTT DoCoMo | 010 | Multiplexing functions at L3CE layer | Postponed to the joint meeting with R2 on August, 27th. | |
| S2-99508 | NTT DoCoMo | 011 | Modified procedures for volume dependent charging | Not approved. | C |

| | | | | | |
|---|---|---|---|---|---|
| S2-99529 | Lucent | 013 | The inclusion of a 'Service Switching Function' in the reference multimedia architecture for the support IN based service features | Not agreed as such (content agreed, but incorporated into A001r2). | |
| S2-99533 | NEC corporation | 014 | Clarification to paging co-ordination in combined CN node | | C |
| S2-99572 | NEC corporation | 017 | Clarification to paging co-ordination in combined CN node | Not approved, because based on 571 which is not approved. | C |
| S2-99566 | Alcatel | 018 | UMTS Call Control for multimedia services: requirements | Not agreed as such (content agreed, but incorporated into A001r2). | |
| S2-99568 | Alcatel | 020 | withdrawn | withdrawn | |
| S2-99569 | Alcatel | 021 | withdrawn | withdrawn | |
| S2-99561 | Alcatel | 022 | Update of SGSN with MS IP address at MIP registration | To be revised in september, after some new CRs on the same subject will be provided by the MIP ad-hoc. | C |
| S2-99888 | Nokia | 028 | Architecture overview for UMTS R99 | To be revised by drafting group. | |
| S2-99908 | Alcatel | 032 | Use of single MSISDN for CS and PS voice services. | Postponed (wait for off-line discussions between Lucent, Alcatel and Ericsson). | C |
| S2-99910 | Alcatel | 034 | UMTS CC for multimedia services architecture | | |
| S2-99936 | Nokia | 038 | Procedures for volume based charging | No conclusion now. Come back on it later. | C |
| S2-99942 | Alcatel | 039 | CR based on S2-99912. | Postponed to e-mail. | |
| S2-99971 | NTT | 040 | withdrawn | withdrawn | |
| S2-99915 | Alcatel | 033 | UMTS CC for multimedia services requirements | | |
| S2-99777 | Nokia | 024r2 | SRNC relocation in relation with SGSN change | Approved ->replaced by 024r3 in S2-99873. | C |

**3GPP TSG-S2 #6**
**New Jersey, USA**

***Document S2-99606***

# 3G 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 | [1r2] | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [X] UTRAN [ ] Core Network [X]

**Source:** Multimedia workshop, Oulu – revised by S2 **Date:** 28-07-99

**Subject:** Architecture for multimedia

**3G Work item:** Multimedia workshop

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

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

**Reason for change:** Description of Multimedia architecture.
+ correction of previous version which omitted the changes previously agreed to P5) & P6) in section 7.4.1 – the revision to section 7.4.1 was revised by S2 #6 to refelect the changes agreed at S2#5.

**Clauses affected:** Section 7.4

**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:**

help.doc

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

# 3G TS 23.121 V2.0.0 (1999-06)

*Technical Specificat*

**3rd Generation Partnersl**
**Technical Specification Group Services a**
**Aspects;**
**Architectural Requirements for Release 1999**
**(3G TS 23.121 version 2.0.0)**

Reference
DTS/TSG<name abbv>-0<WG no><spec no> U

Keywords
<keyword[, keyword]>

***3GPP***

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

# 7.4. UMTS call control

## 7.4.1 Technical Requirements

The following technical requirements are applied to support multimedia in GSM/UMTS.

- P1) GSM/UMTS shall enable the provisioning of multimedia services and ~~with~~ multivendor interworking between UE and network.
- P2) Basic voice and PDP-context establishment shall be based on GSM CC/SM respectively.
- P3) Handover and roaming to and from GSM shall be supported provided GSM is capable of supporting the ongoing media service.
- P4) Ideas, concepts and procedures developed by other fora e.g. other standards bodies such as ITU, IETF etc. shall be included or referenced in ~~the~~ GSM/UMTS ~~CC/SM~~ when found suitable.
- ~~P5) For multimedia services a multimedia CC/SM protocol could be run transparently via a PDP-context or a circuit-switched connection established using GSM SM/CC which would allow transparent handover and roaming between GSM and UMTS provided that GSM supports the QoS requirements.~~
- P5) To ensure multi-vendor inter-working and UE roaming, a single standardised multimedia protocol for CS domain and a single standardised multimedia protocol for PS domain shall be selected for GSM / UMTS R99. This does not preclude the selection of other protocols by UMTS in the future.
- P6) For multimedia services the standardized multimedia protocol shall be run transparently via a PDP-context or a circuit-switched connection established using GSM SM/CC . This allows transparent hand-over and roaming between GSM and UMTS provided that GSM supports the QoS requirements.

Figure 45 illustrates the realisation of the multimedia service based on P6~~5~~). 'Multimedia Protocol' indicates the functionality either inside the communicating user's terminal or a gateway (e.g. H.323 Gateway)/GK.. It is essentially a control function both for user plane and control plane for the multimedia communication.

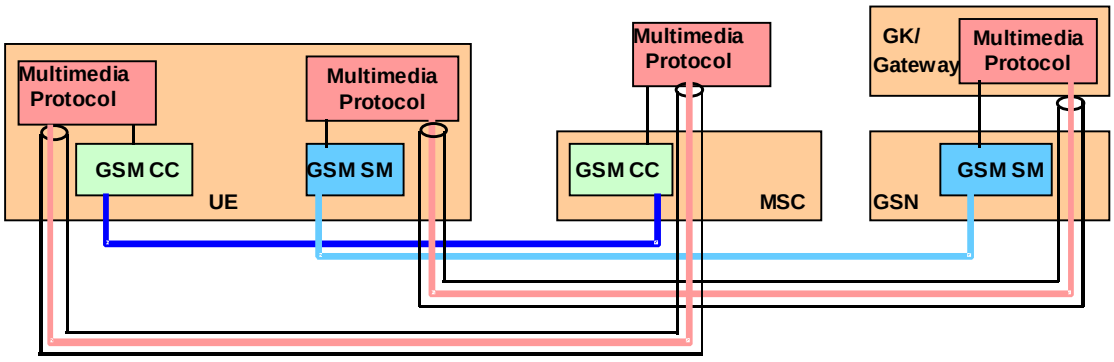



Figure 45: Support of multimedia making use of GSM SM/CC

Based on the requirements listed above, GSM CC/SM represented by GSM 04.08 forms a solid foundation for UMTS CC/SM for Release 99. UMTS CC/SM for Release 99 is to be developed from GSM CC/SM by introducing some well defined enhancements.

Existing (and future) multimedia protocols can be supported by the UMTS CC/SM as application layer protocols, with no (or in some instances only minor) impact to UMTS CC/SM.

## 7.4.x Architecture for Multimedia

In order to include multimedia in release 99 an architecture for multimedia is required. Sections 7.4.x.1 and 7.4.x.2 below detail the architecture for UMTS multimedia. It is recognised that it may not be possible to include all the functionality included in this architecture in release 99.

### 7.4.x.1 Packet Switched Domain

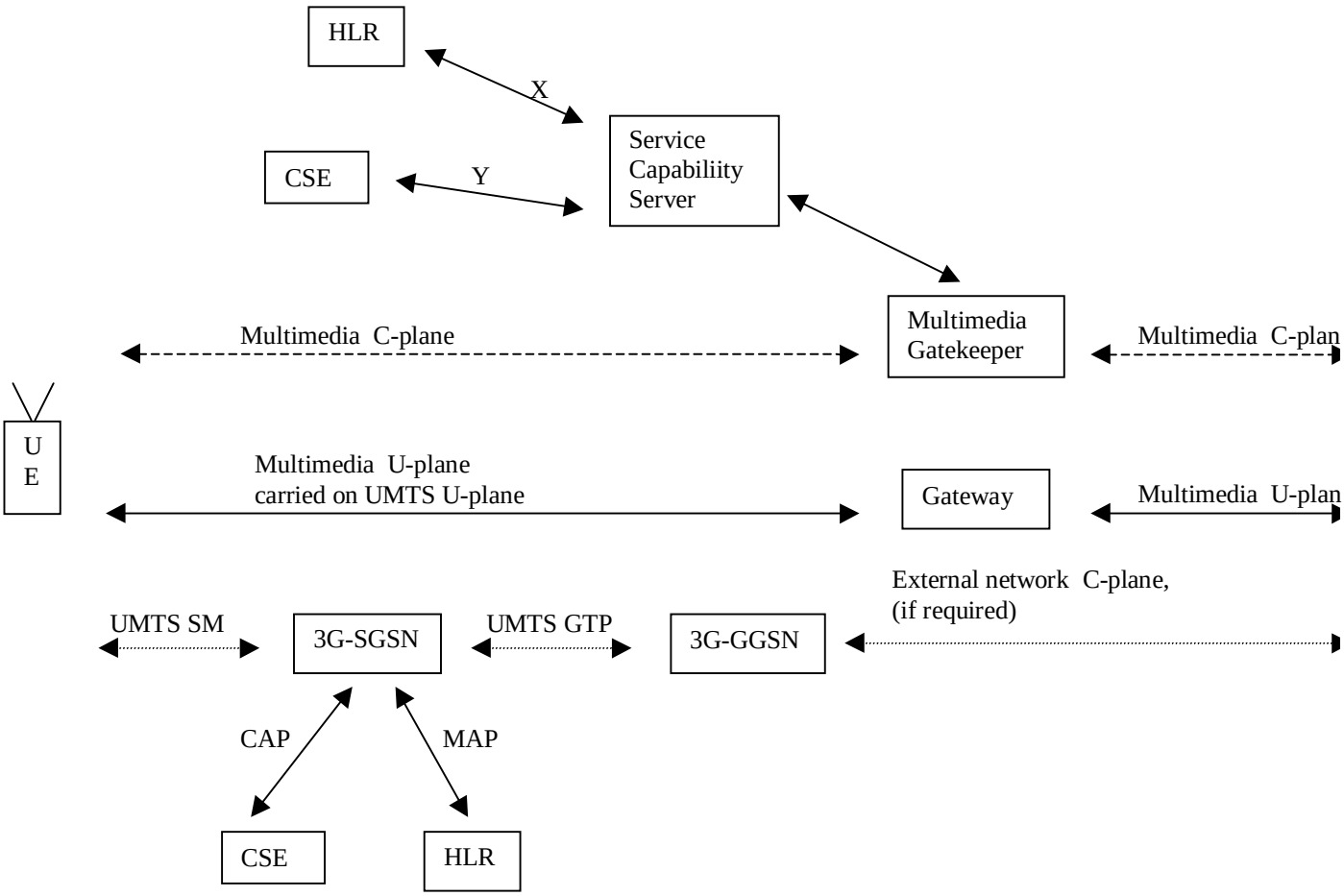



**Figure x: Multimedia architecture PS Domain**

The multimedia C-plane and U-plane are run transparently over a PDP-context between the UE and multimedia gatekeeper and gateway.

The multimedia U-plane runs between the UE and the multimedia gateway. The multimedia gateway maps the multimedia U-plane on to the U plane in the external network eg. Internet, PSTN. In some cases, such as a UMTS to UMTS call this may unnecessary.

The multimedia control protocol is run between the UE and multimedia gatekeeper. The multimedia gatekeeper is responsible for establishing a multimedia C plane connection on the terminating network.

The service capability server is functionally distinct from the multimedia gatekeeper. It is responsible for creating multimedia services. The standardisation of the interface between the service capability server and the multimedia gatekeeper is for further study. The service capability server may require interfaces to the HLR and CSE (Camel Service

Environment) in order to enable interactions between multimedia services and the services provided by these platforms. In this case the interfaces X and Y in figure X will require standardisation, (It is not proposed that this be included in release 99). The handling of MT communications is for further study.

Services can be delivered at two levels:

- Bearer level services are those which correspond to the UMTS bearer service and are delivered via the SGSN, HLR and CSE. Examples of bearer level services are pre-paid or barring of PDP context establishment (for the UMTS bearer service).
- Multimedia level services are delivered via the multimedia gatekeeper and service capability server possibly in combination with the HLR and CSE. Examples of multimedia services are video conferencing, call forwarding and pre-paid (of the multimedia component).

The multimedia gatekeeper and service capability server may be located within or external to the UMTS PLMN. The implications of the location of the multimedia gatekeeper and service capability server are for further study.

## 7.4.x.2 Circuit Switched Domain

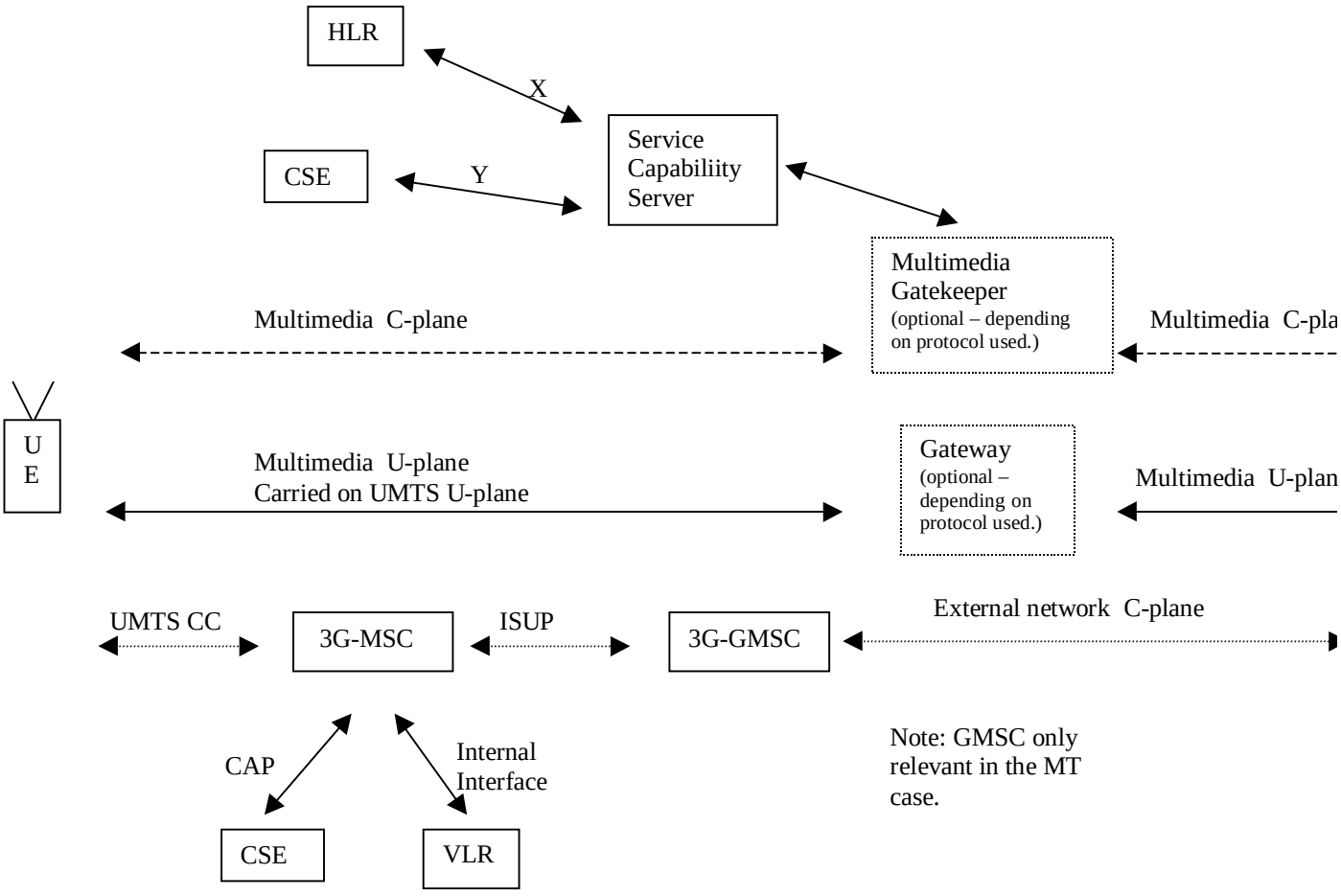


**Figure x: Multimedia architecture CS Domain**

The multimedia C-plane and U-plane are run transparently over a bearer between the UE and destination or optionaly the multimedia gatekeeper and/or gateway if present.

The multimedia U-plane runs between the UE and destination. Optionaly the multimedia U-plane is terminated at the the multimedia gateway, which interworks with the external network.

The multimedia control protocol is run between the UE and the destination. Optionally the multimedia gatekeeper is responsible for establishing a multimedia C plane connection on the fixed network.

The service capability server is functionally distinct from the multimedia gatekeeper. It is responsible for creating multimedia services. The standardisation of the interface between the service capability server and the multimedia gatekeeper is for further study. The service capability server may require interfaces to the HLR and CSE (Camel Service Environment) in order to enable interactions between multimedia services and the services provided by these platforms. In this case the interfaces X and Y in figure X will require standardisation, (It is not proposed that this be included in release 99). The handling of MT communications is for further study.

Services can be delivered at two levels:

- Bearer level services are those which correspond to the UMTS bearer service and are delivered via the MSC, HLR and CSE. Examples of bearer level services are pre-paid or call barring (for the UMTS bearer service).

- Multimedia level services are delivered via the multimedia gatekeeper (if present) and service capability server possibly in combination with the HLR and CSE. Examples of multimedia services are video conferencing, call forwarding and pre-paid (of the multimedia component). If there is no multimedia gatekeeper network level multimedia services can not be provided.

The multimedia gatekeeper and service capability server may be located within or external to the UMTS PLMN. The implications of the location of the multimedia gatekeeper and service capability server are for further study.

## 7.4.2 Typical Scenarios for Multimedia Control and User Plane

Two typical call scenarios to support multimedia services, H.324 and H.323, respectively, are presented as examples. As an assumption, the calls are between the peer multimedia terminals over an IMT-2000 network. As shown in the following sections, the multimedia signalling protocol and data transmission for both call scenarios can be performed end-to-end on the IMT-2000 user plane and is thereby transparent to the IMT-2000 Core Network. The IMT-2000 operators still control the multimedia service towards the end-user by providing the service via a service node (gateway, gatekeeper or application server) inside its own domain. Some other call scenarios e.g. IMT-2000 to ISDN/PSTN and/or IMT-2000 to the IP network can also be illustrated in a similar fashion.

### 7.4.2.1 H.324M to H.324M Call

In Figure Y, the H.324M IMT-2000 terminal initiates the call set-up procedure by sending a 04.08 SET-UP message to the originating MSC/VLR.

After the received 04.08 SETUP message, the originating MSC/VLR sends an ISUP Initial Address Message (IAM) to the terminating MSC/VLR. The terminating MSC/VLR performs a 04.08 SETUP procedure towards the H.324M UMTS terminal. The communication link is now established between the two H.324M endpoints.

The logical channels can now be established using the H.245 open logical channel procedure.

No gateway is needed in this case. This case is simple to support and requires little standardization.

The 04.08 Bearer Capability is used to indicate 64 kbits/s bit transparent case described in GSM 07.01 can be used, as well as H.223/H.245.

The 04.08 LLC is used to indicate H.223/H.245. This makes the called IMT-2000 mobile terminal activate its H.324M application when receiving the SETUP (LLC:H.223/H.245).

| | |
|---|---|
| **Information Transfer Capability** | Unrestricted Digital Information |
| **Sync/Async** | Synchronous |
| **Connection Element** | Transparent |
| **Fixed Network User Rate** | 64 kbit/s |

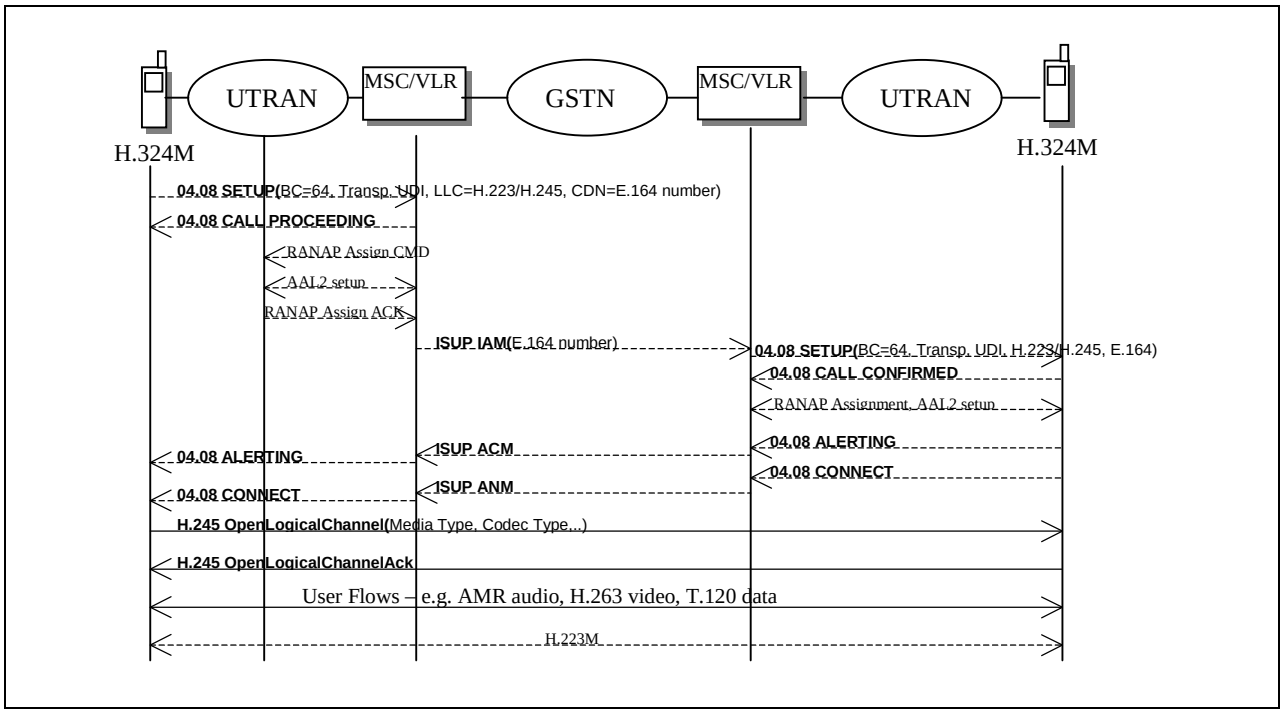



Figure 47: UMTS H.324M – UMTS H.324M call example

### 7.4.2.2 IMT-2000 H.323 to H.323 call

Figure Z shows a Multimedia Call between two H.323 terminals within an IMT-2000 operator domain. It is assumed that a PDP Context using a Best Effort (BE) Radio Access Bearer (RAB) from terminal A towards the Gatekeeper (GK) and one from terminal B towards GK have already been established for H.323 registration in this figure. Terminal A and B now performs Gatekeeper Identification and Gatekeeper Registration using a BE RAB. Thereafter, the terminal A sets up a Real Time (RT) Radio Access Bearer (RAB) to decrease the time for the H.323 control signalling. This need of a Real Time Radio Access Bearer can be indicated from the terminal application to the mobile terminal through the Application Programming Interface (API). The terminal A performs PDP Context activation (see Figure Z) to set up the Real Time Radio Access Bearer. From now on, the established Real Time Radio Access Bearer can be used for H.225.0 RAS control signalling and Q.931 control signalling. After the Real Time Radio Access Bearer is established, the H.323 terminal A performs an Admission Request (ARQ) towards the Gatekeeper. If the terminal A is admitted the Gatekeeper answers with AdmissionConfirm (ACF) otherwise AdmissionReject (ARJ). Terminal A initiates the H.323 connection by sending a Q.931 Setup message to the Gatekeeper when the ACF has been received. The Gatekeeper answers with a Q.931 Call Proceeding to terminal A and sends a Q.931 Setup message to terminal B on a Best Effort (BE) Radio Access Bearer (RAB). Terminal B performs PDP Context Activation to SGSN and GGSN to set up a Real Time Radio Access Bearer and performs an Admission Request towards the Gatekeeper on this Real Time Radio Access Bearer. After this terminal B answers the received Q.931 Setup message with a Q.931 Alert and Connect message to the Gatekeeper on receipt of the Admission ConFirm (ACF) message. The Gatekeeper forwards these two messages to the terminal A. The Real Time Protocol (RTP) is now established between the terminal A and B for transmission of audio, video or data streams (see Figure Z). The Gatekeeper relays the data streams but is not always completely transparent. The Gatekeeper can perform interworking functions e.g. Network Address Translation (NAT) etc between different networks. The voice transcoding is performed end-to-end in the H.323 terminal.

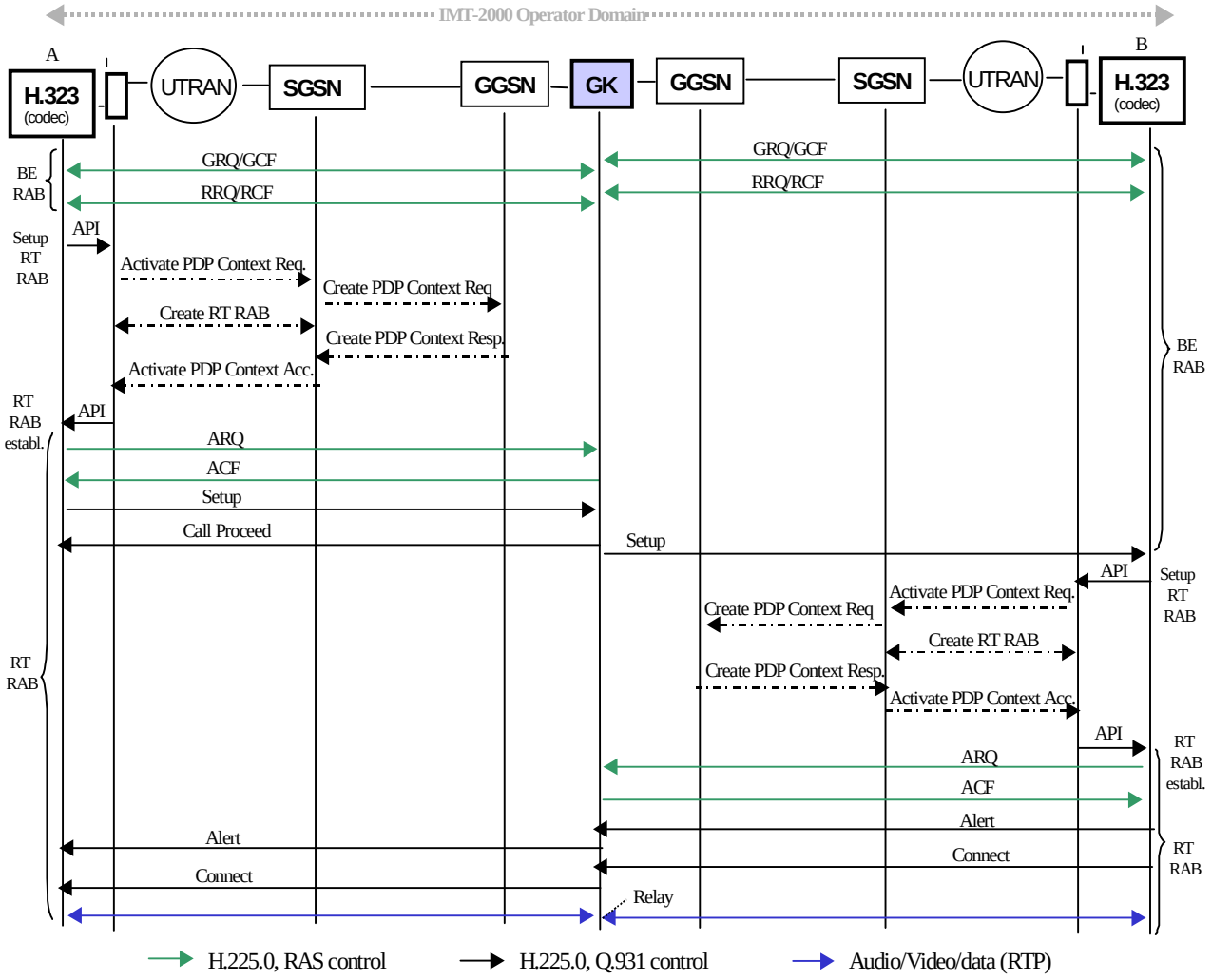



Figure 48: IMT-2000 H.323 – H.323 call example

**3GPP TSG-S2 meeting #6**
**Hazlet, USA (NJ) 26-30 July 19999**

***Document S2-99608***

# 3G 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** | **A003 r1** | Current Version: 3.0.0 |
|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submission to TSG SA #5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [ ] UTRAN [ ] Core Network [X]

**Source:** Telia, Ericsson, Lucent, Nokia **Date:** 1999-07-16

**Subject:** Mobile IP in R99

**3G Work item:** Mobile IP

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

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

**Reason for change:** Since section 4.1 is a summary of the content in 23.121, we propose to add a bullet point about supporting Mobile IP for end users. Although this proposal (Tdoc S2 99 429) was accepted at the S2 meeting in May 1999, it was never included in 23.121.

**Clauses affected:** 4.1

**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:**

## 4.1 General

The phase 1 UMTS/Release ’99 GSM standards should provide the capability to support:

- a core network based on an evolved 2G MSC and an evolved SGSN
- an optionally evolved Gs interface
- class A GSM’ mobiles.
- Mobile IPv4 with Foreign Agent care-of addresses to end users over the UMTS/GPRS network, where the FA is located in the GGSN.
- Transcoder location shall be according to 23.30
- UMTS/IMT2000 Phase1 (Release 99) network architecture and standards shall allow the operator to choose between Integrated and Separated core networks for transmission (including L2)
- The UMTS standard shall allow for both separated and combined MSC/VLR and SGSN configurations.
- The UE shall be able to handle separated or combined MSCs and SGSNs.
- There can be several user planes to these CN nodes.

The following general concepts should be followed :

- Separate the layer 3 control signalling from the layer 2 transport discussion (do not optimise layer 3 for one layer 2 technology).
- MSC-MSC layer 3 call control is out of scope of standardisation in SMG.

As future evolution may lead to the migration of some services from the CS-domain to the PS-domain without changes to the associated higher-layer protocols or functions. UMTS release 99 shall provide the flexibility to do this in a way that is backwards compatible with release 99 UEs provided this does not introduce significant new complexity or requirements in the system.

The following general concepts should be followed :

- Separate the layer 3 control signalling from the layer 2 transport discussion (do not optimise layer 3 for one layer 2 technology).
- MSC-MSC layer 3 call control is out of scope of standardisation in SMG.

As future evolution may lead to the migration of some services from the CS-domain to the PS-domain without changes to the associated higher-layer protocols or functions. UMTS release 99 shall provide the flexibility to do this in a way that is backwards compatible with release 99 UEs provided this does not introduce significant new complexity or requirements in the system.

**3GPP TSG-SA meeting #6**
**Hazlet, USA (NJ), 26-30 July 1999**

***Document S2-99-612***

# 3G 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 | 006 r1 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Siemens **Date:** 29.7.99

**Subject:** Iu network service for the packet domain

**3G Work item:**

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

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

**Reason for change:**

The packet domain Iu interface description specifies not clearly the Iu PS network layer. Besides the reference to the principles of the Gn interface it is not clear whether there is a network layer on Iu or whether direct PVCs between RNC and SGSN transfer the packets. Other chapters describe the use of different IP addresses for load sharing within the network entities.

It is proposed to clarify that the IP layer provides the network service on Iu PS. The AAL5 PVCs are not restricted to point to point connections between RNC and SGSN.

**Clauses affected:** 4.2

**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:**

help.doc

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

## 4.2 Iu Interface

- Transport protocol across the Iu interface for UTRAN shall be according to 23.930
- The UTRAN shall support two logically separate signalling flows via Iu to combined or separate network nodes of different types (MSC and SGSN).
- The UTRAN shall contain a "domain distribution function" to route transparent application-level control signalling from the UE to the correct core network domain. The UE shall indicate the type of application being addressed (eg via a protocol discriminator). The UTRAN shall map this on to the correct Iu instance to forward the signalling.
- UTRAN-services (including radio access bearers) shall be independent from the core network domain used to access them. Either core network domain can access any appropriate UTRAN-service (eg it should be possible to access a "speech" radio access bearer from the PS-domain).
- The protocol architecture for the User Plane of the Iu interface towards the IP domain shall be based on the same principles as for the (evolved) Gn interface, i.e. the user plane part of GTP over UDP/IP shall be used for tunneling of end user data packets over the Iu interface. If the Iu data transport bases on ATM PVCs then the Iu IP layer provides the Iu network layer services, e.g. routing, addressing, load sharing and redundancy. In this case an IP network may be configured to transfer Iu data units between RNSs and 3G-SGSNs.
- One or several AAL5/ATM Permanent VCs may be used as the common layer 2 resources between the UTRAN and the 'IP domain' of the CN. The reason for usage of several permanent AAL5/ATM VCs may e.g. be for load sharing and redundancy. It is also possible to use one switched VC per user flow (PDP context or radio access bearer). Switched VCs may be used, however the standardization of the procedures and protocols for use of Switched VCs is outside the scope of the 3GPP. If operators use switched VC, the specification of procedures and protocol for switched VCs are up to operators and out of scope of the UMTS/IMT-2000 specification.

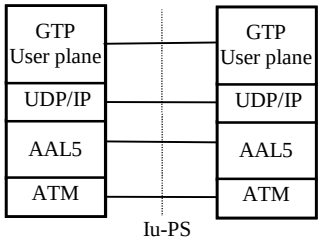



**Figure 1: Protocol Architecture for the Iu user plane towards the IP domain**

Note: The termination point of the GTP-U tunnel in the IP domain of the Core Network is FFS.

### 4.2.1 Iu Control Plane

#### 4.2.1.1 Iu control plane for CS domain

#### 4.2.1.2 Iu control plane for PD domain

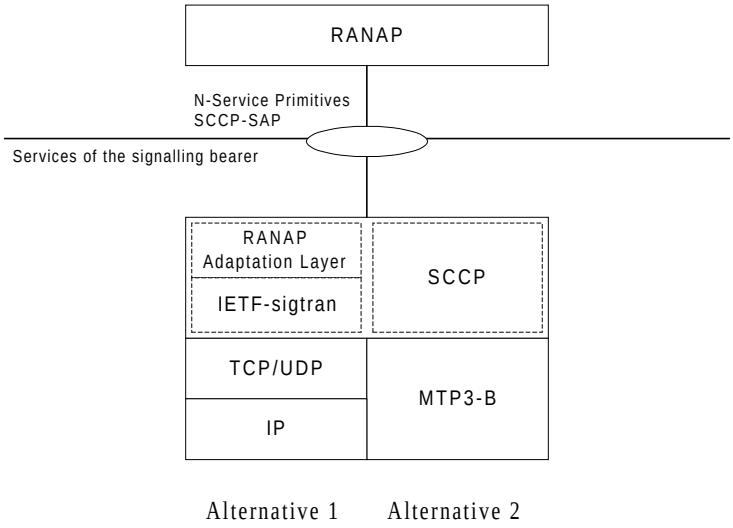



**Figure 2 SAP between RANAP and its transport for the Iu IP domain**

Figure 2 shows, for the Iu IP domain, the point at which the service primitives are invoked. A single SAP is defined independently of the signalling bearer.

The SAP provides the SCCP primitives.

It is agreed to use the SCCP primitive between RANAP & its transport on the understanding that only the features of SCCP necessary for RANAP are used.

The figure is not intended to constrain the architecture.

For transport of RANAP messages over Iu an SCCP protocol shall be used for both packet and circuit switched domains. The SCCP protocol shall fully comply with ITU-T white book. RANAP protocol shall be designed to use this service according to the ITU-T standard. Iu shall be designed so that RANAP is not impacted by alternatives for SCCP message transport on layers below SCCP.

In the circuit switched domain SCCP messages shall be transported on a broadband SS7 stack comprising MTP3b on top of SAAL-NNI. In this domain no other alternatives are standardised in release –99.

In the packet switched domain the UMTS standard shall allow operators to chose one out of two standardised protocol suites for transport of SCCP messages.

Broadband SS7 stack comprising MTP3b on top of SAAL-NNI

IETF/Sigtran CTP protocol suite for MTP3 users with adaptation to SCCP. The protocol suite shall fully comply with the IETF standards developed by the Sigtran working group. No UMTS specific adaptations shall be standardised below the SCCP protocol.

The grey colour denotes protocols being developed by the IETF sigtran group.

RANAP protocol stack options

| RANAP | |
|---|---|
| SCCP | |
| MTP-3b | CTP<br>(module SCCP/MTP3 users) |
| SAAL-NNI | IP |

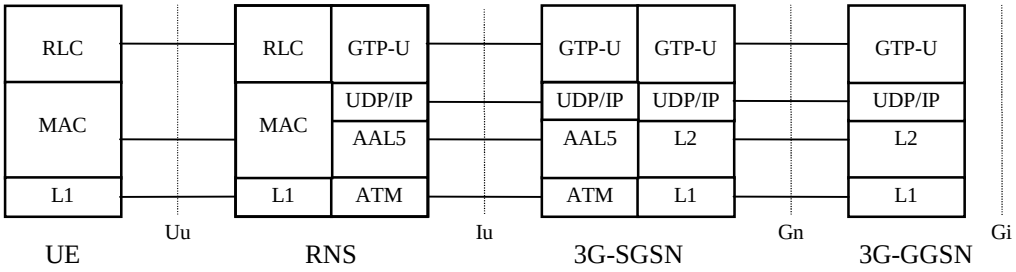
### 4.2.2 Iu User plane

- The standard shall support that the user data flows transported over the Iu reference point to/from the 'IP domain' shall be multiplexed on top of common layer 2 resources.
- If the Iu data transport bases on ATM PVCs then the Iu IP layer provides the Iu network layer services, e.g. routing, addressing, load sharing and redundancy. In this case an IP network may be configured to transfer Iu data units between RNSs and 3G-SGSNs.
- One or several AAL5/ATM Permanent VCs may be used as the common layer 2 resources between the UTRAN and the 'IP domain' of the CN. The reason for usage of several permanent AAL5/ATM VCs may e.g. be for load sharing and redundancy. It is also possible to use one switched VC per user flow (PDP context or radio access bearer).
- A tunnelling protocol is used on top of this common layer 2. This tunnelling protocol corresponds to an evolution of the user plane part of the GTP protocol used in GPRS put on top of UDP/IP.
- The user data plane in the UMTS network is made up of two tunnels:
- a first IP/UDP/GTP tunnel between RNC and 3G SGSN on Iu
- a second IP/UDP/GTP tunnel between GGSN and 3G SGSN on Gn

This architecture:

- Provides hierarchical mobility
- Allows having the RNC directly connected on the IP domain backbone
- Ensures that all traffic is routed through 3G-SGSN that may perform functions such as charging and Lawful Interception.
- Would allow to have different protocols (or protocol version) on Gn and Iu if needed in the future

The protocol stack is shown in Figure 3.




Note: Protocol layers above RLC and GTP-U are FFS

**Figure 3: Protocol Architecture for IP domain user plane**

**3GPP TSG-SA meeting #6** ***Document S2-99518***

**Hazlet, USA (NJ), 26-30 July 1999**

# 3G 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** **A008** Current Version: 3.0.0

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

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

**Source:** Nokia **Date:** 22/7/99

**Subject:** Clarification to MM procedures

**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:** The modification is intended for clarification and to make the text in 23.121 consistent on this matter. In chapter 4.3.1 of 23.121, the location update principle in RRC connected mode is more clearly stated than in current text in chapters 4.3.6.1 and 4.3.6.2. The basic principle is that while in RRC connected mode the UE initiates Location Area update or Routing Area update towards the CN when receiving information indicating a new Location Area / Routing Area. This principle shall be introduced also to chapters 4.3.6.1 and 4.3.6.2.

**Clauses affected:** Chapters 4.3.6.1 and 4.3.6.2

**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:**

help.doc

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

#### 4.3.6.1 Location area update

Location area update is initiated by the UE to inform the CS service domain of the core network that the UE has entered a new location area. In case the new location area is in an area served by another CN node, the location area update also triggers the registration of the subscriber in the new CN node and a location update for CS services towards the HLR.

Location area update is only initiated by the UE when the UE is in state CS-IDLE, and this independently of the PS state. If the UE is CS-IDLE but RRC connected, which means that the UE is in PS-CONNECTED state, location area update is initiated by the UE when it ~~enters~~ receives information indicating a new location area (see also the chapter "Handling of MM system information").

#### 4.3.6.2 Routing area update

Routing area update is initiated by the UE to inform the PS service domain of the core network that the UE has entered a new routing area. In case the new routing area is in an area served by another CN node, the routing area update also triggers the registration of the subscriber in the new CN node and a location update for PS services towards the HLR.

Routing area update is only initiated by the UE when the UE is in state PS-IDLE, and this independently of the CS state. If the UE is PS-IDLE but RRC connected, which means that the UE is in CS-CONNECTED state, routing area update is initiated by the UE when it ~~enters~~ receives information indicating a new routing area (see also the chapter "Handling of MM system information").

**3GPP TSG-SA meeting #6** ***Document*** ***S2-99616***

**Hazlet, USA (NJ), 26-30 July 1999**

# 3G 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** **A009r1** Current Version: 3.0.0

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X] for information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [X] UTRAN [ ] Core Network [X]

**Source:** Nokia **Date:** 29.07.99

**Subject:** Allowed network and terminal implementation configurations in UMTS

**3G Work item:**

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

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

**Reason for change:** Allowed implementation configurations related to PS-domain and CS-domain for both the network and terminal has been discussed in S2. In S2 meeting at Yokohama, S2 noted the liaison from T2 SWG3 (related to same issue) on "GPRS in UMTS" (T2-99422) and responded to it in Tdoc S2-99289. This topic was again raised in S2 meeting at May in Sophia Antipolis.
It is believed that LS send by S2 to T2 SWG3 was a good progress forward on the issue. However, it is also felt that this information is relevant to other groups than T2, like N1 etc. Therefore there is need to distribute this information further. Also confusion and repeated discussions on the topic in S2 shall be avoided. In consequence it is proposed to add a new section to 23.121, which contains allowed network and terminal implementation configurations in UMTS. Contents of this proposal basically follows the text agreed in Yokohama S2 meeting (S2-99289) with some editorial modifications.

**Clauses affected:**

**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:**

help.doc

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

# 4.x Allowed network and terminal configurations

A UMTS network is divided into a radio access network and a core network, which are connected via an open interface over the Iu reference point. Furthermore, the core network is from a functional point of view divided into a Packet Switched Service Domain and a Circuit Switched Service Domain.

The following network configurations shall be allowed:

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.

**3GPP TSG-SA meeting #7** ***Document S2-99770***

**Sophia Antipolis, 24-27 August 1999**

# 3G 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** **A012r1** Current Version: 3.0.0

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X] for information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [X] UTRAN [X] Core Network [X]

**Source:** Nokia **Date:** 20/8/99

**Subject:** Hierarchical tracking concept, recovery of temporarily lost mobiles, and MM and SM relation – Revised version

**3G Work item:**

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

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

**Reason for change:** The relation between SM states and RRC states are not clear in the current version. This CR proposes that UE state may be MM-Idle mode even when a PDP context is established. The reason is that for best effort PDP context, it allows to save radio signaling by performing Routing Area update instead of URA update (assuming a RA significantly bigger than URA). If we assume that most UE in the future will always have at least one PDP context activated, it also avoids the need for RNC to support very large number of RRC connections and very large number of Iu SCCP connections and GTP tunnels.

**Clauses affected:** section 4.3 modified

**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:**

help.doc

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

## 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.

#### 4.3.2.1.1 Location areas

For CS services, the CN uses Location Areas (LA). Location Area is used e.g. at CN initiated paging related to CS services. A CS service related temporary identity, CS –TMSI, may be allocated to the UE. This temporary identity is then unique within a LA.

#### 4.3.2.1.2 Routing areas

For PS services, the CN uses Routing Areas (RA). Routing Area is used e.g. at CN initiated paging related to PS services. A PS service related temporary identity, PS-TMSI, may be allocated to the UE. This temporary identity is then unique within a RA.

~~Note that the routing area concept here differs from the routing area in GSM, which in a sense corresponds to URA (see below) in UMTS.~~

#### 4.3.2.1.3 UTRAN internal areas

UTRAN internal areas are used when the terminal is in RRC-Connected mode (see chapter 3.3). The areas are used at e.g. UTRAN initiated paging. UTRAN internal area updating is a radio network procedure and the UTRAN internal area structure should not be visible outside UTRAN. In RRC connected mode, the UE position is known on cell level or on UTRAN Registration Area (URA) level. RNTI is used as a temporary UE identifier used within UTRAN and allocated at RRC connection establishment. ~~Note that the URA thus corresponds, in a sense, to the routing area in GSM.~~

#### 4.3.2.1.4 Relationship between the different areas

The following area relations exist:

- One URA consists of a number of cells. The cells normally belong to the same RNC, but this assumption may not be a requirement (ffs.).
- One RA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One LA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One RA is handled by only one CN serving node, i.e. one UMSC or one 3G_SGSN.
- One LA is handled by only one CN serving node, i.e. one UMSC or one 3G_MSC/VLR.
- There may not be any relation between LA and RA, i.e. the following relations between LA and RA are possible:
  - RA and LA is equal
  - one RA is a subset of one, and only one, LA, meaning that a RA do not span more than one LA
  - one LA is a subset of one, and only one, RA, meaning that a LA do not span more than one RA
  - independent LA and RA structure

In case of a LA and a RA consisting of both UMTS cells and GSM cells, then the GSM defined relations will apply.

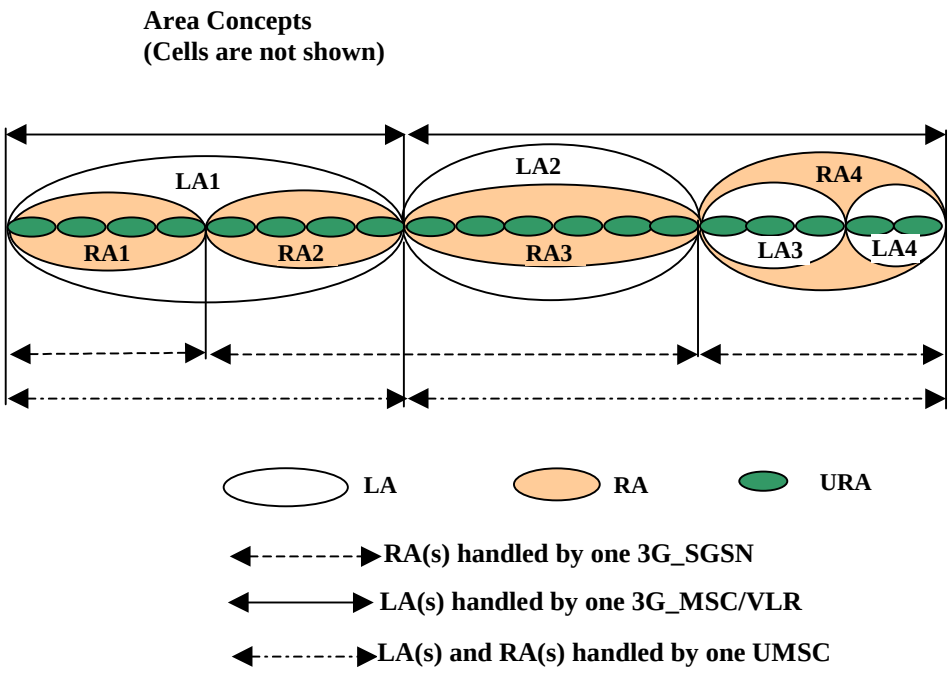



Figure 13: Relationship between different areas. The totally independent LA and RA structure is not described in this figure.

#### 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~~MM~~ Idle state~~mode~~) is tracked at the Routing Area level by SGSN when no data is~~are~~ 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.

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.

### 4.3.12.3 Comparison between UMTS and GSM

For the PSTN/ISDN domain, the proposed UMTS MM concept is in principle identical to the GSM MM.

For the IP domain, the differences between the proposed UMTS MM concept and the GSM GMM are more extensive, such as:

GSM GMM-Ready state where "Cell update" is performed is replaced in UMTS by UMTS PS-CONNECTED state where SGSN is maitaining a connection toward UTRAN and the UE location is tracked by UTRAN (i.e. not on MM level).~~moved from GMM level in GSM to RRC level in UMTS.~~

GSM GMM-standby state corresponds to UMTS PS-IDLE state. In both case, "Routing area update" is performed and SGSN is paging in the routing area.~~in GSM GMM-standby state is moved from GMM level in GSM to RRC level in UMTS and corresponds to "URA update"~~.

~~A new case when "Routing area update" is performed towards 3G_SGSN is introduced in the UMTS PS-IDLE state.~~

A UMTS PS-CONNECTED state is introduced and in this state the UE mobility towards the CN will be handled by UTRAN-CN procedures, i.e. not on MM level.

Figure 25 provides illustration of the above bullets.

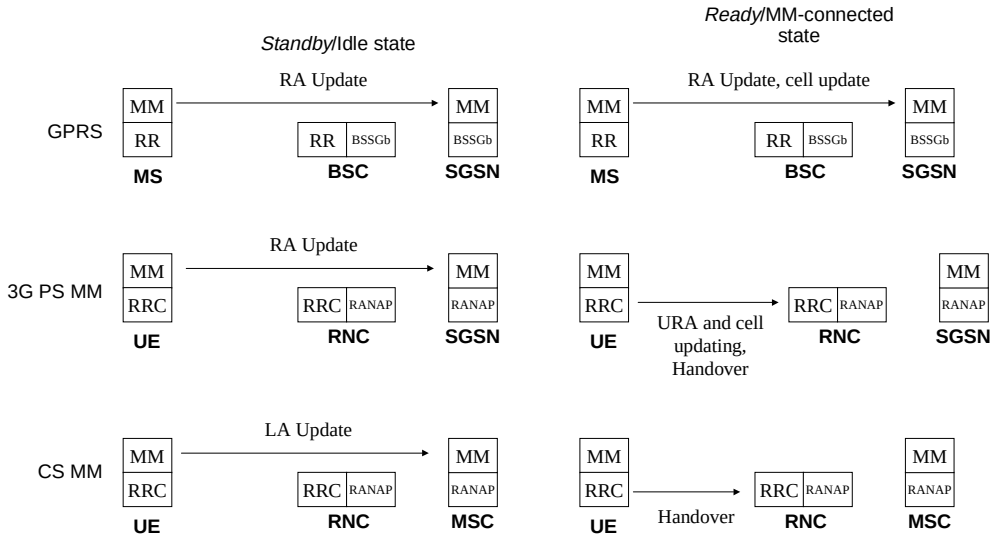



**Figure 40 The states written in italics correspond to those defined in GSM with GPRS.**

### 4.3.12.3.1 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.

### 4.3.12.3.2 PS -connected state

The URA and cell updating and handover procedures presented in Figure 25 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 ~~may~~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 similar functionality in GPRS is offered via standby/ready at MM level~~.

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.

~~To summarise, the RRC procedures proposed by [2] allow the CN MM to be independent of the actual activity. This is a significant deviation from GPRS MM, which is closely related to the activity in terms of implementing standby and ready functionality at MM level. A~~another 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.X 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.

Note: The PDP context status is not modified by the release of the RRC connection, except if the release of the connection is due to an RRC failure which do not permit to maintain the negotiated QoS (e.g. a real time connection).

4.3.Y Requirement in case of temporarily loss of coverage of packet UE

A packet attached UE using non-real time bearer shall not lose its PDP context in case of temporarily loss of coverage. An UE specific Mobile Reachable Timer ~~operator configurable SGSN timer~~ should monitor how long PDP context(s) are kept after a UE has lost coverage.

---

## 4.3.3 MM functionality in different UE service states

… [no change to the beginning of the chapter]

**Moving from PS-IDLE to PS-CONNECTED:**

The state transition from PS-IDLE to PS-CONNECTED is performed when a signalling connection is established between UE and CN for PS services.

Moving from PS-CONNECTED to PS-IDLE:

The state transition from PS-CONNECTED to PS-IDLE is performed when the signalling connection for PS services is released, e.g. at release of a PS service ~~and,~~ no other PS service is ongoing and at release of the RRC connection in case of very low level of activity. A radio link failure may also trigger this state transition.

Moving from PS-IDLE to PS-DETACHED:

The transition from PS-IDLE to PS-DETACHED may be triggered by some action from the user of the UE but an expiring timer in the network could also trigger it. The UE is marked as PS_DETACHED in the CN and then as a consequence no PS service establishment is possible.

---

### 4.3.12.1.2 Routing Area update

This example shows location registration when changing Routing Area including change of 3G_SGSN when the UE is in MM idle state towards the 3G_SGSN.

The illustrated transfer of MM signalling to/from the UE uses an established RRC connection. This RRC connection can have been established beforehand due to ongoing interwork between UE and 3G_MSC/VLR or be established only for this location registration procedure towards the 3G_SGSN.

For each indicated MM message sent in this case to/from UE, the CN discriminator indicates 3G_SGSN.

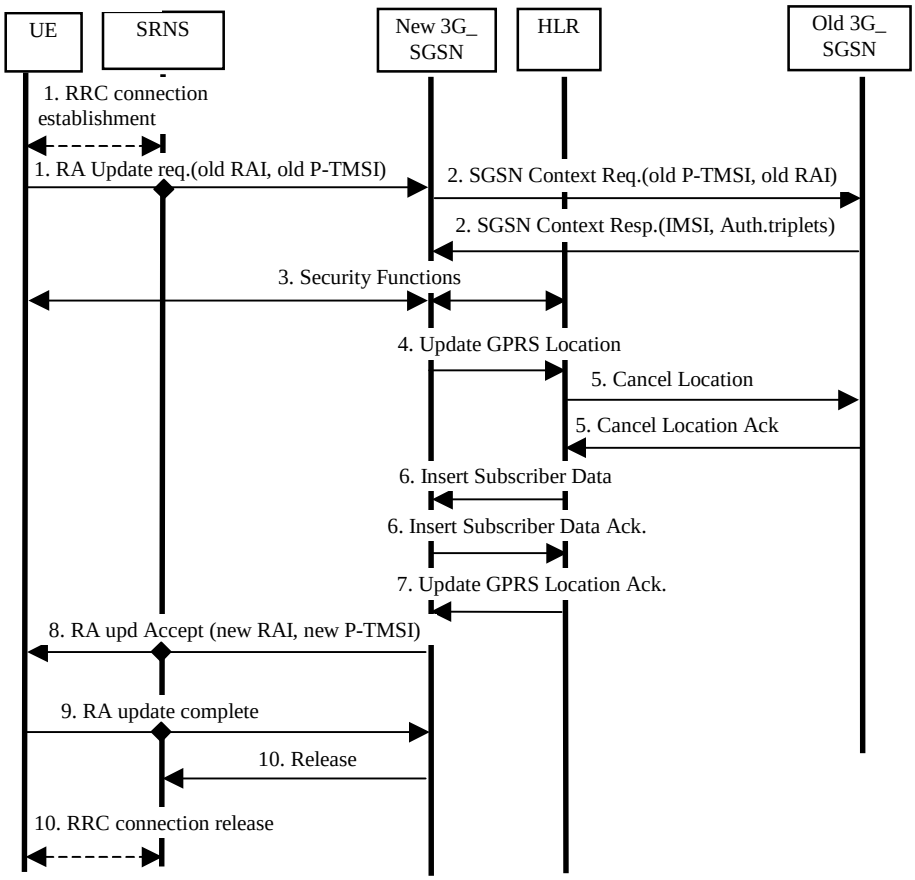



**Figure 23 Interface information transfer for Routing Area update when changing SGSN area (successful case)**

- 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 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.

**3GPP TSG-SA meeting #6** ***Document*** ***S2-99530***
**Hazlet, USA (NJ), 26-30 July 1999**

**Source:** **NTT COMMUNICATIONWARE**
**Subject:** **LAI addition for combined area update procedure**
**Purpose:** **Discussion / Decision**

# Discussion

In GSM combined area update procedure with Gs interface is defined and in invocation only RAI is specified to SGSN because LAI is easily derived from RAI by its definition[1]. But in UMTS independent LA and RA structure is possible[2], so LAI derivation from RAI in SGSN may become inefficient. In this contirbution it is proposed that LAI shall be specified in combined area update and attach.

# Proposal

Proposed CR to 23.121 is in the appedix A.

# References

[1] 23.003 v3.0.0
[2] 23.121 v3.0.0

# Appendix A

## 3G 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** **A16** Current Version: 3.0.0

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#6 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

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

**Source:** NTT Comunicationware **Date:** 26.07.99

**Subject:** LAI addition for combined area update procedure

**3G Work item:**

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

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

**Reason for change:** In GSM combined area update procedure with Gs interface is defined and in invocation only RAI is specified to SGSN because LAI is easily derived from RAI by its definition. But in UMTS independent LA and RA structure is possible, so LAI derivation from RAI in SGSN may become inefficient. Then LAI shall be specified in combined area update, attach and detach.

**Clauses affected:** 4.3.12.1.4, 4.3.13.6, 4.3.13.7

**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:**

help.doc

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

#### 4.3.12.1.4 Periodic Registration with use of Gs/UMSC

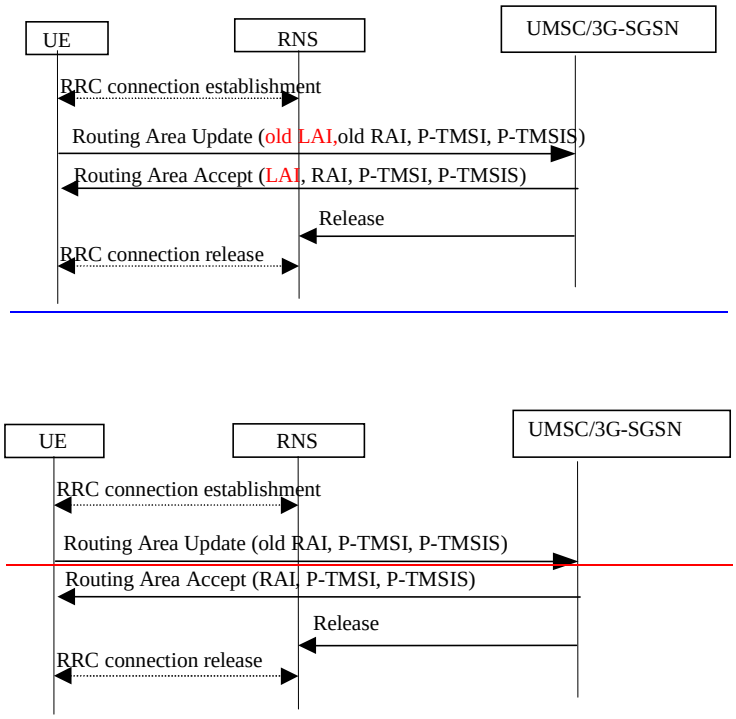



**Figure 25: Periodic update procedure when the MS is attached for both CS and PS services**

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.

### 4.3.13.6 Combined attach case where the previous attach was towards 2 CN elements

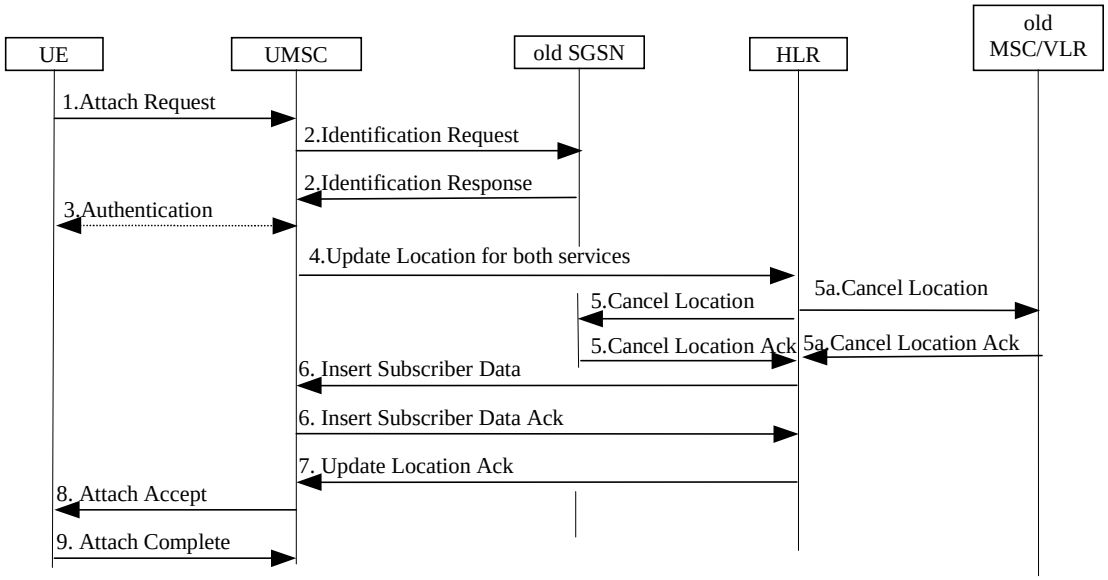



**Figure 43 Combined attach procedure when the Ms moves from 2 CN element to a UMSC**

1) The UE initiates the attach procedure by the transmission of an Attach Request (IMSI or P-TMSI and old LAI, old RAI, Attach Type, old P-TMSI Signature) message to the UMSC. Attach Type indicates which type of attach that is to be performed, i.e., PS attach only, CS attach only, or combined attach (the example given is for combined attach).

2) If the UE identifies itself with P-TMSI and the 3G-SGSN/UMSC has changed since detach, the new UMSC sends an Identification Request (P-TMSI, old RAI, old P-TMSI Signature) to the old SGSN to request the IMSI. The old SGSN responds with Identification Response (IMSI, Authentication Triplets). If the UE is not known in the old SGSN, the old SGSN responds with an appropriate error cause. The old SGSN also 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.

3) The authentication functions are optional and may be used for example if P-TMSI signature authentication was not successful. If the UMSC number has changed since the detach, or if it is the very first attach, routing/location area update procedures are executed:

4) The UMSC sends a Combined Update Location (UMSC Number, UMSC Address, IMSI) to the HLR.

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

6) 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 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.

7) The HLR acknowledges the Update Location message by sending an Update Location Ack to the UMSC. If the Update Location is rejected by the HLR, the UMSC rejects the Attach Request from the UE with an appropriate cause.

8)The UMSC sends an Attach Accept (P-TMSI, TMSI, P-TMSI Signature) to the UE.

9)If P-TMSI or TMSI was changed, the UE acknowledges the received TMSI(s) with Attach Complete (P-TMSI, TMSI).

If the Attach Request cannot be accepted, the UMSC returns an Attach Reject (IMSI, Cause) message to the UE.

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

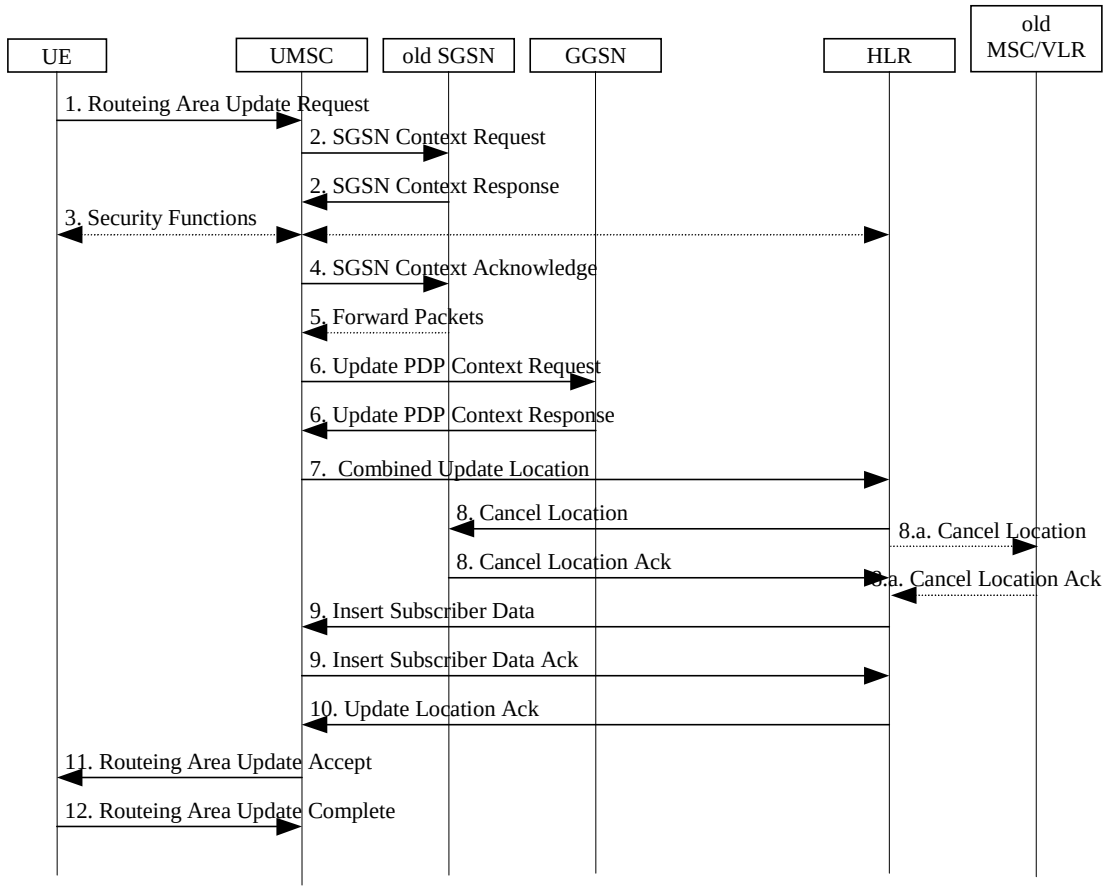



**Figure 44 Combined LA/RA update when the MS moves from 2 CN element to UMSC**

The UE sends a Routing Area Update Request (old LAI, 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 (TID).
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.

**3GPP TSG-SA meeting #6**
**Hazlet, USA (NJ), 26-30 July 1999**

***Document* S2-99567**

# 3G 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 | 019 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Alcatel **Date:** 23.7.99

**Subject:** Clarifications on Iu_ps control plane

**3G Work item:**

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

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

**Reason for change:**

This document aims at clarifying the text of sect. 4.2.1 (Iu control plane) of 23.121 that contains contradictory sentences coming from discussions of the Nynashamn and Yokohama meetings.
For instance, the beginning of the section (Nynashamn meeting) tells that "It is agreed to use the SCCP primitive between RANAP & its transport" and shows an "UMTS RANAP adaptation layer" whereas the end of the section (Yokohama meeting) shows that SCCP layer is used below RANAP on Iu control plane and tells that "No UMTS specific adaptations shall be standardized below the SCCP protocol".

**Clauses affected:** 4.2.1

**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:**

These changes have been agreed in Sophia meeting (S2-99406) but were not incorporated in the specifications.


help.doc

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

### 4.2.1 Iu Control Plane

For transport of RANAP messages over Iu an SCCP protocol shall be used for both packet and circuit switched domains. The SCCP protocol shall fully comply with ITU-T white book. RANAP protocol shall be designed to use this service according to the ITU-T standard. Iu shall be designed so that RANAP is not impacted by alternatives for SCCP message transport on layers below SCCP.

In the circuit switched domain SCCP messages shall be transported on a broadband SS7 stack comprising MTP3b on top of SAAL-NNI. In this domain no other alternatives are standardised in release 99.

In the packet switched domain the UMTS standard shall allow operators to chose one out of two standardised protocol suites for transport of SCCP messages.

1. Broadband SS7 stack comprising MTP3b on top of SAAL-NNI

2. IETF/Sigtran CTP protocol suite for MTP3 users with adaptation to SCCP. The protocol suite shall fully comply with the IETF standards developed by the Sigtran working group. No UMTS specific adaptations shall be standardised below the SCCP protocol.

[rest of the section is unmodified]

**3GPP TSG-SA meeting #7** ***Document S2-99776***

**Sophia Antipolis, 24-27 August 1999**

# 3G 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 | A023 r2 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [X] UTRAN [X] Core Network [X]

**Source:** Nokia **Date:** 20/08/1999

**Subject:** Description of UTRAN coordination – Revised version

**3G Work item:**

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

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

**Reason for change:** The UTRAN may receive request to allocate resource for a given UE from both PS and CS Core network. This contribution proposes that the UTRAN coordinates the allocation of resource as is done for paging. This implies that the UTRAN should always knows a common identity (IMSI) for the UE.

**Clauses affected:** A new chapter is proposed to be introduced.

**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:**

help.doc

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

# 2 References

[…]

[3] ETSI TC-SMG GSM ~~0~~2.0~~6~~0

[…]

## 4.3.x UTRAN coordination

The UTRAN coordinates the resource allocation of an UE attached to both PS and CS services. The UTRAN shall reject or downgrade a connection which cannot be granted [3]. The cause might be congestion on the radio interface, or the existence of other connections between this UE and the other CN.

The UTRAN use the IMSI to identify a UE. The IMSI is transferred from the Core Network to the UTRAN with the common ID procedure. When an Iu connection is established, the Core Network shall perform the RANAP common ID procedure toward UTRAN as soon as the UE is identified (IMSI). The IMSI is only stored in the UTRAN for the duration of the RRC Connection.

**3GPP TSG-SA meeting #8**
**Bonn, 13-17 Sept 1999**

***Document S2-99873***

# 3G 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 | A024 r3 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [X] UTRAN [X] Core Network [X]

**Source:** Nokia **Date:** 10/09/99

**Subject:** SRNC relocation in relation with SGSN change – Revised version

**3G Work item:**

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

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

**Reason for change:**

The SRNC relocation described in section 4.3.12.2.3 proposes to introduce a new procedure: the network initiated Routing Area Update. However, this new procedure is not really needed as a normal Routing area update could be initiated from the UE instead (see Tdoc. S2-99719).

Furthermore, SRNC relocation signaling between the target RNC and target SGSN is updated to be in accordance with the signaling already agreed in RAN WG3.

**Clauses affected:** 4.3.12.2.3; 4.3.1; 4.3.3 and 4.3.6.2

**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:**


help.doc

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

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

This example shows SRNS relocation when source RNC and target RNC are connected to different 3G_SGSN. Figure 33 and Figure 35 illustrate the situation before respective after the SRNS relocation and location registration. Figure 37 illustrates the signalling sequence where each step is explained in the following list.

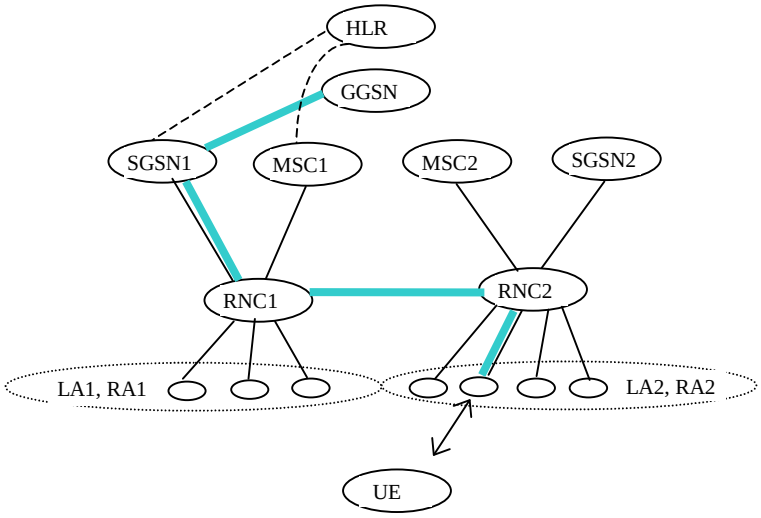



**Figure 33 Before the SRNS relocation and location registration**

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.

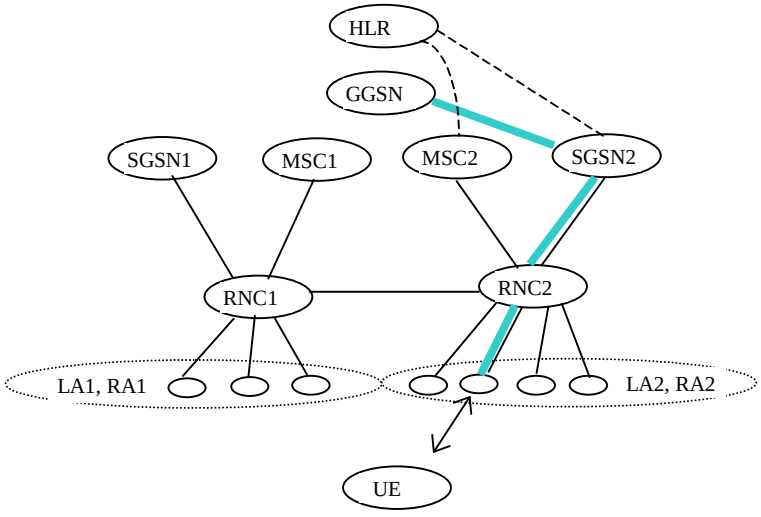



**Figure 35 After the SRNS relocation and location registration**

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

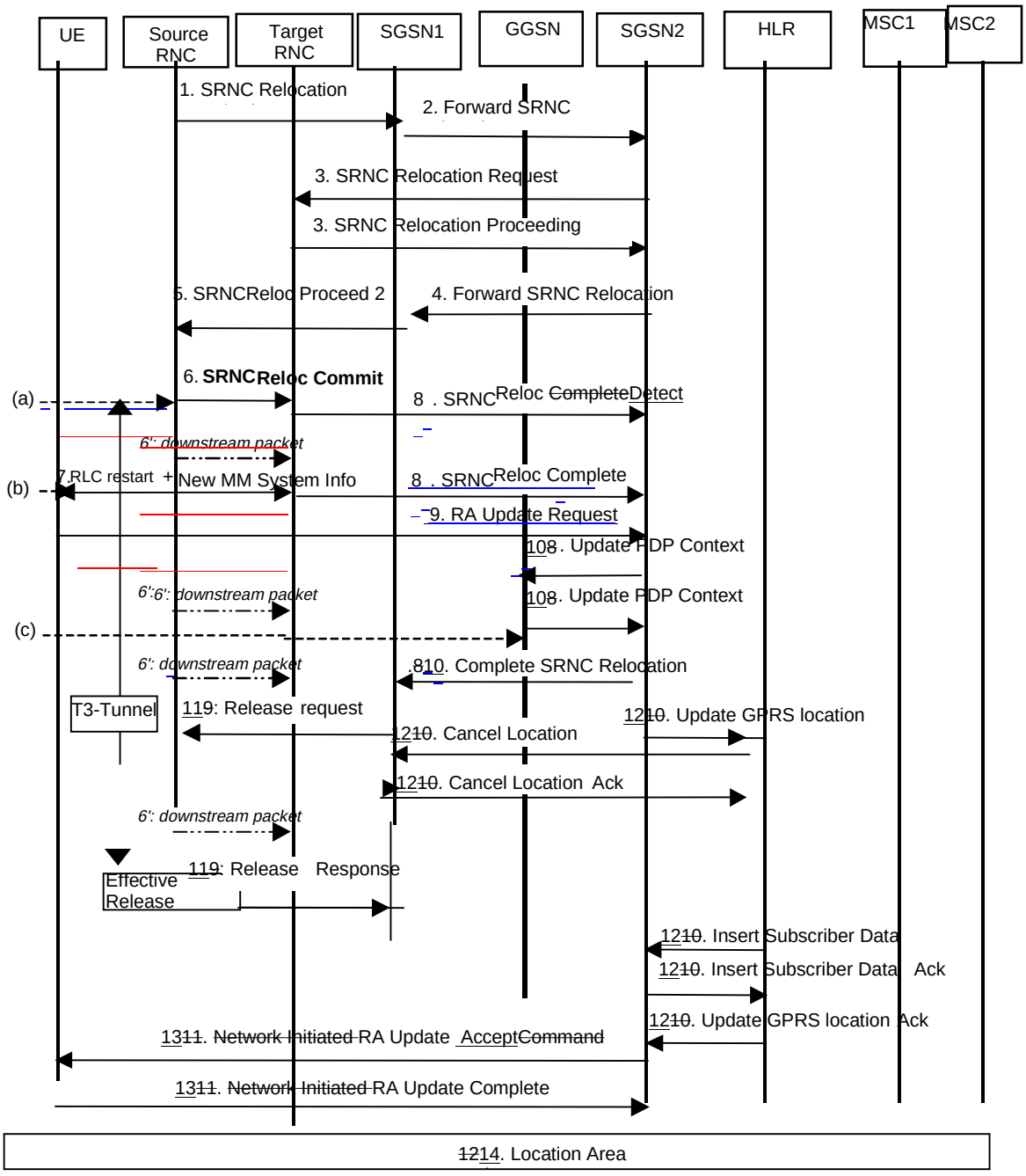



**Figure 37 Interface information transfer for SRNS relocation update when changing SGSN area resulting in a change of registered location and followed by location registration in new Location Area.**

**"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.

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) (possibly one address per PDP context) on which SGSN2 is willing to receive these packets.

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 RLC connection used by the UE (i.e. the Receive State Variable V(R) for all RLC SAPI in acknowledged mode). 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 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)).

- 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 12)

8) Immediately after a successful switch at RNC, target RNC (=SRNC) sends SRNC Relocation ~~Complete~~ 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.

~~9)~~10) Upon reception of ~~this message~~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 SGSN sends a Complete SRNC Relocation towards the SGSN1.

~~9)~~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..

~~10)~~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.

~~11)~~13) At reception of Insert subscriber data from HLR, the SGSN2 will send a Routing Area Update Accept message ~~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.

~~12)~~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 19 may be further refined.

UE-GGSN Communication path during the SRNS relocation procedure

Before point (a), in Figure 37, the connection is established between UE and GGSN via Source SRNC and SGSN1.

… [no change to the rest of the chapter]

---

## 4.3.1 Location Management and Mobility Management concept overview

… [no change to the beginning of the chapter]

**Figure 11: Overview of the UE registration and connection principles within UMTS for the integrated CN architecture case when the CN consists of both a CS service domain and an PS service domain with an UMSC as the main serving node.**

The main PS service states are PS-DETACHED, PS-IDLE and PS-CONNECTED. The main CS service states are CS-DETACHED, CS-IDLE and CS-CONNECTED. For the respective service domain there are specific related MM system information controlling the Mobility Management functionality of the UE

The aim of UTRAN is to offer one unified set of radio bearers which may be used for bursty packet traffic and for traditional telephony traffic. This leads to the conclusion that only one logical control channel structure will be used for all kind of traffic. The radio resource handling is UTRAN internal functionality and the CN does not define the type of radio resource allocated.

The Radio Resource Control (RRC) has two modes, RRC Connected mode and RRC Idle mode. The RRC mode describes which identity is used to identify the UE. In RRC Idle mode the UE is identified by a CN associated identity. In RRC Connected mode the UE is assigned a Radio Network Temporary Identity to be used as UE identity on common transport channels. When the UE is allocated dedicated transport channels, it uses the inherent addressing provided by these transport channels.

In PS-CONNECTED state the UE is in RRC Connected mode. In CS-CONNECTED state the UE is in RRC Connected mode.

For the mobility functionality, four different area concepts are used. Location Areas and Routing Areas are used in the Core Network. UTRAN Registration Areas and Cell Areas are used in UTRAN. Location Areas are related to CS services. Routing Areas are related to PS services.

One Location Area is handled by one CN node. For an UE that is registered in a Location Area, this implies that the UE is registered in the specific CN node handling this specific Location Area. One Routing Area is handled by one CN node. For an UE that is registered in a Routing Area, this implies that the UE is registered in the specific CN node handling this specific Routing Area. Location Area is used by the 3G_MSC/VLR for paging the UE. Routing Area is used by the 3G_SGSN for paging the UE. UTRAN Registration Areas and Cell Areas are only visible in UTRAN and used in RRC-Connected mode.

For the relations between Location Area (LA) and Routing Area (RA) it shall be possible for the operator to have a LA and a RA equal (i.e. same cells), a RA as a part of a LA, a LA as a part of RA, and LA and RA independent. In case of a LA and RA consisting of both UMTS cells and GSM cells the GSM defined relations will apply.

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~~, except during SRNS relocation when RAI in MM system information changes~~.

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.

---

### 4.3.3 MM functionality in different UE service states

Below are the main UE service states and related MM functionality described. For the determination on when LA or RA is changed, see chapter on “Handling of MM system information”.

CS service states and related MM functionality:

CS-DETACHED: The UE is not reachable by the network for CS services. The UE does not initiate LA updates at LA changes and no periodic CS service updates.

CS-IDLE: The UE is reachable by paging for CS services. The UE initiates LA updates at LA changes. The UE may initiate periodic CS service updates and this depending on the CS periodic update state of the present LA.

CS-CONNECTED: The UE has a signalling connection for CS services established between the UE and the CN. The UE does not initiate LA update (even not when the present LA changes) and no periodic CS service updates.

PS service states and related MM functionality:

PS-DETACHED: The UE is not reachable by the network for PS services. The UE does not initiate RA updates at RA changes and no periodic PS service updates.

PS-IDLE: The UE is reachable by paging for PS services. The UE initiates RA updates at RA changes. The UE may initiate periodic PS service updates and this depending on the PS periodic update state of the present RA.

PS-CONNECTED: The UE has a signalling connection for PS services established between the UE and the CN. ~~The UE does not initiate RA update (even not when the present RA changes) at RA changes, except during SRNS relocation when RAI in MM system information changes. and.~~ The UE initiates RA update when RAI in MM system information changes. ~~n~~No periodic PS service updates.

There may also be a NULL state. In the UE, this state corresponds to power off or maybe a “no SIM” condition. In the CN, the NULL state correspond to CS-DETACHED and PS-DETACHED

For each state transition there can be several events that triggers the transition. Some of them are described below. Note that some of these may coincide, e.g. moving from CS-IDLE to CS-DETACHED and moving from PS-IDLE to PS-DETACHED.

**Moving from CS-IDLE to CS-CONNECTED:**

The state transition from CS-IDLE to CS-CONNECTED is performed when a signalling connection is established between UE and CN for CS services. In GSM this state transition is triggered by the message CM_SERVICE_REQUEST or PAGE_RESPONSE.

**Moving from CS-CONNECTED to CS-IDLE:**

The state transition from CS-CONNECTED to CS-IDLE is performed when the signalling connection for CS services is released, e.g. at call release and no other CS service is ongoing. A radio link failure may also trigger this state transition.

**Moving from CS-IDLE to CS-DETACHED:**

The transition from CS-IDLE to CS-DETACHED may be triggered by some action from the user of the UE but an expiring timer in the network could also trigger it. The UE is marked as CS_DETACHED in the CN and then as a consequence no CS service establishment is possible.

**Moving from PS-IDLE to PS-CONNECTED:**

The state transition from PS-IDLE to PS-CONNECTED is performed when a signalling connection is established between UE and CN for PS services.

Moving from PS-CONNECTED to PS-IDLE:

The state transition from PS-CONNECTED to PS-IDLE is performed when the signalling connection for PS services is released, e.g. at release of a PS service and no other PS service is ongoing. A radio link failure may also trigger this state transition.

Moving from PS-IDLE to PS-DETACHED:

The transition from PS-IDLE to PS-DETACHED may be triggered by some action from the user of the UE but an expiring timer in the network could also trigger it. The UE is marked as PS_DETACHED in the CN and then as a consequence no PS service establishment is possible.

---

#### 4.3.6.2 Routing area update

Routing area update is initiated by the UE to inform the PS service domain of the core network that the UE has entered a new routing area. In case the new routing area is in an area served by another CN node, the routing area update also triggers the registration of the subscriber in the new CN node and a location update for PS services towards the HLR.

Routing area update is ~~only~~ initiated by the UE when the UE is in state PS-IDLE ~~except during SRNS relocation when RAI in MM system information changes~~, and this independently of the CS state. If the UE is PS-IDLE but RRC connected, which means that the UE is in CS-CONNECTED state, routing area update is initiated by the UE when it enters a new routing area (see also the chapter “Handling of MM system information”).

When the UE is in PS-CONNECTED state the UE initiates RA update when RAI in MM system information changes.

**3GPP TSG-SA WG2 meeting 7** ***Document*** ***S2-99751***

**Sophia Antipolis, France, 23- 27 August 1999**

# 3G 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 | A025 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

For approval [X] For information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Ericsson **Date:** 1999-08-23

**Subject:** LA/RA – URA relationship

**3G Work item:**

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

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

**Reason for change:**

The current UMTS Mobility Management concept in TS 23.121 specifies a relationship between the CN Registration Areas (Location Areas (LA) and Routing Areas (RA) respectively) and UMTS UTRAN Registration Areas (URA). The URA concept is defined in TS 25.331.

URA is used only when in RRC connected mode and not used by UE at all in RRC idle mode. In RRC idle mode the UE makes controls between LA respective RA of current cell and the LA respective RA in which the mobile made its last registration.

All users registered in one LA respective in one RA are handled by one MSC/VLR respective one SGSN. It is not defined that all cells belonging to an URA must be handled by only one RNC. Keeping the relation between CN areas and URAs gives that one URA can not be shared between RNCs belonging to different MSC/VLR respective SGSN.

The above indicates that the present specified relationship causes unnecessary dependencies between CN registration areas and UTRAN registration areas. It is therefore proposed to remove this relationship and instead add a relationship between LA/RA and cells.

**Clauses affected:** 4.3.2

**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:**

help.doc

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

## 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.

#### 4.3.2.1.1 Location areas

For CS services, the CN uses Location Areas (LA). Location Area is used e.g. at CN initiated paging related to CS services. A CS service related temporary identity, CS –TMSI, may be allocated to the UE. This temporary identity is then unique within a LA.

#### 4.3.2.1.2 Routing areas

For PS services, the CN uses Routing Areas (RA). Routing Area is used e.g. at CN initiated paging related to PS services. A PS service related temporary identity, PS-TMSI, may be allocated to the UE. This temporary identity is then unique within a RA.

Note that the routing area concept here differs from the routing area in GSM, which in a sense corresponds to URA (see below) in UMTS.

#### 4.3.2.1.3 UTRAN internal areas

UTRAN internal areas are used when the terminal is in RRC-Connected mode (see chapter 3.3). The areas are used at e.g. UTRAN initiated paging. UTRAN internal area updating is a radio network procedure and the UTRAN internal area structure should not be visible outside UTRAN. In RRC connected mode, the UE position is known on cell level or on UTRAN Registration Area (URA) level. RNTI is used as a temporary UE identifier used within UTRAN and allocated at RRC connection establishment. Note that the URA thus corresponds, in a sense, to the routing area in GSM.

#### 4.3.2.1.4 Relationship between the different areas

The following area relations exist:

1) There may not be any relation between URA and LA respectively between URA and RA. The URA concept is defined in TS 25.331.~~One URA consists of a number of cells. The cells normally belong to the same RNC, but this assumption may not be a requirement (ffs.).~~

2) One RA consists of a number of cells~~URA:s~~ belonging to RNC:s that are connected to the same CN node.

3) One LA consists of a number of cells~~URA:s~~ belonging to RNC:s that are connected to the same CN node.

4) One RA is handled by only one CN serving node, i.e. one UMSC or one 3G_SGSN.

5) One LA is handled by only one CN serving node, i.e. one UMSC or one 3G_MSC/VLR.

6) There may not be any relation between LA and RA, i.e. the following relations between LA and RA are possible:
   - RA and LA is equal
   - one RA is a subset of one, and only one, LA, meaning that a RA do not span more than one LA
   - one LA is a subset of one, and only one, RA, meaning that a LA do not span more than one RA
   - independent LA and RA structure

In case of a LA and a RA consisting of both UMTS cells and GSM cells, then the GSM defined relations will apply.

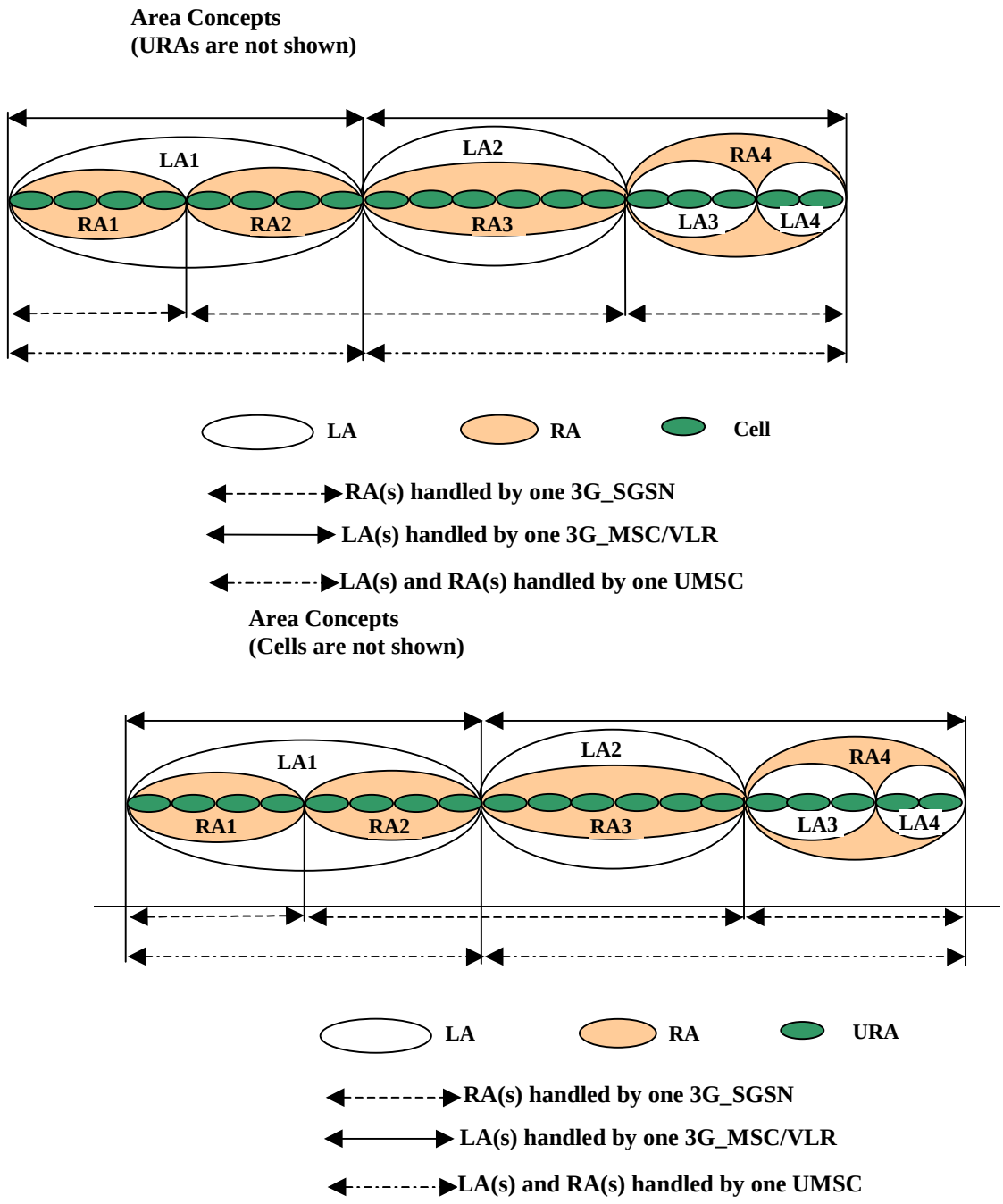



Figure 13: Relationship between different areas. The totally independent LA and RA structure is not described in this figure.

**3GPP TSG-SA WG2 meeting #6bis** *Document* ***S2-99775***

**Sophia Antipolis, France, 24-26 August 1999**

# 3G 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** **26** Current Version: 3.0.0

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submission to TSG: SA#5 *(list TSG meeting no. here ↑)* for approval [X] For information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** NTT DoCoMo, Siemens **Date:** 24/08/1999

**Subject:** Procedures for volume based charging

**3G Work item:** Architecture Requirements for Release 99

**Category:** *(only one category Shall be marked With an X)*

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

**Reason for change:**

Due to the removal of LLC layer, some procedures over Iu interface shall be considered in order for 3G-SGSN to charge only for packet data successfully transferred to a UE. At the previous S2 meeting, two procedures over Iu interface for volume based charging were discussed, but no conclusion can be reached.

After analysing the above two approaches, the source companies can reach a compromised solution which can meet operators' requirements.

From operators' point of view, the following requirements shall be considered.

- The charging shall be based on the packet volume successfully transferred to a UE
- 3G-SGSN shall be able to produce billing information at any time the 3G-SGSN wants.
- Overload signalling due to the charging procedures over Iu shall be avoided.

Currently charging function for down-link packets is located at the 3G-SGSN. On the other hand, only RNC can identify the actual packet volume successfully transferred to a UE. In order for 3G-SGSN to charge only for packet data successfully transferred to a UE, the RNC shall indicate the volume of all not transferred data to the 3G-SGSN.

If RNC sends the unacknowledged volume per error situation, the signalling load over Iu may significantly increase in case of the change of radio environments. Instead, RNC shall be able to send the unacknowledged volume accumulated over an implementation dependent time.

Moreover, since 3G-SGSN is responsible for the charging, 3G-SGSN shall be able to produce billing information at any time when SGSN wants. Therefore, SGSN shall be able to ask the RNC to provide the volume of buffered data to correct its counter. This procedure can be also utilised for supporting real-time billing and pre-paid services.

**Clauses affected:** 4.2

| | | | |
|---|---|---|---|
| **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:** | |

help.doc

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

## 4.2 Iu Interface

- Transport protocol across the Iu interface for UTRAN shall be according to 23.930
- The UTRAN shall support two logically separate signalling flows via Iu to combined or separate network nodes of different types (MSC and SGSN).
- The UTRAN shall contain a "domain distribution function" to route transparent application-level control signalling from the UE to the correct core network domain. The UE shall indicate the type of application being addressed (eg via a protocol discriminator). The UTRAN shall map this on to the correct Iu instance to forward the signalling.
- UTRAN-services (including radio access bearers) shall be independent from the core network domain used to access them. Either core network domain can access any appropriate UTRAN-service (eg it should be possible to access a "speech" radio access bearer from the PS-domain).
- The protocol architecture for the User Plane of the Iu interface towards the IP domain shall be based on the same principles as for the (evolved) Gn interface, i.e. the user plane part of GTP over UDP/IP shall be used for tunneling of end user data packets over the Iu interface
- One or several AAL5/ATM Permanent VCs may be used as the common layer 2 resources between the UTRAN and the 'IP domain' of the CN. The reason for usage of several permanent AAL5/ATM VCs may e.g. be for load sharing and redundancy. It is also possible to use one switched VC per user flow (PDP context or radio access bearer). Switched VCs may be used, however the standardization of the procedures and protocols for use of Switched VCs is outside the scope of the 3GPP. If operators use switched VC, the specification of procedures and protocol for switched VCs are up to operators and out of scope of the UMTS/IMT-2000 specification.

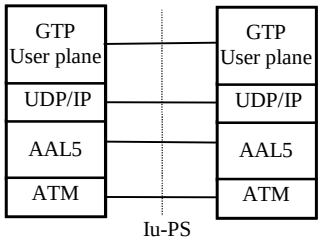



**Figure 1: Protocol Architecture for the Iu user plane towards the IP domain**

Note: The termination point of the GTP-U tunnel in the IP domain of the Core Network is FFS.

- Charging functionality is located at the 3G-SGSN. On the other hand, only RNC can identify the actual packet volume successfully transferred to a UE. In order for 3G-SGSN to provide the volume based charging for IP domain, the standard shall support the following procedures over Iu interface.
  - The RNC indicates the volume of all not transferred downlink data (discarded or forwarded to another entity (2G-SGSN or target RNC)) to the 3G-SGSN so that the 3G-SGSN can correct its counter. Partially transferred packets are handled as not transferred.
  - The RNC delivers to the 3G-SGSN the discarded or forwarded volume accumulated over an implementation dependent time and not per discarded or forwarded packet.
  - The 3G-SGSN can ask the RNC to provide the volume of buffered downlink data to correct its counter at any time the 3G-SGSN wants.

### 4.2.1 Iu Control Plane

**3GPP TSG-SA meeting #8** ***Document S2-99998***

**Bonn, 13-17 September 1999**

# 3G 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** | **027R2** | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

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

**Source:** Siemens **Date:** 16/09/99

**Subject:** Combined location procedures

**3G Work item:**

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

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

**Reason for change:** Between S2#8 13.-17.9.1999 and N2 meeting (same period) there had been liaisons on the feasability of implementing combined location procedures in UMTS R99. Considering the remaining time to terminate R99 and the assessment of N2 on the work to be done it has been agreed that combined location procedures are not a high priority architectural requirement for Release 99. Therefor an according note is added on the section on combined location procedure.

**Clauses affected:** 4.3.1.1.

**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:**

help.doc

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

## 4.3.13 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.

### 4.3.13.1 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.

### 4.3.13.2 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 3.

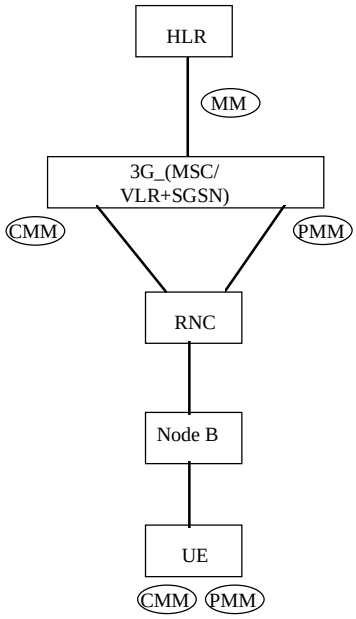



**Figure 41 Combined MM Instance For a Combined 3G-(MSC/VLR+SGSN) Node**

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.

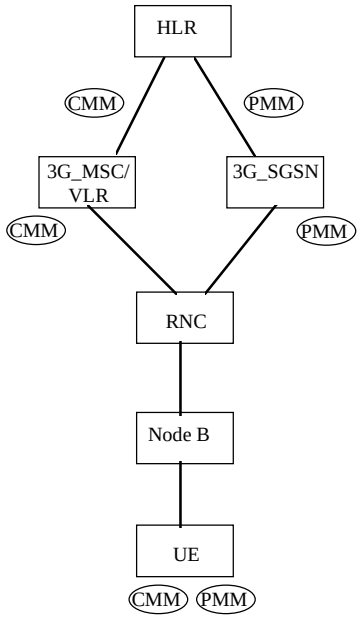



**Figure 42 Split MM Instances for Separate Nodes**

### 4.3.13.3 Requirements on UTRAN

The provision of location information by the UE to the core network must be independently of whether the 3G-MSC/VLR and 3G-SGSN are implemented as separate entities or as a combined node. It shall be possible to use a combined update procedure between serving node and HLR irrespective of the update procedure used between the UE and the serving node.

### 4.3.13.4 List of MAP services for location management between the HLR and MSC-VLR/SGSN for GSM/GPRS

Table 1 shows the MAP services used for location management between the SGSN and MSC/VLR and the HLR as defined in GSM/GPRS release 98.

| MAP service | Comment |
|---|---|
| MAP_UPDATE_LOCATION service | Updates VLR and MSC number in the HLR |
| MAP_UPDATE_GPRS_LOCATION service | Updates SGSN number and address in the HLR |
| MAP-INSERT-SUBSCRIBER-DATA service | Inserts subscriber data for GSM or GPRS |
| MAP_SEND_AUTHENTICATION_INFO service | To send authentication triplets to VLR or SGSN |
| MAP_CANCEL_LOCATION service | Cancels location in VLR or SGSN |
| MAP_PURGE_MS service | Marks user as unreachable in HLR. Common service for both GSM and GPRS |

**Table 1: List of Location management services between the HLR and MSC/VLR and SGSN**

From the above table, it is clear that only minor modifications are required to MAP services between the MSC/VLR and SGSN and the HLR. A new service combining the MAP_UPDATE_LOCATION and

MAP_UPDATE_GPRS_LOCATION services will need to be defined. All other services are common for both GSM and GPRS and can be used with minor modifications in the “conditional” parameter list.

### 4.3.13.5 Signalling procedures for combined update towards HLR

### 4.3.13.6 Combined attach case where the previous attach was towards 2 CN elements

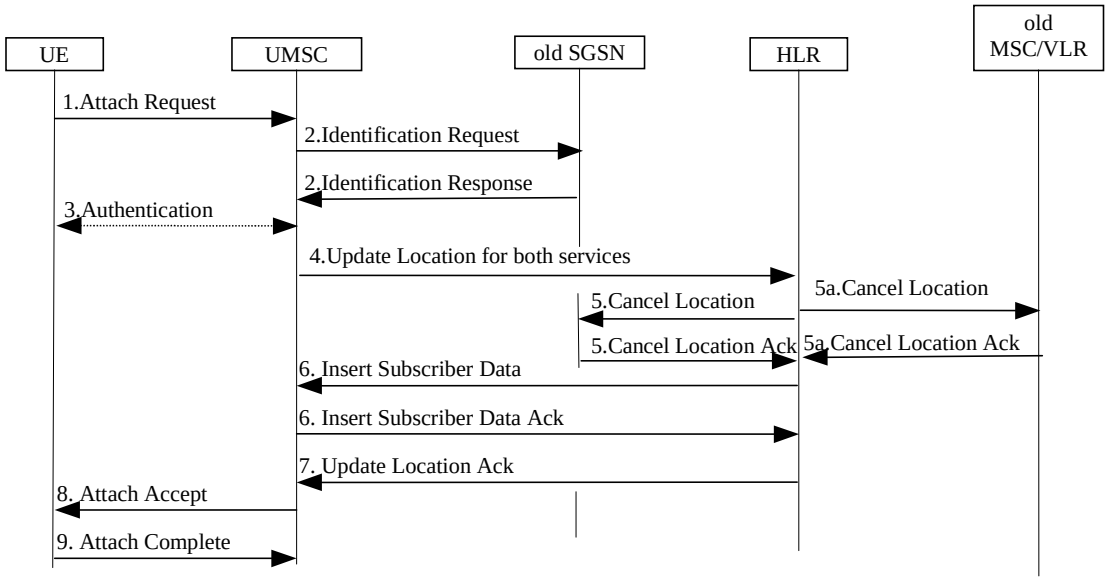



**Figure 43 Combined attach procedure when the Ms moves from 2 CN element to a UMSC**

1) The UE initiates the attach procedure by the transmission of an Attach Request (IMSI or P-TMSI and old RAI, Attach Type, old P-TMSI Signature) message to the UMSC. Attach Type indicates which type of attach that is to be performed, i.e., PS attach only, CS attach only, or combined attach (the example given is for combined attach).

2) If the UE identifies itself with P-TMSI and the 3G-SGSN/UMSC has changed since detach, the new UMSC sends an Identification Request (P-TMSI, old RAI, old P-TMSI Signature) to the old SGSN to request the IMSI. The old SGSN responds with Identification Response (IMSI, Authentication Triplets). If the UE is not known in the old SGSN, the old SGSN responds with an appropriate error cause. The old SGSN also 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.

3) The authentication functions are optional and may be used for example if P-TMSI signature authentication was not successful. If the UMSC number has changed since the detach, or if it is the very first attach, routing/location area update procedures are executed:

4) The UMSC sends a Combined Update Location (UMSC Number, UMSC Address, IMSI) to the HLR.

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

6) 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 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.

7) The HLR acknowledges the Update Location message by sending an Update Location Ack to the UMSC. If the Update Location is rejected by the HLR, the UMSC rejects the Attach Request from the UE with an appropriate cause.

8) The UMSC sends an Attach Accept (P-TMSI, TMSI, P-TMSI Signature) to the UE.

9) If P-TMSI or TMSI was changed, the UE acknowledges the received TMSI(s) with Attach Complete (P-TMSI, TMSI).

If the Attach Request cannot be accepted, the UMSC returns an Attach Reject (IMSI, Cause) message to the UE.

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

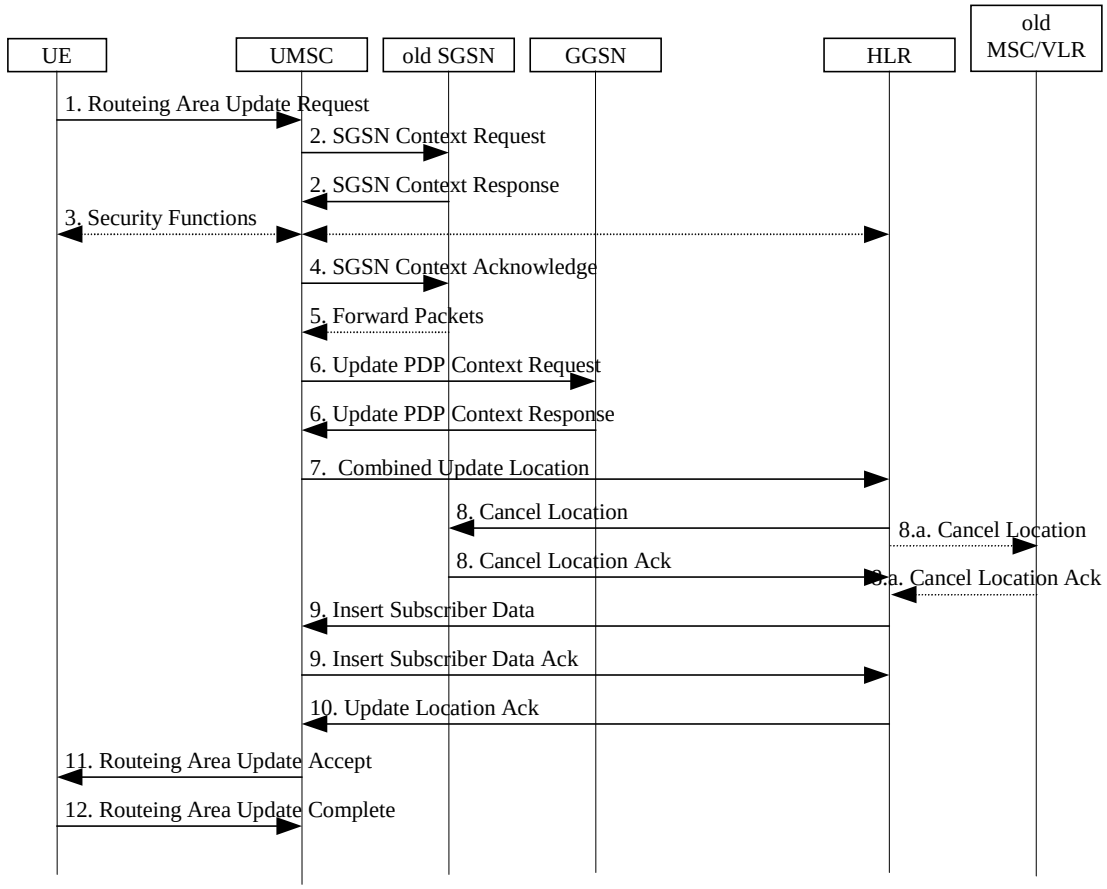



**Figure 44 Combined LA/RA update when the MS moves from 2 CN element to UMSC**

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 (TID).

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.

**3GPP TSG-SA WG2 meeting 8** **Document S2-99836**

**Bonn, Germany, 13- 17 September 1999**

# 3G 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 | 029 ? | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X] for information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Ericsson **Date:** 1999-08-13

**Subject:** Mapping of LA/RA to cells

**3G Work item:**

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

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

**Reason for change:**

It is proposed to introduce a clarification in TS 23.121 on the following:
The mapping between a LA and RNCs is handled within the MSC/VLR owning this LA.
The mapping between a RA and RNCs is handled within the SGSN owning this RA.
The mapping between LA and cells respective between RA and cells is handled within RNC.

**Clauses affected:** 4.3.2

**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:**

help.doc

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

## 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.

#### 4.3.2.1.1 Location areas

For CS services, the CN uses Location Areas (LA). Location Area is used e.g. at CN initiated paging related to CS services. A CS service related temporary identity, CS –TMSI, may be allocated to the UE. This temporary identity is then unique within a LA.

#### 4.3.2.1.2 Routing areas

For PS services, the CN uses Routing Areas (RA). Routing Area is used e.g. at CN initiated paging related to PS services. A PS service related temporary identity, PS-TMSI, may be allocated to the UE. This temporary identity is then unique within a RA.

Note that the routing area concept here differs from the routing area in GSM, which in a sense corresponds to URA (see below) in UMTS.

#### 4.3.2.1.3 UTRAN internal areas

UTRAN internal areas are used when the terminal is in RRC-Connected mode (see chapter 3.3). The areas are used at e.g. UTRAN initiated paging. UTRAN internal area updating is a radio network procedure and the UTRAN internal area structure should not be visible outside UTRAN. In RRC connected mode, the UE position is known on cell level or on UTRAN Registration Area (URA) level. RNTI is used as a temporary UE identifier used within UTRAN and allocated at RRC connection establishment. Note that the URA thus corresponds, in a sense, to the routing area in GSM.

#### 4.3.2.1.4 Relationship between the different areas

The following area relations exist:

- One URA consists of a number of cells. The cells normally belong to the same RNC, but this assumption may not be a requirement (ffs.).
- One RA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One LA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One RA is handled by only one CN serving node, i.e. one UMSC or one 3G_SGSN.
- One LA is handled by only one CN serving node, i.e. one UMSC or one 3G_MSC/VLR.
- There may not be any relation between LA and RA, i.e. the following relations between LA and RA are possible:
  - RA and LA is equal
  - one RA is a subset of one, and only one, LA, meaning that a RA do not span more than one LA
  - one LA is a subset of one, and only one, RA, meaning that a LA do not span more than one RA
  - independent LA and RA structure

In case of a LA and a RA consisting of both UMTS cells and GSM cells, then the GSM defined relations will apply.

The mapping between one LA and RNCs is handled within the MSC/VLR owning this LA. The mapping between one RA and RNCs is handled within the SGSN owning this RA. The mapping between LA and cells respective between RA and cells is handled within RNC.

**3GPP TSG-SA Working Group 2 meeting #8** **TSGS2#8 Tdoc S2-99916**
**September 13-17, 1999**
**Bonn, Germany**

**CHANGE REQUEST No :** **030r1** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

**Technical Specification 3GPP:** 23.121 Version 3.0.0

| | | | | | |
|---|---|---|---|---|---|
| Submitted to TSG SA *list plenary meeting or STC here ↑* | | for approval | X | without presentation ("non-strategic") | X |
| | | for information | | with presentation ("strategic") | |

*PT SMG CR cover form. Filename: crf26_3.doc*

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

**Work item:** 23.121

**Source:** S2 **Date:** 14 Sep, 1999

**Subject:** UMTS - GSM handover

**Category:** *(one category and one release only 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 |
| UMTS | X |

**Reason for change:** Addition in 23.121 of the procedure for the service requirement of UMTS to GSM handover described in 3G TS 22.100 "For UMTS networks composed of both GSM BSS and UTRAN access networks, handover of bearer services shall be supported between GSM BSS and UTRAN cells, in both directions (i.e. UTRAN to GSM BSS and GSM BSS to UTRAN)."

The CR 030 on TS 23.121 (Tdoc S2-99838) was approved with the comment to include the changes described in Tdoc S2-99909 related to UMTS to GPRS handover. These changes are included in CR 030r1.

**Clauses affected:** New section where the number is to be decided

**Other specs affected:**

| | | |
|---|---|---|
| Other releases of same spec | | → List of CRs: |
| Other core specifications | | → List of CRs: |
| MS test specifications / TBRs | | → List of CRs: |
| BSS test specifications | | → List of CRs: |
| O&M specifications | | → List of CRs: |

**Other comments:**

# X Interoperability between GSM and UMTS

- 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

## X.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 ZZA 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..

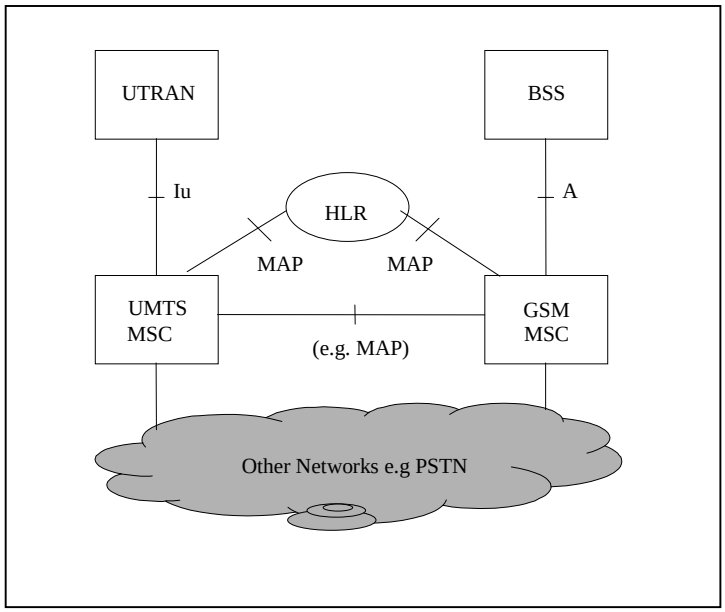



**Figure ZZA Inter-Operability between GSM and UMTS**

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 ZZA 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).

## X.1.1 UMTS to GSM handover for circuit switched services

The signalling sequence in figure ZZB 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.

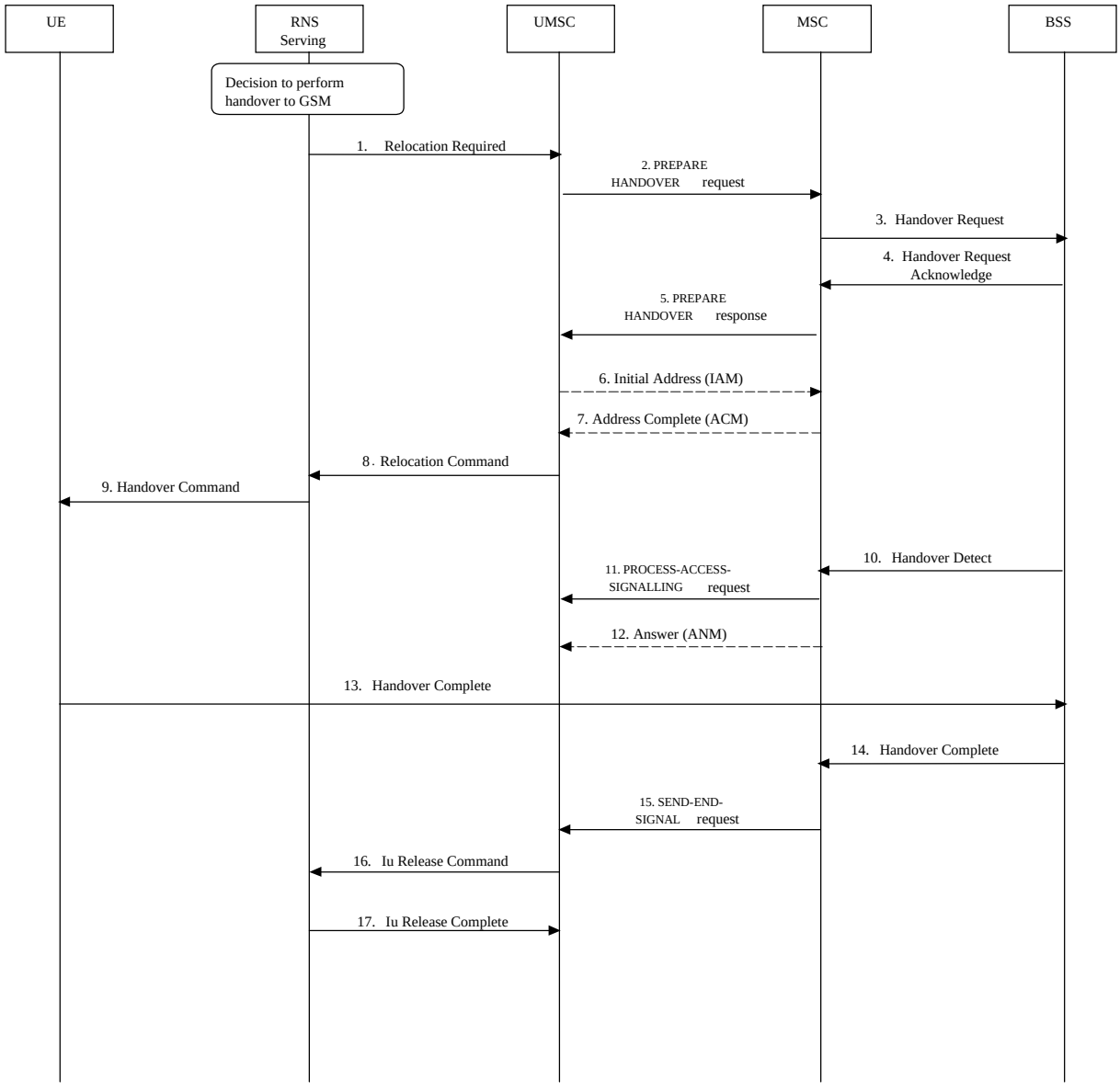



**Figure ZZB. UMTS to GSM handover for circuit switched services e.g. voice**

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) SRNS acknowledges release of resources.

# X.2 Packet Switched Handover and Roaming Principles

The introduction of a UMTS core Network as described in section 11.1 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 ZZA is illustrated in Figure ZZC. 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.

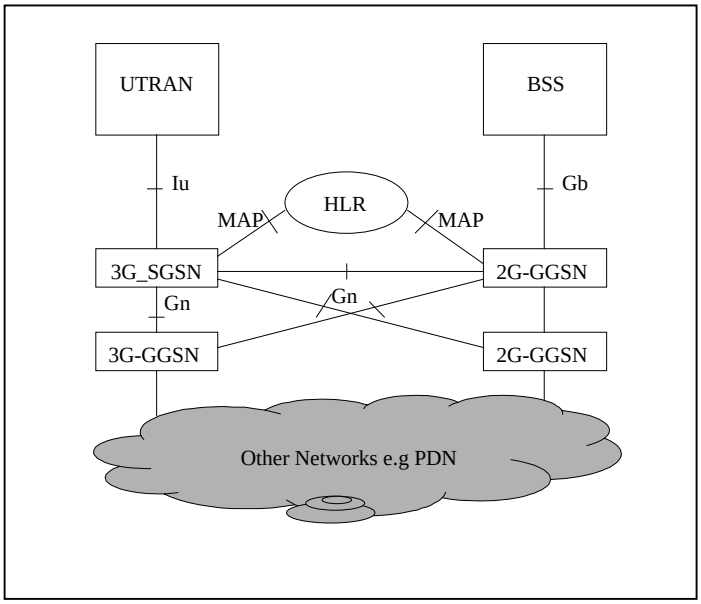



**Figure ZZC Inter-Operability between GSNs and UMTS**

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

From Figure ZZC 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.

## X.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.

## X.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)

### X.2.2.1 Handover from UMTS to GSM GPRS

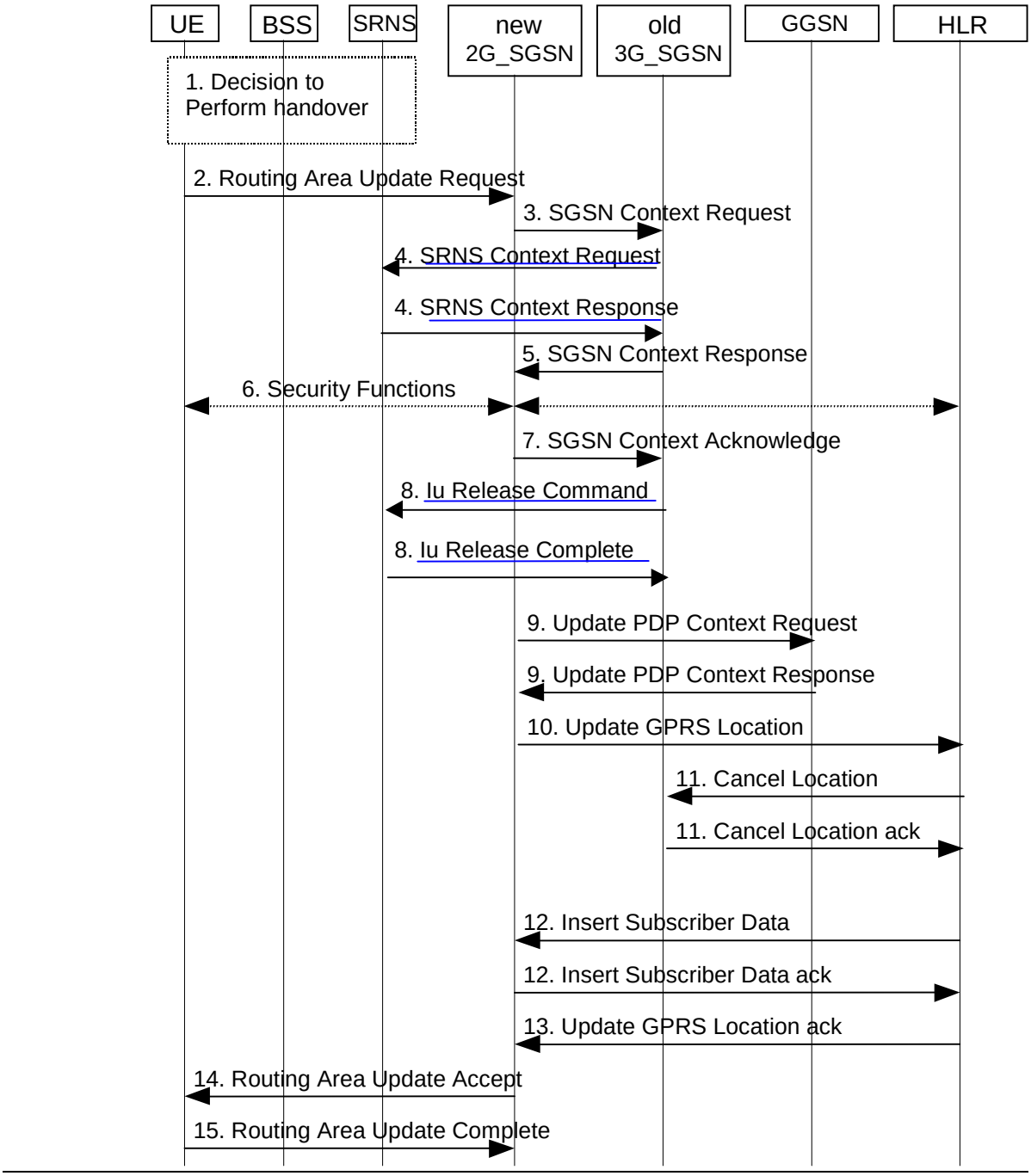



**Figure ZZD: UMTS to GSM GPRS, Inter SGSN Routing Area Update Procedure**

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).

## X.2.2.2 Handover from GSM GPRS to UMTS

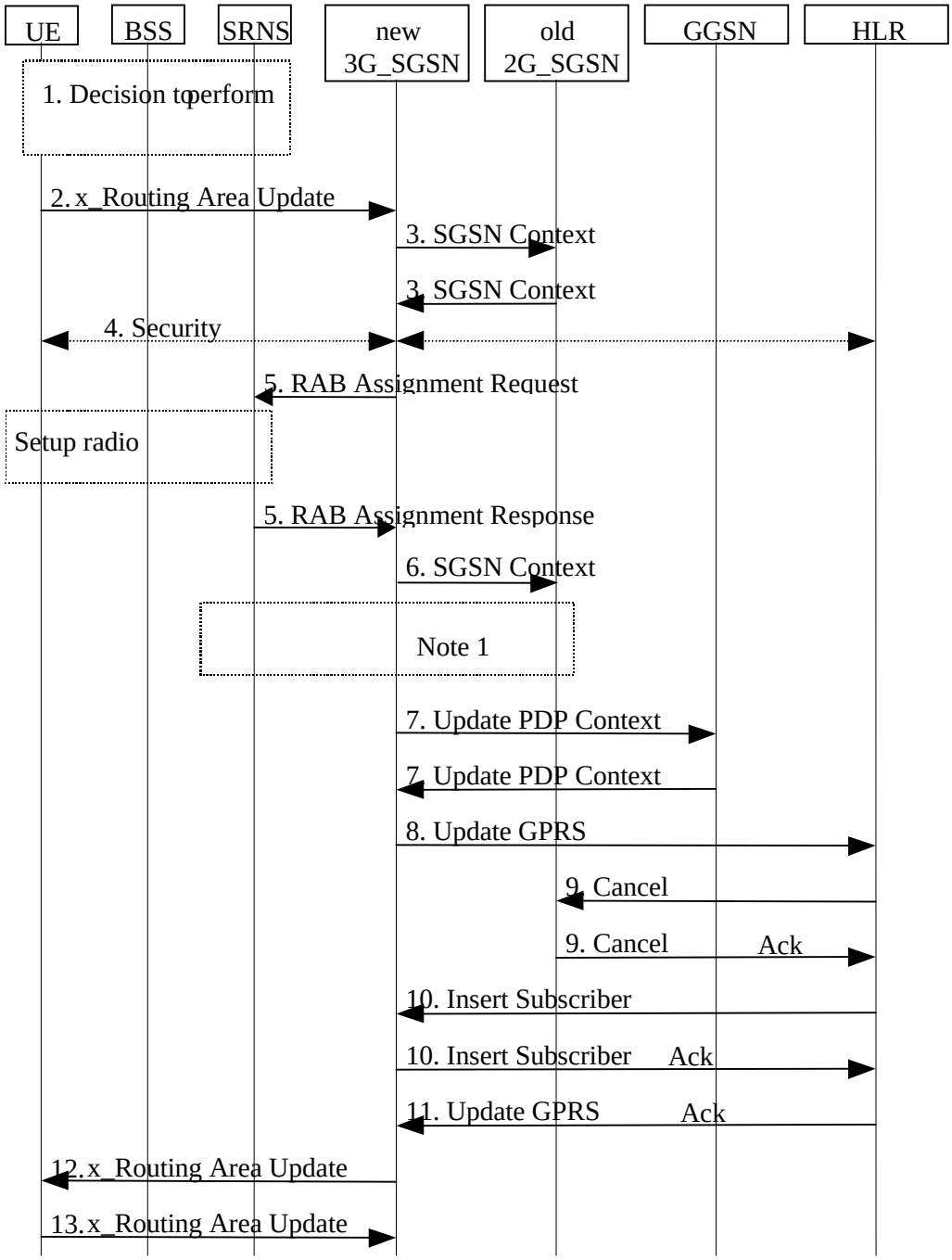



**Figure ZZE: GSM GPRS to UMTS, Inter SGSN Routing Area Update Procedure**

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.

3GPP TSG-SA Working Group 2 meeting #8 **TSGS2#8 Tdoc S2-99839**

September 13-17, 1999

Bonn, Germany

**Agenda Item:** 23.121

**Source:** Ericsson

**Title:** GSM to UMTS handover for circuit switched services

**Affected Specifications:** 23.121

**Document for:** Approval

---

# Background

The intention with this contribution is to include the signalling procedure for the control plane, to be used at GSM to UMTS handover for circuit switched services e.g. voice, in 3G TS 23.121.

It is proposed to insert the content of this change request into UMTS 23.121, into a new chapter under “Interoperability between GSM and UMTS”. The number of that chapter is to be decided.

**CHANGE REQUEST No :** **031** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

**Technical Specification 3GPP:** 23.121 Version 3.0.0

| Submitted to TSG SA | | | | | |
|---|---|---|---|---|---|
| 5 | for approval | X | without presentation ("non-strategic") | X |
| *list plenary meeting or STC here ↑* | for information | | with presentation ("strategic") | |

*PT SMG CR cover form. Filename: crf26_3.doc*

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

**Work item:** 23.121

**Source:** Ericsson **Date:** 6 Sep, 1999

**Subject:** GSM to UMTS handover for circuit switched services

**Category:** *(one category and one release only 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 |
| UMTS | X |

**Reason for change:** Addition to 23.121 of the procedure for the service requirement of GSM to UMTS handover described in 3G TS 22.100 “For UMTS networks composed of both GSM BSS and UTRAN access networks, handover of bearer services shall be supported between GSM BSS and UTRAN cells, in both directions (i.e. UTRAN to GSM BSS and GSM BSS to UTRAN).”

**Clauses affected:** New handover section with a number to be decided

**Other specs affected:**

| | | |
|---|---|---|
| Other releases of same spec | | → List of CRs: |
| Other core specifications | | → List of CRs: |
| MS test specifications / TBRs | | → List of CRs: |
| BSS test specifications | | → List of CRs: |
| O&M specifications | | → List of CRs: |

**Other comments:**

## X.x.x GSM to UMTS handover for circuit switched services

The signalling sequence in figure 1 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.

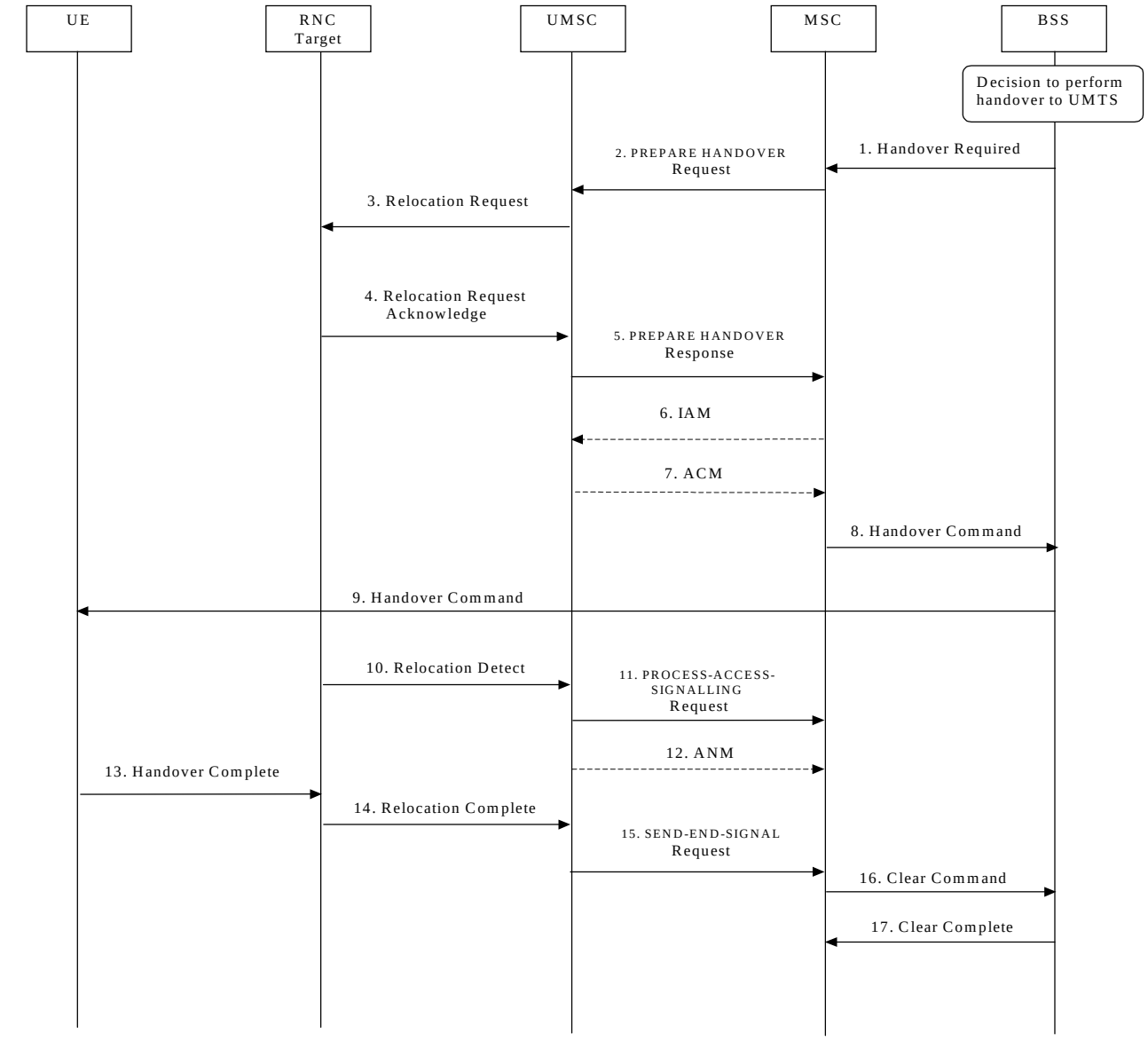



Figure 1. GSM to UMTS handover for circuit switched services e.g. voice

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.
17. BSS acknowledges release of resources.

**3GPP TSG-SA2 meeting #7** **Document S2-99944**

**Bonn, Germany, Sept, 1999**

# 3G 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 | 035 rev 1 | Current Version: V3.0.0 |
|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#7 *list TSG meeting no. here ↑* for approval [X] for information [ ] *(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:** *(at least one should be marked with an X)* USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Alcatel **Date:** September 15, 1999

**Subject:** GTP tunnel termination points in SRNS Relocation for PS domain

**3G Work item:**

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

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

**Reason for change:**

In TS 23.121 v3.0.0, the SRNS Relocation procedure for PS domain, in the case of non real time data service with high reliability, includes the "Data Retrieve" procedure which consists of transferring the data buffered in the old SRNC towards the new SRNC. This is done over GTP-u/UDP/IP protocol stack over the Iu interface.

It is clear that the Iu interface is used at the ATM layer since it allows to share the ATM bandwidth for all transfers towards/from all other RNCs (e.g. by using only one single ATM VP/VC connection). However, there is no reason to have several cascaded GTP tunnels between the old SRNC and the new SRNC (one between old SRNC and old SGSN, one between old SGSN and new SGSN, and one between new SGSN and new SRNC).

On the contrary, using cascaded GTP tunnels has following drawbacks:

- It forces SGSNs to process the data stream at GTP layer instead of processing it as a simple IP router at the IP layer,
- It implies a modification of Gn interface specification: Uplink N-PDUs destined to the GGSN(s) and Downlink N-PDUs that are forwarded from the old SRNC to the new SRNC use the same GTP tunnel between old SRNC and old SGSN. Therefore, it is needed to distinguish these two data streams at SGSN.
- Once this modification on Gn interface made, the SGSN has to route the data streams to the right destination (GGSN or new SRNC), and this implies more processing power than simply route according to the IP address.

So, it is proposed to have only one single GTP tunnel between the old SRNC and the new SRNC. This can be done by simply replacing the old SGSN IP address by the new SRNC IP address. At ATM layer, everything remains unchanged since Iu interface is used for the sake of bandwidth efficiency.

Regarding the charging aspects, the data are not counted twice since the data forwarded from the old SRNC to the new SRNC use a GTP tunnel that is not seen by the SGSNs.

This CR does not lead to modifications of UMTS to/from GPRS handover .

**Clauses affected:**

4.2.2.1.4 Adopted solution for data retrieve in UMTS.

4.2.2.1.5 User plane protocol stacks for UMTS data retrieve.

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

**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:**

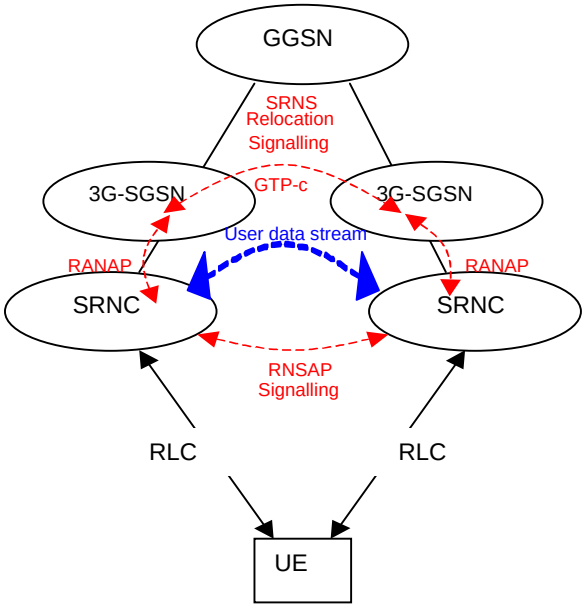
help.doc

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

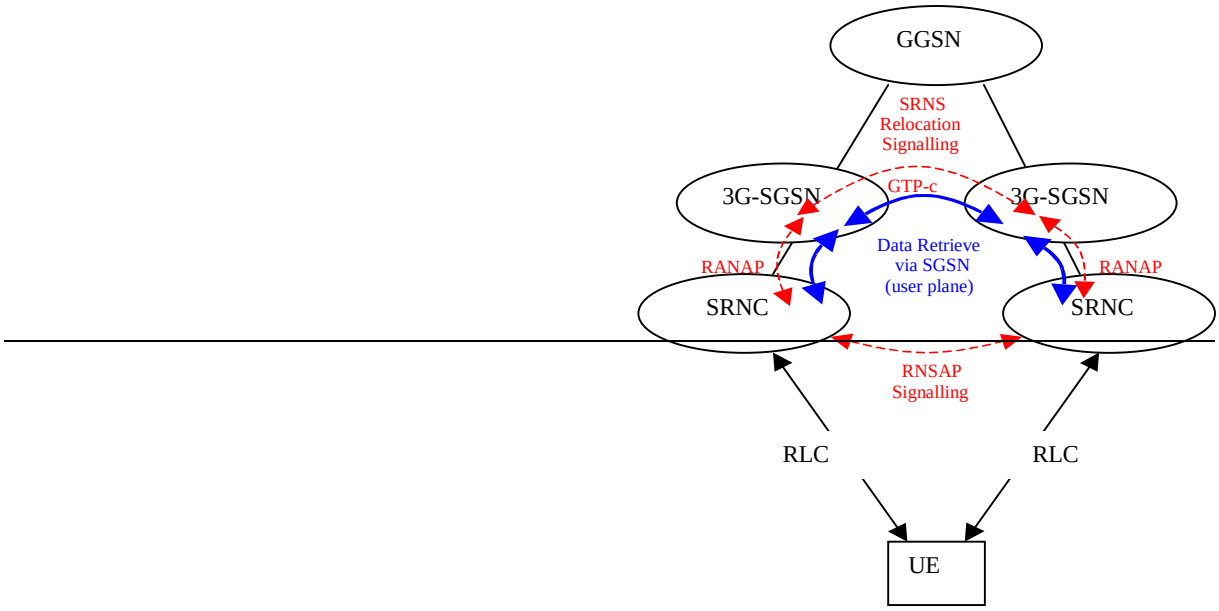
#### 4.2.2.1.4 Adopted solution for data retrieve in UMTS

Data Retrieve procedure at SRNS relocation shall be carried out through the Iu interface: data exchanged between source and target SRNC are carried over Iu at ATM layer. They are routed at IP layer towards the target SRNC and there is one single GTP tunnel between the source SRNC and the target SRNC. ~~handled by the 3G-SGSN (3 GTP pipes: source SRNC – source 3G-SGSN, source 3G-SGSN – destination 3G-SGSN and destination 3G-SGSN – destination SRNC).~~

~~Source 3G-SGSN has to decrement charging counters for user data sent from SRNC to 2G-SGSN, avoiding that such data are charged twice (in 3G-SGSN and in 2G-SGSN).Since neither the source SGSN nor the target SGSN do not see the GTP layer of the forwarded data stream, the user data are not charged twice.~~




data retrieve via 3G-SGSN




data retrieve via 3G-SGSN

**Figure 6: User data Retrieve in UMTS**

#### 4.2.2.1.5 User plane protocol stacks for UMTS data retrieve

The user plane for data retrieve between two RNCs is based on GTP-u/UDP/IP. The GTP connections are terminated in the ~~3G-SGSNs~~source SNRC and the target SRNC as described in the following figure.

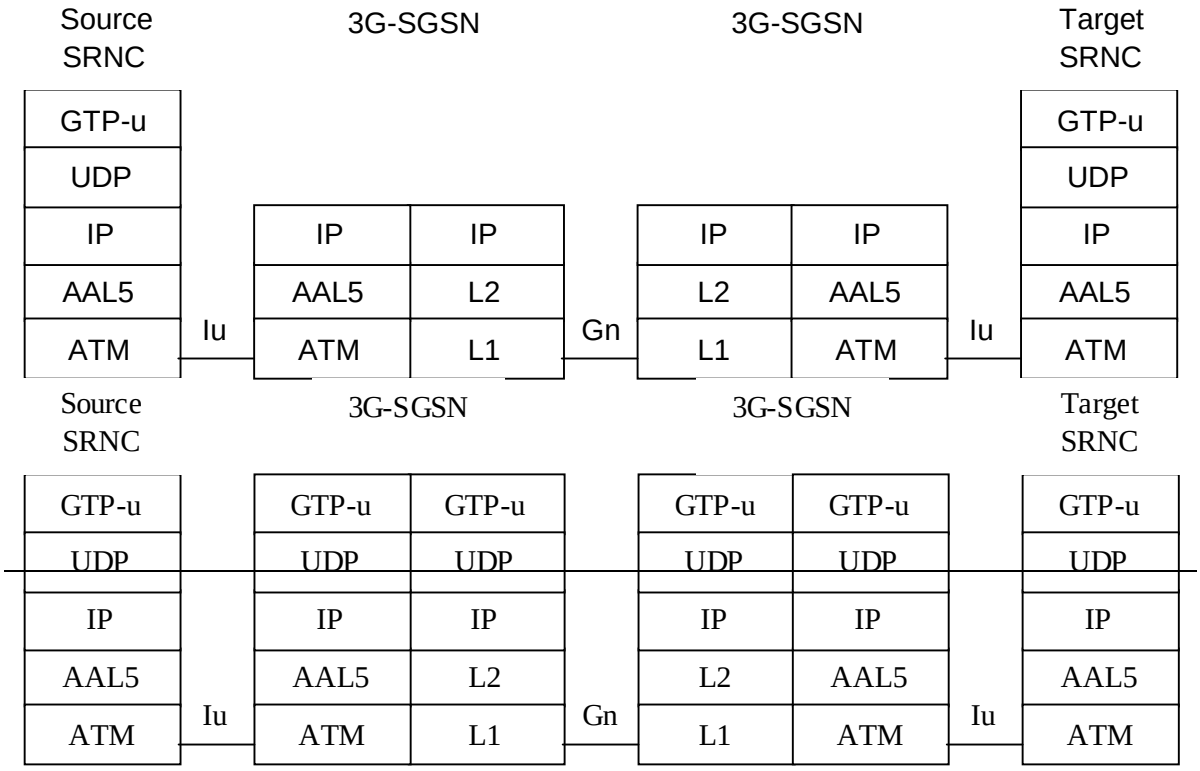



**Figure 7: User plane protocol stack for data retrieve in UMTS**

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

This example shows SRNS relocation when source RNC and target RNC are connected to different 3G_SGSN. Figure 33 and Figure 35 illustrate the situation before respective after the SRNS relocation and location registration. Figure 37 illustrates the signalling sequence where each step is explained in the following list.

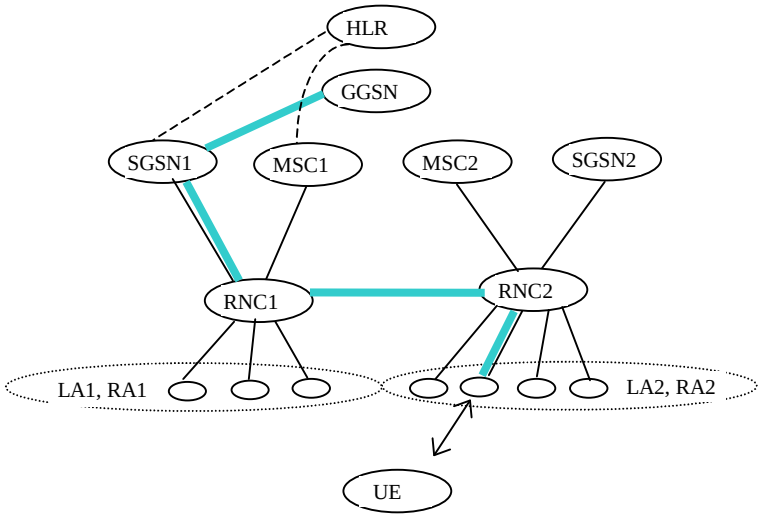



**Figure 33 Before the SRNS relocation and location registration**

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.

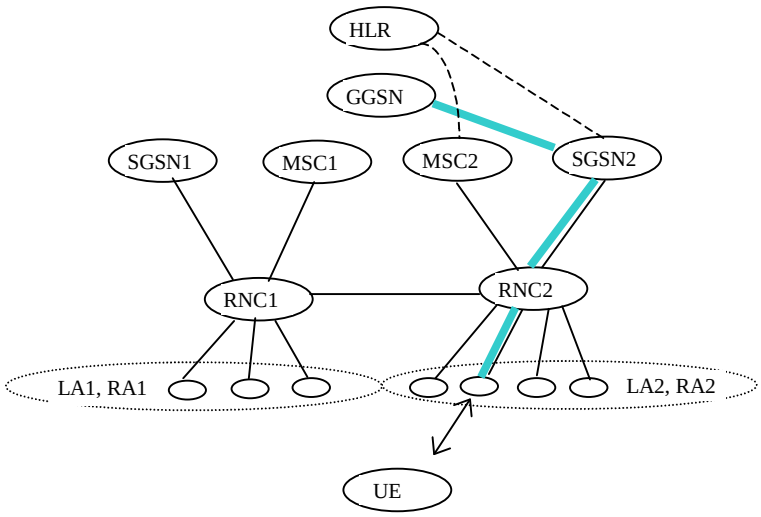



**Figure 35 After the SRNS relocation and location registration**

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

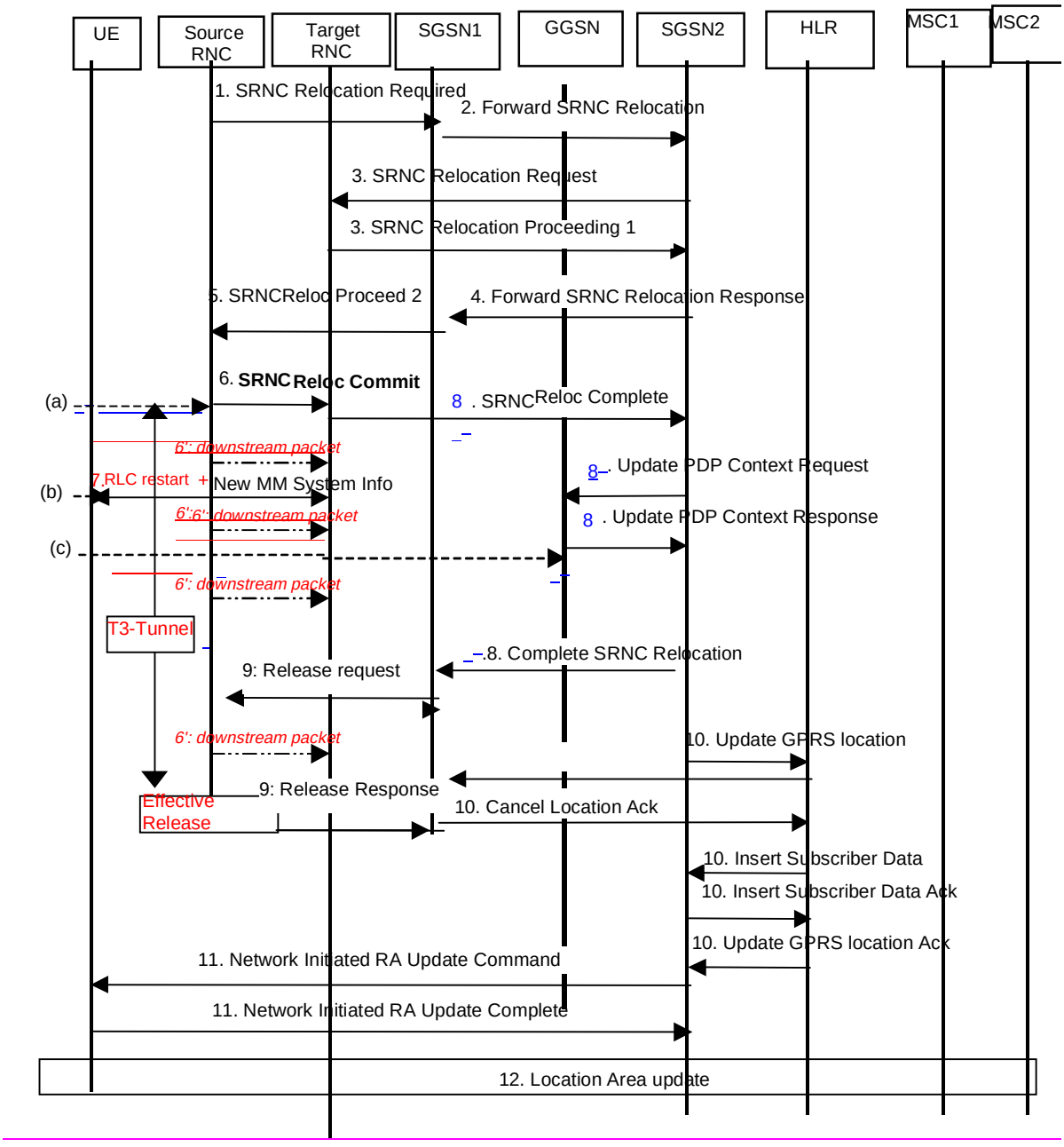



**Figure 37 Interface information transfer for SRNS relocation update when changing SGSN area resulting in a change of registered location and followed by location registration in new Location Area.**

**"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~~(possibly one address per PDP context) on which SGSN2 is willing to receive these packets~~.

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 RLC connection used by the UE (i.e. the Receive State Variable V(R) for all RLC SAPI in acknowledged mode). 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 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)).

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

8) Immediately after a successful switch at RNC, target RNC (=SRNC) sends SRNC Relocation Complete message to the SGSN2. Upon reception of this message, 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 SGSN sends a Complete SRNC Relocation towards the SGSN1.

9) 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..

10) 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.

11) 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.

12) 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 19 may be further refined.

UE-GGSN Communication path during the SRNS relocation procedure

Before point (a), in Figure 37, the connection is established between UE and GGSN via Source SRNC and SGSN1.

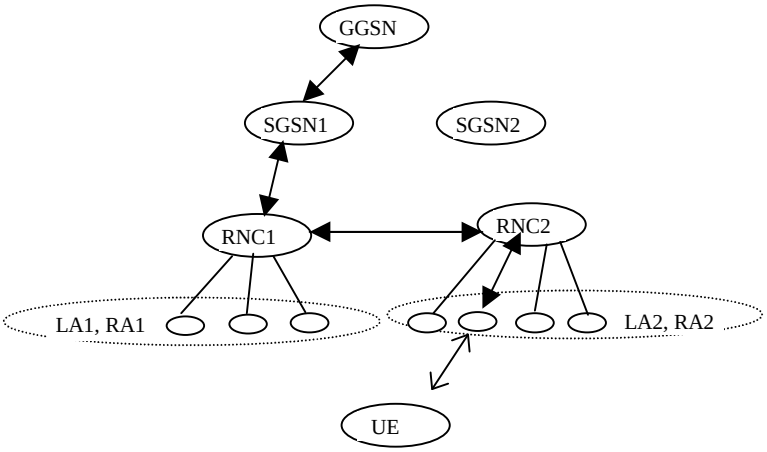



**Figure 39 :Data paths before the SRNS relocation has been actually committed (before point (a) in Figure 37)**

After transmission of the "SRNS relocation commit" to the target SRNC (after point (a) in figure 19), 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 19), 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 (c), in Figure 37, the connection is established between UE and GGSN via Target RNC and SGSN2.

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.

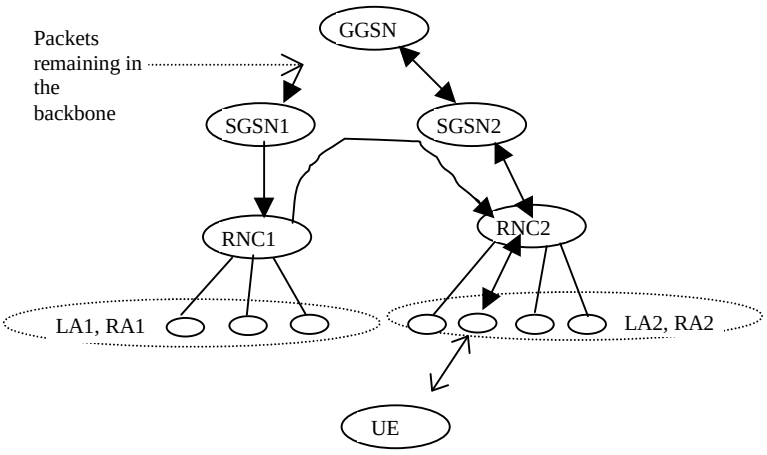



**Figure 21: Data paths after the GGSN update (after point (c) in Figure 37)**

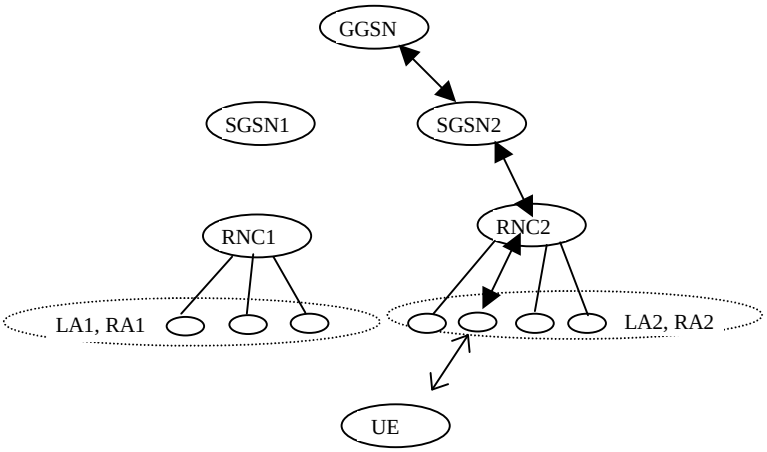



Figure 22: Data paths after the resource release in source RNC (after point (d) in Figure 37))

**Agenda Item:** 23.121

**Source:** Siemens

**Title:** Inter 3G-MSC HO

**Affected Specifications:** 23.121

**Document for:** Approval

---

# Background

In SA WG2 #8 meeting 13.-17.9.1999 the document S2-99868 was approved. It proposes that:

- 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.

The new chapter should be inserted after the section " Interoperability between GSM and UMTS" of the CR xx (S2-99838)

**3GPP TSG-SA meeting #8**
**Bonn, 13-17 September 1999**

***Document S2-99917***

# 3G 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 | 036 | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

*(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:** *(at least one should be marked with an X)*

USIM [ ] ME [ ] UTRAN [ ] Core Network [X]

**Source:** Siemens **Date:** 15/09/99

**Subject:** Inter 3G-MSC HO

**3G Work item:**

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

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

**Reason for change:** The principle for the handling of Inter 3G-MSC HO needs to be described.

**Clauses affected:** new section

**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:**

help.doc

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

# Y. 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”]

3GPP TSG SA WG2
September 13-17, 1999
**Bonn, Germany**

Tdoc S2-99-xxx

**Title:** **Specification of the UMTS Multimedia Call Control Model**
**Source:** **Motorola**
**Document for:** **CR to 23.121**

## 1. INTRODUCTION

At the Sophia Antipolis meeting of TSG SA2, May 25-28, 1999, the fllowing principles for development of multimedia services in UMTS were agreed (see Tdoc S2-99-397 and meeting minutes):

- P1) GSM/UMTS shall enable the provisioning of multimedia services and multivendor interworking between UE and network.
- P2) Basic voice and PDP-context establishment shall be based on GSM CC/SM respectively.
- P3) Handover and roaming to and from GSM shall be supported provided GSM is capable of supporting the ongoing media service.
- P4) Ideas, concepts and procedures developed by other fora e.g. other standards bodies such as ITU, IETF etc. shall be included or referenced in GSM/UMTS when found suitable.
- P5) To ensure multi-vendor inter-working and UE roaming, a single standardised multimedia protocol for CS domain and a single standardised multimedia protocol for PS domain shall be selected for GSM / UMTS R99. This does not preclude the selection of other protocols by UMTS in the future.
- P6) For multimedia services the standardized multimedia protocol shall be run transparently via a PDP-context or a circuit-switched connection established using GSM SM/CC. This allows transparent hand-over and roaming between GSM and UMTS provided that GSM supports the QoS requirements.

Even though P5) calls for a single multimedia call control protocol to be chosen for the CS and the PS domain one is yet to be specified. This contribution proposes a multimedia call control protocol for the PS domain for UMTS Release 99.

## 2. PROPOSAL

Given that H.323 is the dominant multimedia call control protocol in the wireline world, Motorola proposes that

- H.323 be accepted as the single multimedia call control protocol for UMTS Release 99.
- The attached CR to 23.121 must be approved (which reflects the above decision).
- Further, suitable Liaison statements to CN1 and CN3 must be sent to indicate the above decision.

**3GPP TSG-SA meeting #8**
**Bonn, 13-17 September 1999**

***Document S2-99xxx***

# 3G 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** | **037** | Current Version: | 3.0.0+ |
|---|---|---|---|---|

*3G specification number ↑* *↑ CR number as allocated by 3G support team*

For submision to TSG SA#5 *list TSG meeting no. here ↑*

| | | |
|---|---|---|
| for approval | X | *(only one box should* |
| for information | | *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:** *(at least one should be marked with an X)*

| USIM | | ME | X | UTRAN | | Core Network | X |
|---|---|---|---|---|---|---|---|

**Source:** Motorola **Date:** 13/9/99

**Subject:** Multimedia Call Control Protocol for UMTS R 99 PS domain

**3G Work item:**

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

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

**Reason for change:** The specification mentions that a single Multimedia call control protocol will be chosen for the UMTS PS domain however none has been specified as yet. This CR fulfills this deficiency.

**Clauses affected:** section 4.4.1 modified

**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:**

help.doc

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

3. 4.4.1 Technical Requirements

The following technical requirements are applied to support multimedia in GSM/UMTS.

- P1) GSM/UMTS shall enable the provisioning of multimedia services and multivendor interworking between UE and network.

- P2) Basic voice and PDP-context establishment shall be based on GSM CC/SM respectively.

- P3) Handover and roaming to and from GSM shall be supported provided GSM is capable of supporting the ongoing media service.

- P4) Ideas, concepts and procedures developed by other fora e.g. other standards bodies such as ITU, IETF etc. shall be included or referenced in GSM/UMTS when found suitable.

- P5) To ensure multi-vendor inter-working and UE roaming, a single standardised multimedia protocol for CS domain and a single standardised multimedia protocol for PS domain shall be selected for GSM / UMTS R99. This does not preclude the selection of other protocols by UMTS in the future.

    - H.323 shall be the multimedia call control model for the PS domain in UMTS R99.

- P6) For multimedia services the standardized multimedia protocol shall be run transparently via a PDP-context or a circuit-switched connection established using GSM SM/CC . This allows transparent hand-over and roaming between GSM and UMTS provided that GSM supports the QoS requirements.

4.

**3GPP TSG-SA WG2 meeting #8** *Document* ***S2-99994***

**Bonn, Germany, 13-17 September 1999**

# 3G 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** | **041 r1** | Current Version: | 3.0.0 |
|---|---|---|---|---|

*3G specification number* ↑ ↑ *CR number as allocated by 3G support team*

For submission to TSG: SA#5 (*list TSG meeting no. here* ↑) — for approval [X] — For information [ ] (*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:** (*at least one should be marked with an X*) USIM [ ] ME [ ] UTRAN [X] Core Network [X]

**Source:** Nokia **Date:** 17/09/1999

**Subject:** Change to the current UMTS area concept – Revised version

**3G Work item:** Architecture Requirements for Release 99

**Category:** (*only one category Shall be marked With an X*)

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

**Reason for change:** Response LS (Tdoc S2-99966) on the area concept from N1 to S2 stated that in order to fulfill the current requirement in 23.121 and N1 fails to meet the schedule for R99. Therefore, it is agreed that the current requirement on the area concept should be changed to follow the principle of GPRS R97, i.e one RA is a subset or equal to one LA, meaning that a RA do not span more than one LA.

**Clauses affected:** 4.3.1, 4.3.2

**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:**

help.doc

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

### 4.3.1 Location Management and Mobility Management concept overview

From a logical point of view, the Core Network (CN) consists of two service domains, a CS service domain (earlier named PSTN/ISDN domain) and a PS service domain (earlier named IP domain) or one of these domains.

Each service domain has its own service state machine. An UE, that is supporting both CS services and PS services, has a CS service state machine and a PS service state machine. The two peers of the service state machine are working independently to each other, although associated to the same UE. The UE-CN signalling aims to keep the peer entities synchronised.

As an introduction, Figure 9 and Figure 11 below give an overview of the UE registration and connection principles within the UMTS when the CN consists of two separate PS and CS service nodes or one combined CS and PS service node.

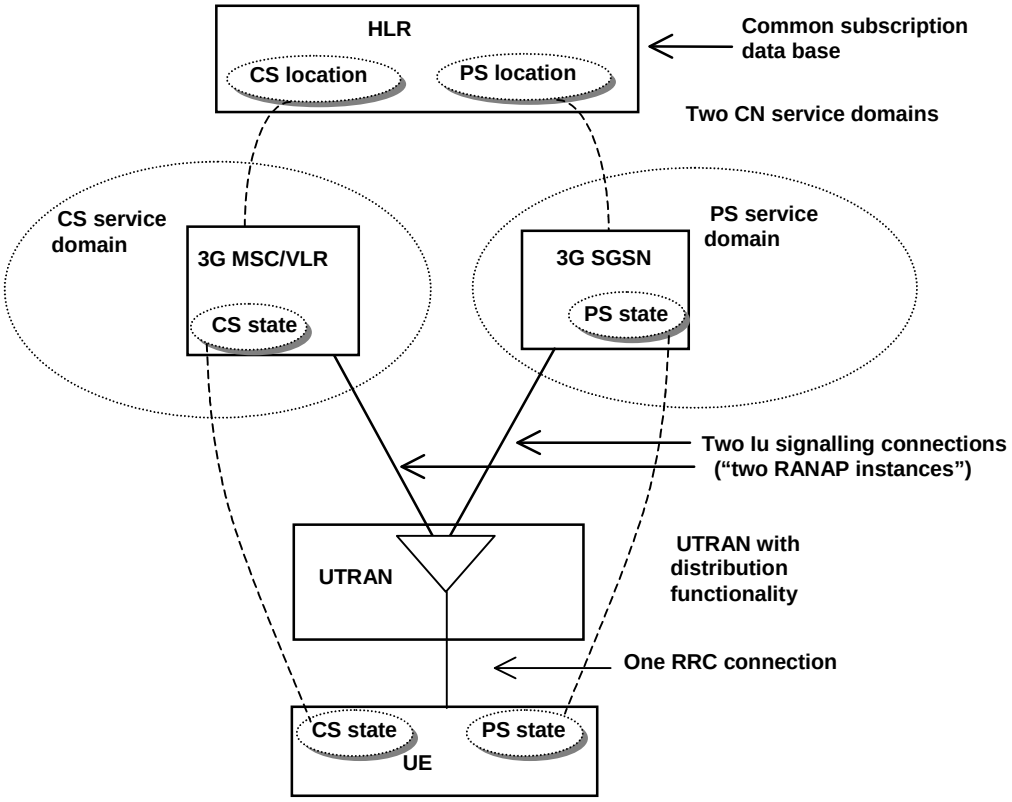



**Figure 9: Overview of the UE registration and connection principles within UMTS for the separate CN architecture case when the CN consists of both a CS service domain with evolved MSC/VLR, 3G_MSC/VLR, as the main serving node and an PS service domain with evolved SGSN/GGSN, 3G_SGSN and 3G GGSN, as the main serving nodes,**

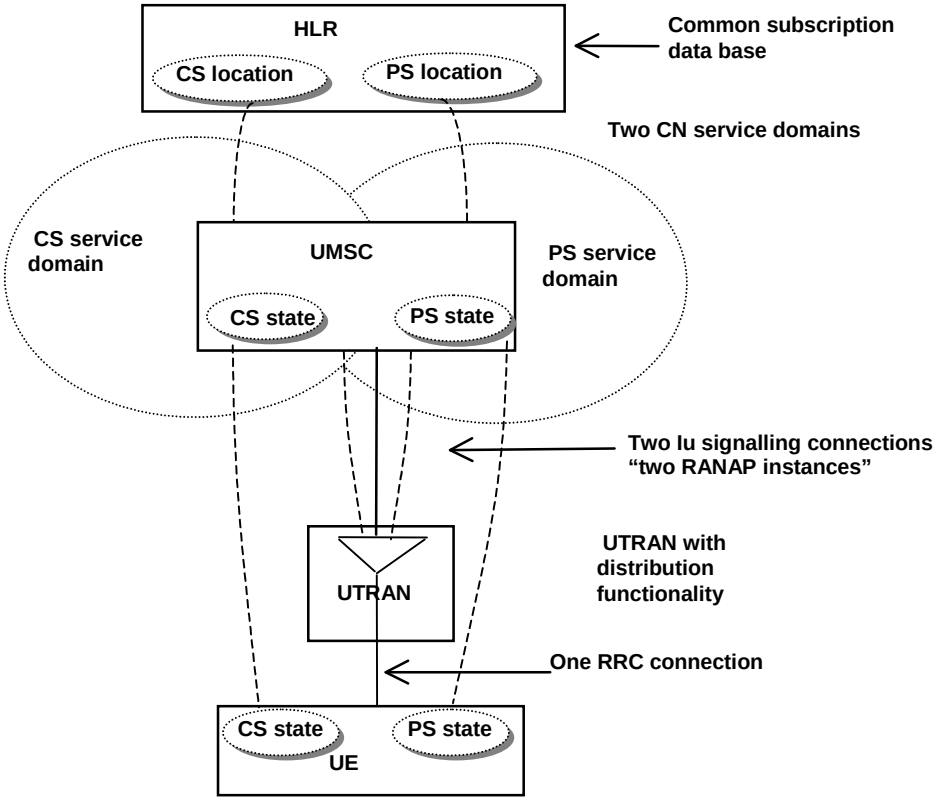



**Figure 11: Overview of the UE registration and connection principles within UMTS for the integrated CN architecture case when the CN consists of both a CS service domain and an PS service domain with an UMSC as the main serving node.**

The main PS service states are PS-DETACHED, PS-IDLE and PS-CONNECTED. The main CS service states are CS-DETACHED, CS-IDLE and CS-CONNECTED. For the respective service domain there are specific related MM system information controlling the Mobility Management functionality of the UE

The aim of UTRAN is to offer one unified set of radio bearers which may be used for bursty packet traffic and for traditional telephony traffic. This leads to the conclusion that only one logical control channel structure will be used for all kind of traffic. The radio resource handling is UTRAN internal functionality and the CN does not define the type of radio resource allocated.

The Radio Resource Control (RRC) has two modes, RRC Connected mode and RRC Idle mode. The RRC mode describes which identity is used to identify the UE. In RRC Idle mode the UE is identified by a CN associated identity. In RRC Connected mode the UE is assigned a Radio Network Temporary Identity to be used as UE identity on common transport channels. When the UE is allocated dedicated transport channels, it uses the inherent addressing provided by these transport channels.

In PS-CONNECTED state the UE is in RRC Connected mode. In CS-CONNECTED state the UE is in RRC Connected mode.

For the mobility functionality, four different area concepts are used. Location Areas and Routing Areas are used in the Core Network. UTRAN Registration Areas and Cell Areas are used in UTRAN. Location Areas are related to CS services. Routing Areas are related to PS services.

One Location Area is handled by one CN node. For an UE that is registered in a Location Area, this implies that the UE is registered in the specific CN node handling this specific Location Area. One Routing Area is handled by one CN node. For an UE that is registered in a Routing Area, this implies that the UE is registered in the specific CN node handling this specific Routing Area. Location Area is used by the 3G_MSC/VLR for paging the UE. Routing Area is used by the 3G_SGSN for paging the UE. UTRAN Registration Areas and Cell Areas are only visible in UTRAN and used in RRC-Connected mode.

For the relations between Location Area (LA) and Routing Area (RA) is described in section 4.3.2. ~~it shall be possible for the operator to have a LA and a RA equal (i.e. same cells), a RA as a part of a LA, a LA as a part of RA, and LA and RA independent. In case of a LA and RA consisting of both UMTS cells and GSM cells the GSM defined relations will apply.~~

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.

#### 4.3.2.1.1 Location areas

For CS services, the CN uses Location Areas (LA). Location Area is used e.g. at CN initiated paging related to CS services. A CS service related temporary identity, CS –TMSI, may be allocated to the UE. This temporary identity is then unique within a LA.

#### 4.3.2.1.2 Routing areas

For PS services, the CN uses Routing Areas (RA). Routing Area is used e.g. at CN initiated paging related to PS services. A PS service related temporary identity, PS-TMSI, may be allocated to the UE. This temporary identity is then unique within a RA.

Note that the routing area concept here differs from the routing area in GSM, which in a sense corresponds to URA (see below) in UMTS.

#### 4.3.2.1.3 UTRAN internal areas

UTRAN internal areas are used when the terminal is in RRC-Connected mode (see chapter 3.3). The areas are used at e.g. UTRAN initiated paging. UTRAN internal area updating is a radio network procedure and the UTRAN internal area structure should not be visible outside UTRAN. In RRC connected mode, the UE position is known on cell level or on UTRAN Registration Area (URA) level. RNTI is used as a temporary UE identifier used within UTRAN and allocated at RRC connection establishment. Note that the URA thus corresponds, in a sense, to the routing area in GSM.

#### 4.3.2.1.4 Relationship between the different areas

The following area relations exist:

- One URA consists of a number of cells. The cells normally belong to the same RNC, but this assumption may not be a requirement (ffs.).
- One RA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One LA consists of a number of URA:s belonging to RNC:s that are connected to the same CN node.
- One RA is handled by only one CN serving node, i.e. one UMSC or one 3G_SGSN.
- One LA is handled by only one CN serving node, i.e. one UMSC or one 3G_MSC/VLR.
- ~~There may not be any relation between LA and RA, i.e. the following~~ The GSM defined relations between LA and RA applies i.e. the following relations between LA and RA are possible:
  - RA and LA is equal
  - one RA is a subset of one, and only one, LA, meaning that a RA do not span more than one LA
  ~~- one LA is a subset of one, and only one, RA, meaning that a LA do not span more than one RA~~
  ~~- independent LA and RA structure~~

~~In case of a LA and a RA consisting of both UMTS cells and GSM cells, then the GSM defined relations will apply.~~

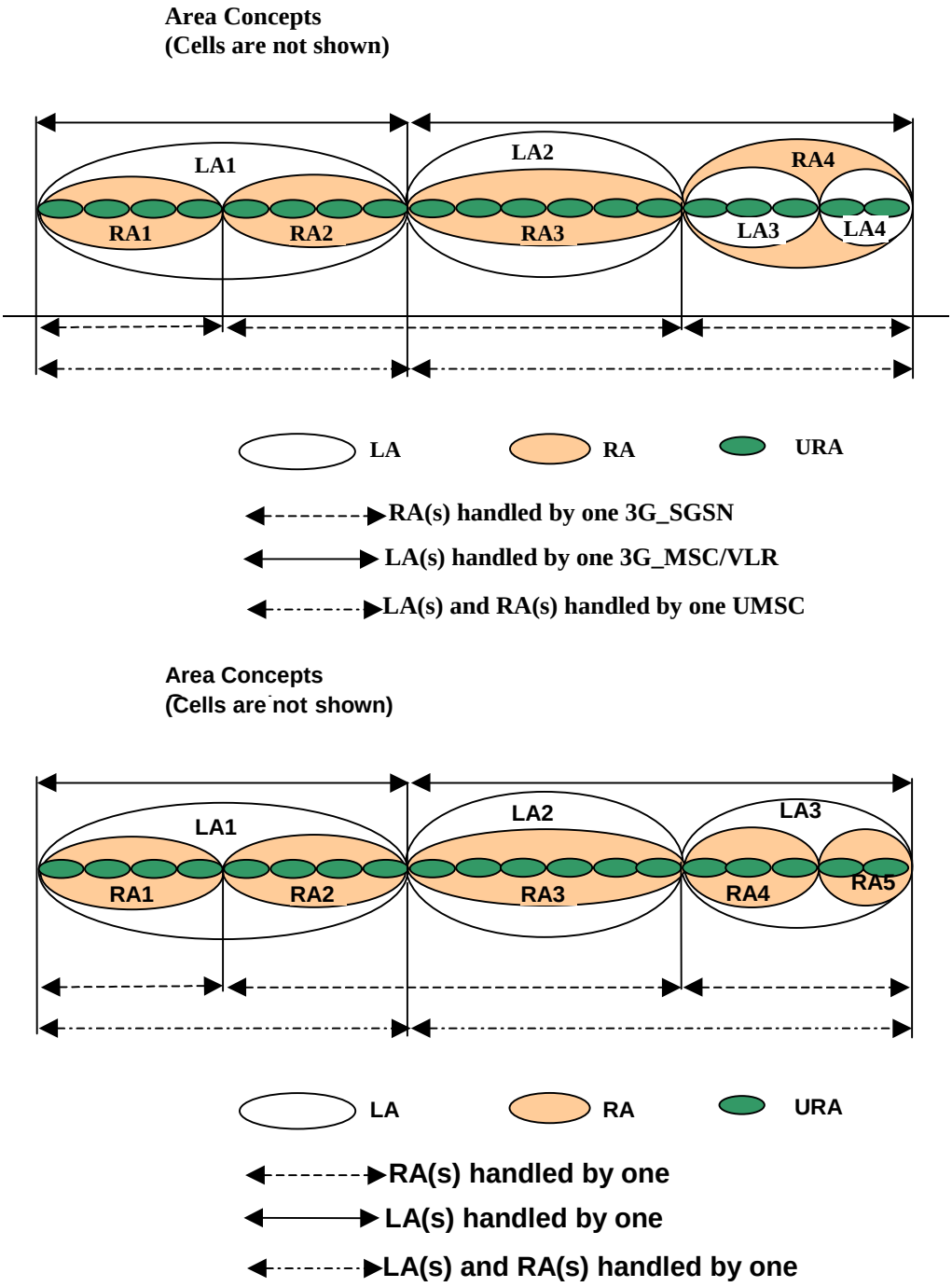



Figure 13: Relationship between different areas. ~~The totally independent LA and RA structure is not described in this figure.~~