Technical Specification Group Services and System Aspects ***TSGS#11(01)0119***

Meeting #11, Palm Springs, USA, 19-22 March 2001

Source: **TSG SA WG2**
Title: **CRs on 23.221 v.4.0.0**
Agenda Item: **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #11.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

CRs applicable to Release 4 to create Release 5

SA2 meeting	S2 Tdoc #	Spec	CR #	Rel	Title	cat	WI
S2-17	S2-010834	23.221	001r1	Rel-5	Inclusion of Release 5 requirements for the IM CN subsystem	A	IMS

3GPP TSG-SA2 Meeting #16 **s2-010xxx**
Los Angeles, 22-26th January 2001

CR-Form-v3

CHANGE REQUEST

⌘	**23.221** CR **CR-001**	⌘	rev	**01**	⌘	Current version:	**4.0.0** ⌘

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

Proposed change affects: ⌘ (U)SIM [ ] ME/UE [ ] Radio Access Network [X] Core Network [x]

Title: ⌘	Inclusion of Release 5 requirements for the IM CN subsystem			
Source: ⌘	Lucent Technologies			
Work item code: ⌘	IMS		***Date:*** ⌘	22-26th January 2001
Category: ⌘	**B**		***Release:*** ⌘	REL-5
	Use one of the following categories: ***F*** *(essential correction)* ***A*** *(corresponds to a correction in an earlier release)* ***B*** *(Addition of feature),* ***C*** *(Functional modification of feature)* ***D*** *(Editorial modification)* Detailed explanations of the above categories can be found in 3GPP TR 21.900.			*Use one of the following releases:* *2 (GSM Phase 2)* *R96 (Release 1996)* *R97 (Release 1997)* *R98 (Release 1998)* *R99 (Release 1999)* *REL-4 (Release 4)* *REL-5 (Release 5)*

Reason for change: ⌘	To include the requirements for the IM CN subsystem
Summary of change: ⌘	Section 4.4 provides the reference to the IMS Stage2. Section 5 has new sections to cover the IP addressing issues introduced by the IMS. Section 7 includes requirements on routing of PSTN originated calls. Section 8 has been included to cover cross domain issues relating to the support of the IM sub-system.
Consequences if not approved: ⌘	The IM subsystem will not be included in Release 5

Clauses affected: ⌘	2,3.3,4.1,4.4,5,7,8		
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	
Other comments: ⌘			

How to create CRs using this form:

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

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

1 Scope

This document covers details the architectural requirements for the GSM in Iu mode and UMTS systems. In particular it details the high level requirements for the Circuit Switched (CS) Domain and the stage 2 procedures that span more than one domain/subsystem within UMTS and GSM. The reference model to which these procedures apply can be found within 3G TS 23.002 [1]. In addition, A mode to Iu mode handover for CS services is addressed. Detailed architectural requirements within the subsystems are contained within the remainder of the 23 series of specifications e.g. the requirements for the Packet Switched (PS) domain are contained within 3G TS 23.060 [2] and the requirements for the Bearer Independent CS Core Network are contained in 3G TS 23.205[14].

2 References

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

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

This specification may contain references to pre-Release-4 GSM specifications. These references shall be taken to refer to the **Error! No text of specified style in document.** version where that version exists. Conversion from the pre-Release-4 number to the Release 4 (onwards) number is given in subclause 6.1 of 3GPP TR 41.001.

[1] 3GPP TS 23.002: "Network Architecture".

[2] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".

[3] 3GPP TS 23.012: “ Location management procedures”

[5] 3GPP TS 25.331: “ Radio Resource Control (RRC) Protocol Specification”

[6] 3G TS 25.301: “Radio interface protocol architecture”

[7] 3G TS 25.303: “UE functions and inter-layer procedures in connected mode”

[8] 3GPP TR 21.905: "3G Vocabulary".

[9] 3GPP TS 25.413: “ UTRAN Iu interface RANAP signalling”

[10] 3GPP TS 25.410: “ UTRAN Iu Interface: General Aspects and Principles”

[11] 3G TS 23.228 “IP Multimedia Subsystem – Stage 2”

[12] 3G TS 43.051 “GERAN Overall Description”

[13] 3G TS 23.153 ,"Out of Band Transcoder Control - Stage 2".

[14] 3G TS 23.205, “Bearer Independent CS Core Network – Stage 2”

[15] 3G TR 25.931: “ UTRAN Functions, examples on signalling procedures”

[16] RFC2766 "Network Address Translation - Protocol Translation (NAT-PT)", G. Tsirtsis, P. Srisuresh. February 2000.

[17] RFC2893 ”Transition Mechanisms for IPv6 Hosts and Routers”, R. Gilligan, E. Nordmark, August 2000.

[18] 3G TS 25.401 ”UTRAN Overall Description”

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms defined in 3GPP TR 21.905 [8] apply:

example: text used to clarify abstract rules by applying them literally.

In Iu mode:

In A/Gb mode:

Editor's Note: The two terms above should be referenced to the definitions defined by CN1. Need to determine if these will be placed in 23.905

RAN: within this document, the term RAN (Radio Access Network) is used to refer to both the UTRAN and GERAN in Iu mode. RAN specific abbreviations such as URA when used with the term RAN, apply to both UTRAN and GERAN in Iu mode, unless otherwise stated.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATM	Aysnchronous Transfer Mode
CM	Connection Management
CN	Core Network
CS	Circuit Switched
CSCF	Call/Session Control Function
CS-MGW	Circuit Switched Media Gateway
DHCP	Dynamic Host Configuration Protocol
GERAN	GSM/EDGE Radio Access Network
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GTP	GPRS Tunnelling Protocol
HLR	Home Location Register
IM	IP Multimedia
IMSI	International Mobile Station Identifier
IMT2000	
IP	Internet Protocol
IPSec	IP Security protocol
LA	Location Area
LAC	Location Area Code
LAN	Local Area Network
LLC	Logical Link Control
LM	Location Management
MAP	Mobile Application Part
MGCF	Media Gateway Control Function

MGW	Media Gateway
MM	Mobility Management
MRF	Media Resource Function
MSC	Mobile Switching Centre
NAT	Network Address Translator
NGN	Next Generation Networks
OoBTC	Out of Band Transcoder Control
PDA	Personal Digital Assistant
PDP	Packet Data Protocol
PLMN	Public Land Mobile Network
PS	Packet Switched
RA	Routing Area
RAC	Routing Area Code
RAI	Routing Area Identifier
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
RLC	Radio Link Control
RNC	Radio Network Controller
RNTI	Radio Network Temporary Identifier
RRC	Radio Resource Control
SGSN	Serving GPRS Support Node
SIP	Session Initiation Protocol
SRNS	Serving Radio Network Subsystem
SS7	Signalling System No. 7
STM	Synchronous Transfer Mode
SGW	Signalling gateway
SRNS	Serving Radio Network Subsystem
TCP	Transmission Control Protocol
TMSI	Temporary Mobile Station Identifier
TrFO	Transcoder Free Operation
UDP	User Datagram Protocol
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
URA	UTRAN Registration Area
UTRAN	UMTS Terrestrial Radio Access Network
VHE	Virtual Home Environment
VLR	Visited Location Register

4 UMTS/GSM domains and subsystems

4.1 Allowed network and terminal configurations

A 3GPP network is divided into a radio AN and a CN, 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 PS Domain, IM Subsystem and a CS Domain (see 3G TS 23.002 [1]). Any deployment of the IM subsystem requires a PS domain.

The following network configurations shall be allowed:

a) networks which provide the functionality of CS Domain and PS Domain (and optionally IM Subsystem);

b) networks which only provide the functionality of the CS Domain;

c) networks which only provide the functionality of the PS Domain (and optionally IM Subsystem).

The following terminal configurations shall be allowed:

a) terminals which are able to access both to the CS Domain and PS Domain (and optionally IM Subsystem);

b) terminals which are only able to access to the PS Domain (and optionally IM Subsystem);

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

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

4.2 Circuit switched (CS) core network domain

4.2.1 Iu mode to Iu mode handover for circuit switched services

For Iu mode to Iu mode Inter-MSC Hand-Over / SRNS relocation the MAP E interface transporting RANAP messages shall be used. Alternatively, in the case of intra-PLMN handover, the GSM to UMTS inter-system handover or SRNS relocation between two MSC-areas may be executed as intra-MSC inter-system handover or SRNS relocation respectively. In such a case this will be performed by utilising a direct SCCP connection between the target RNC located in the target MSC-area and the MSC server already involved in the call.

For handover of circuit-switched services involving the change of CN equipment (only CS-MGW or CS-MGW and MSC-server) the anchor principle shall be applied.

- The first MSC Server involved in a call will become the Anchor MSC Server for this call during and after handover, and will remain in the call until the call is released. Every subsequent handover (Intra and Inter) will be controlled by this MSC Server.

- The first CS-MGW involved in a call will become the Anchor CS-MGW for this call during and after handover , and will remain in the call until the call is released. The Nc interface is anchored in the CS-MGW, the correlation between CS-MGW to PSTN and the CS-MGW to RAN remain fixed until the call is released.

4.2.2 A mode to Iu mode handover for CS services

For A mode to Iu mode inter-system Inter-MSC Hand-Over (GSM to UMTS) the MAP E interface transporting BSSMAP messages shall be used. As a network option, in the case of intra-PLMN inter-system handover from A mode to Iu mode, the handover between two MSC-areas may be executed as

- intra-MSC handover, if the serving BSS is connected to the Anchor MSC; or

- subsequent intra-MSC handover or subsequent inter-MSC handover back to the Anchor MSC Server, if the serving BSS is connected to an MSC-B. The decision between these two alternatives is implementation and network configuration dependent.

The procedure will be performed by utilising a direct SCCP connection between the target RNC located in the target MSC-area and the Anchor MSC or MSC-B, respectively.

4.2.3 General principles for use of CS-MGW resources

The following principles for use of CS-MGW resources apply:

1. it shall not be necessary to have the CS-MGW co-located with the MSC Server;

2. the CS-MGW resources need not be associated with any particular MSC Server (see note 1);

3. it shall be possible for any MSC Server to request resources of any CS-MGW in the network (see note 1);

4. it shall be possible for an RNC to connect to the CS-MGW indicated by the MSC server;

Note 1: For points 2 and 3 above, issues related to O&M procedures such as where notification of restart of a CS-MGW should be sent to, need to be considered. Extensions to H.248 may be required.

The specification of the Bearer Independent CS CN which uses the CS-MGW is in TS 23.205 [14].

4.2.4 Transcoder location

The trancoders are located in the core network. They may be located in the CS-MGW at the border to the RAN (i.e the CS-MGW at the Iu interface) or at the CS-MGW at the edge of the core network (e.g. at the edge towards the PSTN/ISDN) [13].

4.3 Packet Switched (PS) core network domain

The requirements for the PS domain are in 23.060[2].

4.4 IP Multimedia subsystem (IMS)

The requirements for the IMS are in 23.228[11]

4.5 Cross Core Network Domain Requirements

The specifications shall support the option of IP transport for the MAP and CAP based interfaces

4.6 UTRAN

The requirements for the UTRAN are in the 25-series. An overview can be found in 3G TS 25.401 [18].

4.7 GERAN

The requirements for the GERAN are in 3G TS 43.051 [12]

5 IP addressing

5.1 IP version issues

The UMTS/GSM architecture shall support IPv4 / IPv6 based on the statements below.

- IP transport between network elements of the IP Connectivity services (between RNC, SGSN and GGSN) and IP transport for the CS Domain: both IPv4 / IPv6 are options for IP Connectivity
- IM CN subsystem elements (UE to CSCF and the other elements e.g. MRF):
  - The architecture shall make optimum use of IPv6.
  - The IM CN subsystem shall exclusively support IPv6.
  - The UE shall exclusively support IPv6 for the connection to services provided by the IM CN subsystem.

Editor’s note: The exact set of the functionality available in the whole Ipv6 protocol suite (such as IPSec, IP multicast etc.) that will be mandated in R5 is FFS.

- Access to existing data services (Intranet, Internet,…):
- The UE can access IPv4 and IPv6 based services.

5.2 Interoperability between IPv4 and IPv6 networks

Editor’s Note: This text needs to be reworded to remove reference to the IM CN Subsystem

As described in TS 23.228 [11] the IM CN Subsystem is based only on IPv6. Thus, it is needed to describe how these mobiles can connect to legacy IPv4 services. This section describes three different interworking scenarios: UE is IPv4 and IPv6 capable, IPv6 only UE, and IPv6 UE connected via IPv4 network to an IPv6 device. These scenarios are examples of IPv6 and IPv4 interworking.   The scenarios presented below only considered cases of a Transition Gateway (TrGW) for generic services and specialist services may require additional functionally at the application level.

5.2.1 IPv4/IPv6 Mobile connecting to IPv4 and IPv6 networks

An installation where the UE has both IPv4 and IPv6 stacks is shown in Figure 5-1. As depicted, the terminal connects to the IPv4 device directly using an IPv4 PDP Context. Hence, the UE appears to be a standard IPv4 node to the external IPv4 network. This scenario does not need any specific transition support from the network. However, it requires both versions of IP at the UE. The GGSN in this scenario may be different for the IPv6 and the IPv4 connections.

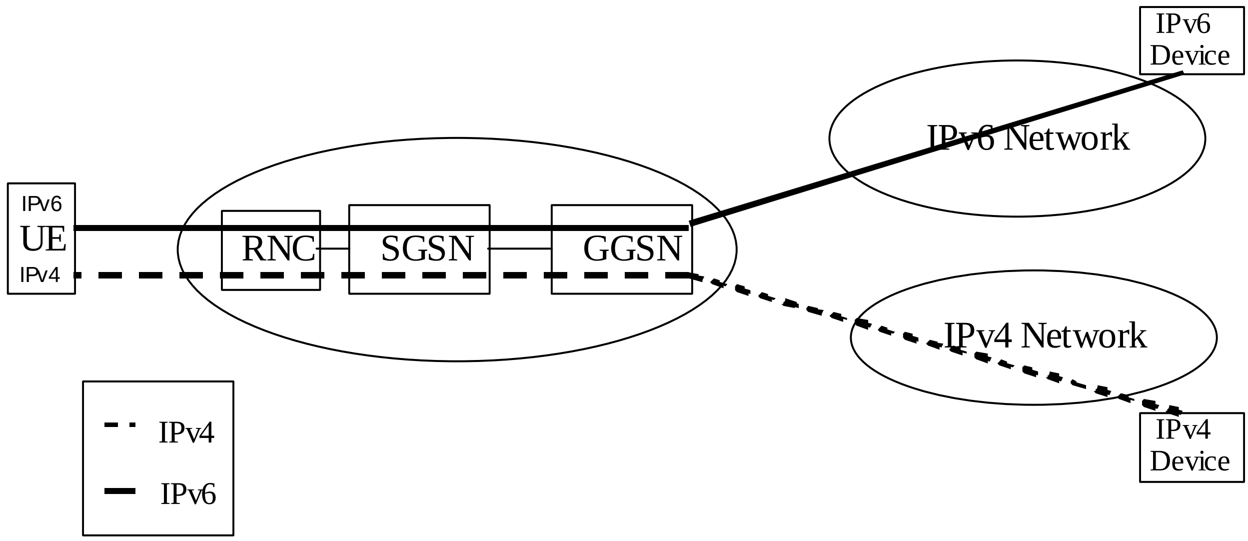

Figure 5-1 UE with IPv4 and IPv6 capability connecting to IPv4 and IPv6 networks

5.2.2 IPv6 only Mobile connecting to IPv4 network

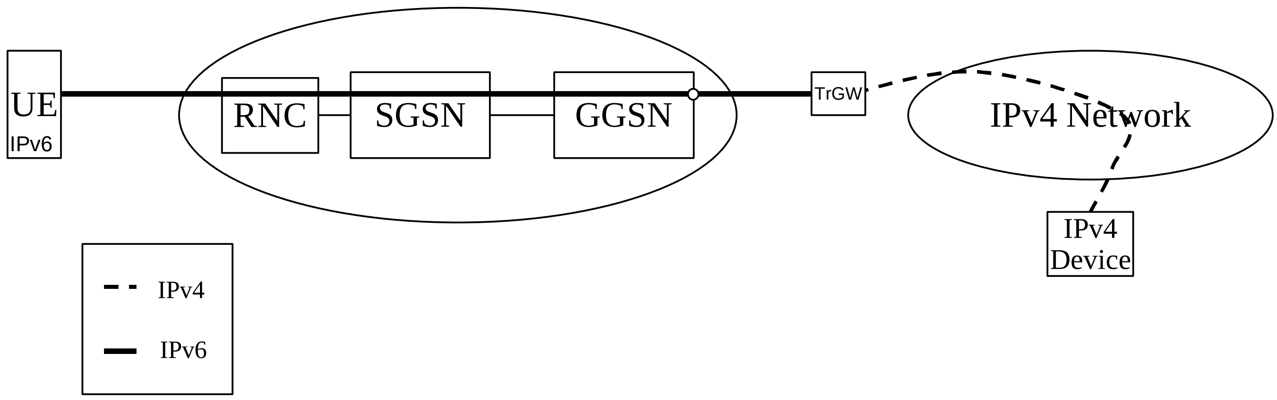

Figure 5-2 IPv6 only mobile connecting to IPv4 data services

Figure 5-2 shows an IPv6 only terminal connected to an IPv4 device. The UE us using an IPv6 PDP Context for access to a Transition Gateway (TrGW) that translates the IPv6 packets to IPv4 and vice versa. The TrGW may be implemented as a Network Address Translation – Protocol Translation (NAT-PT) [16] to convert IPv6 traffic coming from the UE to IPv4 traffic and vice versa.

NAT-PT is a combination of NAT-like address translation and IP header conversion as described in [16].   NAT-PT uses a pool of IPv4 addresses for assignment to IPv6 nodes on a dynamic basis as sessions are initiated across v4-v6 boundaries. NAT-PT binds addresses in the v6 network with addresses in the v4 network to provide transparent routing of packets traversing address realms. This requires no changes to end nodes and IP packet routing is completely transparent to them. It does, however, require NAT-PT to track the sessions it supports and mandates that inbound and outbound packets pertaining to a session traverse the same NAT-PT device.

5.2.3 IPv6 Mobile connected to an IPv6 Device via an IPv4 network

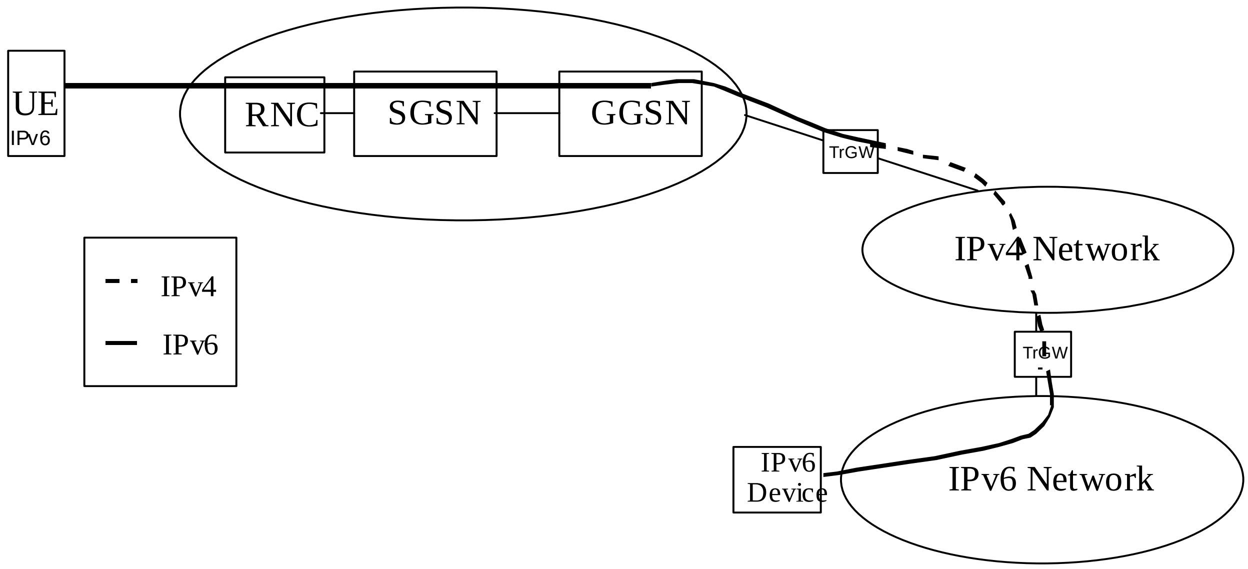

Figure 5-3 IPv6 mobile connected to an IPv6 device via an IPv4 network

Figure 5-3 shows a case where an IPv4 network lies between two IPv6 domains. The IPv6 domains can be interconnected using IETF standard mechanisms such as automatic or configured tunneling of IPv6 over IPv4 [17].

5.3 Address management

Editor's Note: The following text (as worded) is for Release 5 onwards. Should some of this not apply for release 4.

The UMTS network may be implemented as a number logically separate IP networks which contain different parts of the overall system. In this discussion each of these elements is referred to as an "IP Addressing Domain". Within an "IP Addressing Domain" it is required that the nodes within the domain are part of a consistent non-overlapping IP-address space. It is also required that IP packets may be routed from any node in the domain to any other node in the domain using conventional IP routing. In a real implementation an IP Addressing Domain may be a physically separate IP network or an IP VPN.

IP Addressing Domains may be interconnected at various points. At these points of interconnect gateways, firewalls or NATs may be present. It is not guaranteed that IP packets from one IP Addressing Domain can be directly routed to any interconnected IP Addressing Domain. Rather inter-Domain traffic may be handled via firewalls or tunnels. This implies that different IP Addressing Domains can have different (and possibly overlapping) address spaces.

Figure 5-4 below shows an example of the IP Addressing Domains involved in PS-domain and IP-subsystem services.

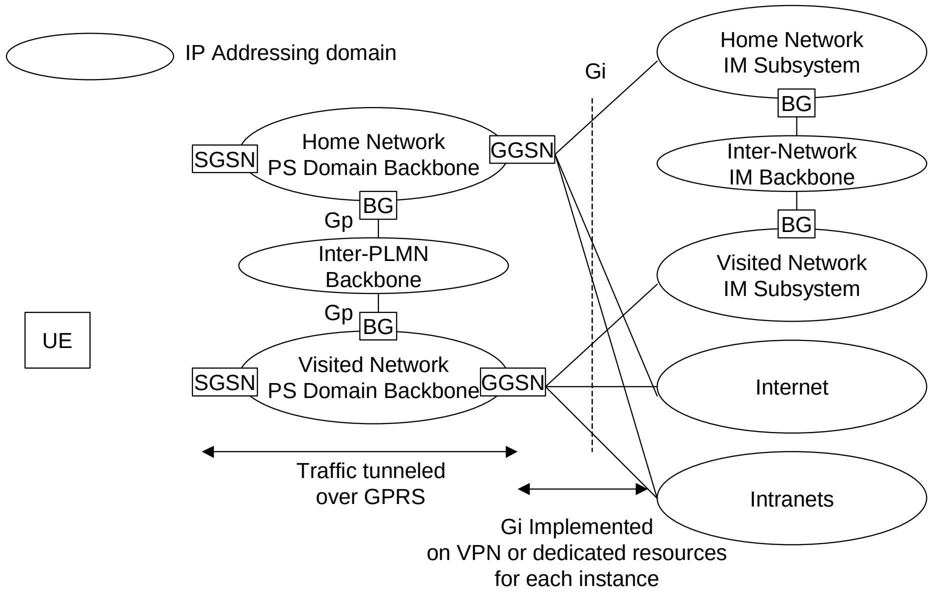

Figure 5-4 – IP Addressing Domains Involved In PS-Domain and IM Services

Though UMTS permits the possibility of using different IP Addressing Domains as shown above it is possible that several different IP Addressing Domains fall under a common co-operative management regime. In this case the different IP Addressing Domains may be implemented as a single administrative domain at the operator's discretion, thus using a common IP-address space.

A UE accessing services in either an IM subsystem, the Internet, or an external Intranet requires an IP address that is part of the target network's IP Addressing Domain. For each of these IP networks, the IP address is linked to a specific PDP context, or set of PDP contexts sharing this IP address.

When the UE establishes the PDP context to access an IP network, it may use an existing PDP context if it has an active context with a compatible IP addressing domain and quality of service profile.

5.4 IP addressing and routing for access to IM-subsystem services

Editor's Note: The following text is for Release 5 onwards.

This section deals with a UE making access to IM-subsystem services only and via UMTS.

Editors Note: How a UE can access IM subsystem services via other access types, or make simultaneous access to services in other IP networks is FFS.

A UE accessing IM-Subsystem services requires an IP address which is logically part of the Serving Network IM Subsystem IP Addressing Domain. This is established using an appropriate PDP-context. For routing efficiency this context should be connected through an GGSN in the visited network An example of the connection between the UE and the Visited Network IM Subsystem is shown below in figure 5-5:

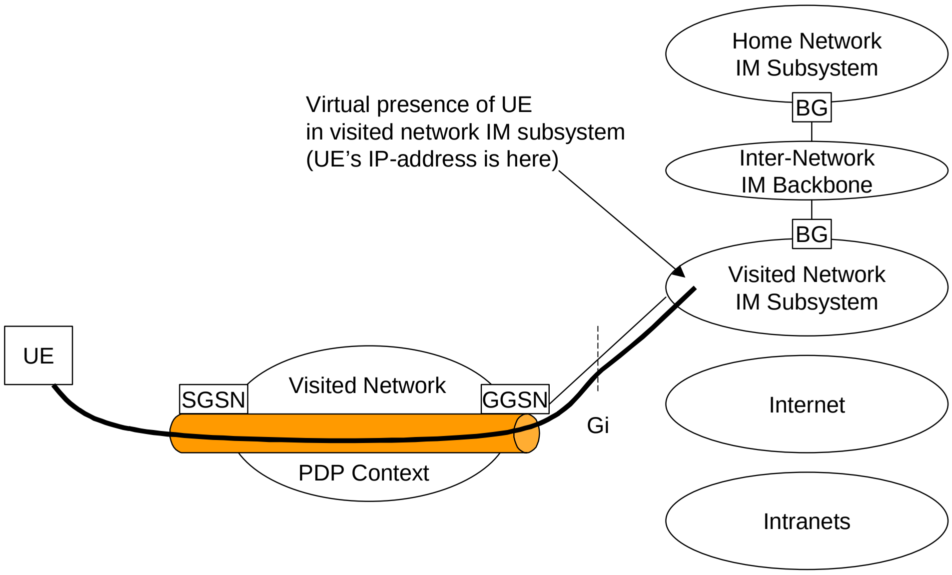

Figure 5-5 UE Accessing IM Subsystem Services in the visited network

5.5 Simultaneous access to multiple services

Editor's Note: The following text (as worded) is for Release 5 onwards. Should some of this not apply for release 4.

A UE can have multiple services active simultaneously. When the services are part of different IP addressing domains, separate PDP contexts and IP addresses are required. The UE shall support multiple IP addresses when simultaneous PDP contexts are activated that require separate IP addresses for different addressing domains.

Figure 5-6 shows an example of a connection between a UE and an Internet/Intranet service that is not available in the Visited Network with a simultaneous connection to the Visited Network's IM Subsystem. In this example, there may be two IPv6 addresses allocated, or one IPv4 address allocated for internet/Intranet access and oneIPv6 address for IM subsystem access..

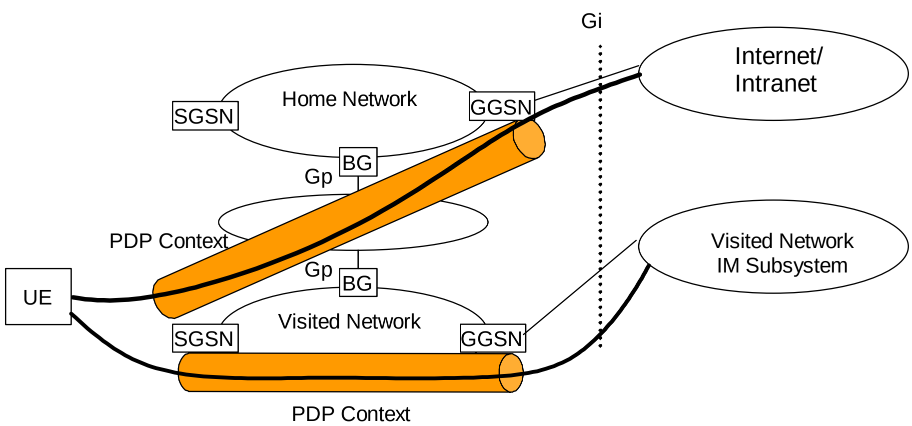

Figure 5-6 UE Accessing Home Internet/Intranet Services and Visited Network IM

7 Call control

7.1 General Aspects

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

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

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

3) For multimedia services the standardized multimedia protocol shall be run transparently via a PDP-context or a CS 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) SIP from the IETF shall be the multimedia call control supported over the PS domain, where the network functional entities for multimedia support are within the PLMN.

NOTE: Other multimedia protocols can be supported e.g. H.323 transparently over the PS domain . In these cases, the multimedia functional entities shall be outside of the PLMN. Support of terminating calls for these protocols are outside the scope of these specifications.

5) H.324M shall be supported within the CS domain.

Figure 7.1 illustrates the realisation of the multimedia service based on requirement 3. 'Multimedia Protocol' indicates the functionality either inside the communicating user's terminal or a server (e.g. SIP server). It is essentially a control function both for user plane and control plane for the multimedia communication.

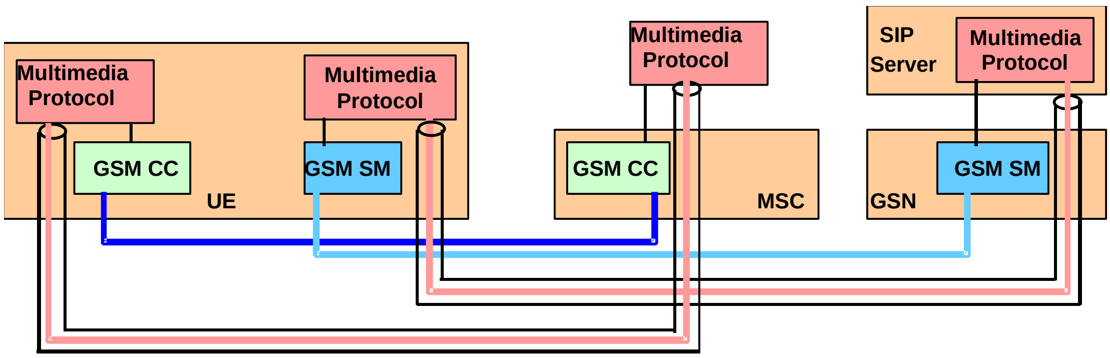

Figure 7.1: Support of multimedia making use of GSM SM/CC

7.2 Domain selection for mobile terminated calls from the PSTN

7.2.1 Calls directed to the CS domain

When the mobile terminated call set-up arrives at a G-MSC server or G-MSC, then the G-MSC Server or G-MSC interrogates the HSS for routing information. The HSS decides on the way the call shall be treated next (e.g. IM CN subsystem, CS domain (e.g. the subscriber is roaming in a legacy network), service platform involvement). According to the decision, the HSS returns information that will make the G-MSC progress the call towards an MGCF (for onward handling in the IMS), a VMSC or to provide further processing (e.g. invoke CAMEL G-MSC processing).

8 Support of IM CN Subsystem services

Editor's note: This clause will only be included in release 5, and will not be included in the release 4 version of this document.

8.1 Context activation and registration

The IP address is allocated to UE either by GPRS or some other means e.g. by DHCP The UE shall use IP addresses assigned to it for, but not limited to, the following:

- the exchange application level signalling (e.g., registration, CC) with the serving CSCF from the access network currently used,

- application level registration to IM CN subsystem as an address used to reach the UE

Editor's Note: The use of DNS names, NAI (Network Access Identifier RFC2486) and SIP URL instead of IP address for application level registration is FFS.

- an address used to reach the UE for multimedia calls.

In GPRS, the terminal is associated with an IP address when the primary PDP context is activated. The IP address used for the purpose described above can be:

- the IP address obtained by the UE during the activation of a primary PDP context (e.g. if the UE does not have any existing PDP context active or desires to use a different IP address)

- the IP address of one of the already active PDP contexts.

In the following, a description of the order in which the registration procedure is executed need and how the IP address is allocated is shown. Figure 8.1 shows what procedures and in which order they are performed during the registration.

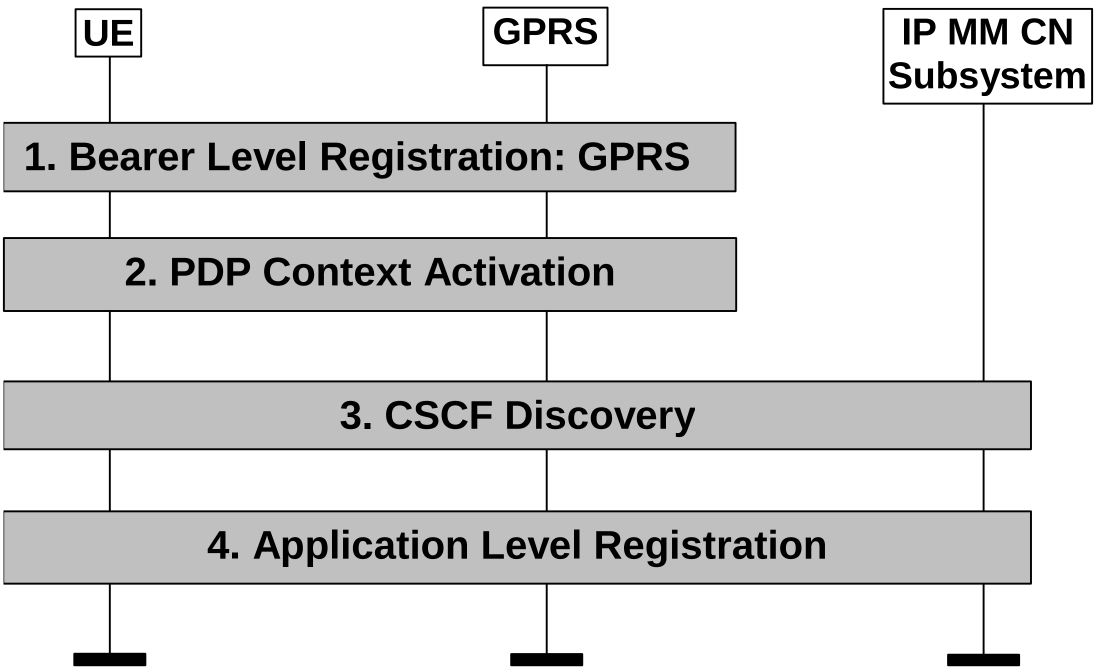

Figure 8.1: Registration

The following steps are performed:

1. the bearer level registration is performed (e.g. when the terminal is switched on or upon explicit indication from the user).

2. the PDP context activation is done. The UE has two options:

- activate a primary PDP context and obtain a new IP address (e.g. if the UE does not have any existing PDP context active or desires to use a different IP address)
- activate a secondary PDP context and re-use the IP address of one of the already active PDP contexts.

3. UE performs the CSCF discovery procedure, where the UE performs a CSCF discovery to select the CSCF to register with.

Editor's note: Details regarding the CSCF discovery procedure are FFS.

There can be time gaps between these procedures and the following one. For instance, the UE may perform PDP context activation and the CSCF discovery, but not the application level registration. The UE may use the activated PDP context for other types of signalling, e.g. for CSCF discovery.

4. UE performs application level registration by providing the IP address obtained at step 2 to the CSCF selected at step 3. The IP address used for signalling purposes is allocated in association with PDP context activation and not on an incoming call basis.

Editor's note: When and how often the UE should update application level registration is FFS.

The selected CSCF becomes the serving-CSCF.

NOTE: The S-CSCF can be either in the home or visited network.

Editor's note: Where the association of the IP address used by the UE and application level identifier is held in the network is FFS.

From the S-CSCF point of view, the IP address provided by the UE is the address where the UE is reachable for mobile-terminated call control signalling and any other type of mobile terminated signaling.

Whether the procedures are activated individually by the UE or some of them are performed automatically depends on implementation of the terminal and on the UE's configuration. For instance, the multimedia application in the UE could start the application level registration and steps 2-4 would have to be executed in response to support the operation initiated by the application. Interaction with the UE may happen during these steps.

8.2 Location management

8.2.1 Registration concepts for a subscriber roaming into CS domain

Figure 8.2 shows the registration concept for a subscriber, who access IM services in the home network, roaming into a CS domain.

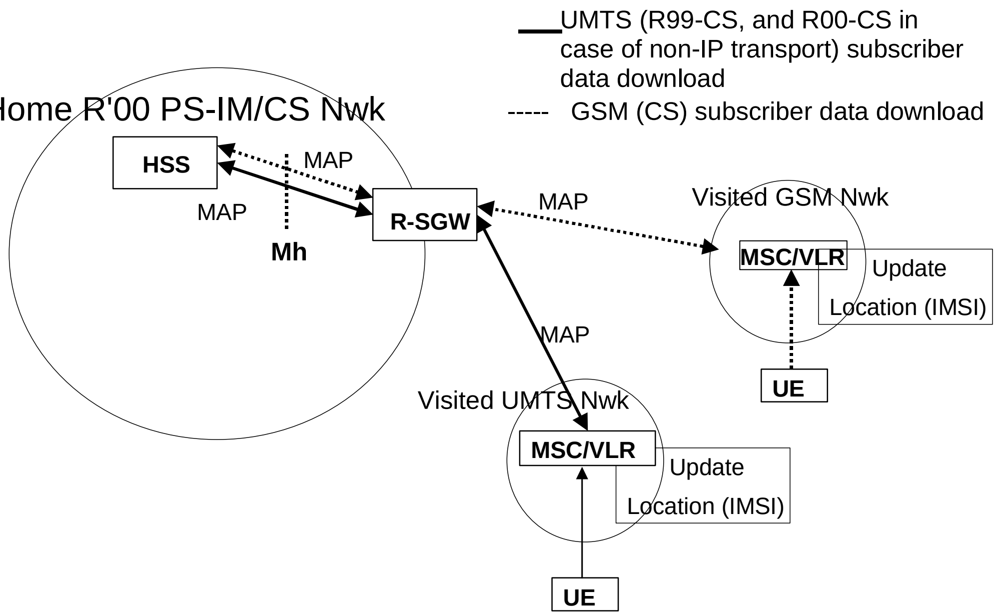

Figure 8.2: A roaming model for registration in a CS domain

The detailed message sequence chart for a subscriber roaming into a CS domain and accessing an IM application is shown in figure 8.3.

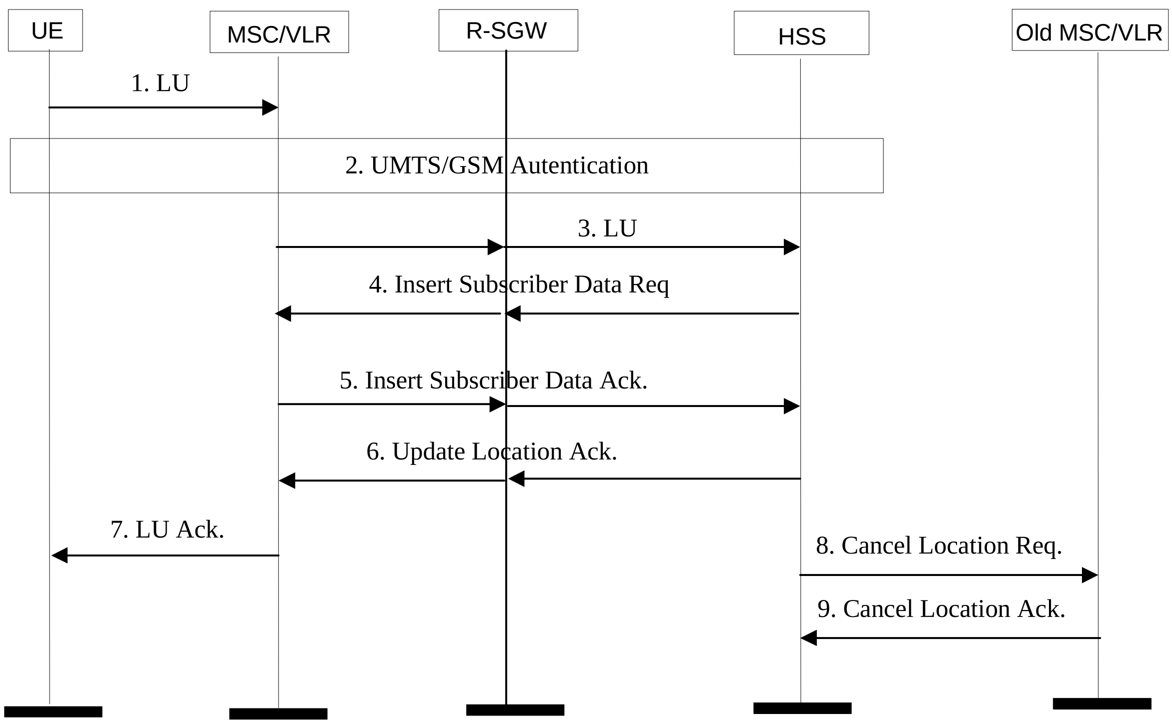

Figure 8.3: Message sequence for roaming into a CS domain

1. The UE initiates the Location Update procedure with the MSC/VLR of the visited network. The LU message contains the IMSI of the subscriber.

2. The authentication is performed as per the existing 3GPP specifications for the CS domain.

3. The MSC/VLR initiates the MAP Location Update procedure towards the HSS of the user via R-SGW. The HSS stores the VLR address etc. The message contains IMSI and other parameters as defined in the 3GPP specifications for the CS domain. The R-SGW performs SS7 transport to/from IP conversion.

4. The HSS provides the subscriber data for the roaming user to VLR by sending MAP Insert Subscriber Data message via R-SGW. The message contains IMSI and other necessary parameters as defined in the 3GPP specification for both Iu and A/Gb mode. The message is passed through the R-SGW transparently while the SS7 to/from IP conversion is performed in R-SGW.

5. The serving VLR then acknowledges the receipt of the subscriber data to the HSS via R-SGW.

6. The HSS acknowledges the completion of location updating procedure to the MSC/VLR via R-SGW.

7. The MSC/VLR acknowledges the completion of location updating procedure to the UE.

8. The HSS sends the MAP Cancel Location message to the old MSC/VLR (optional procedure).

9. Location cancellation is acknowledged to the HSS by the old MSC/VLR.

NOTE 1: The steps 8 and 9 above assume that the UE was previously registered to a CS domain .

NOTE 2: The MAP messages between the MSC/VLR and HSS are passed transparently via R-SGW. The R-SGW does not interpret the MAP messages in anyway, but performs only the lower level conversion between SS7 and IP. This is in accordance with the 3GPP definition for R-SGW.