3GPP TR 23.881 V1.0.0 (2004-03)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Interworking aspects and migration scenarios for IPv4 based IMS Implementations (Release 6)

Select keywords from list provided in specs database.

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

Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

3GPP IMS uses exclusively IPv6, as specified in clause 5.1 of TS 23.221[3]. At the same time, it is understood that there will exist IPv4 based IMS implementations, namely initial IMS implementations and IMS implementations based on 3GPP2 specifications. This is the motivation to study interworking and migration scenarios related to IPv4 based IMS implementations

1 Scope

The present document studies study interworking and migration scenarios related to IPv4 based IMS implementations. The study provides guidelines for operators and vendors on interworking aspects of IPv4 based IMS implementations, and provides guidelines on migrating to 3GPP IMS using IPv6.

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 41.001: "GSM Release specifications".

[2] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".

[3] 3GPP TS 23.221: "Architectural Requirements".

[4] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem - Stage 2.

[5] 3GPP TS 23.141: "Presence Service; Architecture and Functional Description".

[6] draft-ietf-ngtrans-isatap-16.txt (October 2003): "Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)", work in progress.

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 21.905[2] and the following apply.

Dual stack IM CN subsystem: For the purpose of this technical report, a dual stack IM CN subsystem is an IM CN subsystem implementation in which all network entities support IPv4 and IPv6 for IMS communication. It is an IM CN subsystem implementation that supports both IPv6 as per 3GPP release 5 or 6 standards, and an IPv4 IM CN subsystem.

IPv4 based IM CN subsystem implementation, IPv4 IM CN subsystem: For the purpose of this technical report, an IPv4 based IM CN subsystem implementation (or short: IPv4 IM CN subsystem) means an IM CN subsystem implementation, which is based on 3GPP Release 5 or 6 standards, but uses IPv4 rather than IPv6.

IPv4 based UE implementation, IPv4 UE: For the purpose of this technical report, an IPv4 based UE implementation (or short: IPv4 UE) means a UE implementation, which is based on 3GPP Release 5 or 6 IMS standards, but uses IPv4 rather than IPv6.

IMS dual stack UE: For the purpose of this technical report, an IMS dual stack UE means a UE implementation, which is based on 3GPP Release 5 or 6 IMS standards, but in addition to IPv6 can use IPv4 to access an IPv4 IM CN subsystem.

3.2 Symbols

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

Gm Reference Point between a UE and a P-CSCF.

3.3 Abbreviations

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

CN Core Network
CSCF Call/Session Control Function
DHCP Dynamic Host Configuration Protocol
DNS Domain Name System
GGSN Gateway GPRS Support Node
I-CSCF Interrogating CSCF
IM IP Multimedia
IMS IP Multimedia Subsystem
IP Internet Protocol
IPSec IP Security protocol
NAT Network Address Translation
OMA Open Mobile Alliance
OTA Over the Air Activation
P-CSCF Proxy-CSCF
PDP Packet Data Protocol
S-CSCF Serving-CSCF
SGSN Serving GPRS Support Node
SIP Session Initiation Protocol
SMS Short Message Service
UE User Equipment

4 Architectural Requirements

4.1 General

An IMS dual stack UE shall be able to determine whether to use IPv4 or IPv6 when accessing the IMS.

A dual stack IMS shall be able to determine whether to use IPv4 or IPv6.

IMS security shall be possible.

SIP Compression shall be possible.

P-CSCF discovery mechanisms shall be possible.

An IPv4 IM CN Subsystem shall be able to interwork with an IPv4 IM CN Subsystem.

An IPv4 IM CN Subsystem shall be able to interwork with an IPv6 IM CN Subsystem.

A dual stack IM CN Subsystem shall be able to interwork with an IPv4 IM CN Subsystem.

A dual stack IM CN Subsystem shall be able to interwork with an IPv6 IM CN Subsystem.

A dual stack IM CN Subsystem may support IPv4 UEs.

An IPv4 IM CN Subsystem shall support private addressing – i.e. the IMS elements shall support the case in which both the IMS network and the user are within (the same) private address domain.

Since the existing P-CSCF discovery mechanism are only applicable for IPv6 capable terminals and Rel-5 GPRS or require DHCPv6 support from the involved nodes, the operators should be able to use other mechanisms not defined as possible options in 3GPP IMS. As such, configuration of the appropriate P-CSCF information must be performed by other mechanisms(s) (e.g. DHCPv4, DNS, SMS, OTA, OMA Device management or other configuration schemes).

4.2 Support of PDP type IPv6

If GPRS Roaming is used, i.e. the GGSN and P-CSCF are in the home network, then the support of IMS using IPv6 requires the support of PDP contexts of PDP type IPv6 in both the visited and the home network.

Subclause 5.2.2.4.5 discusses a possible work-around for the case where this requirement is not met because the visited network does not support PDP type IPv6.

5 Architectural Concept

5.1 Overall

Editor's Note: The purpose of this subclause is to describe issue, scenarios and architectural concepts, e.g. functional entities, which are used both in migration and interworking scenarios. This may need to include some considerations on IPv4 based IMS implementations, which are considered for interworking and migration scenarios.

5.1.1 IPv4 UE and IPv4 based IM CN subsystem Implementation

In this scenario an IPv4 UE accesses an IPv4 IM CN subsystem. Interworking and migration aspects applicable for this scenario can be derived from the scenario described in Section 5.1.2.

5.1.2. IMS Dual Stack UE accessing an IPv4 IM CN subsystem

An IMS dual stack UE may access an IPv4 IM CN subsystem using IPv4.

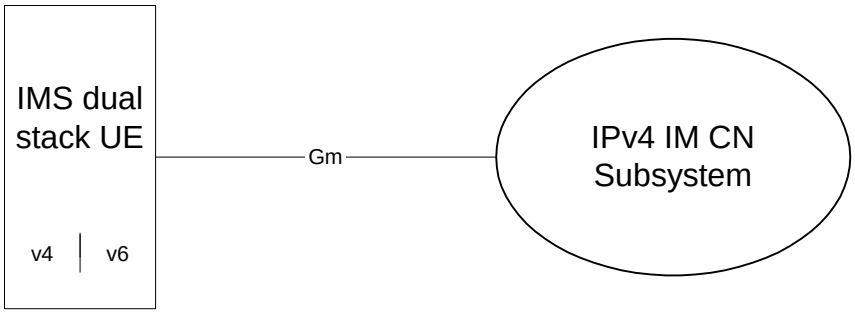

Figure 5-1: IMS Dual Stack UE accessing an IM CN subsystem

From an IM CN subsystem perspective, the UE behaves like an IPv4 based UE implementation in this scenario.

The UE needs to determine whether to use IPv4 or IPv6. One possibility is that the UE is pre-configured to use IPv4 or IPv6 for IMS; in this scenario the UE would be pre-configured to use IPv4. If the UE is not pre-configured, one approach is that the UE first tries to establish a connection towards an IPv6 based IM CN subsystem; if it cannot gain IPv6 connectivity or cannot access an IPv6 based IM CN subsystem, then it should try to access an IPv4 IM CN subsystem. This way no delay is introduced when an IPv6 based 3GPP IM CN subsystem is in place.

5.1.3 IP Versions in UE and P-CSCF

IMS security relies heavily on the security association between UE and P-CSCF: IPSec is used between P-CSCF and UE. Any intermediary node between UE and P-CSCF, which changes the IP messages exchanged, would create serious security problems and require significant changes to the IMS security architecture. Moreover, if SIP compression is used between P-CSCF and the UE, then SIP messages cannot be read or modified by intermediate nodes. In addition mechanisms for P-CSCF discovery would require modification if IP version interworking was applied between UE and P-CSCF.

Thus it is recommended and assumed in this TR that SIP communication between UE and P-CSCF either uses IPv4 or IPv6 without intermediaries changing the IP version.

5.2 Interworking Scenarios

5.2.1 Interworking between an IPv4 IM CN subsystem and an IPv6 based 3GPP IM CN subsystem

An IPv4 based IM CN subsystem implementation may need to support interworking with an IPv6 based 3GPP IM CN subsystem.

TS 23.228 [4], clause 5.18, defines an architecture for interworking between an IPv6 based 3GPP IM CN subsystem and IPv4 SIP networks. An IPv4 based IM CN subsystem is a particular example for an IPv4 SIP network, and thus the interworking architecture may be applied.
These mechanisms defined in 23.228 [4] are applicable when an IPv4 IM CN subsystem migrates to IPv6, and needs to interwork with other IPv4 IM CN subsystems or IPv4 SIP networks.

5.2.2 Interworking Scenarios under Consideration

5.2.2.1 Overview

The following scenarios are those that need to be considered for IMS interworking if it is assumed that there are both IPv6 and IPv4 IMS deployments. This list may not be exhaustive of the possible deployments.

1 IMS interworking – non-roaming scenarios, see subclause 5.2.2.2:

   i) IPv4 IM CN subsystem with IPv6 IM CN subsystem, see subclause 5.2.2.2.1;

   ii) IPv4 IM CN subsystem with IPv4 IM CN subsystem, see subclause 5.2.2.2.2;

   iii) IPv4 IM CN subsystem with dual stack IM CN subsystem, see subclause 5.2.2.2.3;

   iv) Dual stack IM CN subsystem with dual stack IM CN subsystem, see subclause 5.2.2.2.4.

   v) IPv6 IM CN subsystem with dual stack IM CN subsystem, see subclause 5.2.2.2.5.

2 IMS interworking – roaming scenario IPv4 only, see subclause A.1.1:

   i) IPv4 visited network – IPv4 home network.

3 IMS interworking – roaming scenario IPv4 and IPv6, see subclause 5.2.2.4 and clause A.1:

   i) IPv4 visited network, IPv6 home network – GGSN/P-CSCF in visited network, see subclause A.1.2;

   ii) IPv6 visited network, IPv4 home network – GGSN/P-CSCF in visited network, see subclause A.1.3;

   iii) IPv4 visited network, dual stack home network – GGSN/P-CSCF in visited network, see subclause A.1.4;

   iv) Dual stack visited network, IPv4 home network – GGSN/P-CSCF in visited network, see subclause 5.2.2.4.4;

   v) IPv4 visited network, IPv6 home network – GGSN/P-CSCF in home network, see subclause 5.2.2.4.5;

   vi) IPv4 visited with GGSN and dual stack IM CN subsystem in home network, see subclause 5.2.2.4.6.

In all cases it will be necessary to consider the IP version supported by the UE. Particularly, as networks migrate from IPv4 to IPv6, there may exist IPv4 only terminals attempting to access IMS in networks supporting IPv6.

In considering scenarios, it is necessary to take into account the use of private addressing and the use of NAT at the edge of IPv4 networks and the implications for protocols with embedded IPv4 addresses.

It is assumed that the IPv4 NATs are SIP aware.

Interconnect networks are assumed to support either IPv4, or both IPv4 and IPv6.

The main architecture principle assumed for the GPRS system is the use of GGSN in the home network when early deployment and possible migration scenarios of IPv4 based IMS implementation is considered

Editor's Note: Further scenarios are needed for communication within a single IMS dual stack network.

5.2.2.2 Non-roaming scenarios

5.2.2.2.1 Non-roaming - IPv4 IM CN subsystem with IPv6 IM CN subsystem

IPv4 IM CN subsystem and IPv6 IM CN subsystem are in different networks; each leg of the session is contained solely in an IPv4 or IPv6 network. Either network may originate or terminate sessions. The UE in the IPv4 network may be IPv4 only or may be IMS dual stack UE (if it is IPv6 only then this scenario can not be supported).

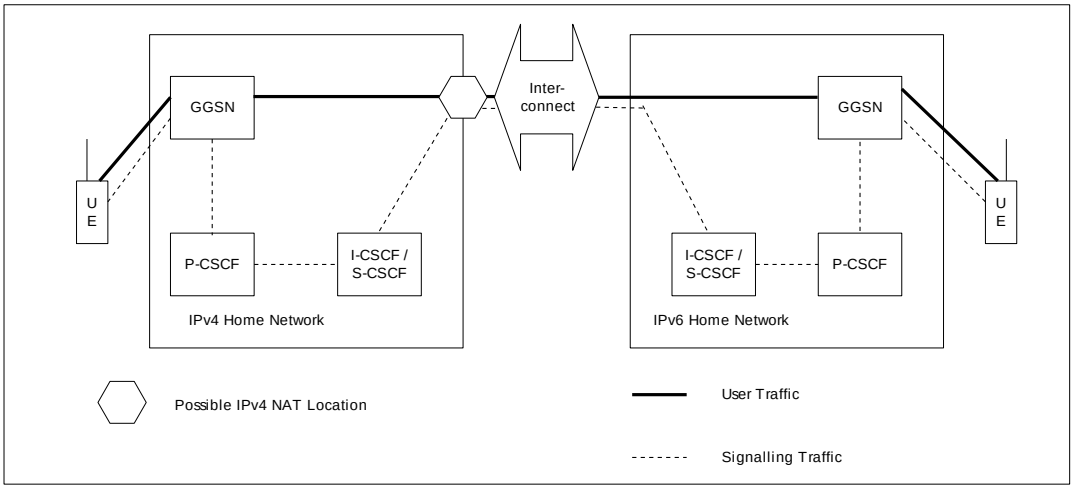

Figure 5-2: Non-roaming IPv4 IM CN subsystem with IPv6 IM CN subsystem

In this scenario

- subclause 5.1.1 and subclause 5.1.2 apply to the UE accessing the IPv4 network;
- subclause 5.2.1 applies to the interconnection between the networks.

5.2.2.2.2 Non-roaming - IPv4 IM CN subsystem with IPv4 IM CN subsystem

The two IPv4 IM CN subsystems are in different networks and hence may use overlapping private IPv4 address spaces. The UE in the IPv4 network may be IPv4 only or may be IMS dual stack UE. If either UE is IPv6 only then this scenario can not be supported.

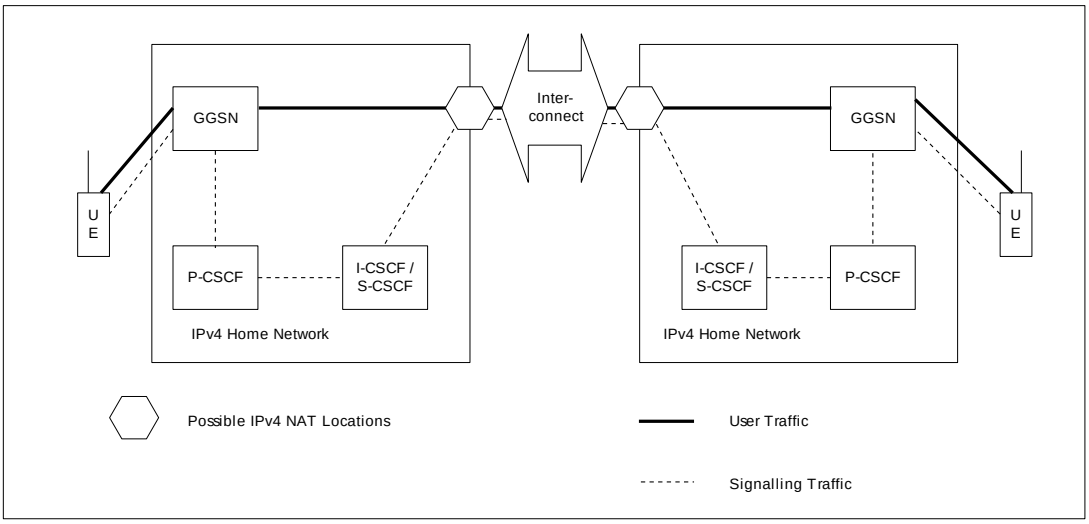

Figure 5-3: Non-roaming IPv4 IM CN subsystem with IPv4 IM CN subsystem

In this scenario subclause 5.1.1 and 5.1.2 apply to the UEs accessing the IPv4 networks.

5.2.2.2.3 Non-roaming IPv4 IM CN subsystem with dual stack IM CN subsystem

The two IM CN subsystems are in different networks. One IM CN subsystem is supporting IPv4 only whereas the second IM CN subsystem is supporting both IPv4 and IPv6. Either network may originate or terminate sessions. The dual stack IMS determines that it is in interacting with an IPv4 IMS and thus uses IPv4 at the network interconnection. The UE in the IPv4 network may be IPv4 only or may be IMS dual stack UE (if it is IPv6 only then this scenario can not be supported).

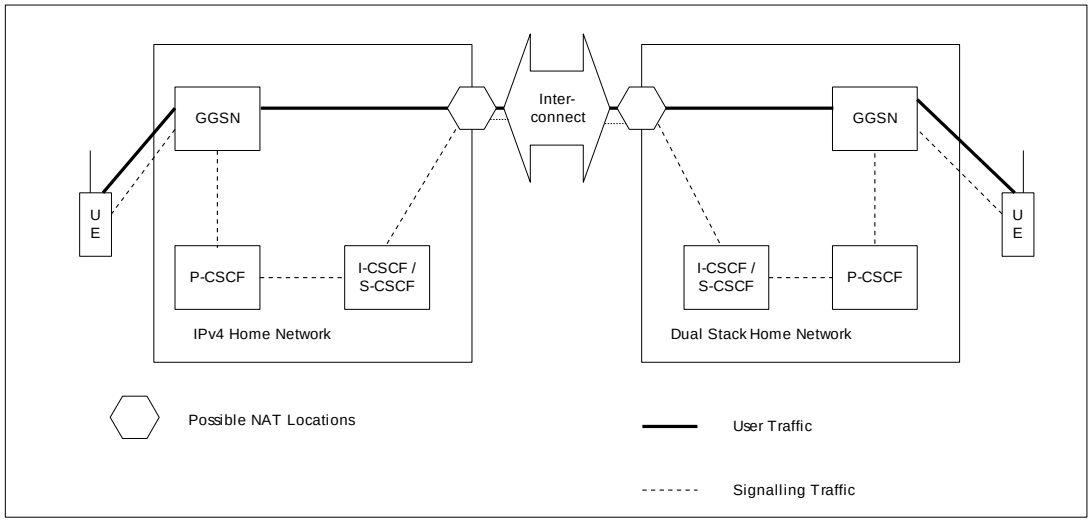

Figure 5-4: Non-roaming IPv4 IM CN subsystem with Dual Stack IM CN subsystem

In this scenario subclause 5.1.1 and subclause 5.1.2 apply to the UE accessing the IPv4 network.

Subclause 5.2.1 is applicable to the interconnection between networks, if IPv6 is used in the dual stack home network.

Even if the UE in the dual stack network is an IMS dual stack UE, the following needs to be considered:

- If the UE has registered with IPv4, then NAT may be needed at the network borders if private addressing is used in the IMS networks.
- If the UE has registered with IPv6, then the dual stack home network will use IPv6 for SIP communication towards the UE, even if it is part of a communication with an IPv4 network.

5.2.2.2.4 Non-roaming dual stack IM CN subsystem with dual stack IM CN subsystem

The two IM CN subsystems are in different networks. Both IM CN subsystems are dual stack. The UEs may be IPv4 only, IPv6 only, or may be IMS dual stack UEs.

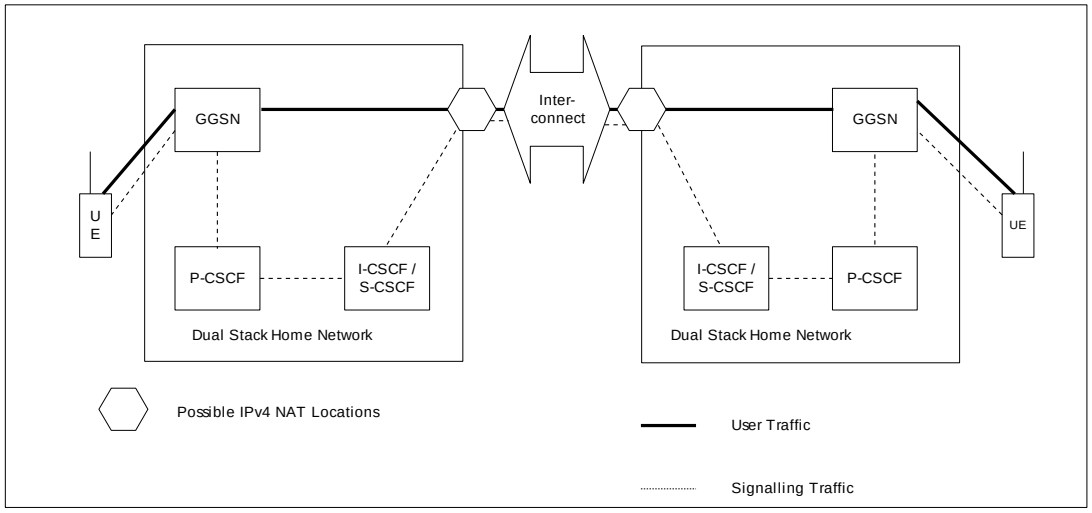

Figure 5-5: Non-roaming Dual Stack IM CN subsystem with Dual Stack IM CN subsystem

5.2.2.2.5 Non-roaming IPv6 IM CN subsystem with dual stack IM CN subsystem

The two IM CN subsystems are in different networks. One IM CN subsystem is supporting IPv6 only whereas the second IM CN subsystem is supporting both IPv4 and IPv6. Either network may originate or terminate sessions. The dual stack IMS determines that it is in interacting with an IPv6 IMS and thus uses IPv6 at the network interconnection. The UE in the IPv6 network may be IPv6 only or may be IMS dual stack UE (if it is IPv4 only then this scenario can not be supported).

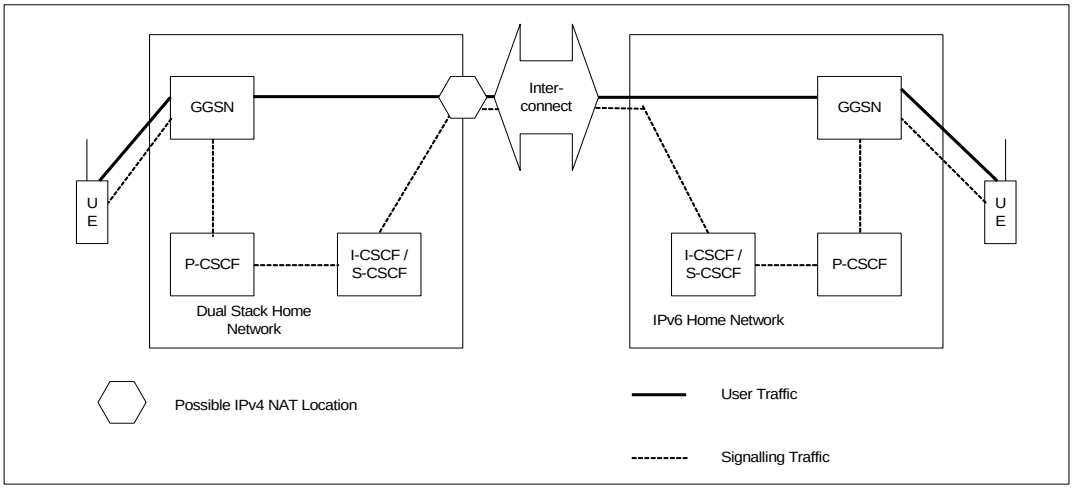

Figure 5-5: Non-roaming IPv6 IM CN subsystem with Dual Stack IM CN subsystem

Editor's Note: further scenarios are needed for non roaming cases with dual stack IM CN Subsystem at one end and IPv4 or IPv6 IM CN Subsystem at the other.

If the UE in the dual stack network is an IMS dual stack UE, which has registered with IPv4, then the dual stack home network will use IPv4 for SIP communication towards the UE, even if even if it is part of a communication with an IPv6 network.

5.2.2.4 Roaming scenarios – mixed IPv4 / IPv6

5.2.2.4.1 Roaming - dual stack IM CN subsystem visited with IPv4 IM CN subsystem home

In this IM CN subsystem roaming scenario, the visited network is dual stack, supporting both IPv4 and IPv6, while the home network supports only IPv4. The UE may be IPv4 only or may be IMS dual stack UE. If the UE is IPv6 only then this scenario can not be supported.

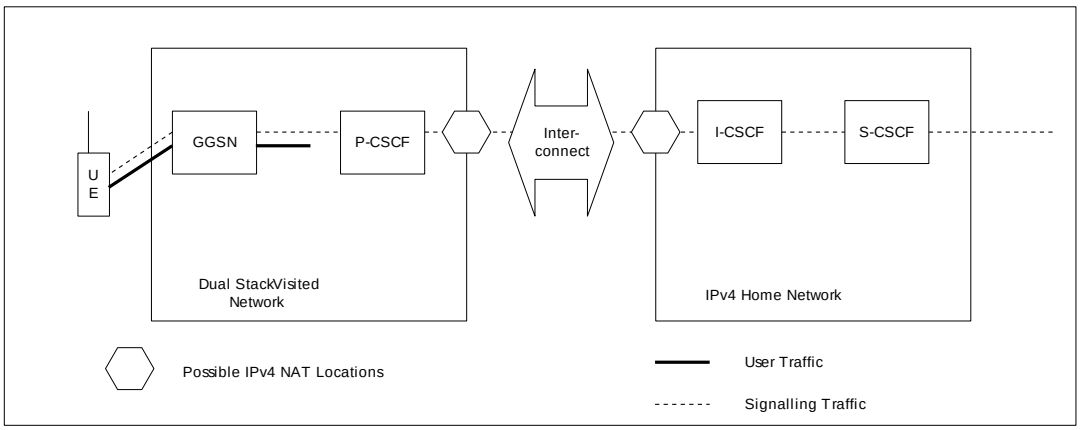

Figure 5-6: Roaming – dual stack IPv4 IM CN subsystem visited with IPv4 IM CN subsystem in home network

Routeing of bearer path is for further study – – bearer path may be:

- Routed to home network and from there onwards towards the destination network;
- Routed from the visited network directly towards the destination network.

5.2.2.4.2 Roaming - IPv4 visited with GGSN and IPv6 IM CN subsystem in home network

UE and SGSN are in the visited network. The GGSN, P-CSCF, I-CSCF and S-CSCF are in the IPv6 home network. The visited network does not support IPv6 PDP context. The GGSN in the IPv6 home network supports an IPv4 context on the APN used to access the IMS. The UE may be IPv4 only or may be IMS dual stack UE. If the UE is IPv6 only then this scenario can not be supported.

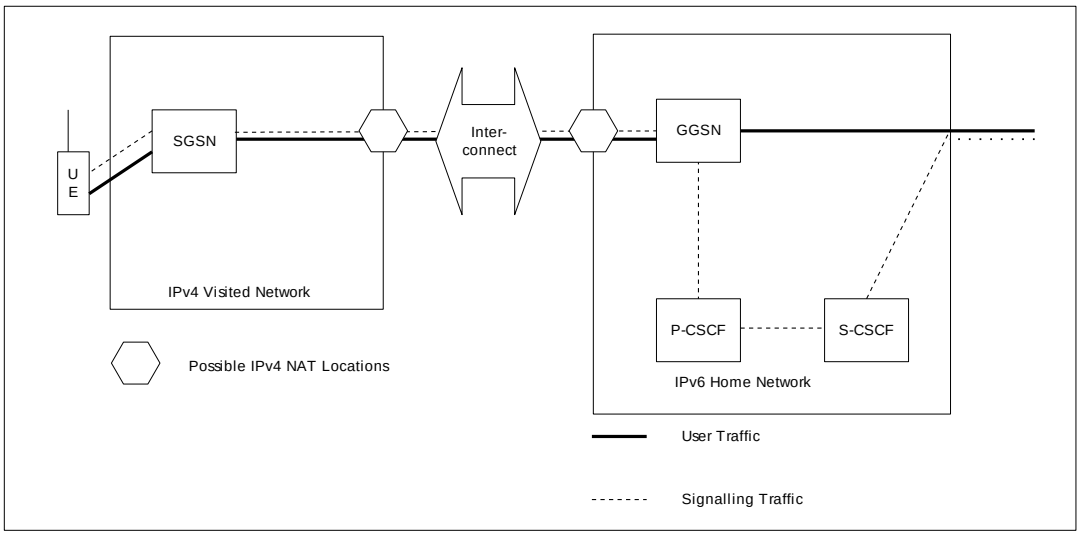

Figure 5-7: Roaming - IPv4 visited with GGSN and IPv6 IM CN subsystem in home network

In this scenario the requirement from subclause 4.2 is not met.

This is an attractive IMS deployment scenario for operators as it does not rely on the support of any explicit IMS functionality in the visited network; however problems arise through the lack of IPv6 PDP context support in the visited network. As such, operators should wherever possible seek agreements with their roaming partners for the support of IPv6 contexts where IMS roaming is to be supported (this should be the long term objective).

In the event that an IPv6 context is not available in the visited network, the alternatives for the operator are (a) to employ a dual stack IMS and establish an IPv4 IMS session or (b) to use a tunnelling method between the UE and home network. Where an IPv4 IMS session is established between the UE and the IMS this essentially becomes an implementation of scenario 5.2.2.4.6.

Tunneling of IPv6 packets over IPv4 from the UE to the IMS CN subsystem is a technically feasible, although complex, option and there are various issues that would need to be addressed. There would be the need for an IPv4-IPv6 gateway acting as the tunnel end-point responsible for packing/unpacking the IPv6 packets. The UE would need to discover and address it. Also, the UE would need the ability to tunnel the packets. .Further work would be needed on how the UE would address this entity, however existing IETF work (e.g. ISATAP [6]) could be used. This implementation would also lead to increased complexity in the UE and inefficiencies over the air interface as the IPv6 is tunneled over IPv4. In many cases header compression would be applied only to the IPv4 header, but not for the IPv6 header inside. The SBLP mechanisms at the Go interface could not be used between an IPv4 GGSN and an IPv6 P-CSCF. This is therefore not a particularly attractive solution.

Similar considerations like in subclause 5.1.2 apply: one approach is that the UE would initially attempt to establish an IPv6 context to its home GGSN and, if this fails, establish an IPv4 context and tunnel an IPv6 IMS session over IPv4.

It can be concluded that network operators, who introduce 3GPP IMS using IPv6, have a strong interest that their GPRS roaming partners provide support for PDP contexts of PDP type IPv6.

5.2.2.4.3 Roaming - IPv4 visited with GGSN and dual stack IM CN subsystem in home network

UE and SGSN are in the visited network. The GGSN, P-CSCF, I-CSCF and S-CSCF are in the dual stack home network. The visited network does not support IPv6 PDP context.

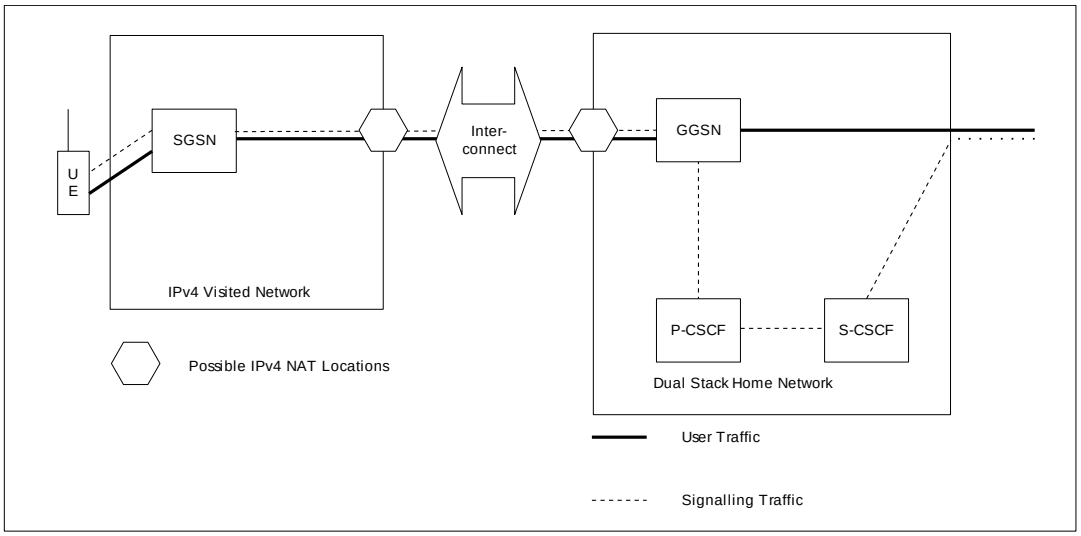

Figure 5-8: Roaming - IPv4 visited with GGSN and dual stack IM CN subsystem in home network

Again, based on the considerations in subclause 4.1 and 5.1.3, UE and P-CSCF cannot use IPv6 for SIP communication, even if both are IPv6 capable. However, in this scenario they can fall back to IPv4, if the UE is dual-stack. In this case similar considerations like in subclause 5.1.2 apply: one approach is that the UE would initially attempt to establish an IPv6 context to its home GGSN and, if this fails, establish an IPv4 context and seek to establish an IPv4 IMS session.

5.2.2.5 Summary of issues arising from the scenarios

The following issues arise from the scenarios presented in subclauses 5.2.2.1 to 5.2.2.4 above:

1 Address translation between private and public IPv4 address spaces;

2 Address translation and protocol translation between IPv4 and IPv6;

3 Routing, address translation and protocol translation for the bearer path;

4 IP version used on the connection between IM CN subsystems, both in roaming and interworking scenarios;

5 IP version used by a dual-stack UE to access the IM CN subsystem in case of IMS roaming;

6 Use of IMS in the home network through GPRS roaming in a network, which does not support IPv6 PDP contexts.

Note: Issue 6 is not directly related to IPv4 based IMS implementations.

5.2.3 IP Version Interworking for Services

5.2.3.1 Application Servers

Any interworking solution needs to consider the support for Application Servers. Application Servers may be dual stack or support only IPv6 or only IPv4.

5.2.3.2 Interworking support in dual stack IM CN subsystem

A dual stack IM CN subsystem and dual stack application servers may provide the necessary support for interworking between IP versions.

In particular, some IMS based services do not involve any media component but are based on SIP signalling only. Important examples are immediate messaging as described in subclause 5.16.1 of 3GPP TS 23.228 [4] and Presence as described in 3GPP TS 23.141 [6]. In such cases SIP signalling does not contain any IP addresses which would require a SIP-ALG. The dual stack IM CN subsystem can provide the necessary interworking: each entity forwards the SIP message using the appropriate IP version. Thus the service can be provided without any additional NAT in the network. This allows e.g. immediate messaging between an IPv4 UE and an IPv6 UE or allows a watcher with an IPv6 UE to subscribe to the presence information of a presentity publishing from a IPv4 UE, or vice versa. This is illustrated in figures 5-x and 5-y below.

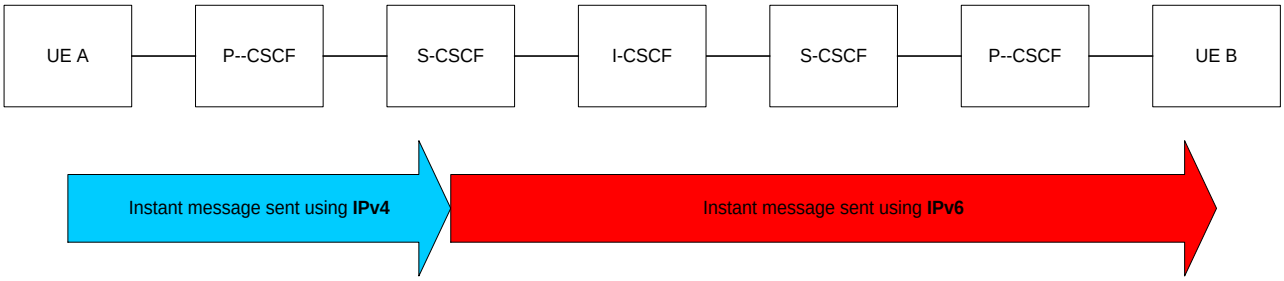

Figure 5-9: Example with dual stack IM CN subsystem and Immediate Messaging

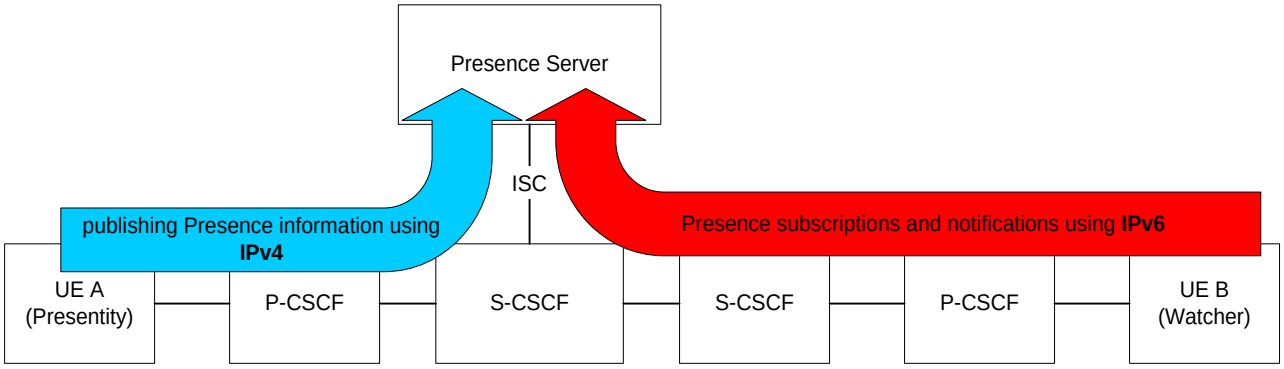

Figure 5-10: Example with dual stack IM CN subsystem and Presence Server

Note: In this scenario, if Presence information contains an IP address, then the IP address is not translated but provided as is to the watcher.

5.3 Migration Scenarios

5.3.1 IPv4 UE and IPv6 IM CN subsystem

Due to migration, there may be cases where some IMS users still connect to the IMS using their IPv4 UE although the IM CN subsystem has evolved from IPv4 to IPv6.

In this case, the P-CSCF needs to support IPv4 towards the UE. An intermediary node between the UE and the P-CSCF would otherwise jeopardise the security association between the UE and P-CSCF.

5.3.2 A partially migrated IPv4 to IPv6 IM CN subsystem

While the final objective is a full scale IPv6 IMS, a combination of IPv4 and IPv6 IM CN subsystem elements may coexist temporarily in the same network due to migration from IPv4 to IPv6. It is for further study how to ensure inter-working in this case.

5.3.3 Migration Aspects for Services

5.3.3.1 Application Servers

Any migration solution needs to consider the support for Application Servers.

5.2.3.2 Migration support in dual stack IM CN subsystem

An IPv4 IM CN subsystem (including application servers), which evolves to a dual stack IM CN subsystem, may provide the necessary support for both IPv4 UEs and IPv6 UEs. The considerations in subclause 5.2.3.2 apply also to this scenario.

Annex A:
Additional Information

This annex contains information that has been investigated during the development of the TR but has been considered not necessary for further development of the work. But the information has been maintained as reference.

A.1 GPRS Deployment scenarios

This section contains GPRS deployment scenarios that are not considered as likely case for IPv4 based IMS deployment.

NOTE: It is understood from the liaison statement from the GSMA to SA2, (reference: S2-033305), that use of GGSN in the home network may initially be operator's preferred option for IM CN subsystem.

Deployment of an infrastructure with GGSN in the visited network has been possible from standards point of view with the early GPRS systems. But from the information available today, it has not been realised yet in the deployed systems. Considering also that there is a growth of functionality interacting with the GGSNs and that the implications of a GGSN in the VPLMN are quite large (operational, charging, feature availability, maintenance, roaming agreements etc.) it seems like the visited GGSN scenarios becomes even more delayed/unlikely.

So, the motivation of upgrading to an IPv6 system seems to be a much more a near term goal then deployment of the GGSN in visited networks. Hence it seems safe to only consider the scenarios where an IPv4 based IMS system always have the GGSN at home.

A.1.1 Roaming scenario – IPv4 only

The call leg is split between different IPv4 networks in a roaming scenario. The GGSN and P-CSCF are in the visited IPv4 network; the I-CSCF and S-CSCF are in the home IPv4 network. The UE in the IPv4 network may be IPv4 only or may be IMS dual stack UE. If either UE is IPv6 only then this scenario can not be supported.

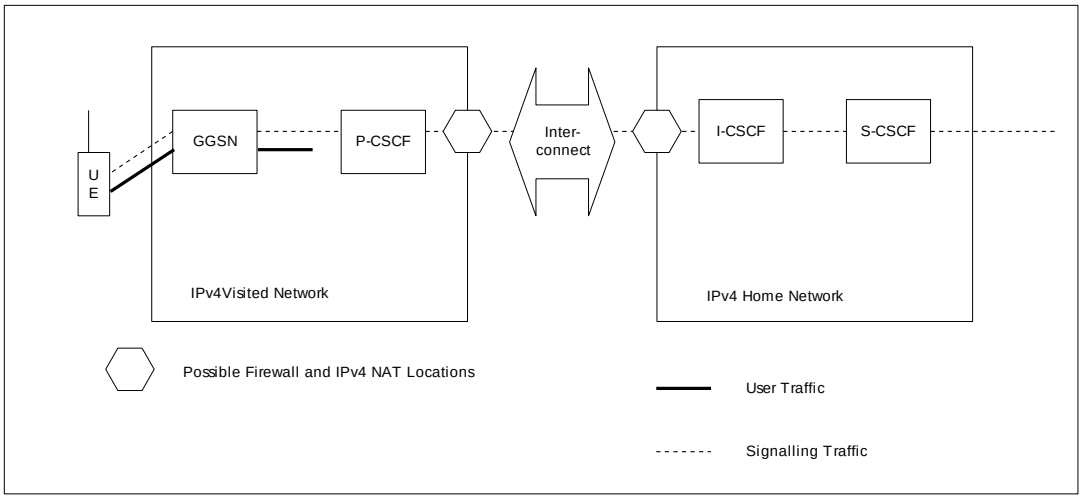

Figure A.1-1: Roaming– IPv4 only

Issues described in subclause 5.2.2.4.1 with respect to routing of bearer path are applicable for this scenario as well.

This scenario is not further considered due to the assumption that GGSN at home is the most likely scenario.

A.1.2 Roaming - IPv4 IM CN subsystem visited with IPv6 IM CN subsystem home

The GGSN and P-CSCF are in the visited IPv4 network; the I-CSCF and S-CSCF are in the home IPv6 network. The UE must support IPv6 in order to interoperate with its Home Network and must support IPv4 in order to interoperate with the IPv4 Visited Network i.e. it is assumed to be IMS dual stack UE. If the UE is IPv6 only (or IPv4 only) then this scenario can not be supported.

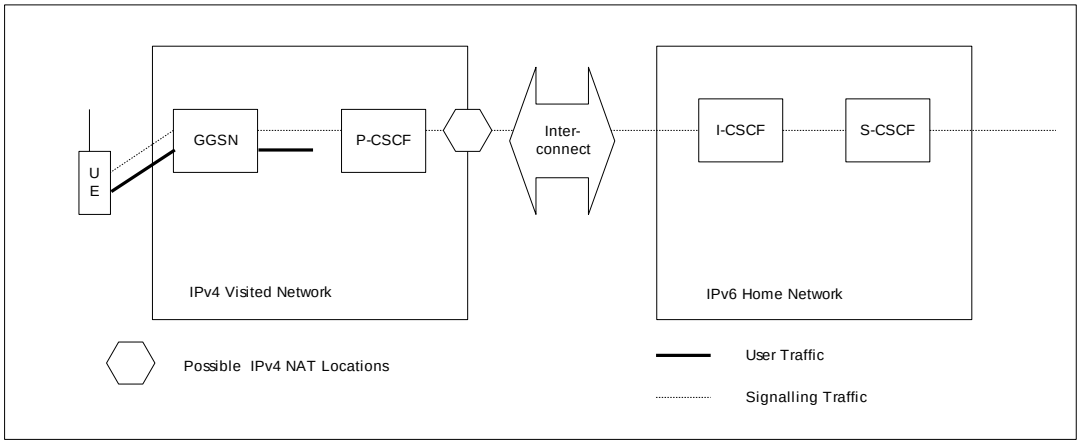

Figure A.1-2: Roaming– IPv4 IM CN subsystem visited with IPv6 IM CN subsystem home

Issues described in subclause 5.2.2.4.1 with respect to routing of bearer path are applicable for this scenario as well.

This scenario assumes an IMS dual stack UE, which can access the visited IM CN subsystem with IPv4, but when at home it uses IPv6 to access the home IM CN subsystem.

This scenario is not further considered due to the assumption that GGSN at home is the most likely scenario.

A.1.3 Roaming - IPv6 IM CN subsystem visited with IPv4 IM CN subsystem home

The GGSN and P-CSCF are in the visited IPv6 network; the I-CSCF and the S-CSCF are in the home IPv4 network. The UE in the IPv6 network must support IPv4 in order to interoperate with its Home Network and must support IPv6 in order to interoperate with the visited network. If the UE is IPv6 only (or IPv4 only) then this scenario can not be supported.

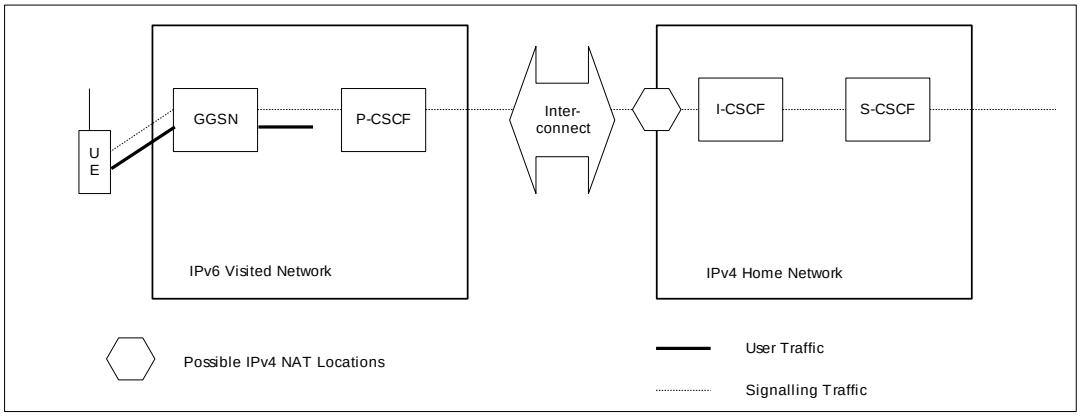

Figure A.1-3: Roaming - IPv6 IM CN subsystem visited with IPv4 IM CN subsystem home

Issues described in subclause 5.2.2.4.1 with respect to routing of bearer path are applicable for this scenario as well.

This scenario assumes an IMS dual stack UE, which can access the visited IM CN subsystem with IPv6, but when at home it uses IPv4 to access the home IM CN subsystem.

This scenario is not further considered due to the assumption that GGSN at home is the most likely scenario.

A.1.4 Roaming - IPv4 IM CN subsystem visited with dual-stack IM CN subsystem home

GGSN and P-CSCF are in the IPv4 visited network. The I-CSCF and S-CSCF are in the home network which supports dual stack. The UE may be IPv4 only or may be IMS dual stack UE. If the UE is IPv6 only then this scenario can not be supported.

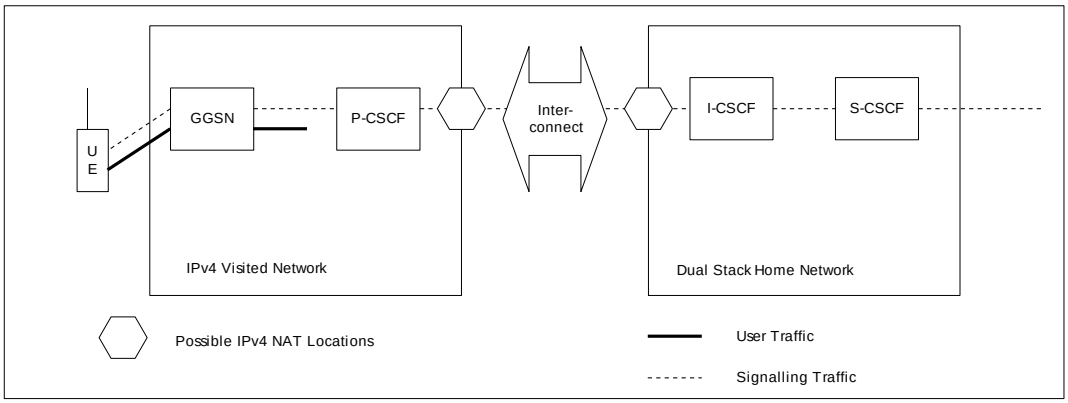

Figure A.1-4: Roaming – IPv4 IM CN subsystem visited with dual stack IM CN subsystem in home network

Issues described in subclause 5.2.2.4.1 with respect to routing of bearer path are applicable for this scenario as well.

This scenario is not further considered due to the assumption that GGSN at home is the most likely scenario.

Annex B: Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2003-10					Initial Draft		0.0.0
2003-11					Included approved documents from SA2#35: S2-033616, S2-033752, S2-033753.	0.0.0	0.1.0
2003-12					Update based on decisions from SA2#36	0.1.0	0.2.0
2004-01					Included approved documents from SA2#37: S2-040405, S2-040406, S2-040407	0.2.0	0.3.0
2004-02					Included approved documents from SA2#38: S2-040830, S2-040973, S2-040975, S2-040976.	0.3.0	0.4.0
2004-03	SA #23	SP-040048			Presentation to SA #23 plenary for information	0.4.0	1.0.0