ETSI TS 129 162 V9.3.0 (2010-01)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Universal Mobile Telecommunications System (UMTS);
LTE;
Interworking between the IM CN subsystem and IP networks
(3GPP TS 29.162 version 9.3.0 Release 9)

Reference
RTS/TSGC-0329162v930

Keywords
GSM, LTE, UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification 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.

1 Scope

The IM CN subsystem interworks with the external IP networks through the Mb reference point.

This document details the interworking between the IM CN subsystem and external IP networks for IM service support. It addresses the issues of control plane interworking and, user plane interworking for specific interworking use cases. Clause 10 describes the IMS-Ix interface requirements in the form of Use Cases which require H.248 protocol procedures. Subclause 10.4 then details the additional Information Elements required to perform the specific procedures.

The IP version Interworking, between IP version 4 RFC 791 [9] and IP version 6 RFC 2460 [10] detailed in terms of the processes and protocol mappings required in order to support both mobile originated and terminated calls.

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 TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[2] IETF RFC 3261: "SIP: Session Initiation Protocol".

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

[4] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[5] 3GPP TS 23.002: "Network architecture".

[6] 3GPP TS 26.235: "Packet switched conversational multimedia applications; Default codecs".

[7] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[8] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[9] IETF RFC 791: "Internet Protocol".

[10] IETF RFC 2460: "Internet Protocol, Version 6 (IPv6) Specification".

[11] IETF RFC 2766: "Network Address Translation - Protocol Translation (NAT-PT)".

[12] IETF RFC 2663: "IP Network Address Translator (NAT) Terminology and Considerations".

[13] 3GPP TR 29.962 version 6.1.0: "Signalling interworking between the 3GPP profile of the Session Initiation Protocol (SIP) and non-3GPP SIP usage".

[14] ITU-T Recommendation H.263: "Video coding for low bit rate communication".

[15] ITU-T Recommendation G.723.1: "Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s".

[16] ITU-T Recommendation G.729: "Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear-prediction (CS-ACELP)".

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

[18] IETF RFC 792: "Internet Control Message Protocol".

[19] IETF RFC 2463: "Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6".

[20] IETF RFC 2765: 'Stateless IP/ICMP Translation Algorithm (SITT)".

[21] 3GPP TS 24.608: "Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM)Core Network (CN) subsystem; Protocol specification'.

[22] IETF RFC 3323: "A Privacy Mechanism for the Session Initiation Protocol (SIP)".

[23] IETF RFC 3325: "Private Extensions to the Session Initiation Protocol (SIP) for Network Asserted Identity within Trusted Networks".

[24] 3GPP TS 24.628: "Protocols for Advanced Networking (TISPAN); Common Basic Communication procedures; Protocol specification".

[25] 3GPP TS 29.238: "Interconnection Border Control Functions – Transition Gateway; H.248 Profile; Stage 3"

[26] ITU-T Recommendation H.248.1 (05): "Gateway Control Protocol: Version 3"

[27] Void

[28] 3GPP TS 23.205: "Bearer-independent circuit-switched core network; Stage 2".

[29] 3GPP TS 29.235: "Interworking between SIP-I based circuit-switched core network and other networks".

[30] IETF RFC 3550: "RTP: A Transport Protocol for Real-Time Applications".

[31] IETF RFC 2474: "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [7] and the following apply:

IM CN subsystem: (IP Multimedia CN subsystem) comprises of all CN elements for the provision of IP multimedia applications over IP multimedia sessions

IP multimedia session: set of multimedia senders and receivers and the data streams flowing from senders to receivers IP multimedia sessions are supported by the IP multimedia CN Subsystem and are enabled by IP connectivity bearers (e.g. GPRS as a bearer). A user may invoke concurrent IP multimedia sessions.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [7] and the following apply: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [7].

BGCF	Breakout Gateway Control Function
IBCF	Interconnect Border Control Function
I-CSCF	Interrogating CSCF
IMS-ALG	IMS - Application Level Gateway
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
MRFP	Multimedia Resource Function Processor
NAT/NAPT	Network Address Translation / Network Address and Port Translation
NA (P) T-PT	Network Address (and Port) Translation - Protocol Translation
P-CSCF	Proxy CSCF
RTCP	Real Time Control Protocol
SCTP	Stream Control Transmission Protocol
SIP UA	SIP User Agent
SIP	Session Initiation Protocol
THIG	Topology Hiding Internetwork Gateway
TrGW	Translation GateWay
WAN	Wide Area Network

4 General

4.1 General interworking overview

The IM CN Subsystem interworks with SIP RFC 3261 [2] based IP Multimedia networks. These IP Multimedia networks include:

- SIP User Agents (UAs);
- SIP Servers.

As such, the IM CN Subsystem has to be able to interwork to all of these above functional entities in the IP multimedia network, as there is a possibility that they all may be involved in an IM session. The general interworking model is shown in figure 1. The SIP based Multimedia networks may use IP version 4 RFC 791 [9] or IP version 6 RFC 2460 [10].

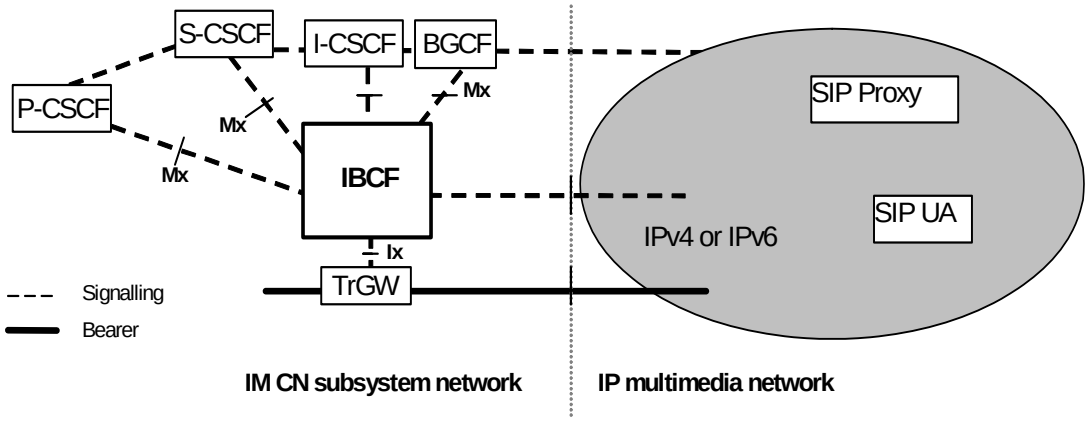


Figure 1: Interworking Model for IM CN Subsystem to IP Multimedia Network

The UE uses the CSCF in order to communicate with the external IP multimedia network entities.

If no IP version interworking or no NAT/NAPT between different realms is required, the CSCF can communicate with SIP UAs in an external IP multimedia network directly.

If no IP version interworking or no NAT/NAPT between different realms is required, the CSCF can also communicate with SIP proxies in an external IP multimedia network directly, which in turn can then communicate with SIP UAs.

To provide the IP version interworking or NAT/NAPT between different realms the functions of an IMS-ALG and a TrGW may be inserted between the CSCF and external IP Multimedia Network by configuration. The IMS-ALG and the TrGW may be implemented as a part of other physical entities in the IMS.

NOTE: Other methods to provide IP version interworking are for further study.

4.2 Interworking scenarios

3GPP specifications design the IM CN subsystem elements and interfaces to exclusively support IPv6.
3GPP TS 23.221 [3] details the interoperability scenarios that an UE may experience when interworking with an external PDN. All of these IP transport layer interworking scenarios can apply to the application layer interworking scenarios detailed in clause 4.2.1.

4.2.1 UE with 3GPP SIP profile capability connecting to an external SIP device

The procedures used by an UE with 3GPP SIP profile to connect to an external SIP device, which may lack 3GPP SIP profile capabilities, have been analysed in Release 6 within 3GPP TR 29.962 [13] and are specified in 3 GPP TS 24.229 [1].

5 Network characteristics

5.1 Key characteristics of IP Multimedia Networks

The Internet is a conglomeration of networks utilising a common set of protocols. IP protocols are defined in the relevant IETF RFCs. The networks topologies may be based on LANs (e.g. Ethernet), Point-to-Point leased lines, PSTN, ISDN, X.25 or WANs using switched technology (e.g. SMDS, ATM).

IP multimedia networks provide the ability for users to invoke IP multimedia applications in order to send and receive (where applicable) voice and data communications. One protocol used to manage IP multimedia sessions is the Session Initiation Protocol (SIP) (RFC 3261 [2]).

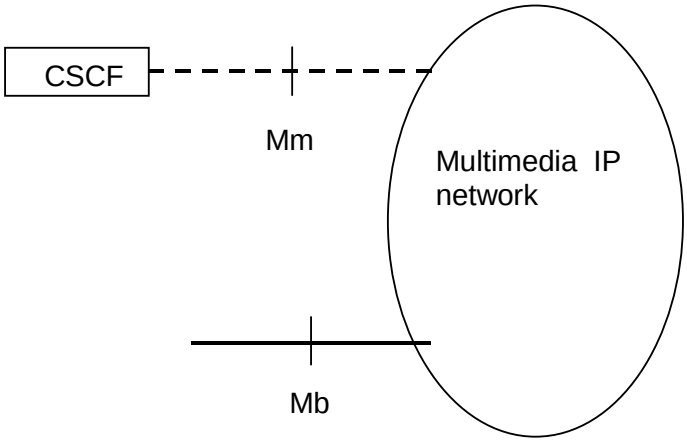
5.2 Key characteristics of UMTS IM CN Subsystem

The UMTS IM CN subsystem uses the SIP protocol to manage IP multimedia sessions, and uses IP as the transport mechanism for both SIP session signalling and media transport.

The UMTS IM CN subsystem shall support interworking with existing fixed and mobile voice and IP data networks, including PSTN, ISDN, Mobile and Internet.

6 Interworking Reference Model for control plane interworking and user plane interworking

Figure 2 details the reference architecture required to support interworking between the IM CN subsystem and IP networks for IM services. Figure 3 details the reference architecture required to support interworking between the IMS and IP SIP networks supporting IP version 4.



NOTE: Multimedia IP networks may be connected via the Mb interface to various network entities, such as an UE (via an GTP Tunnel reaching to the GGSN), an MRFP, or an application server.

Figure 2: IM CN Subsystem to IP network interworking reference Architecture without IP version interworking

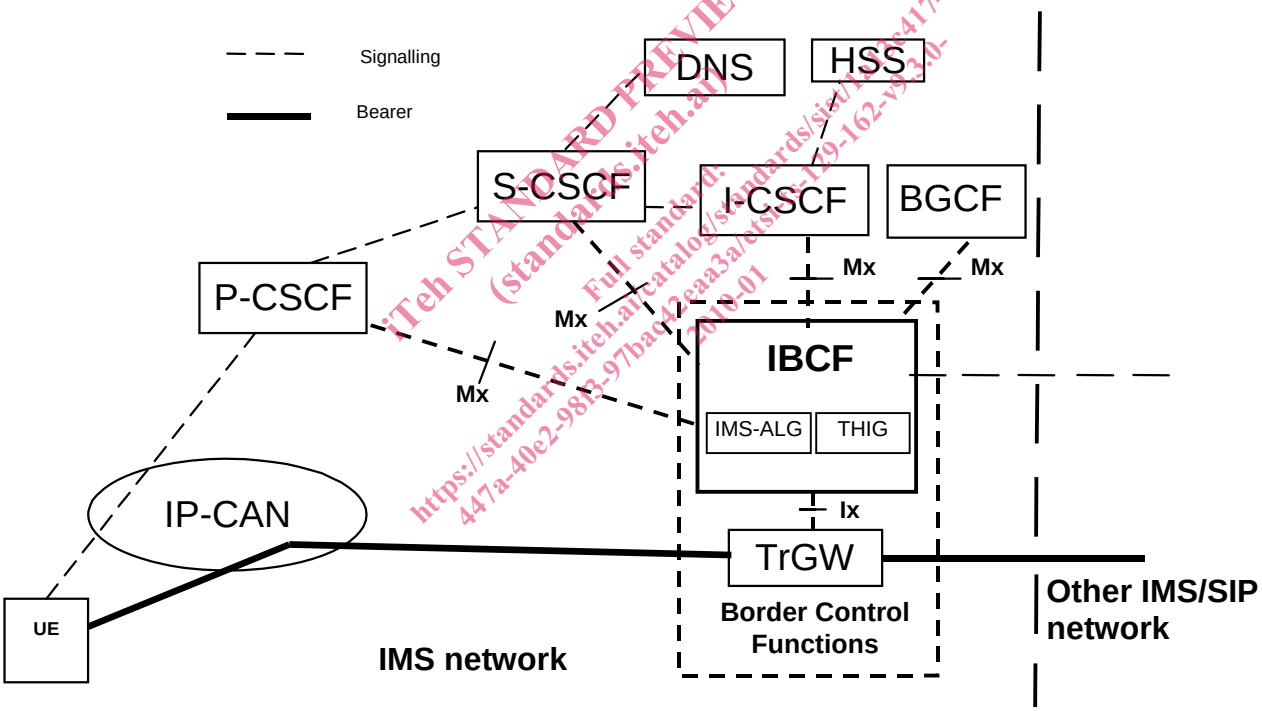


Figure 3: Border Control Functions

Mm reference point: The call control protocol applied to the Mm interface between CSCF and external IP networks is SIP, RFC 3261 [2], as detailed in 3GPP TS 24.229 [1]. SIP extension packages mandated by 3GPP are possibly not supported.

Mb reference point: This interface is defined in 3GPP TS 23.002 [5] and is IP based. Further information is provided in 3GPP TS 29.061 [4] and 3GPP TS 26.235 [6].

Mx reference point: The protocol applied at the Mx reference point is specified in 3GPP TS 24.229 [1].

Ix reference point: The protocol applied at the Ix reference point is specified in 3GPP TS 29.238 [25].

6.1 Interworking Functional Entities

6.1.1 S-CSCF

This entity provides control plane functionality to connect entities following the 3GPP profile of SIP, TS 24.229 [1], and external SIP entities following RFC 3261 [2].

6.1.2 IMS-ALG

IMS-ALG functionality resides in IBCF. An IMS-ALG provides the application level translation function for SIP and SDP in order to communicate between IPv6 and IPv4 SIP applications or, based on operator policies between different realms using the same IP version. The IBCF acts as a B2BUA when it performs IMS-ALG functionality.

6.1.3 TrGW

The TrGW is a NAT-PT/NAPT-PT, which uses a pool of globally unique IPv4 addresses for assignment to IPv6 nodes on a dynamic basis as sessions are initiated across the IP version boundaries. NAT-PT binds addresses in IPv6 network with addresses in IPv4 network and vice versa to provide transparent routing between the two IP domain without requiring any changes to end points. NAPT-PT provides additional translation of transport identifier (TCP, SCTP and UDP port numbers). More detailed information on the NAT-PT/NAPT-PT is given in RFC 2766 [11] and RFC 2663 [12].

The TrGW may provide the NAT/NAPT functionality between two disparate address realms.

7 Control plane interworking

7.1 SIP with 3GPP Profile to Standard SIP Interworking

3GPP TS 24.229 [1] defines the procedures, which allow a 3GPP-IMS UE to connect to a standard SIP terminal.

7.2 Additional interworking of protocol associated with supplementary services

7.2.1 General

This is no impact beyond that specified in subclause 7.1 provided the necessary SIP extensions are supported on both sides of the interworking point unless otherwise specified by subsequent subclause. Based on operator policy and/or service level agreements the interworking of services may be restricted.

Editor"s Note: Impacts when the service is restricted or not supported on one of the interfaces is FFS.

7.2.2 Terminating Identification Presentation (TIP) and Terminating Presentation Restriction (TIR)

See 3GPP TS 24.608 [21] for a description of the service.

If the other IP network is a trusted network and the RFC 3323 [22] and RFC 3325 [23] are supported the following header fields shall be forwarded without changes:

- P-Asserted-Identity header field; and
- Privacy header field.