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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 and user plane interworking.

The control plane interworking, of standard SIP [2] to SIP with 3GPP profile (3GPP TS 24.229 [1]) is detailed in terms of the processes and protocol mappings required in order to support both mobile originated and terminated calls.

Other areas addressed encompass mapping of bearer capabilities and QoS information.

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.

[1]   3GPP TS 24.229: " IP Multimedia Call Control Protocol based on SIP and SDP ".

[2]   IETF RFC 2543: "SIP: Session Initiation Protocol".

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

[4]   3GPP TS 29.061: "Packet Domain; Interworking between the Public Land Mobile Network (PLMN) supporting Packet Based Services and Packet Data Networks (PDNs)"

[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".

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: an IP multimedia session is a 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.

3.3 Abbreviations

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

CSCF   Call Session Control Function
GTP   GPRS Tunnelling Protocol
IETF STD   Internet Engineering Task Force Standard
IM   IP Multimedia
IP   Internet Protocol
IPv6   IP version 6
LAN   Local Area Network
MEGACO   MEdia GAteway COntrol
MRFC   Multimedia Resource Function Controller
MRFP   Multimedia Resource Function Processor
PDN   Packet Data Network
QoS   Quality of Service
S-CSCF   Serving-CSCF
SIP UA   SIP User Agent
SIP   Session Initiation Protocol
UE   User Equipment
WAN   Wide Area Network

4 General

4.1 General Interworking Overview

The IM CN Subsystem shall interwork with SIP [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.
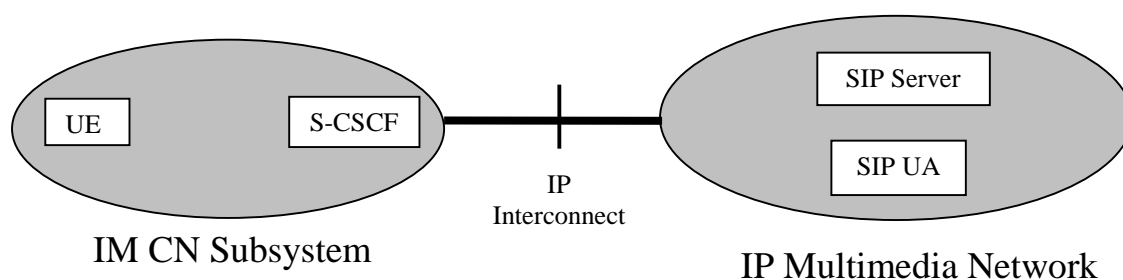
Figure 1: Interworking Model for IM CN Subsystem to IP Multimedia Network

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

It shall be possible for the CSCF to communicate with SIP UAs directly.

It shall be possible for the CSCF to communicate with SIP Servers directly, which in turn can then communicate with SIP UAs.

4.2 Interworking Scenarios

A 3GPP UE with SIP capability shall exclusively support IPv6 for the connection to services provided by the IM CN subsystem. 3GPP TS 23.221 [3] details the interoperability scenarios that an IPv6 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 below.

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

Editors Note: The section details the scenarios where external SIP device have various SIP limitations. Such scenarios are currently being investigated within the Technical Report "Signalling Interworking between the 3GPP Profile of SIP and non-3GPP SIP Usage".

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 STD specifications and 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) [1], which is standardised by the IETF.

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.
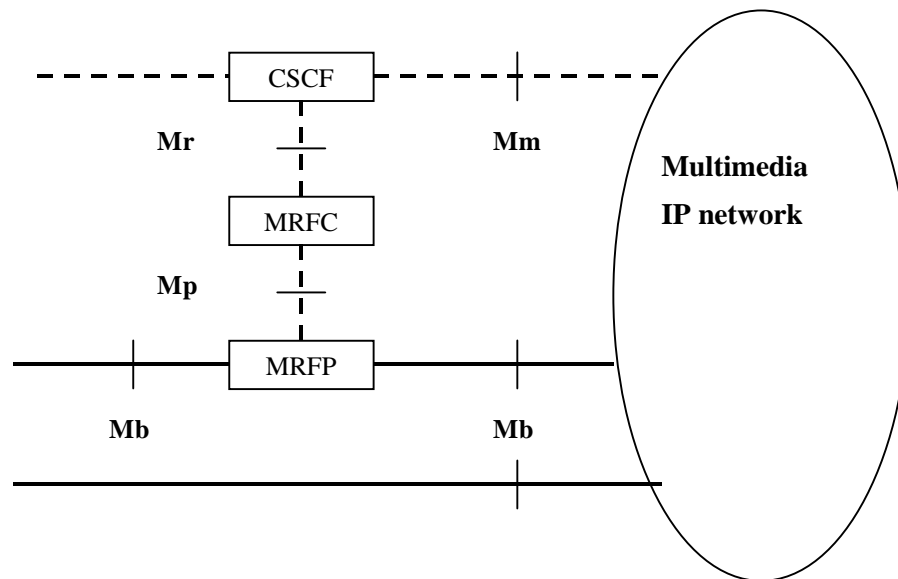
6 Interworking with IP networks

6.1 Interworking Reference Model

The diagram shown in 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 details the reference architecture required to support interworking between the IM CN subsystem and IP networks for IM services and is taken from 3GPP TS 23.002 [5].

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 ref. architecture

Protocol for Mm. The single call control protocol applied to the Mm interface between CSCF and external IP networks will be standard SIP [2] as defined in IETF. SIP extension packages mandated by 3GPP are possibly not supported.

Protocol for Mb. This interface 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].

Protocol for Mr. This interface is detailed in 3GPP TS 24.229 [1].

Protocol for Mp. This interface is defined in 3GPP TS 23.002 [5].

6.1.1 Interworking Functional Entities

6.1.1.1 S-CSCF

This entity provides the control plane interworking functionality between SIP with 3GPP profile [1], and standard SIP [2].

Editors note: This assumption may require revisions when a network entity for this task has been selected in stage 2 work.

6.1.1.2 MRFP

This entity may be used to provide used plane transcoding within the IM CN subsystem.

6.1.1.3 MRFC

This entity controls the MRFP via the Mp interface.

6.2 Control Plane Interworking Model

6.2.1 IM CN Subsystem Originated Calls

Calls which originate in the IM CN subsystem, shall be required to interwork to standard SIP [2] based IP Multimedia network domains at the control plane level within the UMTS IM Subsystem domain.

- For calls terminating in SIP based IP networks, then control plane interworking shall be supported via the Mm reference interface (S-CSCF to external IP multimedia networks).

6.2.2 IM CN Subsystem Terminated Calls

Calls which terminate in the IM CN Subsystem, shall be required to interwork to standard SIP [2] based IP Multimedia network domains at the control plane level within the UMTS IM Subsystem domain.

- For calls originating in SIP based IP networks, then control plane interworking shall be supported via the Mm reference interface (S-CSCF to external IP multimedia networks).
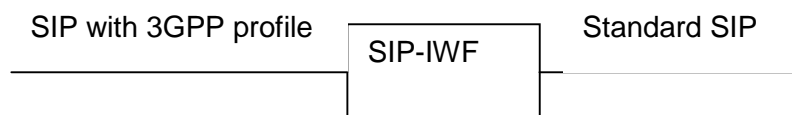
6.2.3 Abstract Control Plane Interworking Model.

The SIP-Interworking-Function (SIP-IWF) interworks between standard SIP [2] and SIP with 3GPP profile [1] and is shown in Figure 3.

Figure 3:The SIP-Interworking-Function

Editors Note: It is not yet decided in stage 2 work which IM CN subsystem network entity will provide the SIP-IWF.

6.3 User Plane Interworking Model

The Mb interface is used to provide the user plane within the IM CN subsystem and towards external IP Multimedia network domains.

A MRFP may be inserted in the user plane. The MRFP provides support for bearer related services such as multi-party sessions, announcements to a user or transcoding.

7 Control Plane Interworking

7.1 SIP with 3GPP Profile to Standard SIP Interworking

Editors Note: CN3 have created a Technical Report on "Signalling Interworking between the 3GPP Profile of SIP and non-3GPP SIP Usage". This will be used to investigate the interworking between the 3GPP profile of SIP and standard SIP and provide possible solutions to issues that may arise due to interworking.

8 User Plane Interworking

8.1 Overview

The present specification addresses user plane interworking between codec types used for either speech or video. Codecs used for conversational services in the PS domain are as defined in 3GPP TS 26.235. Codecs of particular interest are described in Annex B

8.2 Transparent User Plane

The user plane may be transported through the IM CN subsystem without being processed by any IM CN subsystem entity.

8.3 Non Transparent User Plane

The MRFP may provide transcoding of the user plane if a codec mismatch occurs.

Annex A (informative):
Interworking between IPv6 and IPv4

For IPv4/IPv6 interworking purposes it is proposed to have the following functionalities and interfaces with protocols in the IMS:

- A NAT-PT device able to translate the IP headers between different IP protocols and able to provide IPv4 addresses from its pool, when required

- A new functionality in IMS for IPv4/IPv6 interworking purposes on SIP control plane
  The allocation of the new functionality to a network element is for further study

- A control protocol between the network element providing the new functionality and NAT-PT for the purpose of communication between the two entities. The use of MEGACO is ffs.

- Support for DNS ALG in the IMS local name server

Annex B (informative):
Codecs used for Conversational Services

For codecs for conversational services in the PS domain are defined according to 3GPP TS 26.235 [6]. These include:

- Narrowband speech: The support of the AMR codec is mandated.

- For wideband speech: The support of the AMR-WB codec is mandated

- For video: The support of the H.263 profile 0 level 10 v1 is mandated, and the support of MPEG4 visual sp @ level 0 and H.263 profile 3 level 10 are optional.

In non-3GPP SIP networks there are no mandatory codecs. However, the following codecs are of interest:
- Narrowband speech: G.723.1, G.729 and G.711 are known to be commonly deployed.
- Video codecs: H.263 and MPEG4 are expected to be used.

Annex C (informative):
Change history

It is usual to include an annex (usually the final annex of the document) for specifications under TSG change control, which details the change history of the specification using a table as follows:

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2001-02					Version 0.0.0 Presented to CN3 #16 - Sophia Antipolis - Initial Proposal - TS 29.162 number allocated by MCC		0.0.0
2001-05					Tdocs N3-010226 and N3-010200 agreed at CN3#17 - Rio Grande, Puerto Rico		0.1.0
2001-10					Tdoc N3-010331 agreed at CN3#18 - Dresden, Germany	0.1.0	0.2.0
2001-10					Revised TS based on decision within CN3#19 to reduce the scope of Work Item - as proposed in Tdoc N3-010425. Clean version based on changes agreed in N3-010479 at Cn3#19 -Brighton, UK.	0.2.0	0.3.0
2001-11					Added informative Annex A about interworking between IPv4 and IPv6, as agreed in Cn3#20 Cancun.	0.3.0	0.4.0
2002-01					Included N3-020094, N3-020104, and tidied editors notes.	0.4.0	0.5.0
2002-02					Editorial changes agreed in CN3#21, Sophia Antipolis.	0.5.0	0.6.0
2002-02					DAB, MCC some minor editorials	0.6.0	0.6.1
2002-03					Presented as v1.0.0 to TSG#15 for information	0.6.1	1.0.0

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