

# ETSI TS 123 228 V15.5.0 (2022-01)



**Digital cellular telecommunications system (Phase 2+) (GSM);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
IP Multimedia Subsystem (IMS);  
Stage 2  
(3GPP TS 23.228 version 15.5.0 Release 15)**

<https://standards.iteh.ai/catalog/standards/sist/d8210ff5-7333-42ab-9b65-fb398322510/etsi-ts-123-228-v15-5-0-2022-01>



---

**Reference**

RTS/TSGS-0223228vf50

---

**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 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

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

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

---

**Notice of disclaimer & limitation of liability**

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2022.  
All rights reserved.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

## Legal Notice

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. These shall be interpreted as being references to the corresponding ETSI deliverables. (2022-01)

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

---

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	15
1 Scope .....	16
2 References .....	16
3 Definitions, symbols and abbreviations .....	20
3.1 Definitions .....	20
3.2 Symbols.....	22
3.3 Abbreviations .....	23
4 IP multimedia subsystem concepts.....	24
4.0 General .....	24
4.1 Relationship to CS domain and the IP-Connectivity Access Network.....	25
4.2 IMS services concepts .....	26
4.2.1 Home-network based services .....	26
4.2.1.1 Support of CAMEL or IN .....	26
4.2.1.2 Support of OSA.....	26
4.2.1.3 Dynamic services interactions handling.....	26
4.2.1.3.1 Service information exchanged between Application Servers .....	26
4.2.1.3.2 Handling by the Application Server .....	26
4.2.1.3.3 Deletion of services interaction information .....	26
4.2.2 Support of numbers in non-international format in the IMS.....	27
4.2.3 Support of roaming users .....	27
4.2.4 IP multimedia Subsystem Service Control Interface (ISC) .....	29
4.2.4a HSS to service platform Interface .....	31
4.2.4b S-CSCF Service Control Model.....	33
4.2.4c I-CSCF to AS reference point (Ma).....	34
4.2.5 The QoS requirements for an IM CN subsystem session.....	35
4.2.6 QoS Requirements for IM CN subsystem signalling .....	36
4.2.7 Support of SIP forking.....	37
4.2.7.1 SIP Forking .....	37
4.2.7.2 Forking within and outside the IM CN Subsystem .....	37
4.2.7.3 Support for forked requests .....	38
4.3 Naming and addressing concepts .....	38
4.3.1 Address management.....	38
4.3.2 Void .....	38
4.3.3 Identification of users .....	38
4.3.3.0 General .....	38
4.3.3.1 Private User Identities .....	38
4.3.3.2 Public User Identities .....	39
4.3.3.2a Globally Routable User Agent URI (GRUU) .....	40
4.3.3.2a.1 Architecture Requirements .....	40
4.3.3.2b Wildcarded Public User Identity .....	41
4.3.3.3 Routing of SIP signalling within the IP multimedia subsystem .....	41
4.3.3.3a Handling of dialled number formats .....	42
4.3.3.3b Termination of session with the TEL URI format Public User Identity.....	42
4.3.3.4 Relationship of Private and Public User Identities .....	42
4.3.3.5 Relationship of Public User Identities, GRUUs, and UEs .....	43
4.3.4 Identification of network nodes .....	44
4.3.5 E.164 address to SIP URI resolution in an IM CN subsystem.....	44
4.3.5.1 ENUM/DNS translation mechanism .....	44
4.3.5.2 Handling of Tel URIs.....	44
4.3.5.3 Handling of SIP URIs representing a telephone number .....	45
4.3.6 Public Service Identities .....	45

4.4	Signalling concepts.....	45
4.5	Mobility related concepts .....	46
4.6	Roles of Session Control Functions .....	47
4.6.0	General.....	47
4.6.1	Proxy-CSCF.....	47
4.6.2	Interrogating-CSCF .....	48
4.6.2.0	General .....	48
4.6.2.1	Void.....	48
4.6.3	Serving-CSCF.....	48
4.6.4	Breakout Gateway Control Function .....	51
4.6.5	Void .....	51
4.7	Multimedia Resource Function .....	51
4.7a	Media Resource Broker.....	53
4.8	Security Concepts.....	53
4.9	Charging Concepts .....	53
4.10	IMS group management concepts .....	53
4.10.0	General.....	53
4.10.1	IMS group administration.....	53
4.10.2	Group identifiers.....	53
4.11	Relationship to 3GPP Generic User Profile (GUP).....	53
4.12	Network Address Translation traversal in access network.....	54
4.13	Identification of IMS communication Services.....	54
4.13.1	General.....	54
4.13.2	Identification of IMS communication Services .....	54
4.13.3	Identification of IMS applications .....	56
4.14	Border Control concepts.....	57
4.15	IMS in transit network scenarios.....	57
4.15.1	General concepts.....	57
4.15.2	IMS transit network configurations .....	58
4.15.3	Providing IMS application services in transit network scenarios .....	58
4.15a	Roaming Architecture for Voice over IMS with Local Breakout.....	59
4.15b	Roaming Architecture for Voice over IMS with home routed traffic .....	60
4.16	Support of multimedia telephony .....	60
4.16.1	Telephony Application Server .....	60
4.16.2	Identification of multimedia telephony .....	60
4.16.3	Session setup principles.....	60
4.17	Support of short message service .....	61
4.17.1	IP Short Message Gateway (IP-SM-GW).....	61
4.18	Support of Number portability .....	61
4.18.1	Number portability.....	61
4.19	Support of Preferred Circuit Carrier Access and Per Call Circuit Carrier Selection .....	62
4.19.1	Preferred Circuit Carrier Access and Per Call Circuit Carrier Selection .....	62
4.20	Support of IMS Service Centralization and Continuity.....	62
4.21	Support of Overlap Signalling.....	62
4.22	Support of Explicit Congestion Notification (ECN) .....	62
4.22.1	General.....	62
4.22.2	CS GERAN/UTRAN Interworking at MGCF/IM-MGW.....	63
4.22.3	Interworking with non-ECN IP network and/or terminal at IBCF/TrGW .....	63
4.22.4	Interworking with non-3GPP ECN IP terminal at IBCF/TrGW .....	64
4.22.5	ECN support at IMS-ALG/IMS-AGW .....	64
4.22.6	ECN support at MRFC/MRFP.....	65
4.22.7	CS GERAN/UTRAN Interworking at the MSC Server enhanced for ICS/MSC Server enhanced for SRVCC with SIP/CS-MGW .....	65
4.23	Support of Load Balancing.....	65
4.23.1	General.....	65
4.23.2	Registration-based load balancing of S-CSCFs .....	65
4.23.3	Registration independent load balancing of Transit Functions .....	66
4.24	Support of Restoration Procedures.....	66
4.25	Support of Overload Control .....	66
4.25.1	General.....	66
4.25.2	Next-hop monitoring of overload .....	66
4.25.3	Filter based Overload Control.....	67

4.26	Support for Business Trunking.....	67
5	IP multimedia subsystem procedures.....	67
5.0	General.....	67
5.0a	Session-unrelated procedures.....	68
5.1	CSCF related procedures.....	68
5.1.0	Establishing IP-Connectivity Access Network bearer for IM CN Subsystem Related Signalling.....	68
5.1.1	Procedures related to Proxy-CSCF discovery.....	68
5.1.1.0	General.....	68
5.1.1.1	DHCP/DNS procedure for P-CSCF discovery.....	68
5.1.1.2	Void.....	69
5.1.2	Procedures related to Serving-CSCF assignment.....	69
5.1.2.1	Assigning a Serving-CSCF for a user.....	69
5.1.2.2	Cancelling the Serving-CSCF assignment.....	70
5.1.2.3	Void.....	70
5.1.3	Procedures related to Interrogating-CSCF.....	70
5.1.4	Procedures related to Proxy-CSCF.....	71
5.1.5	Subscription Updating Procedures.....	71
5.1.5.0	General.....	71
5.1.5.1	Subscription updating information flow.....	71
5.2	Application level registration procedures.....	71
5.2.0	General.....	71
5.2.1	Requirements considered for registration.....	71
5.2.1a	Implicit Registration.....	73
5.2.1a.0	General.....	73
5.2.1a.1	Implicit Registration for UE without ISIM or IMC.....	74
5.2.2	Registration flows.....	74
5.2.2.1	Requirements to consider for registration.....	74
5.2.2.2	Assumptions.....	74
5.2.2.3	Registration information flow – User not registered.....	75
5.2.2.4	Re-Registration information flow – User currently registered.....	76
5.2.2.5	Stored information.....	78
5.3	Application level de-registration procedures.....	79
5.3.1	Mobile initiated de-registration.....	79
5.3.2	Network initiated de-registration.....	80
5.3.2.0	General.....	80
5.3.2.1	Network Initiated Application (SIP) De-registration, Registration Timeout.....	81
5.3.2.2	Network Initiated Application (SIP) De-registration, Administrative.....	81
5.3.2.2.0	General.....	81
5.3.2.2.1	Network Initiated De-registration by HSS, administrative.....	82
5.3.2.2.2	Network Initiated De-registration by Service Platform.....	82
5.4	Procedures for IP multi-media sessions.....	84
5.4.0	General.....	84
5.4.1	Bearer interworking concepts.....	84
5.4.2	Interworking with Internet.....	84
5.4.2a	IP version interworking.....	84
5.4.3	Interworking with PSTN.....	85
5.4.4	Requirements for IP multi-media session control.....	86
5.4.5	Session Path Information.....	86
5.4.5.1	Session Path Information during Registration and Session Initiation.....	86
5.4.5.2	P-CSCF in the Session Path.....	86
5.4.5.3	S-CSCF in the Session Path.....	87
5.4.6	End-user preferences and terminal capabilities.....	87
5.4.6.0	General.....	87
5.4.6.1	Objectives.....	87
5.4.6.2	End-user expectations.....	87
5.4.6.3	Mechanism for bearer establishment.....	88
5.4.6.4	Session progress indication to the originating UE.....	90
5.4.7	Interaction between QoS and session signalling.....	90
5.4.7.0	General.....	90
5.4.7.1	Authorize QoS Resources.....	91
5.4.7.1a	Resource Reservation with Policy and Charging Control.....	91

5.4.7.2	Enabling of Media Flows .....	92
5.4.7.3	Disabling of Media Flows .....	92
5.4.7.4	Revoke Authorization for IP-Connectivity Access Network and IP Resources.....	92
5.4.7.5	Indication of IP-Connectivity Access Network bearer release.....	92
5.4.7.6	Authorization of IP-Connectivity Access Network bearer modification.....	92
5.4.7.7	Indication of IP-Connectivity Access Network bearer modification .....	93
5.4.7.8	Sharing of Resources for Network Detected Concurrent Sessions .....	93
5.4.7.8.1	Network Detected Concurrent Sessions .....	93
5.4.7.8.2	Initiating Resource Sharing for Network Detected Concurrent Sessions .....	93
5.4.7.8.3	Void.....	94
5.4.7.9	Priority sharing for concurrent sessions .....	94
5.4.8	QoS-Assured Preconditions.....	94
5.4.9	Event and information distribution .....	95
5.4.9.0	General .....	95
5.4.9.1	Subscription to event notifications .....	96
5.4.10	Void .....	98
5.4.11	Signalling Transport Interworking.....	98
5.4.12	Configuration and Routing principles for Public Service Identities .....	98
5.4.12.0	General .....	98
5.4.12.1	PSIs on the originating side.....	98
5.4.12.2	PSIs on the terminating side.....	98
5.4.12.3	Subdomain based PSIs .....	99
5.4.12.4	PSI configuration in the HSS .....	99
5.4.12.5	Requests originated by the AS hosting the PSI.....	99
5.4.13	Transcoding concepts .....	100
5.4a	Overview of session flow procedures.....	100
5.4a.1	End-to-End session flow procedures .....	100
5.4a.2	Transit network session flow procedures.....	103
5.5	Serving-CSCF/MGCF to serving-CSCF/MGCF procedures .....	105
5.5.0	General.....	105
5.5.1	(S-S#1) Different network operators performing origination and termination .....	105
5.5.2	(S-S#2) Single network operator performing origination and termination .....	107
5.5.3	(S-S#3) Session origination with PSTN termination in the same network as the S-CSCF.....	110
5.5.4	(S-S#4) Session origination with PSTN termination in a different network from the S-CSCF .....	112
5.6	Origination procedures .....	114
5.6.0	General.....	114
5.6.1	(MO#1) Mobile origination, roaming .....	114
5.6.2	(MO#2) Mobile origination, home .....	117
5.6.3	(PSTN-O) PSTN origination.....	119
5.6.4	(NI-O) Non-IMS Origination procedure from an external SIP client.....	120
5.6.5	Application Server Origination Procedure.....	122
5.6.5.1	(AS-O) Origination at Application Server .....	122
5.6.5.2	Void.....	124
5.6.5.3	S-CSCF selection by I-CSCF for AS Originating call procedures.....	124
5.7	Termination procedures.....	126
5.7.0	General.....	126
5.7.1	(MT#1) Mobile termination, roaming.....	126
5.7.2	(MT#2) Mobile termination, home .....	129
5.7.2a	(MT#3) Mobile termination, CS Domain roaming .....	131
5.7.3	(PSTN-T) PSTN termination .....	131
5.7.4	(NI-T) Non-IMS Termination to an external SIP client.....	133
5.7.5	(AS-T#1) PSI based Application Server termination – direct.....	135
5.7.6	(AS-T#2) PSI based Application Server termination – indirect.....	135
5.7.7	(AS-T#3) PSI based Application Server termination – DNS routing .....	136
5.7.8	(AST#4) Termination at Application Server based on service logic .....	137
5.7a	Procedures for the establishment of sessions without preconditions.....	138
5.7a.1	General.....	138
5.7a.2	Procedures for the establishment of sessions without preconditions - no resource reservation required before session becomes active .....	140
5.7a.3	Void .....	142
5.8	Procedures related to routing information interrogation.....	142
5.8.0	General.....	142

5.8.1	User identity to HSS resolution .....	142
5.8.2	SLF on register .....	143
5.8.3	SLF on UE invite .....	144
5.8.4	SLF on AS access to HSS.....	145
5.9	Routing of mid-session signalling .....	145
5.10	Session release procedures .....	146
5.10.0	General.....	146
5.10.1	Terminal initiated session release .....	146
5.10.2	PSTN initiated session release.....	148
5.10.3	Network initiated session release.....	149
5.10.3.0	Removal of IP-CAN bearers used to transport IMS SIP signalling .....	149
5.10.3.1	Network initiated session release - P-CSCF initiated.....	149
5.10.3.1.0	General .....	149
5.10.3.1.1	Network initiated session release - P-CSCF initiated – after removal of IP-Connectivity Access Network bearer.....	150
5.10.3.1.2	Void.....	151
5.10.3.2	Network initiated session release - S-CSCF Initiated .....	151
5.11	Procedures to enable enhanced multimedia services .....	152
5.11.1	Session Hold and Resume Procedures .....	152
5.11.1.0	General .....	152
5.11.1.1	Mobile-to-Mobile Session Hold and Resume Procedures.....	152
5.11.1.2	Mobile-initiated Hold and Resume of a Mobile-PSTN Session.....	154
5.11.1.3	PSTN-initiated Hold and Resume of a Mobile-PSTN Session .....	156
5.11.2	Procedures for anonymous session establishment .....	158
5.11.2.0	General .....	158
5.11.2.1	Signalling requirements for anonymous session establishment .....	158
5.11.2.2	Bearer path requirements for anonymous session establishment .....	158
5.11.3	Procedures for codec and media characteristics flow negotiations .....	158
5.11.3.0	General .....	158
5.11.3.1	Codec and media characteristics flow negotiation during initial session establishment .....	159
5.11.3.2	Codec or media characteristics flow change within the existing reservation .....	162
5.11.3.3	Codec or media characteristics flow change requiring new resources and/or authorization .....	163
5.11.3.4	Sample MM session flow - addition of another media.....	166
5.11.4	Procedures for providing or blocking identity .....	169
5.11.4.0	General .....	169
5.11.4.1	Procedures for providing the authenticated identity of the originating party .....	169
5.11.4.2	Procedures for blocking the identity of the originating party.....	171
5.11.4.3	Procedures for providing the authenticated identity of the originating party (PSTN origination) .....	172
5.11.4.4	Procedures for providing the authenticated identity of the originating party (PSTN termination) .....	172
5.11.5	Session Redirection Procedures .....	172
5.11.5.0	General .....	172
5.11.5.1	Session Redirection initiated by S-CSCF to IMS.....	172
5.11.5.2	Session Redirection to PSTN Termination (S-CSCF #2 forwards INVITE) .....	173
5.11.5.2a	Session Redirection to PSTN Termination (REDIRECT to originating UE#1).....	174
5.11.5.3	Session Redirection initiated by S-CSCF to general endpoint (REDIRECT to originating UE#1) .....	176
5.11.5.4	Session Redirection initiated by P-CSCF.....	177
5.11.5.5	Session Redirection initiated by UE.....	178
5.11.5.6	Session Redirection initiated by originating UE#1 after Bearer Establishment (REDIRECT to originating UE#1) .....	179
5.11.6	Session Transfer Procedures .....	180
5.11.6.0	General .....	180
5.11.6.1	Refer operation.....	180
5.11.6.2	Application to Session Transfer Services.....	182
5.11.6.2.0	General .....	182
5.11.6.2.1	Blind Transfer and Assured Transfer .....	182
5.11.6.2.2	Consultative Transfer .....	183
5.11.6.2.3	Three-way Session.....	183
5.12	Mobile Terminating call procedures to unregistered Public User Identities .....	184
5.12.0	General.....	184
5.12.1	Mobile Terminating call procedures to unregistered Public User Identity that has services related to unregistered state .....	184

5.12.2	Mobile Terminating call procedures to unregistered Public User Identity that has no services related to unregistered state .....	186
5.13	IMS Emergency Sessions .....	186
5.14	Interactions involving the MRFC/MRFP .....	186
5.14.0	General.....	186
5.14.1	Interactions between the UE and the MRFC.....	186
5.14.2	Service control based interactions between the MRFC and the AS .....	187
5.14.3	Interactions for services using both the Ut interface and MRFC capabilities.....	187
5.14.4	Transcoding services involving the MRFC/MRFP.....	187
5.15	Mobile Terminating session procedure for unknown user .....	188
5.15.0	General.....	188
5.15.1	Unknown user determined in the HSS.....	188
5.15.2	Unknown user determined in the SLF .....	189
5.16	IMS messaging concepts and procedures .....	189
5.16.0	General.....	189
5.16.1	Immediate Messaging .....	189
5.16.1.0	General .....	189
5.16.1.1	Procedures to enable Immediate Messaging .....	190
5.16.1.1.0	General .....	190
5.16.1.1.1	Immediate messaging procedure to registered Public User Identity.....	190
5.16.1.1.2	Immediate messaging procedure to unregistered Public User Identity.....	191
5.16.1.2	Immediate messages with multiple recipients.....	192
5.16.2	Session-based Messaging .....	192
5.16.2.0	General .....	192
5.16.2.1	Architectural principles.....	192
5.16.2.2	Procedures to enable Session based Messaging .....	193
5.16.2.2.0	General .....	193
5.16.2.2.1	Session based messaging procedure to registered Public User Identity .....	193
5.16.2.2.2	Session based messaging procedure using multiple UEs .....	194
5.16.2.2.3	Session based messaging procedure with an intermediate node.....	197
5.16.2.2.4	Session based messaging release procedure .....	198
5.16.2.2.5	Session based messaging release procedure with an intermediate node.....	199
5.17	Refreshing sessions .....	199
5.18	Void.....	200
5.19	Support for Transit scenarios in IMS .....	200
5.19.1	General.....	200
5.19.2	Providing IMS application services in transit network scenarios .....	203
5.20	Procedures for Assigning, Using, and Processing GRUUs .....	203
5.20.1	UE.....	203
5.20.1.1	Obtaining a GRUU during registration .....	203
5.20.1.2	Using a GRUU .....	204
5.20.1.3	Using a GRUU while requesting Privacy.....	204
5.20.2	Serving-CSCF.....	204
5.20.2.1	Allocating a GRUU during registration .....	204
5.20.2.2	Using a GRUU .....	204
5.20.3	Interrogating-CSCF .....	205
5.20.3a	HSS .....	205
5.20.4	Elements other than UE acting as a UA.....	205
5.20.4.1	Using a GRUU .....	205
5.20.4.2	Assigning a GRUU .....	205
5.21	IMS Multimedia Priority Services Procedures .....	205
5.22	Support of Overload Control .....	206
5.22.1	Next-hop monitoring of overload .....	206
5.22.2	Filter based Overload Control.....	207
<b>Annex A (Informative):</b>	<b>Information flow template .....</b>	<b>208</b>
<b>Annex B (Informative):</b>	<b>Void .....</b>	<b>210</b>
<b>Annex C (Informative):</b>	<b>Void .....</b>	<b>211</b>
<b>Annex D (Informative):</b>	<b>Void .....</b>	<b>212</b>

<b>Annex E (Normative):</b>	<b>IP-Connectivity Access Network specific concepts when using GPRS and/or EPS to access IMS .....</b>	<b>213</b>
E.0	General .....	213
E.1	Mobility related concepts .....	213
E.1.0	General .....	213
E.1.1	Procedures for P-CSCF discovery .....	214
E.1.1.0	General .....	214
E.1.1.1	GPRS/EPS procedure for P-CSCF discovery .....	214
E.1.2	Support for Enhanced Coverage for data centric UEs .....	215
E.2	QoS related concepts .....	216
E.2.1	Application Level Signalling for IMS .....	216
E.2.1.0	General .....	216
E.2.1.1	QoS Requirements for Application Level Signalling .....	216
E.2.1.2	Requirements for IM CN subsystem signalling flag .....	216
E.2.1.3	Application Level Signalling support for IMS services .....	217
E.2.1a	PDP context/EPS Bearer procedures for IMS .....	217
E.2.1a.1	Establishing PDP Context/EPS bearer for IM CN Subsystem Related Signalling .....	217
E.2.1a.2	Deletion of PDP Context/EPS bearer used to transport IMS SIP signalling .....	218
E.2.2	The QoS requirements for an IM CN subsystem session .....	219
E.2.2.0	General .....	219
E.2.2.1	Relation of IMS media components and PDP contexts/EPS bearers carrying IMS media .....	220
E.2.3	Interaction between GPRS/EPS QoS and session signalling .....	220
E.2.3.0	General .....	220
E.2.3.1	Resource Reservation with Policy and Charging Control .....	220
E.2.4	Network initiated session release - P-CSCF initiated .....	221
E.2.4.0	General .....	221
E.2.4.1	Network initiated session release - P-CSCF initiated after loss of radio coverage .....	221
E.3	Address and identity management concepts .....	222
E.3.1	Deriving IMS identifiers from the USIM .....	222
E.4	Void .....	223
E.5	IP version interworking in IMS .....	223
E.6	Usage of NAT in GPRS/EPS .....	223
E.7	Retrieval of Network Provided Location Information in GPRS/EPS .....	224
E.8	Geographical Identifier .....	224
E.9	Support for Paging policy differentiation for IMS services .....	224
<b>Annex F (Informative):</b>	<b>Routing subsequent requests through the S-CSCF .....</b>	<b>226</b>
<b>Annex G (Normative):</b>	<b>Reference Architecture and procedures when the NAT is invoked between the UE and the IMS domain .....</b>	<b>227</b>
G.1	General .....	227
G.1.1	General requirements .....	227
G.2	Reference models .....	227
G.2.1	IMS-ALG and IMS Access Gateway model .....	228
G.2.2	ICE and Outbound reference model .....	228
G.3	Network elements for employing the IMS-ALG and IMS Access Gateway .....	229
G.3.1	Required functions of the P-CSCF .....	229
G.3.2	Required functions of the IMS Access Gateway .....	229
G.3.3	Iq reference point .....	230
G.4	Procedures for employing the IMS-ALG and IMS Access Gateway .....	230
G.4.1	General .....	230
G.4.2	NAT detection in P-CSCF .....	230
G.4.3	Session establishment procedure .....	230

G.4.4	Session release procedure.....	232
G.4.5	Session modification .....	232
G.4.6	Media forwarding in the IMS Access Gateway.....	232
G.5	Network elements for employing NAT Traversal for ICE and Outbound .....	233
G.5.1	General requirements .....	233
G.5.2	ICE .....	233
G.5.2.1	Overview .....	233
G.5.2.2	Required functions of the UE .....	234
G.5.2.3	Required functions of the STUN relay server .....	234
G.5.2.4	Required functions of the STUN server.....	234
G.5.3	Outbound.....	235
G.5.3.1	Overview .....	235
G.5.3.2	Required functions of the P-CSCF .....	235
G.5.3.3	Required functions of the S-CSCF .....	235
G.5.3.4	Required functions of the UE .....	235
G.6	Procedures for employing ICE and Outbound .....	236
G.6.1	Flow establishment procedures .....	236
G.6.2	Session establishment procedures .....	237
G.6.3	Session release procedures .....	239
G.6.4	Session modification procedures.....	240
G.6.5	Policy and Charging Control procedures.....	240
G.6.6	Detection of NAT Traversal support.....	241
G.6.7	Procedures at other IMS entities processing SDP .....	241
<b>Annex H (Informative):</b>	<b>Example HSS deployment.....</b>	<b>242</b>
<b>Annex I (Normative):</b>	<b>Border Control Functions.....</b>	<b>243</b>
I.1	General .....	243
I.2	Overall architecture .....	243
I.3	Border Control Functions.....	244
I.3.1	IP version interworking .....	244
I.3.1.1	Originating Session Flows towards IPv4 SIP network .....	244
I.3.1.2	Terminating Session Flows from IPv4 SIP network.....	246
I.3.2	Configuration independence between operator networks.....	247
I.3.3	Transcoding Support for Interworking .....	247
I.3.3.1	General.....	247
I.3.3.2	Session Flows .....	248
I.3.3.2.1	Proactive transcoding support .....	248
I.3.3.2.2	Reactive transcoding support .....	250
<b>Annex J (Informative):</b>	<b>Dynamic User Allocation to the Application Servers .....</b>	<b>253</b>
J.1	General .....	253
J.2	Representative AS .....	253
J.2.1	Concept of Representative AS.....	253
J.2.2	Procedures related to Representative AS.....	254
J.3	Dynamic assignment of AS by S-CSCF caching .....	254
J.3.1	Concept of Dynamic assignment of AS by S-CSCF caching .....	254
J.3.2	Procedures related to Dynamic assignment of AS by S-CSCF caching .....	255
<b>Annex K (Normative):</b>	<b>Inter-IMS Network to Network Interface between two IM CN subsystem networks .....</b>	<b>256</b>
K.1	General .....	256
K.2	Overall architecture .....	256
<b>Annex L (Normative):</b>	<b>Aspects for use of Common IMS in 3GPP2 systems.....</b>	<b>257</b>

L.1	General .....	257
L.2	Definitions .....	257
L.2.1	HSS .....	257
L.3	Mobility related concepts when using 3GPP2 Packet Data Subsystem .....	257
L.3.1	General .....	257
L.3.2	Procedures for P-CSCF discovery .....	258
L.4	QoS related concepts when using 3GPP2 Packet Data Subsystem .....	258
L.5	IP version support in IMS when using 3GPP2 Packet Data Subsystem .....	258
L.6	Address and identity management concepts .....	258
L.6.1	Deriving IMS identifiers .....	258
L.7	Relationship to 3GPP Generic User Profile (GUP) .....	259
<b>Annex M (Informative): IMS Local Breakout .....</b>		<b>260</b>
M.1	P-CSCF located in visited network .....	260
M.1.1	Description .....	260
M.1.1.0	General .....	260
M.1.1.1	Architecture .....	260
M.1.1.2	Flow for originating session .....	260
M.2	P-CSCF located in home network .....	262
M.2.1	Description .....	262
M.2.1.0	General .....	262
M.2.1.1	Architecture .....	262
M.2.1.2	Flow for originating session .....	262
M.2.2	Address assignment .....	264
M.2.3	IPv4 - IPv6 interworking .....	264
M.2.4	NAT traversal .....	264
M.3	P-CSCF located in visited network and with VPLMN loopback possibility .....	264
M.3.1	Description .....	264
M.3.1.1	General .....	264
M.3.1.2	Architecture .....	264
M.3.1.3	Flow for originating session with VPLMN routing .....	265
M.3.1.4	Flow for originating session with Home routing .....	266
M.3.2	Interaction with SRVCC and ICS .....	267
<b>Annex N (Normative): Aspects for use of Common IMS in Fixed xDSL, Fiber and Ethernet based systems .....</b>		<b>268</b>
N.1	Origination procedures .....	268
N.1.1	(FO#1) Fixed xDSL origination, home .....	268
N.2	Termination procedures .....	270
N.2.1	(FT#1) Fixed xDSL termination, home .....	270
N.3	Geographical Identifier .....	271
<b>Annex P (Informative): Transcoding Support involving the MRFC/MRFP .....</b>		<b>272</b>
P.1	General .....	272
P.1.1	Scope .....	272
P.1.2	Description .....	272
P.1.3	Session flows .....	272
P.1.3.1	General .....	272
P.1.3.2	Proactive transcoding invocation .....	272
P.1.3.3	Reactive transcoding invocation .....	274
<b>Annex Q (Normative): Optimal media routing .....</b>		<b>277</b>
Q.1	General .....	277

Q.2	Procedures and flows.....	278
Q.2.1	SDP extension .....	278
Q.2.2	General IMS-ALG procedures .....	278
Q.2.3	Common flows .....	280
Q.2.3.1	IMS-ALG allocates a TrGW.....	280
Q.2.3.2	IMS-ALG does not allocate a TrGW.....	280
Q.2.3.3	IMS-ALG bypasses its TrGW and one or more prior TrGWs.....	280
Q.2.3.4	IMS-ALG bypasses its TrGW using secondary realm from prior IMS-ALG.....	282
Q.2.3.5	IMS-ALG bypasses one or more prior TrGWs using a secondary realm .....	283
Q.2.3.6	IMS-ALG bypasses TrGWs performing NAT traversal.....	284
Q.2.5	Flows with transcoding .....	285
Q.2.5.1	Proactive transcoding where transcoding is required.....	285
Q.2.5.2	Proactive transcoding where transcoding not required .....	285
Q.2.5.3	IMS-ALG bypasses prior unrequired proactive transcoder .....	287
Q.2.5.4	IMS-ALG bypasses its TrGW and prior unrequired proactive transcoder.....	288
Q.2.5.5	IMS-ALG replaces prior proactive transcoder.....	290
Q.2.5.6	Proactive transcoding without resource reservation .....	291
Q.2.5.7	Reactive transcoding.....	291
Q.3	Charging.....	291
<b>Annex R (Informative): Distribution of Network Provided Location Information within IMS....</b>		<b>292</b>
R.1	General .....	292
R.2	Session Establishment/Modification at Mobile Origination - Location Info in Request .....	292
R.3	Session Establishment/Modification at Mobile Origination - Location Info in Response.....	294
R.4	Session Establishment/Modification at Mobile Termination.....	295
R.5	Session Establishment/Modification - Location Information Distributed by IMS AS.....	296
R.6	Session Release .....	297
<b>Annex S (Normative): Business Trunking .....</b>		<b>298</b>
S.1	General .....	298
S.2	IP-PBXs using static mode Business Trunking.....	298
S.2.1	High level architecture .....	298
S.2.2	High level Flows .....	299
S.2.2.1	General.....	299
S.2.2.2	Originating procedures .....	299
S.2.2.2.1	Originating procedures using the S-CSCF .....	299
S.2.2.2.2	Originating procedures using the Transit Function .....	300
S.2.2.3	Terminating Procedures.....	301
S.2.2.3.1	Terminating procedures using the S-CSCF.....	301
S.2.2.3.2	Terminating procedures using the Transit Function.....	302
<b>Annex T (Normative): IP-Connectivity Access Network specific concepts when using Trusted WLAN (TWAN) to access IMS.....</b>		<b>304</b>
T.0	General .....	304
T.1	Retrieval of Network Provided Location Information in TWAN access .....	304
<b>Annex U (Normative): WebRTC access to IMS - network-based architecture .....</b>		<b>305</b>
U.1	Overview .....	305
U.1.0	General .....	305
U.1.1	Assumptions.....	305
U.1.2	Architecture and reference model .....	306
U.1.3	Functional entities .....	306
U.1.3.1	WIC (WebRTC IMS Client).....	306
U.1.3.2	WWSF (WebRTC Web Server Function) .....	306

U.1.3.3	eP-CSCF (P-CSCF enhanced for WebRTC) .....	307
U.1.3.4	eIMS-AGW (IMS Access GateWay enhanced for WebRTC).....	307
U.1.3.5	WAF (WebRTC Authorisation Function).....	308
U.1.4	Reference points .....	308
U.1.4.1	W1 (UE to WWSF).....	308
U.1.4.2	W2 (UE to eP-CSCF) .....	308
U.1.4.3	Iq (eP-CSCF to eIMS-AGW).....	308
U.1.4.4	W3 (UE to eIMS-AGW).....	308
U.1.4.5	W4 (WWSF to WAF).....	309
U.1.5	Media plane protocol architecture .....	309
U.1.5.0	General.....	309
U.1.5.1	Protocol architecture for MSRP .....	309
U.1.5.2	Protocol architecture for BFCP.....	310
U.1.5.3	Protocol architecture for T.140 .....	310
U.1.5.4	Protocol architecture for Voice and Video .....	310
U.2	Procedures .....	311
U.2.0	WWSF discovery .....	311
U.2.1	Registration .....	311
U.2.1.1	Introduction.....	311
U.2.1.2	WIC registration of individual Public User Identity using IMS authentication .....	312
U.2.1.3	WIC registration of individual Public User Identity based on web authentication .....	312
U.2.1.4	WIC registration of individual Public User Identity from a pool of Public User Identities.....	313
U.2.2	Session management related procedures .....	313
U.2.3	De-Registration procedures .....	314
U.2.4	Media plane Optimization .....	314
<b>Annex V (Normative): IP-Connectivity Access Network specific concepts when using Untrusted WLAN to access IMS.....</b>		<b>317</b>
V.1	General .....	317
V.2	UE Provided Access Information in Untrusted WLAN access.....	317
<b>Annex W (Normative): Support of IMS Services for roaming users in deployments without IMS-level roaming interfaces.....</b>		<b>318</b>
W.1	General .....	318
W.2	Architecture.....	318
W.3	Subscription to changes in PLMN ID at IMS Initial Registration .....	318
<b>Annex X (Normative): IMS 3GPP PS Data Off Service Accessibility.....</b>		<b>320</b>
X.1	General .....	320
X.2	UE Behaviour.....	320
X.2.1	UE 3GPP PS Data Off Status Reporting .....	320
X.2.2	UE Provisioning .....	320
X.2.3	UE Enforcement of 3GPP SIP-Based 3GPP PS Data Off Exempt Services .....	320
X.3	Network Behaviour .....	321
X.3.1	Network Update to 3GPP PS Data Off Exempted Services .....	321
X.3.2	Network Enforcement of SIP-Based 3GPP PS Data Off Exempted Services .....	321
<b>Annex Y (Normative): IP-Connectivity Access Network specific concepts when using 5GS to access IMS .....</b>		<b>322</b>
Y.0	General .....	322
Y.1	Mobility related concepts .....	322
Y.1.0	General .....	322
Y.1.1	Procedures for P-CSCF discovery.....	323
Y.2	QoS related concepts.....	323