

ETSI TS 123 228 V18.6.0 (2024-07)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
IP Multimedia Subsystem (IMS);
Stage 2
(3GPP TS 23.228 version 18.6.0 Release 18)**

<https://standards.iteh.ai/catalog/standards/etsi/cd0d2ad1-e484-4047-9314-58a9b687e8b5/etsi-ts-123-228-v18-6-0-2024-07>



ReferenceRTS/TSGS-0223228vi60

KeywordsGSM,LTE,UMTS

ETSI650 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 the
ETSI Search & Browse Standards [application](#).

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 on ETSI deliver.

Users should be aware that the present document may be revised or have its status changed, this information is available in the Milestones listing.

If you find errors in the present document, please send your comments to the relevant service listed under Committee Support Staff.

If you find a security vulnerability in the present document, please report it through our Coordinated Vulnerability Disclosure (CVD) program.

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 2024.
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. (2024-07)

The cross reference between 3GPP and ETSI identities can be found under <https://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.....	17
1 Scope	18
2 References	18
3 Definitions, symbols and abbreviations	22
3.1 Definitions	22
3.2 Symbols.....	25
3.3 Abbreviations	25
4 IP multimedia subsystem concepts.....	27
4.0 General	27
4.1 Relationship to CS domain and the IP-Connectivity Access Network.....	28
4.2 IMS services concepts	28
4.2.1 Home-network based services	28
4.2.1.1 Support of CAMEL or IN	28
4.2.1.2 Support of OSA.....	29
4.2.1.3 Dynamic services interactions handling.....	29
4.2.1.3.1 Service information exchanged between Application Servers	29
4.2.1.3.2 Handling by the Application Server	29
4.2.1.3.3 Deletion of services interaction information	29
4.2.2 Support of numbers in non-international format in the IMS.....	29
4.2.3 Support of roaming users	30
4.2.4 IP multimedia Subsystem Service Control Interface (ISC)	31
4.2.4a HSS to service platform Interface	34
4.2.4b S-CSCF Service Control Model.....	35
4.2.4c I-CSCF to AS reference point (Ma).....	36
4.2.5 The QoS requirements for an IM CN subsystem session.....	37
4.2.6 QoS Requirements for IM CN subsystem signalling	38
4.2.7 Support of SIP forking.....	39
4.2.7.1 SIP Forking	39
4.2.7.2 Forking within and outside the IM CN Subsystem	39
4.2.7.3 Support for forked requests	40
4.3 Naming and addressing concepts	40
4.3.1 Address management.....	40
4.3.2 Void	40
4.3.3 Identification of users	40
4.3.3.0 General	40
4.3.3.1 Private User Identities	40
4.3.3.2 Public User Identities	41
4.3.3.2a Globally Routable User Agent URI (GRUU)	42
4.3.3.2a.1 Architecture Requirements	42
4.3.3.2b Wildcarded Public User Identity	43
4.3.3.3 Routing of SIP signalling within the IP multimedia subsystem	43
4.3.3.3a Handling of dialled number formats	44
4.3.3.3b Termination of session with the TEL URI format Public User Identity.....	44
4.3.3.4 Relationship of Private and Public User Identities	44
4.3.3.5 Relationship of Public User Identities, GRUUs, and UEs	45
4.3.4 Identification of network nodes	46
4.3.5 E.164 address to SIP URI resolution in an IM CN subsystem.....	46
4.3.5.1 ENUM/DNS translation mechanism	46
4.3.5.2 Handling of Tel URIs.....	46
4.3.5.3 Handling of SIP URIs representing a telephone number	47
4.3.6 Public Service Identities	47

4.4	Signalling concepts.....	47
4.5	Mobility related concepts	48
4.6	Roles of Session Control Functions	49
4.6.0	General.....	49
4.6.1	Proxy-CSCF.....	49
4.6.2	Interrogating-CSCF	50
4.6.2.0	General	50
4.6.2.1	Void.....	50
4.6.3	Serving-CSCF.....	51
4.6.4	Breakout Gateway Control Function	53
4.6.5	Void	53
4.7	Multimedia Resource Function	53
4.7a	Media Resource Broker.....	55
4.8	Security Concepts.....	55
4.9	Charging Concepts	55
4.10	IMS group management concepts	55
4.10.0	General.....	55
4.10.1	IMS group administration.....	55
4.10.2	Group identifiers.....	55
4.11	Relationship to 3GPP Generic User Profile (GUP).....	55
4.12	Network Address Translation traversal in access network.....	56
4.13	Identification of IMS communication Services.....	56
4.13.1	General.....	56
4.13.2	Identification of IMS communication Services	56
4.13.3	Identification of IMS applications	58
4.14	Border Control concepts.....	59
4.15	IMS in transit network scenarios.....	60
4.15.1	General concepts.....	60
4.15.2	IMS transit network configurations	60
4.15.3	Providing IMS application services in transit network scenarios	60
4.15a	Roaming Architecture for Voice over IMS with Local Breakout.....	61
4.15b	Roaming Architecture for Voice over IMS with home routed traffic	62
4.16	Support of multimedia telephony	62
4.16.1	Telephony Application Server	62
4.16.2	Identification of multimedia telephony.....	63
4.16.3	Session setup principles	63
4.17	Support of short message service	63
4.17.1	IP Short Message Gateway (IP-SM-GW).....	63
4.18	Support of Number portability	63
4.18.1	Number portability.....	63
4.19	Support of Preferred Circuit Carrier Access and Per Call Circuit Carrier Selection	64
4.19.1	Preferred Circuit Carrier Access and Per Call Circuit Carrier Selection	64
4.20	Support of IMS Service Centralization and Continuity.....	64
4.21	Support of Overlap Signalling.....	65
4.22	Support of Explicit Congestion Notification (ECN)	65
4.22.1	General.....	65
4.22.2	CS GERAN/UTRAN Interworking at MGCF/IM-MGW.....	65
4.22.3	Interworking with non-ECN IP network and/or terminal at IBCF/TrGW	66
4.22.4	Interworking with non-3GPP ECN IP terminal at IBCF/TrGW	66
4.22.5	ECN support at IMS-ALG/IMS-AGW	67
4.22.6	ECN support at MRFC/MRFP.....	67
4.22.7	CS GERAN/UTRAN Interworking at the MSC Server enhanced for ICS/MSC Server enhanced for SRVCC with SIP/CS-MGW	67
4.23	Support of Load Balancing.....	68
4.23.1	General.....	68
4.23.2	Registration-based load balancing of S-CSCFs	68
4.23.3	Registration independent load balancing of Transit Functions	68
4.24	Support of Restoration Procedures.....	68
4.25	Support of Overload Control	68
4.25.1	General.....	68
4.25.2	Next-hop monitoring of overload	69
4.25.3	Filter based Overload Control.....	69

4.26	Support for Business Trunking.....	69
5	IP multimedia subsystem procedures.....	70
5.0	General.....	70
5.0a	Session-unrelated procedures.....	70
5.1	CSCF related procedures.....	70
5.1.0	Establishing IP-Connectivity Access Network bearer for IM CN Subsystem Related Signalling.....	70
5.1.1	Procedures related to Proxy-CSCF discovery.....	70
5.1.1.0	General.....	70
5.1.1.1	DHCP/DNS procedure for P-CSCF discovery.....	71
5.1.1.2	Void.....	72
5.1.2	Procedures related to Serving-CSCF assignment.....	72
5.1.2.1	Assigning a Serving-CSCF for a user.....	72
5.1.2.2	Cancelling the Serving-CSCF assignment.....	73
5.1.2.3	Void.....	73
5.1.3	Procedures related to Interrogating-CSCF.....	73
5.1.4	Procedures related to Proxy-CSCF.....	73
5.1.5	Subscription Updating Procedures.....	73
5.1.5.0	General.....	73
5.1.5.1	Subscription updating information flow.....	73
5.2	Application level registration procedures.....	74
5.2.0	General.....	74
5.2.1	Requirements considered for registration.....	74
5.2.1a	Implicit Registration.....	75
5.2.1a.0	General.....	75
5.2.1a.1	Implicit Registration for UE without ISIM or IMC.....	76
5.2.2	Registration flows.....	77
5.2.2.1	Requirements to consider for registration.....	77
5.2.2.2	Assumptions.....	77
5.2.2.3	Registration information flow – User not registered.....	77
5.2.2.4	Re-Registration information flow – User currently registered.....	79
5.2.2.5	Stored information.....	81
5.3	Application level de-registration procedures.....	82
5.3.1	Mobile initiated de-registration.....	82
5.3.2	Network initiated de-registration.....	83
5.3.2.0	General.....	83
5.3.2.1	Network Initiated Application (SIP) De-registration, Registration Timeout.....	84
5.3.2.2	Network Initiated Application (SIP) De-registration, Administrative.....	84
5.3.2.2.0	General.....	84
5.3.2.2.1	Network Initiated De-registration by HSS, administrative.....	85
5.3.2.2.2	Network Initiated De-registration by Service Platform.....	86
5.4	Procedures for IP multi-media sessions.....	87
5.4.0	General.....	87
5.4.1	Bearer interworking concepts.....	87
5.4.2	Interworking with Internet.....	87
5.4.2a	IP version interworking.....	88
5.4.3	Interworking with PSTN.....	88
5.4.4	Requirements for IP multi-media session control.....	89
5.4.5	Session Path Information.....	90
5.4.5.1	Session Path Information during Registration and Session Initiation.....	90
5.4.5.2	P-CSCF in the Session Path.....	90
5.4.5.3	S-CSCF in the Session Path.....	90
5.4.6	End-user preferences and terminal capabilities.....	90
5.4.6.0	General.....	90
5.4.6.1	Objectives.....	90
5.4.6.2	End-user expectations.....	91
5.4.6.3	Mechanism for bearer establishment.....	91
5.4.6.4	Session progress indication to the originating UE.....	93
5.4.7	Interaction between QoS and session signalling.....	93
5.4.7.0	General.....	93
5.4.7.1	Authorize QoS Resources.....	94
5.4.7.1a	Resource Reservation with Policy and Charging Control.....	94

5.4.7.2	Enabling of Media Flows	95
5.4.7.3	Disabling of Media Flows	95
5.4.7.4	Revoke Authorization for IP-Connectivity Access Network and IP Resources.....	95
5.4.7.5	Indication of IP-Connectivity Access Network bearer release.....	95
5.4.7.6	Authorization of IP-Connectivity Access Network bearer modification.....	95
5.4.7.7	Indication of IP-Connectivity Access Network bearer modification	96
5.4.7.8	Sharing of Resources for Network Detected Concurrent Sessions	96
5.4.7.8.1	Network Detected Concurrent Sessions	96
5.4.7.8.2	Initiating Resource Sharing for Network Detected Concurrent Sessions	96
5.4.7.8.3	Void.....	97
5.4.7.9	Priority sharing for concurrent sessions	97
5.4.8	QoS-Assured Preconditions.....	97
5.4.9	Event and information distribution	98
5.4.9.0	General.....	98
5.4.9.1	Subscription to event notifications.....	99
5.4.10	Void.....	101
5.4.11	Signalling Transport Interworking.....	101
5.4.12	Configuration and Routing principles for Public Service Identities	101
5.4.12.0	General.....	101
5.4.12.1	PSIs on the originating side.....	101
5.4.12.2	PSIs on the terminating side.....	101
5.4.12.3	Subdomain based PSIs.....	102
5.4.12.4	PSI configuration in the HSS	102
5.4.12.5	Requests originated by the AS hosting the PSI.....	102
5.4.13	Transcoding concepts	103
5.4a	Overview of session flow procedures.....	103
5.4a.1	End-to-End session flow procedures	103
5.4a.2	Transit network session flow procedures.....	106
5.5	Serving-CSCF/MGCF to serving-CSCF/MGCF procedures	108
5.5.0	General.....	108
5.5.1	(S-S#1) Different network operators performing origination and termination	108
5.5.2	(S-S#2) Single network operator performing origination and termination	110
5.5.3	(S-S#3) Session origination with PSTN termination in the same network as the S-CSCF.....	113
5.5.4	(S-S#4) Session origination with PSTN termination in a different network from the S-CSCF	115
5.6	Origination procedures	117
5.6.0	General.....	117
5.6.1	(MO#1) Mobile origination, roaming	117
5.6.2	(MO#2) Mobile origination, home	120
5.6.3	(PSTN-O) PSTN origination.....	122
5.6.4	(NI-O) Non-IMS Origination procedure from an external SIP client.....	123
5.6.5	Application Server Origination Procedure.....	125
5.6.5.1	(AS-O) Origination at Application Server	125
5.6.5.2	Void.....	127
5.6.5.3	S-CSCF selection by I-CSCF for AS Originating call procedures.....	127
5.7	Termination procedures.....	129
5.7.0	General.....	129
5.7.1	(MT#1) Mobile termination, roaming.....	129
5.7.2	(MT#2) Mobile termination, home	132
5.7.2a	(MT#3) Mobile termination, CS Domain roaming	134
5.7.3	(PSTN-T) PSTN termination	134
5.7.4	(NI-T) Non-IMS Termination to an external SIP client.....	136
5.7.5	(AS-T#1) PSI based Application Server termination – direct.....	138
5.7.6	(AS-T#2) PSI based Application Server termination – indirect.....	138
5.7.7	(AS-T#3) PSI based Application Server termination – DNS routing	139
5.7.8	(AST#4) Termination at Application Server based on service logic	140
5.7a	Procedures for the establishment of sessions without preconditions.....	141
5.7a.1	General.....	141
5.7a.2	Procedures for the establishment of sessions without preconditions - no resource reservation required before session becomes active	143
5.7a.3	Void	145
5.8	Procedures related to routing information interrogation.....	145
5.8.0	General.....	145

5.8.1	User identity to HSS resolution	145
5.8.2	SLF on register	146
5.8.3	SLF on UE invite	147
5.8.4	SLF on AS access to HSS.....	148
5.9	Routing of mid-session signalling	148
5.10	Session release procedures	149
5.10.0	General.....	149
5.10.1	Terminal initiated session release	149
5.10.2	PSTN initiated session release.....	151
5.10.3	Network initiated session release.....	152
5.10.3.0	Removal of IP-CAN bearer used to transport IMS SIP signalling.....	152
5.10.3.1	Network initiated session release - P-CSCF initiated.....	152
5.10.3.1.0	General	152
5.10.3.1.1	Network initiated session release - P-CSCF initiated – after removal of IP-Connectivity Access Network bearer.....	153
5.10.3.1.2	Void.....	154
5.10.3.2	Network initiated session release - S-CSCF Initiated	154
5.11	Procedures to enable enhanced multimedia services	155
5.11.1	Session Hold and Resume Procedures.....	155
5.11.1.0	General	155
5.11.1.1	Mobile-to-Mobile Session Hold and Resume Procedures.....	155
5.11.1.2	Mobile-initiated Hold and Resume of a Mobile-PSTN Session.....	157
5.11.1.3	PSTN-initiated Hold and Resume of a Mobile-PSTN Session	159
5.11.2	Procedures for anonymous session establishment	161
5.11.2.0	General	161
5.11.2.1	Signalling requirements for anonymous session establishment	161
5.11.2.2	Bearer path requirements for anonymous session establishment	161
5.11.3	Procedures for codec and media characteristics flow negotiations	161
5.11.3.0	General	161
5.11.3.1	Codec and media characteristics flow negotiation during initial session establishment	162
5.11.3.2	Codec or media characteristics flow change within the existing reservation	164
5.11.3.3	Codec or media characteristics flow change requiring new resources and/or authorization	165
5.11.3.4	Sample MM session flow - addition of another media.....	168
5.11.4	Procedures for providing or blocking identity	171
5.11.4.0	General	171
5.11.4.1	Procedures for providing the authenticated identity of the originating party	171
5.11.4.2	Procedures for blocking the identity of the originating party.....	173
5.11.4.3	Procedures for providing the authenticated identity of the originating party (PSTN origination)	174
5.11.4.4	Procedures for providing the authenticated identity of the originating party (PSTN termination)	174
5.11.5	Session Redirection Procedures	174
5.11.5.0	General	174
5.11.5.1	Session Redirection initiated by S-CSCF to IMS.....	174
5.11.5.2	Session Redirection to PSTN Termination (S-CSCF #2 forwards INVITE)	175
5.11.5.2a	Session Redirection to PSTN Termination (REDIRECT to originating UE#1).....	176
5.11.5.3	Session Redirection initiated by S-CSCF to general endpoint (REDIRECT to originating UE#1)	178
5.11.5.4	Session Redirection initiated by P-CSCF.....	179
5.11.5.5	Session Redirection initiated by UE.....	180
5.11.5.6	Session Redirection initiated by originating UE#1 after Bearer Establishment (REDIRECT to originating UE#1)	181
5.11.6	Session Transfer Procedures	182
5.11.6.0	General	182
5.11.6.1	Refer operation.....	182
5.11.6.2	Application to Session Transfer Services.....	184
5.11.6.2.0	General	184
5.11.6.2.1	Blind Transfer and Assured Transfer	184
5.11.6.2.2	Consultative Transfer	185
5.11.6.2.3	Three-way Session.....	185
5.12	Mobile Terminating call procedures to unregistered Public User Identities	186
5.12.0	General.....	186
5.12.1	Mobile Terminating call procedures to unregistered Public User Identity that has services related to unregistered state	186

5.12.2	Mobile Terminating call procedures to unregistered Public User Identity that has no services related to unregistered state	188
5.13	IMS Emergency Sessions	188
5.14	Interactions involving the MRFC/MRFP	188
5.14.0	General.....	188
5.14.1	Interactions between the UE and the MRFC.....	188
5.14.2	Service control based interactions between the MRFC and the AS	189
5.14.3	Interactions for services using both the Ut interface and MRFC capabilities.....	189
5.14.4	Transcoding services involving the MRFC/MRFP.....	189
5.15	Mobile Terminating session procedure for unknown user	190
5.15.0	General.....	190
5.15.1	Unknown user determined in the HSS.....	190
5.15.2	Unknown user determined in the SLF	191
5.16	IMS messaging concepts and procedures	191
5.16.0	General.....	191
5.16.1	Immediate Messaging	191
5.16.1.0	General	191
5.16.1.1	Procedures to enable Immediate Messaging	192
5.16.1.1.0	General	192
5.16.1.1.1	Immediate messaging procedure to registered Public User Identity.....	192
5.16.1.1.2	Immediate messaging procedure to unregistered Public User Identity.....	193
5.16.1.2	Immediate messages with multiple recipients.....	194
5.16.2	Session-based Messaging	194
5.16.2.0	General	194
5.16.2.1	Architectural principles.....	194
5.16.2.2	Procedures to enable Session based Messaging	195
5.16.2.2.0	General	195
5.16.2.2.1	Session based messaging procedure to registered Public User Identity	195
5.16.2.2.2	Session based messaging procedure using multiple UEs	196
5.16.2.2.3	Session based messaging procedure with an intermediate node.....	199
5.16.2.2.4	Session based messaging release procedure	200
5.16.2.2.5	Session based messaging release procedure with an intermediate node.....	201
5.17	Refreshing sessions	201
5.18	Void.....	202
5.19	Support for Transit scenarios in IMS	202
5.19.1	General.....	202
5.19.2	Providing IMS application services in transit network scenarios	205
5.20	Procedures for Assigning, Using, and Processing GRUUs	205
5.20.1	UE.....	205
5.20.1.1	Obtaining a GRUU during registration	205
5.20.1.2	Using a GRUU	206
5.20.1.3	Using a GRUU while requesting Privacy.....	206
5.20.2	Serving-CSCF.....	206
5.20.2.1	Allocating a GRUU during registration	206
5.20.2.2	Using a GRUU	206
5.20.3	Interrogating-CSCF	207
5.20.3a	HSS	207
5.20.4	Elements other than UE acting as a UA.....	207
5.20.4.1	Using a GRUU	207
5.20.4.2	Assigning a GRUU	207
5.21	IMS Multimedia Priority Services Procedures	207
5.22	Support of Overload Control	208
5.22.1	Next-hop monitoring of overload	208
5.22.2	Filter based Overload Control.....	209
Annex A (informative):	Information flow template	211
Annex B (informative):	Void	213
Annex C (informative):	Void	214
Annex D (informative):	Void	215

Annex E (normative):	IP-Connectivity Access Network specific concepts when using GPRS and/or EPS to access IMS	216
E.0	General	216
E.1	Mobility related concepts	216
E.1.0	General	216
E.1.1	Procedures for P-CSCF discovery	217
E.1.1.0	General	217
E.1.1.1	GPRS/EPS procedure for P-CSCF discovery	217
E.1.2	Support for Enhanced Coverage for data centric UEs	218
E.2	QoS related concepts	219
E.2.1	Application Level Signalling for IMS	219
E.2.1.0	General	219
E.2.1.1	QoS Requirements for Application Level Signalling	219
E.2.1.2	Requirements for IM CN subsystem signalling flag	219
E.2.1.3	Application Level Signalling support for IMS services	220
E.2.1a	PDP context/EPS Bearer procedures for IMS	220
E.2.1a.1	Establishing PDP Context/EPS bearer for IM CN Subsystem Related Signalling	220
E.2.1a.2	Deletion of PDP Context/EPS bearer used to transport IMS SIP signalling	221
E.2.2	The QoS requirements for an IM CN subsystem session	222
E.2.2.0	General	222
E.2.2.1	Relation of IMS media components and PDP contexts/EPS bearers carrying IMS media	223
E.2.3	Interaction between GPRS/EPS QoS and session signalling	223
E.2.3.0	General	223
E.2.3.1	Resource Reservation with Policy and Charging Control	223
E.2.4	Network initiated session release - P-CSCF initiated	224
E.2.4.0	General	224
E.2.4.1	Network initiated session release - P-CSCF initiated after loss of radio coverage	224
E.3	Address and identity management concepts	225
E.3.1	Deriving IMS identifiers from the USIM	225
E.4	Void	226
E.5	IP version interworking in IMS	226
E.6	Usage of NAT in GPRS/EPS	226
E.7	Retrieval of Network Provided Location Information in GPRS/EPS	227
E.8	Geographical Identifier	227
E.9	Support for Paging policy differentiation for IMS services	227
E.10	Support of RAN Assisted Codec Adaptation	228
Annex F (informative):	Routing subsequent requests through the S-CSCF	229
Annex G (normative):	Reference Architecture and procedures when the NAT is invoked between the UE and the IMS domain	230
G.1	General	230
G.1.1	General requirements	230
G.2	Reference models	230
G.2.1	IMS-ALG and IMS Access Gateway model	231
G.2.2	ICE and Outbound reference model	231
G.3	Network elements for employing the IMS-ALG and IMS Access Gateway	232
G.3.1	Required functions of the P-CSCF	232
G.3.2	Required functions of the IMS Access Gateway	232
G.3.3	Iq reference point	233
G.4	Procedures for employing the IMS-ALG and IMS Access Gateway	233
G.4.1	General	233

G.4.2	NAT detection in P-CSCF.....	233
G.4.3	Session establishment procedure.....	233
G.4.4	Session release procedure.....	235
G.4.5	Session modification	235
G.4.6	Media forwarding in the IMS Access Gateway.....	235
G.5	Network elements for employing NAT Traversal for ICE and Outbound	236
G.5.1	General requirements	236
G.5.2	ICE	236
G.5.2.1	Overview	236
G.5.2.2	Required functions of the UE	237
G.5.2.3	Required functions of the STUN relay server.....	237
G.5.2.4	Required functions of the STUN server.....	237
G.5.3	Outbound.....	238
G.5.3.1	Overview	238
G.5.3.2	Required functions of the P-CSCF	238
G.5.3.3	Required functions of the S-CSCF	238
G.5.3.4	Required functions of the UE	238
G.6	Procedures for employing ICE and Outbound	239
G.6.1	Flow establishment procedures	239
G.6.2	Session establishment procedures	240
G.6.3	Session release procedures	242
G.6.4	Session modification procedures.....	243
G.6.5	Policy and Charging Control procedures.....	243
G.6.6	Detection of NAT Traversal support.....	244
G.6.7	Procedures at other IMS entities processing SDP	244
Annex H (informative):	Example HSS deployment.....	245
Annex I (normative):	Border Control Functions.....	246
I.1	General	246
I.2	Overall architecture	246
I.3	Border Control Functions.....	247
I.3.1	IP version interworking	247
I.3.1.1	Originating Session Flows towards IPv4 SIP network	247
I.3.1.2	Terminating Session Flows from IPv4 SIP network.....	249
I.3.2	Configuration independence between operator networks.....	250
I.3.3	Transcoding Support for Interworking	250
I.3.3.1	General.....	250
I.3.3.2	Session Flows	251
I.3.3.2.1	Proactive transcoding support	251
I.3.3.2.2	Reactive transcoding support	253
Annex J (informative):	Dynamic User Allocation to the Application Servers	256
J.1	General	256
J.2	Representative AS	256
J.2.1	Concept of Representative AS.....	256
J.2.2	Procedures related to Representative AS.....	257
J.3	Dynamic assignment of AS by S-CSCF caching	257
J.3.1	Concept of Dynamic assignment of AS by S-CSCF caching	257
J.3.2	Procedures related to Dynamic assignment of AS by S-CSCF caching	258
Annex K (normative):	Inter-IMS Network to Network Interface between two IM CN subsystem networks	259
K.1	General	259
K.2	Overall architecture	259

Annex L (normative):	Aspects for use of Common IMS in 3GPP2 systems.....	260
L.1	General	260
L.2	Definitions.....	260
L.2.1	HSS	260
L.3	Mobility related concepts when using 3GPP2 Packet Data Subsystem	260
L.3.1	General	260
L.3.2	Procedures for P-CSCF discovery.....	261
L.4	QoS related concepts when using 3GPP2 Packet Data Subsystem.....	261
L.5	IP version support in IMS when using 3GPP2 Packet Data Subsystem	261
L.6	Address and identity management concepts.....	261
L.6.1	Deriving IMS identifiers	261
L.7	Relationship to 3GPP Generic User Profile (GUP).....	262
Annex M (informative):	IMS Local Breakout	263
M.1	P-CSCF located in visited network	263
M.1.1	Description	263
M.1.1.0	General.....	263
M.1.1.1	Architecture	263
M.1.1.2	Flow for originating session	263
M.2	P-CSCF located in home network.....	265
M.2.1	Description	265
M.2.1.0	General.....	265
M.2.1.1	Architecture	265
M.2.1.2	Flow for originating session	265
M.2.2	Address assignment.....	267
M.2.3	IPv4 - IPv6 interworking.....	267
M.2.4	NAT traversal.....	267
M.3	P-CSCF located in visited network and with VPLMN loopback possibility	267
M.3.1	Description	267
M.3.1.1	General.....	267
M.3.1.2	Architecture	267
M.3.1.3	Flow for originating session with VPLMN routing.....	268
M.3.1.4	Flow for originating session with Home routing	269
M.3.2	Interaction with SRVCC and ICS.....	270
Annex N (normative):	Aspects for use of Common IMS in Fixed xDSL, Fiber and Ethernet based systems	271
N.1	Origination procedures.....	271
N.1.1	(FO#1) Fixed xDSL origination, home	271
N.2	Termination procedures.....	273
N.2.1	(FT#1) Fixed xDSL termination, home.....	273
N.3	Geographical Identifier.....	274
Annex P (informative):	Transcoding Support involving the MRFC/MRFP	275
P.1	General	275
P.1.1	Scope.....	275
P.1.2	Description	275
P.1.3	Session flows.....	275
P.1.3.1	General.....	275
P.1.3.2	Proactive transcoding invocation.....	275
P.1.3.3	Reactive transcoding invocation.....	277
Annex Q (normative):	Optimal media routing	280

Q.1	General	280
Q.2	Procedures and flows.....	281
Q.2.1	SDP extension	281
Q.2.2	General IMS-ALG procedures	281
Q.2.3	Common flows	283
Q.2.3.1	IMS-ALG allocates a TrGW.....	283
Q.2.3.2	IMS-ALG does not allocate a TrGW.....	283
Q.2.3.3	IMS-ALG bypasses its TrGW and one or more prior TrGWs.....	283
Q.2.3.4	IMS-ALG bypasses its TrGW using secondary realm from prior IMS-ALG.....	285
Q.2.3.5	IMS-ALG bypasses one or more prior TrGWs using a secondary realm	286
Q.2.3.6	IMS-ALG bypasses TrGWs performing NAT traversal	287
Q.2.5	Flows with transcoding	288
Q.2.5.1	Proactive transcoding where transcoding is required.....	288
Q.2.5.2	Proactive transcoding where transcoding not required	288
Q.2.5.3	IMS-ALG bypasses prior unrequired proactive transcoder	290
Q.2.5.4	IMS-ALG bypasses its TrGW and prior unrequired proactive transcoder.....	291
Q.2.5.5	IMS-ALG replaces prior proactive transcoder.....	293
Q.2.5.6	Proactive transcoding without resource reservation	294
Q.2.5.7	Reactive transcoding.....	294
Q.3	Charging.....	294
Annex R (informative): Distribution of Network Provided Location Information within IMS....		295
R.1	General	295
R.2	Session Establishment/Modification at Mobile Origination - Location Info in Request	295
R.3	Session Establishment/Modification at Mobile Origination - Location Info in Response	297
R.4	Session Establishment/Modification at Mobile Termination.....	298
R.5	Session Establishment/Modification - Location Information Distributed by IMS AS.....	299
R.6	Session Release	300
Annex S (normative): Business Trunking		301
S.1	General	301
S.2	IP-PBXs using static mode Business Trunking.....	301
S.2.1	High level architecture	301
S.2.2	High level Flows	302
S.2.2.1	General.....	302
S.2.2.2	Originating procedures	302
S.2.2.2.1	Originating procedures using the S-CSCF	302
S.2.2.2.2	Originating procedures using the Transit Function	303
S.2.2.3	Terminating Procedures	304
S.2.2.3.1	Terminating procedures using the S-CSCF.....	304
S.2.2.3.2	Terminating procedures using the Transit Function.....	305
Annex T (normative): IP-Connectivity Access Network specific concepts when using Trusted WLAN (TWAN) to access IMS		307
T.0	General	307
T.1	Retrieval of Network Provided Location Information in TWAN access	307
Annex U (normative): WebRTC access to IMS - network-based architecture		308
U.1	Overview	308
U.1.0	General	308
U.1.1	Assumptions.....	308
U.1.2	Architecture and reference model	309
U.1.3	Functional entities	309
U.1.3.1	WIC (WebRTC IMS Client).....	309

U.1.3.2	WWSF (WebRTC Web Server Function)	309
U.1.3.3	eP-CSCF (P-CSCF enhanced for WebRTC)	310
U.1.3.4	eIMS-AGW (IMS Access GateWay enhanced for WebRTC).....	310
U.1.3.5	WAF (WebRTC Authorisation Function).....	311
U.1.4	Reference points	311
U.1.4.1	W1 (UE to WWSF).....	311
U.1.4.2	W2 (UE to eP-CSCF)	311
U.1.4.3	Iq (eP-CSCF to eIMS-AGW).....	311
U.1.4.4	W3 (UE to eIMS-AGW).....	311
U.1.4.5	W4 (WWSF to WAF).....	312
U.1.5	Media plane protocol architecture	312
U.1.5.0	General.....	312
U.1.5.1	Protocol architecture for MSRP.....	312
U.1.5.2	Protocol architecture for BFCP.....	313
U.1.5.3	Protocol architecture for T.140.....	313
U.1.5.4	Protocol architecture for Voice and Video	313
U.2	Procedures	314
U.2.0	WWSF discovery	314
U.2.1	Registration	314
U.2.1.1	Introduction.....	314
U.2.1.2	WIC registration of individual Public User Identity using IMS authentication	315
U.2.1.3	WIC registration of individual Public User Identity based on web authentication.....	315
U.2.1.4	WIC registration of individual Public User Identity from a pool of Public User Identities.....	316
U.2.2	Session management related procedures	316
U.2.3	De-Registration procedures	317
U.2.4	Media plane Optimization	317
Annex V (normative):	IP-Connectivity Access Network specific concepts when using Untrusted WLAN to access IMS	320
V.1	General	320
V.2	UE Provided Access Information in Untrusted WLAN access.....	320
Annex W (normative):	Support of IMS Services for roaming users in deployments without IMS-level roaming interfaces.....	322
W.1	General	322
W.2	Architecture.....	322
W.2.1	EPS.....	322
W.2.2	5GS.....	322
W.3	Void.....	322
W.4	Procedures related to PLMN ID change.....	323
W.4.1	Subscription to changes of PLMN ID at IMS Initial Registration	323
W.4.2	UE is not active in an IMS voice session	323
W.4.3	UE is active in an IMS voice session	324
Annex X (normative):	IMS 3GPP PS Data Off Service Accessibility.....	326
X.1	General	326
X.2	UE Behaviour.....	326
X.2.1	UE 3GPP PS Data Off Status Reporting	326
X.2.2	UE Provisioning	326
X.2.3	UE Enforcement of 3GPP SIP-Based 3GPP PS Data Off Exempt Services	326
X.3	Network Behaviour	327
X.3.1	Network Update to 3GPP PS Data Off Exempted Services	327
X.3.2	Network Enforcement of SIP-Based 3GPP PS Data Off Exempted Services	327
Annex Y (normative):	IP-Connectivity Access Network specific concepts when using 5GS to access IMS	328