



**Digital cellular telecommunications system (Phase 2+) (GSM);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
IP multimedia call control protocol based on Session Initiation  
Protocol (SIP) and Session Description Protocol (SDP);  
Stage 3  
(3GPP TS 24.229 version 14.12.0 Release 14)**

TECHNICAL STANDARD REVIEW  
<https://standards.etsi.org/standards/full-standards/etsi-ts-124-229-v14.12.0-release-14>



---

Reference

RTS/TSGC-0124229vec0

---

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**

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>

---

**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 2019.  
All rights reserved.

**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.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables 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 (<https://ipr.etsi.org/>).

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.

## 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.

---

# 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.

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.....	34
1    Scope .....	35
2    References .....	36
3    Definitions and abbreviations.....	50
3.1    Definitions .....	50
3.2    Abbreviations .....	57
3A    Interoperability with different IP-CAN .....	60
4    General .....	61
4.1    Conformance of IM CN subsystem entities to SIP, SDP and other protocols.....	61
4.2    URI and address assignments .....	64
4.2A    Transport mechanisms.....	66
4.2B    Security mechanisms.....	66
4.2B.1    Signalling security .....	66
4.2B.2    Media security .....	68
4.3    Routeing principles of IM CN subsystem entities .....	71
4.4    Trust domain .....	71
4.4.1    General.....	71
4.4.2    P-Asserted-Identity .....	72
4.4.3    P-Access-Network-Info .....	72
4.4.4    History-Info .....	73
4.4.5    P-Asserted-Service.....	73
4.4.6    Resource-Priority .....	73
4.4.7    Reason (in a response) .....	73
4.4.8    P-Profile-Key .....	73
4.4.9    P-Served-User .....	73
4.4.10    P-Private-Network-Indication .....	73
4.4.11    P-Early-Media .....	74
4.4.12    CPC and OLI .....	74
4.4.13    Feature-Caps .....	74
4.4.14    Priority .....	74
4.4.15    iotl .....	74
4.4.16    Restoration-Info .....	74
4.4.17    Relayed-Charge .....	74
4.4.18    Service-Interact-Info .....	74
4.4.19    Cellular-Network-Info .....	75
4.4.20    Response-Source .....	75
4.5    Charging correlation principles for IM CN subsystems .....	75
4.5.1    Overview .....	75
4.5.2    IM CN subsystem charging identifier (ICID) .....	75
4.5.2A    Related ICID .....	76
4.5.3    Access network charging information .....	76
4.5.3.1    General .....	76
4.5.3.2    Access network charging information.....	77
4.5.4    Inter operator identifier (IOI) .....	77
4.5.4.A    Transit inter operator identifier (Transit IOI) .....	78
4.5.5    Charging function addresses .....	79
4.5.6    Relayed charge parameters .....	80
4.5.7    Loopback-indication parameter .....	80
4.5.8    IM CN subsystem Functional Entity Identifier .....	80
4.5.8.1    General .....	80

4.5.8.2	Tracking of IM CN subsystem functional entities generating charging information .....	80
4.5.8.3	Tracking of applications generating charging information .....	80
4.6	Support of local service numbers .....	80
4.7	Emergency service .....	81
4.7.1	Introduction.....	81
4.7.2	Emergency calls generated by a UE .....	81
4.7.3	Emergency calls generated by an AS.....	81
4.7.4	Emergency calls received from an enterprise network .....	81
4.7.5	Location in emergency calls .....	81
4.7.6	eCall type of emergency service .....	82
4.8	Tracing of signalling .....	83
4.8.1	General.....	83
4.8.2	Trace depth .....	83
4.9	Overlap signalling .....	83
4.9.1	General.....	83
4.9.2	Overlap signalling methods .....	83
4.9.2.1	In-dialog method .....	83
4.9.2.1.1	General .....	83
4.9.2.2	Multiple-INVITE method .....	84
4.9.2.2.1	General .....	84
4.9.3	Routeing impacts .....	84
4.9.3.1	General.....	84
4.9.3.2	Deterministic routeing.....	84
4.9.3.3	Digit collection.....	84
4.10	Dialog correlation for IM CN subsystems.....	85
4.10.1	General.....	85
4.10.2	CONF usage.....	85
4.11	Priority mechanisms .....	85
4.12	Overload control.....	86
4.13	II-NNI traversal scenario.....	87
4.13.1	General.....	87
4.13.2	Identifying the II-NNI traversal scenario .....	87
4.13.3	Security aspects .....	88
4.14	Restoration procedures .....	88
4.14.1	General.....	88
4.14.2	P-CSCF restoration procedures.....	88
4.14.3	S-CSCF restoration procedures.....	88
4.15	Resource sharing .....	89
4.16	Priority sharing .....	89
4.17	3GPP PS data off.....	89
4.18	Dynamic Service Interaction .....	90
5	Application usage of SIP .....	90
5.1	Procedures at the UE .....	90
5.1.0	General.....	90
5.1.1	Registration and authentication.....	91
5.1.1.1	General .....	91
5.1.1.1A	Parameters contained in the ISIM .....	91
5.1.1.1B	Parameters provisioned to a UE without ISIM or USIM .....	92
5.1.1.1B.1	Parameters provisioned in the IMC .....	92
5.1.1.1B.2	Parameters when UE does not contain ISIM, USIM or IMC .....	92
5.1.1.2	Initial registration .....	92
5.1.1.2.1	General .....	92
5.1.1.2.2	Initial registration using IMS AKA .....	98
5.1.1.2.3	Initial registration using SIP digest without TLS .....	99
5.1.1.2.4	Initial registration using SIP digest with TLS .....	99
5.1.1.2.5	Initial registration using NASS-IMS bundled authentication .....	100
5.1.1.2.6	Initial registration using GPRS-IMS-Bundled authentication .....	100
5.1.1.3	Subscription to the registration-state event package .....	100
5.1.1.3A	Void.....	101
5.1.1.4	User-initiated reregistration and registration of an additional public user identity .....	101
5.1.1.4.1	General .....	101

5.1.1.4.2	IMS AKA as a security mechanism.....	105
5.1.1.4.3	SIP digest without TLS as a security mechanism.....	106
5.1.1.4.4	SIP digest with TLS as a security mechanism.....	107
5.1.1.4.5	NASS-IMS bundled authentication as a security mechanism .....	107
5.1.1.4.6	GPRS-IMS-Bundled authentication as a security mechanism.....	107
5.1.1.5	Authentication .....	108
5.1.1.5.1	IMS AKA - general .....	108
5.1.1.5.2	Void.....	109
5.1.1.5.3	IMS AKA abnormal cases.....	109
5.1.1.5.4	SIP digest without TLS – general .....	110
5.1.1.5.5	SIP digest without TLS – abnormal procedures .....	110
5.1.1.5.6	SIP digest with TLS – general .....	111
5.1.1.5.7	SIP digest with TLS – abnormal procedures .....	111
5.1.1.5.8	NASS-IMS bundled authentication – general .....	111
5.1.1.5.9	NASS-IMS bundled authentication – abnormal procedures.....	111
5.1.1.5.10	GPRS-IMS-Bundled authentication – general.....	111
5.1.1.5.11	GPRS-IMS-Bundled authentication – abnormal procedures .....	112
5.1.1.5.12	Abnormal procedures for all security mechanisms.....	112
5.1.1.5A	Network-initiated re-authentication .....	112
5.1.1.5B	Change of IPv6 address due to privacy .....	112
5.1.1.6	User-initiated deregistration.....	113
5.1.1.6.1	General .....	113
5.1.1.6.2	IMS AKA as a security mechanism.....	115
5.1.1.6.3	SIP digest without TLS as a security mechanism.....	116
5.1.1.6.4	SIP digest with TLS as a security mechanism.....	116
5.1.1.6.5	NASS-IMS bundled authentication as a security mechanism.....	116
5.1.1.6.6	GPRS-IMS-Bundled authentication as a security mechanism.....	116
5.1.1.7	Network-initiated deregistration .....	117
5.1.2	Subscription and notification .....	118
5.1.2.1	Notification about multiple registered public user identities.....	118
5.1.2.2	General SUBSCRIBE requirements.....	119
5.1.2A	Generic procedures applicable to all methods excluding the REGISTER method .....	119
5.1.2A.1	UE-originating case.....	119
5.1.2A.1.1	General .....	119
5.1.2A.1.2	Structure of Request-URI .....	124
5.1.2A.1.3	UE without dial string processing capabilities .....	125
5.1.2A.1.4	UE with dial string processing capabilities.....	125
5.1.2A.1.5	Setting the "phone-context" tel URI parameter .....	126
5.1.2A.1.5A	Policy on local numbers .....	126
5.1.2A.1.6	Abnormal cases .....	127
5.1.2A.2	UE-terminating case.....	129
5.1.3	Call initiation - UE-originating case .....	131
5.1.3.1	Initial INVITE request .....	131
5.1.4	Call initiation - UE-terminating case .....	134
5.1.4.1	Initial INVITE request .....	134
5.1.4.2	Reliable 18x Policy .....	136
5.1.4A	Session modification.....	137
5.1.4A.0	General .....	137
5.1.4A.1	Generating session modification request.....	137
5.1.4A.2	Receiving session modification request .....	138
5.1.5	Call release.....	138
5.1.5A	Precondition disabling policy .....	138
5.1.6	Emergency service .....	139
5.1.6.1	General .....	139
5.1.6.2	Initial emergency registration.....	140
5.1.6.2A	New initial emergency registration .....	141
5.1.6.3	Initial subscription to the registration-state event package .....	141
5.1.6.4	User-initiated emergency reregistration .....	141
5.1.6.5	Authentication .....	141
5.1.6.6	User-initiated emergency deregistration .....	141
5.1.6.7	Network-initiated emergency deregistration .....	141
5.1.6.8	Emergency session setup.....	141

5.1.6.8.1	General .....	141
5.1.6.8.2	Emergency session set-up in case of no registration .....	143
5.1.6.8.3	Emergency session set-up within an emergency registration .....	145
5.1.6.8.4	Emergency session setup within a non-emergency registration .....	146
5.1.6.9	Emergency session release .....	148
5.1.6.10	Successful or provisional response to a request not detected by the UE as relating to an emergency session.....	148
5.1.6.11	eCall type of emergency service .....	149
5.1.6.11.1	General .....	149
5.1.6.11.2	Initial INVITE request.....	149
5.1.6.11.3	Transfer of an updated MSD .....	150
5.1.6.12	Current location discovery during an emergency call .....	151
5.1.6.12.1	General .....	151
5.1.6.12.2	Current location information requested .....	151
5.1.6.12.3	Providing current location information .....	151
5.1.7	Void .....	152
5.1.8	Void .....	152
5.1.9	P-CSCF addresses management .....	152
5.2	Procedures at the P-CSCF .....	152
5.2.1	General.....	152
5.2.2	Registration.....	157
5.2.2.1	General .....	157
5.2.2.2	IMS AKA as a security mechanism .....	162
5.2.2.3	SIP digest without TLS as a security mechanism .....	166
5.2.2.4	SIP digest with TLS as a security mechanism.....	167
5.2.2.5	NASS-IMS bundled authentication as a security mechanism.....	169
5.2.2.6	GPRS-IMS-Bundled authentication as a security mechanism .....	169
5.2.2.7	P-CSCF reconfigured to not accept registrations .....	170
5.2.3	Subscription to the user's registration-state event package .....	170
5.2.3A	Void .....	171
5.2.3B	SUBSCRIBE request .....	171
5.2.4	Registration of multiple public user identities .....	171
5.2.5	Deregistration .....	173
5.2.5.1	User-initiated deregistration .....	173
5.2.5.2	Network-initiated deregistration .....	174
5.2.6	General treatment for all dialogs and standalone transactions excluding the REGISTER method.....	174
5.2.6.1	Introduction .....	174
5.2.6.2	Determination of UE-originated or UE-terminated case .....	174
5.2.6.3	Requests initiated by the UE .....	175
5.2.6.3.1	General for all requests.....	175
5.2.6.3.2	General for all responses .....	177
5.2.6.3.2A	Abnormal cases .....	177
5.2.6.3.3	Initial request for a dialog.....	178
5.2.6.3.4	Responses to an initial request for a dialog .....	180
5.2.6.3.5	Target refresh request for a dialog.....	181
5.2.6.3.6	Responses to a target refresh request for a dialog .....	181
5.2.6.3.7	Request for a standalone transaction .....	182
5.2.6.3.8	Responses to a request for a standalone transaction .....	183
5.2.6.3.9	Subsequent request other than a target refresh request .....	184
5.2.6.3.10	Responses to a subsequent request other than a target refresh request .....	184
5.2.6.3.11	Request for an unknown method that does not relate to an existing dialog.....	184
5.2.6.3.12	Responses to a request for an unknown method that does not relate to an existing dialog .....	186
5.2.6.4	Requests terminated by the UE .....	186
5.2.6.4.1	General for all requests.....	186
5.2.6.4.2	General for all responses .....	187
5.2.6.4.3	Initial request for a dialog.....	187
5.2.6.4.4	Responses to an initial request for a dialog .....	188
5.2.6.4.5	Target refresh request for a dialog.....	190
5.2.6.4.6	Responses to a target refresh request for a dialog .....	190
5.2.6.4.7	Request for a standalone transaction .....	191
5.2.6.4.8	Responses to a request for a standalone transaction .....	192
5.2.6.4.9	Subsequent request other than a target refresh request .....	193

5.2.6.4.10	Responses to a subsequent request other than a target refresh request .....	193
5.2.6.4.11	Request for an unknown method that does not relate to an existing dialog.....	194
5.2.6.4.12	Responses to a request for an unknown method that does not relate to an existing dialog .....	194
5.2.7	Initial INVITE .....	194
5.2.7.1	Introduction.....	194
5.2.7.2	UE-originating case.....	194
5.2.7.3	UE-terminating case.....	196
5.2.7.4	Access network charging information.....	196
5.2.8	Call release.....	196
5.2.8.1	P-CSCF-initiated call release .....	196
5.2.8.1.1	Cancellation of a session currently being established.....	196
5.2.8.1.2	Release of an existing session .....	197
5.2.8.1.3	Abnormal cases .....	199
5.2.8.1.4	Release of the existing dialogs due to registration expiration and deletion of the security association, IP association or TLS session .....	199
5.2.8.2	Call release initiated by any other entity .....	200
5.2.8.3	Session expiration .....	200
5.2.9	Subsequent requests.....	200
5.2.9.1	UE-originating case.....	200
5.2.9.2	UE-terminating case.....	200
5.2.10	Emergency service .....	200
5.2.10.1	General.....	200
5.2.10.2	General treatment for all dialogs and standalone transactions excluding the REGISTER method – requests from an unregistered user .....	202
5.2.10.2A	General treatment for all dialogs and standalone transactions excluding the REGISTER method – requests to an unregistered user .....	204
5.2.10.3	General treatment for all dialogs and standalone transactions excluding the REGISTER method after emergency registration.....	204
5.2.10.4	General treatment for all dialogs and standalone transactions excluding the REGISTER method - non-emergency registration.....	206
5.2.10.5	Abnormal and rejection cases.....	209
5.2.11	Void .....	211
5.2.12	Resource sharing.....	211
5.2.13	Priority sharing .....	211
5.3	Procedures at the I-CSCF .....	211
5.3.0	General.....	211
5.3.1	Registration procedure .....	211
5.3.1.1	General .....	211
5.3.1.2	Normal procedures .....	211
5.3.1.3	Abnormal cases .....	212
5.3.2	Initial requests.....	213
5.3.2.1	Normal procedures .....	213
5.3.2.1A	Originating procedures for requests containing the "orig" parameter .....	217
5.3.2.2	Abnormal cases .....	218
5.3.3	Void .....	219
5.3.3.1	Void.....	219
5.3.3.2	Void.....	219
5.3.3.3	Void.....	219
5.3.4	Void .....	219
5.3.5	Subsequent requests.....	219
5.4	Procedures at the S-CSCF .....	220
5.4.0	General.....	220
5.4.1	Registration and authentication.....	220
5.4.1.1	Introduction.....	220
5.4.1.2	Initial registration and user-initiated reregistration .....	223
5.4.1.2.1	Unprotected REGISTER .....	223
5.4.1.2.1A	Challenge with IMS AKA as security mechanism .....	224
5.4.1.2.1B	Challenge with SIP digest as security mechanism.....	225
5.4.1.2.1C	Challenge with SIP digest with TLS as security mechanism.....	225
5.4.1.2.1D	Initial registration and user-initiated reregistration for NASS-IMS bundled authentication .....	225
5.4.1.2.1E	Initial registration and user-initiated reregistration for GPRS-IMS-Bundled authentication .....	226
5.4.1.2.2	Protected REGISTER with IMS AKA as a security mechanism.....	228

5.4.1.2.2A	Protected REGISTER with SIP digest as a security mechanism .....	231
5.4.1.2.2B	Protected REGISTER with SIP digest with TLS as a security mechanism.....	235
5.4.1.2.2C	NASS-IMS bundled authentication as a security mechanism .....	235
5.4.1.2.2D	GPRS-IMS-Bundled authentication as a security mechanism.....	235
5.4.1.2.2E	Protected REGISTER – Authentication already performed .....	235
5.4.1.2.2F	Successful registration.....	237
5.4.1.2.3	Abnormal cases - general .....	239
5.4.1.2.3A	Abnormal cases – IMS AKA as security mechanism.....	240
5.4.1.2.3B	Abnormal cases – SIP digest as security mechanism .....	241
5.4.1.2.3C	Abnormal cases – SIP digest with TLS as security mechanism .....	241
5.4.1.2.3D	Abnormal cases – NASS-IMS bundled authentication as security mechanism.....	241
5.4.1.2.3E	Abnormal cases – GPRS-IMS-Bundled authentication as security mechanism.....	241
5.4.1.3	Authentication and reauthentication.....	241
5.4.1.4	User-initiated deregistration.....	242
5.4.1.4.1	Normal cases .....	242
5.4.1.4.2	Abnormal cases - IMS AKA as security mechanism.....	243
5.4.1.4.4	Abnormal cases – SIP digest with TLS as security mechanism .....	243
5.4.1.4.5	Abnormal cases – NASS-IMS bundled authentication as security mechanism.....	243
5.4.1.4.6	Abnormal cases – GPRS-IMS-Bundled authentication as security mechanism.....	244
5.4.1.5	Network-initiated deregistration .....	244
5.4.1.6	Network-initiated reauthentication.....	246
5.4.1.7	Notification of Application Servers about registration status .....	247
5.4.1.7A	Including contents in the body of the third-party REGISTER request.....	248
5.4.1.8	Service profile updates .....	249
5.4.2	Subscription and notification .....	250
5.4.2.1	Subscriptions to S-CSCF events .....	250
5.4.2.1.1	Subscription to the event providing registration state.....	250
5.4.2.1.2	Notification about registration state.....	251
5.4.2.1.3	Void.....	256
5.4.2.1.4	Void.....	256
5.4.2.1A	Outgoing subscriptions to load-control event .....	256
5.4.2.2	Other subscriptions.....	256
5.4.3	General treatment for all dialogs and standalone transactions excluding requests terminated by the S-CSCF .....	256
5.4.3.1	Determination of UE-originated or UE-terminated case .....	256
5.4.3.2	Requests initiated by the served user .....	257
5.4.3.3	Requests terminated at the served user.....	268
5.4.3.4	Original dialog identifier.....	279
5.4.3.5	Void.....	280
5.4.3.6	SIP digest authentication procedures for all SIP request methods initiated by the UE excluding REGISTER.....	280
5.4.3.6.1	General .....	280
5.4.3.6.2	Abnormal cases .....	281
5.4.4	Call initiation .....	282
5.4.4.1	Initial INVITE.....	282
5.4.4.2	Subsequent requests .....	283
5.4.4.2.1	UE-originating case .....	283
5.4.4.2.2	UE-terminating case .....	283
5.4.5	Call release.....	284
5.4.5.1	S-CSCF-initiated session release .....	284
5.4.5.1.1	Cancellation of a session currently being established.....	284
5.4.5.1.2	Release of an existing session .....	284
5.4.5.1.2A	Release of the existing dialogs due to registration expiration .....	285
5.4.5.1.3	Abnormal cases .....	286
5.4.5.2	Session release initiated by any other entity.....	286
5.4.5.3	Session expiration .....	286
5.4.6	Call-related requests .....	286
5.4.6.1	ReINVITE.....	286
5.4.6.1.1	Determination of served user.....	286
5.4.6.1.2	UE-originating case .....	286
5.4.6.1.3	UE-terminating case .....	286
5.4.7	Void .....	287

5.4.7A	GRUU management.....	287
5.4.7A.1	Overview of GRUU operation .....	287
5.4.7A.2	Representation of public GRUUs.....	287
5.4.7A.3	Representation of temporary GRUUs .....	288
5.4.7A.4	GRUU recognition and validity .....	289
5.4.8	Emergency service .....	289
5.4.8.1	General .....	289
5.4.8.2	Initial emergency registration or user-initiated emergency reregistration.....	290
5.4.8.3	User-initiated emergency deregistration .....	291
5.4.8.4	Network-initiated emergency deregistration .....	291
5.4.8.5	Network-initiated emergency reauthentication .....	291
5.4.8.6	Subscription to the event providing registration state .....	291
5.4.8.7	Notification of the registration state .....	291
5.5	Procedures at the MGCF .....	291
5.5.1	General.....	291
5.5.2	Subscription and notification .....	292
5.5.3	Call initiation .....	292
5.5.3.1	Initial INVITE.....	292
5.5.3.1.1	Calls originated from circuit-switched networks.....	292
5.5.3.1.2	Calls terminating in circuit-switched networks .....	293
5.5.3.2	Subsequent requests .....	294
5.5.3.2.1	Calls originating in circuit-switched networks .....	294
5.5.3.2.2	Calls terminating in circuit-switched networks.....	294
5.5.4	Call release.....	295
5.5.4.1	Call release initiated by a circuit-switched network.....	295
5.5.4.2	IM CN subsystem initiated call release.....	295
5.5.4.3	MGW-initiated call release .....	295
5.5.5	Call-related requests .....	295
5.5.5.1	Session modification .....	295
5.5.5.1.0	General .....	295
5.5.5.1.1	Session modifications originating from circuit-switched networks.....	295
5.5.5.1.2	Session modifications terminating in circuit-switched networks .....	296
5.5.6	Further initial requests .....	296
5.6	Procedures at the BGCF .....	296
5.6.1	General.....	296
5.6.2	Common BGCF procedures.....	297
5.6.3	Specific procedures for INVITE requests and responses.....	299
5.6.4	Specific procedures for subsequent requests and responses .....	300
5.7	Procedures at the Application Server (AS).....	300
5.7.1	Common Application Server (AS) procedures .....	300
5.7.1.0	General .....	300
5.7.1.1	Notification about registration status .....	300
5.7.1.2	Extracting charging correlation information .....	302
5.7.1.3	Access-Network-Info and Visited-Network-ID .....	302
5.7.1.3A	Determination of the served user .....	302
5.7.1.3A.1	General .....	302
5.7.1.3A.2	AS serving an originating user .....	302
5.7.1.3A.3	AS serving a terminating user .....	302
5.7.1.3B	Determination of the used registration .....	303
5.7.1.4	User identity verification at the AS .....	303
5.7.1.5	Request authorization.....	305
5.7.1.6	Event notification throttling .....	305
5.7.1.7	Local numbering .....	305
5.7.1.7.1	Interpretation of the numbers in a non-international format.....	305
5.7.1.7.2	Translation of the numbers in a non-international format .....	306
5.7.1.8	GRUU assignment and usage.....	306
5.7.1.9	Use of ICSI and IARI values.....	307
5.7.1.10	Carrier selection .....	308
5.7.1.11	Tracing .....	309
5.7.1.12	Delivery of original destination identity .....	309
5.7.1.13	CPC and OLI.....	309
5.7.1.14	Emergency transactions .....	309

5.7.1.15	Protecting against attacks using 3xx responses .....	310
5.7.1.16	Support of Roaming Architecture for Voice over IMS with Local Breakout .....	310
5.7.1.16.1	Preservation of parameters .....	310
5.7.1.16.2	Preference for loopback routeing not to occur.....	310
5.7.1.17	Delivery of network provided location information.....	311
5.7.1.18	Delivery of MRB address information.....	311
5.7.1.19	Overload control .....	311
5.7.1.19.1	Outgoing subscriptions to load-control event.....	311
5.7.1.19.2	Incoming subscriptions to load-control event.....	312
5.7.1.20	Procedures in the AS for resource sharing .....	312
5.7.1.20.1	General .....	312
5.7.1.20.2	UE-originating case .....	312
5.7.1.20.3	UE-terminating case .....	313
5.7.1.20.3.1	Determine resource sharing using the initial SDP offer .....	313
5.7.1.20.3.2	Determine resource sharing using the initial SDP answer.....	314
5.7.1.20.4	Updating the resource sharing options .....	314
5.7.1.20.5	Abnormal cases .....	314
5.7.1.21	Dynamic Service Interaction.....	315
5.7.1.22	Service access number translation.....	315
5.7.1.23	Procedures in the AS for priority sharing .....	315
5.7.1.23.1	General .....	315
5.7.1.23.2	Session originating procedures .....	315
5.7.1.23.3	Session terminating procedures .....	316
5.7.1.24	Handling re-INVITE request collisions .....	316
5.7.1.25	User verification using the Identity header field .....	316
5.7.1.25.1	General .....	316
5.7.1.25.2	Originating procedures .....	316
5.7.1.25.3	Terminating procedures.....	316
5.7.1.26	Procedures in the AS for 3GPP PS data off .....	317
5.7.2	Application Server (AS) acting as terminating UA, or redirect server .....	317
5.7.3	Application Server (AS) acting as originating UA .....	318
5.7.4	Application Server (AS) acting as a SIP proxy.....	320
5.7.5	Application Server (AS) performing 3rd party call control .....	320
5.7.5.1	General .....	320
5.7.5.2	Call initiation.....	322
5.7.5.2.1	Initial INVITE .....	322
5.7.5.2.2	Subsequent requests.....	323
5.7.5.3	Call release .....	323
5.7.5.4	Call-related requests.....	323
5.7.5.5	Further initial requests.....	323
5.7.5.6	Transcoding services invocation using third-party call control.....	323
5.7.6	Void .....	323
5.8	Procedures at the MRFC .....	323
5.8.1	General.....	323
5.8.2	Call initiation .....	324
5.8.2.1	Initial INVITE .....	324
5.8.2.1.1	MRFC-terminating case .....	324
5.8.2.1.1.1	Introduction.....	324
5.8.2.1.2	MRFC-originating case .....	325
5.8.2.2	Subsequent requests .....	325
5.8.2.2.1	Tones and announcements.....	325
5.8.2.2.2	Transcoding .....	325
5.8.3	Call release.....	325
5.8.3.1	S-CSCF-initiated call release .....	325
5.8.3.1.1	Tones and announcements.....	325
5.8.3.2	MRFC-initiated call release .....	326
5.8.3.2.1	Tones and announcements.....	326
5.8.4	Call-related requests .....	326
5.8.4.1	ReINVITE.....	326
5.8.4.1.1	MRFC-terminating case .....	326
5.8.4.1.2	MRFC-originating case .....	326
5.8.4.2	REFER .....	326

5.8.4.2.1	MRFC-terminating case .....	326
5.8.4.2.2	MRFC-originating case .....	326
5.8.4.2.3	REFER initiating a new session .....	326
5.8.4.2.4	REFER replacing an existing session .....	326
5.8.4.3	INFO .....	326
5.8.5	Further initial requests .....	327
5.8A	Procedures at the MRB .....	327
5.9	Void .....	327
5.9.1	Void .....	327
5.10	Procedures at the IBCF .....	327
5.10.1	General .....	327
5.10.2	IBCF as an exit point .....	328
5.10.2.1	Registration .....	328
5.10.2.1A	General .....	329
5.10.2.2	Initial requests .....	329
5.10.2.3	Subsequent requests .....	331
5.10.2.4	IBCF-initiated call release .....	331
5.10.3	IBCF as an entry point .....	331
5.10.3.1	Registration .....	331
5.10.3.1A	General .....	332
5.10.3.2	Initial requests .....	332
5.10.3.3	Subsequent requests .....	335
5.10.3.4	IBCF-initiated call release .....	336
5.10.3.5	Abnormal cases .....	336
5.10.4	THIG functionality in the IBCF .....	336
5.10.4.1	General .....	336
5.10.4.2	Encryption for network topology hiding .....	338
5.10.4.3	Decryption for network topology hiding .....	339
5.10.5	IMS-ALG functionality in the IBCF .....	339
5.10.6	Screening of SIP signalling .....	340
5.10.6.1	General .....	340
5.10.6.2	IBCF procedures for SIP header fields .....	340
5.10.6.3	IBCF procedures for SIP message bodies .....	341
5.10.7	Media transcoding control .....	341
5.10.8	Privacy protection at the trust domain boundary .....	341
5.10.9	Roaming architecture for voice over IMS with local breakout .....	342
5.11	Procedures at the E-CSCF .....	342
5.11.1	General .....	342
5.11.2	UE originating case .....	343
5.11.3	Use of an LRF .....	347
5.11.4	Subscriptions to E-CSCF events .....	348
5.11.4.1	Subscription to the event providing dialog state .....	348
5.11.4.2	Notification about dialog state .....	349
5.11.4.3	Subscription to the presence event package .....	349
5.11.4.4	Notification about presence .....	350
5.11.5	Current location discovery during an emergency call .....	351
5.11.5.1	General .....	351
5.11.5.2	Requesting current location information .....	351
5.11.5.3	Receiving current location information .....	351
5.12	Location Retrieval Function (LRF) .....	351
5.12.1	General .....	351
5.12.2	Treatment of incoming initial requests for a dialog and standalone requests .....	352
5.12.3	Subscription and notification .....	353
5.12.3.1	Notification about dialog state .....	353
5.12.3.2	Notification about UE location .....	354
5.13	ISC gateway function .....	355
5.13.1	General .....	355
5.13.2	ISC gateway function as an exit point .....	355
5.13.2.1	Registration .....	355
5.13.2.2	General .....	355
5.13.2.3	Initial requests .....	356
5.13.2.4	Subsequent requests .....	357

5.13.2.5	Call release initiated by ISC gateway function .....	357
5.13.3	ISC gateway function as an entry point .....	358
5.13.3.1	Registration .....	358
5.13.3.2	General .....	358
5.13.3.3	Initial requests .....	358
5.13.3.4	Subsequent requests .....	359
5.13.3.5	Call release initiated by the ISC gateway function .....	360
5.13.4	THIG functionality in the ISC gateway function .....	360
5.13.5	IMS-ALG functionality in the ISC gateway function .....	360
5.13.6	Screening of SIP signalling .....	360
6	Application usage of SDP .....	360
6.1	Procedures at the UE .....	360
6.1.1	General .....	360
6.1.2	Handling of SDP at the originating UE .....	363
6.1.3	Handling of SDP at the terminating UE .....	365
6.1.4	Session modification .....	368
6.1.4.1	General .....	368
6.1.4.2	Generating session modification request .....	368
6.1.4.3	Receiving session modification request .....	368
6.2	Procedures at the P-CSCF .....	369
6.3	Procedures at the S-CSCF .....	370
6.4	Procedures at the MGCF .....	370
6.4.1	Calls originating from circuit-switched networks .....	370
6.4.2	Calls terminating in circuit-switched networks .....	371
6.4.3	Optimal Media Routeing (OMR) .....	371
6.4.4	Explicit congestion control support in MGCF .....	371
6.5	Procedures at the MRFC .....	371
6.6	Procedures at the AS .....	371
6.6.1	General .....	371
6.6.2	Transcoding .....	372
6.6.3	AS procedures to support WebRTC media optimization procedure .....	372
6.7	Procedures at the IMS-ALG functionality .....	373
6.7.1	IMS-ALG in IBCF .....	373
6.7.1.1	General .....	373
6.7.1.2	IMS-ALG in IBCF for support of ICE .....	373
6.7.1.2.1	General .....	373
6.7.1.2.2	IBCF full ICE procedures for UDP based streams .....	373
6.7.1.2.2.1	General .....	373
6.7.1.2.2.2	IBCF receiving SDP offer .....	373
6.7.1.2.2.3	IBCF sending SDP offer .....	374
6.7.1.2.2.4	IBCF receiving SDP answer .....	374
6.7.1.2.2.5	IBCF sending SDP answer .....	374
6.7.1.2.3	IBCF ICE lite procedures for UDP based streams .....	374
6.7.1.2.4	ICE procedures for TCP based streams .....	375
6.7.1.2.4.1	General .....	375
6.7.1.2.4.2	IBCF receiving SDP offer .....	375
6.7.1.2.4.3	IBCF sending SDP offer .....	375
6.7.1.2.4.4	IBCF receiving SDP answer .....	375
6.7.1.2.4.5	IBCF sending SDP answer .....	375
6.7.1.3	IMS-ALG in IBCF for transcoding .....	375
6.7.1.4	IMS-ALG in IBCF for NA(P)T and NA(P)T-PT controlled by the IBCF .....	376
6.7.1.4.1	General .....	376
6.7.1.5	IMS-ALG procedure in IBCF to support WebRTC media optimization procedure .....	376
6.7.2	IMS-ALG in P-CSCF .....	377
6.7.2.1	General .....	377
6.7.2.2	IMS-ALG in P-CSCF for media plane security .....	377
6.7.2.3	IMS-ALG in P-CSCF for explicit congestion control support .....	381
6.7.2.3.1	General .....	381
6.7.2.3.2	Incoming SDP offer with ECN .....	381
6.7.2.3.3	Incoming SDP offer without ECN .....	382
6.7.2.4	IMS-ALG in P-CSCF for Optimal Media Routeing (OMR) .....	382