



**Universal Mobile Telecommunications System (UMTS);
LTE;
Policy and Charging Control (PCC);
Reference points
(3GPP TS 29.212 version 15.8.0 Release 15)**



ReferenceRTS/TSGC-0329212vf80

Keywords

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.

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/CommiteeSupportStaff.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.....	15
1 Scope	16
2 References	16
3 Definitions and abbreviations.....	18
3.1 Definitions	18
3.2 Abbreviations	20
4 Gx reference point	20
4.1 Overview	20
4.2 Gx Reference model.....	21
4.3 PCC Rules	21
4.3.1 PCC Rule Definition.....	21
4.3.2 Operations on PCC Rules	23
4.3a IP flow mobility routing rules	24
4.3a.0 General.....	24
4.3a.1 Functional entities.....	24
4.3a.2 IP flow mobility routing rule definition.....	24
4.3a.3 Operations on Routing rules	25
4.3a.4 PCC procedures for IP flow mobility routing rule over Gx reference point	25
4.3a.4.1 Provisioning of IP flow mobility routing rules.....	25
4.3b Void.....	26
4.3c NBIFOM routing rules	26
4.3c.1 General.....	26
4.3c.2 NBIFOM routing rule definition.....	26
4.3c.3 Operations on NBIFOM Routing rules	27
4.4 Functional elements.....	27
4.4.1 PCRF	27
4.4.2 PCEF.....	28
4.5 PCC procedures over Gx reference point	29
4.5.1 Request for PCC rules.....	29
4.5.2 Provisioning of PCC rules	31
4.5.2.0 Overview	31
4.5.2.1 Selecting a PCC rule for Uplink IP packets	34
4.5.2.2 Selecting a PCC rule and IP CAN Bearer for Downlink IP packets	35
4.5.2.3 Gate function.....	35
4.5.2.4 Policy enforcement for "Authorized QoS" per PCC Rule.....	36
4.5.2.5 Usage Monitoring Control	36
4.5.2.6 Redirect function.....	36
4.5.2.7 Support for DSCP marking of downlink packets at the TDF.....	36
4.5.2.8 Traffic Steering Control support	37
4.5.3 Provisioning of Event Triggers.....	37
4.5.4 Provisioning of charging related information for the IP-CAN session	38
4.5.4.1 Provisioning of Charging Addresses.....	38
4.5.4.2 Provisioning of Default Charging Method.....	38
4.5.4.3 Void.....	38
4.5.4.4 Provisioning of Access Network Charging Identifier	38
4.5.5 Provisioning and Policy Enforcement of Authorized QoS	39
4.5.5.0 Overview	39
4.5.5.0a Provisioning of authorized QoS per IP CAN bearer	40
4.5.5.1 Policy enforcement for authorized QoS per IP CAN bearer	40
4.5.5.2 Policy provisioning for authorized QoS per service data flow.....	40
4.5.5.3 Policy enforcement for authorized QoS per service data flow	40

4.5.5.4	Coordination of authorized QoS scopes in mixed mode	41
4.5.5.5	Provisioning of authorized QoS per QCI	41
4.5.5.6	Policy enforcement for authorized QoS per QCI	41
4.5.5.7	Provisioning of authorized QoS per APN	41
4.5.5.8	Policy enforcement for authorized QoS per APN	42
4.5.5.9	Provisioning of authorized QoS for the Default EPS Bearer	43
4.5.5.10	Policy enforcement for authorized QoS of the Default EPS Bearer	43
4.5.5.11	Policy provisioning and enforcement of authorized QoS for service data flows that share resources	43
4.5.5.12	Provisioning and enforcement of time conditioned policy information	43
4.5.5.12.1	General	43
4.5.5.12.2	Time conditioned authorized QoS per APN	44
4.5.5.12.3	Time conditioned authorized default EPS bearer QoS	44
4.5.5.13	Policy provisioning and enforcement of authorized QoS for service data flows that shall be bound to the default bearer	45
4.5.6	Indication of IP-CAN Bearer Termination Implications	46
4.5.7	Indication of IP-CAN Session Termination	46
4.5.8	Request of IP-CAN Bearer Termination	47
4.5.9	Request of IP-CAN Session Termination	47
4.5.10	Bearer Control Mode Selection	48
4.5.11	Provisioning of Event Report Indication	48
4.5.12	PCC Rule Error Handling	49
4.5.13	Time of the day procedures	50
4.5.14	Trace activation/deactivation	51
4.5.15	IMS Emergency Session Support	51
4.5.15.1	Functional Entities	51
4.5.15.2	PCC procedures for Emergency services over Gx reference point	51
4.5.15.2.1	Request for PCC Rules for Emergency services	51
4.5.15.2.2	Provisioning of PCC Rules for Emergency services	51
4.5.15.2.2.1	Provisioning of PCC Rules at Gx session establishment	51
4.5.15.2.2.2	Provisioning of PCC Rules for Emergency Services	52
4.5.15.2.3	Removal of PCC Rules for Emergency Services	52
4.5.15.2.4	Removal of PCC Rules at Gx session termination	53
4.5.16	Requesting Usage Monitoring Control	53
4.5.17	Reporting Accumulated Usage	54
4.5.17.0	General	54
4.5.17.1	Usage Threshold Reached	55
4.5.17.2	PCC Rule Removal	55
4.5.17.3	Usage Monitoring Disabled	56
4.5.17.4	IP-CAN Session Termination	56
4.5.17.5	PCRF Requested Usage Report	56
4.5.17.6	Report in case of Monitoring Time provided	56
4.5.18	IMS Restoration Support	57
4.5.18a	P-CSCF Restoration Enhancement Support	57
4.5.19	Multimedia Priority Support	57
4.5.19.1	PCC Procedures for Multimedia Priority services over Gx reference point	57
4.5.19.1.1	Provisioning of PCC Rules for Multimedia Priority Services	57
4.5.19.1.2	Invocation/Revocation of Priority EPS Bearer Services	58
4.5.19.1.3	Invocation/Revocation of IMS Multimedia Priority Services	59
4.5.20	Sponsored Data Connectivity	59
4.5.21	PCRF Failure and Restoration	60
4.5.22	Reporting Access Network Information	60
4.5.23	Application Detection Information	61
4.5.24	Group Communication Service Support	62
4.5.25	NBIFOM Support	62
4.5.25.1	General	62
4.5.25.1.1	PCRF procedures	62
4.5.25.1.2	PCEF procedures	63
4.5.25.2	NBIFOM impacts on PCC procedures over Gx	64
4.5.25.2.1	IP-CAN session establishment	64
4.5.25.2.2	Addition of an access	64
4.5.25.2.3	Removal of an access	65

4.5.25.2.3.1	UE/PCEF-initiated removal of an access.....	65
4.5.25.2.3.2	PCRF-initiated removal of an access	65
4.5.25.2.4	Network-initiated IP flow mobility within a PDN connection (Network-initiated NBIFOM mode).....	65
4.5.25.2.5	UE-initiated IP flow mobility within a PDN connection (UE-initiated NBIFOM mode)	66
4.5.25.2.6	UE Requested IP Flow Mapping (Network-initiated NBIFOM mode).....	67
4.5.25.2.7	An access becomes not available/available again.....	69
4.5.25.2.8	Access Network Information Reporting.....	69
4.5.25.2.9	Usage monitoring control	69
4.5.25.2.10	UE resource request for a multi-access IP-CAN session.....	70
4.5.26	Detection and handling of late arriving requests.....	70
4.5.26.1	General	70
4.5.26.2	Detection and handling of requests which collide with an existing session context	70
4.5.26.3	Detection and handling of requests which have timed out at the originating entity	70
4.5.27	Resource reservation for services sharing priority.....	71
4.5.28	Support for PCC rule versioning.....	72
4.5.29	3GPP PS Data Off Support.....	72
4.5.30	Extended bandwidth support for EPC supporting Dual Connectivity (E-UTRAN and 5G NR)	74
4.5.31	Policy update When UE suspends.....	74
4.6	Void.....	75
4a	Gxx reference points	75
4a.1	Overview	75
4a.2	Gxx Reference model.....	75
4a.3	Quality of Service Control Rules	76
4a.3.1	Quality of Service Control Rule Definition	76
4a.3.2	Operations on QoS Rules.....	77
4a.4	Functional elements.....	77
4a.4.1	PCRF	77
4a.4.2	BBERF.....	78
4a.5	PCC procedures over Gxx reference points	78
4a.5.1	Gateway control and QoS Rules Request	78
4a.5.2	Gateway control and QoS Rules Provision	80
4a.5.2.1	Overview	80
4a.5.2.2	Support for DSCP marking of downlink packets at the TDF.....	81
4a.5.3	Gateway Control Session Termination	81
4a.5.4	Request of Gateway Control Session Termination	82
4a.5.5	QoS Control Rule error handling.....	82
4a.5.6	Gateway Control session to Gx session linking.....	82
4a.5.7	Multiple BBF support	83
4a.5.7.1	General	83
4a.5.7.2	Handling of two BBFs associated with the same IP-CAN session during handover	83
4a.5.7.3	Handling of multiple BBFs with flow mobility within IP-CAN session.....	85
4a.5.8	Provisioning of Event Triggers.....	85
4a.5.9	Bearer Control Mode Selection	86
4a.5.10	Provisioning and Policy Enforcement of Authorized QoS	86
4a.5.10.1	Provisioning of authorized QoS for the Default EPS Bearer	86
4a.5.10.2	Policy enforcement for authorized QoS of the Default EPS Bearer.....	87
4a.5.10.3	Provisioning of authorized QoS per APN	87
4a.5.10.4	Policy provisioning for authorized QoS per service data flow.....	87
4a.5.10.5	Policy enforcement for authorized QoS per service data flow.....	87
4a.5.10.6	Policy provisioning and enforcement of authorized QoS for service data flows that share resources	87
4a.5.11	Trace activation/deactivation	88
4a.5.12	IMS Emergency Session Support	88
4a.5.12.1	PCC procedures for Emergency services over Gxx reference point	88
4a.5.12.1.1	Gateway control and QoS Rules request for Emergency services.....	88
4a.5.12.1.2	Provisioning of QoS Rules for Emergency services.....	88
4a.5.12.1.2.1	Provisioning of QoS Rules at Gxx session establishment.....	88
4a.5.12.1.2.2	Provisioning of QoS Rules for Emergency services	89
4a.5.12.2	Gateway Control Session to Gx session linking.....	89
4a.5.12.3	Removal of QoS Rules for Emergency Services.....	89

4a.5.12.4	Termination of Gateway Control session for Emergency Services.....	89
4a.5.13	Time of the day procedures.....	89
4a.5.14	Multimedia Priority Support.....	91
4a.5.14.1	PCC Procedures for Multimedia Priority services over Gxx reference point.....	91
4a.5.14.1.1	Provisioning of QoS Rules for Multimedia Priority Services.....	91
4a.5.14.1.2	Invocation/Revocation of Priority EPS Bearer Services	91
4a.5.14.1.3	Invocation/Revocation of IMS Multimedia Priority Services	91
4a.5.15	PCRF Failure and Restoration	91
4a.5.16	Reporting Access Network Information	92
4a.5.17	Resource reservation for services sharing priority	93
4a.5.18	Support for QoS rule versioning	94
4a.5.19	Extended bandwidth support for EPC supporting Dual Connectivity (E-UTRAN and 5G NR)	94
4b	Sd reference point.....	95
4b.1	Overview	95
4b.2	Sd Reference model.....	95
4b.3	Application Detection and Control Rules.....	95
4b.3.1	Functional entities.....	95
4b.3.2	Application Detection and Control Rule Definition	96
4b.3.3	Operations on ADC Rules	98
4b.4	Functional elements.....	98
4b.4.1	PCRF	98
4b.4.2	TDF.....	99
4b.5	ADC procedures over Sd reference point for solicited application reporting.....	100
4b.5.1	Provisioning of ADC rules	100
4b.5.1.1	General	100
4b.5.1.2	Gate function.....	101
4b.5.1.3	Bandwidth limitation function	101
4b.5.1.4	Redirect function.....	101
4b.5.1.5	Usage Monitoring Control	102
4b.5.1.6	Marking of downlink packets.....	102
4b.5.2	Request for ADC rules.....	102
4b.5.3	Provisioning of Event Triggers.....	102
4b.5.4	Request of TDF Session Termination.....	103
4b.5.5	ADC Rule Error Handling	103
4b.5.6	Requesting Usage Monitoring Control	104
4b.5.7	Reporting Accumulated Usage	105
4b.5.7.1	General	105
4b.5.7.2	Usage Threshold Reached.....	106
4b.5.7.3	ADC Rule Removal	106
4b.5.7.4	Usage Monitoring Disabled	106
4b.5.7.5	TDF Session Termination	107
4b.5.7.6	PCRF Requested Usage Report.....	107
4b.5.7.7	Report in case of Monitoring Time provided.....	107
4b.5.8	Provisioning of Event Report Indication	107
4b.5.9	Application Detection Information.....	108
4b.5.10	Time of the day procedures.....	109
4b.5.11	PCRF Failure and Restoration	109
4b.5.12	Bandwidth limitation function	110
4b.5.13	Provisioning of charging related information for the TDF session.....	110
4b.5.13.1	Provisioning of Charging Addresses.....	110
4b.5.13.2	Provisioning of Default Charging Method.....	110
4b.5.13.3	Provisioning of Charging Characteristics.....	110
4b.5.14	Downlink packet marking by the TDF	111
4b.5.15	Traffic steering control support	111
4b.5.16	Sponsored Data Connectivity	112
4b.5.17	Extended bandwidth support for EPC supporting Dual Connectivity (E-UTRAN and 5G NR)	112
4b.5a	ADC procedures over Sd reference point for unsolicited application reporting.....	113
4b.5a.1	Provisioning of ADC rules	113
4b.5a.1.1	General	113
4b.5a.2	Application Detection Information.....	113
4b.5a.3	Request of TDF Session Termination.....	113

4b.5a.4	TDF session to Gx session linking.....	113
4c	St reference point	114
4c.1	Overview	114
4c.2	St Reference model	114
4c.3	Functional elements.....	114
4c.3.1	PCRF	114
4c.3.2	TSSF	115
4c.4	Procedures over St reference point.....	115
4c.4.1	Traffic Steering Control Information Provisioning.....	115
4c.4.2	St Session Termination	116
4c.4.3	ADC Rule Error Handling	116
4c.4.4	UE IPv4 Address Provisioning.....	117
5	Gx protocol.....	117
5.1	Protocol support	117
5.2	Initialization, maintenance and termination of connection and session.....	117
5.3	Gx specific AVPs	118
5.3.0	General.....	118
5.3.1	Bearer-Usage AVP (3GPP-GPRS and 3GPP-EPS access types).....	125
5.3.2	Charging-Rule-Install AVP (All access types)	125
5.3.3	Charging-Rule-Remove AVP (All access types).....	126
5.3.4	Charging-Rule-Definition AVP (All access types).....	126
5.3.5	Charging-Rule-Base-Name AVP (All access types).....	128
5.3.6	Charging-Rule-Name AVP (All access types).....	128
5.3.7	Event-Trigger AVP (All access types).....	128
5.3.8	Metering-Method AVP (All access types).....	136
5.3.9	Offline AVP (All access types).....	136
5.3.10	Online AVP (All access types)	137
5.3.11	Precedence AVP (All access types)	137
5.3.12	Reporting-Level AVP (All access types).....	138
5.3.13	TFT-Filter AVP (3GPP-GPRS access type only)	138
5.3.14	TFT-Packet-Filter-Information AVP (3GPP-GPRS access type only).....	139
5.3.15	ToS-Traffic-Class AVP (All access types).....	139
5.3.16	QoS-Information AVP (All access types).....	139
5.3.17	QoS-Class-Identifier AVP (All access types)	140
5.3.18	Charging-Rule-Report AVP (All access types)	142
5.3.19	PCC-Rule-Status AVP (All access types).....	143
5.3.20	Bearer-Identifier AVP (Applicable access type 3GPP-GPRS)	143
5.3.21	Bearer-Operation AVP (Applicable access type 3GPP-GPRS).....	144
5.3.22	Access-Network-Charging-Identifier-Gx AVP (All access types)	144
5.3.23	Bearer-Control-Mode AVP.....	144
5.3.24	Network-Request-Support AVP	145
5.3.25	Guaranteed-Bitrate-DL AVP	145
5.3.26	Guaranteed-Bitrate-UL AVP	145
5.3.27	IP-CAN-Type AVP (All access types)	145
5.3.28	QoS-Negotiation AVP (3GPP-GPRS Access Type only).....	146
5.3.29	QoS-Upgrade AVP (3GPP-GPRS Access Type only).....	147
5.3.30	Event-Report-Indication AVP (All access types)	147
5.3.31	RAT-Type AVP	148
5.3.32	Allocation-Retention-Priority AVP (All access types)	149
5.3.33	CoA-IP-Address AVP (All access types)	149
5.3.34	Tunnel-Header-Filter AVP (All access types).....	149
5.3.35	Tunnel-Header-Length AVP (All access types)	150
5.3.36	Tunnel-Information AVP (All access types)	150
5.3.37	CoA-Information AVP (All access types)	150
5.3.38	Rule-Failure-Code AVP (All access types)	150
5.3.39	APN-Aggregate-Max-Bitrate-DL AVP	153
5.3.40	APN-Aggregate-Max-Bitrate-UL AVP	153
5.3.41	Revalidation-Time (ALL Access Types).....	153
5.3.42	Rule-Activation-Time (ALL Access Types).....	153
5.3.43	Rule-Deactivation-Time (ALL Access Types)	154

5.3.44	Session-Release-Cause (All access types)	154
5.3.45	Priority-Level AVP (All access types).....	154
5.3.46	Pre-emption-Capability AVP.....	155
5.3.47	Pre-emption-Vulnerability AVP	155
5.3.48	Default-EPS-Bearer-QoS AVP	155
5.3.49	AN-GW-Address AVP (All access types).....	155
5.3.50	Resource-Allocation-Notification AVP (All access types).....	156
5.3.51	Security-Parameter-Index AVP (All access types).....	156
5.3.52	Flow-Label AVP (All access types)	156
5.3.53	Flow-Information AVP (All access types).....	156
5.3.54	Packet-Filter-Content AVP	157
5.3.55	Packet-Filter-Identifier AVP	157
5.3.56	Packet-Filter-Information AVP	157
5.3.57	Packet-Filter-Operation AVP.....	158
5.3.58	PDN-Connection-ID AVP	158
5.3.59	Monitoring-Key AVP	158
5.3.60	Usage-Monitoring-Information AVP.....	158
5.3.61	Usage-Monitoring-Level AVP.....	159
5.3.62	Usage-Monitoring-Report AVP.....	159
5.3.63	Usage-Monitoring-Support AVP	160
5.3.64	CSG-Information-Reporting AVP	160
5.3.65	Flow-Direction AVP	160
5.3.66	Packet-Filter-Usage AVP (All access types)	161
5.3.67	Charging-Correlation-Indicator AVP (All access types)	161
5.3.68	Routing-Rule-Install AVP	161
5.3.69	Routing-Rule-Remove AVP	161
5.3.70	Routing-Rule-Definition AVP	161
5.3.71	Routing-Rule-Identifier AVP.....	162
5.3.72	Routing-Filter AVP.....	162
5.3.73	Routing-IP-Address AVP	162
5.3.74	Void	163
5.3.75	Void	163
5.3.76	Void	163
5.3.77	TDF-Application-Identifier AVP.....	163
5.3.78	TDF-Information AVP	163
5.3.79	TDF-Destination-REALM AVP	163
5.3.80	TDF-Destination-Host AVP	163
5.3.81	TDF-IP-Address AVP.....	163
5.3.82	Redirect-Information AVP.....	163
5.3.83	Redirect-Support AVP	164
5.3.84	PS-to-CS-Session-Continuity AVP (3GPP-EPS access type only)	164
5.3.85	Void	164
5.3.86	Void	164
5.3.87	Void	164
5.3.88	Void	164
5.3.89	Void	164
5.3.90	Void	164
5.3.91	Application-Detection-Information AVP	165
5.3.92	TDF-Application-Instance-Identifier AVP	165
5.3.93	Void	165
5.3.94	Void	165
5.3.95	HeNB-Local-IP-Address AVP (3GPP-EPS access type only)	165
5.3.96	UE-Local-IP-Address AVP (Non-3GPP-EPS access type only)	165
5.3.97	UDP-Source-Port AVP (3GPP-EPS and Non-3GPP-EPS access types).....	165
5.3.98	Mute-Notification AVP	165
5.3.99	Monitoring-Time AVP	166
5.3.100	AN-GW-Status AVP (3GPP-EPS access type).....	166
5.3.101	User-Location-Info-Time AVP.....	166
5.3.102	Credit-Management-Status AVP	166
5.3.103	Default-QoS-Information AVP (FBA access type)	167
5.3.104	Default-QoS-Name AVP (FBA access type).....	167
5.3.105	Conditional-APN-Aggregate-Max-Bitrate (All access types)	167

5.3.106	RAN-NAS-Release-Cause AVP (3GPP-EPS and Non-3GPP-EPS access type).....	168
5.3.107	Presence-Reporting-Area-Elements-List AVP (3GPP-EPS access type)	168
5.3.108	Presence-Reporting-Area-Identifier AVP (3GPP-EPS access type).....	168
5.3.109	Presence-Reporting-Area-Information AVP (3GPP-EPS access type).....	168
5.3.110	Presence-Reporting-Area-Status AVP (3GPP-EPS access type).....	169
5.3.111	NetLoc-Access-Support AVP	169
5.3.112	Fixed-User-Location-Info AVP (FBA access type).....	169
5.3.113	PCSCF-Restoration-Indication AVP	169
5.3.114	IP-CAN-Session-Charging-Scope AVP	169
5.3.115	Monitoring-Flags AVP	170
5.3.116	NBIFOM-Support AVP	170
5.3.117	NBIFOM-Mode AVP	170
5.3.118	Routing-Rule-Report AVP	170
5.3.119	Routing-Rule-Failure-Code AVP	171
5.3.120	Default-Access AVP	171
5.3.121	Access-Availability-Change-Reason AVP	171
5.3.122	RAN-Rule-Support AVP	172
5.3.123	Traffic-Steering-Policy-Identifier-DL AVP	172
5.3.124	Traffic-Steering-Policy-Identifier-UL AVP	172
5.3.125	Resource-Release-Notification AVP (All access types)	172
5.3.126	Removal-Of-Access AVP.....	172
5.3.127	Execution-Time AVP (ALL Access Types)	172
5.3.128	Conditional-Policy-Information AVP.....	173
5.3.129	TCP-Source-Port AVP (Non-3GPP-EPS access type)	173
5.3.130	PRA-Install AVP (3GPP-EPS access type)	173
5.3.131	PRA-Remove AVP (3GPP-EPS access type).....	173
5.3.132	Default-Bearer-Indication AVP	174
5.3.133	3GPP-PS-Data-Off-Status AVP (Applicable access type 3GPP-EPS).....	174
5.3.134	Extended-APN-AMBR-DL AVP	174
5.3.135	Extended-APN-AMBR-UL AVP	174
5.3.136	Extended-GBR-DL AVP	174
5.3.137	Extended-GBR-UL AVP	175
5.3.138	Max-PLR-DL AVP.....	175
5.3.139	Max-PLR-UL AVP.....	175
5.3.140	UE-Status AVP (3GPP-EPS access type).....	175
5.3.141	Presence-Reporting-Area-Node AVP (3GPP-EPS access type).....	175
5.4	Gx re-used AVPs.....	175
5.4.0	General.....	175
5.4.1	Use of the Supported-Features AVP on the Gx reference point	183
5.4.2	Flow-Description AVP	188
5.5	Gx specific Experimental-Result-Code AVP values	189
5.5.1	General.....	189
5.5.2	Success.....	189
5.5.3	Permanent Failures	189
5.5.4	Transient Failures	190
5.6	Gx Messages	191
5.6.1	Gx Application.....	191
5.6.2	CC-Request (CCR) Command.....	191
5.6.3	CC-Answer (CCA) Command.....	192
5.6.4	Re-Auth-Request (RAR) Command	193
5.6.5	Re-Auth-Answer (RAA) Command	194
5a	Gxx protocols	194
5a.1	Protocol support	194
5a.2	Initialization, maintenance and termination of connection and session.....	195
5a.3	Gxx specific AVPs	195
5a.3.0	General.....	195
5a.3.1	QoS-Rule-Install AVP (All access types).....	195
5a.3.2	QoS-Rule-Remove AVP (All access types).....	196
5a.3.3	QoS-Rule-Definition AVP (All access types).....	196
5a.3.4	QoS-Rule-Name AVP (All access types)	197
5a.3.5	QoS-Rule-Report AVP (All access types)	197

5a.3.6	Session-Linking-Indicator AVP (All access types)	197
5a.3.7	QoS-Rule-Base-Name AVP (All access types)	198
5a.4	Gxx re-used AVPs	198
5a.4.0	General	198
5a.4.1	Use of the Supported-Features AVP on the Gxx reference point	204
5a.5	Gxx specific Experimental-Result-Code AVP values	205
5a.6	Gxx Messages	206
5a.6.1	Gxx Application	206
5a.6.2	CC-Request (CCR) Command	206
5a.6.3	CC-Answer (CCA) Command	207
5a.6.4	Re-Auth-Request (RAR) Command	207
5a.6.5	Re-Auth-Answer (RAA) Command	208
5b	Sd protocol	208
5b.1	Protocol support	208
5b.2	Initialization, maintenance and termination of connection and session	208
5b.3	Sd specific AVPs	209
5b.3.0	General	209
5b.3.1	ADC-Rule-Install AVP	209
5b.3.2	ADC-Rule-Remove AVP	209
5b.3.3	ADC-Rule-Definition AVP	210
5b.3.4	ADC-Rule-Base-Name AVP	210
5b.3.5	ADC-Rule-Name AVP	211
5b.3.6	ADC-Rule-Report AVP	211
5b.3.7	Void	211
5b.4	Sd re-used AVPs	211
5b.4.0	General	211
5b.4.1	Use of the Supported-Features AVP on the Sd reference point	221
5b.5	Sd specific Experimental-Result-Code AVP values	222
5b.5.1	General	222
5b.5.2	Success	222
5b.5.3	Permanent Failures	222
5b.5.4	Transient Failures	223
5b.6	Sd Messages	223
5b.6.1	Sd Application	223
5b.6.2	TDF-Session-Request (TSR) Command	223
5b.6.3	TDF-Session-Answer (TSA) Command	224
5b.6.4	CC-Request (CCR) Command	224
5b.6.5	CC-Answer (CCA) Command	225
5b.6.6	Re-Auth-Request (RAR) Command	226
5b.6.7	Re-Auth-Answer (RAA) Command	226
5c	St Diameter protocol	227
5c.1	St Application	227
5c.2	Initialization, maintenance and termination of connection and session	227
5c.3	St specific AVPs	227
5c.3.1	General	227
5c.3.2	Request-Type AVP	228
5c.4	St re-used AVPs	228
5c.4.1	General	228
5c.4.2	Use of the Supported-Features AVP on the St reference point	231
5c.5	St specific Experimental-Result-Code AVP values	232
5c.5.1	General	232
5c.5.2	Success	232
5c.5.3	Permanent Failures	232
5c.5.4	Transient Failures	232
5c.6	St Messages	233
5c.6.1	General	233
5c.6.2	TDF-Session-Request (TSR) Command	233
5c.6.3	TDF-Session-Answer (TSA) Command	234
5c.6.4	Session-Termination-Request (STR) command	234
5c.6.5	Session-Termination-Answer (STA) command	234

5c.6.6	TSSF-Notification-Request (TNR) Command	235
5c.6.7	TSSF-Notification-Answer (TNA) Command.....	235

Annex A (normative): Access specific aspects (GPRS).....236

A.1	Scope	236
A.2	Reference model.....	236
A.2	Functional elements.....	236
A.2.1	PCRF	236
A.3	PCC procedures.....	236
A.3.1	Request for PCC rules	236
A.3.2	Provisioning of PCC rules	237
A.3.2.1	PCC rule request for services not known to PCRF	238
A.3.2.2	Selecting a PCC rule and IP CAN Bearer for Downlink IP packets	238
A.3.3	Provisioning and Policy Enforcement of Authorized QoS	238
A.3.3.0	Overview	238
A.3.3.1	Provisioning of authorized QoS per IP CAN bearer.....	238
A.3.3.2	Policy enforcement for authorized QoS per IP CAN bearer.....	240
A.3.3.2a	Policy provisioning for authorized QoS per service data flow	240
A.3.3.3	Policy enforcement for authorized QoS per service data flow.....	240
A.3.3.3a	Coordination of authorized QoS scopes in mixed mode	240
A.3.3.3b	Provisioning of authorized QoS per QCI.....	241
A.3.3.4	Policy enforcement for authorized QoS per QCI.....	241
A.3.3.5	Void	241
A.3.3.6	Provisioning of authorized QoS per APN.....	241
A.3.4	Indication of IP-CAN Bearer Termination Implications	241
A.3.5	Indication of IP-CAN Session Termination	241
A.3.6	Request of IP-CAN Bearer Termination	242
A.3.7	Request of IP-CAN Session Termination.....	242
A.3.8	Bearer Control Mode Selection	242
A.3.9	Bearer Binding Mechanism.....	243
A.3.10	Void.....	243
A.3.11	PCC Rule Error Handling.....	243
A.3.12	IMS Emergency Session Support.....	243
A.3.12.1	Request of PCC Rules for an Emergency services	243
A.3.12.2	Provisioning of PCC Rules for an Emergency services.....	243
A.3.13	Removal of PCC Rules for Emergency Services	244
A.3.14	Removal of PCC Rules at Gx session termination	244
A.3.15	IMS Restoration Support.....	244
A.3.16	Provisioning of CSG information reporting indication	244
A.3.17	Packet-Filter-Usage AVP	244
A.3.18	Precedence handling.....	245
A.3.19	Reporting Access Network Information.....	245
A.3.20	User CSG Information Reporting.....	245
A.4	QoS mapping.....	245
A.4.1	GPRS QCI to UMTS QoS parameter mapping	245
A.4.2	GPRS ARP to UMTS ARP parameter mapping.....	246

Annex B (normative): Access specific aspects, 3GPP (GERAN/UTRAN/E-UTRAN) EPS247

B.1	Scope	247
B.2	Functional Elements.....	247
B.2.1	PCRF	247
B.2.2	PCEF	247
B.2.3	BBERF	247
B.3	PCC procedures.....	247
B.3.1	Request for PCC and/or QoS rules.....	247
B.3.2	Provisioning of PCC and/or QoS rules.....	248
B.3.3	Provisioning and Policy Enforcement of Authorized QoS	249

B.3.3.1	Provisioning of authorized QoS per APN.....	249
B.3.3.2	Policy enforcement for authorized QoS per APN.....	249
B.3.3.3	QoS handling for interoperation with Gn/Gp SGSN	249
B.3.3.4	Void	252
B.3.3.5	Policy provisioning for authorized QoS per service data flow	252
B.3.3.6	Policy enforcement for authorized QoS of the Default EPS Bearer	252
B.3.4	Packet-Filter-Information AVP	253
B.3.5	Bearer Control Mode Selection	253
B.3.6	Trace activation/deactivation at P-GW.....	253
B.3.7	IMS Restoration Support.....	253
B.3.8	Provisioning of CSG information reporting indication	253
B.3.9	Packet-Filter-Usage AVP	253
B.3.10	User CSG Information Reporting.....	254
B.3.10.1	GTP-based S5/S8.....	254
B.3.10.2	PMIP-based S5/S8	254
B.3.11	Request of IP-CAN Bearer Termination	254
B.3.12	CS to PS handover.....	254
B.3.13	Precedence handling.....	255
B.3.14	S-GW Restoration Support.....	255
B.3.15	Reporting Access Network Information.....	256
B.3.16	Presence Reporting Area Information reporting.....	256
B.3.17	Multiple Presence Reporting Area Information reporting	257
B.3.18	RAN Information Support.....	259
Annex C (Informative):	Mapping table for type of access networks.....	260
Annex D (normative):	Access specific aspects (EPC-based Non-3GPP)	261
D.1	Scope	261
D.2	EPC-based eHRPD Access	261
D.2.1	General	261
D.2.2	Gxa procedures.....	261
D.2.2.1	Request for QoS rules	261
D.2.2.2	Provisioning of QoS rules.....	262
D.2.2.2.1	QoS rule request for services not known to PCRF	262
D.2.2.3	Provisioning and Policy Enforcement of Authorized QoS	262
D.2.2.3.1	Provisioning of authorized QoS	262
D.2.2.3.2	Policy enforcement for authorized QoS	262
D.2.3	Bearer Control Mode selection.....	262
D.2.4	QoS Mapping	263
D.2.4.1	QCI to eHRPD QoS parameter mapping	263
D.3	EPC-based Trusted WLAN Access with S2a.....	263
D.4	EPC-based Untrusted WLAN Access	263
Annex E (normative):	Access specific aspects, Fixed Broadband Access interworking with EPC	265
E.1	Scope	265
E.2	Definitions and abbreviations.....	265
E.2.1	Definitions	265
E.2.2	Abbreviations	265
E.3	Reference points and Reference model	265
E.3.0	General	265
E.3.1	Gx Reference Point	266
E.3.2	Gxx Reference Point	266
E.3.3	S15 Reference Point	266
E.3.3a	Sd Reference Point	266
E.3.4	Reference Model	266
E.4	Functional Elements.....	269