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Title: CRs on Rel5 Work Item e2eQoS (CR Pack 5)

Agenda item: 8.5

Document for: APPROVAL

Introduction:

This document contains **2** CRs on **Rel-5 WI e2eQoS**.

These CRs have been agreed by TSG CN WG3 and are forwarded to TSG CN Plenary meeting #18 for approval.

WG_tdoc	Title	Spec	CR	Rev	Cat	Rel	Version_old
N3-020948	PCF to PDF Change	29.207	067		F	Rel-5	5.1.0
N3-021010	PCF to PDF Change	29.208	013	1	F	Rel-5	5.1.0

3GPP TSG-CN WG3 Meeting #26 ***Tdoc ⌘N3-020948***
Bangkok, Thailand, 11th - 15th November 2002.

CR-Form-v7

CHANGE REQUEST

⌘ **29.207** **CR** **067** ⌘ **rev** **-** ⌘ Current version: **5.1.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	PCF to PDF Change
Source:	⌘	TSG_CN WG3
Work item code:	⌘	e2eQoS
Date:	⌘	11/11/2002
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	It was agreed to use the Policy Decision Function terminology for compatibility with other access networks.
Summary of change:	⌘	Replace the term Policy Control Function with Policy Decision Function throughout the document.
Consequences if not approved:	⌘	Confusion between the 3GPP and other architectures.

Clauses affected:	⌘	1, 3.1, 3.2, 4.1, 4.2, 4.3.1.1, 4.3.1.1.1, 4.3.1.3, 4.3.1.5, 4.3.2, 4.3.2.1, 4.3.2.2, 4.3.2.3, 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.5, 5.1.6, 5.2, 5.2.1.1, 5.2.1.3, 5.2.1.4, 5.2.2, 5.2.2.1, 5.2.2.2, 6.1.1, 6.1.2, 6.2, 6.2.1, 6.3.1.3, 6.3.1.4, 6.3.1.5, 6.3.2, Annex B			
		Y	**N**		
Other specs affected:	⌘	**X**		Other core specifications	⌘ 23.002, 23.207, 23.228, 24.228, 24.229, 29.208
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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3GPP TS 29.207 V5.1.0 (2002-09)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Core Network; Policy control over Go interface (Release 5)

Keywords
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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document provides the stage 3 specification of the Go interface. The functional requirements and the stage 2 specifications of the Go interface are contained in 3GPP TS 23.002 [2] and 3GPP TS 23.207 [3]. The Go interface is the interface between the GGSN and the ~~Policy Control Function~~Policy Decision Function (~~PCF~~PDF).

The present document defines:

- the protocol to be used between ~~PCF~~PDF and GGSN over the Go interface;
- the signalling interactions to be performed between ~~PCF~~PDF and GGSN over the Go interface;
- the information to be exchanged between ~~PCF~~PDF and GGSN over the Go interface.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.002: "Network architecture".

[3] 3GPP TS 23.207: "End to end quality of service concept and architecture".

[4] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[5] IETF RFC 2475: "An Architecture for Differentiated Services".

[6] IETF RFC 2753: "A Framework for Policy-based Admission Control".

[7] IETF RFC 2748: "The COPS (Common Open Policy Service) Protocol".

[8] IETF RFC 3084: "COPS Usage for Policy Provisioning (COPS-PR)".

[9] IETF RFC 3159: "Structure of Policy Provisioning Information (SPPI)".

[10] IETF RFC 2205: "Resource ReSerVation Protocol (RSVP) – Version 1 Functional Specification".

[11] IETF RFC tbd: "Session Authorisation for RSVP" (draft-ietf-rap-rsvp-authsession-03.txt).

[12] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core network protocols; Stage 3".

[13] 3GPP TS 27.060: "Mobile Station (MS) supporting Packet Switched Services".

[14] 3GPP TS 24.229: ” IP Multimedia Call Control Protocol based on SIP and SDP”

[15] IETF RFC 3318: "Framework Policy Information Base".

[16] IETF RFC 3289: "Management Information Base for the Differentiated Services Architecture"

[17] IETF RFC 2327: "SDP: Session Description Protocol".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply:

Common Open Policy Service (COPS) protocol: is a simple query and response protocol that can be used to exchange policy information between a policy server (Policy Decision Point) and its clients (Policy Enforcement Points)

Differentiated Services (DiffServ): Diffserv networks classify packets into one of a small number of aggregated flows or "classes", based on the DiffServ codepoint (DSCP) in the packet's IP header
This is known as behaviour aggregate (BA) classification. At each DiffServ router, packets are subjected to a "per-hop behaviour" (PHB), which is invoked by the DSCP.

Flow identifier: used for the identification of an IP flow within a media component associated with a SIP session
For example, a single, unidirectional media component may contain one IP flow, or two IP flows in the case of an RTP media stream. In case of a bidirectional flow, the same flow identifier is used for both directions. A flow identifier consists of two parts: 1) Media component number defined in increasing order according to the sequence of the "m=" lines in the SDP [17], session description and 2) IP flow number defined in the order of increasing port numbers within each media component, see Annex C.

Go Interface: interface between ~~PCF~~PDF and GGSN [2]

IP Bearer Service Manager: uses standard IP mechanisms to manage the IP Bearer Service. It resides in the GGSN and optionally in the UE

Media component: is a part of an SDP session description conveying information about one media stream (e.g. type, format, IP address, port, transport protocol, bandwidth, direction)
The media stream described by a media component can be either bi- or unidirectional. A media stream containing an RTP flow may also contain an associated RTCP flow. An SDP session description can consist of more than one media component. A media component shall not be deleted nor its position changed within the SDP session description. A media component line where the port number has previously been set to 0 may be reused for a new media component.

~~Policy Control Function~~Policy Decision Function (~~PCF~~PDF): is a logical policy decision element that uses standard IP mechanisms to implement policy in the IP media layer
The ~~PCF~~PDF makes decisions in regard to network based IP policy using policy rules, and communicates these decisions to the PEP in the GGSN.

Proxy Call Session Control Function (P-CSCF): is a network element providing session management services (e.g. telephony call control)

Policy Enforcement Point (PEP): is a logical entity that enforces policy decisions made by the ~~PCF~~PDF. It resides in the IP BS Manager of the GGSN

Policy Information Base (PIB): data carried by COPS-PR is a set of policy data
The protocol assumes a named data structure, known as a Policy Information Base (PIB), to identify the type and purpose of solicited and unsolicited policy information that is sent from the Policy Decision Point to the Policy Enforcement Point for provisioning policy or sent from the Policy Enforcement Point to the Policy Decision Point as a notification.

Provisioning Instance Identifier (PRID): uniquely identifies an instance of a PRC

Resource ReSerVation Protocol (RSVP): is used by a host to request specific qualities of service from the network for particular application data streams or flows
The network responds by explicitly admitting or rejecting RSVP requests.

Translation/mapping function: provides the inter-working between the mechanisms and parameters used within the UMTS Bearer Service and those used within the IP Bearer Service

UMTS Bearer Service Manager: handles resource reservation requests from the UE. It resides in the GGSN and the UE

3.2 Abbreviations

For the purposes of the present document, the abbreviations as specified in 3GPP TR 21.905 [1] and the following abbreviations apply:

COPS	Common Open Policy Service protocol
COPS-PR	COPS for policy PRovisioning
DEC	COPS DECision message
DiffServ	Differentiated Services
DRQ	COPS Delete ReQuest state message
DSCP	DiffServ Code Point
GCID	GPRS Charging IDentifier
ICID	IMS Charging IDentifier
IMS	IP Multimedia core network Subsystem
MIB	Management Information Base
~~PCF~~PDF	~~Policy Control Function~~Policy Decision Function
P-CSCF	Proxy Call Session Control Function
PEP	Policy Enforcement Point
PHB	Per Hop Behaviour
PIB	Policy Information Base
PRC	PRovisioning Class (a type of policy data)
PRI	PRovisioning Instance (an instance of a PRC)
PRID	PRovisioning Instance iDentifier
QoS	Quality of Service
REQ	COPS REQuest message
RPT	COPS RePorT state message
RSVP	resource ReSerVation Protocol
RTCP	RTP Control Protocol
SBLP	Service Based Local Policy
SDP	Session Description Protocol

4 Go interface

4.1 Overview

The Go interface allows service-based local policy information to be "pushed" to or requested by the Policy Enforcement Point (PEP) in the GGSN from a ~~Policy Control Function~~Policy Decision Function (~~PCF~~PDF). As defined in the stage 2 specifications [3], this information is used by the GGSN for:

- GPRS bearer authorisation;
- Charging correlation;
- Policy based "gating" function in GGSN;

The Go interface uses IP flow based policies.

The Common Open Policy Service (COPS) protocol has been developed as a protocol for use between a policy server and a network device, as described in [7].

In addition, COPS for Provisioning extensions have been developed as described in [8] with [9] describing a structure for specifying policy information that can then be transmitted to a network device for the purpose of configuring policy at that device. The model underlying this structure is one of well-defined provisioning classes and instances of these classes residing in a virtual information store called the Policy Information Base (PIB).

The Go interface shall conform to the IETF COPS [7] and the extensions of COPS-PR [8]. For the purpose of exchanging the required specific Go information, a 3GPP Go COPS-PR Policy Information Base (PIB) is defined in the present document.

COPS Usage for Policy Provisioning (COPS-PR) is independent of the type of policy being provisioned (QoS, Security, etc.). In the present document, COPS-PR is used to communicate service-based local policy information between ~~PCF~~PDF and GGSN. COPS-PR can be extended to provide per-flow policy control along with a 3GPP Go Policy Information Base (PIB). The 3GPP Go PIB may inherit part of the data object definitions from other PIBs and MIBs defined in the IETF.

The minimum functionalities that the Go interface shall cover are introduced below.

1. Media Authorisation request from GGSN:

   The GGSN receives the binding information during the activation of a (Secondary) PDP context or during the modification of an existing PDP context that has been previously authorized by the ~~PCF~~PDF. To authorise the PDP context activation, the GGSN shall send a media authorisation request to the ~~PCF~~PDF. To authorise the PDP context modification, the GGSN shall send a media authorisation request to the ~~PCF~~PDF when the requested QoS exceeds the authorised QoS or new binding information is received.

   This authorisation request shall include the following information:

   - Binding information:

     The binding information is used by the GGSN to identify the correct ~~PCF~~PDF and subsequently request service-based local policy information from the ~~PCF~~PDF. The GGSN may receive one or more sets of the binding information during an activation or modification of a PDP context. Each binding information consists of:

     - One Authorisation token;
     - One or more Flow id(s) within the session.

   It is assumed that only one set of binding information is carried within a PDP context in this Release.

2. Media authorisation decision from ~~PCF~~PDF:

   The media authorisation information sent by the ~~PCF~~PDF to the GGSN, contains at a minimum the following information:

   - Decision on the binding information.

   The ~~PCF~~PDF shall respond with an authorisation decision for the binding information. The authorisation decision shall identify that the binding information is validated with an ongoing SIP session. Additionally, the ~~PCF~~PDF shall verify if the multiple media components are correctly assigned to the PDP Context. If validated, the ~~PCF~~PDF shall also communicate the following media authorisation details to the GGSN:

   - "Authorised QoS".

     This information is used by the GGSN to authorise the media resources according to the service-based local policy and the requested bearer QoS.

     The "Authorised QoS" for media components signalled over the Go interface is based on the SDP requirements signalled and agreed previously within SIP signalling for this session.

     The "Authorised QoS" specifies the maximum QoS that is authorised for a PDP context for that specific binding information. In case of an aggregation of multiple media components within one PDP context, the combination of the "Authorised QoS" information of the individual media components is provided as the "Authorised QoS" for the bearer.

     The "Authorised QoS" contains the following information:

     - DiffServ class:

       The DiffServ class determines the highest QoS class that can be used for the media component. It is derived from the media type information of the SDP media description.

- Data rate:

  The Data rate information is extracted from the SDP bandwidth parameter, more specifically the bandwidth value indicated by the "b=AS:" parameter. The Data rate shall include all the overhead coming from the IP-layer and the layers above, e.g. UDP, RTP. The Data rate shall also include the overhead coming from the possible usage of RTCP. The Data rate within the "Authorized QoS" information for the bearer is determined from the data rate values of the individual media components identified in the binding information.

- Packet Classifier.

  The packet classifier for media components is based on the IP-address and port number information in the SDP and shall allow for all IP flows associated with the SDP media component description.

3. Charging correlation:

   The ~~PCF~~PDF shall send the ICID provided by the P-CSCF as part of the authorisation decision. The GGSN shall send the GCID of the PDP Context and the GGSN address to the ~~PCF~~PDF as part of the authorisation report.

4. Approval of QoS Commit / Removal of QoS Commit / Revoke Authorisation for GPRS and IP resources:

   The ~~PCF~~PDF controls media components and may revoke resources at any time. Approval of QoS Commit / Removal of QoS Commit / Revoke Authorisation for GPRS and IP resources is communicated by the ~~PCF~~PDF to the GGSN.

5. Indication of PDP Context Release / Modification to/from 0 kbit/s:

   The GGSN informs the ~~PCF~~PDF of bearer changes related to the authorised resources for the IMS session in the following cases:

   - Loss of radio contact (modification to/from 0 kbit/s for conversational and streaming class);

   - Deactivation of PDP context.

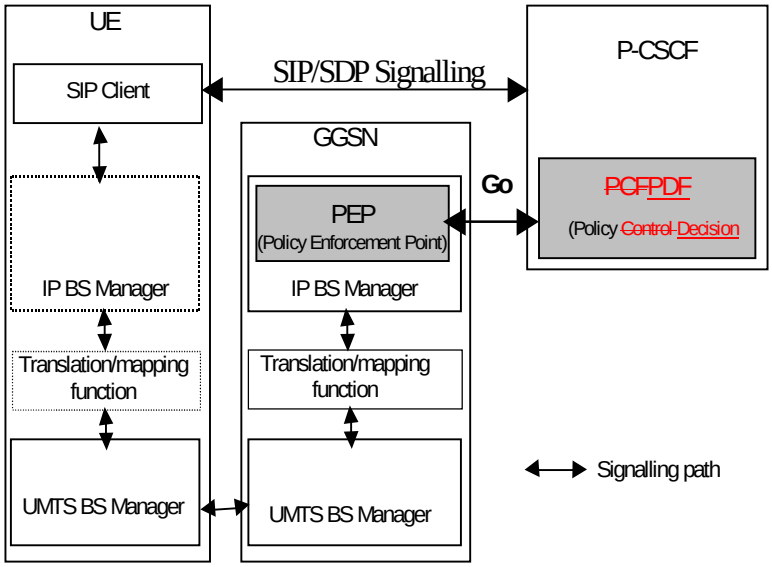
4.2 Go reference model

The Go interface is defined between the ~~PCF~~PDF and the GGSN [2].

The ~~PCF~~PDF is a logical entity of the P-CSCF (if the ~~PCF~~PDF is implemented in a separate physical node, the interface between the ~~PCF~~PDF and P-CSCF is not standardised).

The P-CSCF(~~PCF~~PDF) is in the same PLMN as the GGSN.

The relationships between the different functional entities involved are depicted in figure 4.2.



NOTE: For clarity in the diagram, network elements that are not involved in service-based local policy are not presented here (e.g. radio network elements, SGSN, etc).

Figure 4.2: Go interface architecture model

4.3 Functional elements and capabilities

4.3.1 GGSN

4.3.1.1 Service-based local policy enforcement point

The Policy Enforcement Point (PEP) is a logical entity which resides in the GGSN and communicates with the ~~PCF~~PDF regarding Service-based local policy (SBLP) control. Hereafter in the present document, the GGSN is assumed to contain the PEP implicitly unless otherwise stated. The GGSN sends requests to and receives decisions from the ~~PCF~~PDF. The GGSN may cache the policy decision data of the ~~PCF~~PDF decisions. This cached information may be used later for a local policy decision allowing the GGSN to make policy control decision about the QoS authorization for PDP context modifications without requiring additional interaction with the ~~PCF~~PDF.

The following policy enforcement point functionalities for SBLP in the GGSN are identified:

- Policy based Authorisation:

  The GGSN requests authorisation information from ~~PCF~~PDF for the media components carried by a PDP context. The GGSN enforces the ~~PCF~~PDF decisions related to the media components carried by a PDP context.

  The GGSN shall enforce unsolicited authorisation decisions which update the QoS and packet classifiers.

  Additionally, policy-based authorisation ensures that the resources, which can be used by each particular media component, are within the "Authorised QoS" specified by the ~~PCF~~PDF. This information is mapped by the Translation/mapping function in the GGSN to give the authorised resources for GPRS bearer admission control.

  The GGSN shall also report to the ~~PCF~~PDF its success or failure in carrying out the ~~PCF~~PDF decision.

- Policy based gating functionality:

  Policy based gating functionality represent the control of the GGSN over the Gate Function in the user plane, i.e. the forwarding of IP packets associated with a media component. In the user plane, a "gate" is defined for each direction of a media component. The ~~PCF~~PDF provides the gate description and the commands to open or close the gate. The gate description is received from the ~~PCF~~PDF in the authorisation decision. The command to open or close the gate shall be sent either in the authorisation decision or in subsequent decisions from the ~~PCF~~PDF.

- Indication of bearer release/modification to/from 0 kb/s

  The GGSN shall inform the ~~PCF~~PDF when the bearer changes to or from a data rate of 0 kb/s (an indication of bearer loss/recovery), and at bearer release.

- Charging Correlation

  To ensure charging correlation, the PEP shall send the GCID and the GGSN address to the ~~PCF~~PDF. The ~~PCF~~PDF shall also send the IMS charging identifier to the GGSN.

4.3.1.1.1 QoS Information processing

The GGSN is responsible for the policy based authorisation, i.e. to ensure that the requested QoS is in-line with the "Authorized QoS".

The GGSN needs the "Authorised QoS" information of the PDP context for the uplink as well as for the downlink direction. Therefore, the "Authorized QoS" information for the combination of all IP flows of each direction associated with the media component as determined by the ~~PCF~~PDF is used.

In case of an aggregation of multiple media components within one PDP context, the "Authorised QoS" for the bearer is provided by the ~~PCF~~PDF as the combination of the "Authorised QoS" information of the individual media components.

The GGSN shall perform the proper mapping between the IP QoS information and the UMTS QoS information. This mapping is performed by the Translation/mapping function which maps the "Authorised QoS" information for the PDP context into authorised UMTS QoS information.

It is recommended that the GGSN derives the highest allowed UMTS Traffic class for the PDP context from the Diffserv PHB in the "Authorized QoS" according to table 4.3.1.1.1.

Table 4.3.1.1.1

Diffserv PHB	Traffic Class	Traffic Handling Priority
EF	Conversational	N/A
$AF4_1$	Streaming	N/A
$AF3_1$	Interactive	1
$AF2_1$		2
$AF1_1$		3
BE	Background	N/A

The Data rate within the "Authorized QoS" information for the bearer is the combination of the data rate values of the "Authorised QoS" of the individual media components.

In the case of real-time UMTS bearers (conversational and streaming traffic classes), the GGSN shall consider, the Data rate value of the "Authorized QoS" information as the maximum value of the 'Guaranteed bitrate' UMTS QoS parameter, whereas the ‘Maximum bitrate’ UMTS QoS parameter is limited by the subscriber and service specific setting in the HLR/HSS (SGSN) and by the capacity/capabilities/service configuration of the network (GGSN, SGSN). In the case of non-real-time bearers (interactive and background traffic classes) the GGSN shall consider, the Data rate value of the “Authorized QoS” information as the maximum value of the 'Maximum bitrate' UMTS QoS parameter.

The UMTS BS Manager receives the authorised UMTS QoS information for the PDP context from the Translation/mapping function. If the requested QoS exceeds the authorised QoS, the UMTS BS Manager shall downgrade the requested UMTS QoS information to the authorised UMTS QoS information.

The GGSN may store the authorized QoS for the binding information of an active PDP context in order to be able to make local decisions, when the UE requests for a PDP context modification.

4.3.1.2 Initialisation and maintenance

The GGSN shall comply to the procedures described in [7] for the initialisation and maintenance of the COPS protocol over the Go interface.

4.3.1.3 Gate function

The Gate Function represents a user plane function enabling or disabling the forwarding of IP packets. A gate is described by a set of packet classifiers that identify IP flows associated to the gate. The packet classifier includes the standard 5-tuple (source IP address, destination IP address, source port, destination port, protocol) explicitly describing a unidirectional IP flow.

The packet classifier is received from the ~~PCF~~PDF in an authorisation decision. In the packet classifier the source IP address shall be taken from the SDP information if provided. Otherwise, for bi-directional flows the operator may choose to identify the source IP address from the 64 bit prefix of the destination IP address in order to reduce the possibilities of bearer misuse. If the source IP address is not identified by the SDP information and not identified by the 64 bit prefix of the destination IP address then the source IP address shall be wildcarded by the ~~PCF~~PDF. If the source port number is not identified by the SDP information then the source port number shall be wildcarded by the ~~PCF~~PDF.

The GGSN installs the packet filter corresponding to the packet classifier. The packet classifier includes the status that the gate shall be set to.

The commands to open or close the gate lead to the enabling or disabling of the passage for IP packets. If the gate is closed all packets of the related IP flows are dropped. If the gate is opened the packets of the related IP flows are allowed to be forwarded. The opening of the gate may be part of the authorisation decision event. The closing of the gate may be part of the revoke authorisation decision event.

IP Packets matching a SBLP supplied filter are subject to the gate associated with that packet filter. In the uplink direction, IP packets which do not match any packet filter shall be silently discarded. In the downlink direction, IP packets which do not match any SBLP supplied filter shall be matched against TFT supplied filters.

4.3.1.4 Void

4.3.1.5 Binding mechanism handling

The binding information is used by the GGSN to identify the correct ~~PCF~~PDF and subsequently request service-based local policy information from the ~~PCF~~PDF. The binding information associates a PDP context with one or more media components of an IMS session. The GGSN may receive one or more sets of the binding information during an activation or modification of a PDP context. Each binding information consists of an authorisation token and the flow identifier(s) related to the IP flows of the actual media component. If there is more than one media component to be transported within the PDP context the binding information includes the flow identifier(s) for the IP flows of each of the media components.

The GGSN shall store the binding information and apply it to correlate events and actions between the PDP context and the service-based local policy.

The GGSN shall determine the IP address of the ~~PCF~~PDF from the ~~PCF~~PDF identifier received as part of the Authorization Token. This identifier shall be in the format of a fully qualified domain name.

The GGSN shall forward the binding information received from the UE to the ~~PCF~~PDF. If multiple binding information are received by the GGSN, it shall forward them to the ~~PCF~~PDF. If none of the tokens included in the binding information are of type AUTH_SESSION, or they do not contain an AUTH_ENT_ID attribute to resolve the ~~PCF~~PDF address, then the GGSN shall reject the PDP context activation request. The reason for the rejection is indicated to the UE with the error code value "Invalid binding information". The error code is transferred to the UE in the Protocol Configuration Options information element as defined in 3GPP TS 24.008 [12].

When the GGSN receives a PDP context activation/modification to an APN for which binding information is required, the GGSN shall reject the PDP context activation/modification request if binding information is not received. The reason for the rejection is indicated to the UE with the error code value "Missing binding information". The error code is transferred to the UE in the Protocol Configuration Options information element as defined in 3GPP TS 24.008 [12].

When binding information is received, the GGSN shall ignore any UE supplied TFT, and filters in that TFT shall not be installed in the packet processing table.

4.3.2 ~~PCF~~PDF

4.3.2.1 Service-based local policy decision point

The ~~PCF~~PDF functions as a Policy Decision Point for the service-based local policy control. The ~~PCF~~PDF makes policy decisions based on session and media related information obtained from the P-CSCF. The ~~PCF~~PDF shall exchange the decision information with the GGSN via the Go interface.

The following policy decision point functionalities for SBLP are identified:

- Authorisation function:

  The ~~PCF~~PDF shall be able to provide an authorisation decision upon receiving a bearer authorisation request from the GGSN. The ~~PCF~~PDF shall authorise the request according to the stored session and media related information received from the P-CSCF.

  The ~~PCF~~PDF shall use the binding information to determine the IMS session and the set of media components. Based on the media components, the ~~PCF~~PDF shall determine the authorised QoS, packet filters, and gate status to be applied. The authorised QoS specifies the maximum allowed QoS class, and the data rate for the set of media components identified in the binding information.

  The ~~PCF~~PDF shall be able to provide updates to the authorisation decision at session modifications which change the QoS and packet classifiers for PDP contexts which are already established.

  Editor's Note: a potential for theft of service scenario has been identified with the current mechanism for authorisation. Extensions to the authorisation mechanisms to close potential theft of service scenarios are currently under investigation, and will be specified when determined.

- Revoke function:

  The ~~PCF~~PDF may revoke the authorisation of resources at any time. Revoke Authorisation for GPRS and IP resources is communicated by the ~~PCF~~PDF to the GGSN.

- Approval of QoS Commit / Removal of QoS Commit:

  The ~~PCF~~PDF may allow or deny for the media component(s) the usage of the PDP context by controlling the correlated gate(s).

  The "Approval of QoS Commit" command may either be part of the authorisation decision, or the ~~PCF~~PDF may provide a separate decision with the "Approval of QoS Commit" command to open the gate.

  The "Removal of QoS Commit" command may either be part of the revoke authorisation decision, or the ~~PCF~~PDF may provide a separate decision with the "Removal of QoS Commit" command to close the gate.

- Actions due to Indication of bearer release:

  When the GGSN informs the ~~PCF~~PDF of bearer deactivation, the ~~PCF~~PDF shall remove the corresponding authorisation request state. Additionally, the ~~PCF~~PDF shall inform the P-CSCF about this deletion event.

- Actions due to Indication of bearer modification:

  When the ~~PCF~~PDF receives an indication of bearer modification of the maximum bitrate to or from 0 kbits/s, the ~~PCF~~PDF shall inform the P-CSCF about this modification event.

- Generation of authorisation token:

  During the session set-up the ~~PCF~~PDF generates an authorisation token for the IMS session.

- Mapping SDP parameters to "Authorized QoS" parameters:

  To perform proper authorisation, the ~~PCF~~PDF shall map the necessary SDP parameters containing session and media related information to "Authorized QoS" parameters.

- Charging identifiers exchange:

The ~~PCF~~PDF shall send the ICID provided by the P-CSCF as part of the initial authorisation decision of all the bearer authorization requests that correspond to the respective SIP session.

When the ~~PCF~~PDF receives the GCID together with the GGSN address from the GGSN, it shall forward this information to the P-CSCF to ensure charging correlation.

4.3.2.2 Initialisation and maintenance

The ~~PCF~~PDF shall comply to the procedures described in [7] for the initialisation and maintenance of the COPS protocol over the Go interface.

4.3.2.3 Binding mechanism handling

The binding information is used by the GGSN to identify the correct ~~PCF~~PDF and subsequently request service-based local policy information from the ~~PCF~~PDF. Each set of binding information consists of an authorisation token and one or more flow identifier(s).

During the session set-up the ~~PCF~~PDF generates an Authorisation Token for the IMS session. The Authorisation token shall be sent to the P-CSCF which forwards it to the UE in the SIP signalling. The ~~PCF~~PDF shall allocate its ~~PCF~~PDF identifier as part of the Authorization Token. This identifier shall be in the format of a fully qualified domain name.

The ~~PCF~~PDF receives the binding information and a Client Handle as part of a REQ from the GGSN. The ~~PCF~~PDF shall store the Client Handle for each media component identified by the binding information for subsequent message exchanges.

The authorisation token is applied by the ~~PCF~~PDF to identify the IMS session. If no IMS session can be found for an authorisation token, or if the ~~PCF~~PDF is otherwise unable to authorise the binding information, the ~~PCF~~PDF shall send a COPS decision message carrying both an INSTALL and REMOVE decision. The INSTALL decision shall identify an authorisation failure to the GGSN, and may include further details identifying the cause. The REMOVE decision shall subsequently remove this state from the GGSN. For an initial authorisation, the ~~PCF~~PDF shall then initiate a remove for the authorisation request.

For a valid authorisation token the flow identifier(s) is used to select the available information on the media component(s) of this IMS session. The ~~PCF~~PDF sends the available authorisation information on the media component(s) back to the GGSN.

If the binding information consists of more than one flow identifier, the ~~PCF~~PDF shall also verify that the media components identified by the flow identifiers are allowed to be transferred in the same PDP context. If any of these media components was mandated to be carried in a separate PDP Context, the ~~PCF~~PDF shall send a COPS decision message carrying both an INSTALL and REMOVE decision. The INSTALL decision shall identify an authorisation failure to the GGSN, and may include further details identifying the cause. The REMOVE decision shall subsequently remove this state from the GGSN. For an initial authorisation, the ~~PCF~~PDF shall then initiate a remove for the authorisation request.

For a valid binding information consisting of more than one flow identifier, the information sent back to the GGSN shall include the aggregated QoS for all the flows and a packet filter for each flow. The flow identifiers within the binding information can span one or more media components.

5 Policy control procedures

5.1 GGSN

5.1.1 Initial authorization at PDP context activation

The GGSN receives binding information during the activation of a PDP context by the UE. To perform initial authorization at the PDP context activation the GGSN shall send an authorisation request to the ~~PCF~~PDF including the binding information received from the UE.

The GGSN identifies the required ~~PCF~~PDF from the binding information. The binding information is formatted according to the structure of the policy element defined in [11] and shall include the AUTH_ENT_ID and the SESSION_ID attributes. The GGSN checks for a Policy Element of type AUTH_SESSION ([11]) and retrieves the AUTH_ENT_ID attribute from this. If this is in the form of a Fully Qualified Domain Name, then this is used to identify the correct ~~PCF~~PDF.

The GGSN authorisation request message to the ~~PCF~~PDF shall allow the GGSN to request policy information for authorisation of the media components carried by a PDP context identified by binding information.

When the GGSN receives the ~~PCF~~PDF decision regarding authorisation of the media components, the GGSN shall enforce the policy decision. To enforce the policy decision, the GGSN shall install the packet filters received from the ~~PCF~~PDF, and ignore the UE supplied TFT.

If the ~~PCF~~PDF decision information indicates that the binding information provided by the GGSN is authorised, the GGSN shall proceed with activation of the PDP context. The GGSN shall map the authorized QoS resources into authorized resources for the bearer admission control.

To ensure charging correlation, the GGSN shall send the GCID and GGSN address information to the ~~PCF~~PDF after the successful establishment of the PDP context, i.e. with the report following the initial authorization decision.

When the ~~PCF~~PDF detects that the binding information provided by the GGSN is not associated with an ongoing SIP session at application layer, or is otherwise unable to authorise the binding information, the GGSN will receive a COPS decision message from the ~~PCF~~PDF carrying both an INSTALL and REMOVE decision. The GGSN shall reject the PDP context activation with the error code value 'Authorization failure of the request'. The error code is transferred to the UE in the Protocol Configuration Options information element as defined in 3GPP TS 24.008 [12]. The GGSN shall subsequently remove this state according to the REMOVE decision. For an initial authorisation request, the GGSN shall then send a COPS Delete Request State (DRQ) message to the ~~PCF~~PDF to remove the state in the GGSN and the ~~PCF~~PDF.

When the GGSN sends an authorization request to the ~~PCF~~PDF but the ~~PCF~~PDF does not respond with the decision message, the GGSN's action is according to the local policy in the GGSN. The local policy may be configured by the operator.

If the GGSN supports a local policy decision point (LPDP) configuration it may make local policy decisions in the absence of the ~~PCF~~PDF. The local policy decisions may be used to accept new PDP context activations while the connection to the ~~PCF~~PDF is lost. The synchronization behaviour between the GGSN and the ~~PCF~~PDF is based on the local policy configured by operators.

5.1.2 Modification of previously authorized PDP context

The GGSN is responsible for notifying the ~~PCF~~PDF when a procedure of PDP context modification of a previously authorized PDP context is performed. To authorise the PDP context modification the GGSN shall send an authorisation request to the ~~PCF~~PDF including the binding information received from the UE in the following cases:

- Requested QoS exceeds "Authorised QoS";
- New binding information is received.

The GGSN on receiving the PDP context modification request from the UE will verify the authorisation. If the GGSN does not have sufficient information to authorize the PDP context modification request then the GGSN shall interrogate the ~~PCF~~PDF for modification request authorisation.

If the requested QoS is within the already "Authorized QoS" and the binding information is not changed, the GGSN need not send an authorization request to the ~~PCF~~PDF.

The GGSN is responsible for notifying to the ~~PCF~~PDF when the procedure of the PDP context modification is performed in the following cases:

- Requested QoS maximum bit rate is 0 kbit/s;
- Requested QoS maximum bit rate changes from 0 kbit/s.

5.1.3 Session modification initiated decision

A session modification may occur that modifies the media components without adding or removing media lines, for example, a change in the bandwidth for the media line, or a change to the port number. The GGSN will receive unsolicited authorisation decision from the ~~PCF~~PDF due to such modifications.

When the GGSN receives an unsolicited authorisation decision from the ~~PCF~~PDF with updated QoS information, the GGSN shall update the stored authorised QoS. If the existing QoS of the PDP context exceeds the updated authorised QoS, the GGSN shall initiate a timer for the UE to modify the PDP context to decrease the QoS to within the authorised limit. At expiry of the timer, if the PDP context still exceeds the authorised QoS, the GGSN shall perform a network initiated PDP context modification to reduce the QoS to the authorised level.

When the GGSN receives an unsolicited authorisation decision from the ~~PCF~~PDF, the GGSN shall also install the new set of packet classifiers, removing any existing packet classifiers that are not included in the new set.

5.1.4 PDP context deactivation

The GGSN is responsible for notifying the ~~PCF~~PDF when a procedure of a PDP context deactivation is performed. In case of a PDP context deactivation, the GGSN shall inform the ~~PCF~~PDF of the bearer release related to the SIP session.

When a revoke authorisation for the set of media components on that PDP context is performed, the GGSN receives a decision message from the ~~PCF~~PDF for disabling the use of the "Authorised QoS" resources and deactivation of the PDP context associated with the binding information. The GGSN shall disable the use of the "Authorized QoS" resources. The GGSN shall initiate deactivation of the PDP context used for carrying these media components, in case that the UE has not performed it yet.

5.1.5 Gate control operation

Upon receiving a gate decision from the ~~PCF~~PDF, the GGSN shall enforce this decision on the user plane. For each gate contained in the gate decision the GGSN shall perform the specified command. In case of an “Approval of QoS Commit” command the GGSN shall open the corresponding gate. In case of a “Removal of QoS Commit” command the GGSN shall close the corresponding gate.

5.1.6 User plane operation

The GGSN shall enforce the configuration of the policy based "gating" functionality according to additional authorisation information received from the ~~PCF~~PDF.

The filter(s) and associated gate(s) are connected to the PDP contexts where SBLP applies. For each such PDP context, the information received in the TFT is ignored. In the downlink direction, packets are processed against each filter in turn until a match is found. If a match is not found, packet processing shall then continue against filters installed from UE supplied TFTs for PDP contexts where SBLP is not applied. If a match is found against an SBLP supplied filter, the packet shall be processed according to the associated gate function. If the gate is open, the packet shall be passed to the UE on the associated PDP context. If the gate is closed, the packet shall be silently discarded.

In the uplink direction, packets received on a PDP context with SBLP supplied filters shall be matched against those filters. If a match is found, the packet shall be passed if the gate associated with that filter is open. If the gate is closed, or if the packet does not match any of the packet filters, the packet shall be silently discarded.

5.2 ~~PCF~~PDF

5.2.1 SBLP decisions

5.2.1.1 SBLP authorisation decision

The information needed for the ~~PCF~~PDF to perform media authorization is passed by the P-CSCF upon receiving a SIP message that contains SDP. The SDP contains sufficient information about the session, such as the end-points' IP address and port numbers and bandwidth requirements.

All media components in the SDP are authorised. The media components contain one or more IP flows each represented by a flow identifier. Cf. the definition of flow identifier in clause 3.1. The P-CSCF shall send policy setup information to the ~~PCF~~PDF upon every SIP message that includes an SDP payload. This ensures that the ~~PCF~~PDF passes proper information to perform media authorization for all possible IMS session setup scenarios. The policy setup information provided by the P-CSCF to the ~~PCF~~PDF for each media component shall contain the following:

- Destination IP address;
- Destination port number;
- Transport Protocol id;
- Media direction information;
- Direction of the source (originating or terminating side);
- Indication of the group that the media component belongs to;

Editor's note: The format of this group indication in SIP/SDP is subject to CN1's decision.

- Media type information;
- Bandwidth parameter;
- Indication of forking/non-forking.

Additionally, upon the P-CSCF receives the ICID in SIP signalling, it shall send the ICID to the ~~PCF~~PDF.

The ~~PCF~~PDF stores the authorised policy information, and generates an Authorisation Token to identify this decision. The Authorisation Token is passed back to the P-CSCF for inclusion in the SIP signalling back to the UE.

The Authorisation Token is in the form of a Session Authorisation Data Policy Element as described in [11]. The ~~PCF~~PDF shall include an AUTH_ENT_ID attribute containing the Fully Qualified Domain Name of the ~~PCF~~PDF and the SESSION_ID attribute.

Upon receiving the bearer authorization request from the GGSN, the ~~PCF~~PDF shall authorize the request according to the stored service based local policy information for the session identified by the binding information in the request.

- Decision on the binding information:

  The authorisation shall contain the decision on verifying the binding information. The ~~PCF~~PDF shall identify whether the binding information indeed corresponds to an initiated SIP session.

  The authorization shall also contain decision on the list of flow_IDs contained in the bearer authorisation request sent by the GGSN representing the list of media components intended to be carried in the same PDP Context. This decision shall verify that these media components are indeed allowed to be carried in the same PDP Context. The ~~PCF~~PDF shall make this decision by comparing the list of flow_IDs contained in the bearer authorization request received from the GGSN to the media component grouping indication information received from the P-CSCF.

  In case the UE violates the IMS level indication, and attempts to set up multiple IMS media components in a single PDP context despite of an indication that mandated separate PDP contexts, the ~~PCF~~PDF shall enforce the rejection of this PDP context request by sending an INSTALL and REMOVE decision to the GGSN.

  If the binding information and the list of flow_IDs are successfully authorised (verified) as per the means described above, the ~~PCF~~PDF shall also communicate the authorisation details for each media component to the GGSN.

  The authorisation details contain the "Authorised QoS" and the packet classifier(s) of the associated IP flows. In case of an aggregation of multiple media components within one PDP context, the combination of the "Authorised QoS" information of the individual media components is provided as the "Authorised QoS".

  Based on the media direction information and the direction of the source provided by the P-CSCF, the ~~PCF~~PDF shall define the direction (upstream or downstream) of the "Authorised QoS" and the packet classifier(s).

- Packet classifier(s):

The ~~PCF~~PDF shall use the destination IP address(s), destination port number(s) and transport protocol id(s) to formulate a packet classifier(s).

- If the source IP address, which is part of the standard 5-tuple for packet classifying, is provided by the P-CSCF in the SDP, then this shall be used. Based on operator policy the source IP address for bi-directional flows may be identified from the 64 bit prefix of the destination IP address. If the source IP address is not identified by the SDP information and not identified by the 64 bit prefix of the destination IP address then the source IP address shall be wildcarded by the ~~PCF~~PDF.

- If the source port number, which is part of the standard 5-tuple for packet classifying, is not provided by the P-CSCF in the SDP then the source port number shall be wildcarded by the ~~PCF~~PDF in the packet classifier.

- The ~~PCF~~PDF shall send the destination address and the destination port number for each IP flow associated with the media component.

- "Authorized QoS":

  The "Authorised QoS" information (consisting of maximum DiffServ Class and Data Rate) for a media component is extracted from the media type information and bandwidth parameter of the SDP. The ~~PCF~~PDF shall map the media type information into a DiffServ Class which is the highest class that can be used for the media. As an example, the audio media type shall be mapped into Expedited Forwarding PHB.

  The ~~PCF~~PDF shall extract the Data Rate value from the "b=AS" SDP parameter. The "b=AS" parameter in the SDP shall contain all the overhead coming from the IP-layer and the layers above, e.g. UDP, RTP. The Data Rate includes the overhead coming from the possible usage of RTCP. The ~~PCF~~PDF shall use this value when determining the data rate value applicable for the media component.

  For non-real-time bearers the Data rate value shall be considered as the maximum value of the 'Maximum bitrate' parameter.

  In case of an aggregation of multiple media components within one PDP context, the ~~PCF~~PDF shall provide the "Authorised QoS" for the bearer as the combination of the "Authorised QoS" information of the individual media components. The DiffServ Class in the "Authorised QoS" for the bearer shall contain the highest PHB amongst the ones applied for the individual media components and indicates the highest UMTS traffic class that can be applied to the PDP context.

  Editor's note: It shall be possible the group identifiers to restrict the individual media components carried by the same PDP context to have the same PHBs.

  The Data Rate of the "Authorised QoS" for the bearer shall be the sum of the Data Rate values of the individual media components/IP flows and it is used as the maximum Data Rate value for the PDP context.

The ~~PCF~~PDF may include the gate enabling command as part of the authorisation decision. Alternatively, the ~~PCF~~PDF may provide a separate decision for opening the gate.

The ~~PCF~~PDF shall send the IMS charging identifier provided by the P-CSCF as part of the authorisation decision to the GGSN.

Upon receiving the modified SDP information from the P-CSCF, the ~~PCF~~PDF shall update the media authorization information for the session. The ~~PCF~~PDF may push this updated authorisation information to the GGSN. Under certain condition e.g. revoke of authorization, the ~~PCF~~PDF shall push the updated policy decision to the GGSN.

5.2.1.2 Session modification initiated decision

A session modification may occur that modifies the media components without adding or removing media lines, for example, a change in the bandwidth for the media line, or a change to the port number.

When there are updates to the SDP parameters for media lines which are currently authorised, the authorisation information (QoS, packet classifiers) may change. The updated information (QoS, packet classifiers) shall be pushed down to the GGSN using an unsolicited authorisation decision.

5.2.1.3 SBLP revoke decision

Upon SIP session release the ~~PCF~~PDF shall send a revoke authorisation decision to the GGSN after an operator specific time. The revoke authorisation decision shall be sent for each handle (PDP context) related to the session as a separate decision to the GGSN corresponding to the previous SBLP authorisation decision.

The timer for a pending session release shall be terminated if the ~~PCF~~PDF receives an indication on the termination of all PDP context(s) related to the released session.

Additionally, when a media component which is bound to a PDP context is removed from a SIP session and the UE has not performed the corresponding modification or deactivation of the PDP context within an operator specific time the ~~PCF~~PDF shall revoke the authorisation for the set of media components on that PDP context.

The timer for a pending media component removal shall be terminated if the ~~PCF~~PDF receives either a new authorisation request with the same handle where that media component has been removed, or an indication of the termination of the PDP context.

NOTE: The values of the timers for session termination and media component removal might be different, e.g. to allow for some more time for the required modification of the PDP context.

5.2.1.4 SBLP gate decision

The ~~PCF~~PDF may send a gate decision during the session set-up or whenever the status of a media component changes during the session (e.g. a media component is put on hold, resumed or removed). The ~~PCF~~PDF shall not send a gate decision to the GGSN before it has sent the initial authorisation decision. If the initial authorisation decision has already been sent, the ~~PCF~~PDF may send a gate decision to the GGSN to modify the status of one or several gate(s) on the user plane. The gate decision shall only contain the gate(s) for which the status was changed compared to the last authorisation or gate decision sent to the GGSN. The gate decision contains for each gate either the “Approval of QoS Commit” command to open the gate or the “Removal of QoS Commit” command to close the gate.

5.2.2 Support for forking

The ~~PCF~~PDF shall be able to handle forking when SBLP is applied. Forking can occur as specified in 3GPP TS 23.228 [4].

The related UE procedures are described in 3GPP TS 24.229 [14].

5.2.2.1 Authorization of resources for forked responses

When a SIP session has been originated by a connected UE, the P-CSCF may receive multiple provisional responses due to forking before the first final answer is received. The ~~PCF~~PDF shall allocate the same authorization token to all the forked responses and the corresponding early dialogues.

The UE and the P-CSCF become aware of the forking only when the second provisional response arrives. For this, and any subsequent provisional response, the ~~PCF~~PDF shall identify the existing authorization information for that session. The ~~PCF~~PDF shall authorize any additional media components and any increased QoS requirements for the previously authorized media components, as requested by the forked response. Thus, the QoS authorized for a media component shall be equal to the highest QoS requested for that media component by any of the forked responses. Authorization is done by the procedures for authorization request in sections 5.1.1 and 5.1.2 and SBLP decisions in section 5.2.1.1.

Additional packet classifiers as required by the subsequent responses are sent to the GGSN by the session modification initiated decision specified in section 5.2.1.2.

5.2.2.2 Updating the authorization information at the final answer

The ~~PCF~~PDF shall keep the authorization information requested for each of the individual early dialogues till the first final answer is received. Then the related early dialogue is progressed to establish the final SIP session. All the other early dialogues are terminated. The authorization information for the SIP session is updated to match the requirements of the remaining early dialogue only. Several actions may be needed in the ~~PCF~~PDF:

- Only the packet classifiers and the QoS indicated by the first final answer shall remain authorized. This information shall be sent to the GGSN by the session modification initiated decision specified in section

5.2.1.2. This should be done without delay in order to reduce the risk for initial clipping of the media stream, and minimising possible misuse of resources.

- The authorization for PDP contexts that were used only for the terminated early dialogues, shall be revoked as specified in section 5.1.4.
- The ~~PCF~~PDF shall await new authorization requests for remaining PDP contexts with updated binding information to remove any media components that were authorized for the terminated early dialogues only. If necessary (i.e. after timeout), the authorization for these PDP contexts shall be revoked as specified in section 5.2.1.3.

For example, assume that three forked responses for a certain media component indicate the bandwidths 10, 30 and 20 kbps, respectively. This media component will first be authorized for 10 kbps and then upgraded to 30 kbps, which will be its final value for the early dialogue phase. If the first final answer corresponds to the third forked, provisional response, then QoS is finally downgraded to 20 kbps.

6 Go protocol

6.1 Protocol support

6.1.1 TCP connection for COPS protocol

The GGSN receives the ~~PCF~~PDF identifier received as part of the Authorization Token, during the PDP context activation procedure. The GGSN resolves the ~~PCF~~PDF IP address from the ~~PCF~~PDF identifier, which is in the form of a fully qualified domain name.

If there is no existing TCP connection to the ~~PCF~~PDF, the GGSN shall establish a TCP connection for COPS interactions to the ~~PCF~~PDF. The GGSN shall use an existing TCP connection to the ~~PCF~~PDF, whenever present.

The TCP connection between the GGSN and the ~~PCF~~PDF may be pre-established by configuring the ~~PCF~~PDF addresses on the GGSN.

All communication between the GGSN and the ~~PCF~~PDFs shall use a standardised Client-Type with a corresponding standardised PIB, as defined in annex B.

The validity of the ~~PCF~~PDF may be ensured either by using a private DNS for resolving the ~~PCF~~PDF IP address or by configuring a list of allowed ~~PCF~~PDF IP addresses on the GGSN.

6.1.2 COPS protocol

The Go interface allows service-based local policy and QoS inter-working information to be "pushed" to or requested by the GGSN from a ~~PCF~~PDF.

The COPS protocol supports a client/server interface between the GGSN and the ~~PCF~~PDF. The Go interface shall conform to the IETF COPS framework as a requirement and guideline for Stage 3 work.

The COPS protocol allows both push and pull operations. For the purpose of the initial authorisation of QoS resources the pull operation shall be used. Subsequently the interactions between the ~~PCF~~PDF and the GGSN may use either pull or push operations.

Policy decisions may be stored by the COPS client in a local policy decision point allowing the GGSN to make admission control decisions without requiring additional interaction with the ~~PCF~~PDF.

The COPS client (PEP) can request a policy decision from the ~~PCF~~PDF triggered by a QoS signalling request. One PEP request may be followed by one or more asynchronous ~~PCF~~PDF decisions. Each of the decisions will allow the ~~PCF~~PDF to notify the PEP in the GGSN whenever necessary to change earlier decisions, generate errors etc.

Protocol stack: IP, TCP and COPS.

6.2 Basic COPS events/messages

The Go interface supports event triggered information transfer between the GGSN and ~~PCF~~PDF

6.2.1 Type of messages

The COPS protocol supports several messages between GGSN and ~~PCF~~PDF. The message content is dependent on the type of COPS operation (e.g. Client-Open/Client-Accept/Client-Close, Request, Decision and Delete Request State).

The Client Open, Client Accept, Client Close, Keep Alive, Synchronize State Request and Synchronize State Complete messages are used for setting up and maintaining the connection between the ~~PCF~~PDF and the GGSN.

The following messages supported by the COPS layer for Go interface are used for the policy control operations:

- **Request (REQ)** message from the GGSN to the ~~PCF~~PDF is used by the GGSN to request SBLP and QoS inter-working information.
- **Decision (DEC)** message from the ~~PCF~~PDF to the GGSN is a response to the Request message or an asynchronous notification from ~~PCF~~PDF to the GGSN whenever necessary in order to change earlier decisions, generate errors, etc.
- **Report State (RPT)** message from the GGSN to the ~~PCF~~PDF is used to communicate the success, failure or changes to the client state of the GGSN in carrying out the ~~PCF~~PDF's decision indicated in the Decision message.
- **Delete Request State (DRQ)** message from the GGSN to the ~~PCF~~PDF indicates that the state identified by the client handle is no longer available/relevant and the corresponding state may be removed from the ~~PCF~~PDF.

6.3 Go events/messages

The UMTS-specific information is carried in specific COPS-PR objects, as defined in the 3GPP Go PIB that is given in annex B.

6.3.1 Event descriptions

The Go Interface uses COPS-PR [8] schematics and the 3GPP Go PIB. For COPS-PR to support the Outsourcing Model it is required to add a new 3GPP Go PIB with objects to:

- Describe the Triggering Event Handling.
- Describe the Outsourcing Event.
- Describe the Decision for the Outsourced Event.
- Describe the Termination of the Outsourced Event.
- Describe the resource used for the Outsourced Event.

6.3.1.1 Common Header, Client Type

Client-type is UMTS Go (Client type number to be assigned through IANA).

6.3.1.2 Context Object

The COPS Context Object is sent in the REQ and DEC messages. This object is used to indicate the triggering event.

C-Num = 2, C-Type = 1

0 1 2 3

R-Type	M-Type

R-Type (Request Type Flag)

0x08 for configuration request

M-Type (Message Type)

0x01 initial capability negotiation

0x02 create event state

0x03 update event state

0x04 terminate event state

6.3.1.3 Client Specific Information (ClientSI) for outsourcing Operation

The binding information consisting of the Authorization Token and flow identifier(s) received by the GGSN are encapsulated inside the Client Specific Information object of the COPS request message sent from the GGSN to the ~~PCF~~PDF. The ~~PCF~~PDF identifier is extracted from the token and used inside the GGSN to resolve the address of the actual ~~PCF~~PDF. However, from the Go message perspective, the token is treated as an opaque entity.

6.3.1.4 Reporting of Device Capabilities and Device Limitations

The functionality of reporting of device capabilities and device limitations is as described in RFC 3084 [8]. In addition, the following shall apply.

The configuration request message serves as a request from the GGSN to the ~~PCF~~PDF and include provisioning client information to provide the ~~PCF~~PDF with client-specific configuration or capability information about the GGSN. The capability information to be exchanged shall include the PIB objects supported by the GGSN. This information from the client assists the server in deciding what types of policy the GGSN can install and enforce.

The following GGSN capabilities may be provided in the configuration request message:

- Bearer authorisation capabilities:

  The GGSN notifies the ~~PCF~~PDF that it supports bearer authorisation capabilities. The GGSN will provide the token(s) and media identifier(s) in the REQ for verifying the binding information and the grouping of the media components by the ~~PCF~~PDF.

- "Authorised QoS" capabilities:

  The GGSN notifies the ~~PCF~~PDF that it's capable to enforce the combined "Authorised QoS" for the bearer.

- Packet classifier capabilities:

  The GGSN notifies the ~~PCF~~PDF that it's capable to enforce the packet classifier for each media component direction.

- Open /close the gate capabilities:

  The GGSN informs the ~~PCF~~PDF that it's capable to enforce a separate decision on opening the gate for the authorised media component and it' s capable to enforce a separate decision from the ~~PCF~~PDF regarding disabling of the gate.

- Revoke media authorisation capabilities:

  The GGSN notifies the ~~PCF~~PDF that it's capable to enforce the revoke authorisation for GPRS and IP resources decision from the ~~PCF~~PDF.

- Charging coordination:

The GGSN informs the ~~PCF~~PDF that it's capable to send GCID(s) and GGSN address to the ~~PCF~~PDF.

The GGSN informs the ~~PCF~~PDF that it's capable to receive ICID(s) from the ~~PCF~~PDF.

- Indication of QoS modifications to 0 kbit/s and from 0 kbit/s:

  The GGSN informs the ~~PCF~~PDF that it is able to notify when the maximum bit rate for the PDP context is modified to 0 kbit/s or that the maximum bit rate for the PDP context is changed from 0 kbit/s.

- Indication of the maximum number of media authorisation sessions:

  The GGSN may notify the ~~PCF~~PDF how many parallel media authorisation sessions can be supported.

The ~~PCF~~PDF responds to the configuration request with an initial DEC message.

The R-type = 0x08 for configuration request is used here and M-type = 0x01 initial capability negotiation is used here.

The device capabilities information exchanged by the initial messages shall be stored in the ~~PCF~~PDF.

6.3.1.5 Initial Go Policy Provisioning

The functionality of initial Go policy provisioning is as described in RFC 3084 [8]. In addition, the following shall apply:

- The DEC message is sent from the ~~PCF~~PDF to the GGSN in response to the REQ message received from the GGSN. The Client Handle shall be the same as that received in the corresponding REQ message.

- The DEC message is sent as an immediate response to a configuration request with the solicited message flag set in the COPS message header. The ~~PCF~~PDF informs the GGSN of the capabilities that it supports. The capabilities exchanged shall include the PIB objects supported by the ~~PCF~~PDF. The ~~PCF~~PDF shall also inform the GGSN what types of events shall trigger policy control requests over the Go interface.

- The R-type = 0x08 for configuration request is used here and M-type = 0x01 initial capability negotiation is used here.

6.3.2 Message description

The Go interface uses the COPS-PR protocol.

The following messages and events are available on the Go interface:

- Authorisation_Request (GGSN→~~PCF~~PDF):

  This event allows the GGSN to request authorisation details from the ~~PCF~~PDF. It contains the following information:

  - Client Handle;

  - Binding Information.

  The R-type = 0x08 for configuration request is used here and M-type = 0x02 create event state is used here.

- Authorisation_Decision (~~PCF~~PDF→GGSN):

  This event provides the GGSN with the authorisation status, and relevant authorisation decision data if applicable. The event contains the following information:

  - Client Handle (only in the initial Authorisation_Decision);

  - ICID(s);

  - Unidirectional set (this parameter shall appear once for each direction (uplink and downlink)):

    - Direction indicator;

    - "Authorised QoS";

- Gate description (this parameter shall appear once for each required gate for this direction):
  - Filter Specification - The information about the authorised IP end points addresses and ports is detailed below. The Filter Specification parameters are:
    - Source IP address;
    - Destination IP address;
    - Source ports;
    - Destination ports;
    - Protocol ID.

    The Source and Destination ports are described with a range consisting of a minimum and maximum value. If only one port is authorised, the minimum value and maximum value of the range are identical.

    A filter specification describing more than one IP flow shall be only used in case of identical Protocol IDs, IP addresses and successive port numbers (e.g. RTP and RTCP flow of a media component). Furthermore, the gate status of all IP flows described by this filter specification shall be identical, too.
  - Gate status (opened/closed)

Editor's note: The ICID issue should still be discussed in SA5.

The R-type = 0x08 for configuration request is used here and M-type = 0x02 create event state is used here.

- Authorisation_Failure (~~PCF~~PDF→GGSN):

  This event provides the GGSN with an indication of an authorisation failure, and may carry additional reason details. The event contains the following information:
  - Client Handle;
  - Authorisation failure (including any provided reason information).

  The R-type = 0x08 for configuration request is used here and M-type = 0x04 terminate event state is used here.

- Gate Decision (~~PCF~~PDF→GGSN):

  The Gate Decision indicates to the GGSN the new status of the gate(s) established for a client handle (PDP context). The gate status indicates to the GGSN that the gate shall be opened or closed. Only the gate(s) for which the status is changed are indicated by this event. The event contains the following information:
  - Client Handle;
  - Unidirectional set (this parameter shall appear once for each direction for which gates are being updated (uplink and/or downlink)):
    - Direction indicator;
    - Gate description (this parameter shall appear once for each gate to be modified for this direction) :
      - Filter Specification - The information about the authorised IP end points addresses and ports is detailed below. The Filter Specification parameters are:
        - Source IP address;
        - Destination IP address;
        - Source ports;
        - Destination ports;
        - Protocol ID.

The Source and Destination ports are described with a range consisting of a minimum and maximum value. If only one port is authorised, the minimum value and maximum value of the range are identical.

A filter specification describing more than one IP flow shall be only used in case of identical Protocol IDs, IP addresses and successive port numbers (e.g. RTP and RTCP flow of a media component). Furthermore, the gate status of all IP flows described by this filter specification shall be identical, too.

- Gate status (opened/closed)

NOTE: The opening of the gate may occur at the same time / be part of the authorisation decision event.

The R-type = 0x08 for configuration request is used here and M-type = 0x03 update event state is used here.

- Report (RPT)s (GGSN→~~PCF~~PDF):
  - Authorisation_report; Gate_report:

    The GGSN sends a COPS RPT message back to the ~~PCF~~PDF reporting that it enforced or not the Authorisation_Decision, or the Gate_Decision.

    The events contain the following information:

    - Client Handle;
    - Success / Failure.
  - The Authorization_report of the initial Authorisation_Decision includes:
    - GCID;
    - GGSN address.
  - Report of state changes:

    The GGSN sends the report of state change message to the ~~PCF~~PDF reporting that the maximum bit rate for the PDP context is modified to 0 kbit/s or that the maximum bit rate for the PDP context is changed from 0 kbit/s.

    The event contains the following information:

    - Client Handle;
    - Maximum bit rate (set to 0kbps / changed from 0 kbps).
- Delete request state (GGSN→~~PCF~~PDF):

  The GGSN informs the ~~PCF~~PDF via the delete request state message, that the PDP context is deactivated and the request state identified by the client handle is no longer available/relevant at the GGSN, so the corresponding state shall also be removed at the ~~PCF~~PDF.

  The DRQ message includes the reason why the request state was deleted.

  The event contains the following information:

  - Client Handle;
  - Reason code: "Tear", Sub-code: deactivation of the PDP context.
- Remove_Decision (~~PCF~~PDF→GGSN):

  The ~~PCF~~PDF uses the Remove_Decision to inform the GGSN that the ~~PCF~~PDF revokes the authorized resources for the client handle (PDP context).

  The event contains the following information:

  - Client Handle.

6.4 Go data

The detailed data description is provided in annex B.

6.5 Security Considerations

The security mechanisms described in COPS [7] and COPS-PR [8] should be re-used in 3GPP.

Annex A:
(Void)

Annex B (normative): 3GPP Go PIB

```
GO3GPP-PIB  PIB-DEFINITIONS ::= BEGIN

IMPORTS
    Unsigned32, Integer32, MODULE-IDENTITY,
    MODULE-COMPLIANCE, OBJECT-TYPE, OBJECT-GROUP, pib
            FROM COPS-PR-SPPI
    InstanceId, Prid
            FROM COPS-PR-SPPI-TC

    InetAddress, InetAddressType,
    InetAddressPrefixLength, InetPortNumber
            FROM INET-ADDRESS-MIB

   DscpOrAny
         FROM DIFFSERV-DSCP-TC
     ;

go3gppPib  MODULE-IDENTITY
    SUBJECT-CATEGORIES   { go3gpp (xx) } -- Go 3GPP COPS Client Type
                                         -- xx to be assigned by IANA
    LAST-UPDATED "~~200208012200Z~~200211110000Z"
    ORGANIZATION "3GPP TSG CN WG3"
    CONTACT-INFO
                "Kwok Ho Chan
                 Nortel Networks
                 600 Technology Park Drive
                 Billerica, MA 01821 USA
                 Phone: +1 978 288 8175
                 Email: khchan@nortelnetworks.com

                 Louis-Nicolas Hamer
                 Nortel Networks
                 PO Box 3511 Station C
                 Ottawa, Ontario
                 Canada, K1Y 4H7
                 Phone: +1 613 768 3409
                 Email: nhamer@nortelnetworks.com"
    DESCRIPTION
            "A PIB module containing the set of provisioning
            classes that are required for support of policies for
            3GPP's GO interface, Release 5."
    REVISION "Release 5, v.1 "
    DESCRIPTION
            "This is version 1 of the 3GPP Go PIB for release 5."

    ::= { pib xxx } -- xxx to be assigned by IANA


--
-- The root OID for PRCs in the 3GPP GO PIB
--

go3gppCapabilityClasses      OBJECT IDENTIFIER ::= { go3gppPib 1 }
go3gppEventHandlerClasses    OBJECT IDENTIFIER ::= { go3gppPib 2 }
go3gppEventClasses           OBJECT IDENTIFIER ::= { go3gppPib 3 }
go3gppEventInfoClasses       OBJECT IDENTIFIER ::= { go3gppPib 4 }
go3gppReqInfoClasses         OBJECT IDENTIFIER ::= { go3gppEventInfoClasses 1 }
go3gppDecInfoClasses         OBJECT IDENTIFIER ::= { go3gppEventInfoClasses 2 }
go3gppReportClasses          OBJECT IDENTIFIER ::= { go3gppPib 5 }
go3gppConformance            OBJECT IDENTIFIER ::= { go3gppPib 6 }



-- ------------------------------------------------------------
--
-- Capability and Limitation Policy Rule Classes
--

--
-- 3GPP GO Capability Table
```

```
   --

   go3gppAuthReqCapTable OBJECT-TYPE
       SYNTAX         SEQUENCE OF Go3gppAuthReqCapEntry
       PIB-ACCESS     notify
       STATUS         current
       DESCRIPTION
           "The 3GPP Go Authorization Request Capability PRC."
       ::= { go3gppCapabilityClasses 1 }


   go3gppAuthReqCapEntry OBJECT-TYPE
       SYNTAX         Go3gppAuthReqCapEntry
       STATUS         current
       DESCRIPTION
           "An instance of the go3gppAuthReqCap class identifies a
           specific PRC and associated attributes as supported
           by the device."

       PIB-INDEX { go3gppAuthReqCapPrid }
       UNIQUENESS { }
       ::= { go3gppAuthReqCapTable 1 }


   Go3gppAuthReqCapEntry ::= SEQUENCE {
           go3gppAuthReqCapPrid          InstanceId,
           go3gppAuthReqCapBindingInfos  Unsigned32,
           go3gppAuthReqCapFlowIds       Unsigned32
   }


   go3gppAuthReqCapPrid OBJECT-TYPE
       SYNTAX         InstanceId
       STATUS         current
       DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the go3gppAuthReqCap class."
       ::= { go3gppAuthReqCapEntry 1 }


   go3gppAuthReqCapBindingInfos OBJECT-TYPE
       SYNTAX         Unsigned32
       STATUS         current
       DESCRIPTION
           "Indication of the maximum number of Binding Information
           the PEP can send with each Authorization Request.
           The value of zero indicates limit is not specified."
       DEFVAL  { 0 }
       ::= { go3gppAuthReqCapEntry 2 }


   go3gppAuthReqCapFlowIds OBJECT-TYPE
       SYNTAX         Unsigned32
       STATUS         current
       DESCRIPTION
           "Indication of the maximum number of Flow IDs the PEP can
           send with each Authorization Request.
           The value of zero indicates limit is not specified."
       DEFVAL  { 0 }
       ::= { go3gppAuthReqCapEntry 3 }


--
-- Go 3GPP Authorization Request Decision Capabilities
--

   go3gppAuthReqDecCapTable OBJECT-TYPE
       SYNTAX         SEQUENCE OF Go3gppAuthReqDecCapEntry
       PIB-ACCESS     notify
       STATUS         current
       DESCRIPTION
           "The 3GPP Go Authorization Request Decision Capability PRC."
       ::= { go3gppCapabilityClasses 2 }


   go3gppAuthReqDecCapEntry OBJECT-TYPE
       SYNTAX         Go3gppAuthReqDecCapEntry
       STATUS         current
```

```
        DESCRIPTION
            "An instance of the go3gppAuthReqDecCap class identifies a
            specific PRC and associated attributes as supported
            by the device."

        PIB-INDEX { go3gppAuthReqDecCapPrid }
        UNIQUENESS { }
        ::= { go3gppAuthReqDecCapTable 1 }


    Go3gppAuthReqDecCapEntry ::= SEQUENCE {
            go3gppAuthReqDecCapPrid           InstanceId,
            go3gppAuthReqDecCapIcids          Unsigned32
    }

    go3gppAuthReqDecCapPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppAuthReqDecCap class."
        ::= { go3gppAuthReqDecCapEntry 1 }

    go3gppAuthReqDecCapIcids OBJECT-TYPE
        SYNTAX         Unsigned32
        STATUS         current
        DESCRIPTION
            "Indication of the maximum number of Icid possible
            in a single Authorization Request Decision.
            The value of zero indicates limit is not specified."
        DEFVAL  { 0 }
        ::= { go3gppAuthReqDecCapEntry 2 }




    --
    -- Component Limitations Table
    --
    -- This table supports the ability to export information
    -- detailing provisioning class/attribute implementation limitations
    -- to the ~~policy control function~~policy decision function. This Component Limitiations Table
    -- shall be implementation dependant and does not need to be standardized.


    -- ------------------------------------------------------------
    --
    -- 3GPP GO Event Handler Provisioning Classes
    --
    -- PRCs sent from ~~PCF~~PDF to PEP for indicating how to handle each
    -- kind of event that require actions by the GO interface.
    --
    -- For 3GPP Release 5, PRCs for Event Handling of Authorization
    -- Request containing Binding Information, Flow IDs, and QoS is
    -- specified.
    --

    --
    -- 3GPP GO Authorization Request Event Handler Provisioning Table
    --

    go3gppAuthReqHandlerTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppAuthReqHandlerEntry
        PIB-ACCESS     install
        STATUS         current
        DESCRIPTION
            "PRC from ~~PCF~~PDF to PEP carried by COPS DEC messages
            indicating GO actions to take at the GGSN when an Authorization
            Request Event is detected by the GGSN.  An example of an
            Authorization Request Event is the receive of a PDP Context message."
        ::= { go3gppEventHandlerClasses 1 }


    go3gppAuthReqHandlerEntry OBJECT-TYPE
        SYNTAX         Go3gppAuthReqHandlerEntry
        STATUS         current
        DESCRIPTION
            "An instance of the go3gppAuthReqHandler class sent by the ~~PCF~~PDF to
```

```
        the PEP what the PEP should send upon detection of an Authorization
        Request Event."
    PIB-INDEX { go3gppAuthReqHandlerPrid }
    UNIQUENESS { go3gppAuthReqHandlerEnable,
                 go3gppAuthReqHandlerBindingInfo
               }
    ::= { go3gppAuthReqHandlerTable 1 }


Go3gppAuthReqHandlerEntry ::= SEQUENCE {
        go3gppAuthReqHandlerPrid         InstanceId,
        go3gppAuthReqHandlerEnable       INTEGER,
        go3gppAuthReqHandlerBindingInfo  Unsigned32
}


go3gppAuthReqHandlerPrid OBJECT-TYPE
    SYNTAX         InstanceId
    STATUS         current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of this class."
    ::= { go3gppAuthReqHandlerEntry 1 }


go3gppAuthReqHandlerEnable OBJECT-TYPE
    SYNTAX         INTEGER {
                       enable(1),
                       disable(2)
                   }
    STATUS         current
    DESCRIPTION
        "Controls the usage of 3GPP Authorization Request Events
        to trigger COPS requests to PCFPDF on the go interface."
    DEFVAL { enable }
    ::= { go3gppAuthReqHandlerEntry 2 }


go3gppAuthReqHandlerBindingInfo OBJECT-TYPE
    SYNTAX         Unsigned32
    STATUS         current
    DESCRIPTION
        "Indication of the maximum number of Binding Information
        be associated with a each Authorizating Request.
        The value of zero indicates policy control does not impose
        any limit."
    DEFVAL  { 0 }
    ::= { go3gppAuthReqHandlerEntry 3 }



-- ------------------------------------------------------------
--
-- 3GPP GO Event Classes
--
-- PRCs from PEP to PCFPDF carried by COPS REQ messages
-- indicating the detection of specific events in the GGSN.
-- Information required for PCFPDF to make decision on behave
-- of GGSN is also defined here to be carried by REQ messages.
--

--
-- 3GPP GO Authorization Request Event Table
--
go3gppAuthReqEventTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF Go3gppAuthReqEventEntry
    PIB-ACCESS     notify
    STATUS         current
    DESCRIPTION
        "PRC for indication of Authorization Request Event
        and its relevant information.
        Sent by PEP to PCFPDF upon receive of an Authorization
        Request.  Using COPS REQ message."
    ::= { go3gppEventClasses 1 }


go3gppAuthReqEventEntry OBJECT-TYPE
    SYNTAX         Go3gppAuthReqEventEntry
```

```
        STATUS         current
        DESCRIPTION
            "An entry in the Authorization Request Event Table
            describe a single Event sent by the PEP to the PCFPDF."
        PIB-INDEX { go3gppAuthReqEventPrid }
        UNIQUENESS { }
        ::= { go3gppAuthReqEventTable 1 }


    Go3gppAuthReqEventEntry ::= SEQUENCE {
            go3gppAuthReqEventPrid         InstanceId,
            go3gppAuthReqEventBindingInfos Prid
    }


    go3gppAuthReqEventPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppAuthReqEvent class."
        ::= { go3gppAuthReqEventEntry 1 }


    go3gppAuthReqEventBindingInfos OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the first of a list of go3gppBindingInfo
            class instances that are associated with this
            Authorization Request Event.
            A value of zeroDotZero indicates there are no
            go3gppBindingInfo class instance associated with
            this Authorization Event."
        ::= { go3gppAuthReqEventEntry 2 }


    --
    -- 3GPP Go Event Request Info Classes
    --

    --
    -- 3GPP GO Binding Information Table
    --
    go3gppBindingInfoTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppBindingInfoEntry
        PIB-ACCESS     notify
        STATUS         current
        DESCRIPTION
            "PRC representing Binding Information.
            Sent by PEP to PCFPDF as part of an Authorization
            Request.  In a COPS REQ message."
        ::= { go3gppReqInfoClasses 1 }


    go3gppBindingInfoEntry OBJECT-TYPE
        SYNTAX         Go3gppBindingInfoEntry
        STATUS         current
        DESCRIPTION
            "An entry in the Binding Information Table
            describing a single Binding Info.
            Each entry is referenced by go3gppAuthReqEventBindingInfos
            or go3gppBindingInfoNext."
        PIB-INDEX { go3gppBindingInfoPrid }
        UNIQUENESS { }
        ::= { go3gppBindingInfoTable 1 }


    Go3gppBindingInfoEntry ::= SEQUENCE {
            go3gppBindingInfoPrid          InstanceId,
            go3gppBindingInfoToken         OCTET STRING,
            go3gppBindingInfoFlowIds       Prid,
            go3gppBindingInfoNext          Prid
    }


    go3gppBindingInfoPrid OBJECT-TYPE
        SYNTAX         InstanceId
```

```
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppBindingInfo class."
        ::= { go3gppBindingInfoEntry 1 }


    go3gppBindingInfoToken OBJECT-TYPE
        SYNTAX         OCTET STRING
        STATUS         current
        DESCRIPTION
            "The Authorization Token associated with this
            instance of the go3gppBindingInfo class.
            Each Binding Information must have a Token."
        ::= { go3gppBindingInfoEntry 2 }


    go3gppBindingInfoFlowIds OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the first of a list of FlowIds associated
            with this instance of go3gppBindingInfo class.
            This is the anchor of a list of go3gppFlowIdEntry
            Instances.
            A value of zeroDotZero indicates an empty list which
            is an error condition."
        DEFVAL  { zeroDotZero }
        ::= { go3gppBindingInfoEntry 3 }


    go3gppBindingInfoNext OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the next of a list of go3gppBindingInfo
            instances associated with an Authorization Request.
            A value of zeroDotZero indicates this is the last of
            a list of go3gppBindingInfo instances associated with
            an Authorization Request."
        DEFVAL  { zeroDotZero }
        ::= { go3gppBindingInfoEntry 4 }


    --
    -- 3GPP Go Authorization Request FlowID Table
    --
    go3gppFlowIdTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppFlowIdEntry
        PIB-ACCESS     notify
        STATUS         current
        DESCRIPTION
            "Represents the collection of FlowIDs."
        ::= { go3gppReqInfoClasses 2 }


    go3gppFlowIdEntry OBJECT-TYPE
        SYNTAX         Go3gppFlowIdEntry
        STATUS         current
        DESCRIPTION
            "Each entry describes a single FlowID."
        PIB-INDEX { go3gppFlowIdPrid }
        UNIQUENESS { }
        ::= { go3gppFlowIdTable 1 }


    Go3gppFlowIdEntry ::= SEQUENCE {
            go3gppFlowIdPrid         InstanceId,
            go3gppFlowIdFlowId       Unsigned32,
            go3gppFlowIdNext         Prid
    }


    go3gppFlowIdPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
```

```
            instance of the go3gppFlowId class."
        ::= { go3gppFlowIdEntry 1 }


    go3gppFlowIdFlowId OBJECT-TYPE
        SYNTAX         Unsigned32
        STATUS         current
        DESCRIPTION
            "The FlowId itself."
        ::= { go3gppFlowIdEntry 2 }


    go3gppFlowIdNext OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the next FlowId in the list associated with the
            same Binding Information of an Authorization Request.
            This points to a list of go3gppFlowIdEntry Instances.
            A value of zeroDotZero indicates end of the list."
        DEFVAL  { zeroDotZero }
        ::= { go3gppFlowIdEntry 3 }



    -- ------------------------------------------------------------
    --
    -- 3GPP Go Authorization Request Decisions
    --
    -- PRCs for carrying the Event Decision send from ~~PCF~~PDF to PEP,
    -- carried by the COPS DEC message.
    -- These PRCs include support for Gates/Filters, QoS, ICIDs.
    --


    -- We can define Failure Decisions by use of COPS-PR DEC message
    -- containing first an install decision (with objects indicating
    -- what failed and some indication to the GGSN how to react to this
    -- Error Decision), and second a remove decision (for cleanup of
    -- the installed Error Decision Object).
    --

-- Failures indicated by ~~PCF~~PDF to GGSN
--   Authorization Failure
--
    --
    -- Authorization Request Failure Decision Table
    --
    go3gppAuthReqFailDecTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppAuthReqFailDecEntry
        PIB-ACCESS     install
        STATUS         current
        DESCRIPTION
            "The Authorization failure Table. Indicates failures decisions to the PEP."
        ::= { go3gppDecInfoClasses 1 }


    go3gppAuthReqFailDecEntry OBJECT-TYPE
        SYNTAX         Go3gppAuthReqFailDecEntry
        STATUS         current
        DESCRIPTION
            "Each go3gppAuthReqFailDecEntry is per request."
        PIB-INDEX { go3gppAuthReqFailDecPrid }
        UNIQUENESS { }
        ::= { go3gppAuthReqFailDecTable 1 }


    Go3gppAuthReqFailDecEntry ::= SEQUENCE {
            go3gppAuthReqFailDecPrid        InstanceId,

            go3gppAuthReqFailDecReason      INTEGER
    }

    go3gppAuthReqFailDecPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
```

```
            instance of the go3gppAuthReqFailDec class."
        ::= { go3gppAuthReqFailDecEntry 1 }



    go3gppAuthReqFailDecReason OBJECT-TYPE
        SYNTAX         INTEGER {
                                        noCorrespondingImsSession (1),
                                        invalidBundling (2)
                               }
        STATUS         current
        DESCRIPTION
            "Reason for Auth Request Failure Decision given by PCFPDF:

             noCorrespondingImsSession:    No corresponding IMS Session was found
                                           by the PCFPDF

             invalidBundling:             In case the UE violates the IMS level indication, and
    attempts to set up multiple IMS media components in a single PDP context despite of an indication
    that mandated separate PDP contexts."
        ::= { go3gppAuthReqFailDecEntry 2 }



    --
    -- Authorization Request Decision Table
    --
    go3gppAuthReqDecTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppAuthReqDecEntry
        PIB-ACCESS     install
        STATUS         current
        DESCRIPTION
            "The Authorization Request Decision Table. "
        ::= { go3gppDecInfoClasses 2 }


    go3gppAuthReqDecEntry OBJECT-TYPE
        SYNTAX         Go3gppAuthReqDecEntry
        STATUS         current
        DESCRIPTION
            "Each go3gppAuthReqDecEntry is per Authorization Request."
        PIB-INDEX { go3gppAuthReqDecPrid }
        UNIQUENESS { }
        ::= { go3gppAuthReqDecTable 1 }


    Go3gppAuthReqDecEntry ::= SEQUENCE {
            go3gppAuthReqDecPrid       InstanceId,
            go3gppAuthReqDecIcids      Prid,
            go3gppAuthReqDecDirDecs    Prid
    }


    go3gppAuthReqDecPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppAuthReqDec class."
        ::= { go3gppAuthReqDecEntry 1 }


    go3gppAuthReqDecIcids OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the first of a list of IcIDs associated
            with this instance of go3gppAuthReqDec class.
            There should be one IcID on this list for each Binding
            Information in the corresponding Authorization Request.
            A value of zeroDotZero indicates an empty list and there
            is no IcID change associated with this Authorization Request
            Decision."
        DEFVAL  { zeroDotZero }
        ::= { go3gppAuthReqDecEntry 2 }


    go3gppAuthReqDecDirDecs OBJECT-TYPE
```

```
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the first of a list of Directional Decisions
            associated with this instance of go3gppAuthReqDec class.
            There should be at least one and at most two Directional
            Decisions per Authorization Request Decision.
            Hence a value of zeroDotZero is illegal."
        ::= { go3gppAuthReqDecEntry 3 }


--
-- 3GPP Go ICID Table
--
    go3gppIcidTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppIcidEntry
        PIB-ACCESS     install
        STATUS         current
        DESCRIPTION
            "Represents the collection of ICID entries"
        ::= { go3gppDecInfoClasses 3 }


    go3gppIcidEntry OBJECT-TYPE
        SYNTAX         Go3gppIcidEntry
        STATUS         current
        DESCRIPTION
            "Represents the ICID Entry"
        PIB-INDEX { go3gppIcidPrid }
        UNIQUENESS { go3gppIcidValue }
        ::= { go3gppIcidTable 1 }


    Go3gppIcidEntry ::= SEQUENCE {
            go3gppIcidPrid            InstanceId,
            go3gppIcidValue           OCTET STRING,
            go3gppIcidNext            Prid
    }


    go3gppIcidPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppIcid class."
        ::= { go3gppIcidEntry 1 }


    go3gppIcidValue OBJECT-TYPE
        SYNTAX         OCTET STRING
        STATUS         current
        DESCRIPTION
            "The ICID itself. The syntax of this OBJECT-TYPE needs to be confirmed. "
        ::= { go3gppIcidEntry 2 }


    go3gppIcidNext OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "References the next go3gppIcidEntry of a list of IcIDs
            associated with this instance of go3gppAuthReqDec class.
            There should be one IcID on this list for each Binding
            Information in the corresponding Authorization Request.
            A value of zeroDotZero indicates the end of the list of
            IcIDs associated with an Authorization Request Decision."
        DEFVAL  { zeroDotZero }
        ::= { go3gppIcidEntry 3 }


--
-- 3GPP Go Authorization Request Directional Decision Table
--
    go3gppAuthReqDirDecTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppAuthReqDirDecEntry
        PIB-ACCESS     install
        STATUS         current
```

```
       DESCRIPTION
           "This table represents the authorization request decision for a  unique direction (e.g.
uplink and downlink)."
       ::= { go3gppDecInfoClasses 4 }


   go3gppAuthReqDirDecEntry OBJECT-TYPE
       SYNTAX         Go3gppAuthReqDirDecEntry
       STATUS         current
       DESCRIPTION
           "There should be one of these per direction per AuthReqDec."
       PIB-INDEX { go3gppAuthReqDirDecPrid }
       UNIQUENESS { }
       ::= { go3gppAuthReqDirDecTable 1 }


   Go3gppAuthReqDirDecEntry ::= SEQUENCE {
           go3gppAuthReqDirDecPrid      InstanceId,
           go3gppAuthReqDirDecDirection INTEGER,
           go3gppAuthReqDirDecQos       Prid,
           go3gppAuthReqDirDecGates     Prid,
           go3gppAuthReqDirDecNext      Prid
   }


   go3gppAuthReqDirDecPrid OBJECT-TYPE
       SYNTAX         InstanceId
       STATUS         current
       DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the go3gppAuthReqDirDec class."
       ::= { go3gppAuthReqDirDecEntry 1 }


   go3gppAuthReqDirDecDirection OBJECT-TYPE
       SYNTAX         INTEGER {
                           uplink   (1),
                           downlink (2)
                      }
       STATUS         current
       DESCRIPTION
           "Indicates the direction this decision applies to."
       ::= { go3gppAuthReqDirDecEntry 2 }


   go3gppAuthReqDirDecQos OBJECT-TYPE
       SYNTAX         Prid
       STATUS         current
       DESCRIPTION
           " The Authorized QoS. References the go3gppQos class."
       ::= { go3gppAuthReqDirDecEntry 3 }


   go3gppAuthReqDirDecGates OBJECT-TYPE
       SYNTAX         Prid
       STATUS         current
       DESCRIPTION
           "References the first instance of a list of the go3gppGate class."
       ::= { go3gppAuthReqDirDecEntry 4 }


   go3gppAuthReqDirDecNext OBJECT-TYPE
       SYNTAX         Prid
       STATUS         current
       DESCRIPTION
           "References the next instance of a list of
           go3gppAuthReqDirDec class."
       ::= { go3gppAuthReqDirDecEntry 5 }


--
-- 3GPP Go QoS Table
--
   go3gppQosTable OBJECT-TYPE
       SYNTAX         SEQUENCE OF Go3gppQosEntry
       PIB-ACCESS     install
       STATUS         current
       DESCRIPTION
```

```
          "This table represents the Authorised QoS. It is referenced by the go3gppAuthReqDirDecQos
entry of the go3gppAuthReqDirDecEntry  class."
       ::= { go3gppDecInfoClasses 5 }


   go3gppQosEntry OBJECT-TYPE
       SYNTAX         Go3gppQosEntry
       STATUS         current
       DESCRIPTION
           "There should be one of these per direction per AuthReqDec."
       PIB-INDEX { go3gppQosPrid }
       UNIQUENESS { }
       ::= { go3gppQosTable 1 }



   Go3gppQosEntry ::= SEQUENCE {
           go3gppQosPrid               InstanceId,
           go3gppQosServiceClass       DscpOrAny,
           go3gppQosDataRateUnit       INTEGER,
           go3gppQosDataRate           Unsigned32
   }


   go3gppQosPrid OBJECT-TYPE
       SYNTAX         InstanceId
       STATUS         current
       DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the go3gppQos class."
       ::= { go3gppQosEntry 1 }



   go3gppQosServiceClass OBJECT-TYPE
       SYNTAX         DscpOrAny
       STATUS         current
       DESCRIPTION
           "A Service Class Indication using DSCP Encoding."
       ::= { go3gppQosEntry 2 }


   go3gppQosDataRateUnit OBJECT-TYPE
       SYNTAX         INTEGER {
                        bps     (1),
                        kbps    (2),
                        Mbps    (3)
                      }
       STATUS         current
       DESCRIPTION
           "Indication of the unit of measure for go3gppQosDataRate."
       ::= { go3gppQosEntry 3 }


   go3gppQosDataRate OBJECT-TYPE
       SYNTAX         Unsigned32
       STATUS         current
       DESCRIPTION
           "The Data Rate with unit of measure indicated by
           go3gppQosDataRateUnit."
       ::= { go3gppQosEntry 4 }



--
-- 3GPP Go Gate Decision Table
--
--
-- There could be one of these per direction per GateDec.
--
-- This is for changing Gating Status only when used alone
-- (not as part of Direction Decision).

-- go3gppGateDec is sent in a different COPS DEC message
-- from the DEC message carrying go3gppAuthReqDec.  PCFPDF must
-- have sent a go3gppAuthReqDec before using go3gppGateDec.

   go3gppGateDecTable OBJECT-TYPE
```

```
        SYNTAX          SEQUENCE OF Go3gppGateDecEntry
        PIB-ACCESS      install
        STATUS          current
        DESCRIPTION
            "This table represents an updated gating decision."
        ::= { go3gppDecInfoClasses 6 }


    go3gppGateDecEntry OBJECT-TYPE
        SYNTAX          Go3gppGateDecEntry
        STATUS          current
        DESCRIPTION
            "There should be one of these per direction per AuthReqDec."
        PIB-INDEX { go3gppGateDecPrid }
        UNIQUENESS { }
        ::= { go3gppGateDecTable 1 }



    Go3gppGateDecEntry ::= SEQUENCE {
            go3gppGateDecPrid           InstanceId,
            go3gppGateDecDirection      INTEGER,
            go3gppGateDecGates          Prid,
            go3gppGateDecNext           Prid
    }


    go3gppGateDecPrid OBJECT-TYPE
        SYNTAX          InstanceId
        STATUS          current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gppGateDec class."
        ::= { go3gppGateDecEntry 1 }



    go3gppGateDecDirection OBJECT-TYPE
        SYNTAX          INTEGER {
                             uplink   (1),
                             downlink (2)
                        }
        STATUS          current
        DESCRIPTION
            "References the gate direction."
        ::= { go3gppGateDecEntry 2 }

     go3gppGateDecGates OBJECT-TYPE
        SYNTAX          Prid
        STATUS          current
        DESCRIPTION
            "References the first instance of a list of go3gppGate class."
        ::= { go3gppGateDecEntry 3 }


    go3gppGateDecNext OBJECT-TYPE
        SYNTAX          Prid
        STATUS          current
        DESCRIPTION
            "References the next instance of a list of go3gppGateDec class."
        ::= { go3gppGateDecEntry 4 }




--
-- 3GPP Go Gate Table
--
    go3gppGateTable OBJECT-TYPE
        SYNTAX          SEQUENCE OF Go3gppGateEntry
        PIB-ACCESS      install
        STATUS          current
        DESCRIPTION
            "PRC representing a Gate."
        ::= { go3gppDecInfoClasses 7 }


    go3gppGateEntry OBJECT-TYPE
```

```
    SYNTAX         Go3gppGateEntry
    STATUS         current
    DESCRIPTION
        "Each instance represents one Gate."
    PIB-INDEX { go3gppGatePrid }
    UNIQUENESS { }
    ::= { go3gppGateTable 1 }


Go3gppGateEntry ::= SEQUENCE {
        go3gppGatePrid              InstanceId,
        go3gppGateFilter            Prid,
        go3gppGateStatus            INTEGER,
        go3gppGateNext              Prid
}


go3gppGatePrid OBJECT-TYPE
    SYNTAX         InstanceId
    STATUS         current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the go3gppGate class."
    ::= { go3gppGateEntry 1 }



go3gppGateFilter OBJECT-TYPE
    SYNTAX         Prid
    STATUS         current
    DESCRIPTION
        "References an instance of the go3gppIpFilter class.
        A value of zeroDotZero indicates no go3gppIpFilter is
        used with this go3gppGate."
    ::= { go3gppGateEntry 2 }


go3gppGateStatus OBJECT-TYPE

    SYNTAX         INTEGER {
                        close  (1),
                        open   (2)
                   }
    STATUS         current
    DESCRIPTION
        "Indicates if this gate will allow traffic to flow."
 DEFVAL  { close }
    ::= { go3gppGateEntry 3 }



go3gppGateNext OBJECT-TYPE
    SYNTAX         Prid
    STATUS         current
    DESCRIPTION
        "Reference the next Gate on a list of go3gppGate instances.
        A value of zeroDotZero indicates this is the last Gate
        on the list."
    ::= { go3gppGateEntry 4 }




--
-- The Base Filter Table
--

go3gppBaseFilterTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF Go3gppBaseFilterEntry
    PIB-ACCESS     install
    STATUS         current
    DESCRIPTION

        "The Base Filter class.  A packet has to match all
        fields in an Filter.  Wildcards may be specified for those
        fields that are not relevant."
```

```
    ::= { go3gppDecInfoClasses 8 }


Go3gppBaseFilterEntry OBJECT-TYPE
    SYNTAX         go3gppBaseFilterEntry
    STATUS         current
    DESCRIPTION
        "An instance of the go3gppBaseFilter class."

    PIB-INDEX { go3gppBaseFilterPrid }
    UNIQUENESS { }       ::= { go3gppBaseFilterTable 1 }

go3gppBaseFilterEntry ::= SEQUENCE {
        go3gppBaseFilterPrid         InstanceId
}


go3gppBaseFilterPrid OBJECT-TYPE
    SYNTAX         InstanceId
    STATUS         current
    DESCRIPTION
        "An integer index to uniquely identify this Filter among all
        the Filters."

    ::= { go3gppBaseFilterEntry 1 }


--
-- The Go 3GPP IP Filter Table
--

go3gppIpFilterTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF Go3gppIpFilterEntry
    PIB-ACCESS     install
    STATUS         current
    DESCRIPTION
        "Filter definitions.  A packet has to match all fields in a
        filter.  Wildcards may be specified for those fields that
        are not relevant."

    ::= { go3gppDecInfoClasses 9 }

go3gppIpFilterEntry OBJECT-TYPE
    SYNTAX         Go3gppIpFilterEntry
    STATUS         current
    DESCRIPTION
        "An instance of the go3gppIpFilter class."

    EXTENDS { go3gppBaseFilterEntry }
    UNIQUENESS {
                 go3gppIpFilterAddrType,
                 go3gppIpFilterDstAddr,
                 go3gppIpFilterDstPrefixLength,
                 go3gppIpFilterSrcAddr,
                 go3gppIpFilterSrcPrefixLength,
                 go3gppIpFilterProtocol,
                 go3gppIpFilterDstL4PortMin,
                 go3gppIpFilterDstL4PortMax,
                 go3gppIpFilterSrcL4PortMin,
                 go3gppIpFilterSrcL4PortMax }

    ::= { go3gppIpFilterTable 1 }



Go3gppIpFilterEntry ::= SEQUENCE {
        go3gppIpFilterAddrType         InetAddressType,
        go3gppIpFilterDstAddr          InetAddress,
        go3gppIpFilterDstPrefixLength  InetAddressPrefixLength,
        go3gppIpFilterSrcAddr          InetAddress,
        go3gppIpFilterSrcPrefixLength  InetAddressPrefixLength,
        go3gppIpFilterProtocol         Integer32,
        go3gppIpFilterDstL4PortMin     InetPortNumber,
        go3gppIpFilterDstL4PortMax     InetPortNumber,
        go3gppIpFilterSrcL4PortMin     InetPortNumber,
        go3gppIpFilterSrcL4PortMax     InetPortNumber
}
```

```
go3gppIpFilterAddrType OBJECT-TYPE

    SYNTAX         InetAddressType
    STATUS         current
    DESCRIPTION
        "The address type enumeration value [INETADDR] to specify
         the type of the packet's IP address."

    ::= { go3gppIpFilterEntry 1 }

go3gppIpFilterDstAddr OBJECT-TYPE

    SYNTAX         InetAddress
    STATUS         current
    DESCRIPTION
        "The IP address [INETADDR] to match against the packet's
         destination IP address. go3gppIpFilterDstPrefixLength
         indicates the number of bits that are relevant. "

    ::= { go3gppIpFilterEntry 2 }


go3gppIpFilterDstPrefixLength OBJECT-TYPE
    SYNTAX         InetAddressPrefixLength
    STATUS         current
    DESCRIPTION
        "The length of a mask for the matching of the destination
         IP address.  Masks are constructed by setting bits in
         sequence from the most-significant bit downwards for
         go3gppIpFilterDstPrefixLength bits length. All other bits in
         the mask, up to the  number needed to fill the length of
         the address go3gppIpFilterDstAddr are cleared to zero. A zero
         bit in the mask then means that the corresponding bit in
         the address always matches."

    ::= { go3gppIpFilterEntry 3 }



go3gppIpFilterSrcAddr OBJECT-TYPE
    SYNTAX         InetAddress
    STATUS         current
    DESCRIPTION
        "The IP address to match against the packet's source IP
        address. go3gppIpFilterSrcPrefixLength indicates the
       number of bits that are relevant. "

    ::= { go3gppIpFilterEntry 4 }

go3gppIpFilterSrcPrefixLength OBJECT-TYPE
    SYNTAX         InetAddressPrefixLength
    UNITS          "bits"
    STATUS         current


    DESCRIPTION
        "The length of a mask for the matching of the source IP
         address. Masks are constructed by setting bits in sequence
         from the most-significant bit downwards for
         go3gppIpFilterSrcPrefixLength bits length. All other bits in
         the mask, up to the  number needed to fill the length of
         the address go3gppIpFilterSrcAddr are cleared to zero.  A
         zero bit in the mask then means that the corresponding bit
         in the address always matches."

    ::= { go3gppIpFilterEntry 5 }

go3gppIpFilterProtocol OBJECT-TYPE
    SYNTAX         Integer32 (-1 | 0..255)
    STATUS         current
    DESCRIPTION
        "The IP protocol to match against the packet's protocol.
        A value of -1 means match all."

    ::= { go3gppIpFilterEntry 6 }
```

```
    go3gppIpFilterDstL4PortMin OBJECT-TYPE
        SYNTAX         InetPortNumber
        STATUS         current
        DESCRIPTION
            "The minimum value that the packet's layer 4 destination
            port number can have and match this filter. This value must
            be equal to or lesser that the value specified for this
            filter in go3gppIpFilterDstL4PortMax."

        ::= { go3gppIpFilterEntry 7 }


    go3gppIpFilterDstL4PortMax OBJECT-TYPE
        SYNTAX         InetPortNumber


        STATUS         current
        DESCRIPTION
            "The maximum value that the packet's layer 4 destination
            port number can have and match this filter. This value must
            be equal to or greater that the value specified for this
            filter in go3gppIpFilterDstL4PortMin."

        ::= { go3gppIpFilterEntry 8 }


    go3gppIpFilterSrcL4PortMin OBJECT-TYPE
        SYNTAX         InetPortNumber
        STATUS         current
        DESCRIPTION
            "The minimum value that the packet's layer 4 source port
            number can have and match this filter. This value must
            be equal to or lesser that the value specified for this
            filter in go3gppIpFilterSrcL4PortMax."

        ::= { go3gppIpFilterEntry 9 }


    go3gppIpFilterSrcL4PortMax OBJECT-TYPE
        SYNTAX         InetPortNumber
        STATUS         current
        DESCRIPTION
            "The maximum value that the packet's layer 4 source port
            number can have and match this filter.  This value must be
            equal to or greater that the value specified for this filter
            in go3gppIpFilterSrcL4PortMin."

        ::= { go3gppIpFilterEntry 10 }









    -- ---------------------------------------------------------
    --
    -- 3GPP Go Reports
    --
    -- PRCs for carrying the Decision enforcement result sent from PEP to ~~PCF~~PDF,
    -- carried using the COPS REPORT message.
    -- These PRCs include support for the success or failure of the PEP in
    -- carrying out the ~~PCF~~PDF's decision or -change of the state in the GGSN.
    --

    go3gppReportTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppReportEntry
        PIB-ACCESS     notify
        STATUS         current
        DESCRIPTION
            "This table represents the success or failure of the decision enforcement and
            state changes in the PEP."
        ::= { go3gppReportClasses 1 }


    go3gppReportEntry OBJECT-TYPE
```

```
        SYNTAX         go3gppReportEntry
        STATUS         current
        DESCRIPTION
            ""
        PIB-INDEX { go3gppReportPrid }
        UNIQUENESS { }
        ::= { go3gppReportTable 1 }


    go3gppReportEntry ::= SEQUENCE {
            go3gppReportPrid       InstanceId,
            go3gppReportStatus     INTEGER,
            go3gppReportDetails    Prid }


    go3gppReportPrid OBJECT-TYPE
        SYNTAX         InstanceId
        STATUS         current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the go3gpgReport class."
            ::= { go3gppReportEntry 1 }


    go3gppReportStatus OBJECT-TYPE
        SYNTAX         INTEGER {
                                 success (1),
                                 failure (2),
                                 usage   (3) }
        STATUS         current
        DESCRIPTION
            "When Status is:
               success: Indicates the successful implementation of the
                        decision.
                        go3gppReportDetails:
                          Reference an instance of go3gppRprtGPRSChrgInfo
                          for initial authorization request decision;
                          References nothing otherwise (contains the value
                          zeroDotZero).

               Failure: Indicates the failure of implementing the decision.

                        go3gppReportDetails may references an Error object,
or may have the value zeroDotZero when no error
                        object is needed, in which case COPS and COPS-PR
                        error codes and error objects are sufficient.
               Usage:   go3gppReportDetails references an instance of
                        go3gppRprtUsage class."

        ::= { go3gppReportEntry 2 }


    go3gppReportDetails OBJECT-TYPE
        SYNTAX         Prid
        STATUS         current
        DESCRIPTION
            "May reference an instance of go3gppRprtGPRSChrgInfo,
            go3gppRprtError(not defined), or go3gppRprtUsage class,
            or may have the value of zeroDotZero depending on the value of
            go3gppReportStatus."
        ::= { go3gppReportEntry 3 }


    go3gppRprtGPRSChrgInfoTable OBJECT-TYPE
        SYNTAX         SEQUENCE OF Go3gppRprtGPRSChrgInfoEntry
        PIB-ACCESS     notify
        STATUS         current
        DESCRIPTION
            "This table represents the GPRS Charging information"
        ::= { go3gppReportClasses 2 }


    go3gppRprtGPRSChrgInfoEntry OBJECT-TYPE
        SYNTAX         go3gppRprtGPRSChrgInfoEntry
        STATUS         current
        DESCRIPTION
            "This entry represents the GPRS Charging Identifier and GGSN address."
        PIB-INDEX { go3gppRprtGPRSChrgInfoPrid }
```

```
    UNIQUENESS { go3gppRprtGPRSChrgInfoGGSNAddr,
                 go3gppRprtGPRSChrgInfoGCID }
    ::= { go3gppRprtGPRSChrgInfoTable 1 }


go3gppRprtGPRSChrgInfoEntry ::= SEQUENCE {
        go3gppRprtGPRSChrgInfoPrid       InstanceId,

        go3gppRprtGPRSChrgInfoGGSNAddr   InetAddress,
        go3gppRprtGPRSChrgInfoGCID       OCTET STRING }


go3gppRprtGPRSChrgInfoPrid OBJECT-TYPE
    SYNTAX         InstanceId
    STATUS         current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the go3gpgRprtGPRSChrgInfo class."
        ::= { go3gppRprtGPRSChrgInfoEntry 1 }


go3gppRprtGPRSChrgInfoGGSNAddr OBJECT-TYPE
    SYNTAX         InetAddress
    STATUS         current
    DESCRIPTION
        "Contains the IP Address of the GGSN providing the GCID
        upon successful handling of an Authorization Request."
        ::= { go3gppRprtGPRSChrgInfoEntry 2 }


go3gppRprtGPRSChrgInfoGCID OBJECT-TYPE
    SYNTAX         OCTET STRING
    STATUS         current
    DESCRIPTION
        "The GPRS Charging ID related to this Authorization Request."
    ::= { go3gppRprtGPRSChrgInfoEntry 3 }


--
-- Notice go3gppRprtError PRC is currently not defined because all
-- error condition handling is satisfactorily covered by using the
-- standard COPS-PR error handling mechanism and error objects.
-- go3gppRprtError PRC should only be used for 3GPP GO Application
-- error indications if necessary.
--

go3gppRprtUsageTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF Go3gppRprtUsageEntry
    PIB-ACCESS     notify
    STATUS         current
    DESCRIPTION
        ""
    ::= { go3gppReportClasses 3 }


go3gppRprtUsageEntry OBJECT-TYPE
    SYNTAX         go3gppRprtUsageEntry
    STATUS         current
    DESCRIPTION
        "This entry represents the PEP state changes."
    PIB-INDEX { go3gppRprtUsagePrid }
    UNIQUENESS { go3gppRprtUsageIndication }
    ::= { go3gppRprtUsageTable 1 }


go3gppRprtUsageEntry ::= SEQUENCE {
        go3gppRprtUsagePrid        InstanceId,
        go3gppRprtUsageIndication  INTEGER }



go3gppRprtUsagePrid OBJECT-TYPE
    SYNTAX         InstanceId
    STATUS         current
    DESCRIPTION
        "An arbitrary integer index that uniquely identifies an
        instance of the go3gpgRprtUsage class."
        ::= { go3gppRprtUsageEntry 1 }
```

```
   go3gppRprtUsageIndication OBJECT-TYPE
       SYNTAX         INTEGER {
                        chngdTo0kbs   (1),
                        chngdFrom0kbs (2) }
       STATUS         current
       DESCRIPTION
           "Indication of GPRS Usage change.
           chngdTo0kbs indicates changing to 0kbs,
           chngdFrom0kbs indicates changing from 0kbs."
           ::= { go3gppRprtUsageEntry 2 }


   -- ------------------------------------------------------------
   --
   -- Conformance Section
   --

   go3gppCompliances         OBJECT IDENTIFIER ::= { go3gppConformance 1 }
   go3gppGroups                  OBJECT IDENTIFIER ::= { go3gppConformance 2 }


go3gppCompliance MODULE-COMPLIANCE
       STATUS  current
       DESCRIPTION
               "Describes the requirements for conformance to the
               3GPP GO PIB."


       MODULE FRAMEWORK-PIB
           MANDATORY-GROUPS {
               frwkPrcSupportGroup,
               frwkDeviceIdGroup }


       MODULE GO3GPP-PIB -- this module
           MANDATORY-GROUPS {
               go3gppAuthReqCapGroup,
               go3gppAuthReqDecCapGroup,
               go3gppAuthReqHandlerGroup,
               go3gppAuthReqEventGroup,
               go3gppBindingInfoGroup,
               go3gppFlowIdGroup,
               go3gppAuthReqFailDecGroup,
               go3gppAuthReqDecGroup,
               go3gppIcidGroup,
               go3gppAuthReqDirDecGroup,
               go3gppQosGroup,
               go3gppGateDecGroup,
               go3gppGateGroup,
--SPPI does not allow the OBJECTS clause to be empty. Since there
--are no objects to report in the Base Filter group, it is commented out.
--             go3gppBaseFilterGroup,
               go3gppIpFilterGroup,
               go3gppReportGroup,
               go3gppRprtGPRSChrgInfoGroup,
               go3gppRprtUsageGroup }
       ::= { go3gppCompliances 1 }




   go3gppAuthReqCapGroup OBJECT-GROUP
       OBJECTS {
       go3gppAuthReqCapBindingInfos,
       go3gppAuthReqCapFlowIds
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB Objects that describe the
           Authorisation Request capabilities."
       ::= { go3gppGroups 1 }

go3gppAuthReqDecCapGroup OBJECT-GROUP
       OBJECTS {
     go3gppAuthReqDecCapIcids
        }
```

```
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Authorisation Decision capabilities."
       ::= { go3gppGroups 2 }

go3gppAuthReqHandlerGroup OBJECT-GROUP
       OBJECTS {
     go3gppAuthReqHandlerEnable,
     go3gppAuthReqHandlerBindingInfo
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Authorisation request event handler."
       ::= { go3gppGroups 3 }

go3gppAuthReqEventGroup OBJECT-GROUP
       OBJECTS {
     go3gppAuthReqEventBindingInfos
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Authorisation request events."
       ::= { go3gppGroups 4 }

go3gppBindingInfoGroup OBJECT-GROUP
       OBJECTS {
     go3gppBindingInfoToken,
     go3gppBindingInfoFlowIds,
     go3gppBindingInfoNext
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the binding information."
       ::= { go3gppGroups 5 }

go3gppFlowIdGroup OBJECT-GROUP
       OBJECTS {
     go3gppFlowIdFlowId,
     go3gppFlowIdNext
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the flow ID."
       ::= { go3gppGroups 6 }

go3gppAuthReqFailDecGroup OBJECT-GROUP
       OBJECTS {

     go3gppAuthReqFailDecReason
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Authorisation failure decisions."
       ::= { go3gppGroups 7 }

go3gppAuthReqDecGroup OBJECT-GROUP
       OBJECTS {
     go3gppAuthReqDecIcids,
     go3gppAuthReqDecDirDecs
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Authorisation decisions."
       ::= { go3gppGroups 8 }

go3gppIcidGroup OBJECT-GROUP
       OBJECTS {
     go3gppIcidValue,
     go3gppIcidNext
       }
       STATUS current
```

```
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the ICID."
       ::= { go3gppGroups 9 }

go3gppAuthReqDirDecGroup OBJECT-GROUP
       OBJECTS {
     go3gppAuthReqDirDecDirection,
     go3gppAuthReqDirDecQos,
     go3gppAuthReqDirDecGates,
     go3gppAuthReqDirDecNext
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the authorisation decision direction."
       ::= { go3gppGroups 10 }

go3gppQosGroup OBJECT-GROUP
       OBJECTS {
     go3gppQosServiceClass,
     go3gppQosDataRateUnit,
     go3gppQosDataRate
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the QoS information."
       ::= { go3gppGroups 11 }

go3gppGateDecGroup OBJECT-GROUP
       OBJECTS {
     go3gppGateDecDirection,
     go3gppGateDecGates,
     go3gppGateDecNext
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the Gate decision."
       ::= { go3gppGroups 12 }

go3gppGateGroup OBJECT-GROUP
       OBJECTS {
     go3gppGateFilter,
     go3gppGateStatus,
     go3gppGateNext
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the gate."
       ::= { go3gppGroups 13 }

--SPPI does not allow the OBJECTS clause to be empty. Since there
--are no objects to report in this group, it is commented out.
--go3gppBaseFilterGroup OBJECT-GROUP
--       OBJECTS { }
--       STATUS current
--       DESCRIPTION
--          "This Group defines the PIB Objects that describe the base filter."
--       ::= { go3gppGroups 14 }

go3gppIpFilterGroup OBJECT-GROUP
       OBJECTS {
           go3gppIpFilterAddrType,
           go3gppIpFilterDstAddr,
           go3gppIpFilterDstPrefixLength,
           go3gppIpFilterSrcAddr,
           go3gppIpFilterSrcPrefixLength,
           go3gppIpFilterProtocol,
           go3gppIpFilterDstL4PortMin,
           go3gppIpFilterDstL4PortMax,
           go3gppIpFilterSrcL4PortMin,
           go3gppIpFilterSrcL4PortMax
        }
       STATUS current
       DESCRIPTION
```

```
          "This Group defines the PIB Objects that describe the IP Filter."
       ::= { go3gppGroups 14 }

go3gppReportGroup OBJECT-GROUP
       OBJECTS {
     go3gppReportStatus,
     go3gppReportDetails
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the PEP reports."
       ::= { go3gppGroups 15 }

go3gppRprtGPRSChrgInfoGroup OBJECT-GROUP
       OBJECTS {
     go3gppRprtGPRSChrgInfoGGSNAddr,
     go3gppRprtGPRSChrgInfoGCID
        }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the charging information."
       ::= { go3gppGroups 16 }

go3gppRprtUsageGroup OBJECT-GROUP
       OBJECTS {
           go3gppRprtUsageIndication
       }
       STATUS current
       DESCRIPTION
          "This Group defines the PIB
          Objects that describe the report usage."
       ::= { go3gppGroups 17 }


   END
```

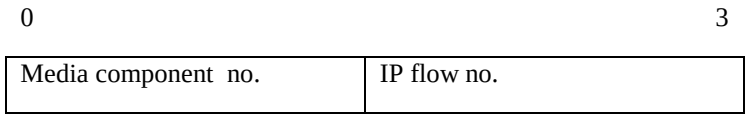
Annex C (normative): Flow identifiers: Format definition and examples

C.1 Format of a flow identifier

A flow identifier is expressed as a 2-tuple as follows:

<Media component no, IP flow no.>

where both are numbered starting from 1.



C.2 Example 1

The second "m=" - line in the SDP information contains one RTP media specification, as follows:

m=video 49160 RTP/AVP 31

Two flow identifiers are assigned as shown in the table below:

IP flow	Port number	Flow id.
RTP	49160	<2,1>
Associated RTCP	49161	<2,2>

C.3 Example 2

In the general case, multiple ports may be specified with a “number of ports” qualifier as follows, ref. [17]:

m=<media> <port>/<number of ports> <transport> <fmt list>

If the third “m=”-line indicates a series of port numbers as follows:

m=video 49170/2 RTP/AVP 31

Four flow identifiers are assigned as shown in the table below:

IP flow	Port number	Flow id.
First RTP	49170	<3,1>
First associated RTCP	49171	<3,2>
Second RTP	49172	<3,3>
Second associated RTCP	49173	<3,4>

Annex D (normative): Go interface related error code values for the PDP context handling

The following error codes are used to indicate Go interface related errors from the GGSN to the UE. The error codes are transferred to the UE in the Protocol Configuration Options information element as defined in 3GPP TS 24.008:

Error code No. 1 "Authorization failure of the request"
This error code indicates that the PDP context activation/modification request is rejected because the authorizing entity is unable to provide an authorization decision for the binding information.

Error code No. 2 "Missing binding information"

This error code indicates that the PDP context activation/modification request is rejected because the binding information was not included in the request although required.

Error code No. 3 "Invalid binding information"

This error code indicates that the PDP context activation/modification request is rejected because the authorizing entity could not be resolved from the binding information.

Annex E (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2001-07		N3-010284			Version 0.0.0 presented to CN3 #18 – Dresden	x.y.z	0.0.0
2001-07		N3-010335			Tdocs N3-010286 and N3-010325 are agreed at CN3 #18 – Dresden, Germany and incorporated. Raised to Version 0.1.0.	0.0.0	0.1.0
2001-10		N3-010480			Tdoc N3-010460 is agreed at CN3 #19 – Brighton, U.K. and incorporated. Deletion of clause 5.4 is also agreed. Raised to Version 0.2.0.	0.1.0	0.2.0
2001-11		N3-010577			Tdocs N3-010574, N3-010573, N3-010546, N3-010553, and N3-010525 are agreed with some modifications at CN3 #20 – Cancun, Mexico and incorporated. Raised to Version 0.3.0.	0.2.0	0.3.0
2001-11		N3-010611			Tdoc N3-010547 is agreed at CN3 #20 – Cancun, Mexico and incorporated. Raised to Version 0.4.0.	0.3.0	0.4.0
2001-11		N3-010614			The figure 4.2-1 is modified based on comments. Raised to Version 0.5.0.	0.4.0	0.5.0
2002-02		N3-020120			Tdocs N3-020028 and N3-020109 are agreed at CN3 #21 – Sophia Antipolis, France and incorporated. Raised to Version 0.6.0.	0.5.0	0.6.0
2002-02		N3-020157			Tdocs N3-020152, N3-020132, N3-020129, N3-020145, N3-020133, N3-020130, N3-020156, N3-020126, N3-020137, N2-020128, N3-020136 and N3-020138 are agreed with some modifications at Go drafting session in CN3 #21 Bis – Sophia Antipolis, France and incorporated. Raised to Version 0.7.0.	0.6.0	0.7.0
2002-02		N3-020158			Tdocs N3-020151 (restructuring), N3-020160, and N3-020159 are agreed with some modifications at Go drafting session in CN3 #21 Bis – Sophia Antipolis, France and incorporated. Raised to Version 0.8.0.	0.7.0	0.8.0
2002-02		N3-020166			Tdocs N3-020163 (additions to gate function) and N3-020161 (UMTS Go PIB) are agreed with some modifications at last day of CN3 #21 Bis – Sophia Antipolis, France and incorporated. Raised to Version 0.9.0.	0.8.0	0.9.0
2002-02		N3-020168			Addition of security consideration regarding the UMTS Go PIB. Raised to Version 0.9.0.	0.9.0	0.10.0
2002-02		NP-020078			Some editorial cleaning - presented to NP#15 for information	0.10.0	1.0.0
2002-04		N3-020364			Tdocs N3-020244, N3-020248, N3-020305, N3-020306, N3-020319, N3-020320, N3-020321, N3-020325, N3-020335, N3-020337, N3-020338, N3-020339, N3-020341, N3-020342, N3-020343, and N3-020347 are agreed at CN3 #22 – Fort Lauderdale, Florida, USA and incorporated. Raised to Version 1.1.0.	1.0.0	1.1.0
2002-05		N3-020514			Tdocs N3-020367, N3-020391, N3-020393, N3-020443, N3-020444, N3-020447, N3-020449, N3-020464, N3-020482, N3-020483, N3-020487, N3-020488, N3-020489, N3-020497, N3-020498, N3-020502, and N3-020511 are agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.2.0.	1.1.0	1.2.0
2002-05		N3-020517			Comments agreed at Go drafting session in CN3 #23 – Budapest, Hungary are incorporated. Raised to Version 1.3.0.	1.2.0	1.3.0
2002-05		N3-020522			Tdocs N3-020389, N3-020465, N3-020516, and N3-020520 are agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.4.0.	1.3.0	1.4.0
2002-05		N3-020524			Comments agreed at CN3 #23 – Budapest, Hungary are incorporated. Raised to Version 1.5.0.	1.4.0	1.5.0
2002-06	NP#16	NP-020167			Approved at NP#16 and placed under change control	2.0.0	5.0.0
2002-09	NP#17	NP-020411	005	1	Revision to the 3GPP Go PIB	5.0.0	5.1.0
2002-09	NP#17	NP-020409	006	1	Authorized QoS vs. guaranteed and maximum bit rates	5.0.0	5.1.0
2002-09	NP#17	NP-020411	007	2	Editorial improvements in the specification	5.0.0	5.1.0
2002-09	NP#17	NP-020411	010	1	SBLP Gate Decision	5.0.0	5.1.0
2002-09	NP#17	NP-020413	011	1	Remove incomplete DS function	5.0.0	5.1.0
2002-09	NP#17	NP-020409	012	1	Align TS 29.207 with TS 23.207	5.0.0	5.1.0
2002-09	NP#17	NP-020411	014	1	User Plane Operation	5.0.0	5.1.0
2002-09	NP#17	NP-020410	016	4	Support for forking	5.0.0	5.1.0
2002-09	NP#17	NP-020411	017	2	Message Descriptions	5.0.0	5.1.0
2002-09	NP#17	NP-020411	018	1	Derivation of flow identifiers from SDP	5.0.0	5.1.0
2002-09	NP#17	NP-020411	019		Revoke Authorization Procedure	5.0.0	5.1.0
2002-09	NP#17	NP-020411	020	1	Go related error codes to UE	5.0.0	5.1.0
2002-09	NP#17	NP-020409	021		Removal of Annex A	5.0.0	5.1.0
2002-09	NP#17	NP-020414	022	2	Source Address filtering over the Go interface	5.0.0	5.1.0
2002-09	NP#17	NP-020411	025	1	Initialisation and maintenance / Security Considerations	5.0.0	5.1.0
2002-09	NP#17	NP-020411	030		Remove incomplete RSVP function	5.0.0	5.1.0
2002-09	NP#17	NP-020411	032		R-Type and M-Type for Authorization_Failure event	5.0.0	5.1.0

2002-09	NP#17	NP-020410	033	2	Session modification initiated decision	5.0.0	5.1.0

3GPP TSG-CN WG3 Meeting #26
Bangkok, Thailand, 11th – 15th november 2002.

Tdoc ⌘N3-021010

CR-Form-v7

CHANGE REQUEST

⌘ **29.208** **CR** **013** ⌘ **rev** **1** ⌘ Current version: **5.1.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	PCF by PDF substitution.
Source:	⌘	TSG_CN WG3
Work item code:	⌘	E2EQoS
Date:	⌘	11/11/2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	It was agreed to use the Policy Decision Function terminology for compatibility with other access networks.
Summary of change:	⌘	Replace the term Policy Control Function with Policy Decision Function throughout the document.
Consequences if not approved:	⌘	Confusion between the 3GPP and other architectures.

Clauses affected:	⌘	3.2, 4.1, 4.2, 5, 6.1, 6.2, 6.2.1, 6.2.2, 6.3, 6.3.1, 6.4, 6.5, 6.5.1, 6.5.2, 7.1, 7.1.1, 7.1.2, 7.1.3, 7.3			
		Y	**N**		
Other specs affected:	⌘	**X**		Other core specifications	⌘ 23.002, 23.207, 23.228, 24.228, 24.229, 29.207
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present specification shows QoS signalling flows for resource reservation to provide end-to-end QoS. The flows are used as bases of developing QoS related protocol descriptions for new and existing specifications.

The relationship between SIP/SDP session level and the bearer level (RSVP and GPRS) in flows is described in 3GPP TS 24.228 [2]. The present specification adds detailed flows of service based local policy (SBLP) procedures over the Go interface and their relationship with the bearer level signalling flows over the Gn interface.

The present specification also describes the mapping of QoS parameters among SDP, UMTS QoS parameters, and QoS authorization parameters.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on SIP and SDP; Stage 3".

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

[4] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[5] 3GPP TS 26.234: "End-to-end transparent streaming service; Protocols and codecs".

[6] 3GPP TS 26.236: "Packet switched conversational multimedia applications; Transport protocols".

[7] 3GPP TS 29.207: "Policy control over Go interface".

[8] 3GPP TS 23.107: "Quality of Service (QoS) concept and architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions as given in 3GPP TR 21.905 [1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply:

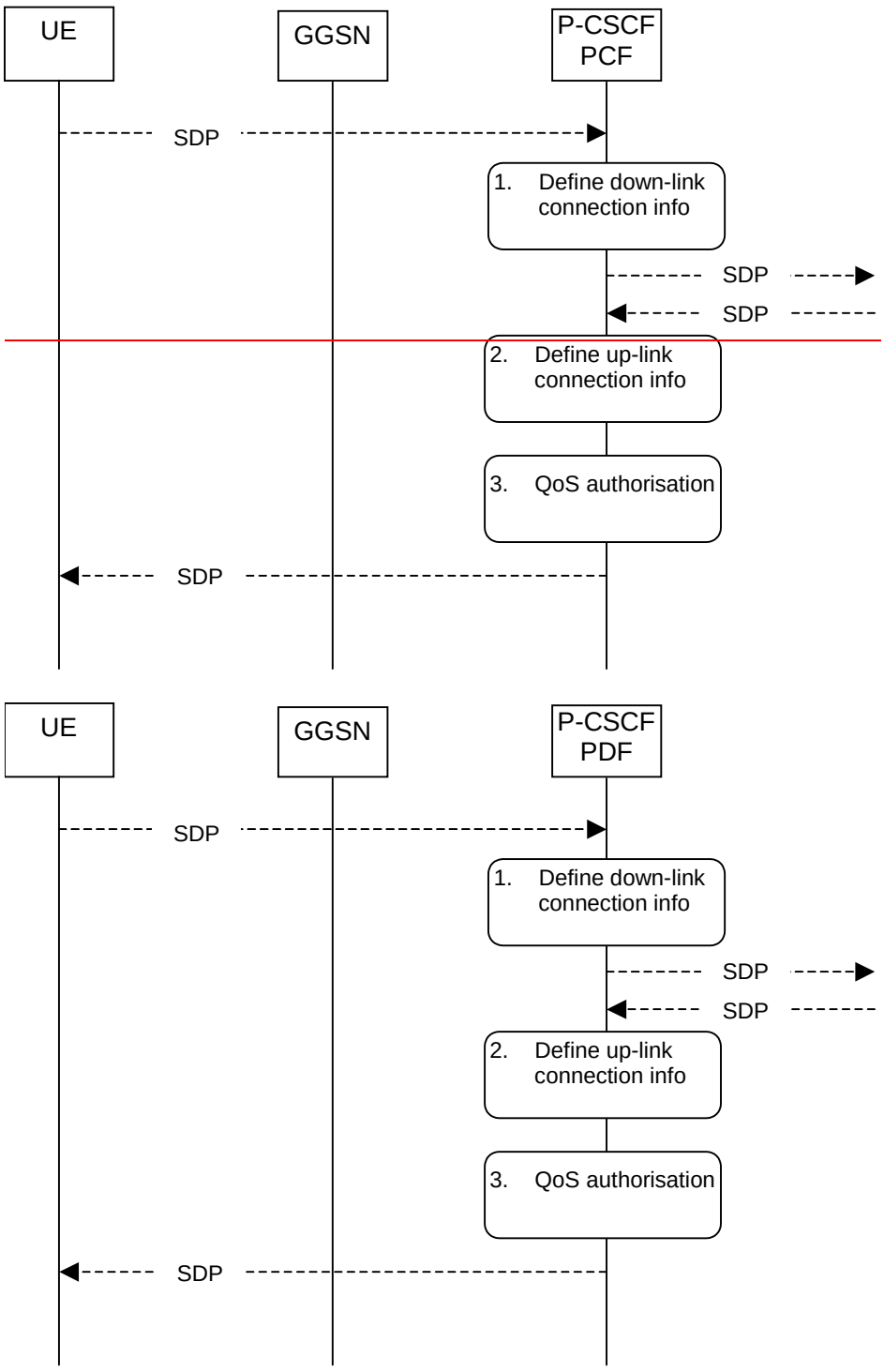
COPS	Common Open Policy Service protocol
DEC	COPS Decision message
DRQ	COPS Delete Request State message
IMS	IP Multimedia CN Subsystem

~~PCF~~PDF	~~Policy Control Function~~Policy Decision Function
REQ	COPS Request message
RPT	COPS Report State message

4 Authorize QoS resources

4.1 Authorize QoS resources at originating ~~PCF~~PDF

This clause covers the Authorize QoS resources procedure at the originating ~~PCF~~PDF.

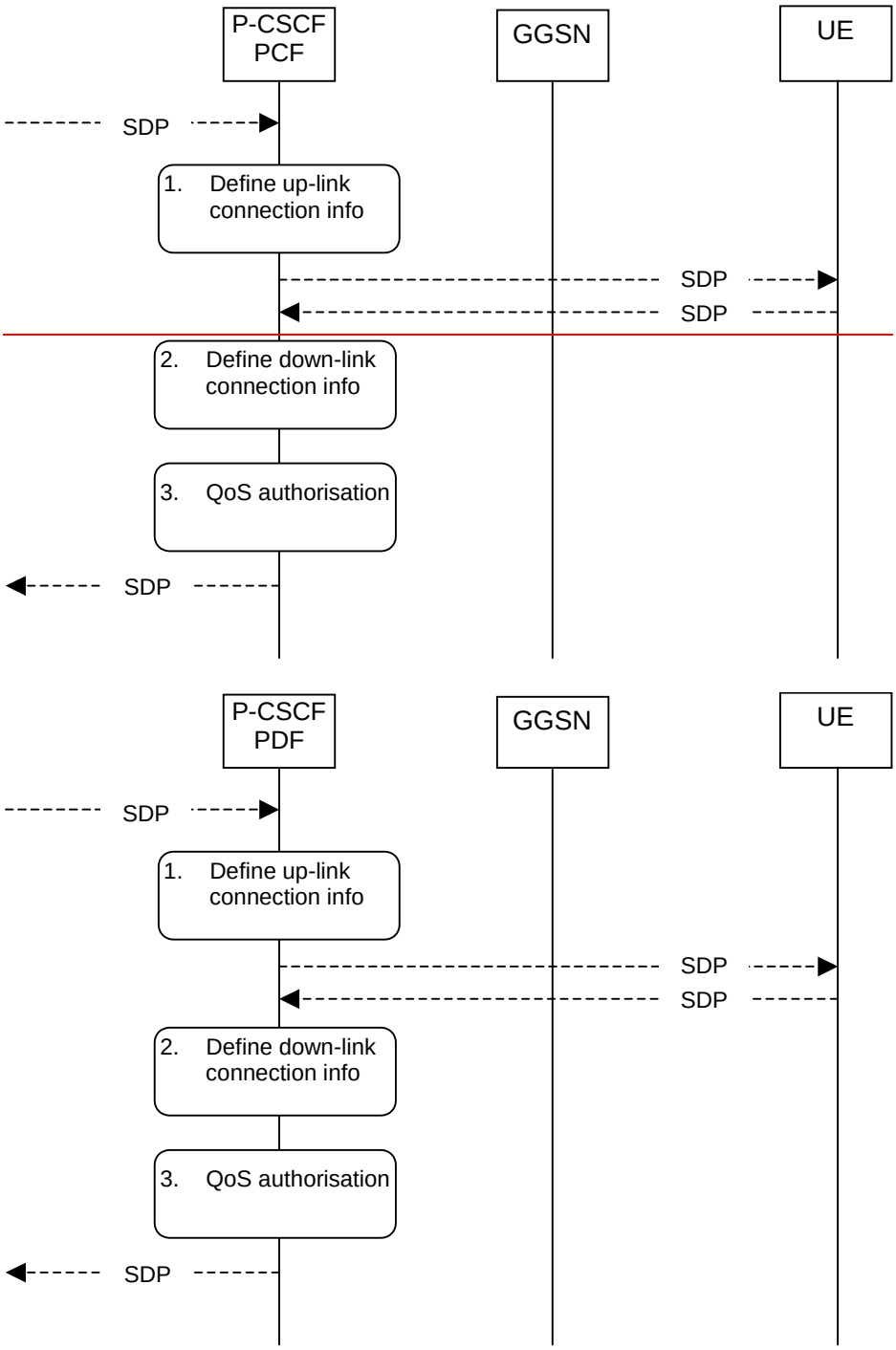


1. The P-CSCF(~~PCF~~PDF) gets the SDP parameters defined by the originator and identifies the connection information needed (IP address of the down link media flow, media ports to be used etc…).
2. The P-CSCF(~~PCF~~PDF) gets the negotiated SDP parameters from the terminating side through SIP signalling interaction. The P-CSCF(~~PCF~~PDF) identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…).
3. The P-CSCF(~~PCF~~PDF) uses the SDP parameters in order to define the QoS resource authorisation. The ~~PCF~~PDF authorises every media component negotiated for the session. The authorization shall be expressed in terms of IP QoS parameters. An authorization token is generated by the ~~PCF~~PDF and sent to the UE.

Figure 4.1: Authorize QoS resources at originating ~~PCF~~PDF

4.2 Authorize QoS resources at terminating ~~PCF~~PDF

This clause covers the Authorize QoS resources procedure at the terminating ~~PCF~~PDF.



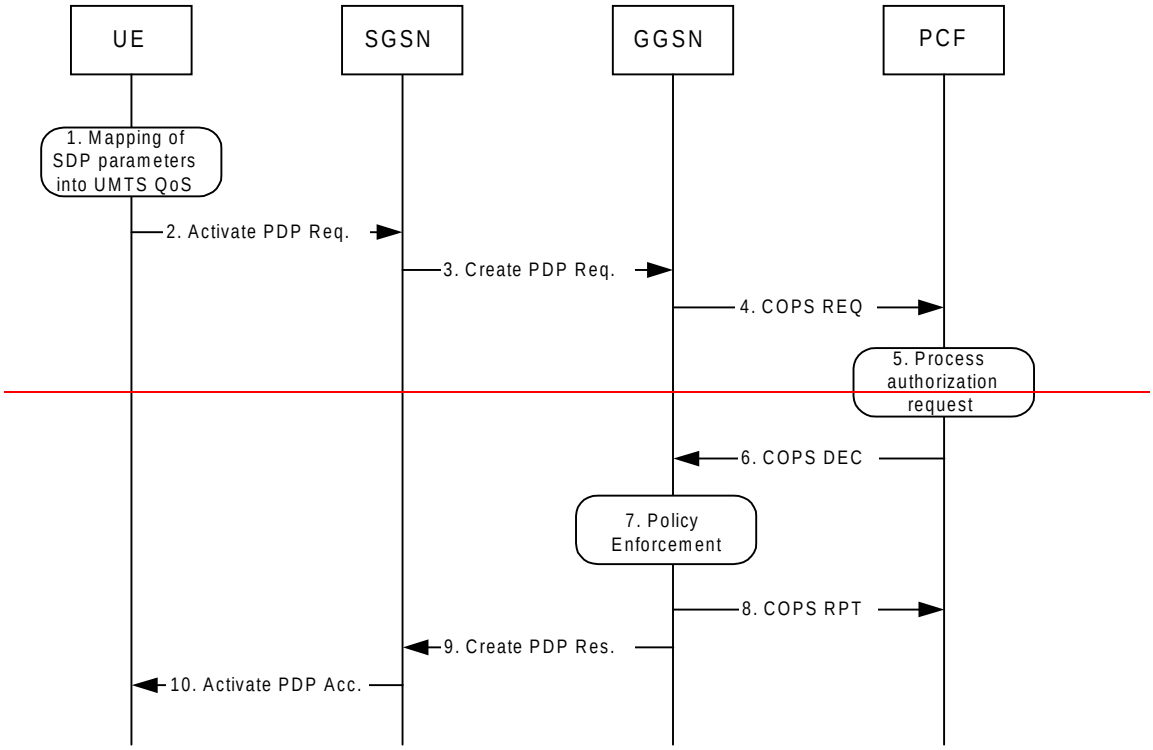
1. The P-CSCF(~~PCF~~PDF) gets the SDP parameters defined by the originator and identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…). An authorization token is generated by the ~~PCF~~PDF and sent to the UE.
2. The P-CSCF(~~PCF~~PDF) receives the negotiated SDP parameters from the UE. The P-CSCF(~~PCF~~PDF) identifies the connection information needed (IP address of the down-link media flow, media ports to be used etc…).
3. The P-CSCF(~~PCF~~PDF) uses the SDP parameters in order to define the QoS resource authorisation. The ~~PCF~~PDF authorises every media component negotiated for the session. The authorization shall be expressed in terms of IP QoS parameters.

Figure 4.2: Authorize QoS resources at terminating ~~PCF~~PDF

5 Resource reservation flow with Service-based local policy

This clause describes a resource reservation flow with service based local policy. The service based local policy is done via exchange of information through the Go interface. The Go interface allows the service based local policy and QoS interworking information to be requested by the GGSN from a ~~PCF~~PDF.

The figure 5.1 presents the "Resource Reservation" procedure at PDP context activation to both the Mobile Originating (MO) side and Mobile Terminating (MT) side.



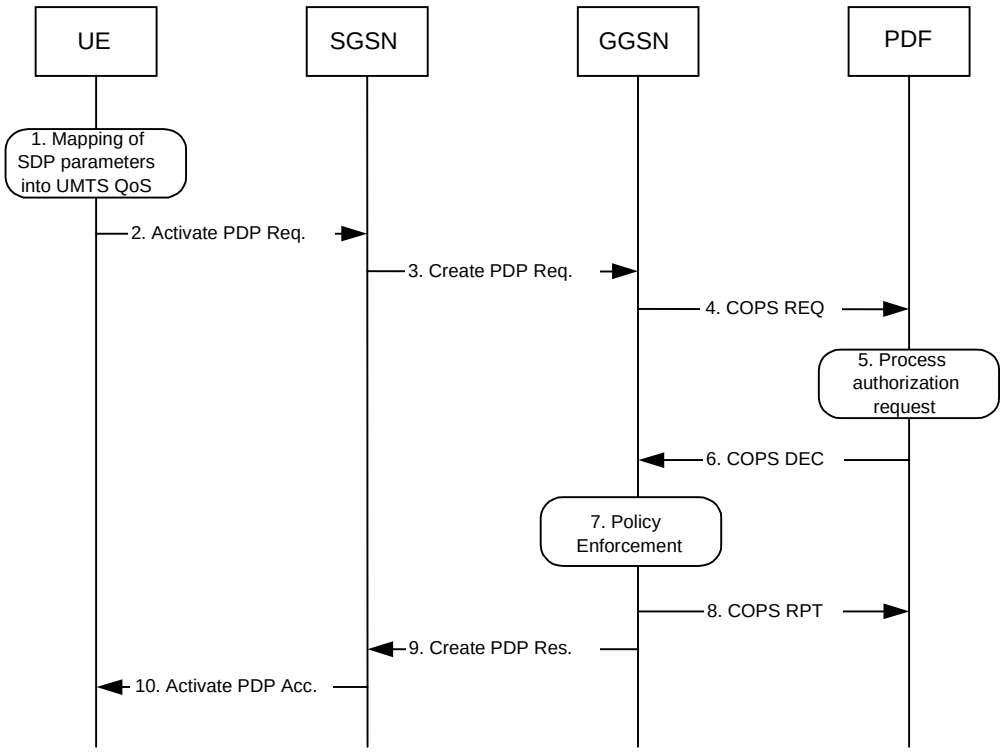


Figure 5.1: Resource reservation flow with service based local policy

1. Mapping from SDP to UMTS QoS parameters

The UE uses the SDP parameters in order to define the UMTS QoS parameter needed to request a PDP context. The QoS parameter mapping mechanism is described in clause 7.2.

2. GPRS: Activate PDP Context Request (UE to SGSN)

The UE sends an Activate PDP Context Request message to the SGSN with the UMTS QoS parameters The UE shall include binding information in the PDP context activation messages to associate the PDP context bearer with policy information. The authorization token is sent by the P-CSCF to the UE during SIP signalling.

3. GPRS: Create PDP Context Request (SGSN to GGSN)

The SGSN carries out the procedures identified in 3GPP TS 23.060 [4] related to the PDP context activation.

4. COPS: REQ (GGSN to ~~PCF~~PDF)

The GGSN receives the PDP context activation request with the binding information. The GGSN uses the authorisation token in order to localise the ~~PCF~~PDF. The GGSN sends a COPS REQ message to the ~~PCF~~PDF and includes the binding information.

5. Process Resource Request (~~PCF~~PDF)

The ~~PCF~~PDF receives the information sent by the GGSN. The ~~PCF~~PDF identifies the multimedia session by using the binding information. The ~~PCF~~PDF performs an authorization decision.

6. COPS: DEC (~~PCF~~PDF to GGSN)

The decision taken by the ~~PCF~~PDF is returned via the COPS DEC message. The DEC message includes the policy information to be used by the GGSN in order to perform the policy-based admission control.

7. Policy Enforcement (GGSN)

The GGSN enforces the ~~PCF~~PDF policy decision based on the received authorization information from the ~~PCF~~PDF for the media flows carried by the PDP context.

8. COPS: RPT (GGSN to ~~PCF~~PDF)

The GGSN sends COPS RPT message back to the ~~PCF~~PDF and reports its success or failure in carrying out the ~~PCF~~PDF decision.

9. GPRS: Create PDP Context Response (GGSN to SGSN)

The GGSN accepts the PDP context request based on the results of the authorisation policy decision enforcement. If the requested QoS parameters are not within the authorized QoS, the GGSN either rejects the PDP context activation request or downgrades the requested UMTS QoS parameters.

10. GPRS: Activate PDP Context Accept (SGSN to UE)

The SGSN sends an Activate PDP Context Accept message to the UE indicating that the PDP context has been activated and that the QoS requirements have been authorized successfully for both downlink and uplink.

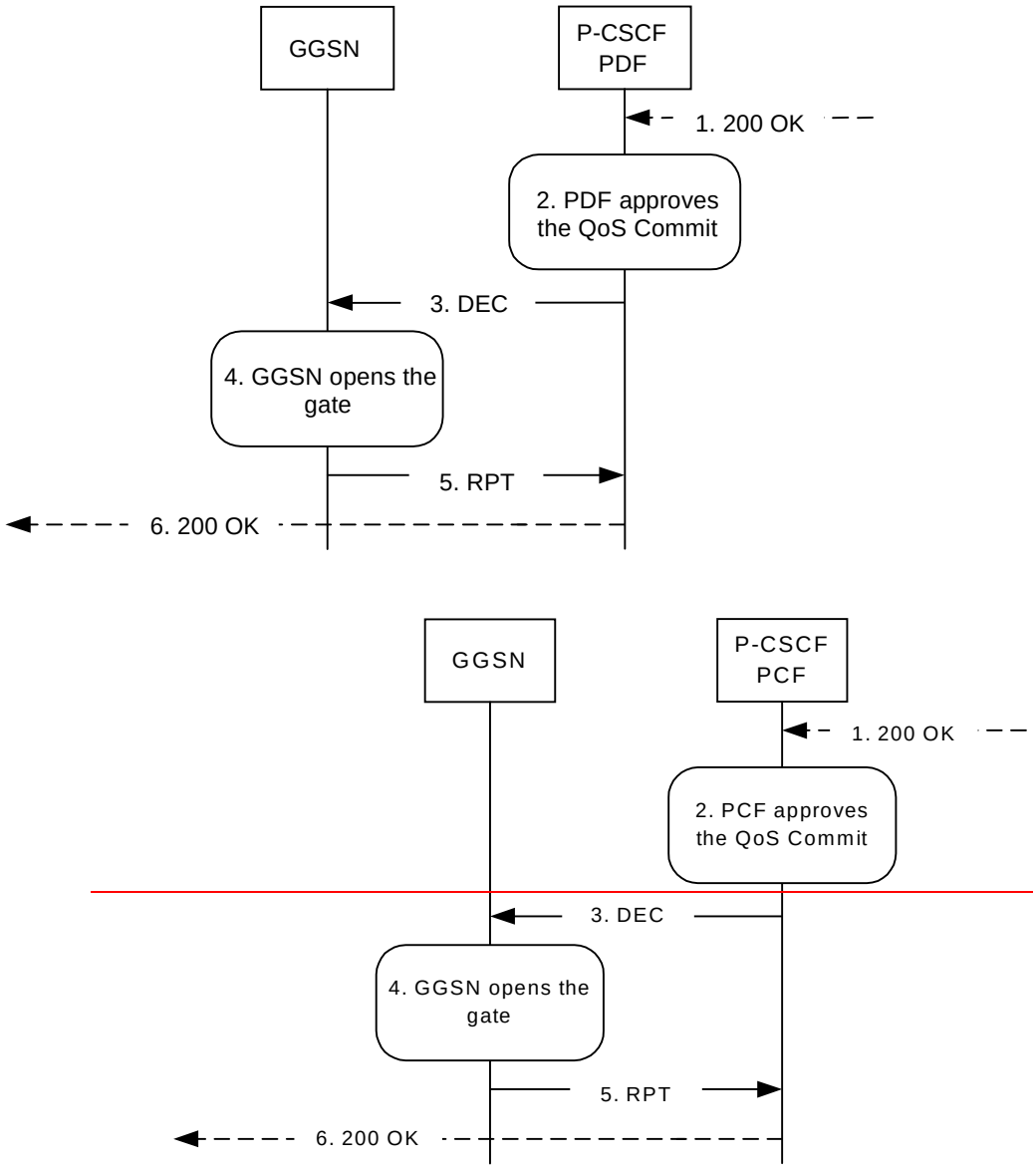
6 Other flows over Go interface

6.1 Approval of QoS commit

Through Approval of QoS Commit the ~~PCF~~PDF makes a final decision to enable the allocated QoS resource for the authorized media stream if the QoS resources are not enable at the time they are authorized by the ~~PCF~~PDF.

The Approval of QoS Commit procedure is triggered by the P-CSCF receiving a 200 OK message.

The following figure is applicable to the Mobile Originating (MO) side and the Mobile Terminating (MT) side.



1. P-CSCF receives the 200 OK message.
2. ~~PCF~~PDF approves the QoS Commit.
3. ~~PCF~~PDF sends a COPS DEC message to the GGSN to open the 'gate' e.g., enable the use of the authorised QoS resources.
4. GGSN receives the COPS DEC message and opens the 'gate' e.g., enables the use of the authorised QoS resources.
5. GGSN sends a COPS RPT message back to the ~~PCF~~PDF.
6. P-CSCF forwards the 200 OK message.

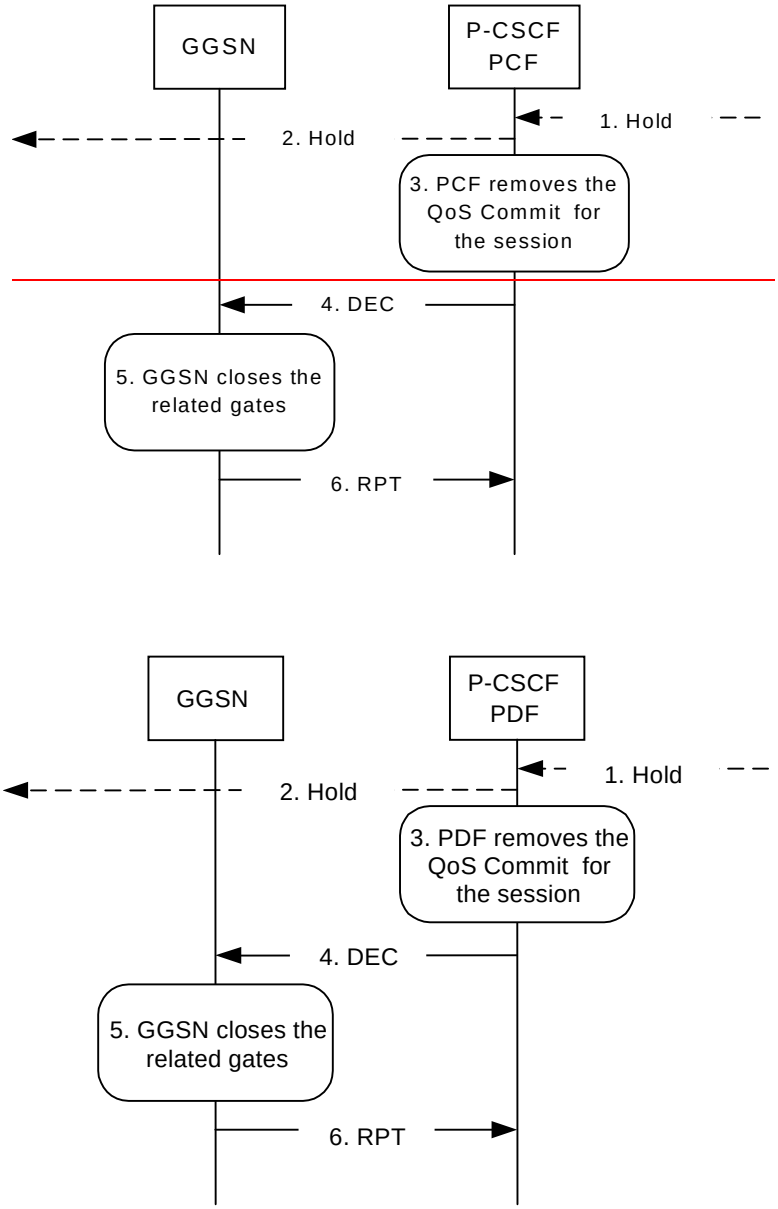
Figure 6.1: Approval of QoS Commit to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

6.2 Removal of QoS commit

The "Removal of QoS commit" procedure is used e.g. when a media component of a session is put on hold. (e.g. in case of a media re-negotiation or call hold). The ~~PCF~~PDF decision of "Removal of QoS commit " shall be sent as a separate decision to the GGSN corresponding to the previous "Authorize QoS Resources" request.

6.2.1 Removal of QoS commit at Session on Hold

The following figure presents the "Removal of QoS commit" procedure at session on hold to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.

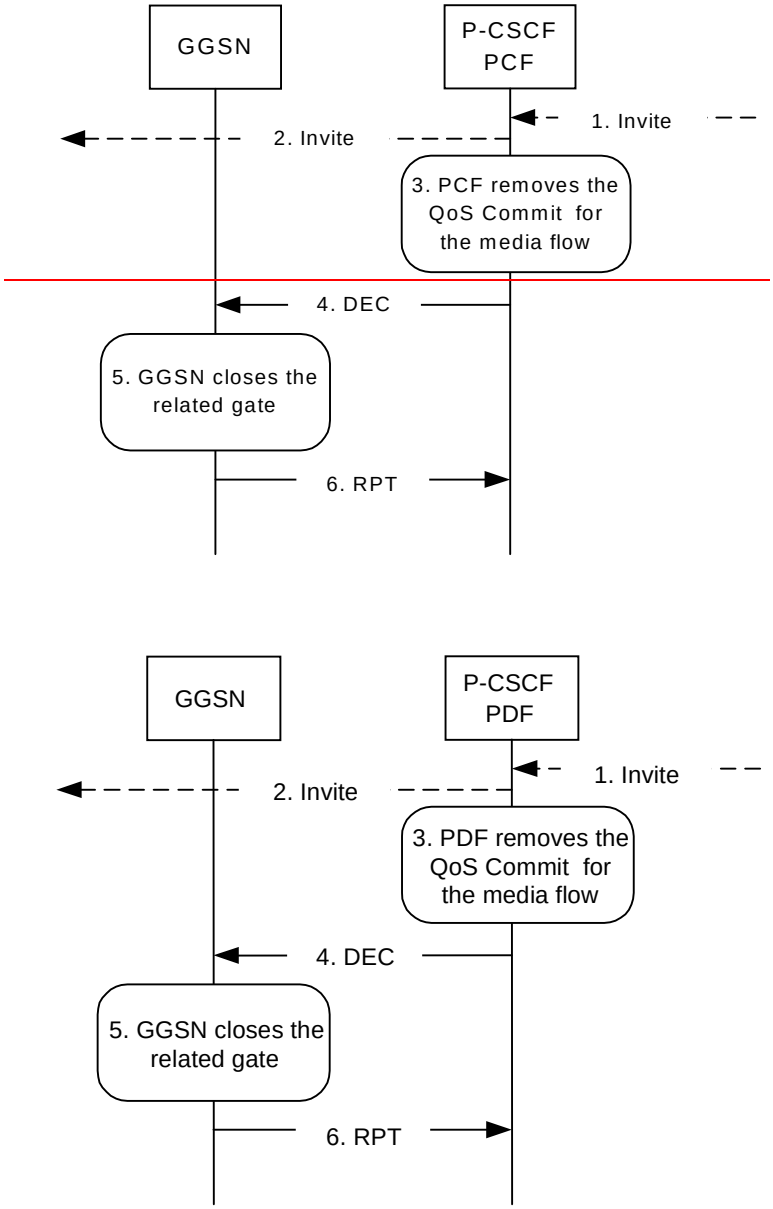


1. P-CSCF receives the Hold message.
2. P-CSCF forwards the Hold message.
3. ~~PCF~~PDF removes the QoS commit for the session.
4. ~~PCF~~PDF sends a COPS DEC message to the GGSN to close the related 'gates'.
5. GGSN receives the COPS DEC message, closes the 'gates'.
6. GGSN sends a COPS RPT message back to the ~~PCF~~PDF.

Figure 6.2.1: Removal of QoS commit at Session on Hold to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

6.2.2 Removal of QoS commit at Codec or media flow change or remove

The following figure presents the "Removal of QoS commit" procedure at Codec or media flow change or remove to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.



1. P-CSCF receives the INVITE message for codec or media change, remove.
2. P-CSCF forwards the INVITE message.
3. ~~PCF~~PDF removes the QoS commit for the related media flow.
4. ~~PCF~~PDF sends a COPS DEC message to the GGSN to close the related 'gate'.
5. GGSN receives the COPS DEC message, closes the 'gate'.
6. GGSN sends a COPS RPT message back to the ~~PCF~~PDF.

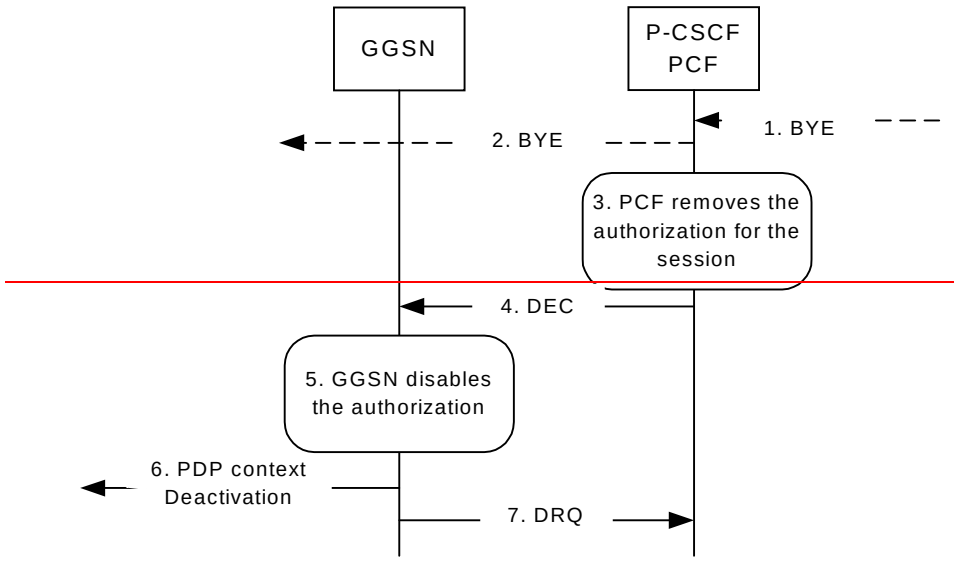
Figure 6.2.2: Removal of QoS commit at codec or media flow change or remove to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

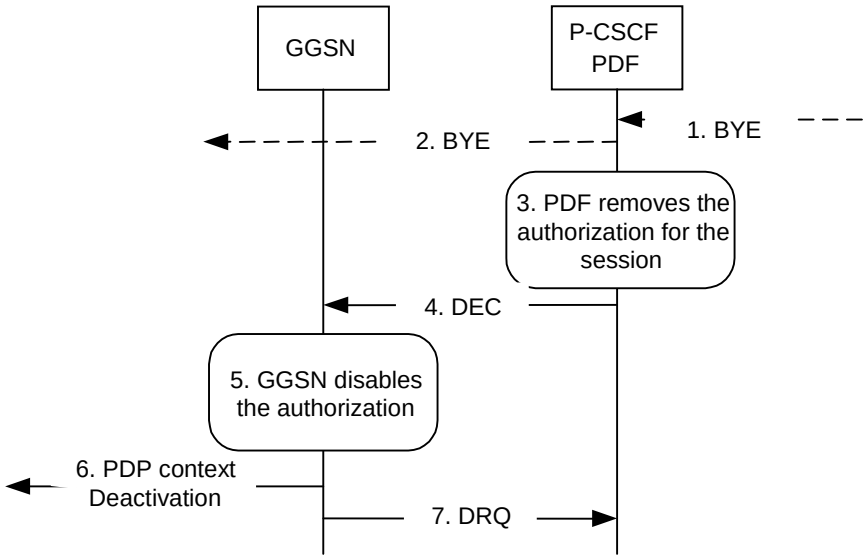
6.3 Revoke authorization for GPRS and IP resources

The "Revoke Authorization for GPRS and IP resources" procedure is used e.g. upon session release. The ~~PCF~~PDF decision of "Revoke Authorization for UMTS and IP Resources" shall be sent as a separate decision to the GGSN corresponding to the previous "Authorize QoS Resources" request.

6.3.1 Mobile initiated session release / Network initiated session release

The following figure presents the "Revoke Authorization for UMTS and IP Resources" at upon Mobile initiated session release / Network initiated session release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.





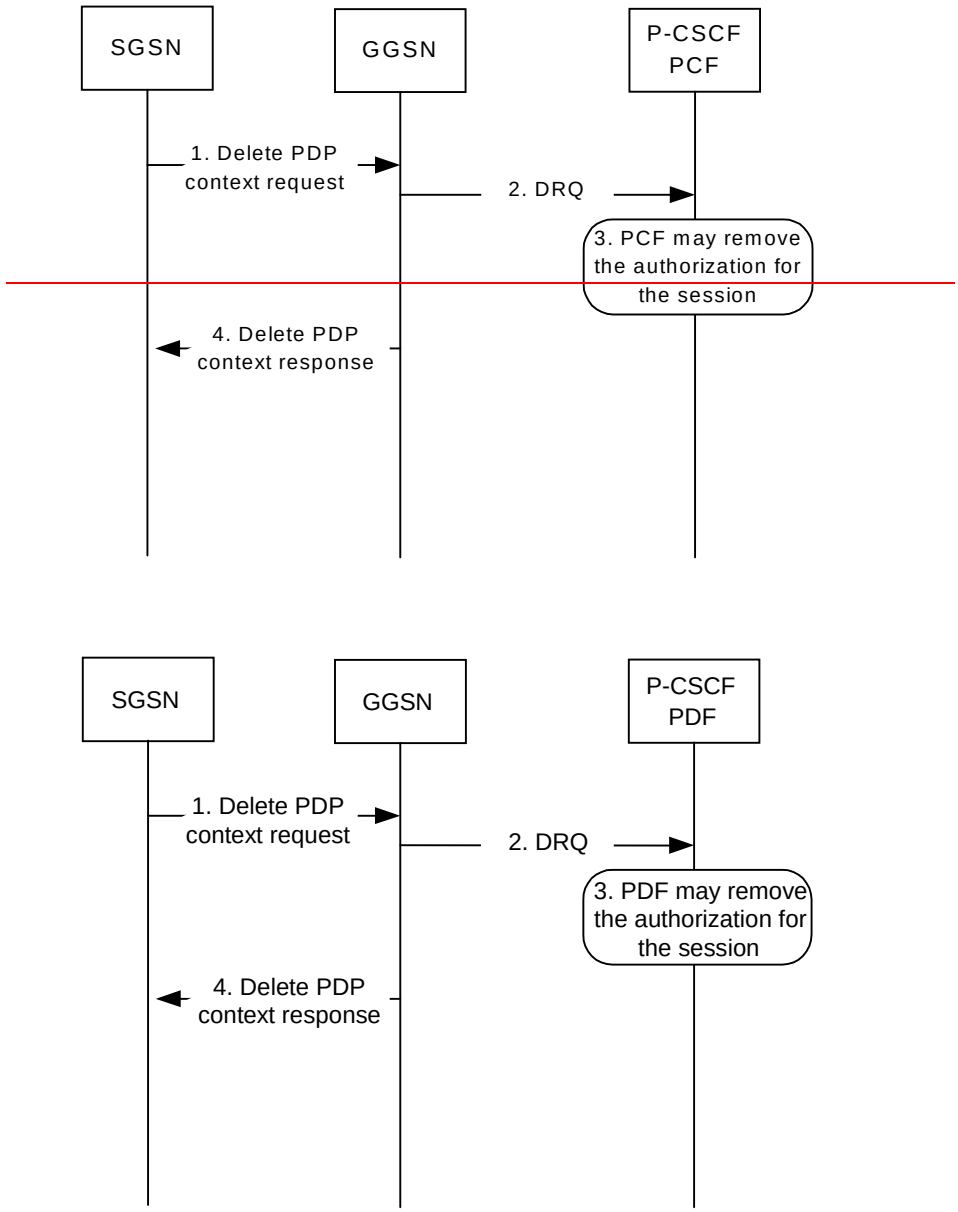
1. One mobile party hangs up or the P-CSCF or S-CSCF initiates BYE message.
2. P-CSCF forwards the BYE message.
3. ~~PCF~~PDF removes the authorisation for resources that had previously been issued for this endpoint for this session.
4. ~~PCF~~PDF sends a COPS DEC message to the GGSN. It includes binding information, which identifies the PDP context to be deactivated.
5. GGSN receives the COPS DEC message, and disables the use of the authorized QoS resources.
6. GGSN initiates deactivation of the PDP context used for the IP multimedia session, in case the UE has not done it before.
7. GGSN sends a COPS DRQ message back to the ~~PCF~~PDF.

Figure 6.3.1: Revoke authorization for GPRS and IP resources - Mobile initiated session release / Network initiated session release to both Mobile Originating (MO) and Mobile termination side

6.4 Indication of PDP Context Release

The "Indication of PDP Context Release" procedure is used upon the release of a PDP Context that was established based on authorisation from the ~~PCF~~PDF in e.g. accidental/malicious removal of a PDP Context that is related to an IMS session.

The following figure presents the "Indication of PDP Context Release" to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.

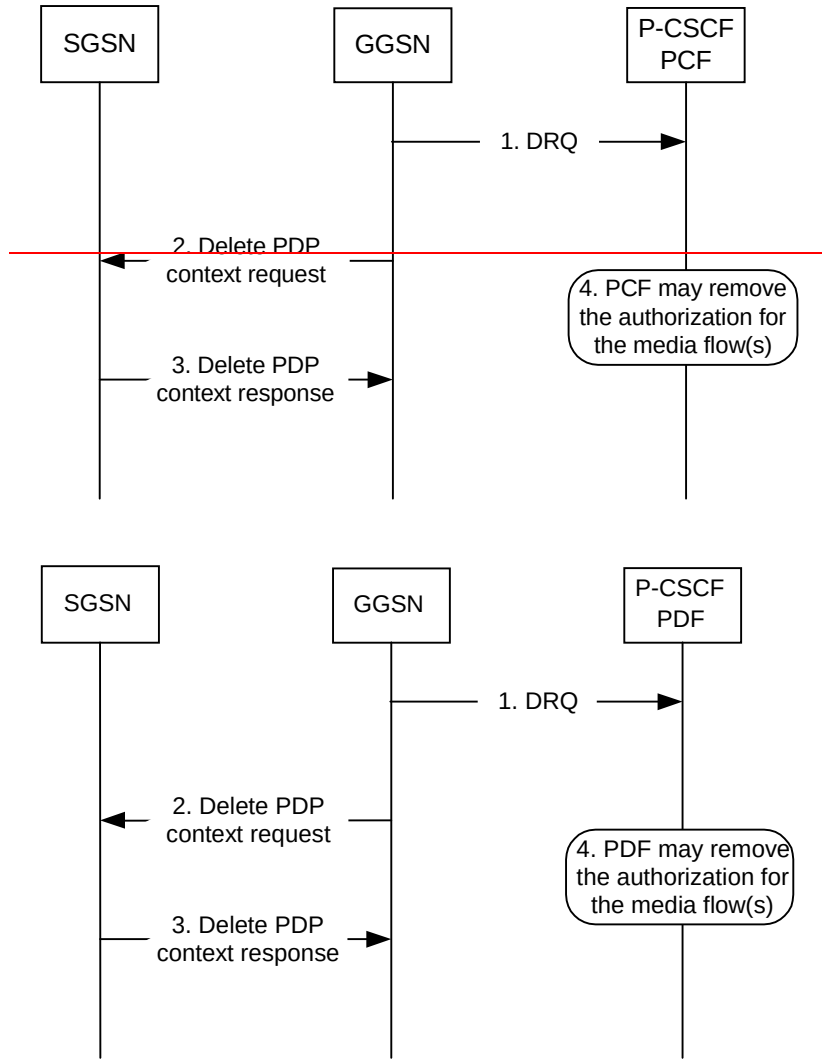


1. SGSN deactivates the PDP context related to the media flow by sending the Delete PDP Context Request message to the GGSN.
2. GGSN sends a COPS DRQ message to the P-CSCF(~~PCF~~PDF).
3. P-CSCF(~~PCF~~PDF) receives the COPS DRQ message and ~~PCF~~PDF may remove the authorization for the session.
4. GGSN sends the Delete PDP Context Response message to the SGSN to acknowledge the PDP context deletion.

NOTE: Step 4 may also occur at the same time or before Step 3.

Figure 6.4.1: Indication of PDP Context Release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

The following figure presents the case when the GGSN initiates the release of a PDP context, i.e. after an error condition has been detected in GGSN.



1. GGSN sends a COPS DRQ message to the P-CSCF(~~PCF~~PDF).
2. GGSN deactivates the PDP context related to the media flow(s) by sending the Delete PDP Context Request message to the SGSN.
3. SGSN sends the Delete PDP Context Response message to the GGSN to acknowledge the PDP context deletion.
4. P-CSCF(~~PCF~~PDF) receives the COPS DRQ message and ~~PCF~~PDF may remove the authorization for the media flow(s) authorized for this PDP context.

NOTE: Step 4 may also occur at the same time or before Step 2 and Step 3.

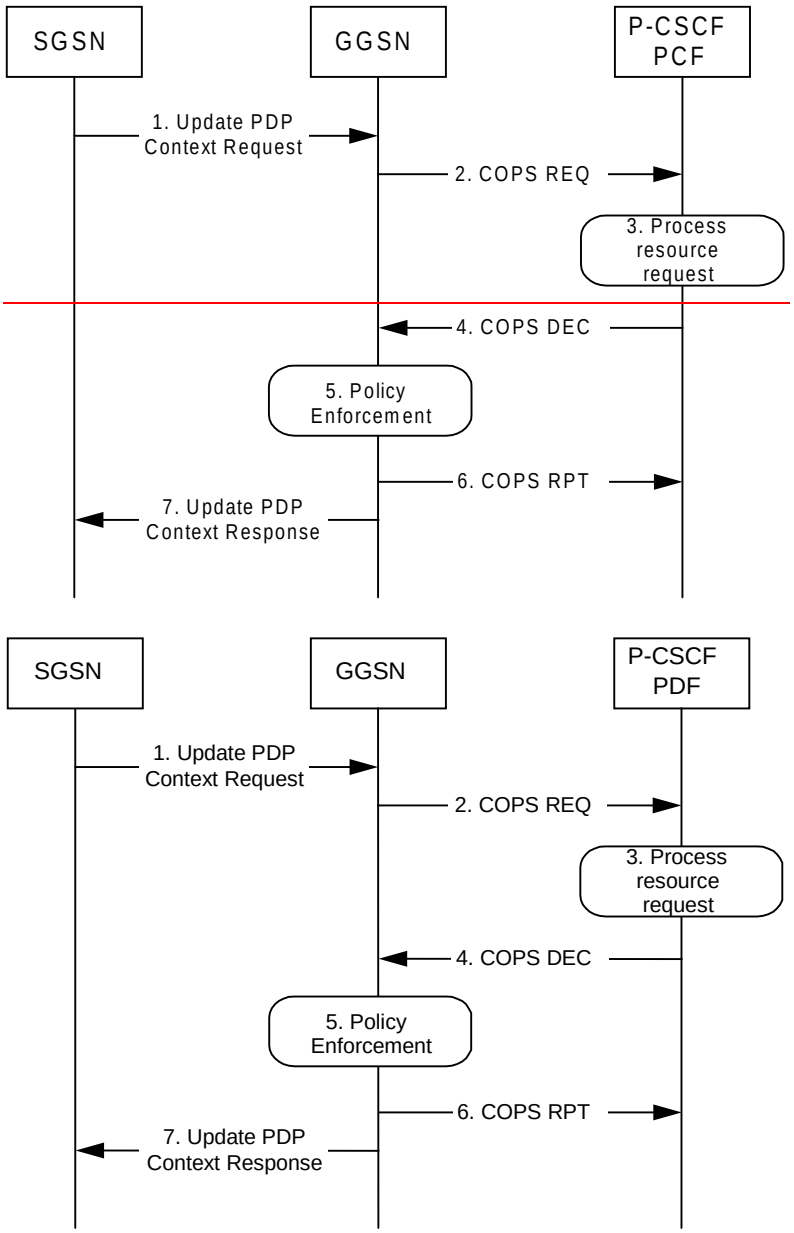
Figure 6.4.2: Indication of GGSN-initiated PDP Context Release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

6.5 Modification of PDP Context

The "Modification of PDP Context" procedure is used when a PDP Context is modified such that the requested QoS falls outside of the limits that were authorized at PDP context activation (or last modification) or such that the maximum bit rate (downlink and uplink) is downgraded to 0 kbit/s. In these cases, the GGSN communicates with the ~~PCF~~PDF as described below.

6.5.1 Authorization of PDP Context Modification

The figure 6.5.1 presents the "Modification of PDP Context" procedure to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side when the UMTS QoS which were authorized at PDP context activation (or last modification) has been changed by UE.

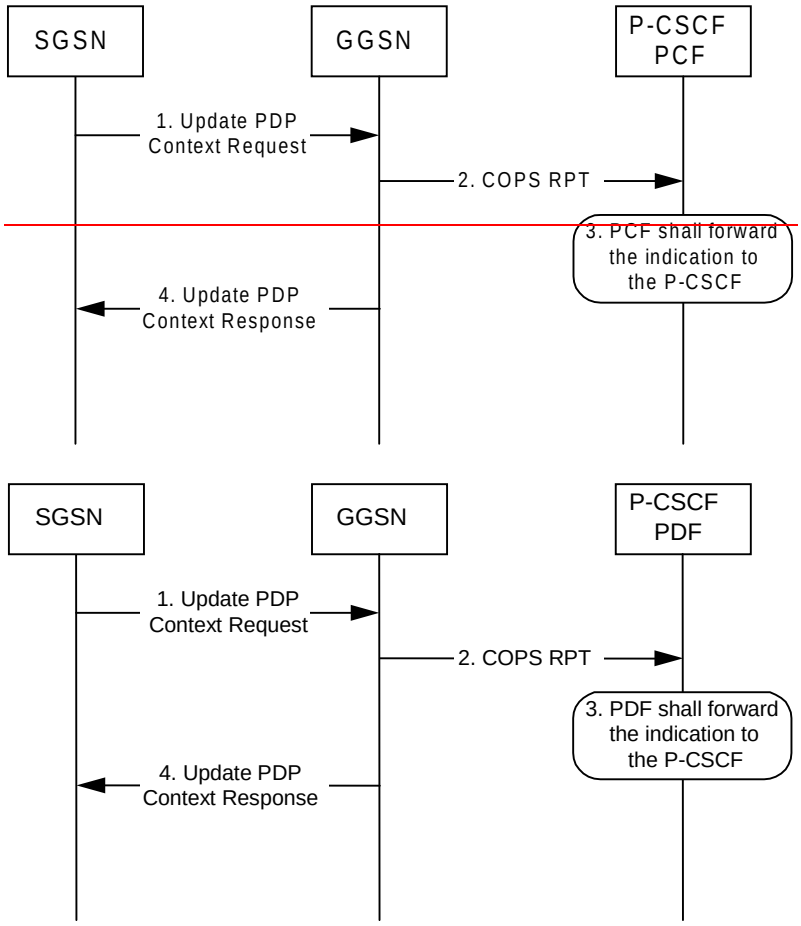


1. A request to modify the PDP context related to the media flow is indicated by sending the Update PDP Context Request message to the GGSN with the changed UMTS QoS parameters.
2. If the GGSN supports a Local Policy Decision Point(LPDP), it can consult the local policy decision stored in the LPDP before sending the COPS REQ message to the ~~PCF~~PDF. In case the requested QoS is within the already authorized QoS and the binding information is not changed, the GGSN does not need to send an authorization request to the ~~PCF~~PDF and proceeds to step 5. Otherwise, the GGSN sends a COPS REQ message to the ~~PCF~~PDF.
3. The ~~PCF~~PDF receives the COPS REQ message and performs an authorization decision according to the requested modification.
4. The decision taken by the ~~PCF~~PDF is returned via the COPS DEC message. The DEC message includes the policy information to be used by the GGSN in order to perform the policy-based admission control.
5. The GGSN enforces the policy decision based on the authorization information cached on the GGSN LPDP or received from the ~~PCF~~PDF for the media flows carried by the PDP context.
6. The GGSN sends COPS RPT message back to the ~~PCF~~PDF and reports its success or failure in carrying out the ~~PCF~~PDF decision and notifies state changes if any.
7. The Update PDP Context Response message is sent to the SGSN to acknowledge the PDP context modification.

Figure 6.5.1: Authorization of PDP Context Modification to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

6.5.2 Indication of PDP Context Modification

The figure 6.5.2 presents the "Indication of PDP Context Modification" procedure to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side when the maximum bit rate (downlink and uplink) for the PDP context is modified to and from 0 kbit/s.



1. SGSN modifies the PDP context related to the media flow(s) by sending the Update PDP Context Request message to the GGSN.
2. GGSN sends a COPS RPT message to the ~~PCF~~PDF notifying the PDP context modification.
3. ~~PCF~~PDF receives the COPS RPT message and forwards the indication to the P-CSCF.
4. GGSN sends the Update PDP Context Response message to the SGSN to acknowledge the PDP context modification.

NOTE: Step 4 may also occur at the same time or before Step 3.

Figure 6.5.2: Indication of PDP Context Modification to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

7 QoS parameter mapping

7.1 QoS parameter mapping between IMS and GPRS

Within the IM sub-system, session establishment and modification involves an end-to-end message-exchange using SIP/SDP with negotiation of media attributes (e.g. Codecs) as defined in 3GPP TS 24.229 [3] and 3GPP TS 24.228 [2]. The P-CSCF shall forward the relevant SDP information to the ~~PCF~~PDF together with an indication of the originator. The ~~PCF~~PDF notes and authorises the chosen media components and their attributes by mapping from SDP parameters to Authorized IP QoS parameters for transfer to the GGSN via the Go interface. The GGSN will map from the Authorized IP QoS parameters to the Authorized UMTS QoS parameters. The SIP/SDP message will also have been passed on to the UE, where the UE will perform its own mapping from the SDP parameters and application demands to

some UMTS QoS Parameters in order to populate the requested QoS field within the PDP context activation or modification. If the SDP parameters are received in an IMS context the UE should take the mapping from the SDP parameters to the Authorized UMTS QoS parameters into consideration. If the UE contains an IP BS manager IP QoS parameters are also generated. Upon receiving the PDP context activation or modification, the GGSN shall compare the UMTS QoS parameters against the Authorized UMTS QoS parameters. If the request lies within the limits authorised by the ~~PCF~~PDF, the PDP context activation or modification shall be accepted.

Figure 7.1 indicates the network entities where QoS mapping functionality is required. This mapping is performed by:

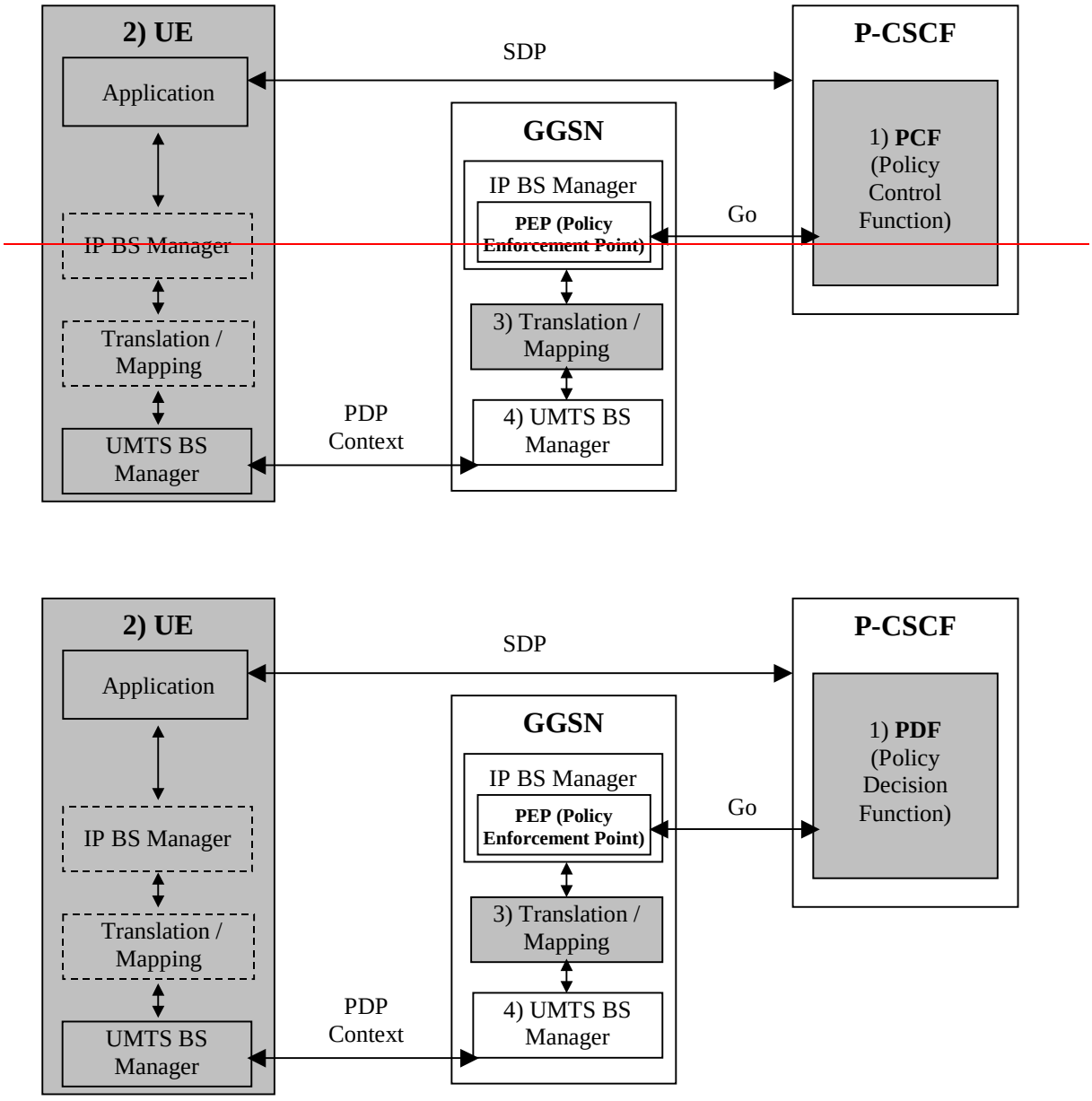
1. The ~~PCF~~PDF maps from the SDP parameters determined from the SIP signalling to the Authorized IP QoS parameters that shall be passed to the GGSN via the Go interface. The mapping is performed for each IP flow of each media component. Upon a request from the GGSN, the ~~PCF~~PDF combines per direction the individual Authorised IP QoS parameters of the IP flows that are identified by the binding information (see clause 7.1.1).

2. The UE maps from the SDP parameters to IP QoS parameters (if an IP BS manager is present) and to UMTS QoS parameters. This mapping is performed for each IP flow of each media component. The IP and UMTS QoS parameters should be generated according to application demands and recommendations for conversational [6] or streaming applications [5] (see clause 7.2.1). The mapping rules for the authorised QoS parameters should be taken into consideration because they define the maximum values for the different requested bit rates and traffic classes (see clause 7.2.2). In case the UE multiplexes several IP flows onto the same PDP context, it has to combine their IP and UMTS QoS parameters. If an IP BS manager is present, the Translation/Mapping function maps the IP QoS parameters to the corresponding UMTS QoS parameters.

3 The GGSN maps from the Authorized IP QoS parameters received from ~~PCF~~PDF to the Authorized UMTS QoS parameters (see clause 7.1.2).

4 The GGSN compares then the UMTS QoS parameters of the PDP context against the Authorized UMTS QoS parameters (see clause 7.1.3).

The mapping that takes place in the UE and the network shall be compatible in order to ensure that the GGSN will be able to correctly authorise the session.



NOTE 1: SDP parameters to Authorized IP QoS parameters mapping.
NOTE 2: SDP parameters to (IP QoS parameters and) UMTS QoS parameters mapping.
NOTE 3: Authorized IP QoS parameters to Authorized UMTS QoS parameters mapping.
NOTE 4: UMTS QoS parameters with Authorized UMTS QoS parameters comparison.

Figure 7.1: Framework for QoS mapping between IMS and GPRS

7.1.1 SDP parameters to Authorized IP QoS parameters mapping in ~~PCF~~PDF

The QoS authorization is to be based on the parameters Maximum Authorized DiffServ PHB and Maximum Authorized Data Rate UL/DL.

The ~~PCF~~PDF shall use the mapping rules in table 7.1.1.1 to derive the Authorized IP QoS parameters Maximum Authorized Data Rate DL/UL and the Maximum Authorized DiffServ PHB from the SDP Parameters. In case of forking, the additional rule in section 7.3 shall apply.

Table 7.1.1.1: Rules for derivation of the Maximum Authorized Data Rates and Maximum Authorized DiffServ PHB per media flow in the ~~PCF~~PDF

Authorized IP QoS Parameter per media flow	Derivation from SDP Parameters

Maximum Authorized Data Rate DL (Max_DR_DL) and UL (Max_DR_UL) per media flow (see note 1)	IF a=recvonly THEN
	IF <SDP direction> = mobile originated THEN
	Direction:= downlink;
	ELSE /* mobile teminated */
	Direction:= uplink;
	ENDIF;
	ELSE
	IF a=sendonly THEN
	IF <SDP direction> = mobile originated THEN
	Direction: = uplink;
	ELSE /* mobile teminated */
	Direction:= downlink;
	ENDIF;
	ELSE /*sendrecv or no direction attribute*/
	Direction:=both;
	ENDIF;
	ENDIF;
	
	IF b=AS:<bandwidth> is present THEN
	IF Direction=downlink THEN
	IF <transport>=”RTP/AVP” then
	Max_DR_UL:=0.025 * <bandwidth>;
	Max_DR_DL:=1.025 * <bandwidth>;
	ELSE
	Max_DR_UL:=0;
	Max_DR_DL:=<bandwidth>;
	ENDIF;
	ELSE
	IF Direction=uplink THEN
	IF <transport>=”RTP/AVP” then
	Max_DR_UL:= 1.025 * <bandwidth>;
	Max_DR_DL:=0.025 * <bandwidth>;
	ELSE
	Max_DR_UL:=<bandwidth>;
	Max_DR_DL:=0;
	ENDIF;
	ELSE /*Direction=both*/
	Max_DR_UL:= 1.025 * <bandwidth>;
	Max_DR_DL:= 1.025 * <bandwidth>;
	ENDIF;
	ENDIF;
	ELSE
	bw:= as set by the operator;
	IF Direction=downlink THEN
	Max_DR_UL:=0;
	Max_DR_DL:=bw;
	ELSE
	IF Direction=uplink THEN
	Max_DR_UL:=bw;
	Max_DR_DL:=0;
	ELSE /*Direction=both*/
	Max_DR_UL:=bw;
	Max_DR_DL:=bw;
	ENDIF;
	ENDIF;
	ENDIF;

Maximum Authorized DiffServ PHB [MaxClass] per media flow (see note 2)	CASE <media> OF “audio”: MaxClass:=EF; /*conversational*/ “video”: MaxClass:=EF; /*conversational*/ “application”: MaxClass:=EF; /*conversational*/ “data”: MaxClass:=AF1; /*interactive with priority 3*/ “control”: MaxClass:=AF3 /*interactive with priority 1*/ /*new media type*/ OTHERWISE: MaxClass:=BE; /*background*/ END;
NOTE 1: For a RTP media flow the Maximum Authorized Bandwidth DL/UL are the sum of the RTP flow DL/UL and the associated RTCP flow DL/UL. NOTE 2: The Maximum Authorized Traffic Class for a RTCP flow is the same as the corresponding RTP flow.	

Editor’s note: Further clarification is required if the SDP b=AS:<bandwidth> parameter includes the bandwidth for RTCP.

The ~~PCF~~PDF shall per ongoing session store the Authorized IP QoS parameters per media flow.

When the GGSN requests the Authorized UMTS QoS parameters for an activated/modified PDP Context carrying one or more media flows (eventually with associated RTCP signalling), the ~~PCF~~PDF shall use the rules in table 7.1.1.2 to calculate the Authorized IP QoS parameters.

Table 7.1.1.2: Rules for calculating the Maximum Authorized Data Rate and Maximum Authorized Diffserv PHB Parameters per Binding Information in the ~~PCF~~PDF

Authorized IP QoS Parameter per Binding	Calculation Rule

Maximum Authorized Data Rate DL and UL per Binding Information	Maximum Authorized Data Rate DL/UL per Binding Information is the sum of all Maximum Authorized Data Rate DL/UL per media flow for all the media flows identified by the Binding Information
	
	IF Maximum Authorized Data Rate DL/UL per Binding Information > 2047 kbps THEN
	Maximum Authorized Data Rate DL/UL per Binding Information = 2047 kbps /* See ref [8] */
	
	END;

Maximum Authorized Diffserv PHB per Binding Information	Maximum Authorized Diffserv PHB per Binding Information = MAX [Maximum Authorized Diffserv PHB per media flow among all the media flows identified by the Binding Information (The MAX function ranks the possible Maximum Authorized Diffserv PHB values as follows: "EF" > "AF4" > "AF3" > "BE")

7.1.2 Authorized IP QoS parameters to Authorized UMTS QoS parameters mapping in GGSN

The Translation/Mapping function in the GGSN shall derive the Authorized UMTS QoS parameters from the Authorized IP QoS parameters received from the ~~PCF~~PDF according to the rules in table 7.1.2.

Table 7.1.2: Rules for derivation of the Authorized UMTS QoS Parameters from the Authorized IP QoS Parameters

Authorized UMTS QoS Parameter	Derivation from Authorized IP QoS Parameters
Maximum Authorized Bandwidth DL and UL	Maximum Authorized Bandwidth DL/UL = Maximum Authorized Data Rate DL/UL
Maximum Authorized Traffic Class	IF Maximum Authorized Diffserv PHB = "EF" THEN Maximum Authorized Traffic Class = "Conversational" ELSEIF Maximum Authorized Diffserv PHB = "AF4" THEN Maximum Authorized Traffic Class = "Streaming" ELSEIF Maximum Authorized Diffserv PHB = "AF3" THEN Maximum Authorized Traffic Class = "Interactive" ELSE Maximum Authorized Traffic Class = "Background" ENDIF ;

7.1.3 Comparing UMTS QoS Parameters against the Authorized UMTS QoS parameters in GGSN

Upon receiving a PDP context activation containing binding information, the GGSN requests the Authorized QoS information from the ~~PCF~~PDF, and might request the Authorized UMTS information if a PDP context containing binding information is modified (see [7] for details). The GGSN compares the requested UMTS QoS parameters against the corresponding Authorized UMTS QoS parameters received via the translation/mapping function. If all the requested parameters lie within the limits, the PDP context activation or modification shall be accepted. I.e. the following criteria shall be fulfilled:

- the requested Guaranteed Bitrate DL/UL (if the requested Traffic Class is Conversational or Streaming) or Maximum Bitrate DL/UL (if the requested Traffic Class is Interactive or Background) is less than or equal to Maximum Authorized data rate DL/UL and
- the requested Traffic Class is less than or equal to Maximum Authorized Traffic Class.

If any of the requested parameters do not lie within their respective limit, the GGSN shall downgrade the requested UMTS QoS parameters.

7.2 QoS parameter mapping in the UE

Figure 7.2 indicates the entities participating in the generation of the requested QoS parameters when activate or modify a PDP Context in the UE. The steps are:

1. The Application provides the UMTS BS Manager, possibly via the IP BS Manager and the Translation/Mapping function, with relevant information to perform step 2 or step 4. (Not subject to standardization within 3GPP).
2. If needed, information from step 1 is used to access a proper set of UMTS QoS Parameters. See 3GPP TS 26.236 [6] for Conversational Codec Applications and 3GPP TS 26.234 [5] for Streaming Codec Applications.
3. If SDP is present then the SDP Parameters might give guidance for the UMTS BS Manager to set the Maximum Bitrate UL/DL, Guaranteed Bitrate UL/DL and the Maximum SDU Size. The Application deliver extracted SDP information, possibly via the IP BS Manager, to the Translation/Mapping function. The Translation/Mapping function finally derives the UMTS QoS parameters according to the rules in clause 7.2.1. Furthermore if the SDP Parameters are received in an IMS context it is recommended that the Maximum Authorized Bandwidth UL and DL and Maximum Authorised Traffic Class are derived according to the rules in clause 7.2.2.
4. A set of UMTS QoS Parameters values from step 2 (or directly from step 1) is eventually merged together with the Maximum Bitrate UL/DL, the Guaranteed Bitrate UL/DL and the Maximum SDU Size from step 3. The result constitutes a recommendation of requested UMTS QoS Parameters. If the PDP Context is activated or

modified in an IMS context it is recommended that the UE checks that the actual requested Guaranteed Bitrate UL/DL or requested Maximum Bitrate UL/DL (depending on the requested Traffic Class) are not greater than the Maximum Authorized Bandwidth UL/DL derived in step 3. Furthermore, if the UE has implemented the mapping rule for Maximum Authorized Traffic Class, as defined in clause 7.2.2, it is also recommended that the requested Traffic Class is not greater than the Maximum Authorised Traffic Class derived in step 3.

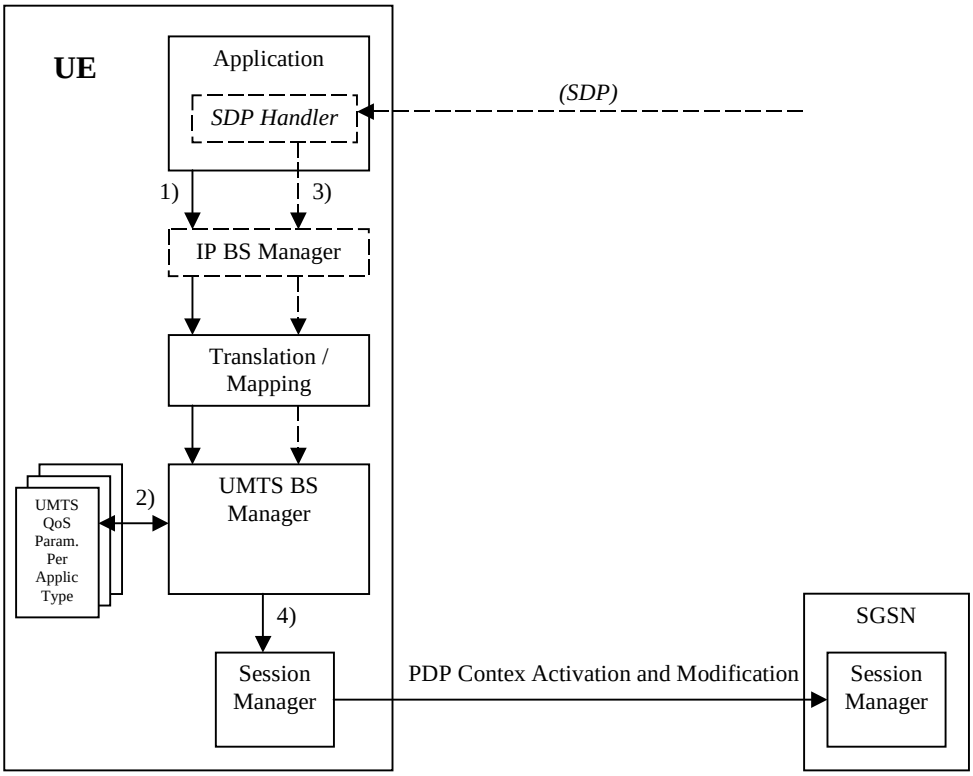


Figure 7.2: Framework for generating requested QoS parameters in the UE

7.2.1 SDP to UMTS QoS parameter mapping in UE

If SDP Parameters are available, then before activating or modifying a PDP Context the UE should check if the SDP Parameters give guidance for setting the requested UMTS QoS Parameters. The UE is recommended to use the mapping rules in table 7.2.1 to derive the Maximum and Guaranteed Bitrate DL/UL and Maximum SDU Size from the SDP Parameters.

Table 7.2.1: Recommended rules for derivation of the requested Maximum and Guaranteed Bitrate DL/UL and the requested Maximum SDU Size in the UE

UMTS QoS Parameter	Derivation from SDP Parameters

Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL	/* Check if the media use codec(s) */
	IF [(<media> = ("audio" or "video")) and (<transport> = "RTP/AVP")] THEN
	
	/* Check if Streaming */
	IF a= ("sendonly" or "recvonly") THEN
	Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified in reference [5] ;
	/* Conversational as default !*/
	ELSE
	Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified in reference [6] ;
	ENDIF ;
	
	/* Check for presence of bandwidth attribute */
	ELSEIF b=AS:<bandwidth-value> is present THEN
	Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL = "bandwidth-value" ;
	ELSE
	
	/* SDP do not give any guidance ! */
	Maximum Bitrate DL/UL and Guaranteed Bitrate DL/UL as specified by the UE manufacturer;
	ENDIF ;

Maximum SDU size	/* Check if the media use codec(s) */
	IF [(<media> = ("audio" or "video")) and (<transport> = "RTP/AVP")] THEN
	
	/* Check if Streaming */
	IF a= ("sendonly" or "recvonly") THEN
	Maximum SDU Size as specified in reference [5] ;
	
	/* Conversational as default !*/
	ELSE
	Maximum SDU Size as specified in reference [6] ;
	ENDIF ;
	
	ELSE
	Maximum SDU Size as specified by the UE manufacturer ;
	ENDIF ;

7.2.2 SDP parameters to Authorized UMTS QoS parameters mapping in UE

If the PDP Context is activated or modified in an IMS context then it is recommended that the UE uses the mapping rules in table 7.2.2.1 to derive the Maximum Authorized Bandwidth UL/DL.

Table 7.2.2.1 also has a mapping rule for derivation of Maximum Authorized Traffic Class. In future releases this mapping rule may change. For the reason of future compatibility, the release 5 mapping rule is optional for the UE.

In the case this mapping rule is implemented then it is recommended that the UE use the mapping rule in table 7.2.2.1 to derive the Maximum Authorised Traffic Class from the SDP Parameters.

When the maximum authorized QoS for a media flow in forked responses is derived, the additional rule in section 7.3 shall apply.

Table 7.2.2.1: Rules for derivation of the Maximum Authorized Bandwidth DL/UL and the Maximum Authorized Traffic Class per media flow in the UE

Authorized UMTS QoS Parameter per media flow	Derivation from SDP Parameters

Maximum Authorized Bandwidth DL (Max_BW_DL) and UL (Max_BW_UL) per media flow	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	IF a=recvonly THEN
	IF <SDP direction> = mobile originated THEN
	Direction:= downlink;
	ELSE /* mobile teminated */
	Direction:= uplink;
	ENDIF;
	ELSE;
	IF a=sendonly THEN
	IF <SDP direction> = mobile originated THEN
	Direction: = uplink;
	ELSE /* mobile teminated */
	Direction:= downlink;
	ENDIF;
	ELSE /*sendrecv or no direction attribute*/
	Direction:=both;
	ENDIF;
	ENDIF;
	
	IF b=AS:<bandwidth> is present THEN
	IF Direction=downlink THEN
	IF <transport>=”RTP/AVP” then
	Max_BW_UL:=0.025 * <bandwidth>;
	Max_BW_DL:=1.025 * <bandwidth>;
	ELSE
	Max_BW_UL:=0;
	Max_BW_DL:=<bandwidth>;
	ENDIF;
	ELSE
	IF Direction=uplink THEN
	IF <transport>=”RTP/AVP” then
	Max_BW_UL:= 1.025 * <bandwidth>;
	Max_BW_DL:=0.025 * <bandwidth>;
	ELSE
	Max_BW_UL:=<bandwidth>;
	Max_BW_DL:=0;
	ENDIF;
	ELSE /*Direction=both*/
	Max_BW_UL:= 1.025 * <bandwidth>;
	Max_BW_DL:= 1.025 * <bandwidth>;
	ENDIF;
	ENDIF;
	ELSE
	bw:= as set by the UE manufacturer;
	IF Direction=downlink THEN
	Max_BW_UL:=0;
	Max_BW_DL:= bw;
	ELSE
	IF Direction=uplink THEN
	Max_BW_UL:= bw;
	Max_BW_DL:=0;
	ELSE /*Direction=both*/
	Max_BW_UL:= bw;
	Max_BW_DL:= bw;
	ENDIF;
	ENDIF;
	ENDIF;
	
	ELSE
	No authorization is done ;
	ENDIF ;

Maximum Authorized Traffic Class [MaxTrafficClass] per media flow	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	CASE <media> OF
	“audio”: MaxTrafficClass:=conversational;
	“video”: MaxTrafficClass:=conversational;
	“application”: MaxTrafficClass:=conversational;
	“data”: MaxTrafficClass:=interactive with priority 3;
	“control”: MaxTrafficClass:=interactive with priority 1;
	/*new media type*/
	OTHERWISE: MaxTrafficClass:=background;
	END;
	ELSE
	No authorization is done ;
	ENDIF ;

Editor’s note: Further clarification is required if the SDP b=AS:<bandwidth> parameter includes the bandwidth for RTCP.

It is recommended that the UE per ongoing session store the Authorized UMTS QoS parameters per media flow.

Furthermore it is recommended that the UE checks that the requested UMTS QoS parameters Traffic Class and Maximum Bitrate UL/DL not exceeds the values of the corresponding Authorized UMTS QoS parameters (calculated according to the rules in table 7.2.2.2) before activating/modifying a PDP Context. See section 7.1.3 for recommended criteria to be fulfilled.

The table 7.2.2.1 defines mapping rules to determine the Maximum Authorized Traffic Class. This table does not specify how to determine the UMTS QoS parameter traffic class.

Table 7.2.2.2: Rules for calculating the Maximum Authorized Bandwidths and Maximum Authorized Traffic Class Parameters per PDP Context in the UE

Authorized UMTS QoS Parameter per PDP Context	Calculation Rule

Maximum Authorized Bandwidth DL and UL per PDP Context	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	Maximum Authorized Bandwidth DL/UL per PDP Context is the sum of all Maximum Authorized Bandwidth DL/UL per media flow for all the media flows to be carried by the PDP Context ;
	
	IF Maximum Authorized Bandwidth DL/UL per PDP Context > 2047 kbps THEN
	Maximum Authorized Bandwidth DL/UL per PDP Context = 2047 kbps /* See ref [8] */
	END;
	
	ELSE
	No authorization is done ;
	ENDIF ;

Maximum Authorized Traffic Class per PDP Context	/* Check if IMS context (the criteria for this check is an UE manufactures issue) */
	IF IMS context THEN
	
	Maximum Authorised Traffic Class per PDP Context = MAX [Maximum Authorised Traffic Class per media flow among all the media flows to be carried by the PDP Context] ;
	
	ELSE
	No authorization is done ;
	ENDIF ;
	
	(The MAX function ranks the possible Maximum Authorised Traffic Class values as follows: Conversational > Streaming > Interactive > Background)

7.3 Support for forking

For an initiated session the UE and the ~~PCF~~PDF may receive several forked responses, ref. 3GPP TS 29.207 [7]. The various forked responses may have different QoS requirements for the same media flow. In the case of forked responses, the maximum authorized QoS for a media flow shall be equal to the highest QoS requested for that media flow by any of the active forked responses. This applies both to the UE and to the ~~PCF~~PDF.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2001-10		N3-010484			The first TS 29.208 V0.1.0 has been produced based on TSab.cde V0.0.0 in N3-010482 discussed at CN3 #19 in Brighton, U.K.	0.0.0	0.1.0
2001-11		N3-010612			Tdocs N3-010608, N3-010554, N3-010526, N3-010609, and N3-010603 are agreed with some modifications at CN3 #20 – Cancun, Mexico and incorporated. Raised to Version 0.2.0.	0.1.0	0.2.0
2002-02		N3-020121			Tdocs N3-020057, N3-020110, N3-020111, and N3-020122 are agreed at CN3 #21 – Sophia Antipolis, France and incorporated. Raised to Version 0.3.0.	0.2.0	0.3.0
2002-02		N3-020164			Tdocs N3-020142, N3-020143, and N3-020125 are agreed with some modifications at Go drafting session in CN3 #21 Bis – Sophia Antipolis, France and incorporated. Raised to Version 0.3.0.	0.3.0	0.4.0
2002-02		NP-020078			Some editorial cleaning - presented to NP#15 for information	0.4.0	1.0.0
2002-04		N3-020365			Tdocs N3-020235, N3-020238, N3-020344, N3-020345, and N3-020363 are agreed at CN3 #22 – Fort Lauderdale, Florida, USA and incorporated. Raised to Version 1.1.0.	1.0.0	1.1.0
2002-05		N3-020515			Tdocs N3-020490, N3-020495, and N3-020509 are agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.2.0.	1.1.0	1.2.0
2002-05		N3-020518			Tdocs N3-020513 is agreed at CN3 #23 – Budapest, Hungary and incorporated. Raised to Version 1.3.0.	1.2.0	1.3.0
2002-05		N3-020518			Comments agreed at CN3 #23 – Budapest, Hungary are incorporated. Raised to Version 1.4.0.	1.3.0	1.4.0
2002-06	NP#16	NP-020166			Approved at NP#16 and placed under change control	2.0.0	5.0.0
2002-09	NP#17	NP-020412	001	2	Service Class Mapping in the ~~PCF~~PDF	5.0.0	5.1.0
2002-09	NP#17	NP-020412	002	3	Data Rate Mapping in the ~~PCF~~PDF and in the UE	5.0.0	5.1.0
2002-09	NP#17	NP-020412	003		Correction of Reference [6]	5.0.0	5.1.0
2002-09	NP#17	NP-020412	004	2	QoS Parameter Mapping between IMS and GPRS	5.0.0	5.1.0
2002-09	NP#17	NP-020409	006	1	Authorized QoS vs. guaranteed and maximum bit rates	5.0.0	5.1.0
2002-09	NP#17	NP-020410	007	1	Support for forking	5.0.0	5.1.0
2002-09	NP#17	NP-020412	008	1	Removal of incomplete function	5.0.0	5.1.0