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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 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 following two types of flows are described:

1) flows defining the interaction of GPRS session management procedures over the Gn interface, service based local policy (SBLP) procedures over the Go interface and QoS interworking (e.g. RSVP) over the Mb interface and

2) end-to-end flows of RSVP and GPRS bearer level.

The relationship between SIP/SDP session level and the bearer level (RSVP and GPRS) in flows showing both SIP/SDP session level and the bearer level in end-to-end flows are described in 3GPP TS24.228 [2]. The present specification adds detailed flows involving the network interfaces Gn, Go and Mb and also further details the flows with detailed RSVP and GPRS bearer level flows not showing the SIP/SDP session level.

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, edition number, version number, etc.) 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"

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

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	Policy Control Function
REQ	COPS Request message
RPT	COPS Report State message

4   QoS Authorization

Editor's Note: This clause should cover QoS authorization flow.

4.1   QoS authorization at originating PCF

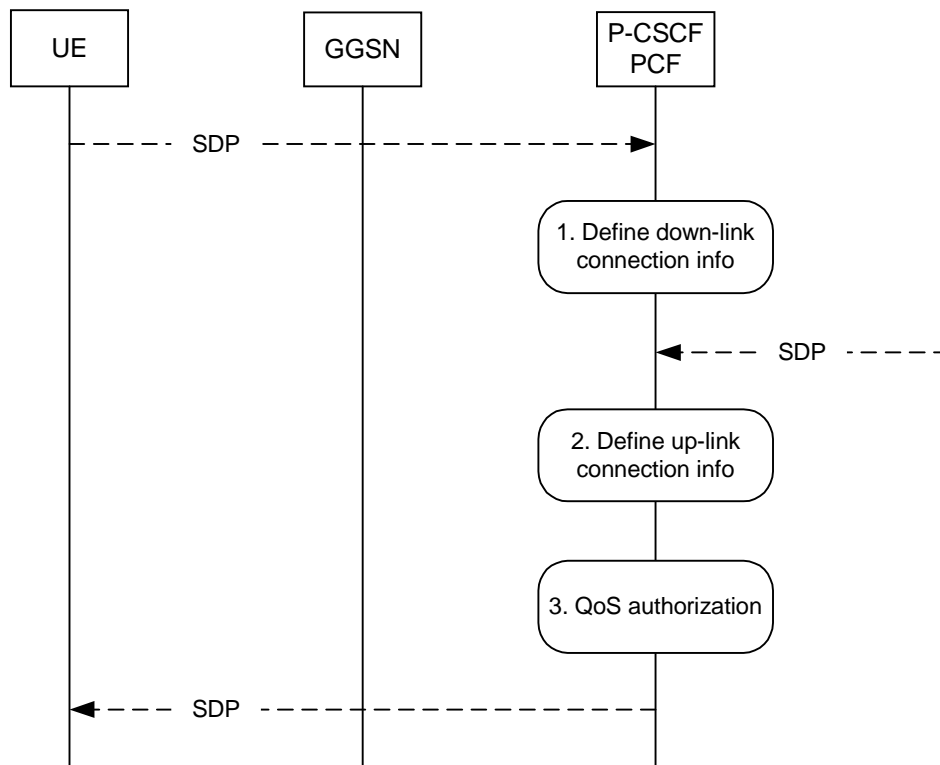This clause covers an example of QoS authorisation procedure at originating PCF

Figure 4.1 QoS Authorization at originating PCF

1. Define down-link connection info

The P-CSCF(PCF) 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. Define up-link connection info.

The P-CSCF(PCF) gets the SDP parameters through SIP signalling interaction. The P-CSCF(PCF) identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…).

3. Authorize QoS.

The P-CSCF(PCF) uses the SDP description in order to define the QoS resource authorisation. The authorization based on the SDP parameters shall be expressed in terms of IPQoS parameters. In order to ensure that the IP bearer flow correlates to the one approved during the SIP session establishment, the SIP extensions for media authorization proposed in IETF shall be used. An authorization token is generated by the PCF. The authorization token should be unique locally. The authorization token contains information that identifies its generator.

4.2   QoS authorization at terminating PCF

This clause covers an example of QoS authorisation procedure at terminating PCF.
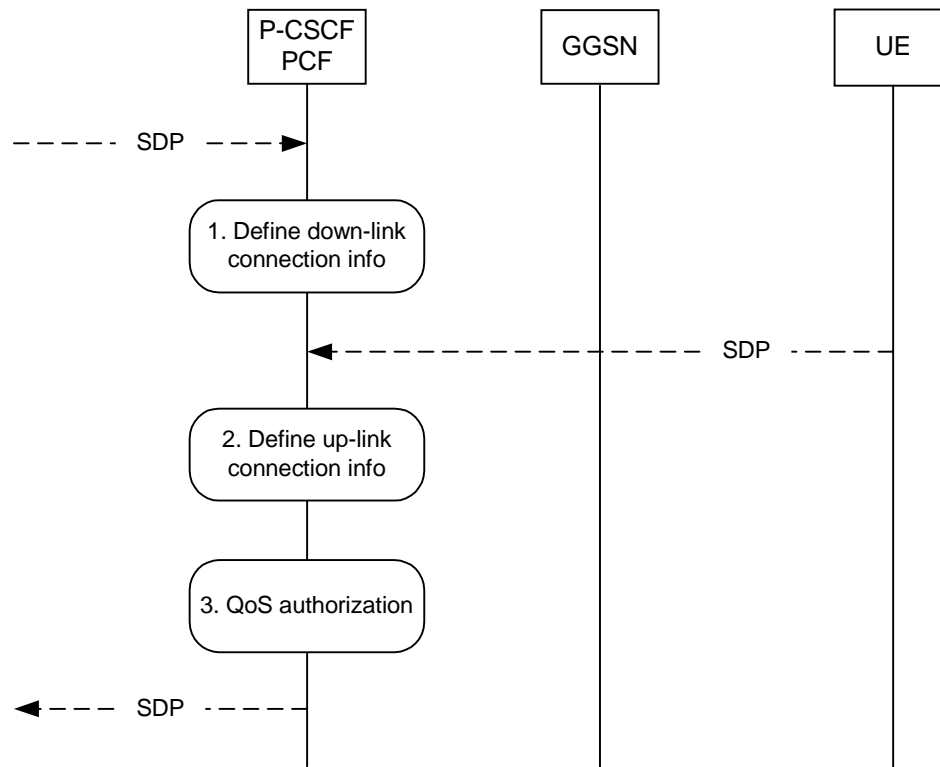
Figure 4.2 QoS Authorization at terminating PCF

1. Define down-link connection info.

The P-CSCF(PCF) 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…). In order to ensure that the IP bearer flow correlates to the one approved during the SIP session establishment, the SIP extensions for media authorization proposed in IETF shall be used. An authorization token is generated by the PCF. The authorization token should be unique locally. The authorization token contains information that identifies its generator.

2. Define up-link connection info

The P-CSCF(PCF) receives the negotiated SDP parameters. The P-CSCF(PCF) identifies the connection information needed (IP address of the up-link media flow, media ports to be used etc…).

3. Authorize QoS resource.

The P-CSCF(PCF) uses the SDP description in order to define the QoS resource authorisation. The authorization based on the SDP parameters shall be expressed in terms of IPQoS parameters.

5. Resource reservation flows with Service-based local policy

Editor's Note: This clause should cover end-to-end QoS signalling flows with service-based local policy.

5.1 Mobile originated without End-to-end RSVP

This clause defines a mobile originated procedure without End to End RSVP with service based local policy. The service local based 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 Policy Control Function (PCF).
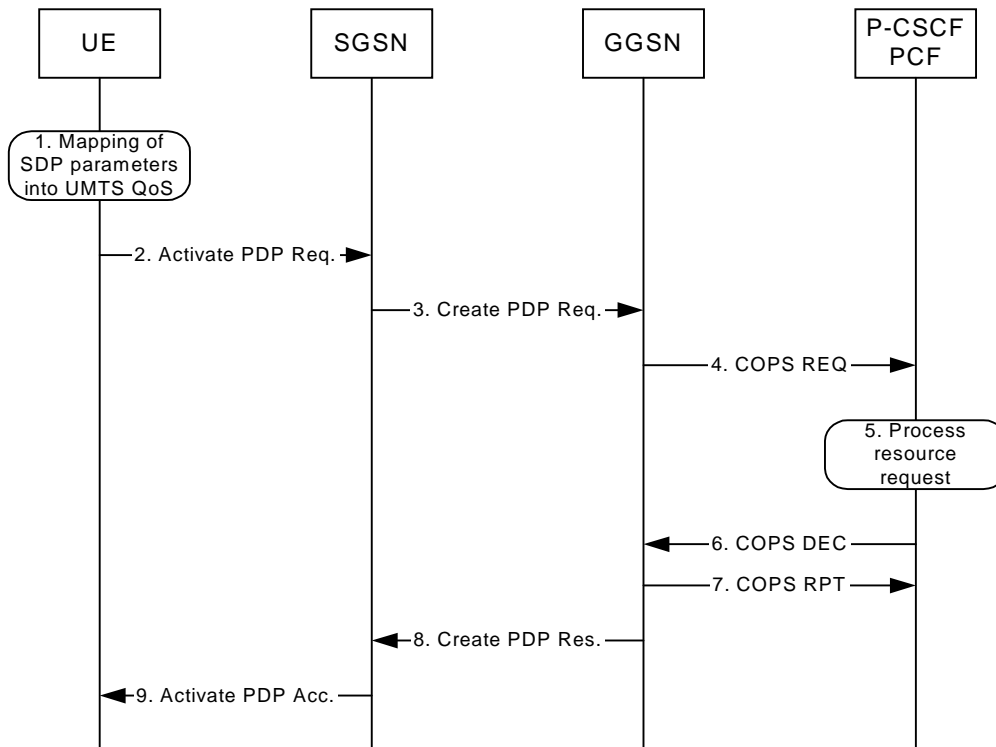
Figure 5.1 Mobile Originated without End to End RSVP

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.

2. 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 or Modification messages to associate the PDP context bearer with policy information. The binding information is sent by the P-CSCF to the UE during SIP signalling.

3. Create PDP Context Request (SGSN to GGSN)

The SGSN carries out the procedures identified in 3GPP TS 23.060 related to PDP Context Activation.

4. COPS:REQ

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

5. Process resource request.

The PCF receives the information sent by the GGSN. The PCF identifies the multimedia session by using the binding information. The PCF performs an authorization decision, which includes limits on IP packet flows and restrictions on IP destination address and port.

6. COPS:DEC.

The decision taken by the PCF is returned via the DEC message.

7. COPS:RPT.

The GGSN acknowledges the decision taken by the PCF.

8. Create PDP context response

The GGSN accepts the PDP context request based on the authorisation policy decision.

9. 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 for both downlink and uplink.

5.2 Mobile terminated without End-to-end RSVP

This clause defines a mobile terminated procedure without End to End RSVP with service based local policy. The service local based 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 Policy Control Function (PCF).
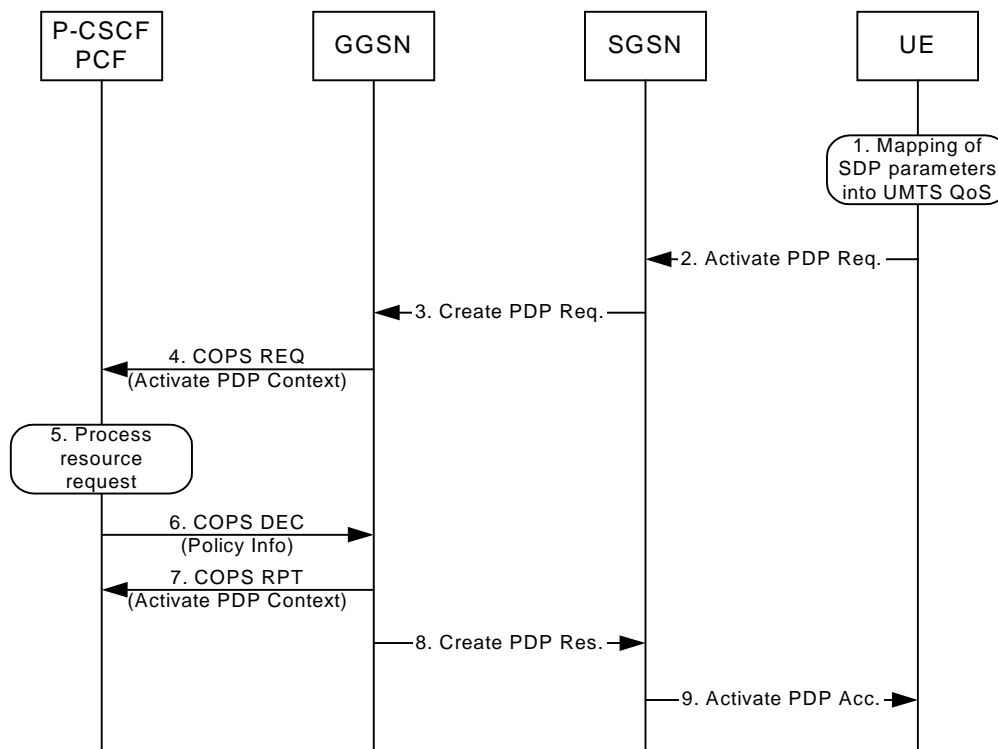
Figure 5.2 Mobile terminated without End to End RSVP

1. Mapping from SDP to UMTS QoS parameters.

The UE uses the SDP parameters in order to define the UMTS QoS needed to request a PDP context.

2. 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 or Modification messages to associate the PDP context bearer with policy information. The binding information is sent by the P-CSCF to the UE during SIP signalling

3. Create PDP Context Request (SGSN to GGSN)

The SGSN carries out the procedures identified in 3GPP TS 23.060 related to PDP Context Activation.

4. COPS:REQ

The GGSN receives the PDP context activation request with the binding information. The GGSN may use the authorisation token in order to localise the PCF. The GGSN sends a REQ message to the PCF, and includes the binding information.

5. Process resource request.

The PCF receives the information sent by the GGSN. The PCF identifies the multimedia session by using the binding information. The PCF performs authorization decision, which includes limits on IP packet flows and restrictions on IP destination address and port.

6. COPS:DEC.

The decision taken by the PCF is returned via the DEC message.

7. COPS:RPT.

The GGSN acknowledges the decision taken by the PCF.

8. Create PDP context response

The GGSN accepts the PDP context request based on the authorisation policy decision.

9. Activate PDP Context Accept (SGSN to UE)

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

5.3 Mobile originated with End-to-end RSVP

Editor's Note: This clause should cover details of the flow in section 6.3.2.3 figure 7 of TS23.207.

5.4 Mobile terminated with End-to-end RSVP

Editor's Note: This clause should cover details of the flow in section 6.3.2.3 figure 8 of TS23.207.

6 Other flows over Go interface

Editor's Note: This clause should cover end-to-end QoS signalling flows with service-based local policy.

6.1 Approval of QoS commit

Editor's Note: This clause should cover details of the flow in section 6.3.3 figure 11 of TS23.207.

Through Approval of QoS Commit the PCF 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.

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) and Mobile termination side.
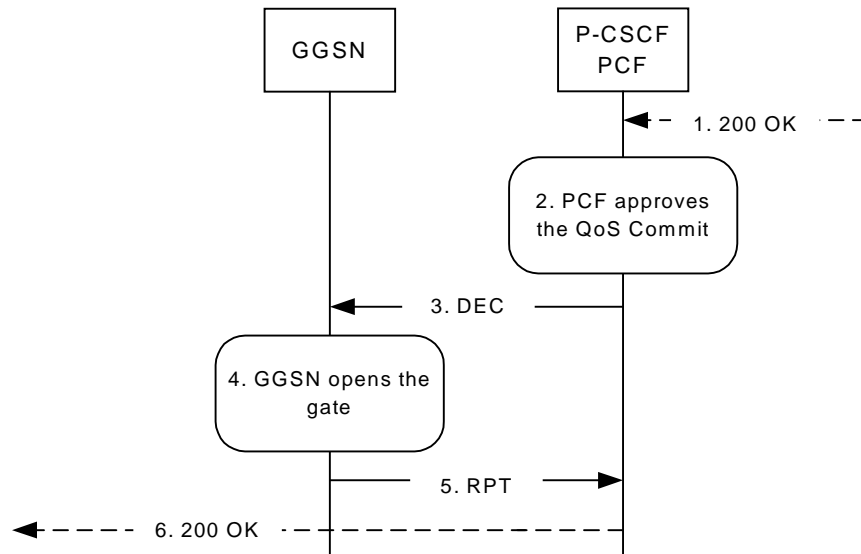
Figure 6.1 Approval of QoS Commit- Mobile origination and Mobile termination

1. P-CSCF receives the 200 OK message.

2. PCF approves the QoS Commit

3. PCF 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.

6. P-CSCF forwards the 200 OK message.

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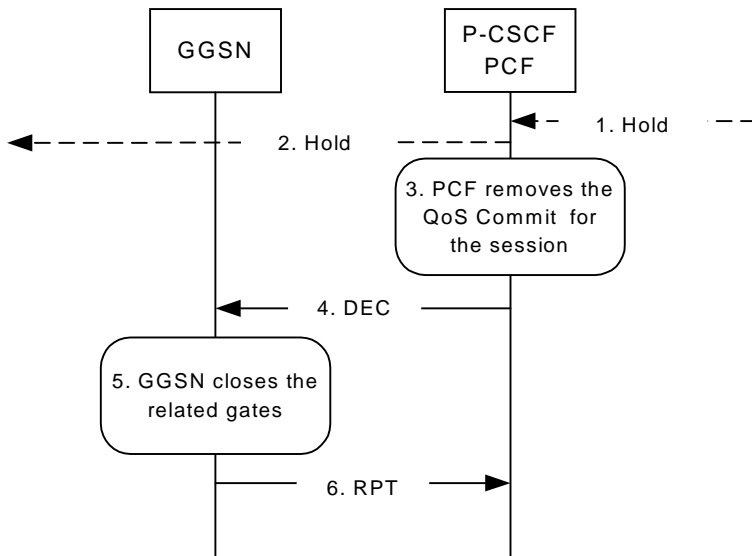
Figure 6.2.1 Removal of QoS commit at Session on Hold to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

1. P-CSCF receives the Hold message

2. P-CSCF forwards the Hold message

3. PCF removes the QoS commit for the session.

4. PCF 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.

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.
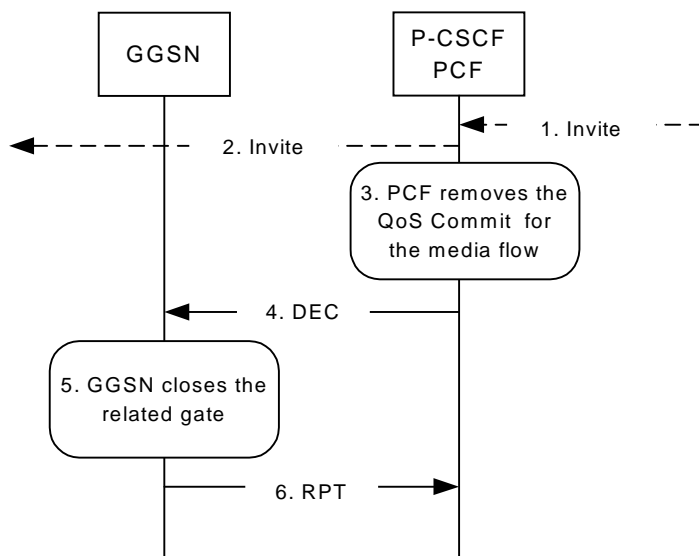

Figure 6.2.2 Removal of QoS commit at codec or media flow change or remove to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

1. P-CSCF receives the INVITE message for codec or media change, remove

2. P-CSCF forwards the INVITE message

3. PCF removes the QoS commit for the related media flow.

4. PCF 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.

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 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 Revoke Authorization for GPRS and IP Resources - 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.
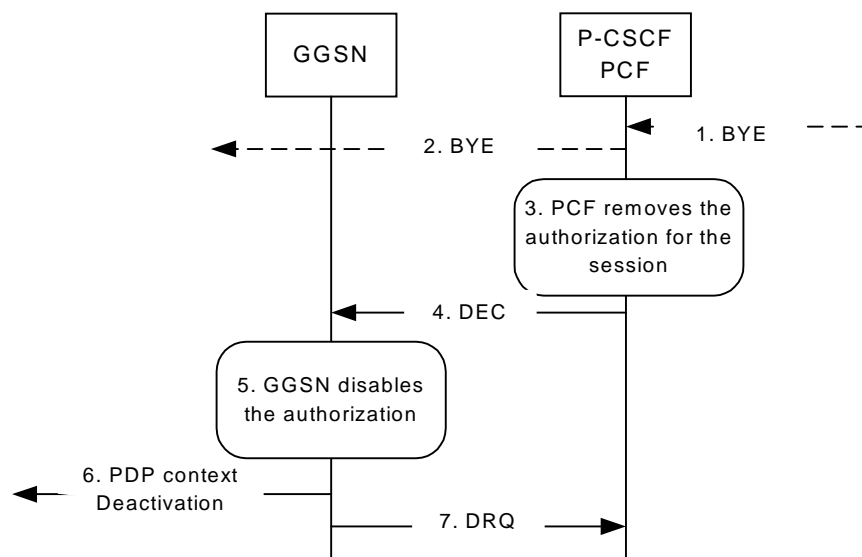

Figure 6.3.1 Revoke Authorization for GPRS and IP resources - Mobile initiated session release/ Network initiated session release to both Mobile Originating (MO) and Mobile termination side

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 removes the authorisation for resources that had previously been issued for this endpoint for this session.

4. PCF sends a COPS DEC (Decision) 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 (Delete Request State) message back to the PCF.

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 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.
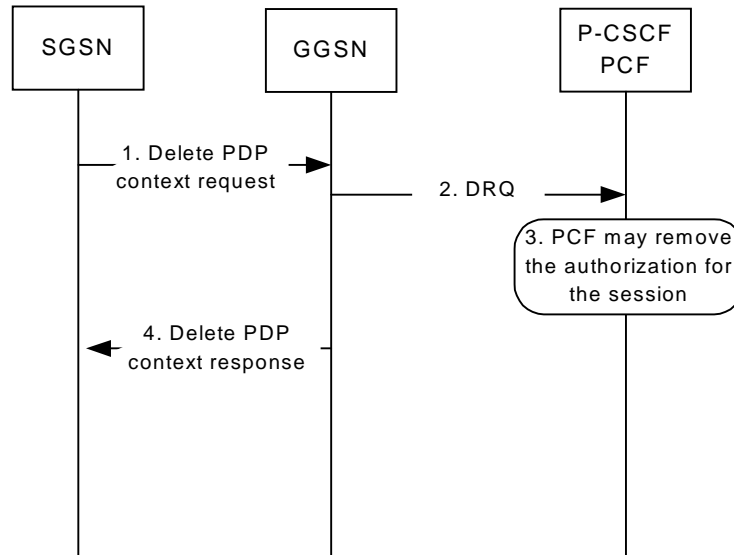

Figure 6.4.1 Indication of PDP Context Release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

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).

3. P-CSCF(PCF) receives the COPS DRQ message and PCF 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.

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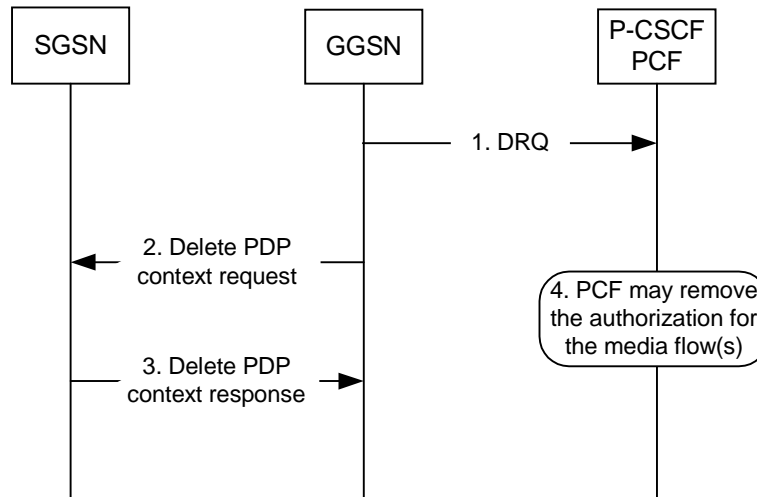
Figure 6.4.2 Indication of GGSN-initiated PDP Context Release to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

1. GGSN sends a COPS DRQ message to the P-CSCF(PCF).

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) receives the COPS DRQ message and PCF 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.

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 as described below.

The following figures present the "Modification of PDP Context" procedure to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side.
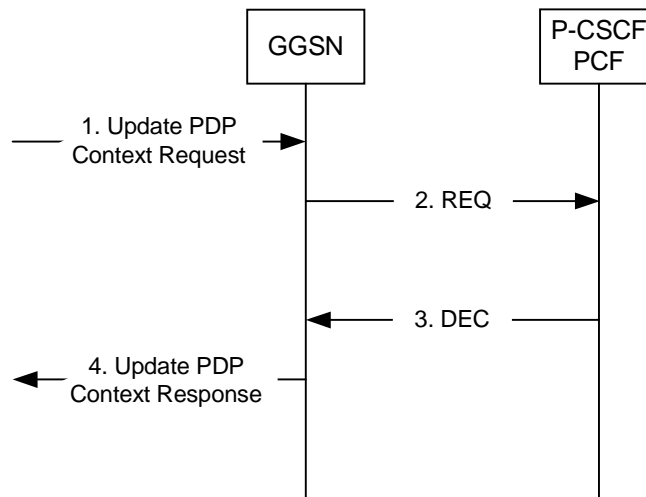
Figure 6.5 Modification of PDP Context to both the Mobile Originating (MO) side and the Mobile Terminating (MT) side

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

2) The GGSN sends a COPS REQ message to the P-CSCF(PCF)

3) The P-CSCF(PCF) receives the COPS REQ message, reacts according to the requested modification and sends a COPS DEC message to the GGSN. In case the requested QoS falls outside the limits that were authorized the COPS DEC message contains the relevant information. In case the maximum bit rate (downlink and uplink) is downgraded to 0 kbit/s the P-CSCF(PCF) may remove the authorization for the media flow(s).

4) The GGSN receives the COPS DEC messages and reacts according to the requested modification. The Update PDP Context Response message is sent to the SGSN to acknowledge the PDP context modification.

7 QoS parameter mapping

Editor's note: The QoS parameter mapping aspects, which is performed on UE, PCF, and GGSN, should be described in this clause. The mapping the QoS parameters among SDP, UMTS, and IP should be considered.

7.1 SDP to UMTS QoS Parameters

Within the IM sub-system, session establishment involves an end-to-end message-exchange using SIP with negotiation of Codecs as defined in TS24.229 [3] and TS24.228 [2]. Upon completion of the negotiation, the P-CSCF shall forward the relevant SDP information to the PCF. The PCF notes and authorises the chosen media flows and Codec preference, maps the appropriate QoS parameters from SDP to QoS authorization parameters for transfer to the GGSN via the Go interface. The SIP message will also have been passed on to the UE, where the UE will perform its own mapping from SDP and applications to UMTS QoS Parameters in order to populate the requested QoS field within the PDP context activation. Upon receiving the PDP context activation, the GGSN shall authorize the UMTS QoS parameters against Go interface QoS authorization parameters. If the request lies within the limits authorised by the PCF, the PDP context activation shall be accepted.

The diagram in Figure 7 indicates the network entities where QoS mapping functionality is required. This mapping is performed by:

1. The PCF maps from the SDP parameters determined from the SIP signalling to the QoS authorization parameters that shall be passed to the GGSN.

2. The GGSN maps from the QoS authorization parameters received from PCF to a UMTS bearer QoS parameters.

3. The UE in which a mapping is made from SDP to UMTS bearer QoS parameters.

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.
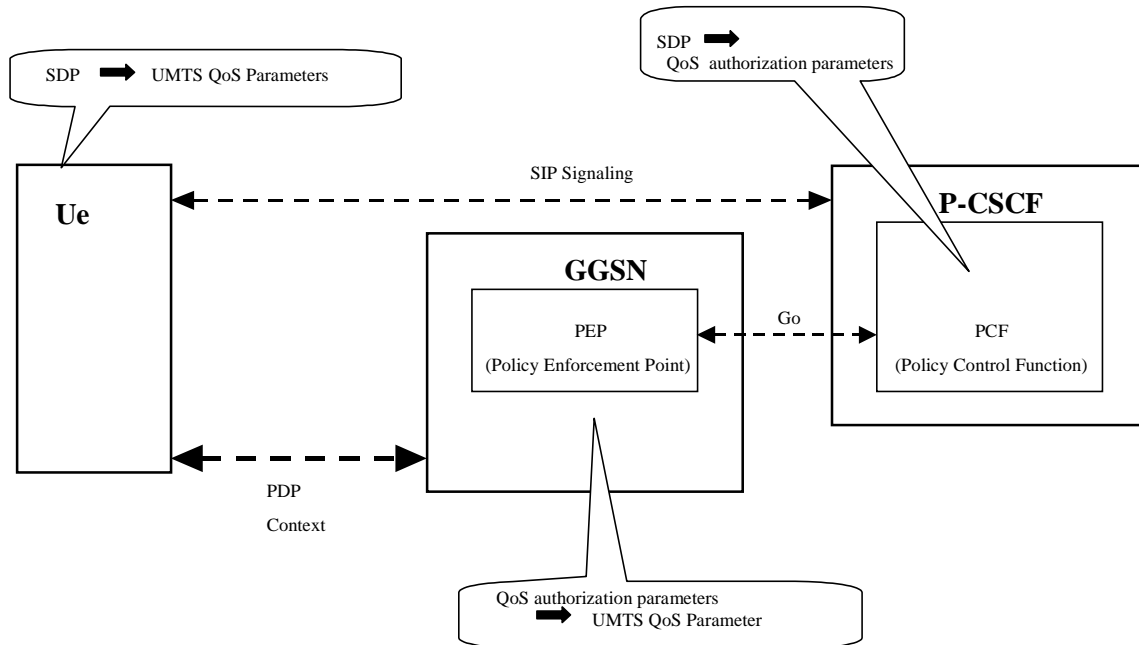

Figure 7 QoS mapping framework

7.1.1 SDP to QoS authorization parameters Mapping in PCF

Editor's Note: This clause should include the SDP to QoS authorization parameters Mapping in PCF.

7.1.2 QoS authorization parameters to UMTS QoS Parameter Mapping in GGSN

Editor's Note: This clause should include the QoS authorization parameters to UMTS QoS Parameter Mapping in GGSN.

7.1.3 SDP to UMTS QoS Parameter Mapping in UE

Editor's Note: This clause should include the SDP to UMTS QoS Mapping in UE. It should be consistent with mapping carried out when SDP -> QoS authorization parameters ->: UMTS is carried out as defined above.

Annex A (informative):
Change history

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Change history							
2001-10		N3-010484			The first TS29.208 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					Some editorial cleaning - presented to NP#15 for information	0.4.0	1.0.0

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