

Configuration Guide for Bearer QoS Control and Bandwidth Management

Ericsson Service-Aware Policy Controller

User Guide

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Configure Bearer QoS Control and Bandwidth Management Overview

Next figure, shows the main parts related to configuration and provisioning in the SAPC.

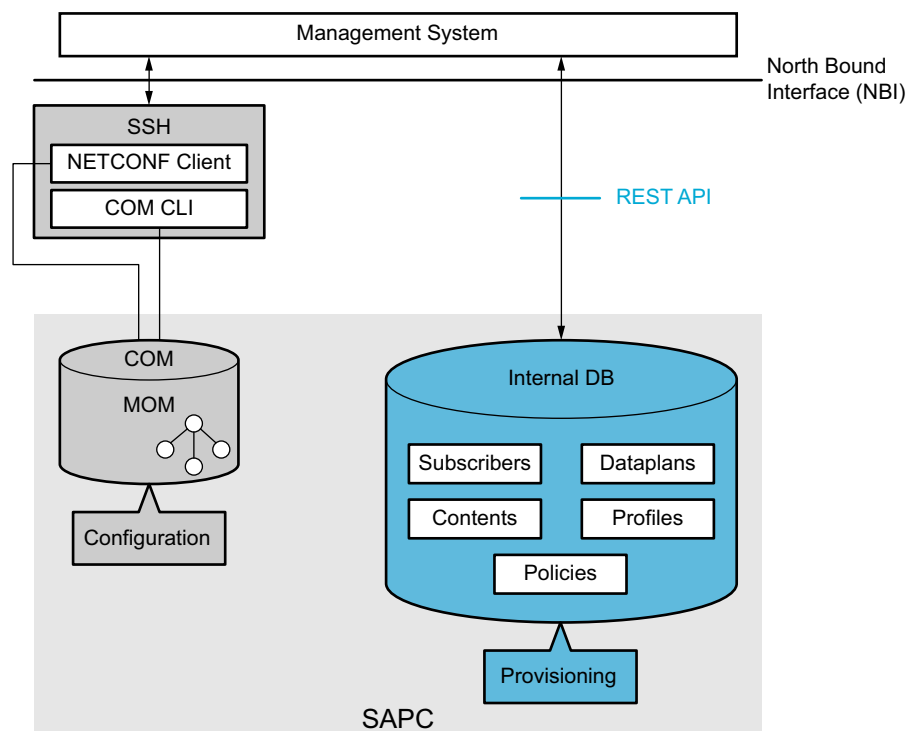


Figure 1 Configuration and Provisioning Overview

The purpose of this document is to provide guidelines to configure the SAPC node for QoS control and bandwidth management by providing configuration examples.

This document is not intended as an exhaustive guide to configure the SAPC for every possible scenario.

The complete parameter list and details of all configured options of the SAPC are included in separate documents, refer to [Managed Object Model \(MOM\)](#) and [Provisioning REST API](#).

Examples in this document cover the case of data configured in the SAPC internal repository. If an external repository is used, refer to [Database Access](#).



1.1 Typographic Conventions

The following typographic and document conventions are used:

Table 1 Typographic Conventions

Convention	Description	Example
Representation of State Transfer (REST)	SAPC REST provisioning. Exact REST resources, methods, attributes, or their corresponding values.	<code>PUT /dataplan/Silver { "dataplanName" : "Silver", "notification" : "sms" }</code>
Managed Object Class (MOC) or Attributes value	Exact COM model object, classes names, attributes, or their corresponding values.	<code>SmsCenter enableDelivery=true</code>
NETCONF	SAPC COM configuration	<code><edit-config> <target> <running /> </target> <config> <ManagedElement xmlns="urn:com:ericsson:ecim:ComTop"> <managedElementId> 1 </managedElementId> <PolicyControlFunction xmlns="urn:com:ericsson:ecim:sapcmom"> <policyControlFunctionId> 1 </ policyControlFunctionId> <NotificationConfig xmlns="urn:com:ericsson: ecim:notificationconfigmom"> <notificationConfigId> 1 </ notificationConfigId> <enableDelivery> true </ enableDelivery> </NotificationConfig> </ PolicyControlFunction> </ManagedElement> </ config> </edit-config></code>

1.2 Other Conventions

This document refers to some configuration and provisioning data.

To clarify which detailed data is managed by COM or by the REST API, this document uses the following conventions:

- Configuration: whenever referring to Managed Object Class (MOC).



The detailed description of the object and attributes can be found in Managed Object Model (MOM).

Example: set enableReauthsOnSubsChange attribute in class AppConfig.

The tools or interfaces to manage these data in the SAPC are:

- NETCONF interface, refer to Ericsson NETCONF Interface.

The configuration examples show the NETCONF file contents, using the following syntax:

```
<edit-config>
...
<config>
<ManagedElement xmlns="urn:com:ericsson:ecim:ComTop">
<managedElementId>1</managedElementId>
...
</ManagedElement>
</config>
</edit-config>
```

- COM CLI, refer to Ericsson Command-Line Interface.
- Provisioning: mainly subscribers, subscriber groups (dataplan), services (contents), profiles, and policy-related data. The SAPC provides a REST API for them, see Provisioning REST API.

This document uses the following terminology for them: <resource-name> URI in the provisioning REST API.

Example: To provision subscriber groups, use the dataplan URI in the provisioning REST API.

Provisioning examples show HTTP operations on REST resources with the following syntax:

```
HTTP-Operation /resource-URI
{json content}
```

where /resource-URI is the relative URI from the SAPC provisioning base URI detailed in Provisioning REST API.

Example:

```
PUT /dataplan/Gold
{ "dataplanName" : "Gold",
  "subscribedContents" : [{ "contentName" : "HTTP_Streaming",
                           "redirect" : false}]
}
```



Note: To ease provisioning operations, the SAPC provides an HTTPS CLI client named `resty`, refer to [Provisioning Tools](#).



2 Configuration Prerequisites

Before configuring the SAPC in an operational network, assure that:

- CBA Components are installed.
- The SAPC product software is installed.
- To have a detailed understanding of the function.

3 Configure QoS Control for the Default Bearer and the APN

To configure QoS Control for the default bearer and the APN, do the following:

Steps

1. Configure the following bearer events related to QoS Control to be notified in the Gx interface:

- For authorized Bearer QoS:
 - For GPRS access: QOS_CHANGE
 - For EPS access:
 - DEFAULT_EPS_BEARER_QOS_CHANGE.

For details on how to configure event triggers, refer to [Configuration Guide for Access and Charging Control \(Gx\)](#).

Note: The following events need no configuration in the SAPC because the PCEF always notifies about them without need of subscription:

- DEFAULT_EPS_BEARER_QOS_MODIFICATION_FAILURE, applying to Bearer QoS for EPS access.
 - APN_AMBR_MODIFICATION_FAILURE, applying for QoS per APN.
 - QOS_CHANGE, when applicable at APN level, this event needs no subscription.
2. Configure QoS Control for the corresponding PCEF (see [Diameter Node Control for QoS Control for the Default Bearer and the APN](#) on page 7)
 3. Provision QoS profiles for the default bearer/APN (see [Provision QoS Profiles for Default Bearer/APN](#) on page 7)
 4. Provision the maximum and minimum bearer QoS profiles applicable to the subscribers or subscriber groups, either unconditionally or conditionally (see [Provision QoS Control for Default Bearer/APN selection](#) on page 9)
 5. In case of integration with an external database, reconfigure the corresponding Entity Data Source, refer to [Database Access](#).



Note: All objects and attributes in this document refer to the default configuration provided at installation time in the SAPC: Entity Data Source pointing to data in the SAPC internal database.

3.1 Diameter Node Control for QoS Control for the Default Bearer and the APN

To execute this function in the SAPC, include the "BEARER_QOS" value in the controls attribute of the `DiameterNode` object class.

For more information on the PCEF node configuration, refer to [Configuration Guide for Access and Charging Control](#).

3.2 Provision QoS Profiles for Default Bearer/APN

A QoS Profile contains QoS characteristics for the default bearer or APN-AMBR. To provision a Bearer/APN QoS Profile, use the `/profiles/ip-can-session-qos/<profileId>` URI in the provisioning REST API.

3.2.1 Configuration of Bearer/APN QoS Profiles for GPRS

The applicable attributes are:

- `profileId`
- `qci` (QoS Class Identifier)
- `mbrDownlink`
- `mbrUplink`
- `arpPriorityLevel`

The following example shows a possible configuration of bearer QoS profiles:

Example 1 Bearer QoS Profiles

```
PUT /profiles/ip-can-session-qos/QosProfile_Default
{
  "arpPriorityLevel" : 7,
  "mbrDownlink" : 1024,
  "mbrUplink" : 512,
  "profileId" : "QosProfile_Default",
  "qci" : 5
}

PUT /profiles/ip-can-session-qos/QosProfile_General_Max
{
  "arpPriorityLevel" : 7,
  "mbrDownlink" : 2560,
  "mbrUplink" : 1024,
  "profileId" : "QosProfile_General_Max",
  "qci" : 5
}
```

The previous example configures the following bearer QoS profiles:

- A maximum interactive bearer QoS profile with QCI=5 and MBR set to 2560 Kbps and 1024 Kbps for downlink and uplink traffic, respectively.
- A default interactive bearer QoS profile sets MBR for downlink to 1024 Kbps and uplink 512 Kbps, respectively.

Note: Depending on the deployment, the PCEF can use MBR or APN-AMBR. Therefore, the values set in `mbrUplink` and `mbrDownlink` attributes correspond to:

- Either Max-Requested-Bandwidth-UL AVP and Max-Requested-Bandwidth-DL AVP
- Or APN-Aggregate-Max-Bitrates-UL AVP and APN-Aggregate-Max-Bitrates-DL AVP

3.2.2 Configuration of Bearer/APN QoS Profiles for EPS

The applicable attributes are:

- `profileId`
- `qci` (QoS Class Identifier)
- `mbrDownlink`
- `mbrUplink`
- `arpPriorityLevel`
- `arpPci`
- `arpPvi`

The following example presents a Bearer QoS profile for EPS access:

Example 2 QoS Profiles for EPS

```
PUT /profiles/ip-can-session-qos/MinGBearerQos
{
  "arpPci" : true,
  "arpPriorityLevel" : 3,
  "arpPvi" : false,
  "mbrDownlink" : 5120,
  "mbrUplink" : 512,
  "profileId" : "MinGBearerQos",
  "qci" : 6
}
```



```
}
```

Note: In this example, the values configured within `mbrDownLink` and `mbrUplink` attributes correspond to:

- APN-Aggregate-Max-Bitrate-DL AVP and APN-Aggregate-Max-Bitrate-UL AVP

Example 3 QoS Profiles for EPS supporting Dual Connectivity (E-UTRAN and 5G NR)

The following example presents a Bearer QoS profile for EPS access supporting Dual Connectivity (E-UTRAN and 5G NR):

```
PUT /profiles/ip-can-session-qos/MinGBearerQos
{
  "arpPci" : true,
  "arpPriorityLevel" : 3,
  "arpPvi" : false,
  "mbrDownlink" : 5242880,
  "mbrUplink" : 5242880,
  "profileId" : "MinGBearerQos",
  "qci" : 6
}
```

Note: The values configured within `mbrDownLink` and `mbrUplink` attributes correspond with the following AVPs when they are above $2^{32}-1$ bps as in the example:

- Extended-APN-AMBR-DL AVP and Extended-APN-AMBR-UL AVP, if Extended Bit Rates over Gx function is supported.
- When Extended Bit Rates over Gx function is not supported, the non-extended APN-Aggregate-Max-Bitrate-DL and APN-Aggregate-Max-Bitrate-UL AVPs are used instead. In this case the SAPC chooses the minimum value between the provisioned bitrate and the highest value that a non-extended AVP can reach, $2^{32}-1$ bps.

3.3 Provision QoS Control for Default Bearer/APN selection

Steps

1. To unconditionally associate a QoS Control for the default bearer/APN depending to a subscriber or subscriber group:



Provision the corresponding subscribers or dataplans URI in the provisioning REST API as explained in [Configuration Guide for Subscription and Policies](#), and set `maxBearerQosProfile` and `minBearerQosProfile` attributes to a value that matches the `profileId` attribute of any bearer QoS profile previously provisioned in the SAPC (see [Provision QoS Profiles for Default Bearer/APN](#) on page 7).

The following example configures maximum and minimum bearer QoS profiles for group "Bronze":

Example

```
PUT /dataplan/Bronze
{
  "dataplanName" : "Bronze",
  "staticQualification" :
  {
    "maxBearerQosProfileId" : "QosProfile_General_Max",
    "minBearerQosProfileId" : "QosProfile_Default"
  }
}
```

2. To configure QoS Control for the default bearer/APN depending on Conditions, create the needed policies using:

- For **Global policy locator**:

`/locators/resources/ip-can-session/contexts/qos`

- For **Subscriber group locator**

`/dataplan/<dataplanName>/locators/resources/ip-can-session/contexts/qos`

- For **Subscriber locator**

`/subscribers/<subscriberId>/locators/resources/ip-can-session/contexts/qos`

- Within the `outputAttributes` object in the rule set:

- `attrName` attribute to `max-qos` or `min-qos`.
- `attrValue` to an expression returning a valid bearer QoS profile id (`ip-can-session-qos`).

Note: To assign a **fixed** QoS profile (for example "Qos1") to the default bearer or APN, set the same expression as `max-qos` or `min-qos`.

The following shows how to assign a QoS for Default Bearer using conditions.



The configuration in this example applies the following range of QoS profiles to "Bronze" subscribers when establishing the bearer for GPRS access (IP-CAN-Type is GPRS):

- Maximum - Fixed QoS profile ("QoSProfile_General_Max") plus the addition of the QoS Profiles assigned to the dynamic services running on that bearer.
- Minimum - Maximum QoS Profile among the ones assigned to the dynamic services running on that bearer.

Example

```
PUT /rules/QoS_General
{
  "condition" : "AccessData.bearer.ipCanType==0",
  "outputAttributes" :
  [
    {
      "attrName" : "max-qos",
      "attrValue" : "(BearerQosProfile[\"QoSProfile_General_Max\"]+sum
QoSProfile)" , "result" : "permit"
    },
    {
      "attrName" : "min-qos",
      "attrValue" : "maxQosProfile",
      "result" : "permit"
    }
  ],
  "ruleName" : "QoS_General"
}

PUT /policies/QoS_General
{
  "policyName" : "QoS_General",
  "ruleCombiningAlgorithm" : "permit-overrides",
  "rules" : [ "QoS_General" ]
}

PUT /dataplan/Bronze/locators/resources/ip-can-session/contexts/qos
{
  "policies" : [ "QoS_General" ]
}
```



4 Configure Bandwidth Management for Services

4.1 Configure Static Services

To select different bandwidth limits for services (PCC Rules) in a standard PCEF or the SASN, the SAPC allows to activate/deactivate different Charging-Rule-Name values. To configure so, it is possible to do it with the following options:

- Unconditionally: using static services, by setting the PCC Rule name in `pccRuleName` attribute of a contents URI in the provisioning REST API.
- Conditionally: using policies for static access, see [Configuration Guide for Access and Charging Control](#).

4.2 Preconfigured and Dynamic Services

To assign bandwidth management to services in the SAPC, there are the following options:

- Unconditionally, assigning QoS Profiles to Services, detailed in [Provision QoS Control for Services](#) on page 14.
- Conditionally, using policies, detailed in [Provision QoS Control for Services](#) on page 14.

For those fields not configured in a QoS profile, values are obtained from QoS-Information AVP.

4.3 Provision Service QoS Profiles

A service QoS profile contains a set of QoS related attributes values shared by services with the same QoS requirements. To provision a Service QoS Profile, use the `/profiles/content-qos/<profileId>` URI in the provisioning REST API.

4.3.1 Configuration for GPRS

The applicable attributes are:

- `profileId`
- `qci` (QoS Class Identifier)
- `mbrDownlink`



- mbrUplink
- gbrDownlink
- gbrUplink
- arpPriorityLevel
- resourceType

The following example configures several service QoS profiles:

Example 4 Service QoS Profiles

```
PUT /profiles/content-qos/QosProfile_Streaming_OTHER
{
  "gbrDownlink" : 2048,
  "gbrUplink" : 1024,
  "mbrDownlink" : 4096,
  "mbrUplink" : 2048,
  "profileId" : "QosProfile_Streaming_OTHER",
  "qci" : 3
}

PUT /profiles/content-qos/QosProfile_Streaming_UTRAN
{
  "gbrDownlink" : 3072,
  "gbrUplink" : 1536,
  "mbrDownlink" : 4096,
  "mbrUplink" : 2048,
  "profileId" : "QosProfile_Streaming_UTRAN",
  "qci" : 3
}

PUT /profiles/content-qos/QosProfile_VoIP
{
  "gbrDownlink" : 4096,
  "gbrUplink" : 4096,
  "mbrDownlink" : 6144,
  "mbrUplink" : 6080,
  "profileId" : "QosProfile_VoIP",
  "qci" : 1
}

PUT /profiles/content-qos/QosProfile_MMS
{
  "gbrDownlink" : 4096,
  "gbrUplink" : 4096,
  "mbrDownlink" : 6144,
  "mbrUplink" : 6080,
  "profileId" : "QosProfile_MMS",
  "qci" : 201,
  "resourceType" : "GBR"
}
```

The previous example configures the following QoS profiles:

- Two QoS profiles for streaming service with QCI="3" (streaming) and high requirements on Maximum Bit Rate (MBR) and Guaranteed Bit Rate (GBR).
- A QoS profile for VoIP service with QCI="1" (conversational) and higher requirements on MBR and GBR.



- A QoS profile for MMS service with QCI="201" (defined by operator) and with resourceType="GBR", meaning that dedicated network resources are permanently allocated.

4.3.2 Configuration for EPS

The applicable attributes are:

- profileId
- qci (QoS Class Identifier)
- mbrDownlink
- mbrUplink
- gbrDownlink
- gbrUplink
- arpPriorityLevel
- arpPci
- arpPvi
- resourceType

The following example presents a QoS profile for EPS access:

Example 5 Service QoS Profiles EPS

```
PUT /profiles/content-qos/MinGBearerQos
{
  "arpPci" : true,
  "arpPriorityLevel" : 3,
  "arpPvi" : false,
  "mbrDownlink" : 5120,
  "mbrUplink" : 512,
  "profileId" : "MinGBearerQos",
  "qci" : 6
}
```

4.4 Provision QoS Control for Services



Steps

1. To unconditionally associate a QoS Control to a service:

Create a contents URI in the provisioning REST API (according to [Configuration Guide for Access and Charging Control \(Gx\)](#)) and set the `qosProfileId` attribute to a value that matches the `profileId` attribute of a previously provisioned content-qos profile (see [Provision Service QoS Profiles](#) on page 12).

The example provisions a streaming service with a Service QoS Profile:

Example

```
PUT /contents/Streaming
{
  "contentName" : "Streaming",
  "flows" :
  [
    {
      "destIpAddr" : "any",
      "destPort" : "",
      "direction" : "dl",
      "flowName" : "1",
      "protocol" : "ip",
      "sourceIpAddr" : "192.168.1.2",
      "sourcePort" : "5001-5050"
    },
    {
      "destIpAddr" : "any",
      "destPort" : "",
      "direction" : "dl",
      "flowName" : "2",
      "protocol" : "ip",
      "sourceIpAddr" : "192.168.1.2",
      "sourcePort" : "5101-5150"
    }
  ],
  "pccRuleName" : "4033",
  "pccRuleType" : 2,
  "staticQualification" :
  {
    "contentQosProfileId" : "QosProfile_VoIP"
  }
}
```

2. To configure QoS Control for services depending on Conditions, create the needed policies using:

— For **Global policy locator**:



- `/locators/resources/<contentName>/contexts/qos`
- For **Subscriber group locator**
`/dataplan/<dataplanName>/locators/resources/<contentName>/contexts/qos`
- For **Subscriber locator**
`/subscribers/<subscriberId>/locators/resources/<contentName>/contexts/qos`
- Within the `outputAttributes` object in the rule set:
 - `attrName` attribute to `qos`.
 - `attrValue` to an expression returning a valid service QoS profile id (`content-qos`).

For some examples about how QoS profiles are conditionally assigned to services using policies, see the example below.

Note: The values configured using policies prevail over the static QoS profiles provisioned in the service. These statically provisioned Service QoS Profiles are only considered when no policies apply, or if the applicable policies do not return any Service QoS Profile.

The following example shows how to qualify a service with conditions:

Example

```
PUT /rules/QoS_Streaming_OTHER
{
  "condition" : "AccessData.bearer.accessType!=1000",
  "outputAttributes" :
  [
    {
      "attrName" : "qos",
      "attrValue" : "ServiceQosProfile[\"QosProfile_Streaming_OTHER\"]" →
    },
    {
      "result" : "permit"
    }
  ],
  "ruleName" : "QoS_Streaming_OTHER"
}

PUT /rules/QoS_Streaming_UTRAN
{
  "condition" : "AccessData.bearer.accessType==1000",
  "outputAttributes" :
  [
    {
      "attrName" : "qos",
      "attrValue" : "ServiceQosProfile[\"QosProfile_Streaming_UTRAN\"]" →
    },
    {
      "result" : "permit"
    }
  ],
  "ruleName" : "QoS_Streaming_UTRAN"
}

PUT /policies/QoS_Streaming
{
  "policyName" : "QoS_Streaming",
```



```
    "ruleCombiningAlgorithm" : "permit-overrides",
    "rules" : [ "QoS_Streaming_UTRAN", "QoS_Streaming_OTHER" ]
  }
PUT /dataplan/Gold/locators/resources/Streaming/contexts/qos
{
  "policies" : [ "QoS_Streaming" ]
}
PUT /dataplan/Gold
{
  "dataplanName" : "Gold",
  "subscribedContents" :
  [
    {
      "contentName" : "Streaming",
      "redirect" : false
    }
  ]
}
```

The Service Profile "QosProfile_Streaming_UTRAN" is selected for a "Gold" subscriber group if the subscriber is using UMTS Radio Access. Otherwise, the Service Profile "QosProfile_Streaming_OTHER" is selected.



5 Appendix A. QoS Policy Types

Table 2 shows the different policy types applicable to QoS Control that can be used and configured in the SAPC.

Table 2 QoS Policy Types

Policy Type	Policy Locator			Output Attributes	Comments
	Context	Resource	Subject		
Bearer QoS Control QoS for Service	qos	<contentId>	<subscriberId> <dataplanId>	permit qos ServiceQosProfile["<qosProfileName>"]	Type II = Mixing policies and qualification Gx Conditions: Access Data Subscriber ToD
Bearer QoS Control QoS for Bearer	qos	ip-can-session	<subscriberId> <dataplanId>	permit max-qos BearerQosProfile["<qosProfileName>"] or qos_prfo_expression permit min-qos BearerQosProfile["<qosProfileName>"] or qos_prfo_expression	Type II = Mixing policies and qualification Gx Conditions: Access Data Subscriber ToD



6 Appendix B. QoS Policy Tags

The following tags related to conditional information about IP-CAN session can be used in the condition formula of rules for QoS Control.

For the policy tags obtained from AVPs received in CCR messages (see Comments column), their values are kept during the session lifetime, unless new values of the AVPs are received in subsequent CCR-U/CCR-T messages.

Table 3 Incoming Message Tags

Tag	Return Type	Possible Values	Comments
AccessData.bearer.accessPoint	String	any	The Called Station ID. Address where the user is connected to. Network ID + Operator ID
AccessData.bearer.accessType	Integer		Radio Access Technology used: —0: WLAN —1000: UTRAN —1001: GERAN —1002: GAN —1003: HSPA_EVOLUTION —1004: E-UTRAN —1005: E-UTRAN-NB-IoT —2000: CDMA2000_1X —2001: HRPD —2002: UMB —2003: EHRPD
AccessData.bearer.eventTriggers	Multivalued Integer	any	Received EventTriggers that causes the CCR update. Use this tag together with contains function: contains (AccessData.bearer.eventTriggers, "<value>")



Tag	Return Type	Possible Values	Comments
AccessData.bearer.ipCanType	Integer	0-7	Connectivity access type technology used: —0: 3GPP-GPRS —1: DOCSIS —2: xDSL —3: WiMAX —4: 3GPP2 —5: 3GPP-EPS —6: Non 3GPP-EPS —7: FBA
AccessData.bearer.isAnTrusted	Boolean	true false	For non-3GPP access networks, indicates if the access is handled as trusted (true) or untrusted (false).
AccessData.bearer.controlMode	Integer	0-2	Indicates the applied bearer control mode: —0: UE_ONLY —2: UE_NW
AccessData.subscriber.chargingChars	Integer	any	Charging Characteristics received from the gateway. ⁽¹⁾
AccessData.subscriber.id	String	any	Subscriber identifier: —Content of the first Subscription-Id AVP received when subsIdType is not configured —AccessData.subscriber.imsi if subsIdType is set to IMSI, or —AccessData.subscriber.msisdn if subsIdType is set to MSISDN.
AccessData.subscriber.imsi	String	any	Subscriber identifier in international IMSI format.
AccessData.subscriber.msisdn	String	any	Subscriber identifier in international E.164 format (MSISDN).
AccessData.subscriber.ueIpAddress	String	any	Subscriber IPv4 address in dot notation format.



Tag	Return Type	Possible Values	Comments
AccessData. subscriber. ueIpv6Prefix	String	any	Subscriber IPv6 Prefix, in colon notation, preferred form, without the length part.
AccessData. subscriber. ueIpAddressType	Integer	0-2	Type of UE allocated address: —0: IPv4 —1: IPv6 —2: Dual (IPv4 and IPv6)
AccessData. subscriber. locationInfo. sgsnAddress	IP Address	any	SGSN IP Address
AccessData. subscriber. locationInfo. anGwIpAddress.v4	IP Address	any	SGW/AGW IPv4 address.
AccessData. subscriber. locationInfo. anGwIpAddress.v6	IP Address	any	SGW/AGW IPv6 address.
AccessData. userEquipmentInfo. model	Integer	any	IMEI-SV Type Allocation Code
AccessData. userEquipmentInfo. serialNr	Integer	any	IMEI-SV Serial Number
AccessData. userEquipmentInfo. version	Integer	any	IMEI-SV Software Version Number
Apns.epsBearerIds	Multivalued String	any	Indicates APNs for EPS bearer priority services.
Apns.imsIds	Multivalued String	any	Indicates APNs for IMS priority services.

(1) Ericsson recommends not using this value if charging characteristics for the subscriber has been provisioned.



Table 4 Subscriber Location Policy Tags

Tag	Return Type	Possible Values	Comments
AccessData. subscriber. locationInfo. cellIdentity	Integer	0-65535 for GPRS, 0-26843 5455 for EPS	Cell identity where the user currently is registered. For 3GPP-GPRS and 3GPP-EPS access types, the cell identity is obtained from the 3GPP-User-Location-Info AVP. For non-LTE, the cell identity is obtained when geographic location type is Cell Global Identification (CGI). For LTE scenarios, E-UTRAN Cell Identifier (ECI) is obtained when geographic location type is ECGI.
AccessData. subscriber. locationInfo. countryCode	Integer	any	Mobile Country Code (MCC) part of the SGSN PLMN Id. It is obtained from 3GPP-SGSN-MCC-MNC AVP.
AccessData. subscriber. locationInfo. locationAreaCode	Integer	0-65535	Location area code where the user currently is registered, within the geographic location. For 3GPP-GPRS and 3GPP-EPS, the location area code is obtained from 3GPP-User-Location-Info AVP, or if this AVP is not available, the location area code is obtained from RAI AVP.
AccessData. subscriber. locationInfo. networkCode	Integer	any	Mobile Network Code part of the SGSN PLMN Id. It is obtained from 3GPP-SGSN-MCC-MNC AVP.
AccessData. subscriber. locationInfo. presenceReportingArea a ["presenceAreaName"] . isInArea	Boolean	true false	PRA status of the UE received from the access network: —true: INSIDE the Area —false: OUTSIDE of the Area It is obtained from the Presence-Reporting-Area-Status AVP.
AccessData. subscriber. locationInfo. routingAreaCode	Integer	0-65535	For non-LTE scenarios, the routing area code is the code of routing area where the user currently is registered, within the



Tag	Return Type	Possible Values	Comments
			<p>Routing Area Identification (RAI) geographical location type.</p> <p>The routing area code is obtained from 3GPP-User-Location-Info AVP, or if this AVP is not available, obtained from RAI AVP.</p> <p>For LTE scenarios, the Tracking Area Code (TAC) obtained is from 3GPP-User-Location-Info AVP, when geographic location type is TAI.</p>
AccessData. subscriber. locationInfo. routingAreaIdentity	String	any	<p>RAI of the SGSN where the UE is registered.</p> <p>The RAI is obtained from RAI AVP. The value is encoded as a UTF-8 string on either 11 (if the MNC contains two digits) or 12 (if the MNC contains three digits) octets</p>
AccessData. subscriber. locationInfo. serviceAreaCode	Integer	0-65535	<p>Service area code where the user is registered, within the Service Area Identification (SAI) geographical location type.</p> <p>For 3GPP-GPRS and 3GPP-EPS, it is obtained from 3GPP-User-Location-Info AVP.</p>
AccessData. subscriber. locationInfo. timezone	Integer	<p>Steps of 15 minutes</p> <p>[-48, +56]</p>	Offset between universal time and local time in steps of 15 minutes (900 seconds) of where the UE currently resides.

Also, the following tags related to dynamic information about QoS can be used in the condition formula of rules:

Table 5 QoS related Policy Tags

Tag	Return Type	Possible Values	Comments
AccessData. bearer. isQosNegotiationPossible	Boolean	<p>true</p> <p>false</p>	Indicates if the bearer QoS for the default bearer has been enforced in the bearer plane.



Tag	Return Type	Possible Values	Comments
AccessData. requestedQos. classIdentifier	Integer	1–254	Requested QoS Class Identifier for the IP-CAN bearer.
AccessData. requestedQos. mbrUplink	Integer	any	Maximum bit rate in the uplink direction for the IP-CAN bearer expressed in bps. When both APN-Aggregate-Max-Bitrate-UL and APN-Extended-APN-AMBR-UL AVPs are available, this bit rate is obtained from the APN-Extended-APN-AMBR-UL AVP.
AccessData. requestedQos. mbrDownlink	Integer	any	Maximum bit rate in the downlink direction for the IP-CAN bearer expressed in bps. When both APN-Aggregate-Max-Bitrate-DL and APN-Extended-APN-AMBR-DL AVPs are available, this bit rate is obtained from the APN-Extended-APN-AMBR-DL AVP.
AccessData. requestedQos. priorityLevel	Integer	1–15	Requested ARP priority level for the IP-CAN bearer.

Note: AccessData.requestedQos.xx tags refer to the values sent by the PCEF in CCR messages (QoS-Information AVP or Default-EPS-Bearer-QoS AVP, depending on the access type). When the SAPC performs Bearer QoS Control, it is not recommended to use AccessData.requestedQos.xx tags, as such requested QoS can be modified in upgrades or downgrades.



7 Appendix C. QoS Selection Tags for Output Attributes Used in Policies

The following set of tags can be used in an output attribute (attrValue item of outputAttributes attribute) to make mathematical operations to calculate the QoS for default bearer or APNs.

Table 6 QoS Selection Tags

Tag	Return Type	Format	Comments
BearerQosProfile	Bearer QoS Profile	BearerQosProfile["QosProfile Name "]	A bearer QoS profile name previously configured.
ServiceQosProfile	Service QoS Profile	ServiceQosProfile["QosProfile Name "]	A service QoS profile name previously configured.
maxQosProfile (1)	Bearer QoS Profile	maxQosProfile	Bearer QoS profile corresponding to the highest value among the QoS profiles associated to the authorized preconfigured services. (2)
sumQosProfile (3)	Bearer QoS Profile	sumQosProfile	Bearer QoS profile corresponding to the aggregation of QoS profiles of the authorized preconfigured services running on the bearer. (4)

(1) Do not use this function in network scenarios that support dedicated bearers. Use instead QoS for services.

(2) This function selects the highest value for every field of the service QoS profiles. For priority-related parameters like QCI, it is the lowest numeric value.

(3) Related to QoS for APN (as APN-AMBR are the aggregation of MBRs of non-GBR bearers for an APN), do not use this function in network scenarios having services running in GBR-bearers.

(4) Adding the individual throughput parameters (MBRs) of the QoS profiles, and selecting the highest value in the rest of the QoS parameters.



8 Appendix D Configuration Summary

The next table summarizes the configuration possibilities grouped by the SAPC functions.

Table 7 Functions and Configuration

Function		Unconditionally	Conditionally (Policies)
QoS Control for the default bearer and the APN		Yes Provision QoS Control for Default Bearer/APN selection on page 9	Yes Provision QoS Control for Default Bearer/APN selection on page 9
Bandwidth Management (QoS Control for services)	Static Services	Yes Configure Static Services on page 12	Yes Configure Static Services on page 12
	Preconfigured	Yes Provision QoS Control for Services on page 14	Yes Provision QoS Control for Services on page 14



9 Reference List

Ericsson Documents

1. Configuration Guide for Access and Charging Control
2. Configuration Guide for Subscription and Policies
3. Managed Object Model (MOM)

Standards

1. Mobile Radio Interface Layer 3 Core Network Protocols, 3GPP TS 24.008
2. End-to-end Quality of Service (QoS) signalling flows, 3GPP TS 29.208
3. Policy control over Gx interface, 3GPP TS 29.209
4. Policy and Charging Control over Gx reference point, 3GPP TS 29.212