

# **Interface Configuration**

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## **Gx Interface Configuration**

This procedure describes how to create a Gx service in which the PCRF mirrors the QoS received from the PCEF/Gateway. When the PCRF receives a Credit-Control-Request (Initial) message, it sends the same QoS parameters back to the PCEF in the Credit-Control-Answer (Initial) message.

- **Step 1** Open Policy Builder, and select the **Services** tab.
- **Step 2** In the left-hand pane, select **Use Case Templates** > **Summary**.
- Step 3 In the Summary pane, click Use Case Template under Create Child, and then do the following:
  - a) In the Name field, type MirrorQoS (using this name for example Use Case Template).
  - b) Select Actions tab.
  - c) Click Add under Service Configurations. The Select Service Configuration dialog box opens, and all of the service configuration objects that are available on the PCRF are listed.
  - d) Scroll down to the gx area in the list of service configuration objects, and select DefaultBearerQoS.
  - e) Click OK. The Select Service Configuration dialog box closes, and the DefaultBearerQoS object is displayed under Service Configurations.
  - f) Click Add again under Service Configurations.
  - g) In the Select Service Configuration dialog box, scroll down to the gx section, and select DefaultBearerQoSActions.
  - h) Click OK.

Now both added service configuration objects are displayed under Service Configurations pane.

**Step 4** From the left-hand pane, select **Services** > **Service Options**.

The new MirrorQoS option is displayed at the bottom of the list of service options.

- **Step 5** Select **MirrorQoS** in the **Service Options** list, and do the following:
  - a) In the MirrorQoS Summary pane, click Service Option under Create Child. The Select Service Configuration dialog box opens. Both of the service configuration objects that you added are listed under Service Configurations.

#### Figure 1: Mirror QoS Summary

Domains	MirrorOoS Summar	v			
Services					
Summary	<ul> <li>Actions</li> </ul>	•			×
4 🗁 Services	Create Child:	Select Service Config	uration		
Gx_RX_Service (Gx_RX_Service)	Service Option	Comico Configurations	Comileo Confiem	nation Deservators (Desuious)	
4 🗁 Service Options		Service Configurations	Service Configu	ration Parameters (Preview)	
Limit Max MAC Registrations		Name h DefaultRearcrOef	~Display Name	value	
Auto Register MAC Credential		DefaultBearerOeCAstions			
Max Concurrent Sessions					
Auto-Provision Quota					
Charge Accounts					
Image:					
ISG Upgraded Service					
Proxy Accounting		Add Remove 😚 🕹			
ISG Base Service					
> 📻 Rx-QoS					
MirrorQoS					
Use Case Templates					
				ОК Са	ncel

- b) Click OK.
- c) Type MirrorQoS in the Name field.
- d) Under **Service Configurations**, select **DefaultBearerQoSActions**. The DefaultBearerQoSActions parameters are displayed to the right.
- e) In the Value column, select Mirror for all of the attribute value pairs.

Figure 2: Mirror QoS Summary - Service Option

Domains	Service Option				
Services					
Summary	Name	Use Case Template: <u>MirrorQoS</u>			
4 🧁 Services	MirrorQoS				
Gx_RX_Service (Gx_RX_Service)	Service Configurations	DefaultBearerQoSActions Parameters			
🗉 🗁 Service Options	Name	*Display Name	Value		
Limit Max MAC Registrations	🚽 DefaultBearerQoS	Priority	0		
> Auto Register MAC Credential	+ DefaultBearerOoSActions	Diameter Client			
Max Concurrent Sessions		Qci	Enforce		
Auto-Provision Queta		Max Reg Bandwidth U L			
		Max Reg Bandwidth D L	Bound		
Charge Accounts		Guaranteed Bit Rate U L	Enforce		
Image:		Guaranteed Bit Rate D L	Mirror		
ISG Upgraded Service	Add Remove 😯 🕹	Apn Agg Max Bit Rate U L	Enforce		
Proxy Accounting	T Actions	Apn Agg Max Bit Rate D L	Enforce		
ISG Base Service	<ul> <li>Actions</li> </ul>	4 Arp			
▶ 📰 Rx-QoS	Сору:	<ul> <li>ArpActions</li> </ul>			
4 MirrorQoS	Current Service Option	Priority Level	Enforce		
MirrorOoS		Preemption Capability	Enforce		
		Descention Mids and States	Enforce		

- **Step 6** In the left-hand pane, select **Services** > **Services**.
  - In the **Services Summary** pane, click **Service** under **Create Child**, and do the following:
  - a) Type a descriptive code for the MirrorQoS service in the Code field.
  - b) Type MirrorQoS in the Name field.
  - c) Uncheck the **Balance Service** option.
  - d) Click Add.
  - e) In the Select Service Configuration dialog box, select the MirrorQoS service option, and click OK.
- **Step 8** Select File > Publish to Runtime Environment.

Step 7

Step 9

The new MirrorQoS service is now available to all Policy Server (QNS) nodes for processing.

- Verify that the newly created service is available for use by doing the following:
  - a) Open the Control Center GUI and go to the Subscribers section.
  - b) Click Create Subscriber.
  - c) Enter the IMSI/MSISDN and the name of the subscriber, and then click **Save & Continue**.

#### Figure 3: Create Subscriber

Subscribers	Subscribers	
Find Subscriber Create Subscriber	Create Subso	riber
Sessions	Credential:	31033012345678
Find Subscriber Session Find Network Session	Name:	GX_TEST_IMSI
	Reset	Save Save & Continue

- d) Go to the **Services** section.
- e) Click the Add section, which lists the available services, and select the new MirrorQoS service.
- Click Save and run a test call to verify that the QoS parameters are mirrored by PCRF in Credit-Control-Answer(Initial) message back to the PCEF.

### **Gy Interface Configuration**

The Diameter Gy reference point is located between the OCS and the PCEF. The CPS supports using the Gy reference point for usage monitoring of the on-board OCS known as the Multi-service Balance Manager (MsBM) against a PCEF.

CPS uses the Gy RatingGroup Service Configuration Object within the Use Case Templates to hold the configuration parameters for Gy. The following procedure describes how to set up a Gy RatingGroup that will be sent upon a CCR-i request from the PCEF. The Gy RatingGroup service option would then be added to a service along with a Gx rule or QoS.

For more information, see Gx Interface Configuration, on page 1 for details on how to create a valid Gx service.

The following procedure is based on the ASR5K acting as the PCEF supporting the Enhanced Charging Service (ECS) mechanism for Gy "Pull" Usage Monitoring. The RatingGroup configuration for Gy will work in a similar method with any supported PCEF using the Gy interface.

- **Step 1** Open the Policy Builder GUI, and select the **Services** tab.
- **Step 2** In the left-hand pane, select **Use Case Templates** > **Summary**.
- **Step 3** In the **Summary** pane, click **Use Case Template** under **Create Child**, and then do the following:
  - a) In the Name field, type Gy.
  - b) Select Actions tab.

c) Click Add under Service Configurations.

The **Select Service Configuration** dialog box opens, and all of the service configuration objects that are available on the PCRF are listed.

- d) Scroll down to the gy area in the list of service configuration objects, and select RatingGroup. The Select Service Configuration dialog box closes, and the RatingGroup object is displayed under Service Configurations.
- **Step 4** In the left-hand pane, select **Service Options**.

The new Gy option is displayed at the bottom of the list of service options.

- **Step 5** Select **Gy** in the **Service Options** list, and do the following:
  - a) In the Gy Summary pane, click Service Option under Create Child. The Select Service Configuration dialog box opens. The RatingGroup service configuration object is listed under Service Configurations.
  - b) Click OK.
  - c) Type **Gy** in the **Name** field.
  - d) Under **Service Configurations**, select **RatingGroup**. The RatingGroup parameters display to the right.

The following table describes the parameters that are necessary to support the ASR5000 ECS Usage Monitoring for a volume quota service:

Parameter	Description
Rating Group	Corresponds to a value configured on the ASR5000 that represents which data should be monitored.
RG Type	Rating Group Type supports one of two values either "volume" or "time".
Dosage	How much quota to initially give the client (in bytes).
Balance Code	
Final Unit Action	In this example, we will use TERMINATE as the default Final Unit Action on quota depletion, which will send a CCR-u with the final usage for the rating group. Other options supported include NONE (no action taken) RESTRICT_ACCESS (send a Restriction Filter Rule and Filter ID) and REDIRECT (send a Redirect Address of Redirect Address Type).
Validity Time	Sets a session timer for the Gy quota grant; even if quota is not exhausted the PCEF must check back in at the end of the validity time (in seconds).
Volume Quota Threshold	PCEF will check back in with OCS when the Volume Quota Threshold has been reached; value must be set as less than the overall Dosage (in bytes).
Quota Holding Time	The amount of time the quota should be available on the PCEF without activity from the user (in seconds)
Quota Consumption Time	Idle traffic threshold time (in seconds); only used with time quota rating groups.

#### Table 1: RatingGroup Parameters

Parameter	Description
Use Shared Bucket	Used in a shared quota use case in which the same account balance and rating group can be used within a shared group of users.
	Default: false

Priority and Diameter Client do not need to be set. Priority can be used to set the priority for the RatingGroup if multiple RatingGroups are on a service.

Tariff Switch Model and Tariff Change Time are outside the scope of this document.

**Note** If Tariff Switch Model is not set, any value set in Tariff Change Time is ignored.

- **Step 6** Validate the Gy service configuration as follows:
  - a) Create a new service in Policy Builder that contains a Gx rule service configuration and the Gy RatingGroup service configuration.
    - **Note** The Gx rule must be a rule defined on the PGW that is associated with a Gy service to the CPS as the OCS.
  - b) Per the Gy pull model, when the PCEF receives the appropriate Gx rule, it initiates a CCR-i to the OCS, which will reply back with the RatingGroup service option values in a CCA.
  - c) Using **tcpdump**, verify that the CCA contains the appropriate values as defined in the RatingGroup.

## Sy Interface Configuration

The Sy reference point is located between the Policy and Charging Rules Function (PCRF) and the Online Charging System (OCS). The Sy reference point enables the transfer of information relating to subscriber spending from OCS to PCRF and supports the following functions:

- Request of policy counter status reporting from PCRF to OCS
- Notifications of policy counter status change from OCS to PCRF
- Cancellations of policy counter status reporting from PCRF to OCS

Since the Sy interface resides between PCRF and OCS in the HPLMN, roaming with home routed or visited access as well as non-roaming scenarios is supported in the same manner.

The following procedure describes how to subscribe to the OCS (Online charging system) counter status updates from the PRCF side by initiating a 'Spending Limit Request (SLR)' message:

Step 1	Open the Policy Builder GUI, and select the Services tab.

**Step 2** Create a Gx service as described in Gx Interface Configuration, on page 1.

Now you are ready to create an Sy service as described in the following steps.

- **Step 3** In the left-hand pane, select **Use Case Templates** > **Summary**.
- Step 4 In the Summary pane, click Use Case Template under Create Child, and then do the following:
  - a) In the **Name** field, type **Sy**.
  - b) Select Actions tab.

- c) Click Add under Service Configurations. The Select Service Configuration dialog box opens, and all of the service configuration objects that are available on the PCRF are listed.
- d) Scroll down to the sy area in the list of service configuration objects, and select SpendingLimitReport.
- e) Click **OK**.

The **Select Service Configuration** dialog box closes, and the SpendingLimitReport object is displayed under **Service Configurations**.

**Step 5** In the left-hand pane, select **Services** > **Service Options**.

The new Sy option is displayed at the bottom of the list of service options.

- **Step 6** Select **Sy** in the **Service Options** list, and do the following:
  - a) In the Sy Summary pane, click Service Option under Create Child. The Select Service Configuration dialog box opens. The SpendingLimitReport service configuration object is listed under Service Configurations.
  - b) Click OK.
  - c) Type **Sy** in the **Name** field.
  - d) Under **Service Configurations**, select **SpendingLimitReport**. The SpendingLimitReport parameters display to the right.
  - e) In the list of parameters, expand **Subscriber Id** (**List**) > **SubscriberId** parameter. The **Identifier** parameter appears.
  - f) Click in the Value column beside the Identifier parameter, and then click the ... button.

#### Figure 4: Identifier Parameter

📑 Service Option			
Name	Use Case Template: <u>Sy</u>		
Sy			
Service Configurations	SpendingLimitReport Parameters		
Name	*Display Name	Value	Pull value from
+ SpendingLimitReport	Priority	0	
	Diameter Client		
	<ul> <li>Subscriber Id (List)</li> </ul>		
	<ul> <li>SubscriberId</li> </ul>		
	Identifier		
	Asynchronous	false	
Add Remove 🔐 🕀	Retry Time Seconds	3600	
	Realm		
<ul> <li>Actions</li> </ul>	Identifier		
Copy:	› Defaults On Failure (List)		
	Add Remove Add Child 😚 🤑		

A dialog box containing a list of identifiers opens.

g) Select Session MSISDN in the list, and click OK. Based on your requirements, you can also use other identifiers such as IMSI, and so on.

#### Figure 5: Session MSISDN Identifier

lame	Use Case Template: Sy		
Sy			
ervice Configurations	SpendingLimitReport Parame	iters	
Name	*Display Name	Value	
+ SpendingLimitReport	Priority	• Plana a last an abiast	
	Diameter Client	Please select an object	U X
	<ul> <li>Subscriber Id (List)</li> </ul>		
	✓ SubscriberId		
	Identifier	<ul> <li>Session Framed IPv6 Prefix</li> </ul>	<b></b>
	Asynchronous	Session IMSI	
	Retry Time Seconds	Session Mac Address	
dd Keniove 🔓 😣	Realm	Session Mac Address (Remove NAS)	
Actions	Identifier	Session MSISDN	
Copy:	<ul> <li>Defaults On Eailure (List)</li> </ul>	Session User Name	
Current Service Option	· Deladics off failure (List)	Session User Name No Realm	=
		Session User Name Realm	
		Session User Name With Realm (realm) (sername)	*
		V Session oser name meriteann (realmasername)	
		OK Can	cel

h) Update the **Realm** parameter with the Sy peer realm (OCS Realm) where the message needs to be sent from PCRF.

In this configuration we are not specifying any counter name in the Identifier columns, which means that the PCRF subscribes to all the counter statuses available on the OCS for the subscriber.

#### Figure 6: Realm Parameter

Service Option		
Name	Use Case Template: <u>Sy</u>	
Sy		
Service Configurations	SpendingLimitReport Parameters	
Name	*Display Name	Value
+ SpendingLimitReport	Priority	0
	Diameter Client	
Add Remove 🗘 👌	<ul> <li>Subscriber Id (List)</li> </ul>	
	<ul> <li>SubscriberId</li> </ul>	
	Identifier	Session MSISDN
	Asynchronous	false
	Retry Time Seconds	3600
	Realm	test-realm.com
• Actions	Identifier	
Сору:	<ul> <li>Defaults On Failure (List)</li> </ul>	
Current Service Option	<ul> <li>DefaultSpendingLimitReport</li> </ul>	
	Failure Reason	NoPeerAvailable
	Identifier	
	Status	

**Step 7** In the left-hand pane, select **Services** > **Services**.

**Step 8** In the **Services Summary** pane, click **Service** under **Create Child**, and do the following:

- a) Type a descriptive code for the Sy service in the Code field.
- b) Type **Sy** in the **Name** field.
- c) Uncheck the Balance Service option.
- d) Click Add.
- e) In the Select Service Configuration dialog box, select the Sy service option, and click OK.
- f) Click Add again, select the MirrorQoS service option, and click OK.

Domains	Service							
Services								
Summary	*Code	*Name						
4 🗁 Services	Sy	Sγ	Sy Chabled Suppress in Portai					
E Service A (SERVICE_A) E Sy (Sy) Balance Service	Add To Sub Accounts	Add To Sub Accounts						
default (DEFAULT)	Service Options	•				×		
MirrorQoS (Mirror)	[81	E Select Service Configura	tion					
Service Options	Sy	Please Select a Service Option		Service Configuration Parameters	(Preview)			
Use Case Templates	<ul> <li>default</li> <li>default</li> <li>eHRPD_Handover</li> </ul>	*	*Display Name Priority Diameter Client	Value 0	•			
	Add Remove 🚱 🔶 View 3	Gy     Gy		Qci Max Req Bandwidth U L Max Req Bandwidth D L Guaranteed Bit Rate U L Guaranteed Bit Rate D L		=		
Create Child: Automatic Balance Provisioning Copy:	pring ⇒ sd ⇒ sd ⇒ sd ⇒ sd ⇒ sy ≤ sy	III	Apn Agg Max Bit Rate U L Apn Agg Max Bit Rate D L Arp Priority Diameter Client	0				
	el default	*	Qci Max Reg Bandwidth U L	Mirror Mirror				
					Ш ОК	Cancel		

#### Figure 7: Adding the Mirror QoS Service Option

- By adding the Gx interface 'MirrorQoS' service, PCRF will mirror the QoS for this subscriber.
- By adding the Sy interface 'Sy' service, PCRF will subscribe with OCS for all the counters per user.
- Both Gx/Sy service options together will generate a successful end-to-end subscriber call.

#### **Step 9** Select File > Publish to Runtime Environment.

The new Sy service is now available to all Policy Server (QNS) nodes for processing.

```
Step 10
```

The new by service is now available to all Policy Server (QNS) node

- Verify that the new Sy service is available for use by doing the following:a) Open the Control Center GUI and go to the **Subscribers** section.
  - $C_{1}^{(1)} = C_{1}^{(1)} + C_{2}^{(1)} +$
  - b) Click **Create Subscriber**.
  - c) Enter the IMSI/MSISDN and the name of the subscriber, and then click Save & Continue.

#### Figure 8: Create Subscriber

Subscribers	Subscribers	
Find Subscriber Create Subscriber	Create Subsc	riber
Sessions	Credential:	31033012345678
Find Network Session	Name:	GX_TEST_IMSI
	Reset	Save Save & Continue

- d) Go to the  ${\bf Services}$  section.
- e) Click add to open Select Service pop-up box which lists the available services. Select the new Sy service.

#### Figure 9: Select New Service - 1

Subscribers	Subscribers			
Find Subscriber Create Subscriber	GX_SY_TEST_IMSI Det	tails		
GX_SY_TEST_IHSI X Overview Details Sessions Balance SSIDs Sessions Find Subscriber Session Find Network Session	General Credentials Services Notifications Subaccounts	Services Service Lis Service Cod	st / Service Detail e add Select Service Service Code Gx RX_Service MirrorQoS Sy	X Service Name Gx_RX_Service MirrorOpS Sy Select Cancel

Figure 10: Select New Service - 2

Subscribers		Subscribers					
Find Subscriber Create Subscriber		GX_SY_TEST_IMSI	Details				
GX_SY_TEST_IMSI							
Overview	-	General	Services				
Details		Credentials	Service List / Ser	vice Detail			
Balance		Services	Service Code	hbe John	Service Name: Sy	Enabled	
SSIDs		Notifications	Sy	remove	Custom Data:	LINDICK	
Sessions		Subaccounts			Code	Value	add
Find Subscriber Session Find Network Session							

- f) Click **Save** and run a test call to verify the following:
  - QoS parameters are mirrored by PCRF in Credit-Control-Answer (Initial) message back to the PCEF.
  - PCRF sends a Spending Limit Request message to the PCS on the Sy interface receives Spending Limit Answer message from the OCS.

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# **Rx Interface Configuration**

The Rx reference point is used to exchange application-level session information between the Policy and Charging Rules Function (PCRF) and the Application Function (AF). This information is part of the input used by the PCRF for the Policy and Charging Control (PCC) decisions.

The PCRF exchanges the PCC rules with the Policy and Charging Enforcement Function (PCEF) and QoS rules with the Bearer Binding and Event Reporting Function (BBERF).

#### Figure 11: Rx Reference Point



The PCRF provides network control regarding the service data flow detection gating QoS and flow based charging (except credit management) towards the PCEF. The PCRF receives session and media related information from the AF and informs AF of traffic plane events.

When a new AF session is being established and media information for this AF session is available at the AF and the related media require PCC supervision the AF shall open an Rx Diameter session with the PCRF for the AF session using an AA-Request command unless an Rx session has already been established for the AF session.

The AF shall provide the full IP address of the UE using either Framed-IP-Address AVP or Framed-Ipv6-Prefix AVP and the corresponding Service Information within Media-Component-Description AVP(s). The AF shall indicate to the PCRF as part of the Media-Component-Description whether the media IP flow(s) should be enabled or disabled with the Flow-Status AVP.

The AF may include the AF-Application-Identifier AVP into the AA-Request in order to indicate the particular service that the AF session belongs to. This AVP can be provided at both AF session level and Media-Component-Description level. When provided at both levels the AF-Application Identifier provided within the Media-Component-Description AVP will have precedence.

#### Use Case:

The following procedure describes how to configure the Rx parameters that are necessary for the establishment of a dedicated bearer and calculating/deriving the QoS for the Dynamic Charging rule names that PCRF sends to the PCEF using a Gx RARmessage:

- Step 1 Open the Policy Builder GUI, and select the Reference Data tab.
- **Step 2** In the left-hand pane, select **Diameter Defaults**.
- Step 3 In the Summary pane, click **Rx Profiles** under Create Child.

The Rx Profile configuration pane appears. When multiple Rx profiles are configured, the first profile should be configured as described in the following steps.

- **Step 4** Select **Prefer answer Codec-Data** if you want the default priority to be given to the answer codec (when both answer and offer are present within the AAR). This option is not selected by default.
  - **Note** CPS will by default select the first of offer or answer that is present in the sent XML. By selecting this checkbox, CPS will prefer answer regardless of the order sent by the Rx endpoint.

#### Figure 12: Rx Profile Configuration

Systems	Rx Profile
Account Balance Templates	
Custom Reference Data Tables	Prefer answer Codec-Data
Diameter Agents	
Diameter Clients	*Default QoS Policy
Diameter Defaults	Qci
Summary	5
🕨 🔁 Custom Avp Profiles	Max Requested Bandwidth U L
🕨 🔁 Tod Schedules	1024000
🕨 🔁 Sd Push Ruless	1024000
) 🗁 Gx Profiles	Max Requested Bandwidth D L
🕨 🗁 Mps Profiles	1024000
🛛 🔁 Rx Profiles	Guaranteed Bitrate U L
Rx Profile	2048
Fault List	2010
Notifications	Guaranteed Bitrate D L
Policy Enforcement Points	2048

**Step 5** In the **Default QoS Policy** area, update the mandatory attribute value pairs as required.

- **Note** The **Default QoS Policy** area is used when there is no Application QoS Policy or Codec QoS Policy defined, or when the incoming call doesn't match the configured values (with regard to AF ID or other parameters).
- **Note** If AF Application Identifier (AF-ID)-specific QoS handling is needed, the Application QoS Policy table needs to be updated. If the AF-ID received in the AAR message from the AF matches the AF Application Identifier configured under the Application QoS Policy section, then the PCRF uses QoS attributes from this table to populate the dynamic rule QoS AVPs, which is then sent to the PCEF for dedicated bearer establishment.
- Step 6 Scroll down to the Actions area in the **Rx Profile** pane, and click **Dynamic Rule Charging Parameters** under **Create Child**.
- **Step 7** Update the fields using one of the following methods as per requirements:
  - Update the default Dynamic Rule Charging Parameters.
  - **Note** This is used in case the provisioned values (AF Identifier based) do not match the incoming AAR message, essentially signifying that the AF ID in the AAR message is not provisioned or that the AAR message did not contain an AF Identifier.
  - Update AF ID-specific Dynamic Rule Charging Parameters.
    - **Note** This is used when the incoming AAR contains AF Identifier that is provisioned in the table shown in the following figure.

#### Figure 13: Dynamic Rule Charging Parameters

🗟 🗇 🛠 🏷 🔛									
Systems	Dynamic Rule Cha	arging Paramete	rs						
Account Balance Templates	-,								
Custom Reference Data Tables	Default Charging	Parameters							
Diameter Agents									
Diameter Clients	Charging Paramet	ers							
Diameter Defaults	Service Identifier	Rating Group	Online	Offline	Metering Method	Reporting Level	Precedence	Af Application Id	Media Type
Summary	81	1	DISABLE	ENABLE	VOLUME	SERVICE_IDENTIFIER	100	urn:urn-7:3gpp-servic	AUDIO
Custom Avp Profiles									
🗁 Tod Schedules									
🖻 🎃 Sd Push Ruless									
😂 Gx Profiles									
🗁 Mps Profiles									
<ul> <li>Rx Profiles</li> </ul>	Add Remove 🔐	4							
- 📻 Rx Profile									
Duarmic Rula Charoina I	<ul> <li>Action:</li> </ul>								
D Synamic Kare Charging P	Copy:								

**Step 8** This configuration is applicable system wide or based on a particular Rx Client if needed. Validate the configuration by executing a basic VoLTE call with the standard Gx configuration. Verify that the CPS is able to handle the incoming AAR message on the Rx interface and can trigger dynamic charging rules on the Gx interface towards the PCEF using the RAR message.

## **Sd Interface Configuration**

The Sd reference point is located between the Policy and Charging Rules Function (PCRF) and the Traffic Detection Function (TDF).

For the solicited application reporting the Sd reference point is used for:

- Establishment and termination of TDF session between PCRF and TDF.
- Provisioning of Application Detection and Control rules from the PCRF for the purpose of traffic detection and enforcement at the TDF.
- Usage monitoring control of TDF session and of detected applications and reporting of the start and the stop of a detected applications traffic and transfer of service data flow descriptions for detected applications if deducible from the TDF to the PCRF.

For the unsolicited reporting the Sd reference point is used for:

- Establishment and termination of TDF session between PCRF and TDF.
- Reporting of the start and the stop of a detected application's traffic and transfer of service data flow descriptions for detected applications if deducible and transfer of Application instance identifier if service data flow descriptions are deducible from the TDF to the PCRF.

Figure 14: Sd Reference Point



The PCRF may provide ADC Rules to the TDF by using Sd interface.

Once the start or stop of the application's traffic matching one of the ADC Rules is detected if PCRF has previously subscribed to the APPLICATION\_START/APPLICATION\_STOP Event-Triggers unless a request to mute such a notification (Mute-Notification AVP) is part of the corresponding ADC Rule the TDF shall report the information regarding the detected application's traffic to the PCRF and apply the enforcement actions if defined within the corresponding ADC Rule.

#### **Use-Case:**

The following procedure describes how to initiate an Sd session from PCRF towards the TDF by sending a Predefined ADC Rule using a TDF-Session-Request (TSR) message to the TDF and getting a successful TDF-Session-Answer (TSA) message on the PCRF:

- **Step 1** Open the Policy Builder GUI, and select the **Services** tab.
- **Step 2** Create a Gx service as described in Gx Interface Configuration, on page 1.

Now you are ready to create an Sd service as described in the following steps.

- **Step 3** In the left-hand pane, select **Use Case Templates** > **Summary**.
- Step 4 In the Summary pane, click Use Case Template under Create Child, and then do the following:
  - a) In the Name field, type Sd.
  - b) Select Actions tab.
  - c) Click Add under Service Configurations. The Select Service Configuration dialog box opens, and all of the service configuration objects that are available on the PCRF are listed.
  - d) Scroll down to the sd area in the list of service configuration objects, and select ADCPredefinedRule.
  - e) Click OK.

The **Select Service Configuration** dialog box closes, and the ADCPredefinedRule object is displayed under **Service Configurations**.

**Step 5** In the left-hand pane, select **Services** > **Service Options**.

The new Sd option is displayed at the bottom of the list of service options.

- **Step 6** Select **Sd** in the **Service Options** list, and do the following:
  - a) In the Sd Summary pane, click Service Option under Create Child. The Select Service Configuration dialog box opens. The ADCPredefinedRule service configuration object is listed under Service Configurations.
  - b) Click OK.
  - c) Type Sd in the Name field.
  - d) Under **Service Configurations**, select **ADCPredefinedRule**. The ADCPredefinedRule parameters display to the right.
  - e) Click in the **Value** column beside the **Rule Name** parameter, and type the name of the ADC Rule that is provisioned on the TDF and that the PCRF needs the TDF to enforce. For this example, we used **test-rule-1**.
    - **Note** The rule that is being configured here MUST already be provisioned on the TDF, or the TDF will return an error (unknown rule name).

#### Figure 15: Rule Name parameter

Domains	Service Option		
Services           Summary           Services	Name Sd	Use Case Template: <u>Sd</u>	
<ul> <li>Sy (Sy)</li> <li>Gx_RX_Service (Gx_RX_Service)</li> <li>MirrorQoS (MirrorQoS)</li> <li>Service Options</li> <li>Tumk Max MAC Registrations</li> <li>Auto Register MAC Credential</li> <li>Max Concurrent Sessions</li> <li>Auto-Provision Quota</li> <li>Charge Accounts</li> <li>Charge Accounts</li> <li>Charge Accounting</li> <li>StG Upgraded Service</li> <li>Proxy Accounting</li> <li>ISG Base Service</li> <li>Rx-QoS</li> <li>MirrorQoS</li> <li>Cisco-QoS-Goup</li> <li>Sy</li> <li>Sd</li> </ul>	Service Configurations          Name         ADCPredefinedRule         Add         Remove         Add         Remove         Add         Copy:         Current Service Option	*DEPredefinedRule Parameters *Display Name Priority Diameter Client Rule Group Rule Name	Value 0 test-rule-1

**Step 7** In the left-hand pane, select **Services** > **Services**.

Step 8

- In the Services Summary pane, click Service under Create Child, and do the following:
  - a) Type a descriptive code for the Sd service in the Code field.
  - b) Type **Sd** in the **Name** field.
  - c) Uncheck the Balance Service option (unless explicitly needed for the use case being developed).
  - d) Click Add.
  - e) In the Select Service Configuration dialog box, select the Sd service option, and click OK.
  - f) Click Add again, select the MirrorQoS service option, and click OK.
    - By adding the Gx interface 'MirrorQoS' service, PCRF will mirror the QoS for this subscriber.
    - By adding the Sd interface 'Sd' service, PCRF will trigger a TSR request with an ADC rule towards TDF.

- Both Gx/Sy service options together will generate a successful end-to-end subscriber call.
- **Step 9** Select File > Publish to Runtime Environment.

The new Sd service is now available to all Policy Server (QNS) nodes for processing.

- **Step 10** Select the **Reference Data** tab.
- **Step 11** In the left-hand pane, select **Diameter Defaults.** > **Summary**.
- Step 12 In the Summary pane, click Sd Push Rules under Create Child.

The Sd Push Rules pane appears.

In order to initiate connections toward the TDF on the Sd interface, the table shown in the following figure needs to be populated with the origin and remote Host/Realm configuration.

The Sd service/template will send messages to the TDF based on the host/realm configuration defined here.

For more information on how to configure the parameters, see Diameter Defaults.

Figure 16: Sd Push Rules Configuration Parameters

Systems	Sd Push Rules			
Account Balance Templates				
Custom Reference Data Tables	Sd Push Rules			
Diameter Agents	*Gx Realm	*Gx Host Pattern	*Tdf Realm	*Tdf Host
Diameter Clients				
Diameter Defaults				
Summary				
🗁 Custom Avp Profiles				
🗁 Tod Schedules				
🛛 🗁 Sd Push Ruless				
Sd Push Rules	Add Remove 😚 🕹			

**Step 13** Verify that the new Sd service is available for use by doing the following:

- a) Open the control center GUI and go to the Subscribers section.
- b) Click Create Subscriber.
- c) Enter the IMSI/MSISDN and the name of the subscriber, and then click Save & Continue.

Subscribers	<ul> <li>Subscribers</li> </ul>	
Find Subscriber Create Subscriber	Create Subsc	riber
Sessions	Credential:	31033012345678
Find Subscriber Session Find Network Session	Name:	GX_TEST_IMSI
	Reset	Save Save & Continue

- d) Go to the Services section.
- e) Click add to open Select Service pop-up box which lists the available services, and select the new Sd service.

Subscribers	Subscribers			
Find Subscriber Create Subscriber	GX_SD_TEST_IMSI De	tails		
GX_SD_TEST_IMSI X Overview Details Sessions Balance SSIDs	General Credentials Services	Services Service List / Service Service Code	Detail	
Sessions  Find Subscriber Session Find Network Session	Subaccounts		Select Service Service Code Gx_RX_Service MirrorQoS Sd Sy Select	Service Name Gx_RX_Service MirrorCoS Sd Sy Cancel

- f) Click Save and run a test call to verify the following:
  - QoS parameters are mirrored by PCRF in Credit-Control-Answer (Initial) message back to the PCEF.
  - PCRF sends a TDF-Session-Request message to the TDF on the Sd interface (with the Predefined ADC rule), receives TDF-Session-Answer message from the TDF.

## **Sh Interface Configuration**

CPS supports the ability to connect to the Home Subscriber Server (HSS) over the Sh interface to parse subscriber profile data in order to make policy decisions.

CPS queries the HSS on Gx session establishment and caches the subscriber data locally. CPS allows the operator to configure which attributes need to be extracted from the User-Data AVP and stored.

### **Create the Diameter Outbound Peer and Realm Connection to HSS**

The connection to the HSS must be enabled by configuring it in the Outbound Peers section in the Diameter Stack configuration.

Refer to Outbound Peers for instructions.

Note When defining the Realm in the Realms table, enter the Processing Protocol as SH\_TGPP.

### **Configure the Sh Domain**

Sh interface connections in CPS are defined per domain and therefore are configured on the Domains screen in Policy Builder.

Refer to Domains for more information.

Note The following steps represent the most common way to configure an Sh interface connection, but other configuration options are available. Step 1 Follow the steps in Defining the General Attributes of the Domain to create a new domain for the Sh Interface. Step 2 On the General tab, set Authorization to Allow all Users. Note While Allow all Users is the most common setting, CPS can be set to have subscribers in the SPR (USuM Authorization) and still use the Sh mechanism for additional profile data. Step 3 On the **Provisioning** tab, set **Provisioning** to **<not** set>. Step 4 On the Advanced Rules tab, select the appropriate service in the Default Service field. The default service applies to all subscribers' requests that hit the Sh domain. Step 5 Continue with the instructions in Defining the Additional Profile Data of the Domain.

### **Configure Multiple Sh Entitlements**

**Note** Enabling this feature may result in CPS system performance degradation.

CPS can now receive and parse multiple values via Sh that use the same location in the data structure. These values are then resolved in conjunction with CRD tables to determine the service and appropriate AVPs to add to the session. This capability allows duplicate data structures to be processed and resolved rather than requiring unique data structures for all values, as was the case for CPS versions prior to 11.0.

The following example illustrates an incoming Sh response that contains multiple Entitlement and Custom AttributeName='4GPFO' values that are not unique. A maximum of five values from the incoming response will be used to determine a "bundled" result. The incoming values are processed against the CRD to compress them into a final result based on priorities.

```
<Sh-Data>
     <RepositoryData>
     <ServiceIndication>CamiantUserData</ServiceIndication>
     <SequenceNumber>0</SequenceNumber>
     <ServiceData><CamiantShUser xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'</pre>
xsi:noNamespaceSchemaLocation='CamiantShUser.xsd'>
     <! [CDATA[<Version>1.0</Version>
     <AccountId>274500345196</AccountId>
     <Entitlement>RTA</Entitlement>
     <Entitlement>RTB</Entitlement>
     <Entitlement>RTC</Entitlement>
     <Custom AttributeName='BillingPlanCode'>L03</Custom>
     <Custom AttributeName='4GPFO'>THR200k200k</Custom>
     <Custom AttributeName='4GPFO'>THR200k300k</Custom>
     <UserId Type='E164' Scope='Public'>2345557890</UserId>
     <UserId Type='NAI'
Scope='Private'>0333444123456789@epc.mnc444.mcc333.3gpp.network.org</UserId>
     <EquipmentId Type='IMEISV' DeviceType='Phone'>35-209900-176148-23</EquipmentId>]]>
     </CamiantShUser>
```

```
</ServiceData>
</RepositoryData>
</Sh-Data>
```

This procedure describes how to configure Policy Builder to assign multiple entitlements to a subscriber, which allows services to be used in a more targeted manner.

**Step 1** Log in to Policy Builder.

**Step 2** Create a Search Table Group and a corresponding Custom Reference Data Table as follows:

- a) Select the Reference Data tab.
- b) In the left pane, select Custom Reference Data Tables.
- c) Click Search Table Groups.
- d) In the Search Table Groups Summary pane, click Search Table Group under Create Child.
- e) In the **Search Table Group** pane, type a name for the group; for example, **subscriber\_sh**. An example is shown below:

Figure 17: Search Table Group

Systems	Search Table Group			A
Account Balance Templates				
Andsf Clients				<ul> <li>Actions</li> </ul>
Custom Reference Data Tables				Create Child:
Summary =	Name	*Evaluation Order		Custom Reference Data Table
🛛 🔁 Search Table Groups	subscriber_sh	0		
▶ 👕 subscriber_sh (0)				Copy:
▶ 👕 US10780_Redirect (0)				Current Search Table Group
> 👕 US10031_Table_Driven_Pred	Rocult Columns			
b ad_groups (0)	*Namo	Display Namo	*1.00 In	Conditi Dofault Value
) 👕 apn-mapping-table (0)	outputColumn		Ose III	Condici Deradic Valde
> 👕 US10031_Table_Driven_Supp	outputcolumn	oucpuccolumn	~	
) 👕 Child-Selection (0)				
> 👕 Mind_Attribute_Decision_Tabl				
) 👕 Entitlement_bundler (0)				
LDAP_test (0)				
b				
				0000000

- f) Click Custom Reference Data Table under Create Child.
- g) In the Custom Reference Data pane, type a Name for the CDR; for example, subscriber sh key.
- h) Under Columns, add a key column, an output column, and a priority column. An example is shown below.

ccount Balance Templates					
ndsf Clients	*Name	Display	Name		he Regulte
stom Reference Data Tables	subscriber_sh_key	subscril	ber_sh_key	V Cat	ne results
Summary	Activation Condition	Best	Match	*Evalu	ation Order
∠ 🔁 subscriber_sh (0)		select <u>clear</u>	Materi	1	
subscriber_sh_key (1)	*Columns				
DS10780_Redirect (0)	*Name	Display Name		*Use In C	onditi *Type
> 👕 US10031_Table_Driven_Pred	keyColumn	keyColumn		~	Text
) 👕 sd_groups (0)	outputColumn	outputColumn		$\checkmark$	Text
) 👕 apn-mapping-table (0)	priorityColumn	priorityColumn		$\checkmark$	Numbe
) 👕 US10031_Table_Driven_Supp					
) 👕 Child-Selection (0)					
Mind_Attribute_Decision_Tabl					
Entitlement_bundler (0)	Add Remove 1 Kernove				

#### Figure 18: Custom Reference Data Table

#### **Step 3** Configure a bundle profile as follows:

- a) Under Custom Reference Data Tables in the left pane, click Bundle Profiles.
- b) In the Bundle Profiles Summary pane, click Bundle Profile under Create Child.
- c) In the **Bundle Profile** pane, type a **Name** for the profile; for example, **Entitlement**.
- d) If you want the bundle profile to apply to the CRD and/or Service Resolution processes, select Use for Crd Resolution and/or Use for Service Resolution.
- e) In the **Search Table Group** field, type the name of the search table group.
- f) In the **Key Column**, **Priority Column** and **Output Column** fields, use the **Select** button to select the names of the columns that were configured in the CRD table. An example is shown below:

#### Figure 19: Bundle Profile

File Tools									
등 🗇 🛠 🗱 🔿									
Systems	Bundle Profile								
Account Balance Templates									
Custom Reference Data Tables	*Name		The second production				*Search Table Group		
Summary	Entitlement		Se For Cra Resolution		Use For Service Resolution		subscriber_sh	select	dear
> 🗁 Search Table Groups	*Kou Column		*Delovity Column		*Output Column				
😂 Custom Reference Data Triggers	Key Column		Priority Column		Output Column				
🛛 🗁 Bundle Profiles	keyColumn	select <u>dear</u>	priorityColumn	select <u>clear</u>	outputColumn	select dear			
Entitlement									
acwentitlement									
D plan									
) 🍃 Custom Reference Data Tables									
	File Tools Systems Account Balance Templates Custom Reference Data Tables Summary Sustom Reference Data Trables Summary Subolite Profiles Endle Profiles Summary Subolite Profiles Subolite Prof	File Tools  Systems Account Balance Templates Custom Reference Data Trijgers  Summary Summary Summary Custom Reference Data Trijgers	File Tools  Systems Account Balance Templates Custom Reference Data Tables  Semmary  Se Search Table Groups  Cattom Reference Data Tables  Cattom Reference Data Tables  Cattom Reference Data Tables  Cattom Reference Data Tables	File Tools  Systems Account Balance Templates Custom Reference Data Tables  Summary Custom Reference Data Tables  Custom Reference Data Tables	File Tools  Systems Systems AccessIt Balance Templates Castom Reference Data Tables  Summary Castom Reference Data Tables  Custom Reference Data Tables  Cu	File Tools  Syntems Account Balance Templates  Soutions Reference Data Trägers  Soutions  Soutions	File Tools  Syntems Account Balance Templates  Suctions Reference Data Tables  Cuttom Reference	File Tools Syntems Accessible Carbon Reference Data Tables → Custom Reference Data Tables → Custom Reference Data Tables → Custom Reference Data Tables → Custom Reference Data Tables	File Tods Syntems Accessed Balance Templates Cactom Reference Data Tables Submary South Reference Data Tables South Reference

**Step 4** Configure the Sh Profile in a new domain or in an existing one:

- a) Select the Policy Builder Services tab.
- b) In the left pane, select **Domains**.
- c) Select an existing domain under **Domains** to edit, or click **Domain** under **Create Child** in the **Service Reference Data Objects** pane to create a new one.

**Note** If this is a new domain type a name for it; for example, **Sh MultipleEntitlements**.

- d) In the **Domain** pane, click the **Additional Profile Data** tab.
- e) Select **Sh Profile** in the pull-down menu on the right-hand side of the **Additional Profile** section heading.
- f) Under **Profile Mappings**, add a new **External Code** and name it using the bundle profile name; in our example, the bundle profile name is Entitlement. An example configuration is shown below:

Figure 20: External Code Configuration using Bundle Profile Name

ne 1 MultipleEntitleme	nts Is De	efault			
eral Provisioning	Additional Profile Data	Locations Advance	d Rules		
ditional Profile					Sh Profile
					onno
rofile Mannings					
* <b>rofile Mappings</b>	*Mapping Type	Regex Expression	*Regex Group	Missing Avp Value	Empty Avp Value
rofile Mappings *External Code BillingPlanCode	*Mapping Type SubscriberAttribute	Regex Expression	*Regex Group	Missing Avp Value	Empty Avp Value
*External Code *External Code BillingPlanCode 4GPFO	*Mapping Type SubscriberAttribute SubscriberAttribute	Regex Expression	*Regex Group 1 1	Missing Avp Value	Empty Avp Value
*External Code BillingPlanCode 4GPFO L03	*Mapping Type SubscriberAttribute SubscriberAttribute SubscriberAttribute	Regex Expression	*Regex Group 1 1 1	Missing Avp Value	Empty Avp Value
*External Code BillingPlanCode 4GPFO L03 Entitlement	*Mapping Type SubscriberAttribute SubscriberAttribute SubscriberAttribute SubscriberAttribute	Regex Expression	*Regex Group 1 1 1 1	Missing Avp Value	Empty Avp Value

g) On rare occasions, you may want to select the **Use Service Indications For Service Resolution** option if you want the Service Indications to be put into the policy state for services resolution. Service Indications are used in the outgoing UDR/SNR to tell the HSS what data to send back to CPS.

Note If you decide to select this option, do so only after consulting with Cisco Advanced Services.

# **LDAP/Ud Interface Configuration**

For more information on LDAP/Ud interface configuration, refer to Domains.