



# Configuring ISG Support for Prepaid Billing

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Intelligent Services Gateway (ISG) is a Cisco IOS software feature set that provides a structured framework in which edge devices can deliver flexible and scalable services to subscribers. ISG prepaid billing support allows an ISG to check a subscriber's available credit to determine whether to allow the subscriber access to a service and how long the access can last. ISG prepaid billing works on a repeated reauthorization model in which fragments of credit, called *quotas*, are allotted by a prepaid billing server. This model allows a subscriber to be connected to multiple simultaneous prepaid services, each with a different billing rate. ISG supports time- and volume-based prepaid billing.

This module provides information about how to configure ISG support for prepaid billing.

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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

## Prerequisites for ISG Prepaid Billing Support

The tasks in this document assume that a subscriber session has been created and a method of service activation is in place.



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## Restrictions for ISG Prepaid Billing Support

- ISG prepaid billing support can only be applied to traffic flows that have been defined by an ISG traffic class.
- Quotas are measured in seconds for time and in bytes for volume. There is no way to change the unit of measure.
- The volume quota is for combined upstream and downstream traffic.
- The volume quota supports a maximum value of 4 GB.

## Information About ISG Prepaid Billing Support

- [Overview of ISG Support for Prepaid Billing, page 2](#)
- [Tips for Preventing ISG from Allocating More Volume Quota than Subscriber is Entitled, page 2](#)
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## Overview of ISG Support for Prepaid Billing

ISG prepaid billing support allows ISG to check the available credit for a subscriber to determine whether to activate the service for the subscriber and how long the session can last. The subscriber's credit is administered by a prepaid billing server as a series of quotas representing either a duration of use (in seconds) or an allowable data volume (in bytes). A *quota* is an allotment, or fragment, of available credit. Allocating quotas in fragments rather than providing all the credit at once enables ISG to support the use of credit for multiple simultaneous prepaid sessions.

ISG uses the RADIUS protocol to facilitate interaction between ISG and external authentication, authorization, and accounting (AAA) servers and prepaid billing servers. A single device can serve as the AAA server and the billing server.

To obtain the first quota for a session, ISG submits an authorization request to the AAA server. The AAA server contacts the prepaid billing server, which forwards the quota values to ISG. ISG then monitors the session to track the quota usage. When the quota runs out or a specified limit is reached, ISG performs reauthorization. During reauthorization, the prepaid billing server may provide ISG with an additional quota if there is available credit. If no further quota is provided, ISG will log the user off from the service or perform some other specified action.

When a service is deactivated, the cumulative usage is provided to the prepaid billing server in an Accounting-Stop message.

## Tips for Preventing ISG from Allocating More Volume Quota than Subscriber is Entitled

The Cisco IOS prepaid volume monitor polling timer determines when ISG will initiate a prepaid reauthorization. The polling timer value is (15 seconds < polling-monitor-time < 300 seconds). This value

is calculated dynamically based on the quota volume (QV) value, actual rate and the configured volume threshold. The prepaid volume monitor polling timer is not directly configurable.

To avoid revenue leak during the first authorization (when usage rate is unknown), the QV value should be a minimum of (15 x access-rate). In cases in which the usage rate is known, the QV value should be at least (15 x usage-rate).

In cases in which the input access-rate is much higher than the QV value, it is recommended that the correct QV value be calculated using the following formula:  $\text{access-rate} \times 15 > \text{QV} < \text{access-rate} \times 300$ . For example, an ADSL2 or VDSL user access-rate can be up to 20 Mbps. That is approximately 2.5 megabytes of data in one second. Calculate the QV value by using the following formula:  $2.5 \text{ MB} \times 15 \text{ seconds} > \text{QV} < 2.5 \text{ MB} \times 300 \text{ seconds}$ . This calculation results in a QV value between 37.5 and 750 MB. We recommend avoiding the boundaries, so for this example you might pick a value of QV = 100MB

## ISG Prepaid Threshold

By default, ISG sends reauthorization requests to the billing server when a subscriber's quota is exhausted. ISG prepaid thresholds allow ISG to send reauthorization requests before a quota is used up. When a prepaid threshold is configured, ISG sends a reauthorization request to the billing server when the amount of remaining quota is equal to the value of the threshold. Prepaid thresholds can be configured for both time and volume.

For example, if the prepaid threshold is configured for 10 seconds, and the prepaid billing server sends ISG a quota of 30 seconds, ISG will send a reauthorization request to the prepaid billing server when the subscriber has used up 20 seconds of the quota and has 10 seconds remaining.

## ISG Prepaid Idle Timeout

The ISG prepaid idle timeout can be used to suspend a prepaid service session if no traffic is received for a specified period of time. ISG keeps the session up during the suspension but releases all quota previously received for the prepaid session. Subsequent traffic on the session will cause ISG to send a reauthorization request and download a new quota for the session.

## ISG Prepaid Tariff Switching

Prepaid tariff switching allows changes in tariffs during the lifetime of a session. Typically, a service provider uses prepaid tariff switching to offer different tariffs to an end user during an active connection; for example, changing a user to a less expensive tariff during off-peak hours.



### Note

ISG is not involved in computing the billing rate changes that occur at tariff switch points. Billing rate change computations are performed by the prepaid billing server.

ISG supports prepaid tariff switching by using two quotas that correspond to the time before and the time after the switch point. In the authorization response to ISG, the prepaid billing server specifies the tariff switch point and the quotas for the periods before and after the tariff switch.

ISG uses the pre-tariff switch quota until the tariff switch occurs. If the pre-tariff switch quota is exhausted (or the threshold is reached) prior to the tariff switch, reauthorization occurs as usual. Upon tariff switch, ISG starts using the post-tariff switch quota for prepaid session monitoring. Reauthorization occurs only when either of these quotas is exhausted, not when a tariff change occurs.

This dual-quota approach to accounting for prepaid tariff switching staggers reauthorization requests according to the usage of the subscriber and prevents the billing server from being overwhelmed with reauthorization requests at the time of a tariff switch.

## Benefits of ISG Prepaid Billing

### Concurrent Prepaid Service Access

The ISG Support for Prepaid Billing feature is capable of supporting concurrent prepaid service access while maintaining the same pool of quota at the prepaid billing server. ISG services can be configured for concurrent or sequential access. Concurrent access allows users to log on to a service while simultaneously connected to other services.

### Real-Time Billing

The ISG Support for Prepaid Billing feature allows for real-time billing with maximum flexibility, regardless of the type of service and billing scheme. Users can be billed on a flat rate, air-time, or volume basis.

### Redirection Upon Exhaustion of Quota

When a user runs out of quota, ISG can redirect the user to a portal where the user can replenish the quota without being disconnected from the service.

### Returning Residual Quota

ISG can return residual quota to the billing server from services that a user is logged into but not actively using. The quota that is returned to the billing server can be applied to other services that the user is actively using.

### Threshold Values

ISG enables you to configure threshold values that cause prepaid sessions to be reauthorized before the subscriber completely consumes the allotted quota for a service.

### Traffic Status During Reauthorization

You can prevent revenue leaks by configuring ISG to drop connected traffic during reauthorization of a service. The user remains connected to the service and does not need to log in to the service again, but no traffic is forwarded during the reauthorization process. This prevents a user from continuing to use a service for which the user has run out of quota while ISG sends a reauthorization request to the billing server.

### Simultaneous Volume-Based and Time-Based Prepaid Billing

ISG supports rating on both time and volume simultaneously for prepaid services. The prepaid billing server may allocate quotas in both time and volume, and ISG monitors the session on both these parameters. ISG performs a reauthorization whenever either of these quota types is exhausted.

## How to Configure ISG Support for Prepaid Billing

- [Configuring RADIUS Attribute Support for ISG Prepaid Billing, page 5](#)
- [Creating an ISG Prepaid Billing Configuration, page 6](#)
- [Enabling ISG Prepaid Billing, page 8](#)
- [Redirecting Subscriber Traffic upon Exhaustion of Credit, page 11](#)
- [Forwarding Subscriber Traffic upon Depletion of Quota, page 15](#)
- [Troubleshooting ISG Prepaid Billing Support, page 17](#)

## Configuring RADIUS Attribute Support for ISG Prepaid Billing

Perform this task to enable ISG to include RADIUS attribute 44 in Access-Request packets and attribute 55 in Accounting-Request packets.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **radius-server attribute 44 include-in-access-req [vrf vrf-name]**
4. **radius-server attribute 55 include-in-acct-req**
5. **end**
6. **show subscriber session [detailed] [identifier identifier | uid session-id] username name]**

### DETAILED STEPS

|               | Command or Action                                                                                                                                                 | Purpose                                                                                                                   |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br>Router> enable                                                                                                            | Enables privileged EXEC mode.<br><br><ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul> |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal                                                                                    | Enters global configuration mode.                                                                                         |
| <b>Step 3</b> | <b>radius-server attribute 44 include-in-access-req [vrf vrf-name]</b><br><br><b>Example:</b><br>Router(config)# radius-server attribute 44 include-in-access-req | Sends RADIUS attribute 44 (Accounting Session ID) in Access-Request packets before user authentication.                   |

| Command or Action                                                                                                                                                                      | Purpose                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Step 4</b> <b>radius-server attribute 55 include-in-acct-req</b><br><br><b>Example:</b><br><br>Router(config)# radius-server attribute 55 include-in-acct-req                       | Sends the RADIUS attribute 55 (Event-Timestamp) in Accounting-Request packets. |
| <b>Step 5</b> <b>end</b><br><br><b>Example:</b><br><br>Router(config)# end                                                                                                             | Exits the current configuration mode and returns to privileged EXEC mode.      |
| <b>Step 6</b> <b>show subscriber session [detailed] [identifier identifier   uid session-id] username name]</b><br><br><b>Example:</b><br><br>Router# show subscriber session detailed | (Optional) Displays ISG subscriber session information.                        |

## Creating an ISG Prepaid Billing Configuration

Perform this task to create or modify an ISG prepaid billing configuration. This configuration can be referenced in service profiles or service policy maps in which ISG prepaid support is enabled.

A default prepaid configuration exists with the following parameters:

```
subscriber feature prepaid default
threshold time 0 seconds
threshold volume 0 bytes
method-list authorization default
method-list accounting default
password cisco
```

The default configuration will not show up in the output of the **show running-config** command unless you change any one of the parameters.

The parameters of named prepaid configurations are inherited from the default configuration, so if you create a named prepaid configuration and want only one parameter to be different from the default configuration, you have to configure only that parameter.

This task assumes that AAA method lists, server groups, and servers have been configured. See the Cisco IOS Security Configuration Guide: Securing User Services for more information.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **subscriber feature prepaid** {*name-of-config* | **default**}
4. **interim-interval** *number-of-minutes*
5. **method-list** {**accounting** | **authorization**} *name-of-method-list*
6. **password** *password*
7. **threshold** {**time** *seconds* | **volume** {*kilobytes* **Kbytes** | *megabytes* **Mbytes** | *bytes* **bytes**}}
8. **end**
9. **show subscriber session** [**detailed**] [**identifier** *identifier* | **uid** *session-id* | **username** *name*]

**DETAILED STEPS**

| Command or Action                                                                                                                                                     | Purpose                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1 enable</b><br><br><b>Example:</b><br>Router> enable                                                                                                         | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>                             |
| <b>Step 2 configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal                                                                                 | Enters global configuration mode.                                                                                                            |
| <b>Step 3 subscriber feature prepaid</b> { <i>name-of-config</i>   <b>default</b> }<br><br><b>Example:</b><br>Router(config)# subscriber feature prepaid conf-prepaid | Creates a new ISG prepaid configuration or specifies an existing configuration so it can be modified, and enters prepaid configuration mode. |
| <b>Step 4 interim-interval</b> <i>number-of-minutes</i><br><br><b>Example:</b><br>Router(config-prepaid)# interim-interval 5                                          | Enables interim prepaid accounting and specifies the interval at which ISG will send interim prepaid accounting records.                     |

| Command or Action                                                                                                                                                                                                                                    | Purpose                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 5</b> <b>method-list</b> { <b>accounting</b>   <b>authorization</b> } <i>name-of-method-list</i><br><br><b>Example:</b><br><br>Router(config-prepaid)# method-list accounting list1                                                          | Specifies the AAA method list to be used for ISG prepaid accounting or authorization.                                                                                                                                                                                                                                                                                                            |
| <b>Step 6</b> <b>password</b> <i>password</i><br><br><b>Example:</b><br><br>Router(config-prepaid)# password cisco                                                                                                                                   | Configures the password to be used for ISG prepaid authorization and reauthorization requests.                                                                                                                                                                                                                                                                                                   |
| <b>Step 7</b> <b>threshold</b> { <b>time</b> <i>seconds</i>   <b>volume</b> { <i>kilobytes</i> <b>Kbytes</b>   <i>megabytes</i> <b>Mbytes</b>   <i>bytes</i> <b>bytes</b> }}<br><br><b>Example:</b><br><br>Router(config-prepaid)# threshold time 20 | Configures the threshold at which ISG will send a reauthorization request to the prepaid billing server. <ul style="list-style-type: none"> <li>The quota provided by the billing server minus the configured threshold equals the value at which ISG will send a reauthorization request</li> <li>This command can be entered twice to configure thresholds in both time and volume.</li> </ul> |
| <b>Step 8</b> <b>end</b><br><br><b>Example:</b><br><br>Router(config-prepaid)# end                                                                                                                                                                   | Exits the current configuration mode and returns to privileged EXEC mode.                                                                                                                                                                                                                                                                                                                        |
| <b>Step 9</b> <b>show subscriber session</b> [ <b>detailed</b> ] [ <b>identifier</b> <i>identifier</i>   <b>uid</b> <i>session-id</i>   <b>username</b> <i>name</i> ]<br><br><b>Example:</b><br><br>Router# show subscriber session detailed         | (Optional) Displays ISG subscriber session information.                                                                                                                                                                                                                                                                                                                                          |

## Enabling ISG Prepaid Billing

Perform one of the following tasks to enable prepaid billing in a service policy map or a remote service profile:

- [Enabling ISG Prepaid Billing in a Service Policy Map, page 8](#)
- [Enabling ISG Prepaid Billing in Service Profile on the AAA Server, page 10](#)

### Enabling ISG Prepaid Billing in a Service Policy Map

Perform this task to enable ISG prepaid billing support in a service policy map.



ISG prepaid billing is enabled in a traffic class within a service policy map. This task assumes that you have defined the traffic class map and associated IP access lists. See the module "Configuring ISG Subscriber Services" for more information.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map type service *policy-map-name***
4. **[*priority*] class type traffic *class-map-name***
5. **prepaid config *name-of-configuration***
6. **end**
7. **show subscriber session [**detailed**] [**identifier** *identifier* | **uid** *session-id*| **username** *name*]**

### DETAILED STEPS

| Command or Action                                                                                                                                                     | Purpose                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1 enable</b><br><br><b>Example:</b><br>Router> enable                                                                                                         | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>                      |
| <b>Step 2 configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal                                                                                 | Enters global configuration mode.                                                                                                     |
| <b>Step 3 policy-map type service <i>policy-map-name</i></b><br><br><b>Example:</b><br>Router(config)# policy-map type service mp3                                    | Creates or defines a service policy map, which is used to define an ISG service, and enters service policy-map configuration mode.    |
| <b>Step 4 [<i>priority</i>] class type traffic <i>class-map-name</i></b><br><br><b>Example:</b><br>Router(config-service-policymap)# class type traffic class-acl-101 | Associates a previously configured traffic class with the policy map, and enters control policy-map traffic class configuration mode. |

| Command or Action                                                                                                                                                                                       | Purpose                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 5</b> <code>prepaid config name-of-configuration</code><br><br><b>Example:</b><br><br><pre>Router(config-control-policymap-class-traffic)# prepaid config conf-prepaid</pre>                    | Enables ISG support for prepaid billing and applies a configuration that defines the prepaid billing parameters.<br><br><b>Note</b> The presence of this command does not guarantee that prepaid billing will be applied to the flow. This command causes the first prepaid authorization request. Whether prepaid billing will be applied to the flow is determined by the billing server. |
| <b>Step 6</b> <code>end</code><br><br><b>Example:</b><br><br><pre>Router(config-control-policymap-class-traffic)# end</pre>                                                                             | Exits the current configuration mode and returns to privileged EXEC mode.                                                                                                                                                                                                                                                                                                                   |
| <b>Step 7</b> <code>show subscriber session [detailed] [identifier identifier   uid session-id  username name]</code><br><br><b>Example:</b><br><br><pre>Router# show subscriber session detailed</pre> | (Optional) Displays ISG subscriber session information.                                                                                                                                                                                                                                                                                                                                     |

- [What to Do Next, page 10](#)

## What to Do Next

You may want to configure a method of activating the service policy map or service profile; for example, control policies can be used to activate services. For more information about methods of service activation, see the module "Configuring ISG Subscriber Services."

## Enabling ISG Prepaid Billing in Service Profile on the AAA Server

Perform this task to enable ISG support for prepaid billing in a service profile that is configured on a remote AAA server.

### SUMMARY STEPS

#### 1. Do one of the following:

- Add the ISG Traffic Class attribute to the service profile.
- Cisco-AVpair = "ip:traffic-class=in access-group [<acl\_number> | name <acl\_name>] [priority <n>]"
- Cisco-AVpair = "ip:traffic-class=out access-group [<acl\_number> | name <acl\_name>] [priority <n>]"

#### 2. Add the ISG Prepaid Billing VSA to the service profile.

## DETAILED STEPS

| Command or Action                                                                                                                                                                                                                                                                                                                                                                                                     | Purpose                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> Do one of the following: <ul style="list-style-type: none"> <li>• Add the ISG Traffic Class attribute to the service profile.</li> <li>• Cisco-AVpair = "ip:traffic-class=in access-group [&lt;acl_number&gt;   name &lt;acl_name&gt;] [priority &lt;n&gt;]"</li> <li>• Cisco-AVpair = "ip:traffic-class=out access-group [&lt;acl_number&gt;   name &lt;acl_name&gt;] [priority &lt;n&gt;]"</li> </ul> | Specifies input and output traffic to which the service will apply. <ul style="list-style-type: none"> <li>• Both an input and output traffic classifier can be added to a service profile.</li> </ul> |
| <b>Step 2</b> Add the ISG Prepaid Billing VSA to the service profile.<br><br><b>Example:</b> <pre>26,9,1 = "prepaid-config={&lt;name-of-config&gt;   default"</pre>                                                                                                                                                                                                                                                   | Enables ISG support for prepaid billing and applies a configuration that defines the prepaid billing parameters.                                                                                       |

- [What to Do Next, page 11](#)

## What to Do Next

You may want to configure a method of activating the service policy map or service profile; for example, control policies can be used to activate services. For more information about methods of service activation, see the module "Configuring ISG Subscriber Services".

## Redirecting Subscriber Traffic upon Exhaustion of Credit

Service providers often want to offer subscribers an opportunity to recharge their accounts when they have run out of credit for their prepaid services. The tasks in this section enable you to redirect a subscriber's Layer 4 traffic to a specified server when the subscriber has run out of credit.

Before you configure ISG Layer 4 Redirect for exhaustion of credit, you should understand the following concept:

Perform the following tasks to redirect a subscriber's Layer 4 traffic upon exhaustion of credit:

- [Credit-Exhausted Event, page 11](#)
- [Configuring L4 Redirection in a Service Policy Map, page 12](#)
- [Applying a Service Policy Map to Subscriber Traffic upon Exhaustion of Credit, page 13](#)
- [What to Do Next, page 15](#)

## Credit-Exhausted Event

The ISG credit-exhausted event occurs when the prepaid server responds with an Access-Accept packet with a quota value of zero (time or volume) and an idle timeout greater than zero. In this case, the prepaid server has determined for certain that the subscriber does not have enough credit, but the idle timeout provides a grace period in which the subscriber could recharge the account. Typically, a service provider would want to redirect the subscriber's traffic to a web portal where the subscriber could recharge the account. At the end of the idle-timeout interval, ISG will send a reauthorization request.

The default ISG behavior is to drop subscriber packets when the credit-exhausted event occurs.



#### Note

Layer 4 redirection is one action that a service provider could take when a subscriber has run out of credit. Other actions can be configured instead of or in addition to Layer 4 redirection.

## Configuring L4 Redirection in a Service Policy Map

Perform this task to configure ISG Layer 4 redirection in a service policy map.

The ISG Layer 4 Redirect feature can also be configured in a service profile on a AAA server. For more information about redirecting Layer 4 subscriber traffic, see the "Redirecting Subscriber Traffic Using ISG Layer 4 Redirect" module.

The ISG Layer 4 Redirect feature is configured under a traffic class within the service policy map. This task assumes that you have defined the traffic class map. See the "Configuring ISG Subscriber Services" module for more information.

Traffic can be redirected to a server or server group. If you are redirecting traffic to a server group, this task assumes that the server group has been configured. See the "Configuring ISG Subscriber Services" module for more information about configuring server groups.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map type service** *policy-map-name*
4. [*priority*] **class type traffic** *class-name*
5. **redirect to** {**group** *server-group-name* | **ip** *ip-address* [**port** *port-number*]} [**duration** *seconds*] [**frequency** *seconds*]
6. **end**
7. **show subscriber session** [**detailed**] [**identifier** *identifier* | **uid** *session-id* | **username** *name*]

### DETAILED STEPS

| Command or Action                                                                            | Purpose                                                                                                          |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> <b>enable</b><br><br><b>Example:</b><br>Router> enable                         | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul> |
| <b>Step 2</b> <b>configure terminal</b><br><br><b>Example:</b><br>Router# configure terminal | Enters global configuration mode.                                                                                |

|               | Command or Action                                                                                                                                                                                                                                                 | Purpose                                                                                                                                          |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 3</b> | <b>policy-map type service <i>policy-map-name</i></b><br><br><b>Example:</b><br>Router(config)# policy-map type service redirect-service                                                                                                                          | Creates or defines a service policy map, which is used to define an ISG service and enters service policy-map configuration mode.                |
| <b>Step 4</b> | <b>[<i>priority</i>] class type traffic <i>class-name</i></b><br><br><b>Example:</b><br>Router(config-service-policymap)# class type traffic class-all                                                                                                            | (Optional) Associates a previously configured traffic class with the policy map, and enters service policy-map traffic class configuration mode. |
| <b>Step 5</b> | <b>redirect to {<i>group server-group-name</i>   <i>ip ip-address</i> [<i>port port-number</i>]} [<i>duration seconds</i>] [<i>frequency seconds</i>]</b><br><br><b>Example:</b><br>Router(config-service-policymap-class-traffic)# redirect to group redirect-sg | Redirects traffic to a specified server or server group.                                                                                         |
| <b>Step 6</b> | <b>end</b><br><br><b>Example:</b><br>Router(config-control-policymap-class-traffic)# end                                                                                                                                                                          | Exits the current configuration mode and returns to privileged EXEC mode.                                                                        |
| <b>Step 7</b> | <b>show subscriber session [<i>detailed</i>] [<i>identifier identifier</i>   <i>uid session-id</i>] [<i>username name</i>]</b><br><br><b>Example:</b><br>Router# show subscriber session detailed                                                                 | (Optional) Displays ISG subscriber session information.                                                                                          |

## Applying a Service Policy Map to Subscriber Traffic upon Exhaustion of Credit

Perform this task to configure a control policy and apply a service policy map to subscriber traffic upon exhaustion of credit.

If you specify a named control class map, this task assumes that the class map has been configured. See the "Configuring ISG Control Policies" module for information about configuring control class maps.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **policy-map type control** *policy-map-name*
4. **class type control** {*control-class-name* | **always**} **event credit-exhausted**
5. *action-number* **service-policy type service name** *policy-map-name*
6. **end**
7. **show subscriber session** [**detailed**] [**identifier** *identifier* | **uid** *session-id* | **username** *name*]

**DETAILED STEPS**

|               | Command or Action                                                                                                                                                                                                         | Purpose                                                                                                                    |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br><br>Router> enable                                                                                                                                                                | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>           |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br><br>Router# configure terminal                                                                                                                                        | Enters global configuration mode.                                                                                          |
| <b>Step 3</b> | <b>policy-map type control</b> <i>policy-map-name</i><br><br><b>Example:</b><br><br>Router(config)# policy-map type control policyA                                                                                       | Creates or modifies a policy map that defines a control policy.                                                            |
| <b>Step 4</b> | <b>class type control</b> { <i>control-class-name</i>   <b>always</b> } <b>event credit-exhausted</b><br><br><b>Example:</b><br><br>Router(config-control-policymap)# class type control<br>always event credit-exhausted | Specifies a control class and event for which actions may be configured.                                                   |
| <b>Step 5</b> | <i>action-number</i> <b>service-policy type service name</b> <i>policy-map-name</i><br><br><b>Example:</b><br><br>Router(config-control-policymap-class-control)# 1 service-policy type service name redirect-profile     | Applies the specified service policy map or service profile in which the ISG Layer 4 Redirect feature has been configured. |

| Command or Action                                                                                                                                                                                     | Purpose                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Step 6</b> <code>end</code><br><br><b>Example:</b><br>Router(config-control-policy-map-class-control)# <code>end</code>                                                                            | Exits the current configuration mode and returns to privileged EXEC mode. |
| <b>Step 7</b> <code>show subscriber session [detailed] [identifier identifier   uid session-id] username name]</code><br><br><b>Example:</b><br>Router# <code>show subscriber session detailed</code> | (Optional) Displays ISG subscriber session information.                   |

## What to Do Next

Control policies must be applied to a context by using the **service-policy type control** command.

## Forwarding Subscriber Traffic upon Depletion of Quota

By default, ISG drops subscriber packets when a subscriber's quota has been depleted. This task enables you override the default and forward subscriber traffic when the quota-depleted event occurs.

Before you perform this task you should understand the concept described in the "Quota-Depleted Event" below.

- [Quota-Depleted Event, page 15](#)
- [What to Do Next, page 17](#)

## Quota-Depleted Event

A quota-depleted event occurs when a subscriber's quota is exhausted and ISG has not yet received a reauthorization response from the billing server. This event can occur in two situations:

- When a prepaid threshold is not configured and the subscriber's quota is used up.
- When a prepaid threshold is configured but the quota is exhausted before the prepaid server responds to the reauthorization request that ISG sent when the threshold was met.

The quota-depleted event is not necessarily an indication that a subscriber does not have any more credit. ISG does not know for certain whether the subscriber has any more credit until a reauthorization response is returned from the billing server. For this reason, some service providers may choose to forward subscriber packets upon quota depletion until a reauthorization response is returned.

The default ISG behavior is to drop subscriber packets when a quota-depleted event occurs.

If you specify a named control class map, this task assumes that the class map has been configured. See the module "Configuring ISG Control Policies" for information about configuring control class maps.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **policy-map type control** *policy-map-name*
4. **class type control** {*control-class-name* | **always**} **event quota-depleted**
5. *action-number* **set-param drop-traffic false**
6. **end**
7. **show subscriber session** [**detailed**] [**identifier** *identifier* | **uid** *session-id* | **username** *name*]

**DETAILED STEPS**

|               | Command or Action                                                                                                                                                                                                  | Purpose                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | <b>enable</b><br><br><b>Example:</b><br><br>Router> enable                                                                                                                                                         | Enables privileged EXEC mode.<br><br><ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>                                                        |
| <b>Step 2</b> | <b>configure terminal</b><br><br><b>Example:</b><br><br>Router# configure terminal                                                                                                                                 | Enters global configuration mode.                                                                                                                                              |
| <b>Step 3</b> | <b>policy-map type control</b> <i>policy-map-name</i><br><br><b>Example:</b><br><br>Router(config)# policy-map type control policyB                                                                                | Creates or modifies a policy map that can be applied globally, to an interface, or to an ATM VC to specify a control policy, and enters control policy-map configuration mode. |
| <b>Step 4</b> | <b>class type control</b> { <i>control-class-name</i>   <b>always</b> } <b>event quota-depleted</b><br><br><b>Example:</b><br><br>Router(config-control-policymap)# class type control always event quota-depleted | Specifies a control class and event for which actions may be configured, and enters control policy-map class control configuration mode.                                       |
| <b>Step 5</b> | <i>action-number</i> <b>set-param drop-traffic false</b><br><br><b>Example:</b><br><br>Router(config-control-policymap-class-control)# 1 set-param drop-traffic false                                              | Configures ISG to continue to allow traffic to pass when the quota has been depleted.                                                                                          |



|               | Command or Action                                                                                                                                                    | Purpose                                                                   |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Step 6</b> | <b>end</b><br><br><b>Example:</b><br>Router(config-control-policy-map-class-control)# end                                                                            | Exits the current configuration mode and returns to privileged EXEC mode. |
| <b>Step 7</b> | <b>show subscriber session [detailed] [identifier identifier   uid session-id] username name]</b><br><br><b>Example:</b><br>Router# show subscriber session detailed | (Optional) Displays ISG subscriber session information.                   |

## What to Do Next

Control policies must be applied to a context by using the **service-policy type control** command.

## Troubleshooting ISG Prepaid Billing Support

Perform these steps to troubleshoot ISG prepaid billing support.

### SUMMARY STEPS

1. Use the **show subscriber session** command to make sure the service in which prepaid billing support is configured has been activated.
2. If the service requires service authentication, make sure the authentication succeeded.
3. Make sure the AAA method list referred to in the prepaid billing configuration is valid and has been configured with the **aaa accounting network** command.
4. Use the **test aaa** command to make sure the AAA server is reachable from ISG.
5. Use the **debug subscriber policy prepaid** command to display debug messages about prepaid operation.

### DETAILED STEPS

- 
- |               |                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | Use the <b>show subscriber session</b> command to make sure the service in which prepaid billing support is configured has been activated.                      |
| <b>Step 2</b> | If the service requires service authentication, make sure the authentication succeeded.                                                                         |
| <b>Step 3</b> | Make sure the AAA method list referred to in the prepaid billing configuration is valid and has been configured with the <b>aaa accounting network</b> command. |
| <b>Step 4</b> | Use the <b>test aaa</b> command to make sure the AAA server is reachable from ISG.                                                                              |
| <b>Step 5</b> | Use the <b>debug subscriber policy prepaid</b> command to display debug messages about prepaid operation.                                                       |
-

# Configuration Examples for ISG Prepaid Billing Support

- [ISG Prepaid Billing Support Example, page 18](#)
- [ISG Policies for Handling Credit-Exhausted and Quota-Depleted Prepaid Billing Events Example, page 19](#)

## ISG Prepaid Billing Support Example

The following example shows ISG prepaid billing support configured with the following parameters:

- The time threshold is 20 seconds.
- The volume threshold is 1000 bytes.
- When the quota-depleted event occurs, ISG will drop subscriber packets until the billing server sends another quota.
- When the credit-exhausted event occurs, subscriber packets will be redirected to the server group “redirect-sg”.
- The prepaid service is called “mp3” and is configured directly on the router in a service policy map.
- The AAA method list that will be used for this service to authenticate subscribers is called “cp-mlist”. That is the same method list to which the service accounting records will be sent.
- Prepaid authorization, reauthorization and accounting messages will be sent to the AAA method list called “ap-mlist”.

```

!
aaa authorization network default local
aaa authorization network ap-mlist group sg2
aaa authentication login cp-mlist group sg1
aaa accounting network cp-mlist start-stop group sg1
aaa accounting network ap-mlist start-stop group sg2
service-policy type control RULEA
!
class-map type traffic match-any CLASS-ALL
!
class-map type traffic match-any CLASS-ACL-101
    match access-group input 101
!
policy-map type control RULEA
    class type control always event credit-exhausted
    1 service-policy type service name redirectprofile
!
policy-map type service redirectprofile
    class type traffic CLASS-ALL
    redirect to group redirect-sg
policy-map type service mp3
    class type traffic CLASS-ACL-101
    accounting aaa list cp-mlist
!
authenticate aaa list cp-mlist
!
subscriber feature prepaid conf-prepaid
method-list accounting ap-mlist
method-list authorization default
password cisco
threshold time 20
threshold volume 1000 bytes

```

## ISG Policies for Handling Credit-Exhausted and Quota-Depleted Prepaid Billing Events Example

In the following example, a single control policy called “RULEA” has been defined to override the ISG prepaid default behavior by forwarding subscriber packets after a quota-depleted event and redirecting subscriber packets after a credit-exhausted event:

```
!class-map type traffic match-any CLASS-ALL
!
policy-map type control RULEA
  class type control always event quota-depleted
    1 set-param drop-traffic false
  class type control always event credit-exhausted
    1 service-policy type service name l4redirect
!
policy-map type service l4redirect
  class type traffic CLASS-ALL
    redirect to group SESM
!
subscriber feature prepaid conf-prepaid
  threshold time 100
  threshold volume 1000 bytes
  method-list author prepaidlist
  method-list accounting default
  password cisco
```

## Additional References

### Related Documents

| Related Topic           | Document Title                                                                                                            |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------|
| AAA configuration tasks | The “Authentication, Authorization, and Accounting (AAA)” section in the <i>Cisco IOS XE Security Configuration Guide</i> |
| AAA commands            | <i>Cisco IOS Security Command Reference</i>                                                                               |
| Cisco IOS commands      | <a href="#">Cisco IOS Master Commands List, All Releases</a>                                                              |
| ISG commands            | <a href="#">Cisco IOS Intelligent Services Gateway Command Reference</a>                                                  |

### Standards

| Standard                                                                                                                              | Title |
|---------------------------------------------------------------------------------------------------------------------------------------|-------|
| No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature. | --    |

**MIBs**

| <b>MIB</b>                                                                                                                  | <b>MIBs Link</b>                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature. | To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:<br><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a> |

**RFCs**

| <b>RFC</b> | <b>Title</b> |
|------------|--------------|
| None       | --           |

**Technical Assistance**

| <b>Description</b>                                                                                                                                                                                                                                          | <b>Link</b>                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.                                                                   | <a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a> |
| To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. |                                                                                                                   |
| Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.                                                                                                                                                                |                                                                                                                   |

## Feature Information for ISG Support for Prepaid Billing

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1**      **Feature Information for ISG Support for Prepaid Billing**

| Feature Name                          | Releases   | Feature Configuration Information                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISG: Accounting: Tariff Switching     | 12.2(28)SB | Prepaid tariff switching allows changes in tariffs during the lifetime of a session. ISG supports prepaid tariff switching by using two quotas that correspond to the time before and the the time after the tariff switch point. Tariff switching can also be used between accounting methods, such as switching from prepaid billing to post paid billing. |
| ISG: Accounting: Time-Based Prepaid   | 12.2(28)SB | ISG prepaid billing support allows ISG to check a subscriber's available credit to determine whether to allow the subscriber access to a service and how long the access can last. ISG supports time-based prepaid billing.                                                                                                                                  |
| ISG: Accounting: Volume-Based Prepaid | 12.2(28)SB | ISG prepaid billing support allows ISG to check a subscriber's available credit to determine whether to allow the subscriber access to a service and how long the access can last. ISG supports volume-based prepaid billing.                                                                                                                                |

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