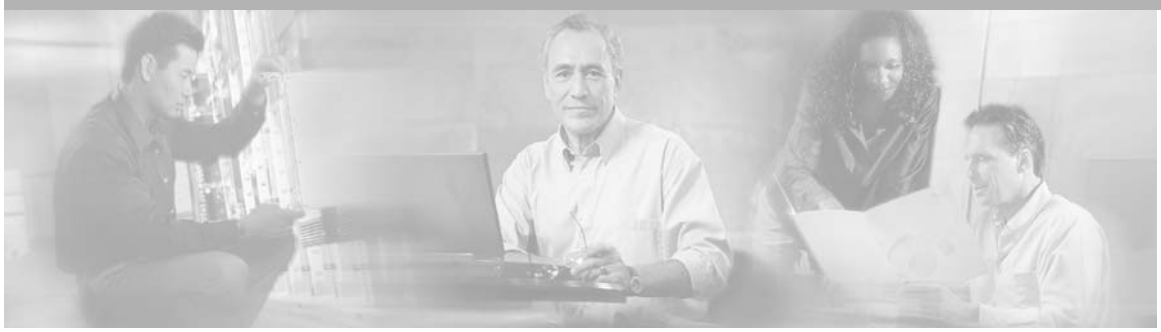

# Cisco IOS Mobile Wireless Command Reference

Release 12.3T

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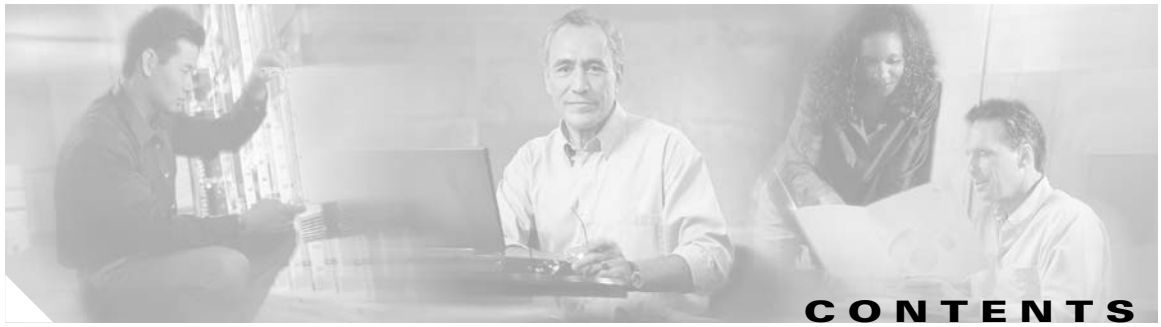
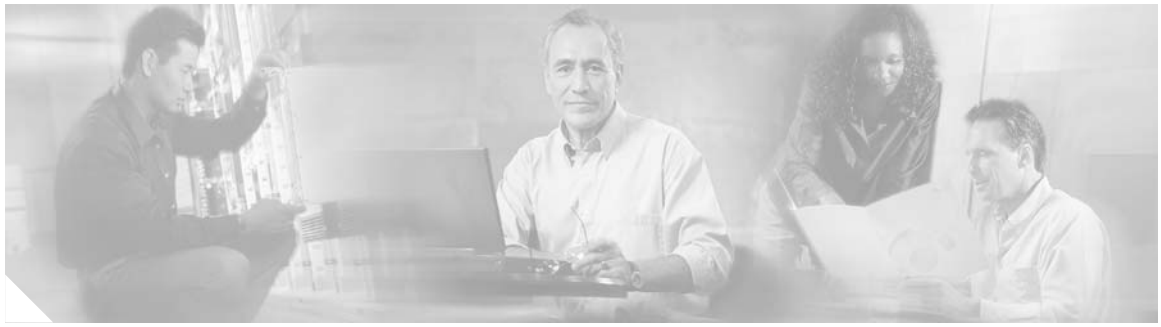
*Mobile Wireless Command Reference, Release 12.3 T*



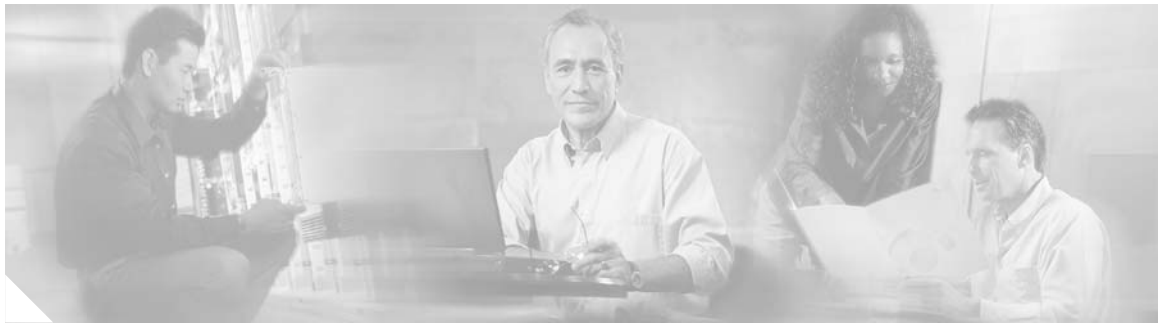
# CONTENTS



# Introduction

This book documents all of the Cisco IOS software commands in Cisco IOS Release 12.3(11)T for the Gateway GPRS Support Node (GGSN), GTP Director Module (GDM), and Packet Data Serving Node (PDSN), in alphabetical order.

For configuration tasks and examples, refer to the *Cisco IOS Mobile Wireless Configuration Guide*.



# Cisco IOS Mobile Wireless Commands

This book documents all of the Cisco IOS software commands in Cisco IOS Release 12.3(11)T for the Gateway GPRS Support Node (GGSN), GTP Director Module (GDM), and Packet Data Serving Node (PDSN), in alphabetical order.

# aaa-accounting

To enable or disable accounting for a particular access point on the GGSN, use the **aaa-accounting** access-point configuration command.

**aaa-accounting** [**enable** | **disable** | **interim update**]

## Syntax Description

| | |
|---|---|
| **enable** | (Optional) Enables accounting on the APN. When you configure an APN for non-transparent access, this is the default value. |
| **disable** | (Optional) Disables accounting on the APN. When you configure an APN for transparent access, this is the default value. |
| interim update | (Optional) Enables interim accounting records to be sent to an accounting server when a routing area update (resulting in an SGSN change) or QoS change has occurred. |

## Defaults

**enable**—For non-transparent APNs

**disable**—For transparent APNs

Interim accounting is disabled.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.2(8)YY | This command was incorporated in GGSN 3.1 and the ability to enable interim accounting records was added. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

You can configure AAA accounting services at an access point. However, for accounting to occur, you also must complete the configuration by specifying the following other configuration elements on the GGSN:

- Enable AAA services using the **aaa new-model** global configuration command.
- Define a server group with the IP addresses of the RADIUS servers in that group using the **aaa group server** global configuration command.
- Configure the following AAA services:
  - AAA authentication using the **aaa authentication** global configuration command
  - AAA authorization using the **aaa authorization** global configuration command

  - AAA accounting using the **aaa accounting** global configuration command

- Assign the type of services that the AAA server group should provide. If you only want the server group to support accounting services, then you need to configure the server for accounting only. You can assign the AAA services to the AAA server groups either at the GPRS global configuration level using the **gprs default aaa-group** command, or at the APN using the **aaa-group** command.
- Configure the RADIUS servers using the **radius-server host** command.

**Note** For more information about AAA and RADIUS global configuration commands, see the *Cisco IOS Security Command Reference.*

You can verify whether AAA accounting services are configured at an APN using the **show gprs access-point** command.

There is not a **no** form of this command.

#### Enabling and Disabling Accounting Services for an Access Point

The Cisco Systems GGSN has different defaults for enabling and disabling accounting services for transparent and non-transparent access points:

- If you configure an APN for non-transparent access using the **access-mode** command, the GGSN automatically enables accounting with authentication at the APN.
- If you configure an APN for transparent access, which is the default access mode, the GGSN automatically disables accounting at the APN.

To selectively disable accounting at specific APNs where you do not want that service, use the **aaa-accounting disable** access-point configuration command.

#### Configuring Interim Accounting for an Access Point

Using the **aaa-accounting interim** access-point configuration command, you can configure the GGSN to send Interim-Update Accounting requests to the AAA server when a routing area update (resulting in an SGSN change) or QoS change has occurred for a PDP context. These changes are conveyed to the GGSN by an Update PDP Context request.

**Note** Interim accounting support requires that accounting services be enabled for the APN and that the **aaa accounting update newinfo** global configuration command be configured.

There is not a **no** form of this command.

## Examples

#### Example 1

The following configuration example disables accounting at access-point 1:

```
interface virtual-template 1
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn.com
  access-mode non-transparent
  aaa-accounting disable
```

### Example 2

The following configuration example enables accounting on transparent access-point 4. Accounting is disabled on access-point 5 because it is configured for transparent mode and the **aaa-accounting enable** command is not explicitly configured.

Accounting is automatically enabled on access-point 1 because it has been configured for non-transparent access mode. Accounting is explicitly disabled at access-point 3, because accounting is automatically enabled for non-transparent access mode.

An example of some of the AAA and RADIUS global configuration commands are also shown:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
aaa group server radius foo1
 server 10.10.0.1
aaa group server radius foo2
 server 10.2.3.4
 server 10.10.0.1
aaa group server foo3
 server 10.6.7.8
 server 10.10.0.1
!
aaa authentication ppp foo group foo
aaa authentication ppp foo2 group foo2
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
aaa accounting network foo1 start-stop group foo1
aaa accounting network foo2 start-stop group foo2
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
  access-point-name www.pdn1.com
  aaa-group authentication foo
!
 access-point 3
  access-point-name www.pdn2.com
  access-mode non-transparent
  aaa-accounting disable
  aaa-group authentication foo
!
 access-point 4
  access-point-name www.pdn3.com
  aaa-accounting enable
  aaa-group accounting foo1
!
 access-point 5
  access-point-name www.pdn4.com
!
gprs default aaa-group authentication foo2
gprs default aaa-group accounting foo3
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.10.0.1 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

**Related Commands**

| Command | Description |
|---|---|
| aaa accounting | Enables AAA accounting of requested services for billing or security purposes. |
| aaa authorization | Sets parameters that restrict user access to a network. |
| aaa group server | Groups different server hosts into distinct lists and distinct methods. |
| aaa-group | Specifies a RADIUS server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| gprs default aaa-group | Specifies a default RADIUS server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| radius-server host | Specifies a RADIUS server host. |
| show gprs access-point | Displays information about access points on the GGSN. |

# aaa-group

To specify a AAA server group and assign the type of AAA services to be supported by the server group for a particular access point on the GGSN, use the **aaa-group** access-point configuration command. To remove a AAA server group, use the **no** form of this command.

**aaa-group** {**authentication** | **accounting**} *server-group*

**no aaa-group** {**authentication** | **accounting**} *server-group*

## Syntax Description

| | |
|---|---|
| **authentication** | Assigns the selected server group for authentication services on the APN. |
| **accounting** | Assigns the selected server group for accounting services only on the APN. |
| *server-group* | Specifies the name of a AAA server group to be used for AAA services on the APN.<br>**Note** The name of the AAA server group that you specify must correspond to a server group that you configure using the **aaa group server** command. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The Cisco Systems GGSN supports authentication and accounting at APNs using AAA server groups. By using AAA server groups, you gain the following benefits:

- You can selectively implement groups of servers for authentication and accounting at different APNs.
- You can configure different server groups for authentication services and accounting services in the same APN.
- You can control which RADIUS services you want to enable at a particular APN, such as AAA accounting.

The GGSN supports the implementation of AAA server groups at both the global and access-point configuration levels. You can minimize your configuration by specifying the configuration that you want to support across most APNs, at the global configuration level. Then, at the access-point configuration level, you can selectively modify the services and server groups that you want to support at a particular APN. Therefore, you can override the AAA server global configuration at the APN configuration level.

To configure a default AAA server group to be used for all APNs on the GGSN, use the **gprs default aaa-group** global configuration command. To specify a different AAA server group to be used at a particular APN for authentication or accounting, use the **aaa-group** access-point configuration command.

If accounting is enabled on the APN, then the GGSN looks for an accounting server group to be used for the APN in the following order:

- First, at the APN for an accounting server group—configured in the **aaa-group accounting** command.
- Second, for a global GPRS default accounting server group—configured in the **gprs default aaa-group accounting** command.
- Third, at the APN for an authentication server group—configured in the **aaa-group authentication** command.
- Last, for a global GPRS default authentication server group—configured in the **gprs default aaa-group authentication** command.

If none of the above commands are configured on the GGSN, then AAA accounting is not performed.

If authentication is enabled on the APN, then the GGSN first looks for an authentication server group at the APN, configured in the **aaa-group authentication** command. If an authentication server group is not found at the APN, then the GGSN looks for a globally configured, GPRS default authentication server group, configured in the **gprs default aaa-group authentication** command.

To complete the configuration, you also must specify the following configuration elements on the GGSN:

- Enable AAA services using the **aaa new-model** global configuration command.
- Configure the RADIUS servers using the **radius-server host** command.
- Define a server group with the IP addresses of the RADIUS servers in that group using the **aaa group server** global configuration command.
- Configure the following AAA services:
  - AAA authentication using the **aaa authentication** global configuration command
  - AAA authorization using the **aaa authorization** global configuration command
  - AAA accounting using the **aaa accounting** global configuration command
- Enable the type of AAA services (accounting and authentication) to be supported on the APN.
  - The GGSN enables accounting by default for non-transparent APNs.

    You can enable or disable accounting services at the APN using the **aaa-accounting** command.
  - Authentication is enabled by default for non-transparent APNs. There is not any specific command to enable or disable authentication. Authentication cannot be enabled for transparent APNs.

You can verify the AAA server groups that are configured for an APN using the **show gprs access-point** command.

**Note** For more information about AAA and RADIUS global configuration commands, see the *Cisco IOS Security Command Reference.*

## Examples

The following configuration example defines four AAA server groups on the GGSN: foo, foo1, foo2, and foo3, shown by the **aaa group server** commands.

Using the **gprs default aaa-group** command, two of these server groups are globally defined as default server groups: foo2 for authentication, and foo3 for accounting.

At access-point 1, which is enabled for authentication, the default global authentication server group of foo2 is overridden and the server group named foo is designated to provide authentication services on the APN. Notice that accounting services are not explicitly configured at that access point, but are automatically enabled because authentication is enabled. Because there is a globally defined accounting server-group defined, the server named foo3 will be used for accounting services.

At access-point 2, which is enabled for authentication, the default global authentication server group of foo2 is used. Because there is a globally defined accounting server-group defined, the server named foo3 will be used for accounting services.

At access-point 4, which is enabled for accounting using the **aaa-accounting enable** command, the default accounting server group of foo3 is overridden and the server group named foo1 is designated to provide accounting services on the APN.

Access-point 5 does not support any AAA services because it is configured for transparent access mode, and accounting is not enabled.

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
aaa group server radius foo1
 server 10.10.0.1
aaa group server radius foo2
 server 10.2.3.4
 server 10.10.0.1
aaa group server foo3
 server 10.6.7.8
 server 10.10.0.1
!
aaa authentication ppp foo group foo
aaa authentication ppp foo2 group foo2
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
aaa accounting network foo1 start-stop group foo1
aaa accounting network foo2 start-stop group foo2
aaa accounting network foo3 start-stop group foo3
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
  access-point-name www.pdn1.com
  aaa-group authentication foo
!
 access-point 2
  access-mode non-transparent
  access-point-name www.pdn2.com
!
 access-point 4
```

```
  access-point-name www.pdn4.com
  aaa-accounting enable
  aaa-group accounting foo1
!
 access-point 5
  access-point-name www.pdn5.com
!
gprs default aaa-group authentication foo2
gprs default aaa-group accounting foo3
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.10.0.1 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

## Related Commands

| Command | Description |
|---|---|
| aaa accounting | Enables AAA accounting of requested services for billing or security purposes. |
| aaa authorization | Sets parameters that restrict user access to a network. |
| aaa group server | Groups different server hosts into distinct lists and distinct methods. |
| aaa-accounting | Enables or disables accounting for a particular access point on the GGSN. |
| gprs default aaa-group | Specifies a default RADIUS server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| radius-server host | Specifies a RADIUS server host. |
| show gprs access-point | Displays information about access points on the GGSN. |

# access-mode

To specify whether the GGSN requests user authentication at the access point to a PDN, use the **access-mode** access-point configuration command. To remove an access mode and return to the default value, use the **no** form of this command.

**access-mode** {**transparent** | **non-transparent**}

**no access-mode** {**transparent** | **non-transparent**}

## Syntax Description

| | |
|---|---|
| **transparent** | Specifies that the users who access the PDN through the access point associated with the current virtual template are allowed access without authorization or authentication. |
| **non-transparent** | Specifies that the users who access the PDN through the current virtual template must be authenticated by the GGSN acting as a proxy for the authentication. |

## Defaults

**transparent**

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **access-mode** command to specify whether users accessing a PDN through a particular access point associated with the virtual template interface have transparent or non-transparent access to the network.

Transparent access means that users who access the PDN through the current virtual template are granted access without further authentication.

Non-transparent access means that users who access the PDN through the current virtual template must be authenticated by the GGSN. You must configure non-transparent access to support RADIUS services at an access point. Authentication is performed by the GGSN while establishing the PDP context.

## Examples

### Example 1

The following example specifies non-transparent access to the PDN, gprs.pdn.com, through access-point 1:

```
interface virtual-template 1
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn.com
  access-mode non-transparent
```

### Example 2

The following example specifies transparent access to the PDN, gprs.pdn2.com, through access-point 2:

```
interface virtual-template 1
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 2
  access-point-name gprs.pdn2.com
```

**Note** Because transparent is the default access mode, it does not appear in the output of the **show running-configuration** command for the access point.

## Related Commands

| Command | Description |
|---|---|
| aaa-group | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| **access-point** | Specifies an access-point number and enters access-point configuration mode. |
| gprs default aaa-group | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |

# access-point

To specify an access point number and enter access-point configuration mode, use the **access-point** access-point list configuration command. To remove an access point number, use the **no** form of this command.

**access-point** *access-point-index*

**no access-point** *access-point-index*

## Syntax Description

| | |
|---|---|
| *access-point-index* | Integer from 1 to 65535 that identifies a GPRS access point. |

## Defaults

No default behavior or values.

## Command Modes

Access-point list configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **access-point** command to create an access point to a PDN.

To configure an access point, first set up an access-point list using the **gprs access-point-list** command and then add the access point to the access-point list.

You can specify access point numbers in any sequence.

**Note** Memory constraints might occur if you define a large number of access points to support VPN Routing and Forwarding (VRF).

## Examples

The following example configures an access point with an index number of 7 in an access-point-list named “abc” on the GGSN:

```
gprs access-point-list abc
 access-point 7
```

**Related Commands**

| Command | Description |
|---|---|
| **access-point-name** | Specifies the network (or domain) name for a PDN that users can access from the GGSN at a defined access point. |
| gprs access-point-list | Configures an access point list that you use to define PDN access points on the GGSN. |

# access-point-name

To specify the network (or domain) name for a PDN that users can access from the GGSN at a defined access point, use the **access-point-name** access-point configuration command. To remove an access point name, use the **no** form of this command.

**access-point-name** *apn-name*

**no access-point-name** *apn-name*

## Syntax Description

| | |
|---|---|
| *apn-name* | Specifies the network or domain name of the private data network that can be accessed through the current access point. |

## Defaults

There is no default value for this command.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **access-point-name** command to specify the PDN name of a network that can be accessed through a particular access point. An access-point name is mandatory for each access point.

To configure an access point, first set up an access-point list using the **gprs access-point-list** command and then add the access point to the access-point list.

The access-point name typically is the domain name of the service provider that users access, for example, www.isp.com.

## Examples

The following example specifies the access-point name for a network:

```
access-point 1
 access-point-name www.isp.com
 exit
```

**Related Commands**

| Command | Description |
|---|---|
| **access-point** | Specifies an access point number and enters access-point configuration mode. |

# access-type

To specify whether an access point is real or virtual on the GGSN, use the **access-type** access-point configuration command. To return to the default value, use the **no** form of this command.

**access-type** {**virtual** | **real**}

**no access-type** {**virtual** | **real**}

## Syntax Description

| | |
|---|---|
| **virtual** | Specifies an APN type that is not associated with any specific physical target network on the GGSN. |
| **real** | Specifies an APN type that corresponds to an external physical network to a PDN on the GGSN. This is the default value. |

## Defaults

**real**

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **access-type** command to specify whether an access point is real or virtual on the GGSN. You only need to configure this command for virtual access types.

Virtual access types are used to configure virtual APN support on the Cisco Systems GGSN to minimize provisioning issues in other GPRS network entities that require configuration of APN information. Using the virtual APN feature on the Cisco Systems GGSN, HLR subscription data can simply provide the name of the virtual APN. User's can still request access to specific target networks that are accessible by the GGSN without requiring each of those destination APNs to be provisioned at the HLR.

The default keyword, **real**, identifies a physical target network that the GGSN can reach. Real APNs must always be configured on the GGSN to reach external networks. Virtual APNs can be configured in addition to real access points to ease provisioning in the GPRS PLMN.

No other access-point configuration commands are applicable if the access type is virtual.

## Examples

The following example shows configuration of a virtual access point type and a real access point type:

```
access-point 1
 access-point-name corporate
```

```
 access-type virtual
 exit
access-point 2
 access-point-name corporatea.com
 ip-address-pool dhcp-client
 dhcp-server 10.21.21.1
```

## Related Commands

| Command | Description |
|---|---|
| **access-point** | Specifies an access point number and enters access-point configuration mode. |
| access-point-name | Specifies the network (or domain) name for a PDN that users can access from the GGSN at a defined access point. |

# access-violation deactivate-pdp-context

To specify that a user's session be ended and the user packets discarded when a user attempts unauthorized access to a PDN through an access point, use the **access-violation deactivate-pdp-context** command. To return to the default value, use the **no** form of this command.

**access-violation deactivate-pdp-context**

**no access-violation deactivate-pdp-context**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The user's session remains active and the user packets are discarded.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW and the **discard-packets** option was removed. |
| 12.2(8)YY | This command was incorporated in Cisco IOS Release 12.2(8)YY. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **access-violation deactivate-pdp-context** command to specify the action that is taken if a user attempts unauthorized access through the specified access point.

The default is that the GGSN simply drops user packets when an unauthorized access is attempted. However, if you specify **access-violation deactivate-pdp-context**, the GGSN terminates the user's session in addition to discarding the packets.

## Examples

The following example shows deactivation of a user's access in addition to discarding the user packets:

```
access-point 1
 access-point-name pdn.aaaa.com
 ip-access-group 101 in
 access-violation deactivate-pdp-context
 exit
```

**Related Commands**

| Command | Description |
|---|---|
| **access-point-name** | Specifies the network (or domain) name for a PDN that users can access from the GGSN at a defined access point. |

# aggregate

To configure the GGSN to create an aggregate route in its IP routing table, when receiving PDP requests from MSs on the specified network, for a particular access point on the GGSN, use the **aggregate** access-point configuration command. To remove an aggregate route, use the **no** form of this command.

**aggregate** {**auto** | *ip-network-prefix*{*/mask-bit-length* | *ip-mask*}}

**no aggregate** {**auto** | *ip-network-prefix*{*/mask-bit-length* | *ip-mask*}}

## Syntax Description

| | |
|---|---|
| **auto** | IP address mask sent by the DHCP or RADIUS server is used by the access point for route aggregation. |
| *ip-network-prefix* | Dotted decimal notation of the IP network address to be used by the GGSN for route aggregation, in the format *a.b.c.d*. |
| */mask-bit-length* | Number of bits (as an integer) that represent the network portion of the specified IP network address. A forward slash is required before the integer.<br>**Note** There is no space between the *ip-network-prefix* and the slash (/). |
| *ip-mask* | Dotted decimal notation of the IP network mask (in the format *e.f.g.h.*), which represents the network and host portion of the specified IP network address. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN uses a static host route to forward user data packets received from the Gi interface to the Gn interface using the virtual template interface of the GTP tunnel.

Without the **aggregate** command or **gprs default aggregate** command, the GGSN creates a static host route for each PDP context. For example, for 45,000 PDP contexts supported, the GGSN creates 45,000 static host routes in its IP routing table.

You can use the **aggregate** command to reduce the number of static routes implemented by the GGSN for PDP contexts at a particular access point. The **aggregate** command allows you to specify an IP network prefix to combine the routes of PDP contexts from the same network as a single route on the GGSN.

To configure the GGSN to automatically aggregate routes that are returned by a DHCP or RADIUS server, use the **aggregate auto** command at the APN. Automatic route aggregation can be configured at the access-point configuration level only on the GGSN. The **gprs default aggregate** global configuration command does not support the **auto** option; therefore, you cannot configure automatic route aggregation globally on the GGSN.

You can specify multiple **aggregate** commands at each access point to support multiple network aggregates. However, if you use the **aggregate auto** command at the APN, you cannot specify any other aggregate route ranges at the APN. If you need to handle other static route cases at the APN, then you will have to use the **gprs default aggregate** global configuration command.

To globally define an aggregate IP network address range for all access points on the GGSN for statically derived addresses, you can use the **gprs default aggregate** command. Then, you can use the **aggregate** command to override this default address range at a particular access point.

The GGSN responds in the following manner to manage routes for MSs through an access point, when route aggregation is configured in the following scenarios:

- No aggregation is configured on the GGSN, at the APN or globally—The GGSN inserts the 32-bit host route of the MS into its routing table as a static route.
- A default aggregate route is configured globally, but no aggregation is configured at the APN:
  - If a statically or dynamically derived address for an MS matches the default aggregate route range, the GGSN inserts an aggregate route into its routing table.
  - If the MS address does not match the default aggregate route, the GGSN inserts the 32-bit host route as a static route into the routing table.
- A default aggregate route is configured globally, and automatic route aggregation is configured at the APN:
  - If a statically derived address for an MS matches the default aggregate route range, the GGSN inserts an aggregate route into its routing table.
  - If a statically derived address for an MS does not match the default aggregate route, the GGSN inserts the 32-bit host route as a static route into its routing table.
  - If a dynamically derived address for an MS is received, the GGSN aggregates the route based on the address and mask returned by the DHCP or RADIUS server.
- A default aggregate route is configured globally, and an aggregate route is also configured at the APN:
  - If a statically or dynamically derived address for an MS matches the aggregate range at the APN through which it was processed, or otherwise matches the default aggregate range, the GGSN inserts an aggregate route into its routing table.
  - If a statically or dynamically derived address for an MS does not match either the aggregate range at the APN, or the global default aggregate range, the GGSN inserts the 32-bit host route as a static route into its routing table.

Use care when assigning IP addresses to an MS before you configure the aggregation ranges on the GGSN. A basic guideline is to aggregate as many addresses as possible, but to minimize your use of aggregation with respect to the total amount of IP address space being used by the access point.

**Note** The **aggregate** command and **gprs default aggregate** commands affect routing on the GGSN. Use care when planning and configuring IP address aggregation.

Use the **show gprs access-point** command to display information about the aggregate routes that are configured on the GGSN. The aggregate output field appears only when aggregate routes have been configured on the GGSN, or the **auto** option is configured.

Use the **show ip route** command to verify whether the static route is in the current IP routing table on the GGSN. The static route created for any PDP requests (aggregated or non-aggregated) appears with the code "U" in the routing table indicating a per-user static route.

**Note** The **show ip route** command only displays a static route for aggregated PDP contexts if PDP contexts on that network have been created on the GGSN. If you configure route aggregation on the GGSN, but no PDP requests have been received for that network, the static route does not appear.

## Examples

### Example 1

The following example specifies two aggregate network address ranges for access point 8. The GGSN will create aggregate routes for PDP context requests received from MSs with IP addresses on the networks 172.16.0.0 and 10.0.0.0:

```
gprs access-point-list gprs
 access-point 8
   access-point-name pdn.aaaa.com
   aggregate 172.16.0.0/16
   aggregate 10.0.0.0/8
```

**Note** Regardless of the format in which you configure the **aggregate** command, the output from the **show running-configuration** command always displays the network in the dotted decimal/integer notation.

### Example 2

The following example shows a route aggregation configuration for access point 8 using DHCP on the GGSN, along with the associated output from the **show gprs gtp pdp-context all** command and the **show ip route** commands.

Notice that the **aggregate auto** command is configured at the access point where DHCP is being used. The **dhcp-gateway-address** command specifies the subnet addresses to be returned by the DHCP server. This address should match the IP address of a loopback interface on the GGSN. In addition, to accommodate route aggregation for another subnet 10.80.0.0, the **gprs default aggregate** global configuration command is used.

In this example, the GGSN aggregates routes for dynamically derived addresses for MSs through access point 8 based upon the address and mask returned by the DHCP server. For PDP context requests received for statically derived addresses on the 10.80.0.0 network, the GGSN also implements an aggregate route into its routing table, as configured by the **gprs default aggregate** command.

```
interface Loopback0
 ip address 10.80.0.1 255.255.255.255
!
interface Loopback2
 ip address 10.88.0.1 255.255.255.255
!
```

```
gprs access-point-list gprs
 access-point 8
   access-point-name pdn.aaaa.com
   ip-address-pool dhcp-proxy-client
   aggregate auto
   dhcp-server 172.16.43.35
   dhcp-gateway-address 10.88.0.1
   exit
!
gprs default aggregate 10.80.0.0 255.255.255.0
```

In the following output for the **show gprs gtp pdp-context all** command, 5 PDP context requests are active on the GGSN for pdn.aaaa.com from the 10.88.0.0/24 network:

```
router# show gprs gtp pdp-context all
TID              MS Addr         Source  SGSN Addr       APN
6161616161610001 10.88.0.1       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610002 10.88.0.2       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610003 10.88.0.3       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610004 10.88.0.4       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610005 10.88.0.5       DHCP    172.16.123.1    pdn.aaaa.com
```

The following output for the **show ip route** command shows a single static route in the IP routing table for the GGSN, which routes the traffic for the 10.88.0.0/24 subnet through the virtual template (or Virtual-Access1) interface:

```
Router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.80.0.0/16 is subnetted, 1 subnets
C       10.80.0.0 is directly connected, Loopback0
     10.113.0.0/16 is subnetted, 1 subnets
C       10.113.0.0 is directly connected, Virtual-Access1
     172.16.0.0/16 is variably subnetted, 3 subnets, 3 masks
C       172.16.43.192/28 is directly connected, FastEthernet0/0
S       172.16.43.0/24 is directly connected, FastEthernet0/0
S       172.16.43.35/32 is directly connected, Ethernet2/3
     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
U       10.88.0.0/24 [1/0] via 0.0.0.0, Virtual-Access1
C       10.88.0.0/16 is directly connected, Loopback2
```

## Related Commands

| Command | Description |
|---|---|
| **gprs default aggregate** | Configures the GGSN to create an aggregate route in its IP routing table when receiving PDP requests from MSs on the specified network for any access point on the GGSN. |
| show gprs access-point | Displays information about access points on the GGSN. |
| show ip route | Displays all static IP routes, or those installed using the AAA route download function. |

# anonymous user

To configure anonymous user access at an access point, use the **anonymous user** access-point configuration command. To remove the username configuration, use the **no** form of this command.

**anonymous user** *username* [*password*]

**no anonymous user** *username* [*password*]

## Syntax Description

| | |
|---|---|
| *username* | Alphanumeric string identifying user. The username argument can be only one word. It can contain any combination of numbers and characters. |
| *password* | Alphanumeric string. The password argument can be only one word. It can contain any combination of numbers and characters. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use this command to allow a mobile station (MS) to access a non-transparent mode APN without supplying the username and password in the GTP protocol configuration option (PCO) information element (IE) of the create PDP context request message. The GGSN will use the username and password configured on the APN for the user session.

This command enables anonymous access, which means that a PDP context can be created by an MS to a specific host without specifying a username and password.

## Examples

The following example specifies the username george and the password abcd123 for anonymous access at access point 49:

```
gprs access-point-list abc
 access-point 49
   access-point-name www.pdn.com
   anonymous user george abcd123
```

# block count

To lock out group members for a length of time after a set number of incorrect passwords, use the **block count** command in local RADIUS server group configuration mode. To remove the user block after invalid login attempts, use the **no** form of this command.

**block count** *count* **time** {*seconds* | **infinite}**

**no block count** *count* **time** {*seconds* | **infinite}**

## Syntax Description

| | |
|---|---|
| *count* | Number of failed passwords that triggers a lockout. |
| **time** | Time that the lockout should last. |
| *seconds* | Number of seconds that the lockout should last. |
| **infinite** | Length of time for the lockout is indefinite until an administrator manually unblocks the locked username. |

## Defaults

No default behavior or values

## Command Modes

Local RADIUS server group configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

If a setting of **infinite** is entered, an administrator must manually unblock the locked username.

## Examples

The following command locks out group members for 120 seconds after 3 incorrect passwords are entered:

```
block count 3 time 120
```

## Related Commands

| Command | Description |
|---|---|
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |

| Command | Description |
|---|---|
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# block-foreign-ms

To restrict GPRS access based on the mobile user's home PLMN, use the **block-foreign-ms** access-point configuration command. To disable blocking of foreign subscribers, use the **no** form of this command.

**block-foreign-ms**

**no block-foreign-ms**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YD | This command was introduced. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The **block-foreign-ms** command enables the GGSN to block foreign MSs from accessing the GGSN.

When you use this command, the GGSN determines if an MS is inside or outside of the PLMN based on the mobile country code (MCC) and mobile network code (MNC). The MCC and MNC are specified using the **gprs mcc mnc** command.

## Examples

The following example blocks access to foreign MSs at access point 49:

```
gprs access-point-list abc
 access-point 49
   access-point-name www.pdn.com
   block-foreign-ms
```

## Related Commands

| Command | Description |
|---|---|
| **gprs mcc mnc** | Configures the mobile country code and mobile network code that the GGSN uses to determine whether a create PDP context request is from a foreign MS. |

# cdma pdsn a10 ahdlc engine

To limit the number of Asynchronous High-Level Data Link Control (AHDLC) channel resources provided by the AHDLC engine, use the **cdma pdsn a10 ahdlc engine** command to in global configuration mode. To reset the number of AHDLC channel resources to the default, use the **no** form of this command.

**cdma pdsn a10 ahdlc engine** *slot* **usable-channels** *usable-channels*

**no cdma pdsn a10 ahdlc engine** *slot* **usable-channels**

## Syntax Description

| | |
|---|---|
| *slot* | Slot number of the AHDLC. |
| ***usable-channels*** *usable-channels* | Maximum number of channels that can be opened in the AHDLC engine. Valid values range between 0 and 8000 or 20000. Specifying 0 disables the engine. |

## Defaults

The default number of usable channels equals the maximum channels supported by the engine; the c-5 images supports 8000 sessions, and all c-6 image support 20000 sessions.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.2(8)BY | The maximum number of usable channels was increased to 20000. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

If the value of *usable-channels* is greater than default maximum channels provided by the engine, the command will fail.

If the engine has any active channels, the command will fail.

## Examples

The following example limits the number of service channels provided by the AHDLC engine to 1000:

```
cdma pdsn a10 ahdlc engine 0 usable-channels 1000
```

## Related Commands

| Command | Description |
|---|---|
| **debug cdma pdsn a10 ahdlc** | Displays debug messages for the AHDLC engine. |
| **show cdma pdsn a10 ahdlc** | Displays information about the AHDLC engine. |
| show cdma pdsn resource | Displays AHDLC resource information. |

# cdma pdsn a10 gre sequencing

To enable inclusion of Generic Routing Encapsulation (GRE) sequence numbers in the packets sent over the A10 interface, use the **cdma pdsn gre sequencing** command in global configuration mode. To disable the inclusion of GRE sequence number in the packets sent over the A10 interface, use the **no** form of this command.

**cdma pdsn a10 gre sequencing**

**no cdma pdsn a10 gre sequencing**

## Syntax Description

This command has no arguments or keywords.

## Defaults

GRE sequence numbers are included in the packets sent over the A10 interface.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example instructs Cisco PDSN to include per-session GRE sequence numbers in the packets sent over the A10 interface:

```
cdma pdsn a10 gre sequencing
```

## Related Commands

| Command | Description |
|---|---|
| debug cdma pdsn a10 gre | Displays debug messages for A10 GRE interface errors. |
| show cdma pdsn pcf | Displays information about PCFs that have R-P tunnels to the PDSN. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn a10 init-ppp-after-airlink-start airlink-start-timeout

To configure the PDSN so that Point-to-Point Protocol (PPP) negotiation with an MN will start only after the traffic channel is assigned, ( inother words, after a Registration Request with airlink-start is received), use the **cdma pdsn a10 init-ppp-after-airlink-start** command in global configuration mode. Use the **no** form of this command to revert to the default behavior.

**cdma pdsn a10 init-ppp-after-airlink-start airlink-start-timeout** *1-120*

**no cdma pdsn a10 init-ppp-after-airlink-start airlink-start-timeout** *1-120*

## Syntax Description

| | |
|---|---|
| 1-120 | Sets the timeout interval before the session is torn down. |

## Defaults

By default, this CLI is not enabled, therefore, the PDSN will initiate PPP negotiation immediately after a Registration Reply is sent to the initial Registration.Request.

When enabled, the default timeout interval is 10 seconds.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB4a | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The PDSN initiates PPP negotiation immediately after a Registration Reply is sent to the initial Registration Request, but the calls (for which the PPP negotiation has started before the traffic channel is assigned to MN) have failed.

When this command is enabled, the PPP negotiation withthe MN will start only after the traffic channel is assigned—after a Registration Request with airlink-start is received. If the airlink start is not received at all, the session will be torn down when timeout occurs.By default, this timeout interval is 10 seconds, or can be configured through the CLI.

The session is not torn down immediately after the timeout, so, in order to minimize the impact on the performance, there is just one timer started to keep track of all the sessions waiting for airlink-start to start PPP.

For example, take the default of 10 seconds. If the timer expires at t1 and a new call comes at t2( t2 >t1), the next run of the timer will be at t1+10. It is likely that the uptime for the call is not more than 10 seconds since t2 > t1. So the call will be checked at the next next run (t1+10+10). That is , the variation is between 1 and 10.

## Examples

The following example illustrates the **cdma pdsn a10 init-ppp-after-airlink-start airlink-start-timeout** command:

```
router# cdma pdsn a10 init-ppp-after-airlink-start airlink-start-timeout 20
```

# cdma pdsn a10 max-lifetime

To specify the maximum A10 registration lifetime accepted, use the **cdma pdsn a10 max-lifetime** command in global configuration mode. To return to the default length of time, use the **no** form of this command.

**cdma pdsn a10 max-lifetime** *seconds*

**no cdma pdsn a10 max-lifetime**

## Syntax Description

| | |
|---|---|
| seconds | Maximum A10 registration lifetime accepted by Cisco PDSN. The range is 1 to 65535 seconds. The default is 1800 seconds. |

## Defaults

1800 seconds.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example specifies that the A10 interface will be maintained for 1440 seconds:

```
cdma pdsn a10 max-lifetime 1440
```

## Related Commands

| Command | Description |
|---|---|
| cdma pdsn a10 gre sequencing | Enables GRE sequence number checking on packets received over the A10 interface. |
| debug cdma pdsn a10 gre | Displays debug messages for A10. |
| show cdma pdsn pcf | Displays information about PCFs that have R-P tunnels to the PDSN. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn a11 dormant ppp-idle-timeout send-termreq

To specify that for dormant sessions, on ppp idle timeout, ppp termreq will be sent, use the **cdma pdsn all dormant ppp-idle-timeout send-termreq** command in global configuration mode. To disble this feature, use the **no** form of this command.

**cdma pdsn all dormant ppp-idle-timeout send-termreq**

**no cdma pdsn all dormant ppp-idle-timeout send-termreq**

## Syntax Description

There are no keywords or variable for this command.

## Defaults

There are no default values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Disabling this behaviour will avoid traffic channel allocation for cleaning up ppp sessions at the mobile.

## Examples

router# cdma pdsn a11 dormant ppp-idle-timeout send-termreq

# cdma pdsn a11 mandate presence airlink-setup

To mandate that the initial RRQ should have Airlink-Setup in Acct CVSE from PCF, use the **cdma pdsn all mandate presence airlink-setup** command in global configuration mode. To disable this feature, use the **no** form of this command.

**cdma pdsn a11 mandate presence airlink-setup**

**no cdma pdsn a11 mandate presence airlink-setup**

## Syntax Description

This command has no keywords or variables.

## Defaults

There are no default values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB1 | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Issuing this command mandates that the initial RRQ should have Airlink-Setup in Acct CVSE from PCF. As a result, if this Airlink setup is not present in the RRQ, the session is not created, and a RRP with error code “86H - Poorly formed request” is returned.

If you do not configure this command, or disable it, then sessions can be opened even with no accounting CVSE being present in the initial RRQ.

## Examples

router# cdma pdsn a11 mandate presence airlink-setup

# cdma pdsn accounting local-timezone

To specify the local time stamp for PDSN accounting events, use the **cdma pdsn accounting local-timezone** command in global configuration mode. To return to the default Universal Time (UTC), use the **no** form of this command.

**cdma pdsn accounting local-timezone**

**no cdma pdsn accounting local-timezone**

## Syntax Description

This command has no arguments or keywords.

## Defaults

UTC time, a standard based on GMT, is enabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(5)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

You must use the ***clock timezone hours-offset*** **[*minutes-offset*]** global configuration command to reflect the difference between local time and UTC time.

## Examples

The following example sets the local time in Korea:

```
clock timezone KOREA 9
cdma pdsn accounting local-timezone
```

## Related Commands

| Command | Description |
|---|---|
| clock timezone | Specifies the hours and minutes (optional) difference between the local time zone and UTC. |
| cdma pdsn accounting send start-stop | Causes the PDSN to send:<br>• An Accounting Stop record when it receives an active stop airlink record (dormant state)<br>• An Accounting Start record when it receives an active start airlink record (active state) |

# cdma pdsn accounting send

To cause the PDSN to send accounting records when the call transitions between active and dormant states, use the **cdma pdsn accounting send start-stop** command in global configuration mode. To stop sending accounting records, use the **no** form of this command.

**cdma pdsn accounting send {start-stop | cdma-ip-tech}**

**no cdma pdsn accounting send {start-stop | cdma-ip-tech}**

## Syntax Description

| Command | Description |
|---|---|
| start-stop | Informs the PDSN when to begin sending accounting records and when to stop sending them. |
| **cdma-ip-tech** | Accounting records are generated with special IP-Tech number. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

When this feature is enabled, the PDSN will send:

- An Accounting Stop record when it receives an active stop airlink record (dormant state).
- An Accounting Start record when it receives an active start airlink record (active state).

## Examples

The following example starts sending PDSN accounting events:

```
cdma pdsn accounting send start-stop
```

## Related Commands

| Command | Description |
|---|---|
| cdma pdsn accounting local-timezone | Specifies the timestamp for PDSN accounting events. |
| cdma pdsn accounting time-of-day | Sets the accounting information for a specific time of day. |
| aaa accounting network pdsn start-stop group radius | Enables AAA accounting of requested services for billing or security purposes when you use RADIUS. |

# cdma pdsn accounting send cdma-ip-tech

To configure specific values for the F11 attribute for proxy Mobile IP and VPDN services, use the **cdma pdsn accounting send cdma-ip-tech** command in global configuration mode. To deconfigure those values, use the **no** form of this command.

**cdma pdsn accounting send cdma-ip-tech** [**proxy-mobile-ip** | **vpdn**]

**no cdma pdsn accounting send cdma-ip-tech** [**proxy-mobile-ip** | **vpdn**]

## Syntax Description

| Command | Description |
|---|---|
| proxy-mobile-ip | Sets the IP-Tech proxy-mobile-ip number. Values are 3-65535. |
| **vpdn** | Sets the IP-Tech vpdn number. Values are 3-65535. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration.

## Command History

| Release | Modification |
|---|---|
| 12.1XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

```
pdsn(config)#cdma pdsn accounting send cdma-ip-tech proxy-mobile-ip 3
pdsn(config)#cdma pdsn accounting send cdma-ip-tech vpdn 4
```

# cdma pdsn accounting time-of-day

To set the accounting information for specified times during the day, use the **cdma pdsn accounting time-of-day** command in global configuration mode. To disable the specification, use the **no** form of this command.

**cdma pdsn accounting time-of-day** *hh:mm:ss*

**no cdma pdsn accounting time-of-day**

## Syntax Description

| | |
|---|---|
| *hh:mm:ss* | Hour:minutes:seconds. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(5)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command is used to facilitate billing when a user is charged different prices based upon the time of the day. Up to ten different accounting triggers can be configured.

## Examples

The following example sets an accounting trigger for 13:30:20:

```
cdma pdsn accounting time-of-day 13:30:30
```

## Related Commands

| Command | Description |
|---|---|
| clock set | Sets the system clock. |
| debug cdma pdsn accounting time-of-day | Displays debug information for the command. |
| show clock | Displays the system clock. |
| cdma pdsn accounting send start-stop | Causes the PDSN to send:<br>• An Accounting Stop record when it receives an active stop airlink record (dormant state)<br>• An Accounting Start record when it receives an active start airlink record (active state) |

# cdma pdsn age-idle-users

To configure the aging of idle users, use the **cdma pdsn age-idle-users** command. To stop aging out idle users, use the **no** form of this command.

**cdma pdsn age-idle-users [minimum-age** *value]*

**no cdma pdsn age-idle-users**

## Syntax Description

| | |
|---|---|
| ***minimum-age*** *value* | (Optional) The minimum number of seconds a user should be idle before they are a candidate for being aged out. Possible values are 1 through 65535. |

## Defaults

By default, no idle users are aged out.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

If no value is specified, the user that has been idle the longest will be aged out. If an age is specified and the user that has been idle the longest has not been idle for the specified value, then no users are aged out.

## Examples

The following example sets a minimum age out value of 5 seconds:

```
cdma pdsn age-idle-users minimum-age 5
```

# cdma pdsn cluster controller

To configure the PDSN to operate as a cluster controller, and to configure various parameters on the cluster controller, use the **cdma pdsn cluster controller** command. To disable certain cluster controller parameters, use the **no** form of this command.

**cdma pdsn cluster controller [ interface** *interface-name* **|** ***timeout*** *seconds [****window*** *number]* **|** ***window*** *number ]*

**no cdma pdsn cluster controller [ interface** *interface-name* **|** ***timeout*** *seconds [****window*** *number]* **|** ***window*** *number ]*

## Syntax Description

| | |
|---|---|
| **interface** | Interface name on which the cluster controller has IP connectivity to the cluster members. |
| *timeout* | The time the cluster controller waits to seek a member when there is no reply from that cluster member. The range is between 10 and 300 seconds, and the default value is 300 seconds. |
| *window number* | The number of sequential seek messages sent to a cluster member before it is presumed offline. |

## Defaults

The timeout default value is 300 seconds.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example enables the cdma cluster controller:

```
cdma pdsn cluster controller interface FastEthernet1/0
```

# cdma pdsn cluster controller session-high

To generate an alarm when the controller reaches the upper threshold of the maximum number of sessions it can handle, use the **cdma pdsn cluster member session-high** command. To disable this feature, use the **no** form of this command.

**cdma pdsn cluster controller session-high** ***1-1000000***

**no cdma pdsn cluster controller session-high** ***1-1000000***

## Syntax Description

| | |
|---|---|
| **1-1000000** | The threshold of the maximum number of sessions the controller can handle. |

## Defaults

The range is 1-1000000. The configured value should be more than the lower threshold value. The default value is 200000.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB1 | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

You should take into account the number of members in the cluster when you configure the high threshold. For example, if there are only 2 members in the cluster, the high threshold should be less than 40000.

## Examples

The following example illustrates the **cdma pdsn cluster contoller session-high** command:

```
Received SNMPv1 Trap:
Community: public
Enterprise: cCdmaPdsnMIBNotifPrefix
Agent-addr: 9.15.72.15
Enterprise Specific trap.
Enterprise Specific trap: 8
Time Ticks: 9333960
cCdmaServiceAffectedLevel.0 = major(3)
cCdmaClusterSessHighThreshold.0 = 50
```

# cdma pdsn cluster controller session-low

To generate an alarm when the controller reaches the lower threshold of the sessions (hint to NOC that the system is being under utilized), use the **cdma pdsn cluster member session-low** command. To disable this feature, use the **no** form of this command.

**cdma pdsn cluster controller session-low** ***1-1000000***

**no cdma pdsn cluster controller session-low** ***1-1000000***

## Syntax Description

| | |
|---|---|
| **1-1000000** | The threshold of the maximum number of sessions the controller can handle. |

## Defaults

The range is 0-999999. The configured value should be less than the upper threshold value. The default value is 190000.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB1 | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

You should take into account the number of members in the cluster when you configure the low threshold.

## Examples

The following example illustrates the **cdma pdsn cluster contoller session-low** command:

```
Received SNMPv1 Trap:
Community: public
Enterprise: cCdmaPdsnMIBNotifPrefix
Agent-addr: 9.15.72.15
Enterprise Specific trap.
Enterprise Specific trap: 9
Time Ticks: 9330691
cCdmaServiceAffectedLevel.0 = major(3)
cCdmaClusterSessLowThreshold.0 = 10
```

# cdma pdsn cluster member

To configure the PDSN to operate as a cluster member, and to configure various parameters on the cluster member, use the **cdma pdsn cluster member** command. To disable certain cluster controller parameters, use the **no** form of this command.

**cdma pdsn cluster member [ controller** *ipaddr* **|** ***interface*** *interface-name* **|** ***prohibit*** *type* **|** ***timeout*** *seconds [**window** number]* **|** ***window*** *number ]*

**no cdma pdsn cluster member [ controller** *ipadd* **| interface** *interface-name* **|** ***timeout*** *seconds [**window** number]* **|** ***window*** *number ]*

## Syntax Description

| | |
|---|---|
| controller *ipaddr* | The controller that a specific member is connected to, identified by the controller's IP address. |
| **interface** | Interface name on which the cluster controller has IP connectivity to the cluster members. |
| prohibit | The type of traffic that the member is allowed to handle, or is prohibited from handling. Administratively prohibits member from accepting new data sessions within the cluster framework. |
| *timeout* | The time the cluster controller waits to seek a member when there is no reply from that cluster member. The range is between 10 and 600 seconds, and the default value is 300 seconds. |
| *window number* | The number of sequential seek messages sent to a cluster member before it is presumed offline. |

## Defaults

The default timeout value for the cluster member is 300 seconds.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The **prohibit** field enables a member to administratively rid itself of its load without service interruption. When enabled, the member is no longer given any new data sessions by the controller.

## Examples

The following example enables a cdma pdsn cluster member:

```
cdma pdsn cluster member interface FastEthernet1/0
```

# cdma pdsn compliance iosv4.1 session-reference

3GPP2 IOS version 4.2 mandates that the Session Reference ID in the A11 Registration Request is always set to 1. To configure the PDSN to interoperate with a PCF that is not compliant with 3GPP2 IOS version 4.2, use the **cdma pdsn compliance iosv4.1 session-reference** command inGlobal configuration mode. To disable this configuration, use the **no** form of this command.

**cdma pdsn compliance iosv4.1 session-reference**

**no cdma pdsn compliance iosv4.1 session-reference**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Session Reference ID set to 1 in the A11 registration Request is on by default.

## Command Modes

Global configuration.

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY1 | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following command instructs the PDSN to skip any checks done on the session reference id of incoming Registration Requests to ensure that they are set to 1.

```
router # cdma pdsn compliance iosv4.1 session-reference
```

## Related Commands

| Command | Description |
|---|---|
| debug cdma pdsn a11 | Displays debug messages for A11 interface errors, events, and packets. |

# cdma pdsn compliance is835a esn-optional

To send an ESN value in accounting packets to the RADIUS server only if it has received an ESN value (A2) in the A11 RRQ from PCF, use the **cdma pdsn compliance is835 esn-optional** command in global configuration mode. To disable the specification, use the **no** form of this command.

**cdma pdsn compliance is835 esn-optional**

**no cdma pdsn compliance is835 esn-optional**

## Syntax Description

There are no keywords or arguments for this command.

## Defaults

The default behavior is to send the ESN attribute in all accounting records..

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)ZB4 | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

If no A2 is received in the RRQ, the PDSN will not send the ESN attribute in the accounting record. This behavior is in accordance to IS835A.

If this command is not configured, the PDSN will send the ESN value regardless whether the A2 attribute value is received from PCF or not. This is in accordance to IS835B.

# cdma pdsn failure-history

To configure CDMA PDSN SNMP session failure history size, use the **cdma pdsn failure-history** command in global configuration mode. To return to the default length of time, use the **no** form of this command.

**cdma pdsn failure-history** *entries*

**no cdma pdsn failure-history**

## Syntax Description

| | |
|---|---|
| *entries* | Maximum number of entries that can be recorded in the SNMP session failure table. Possible values are 0 through 2000. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example specifies that 1000 is the maximum number of entries that can be recorded in the SNMP session table:

```
cdma pdsn failure-history 1000
```

## Related Commands

| Command | Description |
|---|---|
| snmp-server enable traps cdma | Specifies the community access string to permit access to the SNMP protocol. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn ingress-address-filtering

To enable ingress address filtering, use the **cdma pdsn ingress-address-filtering** command in global configuration mode. To disable ingress address filtering, use the **no** form of this command.

**cdma pdsn ingress-address-filtering**

**no cdma pdsn ingress-address-filtering**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Ingress address filtering is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

When this command is configured, the PDSN checks the source IP address of every packet received on the PPP link from the mobile station. If the address is not associated with the PPP link to the mobile station and is not an MIP RRQ or Agent Solicitation, then the PDSN discards the packet and sends a request to reestablish the PPP link.

## Examples

The following example enables ingress address filtering:

```
cdma pdsn ingress-address-filtering
```

## Related Commands

| Command | Description |
|---|---|
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |
| show cdma pdsn session | Displays the session information on the PDSN. |

# cdma pdsn maximum pcf

To set the maximum number of PCFs that can connect to a PDSN, use the **cdma pdsn maximum pcf** command in global configuration mode. To disable a configured limit, use the **no** form of this command.

**cdma pdsn maximum pcf** *maxpcf*

**no cdma pdsn maximum pcf**

## Syntax Description

| | |
|---|---|
| *maxpcf* | Maximum number of PCFs that can communicate with a PDSN. Possible values are 1 through 2000. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

If no maximum number of PCFs is configured, the only limitation is the amount of memory.

You can configure the maximum PCFs to be less than the existing PCFs. As a result, when you issue the **show cdma pdsn** command, you may see more existing PCFs than the configured maximum. It is the responsibility of the user to bring down the existing PCFs to match the configured maximum.

## Examples

The following example specifies that 200 PCFs can be sent:

```
cdma pdsn maximum pcf 200
```

## Related Commands

| Command | Description |
|---|---|
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn maximum sessions

To set the maximum number of mobile sessions allowed on a PDSN, use the **cdma pdsn maximum sessions** command in global configuration mode. To disable a configured limit, use the **no** form of this command.

**cdma pdsn maximum sessions** *maxsessions*

**no cdma pdsn maximum sessions**

## Syntax Description

| | |
|---|---|
| *maxsessions* | Maximum number of mobile sessions allowed on a PDSN. Possible values depend on which image you are using. |

## Defaults

The c-5 images support 8000 sessions, and the c-6 images support 20000 sessions.

## Command Modes

Global Configuration.

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2(8)BY | The maximum number of mobile sessions was raised to 20000. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

If PDSN runs out of resources before the configured number is reached, then PDSN will reject the creation of further sessions.

You can configure the maximum sessions to be less than the existing sessions. As a result, when you issue the **show cdma pdsn** command, you may see more existing sessions than the configured maximum. It is the responsibility of the user to bring down the existing sessions to match the configured maximum.

## Examples

The following example sets the maximum number of mobile sessions to 100:

```
cdma pdsn maximum sessions 100
```

## Related Commands

| Command | Description |
|---|---|
| **show cdma pdsn session** | Displays PDSN session information. |

# cdma pdsn mobile-advertisement-burst

To configure the number and interval of Agent Advertisements that a PDSN FA can send, use the **cdma pdsn mobile-advertisement-burst** command in interface configuration mode. To reset the configuration to the defaults, use the **no** form of this command.

**cdma pdsn mobile-advertisement-burst {number** *value* **| interval** *msec***}**

**no cdma pdsn mobile-advertisement-burst {number | interval}**

## Syntax Description

| | |
|---|---|
| ***number*** *value* | The number of agent advertisements. Possible values are 1 through 10. The default is 5. |
| *interval msec* | Specifies the interval, in milliseconds, between advertisements. Possible values are 50 through 500. The default is 200 milliseconds. |

## Defaults

The default number of agent advertisements to send is 5.

The default interval between advertisements is 200 milliseconds.

## Command Modes

Interface Configuration.

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

You must specify at least one of the optional parameters. Otherwise, the command has no effect. When virtual-access interfaces are created from the virtual template, default values will be used for any parameters not already configured on the virtual template.

This command should be configured on virtual templates only, and only when PDSN service is configured.

## Examples

The following example configures PDSN FA advertisement:

```
cdma pdsn mobile-advertisement-burst number 10 interval 500
```

## Related Commands

| Command | Description |
|---|---|
| **ip mobile foreign-service challenge** | Configures the challenge timeout value and the number of valid recently-sent challenge values. |
| **ip mobile foreign-service challenge forward-mfce** | Enables the FA to forward MFCE and mobile station-AAA to the HA. |

# cdma pdsn msid-authentication

To enable MSID-based authentication and access, use the **cdma pdsn msid-authentication** command in global configuration mode. To disable MSID-based authentication and access, use the **no** form of this command.

**cdma pdsn msid-authentication** [close-session-on-failure][**imsi** *number*] [**irm** *number*] [**min** *number*] [profile-password password]

**no cdma pdsn msid-authentication**

## Syntax Description

| | |
|---|---|
| close-session-on-failure | Closes the session if authorization fails. |
| **imsi** *number* | (Optional) The number digits from the International Mobile Station Identifier (IMSI) that are to be used as the User-Name in the Access-Request for MSID authentication. Possible values are 1 to 15. The default is 5. |
| **irm** *number* | (Optional) International Roaming Mobile Identification Number and the identifier used to retrieve the network profile from the RADIUS server. Possible values are 1 through 10. The default is 4. |
| **min** *number* | (Optional) Mobile Identification Number and the identifier used to retrieve the network profile from the RADIUS server. Possible values are 1 through 10. The default is 6. |
| **profile-password** password | (Optional) The AAA server access password for MSID-based authentication. The default is “cisco”. |

## Defaults

MSID authentication is disabled. When enabled, the default values are as follows:

- imsi: 5
- irm: 4
- min: 6
- profile-password: cisco

## Command Modes

Global Configuration.

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2(2)XC | The **profile-password** keyword was added. |
| 12.2(8)ZB1 | The **close-session-on-failure** keyword was added |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

MSID authentication provides Simple IP service for mobile stations that do not negotiate CHAP or PAP. Cisco PDSN retrieves a network profile based on the MSID from the RADIUS server. The network profile should include the internet realm of the home network that owns the MSID. Cisco PDSN constructs the NAI from the MSID and the realm. The constructed NAI is used in generated accounting records. If the PDSN is unable to obtain the realm, then it denies service to the mobile station.

The identifier used to retrieve the network profile from the RADIUS server depends on the format of the MSID, which can be one of the following:

- International Mobile Station Identity (IMSI)
- Mobile Identification Number (MIN)
- International Roaming MIN (IRM)

If the mobile station uses IMSI, the default identifier that PDSN uses to retrieve network profile is of the form IMSI-nnnnn where nnnnn is the first five digits of the IMSI. The number of digits from the IMSI to be used can be configured using the command **cdma pdsn msid-authentication imsi**.

If the mobile station uses MIN, the default identifier that PDSN uses to retrieve network profile is of the form MIN-nnnnnn where nnnnnn is the first six digits of the MIN. The number of digits from the MIN to be used can be configured using the command **cdma pdsn msid-authentication min**.

If the mobile station uses IRM, the default identifier that PDSN uses to retrieve network profile is of the form IRM-nnnn where nnnn is the first four digits of the IRM. The number of digits from the IRM to be used can be configured using the command **cdma pdsn msid-authentication irm**.

The realm should be defined in the network profile on the RADIUS user with the Cisco AVPair attribute **cdma:cdma-realm**.

## Examples

The following example enables MSID-based authentication and access:

```
cdma pdsn msid-authentication profile-password test1
```

## Related Commands

| Command | Description |
|---|---|
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn retransmit a11-update

To specify the maximum number of times an A11 Registration Update message is retransmitted, use the **cdma pdsn retransmit a11-update** command in global configuration mode. To return to the default of 5 retransmissions, use the **no** form of this command.

**cdma pdsn retransmit a11-update** *number*

**no cdma pdsn retransmit a11-update**

## Syntax Description

| | |
|---|---|
| *number* | Maximum number of times an A11 Registration Update message is retransmitted. Possible values are 0 through 9. The default is 5 retransmissions. |

## Defaults

5 retransmissions.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

PDSN may initiate the release of an A10 connection by sending an A11 Registration Update message to the PCF. In this case, the PCF is expected to send an A11 Registration Acknowledge message followed by an A11 Registration Request with Lifetime set to 0. If PDSN does not receive an A11 Registration Acknowledge or an A11 Registration Request with Lifetime set to 0, or if it receives an A11 Registration Acknowledge message with an update denied status, PDSN retransmits the A11 Registration Update. The number of retransmissions is 5 by default and is configurable using this command.

## Examples

The following example specifies that A11 Registration Update messages will be retransmitted a maximum of 9 times:

```
cdma pdsn retransmit a11-update 9
```

## Related Commands

| Command | Description |
|---|---|
| cdma pdsn timeout a11-update | Specifies A11 Registration Update message timeout. |
| debug cdma pdsn a11 | Displays debug messages for A11 interface errors, events, and packets. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn secure cluster

To configure one common security association for all PDSNs in a cluster, use the **cdma pdsn secure cluster** command. To remove this configuration, use the **no** form of the command.

**cdma pdsn secure cluster** default **spi** {*value* | ***inbound*** *value* ***outbound*** *value}* **key {hex | ascii}** *string*

**no cdma pdsn secure cluster**

## Syntax Description

| | |
|---|---|
| default | Specifies this is the default security configuration. |
| **spi** ***value*** | Security parameter index (SPI) used for authenticating packets. Possible values are 0x100 through 0xffffffff. |
| **inbound** *value* **outbound** *value* | Inbound and outbound SPI. |
| **key {hex \| ascii}** ***string*** | String of ascii or hexadecimal values. No spaces are allowed. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The SPI is the 4-byte index that selects the specific security parameters to be used to authenticate the peer. The security parameters consist of the authentication algorithm and mode, replay attack protection method, timeout, and IP address.

## Examples

The following example shows a security association for a cluster of PDSNs:

```
cdma pdsn secure cluster spi 100 key hex 12345678123456781234567812345678
```

## Related Commands

| Command | Description |
|---|---|
| **ip mobile secure** | Configures the mobility security associations for mobile host, mobile visitor, foreign agent, home agent, or proxy mobile host. |
| cdma pdsn secure pcf | Configures the security association for one or more PCFs or the default security association for all PCFs. |

# cdma pdsn secure pcf

To configure the security association for one or more PCFs or the default security association for all PCFs, use the **cdma pdsn secure pcf** command. To remove this configuration, use the **no** form of the command.

**cdma pdsn secure pcf** {*lower* [*upper*] | default} **spi** {*value* | ***inbound*** *value* ***outbound*** *value}* **key {hex | ascii}** *string [**local-timezone**]*

**no cdma pdsn secure pcf**

## Syntax Description

| | |
|---|---|
| *lower* [*upper*] | Range of mobile host or mobile node group IP addresses. The upper end of the range is optional. |
| default | Specifies this is the default security configuration. |
| **spi *value*** | Security parameter index (SPI) used for authenticating packets. Possible values are 0x100 through 0xffffffff. |
| **inbound** *value* **outbound** *value* | Inbound and outbound SPI. |
| **key {hex \| ascii} *string*** | String of ascii or hexadecimal values. No spaces are allowed. |
| local-timezone | Adds local timezone support for R-P messages. If this keyword is enabled, the timestamp sent in the R-P messages will contain the timestamp of the local timezone.. |

## Defaults

There are no default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.2(8)BY1 | The **local-timezone** keyword was added. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The SPI is the 4-byte index that selects the specific security parameters to be used to authenticate the peer. The security parameters consist of the authentication algorithm and mode, replay attack protection method, timeout, and IP address.

You can configure several explicit and default secure PCF entries. (An explicit entry being one in which the IP address of a PCF is specified.) When the PDSN receives an A11 message from a PCF, it attempts to match the message to a secure PCF entry as follows:

- The PDSN first checks the explicit entries and attempts to find a match based on the SPI value and the key.
- If a match is found, the message is accepted. If no match is found, the PDSN checks the default entries (again attempting to match the SPI and the key).

- If a match is found, the message is accepted. If no match is found, the message is discarded and an error message is generated.

When the PDSN receives a request from a PCF, it performs an identity check. As part of this check, the PDSN compares the timestamp of the request to its own local time and determines whether the difference is within a specified range. This range is determined by the *replay time window*. If the difference between the timestamp and the local time is not within this range, a request rejection message is sent back to the PCF along with the value of PDSN's local time.

## Examples

The following example shows PCF 20.0.0.1, which has a key that is generated by the MD5 hash of the string:

```
cdma pdsn secure pcf 20.0.0.1 spi 100 key hex 12345678123456781234567812345678
```

The following example configures a global default replay time of 60 seconds for all PCFs and all SPIs:

```
cdma pdsn secure pcf default replay 60
```

The following example configures a default replay time of 30 seconds for a specific SPI applicable to all PCFs:

```
cdma pdsn secure pcf default spi 100 key ascii cisco replay 30
```

The following example configures a replay time of 45 seconds for a specific PCF/SPI combination:

```
cdma pdsn secure pcf 192.168.105.4 spi 200 key ascii cisco replay 45
```

## Related Commands

| Command | Description |
|---|---|
| **ip mobile secure** | Configures the mobility security associations for mobile host, mobile visitor, foreign agent, home agent, or proxy mobile host. |
| **cdma pdsn secure cluste**r | Configures one common security association for all PDSNs in a cluster. |

# cdma pdsn selection interface

To configure the interface used to send and receive PDSN selection messages, use the **cdma pdsn selection interface** command in global configuration mode. To remove the configuration, use the **no** form of the command.

**cdma pdsn selection interface** *interface_name*

**no cdma pdsn selection interface**

## Syntax Description

| | |
|---|---|
| *interface_name* | Name (type and number) of the interface that is connected to the LAN to be used to exchange PDSN selection messages with the other PDSNs in the cluster. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Each PDSN in a cluster maintains information about the mobile stations connected to the other PDSNs in the cluster. All PDSNs in the cluster exchange this information using periodic multicast messages. For this reason, all PDSNs in the cluster should be connected to a shared LAN.

This command identifies the interface on the PDSN that is connected to the LAN used for sending and receiving PDSN selection messages.

The Intelligent PDSN Selection feature will not work if you do not configure this interface on each PDSN in the cluster.

## Examples

The following example specifies that the FastEthernet0/1 interface should be used for sending and receiving PDSN selection messages:

```
cdma pdsn selection interface FastEthernet0/1
```

## Related Commands

| Command | Description |
|---|---|
| cdma pdsn selection keepalive | Specifies the keepalive time. |

| Command | Description |
|---|---|
| cdma pdsn selection load-balancing | Enables the load-balancing function of the intelligent PDSN selection feature. |
| **cdma pdsn selection session-table-size** | Defines the size of the selection session database. |

# cdma pdsn selection keepalive

To configure the intelligent PDSN selection keepalive feature, use the **cdma pdsn selection keepalive** command in global configuration mode. To disable the feature, use the **no** form of this command.

**cdma pdsn selection keepalive** *value*

**no cdma pdsn selection keepalive**

## Syntax Description

| | |
|---|---|
| *value* | The keepalive value, in seconds. Possible values are 5 through 60. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example configures a keepalive value of 200 seconds:

```
cdma pdsn selection keepalive 200
```

## Related Commands

| Command | Description |
|---|---|
| cdma pdsn selection load-balancing | Enables the load-balancing function of the intelligent PDSN selection feature. |
| **cdma pdsn selection session-table-size** | Defines the size of the selection session database. |
| show cdma pdsn selection | Displays the PDSN selection session table. |

# cdma pdsn selection load-balancing

To enable the load-balancing function of the intelligent PDSN selection feature, use the **cdma pdsn selection load-balancing** command in global configuration mode. To disable the load-balancing function, use the **no** form of this command.

**cdma pdsn selection load-balancing [threshold *val* [alternate]]**

**no cdma pdsn selection load-balancing**

## Syntax Description

| | |
|---|---|
| **threshold** *val* | (Optional) The maximum number of sessions that can be load-balanced. Possible values are 1 through 20000. The default session threshold is 100. |
| **alternate** | (Optional) The Alternate option alternately suggests two other PDSNs with the least load. |

## Defaults

The threshold value is 100 sessions.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2(8)BY | The maximum number of sessions that can be load-balanced was raised to 20000. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

You must enable PDSN selection session-table-size first. If sessions in a PDSN go beyond the threshold, PDSN selection will redirect the PCF to the PDSN that has less of a load.

## Examples

The following example configures load-balancing with an advertisement interval of 2 minutes and a threshold of 50 sessions:

```
cdma pdsn selection load-balancing advertisement 2 threshold 50
```

## Related Commands

| Command | Description |
|---|---|
| **cdma pdsn selection session-table-size** | Defines the size of the selection session database. |
| show cdma pdsn session | Displays PDSN session information. |

# cdma pdsn selection session-table-size

In PDSN selection, a group of PDSNs maintains a distributed session database. To define the size of the database, use the **cdma pdsn selection session-table-size** command in global configuration mode. To disable PDSN selection, use the **no** form of this command.

**cdma pdsn selection session-table-size** *size*

**no cdma pdsn selection session-table-size**

## Syntax Description

| | |
|---|---|
| *size* | Session table size. Possible values are 2000 through 100000. |

## Defaults

PDSN selection is disabled.

The default session table size is undefined.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example sets the size of the distributed session database to 5000 sessions:

```
cdma pdsn selection session-table-size 5000
```

## Related Commands

| Command | Description |
|---|---|
| **cdma pdsn selection load-balancing** | Enables the load-balancing function of PDSN selection. |
| show cdma pdsn session | Displays PDSN session information. |

# cdma pdsn send-agent-adv

To enable agent advertisements to be sent over a newly formed PPP session with an unknown user class that negotiates IPCP address options, use the **cdma pdsn send-agent-adv** command in global configuration mode. To disable the sending of agent advertisements, use the **no** form of this command.

**cdma pdsn send-agent-adv**

**no cdma pdsn send-agent-adv**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command is used with multiple flows.

## Examples

The following example enables agent advertisements to be sent:

```
cdma pdsn send-agent-adv
```

## Related Commands

| Command | Description |
|---|---|
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn timeout a11-update

To specify a A11 Registration Update message timeout, use the **cdma pdsn timeout a11-update** command in global configuration mode. To return to the default of 1 second, use the **no** form of this command.

**cdma pdsn timeout a11-update** *seconds*

**no cdma pdsn timeout a11-update**

## Syntax Description

| | |
|---|---|
| *seconds* | Maximum A11 Registration Update message timeout value, in seconds. Possible values are 0 through 5. The default is 1 second. |

## Defaults

1 second.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

PDSN may initiate the release of an A10 connection by sending an A11 Registration Update message to the PCF. In this case, the PCF is expected to send an A11 Registration Acknowledge message followed by an A11 Registration Request with Lifetime set to 0. If PDSN does not receive an A11 Registration Acknowledge or an A11 Registration Request with Lifetime set to 0, PDSN times out and retransmits the A11 Registration Update. The default timeout is 1 second and is configurable using this command.

## Examples

The following example specifies an A11 Registration Update message timeout value of 5 seconds:

```
cdma pdsn timeout a11-update 5
```

## Related Commands

| Command | Description |
|---|---|
| **cdma pdsn retransmit a11-update** | Specifies the maximum number of times an A11 Registration Update message will be retransmitted. |
| debug cdma pdsn a11 | Displays debug messages for A11 interface errors, events, and packets. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn timeout mobile-ip-registration

To set the timeout value before which Mobile IP registration should occur for a user skipping the PPP authentication, use the **cdma pdsn timeout mobile-ip-registration** command in global configuration mode. To return to the default 5-second timeout, use the **no** version of the command.

**cdma pdsn timeout mobile-ip-registration** *timeout*

**no cdma pdsn timeout mobile-ip-registration**

## Syntax Description

| | |
|---|---|
| *timeout* | Time, in seconds. Possible values are 1 through 60. The default is 5 seconds. |

## Defaults

5 seconds.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

A CDMA data user using Mobile IP will skip authentication and authorization during PPP and perform those tasks through Mobile IP registration. In order to secure the network, the traffic is filtered. The only packets allowed through the filter are the Mobile IP registration messages. As an additional protection, if the Mobile IP registration does not happen within a defined time, the PPP link is terminated.

## Examples

The following example sets the timeout value for Mobile IP registration to 15 seconds:

```
cdma pdsn mobile-ip-timeout 15
```

## Related Commands

| Command | Description |
|---|---|
| **show ip mobile interface** | Displays information about interfaces that are providing FA service or are home links for mobile stations. |
| show cdma pdsn | Displays the current status and configuration of the PDSN gateway. |

# cdma pdsn virtual-template

To associate a virtual template with PPP over GRE, use the **cdma pdsn virtual-template** command in global configuration mode. To remove the association, use the **no** form of this command.

**cdma pdsn virtual-template** *virtualtemplate_num*

**no cdma pdsn virtual-template** *virtualtemplate_num*

## Syntax Description

| | |
|---|---|
| *virtualtemplate_num* | Virtual template number. Possible values are 1 through 25. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

PPP links are dynamically created. Each link requires an interface. The characteristics of each link are cloned from a virtual template. Because there can be multiple virtual templates defined in a single PDSN, this command is used to identify the virtual template that is used for cloning virtual accesses for PPP over GRE.

## Examples

The following example associate virtual template 2 with PPP over GRE:

```
cdma pdsn virtual-template 2
```

## Related Commands

| Command | Description |
|---|---|
| **interface virtual-template** | Creates a virtual template interface. |

# clear cdma pdsn cluster controller session records age

To clear session records of a specified age, use the **clear cdma pdsn cluster controller session records age** command in privileged EXEC mode.

**clear cdma pdsn cluster controller session** *records age days*

## Syntax Description

| | |
|---|---|
| **days** | The number of days of the record age. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **clear cdma pdsn cluster controller session** *records age* command:

```
Router# clear cdma pdsn cluster controller session records age 1
```

# clear cdma pdsn selection

To clear PDSN selection tables, use the **clear cdma pdsn selection** command in privileged EXEC mode.

**clear cdma pdsn selection** [**pdsn** *ip-addr* | **msid** *number*]

## Syntax Description

| | |
|---|---|
| ***pdsn*** *ip-addr* | (Optional) IP address of the PDSN selection session table to be cleared. |
| ***msid*** *number* | (Optional) Identification of the MSID to be cleared. |

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example clears the pdsn selection session table for PDSN 5.5.5.5:

```
clear cdma pdsn selection pdsn 5.5.5.5
```

## Related Commands

| Command | Description |
|---|---|
| **cdma pdsn selection session-table-size** | Enables the PDSN selection feature and defines the size of the session table. |

# clear cdma pdsn session

To clear one or more user sessions on the PDSN, use the **clear cdma pdsn session** command in privileged EXEC mode.

**clear cdma pdsn session** {**all** | **pcf** *ip_addr* | **msid** *number*}

## Syntax Description

| | |
|---|---|
| **all** | Keyword to clear all sessions on a given PDSN. |
| ***pcf*** *ip_addr* | IP address of the PCF sessions that are to be cleared. |
| ***msid*** *number* | Identification of the MSID to be cleared. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command terminates one or more user sessions. When this command is issued, the PDSN initiates the session release by sending an A11Registration Update message to the PCF.

The keyword **all** clears all sessions on a given PDSN. The keyword **pcf** with an IP address clears all the sessions coming from a given PCF. The keyword **msid** with a number will clear the session for a given MSID.

## Examples

The following example clears session MSID 0000000002:

```
clear cdma pdsn session msid 0000000002
```

## Related Commands

| Command | Description |
|---|---|
| **show cdma pdsn session** | Displays PDSN session information. |

# clear cdma pdsn statistics

To clear the RAN-to-PDSN interface (RP) or PPP statistics on the PDSN, use the **clear cdma pdsn statistics** command in privileged EXEC mode.

**clear cdma pdsn statistics**

## Syntax Description

There are no arguments or keywords for this command.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Previous releases used the **show cdma pdsn statistics** command to show PPP and RP statistic summaries from the time the system was restarted. The **clear cdma pdsn statistics** command allows the user to reset the counters as desired, and to view the history since the counters were last reset.

## Examples

The following example illustrates the **clear cdma pdsn statistics rp** command before and after the counters are reset.

**Before counters are reset**

```
Router#show cdma pdsn statistics rp
RP Interface:
  Reg Request rcvd 5, accepted 5, denied 0, discarded 0
```

**Note** Non-zero values of counters.

```
  Initial Reg Request accepted 4, denied 0
  Re-registration requests accepted 0, denied 0
  De-registration accepted 1, denied 0
  Registration Request Errors:
    Unspecified 0, Administratively prohibited 0
    Resource unavailable 0, Authentication failed 0
    Identification mismatch 0, Poorly formed requests 0
    Unknown PDSN 0, Reverse tunnel mandatory 0
    Reverse tunnel unavailable 0, Bad CVSE 0

  Update sent 1, accepted 1, denied 0, not acked 0
  Initial Update sent 1, retransmissions 0
  Acknowledge received 1, discarded 0
  Update reason lifetime expiry 0, PPP termination 1, other 0
```

```
  Registration Update Errors:
    Unspecified 0, Identification mismatch 0
    Authentication failed 0, Administratively prohibited 0
    Poorly formed request 0

  Service Option:
    asyncDataRate2 (12) success 4, failure 0
```

### After the counters are reset

```
Router#clear cdma pdsn statistics rp
==> RESETTING COUNTERS

Router#show cdma pdsn statistics rp
RP Interface:
  Reg Request rcvd 0, accepted 0, denied 0, discarded 0
```

**Note** The counter values are zeroes.

```
  Initial Reg Request accepted 0, denied 0
  Re-registration requests accepted 0, denied 0
  De-registration accepted 0, denied 0
  Registration Request Errors:
    Unspecified 0, Administratively prohibited 0
    Resource unavailable 0, Authentication failed 0
    Identification mismatch 0, Poorly formed requests 0
    Unknown PDSN 0, Reverse tunnel mandatory 0
    Reverse tunnel unavailable 0, Bad CVSE 0

  Update sent 0, accepted 0, denied 0, not acked 0
  Initial Update sent 0, retransmissions 0
  Acknowledge received 0, discarded 0
  Update reason lifetime expiry 0, PPP termination 0, other 0
  Registration Update Errors:
    Unspecified 0, Identification mismatch 0
    Authentication failed 0, Administratively prohibited 0
    Poorly formed request 0

  Service Option:
    asyncDataRate2 (12) success 4, failure 0
```

## Related Commands

| Command | Description |
|---|---|
| **show cdma pdsn statistics** | Displays PDSN statistics. |

# clear gprs access-point statistics

To clear statistics counters for a specific access point or for all access points on the GGSN, use the **clear gprs access-point statistics** privileged EXEC command.

**clear gprs access-point statistics** {*access-point-index* | **all**}

## Syntax Description

| | |
|---|---|
| *access-point-index* | Index number of an access point. Information about that access point is cleared. |
| all | Information about all access points on the GGSN is cleared. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

This command clears the statistics that are displayed by the **show gprs access-point statistics** command.

## Examples

The following example clears the statistics at access point 2:

```
clear gprs access-point statistics 2
```

The following example clears the statistics for all access points:

```
clear gprs access-point statistics all
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs access-point statistics** | Displays data volume and PDP context activation and deactivation statistics for access points on the GGSN. |

# clear gprs charging cdr

To clear GPRS call detail records (CDRs), use the **clear gprs charging cdr** privileged EXEC configuration command.

**clear gprs charging cdr** {**access-point** *access-point-index* | **all** | **partial-record** | **tid** *tunnel-id*}

## Syntax Description

| | |
|---|---|
| **access-point** *access-point-index* | Closes CDRs for a specified access-point index. |
| **all** | Closes all CDRs on the GGSN. |
| partial-record | Closes all CDRs, and opens partial CDRs for any existing PDP contexts. |
| **tid** *tunnel-id* | Closes CDRs by tunnel ID. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX and the **partial-record** keyword was added. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **clear gprs charging cdr** command to clear the CDRs for one or more PDP contexts.

To clear CDRs by tunnel ID (TID), use the **clear gprs charging cdr** command with the **tid** keyword and specify the corresponding TID for which you want to clear the CDRs. To determine the tunnel ID (TID) of an active PDP context, you can use the **show gprs gtp pdp-context all** command to obtain a list of the currently active PDP contexts (mobile sessions).

To clear CDRs by access point, use the **clear gprs charging cdr** command with the **access-point** keyword and specify the corresponding access-point index for which you want to clear CDRs. To obtain a list of access points, you can use the **show gprs access-point** command.

When you clear CDRs for a TID, an access point, or for all access points, charging data records for the specified TID or access point(s) are sent immediately to the charging gateway. When you run these versions of this command, the following things occur:

- The GGSN no longer sends charging data that has been accumulated for the PDP context to the charging gateway.

- The GGSN closes the current CDRs for the specified PDP contexts.
- The GGSN no longer generates CDRs for existing PDP contexts.

To close all CDRs and open partial CDRs for existing PDP contexts on the GGSN, use the **clear gprs charging cdr partial-record** command.

The **clear gprs charging cdr** command is normally used before disabling the charging function.

## Examples

The following example shows how to clear CDRs by tunnel ID:

```
router# show gprs gtp pdp-context all
TID              MS Addr         Source  SGSN Addr       APN
1234567890123456 10.11.1.1       Radius  10.4.4.11       www.pdn1.com
2345678901234567 Pending         DHCP    10.4.4.11       www.pdn2.com
3456789012345678 10.21.1.1       IPCP    10.1.4.11       www.pdn3.com
4567890123456789 10.31.1.1       IPCP    10.1.4.11       www.pdn4.com
5678901234567890 10.41.1.1       Static  10.4.4.11       www.pdn5.com

router# clear gprs gtp charging cdr tid 1234567890123456
```

The following example shows how to clear CDRs for access point 1:

```
router# clear gprs charging cdr access-point 1
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging statistics** | Displays current statistics about the transfer of charging packets between the GGSN and charging gateways. |
| **show gprs access-point** | Displays information about an access point. |

# clear gprs gtp pdp-context

To clear one or more PDP contexts (mobile sessions), use the **clear gprs gtp pdp-context** privileged EXEC configuration command.

**clear gprs gtp pdp-context** {**tid** *tunnel-id* | **imsi** *imsi_value* | **path** *ip-address* | **access-point** *access-point-index* | **all**}

## Syntax Description

| | |
|---|---|
| **tid** *tunnel-id* | Tunnel ID (TID) for which PDP contexts are to be cleared. |
| **imsi** *imsi_value* | International Mobile Subscriber Identity (IMSI) value for which PDP contexts are to be cleared. |
| **path** *ip-address* | Remote SGSN IP address for which all PDP contexts associated with the SGSN are to be cleared. |
| **access-point** *access-point-index* | Access-point index for which PDP contexts are to be cleared. |
| **all** | Clear all currently active PDP contexts. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **clear gprs gtp pdp-context** command to clear one or more PDP contexts (mobile sessions). Use this command when operator intervention is required for administrative reasons—for example, when there are problematic user sessions or the system must be taken down for maintenance.

After the **clear gprs gtp pdp-context** command is issued, those users who are accessing the PDN through the specified TID, IMSI, path, or access point are disconnected.

To determine the tunnel ID of an active PDP context, you can use the **show gprs gtp pdp-context** command to obtain a list of the currently active PDP contexts (mobile sessions). Then, to clear a PDP context by tunnel ID, use the **clear gprs gtp pdp-context** command with the **tid** keyword and the corresponding tunnel ID that you want to clear.

To clear PDP contexts by access point, use the **clear gprs gtp pdp-context** command with the **access-point** keyword and the corresponding access-point index. To display a list of access points that are configured on the GGSN, use the **show gprs access-point** command.

If you know the IMSI of the PDP context, you can use the **clear gprs gtp pdp-context** with the **imsi** keyword and the corresponding IMSI of the connected user to clear the PDP context. If you want to determine the IMSI of a PDP context, you can use the **show gprs gtp pdp-context all** command to display a list of the currently active PDP contexts. Then, after finding the TID value that corresponds to the session that you want to clear, you can use the **show gprs gtp pdp-context tid** command to display the IMSI.

## Examples

The following example shows how to clear PDP contexts by tunnel ID:

```
router# show gprs gtp pdp-context all
TID              MS Addr         Source  SGSN Addr       APN
1234567890123456 10.11.1.1       Radius  10.4.4.11       www.pdn1.com
2345678901234567 Pending         DHCP    10.4.4.11       www.pdn2.com
3456789012345678 10.21.1.1       IPCP    10.1.4.11       www.pdn3.com
4567890123456789 10.31.1.1       IPCP    10.1.4.11       www.pdn4.com
5678901234567890 10.41.1.1       Static  10.4.4.11       www.pdn5.com

router# clear gprs gtp pdp-context tid 1234567890123456
```

The following example shows how to clear PDP contexts at access point 1:

```
router# clear gprs gtp pdp-context access-point 1
```

# clear gprs gtp statistics

To clear the current GPRS GTP statistics, use the **clear gprs gtp statistics** privileged EXEC configuration command.

**clear gprs gtp statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **clear gprs gtp statistics** command to clear the current GPRS GTP statistics. This command clears the counters that are displayed by the **show gprs gtp statistics** command.

**Note** The **clear gprs gtp statistics** command does not clear the counters that are displayed by the **show gprs gtp status** command.

## Examples

The following example clears the GPRS GTP statistics:

```
router# clear gprs gtp statistics
```

# clear gprs gtp-director statistics

To clear the current counters for GTP Director Module (GDM) statistics, use the **clear gprs gtp-director statistics** privileged EXEC configuration command.

**clear gprs gtp-director statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **clear gprs gtp-director statistics** command to clear all of the counters that are displayed by the **show gprs gtp-director statistics** command.

## Examples

The following example clears the GDM counters:

```
router# clear gprs gtp-director statistics
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs gtp-director statistics** | Displays the current statistics for requests received and processed by GDM. |

# clear ip mobile host-counters

To clear the mobility counters specific to each mobile node, use the **clear ip mobile host-counters** command in EXEC mode.

**clear ip mobile host-counters** [[*ip-address* | **nai** *string*] **undo**]]

## Syntax Description

| | |
|---|---|
| *ip-address* | (Optional) IP address of a mobile node. |
| **nai** *string* | (Optional) Network access identifier of the mobile node. |
| **undo** | (Optional) Restores the previously cleared counters. |

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.2(2)XC | The **nai** keyword was added. |
| 12.2(13)T | The **nai** keyword was integrated into Cisco IOS Release 12.2(13)T. |

## Usage Guidelines

This command clears the counters that are displayed when you use the **show ip mobile host** command. The **undo** keyword restores the counters (this option is useful for debugging).

## Examples

The following example shows how the counters can be used for debugging:

```
Router# show ip mobile host

10.0.0.1:
    Allowed lifetime 10:00:00 (36000/default)
    Roaming status -registered-, Home link on virtual network 20.0.0.0/8
    Accepted 2, Last time 04/13/02 19:04:28
    Overall service time 00:04:42
    Denied 0, Last time -never-
    Last code '-never- (0)'
    Total violations 1
    Tunnel to MN - pkts 0, bytes 0
    Reverse tunnel from MN - pkts 0, bytes 0

    .
Router# clear ip mobile host-counters

Router# show ip mobile host-counters

20.0.0.1:
    Allowed lifetime 10:00:00 (36000/default)
    Roaming status -Unregistered-, Home link on virtual network 20.0.0.0/8
    Accepted 0, Last time -never-
    Overall service time -never-
    Denied 0, Last time -never-
    Last code '-never- (0)'
```

```
Total violations 0
Tunnel to MN - pkts 0, bytes 0
Reverse tunnel from MN - pkts 0, bytes 0
```

## Related Commands

| Command | Description |
|---|---|
| **show ip mobile host** | Displays mobile node counters and information. |

# clear ip mobile secure

To clear and retrieve remote security associations, use the **clear ip mobile secure** command in EXEC mode.

**clear ip mobile secure** {**host** *lower* [*upper*] | **nai** *string* | **empty** | **all**} [**load**]

## Syntax Description

| | |
|---|---|
| **host** | Mobile node host. |
| *lower* | IP address of mobile node. Can be used alone, or as lower end of a range of IP addresses. |
| *upper* | (Optional) Upper end of a range of IP addresses. |
| **nai** *string* | Network access identifier of the mobile node. |
| **empty** | Load in only mobile nodes without security associations. Must be used with the **load** keyword. |
| **all** | Clears all mobile nodes. |
| **load** | (Optional) Reload the security association from the AAA server after security association has been cleared. |

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.2(2)XC | The **nai** keyword was added. |
| 12.2(13)T | The **nai** keyword was integrated into Cisco IOS Release 12.2(13)T. |

## Usage Guidelines

Security associations are required for registration authentication. They can be stored on an AAA server. During registration, they may be stored locally after retrieval from the AAA server. The security association on the router may become stale or out of date when the security association on the AAA server changes.

This command clears security associations that have been downloaded from the AAA server.

**Note** Security associations that are manually configured on the router or not stored on the router after retrieval from the AAA server are not applicable.

## Examples

In the following example, the AAA server has the security association for user 10.2.0.1 after registration:

```
Router# show ip mobile secure host 10.2.0.1

Security Associations (algorithm,mode,replay protection,key):
10.2.0.1:
    SPI 300,  MD5, Prefix-suffix, Timestamp +/- 7,
    Key 'oldkey' 1230552d39b7c1751f86bae5205ec0c8
```

If you change the security association stored on the AAA server for this mobile node, the router clears the security association and reloads it from the AAA server:

```
Router# clear ip mobile secure host 10.2.0.1 load

Router# show ip mobile secure host 10.2.0.1

10.2.0.1:
    SPI 300,  MD5, Prefix-suffix, Timestamp +/- 7,
    Key 'newkey' 1230552d39b7c1751f86bae5205ec0c8
```

## Related Commands

| Command | Description |
|---|---|
| **ip mobile secure** | Specifies the mobility security associations for mobile host, visitor, home agent, and foreign agent. |

# clear ip mobile visitor

To remove visitor information, use the **clear ip mobile visitor** command in privileged EXEC mode.

**clear ip mobile visitor** [*ip-address* | **nai** *string* [**session-id** *string*] [*ip-address*]]

## Syntax Description

| | |
|---|---|
| *ip-address* | (Optional) IP address. If not specified, visitor information will be removed for all addresses. |
| **nai** *string* | (Optional) Network access identifier (NAI) of the mobile node. |
| **session-id** *string* | (Optional) Session identifier. The string value must be fewer than 25 characters in length. |
| ip-address | (Optional) IP address associated with the NAI. |

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.2(2)XC | The **nai** keyword and associated variables were added. |
| 12.2(13)T | The **nai** keyword and associated variables were integrated into Cisco IOS Release 12.2(13)T. |
| 12.3(4)T | The **session-id** keyword was added. |

## Usage Guidelines

The foreign agent creates a visitor entry for each accepted visitor. The visitor entry allows the mobile node to receive packets while in a visited network. Associated with the visitor entry is the Address Resolution Protocol (ARP) entry for the visitor. There should be no need to clear the entry because it expires after lifetime is reached or when the mobile node deregisters.

When a visitor entry is removed, the number of users on the tunnel is decremented and the ARP entry is removed from the ARP cache. The visitor is not notified.

If the **nai** *string* **session-id** *string* option is specified, only the visitor entry with that session identifier is cleared. If the **session-id** keyword is not specified, all visitor entries (potentially more than one, with different session identifiers) for that NAI are cleared. You can determine the **session-id** *string* value by using the **show ip mobile visitor** command.

Use this command with care because it may terminate any sessions used by the mobile node. After you use this command, the visitor will need to reregister to continue roaming.

## Examples

The following example administratively stops visitor 172.21.58.16 from visiting:

```
Router# clear ip mobile visitor 172.21.58.16
```

**Related Commands**

| Command | Description |
|---|---|
| **show ip mobile visitor** | Displays the table containing the visitor list of the foreign agent. |

# clear ip rtp header-compression

To clear Real-Time Transport Protocol (RTP) header compression structures and statistics, use the **clear ip rtp header-compression** command in privileged EXEC mode.

**clear ip rtp header-compression** [*interface-type interface-number*]

## Syntax Description

| | |
|---|---|
| *interface-type interface-number* | (Optional) Interface type and number. |

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 11.3 | This command was introduced. |

## Usage Guidelines

If this command is used without an interface type and number, it clears all RTP header compression structures and statistics.

## Examples

The following example clears RTP header compression structures and statistics for serial interface 0:

```
Router# clear ip rtp header-compression serial 0
```

## Related Commands

| Command | Description |
|---|---|
| **ip rtp header-compression** | Enables RTP header compression. |

# clear ppp mux

To clear PPP mux statistics, use the **clear ppp mux** EXEC command.

**clear ppp mux** [**interface** *interface*]

**Syntax Description**

| | |
|---|---|
| interface | (Optional) The identifier of the multilink or serial interface for which you want to clear counters. |

**Defaults**

If no interface is specified, statistics for all multilink and serial interfaces are cleared.

**Command Modes**

EXEC

**Command History**

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS Release 12.3(11)T. |

**Usage Guidelines**

None

**Examples**

The following example clears PPP mux statistics for multilink interface 1:

```
clear ppp mux interface multilink1
```

**Related Commands**

| Command | Description |
|---|---|
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# clear radius local-server

To clear the display on the local server or to unblock a locked username, use the **clear radius local-server** command in privileged EXEC mode.

**clear radius local-server {statistics | user** *username*}

## Syntax Description

| | |
|---|---|
| **statistics** | Clears the display of statistical information. |
| **user** | Unblocks the locked username specified. |
| *username* | Locked username. |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following example unblocks the locked username “smith”:

```
Router# clear radius local-server user smith
```

## Syntax Description

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |

| Command | Description |
|---|---|
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# crypto map (global IPSec)

To enter crypto map configuration mode and create or modify a crypto map entry, to create a crypto profile that provides a template for configuration of dynamically created crypto maps, or to configure a client accounting list, use the **crypto map** command in global configuration mode. To delete a crypto map entry, profile, or set, use the **no** form of this command.

**crypto map** *map-name seq-num* [**ipsec-manual**]

**crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*]

**crypto map** *map-name* [**client-accounting-list** *aaalist*]

**no crypto map** *map-name seq-num*

**Note** Issue the **crypto map** *map-name seq-num* command without a keyword to modify an existing crypto map entry.

## Syntax Description

| | |
|---|---|
| *map-name* | Name that identifies the crypto map set. This is the name assigned when the crypto map was created. |
| *seq-num* | Sequence number you assign to the crypto map entry. See additional explanation for using this argument in the "Usage Guidelines" section. |
| **ipsec-manual** | (Optional) Indicates that Internet Key Exchange (IKE) will not be used to establish the IP Security (IPSec) security associations (SAs) for protecting the traffic specified by this crypto map entry. |
| **ipsec-isakmp** | (Optional) Indicates that IKE will be used to establish the IPSec SAs for protecting the traffic specified by this crypto map entry. |
| **dynamic** | (Optional) Specifies that this crypto map entry is to reference a preexisting dynamic crypto map. Dynamic crypto maps are policy templates used in processing negotiation requests from a peer IPSec device. If you use this keyword, none of the crypto map configuration commands will be available. |
| *dynamic-map-name* | (Optional) Specifies the name of the dynamic crypto map set that should be used as the policy template. |
| **discover** | (Optional) Enables peer discovery. By default, peer discovery is not enabled. |
| **profile** | (Optional) Designates a crypto map as a configuration template. The security configurations of this crypto map will be cloned as new crypto maps are created dynamically on demand. |
| *profile-name* | (Optional) Name of the crypto profile being created. |
| **client-accounting-list** | (Optional) Designates a client accounting list. |
| *aaalist* | (Optional) List name. |

## Defaults

No crypto maps exist.

Peer discovery is not enabled.

**Command Modes** Global configuration

**Command History**

| Release | Modification |
|---|---|
| 11.2 | This command was introduced. |
| 11.3 T | The following keywords and arguments were added:<br>• **ipsec-manual**<br>• **ipsec-isakmp**<br>• **dynamic**<br>• *dynamic-map-name* |
| 12.0(5)T | The **discover** keyword was added to support Tunnel Endpoint Discovery (TED). |
| 12.2(4)T | The **profile** *profile-name* keyword and argument combination was introduced to allow the generation of a crypto map profile that is cloned to create dynamically created crypto maps on demand. |
| 12.2(11)T | Support was added for the Cisco 1760, Cisco AS5300, Cisco AS5400, and Cisco AS5800 platforms. |
| 12.2(15)T | The **client-accounting-list** keyword and *aaalist* argument were added. |

**Usage Guidelines** Use this command to create a new crypto map entry, to create a crypto map profile, or to modify an existing crypto map entry or profile.

After a crypto map entry has been created, you cannot change the parameters specified at the global configuration level because these parameters determine which of the configuration commands are valid at the crypto map level. For example, after a map entry has been created using the **ipsec-isakmp** keyword, you cannot change it to the option specified by the **ipsec-manual** keyword; you must delete and reenter the map entry.

After you define crypto map entries, you can assign the crypto map set to interfaces using the **crypto map** (interface IPSec) command.

#### Crypto Map Functions

Crypto maps provide two functions: filtering and classifying traffic to be protected and defining the policy to be applied to that traffic. The first use affects the flow of traffic on an interface; the second affects the negotiation performed (via IKE) on behalf of that traffic.

IPSec crypto maps define the following:

- What traffic should be protected
- To which IPSec peers the protected traffic can be forwarded—these are the peers with which an SA can be established
- Which transform sets are acceptable for use with the protected traffic
- How keys and security associations should be used or managed (or what the keys are, if IKE is not used)

### Multiple Crypto Map Entries with the Same Map Name Form a Crypto Map Set

A crypto map set is a collection of crypto map entries, each with a different *seq-num* argument but the same *map-name* argument. Therefore, for a given interface, you could have certain traffic forwarded to one IPSec peer with specified security applied to that traffic and other traffic forwarded to the same or a different IPSec peer with different IPSec security applied. To accomplish differential forwarding you would create two crypto maps, each with the same *map-name* argument, but each with a different *seq-num* argument. Crypto profiles must have unique names within a crypto map set.

### Sequence Numbers

The number you assign to the *seq-num* argument should not be arbitrary. This number is used to rank multiple crypto map entries within a crypto map set. Within a crypto map set, a crypto map entry with a lower *seq-num* is evaluated before a map entry with a higher *seq-num*; that is, the map entry with the lower number has a higher priority.

For example, consider a crypto map set that contains three crypto map entries: mymap 10, mymap 20, and mymap 30. The crypto map set named "mymap" is applied to serial interface 0. When traffic passes through serial interface 0, the traffic is evaluated first for mymap 10. If the traffic matches any access list permit statement entry in the extended access list in mymap 10, the traffic will be processed according to the information defined in mymap 10 (including establishing IPSec SAs when necessary). If the traffic does not match the mymap 10 access list, the traffic will be evaluated for mymap 20, and then mymap 30, until the traffic matches a permit entry in a map entry. (If the traffic does not match a permit entry in any crypto map entry, it will be forwarded without any IPSec security.)

### Dynamic Crypto Maps

Refer to the "Usage Guidelines" section of the **crypto dynamic-map** command for a discussion on dynamic crypto maps.

Crypto map entries that reference dynamic map sets should be the lowest priority map entries, allowing inbound SA negotiation requests to try to match the static maps first. Only after the request does not match any of the static maps, do you want it to be evaluated against the dynamic map set.

To make a crypto map entry referencing a dynamic crypto map set the lowest priority map entry, give the map entry the highest *seq-num* of all the map entries in a crypto map set.

Create dynamic crypto map entries using the **crypto dynamic-map** command. After you create a dynamic crypto map set, add the dynamic crypto map set to a static crypto map set with the **crypto map** (global IPSec) command using the **dynamic** keyword.

### TED

TED is an enhancement to the IPSec feature. Defining a dynamic crypto map allows you to dynamically determine an IPSec peer; however, only the receiving router has this ability. With TED, the initiating router can dynamically determine an IPSec peer for secure IPSec communications.

Dynamic TED helps to simplify IPSec configuration on the individual routers within a large network. Each node has a simple configuration that defines the local network that the router is protecting and the IPSec transforms that are required.

**Note** TED helps only in discovering peers; otherwise, TED does not function any differently from normal IPSec. Thus, TED does not improve the scalability of IPSec (in terms of performance or the number of peers or tunnels).

### Crypto Map Profiles

Crypto map profiles are created using the **profile** *profile-name* keyword and argument combination. Crypto map profiles are used as configuration templates for dynamically creating crypto maps on demand for use with the Layer 2 Transport Protocol (L2TP) Security feature. The relevant SAs the crypto map profile will be cloned and used to protect IP traffic on the L2TP tunnel.

**Note** The **set peer** and **match address** commands are ignored by crypto profiles and should not be configured in the crypto map definition.

## Examples

The following example shows the minimum required crypto map configuration when IKE will be used to establish the SAs:

```
crypto map mymap 10 ipsec-isakmp
 match address 101
 set transform-set my_t_set1
 set peer 10.0.0.1
```

The following example shows the minimum required crypto map configuration when the SAs are manually established:

```
crypto transform-set someset ah-md5-hmac esp-des
crypto map mymap 10 ipsec-manual
 match address 102
 set transform-set someset
 set peer 10.0.0.5
 set session-key inbound ah 256 9876543210987654987654321098765 4
 set session-key outbound ah 256 fedcbafedcbafedcfedcbafedcbafedc
 set session-key inbound esp 256 cipher 0123456789012345
 set session-key outbound esp 256 cipher abcdefabcdefabcd
```

The following example configures an IPSec crypto map set that includes a reference to a dynamic crypto map set.

Crypto map “mymap 10” allows SAs to be established between the router and either (or both) of two remote IPSec peers for traffic matching access list 101. Crypto map “mymap 20” allows either of two transform sets to be negotiated with the remote peer for traffic matching access list 102.

Crypto map entry “mymap 30” references the dynamic crypto map set “mydynamicmap,” which can be used to process inbound SA negotiation requests that do not match “mymap” entries 10 or 20. In this case, if the peer specifies a transform set that matches one of the transform sets specified in “mydynamicmap,” for a flow permitted by the access list 103, IPSec will accept the request and set up SAs with the remote peer without previously knowing about the remote peer. If the request is accepted, the resulting SAs (and temporary crypto map entry) are established according to the settings specified by the remote peer.

The access list associated with “mydynamicmap 10” is also used as a filter. Inbound packets that match any access list permit statement in this list are dropped for not being IPSec protected. (The same is true for access lists associated with static crypto maps entries.) Outbound packets that match a permit statement without an existing corresponding IPSec SA are also dropped.

```
crypto map mymap 10 ipsec-isakmp
 match address 101
 set transform-set my_t_set1
 set peer 10.0.0.1
 set peer 10.0.0.2
crypto map mymap 20 ipsec-isakmp
 match address 102
```

```
 set transform-set my_t_set1 my_t_set2
 set peer 10.0.0.3
crypto map mymap 30 ipsec-isakmp dynamic mydynamicmap
!
crypto dynamic-map mydynamicmap 10
 match address 103
 set transform-set my_t_set1 my_t_set2 my_t_set3
```

The following example configures TED on a Cisco router:

```
crypto map testtag 10 ipsec-isakmp dynamic dmap discover
```

The following example configures a crypto profile to be used as a template for dynamically created crypto maps when IPSec is used to protect an L2TP tunnel:

```
crypto map l2tpsec 10 ipsec-isakmp profile l2tp
```

## Related Commands

| Command | Description |
|---|---|
| **crypto dynamic-map** | Creates a dynamic crypto map entry and enters the crypto map configuration command mode. |
| **crypto isakmp profile** | Audits IPSec user sessions. |
| **crypto map (interface IPSec)** | Applies a previously defined crypto map set to an interface. |
| **crypto map local-address** | Specifies and names an identifying interface to be used by the crypto map for IPSec traffic. |
| **debug crypto isakmp** | Applies a previously defined crypto map set to an interface. |
| **match address (IPSec)** | Specifies an extended access list for a crypto map entry. |
| **set peer (IPSec)** | Specifies an IPSec peer in a crypto map entry. |
| **set pfs** | Specifies that IPSec should ask for PFS when requesting new SAs for this crypto map entry, or that IPSec requires PFS when receiving requests for new SAs. |
| **set security-association level per-host** | Specifies that separate IPSec SAs should be requested for each source/destination host pair. |
| **set security-association lifetime** | Overrides (for a particular crypto map entry) the global lifetime value, which is used when negotiating IPSec SAs. |
| **set session-key** | Specifies the IPSec session keys within a crypto map entry. |
| **set transform-set** | Specifies which transform sets can be used with the crypto map entry. |
| **show crypto map (IPSec)** | Displays the crypto map configuration. |

# dhcp-gateway-address

To specify the subnet in which the DHCP server should return addresses for DHCP requests for MS users entering a particular PDN access point, use the **dhcp-gateway-address** access-point configuration command. To remove a DHCP gateway address and return to the default, use the **no** form of this command.

**dhcp-gateway-address** *ip-address*

**no dhcp-gateway-address** *ip-address*

## Syntax Description

| | |
|---|---|
| *ip-address* | The IP address of the DHCP gateway to be used in DHCP requests for users who connect through the specified access point. |

## Defaults

When you do not configure a **dhcp-gateway-address**, the GGSN uses the virtual template interface address as the DHCP gateway address.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The **dhcp-gateway-address** specifies the value of the giaddr field that is passed in DHCP messages between the GGSN and the DHCP server. If you do not specify a DHCP gateway address, the address assigned to the virtual template is used.

Though a default value for the virtual template address will occur, you should configure another value for the **dhcp-gateway-address** command whenever you are implementing DHCP services at an access point.

If the access point is configured for VRF, then the dynamic (or static addresses) returned for MSs of PDP contexts at the access point will also be part of that VRF address space. If the DHCP server is located within the VRF address space, then the corresponding loopback interface for the **dhcp-gateway-address** must also be configured within the VRF address space.

## Examples

The following example specifies an IP address of 10.88.0.1 for the giaddr field (the **dhcp-gateway-address**) of DHCP server requests. Note that the IP address of a loopback interface, in this case Loopback2, matches the IP address specified in the **dhcp-gateway-address** command. This is required for proper configuration of DHCP on the GGSN.

```
interface Loopback2
 ip address 10.88.0.1 255.255.255.255
!
gprs access-point-list gprs
 access-point 8
   access-point-name pdn.aaaa.com
   ip-address-pool dhcp-proxy-client
   aggregate auto
   dhcp-server 172.16.43.35
   dhcp-gateway-address 10.88.0.1
   exit
```

## Related Commands

| Command | Description |
|---|---|
| **dhcp-server** | Specifies a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point. |
| **gprs default ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the GGSN. |
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |

# dhcp-server

To specify a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point, use the **dhcp-server** access-point configuration command. To remove the DHCP server from the access-point configuration, use the **no** form of this command.

**dhcp-server** {*ip-address*} [*ip-address*] [**vrf**]

**no dhcp-server** {*ip-address*} [*ip-address*] [**vrf**]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of a DHCP server. The first *ip-address* argument specifies the IP address of the primary DHCP server. The second (optional) *ip-address* argument specifies the IP address of a backup DHCP server. |
| **vrf** | DHCP server uses the VPN routing and forwarding (VRF) table that is associated with the APN. |

## Defaults

Global routing table

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, with the following changes:<br>• The **vrf** keyword was added.<br>• The *name* argument, as an option for a hostname in place of the IP address of a host, has been removed. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

To configure DHCP on the GGSN, you must configure either the **gprs default ip-address-pool** global configuration command, or the **ip-address-pool** access-point configuration command with the **dhcp-proxy-client** keyword option.

After you configure the access point for DHCP proxy client services, use the **dhcp-server** command to specify a DHCP server.

Use the *ip-address* argument to specify the IP address of the DHCP server. The second, optional *ip-address* argument can be used to specify the IP address of a backup DHCP server to be used in the event that the primary DHCP server is unavailable. If you do not specify a backup DHCP server, then no backup DHCP server is available.

The DHCP server can be specified in two ways:

- At the global configuration level, using the **gprs default dhcp-server** command.
- At the access-point configuration level, using the **dhcp-server** command.

If you specify a DHCP server at the access-point level using the **dhcp-server** command, then the server address specified at the access point overrides the address specified at the global level. If you do not specify a DHCP server address at the access-point level, then the address specified at the global level is used.

Therefore, you can have a global address setting and also one or more local access-point level settings if you need to use different DHCP servers for different access points.

Use the **vrf** keyword when the DHCP server itself is located within the address space of a VRF interface on the GGSN. If the DHCP server is located within the VRF address space, then the corresponding loopback interface for the **dhcp-gateway-address** must also be configured within the VRF address space.

## Examples

### Example 1

The following example specifies both primary and backup DHCP servers to allocate IP addresses to mobile station users through a non-VPN access point. Because the **vrf** keyword is not configured, the default global routing table is used. The primary DHCP server is located at IP address 10.60.0.1, and the secondary DHCP server is located at IP address 10.60.0.2:

```
access-point 2
 access-point-name xyz.com
 dhcp-server 10.60.0.1 10.60.0.2
 dhcp-gateway-address 10.60.0.1
 exit
```

### Example 2

The following example shows a VRF configuration for vpn3 (without tunneling) using the **ip vrf** global configuration command. Because the **ip vrf** command establishes both VRF and CEF routing tables, notice that **ip cef** also is configured at the global configuration level to enable CEF switching at all of the interfaces.

The following other configuration elements must also associate the same VRF named vpn3:

- FastEthernet0/0 is configured as the Gi interface using the **ip vrf forwarding** interface configuration command.
- Access-point 2 implements VRF using the **vrf** command access-point configuration command.

The DHCP server at access-point 2 also is configured to support VRF. Notice that access-point 1 uses the same DHCP server, but is not supporting the VRF address space. The IP addresses for access-point 1 will apply to the global routing table:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
```

```
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
ip cef
!
ip vrf vpn3
 rd 300:3
!
interface Loopback1
 ip address 10.30.30.30 255.255.255.255
!
interface Loopback2
 ip vrf forwarding vpn3
 ip address 10.27.27.27 255.255.255.255
!
interface FastEthernet0/0
 ip vrf forwarding vpn3
 ip address 10.50.0.1 255.255.0.0
 duplex half
!
interface FastEthernet1/0
 ip address 10.70.0.1 255.255.0.0
 duplex half
!
interface Virtual-Template1
 ip address 10.8.0.1 255.255.0.0
 encapsulation gtp
 gprs access-point-list gprs
!
ip route 10.10.0.1 255.255.255.255 Virtual-Template1
ip route vrf vpn3 10.100.0.5 255.255.255.0 fa0/0 10.50.0.2
ip route 10.200.0.5 255.255.255.0 fa1/0 10.70.0.2
!
no ip http server
!
gprs access-point-list gprs
 access-point 1
  access-point-name gprs.pdn.com
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.200.0.5
  dhcp-gateway-address 10.30.30.30
  network-request-activation
  exit
  !
 access-point 2
  access-point-name gprs.pdn2.com
  access-mode non-transparent
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.100.0.5 10.100.0.6 vrf
  dhcp-gateway-address 10.27.27.27
  aaa-group authentication foo
  vrf vpn3
  exit
!
gprs default ip-address-pool dhcp-proxy-client
gprs gtp ip udp ignore checksum
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

**Related Commands**

| Command | Description |
|---|---|
| **dhcp-gateway-address** | Specifies the subnet in which the DHCP server should return addresses for DHCP requests for MS users entering a particular PDN access point. |
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |
| vrf | Configures VPN routing and forwarding at a GGSN access point and associates the access point with a particular VRF instance. |

# dns primary

To specify a primary (and backup) DNS to be sent in create PDP responses at the access point, use the **dns primary** access-point configuration command. To remove the DNS from the access-point configuration, use the **no** form of this command

**dns primary** *ip-address* [**secondary** *ip-address*]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of the primary DNS. |
| **secondary** *ip-address* | (Optional) Specifies the IP address of the backup DNS. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YY | This command was introduced. |
| 12.3(2)XB | This command was integratedin Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **dns primary** command to specify the primary (and backup) DNS at the access point level.

This feature is benefits address allocation schemes where there is no mechanism to obtain these address. Also, for a RADIUS-based allocation scheme, it prevents the operator from having to configure a NBNS and DNS under each user profile.

The DNS address can come from three possible sources: DHCP server, RADIUS server, or local APN configuration. The criterium for selecting the DNS address depends on the IP address allocation scheme configured under the APN. Depending on the configuration, the criterium for selecting the DNS address is as follows:

1. DHCP-based IP address allocation scheme (local and external)—DNS address returned from the DHCP server is sent to the MS. If the DHCP server does not return a DNS address, the local APN configuration is used.
2. RADIUS-based IP address allocation scheme—DNS address returned from the RADIUS server (in Access-Accept responses) is used. If the RADIUS server does not return a DNS address, the local APN configuration is used.
3. Local IP Address Pool-based IP address allocation scheme—Local APN configuration is used.
4. Static IP Addresses—Local APN configuration is used.

**Note** The GGSN sends DNS addresses in the create PDP response only if the MS is requesting the DNS address in the PCO IE.

## Examples

The following example specifies a primary and secondary DNS at the access point level:

```
access-point 2
 access-point-name xyz.com
 dns primary 10.60.0.1 secondary 10.60.0.2
 exit
```

## Related Commands

| Command | Description |
|---|---|
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |
| nbns primary | Specifies a primary (and backup) NBNS at the access point level. |

# encapsulation gtp

To specify the GPRS tunneling protocol (GTP) as the encapsulation type for packets transmitted over the virtual template interface, use the **encapsulation gtp** interface configuration command. To remove the GTP encapsulation type and return to the default, use the **no** form of this command.

**encapsulation gtp**

**no encapsulation gtp**

## Syntax Description

This command has no arguments or keywords.

## Defaults

PPP encapsulation

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **encapsulation gtp** command to specify the GTP as the encapsulation type for a virtual template. This is a mandatory setting for both the GGSN and GDM.

## Examples

The following example specifies the GPRS tunneling protocol (GTP) as the encapsulation type:

```
interface virtual-template 1
 ip address 10.10.10.1 255.255.255.0
 no ip directed-broadcast
 encapsulation gtp
```

# gprs access-point-list

To configure an access point list that you use to define PDN access points on the GGSN, use the **gprs access-point-list** global configuration command. To remove an existing access-point list, use the **no** form of this command.

**gprs access-point-list** *list_name*

**no gprs access-point-list** *list_name*

## Syntax Description

| | |
|---|---|
| *list_name* | The name of the access-point list. |

## Defaults

No access-point list is defined.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs access-point-list** command to configure an access list that you use to define PDN access points on the GGSN. Currently, only one access list can be defined per virtual template.

## Examples

The following example sets up an access list that is used to define two GPRS access points:

```
! Virtual Template configuration
interface virtual-template 1
 ip address 10.10.10.1 255.255.255.0
 no ip directed-broadcast
 encapsulation gtp
 gprs access-point-list abc
!
! Access point list configuration
gprs access-point-list abc
 access-point 1
  access-point-name gprs.somewhere.com
  exit
!
 access-point 2
```

```
access-point-name xyz.com
exit
```

## Related Commands

| Command | Description |
|---|---|
| **access-point** | Specifies an access point number and enters access-point configuration mode. |

# gprs canonical-qos best-effort bandwidth-factor

To specify the bandwidth factor to be applied to the canonical best-effort Quality of Service (QoS) class, use the **gprs canonical-qos best-effort bandwidth-factor** global configuration command. To return to the default value, use the **no** form of this command.

**gprs canonical-qos best-effort bandwidth-factor** *bandwidth-factor*

**no gprs canonical-qos best-effort bandwidth-factor** *bandwidth-factor*

## Syntax Description

| | |
|---|---|
| *bandwidth-factor* | Integer from 1 to 4000000 that specifies the desired bandwidth factor (in bits per second). The default is 10 bits per second. |

## Defaults

10 bits per second

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The **canonical qos best-effort bandwidth-factor** command specifies an average bandwidth that is expected to be used by best-effort QoS class mobile sessions. The default value of 10 bps is chosen arbitrarily. If you observe that users accessing the GGSN are using a higher average bandwidth, then you should increase the bandwidth value.

**Note** Before configuring the average bandwidth expected to be used by the best-effort QoS class using the **gprs canonical-qos best-effort bandwidth-factor** command, canonical QoS must be enabled using the **gprs qos map canonical-qos** command.

## Examples

The following example configures a bandwidth factor of 20:

```
gprs canonical-qos best-effort bandwidth-factor 20
```

**Related Commands**

| Command | Description |
|---|---|
| **gprs canonical-qos gsn-resource-factor** | Specifies the total amount of resource that the GGSN uses to provide canonical QoS service levels to mobile users. |

# gprs canonical-qos gsn-resource-factor

To specify the total amount of resource that the GGSN uses to provide canonical QoS service levels to mobile users, use the **gprs canonical-qos gsn-resource-factor** global configuration command. To return to the default value, use the **no** form of this command.

**gprs canonical-qos gsn-resource-factor** *resource-factor*

**no gprs canonical-qos gsn-resource-factor** *resource-factor*

## Syntax Description

| | |
|---|---|
| *resource-factor* | Integer between 1 and 4294967295 representing an amount of resource that the GGSN calculates internally for canonical QoS processing. The default value is 3145728000. |

## Defaults

3,145,728,000

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX and the default value was changed from 1,048,576 to 3,145,728,000 bits per second. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The default value for this command was chosen to support 10000 PDP contexts with a premium QoS class. If a greater throughput is required for GPRS user data, increase the resource factor value. However, selecting a high value may result in exceeding the actual processing capacity of the GGSN.

## Examples

The following example configures a resource factor of 1048576:

```
gprs canonical-qos gsn-resource-factor 1048576
```

## Related Commands

| Command | Description |
|---|---|
| **gprs canonical-qos best-effort bandwidth-factor** | Specifies the bandwidth factor to be applied to the canonical best-effort QoS class. |
| gprs canonical-qos premium mean-throughput-deviation | Specifies a mean throughput deviation factor that the GGSN uses to calculate the allowable data throughput for the premium QoS class. |

# gprs canonical-qos map tos

To specify a QoS mapping from the canonical QoS classes to an IP type of service (ToS) precedence value, use the **gprs canonical-qos map tos** global configuration command. To remove a QoS mapping and return to the default values, use the **no** form of this command.

**gprs canonical-qos map tos** [**premium** *tos-value* [**normal** *tos-value* [**best-effort** *tos-value*]]]

**no gprs canonical-qos map tos** [**premium** *tos-value* [**normal** *tos-value* [**best-effort** *tos-value*]]]

## Syntax Description

| | |
|---|---|
| **premium** *tos-value* | ToS mapping for a premium QoS. The *tos-value* can be a number from 0 to 5. A higher number indicates a higher service priority. The default is 2. |
| **normal** *tos-value* | ToS mapping for a normal QoS. The *tos-value* can be a number from 0 to 5. A higher number indicates a higher service priority. The default is 1. |
| **best-effort** *tos-value* | ToS mapping for a best effort QoS. The *tos-value* can be a number from 0 to 5. A higher number indicates a higher service priority. The default is 0. |

## Defaults

When canonical QoS is enabled on the GGSN, the default IP ToS precedence values are assigned according to the canonical QoS class as follows:

- Premium—2
- Normal—1
- Best effort—0

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs canonical-qos map tos** command to specify a mapping between various QoS categories and the ToS precedence bits in the IP header for packets transmitted over the Gn (GTP tunnels) and Gi interfaces.

All the keyword arguments for the command are optional. However, if you specify a value for the **normal** argument, you must specify a value for the **premium** argument. And if you specify a value with the **best-effort** argument, then you must specify a value for both the **premium** and the **normal** arguments.

When a request for a user session comes in (a PDP context activation request), the GGSN determines whether the requested QoS for the session packets can be handled based on the maximum packet handling capability of the GGSN. Based on this determination, one of the following occurs:

- If the requested QoS can be provided, then it is maintained.
- If the requested QoS cannot be provided, then the QoS for the requested session is either lowered, or the session is rejected.

## Examples

The following example specifies a QoS mapping from the canonical QoS classes to a premium ToS category of five, a normal ToS category of three, and a best-effort ToS category of two:

```
gprs canonical-qos map tos premium 5 normal 3 best-effort 2
```

## Related Commands

| Command | Description |
|---|---|
| **gprs canonical-qos best-effort bandwidth-factor** | Specifies the bandwidth factor to be applied to the canonical best-effort QoS class. |
| **gprs canonical-qos gsn-resource-factor** | Specifies the total amount of resource that the GGSN uses to provide canonical QoS service levels to mobile users. |
| **gprs canonical-qos premium mean-throughput-deviation** | Specifies a mean throughput deviation factor that the GGSN uses to calculate the allowable data throughput for the premium QoS class. |
| **gprs qos map canonical-qos** | Enables mapping of GPRS QoS categories to a canonical QoS method that includes best effort, normal, and premium QoS classes. |

# gprs canonical-qos premium mean-throughput-deviation

To specify a mean throughput deviation factor that the GGSN uses to calculate the allowable data throughput for the premium QoS class, use the **gprs canonical-qos premium mean-throughput-deviation** global configuration command. To return to the default value, use the **no** form of this command.

**gprs canonical-qos premium mean-throughput-deviation** *deviation_factor*

**no gprs canonical-qos premium mean-throughput-deviation** *deviation_factor*

## Syntax Description

| | |
|---|---|
| *deviation_factor* | Value that specifies the deviation factor. This value can range from 1 to 1000. The default value is 100. |

## Defaults

100

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN uses the **gprs canonical-qos premium mean-throughput-deviation** command to calculate a mean throughput value that determines the amount of data throughput used for a premium QoS. The calculation is made based on the following formula, which includes the input deviation factor:

EB = Min[p, m + a(p - m)]

Where

EB = the effective bandwidth
p = peak throughput from the GPRS QoS profile in PDP context requests
m = mean throughput from the GPRS QoS profile in PDP context requests
a = the deviation factor divided by 1000 (a/1000)

## Examples

The following example configures a mean throughput deviation of 1000:

```
gprs canonical-qos premium mean-throughput-deviation 1000
```

## Related Commands

| Command | Description |
|---|---|
| **gprs canonical-qos best-effort bandwidth-factor** | Specifies the bandwidth factor to be applied to the canonical best-effort QoS class. |
| **gprs canonical-qos gsn-resource-factor** | Specifies the total amount of resource that the GGSN uses to provide canonical QoS service levels to mobile users. |
| **gprs canonical-qos map tos** | Specifies a QoS mapping from the canonical QoS classes to an IP ToS category. |

# gprs charging cdr-aggregation-limit

To specify the maximum number of call detail records (CDRs) that the GGSN aggregates in a charging data transfer message to a charging gateway, use the **gprs charging cdr-aggregation-limit** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging cdr-aggregation-limit** *cdr-limit*

**no gprs charging cdr-aggregation-limit** *cdr-limit*

## Syntax Description

| | |
|---|---|
| *cdr-limit* | An integer between 1 and 255 that specifies the number of CDRs that can be accumulated in a charging data transfer message. The default is 255 CDRs. |

## Defaults

255 CDRs

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging cdr-aggregation-limit** command to specify the maximum number of CDRs that can be accumulated in a charging data transfer message to a charging gateway connected to the GGSN.

When the aggregation limit is reached, the GGSN puts the CDRs into a message and immediately sends it to the charging gateway.

To view the configured CDR aggregation limit, use the **show gprs charging parameters** command.

## Examples

The following example specifies 128 CDRs:

```
gprs charging cdr-aggregation-limit 128
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging container volume-threshold** | Specifies the maximum number of bytes that the GGSN maintains across all containers for a particular PDP context before closing and updating the G-CDR. |
| **gprs charging packet-queue-size** | Specifies the maximum number of unacknowledged charging data transfer requests that the GGSN maintains in its queue. |
| **gprs charging transfer interval** | Specifies the number of seconds that the GGSN waits before it transfers charging data to the charging gateway. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging cdr-option

To configure the GGSN to include or not include certain parameters in G-CDRs, use the **gprs charging cdr-option** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging cdr-option [apn | apn-selection-mode | chch-selection-mode | dynamic-address | external-charging-id | local-record-sequence-number | nip | node-id | no-partial-cdr-generation | packet-count | pdp-address | pdp-type | served-msisdn | sgsn-plmn]**

**no gprs charging cdr-option [apn | apn-selection-mode | chch-selection-mode | dynamic-address | local-record-sequence-number | nip | node-id | no-partial-cdr-generation | packet-count | pdp-address | pdp-type | served-msisdn | sgsn-plmn]**

## Syntax Description

| | |
|---|---|
| **apn** | Specifies that the APN parameter be included or not included in G-CDRs. |
| **apn-selection-mode** | Specifies that the reason code for APN selection be included or not included in G-CDRs. |
| **chch-selection-mode** | Specifies that the charging characteristics selection mode parameter be included or not included in G-CDRs. |
| **dynamic-address** | Specifies that the dynamic address flag parameter be included or not included in G-CDRs. |
| **local-record-sequence-number** | Enables the GGSN to use the local record sequence number field in G-CDRs. |
| **nip** | Specifies that the NIP parameter be included or not included in G-CDRs. |
| **node-id** | Specifies that the GGSN includes the node that generated the CDR in the node ID field in G-CDRs. |
| **no-partial-cdr-generation** | Disables the GGSN from creating partial CDRs. |
| **packet-count** | Enables the GGSN to provide uplink and downlink packet counts in the optional record extension field of a G-CDR. |
| **pdp-address** | Specifies that the PDP address parameter be included or not included in G-CDRs. |
| **pdp-type** | Specifies that the PDP type parameter be included or not included in G-CDRs. |
| **served-msisdn** | Enables the GGSN to provide the mobile station integrated digital network (MSISDN) number from the create PDP context request in a G-CDR. |
| **sgsn-plmn** | Specifies that the SGSN PLMN identifier be included or not included in G-CDRs. |

## Defaults

By default, the parameters configured by the following keyword options are included in G-CDRs:

- apn
- dynamic-address
- nip
- pdp-address

- pdp-type

By default, the parameters configured by the following keyword options are not included in G-CDRs:

- apn-selection
- local-record-sequence-number
- node-id
- packet-count
- served-msisdn

By default, non-primary partial CDR generation is enabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T and the **no-partial-cdr-generation** and **packet-count** keyword options were added. |
| 12.2(2) | This command was integrated in Cisco IOS Release 12.2(2) and the **served-msisdn** keyword option was added. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX and the **apn-selection-mode** keyword option was added. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(2)XB2 | This command was incorporated in Cisco IOS Release 12.3(2)XB2 and the **sgsn-plmn** keyword option was added. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging cdr-option** command to configure the GGSN to include or not include (using the **no** form of the command) the APN, dynamic address flag, NIP, PDP address, or PDP type parameters in G-CDRs.

### apn-selection-mode

Use the **gprs charging cdr-option apn-selection-mode** command to enable the GGSN to provide the reason code for APN selection in G-CDRs.

The following list shows the possible APN selection reason codes:

- 0—MS or network provided, subscription verified
- 1—MS provided, subscription not verified
- 2—Network provided, subscription not verified

To verify configuration of APN selection in G-CDRs, use the **show gprs charging parameters** command.

#### local-record-sequence-number

Certain charging data systems use the local record sequence number field in CDRs to associate the partial records generated in the SGSN and GGSN with a particular PDP context. If the charging gateway implements this feature, use the **gprs charging cdr-option local-record-sequence-number** command to enable the feature on the GGSN.

To verify configuration of the local record sequence number in G-CDRs, use the **show gprs charging parameters** command.

#### node-id

Certain charging data systems use the node ID field in CDRs to identify the node that generated the CDR. If the charging gateway that your GGSN communicates with uses this feature, use the **gprs charging cdr-option node-id** command to enable the feature.

To verify configuration of the node ID field in G-CDRs, use the **show gprs charging parameters** command.

#### no-partial-cdr-generation

Use the **gprs charging cdr-option no-partial-cdr-generation** command when you want all of the fields in the primary G-CDR to be included in any subsequent G-CDRs (partial G-CDRs) for the same PDP context request. By default, partial G-CDRs do not contain the following fields: network initiated PDP context, access point name (network identifier), PDP type, served PDP address, and dynamic address flag.

The CDR fields identify its uniqueness and association with a particular PDP context. When you enable the **gprs charging cdr-option no-partial-cdr-generation** command, the GGSN creates any subsequent G-CDRs for the same PDP context request with the same fields in all G-CDRs and maintains sequence numbering.

If the **gprs charging cdr-option no-partial-cdr-generation** command is configured, and a G-CDR is closed due to any triggers (such as tariff times, or QoS changes), then the GGSN copies the last SGSN (the current SGSN) in the list in the new G-CDR. If the **gprs charging cdr-option no-partial-cdr-generation** command is not configured, the current SGSN is not included in the subsequent partial G-CDR.

If the **gprs charging container sgsn-change-limit** command is configured when the **gprs charging cdr-option no-partial-cdr-generation** command is configured, the list is not sent. This is a reason that the **gprs charging cdr-option no-partial-cdr-generation** command is not compatible with the **gprs charging container sgsn-change-limit** command.

**Note** Enable this command only when there are no active PDP contexts. Enabling this feature will affect all subsequent PDP contexts.

To verify whether non-primary partial CDR creation is enabled or disabled on the GGSN, use the **show gprs charging parameters** command.

#### packet-count

When you issue the **gprs charging cdr-option packet-count** command, then the GGSN provides a packet count in the optional record extension field for all uplink and downlink packets transferred since the CDR was opened and subsequently closed.

The following object IDs (OIDs) are used in the optional record extension field of the CDR for the uplink and downlink packet counts:

- OID of the uplink packet count—1.3.6.1.4.1.9.10.48.1.2.2.98
- OID of the downlink packet count—1.3.6.1.4.1.9.10.48.1.2.2.99

To verify whether the packet count CDR option is enabled or disabled on the GGSN, use the **show gprs charging parameters** command.

#### served-msisdn

Use the **gprs charging cdr-option served-msisdn** command to enable the GGSN to provide the mobile station ISDN number from the create PDP context request in a G-CDR.

To verify whether the served MSISDN option is enabled or disabled on the GGSN, use the **show gprs charging parameters** command.

## Examples

The following example configures the GGSN to exclude the APN parameter in G-CDRs:

```
no gprs charging cdr-option apn
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging cg-path-requests

To specify the number of minutes that the GGSN waits before trying to establish the TCP path to the charging gateway when TCP is the specified path protocol, use the **gprs charging cg-path-requests** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging cg-path-requests** *minutes*

**no gprs charging cg-path-requests**

## Syntax Description

| | |
|---|---|
| *minutes* | Number of minutes the GGSN waits before retrying a charging request. The default value is 0 minutes, which disables the timer. |

## Defaults

0 minutes

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging cg-path-requests** command to specify the number of minutes that the GGSN waits before trying to establish the TCP path to the charging gateway when TCP is the specified path protocol.

## Examples

The following example specifies that the GGSN waits 5 minutes before trying to establish the TCP path to the charging gateway:

```
gprs charging cg-path-requests 5
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging container change-limit

To specify the maximum number of charging containers within each CDR from the GGSN, use the **gprs charging container change-limit** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging container change-limit** *number*

**no gprs charging container change-limit** *number*

## Syntax Description

| | |
|---|---|
| *number* | Integer from 1 to 100. The default value is 5. |

## Defaults

5 containers

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

For each activated PDP context on the GGSN, the GGSN creates a G-CDR to collect charging information to be sent to the charging gateway. When certain conditions occur for a PDP context, the GGSN adds information to the CDR or closes the CDR, depending on the trigger condition.

When a CDR is open for a PDP context and the GGSN detects a trigger condition, the GGSN collects the current charging data for that PDP context and appends it to the existing G-CDR in what is called a CDR container.

The following conditions cause the GGSN to create a CDR container and send updates to the charging gateway:

- Quality of service (QoS) change
- Tariff time change
- Periodic collection interval
- Destination change
- CDR closure

The following conditions cause the GGSN to create a CDR container and close the G-CDR:

- End of PDP context
- Partial record reason

To control the maximum number of these trigger conditions, and therefore CDR containers in each G-CDR, use the **gprs charging container change-limit** command.

When the number of containers added to a G-CDR reaches the limit specified in the **gprs charging container change-limit** command, the G-CDR is closed and sent as a partial CDR to the charging gateway. If the PDP context remains active, the GGSN opens another G-CDR with a subsequent sequence number associated with that PDP context and its charging data.

## Examples

The following example specifies that each CDR includes 25 charging containers:

```
gprs charging change-condition-limit 25
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging container volume-threshold** | Specifies the maximum number of bytes that the GGSN maintains across all containers for a particular PDP context before closing and updating the G-CDR. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging container sgsn-change-limit

To specify the maximum number of SGSN changes before closing a G-CDR for a particular PDP context, use the **gprs charging container sgsn-change-limit** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging container sgsn-change-limit** *number*

**no gprs charging container sgsn-change-limit** *number*

## Syntax Description

| | |
|---|---|
| *number* | Integer from 0 to 15. The default value is disabled. |

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD, with the following changes:<br>• The **no** form of the command was added.<br>• The default value changed from 15 to disabled. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

A value of 0 means that a G-CDR is closed each time that a new SGSN begins handling the PDP context.

The command specifies the number of changes, not the number of SGSNs to be supported. The number of SGSNs supported is equal to 1 more than the change limit. For example, if the SGSN change limit is 2, the maximum number of SGSNs in the list before the GGSN closes the G-CDR is 3.

The CDR fields identify its uniqueness and association with a particular PDP context. When you enable the **gprs charging cdr-option no-partial-cdr-generation** command, the GGSN creates any subsequent G-CDRs for the same PDP context request with the same fields in all G-CDRs and maintains sequence numbering.

If the **gprs charging container sgsn-change-limit** command is not configured when **gprs charging cdr-option no-partial-cdr-generation** command is configured, and a G-CDR is closed due to any other trigger (such as tariff times or QoS changes), the GGSN copies the last SGSN (the current SGSN) in the list in the new G-CDR.

If the **gprs charging container sgsn-change-limit** command is configured when the **gprs charging cdr-option no-partial-cdr-generation** command is configured, the list is not sent. This is a reason that the **gprs charging container sgsn-change-limit** command is not compatible with the **gprs charging cdr-option no-partial-cdr-generation** command.

## Examples

The following example specifies that a G-CDR closes after 5 SGSNs in a list for a particular PDP context. If the PDP context is still active, then a partial CDR is opened:

```
gprs charging container sgsn-change-limit 5
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging container volume-threshold

To specify the maximum number of bytes that the GGSN maintains across all containers for a particular PDP context before closing and updating the G-CDR, use the **gprs charging container volume-threshold** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging container volume-threshold** *threshold-value*

**no gprs charging container volume-threshold** *threshold-value*

## Syntax Description

| | |
|---|---|
| *threshold-value* | A value between 1 and 4294967295 that specifies the container threshold value, in bytes. The default is 1,048,576 bytes (1 MB). |

## Defaults

1,048,576 bytes (1 MB)

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

While a PDP context (mobile session) is active, charging events are generated based on various actions. One way that users can be charged is based on the amount of data transmitted between the PDN and the mobile station. Data volume is recorded in each of the containers of a G-CDR record. Service providers can use this recorded data volume to bill users by volume usage.

Use the **gprs charging container volume-threshold** command to control the maximum amount of data volume that can be reported in each G-CDR from an active PDP context before the G-CDR is eligible for an update to the charging gateway for subsequent billing. The GGSN opens another partial G-CDR for that PDP context while it remains in session on the GGSN.

For example, consider that a volume threshold setting of 1 MB is configured on the GGSN. The GGSN opens a container in a G-CDR for a new PDP context. A trigger occurs for the PDP context, and at that time the GGSN has registered transmission of 500 KB of data for the PDP context. The trigger causes the GGSN to close the container for the PDP context, which has occurred before the volume limit is reached (500 KB of data transmitted, and 1 MB allowed).

As transmission for the PDP context continues, the GGSN opens a new container in the G-CDR. The GGSN now has up to 500 KB more data that can be processed for that PDP context before reaching the volume threshold limit for the G-CDR. When the volume threshold is reached across all containers for the PDP context (that is, the sum of all of the byte counts across all containers for the PDP context reaches 1 MB), the GGSN closes the G-CDR with a volume limit cause so that the G-CDR can be sent to the charging gateway. The GGSN opens another partial G-CDR for the PDP context while it remains in session.

## Examples

The following example specifies a threshold value of 2097152:

```
gprs charging container volume-threshold 2097152
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging container change-limit** | Specifies the maximum number of charging containers within each CDR from the GGSN |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging disable

To disable charging transactions on the GGSN, use the **gprs charging disable** global configuration command. To re-enable charging transactions, use the **no** form of this command.

**gprs charging disable**

**no gprs charging disable**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Charging is enabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging disable** command to disable charging. By default, charging processing is enabled on the GGSN.

Before the GGSN can disable charging, any currently open CDRs must be cleared. To clear any open CDRs, use the **clear gprs charging cdr** command.

If you disable charging on the GGSN using the **gprs charging disable** command, then you can re-enable charging using the **no gprs charging disable** command.

**Caution** The **gprs charging disable** command removes charging data processing on the GGSN, which means that the data required to bill customers for network usage is not being collected by the GGSN nor sent to the charging gateway. Cisco Systems recommends that you avoid using this command in production GPRS network environments. If you must configure this command, use it with extreme care and reserve its usage only for non-production network conditions.

The **gprs charging disable** command is a hidden command in the Cisco IOS software and does not appear when querying the command line interface help using "?".

## Examples

The following example disables GPRS charging processing:

```
gprs charging disable
```

# gprs charging flow-control private-echo

To implement an echo request with private extensions for maintaining flow control on packets transmitted to the charging gateway, use the **gprs charging flow-control private-echo** global configuration command. To disable private extensions for flow control, use the **no** form of this command.

**gprs charging flow-control private-echo**

**no gprs charging flow-control private-echo**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Private flow control is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

If the charging gateway that the GGSN communicates with implements a proprietary private extension to the echo signal that maintains flow control, use the **gprs charging flow-control private-echo** command to enable private echo signaling. If your charging gateway does not implement this feature, disable the feature.

## Examples

The following example enables an echo request:

```
gprs charging flow-control private-echo
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging header short

To enable the GGSN to use the GTP short header (6-byte header), use the **gprs charging header short** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging header short**

**no gprs charging header short**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled. The GGSN uses the GTP long header.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |

## Usage Guidelines

Use the **gprs charging header short** command to specify for the GGSN to use the GTP short header (6-byte header).

## Examples

The following example shows the use of the GTP short header being enabled:

```
gprs charging header short
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging map data tos

To specify an IP ToS mapping for GPRS charging packets, use the **gprs charging map data tos** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging map data tos** *tos-value*

**no gprs charging map data tos** *tos-value*

## Syntax Description

| | |
|---|---|
| *tos-value* | Specifies a ToS mapping value between 0 and 5. A higher number indicates a higher service priority. The default value is 3. |

## Defaults

3

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging map data tos** command to specify a value for the ToS precedence bits in the IP header for charging packets transmitted by the GGSN.

## Examples

The following example shows type of service mapping value of 5:

```
gprs charging map data tos 5
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging message transfer-request command-ie

To specify for the GGSN to include the Packet Transfer Command IE in the Data Record Transfer Response messages, use the **gprs charging message transfer-request command-ie** command. To return to the default value, use the no form of this command.

**gprs charging message transfer-request command-ie**

**no gprs charging message transfer-request command-ie**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The GGSN does not include the Packet Transfer Command IE.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Even though GGSN 4.0 supports the Packet Transfer Command IE, only the "Send Data Record Packet" value is used, even though the packet might be duplicated. GGSN 4.0 does not support the "Send Possibly Duplicated Data Record Packet," "Cancel Data Record Packet," or "Release Data Record Packet" values. Therefore, the CG or billing servers must have the ability to eliminate duplicate CDRs.

## Examples

The following example specifies for the GGSN to include the Packet Transfer Command IE in Data Record Transfer Response messages:

```
gprs charging message transfer-request command-ie
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging message transfer-response number-responded

To specify for the GGSN to use the Number of Requests Responded field instead of the Length field in the Requests Responded Information Element (IE) of Data Record Transfer Response messages, use the **gprs charging message transfer-response number-responded** command. To return to the default value, use the **no** form of this command.

**gprs charging message transfer-response number-responded**

**no gprs charging message transfer-response number-responded**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The GGSN uses the Length field.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging message transfer-response number-responded** command to specify for the GGSN to use the Number of Requests Responded field instead of the Length field in the Requests Responded IE of Data Record Transfer Response messages when connecting to a charging gateway that does not support the Length field.

## Examples

The following example specifies for the GGSN to use the Number of Requests Responded field:

```
gprs charging message transfer-response number-responded
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging packet-queue-size

To specify the maximum number of unacknowledged charging data transfer requests that the GGSN maintains in its queue, use the **gprs charging packet-queue-size** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging packet-queue-size** *queue-size*

**no gprs charging packet-queue-size** *queue-size*

## Syntax Description

| | |
|---|---|
| *queue-size* | Value between 1 and 512 that specifies the maximum queue size for the GGSN charging packet data queue. The default is 128 packets. |

## Defaults

128 packets

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging packet-queue-size** command to specify the maximum size of the GGSN queue of outstanding charging data transfer requests. This queue stores all unacknowledged charging data requests.

When the charging packet queue reaches the specified size, the GGSN stops queuing charging packets until a packet is cleared from the queue and stores new charging packets in memory.

If monitoring of the performance of the charging gateway indicates that it is processing charging packets slowly, you can increase the size of the charging packet queue. Conversely, if the performance of the charging gateway is fast, you can decrease the size of the charging packet queue.

## Examples

The following example specifies a GGSN queue of 512 charging data transfer requests:

```
gprs charging packet-queue-size 512
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging path-protocol

To specify the protocol that the GGSN uses to transmit and receive charging data, use the **gprs charging path-protocol** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging path-protocol** {**udp** | **tcp**}

**no gprs charging path-protocol** {**udp** | **tcp**}

## Syntax Description

| | |
|---|---|
| **udp** | User Datagram Protocol, which is a connectionless transport protocol. |
| **tcp** | Transport Control Protocol, which is a connection-based transport protocol. |

## Defaults

UDP

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging path-protocol** command to specify the protocol used by the GGSN to transfer charging data.

## Examples

The following example shows a UDP protocol:

```
gprs charging path-protocol udp
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging cg-path-requests** | Specifies the number of minutes that the GGSN waits before trying to establish the TCP path to the charging gateway when TCP is the specified path protocol. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging port

To configure the destination port of the charging gateway, use the **gprs charging port** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging port** *port-num*

**no gprs charging port** *port-num*

## Syntax Description

| | |
|---|---|
| *port-num* | Integer from 1024 to 10000. The default port is 3386. |

## Defaults

Port 3386

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Examples

The following example changes the default port of 3386 to 1055:

```
gprs charging port 1055
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging reconnect

To configure the GGSN to periodically attempt to reconnect to a CG that is unreachable to determine when the link is back up, use the **gprs charging reconnect** global configuration command.

**gprs charging reconnect** *minutes*

## Syntax Description

| | |
|---|---|
| *minutes* | Number of minutes the GGSN waits between attempts to reconnect to a charging gateway. The valid range is 1 to 600 minutes. The default is 1 minute. |

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Configuring the GGSN to automatically attempt to reconnected to a unreachable CG is only necessary when UDP is used as the charging transport protocol and the charging gateway does not support echo requests.

## Examples

The following example configures the GGSN to try to reconnect to a chaging gateway every 5 minutes:

```
gprs charging reconnect 5
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging path-protocol** | Specifies the transport path protocol to be used by the GGSN to transmit and receive charging data. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging release

To specify that the GGSN present R98/R97 and R99 QoS profile formats in G-CDRs or present only R97/R98 QoS profile formats, use the **gprs charging release** global configuration command. To disable specifying the configuration, use the **no** form of this command.

**gprs charging release** {**99** | **98**}

**no gprs charging release** {**99** | **98**}

## Syntax Description

| | |
|---|---|
| **99** | Specifies for the GGSN to present R97/R98 and R99 QoS profile formats in G-CDRs. |
| **98** | Specifies for the GGSN to present only R97/R98 QoS profile formats in G-CDRs. |

## Defaults

99

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

When 99 is configured, the Charging Characteristics parameter is included in G-CDRs.

To verify configuration of the QoS profile format in G-CDRs, use the **show gprs charging parameters** command.

## Examples

The following example enables the GGSN to present both R97/R98 QoS profile formats and R99 QoS profile formats in G-CDRs:

```
gprs charging release 99
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging roamers

To enable charging for roamers on the GGSN, use the **gprs charging roamers** global configuration command. To disable charging for roamers on the GGSN, use the **no** form of this command.

**gprs charging roamers**

**no gprs charging roamers**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Charging for roamers is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging roamers** command to enable support on the GGSN for the creation of call detail records (CDRs) for roaming mobile subscribers.

There are several scenarios that should be considered for charging for roaming mobile subscribers. The GGSN does not support charging for all roaming scenarios.

### Supported Roaming Scenario

The GGSN correctly supports charging in the following roaming scenario:

MS1 is subscribed to PLMN1 and attaches to PLMN1. From PLMN1, MS1 initiates a PDP context with an SGSN in PLMN1 that is connected to our GGSN. In this case MS1 is not a roamer. The MCC and MNC values within the TID should match the MCC and MNC values on the GGSN, and G-CDRs are not created.

### Roaming Scenario Restrictions

In the following roaming scenarios, the GGSN does not behave as expected for charging support:

- MS2 is subscribed to PLMN2 and attaches to PLMN1. From PLMN1, MS2 initiates a PDP context with an SGSN in PLMN1 that is connected to our GGSN. In this case MS2 is considered a roamer. The MCC and MNC values within the TID should not match the MCC and MNC values on the GGSN, and G-CDRs are created.

  G-CDRs are created in this scenario even though the SGSN and GGSN reside within the same PLMN. The feature does not work as expected in this scenario.

- MS1 is subscribed to PLMN1 and attaches to PLMN2. From PLMN2, MS1 initiates a PDP context to an SGSN in PLMN1 that is connected to our GGSN. In this case MS1 is also a roamer. However, the MCC and MNC values within the TID match the MCC and MNC values on the GGSN, and G-CDRs are not created. Only S-CDRs are created in the visited PLMN (PLMN2).

  G-CDRs are not created in this scenario even though the MS is roaming in PLMN2. The feature does not work as expected in this scenario.

**Note** If the charging policy of the service provider is not consistent with this behavior, then you might not want to implement charging for roamers on the GGSN.

### Configuration Guidelines

To enable charging for roamers on the GGSN, you must first configure the **gprs mcc mnc** command. The GGSN uses the values that you configure in this command to compare with the tunnel ID (TID) in a create PDP context request. If the values for the MCC and MNC in the TID of a PDP context do not match the values configured on the GGSN, and if the **gprs charging roamers** command is configured, then the GGSN creates a CDR for the PDP context.

The GGSN automatically specifies values of 000 for the MCC and MNC. However, you must configure non-zero values for both the MCC and MNC before you can enable the GGSN to create charging CDRs for roamers.

It is important that you configure the **gprs mcc mnc** and **gprs charging roamers** commands in their proper order. After you configure the MCC and MNC values, use the **gprs charging roamers** command to enable charging for roamers on the GGSN. You can change the MCC and MNC values by reissuing the **gprs mcc mnc** command.

To verify your configuration of these codes on the GGSN, use the **show gprs charging parameters** command.

## Examples

The following example enables the charging for roamers feature on the GGSN:

```
gprs charging roamers
```

## Related Commands

| Command | Description |
|---|---|
| **gprs mcc mnc** | Configures the mobile country code and mobile network node that the GGSN uses to determine whether a create PDP context request is from a roamer. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging send-buffer

To configure the size of the buffer that contains the GTP' PDU and signaling messages on the GGSN, use the **gprs charging send-buffer** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging send-buffer** *bytes*

**no gprs charging send-buffer** *bytes*

## Syntax Description

| | |
|---|---|
| *bytes* | Integer from 100 to 1460. The default value is 1460 bytes. |

## Defaults

1460 bytes

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Examples

The following example specifies a buffer size of 512 bytes:

```
gprs charging send-buffer 512
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging server-switch-timer

To specify a timeout value that determines when the GGSN attempts to find an alternate charging gateway after a destination charging gateway cannot be located or becomes unusable, use the **gprs charging server-switch-timer** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging server-switch-timer** *seconds*

**no gprs charging server-switch-timer** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Timeout value (between 0 and 300 seconds), that the GGSN waits before attempting to contact an alternate charging gateway. The default value is 60 seconds. |

## Defaults

60 seconds

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging server-switch-timer** command to specify a timeout value that determines when the GGSN contacts an alternate charging gateway when the current charging gateway becomes unusable or cannot be located.

To specify that the switch-over to an alternate charging gateway takes place immediately, specify a value of 0.

## Examples

The following example configures a time-out value of 30 seconds:

```
gprs charging server-switch-timer 30
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging tariff-time

To specify a time of day when GPRS charging tariffs change, use the **gprs charging tariff-time** global configuration command. To remove an existing tariff time, use the **no** form of this command.

**gprs charging tariff-time** *time*

**no gprs charging tariff-time** *time*

## Syntax Description

| | |
|---|---|
| *time* | A time of day when the charging tariff changes. Specify the time format as hh:mm:ss. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging tariff-time** command to specify when the charging tariff for using GPRS will change. When the tariff time changes, a container is attached to the CDR for the user.

You can set up a maximum of 32 tariff change times.

## Examples

The following example specifies 14:30:00 as the time when the charging tariff changes:

```
gprs charging tariff-time 14:30:00
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs charging transfer interval

To specify the number of seconds that the GGSN waits before it transfers charging data to the charging gateway, use the **gprs charging transfer interval** global configuration command. To return to the default value, use the **no** form of this command.

**gprs charging transfer interval** *seconds*

**no gprs charging transfer interval** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Interval between charging transfers, in seconds. Can be a value between 1 and 4294967295 seconds. The default is 105 seconds. |

## Defaults

105 seconds

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs charging transfer interval** command to specify how often the GGSN transfers charging data for a given PDP context (mobile session) to a charging gateway.

## Examples

The following example specifies an interval of 512 seconds:

```
gprs charging transfer interval 512
```

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs default aaa-group

To specify a default AAA server group and assign the type of AAA services to be supported by the server group for all access points on the GGSN, use the **gprs default aaa-group** global configuration command. To remove the default AAA server group, use the **no** form of this command.

**gprs default aaa-group** {**authentication** | **accounting**} *server-group*

**no gprs default aaa-group** {**authentication** | **accounting**} *server-group*

## Syntax Description

| | |
|---|---|
| **authentication** | Assigns the selected server group for authentication services on all APNs. |
| **accounting** | Assigns the selected server group for accounting services on all APNs. |
| *server-group* | Specifies the name of a AAA server group to be used for AAA services on all APNs.<br>**Note** The name of the AAA server group that you specify must correspond to a server group that you configure using the **aaa group server** command. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The Cisco Systems GGSN supports authentication and accounting at APNs using AAA server groups. By using AAA server groups, you gain the following benefits:

- You can selectively implement groups of servers for authentication and accounting at different APNs.
- You can configure different server groups for authentication services and accounting services in the same APN.
- You can control which RADIUS services you want to enable at a particular APN, such as AAA accounting.

The GGSN supports the implementation of AAA server groups at both the global and access-point configuration levels. You can minimize your configuration by specifying the configuration that you want to support across most APNs, at the global configuration level. Then, at the access-point configuration level, you can selectively modify the services and server groups that you want to support at a particular APN. Therefore, you can override the AAA server global configuration at the APN configuration level.

To configure a default AAA server group to be used for all APNs on the GGSN, use the **gprs default aaa-group** global configuration command. To specify a different AAA server group to be used at a particular APN for authentication or accounting, use the **aaa-group** access-point configuration command.

If accounting is enabled on the APN, then the GGSN looks for an accounting server group at the APN or globally in the following order:

- First, at the APN for an accounting server group—configured in the **aaa-group accounting** command.
- Second, for a global GPRS default accounting server group—configured in the **gprs default aaa-group accounting** command.
- Third, at the APN for an authentication server group—configured in the **aaa-group authentication** command.
- Last, for a global GPRS default authentication server group—configured in the **gprs default aaa-group authentication** command.

If authentication is enabled on the APN, then the GGSN first looks for an authentication server group at the APN. If an authentication server group is not found at the APN, then the GGSN looks for a globally configured, GPRS default authentication server group.

To complete the configuration, you also must specify the following configuration elements on the GGSN:

- Configure the RADIUS servers using the **radius-server host** command.
- Define a server group with the IP addresses of the AAA servers in that group using the **aaa group server** global configuration command.
- Enable the type of AAA services (accounting and authentication) to be supported on the APN.
  - The GGSN enables accounting by default for non-transparent APNs.

    You can disable accounting services at the APN using the **aaa-accounting disable** command.
  - You can enable authentication at the APN level by configuring the **access-mode non-transparent** command. When you enable authentication, the GGSN automatically enables accounting on the APN. There is not a global configuration command to enable or disable authentication.
- Configure AAA accounting and authentication using the **aaa accounting** and **aaa authentication** global configuration commands.

**Note** For more information about AAA and RADIUS global configuration commands, see the *Cisco IOS Security Command Reference.*

## Examples

The following configuration example defines four AAA server groups on the GGSN: foo, foo1, foo2, and foo3, shown by the **aaa group server** commands.

Using the **gprs default aaa-group** command, two of these server groups are globally defined as default server groups: foo2 for authentication, and foo3 for accounting.

At access-point 1, which is enabled for authentication, the default global authentication server group of foo2 is overridden and the server group named foo is designated to provide authentication services on the APN. Notice that accounting services are not explicitly configured at that access point, but are automatically enabled because authentication is enabled. Because there is a globally defined accounting server-group defined, the server named foo3 will be used for accounting services.

At access-point 4, which is enabled for accounting using the **aaa-accounting enable** command, the default accounting server group of foo3 is overridden and the server group named foo1 is designated to provide accounting services on the APN.

Access-point 5 does not support any AAA services because it is configured for transparent access mode.

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
aaa group server radius foo1
 server 10.10.0.1
aaa group server radius foo2
 server 10.2.3.4
 server 10.10.0.1
aaa group server foo3
 server 10.6.7.8
 server 10.10.0.1
!
aaa authentication ppp foo group foo
aaa authentication ppp foo2 group foo2
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
aaa accounting network foo1 start-stop group foo1
aaa accounting network foo2 start-stop group foo2
aaa accounting network foo3 start-stop group foo3
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
  access-point-name www.pdn1.com
  aaa-group authentication foo
!
 access-point 4
  access-mode transparent
  access-point-name www.pdn2.com
  aaa-accounting enable
  aaa-group accounting foo1
!
 access-point 5
  access-mode transparent
  access-point-name www.pdn3.com
!
gprs default aaa-group authentication foo2
gprs default aaa-group accounting foo3
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.10.0.1 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

**Related Commands**

| Command | Description |
|---|---|
| **aaa accounting** | Enables AAA accounting of requested services for billing or security purposes. |
| **aaa authorization** | Sets parameters that restrict user access to a network. |
| **aaa group server** | Groups different server hosts into distinct lists and distinct methods. |
| **aaa-accounting** | Enables or disables accounting for a particular access point on the GGSN. |
| **aaa-group** | Specifies a RADIUS server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| **radius-server host** | Specifies a RADIUS server host. |

# gprs default aggregate

To configure the GGSN to create an aggregate route in its IP routing table when receiving PDP requests from MSs on the specified network for any access point on the GGSN, use the **gprs default aggregate** global configuration command. To remove a global aggregate route, use the **no** form of this command.

**gprs default aggregate** *ip-network-prefix* {*/mask-bit-length* | *ip-mask*}

**no gprs default aggregate** *ip-network-prefix* {*/mask-bit-length* | *ip-mask*}

## Syntax Description

| | |
|---|---|
| *ip-network-prefix* | Dotted decimal notation of the IP network address to be used by the GGSN for route aggregation, in the format *a.b.c.d*. |
| */mask-bit-length* | Number of bits (as an integer) that represent the network portion of the specified IP network address. A forward slash is required before the integer.<br>**Note** There is no space between the *ip-network-prefix* and the slash (/). |
| *ip-mask* | Dotted decimal notation of the IP network mask (in the format *e.f.g.h.*), which represents the network and host portion of the specified IP network address. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN uses a static host route to forward user data packets received from the Gi interface to the Gn interface using the virtual template interface of the GTP tunnel.

Without the **gprs default aggregate** command or **aggregate** command, the GGSN creates a static host route for each PDP request. For example, for 45,000 PDP contexts supported, the GGSN creates 45,000 static host routes in its IP routing table.

You can use the **gprs default aggregate** command to reduce the number of static routes implemented by the GGSN for PDP requests at all access points on the GGSN. The **gprs default aggregate** command allows you to specify an IP network prefix to combine the routes of PDP requests from the same network as a single route on the GGSN.

If you use the **gprs default aggregate** command to globally define an aggregate IP network address range for all access points on the GGSN, you can use the **aggregate** command to override this default address range at a particular access point. Automatic route aggregation can be configured at the access-point configuration level only on the GGSN. The **gprs default aggregate** global configuration command does not support the **auto** option; therefore, you cannot configure automatic route aggregation globally on the GGSN.

The GGSN responds in the following manner to manage routes for MSs through an access point, when route aggregation is configured in the following scenarios:

- No aggregation is configured on the GGSN, at the APN or globally—The GGSN inserts the 32-bit host route of the MS into its routing table as a static route.
- A default aggregate route is configured globally, but no aggregation is configured at the APN:
  - If a statically or dynamically derived address for an MS matches the default aggregate route range, the GGSN inserts an aggregate route into its routing table.
  - If the MS address does not match the default aggregate route, the GGSN inserts the 32-bit host route as a static route into the routing table.
- A default aggregate route is configured globally, and automatic route aggregation is configured at the APN:
  - If a statically derived address for an MS matches the default aggregate route range, the GGSN inserts an aggregate route into its routing table.
  - If a statically derived address for an MS does not match the default aggregate route, the GGSN inserts the 32-bit host route as a static route into its routing table.
  - If a dynamically derived address for an MS is received, the GGSN aggregates the route based on the address and mask returned by the DHCP or RADIUS server.
- A default aggregate route is configured globally, and an aggregate route is also configured at the APN:
  - If a statically or dynamically derived address for an MS matches the aggregate range at the APN through which it was processed, or otherwise matches the default aggregate range, the GGSN inserts an aggregate route into its routing table.
  - If a statically or dynamically derived address for an MS does not match either the aggregate range at the APN, or the global default aggregate range, the GGSN inserts the 32-bit host route as a static route into its routing table.

Use care when assigning IP addresses to an MS before you configure the aggregation ranges on the GGSN. A basic guideline is to aggregate as many addresses as possible, but to minimize your use of aggregation with respect to the total amount of IP address space being used by the access point.

**Note** The **aggregate** command and **gprs default aggregate** commands affect routing on the GGSN. Use care when planning and configuring IP address aggregation.

## Examples

The following example shows a route aggregation configuration for access point 8 using DHCP on the GGSN, along with the associated output from the **show gprs gtp pdp-context all** command and the **show ip route** commands.

Notice that the **aggregate auto** command is configured at the access point where DHCP is being used. The **dhcp-gateway-address** command specifies the subnet addresses to be returned by the DHCP server. This address should match the IP address of a loopback interface on the GGSN. In addition, to accommodate route aggregation for another subnet 10.80.0.0, the **gprs default aggregate** global configuration command is used.

In this example, the GGSN aggregates routes for dynamically derived addresses for MSs through access point 8 based upon the address and mask returned by the DHCP server. For PDP context requests received for statically derived addresses on the 10.80.0.0 network, the GGSN also implements an aggregate route into its routing table, as configured by the **gprs default aggregate** command.

```
interface Loopback0
 ip address 10.80.0.1 255.255.255.255
!
interface Loopback2
 ip address 10.88.0.1 255.255.255.255
!
gprs access-point-list gprs
 access-point 8
   access-point-name pdn.aaaa.com
   ip-address-pool dhcp-proxy-client
   aggregate auto
   dhcp-server 172.16.43.35
   dhcp-gateway-address 10.88.0.1
   exit
!
gprs default aggregate 10.80.0.0 255.255.255.0
```

In the following output for the **show gprs gtp pdp-context all** command, 5 PDP context requests are active on the GGSN for pdn.aaaa.com from the 10.88.0.0/24 network:

```
router# show gprs gtp pdp-context all
TID              MS Addr         Source  SGSN Addr       APN
6161616161610001 10.88.0.1       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610002 10.88.0.2       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610003 10.88.0.3       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610004 10.88.0.4       DHCP    172.16.123.1    pdn.aaaa.com
6161616161610005 10.88.0.5       DHCP    172.16.123.1    pdn.aaaa.com
```

The following output for the **show ip route** command shows a single static route in the IP routing table for the GGSN, which routes the traffic for the 10.88.0.0/24 subnet through the virtual template (or Virtual-Access1) interface:

```
router# show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     10.80.0.0/16 is subnetted, 1 subnets
C       10.80.0.0 is directly connected, Loopback0
     10.113.0.0/16 is subnetted, 1 subnets
```

```
C       10.113.0.0 is directly connected, Virtual-Access1
     172.16.0.0/16 is variably subnetted, 3 subnets, 3 masks
C       172.16.43.192/28 is directly connected, FastEthernet0/0
S       172.16.43.0/24 is directly connected, FastEthernet0/0
S       172.16.43.35/32 is directly connected, Ethernet2/3
     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
U       10.88.0.0/24 [1/0] via 0.0.0.0, Virtual-Access1
C       10.88.0.0/16 is directly connected, Loopback2
```

## Related Commands

| Command | Description |
|---|---|
| **aggregate** | Configures the GGSN to create an aggregate route in its IP routing table when receiving PDP requests from MSs on the specified network for a particular access point on the GGSN. |
| **show gprs access-point** | Displays information about access points on the GGSN. |

# gprs default charging-gateway

To specify the default charging gateway, use the **gprs default charging gateway** global configuration command. To remove the charging gateway, use the **no** form of this command.

**gprs default charging-gateway** {*ip-address* | *name*} [{*ip-address* | *name*}]

**no gprs default charging-gateway** {*ip-address* | *name*} [{*ip-address* | *name*}]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of a default gateway. |
| *name* | Host name for a default gateway. |

## Defaults

No default charging gateway is assigned.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs default charging-gateway** command to specify the IP address or host name of a default charging gateway that the GGSN uses to communicate charging information. If you specify two gateways, then the first gateway is the primary gateway, and the second gateway is the backup.

## Examples

The following example specifies two default charging gateway IP addresses:

```
gprs default charging-gateway 10.100.0.3 10.100.0.2
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging container volume-threshold** | Specifies the maximum number of bytes that the GGSN maintains across all containers for a particular PDP context before closing and updating the CDR. |
| **gprs charging flow-control private-echo** | Implements an echo request with private extensions for maintaining flow control on packets transmitted to the charging gateway. |
| **gprs charging packet-queue-size** | Specifies the maximum number of unacknowledged charging data transfer requests that the GGSN maintains in its queue. |
| **gprs charging server-switch-timer** | Specifies a timeout value that determines when the GGSN attempts to find an alternate charging gateway after a destination charging gateway cannot be located or becomes unusable. |
| **gprs charging tariff-time** | Specifies a time of day when GPRS charging tariffs change. |
| **gprs charging transfer interval** | Specifies the number of seconds that the GGSN waits before it transfers charging data to the charging gateway. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs default dhcp-server

To specify a default Dynamic Host Configuration Protocol (DHCP) server from which the GGSN obtains IP address leases for mobile users, use the **gprs default dhcp-server** global configuration command. To remove the default DHCP server, use the **no** form of this command.

**gprs default dhcp-server** {*ip-address* | *name*} [{*ip-address* | *name*}]

**no gprs default dhcp-server** {*ip-address* | *name*} [{*ip-address* | *name*}]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of a DHCP server. The first IP address is the name of the primary DHCP server. The second (optional) *ip-address* argument specifies the IP address of a backup DHCP server. |
| *name* | Host name of a DHCP server. The second (optional) *name* argument specifies the host name of a backup DHCP server. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs default dhcp-server** command to specify a DHCP server from which the GGSN obtains IP address leases for mobile users across all access points. Use the optional second set of arguments to specify the name, or IP address, of a backup DHCP server to use if the primary DHCP server is unavailable. If you do not specify a backup DHCP server, then no backup DHCP server is available.

In addition to specifying a DHCP server for the GGSN, you must also specify the GGSN as a DHCP proxy client. You can configure the GGSN as a DHCP proxy client using either the **gprs default ip-address-pool dhcp-proxy-client** global configuration command, or the **ip-address-pool dhcp-proxy-client** access-point configuration command.

You can override the DHCP server that is configured globally, and specify a different DHCP server for a particular access point using the **dhcp-server** access-point configuration command. If you do not specify a DHCP server for a specified access point, then the DHCP server specified with the **gprs default dhcp-server** command is used for that access point.

**Note** You cannot specify a DHCP server that is located within a private network using VRF with the **gprs default dhcp-server global configuration** command. To specify a DHCP server that is within a VRF address space, you must use the **dhcp-server** access-point configuration command.

## Examples

The following example specifies 10.101.100.3 as the GPRS default DHCP server for GPRS, using the **gprs default dhcp-server** command. Although this DHCP server is also configured globally on the router using the **ip dhcp-server** global configuration command, this is not required.

Because DHCP is the default dynamic addressing method specified by the **gprs default ip-address-pool dhcp-proxy-client** command, access-point 3 will use the DHCP server located at 10.101.100.3 for IP addressing support. Access-point 1 and access-point 2 override the default DHCP server using the **dhcp-server** access-point configuration command to specify alternative DHCP servers:

```
interface Loopback1
 ip address 10.30.30.30 255.255.255.255
!
interface Loopback2
 ip address 10.27.27.27 255.255.255.255
!
interface Loopback3
 ip address 10.25.25.25 255.255.255.255
!
interface virtual-template 1
 ip address 10.15.10.1 255.255.255.0
 no ip directed-broadcast
 encapsulation gtp
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn1.com
  dhcp-server 10.102.100.3
  dhcp-gateway-address 10.30.30.30
  exit
!
 access-point 2
  access-point-name gprs.pdn2.com
  dhcp-server 10.60.0.1
  dhcp-gateway-address 10.27.27.27
  exit
!
 access-point 3
  access-point-name www.pdn3.com
  access-mode non-transparent
  dhcp-gateway-address 10.25.25.25
  exit
!
gprs default ip-address-pool dhcp-proxy-client
gprs default dhcp-server 10.101.100.3
```

**Related Commands**

| Command | Description |
|---|---|
| **dhcp-server** | Specifies a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point. |
| **gprs default ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the GGSN. |
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |

# gprs default ip-address-pool

To specify a dynamic address allocation method using IP address pools for the GGSN, use the **gprs default ip-address-pool** global configuration command. To disable dynamic address allocation, use the **no** form of this command.

**gprs default ip-address-pool** {**dhcp-proxy-client** | **disable** | **radius-client**}

**no gprs default ip-address-pool** {**dhcp-proxy-client** | **disable** | **radius-client**}

## Syntax Description

| | |
|---|---|
| **dhcp-proxy-client** | GGSN dynamically acquires IP addresses for an MS from a DHCP server. |
| **disable** | Disables dynamic address allocation by the GGSN. |
| **radius-client** | GGSN dynamically acquires IP addresses for an MS from a RADIUS server. |

## Defaults

IP address pools are disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs default ip-address-pool** command to specify the method by which the GGSN obtains address leases for mobile stations across all access points.

If you specify **dhcp-proxy-client** for the GPRS default IP address pool, then you must specify a DHCP server for address allocation. To specify a DHCP server, use either the **gprs default dhcp-server** global configuration command, or the **dhcp-server** access-point configuration command.

If you specify **radius-client** as the method for IP address allocation, then you must configure RADIUS services at the GGSN. This involves configuring AAA server groups using the **gprs default aaa-group** or **aaa-group** commands, and configuring the **radius-server hos**t commands to specify the RADIUS servers that provide the address pool. You also need to configure AAA on the GGSN. For more information about configuring RADIUS on the GGSN, refer to the Usage Guidelines section for the **aaa-group** and **gprs default aaa-group** commands.

To disable the selected IP address allocation method, use the **no** form of this command or issue the command with the **disable** keyword (the default form of this command).

## Examples

The following example specifies **gprs default ip-address-pool dhcp-proxy-client** as the dynamic address allocation method for the GGSN across all access points.

Access-point 3 overrides the default by specifying **ip-address-pool radius-client** as the dynamic address allocation method for that access point. The corresponding RADIUS and AAA configuration is also shown as an example.

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
interface Loopback1
 ip address 10.30.30.30 255.255.255.255
!
interface Loopback2
 ip address 10.27.27.27 255.255.255.255
!
interface virtual-template 1
 ip address 10.15.10.1 255.255.255.0
 no ip directed-broadcast
 encapsulation gtp
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn1.com
  dhcp-server 10.102.100.3
  dhcp-gateway-address 10.30.30.30
  exit
!
 access-point 2
  access-point-name gprs.pdn2.com
  dhcp-server 10.60.0.1
  dhcp-gateway-address 10.27.27.27
  exit
!
 access-point 3
  access-point-name www.pdn3.com
  access-mode non-transparent
  ip-address-pool radius-client
  aaa-group authentication foo
  exit
!
gprs default ip-address-pool dhcp-proxy-client
gprs default dhcp-server 10.101.100.3
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

**Related Commands**

| Command | Description |
|---|---|
| **dhcp-server** | Specifies a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point. |
| **gprs default dhcp-server** | Specifies a default DHCP server from which the GGSN obtains IP address leases for mobile users. |
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |
| **aaa-group** | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| **gprs default aaa-group** | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |

# gprs default map-converting-gsn

To specify the IP address or host name of the primary (and backup) GSN to communicate with the HLR in sending and receiving MAP messages, use the **gprs default map-converting-gsn** global configuration command. To remove the GSN configuration, use the **no** form of this command.

**gprs default map-converting-gsn** {*ip-address* | *hostname*} [*ip-address* | *hostname*]

**no gprs default map-converting-gsn** {*ip-address* | *hostname*} [*ip-address* | *hostname*]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of the GSN handling MAP messages with the HLR. The first *ip-address* argument specifies the IP address of the primary GSN. The second (optional) *ip-address* argument specifies the IP address of a backup GSN. |
| *hostname* | Host name of the GSN handling MAP messages with the HLR. The second (optional) *name* argument specifies the host name of a backup GSN. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs default map-converting-gsn** command to identify an GSN that can convert GTP messages to and from Mobile Application Protocol (MAP) messages. This GTP-to-MAP and MAP-to-GTP conversion allows the GSN to communicate with an HLR.

The GGSN must be able to send MAP messages to an HLR to support network-initiated PDP requests. Network-initiated PDP requests are one example of an application that requires this MAP conversion function.

The GGSN supports a maximum of two protocol-converting GSNs. Therefore, you can specify both a primary and backup GSN using a single **gprs default map-converting-gsn** command. However, you cannot configure more than one instance of the **gprs default map-converting-gsn** command.

The GGSN uses the backup GSN when the GGSN reaches the maximum signaling threshold (N3 GTP signaling requests x T3).

In addition to configuring the **gprs default map-converting-gsn** command, you must configure the following other commands to support network-initiated PDP requests on the GGSN:

- **gprs ni-pdp ip-imsi single**
- **network-request-activation**

## Examples

The following example configures the GSN, located at IP address 172.16.10.10, to convert MAP messages between the HLR and the GGSN:

```
gprs default map-converting-gsn 172.16.10.10
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp ip-imsi single** | Specifies a static IP address to IMSI mapping for a single MS for network-initiated PDP requests from a particular APN. |
| **network-request-activation** | Enables an access point to support network-initiated PDP requests to a MS. |

# gprs delay-qos map tos

To specify a QoS mapping from the delay QoS classes to an IP type of service (ToS) precedence value, use the **gprs delay-qos map tos class** global configuration command. To return to the default values, use the **no** form of this command.

**gprs delay-qos map tos class1** *tos-value* [**class2** *tos-value* [**class3** *tos-value* [**class-best-effort** *tos-value*]]]

**no gprs delay-qos map tos class1** *tos-value* [**class2** *tos-value* [**class3** *tos-value* [**class-best-effort** *tos-value*]]]

## Syntax Description

| | |
|---|---|
| **class1** *tos-value* | ToS mapping for a delay1 class QoS. The *tos-value* can be a number from 0 to 4. The default is 3. |
| **class2** *tos-value* | ToS mapping for a delay2 class QoS. The *tos-value* can be a number from 0 to 4. The default is 2. |
| **class3** *tos-value* | ToS mapping for a delay3 class QoS. The *tos-value* can be a number from 0 to 4. The default is 1. |
| **class-best-effort** *tos-value* | ToS mapping for a delaybesteffort class QoS. The *tos-value* can be a number from 0 to 4. The default is 0. |

## Defaults

The default value for the class1 ToS category is 3.

The default value for the class2 ToS category is 2.

The default value for the class3 ToS category is 1.

The default value for the class-best-effort ToS category is 0.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs delay-qos map tos** command to specify a mapping between various QoS categories and the ToS precedence bits in the IP header for packets transmitted over the Gn interface (GTP tunnels).

**Note** You must enable delay QoS mapping by configuring the **gprs qos map delay** command *before* configuring the **gprs delay-qos map tos** command.

The **class2**, **class3** and **class-best-effort** keyword arguments are optional. However, if you specify a value for the **class3** argument, you must specify a value for the **class2** argument. And, if you specify a value for the **class-best-effort** argument, then you must specify a value for both the **class2** and the **class3** arguments.

Only ToS classes 0 through 5 will be used for GGSN signaling and user data. The GTP signaling message should have the highest precedence. ToS class 5 is the default ToS for GTP signaling. Use the **gprs gtp map signalling tos** command to specify an IP ToS mapping for GTP signaling packets.

The ToS precedence classes are defined as follows:

0 Routine

1 Priority

2 Immediate

3 Flash

4 Flash Override

5 Critical ECP

6 Internetwork Control

7 Network Control

## Examples

The following example specifies a QoS mapping from the delay QoS classes to a class1 ToS category of four, a class2 ToS category of three, a class3 ToS category of two, and a best-effort ToS category of one.

```
gprs delay-qos map tos class1 4 class2 3 class3 2 class-best-effort 1
```

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp map signalling tos** | Specifies an IP ToS mapping for GPRS signaling packets. |
| **gprs qos default-response requested** | Configures the GGSN to set its default QoS values in the response message exactly as requested in the create PDP context request message. |
| **gprs qos map delay** | Enables mapping of GPRS QoS categories to a delay QoS method that includes the delaybesteffort, delay1, delay2, and delay3 classes. |

# gprs dfp max-weight

To specify the maximum weight sent to a DFP manager by a GGSN acting as a DFP agent, use the **gprs dfp max-weight** global configuration command. To return to the default value, use the **no** form of this command.

**gprs dfp max-weight** [*max-weight-value*]

**no gprs dfp max-weight** [*max-weight-value*]

## Syntax Description

| | |
|---|---|
| *max-weight-value* | Specifies the maximum weight sent by the GGSN, acting as a DFP agent, to a DFP manager. The valid range is 1 to 100. The default value is 8. |

## Defaults

8

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(9)E | This command was introduced. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

If you use DFP with GPRS load balancing, you must also specify a maximum number of PDP contexts for each GGSN, using the **gprs maximum-pdp-context-allowed** command. *Do not* accept the default value of 10000 PDP contexts. A value of **45000** is recommended. Significantly lower values can impact performance in a GPRS load-balancing environment.

**Note** For more information about configuring GPRS load balancing, see the *IOS Server Load Balancing*, 12.1(9)E documentation located at Cisco.com at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121e/121e9/index.htm

## Examples

The following example sets the maximum weight sent by GGSN to 43:

```
gprs dfp max-weight 43
```

**Related Commands**

| Command | Description |
|---|---|
| **agent** | Identifies a DFP agent to which IOS SLB can connect. |
| **gprs maximum-pdp-context-allowed** | Specifies the maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN. |
| **ip dfp agent** | Identifies a DFP agent subsystem and enters DFP agent configuration mode. |
| **ip slb dfp** | Configures DFP, supplies an optional password, and enters DFP configuration mode. |

# gprs gtp echo-timer dynamic enable

To enable the dynamic echo timer on the GGSN, use the **gprs gtp echo-timer dynamic enable** global configuration command. To disable the dynamic echo timer, use the **no** form of this command.

**gprs gtp echo-timer dynamic enable**

**no gprs gtp echo-timer dynamic enable**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

For a GTP path to be active, the SGSN needs to be active. To determine that an SGSN is active, the GGSN and SGSN exchange echo messages. Although the GGSN supports different methods of echo message timing, the basic echo flow begins when the GGSN sends an echo request message to the SGSN. The SGSN sends a corresponding echo response message back to the GGSN.

If the GGSN does not receive a response after a certain number of retries (a configurable value), the GGSN assumes that the SGSN is not active. This indicates a GTP path failure, and the GGSN clears all PDP context requests associated with that path.

The GGSN supports two different methods of echo timing—the default echo timer and the dynamic echo timer.

The GGSN's default echo timer can not be configured to accommodate network congestion and therefore the GTP path could be cleared prematurely. The dynamic echo timer feature enables the GGSN to better manage the GTP path during periods of network congestion. Use the **gprs gtp echo-timer dynamic enable** command to enable the GGSN to perform dynamic echo timing.

### Default echo timer

The dynamic echo timer is based on the default echo timer in the GGSN. A description of the default echo timer follows as a means of comparison.

The default echo timer configuration uses the following commands:

- **gprs gtp n3-requests**—Specifies maximum number of times that the GGSN attempts to send a echo-request message. The default is 5 times.
- **gprs gtp path-echo-interval**—Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. The default is 60 seconds.
- **gprs gtp t3-response**—Specifies the number of seconds that the GGSN waits before resending an echo-request message after the path echo interval has expired and the echo response from the SGSN has not been received. The default is 1 second.

If the GGSN receives the echo response within the path echo interval (as specified in the **gprs gtp path-echo-interval** command; default is 60 seconds), it sends another echo request message after 60 seconds (or whatever time was configured in the **gprs gtp path-echo-interval** command). This message flow continues as long as the GGSN receives an echo response message from the SGSN within the specified path echo interval.

If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it resends echo request messages until the N3-requests counter is reached (as specified by the **gprs gtp n3-requests** command; default is 5). Because the initial request message is included in the N3-requests counter, the total number of retries is N3-1. The T3 timer increases by a factor of two for each retry (the factor value is not configurable).

For example, if N3 is set to the default of 5, and T3 is set to the default of 1 second, the GGSN will resend 4 echo request messages (the initial request + 4 retries=5). The T3 time increments for each additional echo request, by a factor of 2 seconds. So, the GGSN resends a message in 2 seconds, 4 seconds, 8 seconds, and 16 seconds. If the GGSN fails to receive an echo response message from the SGSN within the time period of the N3-requests counter, it clears the GTP path and deletes all of the PDP contexts.

For the above example, the total elapsed time from when the first request message is sent, to when the GTP path is cleared, is: 60+2+4+8+16=90 seconds,

where 60 is the initial value of the path echo interval, and the remaining 4 time periods are the increments of the T3 timer for the subsequent retries.

#### Dynamic echo timer

The dynamic echo timer method is different from the default echo timer method on the GGSN because it uses a calculated round-trip timer (RTT), as well as a configurable factor or multiplier to be applied to the RTT statistic.

The dynamic echo timer configuration uses the following commands:

- **gprs gtp echo-timer dynamic enable**—Enables the dynamic echo timer on the GGSN.
- **gprs gtp echo-timer dynamic minimum**—Specifies the minimum time period (in seconds) for the dynamic echo timer. If the RTT is less than this value, the GGSN uses the value set in this command.
- **gprs gtp echo-timer dynamic smooth-factor**—Configures the multiplier that the dynamic echo timer uses when calculating the time to wait to send retries, when it has not received a response from the SGSN within the path echo interval.
- **gprs gtp n3-requests**—Specifies the maximum number of times that the GGSN attempts to send an echo-request message. The default is 5 times.
- **gprs gtp path-echo-interval**—Specifies the number of seconds within which the GGSN expects to receive an echo response from the SGSN. This is the period of time that the GGSN waits before sending another echo-request message. The default is 60 seconds.

The GGSN calculates the RTT statistic for use by the dynamic echo timer feature. The RTT is the amount of time between sending a particular echo request message and receiving the corresponding echo response message. RTT is calculated for the first echo response received; the GGSN records this statistic. Because the RTT value might be a very small number, there is a minimum time for the dynamic echo timer to use. This value is configured using the **gprs gtp echo-timer dynamic minimum** command.

If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it goes into retransmission, or path failure mode. During path failure mode, the GGSN uses a value referred to as the T-dynamic. The T-dynamic is the greater of either the dynamic minimum, or the RTT statistic multiplied by the smooth factor.

The T-dynamic essentially replaces the use of the **gprs gtp t3-response** command, which is used in the default echo timer method on the GGSN. The T-dynamic timer increases by a factor of two for each retry (again, this factor is not configurable), until the N3-requests counter is reached (N3-requests counter includes the initial request message).

For example, if the RTT is 6 seconds, N3 is set to 5, and the smooth factor is set to 3, the GGSN will resend 4 echo request messages in path failure mode. The T-dynamic value is 18 (RTT x smooth factor), so the GGSN sends a retry echo request message in 36 seconds, 72 seconds, 144 seconds, and 288 seconds. If the GGSN fails to receive an echo response message from the SGSN in this time period, it clears the GTP path and deletes all PDP contexts. The total elapsed time from when the first request message is sent to when the GTP path is cleared is: 60+36+72+144+288=600 seconds, where 60 is the initial value of the path echo interval, and the remaining 4 time periods are the increments of the T-dynamic for the subsequent retries.

## Examples

The following example turns on the dynamic echo timer, sets the minimum value to 5 seconds, and configures a smooth factor of 3:

```
gprs gtp echo-timer dynamic enable
gprs gtp echo-timer dynamic minimum 5
gprs gtp echo-timer dynamic smooth-factor 3
```

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp echo-timer dynamic minimum** | Specifies the minimum time period used by the dynamic echo timer. |
| **gprs gtp echo-timer dynamic smooth-factor** | Configures the multiplier that the GGSN uses to calculate the time to wait to send retries of the dynamic echo timer. |
| **gprs gtp n3-requests** | Specifies the maximum number of times that the GGSN attempts to send a signaling request. |
| **gprs gtp path-echo-interval** | Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. |

# gprs gtp echo-timer dynamic minimum

To specify the minimum time period used by the dynamic echo timer, use the **gprs gtp echo-timer dynamic minimum** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp echo-timer dynamic minimum** *number*

**no gprs gtp echo-timer dynamic minimum** *number*

## Syntax Description

| | |
|---|---|
| *number* | Minimum time period (between 1 and 60 seconds) of the dynamic echo timer. Value must be an integer. The default value is 5 seconds. |

## Defaults

5 seconds

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use this command to specify the minimum time period (in seconds) used by the dynamic echo timer, also referred to as the T-dynamic. If the GGSN's current calculation of the round-trip timer (RTT) statistic, multiplied by the smooth factor, is less than the configured dynamic minimum value, then the GGSN uses the configured minimum as the T-dynamic.

The GGSN calculates the RTT statistic for use by the dynamic echo timer feature. The RTT is the amount of time between sending a particular echo request message and receiving the corresponding echo response message. RTT is calculated for the first echo response received; the GGSN records this statistic. Because the RTT value might be a very small number, there is a minimum time for the dynamic echo timer to use. This value is configured using the **gprs gtp echo-timer dynamic minimum** command.

If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it goes into retransmission, or path failure mode. During path failure mode, the GGSN uses a value referred to as the T-dynamic. The T-dynamic is the greater of either the dynamic minimum, or the RTT statistic multiplied by the smooth factor.

The T-dynamic essentially replaces the use of the **gprs gtp t3-response** command, which is used in the default echo timer method on the GGSN. The T-dynamic timer increases by a factor of two for each retry (again, this factor is not configurable), until the N3-requests counter is reached (N3-requests counter includes the initial request message).

**Note** For more information about the dynamic echo timer on the GGSN, refer to the Usage Guidelines section for the **gprs gtp echo-timer dynamic enable** command.

## Examples

The following example turns on the dynamic echo timer, sets the minimum value to 6 seconds, and configures a smooth factor of 2:

```
gprs gtp echo-timer dynamic enable
gprs gtp echo-timer dynamic minimum 6
gprs gtp echo-timer dynamic smooth-factor 2
```

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp echo-timer dynamic enable** | Enables the dynamic echo timer on the GGSN. |
| **gprs gtp echo-timer dynamic smooth-factor** | Configures the multiplier that the GGSN uses to calculate the time to wait to send retries of the dynamic echo timer. |
| **gprs gtp n3-requests** | Specifies the maximum number of times that the GGSN attempts to send a signaling request. |
| **gprs gtp path-echo-interval** | Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. |

# gprs gtp echo-timer dynamic smooth-factor

To configure the multiplier that the GGSN uses to calculate the time to wait to send retries of the dynamic echo timer, use the **gprs gtp echo-timer dynamic smooth-factor** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp echo-timer dynamic smooth-factor** *number*

**no gprs gtp echo-timer dynamic smooth-factor** *number*

## Syntax Description

| | |
|---|---|
| *number* | Integer (between 1 and 100) used by the GGSN as a multiplier for the RTT statistic, to calculate the T-dynamic. The default is 2. |

## Defaults

2

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The dynamic echo timer uses the smooth factor to calculate what is known as the T-dynamic. The T-dynamic is calculated by multiplying the RTT (or the value configured in the **gprs gtp echo-timer dynamic minimum**, whichever is greater) times the smooth-factor.

**Note** Refer to the Usage Guidelines section for the **gprs gtp echo-timer dynamic enable** command for a detailed explanation of how the dynamic echo timer works.

## Examples

The following example turns on the dynamic echo timer, sets the minimum value to 1 second, and configures a smooth factor of 2:

```
gprs gtp echo-timer dynamic enable
gprs gtp echo-timer dynamic minimum 1
gprs gtp echo-timer dynamic smooth-factor 2
```

**Related Commands**

| Command | Description |
|---|---|
| **gprs gtp echo-timer dynamic enable** | Enables the dynamic echo timer on the GGSN. |
| **gprs gtp echo-timer dynamic minimum** | Specifies the minimum time period used by the dynamic echo timer. |
| **gprs gtp n3-requests** | Specifies the maximum number of times that the GGSN attempts to send a signaling request. |
| **gprs gtp path-echo-interval** | Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. |
| **gprs gtp t3-response** | Specifies the initial time that the GGSN waits before resending a signaling request message when a response to a request has not been received |

# gprs gtp error-indication throttle

To specify the maximum number of error indication messages that the GGSN sends out in one second, use the **gprs gtp error-indication throttle** command. To disable the GGSN from sending error indication messages, use the **no** form of this command.

**gprs gtp error-indication throttle window-size** *size*

**no gprs gtp error-indication throttle**

## Syntax Description

| | |
|---|---|
| *size* | Integer (between 0 and 256) that specifies the maximum number of error indication messages that the GGSN sends in one second. |

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs gtp error-indication throttle** command to specify the maximum number of error indication messages that are sent by the GGSN in one second. This provides a way to implement flow control for transmission of GTP error messages. The GGSN maintains a counter that decrements each time that an error indication message is sent. The GGSN resets this counter to the configured throttle value after one second.

If you do not issue the command, error indication throttling is not enabled. To restore the default value (error indication throttling is disabled) use the **no** form of this command.

## Examples

The following example shows a throttle value of 150:

```
gprs gtp error-indication throttle window-size 150
```

# gprs gtp ip udp ignore checksum

To disable verification of the user datagram protocol (UDP) checksum to support CEF switching on the GGSN, use the **gprs gtp ip udp ignore checksum** global configuration command. To enable UDP checksum verification on the GGSN, use the **no** form of this command.

**gprs gtp ip udp ignore checksum**

**no gprs gtp ip udp ignore checksum**

## Syntax Description

This command has no arguments or keywords.

## Defaults

UDP checksum verification is enabled on the GGSN.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

UDP checksum verification can prohibit operation of CEF switching processing on the GGSN if the checksum should have a non-zero result. Therefore, if you want to enable CEF switching on the GGSN, you should configure the **gprs gtp ip udp ignore checksum** command.

If UDP checksum verification remains enabled on the GGSN and a non-zero result occurs, the GTP T-PDUs will be process switched, even if you have configured the GGSN for CEF switching.

The **gprs gtp ip udp ignore checksum** command does not apply if you are only using process switching on the GGSN.

For more information about switching processes on the router, refer to the *Cisco IOS Switching Services Configuration Guide*.

## Examples

The following example disables UDP checksum verification on the GGSN:

```
gprs gtp ip udp ignore checksum
```

## Related Commands

| Command | Description |
|---|---|
| ip cef | Enables CEF on the route processor card. |

# gprs gtp map signalling tos

To specify an IP ToS mapping for GPRS tunneling protocol (GTP) signaling packets, use the **gprs gtp map signalling tos** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp map signalling tos** *tos-value*

**no gprs gtp map signalling tos** *tos-value*

## Syntax Description

| | |
|---|---|
| *tos-value* | Value between 0 and 7 that specifies the IP ToS mapping. The default value is 5. |

## Defaults

ToS value 5

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs gtp map signalling tos** command to specify the IP ToS mapping for GTP signaling packets transmitted by the GGSN. The higher the value, the higher the class of service provided to the packets.

## Examples

The following example specifies a IP ToS mapping value of 3:

```
gprs gtp map signalling tos 3
```

## Related Commands

| Command | Description |
|---|---|
| gprs canonical-qos map tos | Specifies a QoS mapping from the canonical QoS classes to an IP ToS category. |
| **gprs charging container volume-threshold** | Specifies the maximum number of bytes that the GGSN maintains in a user's charging container before closing the charging container and updating the CDR. |
| gprs charging map data tos | Specifies an IP ToS mapping for GPRS charging data packets. |

| Command | Description |
|---|---|
| **gprs charging packet-queue-size** | Specifies the maximum number of unacknowledged charging data transfer requests that the GGSN maintains in its queue. |
| **gprs charging transfer interval** | Specifies the number of seconds that the GGSN waits before it transfers charging data to the charging gateway. |

# gprs gtp n3-buffer-size

To specify the size of the receive buffer that the GGSN uses to receive GTP signaling messages and packets sent through the tunneling protocol, use the **gprs gtp n3-buffer-size** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp n3-buffer-size** *bytes*

**no gprs gtp n3-buffer-size**

## Syntax Description

| | |
|---|---|
| *bytes* | Number of bytes (between 2048 and 65535) that specifies the size of the N3 buffer. The default is 8192 bytes. |

## Defaults

8192 bytes

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs gtp n3-buffer-size** command to specify the size of the GTP N3 buffer on the GGSN. The N3 buffer is a receive buffer that the GGSN uses to receive GTP signaling messages and packets sent through the tunneling protocol. The recommended value for the N3 buffer size is 8192 (the default size).

## Examples

The following example specifies a buffer size of 2084 bytes:

```
gprs gtp n3-buffer-size 2048
```

# gprs gtp n3-requests

To specify the maximum number of times that the GGSN attempts to send a signaling request to an SGSN, use the **gprs gtp n3-requests** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp n3-requests** *requests*

**no gprs gtp n3-requests** *requests*

## Syntax Description

| | |
|---|---|
| *requests* | A number between 1 and 65535 that specifies the number of times a request is attempted. The default is 5 requests. |

## Defaults

5 requests

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The value of the **gprs gtp n3-requests** command is used for all signaling requests on the GGSN.

The GGSN supports two different methods of echo timing—the default echo timer and the dynamic echo timer. The **gprs gtp n3-requests** command is used by the GGSN to perform either type of echo processing.

## Examples

```
The following example shows the GGSN attempting to send a signaling request 3 times:
gprs gtp n3-requests 3
```

## Related Commands

| Command | Description |
|---|---|
| gprs gtp echo-timer dynamic enable | Enables the dynamic echo timer on the GGSN. |
| **gprs gtp n3-buffer-size** | Specifies the size of the receive buffer that the GGSN uses to receive GTP signaling messages and packets sent through the tunneling protocol. |

| Command | Description |
|---|---|
| gprs gtp path-echo-interval | Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. |
| gprs gtp t3-response | Specifies the initial time that the GGSN waits before resending a signaling request message when a response to a request has not been received. |

# gprs gtp path-echo-interval

To specify the number of seconds that the GGSN waits before sending an echo-request message to the SGSN, use the **gprs gtp path-echo-interval** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp path-echo-interval** *interval*

**no gprs gtp path-echo-interval** *interval*

## Syntax Description

| | |
|---|---|
| *interval* | Number of seconds that the GGSN waits before sending an echo-request message. Specify a value between 60 and 65535 seconds. The value 0 disables the echo-request feature. The default is 60 seconds. |

## Defaults

60 seconds

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN supports two different methods of echo timing—the default echo timer and the dynamic echo timer. The **gprs gtp path-echo-interval** command is used on the GGSN to perform either type of echo processing.

Use the **gprs gtp path-echo-interval** command to specify the interval that the GGSN waits before sending an echo-request message to the SGSN to check for GTP path failure.

**Note** A value of 0 seconds disables echo requests on the GGSN.

## Examples

The following example shows the GGSN waiting 90 seconds before sending an echo-request message:

```
gprs gtp path echo-interval 90
```

**Related Commands**

| Command | Description |
|---|---|
| gprs gtp echo-timer dynamic enable | Enables the dynamic echo timer on the GGSN. |
| gprs gtp n3-requests | Specifies the maximum number of times that the GGSN attempts to send a signaling request to an SGSN. |
| gprs gtp t3-response | Specifies the initial time that the GGSN waits before resending a signaling request message when a response to a request has not been received. |

# gprs gtp ppp vtemplate

To associate the virtual template interface that defines the PPP characteristics with support for the PPP PDP type over GTP on the GGSN, use the **gprs gtp ppp vtemplate** global configuration command. To remove specification of the PPP virtual template interface for GTP on the GGSN, use the **no** form of this command.

**gprs gtp ppp vtemplate** *number*

**no gprs gtp ppp vtemplate** *number*

## Syntax Description

| | |
|---|---|
| *number* | Integer identifier of the virtual template interface over which the PPP characteristics are defined on the GGSN. This number must match the number configured in the corresponding **interface virtual-template** command. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Before you configure the **gprs gtp ppp vtemplate** command, you must configure the virtual template interface with the necessary PPP characteristics. The number that you configure for the virtual template interface that defines the PPP characteristics, must correspond to the number that you specify in the **gprs gtp ppp vtemplate** command.

## Examples

The following example configures two virtual template interfaces on the GGSN, one for GTP encapsulation and one for PPP, and specifies the PPP virtual template interface for GTP on the GGSN.

**Note** The virtual template interface for PPP is a different virtual template interface than the GPRS virtual template interface for GTP encapsulation.

The first section of commands configures the GPRS virtual template interface for GTP:

```
interface Virtual-Template 1
 ip address 10.1.1.1 255.0.0.0
```

```
 no ip directed-broadcast
 encapsulation gtp
 no ip route-cache
 gprs access-point-list gprs
```

The following example configures a virtual template interface for PPP and associates the virtual template for support of the PPP PDP type over GTP on the GGSN:

```
interface Virtual-Template 2
 ip unnumbered FastEthernet 1/0
 no ip directed-broadcast
 no peer default ip address
 ppp authentication chap
 ppp timeout retry 30

gprs gtp ppp vtemplate 2
```

## Related Commands

| Command | Description |
|---|---|
| **interface virtual-template** | Creates a virtual template interface that can be configured and applied dynamically in creating virtual access interfaces. |

# gprs gtp ppp-regeneration vtemplate

To associate the virtual template interface that is configured for PPP encapsulation with support for regenerated PPP sessions on the GGSN, use the **gprs gtp ppp-regeneration vtemplate** global configuration command. To remove specification of the PPP virtual template interface for regenerated PPP sessions on the GGSN, use the **no** form of this command.

**gprs gtp ppp-regeneration vtemplate** *number*

**no gprs gtp ppp-regeneration vtemplate** *number*

## Syntax Description

| | |
|---|---|
| *number* | Integer identifier of the virtual template interface which defines PPP encapsulation on the GGSN. This number must match the number configured in the corresponding **interface virtual-template** command. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Before you configure the **gprs gtp ppp-regeneration vtemplate** command, you must configure the virtual template interface for PPP encapsulation using the **encapsulation ppp** command. In addition, you must also configure the **ip address negotiated** command and the **no peer neighbor-route** command at the virtual template interface for PPP encapsulation.

The number that you configure for the virtual template interface to support PPP encapsulation, must correspond to the number that you specify in the **gprs gtp ppp-regeneration vtemplate** command.

## Examples

The following example configures two virtual template interfaces on the GGSN, one for GTP encapsulation for communication between the GGSN and the SGSN, and one for PPP regeneration. The virtual template interface for PPP regeneration supports the creation of PPP sessions from the GGSN over Layer 2 Tunneling Protocol (L2TP) tunnels to an L2TP network server (LNS).

**Note** The virtual template interface for PPP regeneration is a different virtual template interface than the GPRS virtual template interface for PPP PDP type support and for GTP encapsulation.

The first section of commands configures the GPRS virtual template interface for GTP:

```
interface Virtual-Template 1
 ip address 10.1.1.1 255.0.0.0
 no ip directed-broadcast
 encapsulation gtp
 no ip route-cache
 gprs access-point-list gprs
```

The following example configures a virtual template interface for PPP regeneration:

```
interface Virtual-Template 11
 ip address negotiated
 no peer neighbor-route
 encapsulation ppp
```

The following example specifies virtual template interface 11 for PPP regeneration on the GGSN:

```
gprs gtp ppp-regeneration vtemplate 11
```

## Related Commands

| Command | Description |
|---|---|
| **interface virtual-template** | Creates a virtual template interface that can be configured and applied dynamically in creating virtual access interfaces. |

# gprs gtp response-message pco ipcp nack

To configure the GGSN to return an IPCP Conf-Nack (Code 03) in the GTP protocol configuration option (PCO) information element (IE) of a create PDP context response when returning IP Control Protocol (IPCP) options for which the granted values (non-zero) differ from those requested (IPCP Conf-Reject [Code 04] for those options for which the returned address values are zero), use the **gprs gtp response-message pco ipcp nack** global configuration command. To return to the default, use the **no** form of the command.

**gprs gtp response-message pco ipcp nack**

**no gprs gtp response-message pco ipcp nack**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The GGSN sends an IPCP Conf-Ack (Code 2) in the PCO IE of the create PDP context response for the IPCP options for all the requested IPCP address options supported by the GGSN. The values being returned might be the same as or differ from those requested, or be zero.

For unsupported options, an IPCP Conf-Reject is returned.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB1 | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs gtp response-message pco ipcp nack** command to configure the GGSN to return an IPCP Conf-Nack in the PCO IE of a create PDP context response when returning IPCP options for which the granted values differ from those requested.

When the **gprs gtp response-message pco ipcp nack** command is configured, and the PCO IE of the create PDP context request contains IPCP options, the PCO IE in the create PDP response includes the following, depending on the whether options are supported by (and values are acceptible to) the GGSN:

- IPCP Conf-Ack—One or (zero) IPCP Conf-Ack for the IPCP options for which the requested values are acceptible by the GGSN.
- IPCP Conf-Nack—One or (zero) IPCP Conf-Nack containing the IPCP options for which the granted values differ from those requested.
- IPCP Conf-Reject—One (or zero) IPCP Conf-Reject containing the requested options which are not supported by the GGSN, or, if supported, for which no values can be granted.

# gprs gtp response-message wait-accounting

To configure the GGSN to wait for a RADIUS accounting response before sending a create PDP context response to the SGSN, for create PDP context requests received across all access points, use the **gprs gtp response-message wait-accounting** global configuration command. To configure the GGSN to send a create PDP context response to the SGSN after sending a RADIUS start accounting message to the RADIUS server (without waiting for a response from the RADIUS accounting server), use the **no** form of this command.

**gprs gtp response-message wait-accounting**

**no gprs gtp response-message wait-accounting**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The GGSN sends a create PDP context response to the SGSN after sending a RADIUS start accounting message to the RADIUS accounting server. The GGSN does not wait for a RADIUS accounting response from the RADIUS accounting server.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs gtp response-message wait-accounting** command to configure the GGSN to wait for a RADIUS accounting response from the RADIUS accounting server, before sending a create PDP context response to the SGSN, for create PDP context requests received across all access points.

If the GGSN does not receive a response from the RADIUS accounting server when you have configured the **gprs gtp response-message wait-accounting** command, then the GGSN rejects the PDP context request.

The GGSN supports configuration of RADIUS response message waiting at both the global and access-point configuration levels. You can minimize your configuration by specifying the configuration that you want to support across most APNs, at the global configuration level. Then, at the access-point configuration level, you can selectively modify the behavior that you want to support at a particular APN. Therefore, at the APN configuration level, you can override the global configuration of RADIUS response message waiting.

To configure the GGSN to wait for a RADIUS accounting response as the default behavior for all APNs, use the **gprs gtp response-message wait-accounting** global configuration command. To disable this behavior for a particular APN, use the **no response-message wait-accounting** access-point configuration command.

To verify whether RADIUS response message waiting is enabled or disabled at an APN, you can use the **show gprs access-point** command and observe the value reported in the wait_accounting output field.

## Examples

The following example globally configures the GGSN to wait for a RADIUS accounting response from the RADIUS accounting server before sending an activate PDP context response to the SGSN, for PDP context requests received across all access points except access-point 1. RADIUS response message waiting has been overridden at access-point 1 using the **no gtp response-message wait-accounting** command:

**Note** This example shows only a partial configuration of the GGSN, to highlight those commands related to implementing RADIUS response message waiting. Additional configuration statements are required to complete a full configuration of the GGSN.

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
  access-point-name www.pdn1.com
  aaa-group authentication foo
  no gtp response-message wait-accounting
  exit
 access-point 2
  access-mode non-transparent
  access-point-name www.pdn2.com
  aaa-group authentication foo
!
gprs gtp response-message wait-accounting
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

## Related Commands

| Command | Description |
|---|---|
| **gtp response-message wait-accounting** | Configures the GGSN to wait for a RADIUS accounting response before sending a create PDP context response to the SGSN, for create PDP context requests received at a particular APN. |
| show gprs access-point | Displays information about access points on the GGSN. |

# gprs gtp t3-response

To specify the initial time that the GGSN waits before resending a signaling request message when a response to a request has not been received, use the **gprs gtp t3-response** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp t3-response** *response-interval*

**no gprs gtp t3-response** *response-interval*

## Syntax Description

| | |
|---|---|
| *response-interval* | A value between 1 and 65535 that specifies the length of the T3 response interval, in seconds. The default is 1 second. |

## Defaults

1 second

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The **gprs gtp t3-response** command is used by the GGSN to process delete PDP context requests and to perform the default method of echo timing.

For delete PDP context requests, the **gprs gtp t3-response** command is used by the GGSN to specify how long the GGSN waits before sending a retry of the delete PDP context request when a response is not received from the SGSN, until the **gprs gtp n3-requests** limit is reached.

The GGSN supports two echo timer implementations—the default echo timer and the dynamic echo timer. The **gprs gtp t3-response** command also is used on the GGSN to perform the default type of echo processing, when the dynamic echo timer is not enabled.

If the GGSN receives the echo response within the path echo interval (as specified in the **gprs gtp path-echo-interval** command; default is 60 seconds), it sends another echo request message after 60 seconds (or whatever time was configured in the **gprs gtp path-echo-interval** command). This message flow continues as long as the GGSN receives an echo response message from the SGSN within the specified path echo interval.

If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it resends echo request messages until the N3-requests counter is reached (as specified by the **gprs gtp n3-requests** command; default is 5). Because the initial request message is included in the N3-requests counter, the total number of retries is N3-1. The T3 timer increases by a factor of two for each retry (the factor value is not configurable).

For example, if N3 is set to the default of 5, and T3 is set to the default of 1 second, the GGSN will resend 4 echo request messages (the initial request + 4 retries=5). The T3 time increments for each additional echo request, by a factor of 2 seconds. So, the GGSN resends a message in 2 seconds, 4 seconds, 8 seconds, and 16 seconds. If the GGSN fails to receive an echo response message from the SGSN within the time period of the N3-requests counter, it clears the GTP path and deletes all of the PDP contexts.

For the above example, the total elapsed time from when the first request message is sent, to when the GTP path is cleared, is: 60+2+4+8+16=90 seconds,

where 60 is the initial value of the path echo interval, and the remaining 4 time periods are the increments of the T3 timer for the subsequent retries.

## Examples

The following example shows a T3 interval response interval of 524 seconds:

```
gprs gtp t3-response 524
```

## Related Commands

| Command | Description |
|---|---|
| gprs gtp n3-requests | Specifies the maximum number of times that the GGSN attempts to send a signaling request to an SGSN. |
| gprs gtp path-echo-interval | Specifies the number of seconds that the GGSN waits before sending an echo-request message to the SGSN. |

# gprs gtp-director retry-timeout

To specify the amount of time during which GDM forwards all retries of create PDP context requests for a specific TID from an SGSN to the same GGSN, use the **gprs gtp-director retry-timeout** global configuration command. To return to the default value, use the **no** form of this command.

**gprs gtp-director retry-timeout** *seconds*

**no gprs gtp-director retry-timeout** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds (between 1 and 65535) during which GDM forwards retries for a specific TID to the same GGSN. The default is 30 seconds. |

## Defaults

30 seconds

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **gprs gtp-director retry-timeout** command only when configuring the GTP Director Module (GDM). Do not configure this command on a GGSN.

Use the **gprs gtp-director retry-timeout** command to specify how long GDM forwards all retries of create PDP context requests for a specific TID from an SGSN to the same GGSN. The retry-timeout value represents the maximum period of time during which GDM expects the real GGSN to establish or reject the PDP context request.

It is recommended that the retry-timeout value be specified according to the following formula:

$T \geq (N3 \bullet T3 + B)$ ,

where

- T is the GDM retry-timeout. This is the value that you need to determine for the **gprs gtp-director retry-timeout** command on the GDM router.
- N3 is the retry count that is configured on the SGSN.
- T3 is the retry timer that is configured on the SGSN.
- B is some integer that you choose as a buffer factor. The buffer factor is suggested to allow sufficient time for routing and processing the request by the real GGSN.

**Note** You can configure the **gprs gtp-director retry-timeout** command in real time for GDM. The new value will be used for create PDP context requests coming in for any new TIDs. The new value is not retroactive for existing TIDs. Therefore, the old value is used for any PDP context requests for an existing TID.

## Examples

The following example configures GDM to forward all retries of create PDP context requests for a specific TID to the same GGSN for 1 minute:

```
gprs gtp-director retry-timeout 60
```

## Related Commands

| Command | Description |
|---|---|
| **service gprs gtp-director** | Configures a router for GTP director module functions. |

# gprs idle-pdp-context purge-timer

To specify the time that the GGSN waits before purging idle mobile sessions, use the **gprs idle-pdp-context purge-timer** global configuration command. To return to the default value, use the **no** form of this command**.**

**gprs idle-pdp-context purge-timer** *hours*

**no gprs idle-pdp-context purge-timer** *hours*

## Syntax Description

| | |
|---|---|
| *hours* | Value between 0 and 255 that specifies the number of hours that the GGSN waits before purging idle sessions. The value 0 disables the purge timer. The default is 72 hours. |

## Defaults

72 hours

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

To specify the time that the GGSN waits before purging idle mobile sessions, use the **gprs idle-pdp-context purge-timer** command. To disable this feature, specify a purge-timer value of 0.

You can override the value of the global purge timer using the **session idle-time** access-point configuration command.

## Examples

The following example specifies that the GGSN wait for 60 hours before purging idle sessions:

```
gprs idle-pdp-context purge-timer 60
```

## Related Commands

| Command | Description |
|---|---|
| **session idle-time** | Specifies the time that the GGSN waits before purging idle mobile sessions for the current access point. |

# gprs maximum-pdp-context-allowed

To specify the maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN, use the **gprs maximum-pdp-context-allowed** global configuration command. To return to the default value, use the **no** form of this command.

**gprs maximum-pdp-context-allowed** *pdp-contexts*

**no gprs maximum-pdp-context-allowed** *pdp-contexts*

## Syntax Description

| | |
|---|---|
| *pdp-contexts* | Integer between 1 and 4294967295 that specifies the number of active PDP contexts allowed. The default is 10000 PDP contexts. |

## Defaults

10000 PDP contexts

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the default value was changed from 1000 to 10000. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs maximum-pdp-context-allowed** command to specify the maximum number of PDP contexts allowed on the GGSN. When the maximum allowable number of PDP contexts is reached, the GGSN refuses new PDP contexts (mobile sessions) until sessions are available.

**Note** The practical upper limit for the maximum number of PDP contexts depends on the router platform that you are using, the amount of memory available on the router, and the type of configuration configured (whether a method of Point to Point Protocol [PPP] has been configured to forward packets beyond the terminal equipment and mobile termination and the rate of PDP context creation to be supported).

If you use DFP with GPRS load balancing, you must also specify a maximum number of PDP contexts for each GGSN, using the **gprs maximum-pdp-context-allowed** command. Do not accept the default value of 10000 PDP contexts. A value of 45000 is recommended. Significantly lower values can impact performance in a GPRS load-balancing environment.

**Note** For more information about configuring GPRS load balancing, see the *IOS Server Load Balancing*, 12.1(9)E documentation located at Cisco.com at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121e/121e9/index.htm

## Examples

In the following example 15000 PDP contexts are allowed on the GGSN:

```
gprs maximum-pdp-context-allowed 15000
```

## Related Commands

| Command | Description |
|---|---|
| **gprs idle-pdp-context purge-timer** | Specifies the time that the GGSN waits before purging idle mobile sessions. |

# gprs mcc mnc

To configure the mobile country code and mobile network node that the GGSN uses to determine whether a create PDP context request is from a roamer, use the **gprs mcc mnc** global configuration command. To return to the default values, use the **no** form of this command.

**gprs mcc** *mcc-num* **mnc** *mnc-num*

**no gprs mcc** *mcc-num* **mnc** *mnc-num*

## Syntax Description

| | |
|---|---|
| **mcc** *mcc-num* | 3-digit decimal number for the mobile country code. The valid ranges for the MCC are 000–999. The default value is 000, which is not a valid code. |
| **mnc** *mnc-num* | 2- or 3-digit decimal number for the mobile network code. The valid ranges for the MNC are 00–999. The default value is 000, which is not a valid code. |

## Defaults

000—For both the MCC and MNC. A valid code must be a non-zero value.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs mcc mnc** command as part of the configuration required on the GGSN to support creation of CDRs for roaming mobile subscribers, or to block roamers from being able to create PDP context requests.

The GGSN uses the values that you configure in this command to compare with the tunnel ID (TID) in a create PDP context request.

The GGSN automatically specifies values of 000 for the MCC and MNC. However, you must configure non-zero values for both the MCC and MNC before you can enable the GGSN to create charging CDRs for roamers.

To properly issue the **gprs mcc mnc** command, you must specify both the **mcc** keyword with its argument and the **mnc** keyword with its argument. You cannot issue the command without specifying both keywords.

It is important that you configure the **gprs mcc mnc** and **gprs charging roamers** commands in their proper order. After you configure the MCC and MNC values, use the **gprs charging roamers** command to enable charging for roamers on the GGSN. You can change the MCC and MNC values by reissuing the **gprs mcc mnc** command.

To verify your configuration of these codes on the GGSN, use the **show gprs charging parameters** command.

**Note** To see a list of some established MCC and MNC codes, refer to the "Appendix B: Table of MCC and MNC Codes" section on page 463. To find more information about MCC and MNC codes, see the ITU E.212 recommendation, *Identification Plan for Land Mobile Stations*.

## Examples

The following example replaces the default values of 000 on the GGSN, and specifies an MCC code of 310 for the USA and an MNC code of 15 for the Bell South service provider:

```
gprs mcc 310 mnc 15
```

## Related Commands

| Command | Description |
|---|---|
| block-foreign-ms | Restricts GPRS access based on the mobile user's home PLMN. |
| gprs charging roamers | Enables charging for roamers on the GGSN. |
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |

# gprs memory threshold

To prevent the GGSN from draining processory memory during abnormal conditions (such as charging gateways [CGs] being down), use the **gprs memory threshold** global configuration command. To disable the memory protection feature, issue the **no** version of the command.

**gprs memory threshold** *threshold*

## Syntax Description

| | |
|---|---|
| *threshold* | Memory threshold, that when fallen below enables the memory protection feature on the GGSN. Valid range is 0 to 1024. |

## Defaults

The default is 0. The recommended value is 512 (approximately 50 MB).

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

To prevent the processor memory from being completely drained during periods of abnormal conditions (for example, all CGs are down), you must configure the memory protection feature on the GGSN using the **gprs memory threshold** global configuration command.

When the memory protection feature is configured and the amount of memory remaining on the system reaches the defined threshold, the GGSN performs the following actions in an attempt to keep the processory memory from falling below the threshold:

- Rejects new create PDP requests witht he cause value “No Resource”.
- Drops any existing PDP for which an update is received with the cause value “Management Intervention”.
- Drops any PDPs for which a volume trigger has occurred.

Byte counts will be maintained and reported after the GGSN recovers. However, because some change conditions are not handled, some counts will not reflect the accurate charging condition, for example, QoS and tariff.

The memory protection feature is required and must be configured according to the router and memory size.

## Examples

The following example sets the memory threshold to 50 KB:

```
gprs memory threshold 512
```

# gprs ms-address exclude-range

To specify the IP address range(s) used by the GPRS network, and thereby excluded from the mobile station (MS) IP address range, use the **gprs ms-address exclude-range** global configuration command. To remove the specified range(s), use the **no** form of this command.

**gprs ms-address exclude-range** *start-ip end-ip*

**no gprs ms-address exclude-range** *start-ip end-ip*

## Syntax Description

| | |
|---|---|
| *start-ip* | IP address at the beginning of the range. |
| *end-ip* | IP address at the end of the range. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

An MS can not have the same IP address as another GPRS network entity. Use the **gprs ms-address exclude-range** command to reserve certain IP address ranges for use by the GPRS network, and to disallow them from use by an MS.

During a create PDP context request, the GGSN verifies whether the IP address of an MS falls within the specified excluded range. If there is an overlap of the MS IP address with an excluded range, then the PDP context request is rejected. This measure prevents duplicate IP addressing in the network.

You can configure up to 100 IP address ranges. A range can be one or more addresses. However, you can configure only one IP address range per command entry. To exclude a single IP address, you can repeat the IP address in the *start-ip* and *end-ip* arguments. IP addresses are 32-bit values.

## Examples

### Example 1

The following example specifies the IP address ranges used by the GPRS network (which are thereby excluded from the MS IP address range:

```
gprs ms-address exclude-range 10.0.0.1 10.20.40.50
gprs ms-address exclude-range 172.16.150.200 172.30.200.255
gprs ms-address exclude-range 192.168.100.100 192.168.200.255
```

**Example 2**

The following example excludes an MS from using the IP address of 10.10.10.1:

```
gprs ms-address exclude-range 10.10.10.1 10.10.10.1
```

**Related Commands**

| Command | Description |
|---|---|
| show gprs ms-address exclude-range | Displays the IP address range(s) configured on the GGSN for the GPRS network. |

# gprs ni-pdp cache-timeout

To specify the maximum amount of time that the GGSN caches an SGSN address for an MS after an unsuccessful network-initiated PDP context attempt, use the **gprs ni-pdp cache-timeout** global configuration command. To return to the default value, use the **no** form of this command.

**gprs ni-pdp cache-timeout** *number*

**no gprs ni-pdp cache-timeout** *number*

## Syntax Description

| | |
|---|---|
| *number* | Number of seconds from 0 to 65535. The default value is 600 (10 minutes). |

## Defaults

600 seconds (10 minutes)

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN obtains the SGSN address for an MS from the HLR and caches it for the period of time specified by the **gprs ni-pdp cache-timeout** command, for unsuccessful network-initiated PDP context attempts with a cause of "MS not reachable" or "MS refuses." The GGSN needs the SGSN address if the MS is not reachable or if the MS refuses the PDP PDU.

## Examples

The following example specifies that the GGSN caches the SGSN address for an MS for 300 seconds (5 minutes):

```
gprs ni-pdp cache-timeout 300
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp discard-period** | Specifies the amount of time that the GGSN discards subsequent PDP PDUs received on the Gi interface for an MS, after an unsuccessful network-initiated PDP context attempt. |

| Command | Description |
|---|---|
| gprs ni-pdp pdp-buffer | Specifies the maximum size of the GGSN buffer to be used for each network-initiated PDP request. |
| gprs ni-pdp percentage | Specifies the maximum number of PDP contexts on the GGSN that can be network-initiated, as a percentage of the maximum number of PDP contexts allowed on the GGSN. |

# gprs ni-pdp discard-period

To specify the amount of time that the GGSN discards subsequent PDP PDUs received on the Gi interface for an MS, after an unsuccessful network-initiated PDP context attempt, use the **gprs ni-pdp discard-period** global configuration command. To return to the default value, use the **no** form of this command.

**gprs ni-pdp discard-period** *number*

**no gprs ni-pdp discard-period** *number*

## Syntax Description

| | |
|---|---|
| *number* | Number of seconds from 0 to 65535. The default value is 300 (5 minutes). |

## Defaults

300 seconds (5 minutes)

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Used the **gprs ni-pdp discard-period** command to specify how long the GGSN discards subsequent PDUs for a PDP context from an MS, after an unsuccessful network-initiated PDP context attempt.

## Examples

The following example specifies that, after an unsuccessful network-initiated PDP delivery attempt, the GGSN discards subsequent PDP PDUs received on the Gi interface for 180 seconds (3 minutes):

```
gprs ni-pdp discard-period 180
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp cache-timeout** | Specifies the maximum amount of time that the GGSN caches an SGSN address for an MS, after an unsuccessful network-initiated PDP context attempt. |

| Command | Description |
|---|---|
| gprs ni-pdp pdp-buffer | Specifies the maximum size of the GGSN buffer to be used for each network-initiated PDP request. |
| gprs ni-pdp percentage | Specifies the maximum number of PDP contexts on the GGSN that can be network-initiated, as a percentage of the maximum number of PDP contexts allowed on the GGSN. |

# gprs ni-pdp ip-imsi single

To specify a static IP address to IMSI mapping for a single MS for network-initiated PDP requests from a particular APN, use the **gprs ni-pdp ip-imsi single** global configuration command. To remove the static mapping, use the **no** form of this command.

**gprs ni-pdp ip-imsi single** *apn-index ip-address imsi*

**no gprs ni-pdp ip-imsi single** *apn-number ip-address imsi*

## Syntax Description

| | |
|---|---|
| *apn-index* | Integer from 1 to 65535 that identifies a GPRS access point. |
| *ip-address* | IP address for the specified IMSI to be used as the PDP address. |
| *imsi* | 16-digit hexadecimal value of the international mobile subscriber identity for the mobile station. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN supports a single IP address and APN combination for the **gprs ni-pdp ip-imsi single** command. The IMSI must be unique for each IP and APN combination.

You can configure multiple instances of the **gprs ni-pdp ip-imsi single** command.

In addition to configuring the **gprs ni-pdp ip-imsi single** command, you must configure the following other commands to support network-initiated PDP requests on the GGSN:

- **gprs default map-converting-gsn**
- **network-request-activation**

**Note** The IMSI digits are packed in the same format as the TID. The second to last hexadecimal digit is overwritten as “F”, resulting in a 15-digit hexadecimal IMSI.

## Examples

The following example configures a static IP address 10.10.10.10 for a network-initiated PDP request from access point 200 for an MS with an IMSI of 18273645546374.

```
gprs ni-pdp ip-imsi single 200 10.10.10.10 18273645546374
gprs default map-converting-gsn 172.16.10.10
!
gprs access-point-list abc
 access-point 200
  network-request-activation
```

Note that the **gprs default map-converting-gsn** global configuration command and the **network-request-activation** command at access point 200 are also required to implement the network-initiated PDP support at access point 200.

## Related Commands

| Command | Description |
|---|---|
| **gprs default map-converting-gsn** | Specifies the IP address or host name of the primary (and backup) GSN to communicate with the HLR in sending and receiving MAP messages. |
| **network-request-activation** | Enables an access point to support network-initiated PDP requests to a MS. |

# gprs ni-pdp pdp-buffer

To specify the maximum size of the GGSN buffer to be used for each network-initiated PDP request, use the **gprs ni-pdp pdp-buffer** global configuration command. To return to the default value, use the **no** form of this command.

**gprs ni-pdp pdp-buffer** *number*

**no gprs ni-pdp pdp-buffer** *number*

## Syntax Description

| | |
|---|---|
| *number* | Number of bytes from 0 to 65535. The default is 2000. |

## Defaults

2000 bytes

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN supports three options that together determine the maximum possible memory that the GGSN allocates to buffer any PDU data before a network-initiated PDP request has completed:

- Maximum number of PDP contexts allowed
- Maximum network-initiated PDP percentage
- Maximum buffer size per network-initiated PDP request

Use the following formula to determine the maximum possible memory that the GGSN allocated for buffering of any PDU data for each network-initiated PDP request. The corresponding value for each command should be substituted into the following equation:

(**gprs maximum-pdp-context-allowed** x **gprs ni-pdp percentage /** 100) x **gprs ni-pdp pdp-buffer**

By default, the GGSN allocates the following amount of memory for network-initiated PDP request data buffering: (10000 x 10/100) x 2000 bytes = 2,000,000 bytes.

Use the **gprs maximum-pdp-context-allowed** command to configure the total maximum number of active PDP contexts supported by the GGSN—both mobile-initiated and network-initiated PDP requests combined. The maximum number of PDP contexts supported on the GGSN is router dependent. For more information, see the "Restrictions" section in the "Planning to Configure the GGSN" chapter of the *Cisco IOS Mobile Wireless Configuration Guide*.

The GGSN allocates buffer space as needed and does not preallocate memory. Therefore, it is possible that other functions requiring memory by the GGSN can prevent memory from being available for allocation to the network-initiated PDP requests—even though the buffer has been configured.

In addition, if an entire PDU requiring caching does not fit in the remaining available buffer space, the PDU is discarded.

## Examples

The following example configures 3000 bytes as the maximum size of the GGSN buffer to be used for each network-initiated PDP request:

```
gprs ni-pdp pdp-buffer 3000
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp cache-timeout** | Specifies the maximum amount of time that the GGSN caches an SGSN address for an MS, after an unsuccessful network-initiated PDP context attempt. |
| **gprs ni-pdp discard-period** | Specifies the amount of time that the GGSN discards subsequent PDP PDUs received on the Gi interface for an MS, after an unsuccessful network-initiated PDP context attempt. |
| **gprs ni-pdp percentage** | Specifies the maximum number of PDP contexts on the GGSN that can be network-initiated, as a percentage of the maximum number of PDP contexts allowed on the GGSN. |

# gprs ni-pdp percentage

To specify the maximum number of PDP contexts on the GGSN that can be network-initiated, as a percentage of the maximum number of PDP contexts allowed on the GGSN, use the **gprs ni-pdp percentage** global configuration command. To return to the default value, use the **no** form of this command.

**gprs ni-pdp percentage** *percentage-number*

**no gprs ni-pdp percentage** *percentage-number*

## Syntax Description

| | |
|---|---|
| *percentage-number* | Percentage from 0 to 100 of the total number of PDP contexts that can be network-initiated. The default is 10 percent. |

## Defaults

10 percent

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN supports three options that together determine the maximum possible memory that the GGSN allocates to buffer any PDU data before a network-initiated PDP request has completed:

- Maximum number of PDP contexts allowed
- Maximum network-initiated PDP percentage
- Maximum buffer size per network-initiated PDP request

Use the following formula to determine the maximum possible memory that the GGSN allocated for buffering of any PDU data for each network-initiated PDP request. The corresponding value for each command should be substituted into the following equation:

(**gprs maximum-pdp-context-allowed** x **gprs ni-pdp percentage** / 100) x **gprs ni-pdp pdp-buffer**

By default, the GGSN allocates the following amount of memory for network-initiated PDP request data buffering: (10000 x 10/100) x 2000 bytes = 2,000,000 bytes.

Use the **gprs maximum-pdp-context-allowed** command to configure the total maximum number of active PDP contexts supported by the GGSN—both mobile-initiated and network-initiated PDP requests combined. The maximum number of PDP contexts supported on the GGSN is router dependent. For more information, see the Restrictions section of the "Planning to Configure the GGSN" chapter in the *Cisco IOS Mobile Wireless Configuration Guide*.

The GGSN allocates buffer space as needed and does not preallocate memory. Therefore, it is possible that other functions requiring memory by the GGSN can prevent memory from being available for allocation to the network-initiated PDP requests—even though the buffer has been configured.

## Examples

The following example configures 25 percent as the maximum number of network-initiated PDP requests supported by the GGSN:

```
gprs ni-pdp percentage 25
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp pdp-buffer** | Specifies the maximum size (in bytes) of the GGSN buffer to be used for each network-initiated PDP request. |
| **gprs maximum-pdp-context-allowed** | Specifies the maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN. |

# gprs plmn ip address

To specify the IP address range of a PLMN, use the **gprs plmn ip address** global configuration command.

**gprs plmn ip address** *start_ip end_ip* [**sgsn**]

## Syntax Description

| | |
|---|---|
| *start_ip* | IP address at the beginning of the range. |
| *end_ip* | IP address at the end of the range. |
| **sgsn** | (Optional) Specifies that only the PLMN IP address ranges defined with the SGSN keyword specified be used to determine when a SGSN is located in a PLMN other than the GGSN. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs plmn ip address** global configuration command to specify the IP address range of the PLMN.

When using the **gprs plmn ip address** command with the GGSN charging for roamers feature (**gprs charging roamers** command), the charging for roamer feature functions as follows, depending on how the PLMN IP address ranges have been defined using the **gprs plmn ip address** *start_ip end_ip* [**sgsn**] command:

- If no PLMN IP address ranges have been configured using the **gprs plmn ip address** *start_ip end_ip* [**sgsn**] command, the GGSN will generate CDRs for all initiated PDP contexts regardless of whether the GGSN and SGSN are located within the same PLMN.
- If a list of PLMN IP address ranges has been configured using the **gprs plmn ip address** *start_ip end_ip* [**sgsn**] command, but the **sgsn** keyword has not been specified for any of the ranges, the GGSN will use all the range entries when determining whether the SGSN is located within the same PLMN.
- If a list of PLMN IP address ranges has been configured using the **gprs plmn ip address** *start_ip end_ip* [**sgsn**] command, and one or more of those ranges has been defined using the **sgsn** key word, the GGSN will use those ranges with the **sgsn** keyword specified to determine whether an SGSN is located within the same PLMN.

  With this configuration, the following scenarios outline how the charging for roamers feature will function:

- MS1 is subscribed to PLMN1 and attaches to an SGSN in PLMN2. From PLMN2, MS1 initiates a PDP context with the GGSN in PLMN1. In this case, MS1 is a roamer and the GGSN generates a CDR because it determines that the SGSN is located in a different PLMN.
- MS1 is subscribed to PLMN1 and attaches to an SGSN in PLMN2. From PLMN2, MS1 initiates a PDP context with the GGSN in PLMN2. In this case, MS1 is not a roamer because the SGSN and GGSN are in the same PLMN. The GGSN does not create a G-CDR.

### Configuration Guidelines

To enable charging for roamers on the GGSN, you should first define a set of IP address ranges for a PLMN using the **gprs plmn ip address** command.

It is important that you configure the **gprs plmn ip address** and **gprs charging roamers** commands in their proper order. After you configure the IP address range for a PLMN, use the **gprs charging roamers** command to enable charging for roamers on the GGSN. You can change the IP address range by reissuing the **gprs plmn ip address** command.

To verify your configuration, use the **show gprs charging parameters** command to see if the charging for roamers command is enabled. To verify your PLMN IP address ranges, use the **show gprs plmn ip address** command.

## Examples

The following example specifies the IP address range of a PLMN:

```
gprs plmn ip address 10.0.0.1 10.20.40.50
```

## Related Commands

| Command | Description |
|---|---|
| **gprs charging roamers** | Enables charging for roamers on the GGSN. |
| **show gprs plmn ip address** | Displays a list of IP address ranges defined for the PLMN. |

# gprs qos default-response requested

To specify that the GGSN sets its default QoS values in the response message exactly as requested in the create PDP context request message, use the **gprs qos default-response requested** global configuration command. To return to the default QoS, use the **no** form of this command.

**gprs qos default-response requested**

**no gprs qos default-response requested**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled. The GGSN sets its QoS default to the best-effort class.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2) | This command was introduced. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The **gprs qos default-response requested** command is only useful when canonical QoS is not configured on the GGSN. Canonical QoS is enabled using the **gprs qos map canonical-qos** command.

When canonical QoS is not enabled, and the **gprs qos default-response requested** command has not been configured on the GGSN, the GGSN always sets its QoS values to best-effort in the response message.

## Examples

The following example enables the GGSN to set its QoS values in the response message according to the QoS values requested in the create PDP context request message:

```
gprs qos default-response requested
```

## Related Commands

| Command | Description |
|---|---|
| **gprs qos map canonical-qos** | Enables mapping of GPRS QoS categories to a canonical QoS method that includes best-effort, normal, and premium QoS classes. |

# gprs qos map canonical-qos

To enable mapping of GPRS QoS categories to a canonical QoS method that includes best-effort, normal, and premium QoS classes, use the **gprs qos map canonical-qos** global configuration command. To disable canonical mapping, use the **no** form of this command.

**gprs qos map canonical-qos**

**no gprs qos map canonical-qos**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Canonical QoS mapping is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **qprs qos map canonical-qos** command to map GPRS QoS into the following canonical categories: best effort, normal, and premium.

## Examples

The following example shows canonical QoS mapping enabled:

```
qos map canonical-qos
```

## Related Commands

| Command | Description |
|---|---|
| **gprs canonical-qos gsn-resource-factor** | Specifies a value that is used by the GGSN to calculate the QoS level provided to mobile users. |
| **gprs canonical-qos map tos** | Specifies a QoS mapping from the canonical QoS classes to an IP ToS category. |
| gprs canonical-qos premium mean-throughput-deviation | Specifies a mean throughput deviation factor that the GGSN uses to calculate the allowable data throughput for QoS. |

# gprs qos map delay

To enable mapping of GPRS QoS categories to delay QoS classes, use the **gprs qos map delay** global configuration command. To disable delay mapping, use the **no** form of this command.

**gprs qos map delay**

**no gprs qos map delay**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs qos map delay** command to enable QoS delay mapping on the GGSN. To map the QoS delay classes (class 1, class 2, class 3, and best effort) to IP type of service (ToS) categories, use the **gprs delay-qos map tos** command.

## Examples

The following example enables delay QoS mapping:

```
gprs qos map delay
```

## Related Commands

| Command | Description |
|---|---|
| **gprs delay-qos map tos** | Specifies a QoS mapping from the delay QoS classes to an IP type of service (ToS) category. |
| gprs qos default-response requested | Configures the GGSN to set its default QoS mapping values in a create PDP response message which has no QoS mapping selected. |

# gprs qos map umts

To enable UMTS QoS on the GGSN, use the **gprs qos map umts** global configuration command. To disable this mapping and return to the default QoS mapping, use the **no** form of this command.

**gprs qos map umts**

**no gprs qos map umts**

## Syntax Description

This command has no arguments or keywords.

## Defaults

UMTS QoS mapping is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs qos map umts** command to enable UMTS QoS mapping.

## Examples

The following example enables UMTS traffic QoS mapping:

```
gprs qos map umts
```

## Related Commands

| Command | Description |
|---|---|
| **gprs umts-qos map traffic-class** | Specifies a QoS mapping from the UMTS traffic classes to a differentiated services (DiffServ) per-hop behavior (PHB) group. |
| **gprs umts-qos map diffserv-phb** | Assigns a differentiated services code point (DSCP) to a DiffServ PHB group. |
| **gprs umts-qos dscp unmodified** | Specifies that the subscriber datagram be forwarded through the GTP path without modifying its DSCP. |
| **show gprs qos status** | Displays QoS statistics for the GGSN. |
| **show gprs umts-qos map traffic-class** | Displays UMTS QoS mapping information. |

# gprs radius attribute chap-challenge

To specify that the CHAP challenge always be included in the Challenge Attribute field (and not in the Authenticator field) in an Access-Request to the Remote Access Dial-In User Service (RADIUS) server, use **gprs radius attribute chap-challenge global configuration** command. To disable, use the **no** form of this command.

**gprs radius attribute chap-challenge**

**no gprs radius attribute chap-challenge**

## Syntax Description

This command has no arguments or keywords.

## Defaults

If the CHAP challenge length is 16 bytes, it is sent in the Authenticator field of an Access-Request. If it is greater than 16 bytes, it is sent in the Challenge Attribute field.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(1) | This command was introduced. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs radius attribute chap-challenge** command when configuring RADIUS security on the GGSN.

When the **gprs radius attribute chap-challenge** command is configured, the CHAP challenge is always sent in the Challenge Attribute field of an Access-Request to the RADIUS server and not in the Authenticator field. When the command is not configured, the CHAP challenge is sent in the Authenticator field unless the challenge exceeds 16 bytes, in which case, it is sent in the Challenge Attribute field of the Access-Request.

## Examples

The following example configures the CHAP challenge to always be sent in an Access Request to the RADIUS server:

```
gprs radius msisdn first-byte
```

# gprs radius msisdn first-byte

To specify that the first byte of the Mobile Stations International PSTN/ISDN (MSISDN) information element (IE) is included in a Remote Access Dial-In User Service (RADIUS) request, use the **gprs radius msisdn first-byte** global configuration command. To remove the first byte from the MSISDN IE in a RADIUS request, use the **no** form of this command.

**gprs radius msisdn first-byte**

**no gprs radius msisdn first-byte**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The first byte is not included.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(1) | This command was introduced. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs radius msisdn first-byte** command when configuring RADIUS security on the GGSN.

The first octet of an MSISDN IE using E.164 addressing is 91 in hexadecimal, that is 10010001. In this 91 code, the 1 is the extension bit, 001 is the international number, and 0001 indicates E.164 numbering.

## Examples

The following example specifies that the first byte of the MSISDN IE is included in a RADIUS request:

```
gprs radius msisdn first-byte
```

# gprs slb cef

To identify the IP address of the GGSN virtual server to CEF, use the **gprs slb cef** global configuration command. To remove the IP address identification, use the **no** form of this command.

**gprs slb cef** *virtual-server-address*

**no gprs slb cef** *virtual-server-address*

## Syntax Description

| | |
|---|---|
| virtual-server-address | IP address of the GGSN virtual server instance used by clients to connect to the server farm. (This virtual IP address is also a loopback address on the GGSN.) |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(9)E | This command was introduced. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command is required if the GGSN is using CEF switching. If the GGSN is *not* using CEF switching, do not use this command.

**Note** For more information about configuring GPRS load balancing, see the *IOS Server Load Balancing*, 12.1(9)E documentation located at Cisco.com at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121e/121e9/index.htm

## Examples

The following example identifies the IP address of the GGSN virtual server, 10.0.0.13, to CEF:

```
gprs slb cef 10.0.0.13
```

**Related Commands**

| Command | Description |
|---|---|
| interface loopback | Creates a loopback interface. |
| ip cef | Enables CEF on the RP card. |
| **virtual (virtual server)** | Configures the virtual server attributes. |

# gprs umts-qos dscp unmodified

To specify that the subscriber datagram be forwarded through the GTP path without modifying its DSCP, use the **gprs umts-qos dscp unmodified** global configuration command. To remove this specification and enable the DSCP to be re-marked with the DSCP assigned to the traffic class during the PDP context creation, use the **no** form of this command.

**gprs umts-qos dscp unmodified** [**up** | **down** | **all**]

**no gprs umts-qos dscp unmodified** [**up** | **down** | **all**]

## Syntax Description

| | |
|---|---|
| **up** | (Optional) Specifies subscriber datagram DSCPs in the uplink GTP path. |
| **down** | (Optional) Specifies subscriber datagram DSCPs in the downlink GTP path. |
| **all** | (Optional) Specifies subscriber datagram DSCPs in all GTP paths. |

## Defaults

The DSCP in the subscriber datagram is re-marked with the DSCP assigned to the traffic class during the PDP context creation.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs umts-qos dscp unmodified** command to configure the GGSN to forward subscriber datagram DSCPs through the GTP path without modifying the DSCP.

## Examples

The following example sets subscriber datagrams in the uplink GTP path to retain their DSCPs:

```
gprs umts-qos dscp unmodified up
```

## Related Commands

| Command | Description |
|---|---|
| **gprs qos map umts** | Enables UMTS QoS on the GGSN. |
| **gprs umts-qos map traffic-class** | Specifies a QoS mapping from the UMTS traffic classes to a differentiated services (DiffServ) per-hop behavior (PHB) group. |
| **gprs umts-qos map diffserv-phb** | Assigns a differentiated services code point (DSCP) to a DiffServ PHB group. |

| Command | Description |
|---|---|
| **show gprs qos status** | Displays QoS statistics for the GGSN. |
| **show gprs umts-qos map traffic-class** | Displays UMTS QoS mapping information. |

# gprs umts-qos map diffserv-phb

To assign a differentiated services code point (DSCP) to a DiffServ PHB group, use the **gprs umts-qos map diffserv-phb** global configuration command. To set the specified DSCP to the default DiffServ PHB group, use the **no** form of this command.

**gprs umts-qos map diffserv-phb** *diffserv-phb-group* [*dscp1*] [*dscp2*] [*dscp3*]

**no gprs umts-qos map diffserv-phb** *diffserv-phb-group* [*dscp1*] [*dscp2*] [*dscp3*]

## Syntax Description

| | |
|---|---|
| *diffserv-phb-group* | Specifies the DiffServ PHB group. The PHB groups are:<br>• signalling-class<br>• ef-class<br>• af1-class<br>• af2-class<br>• af3-class<br>• af4-class<br>• best-effort |
| *dscp1* | Required for all classes. Specifies one of 64 DSCP values from 0 to 63. The DSCP value corresponds to drop precedence 1. |
| *dscp2* | (Optional for AF classes only) Specifies one of 64 DSCP values from 0 to 63. The DSCP value corresponds to drop precedence 2. |
| *dscp3* | (Optional for AF classes only) Specifies one of 64 DSCP values from 0 to 63. The DSCP value corresponds to drop precedence 3. |

## Defaults

The default DSCP value associated with the PHB class is used.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

For the Assured Forwarding (AF) PHB group, you can specify up to three DSCP values for each drop precedence. The signalling, EF, and best-effort classes do not have drop precedence, so only the first DSCP value is used. If you enter a value for the *dscp2* or *dscp3* arguments for these classes, it is ignored.

Drop precedence indicates the order in which a packet will be dropped when there is congestion on the network.

Table 1 shows the default DSCP values for each PHB group.

***Table 1 Default DSCP Values per PHB Group***

| PHB | DSCP |
|---|---|
| Signalling | 5? |
| EF | 101110 (46) |
| AF11 | 001010 (10) |
| AF12 | 001100 (12) |
| AF13 | 001110 (14) |
| AF21 | 010010 (18) |
| AF22 | 010100 (20) |
| AF23 | 010110 (22) |
| AF31 | 011010 (26) |
| AF32 | 011100 (28) |
| AF33 | 011110 (30) |
| AF41 | 100010 (34) |
| AF42 | 100100 (36) |
| AF43 | 100110 (38) |
| Best effort | 000000 (0) |

## Examples

The following example assigns a DSCP value of 31 to the EF class and three DSCP values to AF class2 of 51, 52, and 53:

```
gprs umts-qos map diffserv-phb ef-class 31
gprs umts-qos map diffserv-phb af-class2 51 52 53
```

## Related Commands

| Command | Description |
|---|---|
| **gprs qos map umts** | Enables UMTS QoS on the GGSN. |
| **gprs umts-qos map traffic-class** | Specifies a QoS mapping from the UMTS traffic classes to a differentiated services (DiffServ) per-hop behavior (PHB) group. |
| **gprs umts-qos dscp unmodified** | Specifies that the subscriber datagram be forwarded through the GTP path without modifying its DSCP. |
| **show gprs qos status** | Displays QoS statistics for the GGSN. |
| **show gprs umts-qos map traffic-class** | Displays UMTS QoS mapping information. |
| class-map | Creates a class map to be used for matching packets to a specified class. |
| match protocol | Configures the match criteria for a class map on the basis of the specified protocol. |

# gprs umts-qos map traffic-class

To specify a QoS mapping from the UMTS traffic classes to a differentiated services (DiffServ) per-hop behavior (PHB) group, use the **gprs umts-qos map traffic-class** global configuration command. To remove a QoS mapping and set the specified traffic class to the default mapping, use the **no** form of this command.

**gprs umts-qos map traffic-class** *traffic-class diffserv-phb-group*

**no gprs umts-qos map traffic-class** *traffic-class diffserv-phb-group*

## Syntax Description

| | |
|---|---|
| *traffic-class* | Specifies the traffic class. The UMTS traffic classes are:<br>• signalling<br>• conversational<br>• streaming<br>• interactive<br>• background |
| *diffserv-phb-group* | Specifies the DiffServ PHB group. The PHB groups are:<br>• signalling-class<br>• ef-class<br>• af1-class<br>• af2-class<br>• af3-class<br>• af4-class<br>• best-effort |

## Defaults

You must enable UMTS QoS using the **gprs qos map umts** command before entering this command.

**Note** Use the **gprs umts-qos map traffic-class** command only if you want to use mapping values other than the defaults.

The default mapping values for the UMTS traffic classes are as follows:

- signalling traffic class to the signalling-class DiffServ PHB group
- conversational traffic class to the ef-class DiffServ PHB group
- streaming traffic class to the af2-class DiffServ PHB group
- interactive traffic class to the af3-class DiffServ PHB group
- background traffic class to the best-effort DiffServ PHB group

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gprs umts-qos map traffic-class** command to specify a mapping between various QoS UMTS traffic categories and the DiffServ PHB groups.

## Examples

The following example specifies a QoS mapping from the UMTS traffic class conversational to the DiffServ PHB group af-class1:

```
gprs umts-qos map traffic-class conversational af1-class
```

## Related Commands

| Command | Description |
|---|---|
| **gprs qos map umts** | Enables UMTS QoS on the GGSN. |
| **gprs umts-qos map diffserv-phb** | Assigns a differentiated services code point (DSCP) to a DiffServ PHB group. |
| **gprs umts-qos dscp unmodified** | Specifies that the subscriber datagram be forwarded through the GTP path without modifying its DSCP. |
| **show gprs qos status** | Displays QoS statistics for the GGSN. |
| **show gprs umts-qos map traffic-class** | Displays UMTS QoS mapping information. |

# gtp response-message wait-accounting

To configure the GGSN to wait for a RADIUS accounting response before sending a create PDP context response to the SGSN, for create PDP context requests received at a particular APN, use the **gtp response-message wait-accounting** access-point configuration command. To configure the GGSN to send a create PDP context response to the SGSN after sending a RADIUS start accounting message to the RADIUS server (without waiting for a response from the RADIUS accounting server), use the **no** form of this command.

**gtp response-message wait-accounting**

**no gtp response-message wait-accounting**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The GGSN sends a create PDP context response to the SGSN after sending a RADIUS start accounting message to the RADIUS accounting server. The GGSN does not wait for a RADIUS accounting response from the RADIUS accounting server.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **gtp response-message wait-accounting** command to configure the GGSN to wait for a RADIUS accounting response from the RADIUS accounting server, before sending a create PDP context response to the SGSN.

If the GGSN does not receive a response from the RADIUS accounting server when you have configured the **gtp response-message wait-accounting** command, then the GGSN rejects the PDP context request.

The GGSN supports configuration of RADIUS response message waiting at both the global and access-point configuration levels. You can minimize your configuration by specifying the configuration that you want to support across most APNs, at the global configuration level. Then, at the access-point configuration level, you can selectively modify the behavior that you want to support at a particular APN. Therefore, at the APN configuration level, you can override the global configuration of RADIUS response message waiting.

To configure the GGSN to wait for a RADIUS accounting response as the default behavior for all APNs, use the **gprs gtp response-message wait-accounting** global configuration command. To disable this behavior for a particular APN, use the **no gtp response-message wait-accounting** access-point configuration command.

To verify whether RADIUS response message waiting is enabled or disabled at an APN, you can use the **show gprs access-point** command and observe the value reported in the wait_accounting output field.

## Examples

The following examples show only a partial configuration of the GGSN, to highlight those commands related to implementing RADIUS response message waiting. Additional configuration statements are required to complete a full configuration of the GGSN.

### Example 1

The following example configures the GGSN to wait for an accounting response from the RADIUS server before sending a create PDP context response to the SGSN, for PDP context requests at access-point 1:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
  access-point-name www.pdn1.com
  aaa-group authentication foo
  gtp response-message wait-accounting
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

### Example 2

The following example globally configures the GGSN to wait for a RADIUS accounting response from the RADIUS server before sending a create PDP context response to the SGSN. The GGSN waits for a response for PDP context requests received across all access points, except access-point 1. RADIUS response message waiting has been overridden at access-point 1 using the **no gtp response-message wait-accounting** command:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
gprs access-point-list gprs
 access-point 1
  access-mode non-transparent
```

```
  access-point-name www.pdn1.com
  aaa-group authentication foo
  no gtp response-message wait-accounting
  exit
 access-point 2
  access-mode non-transparent
  access-point-name www.pdn2.com
  aaa-group authentication foo
!
gprs gtp response-message wait-accounting
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp response-message wait-accounting** | Configures the GGSN to wait for a RADIUS accounting response before sending an activate PDP context request to the SGSN, for create PDP context requests received across all access points. |
| show gprs access-point | Displays information about access points on the GGSN. |

# group (local RADIUS server)

To enter user group configuration mode and to configure shared settings for a user group, use the **group** command in local RADIUS server configuration mode. To remove the group configuration from the local RADIUS server, use the **no** form of this command.

**group** *group-name*

**no group** *group-name*

## Syntax Description

| | |
|---|---|
| *group-name* | Name of user group. |

## Defaults

No default behavior or values

## Command Modes

Local RADIUS server configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following example shows that shared settings are being configured for group “team1”:

```
group team1
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |

| Command | Description |
|---|---|
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# interface cdma-Ix

To define the virtual interface for the R-P tunnels, use the **interface cdma-Ix** command in global configuration mode. To disable the interface, use the **no** form of this command.

**interface cdma-Ix1**

**no interface cdma-Ix1**

## Syntax Description

| | |
|---|---|
| *Ix1* | Interface number 1. Only one interface definition per PDSN is allowed. |

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The only interface level command allowed on the virtual interface is the IP address configuration.

## Examples

The following example defines the virtual interface for the R-P tunnel and configures the IP address:

```
interface cdma-Ix1
 ip address 1.1.1.1 255.255.0.0
```

## Related Commands

| Command | Description |
|---|---|
| **show interfaces** | Displays statistics about the network interfaces. |

# ip mobile foreign-agent skip-aaa-reauthentication

To enable FA-CHAP during Mobile IP registration, and then to skip it in all subsequent re-registrations, use the **ip mobile foreign-agent skip-aaa-reauthentication** command in global configuration mode. To disable this feature, use the **no** form of this command.

**ip mobile foreign-agent skip-aaa-reauthentication**

**no ip mobile foreign-agent skip-aaa-reauthentication**

## Syntax Description

There are no keywords or arguments for this commmand.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(11)T | This command was introduced. |

## Usage Guidelines

FA-CHAP is a mechanism for authentication in Mobile IP. As per IS835, FA-CHAP is mandatory during Mobile IP call setup (registration), and requires access to a AAA server. A Mobile IP call has a parameter lifetime, so in order to continue a Mobile IP call, re-registration is required before the lifetime expires, and this re-registration leads to extending of lifetime.

Because FA-CHAP is mandatory, and the call is authenticated during registration, it may be undesirable to access AAA during re-registration of the Mobile IP call. The **ip mobile foreign-agent skip-aaa-reauthentication** command provides flexibility in this scenario.

When this command is configured, FA-CHAP is performed during Mobile IP registration, and is skipped in all subsequent re-registrations.

The default value is “false”, implying that AAA access is not skipped during Mobile IP re-registration.

## Examples

The following example shows that FA-CHAP is enabled during Mobile IP registration, but disabled for all subsequent re-registrations:

```
ip mobile foreign-agent skip-aaa-reauthentication
```

# ip mobile foreign-service

To enable foreign agent service on if care-of addresses are configured, use the **ip mobile foreign-service** command in interface or global configuration mode. To disable this service, use the **no** form of this command.

**ip mobile foreign-service** [**home-access** *access-list*] [**limit** *number*] [**registration-required**] [**challenge** {**timeout** *value* | **window** *number* | **forward-mfce**}] [**reverse-tunnel** [**mandatory**]]

**no ip mobile foreign-service** [**home-access** *access-list*] [**limit** *number*] [**registration-required**] [**challenge** {**timeout** *value* | **window** *number* | **forward-mfce**}] [**reverse-tunnel** [**mandatory**]]

## Syntax Description

| | |
|---|---|
| **home-access** *access-list* | (Optional) Controls which home agent addresses mobile nodes can be used to register. The access list can be a string or number from 1 to 99. For releases prior to 12.3T, you cannot use this keyword when you enable foreign agent service on a subinterface. |
| **limit** *number* | (Optional) Number of visitors allowed on the interface. The Busy (B) bit will be advertised when the number of registered visitors reaches this limit. For releases prior to 12.3T, you cannot use this keyword when you enable foreign agent service on a subinterface. |
| **registration-required** | (Optional) Solicits registration from the mobile node even if it uses colocated care-of addresses. The Registration-required (R) bit will be advertised. For releases prior to 12.3T, you cannot use this keyword when you enable foreign agent service on a subinterface. |
| **challenge** | (Optional) Configures the foreign agent challenge parameters. For releases prior to 12.3T, you cannot use this keyword when you enable foreign agent service on a subinterface. |
| **timeout** *value* | (Optional) Challenge timeout in seconds. Possible values are from 1 to 10. |
| **window** *number* | (Optional) Maximum number of valid challenge values to maintain. Possible values are from 1 to 10. The default is 2. |
| **forward-mfce** | (Optional) Enables the foreign agent to forward mobile foreign challenge extensions (MFCEs) and mobile node-AAA extensions to the home agent. |
| **reverse-tunnel** [**mandatory**] | (Optional) Enables reverse tunneling on the foreign agent. For releases prior to 12.3T, you cannot use this keyword when you enable foreign agent service on a subinterface. |

## Defaults

Foreign agent service is not enabled.
There is no limit to the number of visitors allowed on an interface.
**window** *number:* 2
Foreign agent reverse tunneling is not enabled. When foreign agent reverse tunneling is enabled, it is not mandatory by default.

## Command Modes

Interface and global configuration

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.1(3)XS | The **challenge** keyword and associated parameters were added. |
| 12.2(2)XC | The **reverse-tunnel** [**mandatory**] keywords were added. |
| 12.2(13)T | The **challenge** keyword and associated parameters and the **reverse-tunnel** [**mandatory**] keywords were integrated into Cisco IOS Release 12.2(13)T. |
| 12.3(11)T | Global configuration mode was added. |

## Usage Guidelines

This command enables foreign agent service on the interface or all interfaces (global configuration). The foreign agent (F) bit will be set in the agent advertisement, which is appended to the IRDP router advertisement whenever the foreign agent or home agent service is enabled on the interface.

**Note** The Registration-required bit only tells the visiting mobile node to register even if the visiting mobile node is using a colocated care-of address. You must set up packet filters to enforce this. For example, you could deny packets destined for port 434 from the interface of this foreign agent.

When you use the **reverse-tunnel** keyword to enable foreign agent reverse tunneling on an interface, the reverse tunneling support (T) bit is set in the agent advertisement.

Cisco Express Forwarding (CEF) switching is currently not supported on a foreign agent when reverse tunneling is enabled. If reverse tunneling is enabled at the foreign agent, disable CEF on the foreign agent, using the **no ip cef** global configuration command. If the foreign agent does not support reverse tunneling, then there is no need to disable CEF at the global configuration level.

Table 2 lists the advertised bitflags.

***Table 2 Foreign Agent Advertisement Bitflags***

| Bit Set | Service Advertisement |
|---|---|
| T | Set if the **reverse-tunnel** parameter is enabled. |
| R | Set if the **registration-required** parameter is enabled. |
| B | Set if the number of visitors reached the **limit** parameter. |
| H | Set if the interface is the home link to the mobile host (group). |
| F | Set if foreign-agent service is enabled. |
| M | Never set. |
| G | Always set. |
| V | Reserved. |
| reserved | Never set. |

## Examples

The following example shows how to enable foreign agent service for up to 100 visitors:

```
interface Ethernet 0
 ip mobile foreign-service limit 100 registration-required
```

The following example shows how to enable foreign agent reverse tunneling:

```
interface ethernet 0
 ip mobile foreign-service reverse-tunnel
```

The following example shows how to configure foreign agent challenge parameters:

```
interface ethernet 0
 ip mobile foreign-service challenge window 2
```

## Related Commands

| Command | Description |
|---|---|
| **ip cef** | Enables CEF on the RP card. |
| **ip mobile tunnel** | Specifies the settings of tunnels created by Mobile IP. |
| **show ip mobile interface** | Displays advertisement information for interfaces that are providing foreign agent service or are home links for mobile nodes. |

# ip mobile host

To configure the mobile host or mobile node group, use the **ip mobile host** command in global configuration mode. To disable these services, use the **no** form of this command.

**ip mobile host** {*lower* [*upper*] | **nai** *string* [**static-address** {*addr1* [*addr2*] [*addr3*] [*addr4*] [*addr5*] | **local-pool** *name*}] [**address** {*addr* | **pool** {**local** *name* | **dhcp-proxy-client** [**dhcp-server** *addr*]}]} {**interface** *name* | **virtual-network** *network-address mask*} [**aaa** [**load-sa** [**permanent**]]] [**authorized-pool** *name*] [**skip-aaa-reauthentication**][**care-of-access** *access-list*] [**lifetime** *seconds*]

**no ip mobile host** {*lower* [*upper*] | **nai** *string* [**static-address** {*addr1* [*addr2*] [*addr3*] [*addr4*] [*addr5*] | **local-pool** *name*}] [**address** {*addr* | **pool** {**local** *name* | **dhcp-proxy-client** [**dhcp-server** *addr*]}]} {**interface** *name* | **virtual-network** *network-address mask*} [**aaa** [**load-sa** [**permanent**]]] [**authorized-pool** *name*] [**skip-aaa-reauthentication**] [**care-of-access** *access-list*] [**lifetime** *seconds*]

## Syntax Description

| | |
|---|---|
| *lower* [*upper*] | One or a range of mobile host or mobile node group IP addresses. The upper end of the range is optional. |
| **nai** *string* | Network access identifier. The NAI can be a unique identifier (username@realm) or a group identifier (@realm). |
| **static-address** | (Optional) Indicates that a static IP address is to be assigned to the flows on this NAI. This parameter is not valid if the NAI is a realm. |
| *addr1, addr2, ...* | (Optional) One to a maximum of five IP addresses to be assigned using the **static-address** keyword. |
| **local-pool** *name* | (Optional) Name of the local pool of addresses to use for assigning a static IP address to this NAI. |
| **address** | (Optional) Indicates that a dynamic IP address is to be assigned to the flows on this NAI. |
| *addr* | (Optional) IP address to be assigned using the **address** keyword. |
| **pool** | (Optional) Indicates that a pool of addresses is to be used in assigning a dynamic IP address. |
| **local** *name* | (Optional) The name of the local pool to use in assigning addresses. |
| **dhcp-proxy-client** | (Optional) Indicates that the DHCP request should be sent to a DHCP server on behalf of the mobile node. |
| **dhcp-server** *addr* | (Optional) IP address of the DHCP server. |
| **interface** *name* | When used with DHCP, specifies the gateway address from which the DHCP server should select the address. |
| **virtual-network** *network-address mask* | Indicates that the mobile station resides in the specified virtual network, which was created using the **ip mobile virtual-network** command. |
| **aaa** | (Optional) Retrieves security associations from a AAA (TACACS+ or RADIUS) server. Allows the home agent to download address configuration details from the AAA server. |
| load-sa | (Optional) Caches security associations after retrieval by loading the security association into RAM. See Table 4 for details on how security associations are cached for NAI hosts and non-NAI hosts. |

| | |
|---|---|
| **permanent** | (Optional) Caches security associations in memory after retrieval permanently. Use this optional keyword only for NAI hosts. |
| **authorized-pool** *name* | (Optional) Verifies the IP address assigned to the mobile node if it is within the pool specified by the *name* argument. |
| **skip-aaa-reauthentication** | (Optional) When configured, the home agent does not send an access request for authentication for mobile IP re-registration requests. When disabled, the home agent sends an access request for all Mobile IP registration requests. |
| **care-of-access** *access-list* | (Optional) Access list. This can be a named access list or standard access list. The range is from 1 to 99. Controls where mobile nodes roam—the acceptable care-of addresses. |
| **lifetime** *seconds* | (Optional) Lifetime (in seconds). The lifetime for each mobile node (group) can be set to override the global value. The range is from 3 to 65535 (infinite). |

## Defaults

No host is configured.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.2(2)XC | The **nai** keyword and associated parameters were added. |
| 12.2(13)T | The **permanent** keyword was added and the command was integrated into Cisco IOS Release 12.2(13)T. |
| 12.3(4)T | The **authorized-pool** *and* **skip-aaa-reauthentication** keywords were added. |

## Usage Guidelines

This command configures the mobile host or mobile node group (ranging from *lower* address to *upper* address) to be supported by the home agent. These mobile nodes belong to the network on an interface or a virtual network (via the **ip mobile virtual-network** command). The security association for each mobile host must be configured using the **ip mobile secure** command or downloaded from a AAA server.

All hosts must have security associations for registration authentication. Mobile nodes can have more than one security association. The memory consumption calculations shown in Table 3 are based on the assumption of one security association per mobile node. Caching behavior of security associations differs between NAI and non-NAI hosts as described in Table 4.

The **nai** keyword allows you to specify a particular mobile node or range of mobile nodes. The mobile node can request a static IP address (**static-address** keyword), which is configured using the *addr1* variable (for a specific address) or the **local-pool** keyword (for an IP address from an address pool; the requested address must be in the pool). Or, the mobile node can request a dynamic address (**address** keyword), which is configured using the *addr* variable (for a specific address) or the **pool** keyword (for an IP address from a pool or DHCP server). If this command is used with the Packet Data Serving Node (PDSN) proxy Mobile IP feature and a realm is specified in the **ip mobile proxy-host nai** command, then only a pool of addresses can be specified in this command.

The address pool can be defined by a local pool or by use of a DHCP proxy client. For DHCP, the **interface** *name* keyword and argument combination specifies the gateway address from which the DHCP server should select the address and the **dhcp-server** keyword specifies the DHCP server address. The NAI is sent in the client-id option of the DHCP packet and can be used to provide dynamic DNS services.

You can also use this command to configure the static IP address or address pool for multiple flows with the same NAI. A flow is a set of {NAI, IP address}.

Security associations can be stored using one of three methods:

- On the router
- On the AAA server, retrieve security association each time registration comes in (**aaa** optional keyword)
- On the AAA server, retrieve and cache security association (**aaa load-sa** option)

Each method has advantages and disadvantages, which are described in Table 3.

***Table 3 Methods for Storing Security Associations***

| Storage Method | Advantage | Disadvantage |
|---|---|---|
| On the router | • Security association is in router memory, resulting in fast lookup.<br>• For home agents supporting fewer than 1500 mobile nodes, this provides optimum authentication performance and security (keys never leave router). | • NVRAM of router is limited, cannot store many security associations. Each security association configuration takes about 80 bytes. For 125 KB NVRAM, you can store about 1500 security associations on a home agent. |

*Table 3 Methods for Storing Security Associations (continued)*

| Storage Method | Advantage | Disadvantage |
|---|---|---|
| On the AAA server, retrieve security association each time registration comes in | • Central administration and storage of security association on AAA server.<br>• If keys change constantly, administration is simplified to one server, latest keys always retrieved during registration.<br>• Router memory (DRAM) is conserved. Router will need memory only to load in a security association, and then release the memory when done. | • Requires network to retrieve security association, slower than other storage methods, and dependent on network and server performance.<br>• Multiple home agents that use one AAA server, which can become the bottleneck, can get slow response.<br>• Key can be snooped if packets used to retrieve from AAA are not encrypted (for example, using RADIUS or unencrypted TACACS+ mode). |
| On the AAA server, retrieve and store security association | • AAA acts as an offload configuration server, security associations are loaded into router DRAM, which is more abundant (for example, 16 MB, 32 MB, 64 MB) when the first registration comes in. Each security association takes only about 50 bytes of DRAM, so 10,000 mobile nodes will use up 0.5 MB.<br>• If keys remain fairly constant, once security associations are loaded, home agent authenticates as fast as when stored on the router.<br>• Only security associations that are needed are loaded into router memory. Mobile nodes that never register will not waste memory. | • If keys change on the AAA server after the mobile node registered, then you need to use **clear ip mobile secure** command to clear and load in new security association from AAA, otherwise the security association of the router is stale. |

The caching behavior of security associations for NAI hosts and non-NAI hosts is described in Table 4.

*Table 4 Caching Behavior for Security Associations*

| Keyword Option | NAI Hosts | Non-NAI Hosts |
|---|---|---|
| **aaa** | Security associations are deleted after authentication and are not cached. | Security associations are deleted after authentication and are not cached. |
| **aaa load-sa** | Security associations are cached until binding persists. After the binding is deleted (timed out or cleared), the security associations are removed. | Security associations are cached permanently. |
| **aaa load-sa permanent** | Security associations are cached permanently after being retrieved from the AAA server. | — |

## Examples

The following example configures a mobile node group to reside on virtual network 20.0.0.0 and retrieve mobile node security associations from a AAA server every time the mobile node registers:

```
ip mobile host 20.0.0.1 20.0.0.3 virtual-network 20.0.0.0 aaa
```

The following example configures a mobile node group to reside on virtual network 10.99.1.0 and retrieve and cache mobile node security associations from a AAA server. The cached security association is then used for subsequent registrations.

```
ip mobile host 10.99.1.1 10.99.1.100 virtual-network 10.99.1.0 aaa load-sa
```

The following example configures a local pool of dynamic addresses to be used in assigning IP addresses to mobile nodes in the cisco.com domain:

```
ip mobile host nai @cisco.com address pool local mobilenodes virtual-network 9.0.0.0
255.0.0.0 aaa lifetime 180
```

The following example configures a local pool of dynamic addresses to be used in assigning IP addresses to mobile nodes in the cisco.com domain. The security associations that are retrieved from the AAA server are cached as long as the binding is present and are deleted on the home agent when the binding is removed (due to manual clearing of the binding or lifetime expiration).

```
ip mobile host nai @cisco.com address pool local mobilenodes virtual-network 10.2.0.0
255.255.0.0 aaa load-sa lifetime 180
```

The following example configures a local pool of static addresses to be used in assigning IP addresses to mobile nodes in the cisco.com domain:

```
ip mobile host nai @cisco.com static-address local-pool mobilenodes
```

The following example configures a local pool of dynamic addresses to be used in assigning IP addresses to mobile nodes in the cisco.com domain. The security associations that are retrieved from the AAA server are cached permanently until cleared manually.

```
ip mobile host nai @cisco.com address pool local mobilenodes virtual network 10.2.0.0
255.255.0.0 aaa load-sa permanent lifetime 180
```

The following example configures the DHCP proxy client to use a DHCP server located at 10.1.2.3 to allocate a dynamic home address:

```
ip mobile host nai @dhcppool.com address pool dhcp-proxy-client dhcp-server 10.1.2.3
interface FastEthernet 0/0
```

## Related Commands

| Command | Description |
|---|---|
| **aaa authorization ipmobile** | Authorizes Mobile IP to retrieve security associations from the AAA server using TACACS+ or RADIUS. |
| **clear ip mobile secure** | Clears and retrieves remote security associations. |
| **ip mobile proxy-host** | Locally configures the proxy Mobile IP attributes |
| **ip mobile secure** | Specifies the mobility security associations for mobile host, visitor, home agent, and foreign agent. |
| **show ip mobile host** | Displays mobile node counters and information. |

# ip mobile prefix-length

To append the prefix-length extension to the advertisement, use the **ip mobile prefix-length** command in interface configuration mode. To restore the default, use the **no** form of this command.

**ip mobile prefix-length**

**no ip mobile prefix-length**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The prefix-length extension is not appended.

## Command Modes

Interface and Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.3(11)T | Global configuration mode was added. |

## Usage Guidelines

The prefix-length extension is used for movement detection. When a mobile node registered with one foreign agent receives an agent advertisement from another foreign agent, the mobile node uses the prefix-length extension to determine whether the advertisements arrived on the same network. The mobile node needs to register with the second foreign agent if it is on a different network. If the second foreign agent is on the same network, reregistration is not necessary.

## Examples

The following example appends the prefix-length extension to agent advertisements sent by a foreign agent:

```
ip mobile prefix-length
```

## Related Commands

| Command | Description |
|---|---|
| **show ip mobile interface** | Displays advertisement information for interfaces that are providing foreign agent service or are home links for mobile nodes. |

# ip mobile registration-lifetime

To set the registration lifetime value advertised, use the **ip mobile registration-lifetime** command in interface or global configuration mode.

**ip mobile registration-lifetime** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Lifetime in seconds. Range is from 3 to 65535 (infinity). |

## Defaults

36000 seconds

## Command Modes

Interface and global configuration

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.3(11)T | Global configuration mode was added. |

## Usage Guidelines

This command allows an administrator to control the advertised lifetime on the interface. The foreign agent uses this command to control duration of registration. Visitors requesting longer lifetimes will be denied.

## Examples

The following example sets the registration lifetime to 10 minutes on interface Ethernet 1 and 1 hour on interface Ethernet 2:

```
interface e1
 ip mobile registration-lifetime 600
interface e2
 ip mobile registration-lifetime 3600
```

## Related Commands

| Command | Description |
|---|---|
| **show ip mobile interface** | Displays advertisement information for interfaces that are providing foreign agent service or are home links for mobile nodes. |

# ip mobile secure host

To specify the mobility security associations (SAs) for a mobile host, use the **ip mobile secure host** command in global configuration mode. To remove the mobility SAs, use the **no** form of this command.

**ip mobile secure host** {*lower-address* [*upper-address*] | **nai** *nai-string*} {**inbound-spi** *spi-in* **outbound-spi** *spi-out* | **spi** {*hex-value* | **decimal** *decimal-value*}} **key** {**ascii** *string* | **hex** *string*} [**replay timestamp** *seconds*] [**algorithm** {**md5 mode prefix-suffix** | **hmac-md5**}] [**skip-aaa-reauthentication**]

**no ip mobile secure host** {*lower-address [upper-address]* | **nai** *nai-string} {***inbound-spi** *spi-in* **outbound-spi** *spi-out* | **spi {***hex-value* | **decimal** *decimal-value*}} **key** {**ascii** *string* | **hex** *string*} [**replay timestamp** *seconds*] [**algorithm** {**md5 mode prefix-suffix** | **hmac-md5**}] [**skip-aaa-reauthentication**]

## Syntax Description

| | |
|---|---|
| *lower-address* | IP address of a host or lower range of IP address pool.<br>• *upper-address*—(Optional) Upper range of IP address pool. If specified, SAs for multiple hosts are configured.<br>**Note** The *upper-address* value must be greater than the *lower-address* value. |
| **nai** | Network access identifier (NAI) of the mobile node (MN).<br>• *nai-string*—NAI username or username@realm. |
| **inbound-spi** | Bidirectional 4-byte security parameter index (SPI) used for authenticating inbound registration packets.<br>• *spi-in*—Index for inbound registration packets. The range is from 100 to ffffffff. |
| **outbound-spi** | SPI used for calculating the authenticator in outbound registration packets.<br>• *spi-out*—Index for outbound registration packets. The range is from 100 to ffffffff. |
| **spi** | SPI authenticates a peer. The argument and keyword are as follows:<br>• *hex-value*—SPI expressed as a hexadecimal number. The range is from 100 to ffffffff.<br>**Note** Cisco recommends that you use hexadecimal values instead of decimal values for interoperability.<br>• **decimal—**Decimal SPI. The argument is as follows:<br>– *decimal-value*—SPI expressed as a decimal number. The range is from 256 to 4294967295. |
| **key** | Security key. The arguments and keywords are as follows:<br>• **ascii** *string*—Security key expressed as an ASCII string. A maximum of 32 characters is allowed. No spaces are allowed.<br>• **hex** *string*—Security key expressed in hexadecimal digits. A maximum of 32 hex digits is allowed. The range is from 100 to ffffffff. No spaces are allowed. |

| | |
|---|---|
| **replay timestamp** | (Optional) Specifies the number of seconds that the router uses for replay protection.<br>• *seconds*—Time, in seconds, that a router uses for replay protection. The range is from plus or minus 255. The default is plus or minus 7.<br>**Note** The registration packet is considered "not replayed" if the time stamp in the packet is within plus or minus the configured number of seconds of the router clock. |
| **algorithm** | (Optional) Algorithm used to authenticate messages during registration. The keywords are as follows:<br>• **md5 mode**—Message Digest 5 (MD5) mode used to authenticate packets during registration.<br>• **prefix-suffix**—Wrapped registration information for authentication (for example, key registration information key) that calculates the message digest.<br>**Note** Cisco no longer recommends this method of authentication, but it is retained for backward compatibility.<br>• **hmac-md5**—Hash-based Message Authentication Code (HMAC) MD5.<br>**Note** The HMAC-MD5 authentication algorithm or MD5 (prefix-suffix) authentication algorithm is mandatory for mobile-home authentication (MHAE), mobile-foreign authentication (MFAE), or foreign-home authentication (FHAE). |
| **skip-aaa-reauthentication** | (Optional) When configured, the home agent does not send an access request for authentication for mobile IP re-registration requests. When disabled, the home agent sends an access request for all Mobile IP registration requests. |

## Defaults

No SA is specified for mobile hosts.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.0(1)T | This command was introduced. |
| 12.2 | The *lower-address* and *upper-address* arguments were added. |
| 12.2(2)XC | The **nai** keyword was added. |
| 12.2(13)T | The **hmac-md5** keyword was added. |

## Usage Guidelines

The SA consists of an entity address, SPI, key, replay protection method, authentication algorithm, and authentication algorithm mode (prefix-suffix).

The SA of a visiting mobile host on the MFAE and the SA of the home agent (HA) on the FHAE are optional as long as they are not specified on the other entity. Multiple SAs for each entity can be configured.

The HMAC-MD5 authentication algorithm is mandatory for MHAE, MFAE, and FHAE.

**Note** NTP is not required for operation, but NTP can be used to synchronize time for all parties.

## Examples

The following example shows the configuration of an SA for a host:

```
ip mobile secure host 10.0.0.4 spi 100 key hex 12345678123456781234567812345678
```

## Related Commands

| Command | Description |
|---|---|
| **ip mobile host** | Configures the mobile host or mobile node group. |
| **ip mobile proxy-host** | Configures the proxy Mobile IP attributes. |
| **ip mobile secure aaa-download** | Configures the rate at which AAA security associations are downloaded. |
| **ip mobile secure foreign-agent** | Configures the mobility SAs for an FA. |
| **ip mobile secure home-agent** | Configures the mobility SAs for an HA. |
| **ip mobile secure mn-aaa** | Specifies non-standard SPI values in the MN-AAA authentication extension that need to be accepted by the home agent or foreign agent. |
| **ip mobile secure proxy-host** | Configures the mobility SAs for a proxy host. |
| **ip mobile secure visitor** | Configures the mobility SAs for a visitor. |
| **ntp server** | Allows the system clock to be synchronized by a time server. |
| **show ip mobile secure** | Displays the mobility SAs for a mobile host, mobile visitor, FA, or HA. |

# ip probe path

To enable route probe support on an APN, use the **ip probe path** access-point configuration command. To return to the default, use the **no** form of this command.

**ip probe path** *ip_address* **protocol udp [port** *port* **ttl** *ttl***]**

**no ip probe path** *ip_address* **protocol udp [port** *port* **ttl** *ttl***]**

## Syntax Description

| | |
|---|---|
| *ip_address* | IP address to which the GGSN is to send a probe packet for each PDP context successfully created. |
| protocol udp | Specifies UDP. |
| **port** *port* | (Optional) UDP destination port. |
| **ttl** *ttl_value* | (Optional) IP time-to-live (TTL) value for outgoing packet. |

## Defaults

Disabled

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB1 | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **ip probe path** access-point configuration command to enable the GGSN to send a probe packet to a specific destination for each PDP context that is successfully established.

An example of how to use this feature is when a firewall load balancer (FWLB) is being used in the network. If the **ip probe path** command is configured, when a PDP context is established, the GGSN sends a probe packet the FWLB. This enables the FWLB to create an entry for the PDP context even if there is no upstream packet from the MS. Once an entry is created, the FWLB can forward any downstream packet from the network for the MS to the appropriate GGSN without depending on the MS to send the packet first.

**Note** If an APN is mapped to a VRF, the route probe packet will go through the VRF routing table.

# ip rtp compression-connections

To specify the total number of Real-Time Transport Protocol (RTP) header compression connections that can exist on an interface, use the **ip rtp compression-connections** command in interface configuration mode. To restore the default value, use the **no** form of this command.

**ip rtp compression-connections** *number*

**no ip rtp compression-connections**

## Syntax Description

| | |
|---|---|
| *number* | Number of RTP header compression connections the cache supports, in the range from 3 to 1000. |

## Defaults

For PPP and High-Level Data Link Control (HDLC) interfaces, the default is 16 compression connections.

For Frame Relay interfaces, the default is 256 compression connections.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 11.3 | This command was introduced. |
| 12.0(7)T | For PPP and HDLC interfaces, the maximum number of compression connections increased from 256 to 1000.<br>For Frame Relay interfaces, the maximum number of compression connections increased from 32 to 256. The default number of compression connections was increased from 32 (fixed) to 256 (configurable). |
| 12.1(4)E | This command was incorporated in Cisco IOS Release 12.1(4)E and was supported on Cisco 7100 series routers. |
| 12.2(8)MC1 | This command was incorporated in Cisco IOS Release 12.2(8)MC1 and the maximum number of compression connections for the MGX-RPM-1FE-CP back card was set at 1000. |
| 12.2(8)MC2 | This command was incorporated in Cisco IOS Release 12.2(8)MC2 andthe maximum number of compression connections for the MWR 1941-DC was set at 1000. |
| 12.3(11)T | This command was incorporated in Cisco IOS Release 12.3(11)T. |

## Usage Guidelines

You should configure one connection for each RTP call through the specified interface.

Each connection sets up a compression cache entry, so you are in effect specifying the maximum number of cache entries and the size of the cache. Too few cache entries for the specified interface can lead to degraded performance, and too many cache entries can lead to wasted memory.

**Note** Both ends of the serial connection must use the same number of cache entries.

**Note** The MGX-RPM-1FE-CP back card supports up to 150 RTP header compression connections on a T1 interface and up to 1000 connections per MLP bundle regardless of whether the bundle contains one T1 interface or four.

## Examples

The following example changes the number of RTP header compression connections supported to 150:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression
Router(config-if)# ip rtp compression-connections 150
Router(config-if)# exit
```

## Related Commands

| Command | Description |
|---|---|
| **ip rtp header-compression** | Enables RTP header compression. |
| **show ip rtp header-compression** | Displays RTP header compression statistics. |

# ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression, use the **ip rtp header-compression** command in interface configuration mode. To disable RTP header compression, use the **no** form of this command.

**ip rtp header-compression** [**passive | iphc-format | ietf-format**] [**periodic-refresh**] **[ignore-id]**

**no ip rtp header-compression** [**passive | iphc-format | ietf-format**] [**periodic-refresh**] **[ignore-id]**

## Syntax Description

| | |
|---|---|
| **passive** | (Optional) Compresses outgoing RTP packets only if incoming RTP packets on the same interface are compressed. If you do not specify the **passive** keyword, all RTP packets are compressed. This option is not applicable on PPP links. |
| **iphc-format** | (Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used. |
| **ietf-format** | (Optional) Indicates that the Internet Engineering Task Force (IETF) format of header compression will be used. |
| **periodic-refresh** | (Optional) Indicates that the compressed IP header will be refreshed periodically. |
| **ignore-id** | (Optional) Suppresses the IP ID checking in RTP/UDP header compression. |

## Defaults

Disabled

For PPP interfaces, the default format for header compression is the IPHC format.

For High-Level Data Link Control (HDLC) and Frame Relay interfaces, the default format for header compression is the original proprietary Cisco format. The maximum number of compression connections for the proprietary Cisco format is 256.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 11.3 | This command was introduced. |
| 12.0 | This command was integrated into Cisco IOS Release 12.0. The **iphc-format** optional keyword was added. |
| 12.3(2)T | This command was integrated into Cisco IOS Release 12.3(2)T and the **periodic-refresh** optional keyword was added. |
| 12.3(4)T | This command was integrated into Cisco IOS Release 12.3(4)T and the **ietf-format** and **ignore-id** optional keywords were added. |

## Usage Guidelines

You can compress IP/User Datagram Protocol (UDP)/RTP headers to reduce the size of your packets. Compressing headers is especially useful for RTP because RTP payload size can be as small as 20 bytes, and the uncompressed header is 40 bytes.

#### Header Compression passive Keyword

By default, the **ip rtp header-compression** command compresses outgoing RTP traffic. This command includes an optional **passive** keyword. If you specify the **passive** keyword, outgoing RTP traffic is compressed only if *incoming* RTP traffic on the *same* interface is compressed. If you do not specify the **passive** keyword, *all* RTP traffic is compressed.

For PPP interfaces, the **passive** keyword is ignored. PPP interfaces negotiate the use of header-compression, regardless of whether the **passive** keyword is specified. Therefore, on PPP interfaces, the **passive** keyword is replaced by the IPHC format, the default format for PPP interfaces.

#### Header Compression iphc-format Keyword

This command includes the **iphc-format** keyword. The **iphc-format** keyword indicates the type of header compression that will be used. For PPP and HDLC interfaces, when the **iphc-format** keyword is specified, TCP header-compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP and TCP header compression are enabled, both UDP and TCP packets are compressed.

The **iphc-format** keyword includes checking whether the destination port number is even and in the ranges of 16385 to 32767 (for Cisco audio) or 49152 to 65535 (for Cisco video). Valid RTP packets that meet the criteria (that is, the port number is even and within the specified range) are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

**Note** For Frame Relay interfaces, the **iphc-format** keyword is not available.

#### Header Compression ietf-format Keyword

This command includes the **ietf-format** keyword. The **ietf-format** keyword indicates the type of header compression that will be used. For HDLC interfaces, the ietf-format compresses only UDP packets. For PPP interfaces, when the **ietf-format** keyword is specified, TCP header-compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP and TCP header compression are enabled, both UDP and TCP packets are compressed.

However, with the **ietf-format** keyword, the requirement of checking whether a destination port number is in a specific range has been removed. Any even destination port number higher than 1024 can be used. Valid RTP packets that meet the criteria (that is, the port number is even and higher than 1024), are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

**Note** For Frame Relay interfaces, the **ietf-format** keyword is not available.

#### Support for Serial Lines

RTP header compression is supported on serial lines using Frame Relay, HDLC, or PPP encapsulation. You must enable compression on both ends of a serial connection.

#### Unicast or Multicast RTP Packets

This command can compress unicast or multicast RTP packets, and, hence, multicast backbone (MBONE) traffic can also be compressed over slow links. The compression scheme is beneficial only when you have small payload sizes, as in audio traffic.

## Examples

The following example enables RTP header compression on the Serial1/0.0 subinterface and limits the number of RTP header compression connections to 10. In this example, the optional **iphc-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# exit
```

The following example enables RTP header compression on the Serial2/0.0 subinterface and limits the number of RTP header compression connections to 20. In this example, the optional **ietf-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression ietf-format
Router(config-if)# ip rtp compression-connections 20
Router(config-if)# exit
```

In the following example, RTP header compression is enabled on the Serial1/0.1 subinterface and the optional **periodic-refresh** keyword of the **ip rtp header-compression** command is specified:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0.1
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format periodic-refresh
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# exit
```

## Related Commands

| Command | Description |
|---|---|
| **clear ip rtp header-compression** | Clears RTP header compression structures and statistics. |
| **ip rtp compression-connections** | Specifies the total number of RTP header compression connections that can exist on an interface. |
| **show ip rtp header-compression** | Displays RTP header compression statistics. |
| **show running-config** | Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information. |

# ip-access-group

To specify access permissions between an MS and a PDN through the GGSN at a particular access point, use the **ip-access-group** access-point configuration command. To disable the input access list, use the **no** form of this command.

**ip-access-group** *access-list-number* {**in** | **out**}

**no ip-access-group** *access-list-number* {**in** | **out**}

## Syntax Description

| | |
|---|---|
| *access-list-number* | Number of an access list that has been set up using the **access-list** command. |
| **in** | The specified access list controls access from the PDN to the mobile station. |
| **out** | The specified access list controls access from the mobile station to the PDN. |

## Defaults

No access list is enforced.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **ip-access-group** command to specify an access list that indicates whether users are given or denied permission to access the mobile station from the PDN through the GGSN using a specified access point.

## Examples

The following example grants access-list 101 inbound access to the mobile station from the PDN through the GGSN:

```
access-list 101 permit ip 10.0.0.2 0.255.255.255 any
interface virtual-template 1
 ip address 172.16.10.1 255.255.255.0
 no ip directed-broadcast
 encapsulation gtp
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
```

```
  access-point-name gprs.somewhere.com
  dhcp-server 10.100.0.3
  ip-access-group 101 in
  exit
!
```

# ip-address-pool

To specify a dynamic address allocation method using IP address pools for the current access point, use the **ip-address-pool** access-point configuration command. To return to the default value, use the **no** form of this command.

**ip-address-pool** {**dhcp-proxy-client** | **radius-client** | **local** *pool-name* | **disable**}

**no ip-address-pool** {**dhcp-proxy-client** | **radius-client** | **local** *pool-name* | **disable**}

## Syntax Description

| | |
|---|---|
| **dhcp-proxy-client** | The access-point IP address pool is allocated using a DHCP server. |
| **radius-client** | The access-point IP address pool is allocated using a RADIUS server. |
| **local** | The access-point IP address pool is allocated using a locally configured address pool. |
| **disable** | Disables dynamic address allocation for this access point. |

## Defaults

The global setting specified with the **gprs default ip-address-pool** command is used. The default value for the global configuration command is that IP address pools are disabled.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB and the **local** option was added. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

You can specify an IP allocation method for an access point in two ways:

- Enter access-point configuration mode and use the **ip-address-pool** command to specify an IP address allocation method for the current access point.
- Specify a global value for the IP address pool by issuing the **gprs default ip-address-pool** command. In that case, you do not need to specify an address-pool method for the specific access point.

If you specify **dhcp-proxy-client** as the method for allocating IP addresses, then you must configure a DHCP server for IP address allocation. You can do this at the global configuration level using the **gprs default-dhcp server** command, or at the access point level using the **dhcp-server** command.

If you specify **radius-client** as the method for allocating IP addresses, then you must configure a RADIUS server for IP address allocation, configure AAA on the GGSN, and configure AAA server groups globally on the GGSN or at the access point. For more information about configuring RADIUS on the GGSN, refer to the Usage Guidelines section for the **aaa-group** and **gprs default aaa-group** commands.

**Note** Configuring a local IP address pool under an APN (using the **ip-address-pool local** access-point configuration command) improves the PDP context activation rate as the number of PDP contexts increases.

## Examples

The following example configures DHCP as the IP address pool allocation method for access-point 1 and specifies that the other access points use the global default, which is specified as RADIUS:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
aaa group server radius foo1
 server 10.10.0.1
!
aaa authentication ppp foo group foo
aaa authentication ppp foo group foo1
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
aaa accounting network foo1 start-stop group foo1
!
interface Loopback0
 ip address 10.88.0.1 255.255.255.255
!
interface virtual-template 1
 ip unnumber Loopback0
 no ip directed-broadcast
 encapsulation gtp
 gprs access-point-list abc
!
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn1.com
  ip address-pool dhcp-proxy-client
  aggregate auto
  dhcp-server 10.100.0.3
  dhcp-gateway-address 10.88.0.1
  exit
!
 access-point 2
  access-point-name gprs.pdn2.com
  access-mode non-transparent
  aaa-group authentication foo
  exit
!
gprs default ip-address-pool radius-client
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.10.0.1 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

**Related Commands**

| Command | Description |
|---|---|
| **dhcp-server** | Specifies a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point. |
| **gprs default dhcp-server** | Specifies a default DHCP server from which the GGSN obtains IP address leases for mobile users. |
| **gprs default ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the GGSN. |
| aaa-group | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| gprs default aaa-group | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN |

# keepalive

To enable keepalive packets and to specify the number of times that the Cisco IOS software tries to send keepalive packets without a response before bringing down the interface or before bringing the tunnel protocol down for a specific interface, use the **keepalive** command in interface configuration mode. When the keepalive function is enabled, a keepalive packet is sent at the specified time interval to keep the interface active. To turn off keepalive packets entirely, use the **no** form of this command.

**keepalive** [*period* [*retries*]]

**no keepalive** [*period* [*retries*]]

## Syntax Description

| | |
|---|---|
| *period* | (Optional) Integer value in seconds greater than 0. The default is 10. |
| *retries* | (Optional) Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. Integer value greater than 1 and less than 255. If omitted, the value that was previously set is used; if no value was specified previously, the default of 5 is used.<br><br>If using this command with a tunnel interface, specifies the number of times that the device will continue to send keepalive packets without response before bringing the tunnel interface protocol down. |

## Defaults

*period*: 10 seconds
*retries*: 5
If you enter only the **keepalive** command with no arguments, defaults for both arguments are used.
If you enter only the **keepalive** command and the timeout parameter, the default number of retries (5) is used.
If you enter the **no keepalive** command, keepalive packets are disabled on the interface.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 10.0 | This command was introduced. |
| 12.2(8)T | The *retries* argument was added and made available on tunnel interfaces. |
| 12.2(13)T | The default value for the *retries* argument was increased to 5. |

## Usage Guidelines

### Keepalive Time Interval

You can configure the keepalive time interval, which is the frequency at which the Cisco IOS software sends messages to itself (Ethernet and Token Ring) or to the other end (serial and tunnel), to ensure that a network interface is alive. The interval is adjustable in 1-second increments down to 1 second. An interface is declared down after three update intervals have passed without receiving a keepalive packet unless the retry value is set higher.

Setting the keepalive timer to a low value is very useful for rapidly detecting Ethernet interface failures (transceiver cable disconnecting, cable not terminated, and so on).

#### Line Failure

A typical serial line failure involves losing Carrier Detect (CD) signal. Because this sort of failure is typically noticed within a few milliseconds, adjusting the keepalive timer for quicker routing recovery is generally not useful.

#### Keepalive Packets with Tunnel Interfaces

GRE keepalive packets may be sent from both sides of a tunnel, or from just one side. If they are sent from both sides, the period and retry parameters can be different at each side of the link. If you configure keepalives on only one side of the tunnel, the tunnel interface on the sending side might perceive the tunnel interface on the receiving side to be down because the sending interface is not receiving keepalives. From the receiving side of the tunnel, the link appears normal because no keepalives were enabled on the second side of the link.

#### Dropped Packets

Keepalive packets are treated as ordinary packets, so it is possible that they will be dropped. To reduce the chance that dropped keepalive packets will cause the tunnel interface to be taken down, increase the number of retries.

**Note** When adjusting the keepalive timer for a very low bandwidth serial interface, large datagrams can delay the smaller keepalive packets long enough to cause the line protocol to go down. You may need to experiment to determine the best values to use for the timeout and the number of retry attempts.

#### GRE Tunnels with IPSec

When using GRE with IPSec, the keepalives are encrypted like any other traffic. As with user data packets, if the IKE and IPSec security associations are not already active on the GRE tunnel, the first GRE keepalive packet will trigger IKE/IPSec initialization.

## Examples

The following example shows how to set the keepalive interval to 3 seconds:

```
Router(config)# interface ethernet 0
Router(config-if)# keepalive 3
```

The following example shows how to set the keepalive interval to 3 seconds and the retry value to 7:

```
Router(config)# interface tunnel 1
Router(config-if)# keepalive 3 7
```

# mode y-cable

To access the command mode that allows you to manually control the relays on the VWIC card, use the **mode y-cable** command.

**mode y-cable**

## Syntax Description

This command has no parameters, it invokes the y-cable mode.

## Defaults

There are no default settings or behaviors.

## Command Modes

Redundancy configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC2 | This command was introduced. |
| 12.2(15)MC1 | This command was incorporated in Cisco IOS 12.2(15)MC1. |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Examples

The following example enables y-cable mode.

```
mode y-cable
```

## Related Commands

| Command | Description |
|---|---|
| **standalone** | Indicates whether the MWR 1941-DC router is being used as a standalone device and manually sets the relays. |
| **standby use-interface** | Designates a loopback interface as a health or revertive interface. |
| **redundancy** | Invokes redundancy mode. |

# msisdn suppression

To specify that the GGSN overrides the mobile station integrated services digital network (MSISDN) number with a pre-configured value in its authentication requests to a RADIUS server, use the **msisdn suppression** access point configuration command. To enable the GGSN to send the MSISDN number in authentication requests to a RADIUS server, use the **no** form of the command.

**msisdn suppression** [*value*]

**no msisdn suppression** [*value*]

## Syntax Description

| | |
|---|---|
| value | (Optional) String (up to 20 characters long) that the GGSN sends in place of the MSISDN number in authentication requests to a RADIUS server. Valid characters for the string are any of those accepted by the MSISDN encoding specifications, including the integers 0–9, and characters a, b, c, * and #. The default value is that no string is sent. |

## Defaults

The MSISDN number is suppressed, and no ID string is sent to the RADIUS server in place of the MSISDN number.

## Command Modes

Access point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(2) | This command was introduced. |
| 12.2(4)MX2 | This command was incorporated in Cisco IOS Release 12.2(4)MX2. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Certain countries have privacy laws which prohibit service providers from identifying the MSISDN number of mobile stations in authentication requests. Use the **msisdn suppression** command to specify a value that the GGSN sends in place of the MSISDN number in its authentication requests to a RADIUS server. If no value is configured, then no number is sent to the RADIUS server.

To use the **msisdn suppression** command, you must configure a RADIUS server either globally or at the access point and specify non-transparent access mode.

## Examples

The following example will override the MSISDN ID sent in the create request and will not send any ID to the RADIUS server:

```
gprs access-point-list abc
   access-point 1
```

```
radius-server 192.168.1.1
access-mode non-transparent
msisdn suppression
```

**Related Commands**

| Command | Description |
|---|---|
| access-mode | Specifies whether the GGSN requests user authentication at the access point to a PDN. |
| access-mode | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| gprs default aaa-group | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |

# nas

To add an access point or router to the list of devices that use the local authentication server, use the **nas** command in local RADIUS server configuration mode. To remove the identity of the network access server (NAS) that is configured on the local RADIUS server, use the **no** form of this command

**nas** *ip-address* **key** *shared-key*

**no nas** *ip-address* **key** *shared-key*

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of the access point or router. |
| **key** | Specifies a key. |
| *shared-key* | Shared key that is used to authenticate communication between the local authentication server and the access points and routers that use this authenticator. |

## Defaults

No default behavior or values

## Command Modes

Local RADIUS server configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following command adds the access point having the IP address 192.168.12.17 to the list of devices that use the local authentication server, using the shared key "*shared256*."

```
nas 192.168.12.17 key shared256
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |

| Command | Description |
|---|---|
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# nbns primary

To specify a primary (and backup) NBNS to be sent in create PDP responses at the access point, use the **nbns primary** access-point configuration command. To remove the NBNS from the access-point configuration, use the **no** form of this command

**nbns primary** *ip-address* [**secondary** *ip-address*]

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of the primary NBNS. |
| **secondary** *ip-address* | (Optional) Specifies the IP address of the backup NBNS. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **nbns primary** command to specify the primary (and backup) NBNS at the access point level.

This feature is benefits address allocation schemes where there is no mechanism to obtain these address. Also, for a RADIUS-based allocation scheme, it prevents the operator from having to configure a NBNS and DNS under each user profile.

The NBNS address can come from three possible sources: DHCP server, RADIUS server, or local APN configuration. The criterium for selecting the NBNS address depends on the IP address allocation scheme configured under the APN. Depending on the configuration, the criterium for selecting the DNS and NBNS addresses is as follows:

1. DHCP-based IP address allocation scheme (local and external)—NBNS address returned from the DHCP server is sent to the MS. If the DHCP server does not return an NBNS address, the local APN configuration is used.
2. RADIUS-based IP address allocation scheme—NBNS address returned from the RADIUS server (in Access-Accept responses) is used. If the RADIUS server does not return an NBNS address, the local APN configuration is used.
3. Local IP Address Pool-based IP address allocation scheme—Local APN configuration is used.
4. Static IP Addresses—Local APN configuration is used.

**Note** The GGSN sends DNS addresses in the create PDP response only if the MS is requesting the DNS address in the PCO IE.

## Examples

The following example specifies a primary and secondary NBNS at the access point level:

```
access-point 2
 access-point-name xyz.com
 nbns primary 10.60.0.1 secondary 10.60.0.2
 exit
```

## Related Commands

| Command | Description |
|---|---|
| **ip-address-pool** | Specifies a dynamic address allocation method using IP address pools for the current access point. |
| dns primary | Specifies a primary (and backup) DNS at the access point level. |

# network-behind-mobile

To enable an access point to support routing behind the mobile station (MS), use the **network-behind-mobile** access-point configuration command. To disable support for routing behind the MS, use the **no** form of this command.

**network-behind-mobile**

**no network-behind-mobile**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(8)T | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the network-behind-mobile access-point configuration command to enable an access point to support routing behind the MS. The routing behind the MS feature enables the routing of packets to IP addresses that do not belong to the PDP context (the MS), but exist behind it. The network address of the destination can be different than the MS address.

Before enabling routing behind the MS, the following requirements must be met:

- The MS must use RADIUS for authentication and authorization.
- At minimum, one Framed-Route, attribute 22 as defined in Internet Engineering Task Force (IETF) standard RFC 2865, must be configured in the RADIUS server for each MS that wants to use this feature.

  When configured, the Framed-Route attribute is automatically downloaded to the GGSN during the authentication and authorization phase of the PDP context creation. If routing behind the MS is not enabled, the GGSN ignores the Framed-Route attribute. If multiple Framed-Route attributes have been configured for an MS, the GGSN uses the first attribute configured. When the MS session is no longer active, the route is deleted.
- For PDP Regen or PPP with L2TP sessions, the Framed-Route attribute must be configure in the RADIUS server of the LNS.
- For PPP Regen sessions, if the **security verify source** command is configure, the Framed-Route attribute must also be configured in the user profile in the GGSN RADIUS server.Packets routed behind the MS share the same 3GPP QoS settings of the MS.

## Examples

The following example shows how to enable support for routing behind the MS at access point 200:

```
gprs access-point-list abc
 access-point 200
  network-behind-mobile
```

## Related Commands

| Command | Description |
|---|---|
| **security verify** | Specifies the verification of source and/or destination addresses. |

# network-request-activation

To enable an access point to support network-initiated PDP requests, use the **network-request-activation** access-point configuration command. To disable support for network-initiated PDP requests at an access point, use the **no** form of this command.

**network-request-activation**

**no network-request-activation**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

In addition to configuring the **network-request-activation** command, you must configure the following other commands to support network-initiated PDP requests on the GGSN:

- **gprs ni-pdp ip-imsi single**
- **gprs default map-converting-gsn**

## Examples

The following example shows how to enable support for network-initiated PDP requests at access point 200:

```
gprs access-point-list abc
 access-point 200
  network-request-activation
```

## Related Commands

| Command | Description |
|---|---|
| **gprs ni-pdp ip-imsi single** | Specifies a static IP address to IMSI mapping for a single MS for network-initiated PDP requests from a particular APN. |
| **gprs default map-converting-gsn** | Specifies the address or host name of the SGSN that sends Mobile Application Protocol (MAP) messages to and from the home location register (HLR). |

# ppp accm

To specify the Asynchronous Control Character Map (ACCM) to be negotiated with a mobile station or sent to a peer in PPP outbound requests, use the **ppp accm** command in interface configuration mode. To restore the default state, use the **no** form of this command.

**ppp accm** *hex-number*

**no ppp accm**

## Syntax Description

| | |
|---|---|
| *hex-number* | Specifies the initial value for the ACCM. The value must be a hexadecimal number in the range from 0x0 to 0xFFFFFFFF, where the bit positions from right to left correspond to the characters 0x00 through 0x1F. The default character map (0xA0000) escapes the characters represented by 0x11 (^Q, DC1, and X-on) and 0x13 (^S, DC3, and X-off).<br>**Note** The leading 0x is not necessary when entering the *hex-number* argument , but is accepted by the software. |

## Defaults

0xA0000.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2 | This command was integrated into Cisco IOS Release 12.2. |

## Usage Guidelines

The ACCM is a four octet hexadecimal number that is sent to a peer in a PPP outbound Config-Request packet, informing the peer of which characters need to be escaped during transmission of Asynchronous HDLC (AHDLC) frames containing control characters. The escaped characters set by the **ppp accm** command are useful for allowing data to pass uninterpreted through a network that would normally interpret the control sequences as a command.

For example, the ^Q and ^S characters are software flow control commands used by asynchronous modems to start and stop data transmissions. To allow these characters to be sent as part of a data stream and not be interpreted as control codes by intervening devices, the characters must be escaped, and the **ppp accm** command specifies which characters to use.

The TIA/EIA/IS-835-B requires that the PDSN propose an ACCM of 0x00000000. To be compliant with TIA/EIA/IS-835-B, **ppp accm 00000000** must be configured on the virtual template interface on Cisco PDSN.

The **ppp accm** command is meaningful only on asynchronous interfaces. If entered on other interface types, it will be ignored.

## Examples

In the following example, all characters can be transmitted intact to the receiver so that it is not necessary for the transmitter to escape anything:

```
interface async 0
 encapsulation ppp
 ppp accm 0
```

## Related Commands

| Command | Description |
|---|---|
| **ppp authentication** | Specifies CHAP or PAP authentication. |

# ppp authentication

To enable at least one PPP authentication protocol and to specify the order in which the protocols are selected on the interface, use the **ppp authentication** command in interface configuration mode. To disable this authentication, use the **no** form of this command.

**ppp authentication** {*protocol1* [*protocol2...*]} [**if-needed**] [*list-name* | **default**] [**callin**] [**one-time**] [**optional**]

**no ppp authentication**

## Syntax Description

| | |
|---|---|
| *protocol1* [*protocol2...*] | At least one of the keywords described in Table 5. |
| **if-needed** | (Optional) Used with TACACS and extended TACACS. Does not perform Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP) authentication if authentication has already been provided. This option is available only on asynchronous interfaces. |
| *list-name* | (Optional) Used with authentication, authorization, and accounting (AAA). Specifies the name of a list of methods of authentication to use. If no list name is specified, the system uses the default. The list is created with the **aaa authentication ppp** command. |
| **default** | (Optional) Name of the method list created with the **aaa authentication ppp** command. |
| **callin** | (Optional) Authentication on incoming (received) calls only. |
| **one-time** | (Optional) The username and password are accepted in the username field. |
| optional | (Optional) Accepts the connection even if the peer refuses to accept the authentication methods that the router has requested. |

## Defaults

PPP authentication is not enabled.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 10.0 | This command was introduced. |
| 12.1(1) | The **optional** keyword was added. |
| 12.1(3)XS | The **optional** keyword was added. |
| 12.2(2)XB5 | Support for the **eap** authentication protocol was added on the Cisco 2650, Cisco 3640, Cisco 3660, Cisco AS5300, and Cisco AS5400 platforms. |
| 12.2(13)T | The **eap** authentication protocol support introduced in Cisco IOS Release 12.2(2)XB5 was integrated into Cisco IOS Release 12.2(13)T. |

## Usage Guidelines

When you enable PAP, CHAP, or Extensible Authentication Protocol (EAP) authentication (or all three methods), the local router requires the remote device to prove its identity before allowing data traffic to flow. PAP authentication requires the remote device to send a name and a password, which is checked against a matching entry in the local username database or in the remote security server database. CHAP authentication sends a challenge message to the remote device. The remote device encrypts the challenge value with a shared secret and returns the encrypted value and its name to the local router in a Response message. The local router attempts to match the name of the remote device with an associated secret stored in the local username or remote security server database; it uses the stored secret to encrypt the original challenge and verify that the encrypted values match. EAP works much as CHAP does, except that identity request and response packets are exchanged when EAP starts.

You can enable CHAP, Microsoft CHAP (MS-CHAP), PAP, or EAP in any order. If you enable all four methods, the first method specified is requested during link negotiation. If the peer suggests using the second method, or refuses the first method, the second method is tried. Some remote devices support only one method. Base the order in which you specify methods on the ability of the remote device to correctly negotiate the appropriate method and on the level of data-line security you require. PAP usernames and passwords are sent as clear text strings, which can be intercepted and reused.

**Caution** If you use a *list-name* value that was not configured with the **aaa authentication ppp** command, you will disable PPP on this interface.

Table 5 lists the protocols used to negotiate PPP authentication.

***Table 5 ppp authentication Protocols***

| | |
|---|---|
| **chap** | Enables CHAP on a serial interface. |
| **eap** | Enables EAP on a serial interface. |
| **ms-chap** | Enables MS-CHAP on a serial interface. |
| **pap** | Enables PAP on a serial interface. |

Enabling or disabling PPP authentication does not affect the ability of the local router to authenticate itself to the remote device.

If you are using autoselect on a tty line, you can use the **ppp authentication** command to turn on PPP authentication for the corresponding interface.

MS-CHAP is the Microsoft version of CHAP. Like the standard version of CHAP, MS-CHAP is used for PPP authentication; authentication occurs between a personal computer using Microsoft Windows NT or Microsoft Windows 95 and a Cisco router or access server acting as a network access server.

To configure Cisco PDSN in compliance with the TIA/EIA/IS-835-B standard, you must configure the PDSN virtual template as follows:

```
ppp authentication chap pap optional
```

## Examples

The following example configures virtual-template interface 4:

```
interface virtual-template 4
 ip unnumbered loopback0
 ppp authentication chap pap optional
```

The following example enables CHAP on asynchronous interface 4 and uses the authentication list MIS-access:

```
interface async 4
 encapsulation ppp
 ppp authentication chap MIS-access
```

The following example enables EAP on dialer interface 1:

```
interface dialer 1
 encapsulation ppp
 ppp authentication eap
```

## Related Commands

| Command | Description |
|---|---|
| **aaa authentication ppp** | Specifies one or more AAA authentication methods for use on serial interfaces running PPP. |
| **aaa new-model** | Enables the AAA access control model. |
| **autoselect** | Configures a line to start an ARAP, PPP, or SLIP session. |
| **encapsulation** | Sets the encapsulation method used by the interface. |
| **ppp accm** | Identifies the ACCM table. |
| **username** | Establishes a username-based authentication system, such as PPP, CHAP, and PAP. |

# ppp mux

To enable PPP multiplexing/demultiplexing, use the **ppp mux** command in interface configuration mode. To disable PPP multiplexing/demultiplexing, use the **no** form of this command.

**ppp mux**

**no ppp mux**

## Syntax Description

This command has no parameters.

## Defaults

PPP multiplexing/demultiplexing is disabled by default.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Examples

The following example enables PPP multiplexing/demultiplexing.

```
ppp mux
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux delay** | Sets the maximum delay. |
| **ppp mux frame** | Sets the maximum length of the PPP superframe. |
| **ppp mux pid** | Sets the default PPP protocol ID. |
| ppp mux subframe count | Sets the maximum number of subframes in a superframe. |
| **ppp mux subframe length** | Sets the maximum length of the PPP subframe. |
| show ppp mux | Displays PPP mux counters for the specified multilink interface. |

# ppp mux delay

To set the maximum time the processor can wait before sending a superframe, use the **ppp mux delay** command in interface configuration mode. To set the maximum delay to the default, use the **no** form of this command.

**ppp mux delay** ***integer***

**no ppp mux delay**

## Syntax Description

| | |
|---|---|
| *integer* | The maximum number of microseconds that the processor can wait before sending out a PPP superframe.<br>Possible values:<br>• Cisco MWR 1941-DC router—0 through 4000000 microseconds.<br>• MGX-RPM-1FE-CP back card—1 through 4000000 microseconds. |

## Defaults

Cisco MWR 1941-DC router—The default maximum delay is 0, which indicates that a superframe will be sent when the transmit queue is full.

MGX-RPM-1FE-CP back card—The default maximum delay is 800.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Usage Guidelines

To use this command, you must first enable PPP multiplexing/demultiplexing.

### MGX-RPM-1FE-CP Back Card

When the ppp mux delay command is configured, the maximum number of microseconds that the processor can wait resolves to the nearest 200-microsecond increment. For example, if ppp mux delay 302 is specified, the actual maximum number of microseconds that the processor can wait before sending out a PPP superframe is 400. If ppp mux delay 298 is specified, the actual maximum number of microseconds that the processor can wait before sending out a PPP superframe is 200.

## Examples

The following example sets the maximum delay to 5 microseconds on the MWR 1941-DC router.

```
ppp mux delay 5
```

The following example sets the maximum delay to 200 microseconds on the MGX-RPM-1FE-CP back card.

```
ppp mux delay 200
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |
| **ppp mux frame** | Sets the maximum length of the PPP superframe. |
| **ppp mux pid** | Sets the default PPP protocol ID. |
| **ppp mux subframe count** | Sets the maximum number of subframes in a superframe. |
| **ppp mux subframe length** | Sets the maximum length of the PPP subframe. |
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# ppp mux frame

To set the maximum length (in bytes) of the PPP superframes, use the **ppp mux frame** command in interface configuration mode. To set the maximum length to the default, use the **no** form of this command.

**ppp mux frame** ***integer***

**no ppp mux frame**

## Syntax Description

| | |
|---|---|
| *integer* | The maximum number of bytes in any multiplexed PPP superframe.<br>Possible values:<br>• Cisco MWR 1941-DC router—1 through 512 bytes.<br>• MGX-RPM-1FE-CP back card—0 through 512 bytes. |

## Defaults

The default maximum length is 197.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Usage Guidelines

To use this command, you must first enable PPP multiplexing/demultiplexing.

## Examples

The following example sets the maximum superframe length to 80 bytes.

```
ppp mux frame 80
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |
| **ppp mux delay** | Sets the maximum delay. |
| **ppp mux pid** | Sets the default PPP protocol ID. |
| **ppp mux subframe count** | Sets the maximum number of subframes in a superframe. |
| **ppp mux subframe length** | Sets the maximum length of the PPP subframe. |
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# ppp mux pid

To set the default receiving PPP protocol ID, use the **ppp mux pid** command in interface configuration mode. To remove this configuration, use the **no** form of this command.

**ppp mux pid** ***integer***

**no ppp mux pid**

## Syntax Description

| | |
|---|---|
| *integer* | The default value of the PPP protocol ID. Possible values are 0 through 65534. |

## Defaults

The default is 33 (0x21), which is the IP protocol.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Usage Guidelines

To use this command, you must first enable PPP multiplexing/demultiplexing.

## Examples

The following example sets the default PPP protocol ID to 8.

```
ppp mux pid 8
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |
| **ppp mux delay** | Sets the maximum delay. |
| **ppp mux frame** | Sets the maximum length of the PPP superframe. |
| **ppp mux subframe count** | Sets the maximum number of subframes in a superframe. |
| **ppp mux subframe length** | Sets the maximum length of the PPP subframe. |
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# ppp mux subframe count

To set the maximum number of PPP subframes that can be contained in a superframe, use the **ppp mux subframe count** command in interface configuration mode. To set the maximum number to the default, use the **no** form of this command.

**ppp mux subframe count** ***integer***

**no ppp mux subframe count**

## Syntax Description

| | |
|---|---|
| *integer* | The maximum number of subframes that can be contained in a superframe. Possible values are 1 through 15 bytes.<br>Possible values:<br>• Cisco MWR 1941-DC router—1 through 15 bytes.<br>• MGX-RPM-1FE-CP back card—0 through 15 bytes. |

## Defaults

The default maximum is 15.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Usage Guidelines

To use this command, you must first enable PPP multiplexing/demultiplexing.

## Examples

The following example sets the maximum subframe count to 20 bytes.

```
ppp mux subframe count 20
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |
| **ppp mux delay** | Sets the maximum delay. |
| **ppp mux frame** | Sets the maximum length of the PPP superframe. |
| **ppp mux pid** | Sets the default PPP protocol ID. |

| Command | Description |
|---|---|
| **ppp mux subframe length** | Sets the maximum length of the PPP subframe. |
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# ppp mux subframe length

To set the maximum length (in bytes) of the PPP subframes, use the **ppp mux subframe length** command in interface configuration mode. To set the maximum length to the default, use the **no** form of this command.

**ppp mux subframe length** *integer*

**no ppp mux subframe length**

## Syntax Description

| | |
|---|---|
| *integer* | The maximum number of bytes in any single subframe that is to be multiplexed.<br>Possible values:<br>• Cisco MWR 1941-DC router—1 through 512 bytes.<br>• MGX-RPM-1FE-CP back card—0 through 512 bytes. |

## Defaults

The default maximum length is 195.

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC2 | This command was introduced. |
| 12.3(11)T | This command was incorporated in Cisco IOS 12.3(11)T. |

## Usage Guidelines

To use this command, you must first enable PPP multiplexing/demultiplexing. The maximum length of the subframe should be the maximum length of the superframe minus the length of the L2 header.

## Examples

The following example sets the maximum subframe length to 20 bytes.

```
ppp mux subframe length 20
```

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |
| **ppp mux delay** | Sets the maximum delay. |
| **ppp mux frame** | Sets the maximum length of the PPP superframe. |
| **ppp mux pid** | Sets the default PPP protocol ID. |
| **ppp mux subframe count** | Sets the maximum number of subframes in a superframe. |
| **show ppp mux** | Displays PPP mux counters for the specified multilink interface. |

# ppp-regeneration

To enable an access point to support PPP regeneration, use the **ppp-regeneration** access-point configuration command. To disable support for PPP regeneration at an access point, use the **no** form of this command.

**ppp-regeneration** [**max-session** *number*] [**setup-time** *seconds*]

**no ppp-regeneration** [**max-session** *number*] [**setup-time** *seconds*]

## Syntax Description

| | |
|---|---|
| **max-session** *number* | Maximum number of PPP regenerated sessions allowed at the access point. The default value 65535. |
| **setup-time** *seconds* | Maximum amount of time (between 1 and 65535 seconds) within which a PPP regenerated session must be established. The default value is 60 seconds. |

## Defaults

The default **max-session** value is 65535.

The default **setup-time** is 60 seconds.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the default value changed from being device dependent to 65535. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **ppp-regeneration** command to enable an access point to support PPP regeneration and to specify parameters for PPP regeneration sessions on the GGSN.

**Note** PPP regeneration support at an access point requires CEF to be enabled on the RP using the **ip cef** command.

The maximum **setup-time** value should allow for the total amount of time required to create the PPP virtual access (VA) and to establish a PPP session. If the setup-time is reached before the PPP IP Control Protocol (IPCP) is up, the GGSN tears down the L2TP session, PPP VA, and PDP context.

The method of PPP configured to forward packets beyond the terminal equipment and mobile termination affects the maximum number of PDP contexts supported on the GGSN. For more information, see the "Configuring PPP Support on the GGSN" chapter of the Cisco IOS Mobile Wireless Configuration Guide for Cisco IOS Release 12.2(8)YD.

## Examples

The following example shows a partial GGSN configuration for PPP regeneration, where PPP regeneration is enabled at access point 1. It specifies a maximum of 100 PPP regeneration sessions, with a limit of 30 seconds to create the PPP VA and establish a PPP session:

```
gprs access-point-list abc
 access-point 1
  access-point-name gprs.corporate.com
  ppp-regeneration max-session 100 setup-time 30
  exit
```

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp ppp-regeneration vtemplate** | Associates the virtual template interface that is configured for PPP encapsulation with support for regenerated PPP sessions on the GGSN. |
| **interface virtual-template** | Creates a virtual template interface that can be configured and applied dynamically in creating virtual access interfaces. |

# radius attribute nas-id

To specify that the GGSN include the NAS-Identifier (attribute 32) in access requests at an APN, use the following access-point configurationcommand. To disable this configuration, use the **no** form of this command.

**radius attribute nas-id** *format*

**no radius attribute nas-id**

## Syntax Description

| | |
|---|---|
| *format* | String sent in attribute 32 containing an IP address (%i), a hostname (%h), and a domain name (%d). |

## Defaults

The default is to not send the NAS-Identifier in access requests.

## Command Modes

Access point configuration

## Command History

| Release | Modification |
|---|---|
| 12.3(2)XB | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **radius attribute nas-id** command to include the NAS-Identifier in access requests at an APN.

This command overrides the configuration of the **radius-server attribute 32 include-in-access-req format** global configuration command.

## Examples

The following example configures the GGSN to send the NAS-Identifier in access requests at the APN:

```
gprs access-point-list abc
   access-point 1
     radius attribute nas-id %h
```

## Related Commands

| Command | Description |
|---|---|
| **access-mode** | Specifies whether the GGSN requests user authentication at the access point to a PDN. |
| aaa-group | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| gprs default aaa-group | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| show gprs access-point | Displays information about access points on the GGSN. |

# radius attribute suppress imsi

To specify that the GGSN suppress the Third Generation Partnership Project (3GPP) vendor-specific attribute (VSA) 3GGP-IMSI number in its authentication and accounting requests to a RADIUS server, use the **radius attribute suppress imsi** access point configuration command. To enable the GGSN to send the 3GPP VSA 3GPP-IMSI number in authentication and accounting requests to a RADIUS server, use the **no** form of the command.

**radius attribute suppress imsi**

**no radius attribute suppress imsi**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is to send the 3GPP VSA 3GPP-IMSI number in authentication and accounting requests to a RADIUS server.

## Command Modes

Access point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YD | This command was introduced. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **radius attribute suppress imsi** command to have GGSN suppress the 3GPP VSA 3GPP-IMSI number in its authentication and accounting requests to a RADIUS server.

## Examples

The following example will not send the 3GPP VSA 3GPP-IMSI to the RADIUS server:

```
gprs access-point-list abc
   access-point 1
     radius attribute suppress imsi
```

## Related Commands

| Command | Description |
|---|---|
| **access-mode** | Specifies whether the GGSN requests user authentication at the access point to a PDN. |
| **aaa-group** | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |

| Command | Description |
|---|---|
| **gprs default aaa-group** | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| **show gprs access-point** | Displays information about access points on the GGSN. |

# radius attribute suppress qos

To specify that the GGSN suppress the 3GPP VSA 3GPP-GPRS-QoS-Profile in its authentication and accounting requests to a RADIUS server, use the **radius attribute suppress qos** access point configuration command. To enable the GGSN to send the 3GPP VSA 3GPP-GPRS-QoS-Profile in authentication and accounting requests to a RADIUS server, use the **no** form of the command.

**radius attribute suppress qos**

**no radius attribute suppress qos**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is to send the 3GPP VSA 3GPP-GPRS-QoS-Profile in authentication and accounting requests to a RADIUS server.

## Command Modes

Access point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)B | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **radius attribute suppress qos** command to have GGSN suppress the 3GPP VSA 3GPP-GPRS-QoS-Profile in its authentication and accounting requests to a RADIUS server.

## Examples

The following example will not send the 3GPP VSA 3GPP-GPRS-QoS-Profile to the RADIUS server:

```
gprs access-point-list abc
   access-point 1
     radius attribute suppress qos
```

## Related Commands

| Command | Description |
|---|---|
| **access-mode** | Specifies whether the GGSN requests user authentication at the access point to a PDN. |
| **aaa-group** | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| **gprs default aaa-group** | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| **show gprs access-point** | Displays information about access points on the GGSN. |

# radius attribute suppress sgsn-address

To specify that the GGSN suppress the 3GPP VSA 3GPP-SGSN-Address in its authentication and accounting requests to a RADIUS server, use the **radius attribute suppress sgsn-address** access point configuration command. To enable the GGSN to send the 3GPP VSA 3GPP-SGSN-Address in authentication and accounting requests to a RADIUS server, use the **no** form of the command.

**radius attribute suppress sgsn-address**

**no radius attribute suppress sgsn-address**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is to send the 3GPP VSA 3GPP-SGSN-Address in authentication and accounting requests to a RADIUS server.

## Command Modes

Access point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)B | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **radius attribute suppress sgsn-address** command to have GGSN suppress the 3GPP VSA 3GPP-SGSN-Address in its authentication and accounting requests to a RADIUS server.

## Examples

The following example will not send the 3GPP VSA 3GPP-SGSN-Address to the RADIUS server:

```
gprs access-point-list abc
   access-point 1
     radius attribute suppress sgsn-address
```

## Related Commands

| Command | Description |
|---|---|
| **access-mode** | Specifies whether the GGSN requests user authentication at the access point to a PDN. |
| **aaa-group** | Specifies a AAA server group and assigns the type of AAA services to be supported by the server group for a particular access point on the GGSN. |
| **gprs default aaa-group** | Specifies a default AAA server group and assigns the type of AAA services to be supported by the server group for all access points on the GGSN. |
| **show gprs access-point** | Displays information about access points on the GGSN. |

# radius-server local

To enable the access point or wireless-aware router as a local authentication server and to enter into configuration mode for the authenticator, use the **radius-server local** command in global configuration mode. To remove the local RADIUS server configuration from the router or access point, use the **no** form of this command.

**radius-server local**

no **radius-server local**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following example shows that the access point is being configured to serve as a local authentication server:

```
Router (config)# radius-server local
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |

| Command | Description |
|---|---|
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# reauthentication time

To enter the time limit after which the authenticator should reauthenticate, use the **reauthentication time** command in local RADIUS server group configuration mode. To remove the requirement that users reauthenticate after the specified duration, use the **no** form of this command.

**reauthentication time** *seconds*

**no reauthentication time** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds after which reauthentication occurs. |

## Defaults

The default setting is 0 seconds, which means that group members are not required to reauthenticate.

## Command Modes

Local RADIUS server group configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following example shows that the time limit after which the authenticator should reauthenticate is *30* seconds:

```
reauthentication time 30
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |

| Command | Description |
|---|---|
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# redirect all ip

To redirect all traffic to an external device, use the **redirect all  ip** access-point configuration command. To disable the redirection of all traffic, use the **no** form of this command.

**redirect intermobile ip** *ip-address*

**no redirect intermobile ip** *ip-address*

**Syntax Description**

| | |
|---|---|
| *ip-address* | IP address to where you want to redirect traffic. |

**Defaults**

Disabled

**Command Modes**

Access-point configuration

**Command History**

| Release | Modification |
|---|---|
| 12.3(2)XB2 | This command was introduced. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

**Usage Guidelines**

Use the **redirect all ip** access-point command to redirect all traffic to an IP address.

The redirect all traffic feature enables you to do the following:

- Redirect all packets to a specified destination regardless of whether the destination address belongs to a mobile station (MS) on the same GGSN or not.

  If redirecting traffic using the Mobile-to-Mobile Redirect feature, only packets for which the destination address belongs to an MS that is active on the same GGSN can be redirected. If the receiving MS has no PDP context in the GGSN where the sending MS PDP context is created, the packets are dropped.
- Redirect all traffic to a specific destination when aggregate routes are configured..

**Examples**

The following example redirects traffic to 5.5.5.13:

```
redirect all ip 5.5.5.13
```

**Related Commands**

| Command | Description |
|---|---|
| **gprs plmn ip address** | Specifies the IP address range of a PLMN. |
| security verify | Specifies the verification of source and/or destination addresses. |

# redirect intermobile ip

To redirect mobile-to-mobile traffic to an external device, use the **redirect intermobile interface ip** access-point configuration command. To disable the redirection of mobile-to-mobile traffic, use the **no** form of this command.

**redirect intermobile ip** *ip-address*

**no redirect intermobile ip** *ip-address*

## Syntax Description

| | |
|---|---|
| *ip-address* | IP address of the external device to which you want to redirect mobile-to-mobile traffic. |

## Defaults

Disabled

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)B | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **redirect intermobile ip** access-point command to redirect mobile-to-mobile traffic to an external device (such as an external firewall) for verification.

Redirection of intermobile traffic does not occur on an ingress APN unless the TPDUs are exiting the same APN. In addition, redirection of TPDUs tunneled by L2TP from the ingress APN to the LNS of the PDN does not occur.

**Note** Redirection of intermobile traffic does not occur on an ingress APN unless the TPDUs are exiting the same APN. In addition, redirection of TPDUs tunneled by L2TP from the ingress APN to the LNS of the PDN does not occur.

## Examples

The following example redirects mobile-to-mobile traffic to 5.5.5.13:

```
redirect intermobile ip 5.5.5.13
```

## Related Commands

| Command | Description |
|---|---|
| **gprs plmn ip address** | Specifies the IP address range of a PLMN. |
| security verify | Specifies the verification of source and/or destination addresses. |

# redundancy

To enter redundancy configuration mode, use the **redundancy** command in global configuration mode. To disable, use the **no** form of this command.

**redundancy**

**no redundancy**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Redundancy is disabled.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(5)VX1 | This command was introduced on the Cisco AS5800 universal access server. |
| 12.0(16)ST | This command was introduced on the Cisco 7500 series routers. |
| 12.2(8)MC2 | This command was introduced on the MWR 1900 Mobile Wireless Edge Router. |
| 12.0(22)S | This command was integrated into Cisco IOS Release 12.0(22)S. |
| 12.2(11)T | This command was integrated into Cisco IOS 12.2(11)T. |
| 12.2(14)S | This command was integrated into Cisco IOS Release 12.2(14)S. |
| 12.3(11)T | This command was integrated into Cisco IOS Release 12.3(11)T. |

## Usage Guidelines

Use the **redundancy** command to enter redundancy configuration mode where you can define aspects of redundancy, such as shelf redundancy for the Cisco AS5800 universal access server.

## Examples

### Cisco AS5800 Example

The following example assigns the configured router shelf to the redundancy pair designated as 25. This command must be issued on both router shelves in the redundant router-shelf pair:

```
Router(config)# redundancy
Router(config-red)# failover group-number 25
```

### Cisco MWR 1941-DC Router Example

The following example enables redundancy mode on the Cisco MWR 1941-DC router:

```
Router(config)# redundancy
```

## Related Commands

| Command | Description |
|---|---|
| **failover group-number** | Assigns a router-shelf pair to a redundancy router-shelf pair code. |
| **hw-module sec-cpu reset** | Resets and reloads the standby RSP with the specified Cisco IOS image and executes the image. |
| **hw-module slot image** | Specifies a high availability Cisco IOS image to run on a standby RSP. |
| **mode (HSA redundancy)** | Configures the redundancy mode. |
| **mode y-cable** | Invokes y-cable mode. |
| **standalone** | Indicates whether the MWR 1941-DC router is being used as a standalone device and manually sets the relays. |
| **standby use-interface** | Designates a loopback interface as a health or revertive interface. |
| **show redundancy** | Displays current or historical status and related information and displays the router-shelf redundancy status. |

# security verify

To enable the GGSN to verify the IP verification of IP addresses in TPDUs, use the **security verify** access-point configuration command. To disable the verification of IP addresses, use the **no** form of this command.

**security verify** {**source** | **destination**}

**no security verify** {**source** | **destination**}

## Syntax Description

| | |
|---|---|
| **source** | Specifies that the source IP address of an upstream TPDU be verified against the address previously assigned an MS. |
| **destination** | Specifies that the destination address of upstream TPDU received off a GTP tunnel be verified against the global list of PLMN addresses specified by the **gprs plmn ip address** global configuration command. |

## Defaults

Disabled

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)B | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **security verify source** access point configuration command to configure the GGSN to verify the source IP address of an upstream TPDU against the address previously assigned to an MS.

When the **security verify source** command is configured on an APN, the GGSN verifies the source address of a TPDU before GTP will accept and forward it. If the GGSN determines that the address differs from that previously assigned to the MS, it drops the TPDU and accounts it as an illegal packet in its PDP context and APN. Configuring the **security verify source access point** configuration command protects the GGSN from faked user identities.

Use the **security verify destination** access point configuration command to have the GGSN verify the destination addresses of upstream TPDUs against global lists of PLMN addresses specified using the **gprs plmn ip address** command. If the GGSN determines that a destination address of a TPDU is within the range of a list of addresses, it drops the TPDU. If it determines that the TPDU contains a destination address that does not fall within the range of a list, it forwards the TPDU to its final destination.

**Note** The **security verify destination** command is not applied to APNs using VRF. In addition, the verification of destination addresses does not apply to GTP-PPP regeneration or GTP-PPP with L2TP.

## Examples

The following example enables the verification of source IP addresses received in upstream TPDUs:

```
security verify source
```

## Related Commands

| Command | Description |
|---|---|
| **redirect intermobile interface ip** | Specifies the redirection of mobile-to-mobile traffic. |
| gprs plmn ip address | Specifies the IP address range of a PLMN. |
| **show gprs access-point** | Displays information about access points on the GGSN. |

# service cdma pdsn

To enable PDSN service, use the **service cdma pdsn** command in global configuration mode. To disable PDSN service, use the **no** form of this command.

**service cdma pdsn**

**no service cdma pdsn**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command must be configured to enable CDMA PDSN on the router.

## Examples

The following example enables PDSN service:

```
service cdma pdsn
```

## Related Commands

| Command | Description |
|---|---|
| **show cdma pdsn pcf brief** | Displays a table of all PCFs that have R-P tunnels to the PDSN. |
| **show cdma pdsn session** | Displays PDSN session information. |

# service gprs ggsn

To configure a router for gateway GPRS support node functions, use the **service gprs ggsn** command. To disable GGSN functionality, use the **no** form of this command.

**service gprs ggsn**

**no service gprs ggsn**

## Syntax Description

This command has no keywords or arguments.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the **sgsn-datacom** option was removed. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **service gprs ggsn** command to configure the router as a gateway GPRS support node.

## Examples

The following example configures the router as a GGSN:

```
service gprs ggsn
```

# service gprs gtp-director

To configure a router for GTP Director Module (GDM) functions, use the **service gprs gtp-director** command. To disable GDM functionality, use the **no** form of this command.

**service gprs gtp-director**

**no service gprs gtp-director**

## Syntax Description

This command has no keywords or arguments.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **service gprs gtp-director** command to configure the router for GTP director module (GDM) services. The router cannot be configured to provide GGSN and GDM services at the same time.

## Examples

The following example configures the router as a GTP director:

```
service gprs gtp-director
```

## Related Commands

| Command | Description |
|---|---|
| **encapsulation gtp** | Specifies GTP as the encapsulation type for packets transmitted over the virtual template interface. |
| **gprs gtp-director retry-timeout** | Specifies the amount of time during which the GTP director forwards retries from an SGSN to the selected GGSN. |

# session idle-time

To specify the time that the GGSN waits before purging idle mobile sessions for the current access point, use the **session idle-time** access-point configuration command. To disable the idle timer at the access point, use the **no** form of this command.

**session idle-time** *number*

**no session idle-time** *number*

## Syntax Description

| | |
|---|---|
| *number* | Number of hours between 1 and 168. |

## Defaults

No session idle timer is configured on the access point.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

The GGSN implements the idle timer in 3 ways. These implementations are listed in the order in which the GGSN processes them.

- Radius server—If the access-point is configured for non-transparent access mode and the Radius server returns a session timeout attribute, then the GGSN uses the session idle timeout value from the Radius server.
- Access-point—If the access-point is configured for transparent access mode, or is in non-transparent access mode and the Radius server does not return a session idle timeout value, the GGSN uses the value that you specified for the **session idle-time** command.
- Global timer—If the GGSN does not get a session idle timeout value from the Radius server or the access-point, it uses the value that you specified in the **gprs idle-pdp-context purge-timer** command.

The **session idle-time** command value overrides the value configured in the **gprs idle-pdp-context purge-timer** command for that access-point.

When the session reaches the timeout value, the PDP context is deleted.

Use the **show gprs gtp pdp-context tid** command to view the session idle-time value. The value is shown in the “gtp pdp idle time” field.

## Examples

The following example specifies that the GGSN waits for 5 hours before purging idle time sessions for access-point 1. The GGSN waits for 60 hours before purging idle time sessions for all access points *except* access-point 1:

```
gprs access-point-list abc
 access-point 1
  access-point-name gprs.pdn1.com
  session idle-time 5

gprs idle-pdp-context purge-timer 60
```

## Related Commands

| Command | Description |
|---|---|
| **gprs idle-pdp-context purge-timer** | Specifies the time that the GGSN waits before purging idle mobile sessions. |
| **show gprs gtp pdp-context** | Displays a list of the currently active PDP contexts (mobile sessions). |

# show cdma pdsn

To display the status and current configuration of the PDSN gateway, use the **show cdma pdsn** command in privileged EXEC mode.

**show cdma pdsn**

## Syntax Description

This command has no keywords or arguments.

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn** command:

**7200-c5 image:**

```
PRG5-7206-PDSN#show cdma pdsn
PDSN software version 1.2, service is enabled

  A11 registration-update timeout 1 sec, retransmissions 5
  Mobile IP registration timeout 300 sec
  A10 maximum lifetime allowed 1800 sec
  GRE sequencing is on
  Maximum PCFs limit not set
  Maximum sessions limit not set (default 8000 maximum)  <<<<<<< changed
  SNMP failure history table size 10
  MSID Authentication is disabled
  Ingress address filtering is disabled
  Sending Agent Adv in case of IPCP Address Negotiation  is disabled
  Aging of idle users disabled

  Number of pcfs connected 0
  Number of sessions connected 0,
    Simple IP flows 0, Mobile IP flows 0,
    Proxy Mobile IP flows 0
```

**7200-c6 image**

```
PRG5-7206-PDSN#sho cdma pdsn
PDSN software version 1.2, service is enabled

  A11 registration-update timeout 1 sec, retransmissions 5
  Mobile IP registration timeout 300 sec
```

```
A10 maximum lifetime allowed 1800 sec
GRE sequencing is on
Maximum PCFs limit not set
Maximum sessions limit not set (default 20000 maximum) <<<<< changed
SNMP failure history table size 10
MSID Authentication is disabled
Ingress address filtering is disabled
Sending Agent Adv in case of IPCP Address Negotiation  is disabled
Aging of idle users disabled

Number of pcfs connected 0
Number of sessions connected 0,
  Simple IP flows 0, Mobile IP flows 0,
  Proxy Mobile IP flows 0
```

# show cdma pdsn accounting

To display the accouting information for all sessions and the corresponding flows, use the **show cdma pdsn accounting** command in privileged EXEC mode.

**show cdma pdsn accounting**

## Syntax Description

This command has no keywords or arguments.

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The counter names appear in abbreviated format.

## Examples

The following example shows output from the **show cdma pdsn accounting** command:

```
PDSN-6500#sh cdma pdsn accounting
 UDR for session
 session ID: 12
 Mobile Station ID IMSI 123451234512357

    A - A1:123451234512357
    C - ' 'C3:0
    D - D3:4.0.0.11 D4:000000000000
    E - E1:0000
    F - F1:00F1 F2:00F2 F5:00F5 F6:F6 F7:F7 F8:F8 F9:F9 F10:FA F14:00
    G - G3:0 G8:0 G9:0 G10:0 G11:0 G12:0 G13:0 G14:655 G15:408 G16:378
    I - I1:0 I4:0
    Y - Y2:12

 UDR for flow
    Mobile Node IP address 15.0.0.3
    B - B1:15.0.0.3 B2:mwts-mip-p1-user121@ispxyz.com
    C - ' 'C2:36
    D - D1:0.0.0.0
    F - F11:02 F12:01 F13:00
    G - G1:0 G2:0 G4:1023906326
    Packets- in:0 out:0

 UDR for flow
    Mobile Node IP address 15.0.0.4

    B - B1:15.0.0.4 B2:mwts-mip-p1-user122@ispxyz.com
```

```
   C - ' 'C2:37
   D - D1:0.0.0.0
   F - F11:02 F12:01 F13:00
   G - G1:0 G2:0 G4:1023906326
   Packets- in:0 out:0

UDR for flow
   Mobile Node IP address 15.0.0.5

   B - B1:15.0.0.5 B2:mwts-mip-p1-user123@ispxyz.com
   C - ' 'C2:38
   D - D1:0.0.0.0
   F - F11:02 F12:01 F13:00
   G - G1:0 G2:0 G4:1023906326
   Packets- in:0 out:0

UDR for session
session ID: 2
Mobile Station ID IMSI 00000000003

   A - A1:00000000003
   C - ' 'C3:0
   D - D3:4.0.0.1 D4:000000000000
   E - E1:0000
   F - F1:00F1 F2:00F2 F5:00F5 F6:F6 F7:F7 F8:F8 F9:F9 F10:FA F14:00
   G - G3:0 G8:0 G9:0 G10:0 G11:0 G12:0 G13:0 G14:201 G15:0 G16:0
   I - I1:0 I4:0
   Y - Y2:2

UDR for flow
   Mobile Node IP address 6.0.0.5

   B - B1:6.0.0.5 B2:mwt10-sip-user1
   C - ' 'C2:39
   D - D1:0.0.0.0
   F - F11:01 F12:00 F13:00
   G - G1:0 G2:0 G4:1023906826
   Packets- in:0 out:0

UDR for session
session ID: 3
Mobile Station ID IMSI 00000000004

   A - A1:00000000004
   C - ' 'C3:0
   D - D3:4.0.0.1 D4:000000000000
   E - E1:0000
   F - F1:00F1 F2:00F2 F5:00F5 F6:F6 F7:F7 F8:F8 F9:F9 F10:FA F14:00
   G - G3:0 G8:0 G9:0 G10:0 G11:0 G12:0 G13:0 G14:241 G15:0 G16:0
   I - I1:0 I4:0
   Y - Y2:3

UDR for flow
   Mobile Node IP address 6.0.0.14

   B - B1:6.0.0.14 B2:mwt10-sip-user1
   C - ' 'C2:40
   D - D1:0.0.0.0
   F - F11:01 F12:00 F13:00
   G - G1:0 G2:0 G4:1023906826
   Packets- in:0 out:0

PDSN-6500#
```

# show cdma pdsn accounting detail

To display accounting information for all sessions and the corresponding flows, and to display the counter names (along with the abbreviated names), use the **show cdma pdsn accounting detail** command in privileged EXEC mode.

**show cdma pdsn accounting detail**

## Syntax Description

This command has no keywords or arguments.

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn accounting detail** command:

```
PDSN-6500#sh cdma pdsn accounting detail
 UDR for session
 session ID: 12
 Mobile Station ID IMSI 123451234512357

   Mobile Station ID (A1) IMSI 123451234512357
   Session Continue (C3) ' ' 0
   Serving PCF (D3) 4.0.0.11 Base Station ID (D4) 000000000000
   User Zone (E1) 0000
   Forward Mux Option (F1) 241  Reverse Mux Option (F2) 242
   Service Option (F5) 245  Forward Traffic Type (F6) 246
   Reverse Traffix type (F7) 247  Fundamental Frame size (F8) 248
   Forward Fundamental RC (F9) 249  Reverse Fundamntal RC (F10) 250
   DCCH Frame Format (F14) 0
   Bad PPP Frame Count (G3) 0 Active Time (G8) 0
   Number of Active Transitions (G9) 0
   SDB Octet Count Terminating (G10) 0
   SDB Octet Count Originating (G11) 0
   Number of SDBs Terminating (G12) 0
   Number of SDBs Originating G13 0
   Number of HDLC Layer Bytes Received (G14) 655
   In-Bound Mobile IP Signalling Octet Count (G15) 408
   Out-bound Mobile IP Signalling Octet Count (G16) 378
   IP Quality of Service (I1) 0
   Airlink Quality of Service (I4) 0
   R-P Session ID (Y2) 12

 UDR for flow
    Mobile Node IP address 15.0.0.3
```

```
    IP Address (B1) 15.0.0.3,  Network Access Identifier (B2)
mwts-mip-p1-user121@ispxyz.com
    Correlation ID (C2) ' ' 36
    MIP Home Agent  (D1) 0.0.0.0
    IP Technology (F11) 02 Compulsory Tunnel indicator (F12) 01
    Release Indicator (F13) 00
    Data Octet Count Terminating (G1) 0
    Data Octet Count Originating (G2) 0  Event Time G4:1023906326
    Packets- in:0 out:0

 UDR for session
 session ID: 2
 Mobile Station ID IMSI 00000000003

   Mobile Station ID (A1) IMSI 00000000003
   Session Continue (C3) ' ' 0
   Serving PCF (D3) 4.0.0.1 Base Station ID (D4) 000000000000
   User Zone (E1) 0000
   Forward Mux Option (F1) 241  Reverse Mux Option (F2) 242
   Service Option (F5) 245  Forward Traffic Type (F6) 246
   Reverse Traffix type (F7) 247  Fundamental Frame size (F8) 248
   Forward Fundamental RC (F9) 249  Reverse Fundamntal RC (F10) 250
   DCCH Frame Format (F14) 0
   Bad PPP Frame Count (G3) 0 Active Time (G8) 0
   Number of Active Transitions (G9) 0
   SDB Octet Count Terminating (G10) 0
   SDB Octet Count Originating (G11) 0
   Number of SDBs Terminating (G12) 0
   Number of SDBs Originating G13 0
   Number of HDLC Layer Bytes Received (G14) 201
   In-Bound Mobile IP Signalling Octet Count (G15) 0
   Out-bound Mobile IP Signalling Octet Count (G16) 0
   IP Quality of Service (I1) 0
   Airlink Quality of Service (I4) 0
   R-P Session ID (Y2) 2

 UDR for flow
    Mobile Node IP address 6.0.0.5

    IP Address (B1) 6.0.0.5,  Network Access Identifier (B2)
mwt10-sip-user1
    Correlation ID (C2) ' ' 39
    MIP Home Agent  (D1) 0.0.0.0
    IP Technology (F11) 01 Compulsory Tunnel indicator (F12) 00
    Release Indicator (F13) 00
    Data Octet Count Terminating (G1) 0
    Data Octet Count Originating (G2) 0  Event Time G4:1023906826
    Packets- in:0 out:0

 UDR for session
 session ID: 3
 Mobile Station ID IMSI 00000000004

   Mobile Station ID (A1) IMSI 00000000004
   Session Continue (C3) ' ' 0
   Serving PCF (D3) 4.0.0.1 Base Station ID (D4) 000000000000
   User Zone (E1) 0000
   Forward Mux Option (F1) 241  Reverse Mux Option (F2) 242
   Service Option (F5) 245  Forward Traffic Type (F6) 246
   Reverse Traffix type (F7) 247  Fundamental Frame size (F8) 248
   Forward Fundamental RC (F9) 249  Reverse Fundamntal RC (F10) 250
   DCCH Frame Format (F14) 0
   Bad PPP Frame Count (G3) 0 Active Time (G8) 0
   Number of Active Transitions (G9) 0
```

```
   SDB Octet Count Terminating (G10) 0
   SDB Octet Count Originating (G11) 0
   Number of SDBs Terminating (G12) 0
   Number of SDBs Originating G13 0
   Number of HDLC Layer Bytes Received (G14) 241
   In-Bound Mobile IP Signalling Octet Count (G15) 0
   Out-bound Mobile IP Signalling Octet Count (G16) 0
   IP Quality of Service (I1) 0
   Airlink Quality of Service (I4) 0
   R-P Session ID (Y2) 3

 UDR for flow
    Mobile Node IP address 6.0.0.14

    IP Address (B1) 6.0.0.14,  Network Access Identifier (B2)
mwt10-sip-user1
    Correlation ID (C2) ' ' 40
    MIP Home Agent  (D1) 0.0.0.0
    IP Technology (F11) 01 Compulsory Tunnel indicator (F12) 00
    Release Indicator (F13) 00
    Data Octet Count Terminating (G1) 0
    Data Octet Count Originating (G2) 0  Event Time G4:1023906826
    Packets- in:0 out:0

PDSN-6500#
```

# show cdma pdsn accounting session

To display the accounting information for the session identified by the msid, and the acounting information for the flows tied to the session, use the **show cdma pdsn accounting session** command in privileged EXEC mode.

**show cdma pdsn accounting session** *msid*

## Syntax Description

| | |
|---|---|
| msid | The ID number of the mobile subscriber. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The counter names appear in abbreviated format.

## Examples

The following example shows output from the **show cdma pdsn accounting session** command:

```
PDSN-6500#show cdma pdsn accounting session 00000000004
 UDR for session
 session ID: 3
 Mobile Station ID IMSI 00000000004

    A - A1:00000000004
    C - ' 'C3:0
    D - D3:4.0.0.1 D4:000000000000
    E - E1:0000
    F - F1:00F1 F2:00F2 F5:00F5 F6:F6 F7:F7 F8:F8 F9:F9 F10:FA F14:00
    G - G3:0 G8:0 G9:0 G10:0 G11:0 G12:0 G13:0 G14:241 G15:0 G16:0
    I - I1:0 I4:0
    Y - Y2:3

 UDR for flow
    Mobile Node IP address 6.0.0.14

    B - B1:6.0.0.14 B2:mwt10-sip-user1
    C - ' 'C2:40
    D - D1:0.0.0.0
    F - F11:01 F12:00 F13:00
    G - G1:0 G2:0 G4:1023906826
    Packets- in:0 out:0
PDSN-6500#
```

# show cdma pdsn accounting session detail

To display the accounting information (with counter names) for the session identified by the msid, and the acounting information for the flows tied to the session, use the **show cdma pdsn accounting session detail** command in privileged EXEC mode.

**show cdma pdsn accounting session** *msid* **detail**

## Syntax Description

| | |
|---|---|
| msid | The ID number of the mobile subscriber. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The counter names appear in abbreviated format.

## Examples

The following example shows output from the **show cdma pdsn accounting session** command:

```
PDSN-6500#sh cdma pdsn accounting session 00000000004 detail
 UDR for session
 session ID: 3
 Mobile Station ID IMSI 00000000004

   Mobile Station ID (A1) IMSI 00000000004
   Session Continue (C3) ' ' 0
   Serving PCF (D3) 4.0.0.1 Base Station ID (D4) 000000000000
   User Zone (E1) 0000
   Forward Mux Option (F1) 241  Reverse Mux Option (F2) 242
   Service Option (F5) 245  Forward Traffic Type (F6) 246
   Reverse Traffix type (F7) 247  Fundamental Frame size (F8) 248
   Forward Fundamental RC (F9) 249  Reverse Fundamntal RC (F10) 250
   DCCH Frame Format (F14) 0
   Bad PPP Frame Count (G3) 0 Active Time (G8) 0
   Number of Active Transitions (G9) 0
   SDB Octet Count Terminating (G10) 0
   SDB Octet Count Originating (G11) 0
   Number of SDBs Terminating (G12) 0
   Number of SDBs Originating G13 0
   Number of HDLC Layer Bytes Received (G14) 241
   In-Bound Mobile IP Signalling Octet Count (G15) 0
   Out-bound Mobile IP Signalling Octet Count (G16) 0
   IP Quality of Service (I1) 0
   Airlink Quality of Service (I4) 0
```

```
   R-P Session ID (Y2) 3

 UDR for flow
    Mobile Node IP address 6.0.0.14

    IP Address (B1) 6.0.0.14,  Network Access Identifier (B2)
mwt10-sip-user1
    Correlation ID (C2) ' ' 40
    MIP Home Agent  (D1) 0.0.0.0
    IP Technology (F11) 01 Compulsory Tunnel indicator (F12) 00
    Release Indicator (F13) 00
    Data Octet Count Terminating (G1) 0
    Data Octet Count Originating (G2) 0  Event Time G4:1023906826
    Packets- in:0 out:0

PDSN-6500#
```

# show cdma pdsn accounting session flow

To display the accounting information for a specific flow that is associated with the session identified by the msid, use the **show cdma pdsn accounting session flow** command in privileged EXEC mode.

**show cdma pdsn accounting session** *msid* **flow** { **mn-ip-address** *IP_address* }

## Syntax Description

| | |
|---|---|
| msid | The ID number of the mobile subscriber. |
| mn-ip-address *ip_address* | Specifies the IP addresses assigned to the mobile numbers in each session. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

The counter names appear in abbreviated format.

## Examples

The following example shows output from the **show cdma pdsn accounting session flow** command:

```
PDSN-6500#show cdma pdsn accounting session 00000000004 flow
mn-ip-address 6.0.0.14
 UDR for flow
    Mobile Node IP address 6.0.0.14

    B - B1:6.0.0.14 B2:mwt10-sip-user1
    C - ' 'C2:40
    D - D1:0.0.0.0
    F - F11:01 F12:00 F13:00
    G - G1:0 G2:0 G4:1023906826
    Packets- in:0 out:0

PDSN-6500#
```

# show cdma pdsn accounting session flow user

To display accounting information for a flow with username that is associated with the session identified by the msid, use the **show cdma pdsn accounting session flow user** command in privileged EXEC mode.

**show cdma pdsn accounting session** *msid* **flow user** *username*

## Syntax Description

| | |
|---|---|
| username | The username that is associated with the session identified by the msid. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn accounting session flow user** command:

```
PDSN-6500#show cdma pdsn accounting session 123451234512357 flow user
mwts-mip-p1-user121@ispxyz.com

 UDR for flow
    Mobile Node IP address 15.0.0.3

    B - B1:15.0.0.3 B2:mwts-mip-p1-user121@ispxyz.com
    C - ' 'C2:36
    D - D1:0.0.0.0
    F - F11:02 F12:01 F13:00
    G - G1:0 G2:0 G4:1023906326
    Packets- in:0 out:0

PDSN-6500#
```

# show cdma pdsn ahdlc

To display AHDLC engine information, use the **show cdma pdsn ahdlc** command in privileged EXEC mode.

**show cdma pdsn ahdlc** *slot_number* **channel** [*channel_id]*

## Syntax Description

| | |
|---|---|
| **slot_number** | Slot number of the AHDLC of interest. |
| ***channel*** *[channel_id]* | Channel on the AHDLC. Possible values are 0 through 8000, or 0 to 20000 depending on the image you are using. If no channel is specified, information for all channels is displayed. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.2(8)BY | The possible values for channel ID were extended to 20000. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn ahdlc** command:

```
Router# show cdma pdsn ahdlc 0 channel
 Ch id  State   Framing ACCM            Deframing ACCM  FCS size
 12     OPENED  00000000                 00000000           16
 13     OPENED  00000000                 00000000           16
 14     OPENED  00000000                 00000000           16

Router# show cdma pdsn ahdlc 0 channel 12
 Channel id = 12 State = OPENED Framing ACCM = 00000000
Deframing ACCM = 00000000 FCS size = 16
 Framing input 153 bytes 7 paks
 Framing output 242 bytes 7 paks 0 errors
 Deframing input 181 bytes 9 paks
 Deframing output 121 bytes 5 paks 0 errors
 0 Bad FCS 0 Escaped end
```

# show cdma pdsn cluster controller

To display configuration and statistics for the PDSN cluster controller, use the **show cdma pdsn cluster controller** command in privileged EXEC mode.

**show cdma pdsn cluster controller** {**configuration** | **statistics** }

## Syntax Description

| | |
|---|---|
| **configuration** | Displays configuration information associated with the cluster controller. |
| ***statistics*** | Displays various statistics collected on the cluster controller signaling messages with the cluster member, and redundancy message statistics with the redundancy peer. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn cluster controller** command:

```
Router# show cdma pdsn cluster controller
```

# show cdma pdsn cluster controller configuration

To display the IP addresses of the members that registered with a specific controller, use the **show cdma pdsn cluster controller configuration** command in privileged EXEC mode.

**show cdma pdsn cluster controller configuration**

## Syntax Description

There are no arguments or keywords for this command.

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn cluster controller configuration** command:

```
Router# show cdma pdsn cluster controller configuration
sh cdma pdsn cluster controller config
cluster interface FastEthernet0/0
no R-P signaling proxy
timeout to seek member = 10 seconds
window to seek member is 2 timeouts in a row if no reply (afterwards the member is
declared offline)
this PDSN cluster controller is configured

controller redundancy:
  database in-sync or no need to sync
  group: sit_cluster1
```

# show cdma pdsn cluster controller member

To display detailed information about a specific cluster controller member, use the **show cdma pdsn cluster controller member** command in privileged EXEC mode.

**show cdma pdsn cluster controller member** *{ load | time | ipaddr}*

## Syntax Description

| | |
|---|---|
| **load** | The load reported by every PDSN member in the cluster, sorted from the lowest load value. |
| ***time*** | The seek time of the member, sorted from the past to the future. |
| ipaddr | Specifies the controller member. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn cluster controller member** command:

```
Router# show cdma pdsn cluster controller member
 Ch id  State   Framing ACCM            Deframing ACCM  FCS size
 12     OPENED  00000000                 00000000           16
 13     OPENED  00000000                 00000000           16
 14     OPENED  00000000                 00000000           16

Router# show cdma pdsn ahdlc 0 channel 12
 Channel id = 12 State = OPENED Framing ACCM = 00000000
Deframing ACCM = 00000000 FCS size = 16
 Framing input 153 bytes 7 paks
 Framing output 242 bytes 7 paks 0 errors
 Deframing input 181 bytes 9 paks
 Deframing output 121 bytes 5 paks 0 errors
 0 Bad FCS 0 Escaped end
```

# show cdma pdsn cluster controller session

To display session count, or count by age, or one or a few oldest session records, or a session records corresponding to the IMSI entered and a few session records that arrived afterwards, use the **show cdma pdsn cluster controller session** command in privileged EXEC mode.

**show cdma pdsn cluster controller session** *{ count [age days] | oldest [more 1-20 records] | imsi BCDs [more 1-20 records] }*

## Syntax Description

| | |
|---|---|
| **count** | The number of session records on cluster controller. |
| age | The number of session records of this age on the cluster controller. Age measured in days. |
| ***oldest*** | The oldest session record on the cluster controller. |
| more *1-20 records* | Displays the configured number (from 1 to 20) of the oldest session records on the cluster controller. |
| imsi *BCDs* | Displays the session record with this imsi on the cluster controller. |
| more *1-20 records* | Displays the configured number (from 1 to 20) of additional session records on the cluster controller. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn cluster controller session** command:

```
Router# show cdma pdsn clu contr session imsi 00000000007

    IMSI   Member IPv4 Addr   Age [days]   Anchor changes
-----------------------------------------------------------------
00000000007          10.0.0.50
-----------------------------------------------------------------

Router# show cdma pdsn clu contr session count
        10 session records

Router# show cdma pdsn clu contr session oldest
    IMSI   Member IPv4 Addr   Age [days]   Anchor changes
-----------------------------------------------------------------
00000000002          10.0.0.50
-----------------------------------------------------------------
```

# show cdma pdsn cluster controller statistics

To display the IP addresses of the members that registered with a specific controller, use the **show cdma pdsn cluster controller statistics** command in privileged EXEC mode.

**show cdma pdsn cluster controller statistics**

## Syntax Description

There are no arguments or keywords for this command.

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn controller statistics** command:

```
Router# show cdma pdsn cluster controller statistics
0 times did not get a buffer for a packet
         0 times couldn't allocate memory
       744 A11-RegReply received
         0 A11-RegReply discarded, authenticaton problem
         0 A11-RegReply discarded, identification problem
         0 A11-RegReply discarded, unrecognized extension
       975 A11-RegRequest received
         0 A11-RegRequest discarded, authenticaton problem
         0 A11-RegRequest discarded, identification problem
         0 A11-RegRequest discarded, unrecognized application type
         0 A11-RegRequest discarded, unrecognized extension
         0 A11-RegRequest with unrecognized type of data
         0 A11-RegRequest not sent, interface cdma-Ix not configed
       744 CVSEs seek reply received
       755 CVSEs seek received
         4 CVSEs state ready received
         4 CVSEs state admin prohibited received
         0 msgs received neither A11-RegReq nor A11-RegReply
       116 A10 up A11-RegReq received
        96 A10 end A11-RegReq received
         2 PDSN cluster members
redundancy:
    error: mismatch id 0 authen fail 0
           ignore due to no redundancy 0
    Update rcvd 0 sent 1481 orig sent 1300 fail 4
    UpdateAck rcvd 1466 sent 0
    DownloadReq rcvd 1 sent 4 orig sent 2 fail 0
    DownloadReply rcvd 4 sent 2 orig sent 2 fail 0 drop 0
    DownloadAck rcvd 2 sent 4 drop 0
mwt13-6500c#
```

# show cdma pdsn cluster member

To display configuration and statistics for the PDSN cluster member, use the **show cdma pdsn cluster member** command in privileged EXEC mode.

**show cdma pdsn cluster member** {**configuration** | **statistics**}

## Syntax Description

| | |
|---|---|
| **configuration** | Displays configuration information associated with the cluster member. |
| ***statistics*** | Displays various statistics collected on cluster member signaling messages with the cluster controller. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn cluster member** command:

```
Router# show cdma pdsn cluster member
```

# show cdma pdsn flow

To display flow-based summary of active sessions, and the flows and IP addresses assigned to the mobile numbers in each session, use the **show cdma pdsn flow** command in privileged EXEC mode.

**show cdma pdsn flow {mn-ip-address** *ip_address* **| msid** *string* **| service-type | user** *string*}

## Syntax Description

| | |
|---|---|
| **mn- ip-address ip_address** | Specifies the IP addresses assigned to the mobile numbers in each session. |
| **msid** string | Specifies the mobile subscriber id number. |
| service-type | Specifies the service type. |
| **user** string | Specifies the user. |

## Defaults

No default keywords or arguments.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)BY | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn flow** command:

```
Router# show cdma pdsn flow

MSID            NAI                                 Type         MN IP Address    St
100000000000099 sim1                                Simple       100.4.1.1        ACT
200000000000047 sim1                                Simple       100.4.1.2        ACT
100000000000100 sim1                                Simple       100.4.1.40       ACT
200000000000048 sim1                                Simple       100.4.1.3        ACT
100000000000101 sim1                                Simple       100.4.1.5        ACT
200000000000049 sim1                                Simple       100.4.1.4        ACT
100000000000102 sim1                                Simple       100.4.1.6        ACT
200000000000050 sim1                                Simple       100.4.1.7        ACT
100000000000103 sim1                                Simple       100.4.1.9        ACT
200000000000051 sim1                                Simple       100.4.1.8        ACT
100000000000104 sim1                                Simple       100.4.1.11       ACT
200000000000052 sim1                                Simple       100.4.1.10       ACT
100000000000105 sim1                                Simple       100.4.1.12       ACT
200000000000053 sim1                                Simple       100.4.1.13       ACT
300000000000008 sim1                                Simple       100.4.1.14       ACT
100000000000106 sim1                                Simple       100.4.1.15       ACT
200000000000054 sim1                                Simple       100.4.1.16       ACT
300000000000009 sim1                                Simple       100.4.1.17       ACT
100000000000107 sim1                                Simple       100.4.1.19       ACT
200000000000055 sim1                                Simple       100.4.1.18       ACT
100000000000122 sim1                                Simple       100.4.1.21       ACT
200000000000070 sim1                                Simple       100.4.1.20       ACT
```

```
300000000000025 sim1                    Simple      100.4.1.22      ACT
100000000000123 sim1                    Simple      100.4.1.24      ACT
200000000000071 sim1                    Simple      100.4.1.23      ACT
300000000000026 sim1                    Simple      100.4.1.25      ACT
100000000000124 sim1                    Simple      100.4.1.26      ACT
200000000000072 sim1                    Simple      100.4.1.27      ACT
300000000000027 sim1                    Simple      100.4.1.28      ACT
100000000000125 sim1                    Simple      100.4.1.29      ACT
200000000000073 sim1                    Simple      100.4.1.30      ACT
300000000000028 sim1                    Simple      100.4.1.31      ACT
100000000000126 sim1                    Simple      100.4.1.33      ACT
200000000000074 sim1                    Simple      100.4.1.32      ACT
300000000000029 sim1                    Simple      100.4.1.34      ACT
100000000000127 sim1                    Simple      100.4.1.36      ACT
200000000000075 sim1                    Simple      100.4.1.35      ACT
300000000000030 sim1                    Simple      100.4.1.37      ACT
100000000000128 sim1                    Simple      100.4.1.39      ACT
200000000000076 sim1                    Simple      100.4.1.38      ACT
300000000000101 sim1                    Simple      100.4.1.41      ACT
100000000000199 sim1                    Simple      100.4.1.43      ACT
200000000000147 sim1                    Simple      100.4.1.42      ACT
300000000000102 sim1                    Simple      100.4.1.44      ACT
100000000000200 sim1                    Simple      100.4.1.46      ACT
 --More--
```

# show cdma pdsn pcf

To display information about PCFs that have R-P tunnels to the PDSN, use the **show cdma pdsn pcf** command in privileged EXEC mode.

**show cdma pdsn pcf** {**brief** | *ip_addr* | ***secure***}

## Syntax Description

| | |
|---|---|
| **brief** | Displays information about all PCFs with connected sessions. |
| *ip_addr* | Displays detailed PCF information by IP address. |
| **secure** | Displays the security associations for all PCFs on this PDSN. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2(2)XC | The parameters of this command were changed. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output of the **show cdma pdsn pcf** command with the keyword **brief** specified, with an IP address specified, and with the keyword **secure** specified:

```
router# show cdma pdsn pcf brief
PCF IP Address     Sessions      Pkts In     Pkts Out     Bytes In    Bytes Out
4.0.0.1                   1           14          275           23          936
```

Table 6 describes the fields shown in the output of the brief version of the command.

***Table 6 show cdma pdsn pcf brief Field Descriptions***

| Field | Description |
|---|---|
| PCF IP Address | IP address of the PCF. |
| Sessions | Number of active sessions. |
| Pkts In | Total packets received from a PCF. |
| Pkts Out | Total packets sent to a PCF. |
| Bytes In | Total bytes received from a PCF. |
| Bytes Out | Total bytes sent to a PCF. |

```
router# show cdma pdsn pcf 4.0.0.1
PCF 4.0.0.1 has 1 session
  Received 14 pkts (275 bytes), sent 23 pkts (936 bytes)
```

```
  PCF Session ID 1, Mobile Station ID MIN 2000000001
    A10 connection age 00:00:28
    A10 registration lifetime 65535 sec, time since last registration 28 sec
```

Table 7 describes the fields shown in the output of the command when an IP address is specified.

***Table 7 show cdma pdsn pcf Field Descriptions***

| Field | Description |
|---|---|
| PCF (*x.x.x.x*) has *x* session | PCF address and the number of active sessions. |
| received *x* pkts (*x* bytes) | Total packets received from a PCF. |
| sent *x* pkts (*x* bytes) | Total packets sent to a PCF. |
| PCF Session ID *x* | Session ID associated with the PCF. |
| Mobile Station ID MIN *xxxx* | MIN of the mobile station initiating the session. |
| status | Status of the IMSI session. |
| A10 connection age | Amount of time the connection has been active. |
| A10 registration lifetime | Duration for which the A10 registration will be active. |

```
Router# show cdma pdsn pcf secure
Security Associations (algorithm, replay protection, key):
default:
 spi 300, Timestamp +/- 60, key ascii foo
4.0.0.1:
 spi 100, Timestamp +/- 60, key ascii test
 spi 200, Timestamp +/- 60, key ascii foo
4.0.0.2:
 spi 100, Timestamp +/- 0, key ascii test
 spi 400, Timestamp +/- 0, key hex 12345678901234567890123456789012
4.0.0.3:
 spi inbound 100 outbound 200, Timestamp +/- 0, key ascii test
```

Table 8 describes the fields shown in the output of the command when the keyword **secure** is specified.

***Table 8 show cdma pdsn pcf secure Field Descriptions***

| Field | Description |
|---|---|
| default | The default security associations (used for PCFs that do not have an explicitly configured security association). |
| *x.x.x.x* | IP address of the PCF |
| spi *spi_value* | Security Parameter Index, a 4-byte hex index within the security association that selects the specific security parameters to be used. |
| Timestamp +/- *value* | Maximum difference allowed between the timestamp received in the A11 message and the system time on the PDSN for the A11 message to be accepted. |
| key {ascii\|hex} *key* | The shared secret key for the security associations |

# show cdma pdsn resource

To display AHDLC resources allocated in resource manager, use the **show cdma pdsn resource** command in privileged EXEC mode.

**show cdma pdsn resource** [*slot_number* [**ahdlc-channel** [*channel_id*]]]

## Syntax Description

| | |
|---|---|
| **slot_number** | (Optional) Slot number of the AHDLC of interest. |
| ***ahdlc-channel*** *[channel_id]* | (Optional) Channel on the AHDLC. If no channel is specified, information for all channels is displayed. |

## Defaults

The c6500-c5 image supports 8000 sessions and the c6500-c6 image supports 20000 sessions.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(2)XC | This command was introduced. |
| 12.2(8)BY | The possible values for channel ID was extended to 20000. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output from the **show cdma pdsn resource** command:

```
Router# show cdma pdsn resource
Resource allocated/available in the resource manager

slot 0:
        AHDLC Engine Type:CDMA HDLC ENGINE
                 Engine is ENABLED
                total channels:16000, available channels:16000


Router#show cdma pdsn resource 0 ahdlc-channel 0
        AHDLC Channel 0 State CLOSED
```

# show cdma pdsn selection

To display a summary of a session table entry or the entry by MSID, use the **show cdma pdsn selection** command in privileged EXEC mode.

**show cdma pdsn selection** {**summary** | **msid** *octet_stream*}

## Syntax Description

| | |
|---|---|
| **summary** | Displays a summary of the session table entry. |
| **msid number** | Keyword to indicate that the PDSN selection table entry for a particular MSID is to be displayed. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output of the **show cdma pdsn selection** command with the **msid** specified:

```
router#show cdma pdsn selection msid 00000000400000
MSID=00000000400000 PDSN=51.4.1.40 (7206-PDSN-1)
```

The following example shows output of the **show cdma pdsn selection** command with **summary** specified:

```
Router#show cdma pdsn selection summary
CDMA PDSN selection summary
    Hostname         PDSN         Session-count     Max-sessions
   *7206-PDSN-1      51.4.1.40        0                 16000
    7206-PDSN-3      51.4.3.40        0                 16000
    7206-PDSN-2      51.4.2.40        0                 16000

    Hostname         Keepalive    Interface         Load-factor
   *7206-PDSN-1         10        70.4.1.40            0.00
    7206-PDSN-3         10        70.4.3.40            0.00
    7206-PDSN-2         10        70.4.2.40            0.00
```

# show cdma pdsn session

To display the session information on the PDSN, use the **show cdma pdsn session** command in privileged EXEC mode.

**show cdma pdsn session** [brief | **dormant** | mn-ip-address address | **msid** *number* | **user** *nai* | **prepaid**]

## Syntax Description

| | |
|---|---|
| **brief** | (Optional) Displays a summary of all sessions. |
| **dormant** | (Optional) Displays information about dormant PDSN sessions. |
| mn-ip-address *address* | (Optional) Displays user information for the specified IP address. |
| ***msid*** *number* | (Optional) Displays information for the specified MSID. |
| ***user*** *nai* | (Optional) Displays information for the specified NAI. |
| prepaid | (Optional) Displays information about prepaid flows. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.2(2)XC | The parameters of this command were altered. |
| 12.2(8)BY | The **prepaid** variable was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output of the **show cdma pdsn session** command:

```
router# show cdma pdsn session
Mobile Station ID IMSI 111111111111111
  PCF IP Address 2.2.2.100, PCF Session ID 1
  A10 connection time 00:00:09,  registration lifetime 65535 sec
  Number of A11 re-registrations 0, time since last registration 9 sec
  Current Access network ID 0002-0202-64
  Last airlink record received is Active Start, airlink is active
  GRE sequence number transmit 8, receive 10
  Using interface Virtual-Access1, status ACT
  Using AHDLC Engine on slot 1, channel ID 2
  This session has 1 flow

Flow service Proxy-Mobile, NAI mwts-mipp-np-homeaddr@ispxyz.com
  Mobile Node IP address 30.0.0.2
  Home Agent IP address 7.0.0.2
  Packets in 0, bytes in 0
  Packets out 0, bytes out 0
  Prepaid duration 36000 secs, used 6500 secs, cumulative 13000 secs
```

# show cdma pdsn statistics

To display VPDN, PPP, and RP interface statistics for the PDSN, use the **show cdma pdsn selection** command in privileged EXEC mode.

**show cdma pdsn statistics [ rp | ppp | ahdlc *0-6* ]**

## Syntax Description

| | |
|---|---|
| **rp** | Displays all RP interface statistics. |
| **ppp** | Displays all PPP interface statistics |
| ahdlc *0-6* | Displays all AHDLC statistics. where the range <0-6> is engine slot-id and an optional parameter. In the absence of the optional parameter, the statistics for all the engines will get displayed. The output of this command with the new option is the framing/defarming statistics of the engine. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example shows output of the **show cdma pdsn statistics** command:

```
router# show cdma pdsn statistics
RP Interface:
    Reg Request rcvd 23, accepted 22, denied 1, discarded 0
    Initial Reg Request accepted 4, denied 0
    Re-registration requests accepted 14, denied 0
    De-registration accepted 4, denied 0
    Error: Unspecified 23, Administratively prohibited 0
      Resource unavailable 4, Authentication failed 4
      Identification mismatch 2, Poorly formed requests 2
      Unknown PDSN 2, Reverse tunnel mandatory 22
      Reverse tunnel unavailable 1, Bad CVSE 0

    Update sent 2, accepted 2, denied 0, not acked 0
    Initial Update sent 2, retransmissions 0
    Acknowledge received 2, discarded 0
    Update reason lifetime expiry 1, PPP termination 0, other 1
    Error: Unspecified 23 Administratively prohibited 0
      Authentication failed 4, Identification mismatch 4
      Poorly formed request 2

PPP:
    Current Connections 0
    Connection requests 4, success 4, failure 0
    Failure reason LCP 0, authentication 0, IPCP 3
```

```
    Connection enters stage LCP 4, Auth 4, IPCP 7

    Renegotiation total 0, by PDSN 0, by Mobile Node 0
    Renegotiation reason LCP/IPCP 0, address mismatch 0, other 0

    CHAP attempt 4, success 4, failure 0
    PAP attempt 0, success 0, failure 0
    MSCHAP attempt 0, success 0, failure 0
    EAP attempt 0, success 0, failure 0
    Release total 4, by PDSN 4, by Mobile Node 0
    Release by ingress address filtering 0
    Release reason: administrative 1, LCP termination 0, idle timeout 0
      L2TP tunnel NOT READY YET
      insufficient resources 0, session timeout 0
      service unavailable 0, other 0

    Connection negotiated compression 0
    Compression Microsoft 0, Stack 0, other 0
    Connections negotiated MRRU 0, IPX 0, IP 4
    Connections negotiated VJ-Compression 0, BAP 0
    PPP bundles 0

VPDN Flows:
  A11 registration-update timeout 1 sec, retransmissions 5
  Mobile IP registration timeout 5 sec
  A10 maximum lifetime allowed 65535 sec
  GRE sequencing is on
  Maximum PCFs limit not set
  Maximum sessions limit not set (default 20000 maximum)
  SNMP failure history table size 100
  MSID Authentication is disabled
  Ingress address filtering is disabled
  Sending Agent Adv in case of IPCP Address Negotiation  is disabled
  Aging of idle users disabled

  Number of pcfs connected 1
  Number of sessions connected 29,
    Simple IP flows 10, Mobile IP flows 9,
    Proxy Mobile IP flows 0, VPDN flows 10

AHDLC:

PDSN#show cdma pdsn statistics ahdlc
slot 0:
  AHDLC Engine Type: CDMA HDLC SW ENGINE
     Engine is ENABLED
    total channels: 8000, available channels: 8000

  Framing input 0 bytes, 0 paks
  Framing output 0 bytes, 0 paks
  Framing errors 0, insufficient memory 0,
        queue overflow 0, invalid size 0

  Deframing input 0 bytes, 0 paks
  Defaming output 0 bytes, 0 paks
  Deframing errors 0, insufficient memory 0,
        queue overflow 0, invalid size 0, CRC errors 0
```

# show gprs access-point

To display information about access points on the GGSN, use the **show gprs access-point** command in privileged EXEC mode.

**show gprs access-point** {*access-point-index* [**address-allocation**] | **all**}

## Syntax Description

| | |
|---|---|
| *access-point-index* | Integer (from 1 to 65535) that identifies a GPRS access point. Information about that access point is shown. |
| *access-point-index* **address-allocation** | TID and dynamically allocated mobile station (MS) addresses (by either a DHCP or RADIUS server) for PDP contexts on the specified access point are shown. |
| **all** | Information about all access points on the GGSN is shown. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>• The following output fields were added to the display:<br>– accounting<br>– aggregate<br>– apn_accounting_server_group<br>– apn_authentication_server_group<br>– apn-type<br>– apn_username<br>– apn_password<br>– Block Roamer Mode<br>– GPRS vaccess interface<br>– VPN<br>– wait_accounting<br>• The following output fields were removed from the display:<br>– apn_charging_gw<br>– apn_backup_charging_gw<br>– apn_radius_server<br>• Several output field results were changed from binary 0 and 1 to Yes and No.<br>• The following output fields were added to the **all** version of this command:<br>– Access-type<br>– ppp-regeneration (max-session, setup-time)<br>– VRF Name |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the Block Roamer Mode output field was changed to Block Foreign-MS Mode output field. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW.<br>• The following output fields were added to the display:<br>– input ACL<br>– output ACL<br>– backup<br>– RADIUS attribute suppress MSISDN<br>– RADIUS attribute suppress IMSI<br>– RADIUS attribute suppress SGSN Address<br>– RADIUS attribute suppress QoS<br>• The format of the apn_username: , apn_password: display fields was changed to apn_username: apn_password:. |

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>• The following output fields were added to the display:<br>– accounting<br>– aggregate<br>– apn_accounting_server_group<br>– apn_authentication_server_group<br>– apn-type<br>– apn_username<br>– apn_password<br>– Block Roamer Mode<br>– GPRS vaccess interface<br>– VPN<br>– wait_accounting<br>• The following output fields were removed from the display:<br>– apn_charging_gw<br>– apn_backup_charging_gw<br>– apn_radius_server<br>• Several output field results were changed from binary 0 and 1 to Yes and No.<br>• The following output fields were added to the **all** version of this command:<br>– Access-type<br>– ppp-regeneration (max-session, setup-time)<br>– VRF Name |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the Block Roamer Mode output field was changed to Block Foreign-MS Mode output field. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW.<br>• The following output fields were added to the display:<br>– input ACL<br>– output ACL<br>– backup<br>– RADIUS attribute suppress MSISDN<br>– RADIUS attribute suppress IMSI<br>– RADIUS attribute suppress SGSN Address<br>– RADIUS attribute suppress QoS<br>• The format of the apn_username: , apn_password: display fields was changed to apn_username: apn_password:. |

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>• The following output fields were added to the display:<br>– accounting<br>– aggregate<br>– apn_accounting_server_group<br>– apn_authentication_server_group<br>– apn-type<br>– apn_username<br>– apn_password<br>– Block Roamer Mode<br>– GPRS vaccess interface<br>– VPN<br>– wait_accounting<br>• The following output fields were removed from the display:<br>– apn_charging_gw<br>– apn_backup_charging_gw<br>– apn_radius_server<br>• Several output field results were changed from binary 0 and 1 to Yes and No.<br>• The following output fields were added to the **all** version of this command:<br>– Access-type<br>– ppp-regeneration (max-session, setup-time)<br>– VRF Name |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the Block Roamer Mode output field was changed to Block Foreign-MS Mode output field. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW.<br>• The following output fields were added to the display:<br>– input ACL<br>– output ACL<br>– backup<br>– RADIUS attribute suppress MSISDN<br>– RADIUS attribute suppress IMSI<br>– RADIUS attribute suppress SGSN Address<br>– RADIUS attribute suppress QoS<br>• The format of the apn_username: , apn_password: display fields was changed to apn_username: apn_password:. |

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>• The following output fields were added to the display:<br>– accounting<br>– aggregate<br>– apn_accounting_server_group<br>– apn_authentication_server_group<br>– apn-type<br>– apn_username<br>– apn_password<br>– Block Roamer Mode<br>– GPRS vaccess interface<br>– VPN<br>– wait_accounting<br>• The following output fields were removed from the display:<br>– apn_charging_gw<br>– apn_backup_charging_gw<br>– apn_radius_server<br>• Several output field results were changed from binary 0 and 1 to Yes and No.<br>• The following output fields were added to the **all** version of this command:<br>– Access-type<br>– ppp-regeneration (max-session, setup-time)<br>– VRF Name |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the Block Roamer Mode output field was changed to Block Foreign-MS Mode output field. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW.<br>• The following output fields were added to the display:<br>– input ACL<br>– output ACL<br>– backup<br>– RADIUS attribute suppress MSISDN<br>– RADIUS attribute suppress IMSI<br>– RADIUS attribute suppress SGSN Address<br>– RADIUS attribute suppress QoS<br>• The format of the apn_username: , apn_password: display fields was changed to apn_username: apn_password:. |

| Release | Modification |
|---|---|
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(4)T | The changes introduced in Cisco IOS Release 12.2(4)MX, 12.2(8)YD, and 12.2(8)YW were incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the *access-point-index* argument to specify a particular access point number for which you want to obtain information.

Use the **address-allocation** keyword, to obtain information about dynamically allocated MS addresses and lease terms by access point.

Use the **all** keyword to obtain information about all access points in an abbreviated format.

## Examples

### Example 1

The following is sample output of the **show gprs access-point** command for access-point 1:

```
router# show gprs access-point 1
    apn_index 1          apn_name = gprs.corporate.com
    apn_mode: transparent
    apn-type: Real
    accounting: Disable
    wait_accounting: Disable
    input ACL: None, output ACL: None
    dynamic_address_pool: dhcp-proxy-client
    apn_dhcp_server: 10.99.100.5     backup: 10.99.100.4
    apn_dhcp_gateway_addr: 10.27.1.1
    apn_authentication_server_group: foo
    apn_accounting_server_group: foo1
    apn_username:  apn_password:
    subscribe_required: No
    deactivate_pdp_context_on violation: Yes
    network_activation_allowed: Yes
    Block Foreign-MS Mode: Disable
    VPN: Disable  (VRF Name : None)
    GPRS vaccess interface: Virtual-Access2
    RADIUS attribute suppress MSISDN: Disabled
    RADIUS attribute suppress IMSI: Disabled
    RADIUS attribute suppress SGSN Address: Disabled
    RADIUS attribute suppress QoS
    number of ip_address_allocated 0
    idle timer: 0
    Security features
     Verify mobile source addr: enable
     Verify mobile destination addr: enable

    Traffic redirection:
     Mobile-to-mobile: destination 1.1.1.1

    Total number of PDP in this APN :0

    aggregate:
    In APN:    Disable

    In Global: Disable
```

The following table describes the fields show in the display.

| Field | Description |
|---|---|
| accounting | Current status of accounting services at the APN:<br>• Enable—Accounting services are enabled at the APN. This is the default for non-transparent access APNs.<br>• Disable—Accounting services are disabled at the APN. This is the default for transparent access APNs.<br>You can configure an APN for accounting services using the **aaa-accounting** access-point configuration command. |
| aggregate | Route aggregation configuration information on the GGSN.<br>The output display includes the "In APN" field for configuration information for the access point, and the "In global" field for global configuration on the GGSN.<br>The output field may contain the following information:<br>• IP network address and mask for which PDP requests on the access point will be collectively routed over the virtual template interface on the GGSN. IP address and mask information appears if an aggregate range has been configured on the GGSN.<br>• auto—Indicates that the GGSN uses the allocated IP mask from the DHCP or RADIUS server to perform route aggregation on the APN. This keyword appears when the APN has been configured with the **aggregate auto** access-point configuration command. This value only applies to the APN.<br>• Disable—Indicates that route aggregation is not configured at either the APN or global level. |
| apn_accounting_server_group | Name of the AAA server group providing accounting services. |
| apn_authentication_server_group | Name of the AAA server group providing authentication services. |
| apn_dhcp_gateway_addr | IP address of the DHCP gateway, if configured. |
| apn_dhcp_server | IP address of the DHCP server, if configured. |
| apn_index | Number assigned to this access point. |
| apn_mode | Current setting for the **access-mode** command:<br>• Transparent—Users are allowed access without authorization or authentication.<br>• Non-transparent—Users must be authenticated by the GGSN acting as a proxy for the authentication. |
| apn_name | Access point name. |
| apn-type | Current setting for the **access-type** command:<br>• Real—APN type that corresponds to a physical interface to an external network on the GGSN.<br>• Virtual—APN type that is not associated with any specific physical target network. |

| Field | Description |
|---|---|
| apn_username | Username specified in the **anonymous user** command. If the **anonymous user** command is not configured, this field will be blank. |
| apn_password | Password specified in the **anonymous user** command. If the **anonymous user** command is not configured, this field will be blank. |
| backup | IP address of the backup DHCP server, if configured. |
| Block Foreign-MS Mode | Current setting for the **block-foreign-ms** command:<br>• Enable—Blocking for foreign MSs is configured.<br>• Disable—Blocking for foreign MSs is not configured. |
| deactivate_pdp_context_on violation | Current setting for the **access-violation** command:<br>• No—User packets are discarded.<br>• Yes—Mobile sessions are terminated when there is an access violation. |
| dynamic_address_pool | Current setting for the **ip-address-pool** command. |
| GPRS vaccess interface | Name of the virtual access interface associated with the VPN.<br>If no VPN is configured at the access point, the name of the virtual access interface for the GGSN virtual template is shown, which is always Virtual-Access1. |
| idle_timer | Amount of time the GGSN will wait before purging idle mobile sessions for the access point configured using the **session idle-time** command. |
| input ACL | IP access list for inbound packets (Gi to Gn interfaces). |
| Mobile-to-Mobile | Current setting for the **redirect intermobile ip** command. |
| network_activation_allowed | Indicates whether network-initiated PDP context support is configured using the **network-request-activation** command:<br>• No—Network-initiated PDP context support is disabled.<br>• Yes—Network-initiated PDP context support is enabled. |
| number of ip_address_allocated | Number of IP addresses allocated to MS users. |
| output ACL | IP access list for outbound packets (Gn to Gi interfaces). |
| RADIUS attribute suppress IMSI | Current setting for the **radius attribute suppress imsi** command:<br>• Enabled—GGSN suppresses the 3GPP-IMSI number in its authentication and accounting requests to a RADIUS server.<br>• Disabled—GGSN does not suppress the 3GPP-IMSI number in its authentication and accounting requests to a RADIUS server. |
| RADIUS attribute suppress MSISDN | Current setting for the **msisdn suppression** command:<br>• Enabled—GGSN overrides or suppresses the MSISDN number in its RADIUS authentication.<br>• Disabled—GGSN does not override or suppress the MSISDN number in its RADIUS authentication. |

| Field | Description |
|---|---|
| RADIUS attribute suppress SGSN Address | Current setting for the **radius attribute suppress sgsn-address** command:<br>• Enabled—GGSN suppresses the 3GPP VSA 3GPP-SGSN-Address subattribute in its RADIUS authentication and accounting requests.<br>• Disabled—GGSN does not suppress the 3GPP VSA 3GPP-SGSN-Address subattribute in its RADIUS authentication and accounting requests. |
| RADIUS attribute suppress QoS | Current setting for the **radius attribute suppress qos** command:<br>• Enabled—GGSN suppresses the 3GPP VSA 3GPP-QoS-Profile subattribute in its RADIUS authentication and accounting requests.<br>• Disabled—GGSN does not suppress the 3GPP VSA 3GPP-QoS-Profile subattribute in its RADIUS authentication and accounting requests. |
| subscribe_required | Current setting for the **subscription-required** command:<br>• No—No subscription is required.<br>• Yes—Subscription is required for access point users. The GGSN looks for the “subscription verified” selection mode in the PDP context request to establish the session. |
| Total number of PDP in this APN | Number of active PDP contexts for this access point. |
| Verify mobile source addr | Current setting for the **security verify source** command:<br>• Enabled—GGSN verifies the source IP address of upstream TPDUs against addresses previously assigned to MSs.<br>• Disabled—GGSN does not verify the source IP address of upstream TPDUs against addresses previously assigned to MSs. |
| Verify mobile destination addr | Current setting for the **security verify destination** command:<br>• Enabled—GGSN verifies the destination address of upstream TPDUs against the global list of PLMN addresses specified using the **gprs plmn ip address** command.<br>• Disabled—GGSN does not verify the destination address of upstream TPDUs against the global list of PLMN addresses specified using the **gprs plmn ip address** command. |
| VPN | Indicates whether a Virtual Private Network (VPN) is enabled or disabled at the access point. |

| Field | Description |
|---|---|
| VRF name | Name assigned to the VPN Routing and Forwarding instance. A value of None appears when VRF is not enabled at the access point. |
| wait_accounting | Current status of RADIUS accounting response message waiting at the APN:<br>• Enable—GGSN waits for an accounting response message from the RADIUS server before sending an activate PDP context request to the SGSN.<br>• Disable—GGSN sends an activate PDP context request to the SGSN after sending an accounting request to the RADIUS server. The GGSN does not wait for a RADIUS accounting response.<br>You can configure RADIUS accounting response message waiting using the **gprs gtp response-message wait-accounting** global configuration command, or the **response-message wait-accounting** access-point configuration command. |

### Example 2

The following is sample output of the **show gprs access-point address-allocation** command:

```
router# show gprs access-point 8 address-allocation

TID                     PDP_ADDRESS

1111111100000099        10.88.105.227
1111111100000191        10.88.105.7
1111111100000192        10.88.105.70
1111111100000297        10.88.106.162
1111111100000298        10.88.106.169
1111111100000299        10.88.106.161
1111111100000391        10.88.106.150
1111111100000392        10.88.106.25
1111111100000442        10.88.106.196
1111111100000443        10.88.106.197
1111111100000886        10.88.108.153
1111111100000887        10.88.108.158
2222222200000000        10.88.111.255
```

The following table describes the fields show in the display.

| Field | Description |
|---|---|
| TID | Tunnel ID for the PDP context request on the APN. |
| PDP_ADDRESS | IP address assigned to the PDP context request on the APN. |

### Example 3

The following is sample output of the **show gprs access-point all** command:

```
router# show gprs access-point all

There are 3 Access-Points configured

Index   Mode            Access-type    AccessPointName      VRF Name
```

```
------------------------------------------------------------------------
1       transparent        Real        corporate_1.com       corporate_1.com
        ppp-regeneration (max-session: 10000, setup-time: 60)
------------------------------------------------------------------------
2       non-transparent    Real        corporate_2.com
------------------------------------------------------------------------
3       transparent        Virtual     corporate_3.com
------------------------------------------------------------------------
```

The following table describes the fields show in the display.

| Field | Description |
|---|---|
| Index | Integer assigned to the access point in the GGSN configuration. The index number is used to reference an APN in GGSN commands. |
| Mode | Authorization configured on the access point. The possible values are:<br>• transparent—Users who access the PDN through the access point associated with the current virtual template are allowed access without authorization or authentication.<br>• non-transparent—Users who access the PDN through the current virtual template must be authenticated by the GGSN acting as a proxy for the authentication. |
| Access-type | Type of access point. The possible values are:<br>• Real—APN type that corresponds to an external physical network on the GGSN. This is the default value.<br>• Virtual—APN type that is not associated with any specific physical target network on the GGSN. Virtual APNs are used to simply HLR provisioning in the PLMN. |
| AccessPointName | Access point network ID, which is commonly an Internet domain name. |
| ppp-regeneration (max-session, setup-time) | PPP regeneration session parameters configured at the access point:<br>• max-session—Maximum number of PPP regenerated sessions allowed at the access point.<br>• setup-time—Maximum amount of time (between 1 and 65535 seconds) within which a PPP regenerated session must be established. |
| VRF Name | Name of the VPN routing and forwarding instance associated with the APN. |

## Related Commands

| Command | Description |
|---|---|
| **access-point** | Specifies an access point number and enters access-point configuration mode. |

# show gprs access-point statistics

To display data volume and PDP activation and deactivation statistics for access points on the GGSN, use the **show gprs access-point statistics** command in privileged EXEC mode.

**show gprs access-point statistics** {*access-point-index* | **all**}

## Syntax Description

| | |
|---|---|
| *access-point-index* | Index number of an access point. Statistics for that access point are shown. |
| **all** | Statistics for all access points on the GGSN are shown. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **show gprs access-point statistics** command to display data volume and PDP activation and deactivation statistics for access points on the GGSN.

Use the *access-point-index* argument to specify a particular access point number for which you want to obtain information.

Use the **all** keyword to obtain information about all access points in an abbreviated format.

## Examples

The following example displays PDP context activation and deactivation statistics for all access points on the GGSN:

```
router# show gprs access-point statistics all

There are 3 Access-Points activated

Index   Mode            Access-type    AccessPointName     VRF Name
--------------------------------------------------------------------------
1       transparent        Real       gprt.pdn.com
     ppp-regeneration (max-session: 10000, setup-time: 60)
     PDP activation initiated by MS:                 3
     Successful PDP activation initiated by MS:      3
     Dynamic PDP activation initiated by MS:         3
     Successful dynamic activation initiated by MS:  0
     PDP deactivation initiated by MS:               0
     Successful PDP deactivation initiated by MS:    0
     Network initiated PDP activation:               0
```

```
     Successful network initiated PDP activation:    0
     PDP deactivation initiated by GGSN:             1
     Successful PDP deactivation initiated by GGSN:  1
     active PDP:                                     3
     upstream data volume in octets:                 0
     downstream data volume in octets:               0
-------------------------------------------------------------
4       transparent         gprs.pdn.com
     PDP activation initiated by MS:                 1
     Successful PDP activation initiated by MS:      1
     Dynamic PDP activation initiated by MS:         0
     Successful dynamic activation initiated by MS:  0
     PDP deactivation initiated by MS:               0
     Successful PDP deactivation initiated by MS:    0
     Network initiated PDP activation:               0
     Successful network initiated PDP activation:    0
     PDP deactivation initiated by GGSN:             6
     Successful PDP deactivation initiated by GGSN:  6
     active PDP:                                     0
     upstream data volume in octets:                 0
     downstream data volume in octets:               0
-------------------------------------------------------------
5       transparent         gpru.pdn.com
     PDP activation initiated by MS:                 1
     Successful PDP activation initiated by MS:      1
     Dynamic PDP activation initiated by MS:         0
     Successful dynamic activation initiated by MS:  0
     PDP deactivation initiated by MS:               0
     Successful PDP deactivation initiated by MS:    0
     Network initiated PDP activation:               0
     Successful network initiated PDP activation:    0
     PDP deactivation initiated by GGSN:             0
     Successful PDP deactivation initiated by GGSN:  6
     active PDP:                                     0
     upstream data volume in octets:                 0
     downstream data volume in octets:               0
```

Table 9 describes the fields shown in the display:

***Table 9 show gprs access-point statistics Field Descriptions***

| Field | Description |
|---|---|
| active PDP | Number of PDP contexts that are currently established on the GGSN. |
| downstream data volume in octets | Number of bytes of data received by the GGSN from the PDN, or network. |
| Dynamic PDP activation initiated by MS | Number of Create PDP Context Request messages received by the GGSN from an MS without a PDP address. (Duplicate requests are not counted.) |
| Network initiated PDP activation | Number of Create PDP Context Request messages received by the GGSN from network initiation. |
| PDP activation initiated by MS | Number of Create PDP Context Request messages received by the GGSN from an SGSN. (Duplicate requests are not counted.) |
| PDP deactivation initiated by GGSN | Number of Delete PDP Context Request messages sent by the GGSN to an SGSN. |
| PDP deactivation initiated by MS | Number of Delete PDP Context Request messages received by the GGSN from an SGSN. (Duplicate messages are not counted.) |

*Table 9 show gprs access-point statistics Field Descriptions (continued)*

| Field | Description |
|---|---|
| ppp-regeneration (max-session, setup-time) | PPP regeneration session parameters configured at the access point:<br>• max-session—Maximum number of PPP regenerated sessions allowed at the access point.<br>• setup-time—Maximum amount of time (between 1 and 65535 seconds) within which a PPP regenerated session must be established. |
| Successful dynamic activation initiated by MS | Number of Create PDP Context Response messages sent by the GGSN with a cause value of "GTP_RES_REQACCEPTED", indicating that the PDP address has been dynamically assigned. |
| Successful network initiated PDP activation | Number of PDP contexts activated on the GGSN that were initiated by the network. |
| Successful PDP activation initiated by MS | Number of Create PDP Context Response messages sent by the GGSN with a cause value of "GTP_RES_REQACCEPTED." |
| Successful PDP deactivation initiated by GGSN | Number of Delete PDP Context Response messages received by the GGSN from an SGSN. |
| Successful PDP deactivation initiated by MS | Number of Delete PDP Context Response messages sent by the GGSN to an SGSN with a cause value of "GTP_RES_REQACCEPTED". |
| upstream data volume in octets | Number of bytes of data received by the GGSN from the SGSN. |

## Related Commands

| Command | Description |
|---|---|
| clear gprs access-point statistics | Clears statistics counters for a specific access point or for all access points on the GGSN. |
| show gprs access-point | Displays information about access points on the GGSN. |

# show gprs charging parameters

To display information about the current GPRS charging configuration, use the **show gprs charging parameters** command in privileged EXEC mode.

**show gprs charging parameters**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>The following output fields were added to the display:<br>• Charging CDR Option Local Record Sequence Number<br>• Charging CDR Option No Partial CDR Generation<br>• Charging CDR Option Node ID<br>• Charging CDR Option Packet Count<br>• Charging Change Condition Limit<br>• Charging Send Buffer Size<br>• Charging GTP' Port Number<br>• Charging MCC Code<br>• Charging MNC Code<br>• Charging Roamers CDR Only<br>• Charging HPLMN Matching Criteria<br>• Charging SGSN Limit<br>The following output fields were removed from the display:<br>• Charging MCC Code<br>• Charging MNC Code<br>• Charging HPLMN Matching Criteria |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was incorporated in the Cisco IOS Release 12.2(8)YW.<br>• The Charging Path Protocol field was changed from binary 0 and 1 to udp and tcp.<br>• The Charging qos-info output field was changed to Charging release.<br>• The following output fields were added to the display:<br>– Charging Time Limit<br>– Charging qos-info<br>– Charging Transfer Format.<br>– GTP' use short header |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(4)T | The changes introduced in Cisco IOS Release 12.2(4)MX and 12.2(8)YW were incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **show gprs charging parameters** command to display the currently active charging parameters for the GGSN.

## Examples

The following is sample output of the **show gprs charging parameters** command:

```
router# show gprs charging parameters

GPRS Charging Protocol Parameters
        ================================

* Default Charging Gateway Address:       <9.9.9.9>
* Default Backup Charging Gateway Address:UNDEFINED.
* Current Active Charging Gateway Address:<9.9.9.9>
* Current Backup Charging Gateway Address:UNDEFINED.
* Charging Server Switch-Over Timer:      <15> seconds.
* Charging Path Protocol:                 tcp
* GTP' use short header:                  DISABLED
* Charging Message Options:
   Transfer Request:
 - Packet Transfer Command IE:            ENABLED.
   Transfer Response:
 - Number Responded:                      DISABLED.
* Charging MAP DATA TOS:                  <3>
* Charging Transfer Interval:             <105> seconds.
* Charging Transfer Threshold:            <400> bytes.
* Charging CDR Aggregation Limit:         <255> CDRs per msg.
* Charging Packet Queue Size:             <128> messages.
* Charging Gateway Path Request Timer:    <1> Minutes.
* Charging Change Condition Limit:        <5>
* Charging SGSN Limit:                    DISABLED.
* Charging Time Limit:                    <3000>
* Charging Send Buffer Size:              <1460>
* Charging Port Number:                   <3386>
* Charging Roamers CDR Only:              DISABLED.
* Charging CDR Option:
 - Local Record Sequence Number:          DISABLED.
 - APN Selection Mode:                    DISABLED.
 - No Partial CDR Generation:             DISABLED.
```

```
 - Node ID:                                DISABLED.
 - Packet Count:                           DISABLED.
 - Served MSISDN:                          DISABLED.
 - Private Echo:                           DISABLED.
* Charging release:                        99
* Charging Tariff Time Changes:
 - Tariff Time Change (#0):               04:04:01
 - Tariff Time Change (#1):               17:00:00
 - Tariff Time Change (#2):               21:25:00
```

Table 10 describes the fields shown in the display.

***Table 10 show gprs charging parameters Field Descriptions***

| Field | Description |
|---|---|
| Charging CDR Aggregation Limit | Maximum number of CDRs that the GGSN aggregates in a charging data transfer message to the charging gateway.<br>You can configure this limit using the **gprs charging cdr-aggregation-limit** command. |
| Charging CDR Option: Local Record Sequence Number | Status indicating if the GGSN uses the local record sequence field in G-CDRs. The possible values are enabled or disabled.<br>You can enable the GGSN to use the local record sequence field in G-CDRs using the **gprs charging cdr-option local-record-sequence-number** command. |
| Charging CDR Option: APN Selection Mode | Status indicating if the GGSN provides the reason code for APN selection in G-CDRs. The possible values are enabled or disabled.<br>You can enable the GGSN to provide the APN selection mode in G-CDRs using the **gprs charging cdr-option apn-selection-mode** command. |
| Charging CDR Option: No Partial CDR Generation | Status indicating if the GGSN can create partial CDRs. The possible values are enabled or disabled.<br>You can disable partial CDR generation by the GGSN using the **gprs charging cdr-option no-partial-cdr-generation** command. |
| Charging CDR Option: Node ID | Status indicating if the GGSN specifies the name of the node that generated the CDR in the node ID field of the G-CDR. The possible values are enabled or disabled.<br>You can enable the GGSN to use the node ID field in G-CDRs using the **gprs charging cdr-option node-id** command. |
| Charging CDR Option: Packet Count | Status indicating if the GGSN provides uplink and downlink packet counts in the optional record extension field of a G-CDR. The possible values are ON or OFF.<br>You can enable the GGSN to provide packet counts using the **gprs charging cdr-option packet-count** command. |

*Table 10 show gprs charging parameters Field Descriptions (continued)*

| Field | Description |
|---|---|
| Charging CDR Option: Served MSISDN | Status indicating if the GGSN provides the mobile station integrated services digital network number from the create PDP context request in a G-CDR. The possible values are enabled or disabled.<br>You can enable the GGSN to provide the MSISDN number using the **gprs charging cdr-option served-msisdn** command. |
| Charging CDR Option: Private Echo | Status indicating if the GGSN uses private echo signaling for flow control. The possible values are enabled or disabled.<br>You can enable private echo signaling using the **gprs charging flow-control private-echo** command. |
| Charging Change Condition Limit | Maximum number of charging containers in each G-CDR.<br>You can configure the change condition limit using the **gprs charging container change-limit** command. |
| Charging Gateway Path Request Timer | Number of minutes that the GGSN waits before trying to establish the TCP path to the charging gateway when TCP is the specified path protocol.<br>You can configure the path request timer using the **gprs charging cg-path-requests** command. |
| Charging MAP DATA TOS | Type of service (ToS) priority currently configured for GPRS charging packets. Value (between 0 and 5) is set in the precedence bits of the IP header of charging packets.<br>You can configure the ToS mapping using the **gprs charging map data tos** command. |
| Charging Message Options: Transfer Request | Whether the GGSN includes the Packet Transfer Command IE in the Data Record Transfer Response messages.<br>The possible values are ENABLED (the GGSN includes the Packet Transfer Command IE) or DISABLED (the GGSN does not include the IE). |
| Charging Messages Options: Transfer Response | Whether the GGSN is using the Number of Requests Responded field instead or the Length field in the Requests Responded IE of Data Record Transfer Response messages.<br>The possible values are ENABLED (the GGSN uses the Number of Requests Responded field) or DISABLED (the GGSN uses the Length field). |
| Charging Packet Queue Size | Maximum number of unacknowledged charging data transfer requests that the GGSN maintains in its queue.<br>You can configure the maximum queue size using the **gprs charging packet-queue-size** command. |

*Table 10 show gprs charging parameters Field Descriptions (continued)*

| Field | Description |
|---|---|
| Charging Path Protocol | Protocol in use between the GGSN and the charging gateway. The possible values are udp or tcp.<br>You can configure the charging path protocol using the **gprs charging path-protocol** command. |
| Charging Port Number | Destination port of the charging gateway.<br>You can configure the destination port using the **gprs charging port** command. |
| Charging release | Whether UMTS (R99) and GSM (R97/R98) QoS profile formats are presented in G-CDRs. The possible values are 99 (GSM and UMTS QoS profile formats are presented) or 98 (only GSM QoS profile formats are presented).<br>You can configure the type of QoS profile format to be included using the **gprs charging release** command. |
| Charging Roamers CDR Only | Status of the charging for roamers feature on the GGSN. The possible values are enabled or disabled.<br>You can configure the GGSN to support creation of CDRs for roaming subscribers using the **gprs charging roamers** command. |
| Charging Send Buffer Size | Size (in bytes) of the buffer that contains the GTP' PDU and signaling messages on the GGSN.<br>You can configure the buffer size using the **gprs charging send-buffer** command. |
| Charging Server Switch-Over Timer | Amount of time (in seconds) that the GGSN waits before sending charging data to the backup charging gateway, after the active charging gateway fails.<br>You can configure this period of time using the **gprs charging server-switch-timer** command. |
| Charging SGSN Limit | Maximum number of SGSN changes that can occur before the GGSN closes a G-CDR for a particular PDP context. |
| Charging Tariff Time Changes | Time of day when GPRS charging tariffs change.<br>You can configure this time using the **gprs charging tariff-time** command. |
| Charging Transfer Interval | Amount of time (in seconds) that the GGSN waits before checking and sending any closed CDRs to the charging gateway.<br>You can configure this period of time using the **gprs charging transfer interval** command. |

*Table 10 show gprs charging parameters Field Descriptions (continued)*

| Field | Description |
|---|---|
| Charging Transfer Threshold | Maximum size (in bytes) that the GGSN maintains in a charging container before closing it and updating the CDR.<br>You can configure the container volume using the **gprs charging container volume-threshold** command. |
| Current Active Charging Gateway Address | IP address of the charging gateway to which the GGSN is currently sending charging data.<br>You can configure the primary charging gateway using the **gprs default charging-gateway** command. |
| Current Backup Charging Gateway Address | IP address of the backup charging gateway to which the GGSN will send charging data if the current active charging gateway becomes unavailable.<br>You can configure the backup charging gateway using the **gprs default charging-gateway** command. |
| Default Backup Charging Gateway Address | IP address of the default secondary, or backup, charging gateway.<br>You can configure the default backup charging gateway using the **gprs default charging-gateway** command. |
| Default Charging Gateway Address | IP address of the default primary charging gateway.<br>You can configure the default primary charging gateway using the **gprs default charging-gateway** command. |
| GTP' use short header | Whether the GGSN is using the GTP short header (6-byte header). The possible values are ENABLED (the GGSN is using the GTP short header) or DISABLED (the GGSN is using the GTP long header).<br>You can configure the GGSN to use the GTP short header using the **gprs charging header short** command. |

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging statistics** | Displays cumulative charging statistics for the GGSN. |

# show gprs charging statistics

To display cumulative charging statistics for the GGSN, use the **show gprs charging statistics** privileged EXEC command.

**show gprs charging statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the statistics were changed to be cumulative since the last restart of the GGSN and the keyword options were removed. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs charging statistics** command to display cumulative charging statistics since the last restart of the GGSN.

## Examples

The following is sample output of the **show gprs charging statistics** command:

```
router# show gprs charging statistics all
            GPRS Charging Protocol Statistics
            =================================

   * Total Number of CDRs for Charging:             <200>
   * Total Number of Containers for Charging:       <104>
   * Total Number of CDR_Output_Msgs sent:          <22>

   -- Charging Gateway Statistics --
   * Charging Gateway Down Count:                   <1>
   * Last Charging Gateway Down Time = 2001/11/29 15:23:0
```

Table 11 describes the fields shown in the display.

*Table 11 show gprs charging statistics Field Descriptions*

| Field | Description |
|---|---|
| Total Number of CDRs for Charging | Cumulative number of open and closed G-CDRs on the GGSN since the last startup of the GGSN. |
| Total Number of Containers for Charging | Cumulative number of all open and closed charging containers for all G-CDRs on the GGSN since the last startup of the GGSN. |
| Total Number of CDR_Output_Msgs sent | Cumulative number of G-CDR output messages that the GGSN sent to the charging gateway and received acknowledgment for since the last startup of the GGSN. |
| Charging Gateway Down Count | Number of times that the charging gateway has transitioned its state (from up or unknown, to down) since the last startup of the GGSN. |
| Last Charging Gateway Down Time | Recorded system time when the charging gateway was last in a down state. This statistics only appears if a charging gateway has been down. |

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |
| show gprs charging status | Displays current statistics about the transfer of charging packets between the GGSN and charging gateways. |

# show gprs charging status

To display current statistics about the transfer of charging packets between the GGSN and charging gateways, use the **show gprs charging status** privileged EXEC command.

**show gprs charging status** {**tid** *tunnel_id* | **access-point** *access-point-index* | **all**}

## Syntax Description

| | |
|---|---|
| **tid** *tunnel_id* | Specifies a tunnel ID for which you want to display charging statistics. |
| **access-point** *access-point-index* | Specifies the index of the access point for which you want to display charging statistics. |
| **all** | Requests display of all charging statistics. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the Number of partial CDRs output field was changed to the Number of closed CDRs buffered. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs charging status** command to display current statistics for the transfer of charging packets between the GGSN and charging gateways since the last G-CDR was sent.

## Examples

### Example 1

The following is sample output of the **show gprs charging status tid** command:

```
router# show gprs charging status tid 1231231111111100
                   GPRS Charging Protocol Status for TID
                   =====================================

           * Number of CDRs :                              <1>
           * Number of closed CDRs buffered:               <0>
           * Number of Containers:                         <0>
```

Table 12 describes the fields shown in the display.

*Table 12 show gprs charging status tid Field Descriptions*

| Field | Description |
|---|---|
| Number of CDRs | Number of currently open and closed G-CDRs on the GGSN for the specified TID, since the last G-CDR was successfully sent to the charging gateway. |
| Number of closed CDRs buffered | Number of currently closed G-CDRs that the GGSN has not yet sent to the charging gateway for the specified TID. |
| Number of Containers | Number of all currently open and closed charging containers for the specified TID, since the last G-CDR was successfully sent to the charging gateway. |

### Example 2

The following is sample output of the **show gprs charging status access-point** command:

```
router# show gprs charging status access-point 1

                    GPRS Charging Protocol Status for APN
                    =====================================

           * Number of CDRs:                                <96>
           * Number of closed CDRs buffered:                <0>
           * Number of Containers:                          <0>
```

Table 13 describes the fields shown in the display.

*Table 13 show gprs charging status access-point Field Descriptions*

| Field | Description |
|---|---|
| Number of CDRs | Number of currently open and closed G-CDRs on the GGSN for the specified access point, since the last G-CDR was successfully sent to the charging gateway. |
| Number of closed CDRs buffered | Number of currently closed G-CDRs that the GGSN has not yet sent to the charging gateway for the specified access point. |
| Number of Containers | Number of all currently open and closed charging containers for the specified access point, since the last G-CDR was successfully sent to the charging gateway. |

### Example 3

The following is sample output of the **show gprs charging status all** command:

```
router# show gprs charging status all
             GPRS Charging Protocol Status
             =============================

    * Number of APNs :                              <1>
    * Number of CDRs :                              <96>
    * Number of closed CDRs buffered:               <0>
    * Number of Containers buffered:                <0>
    * Number of pending unack. CDR_Output_Msgs:     <1>
```

Table 14 describes the fields shown in the display.

*Table 14 show gprs charging status Field Descriptions*

| Field | Description |
|---|---|
| Number of APNs | Number of access points for which charging data has currently been collected. This statistic appears in the **all** version of this command only. |
| Number of CDRs | Number of currently open and closed G-CDRs on the GGSN since the last G-CDR was successfully sent to the charging gateway. For the **tid** and **access-point** versions of this command, this is the number of currently open and closed G-CDRs for the specified TID or access point. |
| Number of closed CDRs buffered | Number of currently closed G-CDRs that the GGSN has not yet sent to the charging gateway. For the **tid** and **access-point** versions of this command, this is the number of currently closed G-CDRs for the specified TID or access-point that have not yet been sent to the charging gateway. |
| Number of Containers buffered | Number of all currently open and closed charging containers since the last G-CDR was successfully sent to the charging gateway. |
| Number of pending unack. CDR_Output_Msgs | Number of G-CDR output messages sent by the GGSN that are not acknowledged by the charging gateway. |

## Related Commands

| Command | Description |
|---|---|
| **show gprs charging parameters** | Displays information about the current GPRS charging configuration. |
| **show gprs charging statistics** | Displays cumulative charging statistics for the GGSN. |

# show gprs gtp ms

To display the currently active MSs on the GGSN, use the **show gprs gtp ms** privileged EXEC command.

**show gprs gtp ms** {**imsi** *imsi*| **access-point** *access-point-index* | **all**}

## Syntax Description

| | |
|---|---|
| **imsi** *imsi* | Displays MSs by International Mobile Subscriber Identity (IMSI). The IMSI can be up to 15 numeric digits. You can obtain the IMSI from the output for the **show gprs gtp ms all** command or the **show gprs gtp pdp-context tid** command. |
| **access-point** *access-point-index* | Displays MSs by access point. |
| **all** | Displays all MSs. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB.<br>• The MS Addr field was updated to reflect the virtual interface identifier for PPP PDP contexts and the status of PPP PDP with L2TP contexts.<br>• The SGSN MCC/MNC field was added |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs gtp ms** command to display information about the mobile stations that are currently active on the GGSN. You can display the MS information according to access-point or IMSI. You can also display information for all MSs.

## Examples

The following example displays information for all MSs:

```
router# show gprs gtp ms all
IMSI               SGSN MCCMNC     MS ADDRESS      APN
112233445565437    12345           10.3.0.1        gprsa.apn.com

223456788765437    67891           10.2.0.1 (Vi5)  gprsb.apn.com
```

The following example displays information for all MSs on access-point 1:

```
router# show gprs gtp ms access-point 1
IMSI                    SGSN MCCMNC    MS ADDRESS      APN
112233445565437         12345          10.3.0.1        gprsa.apn.com
```

The following example displays information for all MSs on IMSI 110406080002045:

```
router# show gprs gtp ms imsi 110406080002045
IMSI              SGSN MCCMNC     MS ADDRESS      APN
110406080002045   12345           10.10.10.2      gprsc.apn.com

 number of pdp:2
 reference count:1
```

Table 15 describes the fields shown in the display.

***Table 15 show gprs gtp ms Field Descriptions***

| Field | Description |
|---|---|
| IMSI | International mobile subscriber identity for the MSs. |
| MS ADDRESS | The IP address for the MSs.<br>**Note** For PPP PDP contexts, this field will also display the virtual interface identifier. For PPP PDP with L2TP contexts, this field will also display the state of the PDP context. Possible states are Pending, Forwarded, or Terminating. |
| APN | Access point name. |
| number of pdp | Number of PDP contexts on the MSs. |
| reference count | Internal data structure field. It is used only for internal troubleshooting purposes. |
| SGSN MCCMNC | MCC/MNC of the SGSN. |

## Related Commands

| Command | Description |
|---|---|
| **show gprs gtp pdp-context** | Displays a list of the currently active PDP contexts (mobile sessions). |
| **show gprs gtp status** | Displays information about the current status of the GTP on the GGSN (such as activated PDP contexts, throughput, and QoS statistics). |

# show gprs gtp parameters

To display information about the current GPRS Tunneling Protocol (GTP) configuration on the GGSN, use the **show gprs gtp parameters** privileged EXEC command.

**show gprs gtp parameters**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>The following output fields were added to the display:<br>• Charging MCC Code<br>• Charging MNC Code<br>• Charging HPLMN Matching Criteria<br>• GTP dynamic echo-timer minimum<br>• GTP dynamic echo-timer smooth factor<br>The following output field was removed:<br>• GTP max hold time for old sgsn PDUs T3_tunnel |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the following output field was removed from the display:<br>• GPRS HPLMN Matching Criteria |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs gtp parameters** command to display the current GTP parameters configured on the GGSN.

## Examples

The following is sample output of the **show gprs gtp parameters** command:

```
router# show gprs gtp parameters
    GTP path echo interval                        = 60
```

```
GTP signal max wait time T3_response          = 1
GTP max retry N3_request                      = 5
GTP dynamic echo-timer minimum                = 5
GTP dynamic echo-timer smooth factor          = 2
GTP buffer size for receiving N3_buffer       = 8192
GTP max pdp context                           = 45000
GPRS MCC Code                                 = 310
GPRS MNC Code                                 = 15
```

Table 16 describes the fields shown in the display.

***Table 16 show gprs gtp parameters Field Descriptions***

| Field | Description |
|---|---|
| GPRS MCC Code | Mobile country code (MCC) that the GGSN uses in conjunction with the mobile network node to determine whether a create PDP context request is from a roamer.<br>You can configure the MCC using the **gprs mcc mnc** command. |
| GPRS MNC Code | Mobile network node (MNC) that the GGSN uses in conjunction with the mobile country code to determine whether a create PDP context request is from a roamer.<br>You can configure the MNC using the **gprs mcc mnc** command. |
| GTP buffer size for receiving N3_buffer | Current size of the receive buffer (in bytes) that the GGSN uses to receive GTP signaling messages and packets sent through the tunneling protocol.<br>You can configure the N3 buffer using the **gprs gtp n3-buffer-size** command. |
| GTP dynamic echo-timer minimum | Current minimum time period (in seconds) used by the dynamic echo timer.<br>You can configure the minimum value using the **gprs gtp echo-timer dynamic minimum** command. |
| GTP dynamic echo-timer smooth factor | Current multiplier used by the GGSN to calculate the T-dynamic for the dynamic echo timer.<br>You can configure the smooth factor using the **gprs gtp echo-timer dynamic smooth-factor** command. |
| GTP max pdp context | Current maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN.<br>You can configure the maximum number of PDP context requests using the **gprs maximum-pdp-context-allowed** command. |
| GTP max retry N3_request | Maximum number of times that the GGSN attempts to send a signaling request to an SGSN.<br>You can configure the maximum number of signaling requests made by the GGSN using the **gprs gtp n3-requests** command. |

*Table 16 show gprs gtp parameters Field Descriptions (continued)*

| Field | Description |
|---|---|
| GTP path echo interval | Interval, in seconds, that the GGSN waits before sending an echo-request message to the SGSN.<br>You can configure the path echo interval using the **gprs gtp path-echo-interval** command. |
| GTP signal max wait time T3_response | Interval, in seconds, that the GGSN waits before responding to a signaling request message.<br>You can configure the maximum interval using the **gprs gtp t3-response** command. |

## Related Commands

| Command | Description |
|---|---|
| show gprs gtp statistics | Displays the current GTP statistics for the GGSN (such as IE, GTP signaling, and GTP PDU statistics). |
| show gprs gtp status | Displays information about the current status of the GTP on the GGSN (such as activated PDP contexts, throughput, and QoS statistics). |

# show gprs gtp path

To display information about one or more GTP paths between the GGSN and other GPRS devices, use the **show gprs gtp path** privileged EXEC command.

**show gprs gtp path** {**remote-address** *ip-address* [*remote-port-num*] | **version** *gtp-version* | **all**}

## Syntax Description

| | |
|---|---|
| **remote-address** *ip-address* [*remote_port_num*] | Displays GTP path information for a specified remote IP address. Optionally, displays GTP path information for a specified remote IP address and port number. |
| **version** *gtp-version* | Displays the GTP paths by the GTP version (0 or 1). |
| **all** | Displays information for all GTP paths. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the following output field was added to the display:<br>• Dynamic echo timer |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in Cisco IOS Release 12.2(8)YW.<br>• The **version** keyword option and the option to display GTP path information for a remote IP address and remote port number were added.<br>• The GTP version output field was added to the display. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs gtp path** command to display information about one or more GTP paths from the GGSN.

## Examples

### Example 1

The following example shows the output for the GTP path to the remote device with an IP address of 10.49.85.100:

```
router# show gprs gtp path 10.49.85.100
Local address       Remote address          GTP version         Dynamic echo timer
10.10.10.1(2123)    10.49.85.100(2123)      1                        5
10.10.10.1(2152)    10.49.85.100(2152)      1                        5
```

### Example 2

The following example shows the output for the GTP path to the remote device with an IP address of 10.49.85.100 and remote port number 2123:

```
router# show gprs gtp path 10.49.85.100 2123
Local address       Remote address          GTP version         Dynamic echo timer
10.10.10.1(2123)    10.49.85.100(2123)      1                        5
```

### Example 3

The following example shows the output for all paths on the GGSN that are using GTP version 1:

```
router# show gprs gtp path version 1
Local address       Remote address          GTP version         Dynamic echo timer
10.10.10.1(3386)    10.49.85.100(3386)      1                        5
10.10.10.1(3386)    10.7.7.7(3386)          1                        2
```

### Example 4

The following example shows the output for all GTP paths on the GGSN:

```
router# show gprs gtp path all
Total number of path : 3
Local address       Remote address          GTP version         Dynamic echo timer
10.10.10.1(3386)    10.49.85.100(3386)      1                        Disabled
10.10.10.1(3386)    10.1.1.1(3386)          0                        2
10.10.10.1(3386)    10.7.7.7(3386)          1                        5
```

Table 17 describes the fields shown in the display.

***Table 17 show gprs gtp path Field Descriptions***

| Field | Description |
|---|---|
| Total number of path | Total number of GTP paths currently established. |
| Dynamic echo timer | Current setting (in seconds) for the dynamic echo timer. “Disabled” appears when the dynamic echo timer is not in use. |
| Local address | IP address and port number for the local end of the GTP path. |
| Remote address | IP address and port number for the remote end of the GTP path, such as the address of the SGSN. |
| GTP version | Version of the GTP protocol (version 0 or 1) supported by the path. |

# show gprs gtp pdp-context

To display a list of the currently active PDP contexts (mobile sessions), use the **show gprs gtp pdp-context** privileged EXEC command.

**show gprs gtp pdp-context** {**tid** *tunnel_id* | **ms-address** *ip_address* [**apn-index** *access-point-index*] | **imsi** *imsi* [**nsapi** *nsapi* [**tft**]] | **path** *ip-address* [*remote-port-num*] | **access-point** *access-point-index* | **pdp-type** {**ip** | **ppp**} | **qos-umts-class** {**background** | **conversational** | **interactive** | **streaming**} | **qos** {**precedence** {**low** | **normal** | **high**} | **qos-delay** {**class1** | **class2** | **class3** | **classbesteffort**} | **version** *gtp-version*} | **all**}

## Syntax Description

| | |
|---|---|
| **tid** *tunnel_id* | Displays PDP contexts by tunnel ID. This value corresponds to the IMSI plus NSAPI and can be up to 16 numeric digits. |
| **ms-address** *ip_address* | Displays PDP contexts for the specified mobile station IP address (in dotted-decimal format). |
| **apn-index** *access-point-index* | (Optional) Displays PDP contexts for the specified mobile station IP address at a particular access point. This option is required to display mobile stations that are accessing a private VPN. |
| **imsi** *imsi* | Displays PDP contexts by International Mobile Subscriber Identity (IMSI). The IMSI value can be up to 15 numeric digits. |
| **nsapi** *nsapi* [**tft**] | (Optional) Displays a particular PDP context by Network Service Access Point Identifier (NSAPI) for the specified IMSI. Optionally, displays the traffic flow template (TFT) filters associated with the NSAPI. |
| **path** *ip-address* [*remote_port_num*] | Displays PDP contexts by path. Optionally, displays PDP contexts by remote IP address and port number. |
| **access-point** *access-point-index* | Displays PDP contexts by access point. Possible values are 1 to 65535. |
| **pdp-type** {**ip** \| **ppp**} | Displays PDP contexts that are transmitted using either IP or PPP. |
| **qos-umts-class** | Displays PDPs by UMTS QoS traffic class. You can specify the following traffic classes: **background**, **conversational**, **interactive**, and **streaming**. This option is available when UMTS QoS is enabled. |
| **qos-precedence** | Displays PDP contexts for a specified GPRS QoS precedence type. You can specify the following precedence types: **low**, **normal**, and **high**. This option is available when GPRS QoS canonical QoS is enabled. |
| **qos-delay** | Displays PDP contexts for a specified GPRS quality of service delay class type. You can specify the following delay class types: **class1**, **class2**, **class3**, and **classbesteffort**. This option is available when GPRS QoS delayed-based QoS is enabled. |
| **version** *gtp-version* | Displays PDP contexts by GTP version. The possible values are 0 or 1. |
| **all** | Displays all PDP contexts. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated into Cisco IOS Release 12.1(5)T. |
| 12.2(1) | The MS International PSTN/ISDN Number (MSISDN) field was added to the output display. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX.<br>• The **pdp-type ppp** and **qos-delay** options were added to the command.<br>• The following fields were added to the output display of the **tid** version of this command:<br>– cef_down_byte<br>– cef_down_pkt<br>– cef_drop<br>– cef_up_byte<br>– cef_up_pkt<br>– gtp pdp idle time<br>• The Network Init Information section was added to the output display of the **tid** version of this command with the following new fields:<br>– Buf.Bytes<br>– MNRG Flag<br>– NIP State<br>– PDU Discard Flag<br>– SGSN Addr<br>• The following fields were removed from the output display of the **tid** version of this command:<br>– fast_up_pkt<br>– fast_up_byte<br>– fast_down_pkt<br>– fast_down_byte<br>– fast_drop<br>• The “dynamic?” and “Dynamic” fields were removed from the output display of the **all** and **tid** versions of this command, and were replaced by the Source field. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD and the following fields were added to the output display of the **tid** version of this command:<br>• primary dns<br>• secondary dns<br>• primary nbns<br>• secondary nbns |

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was incorporated in the 12.2(8)YW.<br>• The the option of displaying PDP contexts by remote IP address and port number was added.<br>• The delay Qos class(req.) output field was added to the display of the **tid** version of this command when the mapping of GPRS QoS categories to delay QoS classes is enabled.<br>• The **ms-address**, **imsi**, **qos-umts-class** and **version** options were added to the command.<br>• The ggsn_addr_signal field was changed to the sgsn_addr_data in the output display of the **tid** version of this command.<br>• The following fields were added to the output display of the **tid** version of this command:<br>– control teid local<br>– control teid remote<br>– data teid local<br>– data teid remote<br>– primary pdp<br>– nsapi |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB and the MS Addr field updated to reflect the virtual interface identifier for PPP PDP and PPP-REGEN contexts and the status of PPP PDP with L2TP contexts. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T and the Framed-route and mask fields were added. |

## Usage Guidelines

Use the **show gprs gtp pdp-context** command to display the currently active PDP contexts on the GGSN. You can display PDP contexts by tunnel ID, by IMSI, by access point, by PDP type, and by GPRS QoS precedence, UMTS QoS traffic class, or you can display all PDP contexts.

Several versions of the **show gprs gtp pdp-context** command display similar output. The examples provided show these two different types of output.

### Interpreting the Effective Bandwidth

Example 2 provides sample output from the **show gprs gtp pdp-context tid** command, which includes the field called effective bandwidth (in bps). The effective bandwidth is determined according to the GPRS QoS canonical QoS class (premium, normal, or best effort) for the PDP context; it does not represent the actual bandwidth in use by the PDP context. The potential number of supported PDP contexts for that class of QoS can then be calculated according to the total amount of bandwidth (GSN resource) available to the GGSN.

For more information about GPRS QoS canonical QoS and resources on the GGSN, see the "Configuring QoS on the GGSN" chapter in the *Cisco IOS Mobile Wireless Configuration Guide*.

## Examples

### Example 1

The following is sample output of the **show gprs gtp pdp-context all** command:

```
router# show gprs gtp pdp-context all
TID              MS Addr         Source  SGSN Addr       APN
1234567890123456 10.11.1.1       Radius  10.4.4.11       www.pdn1.com
2345678901234567 Forwarded (Vi5) IPCP    10.4.4.11       www.pdn2.com
3456789012345678 10.21.1.1 (Vi7) IPCP    10.1.4.11       www.pdn3.com
4567890123456789 10.31.1.1 (Vi9) IPCP    10.1.4.11       www.pdn4.com
5678901234567890 10.41.1.1       Static  10.4.4.11       www.pdn5.com
```

**Note** The same output fields shown in Example 1 also appear when you use the **access-point**, **path**, **pdp-type**, **qos-delay**, or **qos-precedence** keyword options of the **show gprs gtp pdp-context** command.

The following table describes the fields shown in the display.

| Field | Description |
|---|---|
| APN | Access point name where the PDP context is active. |
| MS Addr | IP address of the mobile station.<br>**Note** For PPP PDP and PPP-REGEN contexts, this field will also display the virtual interface identifier. For PPP PDP with L2TP contexts, this field will also display the state of the PDP context. Possible states are Pending, Forwarded, or Terminating. |
| SGSN Addr | IP address of the SGSN that is processing the packets. |
| Source | Source of IP addressing for the MS. The possible values are:<br>• DHCP—Dynamic address allocation using DHCP.<br>• IPCP—Dynamic address allocation for PPP PDP types, or for IP PDP types with PPP regeneration, using PPP IP Control Protocol.<br>• Pending—Waiting for dynamic address allocation. Dynamic address source is unknown.<br>• Radius—Dynamic address allocation using RADIUS.<br>• Static—IP address is not dynamically assigned. |
| TID | Tunnel ID for the PDP context. |

### Example 2

The following is sample output from the **show gprs gtp pdp-context tid** command for a PDP context created by GTP version 1 and GPRS QoS canonical QoS is configured:

```
router#show gprs gtp pdp-context tid 1111111111111111
TID              MS Addr         Source  SGSN Addr       APN
1111111111111111 10.1.1.1        Radius  10.8.8.1        dns.com

    current time :Mar 18 2002 11:24:36
    user_name (IMSI):1111111111111111   MS address:10.1.1.1
```

```
MS International PSTN/ISDN Number (MSISDN):ABC
sgsn_addr_signal:10.8.8.1           sgsn_addr_data:10.8.0.1
control teid local: 0x63493E0C
control teid remove: 0x00000121
data teid local:  0x63483E10
data teid remote:  0x00000121
primary pdp: Y      nsapi: 0
signal_sequence: 0                  seq_tpdu_up:     0
seq_tpdu_down:   0
upstream_signal_flow:  1            upstream_data_flow:  2
downstream_signal_flow:14           downstream_data_flow:12
RAupdate_flow:         0
pdp_create_time:  Mar 18 2002 09:58:39
last_access_time: Mar 18 2002 09:58:39
mnrgflag:         0                 tos mask map:00
gtp pdp idle time:72
gprs qos_req:091101               canonical Qos class(req.):01
gprs qos_neg:25131F               canonical Qos class(neg.):01
effective bandwidth:0.0
rcv_pkt_count:     0              rcv_byte_count:  0
send_pkt_count:    0              send_byte_count: 0
cef_up_pkt:        0              cef_up_byte:    0
cef_down_pkt:      0              cef_down_byte:  0
cef_drop:           0
Src addr violation:            2 paks,     1024 bytes
Dest addr violation:           2 paks,     1024 bytes
Redirected mobile-to-mobile traffic:  2 paks,     1024 bytes
charging_id:        29160231
pdp reference count:2
primary dns:        2.2.2.2
secondary dns:      4.4.4.4
primary nbns:       3.3.3.3
secondary nbns:     5.5.5.5
ntwk_init_pdp:      0
Framed_route 5.5.5.0 mask 255.255.255.0

** Network Init Information **
MNRG Flag: 0                PDU Discard Flag: 0
SGSN Addr: 172.16.44.1      NIP State:        NIP_STATE_WAIT_PDP_ACTIVATION
Buf.Bytes: 500
```

Table 18 describes the fields shown in the display.

**Note** The Network Init Information section of the output appears only while network-initiated PDP contexts are being processed by the GGSN.

**Note** The same output fields shown in Example 2 also appear when you use the **imsi** keyword option of the **show gprs gtp pdp-context** command.

*Table 18 show gprs gtp pdp-context tid Field Descriptions*

| Field | Description |
|---|---|
| APN | Access point name where the PDP context is active. |
| canonical Qos class (neg.) | Negotiated canonical quality of service class for the PDP context, with the following values:<br>• 01—Best effort<br>• 02—Normal<br>• 03—Premium<br>This field displays when GPRS QoS canonical QoS is enabled on the GGSN. |
| canonical Qos class (req.) | Requested GPRS canonical QoS class by the PDP context, with the following values:<br>• 01—Best effort<br>• 02—Normal<br>• 03—Premium<br>This field displays when GPRS QoS canonical QoS is enabled on the GGSN. |
| cef_down_byte | Total number of G-PDU bytes CEF switched on the downlink, from the GGSN to the SGSN. |
| cef_down_pkt | Total number of G-PDU packets CEF switched on the downlink, from the GGSN to the SGSN. |
| cef_drop | Total number of G-PDU packets dropped during CEF switching. |
| cef_up_byte | Total number of G-PDU bytes CEF switched on the uplink, from the SGSN to the GGSN. |
| cef_up_pkt | Total number of G-PDU packets CEF switched on the uplink, from the SGSN to the GGSN. |
| charging_id | Unique 4-octet value generated by the GGSN for the PDP context. The value 0 is reserved. |
| control teid local | Uplink tunnel endpoint identifier (TEID) chosen by the GGSN for control plane messages.<br>This field displays for PDP contexts created with GTP version 1. |
| control teid remote | Downlink TEID chosen by the SGSN for control plane messages.<br>This field displays for PDP contexts created with GTP version 1. |
| current time | Date and time of the show command output. |
| data teid local | Uplink TEID chosen by the GGSN for G-PDUs.<br>This field displays for PDP contexts created with GTP version 1. |
| data teid remote | Downlink TEID chosen by the SGSN for PDUs.<br>This field displays for PDP contexts created with GTP version 1. |

*Table 18 show gprs gtp pdp-context tid Field Descriptions (continued)*

| Field | Description |
|---|---|
| Dest addr violation | Number of packets (and bytes) dropped by the GGSN because of a source address violation.<br>This field displays only when the **security verify destination** command is configured.<br>**Note** This field does not apply to APNs using VRF. In addition, verification of destination addresses does not apply to GTP-PPP regeneration or GTP-PPP with L2TP. |
| downstream_data_flow | Flow label of downlink G-PDUs. |
| downstream_signal_flow | Flow label of downlink signaling messages. |
| effective bandwidth | Estimated number of bits per second allocated by the GGSN for this PDP context. The effective bandwidth is determined according to the QoS class (premium, normal, or best effort) for the PDP context. The potential number of supported PDP contexts for that class of QoS can be calculated according to the total amount of bandwidth (GSN resource) available to the GGSN.<br>This field displays when canonical QoS is enabled on the GGSN.<br>**Note** The effective bandwidth does not represent actual bandwidth usage. |
| Framed_route | Framed-Route, attribute 22, for the PDP context, downloaded from the RADIUS server during authentication and authorization. |
| gprs qos_neg | Negotiated quality of service for the PDP context. The field is in the format *vwxyzz*, which represents the following QoS classes (as defined in the GSM specifications for quality of service profiles):<br>• *v*—Delay class<br>• *w*—Reliability class<br>• *x*—Peak throughput class<br>• *y*—Precedence class<br>• *zz*—Mean throughput class<br>**Note** To determine the GPRS QoS attributes shown in this output, you must convert the value to binary and interpret the values to find the corresponding class attributes. Some of the bits represent "don't care" bits and are not interpreted as part of the final value. For more information about how to interpret this value, see the "Interpreting the Requested and Negotiated GPRS QoS" section of the "Configuring QoS" chapter in the *Cisco IOS Mobile Wireless Configuration Guide*. |

*Table 18 show gprs gtp pdp-context tid Field Descriptions (continued)*

| Field | Description |
|---|---|
| gprs qos_req | Requested quality of service by the PDP context. The field is in the format *vwxyzz*, which represents the following QoS classes (as defined in the GSM specifications for GPRS QoS profiles):<br>• *v*—Delay class<br>• *w*—Reliability class<br>• *x*—Peak throughput class<br>• *y*—Precedence class<br>• *zz*—Mean throughput class<br>**Note** See the Note in the description of the gprs qos_neg output field above. |
| gtp pdp idle time | Current setting for the **gprs idle-pdp-context purge-timer** command, unless the **session idle-time** command is configured. Indicates the amount of idle time (in hours) allowed before PDP contexts are deleted. |
| last_access_time | Time when the PDP context for this TID was last accessed. The date format is MMM DD YYYY. The time format is hours:minutes:seconds.<br>When a signaling packet or data packet for a PDP context arrives on the GGSN, the last_access_time is reset to the current date and time. If the last_access_time exceeds the purge timer for idle PDP contexts, then the PDP context is purged by the GGSN. |
| mask | Framed-Route subnet. |
| mnrgflag | Mobile not reachable flag, with the following values:<br>• 0—flag is off.<br>• 1—flag is on, indicating that the MS is not reachable |
| MS_ADDR and MS Address | IP address of the mobile station.<br>**Note** For PPP PDP and PPP-REGEN contexts, this field will also display the virtual interface identifier. For PPP PDP with L2TP contexts, this field will also display the state of the PDP context. Possible states are Pending, Forwarded, or Terminating. |
| MS International PSTN/ISDN Number (MSISDN) | Integrated Services Digital Network (ISDN) number of the mobile station. |
| nsapi | Network Service Access Point Identifier (NSAPI).<br>This field displays for PDP contexts created with GTP version 1. |
| ntwk_init_pdp | Network initiated PDP context indicator, with the following values:<br>• 0—Not a network initiated PDP context. This indicates a mobile initiated PDP context.<br>• 1—Network initiated PDP context |

*Table 18 show gprs gtp pdp-context tid Field Descriptions (continued)*

| Field | Description |
|---|---|
| pdp_create_time | Time when the PDP context for this TID was created. The date format is MMM DD YYYY. The time format is hours:minutes:seconds. |
| pdp reference count | Number of subsystems on the GGSN that are aware of the PDP context. For example, if both the charging and GTP subsystems are aware of the PDP context, then the pdp reference counter shows a value of 2. |
| primary dns | IP address of the primary DNS server. |
| primary nbns | IP address of the primary NetBIOS Name Service (NBNS). |
| primary pdp | Whether the PDP is primary or secondary. Possible values are Y (PDP is primary) or N (PDP is secondary).<br>This field displays for PDP contexts created with GTP version 1. |
| RAupdate_flow | Flow Label Data II information element in GTP header. This IE contains the flow label for data transmission between old and new SGSNs for a particular PDP context. This IE is requested by the new SGSN. |
| rcv_byte_count | Total number of G-PDU bytes received. For the GGSN, this is the total byte count on the uplink. |
| rcv_pkt_count | Total packet count of received G-PDUs. For the GGSN, this is the total byte count on the uplink. |
| Redirected mobile-to-mobile traffic | Number of packets (and bytes) dropped at the APN from which they exit because mobile-to-mobile traffic has been redirected. This field displays only when the **redirect intermobile ip** command is configured. |
| secondary dns | IP address of the secondary DNS server. |
| secondary nbns | IP address of the secondary NBNS. |
| send_byte_count | Total number of G-PDU bytes sent by the GSN (GGSN or SGSN D-node). |
| send_pkt_count | Total number of G-PDU packets sent by the GSN (GGSN or SGSN D-node). |
| seq_tpdu_down | Last sequence number used in the downlink T-PDU. This number wraps to 0 after 65535. |
| seq_tpdu_up | Last sequence number used in the uplink T-PDU. This number wraps to 0 after 65535. |
| sgsn_addr_signal | IP address of the SGSN that is processing the packets. |
| sgsn_addr_data | IP address of the SGSN that is processing tunnel packet data units (TPDUs). |
| signal_sequence | Last sequence number used in the GTP signaling message. |

*Table 18 show gprs gtp pdp-context tid Field Descriptions (continued)*

| Field | Description |
|---|---|
| Source | Source of IP addressing for the MS. The possible values are:<br>• DHCP—Dynamic address allocation using DHCP.<br>• IPCP—Dynamic address allocation for PPP PDP types, or for IP PDP types with PPP regeneration, using PPP IP Control Protocol.<br>• Pending—Waiting for dynamic address allocation. Dynamic address source is unknown.<br>• Radius—Dynamic address allocation using RADIUS.<br>• Static—IP address is not dynamically assigned. |
| Src addr violation | Number of packets (and bytes) dropped because of source address violation. This field displays only when the **security verify source** command is configured. |
| TID | Tunnel ID for the PDP context. |
| tos mask map | ToS value in IP header of this PDP context. |
| umts qos_req | Requested UMTS quality of service by the PDP context. This field displays when UMTS QoS is enabled on the GGSN. |
| umts qos_neg | Negotiated UMTS quality of service for the PDP context. This field displays when UMTS QoS is enabled on the GGSN. |
| upstream_data_flow | Flow label of uplink G-PDUs. |
| upstream_signal_flow | Flow label of uplink signaling messages. |
| user_name (IMSI) | International mobile subscriber identity for the PDP context. |

Table 19 describes the fields shown in the Network Init Information section of the output.

**Note** The Network Init Information section of the output appears only when network-initiated PDP contexts are unsuccessful.

*Table 19 show gprs gtp pdp-context tid Network Init Information Field Descriptions*

| Field | Description |
|---|---|
| Buf.Bytes | Number of bytes currently buffered for this network-initiated PDP context. |
| last_access_time | Time when the PDP context for this TID was last accessed. The date format is MMM DD YYYY. The time format is hours:minutes:seconds.<br>When a signaling packet or data packet for a PDP context arrives on the GGSN, the last_access_time is reset to the current date and time. If the last_access_time exceeds the purge timer for idle PDP contexts, then the PDP context is purged by the GGSN. |

*Table 19 show gprs gtp pdp-context tid Network Init Information Field Descriptions (continued)*

| Field | Description |
|---|---|
| MNRG Flag | Mobile not reachable flag, with the following values:<br>• 0—flag is off.<br>• 1—flag is on, indicating that the MS is not reachable |
| NIP State | State information for the network initiated PDP process on the GGSN. |
| PDU Discard Flag | Discarded PDU indicator for a network initiated PDP context, with the following values:<br>• 0—PDUs are not discarded. This indicates that PDUs for a network initiated PDP context are being sent to the SGSN.<br>• 1—PDUs are being discarded by the GGSN. PDUs are discarded by the GGSN when a network initiated PDP context procedure is unsuccessful. This occurs when the SGSN sends a rejection of the PDP context request to the GGSN with a Cause value of either "MS Refuses" or "MS is not GPRS Responding."<br><br>When the flag is set to 1, the GGSN ignores PDUs destined for that MS for the specified PDU discard period. The default period is 300 seconds (5 minutes). You can configure the PDU discard time using the **gprs ntwk-init-pdp pdu-discard-period** command. |
| SGSN Addr | IP address of the SGSN that is associated with the network-initiated procedure for this PDP context (used for paging). |

## Related Commands

| Command | Description |
|---|---|
| **show gprs access-point** | Displays information about access points on the GGSN. |
| **show gprs gtp status** | Displays information about the current status of the GTP on the GGSN (such as activated PDP contexts, throughput, and QoS statistics). |

# show gprs gtp statistics

To display the current GPRS Tunneling Protocol (GTP) statistics for the GGSN (such as IE, GTP signaling, and GTP PDU statistics), use the **show gprs gtp statistics** privileged EXEC command.

**show gprs gtp statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(2)GB | This command was integrated in Cisco IOS Release 12.1(2)GB and the following fields were added to the output display:<br>• total created_pdp<br>• total deleted_pdp |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the following new output fields were added:<br>• ntwk_init_pdp_act_rej<br>• ppp_regen_pending<br>• ppp_regen_pending_peak<br>• ppp_regen_total_drop<br>• ppp_regen_no_resource<br>• total created_ppp_pdp<br>• total ntwkInit created pdp |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in the Cisco IOS Release 12.2(8)YW and the following new output fields were added:<br>• tft_semantic_error<br>• tft_syntactic_error<br>• packet_filter_semantic_error<br>• packet_filter_syntactic_error<br>• total deleted_ppp_pdp |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |

| Release | Modification |
|---|---|
| 12.3(4)T | This command was incorporated in Cisco IOS 12.3(4)T. |
| 12.3(8)T | This command was incorporated in GGSN 5.0 and the following new output fields were added:<br>• insert_download_route_fail<br>• network_behind_ms APNs<br>• save_download_route_fail<br>• total_download_route<br>• total_insert_download_route<br>• unsupported_comp_exthdr |

## Usage Guidelines

Use the **show gprs gtp statistics** command to display the GTP statistics for the GGSN. The counter values displayed by this command represent totals accumulated since the last time the statistical counters were cleared using the **clear gprs gtp statistics** command.

## Examples

The following is sample output of the **show gprs gtp statistics** command:

```
router# show gprs gtp statistics
GPRS GTP Statistics:
  version_not_support        0            msg_too_short              0
  unknown_msg                0            unexpected_sig_msg         0
  unexpected_data_msg        0            mandatory_ie_missing       0
  mandatory_ie_incorrect     0            optional_ie_invalid        0
  ie_unknown                 0            ie_out_of_order            0
  ie_unexpected              0            ie_duplicated              0
  optional_ie_incorrect      0            pdp_activation_rejected    10981
  tft_semantic_error         0            tft_syntactic_error        0
  pkt_ftr_semantic_error     0            pkt_ftr_syntactic_error    0
  non_existent               0            path_failure               0
  total_dropped              0            signalling_msg_dropped     0
  data_msg_dropped           0            no_resource                0
  get_pak_buffer_failure     0            rcv_signalling_msg         15401
  snd_signalling_msg         19243        rcv_pdu_msg                0
  snd_pdu_msg                0            rcv_pdu_bytes              0
  snd_pdu_bytes              0            total created_pdp          3761
  total deleted_pdp          3661         total created_ppp_pdp      0
  total deleted_ppp_pdp      0            ppp_regen_pending          0
  ppp_regen_pending_peak     0            ppp_regen_total_drop       0
  ppp_regen_no_resource      0            ntwk_init_pdp_act_rej      0
  total ntwkInit created pdp 0

GPRS Network behind mobile Statistics:
  network_behind_ms APNs      1          total_download_route       5
  save_download_route_fail    0          insert_download_route_fail 2
  total_insert_download_route 3
```

Table 20 describes the fields shown in the display:

*Table 20 show gprs gtp statistics Field Descriptions*

| Field | Description |
|---|---|
| data_msg_dropped | Number of GTP PDUs dropped. |
| get_pak_buffer_failure | Number of times the GGSN has failed to obtain a GTP packet. |
| ie_duplicated | Number of GTP messages received with a duplicated information element. |
| ie_out_of_order | Number of GTP messages received with an information element (IE) out of order. |
| ie_unexpected | Number of GTP messages received with an information element that not expected in the GTP message, but is defined in GTP. GTP messages with unexpected IEs are processed as if the IE was not present. |
| ie_unknown | Number of GTP messages received with an information element of an unknown type. |
| insert_download_route_fail | Number of routes downloaded from the RADIUS server that failed to be inserted into the routing table because they conflicted with others. |
| mandatory_ie_incorrect | Number of GTP messages received with an incorrect mandatory information element—for example, with an information element that has an incorrect length. |
| mandatory_ie_missing | Number of GTP messages received with a missing mandatory information element. |
| msg_too_short | Number of GTP messages received that are too short to hold the GTP header for the supported GTP version. |
| network_behind_ms APNs | Number of APNs configured to support routing behind the MS. |
| no_resource | Number of times a resource was not available for transmitting GTP messages. For example, the router may be out of memory. |
| non-existent | Number of |
| ntwk_init_pdp_act_rej | Number of rejected PDP context requests that were initiated by the network (PDN). |
| optional_ie_incorrect | Number of GTP messages received with an optional IE that is incorrect, which prevents the GGSN from processing the GTP message correctly. |
| optional_ie_invalid | Number of GTP messages received with an information element that contains a value that is not within the defined range for that IE. GTP messages with invalid optional IEs are processed as if the IE was not present. |
| packet_filter_semantic_error | Number of GTP messages received with an IE element with packet filter semantic errors. A semantic error is when the defined format of the information element (IE) is valid but the content of the IE is inconsistent or invalid. |
| packet_filter_syntactic_error | Number of GTP messages received with an IE element with packet filter syntactic errors. A syntactic error is when the coding of the IE is invalid. |

*Table 20 show gprs gtp statistics Field Descriptions*

| Field | Description |
|---|---|
| path_failure | Number of path failures on the GPRS Support Node (GSN). |
| pdp_activation_rejected | Number of times a request to activate a PDP context was rejected. |
| ppp_regen_no_resource | Total number of rejected responses to create PDP context and delete PDP context requests due to unavailable resource on the GGSN for PPP regeneration. |
| ppp_regen_pending | Number of pending PPP regeneration sessions. |
| ppp_regen_pending_peak | Maximum number of pending PPP regeneration sessions since the statistic was cleared. |
| ppp_regen_total_drop | Total number of create PDP context and delete PDP context requests that were dropped due to the threshold limit being reached for maximum number of PPP regeneration sessions allowed on the GGSN. |
| rcv_pdu_bytes | Number of bytes received in protocol data units (PDUs). |
| rcv_pdu_msg | Number of PDU messages received. |
| rcv_signaling_msg | Number of GTP signaling messages received. |
| save_download_route_fail | Number of times a downloaded route could not be saved because there was not enough memory. |
| signalling_msg_dropped | Number of GTP signaling messages dropped. |
| snd_pdu_bytes | Number of PDU bytes sent. |
| snd_pdu_msg | Number of PDU messages sent. |
| snd_signalling_msg | Number of GTP signaling messages sent. |
| tft_semantic_error | Number of GTP messages received with an IE element with traffic flow template (TFT) semantic errors. A semantic error is when the defined format of the information element (IE) is valid but the content of the IE is inconsistent or invalid. |
| tft_syntactic_error | Number of GTP messages received with an IE element with TFT syntactic errors. A syntactic error is when the coding of the IE is invalid. |
| total created_pdp | Total number of PDP contexts created since system startup (supports Special Mobile Group (SMG)-28 standards level and later) |
| total created_ppp_pdp | Total number of PDP contexts created for PPP PDP PDU types. |
| total deleted_pdp | Total number of PDP contexts deleted since system startup (supports SMG-28 standards level and later) |
| total deleted_ppp_pdp | Total number of PDP contexts created for PPP PDP PDU types deleted since system startup. |
| total_download_route | Total number of routes downloaded from the RADIUS server. |
| total_dropped | Number of GTP messages dropped. |

*Table 20 show gprs gtp statistics Field Descriptions*

| Field | Description |
|---|---|
| total_insert_download_route | Total number of routes downloaded from the RADIUS server that have been inserted into the routing table by the GGSN. |
| total ntwkInit created pdp | Number of PDP context requests activated by the GGSN that were initiated by the network (PDN). |
| unexpected_data_msg | Number of GTP PDUs received for nonexistent PDP contexts. |
| unexpected_sig_msg | Number of unexpected GTP signaling messages received—for example, a message received on the wrong end of the tunnel or a response message received for a request that was not sent by the GGSN. |
| unknown_msg | Number of unknown GTP messages received. |
| version_not_support | Number of GTP messages received from devices running an unsupported version of the GTP. |

## Related Commands

| Command | Description |
|---|---|
| **show gprs gtp parameters** | Displays the current GTP parameters configured on the GGSN. |
| **show gprs gtp path** | Displays information about one or more GTP paths between the GGSN and other GPRS devices. |
| **show gprs gtp pdp-context** | Displays a list of the currently active PDP contexts (mobile sessions). |
| **show gprs gtp status** | Displays information about the current status of GTP on the GGSN. |
| **show gprs charging statistics** | Displays current statistics for the transfer of charging packets between the GGSN and charging gateways. |

# show gprs gtp status

To display information about the current status of the GPRS Tunneling Protocol (GTP) on the GGSN (such as activated PDP contexts, throughput, and QoS statistics), use the **show gprs gtp status** privileged EXEC command.

**show gprs gtp status**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX, and the following output fields were added:<br>• activated_ppp_pdp<br>• activated_ppp_regen_pdp<br>• ntwk_init_pdp<br>• qos_delay1_pdp<br>• qos_delay2_pdp<br>• qos_delay3_pdp<br>• qos_delaybesteffort_pdp |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)YW | This command was incorporated in the Cisco IOS Release 12.2(8)YW and the following output fields were added:<br>• activated gtpv0 pdp<br>• activated gtpv1 pdp<br>• activated ms |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs gtp status** command to display information about the status of GTP running on the GGSN. The output fields displayed by the **show gprs gtp status** command vary by the type of QoS method that is enabled on the GGSN.

The values displayed by the **show gprs gtp status** command show the current counts since the GGSN was started. Unlike the values displayed by the **show gprs gtp statistics** command, these values cannot be cleared.

## Examples

### Example 1

The following example shows output from the **show gprs gtp status** command for an activated network-initiated PDP context using the canonical QoS method:

```
Router# show gprs gtp status
GPRS GTP Status:
  gsn_used_bandwidth     7399   total gsn_resource         4294967295
  activated_pdp          1      ntwk_init_pdp              1
  mean_throughput_premium    1110.000
  mean_throughput_normal 0.000  mean_throughput_besteffort 0.000
  qos_high_pdp           1      qos_normal_pdp             0
  qos_low_pdp            0      qos premium mean-throughput-deviation 0.100
```

### Example 2

The following example shows output from the **show gprs gtp status** command for activated 2 PPP PDP contexts using the canonical QoS method. Both of the PDP contexts are using the premium QoS class, indicated by the qos_high_pdp output field:

```
Router# show gprs gtp status
GPRS GTP Status:
  gsn_used_bandwidth     14798  total gsn_resource         1048576
  activated_pdp          2      ntwk_init_pdp              0
  activated_ppp_pdp      2
  mean_throughput_premium    2220.000
  mean_throughput_normal 0.000  mean_throughput_besteffort 0.000
  qos_high_pdp           2      qos_normal_pdp             0
  qos_low_pdp            0      qos premium mean-throughput-deviation 0.100
```

**Note** All output fields except those related to PDP context creation appear only when canonical QoS is enabled on the GGSN.

### Example 3

The following example shows output from the **show gprs gtp status** command for 3 activated PPP regenerated PDP contexts not using either the canonical or delay QoS method:

```
Router# show gprs gtp status
GPRS GTP Status:
  activated_pdp          3     ntwk_init_pdp              0
  activated_ppp_pdp      0     activated_ppp_regen_pdp    3
```

### Example 4

The following example shows output from the **show gprs gtp status** command for 4 activated PDP contexts using the delay QoS method. The PDP contexts are using the delay class 1, delay class 2, and delay best effort class:

```
Router# show gprs gtp status
GPRS GTP Status:
```

```
activated_pdp           4     ntwk_init_pdp              0
activated_ppp_pdp       0     activated_ppp_regen_pdp    0
qos_delay1_pdp          1     qos_delay2_pdp             1
qos_delay3_pdp          0     qos_delaybesteffort_pdp    2
```

### Example 5

The following example shows output from the **show gprs gtp status** command with 2 active PDP contexts using GTP version 1, and 5 active mobile stations:

```
router# show gprs gtp status
GPRS GTP Status:
activated_pdp                    2      ntwk_init_pdp              0
activated_ppp_pdp                0
activated gtpv0 pdp              0
activated gtpv1 pdp              2
activated ms                     5
```

Table 21 describes the fields shown in the display.

***Table 21 show gprs gtp status Field Descriptions***

| Field | Description |
|---|---|
| activated gtpv0 pdp | Number of PDP contexts created with GTP version 0. |
| activated gtpv1 pdp | Number of PDP contexts created with GTP version 1. |
| activated ms | Number of active mobile stations (MS). |
| activated_pdp | Number of PDP contexts currently activated. This number includes PDP contexts initiated by both the MS and the network (PDN). |
| activated_ppp_pdp | Number of point-to-point protocol PDP contexts currently activated. |
| activated_ppp_regen_pdp | Number of point-to-point protocol PDP contexts created on the GGSN. |
| gsn_used_bandwidth | Currently used bandwidth, in bits per second. Represents the cumulative bandwidth for all active PDP context requests currently using canonical QoS. This field only appears when canonical QoS is enabled. |
| mean_throughput_besteffort | Total mean throughput for best effort QoS users, in bits per second. Represents the cumulative throughput for all active PDP context requests classified in the best effort canonical QoS class. This field only appears when canonical QoS is enabled. |
| mean_throughput_normal | Total mean throughput for normal QoS users, in bits per second. Represents the cumulative throughput for all active PDP context requests classified in the normal canonical QoS class. This field only appears when canonical QoS is enabled. |
| mean_throughput_premium | Total mean throughput for premium QoS users, in bits per second. Represents the cumulative throughput for all active PDP context requests classified in the premium canonical QoS class. This field only appears when canonical QoS is enabled. |
| ntwk_init_pdp | Current number of active PDP contexts that are initiated by the network to an MS. |

*Table 21 show gprs gtp status Field Descriptions*

| Field | Description |
|---|---|
| qos_delay1_pdp | Current number of active PDP contexts that are classified in the class 1 delay QoS class. This field only appears when delay QoS is enabled. |
| qos_delay2_pdp | Current number of active PDP contexts that are classified in the class 2 delay QoS class. This field only appears when delay QoS is enabled. |
| qos_delay3_pdp | Current number of active PDP contexts that are classifed in the class 3 delay QoS class. This field only appears when delay QoS is enabled. |
| qos_delaybesteffort_pdp | Current number of active PDP contexts that are classified in the best effort delay QoS class. This field only appears when delay QoS is enabled. |
| qos_high_pdp | Current number of active PDP contexts that are classified in the premium canonical QoS class. This field only appears when canonical QoS is enabled. |
| qos_low_pdp | Current number of PDP contexts that are classified in the best effort canonical QoS class. This field only appears when canonical QoS is enabled. |
| qos_normal_pdp | Current number of PDP contexts that are classified in the normal canonical QoS class. This field only appears when canonical QoS is enabled. |
| qos premium mean-throughput-deviation | Current mean throughput deviation for QoS. This field only appears when canonical QoS is enabled. |
| total gsn_resource | Currently available GSN resources. This field only appears when canonical QoS is enabled. |

## Related Commands

| Command | Description |
|---|---|
| **encapsulation gtp** | Sets the encapsulation type for all connections established using the virtual template to GTP. This is mandatory for all GTP interfaces. |
| **show gprs gtp statistics** | Displays the current GTP statistics for the GGSN. |

# show gprs gtp-director pending-request

To display a list of the create PDP context requests sent by GDM to a real GGSN that are pending expiration of the retry timer, use the **show gprs gtp-director pending-request** privileged EXEC command.

**show gprs gtp-director pending-request** {**tid** *hex-data* | **all**}

## Syntax Description

| | |
|---|---|
| **tid** *hex-data* | Displays the create PDP context currently requested by GDM for the specified tunnel ID. Enter the TID in hexadecimal format. |
| **all** | Displays a list of all create PDP contexts currently requested by GDM. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **show gprs gtp-director pending-request** command to display a list of the create PDP context requests currently sent by GDM to a real GGSN that are pending expiration of the retry timer.

**Note** The **show gprs gtp-director pending-request** command shows only those PDP contexts that have been *requested* by GDM for a real GGSN—it does not represent the number of PDP contexts that are currently *active* with that GGSN.

The create PDP context requests that have been sent will continue to appear in the GDM output display until the GTP director retry timeout period has expired. You can configure the GTP director retry timeout period using the **gprs gtp-director retry-timeout** command.

## Examples

### Example 1

The following is sample output of the **show gprs gtp-director pending-request tid** command. The output shows that GDM has sent a create PDP context request for TID 1234120000000000 to the real GGSN with IP address 10.41.41.1 for a real APN called corporateb.com.

GDM received the original create PDP context request from the SGSN with IP address 10.23.23.1, for an APN called corporate. The corporate APN is a virtual APN that is configured at the HLR and at the DNS server used by the SGSN. The DNS server used by the SGSN should return the IP address of the GDM router for the virtual APN name.

Notice that corporateb.com appears under the output field called Domain-Name, which represents the domain portion of the username. The username (with format login@domain) is specified in the protocol configuration option (PCO) of the original create PDP context request from the SGSN. The domain name becomes the APN that GDM specifies in its create PDP context request sent to the real GGSN. In this case, GDM has sent a create PDP context request for TID 1234120000000000 to GGSN 10.41.41.1 for the corporateb.com APN:

```
router# show gprs gtp-director pending-request tid 1234120000000000
TID               GGSN-ADDR      SGSN-ADDR     APN-NAME            DOMAIN-NAME
1234120000000000  10.41.41.1     10.23.23.1    corporate           corporateb.com
```

### Example 2

The following is sample output of the **show gprs gtp-director pending-request all** command:

```
router# show gprs gtp-director pending-request all
TID               GGSN-ADDR      SGSN-ADDR     APN-NAME            DOMAIN-NAME
1234000000000000  10.41.41.1     10.23.23.1    corporate           corporatea.com
1234120000000000  10.41.41.1     10.23.23.1    corporate           corporateb.com
8808000000000000  10.41.41.1     10.23.23.1    corporate           corporatec.com
```

### Example 3

The following is sample output of the **show gprs gtp-director pending-request tid** command, where no domain name has been provided in the PCO IE. In this case, GDM specifies corporatea.com as the APN in the create PDP context request to the GGSN at 10.41.41.1:

```
router# show gprs gtp-director pending-request tid 1111220000333000
TID               GGSN-ADDR      SGSN-ADDR     APN-NAME            DOMAIN-NAME
1111220000333000  10.41.41.1     10.23.23.1    corporatea.com            —
```

Table 22 describes the fields shown in the displays:

*Table 22 show gprs gtp-director pending-request Field Descriptions*

| Field | Description |
|---|---|
| TID | Tunnel identifier of the PDP context request. |
| GGSN-ADDR | IP address of the real GGSN to which GDM has sent the create PDP context request. |
| SGSN-ADDR | IP address of the SGSN from which the original create PDP context request was received by GDM. |

*Table 22 show gprs gtp-director pending-request Field Descriptions (continued)*

| Field | Description |
|---|---|
| APN-NAME | APN name specified in the original create PDP context request from the SGSN.<br>**Note** In the case where a domain name is provided in the PCO information element (IE) of the create PDP context request, this APN represents a virtual APN name, which means that this APN does not correspond to a real destination network. GDM determines the real destination network by the domain requested in the PCO IE. |
| DOMAIN-NAME | Domain name specified in the username portion of the PCO. This domain is the APN of the real destination network that is requested by GDM in the create PDP context request to the real GGSN.<br>**Note** If the Domain-Name field contains a dash, it indicates that the domain name is not provided in the PCO IE. In this case, GDM uses the value of the APN as the real destination network. |

## Related Commands

| Command | Description |
|---|---|
| **gprs gtp-director retry-timeout** | Specifies the amount of time during which the GTP director forwards retries from an SGSN to the selected GGSN to establish a PDP context. |

# show gprs gtp-director statistics

To display the current statistics for create requests received by GDM, use the **show gprs gtp-director statistics** privileged EXEC command.

**show gprs gtp-director statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **show gprs gtp-director statistics** command to display the current statistics for create requests received by GDM.

Most of the counter values displayed by this command represent totals accumulated since the last time the statistical counters were cleared using the **clear gprs gtp-director statistics** command. However, the counter for the number of unique PDP contexts pending retry timeout increments and decrements as the GTP director idle time-out period is reached for a forwarded PDP context.

## Examples

The following is sample output of the **show gprs gtp-director statistics** command:

```
router# show gprs gtp-director statistics
     GTP-Director Statistics
Number of unique pdp-contexts forwarded:             23
Total number of create requests forwarded:           50
Total number of create requests rejected:            0
Number of unique pdp-contexts pending retry-timeout: 2
Total number of unsupported messages received:       0
Total number of requests dropped:                    0
```

Table 23 describes the fields shown in the display.

*Table 23 show gprs gtp-director statistics Field Descriptions*

| Field | Description |
|---|---|
| Number of unique pdp-contexts forwarded | Number of create PDP context requests with unique TIDs that GDM has forwarded to a real GGSN. This number does not include retries by the SGSN. |
| Total number of create requests forwarded | Total number of create PDP context requests, including retries from the SGSN, that GDM has forwarded to a real GGSN. |
| Total number of create requests rejected | Total number of create PDP context requests sent by the SGSN that GDM has rejected. For example, if an invalid domain name is requested, the create PDP context request is rejected. |
| Number of unique pdp-contexts pending retry-timeout | Number of create PDP context requests with unique TIDs, that have been forwarded by GDM to a real GGSN, whose retry timeout period has not expired. When the retry timeout period is reached, this counter is decremented.<br>You can display the create PDP context requests that are pending retry timeout using the **show gprs gtp-director pending-request** command. |
| Total number of unsupported messages received | Total number of messages received that GDM cannot process (for example, delete PDP context requests or echo messages).<br>Under normal conditions, this counter should not increment. If the counter is incrementing, a problem in the network is indicated.<br>The only signaling message that GDM receives and processes is a create PDP context request. |
| Total number of requests dropped | Total number of create PDP context requests that were unable to be forwarded by GDM.<br>Dropped requests indicate a routing problem between the GTP stack and the IP stack. However, this counter does not indicate problems at the IP level. |

## Related Commands

| Command | Description |
|---|---|
| **clear gprs gtp-director statistics** | Clears the current GDM forwarded and rejected request counters. |
| gprs gtp-director retry-timeout | Specifies the amount of time during which the GTP director forwards retries from an SGSN to the selected GGSN to establish a PDP context. |
| **show gprs gtp-director pending-request** | Displays a list of the create PDP context requests sent by GDM to a real GGSN that are pending retry timeout. |

# show gprs ms-address exclude-range

To display the IP address range(s) configured on the GGSN for the GPRS network, use the **show gprs ms-address exclude-range** privileged EXEC command.

**show gprs ms-address exclude-range**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs ms-address exclude-range** command to display the IP address range(s) configured on the GGSN for the GPRS network.

IP addresses are 32-bit values.

## Examples

The following is sample output of the **show gprs ms-address exclude-range** command:

```
router# show gprs ms-address exclude-range
Start IP         End IP
10.0.0.1         10.10.10.10
```

Table 24 describes the fields shown in the display.

*Table 24 show gprs ms-address exclude-range Field Descriptions*

| Field | Description |
|---|---|
| Start IP | IP address at the beginning of the range. |
| End IP | IP address at the end of the range. |

## Related Commands

| Command | Description |
|---|---|
| gprs ms-address exclude-range | Specifies the IP address range(s) used by the GPRS network and thereby excluded from the mobile station (MS) IP address range. |

# show gprs plmn ip address

To display the IP address range(s) configured for a PLMN, use the **show gprs plmn ip address** privileged EXEC command.

**show gprs plmn ip address**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs plmn ip address** command to display the IP address range(s) configured for a PLMN.

IP addresses are 32-bit values.

## Examples

The following is sample output of the **show gprs plmn ip address** command:

```
router# show gprs plmn ip address
PLMN Start IP    End IP           Range Type
9.9.9.9          9.9.9.9
10.2.25.1        10.2.25.255
16.0.0.9         16.0.0.9
99.100.0.1       99.100.0.255
101.0.1.1        101.0.1.1        sgsn
105.0.1.1        105.0.1.1        sgsn
106.0.1.1        106.0.1.1        sgsn
110.12.0.2       110.12.0.2
110.13.0.2       110.13.0.2
```

Table 24 describes the fields shown in the display.

***Table 25 show gprs plmn ip address Field Descriptions***

| Field | Description |
|---|---|
| PLMN Start IP | IP address at the beginning of the range. |
| End IP | IP address at the end of the range. |

**Related Commands**

| Command | Description |
|---|---|
| gprs plmn ip address | Specifies the PLMN IP address range(s) used by the GGSN. |

# show gprs qos status

To display the number of PDP contexts currently active on the GGSN for a particular QoS class, use the **show gprs qos status** privileged EXEC command.

**show gprs qos status**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs qos status** command to display the number of PDP contexts currently active on the GGSN for a particular QoS class.

## Examples

### Example 1

The following example shows output from the **show gprs qos status** command for UMTS QoS:

```
router# show gprs qos status
GPRS QoS Status:
  type:UMTS
  conversational_pdp      100   streaming_pdp     150
  interactive_pdp         1345  background_pdp    2000
```

Table 26 describes the fields shown in the display.

*Table 26 show gprs qos status Field Descriptions*

| Field | Description |
|---|---|
| type | Type of QoS. Possible QoS types are:<br>• Canonical—Configured using the **gprs qos map canonical-qos** command.<br>• Delay—Configured using the **gprs qos map delay** command.<br>• UMTS—Configured using the **gprs qos map umts** command.<br>• None—No QoS is configured on the GGSN. |
| conversational_pdp | Current number of PDP contexts that have a conversational UMTS QoS traffic class. |
| streaming_pdp | Current number of PDP contexts that have a streaming UMTS QoS traffic class. |
| interactive_pdp | Current number of PDP contexts that have a interactive UMTS QoS traffic class. |
| background_pdp | Current number of PDP contexts that have a background UMTS QoS traffic class. |

### Example 2

The following example displays output from the **show gprs qos status** command for canonical QoS:

```
router# show gprs qos status
GPRS QoS Status:
type:Canonical
 gsn_used_bandwidth:1110.000        total gsn_resource:1048576
 mean_throughput_premium:0.000
 mean_throughput_normal:1110.000    mean_throughput_besteffort 0.000
 qos_high_pdp:0                     qos_normal_pdp:1
 qos_low_pdp :0                     qos_premium mean-throughput-deviation 0.100
```

Table 27 describes the fields shown in the display.

*Table 27 show gprs qos status Field Descriptions*

| Field | Description |
|---|---|
| type | Type of QoS. Possible QoS types are:<br>• Canonical—Configured using the **gprs qos map canonical-qos** command.<br>• Delay—Configured using the **gprs qos map delay** command.<br>• UMTS—Configured using the **gprs qos map umts** command.<br>• None—No QoS is configured on the GGSN. |
| gsn_used_bandwidth | Currently used bandwidth, in bits per second. |
| total gsn_resource | Currently available GSN resources. |

*Table 27 show gprs qos status Field Descriptions*

| Field | Description |
|---|---|
| mean_throughput_premium: | Total mean throughput for premium QoS users, in bytes. |
| mean_throughput_normal | Total mean throughput for normal QoS users, in bytes. |
| mean_throughput_besteffort | Total mean throughput for best effort QoS users, in bytes. |
| qos_high_pdp | Current number of PDP contexts that have a high QoS. |
| qos_normal_pdp | Current number of PDP contexts that have a normal QoS. |
| qos_low_pdp | Current number of PDP contexts that have a low QoS. |
| qos_premium mean-throughput-deviation | Current mean throughput deviation for QoS. |

### Example 3

The following example displays output from the **show gprs qos status** command for delay QoS:

```
router# show gprs qos status
GPRS QoS Status:
type:Delay
qos_delay1_pdp:0            qos_delay2_pdp: 0
qos_delay3_pdp:0            qos_delaybesteffort_pdp    0
```

Table 28 describes the fields shown in the display.

*Table 28 show gprs qos status Field Descriptions*

| Field | Description |
|---|---|
| type | Type of QoS. Possible QoS types are:<br>• Canonical—Configured using the **gprs qos map canonical-qos** command.<br>• Delay—Configured using the **gprs qos map delay** command.<br>• UMTS—Configured using the **gprs qos map umts** command.<br>• None—No QoS is configured on the GGSN. |
| qos_delay1_pdp | Current number of PDP contexts that have a delay1 QoS class. |
| qos_delay2_pdp | Current number of PDP contexts that have a delay2 QoS class. |
| qos_delay3_pdp | Current number of PDP contexts that have a delay3 QoS class. |
| qos_delaybesteffort_pdp | Current number of PDP contexts that have a delaybesteffort_pdp QoS class. |

### Example 4

The following example shows output from the **show gprs qos status** command when no QoS has been configured on the GGSN:

```
router# show gprs qos status
GPRS QoS Status:
type:None
```

**Related Commands**

| Command | Description |
|---|---|
| **gprs qos map canonical-qos** | Enables mapping of GPRS QoS categories to a canonical QoS method that includes best-effort, normal, and premium QoS classes. |
| **gprs qos map delay** | Enables Delay QoS on the GGSN. |
| **gprs qos map umts** | Enables UMTS QoS on the GGSN. |

# show gprs umts-qos map traffic-class

To display UMTS QoS mapping information, use the **show gprs umts-qos map traffic-class** privileged EXEC command.

**show gprs umts-qos map traffic-class** {**all | signalling | conversational | streaming | interactive | background**}

## Syntax Description

| | |
|---|---|
| **all** | Displays information for all UMTS QoS traffic classes. |
| **signalling** | Displays information for the UMTS QoS traffic class signalling. |
| **conversational** | Displays information for the UMTS QoS traffic class conversational. |
| **streaming** | Displays information for the UMTS QoS traffic class streaming. |
| **interactive** | Displays information for the UMTS QoS traffic class interactive. |
| **background** | Displays information for the UMTS QoS traffic class background. |

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)YW | This command was introduced. |
| 12.3(2)XB | This command was incorporated in Cisco IOS Release 12.3(2)XB. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **show gprs umts-qos map traffic-class** command to display information about UMTS QoS mapping.

## Examples

The following example shows output from the **show gprs umts-qos map traffic-class** command for all UMTS QoS traffic classes:

```
router# show gprs umts-qos map traffic-class all
Traffic Class       Diffserv PHB Group       Diffserv Code Point

signaling           Signaling Class          40

conversational      EF Class                 46

streaming           AF2 Class                18,20,22

interactive         AF3 Class                26,28,30

background          Best Effort              0
```

Table 29 describes the fields shown in the display.

*Table 29 show gprs umts-qos map traffic-class Field Descriptions*

| Field | Description |
|---|---|
| Traffic Class | Type of UMTS QoS traffic class as specified in the **gprs umts-qos map traffic-class** command. The UMTS QoS traffic classes are:<br>• signaling<br>• conversational<br>• streaming<br>• interactive<br>• background |
| Diffserv PHB Group | Type of DiffServ PHB group as specified in the **gprs umts-qos map diffserv-phb** command. Possible DiffServ PHB groups are:<br>• signalling-class<br>• ef-class<br>• af1-class<br>• af2-class<br>• af3-class<br>• af4-class<br>• best-effort |
| Diffserv Code Point | Number of DSCPs as specified in the **gprs umts-qos map diffserv-phb** command. |

## Related Commands

| Command | Description |
|---|---|
| **gprs umts-qos map traffic-class** | Specifies a QoS mapping from the UMTS traffic classes to a differentiated services (DiffServ) per-hop behavior (PHB) group |
| **gprs umts-qos map diffserv-phb** | Assigns a differentiated services code point (DSCP) to a DiffServ PHB group. |

# show ip rtp header-compression

To display Enhanced Compressed Real-Time Transport Protocol (CRTP) statistics, use the **show ip rtp header-compression** command in privileged EXEC mode.

**show ip rtp header-compression** [**detail**] [*interface-type interface-number*]

## Syntax Description

| | |
|---|---|
| **detail** | (Optional) Displays details of each connection. |
| *interface-type interface-number* | (Optional) The interface type and number. |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 11.3 | This command was introduced. |
| 12.1(5)T | The command output was modified to include information related to the Distributed Compressed Real-Time Transport Protocol (dCRTP) feature. |
| 12.3(11)T | The command output was modified to include information related to the Enhanced Compressed Real-Time Transport Protocol (ECRTP) feature. |

## Usage Guidelines

The **detail** keyword is not available with the **show ip rtp header-compression** command on a Route Switch Processor (RSP). However, the **detail** keyword is available with the **show ip rtp header-compression** command on a Versatile Interface Processor (VIP). Enter the **show ip rtp header-compression** *interface-type interface-number* **detail** command on a VIP to retrieve detailed information regarding RTP header compression on a specific interface.

The **detail** keyword is not supported with the **show ip rtp header-compression** command on the Cisco MWR 1941-DC router or the MGX-RPM-1FE-CP back card. If specified when the command is entered, the output does not display. Additionally, not all field descriptions displayed by the **show ip rtp header-compression** command are applicable to the MWR 1941-DC router and MGX-RPM-1FE-CP back card.

## Examples

The following example displays statistics from ECRTP on an interface:

```
Router# show ip rtp header-compression

RTP/UDP/IP header compression statistics:
  Interface Serial2/0 (compression on, IETF, ECRTP)
    Rcvd:    1473 total, 1452 compressed, 0 errors, 0 status msgs
             0 dropped, 0 buffer copies, 0 buffer failures
    Sent:    1234 total, 1216 compressed, 0 status msgs, 379 not predicted
             41995 bytes saved, 24755 bytes sent
             2.69 efficiency improvement factor
    Connect: 16 rx slots, 16 tx slots,
             6 misses, 0 collisions, 0 negative cache hits, 13 free contexts
             99% hit ratio, five minute miss rate 0 misses/sec, 0 max
```

Table 30 describes the significant fields shown in the display.

***Table 30 show ip rtp header-compression Field Descriptions***

| Field | Description |
|---|---|
| Interface | Type and number of interface. |
| Rcvd | Received statistics described in subsequent fields. |
| total | Number of packets received on the interface. |
| compressed | Number of packets received with compressed headers. |
| errors | Number of errors. |
| status msgs | Number of resynchronization messages received from the peer. |
| dropped | Number of packets dropped. |
| buffer copies | Number of buffers that were copied. |
| buffer failures | Number of failures in allocating buffers. |
| Sent | Sent statistics described in subsequent fields. |
| total | Number of packets sent on the interface. |
| compressed | Number of packets sent with compressed headers. |
| status msgs | Number of resynchronization messages sent from the peer. |
| not predicted | Number of packets taking a non-optimal path through the compressor. |
| bytes saved | Total savings in bytes due to compression. |
| bytes sent | Total bytes sent after compression. |
| efficiency improvement factor | Compression efficiency. |
| Connect | Connect statistics described in subsequent fields. |
| rx slots | Total number of receive slots. |
| tx slots | Total number of transmit slots. |
| misses | Total number of misses. |
| collisions | Total number of collisions. |
| negative cache hits | Total number of negative cache hits. |
| free contexts | Number of available context resources. |

*Table 30 show ip rtp header-compression Field Descriptions (continued)*

| Field | Description |
|---|---|
| hit ratio | Percentage of received packets that have an associated context. |
| five minute miss rate | Number of new flows found per second averaged over the last five minutes. |
| max | Highest average rate of new flows reported. |

## Related Commands

| Command | Description |
|---|---|
| **ip rtp compression-connections** | Specifies the total number of RTP header compression connections supported on the interface. |
| **ip rtp header-compression** | Enables RTP header compression. |

# show ppp mux

To display counters for a multilink interface, use the **show ppp mux** command in EXEC mode.

**show ppp mux [interface *interface*]**

## Syntax Description

| | |
|---|---|
| **interface** *interface* | (Optional) The identifier of the multilink or serial interface for which you want to view counters. |

## Defaults

If no interface is specified, statistics for all multilink and serial interfaces are displayed.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC1 | This command was introduced (MGX-RPM-1FE-CP back card). |
| 12.2(8)MC2 | This command was introduced (MWR 1941-DC router). |
| 12.3(11)T | This command was incorporated into Cisco IOS Release 12.3(11)T. |

## Usage Guidelines

This command is only valid when issued against multilink or PPP interfaces.

## Examples

The following is an example of the output generated by this command.

```
show ppp mux interface multilink 1

PPP Multiplex Statistics on Interface Multilink1:

Multiplex:
 Total input packets:0
 Errored input packets:0
 Valid input bytes:0
 Total output packets:0
 Multiplexed output packets:0
 Output bytes:0
 Efficiency improvement factor:0%

Demultiplex:
 Total input packets:0
 Multiplexed input packets:0
 Errored input packets:0
 Valid input bytes:0
 Total output packets:0
 Output bytes:0
 Efficiency improvement factor:0%
```

Table 31 describes the significant fields shown in the display.

***Table 31 show ppp mux Field Descriptions***

| Field | Description |
|---|---|
| Total output packets | Number of outbound packets |
| Multiplexed output packets | Number of outbound multiplexed superframes |
| Output byte count | Number of outbound bytes |
| Total input packets | Number of inbound packets |
| Errored input packets | Number of inbound packets discarded due to error |
| Efficiency improvement factor | Percentage of efficiency improvement achieved through multiplexing or demultiplexing |

The efficiency improvement factor is calculated as follows:

Multiplex efficiency improvement factor = 100 * (Total bytes saved) / (Total bytes received)

Where total bytes saved = bytes_received_at_muxer - bytes_sent_at_muxer.

Demultiplex efficiency improvement factor = 100 * (Total bytes saved) / (Total bytes sent)

Where total bytes saved = bytes_sent_at_demuxer - bytes_received_at_demuxer.

## Related Commands

| Command | Description |
|---|---|
| **ppp mux** | Enables PPP multiplexing/demultiplexing |

# show radius local-server statistics

To display the statistics for the local authentication server, use the **show radius local-server statistics** command in privileged EXEC mode.

**show radius local-server statistics**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

The following output displays statistics for the local authentication server:

```
Router# show radius local-server statistics

Successes              : 11262       Unknown usernames      : 0
Client blocks          : 0           Invalid passwords      : 8
Unknown NAS            : 0           Invalid packet from NAS: 0

NAS : 10.0.0.1
Successes              : 11262       Unknown usernames      : 0
Client blocks          : 0           Invalid passwords      : 8
Corrupted packet       : 0           Unknown RADIUS message : 0
No username attribute  : 0           Missing auth attribute : 0
Shared key mismatch    : 0           Invalid state attribute: 0
Unknown EAP message    : 0           Unknown EAP auth type  : 0

Maximum number of configurable users: 50, current user count: 11
Username                   Successes  Failures  Blocks
vayu-ap-1                       2235         0       0
vayu-ap-2                       2235         0       0
vayu-ap-3                       2246         0       0
vayu-ap-4                       2247         0       0
vayu-ap-5                       2247         0       0
vayu-11                            3         0       0
vayu-12                            5         0       0
vayu-13                            5         0       0
vayu-14                           30         0       0
vayu-15                            3         0       0
scm-test                           1         8       0
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# show tech-support cdma pdsn

To display PDSN information that is useful to Cisco Customer Engineers for diagnosing problems, use the **show tech-support cdma pdsn** command in privileged EXEC mode.

**show tech support cdma pdsn**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was modified to include PDSN status. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

This command displays the output of several **show** commands. We recommend that you attach the output of this command whenever you submit a PDSN problem report.

## Examples

The following example shows typical output of the **show tech-support cdma pdsn** command:

```
pdsn-6500#show tech-support cdma pdsn

------------------ show version ------------------

Cisco Internetwork Operating System Software
IOS (tm) 6500 Software (C6500-C5IS-M), Experimental Version 12.2(20020306:074931)
[user-dw91527 104]
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Wed 06-Mar-02 22:21 by user
Image text-base:0x600088E0, data-base:0x6169A000

ROM:System Bootstrap, Version 12.0(19990210:195103) [12.0XE 105], DEVELOPMENT SOFTWARE
BOOTLDR:6500 Software (C6500-BOOT-M), Version 12.0(3)T,  RELEASE SOFTWARE (fc1)

mwt10-7206a uptime is 20 minutes
System returned to ROM by reload at 23:17:59 UTC Wed Mar 6 2002
System image file is "tftp://223.255.254.254/user/c6500-c5is-mz.dw91527"

cisco 7206VXR (NPE300) processor (revision D) with 229376K/65536K bytes of memory.
Processor board ID 21302179
R7000 CPU at 262Mhz, Implementation 39, Rev 2.1, 256KB L2, 2048KB L3 Cache
6 slot VXR midplane, Version 2.1

Last reset from power-on
Bridging software.
```

```
X.25 software, Version 3.0.0.
8 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
1 ATM network interface(s)
125K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0


------------------ show running-config ------------------


Building configuration...

Current configuration :3015 bytes
!
version 12.2
no parser cache
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service cdma pdsn
!
hostname mwt10-7206a
!
aaa new-model
!
!
aaa authentication login default none
aaa authentication ppp default group radius
aaa authentication ppp VPDN group radius
aaa authorization config-commands
aaa authorization ipmobile default group radius
aaa authorization network default group radius
aaa authorization network VPDN group radius
aaa authorization config-commands
aaa authorization network default group radius
aaa authorization configuration default group radius
aaa accounting update periodic 10
aaa accounting network pdsn start-stop group radius
aaa session-id common
enable secret 5 <removed>
enable password <removed>
!
username abc password 0 <removed>
ip subnet-zero
no ip gratuitous-arps
ip cef
ip cef accounting per-prefix non-recursive prefix-length
!
!
!
ip ftp source-interface Ethernet2/0
no ip domain-lookup
!
vpdn enable
vpdn authen-before-forward
virtual-profile aaa
!
!
!
```

```
!
!
!
!
interface Loopback0
 ip address 6.0.0.1 255.0.0.0
!
interface CDMA-Ix1
 ip address 5.0.0.1 255.0.0.0
 tunnel source 5.0.0.1
 tunnel key 0
 tunnel sequence-datagrams
!
interface FastEthernet1/0
 ip address 4.0.0.101 255.0.0.0
 duplex half
 speed auto
 no cdp enable
!
interface Ethernet2/0
 ip address 7.0.0.1 255.0.0.0
 no ip proxy-arp
 no ip route-cache
 no ip mroute-cache
 duplex half
 no cdp enable
!
interface Ethernet2/1
 ip address 150.1.10.4 255.255.0.0
 duplex half
 no cdp enable
!
interface Ethernet2/2
 no ip address
 no ip mroute-cache
 shutdown
 duplex half
 no cdp enable
!
interface Ethernet2/3
 no ip address
 no ip mroute-cache
 shutdown
 duplex half
 no cdp enable
!
interface Ethernet2/4
 no ip address
 no ip mroute-cache
 shutdown
 duplex half
 no cdp enable
!
interface Ethernet2/5
 no ip address
 no ip mroute-cache
 shutdown
 duplex half
 no cdp enable
!
interface Ethernet2/6
 no ip address
 no ip mroute-cache
 shutdown
```

```
 duplex half
 no cdp enable
!
interface Ethernet2/7
 no ip address
 no ip mroute-cache
 shutdown
 duplex half
 no cdp enable
!
interface ATM4/0
 no ip address
 no ip mroute-cache
 shutdown
 no atm ilmi-keepalive
!
interface Virtual-Template1
 ip unnumbered Loopback0
 ip mobile foreign-service challenge
 ip mobile foreign-service reverse-tunnel
 ip mobile registration-lifetime 65535
 no peer default ip address
 ppp authentication chap pap optional
!
router mobile
!
ip local pool ispabc-pool1 9.0.0.1 9.0.0.255
ip classless
ip route 10.0.0.0 255.0.0.0 7.0.0.2
no ip http server
ip pim bidir-enable
ip mobile foreign-agent care-of Ethernet2/0
ip mobile proxy-host nai mwts-mipp-np-user1@ispxyz.com flags 42
!
!
dialer-list 1 protocol ip permit
dialer-list 1 protocol ipx permit
no cdp run
!
!
radius-server host 150.1.0.1 auth-port 1645 acct-port 1646 key <removed>
radius-server retransmit 3
radius-server optional-passwords
radius-server key <removed>
radius-server vsa send accounting
radius-server vsa send authentication
radius-server vsa send accounting 3gpp2
radius-server vsa send authentication 3gpp2
cdma pdsn virtual-template 1
cdma pdsn a10 max-lifetime 65535
cdma pdsn a10 ahdlc-engine 5 usable-channels 8000
cdma pdsn timeout mobile-ip-registration 300
cdma pdsn msid-authentication
cdma pdsn selection interface Ethernet2/0
cdma pdsn secure pcf default spi 100 key ascii test
cdma pdsn secure pcf 4.0.0.1 spi 100 key ascii test
cdma pdsn secure pcf 4.0.0.1 spi 1000 key ascii cisco
cdma pdsn secure cluster default spi 100 key ascii cisco
call rsvp-sync
!
!
mgcp profile default
!
dial-peer cor custom
```

```
!
!
!
!
gatekeeper
 shutdown
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password <removed>
!
!
end


------------------ show cdma pdsn ------------------


PDSN software version 1.2, service is enabled

  A11 registration-update timeout 1 sec, retransmissions 5
  Mobile IP registration timeout 300 sec
  A10 maximum lifetime allowed 65535 sec
  GRE sequencing is on
  Maximum PCFs limit not set, maximum sessions limit not set
  SNMP failure history table size 100
  MSID Authentication is enabled
      Network code digits for IMSI 5, MIN 6, IRM 4
      Profile Password is cisco
  Ingress address filtering is disabled
  Sending Agent Adv in case of IPCP Address Negotiation  is disabled
  Aging of idle users disabled

  Number of pcfs connected 1
  Number of sessions connected 1,
    Simple IP flows 0, Mobile IP flows 0,
    Proxy Mobile IP flows 1


------------------ show ip interface brief ------------------


Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet1/0            4.0.0.101       YES NVRAM  up                    up
Ethernet2/0                7.0.0.1         YES manual up                    up
Ethernet2/1                150.1.10.4      YES NVRAM  up                    up
Ethernet2/2                unassigned      YES NVRAM  administratively down down
Ethernet2/3                unassigned      YES NVRAM  administratively down down
Ethernet2/4                unassigned      YES NVRAM  administratively down down
Ethernet2/5                unassigned      YES NVRAM  administratively down down
Ethernet2/6                unassigned      YES NVRAM  administratively down down
Ethernet2/7                unassigned      YES NVRAM  administratively down down
ATM4/0                     unassigned      YES NVRAM  administratively down down
Loopback0                  6.0.0.1         YES NVRAM  up                    up
CDMA-Ix1                   5.0.0.1         YES NVRAM  up                    up
Virtual-Template1          6.0.0.1         YES unset  down                  down
Virtual-Access1            unassigned      YES unset  up                    up
Mobile0                    unassigned      YES unset  up                    up
Tunnel0                    unassigned      YES unset  up                    up
Tunnel1                    7.0.0.1         YES unset  up                    up
Virtual-Access2            unassigned      YES unset  down                  down
```

```
Virtual-Access3            unassigned      YES unset  up                    up
Virtual-Access3.1          6.0.0.1         YES unset  up                    up

------------------ show ip route ------------------


Codes:C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    4.0.0.0/8 is directly connected, FastEthernet1/0
C    5.0.0.0/8 is directly connected, CDMA-Ix1
C    6.0.0.0/8 is directly connected, Loopback0
C    7.0.0.0/8 is directly connected, Ethernet2/0
S    10.0.0.0/8 [1/0] via 7.0.0.2
C    150.1.0.0/16 is directly connected, Ethernet2/1
     30.0.0.0/32 is subnetted, 1 subnets
C       30.0.0.1 is directly connected, Virtual-Access3.1

------------------ show cdma pdsn session brief ------------------

MSID            PCF IP Address          PSI      Age  St Flows Interface
11122000050031  4.0.0.1                   1 00:19:57 ACT     1 Virtual-Access3.1


------------------ show cdma pdsn session ------------------


Mobile Station ID IMSI 11122000050031
  PCF IP Address 4.0.0.1, PCF Session ID 1
  A10 connection time 00:19:57,  registration lifetime 1800 sec
  Number of A11 re-registrations 1, time since last registration 1193 sec
  Current Access network ID 0004-0000-01
  Last airlink record received is Active Start, airlink is active
  GRE sequence number transmit 12, receive 12
  Using interface Virtual-Access3.1, status ACT
  Using AHDLC engine on slot 5, channel ID 0
  This session has 1 flow

  Flow service Proxy-Mobile, NAI mwts-mipp-np-user1@ispxyz.com
    Mobile Node IP address 30.0.0.1
    Home Agent IP address 7.0.0.2
    Packets in 0, bytes in 0
    Packets out 0, bytes out 0


------------------ show cdma pdsn pcf brief ------------------

PCF IP Address     Sessions      Pkts In     Pkts Out     Bytes In    Bytes Out
4.0.0.1                   1            0           12            0          396


------------------ show cdma pdsn pcf ------------------


PCF 4.0.0.1 has 1 session
  Received 0 pkts (0 bytes), sent 12 pkts (396 bytes)
```

```
  PCF Session ID 1, Mobile Station ID IMSI 11122000050031
    A10 connection age 00:19:58
    A10 registration lifetime 1800 sec, time since last registration 1194 sec



------------------ show cdma pdsn selection summary ------------------


CDMA PDSN selection summary:
    Hostname         PDSN            Session-count  Max-sessions
   *mwt10-7206a      5.0.0.1             1              8000
    mwt10-7206b      12.0.0.1            0              8000

    Hostname         Keepalive    Interface       Load-factor
   *mwt10-7206a          30       7.0.0.1            0.00
    mwt10-7206b          30       7.0.0.2            0.00

------------------ show ip mobile traffic ------------------

IP Mobility traffic:
Advertisements:
    Solicitations received 0
    Advertisements sent 0, response to solicitation 0
Home Agent Registrations:
    Register 0, Deregister 0 requests
    Register 0, Deregister 0 replied
    Accepted 0, No simultaneous bindings 0
    Denied 0, Ignored 0 , Dropped 0
    Unspecified 0, Unknown HA 0
    Administrative prohibited 0, No resource 0
    Authentication failed MN 0, FA 0, active HA 0
    Bad identification 0, Bad request form 0
    Unavailable encap 0, reverse tunnel 0
    Reverse tunnel mandatory 0
    Binding Updates received 0, sent 0 total 0 fail 0
    Binding Update acks received 0 sent 0
    Binding info requests received 0, sent 0 total 0 fail 0
    Binding info reply received 0 drop 0, sent 0 total 0 fail 0
    Binding info reply acks received 0 drop 0, sent 0
    Gratuitous 0, Proxy 0 ARPs sent
    Route Optimization Binding Updates sent 0, acks received 0 neg acks received 0
    Unrecognized VendorID or CVSE-Type in CVSE sent by MN to HA 0
    Unrecognized VendorID or CVSE-Type in CVSE sent by FA to HA 0
Foreign Agent Registrations:
    Request in 0,
    Forwarded 0, Denied 0, Ignored 0
    Unspecified 0, HA unreachable 0
    Administrative prohibited 0, No resource 0
    Bad lifetime 0, Bad request form 0
    Unavailable encapsulation 0, Compression 0
    Unavailable reverse tunnel 0
    Reverse tunnel mandatory 0
    Replies in 1
    Forwarded 0, Bad 0, Ignored 1
    Authentication failed MN 0, HA 0
    Received challenge/gen. authentication extension, feature not enabled 0
    Route Optimization Binding Updates received 0, acks sent 0 neg acks sent 0
    Unknown challenge 0, Missing challenge 0, Stale challenge 0
    Unrecognized VendorID or CVSE-Type in CVSE sent by MN to FA 0
    Unrecognized VendorID or CVSE-Type in CVSE sent by HA to FA 0

------------------ show ip mobile globals ------------------
```

```
IP Mobility global information:
Home Agent is not enabled

Foreign Agent

    Pending registrations expire after 15 secs
    Care-of addresses advertised
        Ethernet2/0 (7.0.0.1) - up

0 interfaces providing service
Encapsulations supported:IPIP and GRE
Tunnel fast switching enabled
Tunnel path MTU discovery aged out after 10 min

------------------ show ip mobile interface ------------------

IP Mobility interface information:

------------------ show vpdn tunnel ------------------



------------------ show cdma pdsn resource ------------------


Resource allocated/available in the resource manager

slot 0:
        AHDLC Engine Type:CDMA HDLC SW ENGINE
                 Engine is ENABLED
                total channels:16000, available channels:16000
```

# show wlccp wds

To display information about the wireless domain services (WDS) device or information about client devices, use the **show wlccp wds** command in privileged EXEC mode.

**show wlccp wds** [**ap | mn**] [**detail**] [**mac-addr** *mac-address*]

## Syntax Description

| | |
|---|---|
| **ap** | (Optional) Displays access points participating in Cisco Centralized Key Management (CCKM). |
| mn | (Optional) Displays cached information about client devices, also called mobile nodes. |
| detail | (Optional) Displays the lifetime of the client, the service set identifier (SSID), and the virtual LAN (VLAN) ID. |
| mac-addr | (Optional) Displays information about a specific client device. |
| *mac-address* | Client's MAC address. |

## Defaults

If you do not enter any options with the **show wlccp wds** command, this command displays the IP address of the WDS device, the MAC address, the priority, and the interface state. If the interface state is backup, the command also displays the IP address of the current WDS device, the MAC address, and the priority.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

To show information about the WDS device, do not enter any keywords with this command.

## Examples

The following command entry displays information about the WDS device:

```
show wlccp wds ap
```

The following command entry displays cached information, including details, about the client device with the specified MAC address:

```
show wlccp wds mn detail mac-addr 00-05-C2-00-01-F5
```

The following is sample output from the **show wlccp wds** command:

```
Router# show wlccp wds
```

```
MAC:0001.28e0.a400, IP-ADDR:10.0.0.1       , Priority:255
Interface Vlan1, State:Administratively StandAlone - ACTIVE
AP Count:1   , MN Count:0   , MAX AP Count:50
```

The following table describes the significant fields shown in the display.

| Field | Description |
|---|---|
| MAC | MAC address of the interface on which the WDS is configured. |
| IP-Addr | IP address of the interface on which the WDS is configured. |
| Priority | Priority of the WDS. |
| Interface | Interface on which the WDS is configured. |
| State | State of the WDS. The state can be INITIALIZATION/BACKUP/ACTIVE/. |
| AP Count | Number of access points registered to the WDS. |
| MN Count | Number of mobile nodes registered to the WDS. |
| MAX AP Count | Maximum number of access points that can be registered. |

## Related Commands

| Command | Description |
|---|---|
| **debug wlccp packet** | Displays packet traffic to and from the WDS router. |
| **debug wlccp wds** | Displays either WDS debug state or WDS statistics messages. |
| **wlccp authentication-server client** | Configures the list of servers to be used for 802.1X authentication. |
| **wlccp authentication-server infrastructure** | Configures the list of servers to be used for 802.1X authentication for the wireless infrastructure devices. |
| **wlccp wds priority interface** | Enables a wireless device such as an access point or a wireless-aware router to be a WDS candidate. |

# snmp-server enable traps cdma

To enable network management traps for CDMA, use the **snmp-server enable traps cdma** command in global configuration mode. To disable network management traps for CDMA, use the **no** form of this command.

**snmp-server enable traps cdma**

**no snmp-server enable traps cdma**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Network management traps disabled.

## Command Modes

Global Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(3)XS | This command was introduced. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |

## Examples

The following example enables network management traps for CDMA:

```
snmp-server enable traps cdma
```

# ssid

To enter up to 20 service set identifiers (SSIDs) to a user group, use the **ssid** command in local RADIUS server group configuration mode. To instruct the access point (AP) not to check if the client has come in on a list of specified SSIDs, use the **no** form of this command.

**ssid** *ssid-number*

**no ssid** *ssid-number*

## Syntax Description

| | |
|---|---|
| *ssid-number* | SSID number of user group members. |

## Defaults

No default behavior or values

## Command Modes

Local RADIUS server group configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

You can enter up to 20 SSIDs to limit users to those SSIDs.

## Examples

The following example shows that the SSID "*green" has been added* to the local user group:

```
ssid green
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |

| Command | Description |
|---|---|
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **user** | Authorizes a user to authenticate using the local authentication server. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# standalone

To specify that the MWR 1941-DC is being used in a stand-alone configuration (which impacts the relays on the VWIC), use the **standalone** command. To use the MWR 1941-DC in a redundant configuration, use the **no** form of this command.

[**no**] **standalone**

## Syntax Description

This command has no attributes.

## Defaults

By default, the MWR 1941-DC is configured to be used in a redundant configuration (**no standalone**) and the relays are open.

## Command Modes

Y-cable configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC2 | This command was introduced. |
| 12.3(11)T | This command was incorporated in Cisco IOS Release 12.3(11)T. |

## Usage Guidelines

Issuing the standalone command closes the relays on the VWICs installed in the MWR 1941-DC.

## Examples

The following example closes the relays so that the MWR 1941-DC can be used as a stand-alone device.

```
standalone
```

## Related Commands

| Command | Description |
|---|---|
| **mode y-cable** | Invokes y-cable mode. |
| **standby use-interface** | Specifies the interfaces to be used for health and revertive interfaces. |

# standby use-interface

To designate a loopback interface as a health or revertive interface, use the **standby use-interface** command.

**standby use-interface** *interface* {**health** | **revertive** | **backhaul**}

## Syntax Description

| | |
|---|---|
| *interface* | Indicates the interface to be used with the specified parameter. For **health** and **revertive**, this is the loopback interface specified in the **standby track** command. For **backhaul**, the interface must be an MLPPP interface. If you want to use a serial interface as the backhaul, you must first configure that interface to be part of an MLPPP bundle. |
| health | Indicates the interface to monitor for an over temperature condition, the state of the processor, and the state of the T1/E1 firmware. If any of these watched conditions indicate a failure, this interface is brought down. Otherwise, the health interface remains in the up state. |
| revertive | Indicates the interface that acts as the revertive interface. If the MWR 1941-DC router changes state from active to standby, the revertive interface is brought up. If the MWR 1941-DC router changes state from standby to active, the revertive interface is brought down. |
| backhaul | Indicates the interface to be used for backhauling. |

## Defaults

By default, the MWR 1941-DC is configured to be used in a redundant configuration (**no standalone**) and the relays are open.

## Command Modes

Y-cable configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8)MC2 | This command was introduced. |
| 12.3(11)T | This command was incorporated in Cisco IOS Release 12.3(11)T. |

## Usage Guidelines

The loopback interfaces that you specify for health and revertive interfaces must be the same loopback interfaces that you specified in the **standby track** command. In the **standby track** command, the decrement value for the revertive interface should always be less than that for other interfaces. We recommend that you use loopback101 for health and loopback102 for revertive.

The interface that you specify for the backhaul must be an MLPPP interface. If you want to use a serial interface as the backhaul, you must first configure that interface to be part of an MLPPP bundle. We recommend you use multilink1 for the backhaul interface.

## Examples

The following example specifies loopback101 as the health interface and loopback102 as the revertive interface.

```
standby use-interface loopback101 health
standby use-interface loopback102 revertive
standby use-interface multilink1 backhaul
```

## Related Commands

| Command | Description |
|---|---|
| **mode y-cable** | Invokes y-cable mode. |
| **redundancy** | Invokes redundancy mode. |
| **standalone** | Specifies whether the MWR 1941-DC router is used in a redundant or stand-alone configuration. |
| **standby** | Sets HSRP attributes |

# subscription-required

To specify that the GGSN checks the value of the selection mode in a PDP context request to determine if a subscription is required to access a PDN through a particular access point, use the **subscription-required** access-point configuration command. To specify that no subscription is required, use the **no** form of this command.

**subscription-required**

**no subscription-required**

## Defaults

No subscription is required

## Command Modes

Access-point configuration.

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(5)T | This command was integrated in Cisco IOS Release 12.1(5)T. |
| 12.2(4)MX | This command was incorporated in Cisco IOS Release 12.2(4)MX. |
| 12.2(8)YD | This command was incorporated in Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was incorporated in Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was incorporated in Cisco IOS Release 12.3(4)T. |
| 12.3(8)T | This command was incorporated in Cisco IOS Release 12.3(8)T. |

## Usage Guidelines

Use the **subscription-required** command to specify that the GGSN checks the value of the selection mode in a PDP context request to determine if a subscription is required for user access to PDNs through the current access point. When you configure the **subscription-required** command at the APN, the GGSN looks for the "subscription verified" selection mode in the PDP context request to establish the session. If the GGSN finds that the selection mode is designated as subscription not verified in the PDP context request, then the GGSN rejects the PDP context request.

The subscription must be set up by the service provider, and subscription information must be passed with the mobile user's PDP context requests.

## Examples

The following example specifies that the GGSN checks for subscription verification in the selection mode before establishing a session at the access-point:

```
access-point 1
 access-point-name gprs.somewhere.com
 dhcp-server 10.100.0.3
 dhcp-gateway-address 10.88.0.1
 subscription-required
 exit
```

# user

To enter the names of users that are allowed to authenticate using the local authentication server, use the **user** command in local RADIUS server configuration mode. To remove the user name and password from the local RADIUS server, use the **no** form of this command.

**user** *username* {**password** | **nthash**} *password* [**group** *group-name*]

**no user** *username* {**password** | **nthash**} *password* [**group** *group-name*]

## Syntax Description

| | |
|---|---|
| *username* | Name of the user that is allowed to authenticate using the local authentication server. |
| **password** | Indicates that the user password will be entered. |
| **nthash** | Indicates that the NT value of the password will be entered. |
| *password* | User password. |
| **group** *group-name* | (Optional) Name of group to which the user will be added. |

## Defaults

If no group name is entered, the user is not assigned to a virtual LAN (VLAN) and is never required to reauthenticate.

## Command Modes

Local RADIUS server configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

If you do not know the user password, look up the NT value of the password in the authentication server database, and enter the NT hash as a hexadecimal string.

## Examples

The following example shows that user *"ssmith" has been allowed to* authenticate using the local authentication server (using the password "*smithisok").* The user will be added to the group "*team1"*:

```
user ssmith password smithisok group team1
```

**Related Commands**

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **vlan** | Specifies a VLAN to be used by members of a user group. |

# vlan

To specify a virtual LAN (VLAN) to be used by members of the user group, use the **vlan** command in local RADIUS server group configuration mode. To reset the parameter to the default value, use the **no** form of the command.

**vlan** *vlan*

**no vlan** *vlan*

## Syntax Description

| | |
|---|---|
| *vlan* | VLAN ID. |

## Defaults

No default behavior or values

## Command Modes

Local RADIUS server group configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet Access Point 1100 and Cisco Aironet Access Point 1200. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

The access point or router moves group members into the VLAN that you specify, overriding any other VLAN assignments. You can assign only one VLAN to a user group.

## Examples

The following example shows that VLAN *"225" is* to be used by members of the user group:

```
vlan 225
```

## Related Commands

| Command | Description |
|---|---|
| **block count** | Configures the parameters for locking out members of a group to help protect against unauthorized attacks. |
| **clear radius local-server** | Clears the statistics display or unblocks a user. |
| **debug radius local-server** | Displays the debug information for the local server. |
| **group** | Enters user group configuration mode and configures shared setting for a user group. |

| Command | Description |
|---|---|
| **nas** | Adds an access point or router to the list of devices that use the local authentication server. |
| **radius-server host** | Specifies the remote RADIUS server host. |
| **radius-server local** | Enables the access point or router to be a local authentication server and enters into configuration mode for the authenticator. |
| **reauthentication time** | Specifies the time (in seconds) after which access points or wireless-aware routers must reauthenticate the members of a group. |
| **show radius local-server statistics** | Displays statistics for a local network access server. |
| **ssid** | Specifies up to 20 SSIDs to be used by a user group. |
| **user** | Authorizes a user to authenticate using the local authentication server. |

# vrf (access-point configuration)

To configure VPN routing and forwarding at a GGSN access point and associate the access point with a particular VRF instance, use the **vrf** command in access-point configuration mode.

**vrf** *vrf-name*

## Syntax Description

| | |
|---|---|
| *vrf-name* | Name of the corresponding VRF instance with which the access point is associated. |

## Defaults

No default behavior or values.

## Command Modes

Access-point configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(4)MX | This command was introduced. |
| 12.2(8)YD | This command was integrated into Cisco IOS Release 12.2(8)YD. |
| 12.2(8)B | This command was integrated into Cisco IOS Release 12.2(8)B. |
| 12.3(4)T | This command was integrated into Cisco IOS Release 12.3(4)T. |

## Usage Guidelines

Use the **vrf** command to configure VPN routing and forwarding (VRF) at a GGSN access point and associate the access point with a particular VRF instance. The *vrf-name* should match the name configured in an **ip vrf** global configuration command, and also the **ip vrf forwarding** command at the Gi interface.

To support VRF, you must also enable Cisco Express Forwarding (CEF) switching on the router using the **ip cef** global configuration command.

If you are also configuring DHCP services at the APN, then you must also configure the **dhcp-server** *ip-address* **vrf** command.

**Note** Memory constraints might occur if you define a large number of access points to support VPN Routing and Forwarding (VRF).

## Examples

The following example shows a VRF configuration for vpn3 (without tunneling) using the **ip vrf** global configuration command. Because the **ip vrf** command establishes both VRF and CEF routing tables, notice that **ip cef** also is configured at the global configuration level to enable CEF switching at all of the interfaces.

The following other configuration elements must also associate the same VRF named vpn3:

- FastEthernet0/0 is configured as the Gi interface using the **ip vrf forwarding** interface configuration command.

- Access-point 2 implements VRF using the **vrf** command access-point configuration command.

The DHCP server at access-point 2 also is configured to support VRF. Notice that access-point 1 uses the same DHCP server, but is not supporting the VRF address space. The IP addresses for access-point 1 will apply to the global routing table:

```
aaa new-model
!
aaa group server radius foo
 server 10.2.3.4
 server 10.6.7.8
!
aaa authentication ppp foo group foo
aaa authorization network default group radius
aaa accounting exec default start-stop group foo
!
ip cef
!
ip vrf vpn3
 rd 300:3
!
interface Loopback1
 ip address 10.30.30.30 255.255.255.255
!
interface Loopback2
 ip vrf forwarding vpn3
 ip address 10.27.27.27 255.255.255.255
!
interface FastEthernet0/0
 ip vrf forwarding vpn3
 ip address 10.50.0.1 255.255.0.0
 duplex half
!
interface FastEthernet1/0
 ip address 10.70.0.1 255.255.0.0
 duplex half
!
interface Virtual-Template1
 ip address 10.8.0.1 255.255.0.0
 encapsulation gtp
 gprs access-point-list gprs
!
ip route 10.10.0.1 255.255.255.255 Virtual-Template1
ip route vrf vpn3 10.100.0.5 255.255.255.0 fa0/0 10.50.0.2
ip route 10.200.0.5 255.255.255.0 fa1/0 10.70.0.2
!
no ip http server
!
gprs access-point-list gprs
 access-point 1
  access-point-name gprs.pdn.com
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.200.0.5
  dhcp-gateway-address 10.30.30.30
  network-request-activation
  exit
  !
 access-point 2
  access-point-name gprs.pdn2.com
  access-mode non-transparent
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.100.0.5 10.100.0.6 vrf
  dhcp-gateway-address 10.27.27.27
  aaa-group authentication foo
```

```
  vrf vpn3
  exit
!
gprs default ip-address-pool dhcp-proxy-client
gprs gtp ip udp ignore checksum
!
radius-server host 10.2.3.4 auth-port 1645 acct-port 1646 non-standard
radius-server host 10.6.7.8 auth-port 1645 acct-port 1646 non-standard
radius-server key ggsntel
```

## Related Commands

| Command | Description |
|---|---|
| dhcp-server | Specifies a primary (and backup) DHCP server to allocate IP addresses to MS users entering a particular PDN access point. |
| ip cef | Enables CEF on the RP card. |
| ip vrf | Configures a VRF routing table. |
| ip vrf forwarding | Associates a VRF with an interface or subinterface. |
| rd | Creates routing and forwarding tables for a VRF and and specifies the default route distinguisher for a VPN. |

# wlccp authentication-server client

To configure the list of servers to be used for 802.1X authentication, use the **wlccp authentication-server client** command in global configuration mode. To disable the server list, use the **no** form of this command.

**wlccp authentication-server client** {**any | eap | leap | mac**} *list*

**no wlccp authentication-server client** {**any | eap | leap | mac**} *list*

## Syntax Description

| | |
|---|---|
| **any** | Specifies client devices that use any authentication. |
| eap | Specifies client devices that use Extensible Authentication Protocol (EAP) authentication. |
| leap | Specifies client devices that use Light Extensible Authentication Protocol (LEAP) authentication. |
| mac | Specifies client devices that use MAC-based authentication. |
| *list* | List of client devices. |

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

You can specify a list of client devices that use any type of authentication, or you can specify a list of client devices that use a certain type of authentication (such as EAP, LEAP, or MAC-based authentication).

## Examples

The following example shows how to configure the server list for LEAP authentication for client devices:

```
Router (config)# wlccp authentication-server client leap leap-list1
```

## Related Commands

| Command | Description |
|---|---|
| **debug wlccp packet** | Displays packet traffic to and from the WDS router. |
| **debug wlccp wds** | Displays either WDS debug state or WDS statistics messages. |

| Command | Description |
|---|---|
| **show wlccp wds** | Shows information about access points and client devices on the WDS router. |
| **wlccp authentication-server infrastructure** | Configures the list of servers to be used for 802.1X authentication for the wireless infrastructure devices. |
| **wlccp wds priority interface** | Enables a wireless device such as an access point or a wireless-aware router to be a WDS candidate. |

# wlccp authentication-server infrastructure

To configure the list of servers to be used for 802.1X authentication for the wireless infrastructure devices, use the **wlccp authentication-server infrastructure** command in global configuration mode. To disable the server list, use the **no** form of this command.

**wlccp authentication-server infrastructure** *list*

**no wlccp authentication-server infrastructure** *list*

## Syntax Description

| | |
|---|---|
| *list* | List of servers to be used for 802.1X authentication for the wireless infrastructure devices, such as access points, repeaters, and wireless-aware routers. |

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced on Cisco Aironet access points. |
| 12.3(11)T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Examples

This example shows how to configure the server list for 802.1X authentication for infrastructure devices participating in Cisco Centralized Key Management (CCKM):

```
Router (config)# wlccp authentication-server infrastructure wlan-list1
```

## Related Commands

| Command | Description |
|---|---|
| **debug wlccp packet** | Displays packet traffic to and from the WDS router. |
| **debug wlccp wds** | Displays either WDS debug state or WDS statistics messages. |
| **show wlccp wds** | Shows information about access points and client devices on the WDS router. |
| **wlccp authentication-server client** | Configures the list of servers to be used for 802.1X authentication. |
| **wlccp wds priority interface** | Enables a wireless device such as an access point or a wireless-aware router to be a WDS candidate. |

# wlccp wds priority interface

To configure the router or access point to provide WDS, use the **wlccp wds priority interface** command in global configuration mode. To remove the WDS configuration from the router or access point, use the **no** form of the command .

**wlccp wds priority** *priority* **interface** *interface*

**no wlccp wds priority** *priority* **interface** *interface*

## Syntax Description

| | |
|---|---|
| *priority* | Priority of this WDS candidate. The valid range is from 1 to 255. The greater the priority value, the higher the priority. |
| *interface* | Interface on which the router sends out WDS advertisements. Supported interface types are as follows:<br>• For access points—bvi<br>• For wireless-aware routers—bvi, svi, Fast Ethernet, and Gigabit Ethernet. |

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(11)JA | This command was introduced with support for Cisco Aironet access points. |
| 12.3(11T | This command was implemented on the following platforms: Cisco 2600XM, Cisco 2691, Cisco 2811, Cisco 2821, Cisco 2851, Cisco 3700, and Cisco 3800 series routers. |

## Usage Guidelines

The WDS candidate with the highest priority becomes the active WDS device.

## Examples

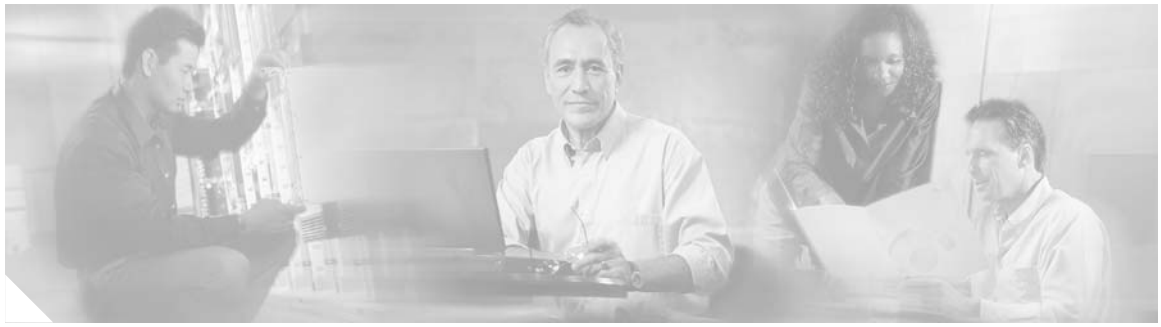
This example shows how to configure the priority for an access point as a candidate to provide WDS with priority 200:

```
Router (config)# wlccp wds priority 200 interface bvi 1
```

## Related Commands

| Command | Description |
|---|---|
| **debug wlccp packet** | Displays packet traffic to and from the WDS router. |
| **debug wlccp wds** | Displays either WDS debug state or WDS statistics messages. |
| **show wlccp wds** | Shows information about access points and client devices on the WDS router. |

| Command | Description |
|---|---|
| **wlccp authentication-server client** | Configures the list of servers to be used for 802.1X authentication. |
| **wlccp authentication-server infrastructure** | Configures the list of servers to be used for 802.1X authentication for the wireless infrastructure devices. |



# Appendix A: SGSN D-Node Commands

The commands in this section are for certain operator-specific, SGSN D-node implementations only. These commands are not to be used for any other type of standard, SGSN-related configuration, or to configure any GGSN services.

# clear gprs isgsn statistics

To clear the current GPRS intra-Serving GPRS Support Node (iSGSN) statistics, use the **clear gprs isgsn statistics** privileged EXEC command (SGSN D-node only).

**clear gprs isgsn statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Use the **clear gprs isgsn statistics** command to clear the current GPRS iSGSN statistics. This command clears the counters that are displayed by the **show gprs isgsn statistics** command.

## Examples

The following example clears the current GPRS iSGSN statistics:

```
router# clear gprs isgsn statistics
```

# clear l2relay statistics

To clear the Layer 2 Relay (l2relay) statistics for the SGSN, use the **clear l2relay statistics** privileged EXEC command (SGSN D-node only).

**clear l2relay statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Use the **clear l2relay statistics** command to clear the current l2relay statistics.

## Examples

The following example clears the l2relay statistics:

```
router# clear l2relay statistics
```

## Related Commands

| Command | Description |
|---|---|
| **clear l2relay topology-map** | Clears the Layer 2 Relay topology map for the SGSN. |

# clear l2relay topology-map

To clear the Layer 2 Relay topology map for the SGSN, use the **clear l2relay topology-map** privileged EXEC command (SGSN D-node only).

**clear l2relay topology-map**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

The SGSN module maintains a l2relay topology map that the router uses to keep a list of the unit IDs (UIDs) of the SGSN-datacom (SGSN-D) and SGSN-telecom (SGSN-T) units with which it can communicate. UIDs are added to the topology map when the router receives self-ID packets from SGSN-D and SGSN-T units on the network.

For debugging purposes, it may be useful to clear the Layer 2 Relay topology map. Using the **clear l2relay topology-map** command clears all of the data structures in the list of SGSN units so that the list can be rebuilt.

Normally you will not need to use this command. If problems with the SGSN are encountered, Cisco technical support personnel may request that you clear the Layer 2 Relay topology map.

## Examples

The following example clears the l2relay topology map for the SGSN:

```
router# clear l2relay topology-map
```

## Related Commands

| Command | Description |
|---|---|
| **clear l2relay statistics** | Clears the l2relay statistics for the SGSN (SGSN D-node only). |

# l2relay echo-interval

To specify the interval at which the SGSN sends l2relay keepalive messages, use the **l2relay echo-interval** global configuration command. To restore the default value for the echo interval (10 seconds) use the **no** form of the command (SGSN D-node only).

**l2relay echo-interval** *seconds*

**no l2relay echo-interval**

## Syntax Description

| | |
|---|---|
| *seconds* | The length of the echo interval, in seconds. Specify a value between 1 and 360 seconds. The default is 10 seconds. |

## Defaults

10 seconds

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Use the **l2relay echo-interval** command to specify the interval at which the SGSN sends Layer 2 Relay keepalive messages.

The SGSN module uses the proprietary l2relay protocol in conjunction with the intra-Serving GPRS Support Node (iSGSN) protocol for communication between the SGSN-datacom (SGSN-D) and SGSN-telecom (SGSN-T) units that comprise the SGSN. Each SGSN-D or SGSN-T unit periodically sends out keepalive messages (echo requests) to the other SGSN units to inform them that it is functioning. You can fine-tune the performance of the nodes that comprise the SGSN by adjusting the echo interval value.

To restore the default value for the echo interval (10 seconds) use the **no** form of the command.

## Examples

The following example shows an interval of 15 seconds between Layer 2 Relay keepalive messages:

```
l2relay echo-interval 15
```

# l2relay flow-control

To specify quench threshold and resume threshold percentages that determine when the l2relay protocol begins and ends flow control processing, use the **l2relay flow-control** global configuration command. To restore the default values for flow control processing, use the **no** form of the command (SGSN D-node only).

**l2relay flow-control** {**enable** | *quench-threshold* | *resume-threshold*}

**no l2relay flow-control**

## Syntax Description

| | |
|---|---|
| **enable** | Enables flow control. |
| *quench-threshold* | The percentage of congestion that triggers flow control processing. |
| *resume-threshold* | The percentage of congestion that triggers resumption of normal processing. |

## Defaults

The default value for the *quench-threshold* argument is 80.

The default value for the *resume-threshold* argument is 20.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

If you have enabled Layer 2 Relay flow-control processing using the **l2relay flow-control enable** command, you can use the **l2relay flow-control** command to specify congestion percentages that trigger flow control processing or resumption of normal Layer 2 Relay processing.

The *quench-threshold* argument specifies the congestion percentage that must be reached before flow-control processing begins. For example, if you specify 60 for the quench-threshold argument, then the SGSN initiates flow control when Layer 2 Relay processing becomes 60% congested.

The *resume-threshold* argument specifies the congestion percentage that must be reached before normal Layer 2 Relay processing is resumed. For example, if you specify 40 for the resume-threshold argument, then the SGSN resumes normal Layer 2 Relay processing when the congestion percentage decreases to 40%.

## Examples

In the following example, 60 is specified for the quench-threshold argument:

```
l2relay flow-control quench-threshold 60
```

# l2relay pilot-uid

To specify the unit ID of an SGSN-T node to which packets with unknown destination information are transmitted, use the **l2relay pilot-uid** global configuration command. To delete the pilot UID, use the **no** form of the command (SGSN D-node only).

**l2relay pilot-uid** *uid*

**no l2relay pilot-uid**

## Syntax Description

| | |
|---|---|
| *uid* | Number between 1 and 32 that specifies unit ID for the pilot unit. The default is 0xFF. |

## Defaults

0xFF (invalid UID)

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Each router that is running an SGSN module is assigned a unit ID as part of SGSN configuration. In the event that a packet comes in for an unknown SGSN, the receiving SGSN sends the packet to a unit designated as the "pilot" SGSN-T unit. Use the **l2relay pilot-uid** command to specify the SGSN-T unit to which packets with unknown destination information are transmitted.

## Examples

```
l2relay uid 5
l2relay pilot-uid 3
```

# l2relay use-interface

To specify the physical interfaces used by the l2relay protocol running on the SGSN, use the **l2relay use-interface** global configuration command (SGSN D-node only).

**l2relay use-interface** *interface_1* [*interface_2*]

## Syntax Description

| | |
|---|---|
| *interface_1* | Interface that is used by the Layer 2 Relay protocol. |
| *interface_2* | A secondary interface that can be used by the Layer 2 Relay protocol. |

## Defaults

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Use the **l2relay use-interface** command to specify one or more interfaces that the Layer 2 Relay protocol uses to communicate with the SGSN-T and SGSN-D units that comprise the SGSN.

## Examples

The following example shows the configuration for a Fast Ethernet interface (FastEthernet3/0) and the **l2relay use-interface** command that specifies use of that interface.

```
interface FastEthernet3/0
 ip address 5.0.0.55 255.0.0.0
 no ip directed-broadcast
 no ip mroute-cache
 no keepalive
!
l2relay use-interface FastEthernet3/0
```

# show gprs isgsn statistics

To display statistics that show the status of the intra-Serving GPRS Support Node running on the router, use the **show gprs isgsn statistics** privileged EXEC command (SGSN D-node only).

**show gprs isgsn statistics**

## Syntax Description

This command has no keywords or arguments.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(2)GB | The Local Rejected PDPs field was added to the output display. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

The processing nodes that comprise the SGSN communicate using the proprietary iSGSN Protocol. Each SGSN component running on a Cisco 7200 series router maintains statistical information about the status of the service. Use the **show gprs isgsn statistics** command to display status information about the iSGSN Protocol.

## Examples

The following example shows output from the **show gprs isgsn statistics** command:

```
router# show gprs isgsn statistics

        Input Packets:  16    Bytes:               864
        Output Packets: 16    Bytes:               752
        Input Drops:    4     Out Drops:           0
        Out Errors:     0     Local Rejected PDPs: 0
```

Table 32 describes the fields shown in the display.

*Table 32 show gprs isgsn statistics Field Descriptions*

| Field | Description |
|---|---|
| Input Packets, Bytes | Number of input packets and total bytes. |
| Output Packets, Bytes | Number of output packets and total bytes. |
| Input Drops | Number of dropped input packets. |
| Out Drops | Number of dropped output packets. |

*Table 32 show gprs isgsn statistics Field Descriptions (continued)*

| Field | Description |
|---|---|
| Out Errors | Number of output errors. |
| Local Rejected PDPs | Number of GTP create PDP contexts rejected by the D-node (supports SMG-28 standards level and later). |

## Related Commands

| Command | Description |
|---|---|
| **show l2relay statistics** | Displays statistics that show the status of the Layer 2 Relay Protocol running on the SGSN. |

# show l2relay statistics

To display statistics that show the status of the Layer 2 Relay Protocol running on the SGSN, use the **show l2relay statistics** privileged EXEC command (SGSN D-node only).

**show l2relay statistics**

## Syntax Description

This command has no keywords or arguments.

## Defaults

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(1)GA | This command was introduced. |
| 12.1(3)T | This command was integrated in Cisco IOS Release 12.1(3)T. |

## Usage Guidelines

Use the **show l2relay statistics** command to display statistical and other information about the Layer 2 Relay protocol running on the SGSN, including the following information:

- Layer 2 Relay Protocol configuration and performance
- The topology of the SGSN components
- Data throughput on the SGSN components

## Examples

The following example shows output from the **show l2relay statistics** command:

```
router# show l2relay statistics

         l2relay uid = 3                 unit-type = D
         l2relay echo-time = 10          flow control enable = 1
         l2relay reset_value = 164       l2rly_pak_drop = 0
         l2relay_inputQ len = 0          l2relay_mgmtQ len = 0
         l2relay_flow_quench at 80 %     resume at 20 %
         l2relay pilot_uid = 1

l2relay topology:
-----------------------------------------------------------------
         FastEthernet3/0
Type UID  mac_address1  Tx/Rx   mac_address2    Tx/Rx   Cngst   OQlen
 D   3   0050.2a53.0854 1/1     0000.0000.0000  0/0     0       0
 T   1   0040.05a2.26cb 1/1     0000.0000.0000  0/0     0       0

l2relay accounting:
-------------------------------------------------------------
Type    UID     Byte_out/Pak_out        Byte_in/Pak_in
 D      3       16936/542               0/0
 T      1       0/0                     0/0
```

Table 33 describes the fields shown in the first part of the display.

*Table 33 show l2relay statistics Field Descriptions*

| Field | Description |
|---|---|
| l2relay uid | Unit ID of the SGSN component running on the router. |
| unit-type | Type of SGSN unit running on the router: D indicates an SGSN-D unit; T indicates an SGSN-T unit. |
| l2relay echo-time | Configured value for the Layer 2 Relay echo interval. |
| flow control enable | Indicates whether flow control is enabled on the SGSN unit: 0 indicates flow control is enabled; 1 indicates it is disabled. |
| l2relay reset_value | Number of times that the SGSN D-unit or T-unit has been reset. |
| l2rly_pak_drop | Number of packets dropped by the Layer 2 Relay Protocol module. |
| l2relay_inputQ len | Current length of the Layer 2 Relay input queue. |
| l2relay_mgmtQ len | Current length of the Layer 2 Relay management queue. |
| l2relay_flow_quench at | Current Layer 2 Relay quench percentage setting. |
| resume at | Current Layer 2 Relay resume percentage setting. |
| l2relay pilot_uid | Currently configured Layer 2 Relay pilot unit ID. |

The second part of the output from **show l2relay statistics** shows Layer 2 Relay topology information about each SGSN unit that is running.

Table 34 describes the fields shown in the l2relay topology section of the display.

*Table 34 show l2relay statistics Field Descriptions*

| Field | Description |
|---|---|
| Cngst | UID congestion indicator, with the following values:<br>• 0—No congestion.<br>• 1—Congestion. |
| Interface name | Name of the interface specified in the **l2relay use-interface** command. In the example, the interface is the FastEthernet3/0 interface. |
| mac_address1 | MAC address of the first interface configured with the **l2relay use-interface** command. |
| mac_address2 | MAC address of the second interface configured with the **l2relay use-interface** command (if one is configured). |
| OQlen | Current length of the output queue. |
| Tx/Rx (first field) | Number of packets transmitted and received over this interface. |
| Tx/Rx (second field) | Path status indicator for the transmit (Tx) and receive (Rx) path, with the following values:<br>• 0—Problem condition detected on the path.<br>• 1—Path is functional. |

*Table 34 show l2relay statistics Field Descriptions (continued)*

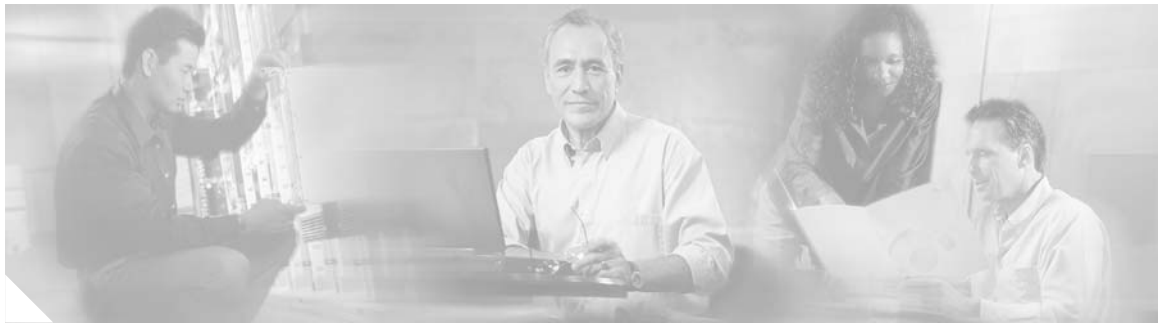
| Field | Description |
|---|---|
| Type | Type of SGSN unit, with the following values:<br>• D—SGSN datacom (SGSN-D) unit<br>• T—SGSN telecom (SGSN-T) unit |
| UID | Unit identifier. |

The last part of the output from the **show l2relay statistics** command shows Layer 2 Relay accounting information for each SGSN unit.

Table 35 describes the fields shown in the l2relay accounting section of the display.

*Table 35 show l2relay statistics Field Descriptions*

| Field | Description |
|---|---|
| Byte_in/Pak_in | Number of bytes/packets received by this unit. |
| Byte_out/Pak_out | Number of bytes/packets transmitted by this unit. |
| Type | Type of SGSN unit, with the following values:<br>• D—SGSN datacom (SGSN-D) unit<br>• T—SGSN telecom (SGSN-T) unit |
| UID | Unit identifier. |



# Appendix B: Table of MCC and MNC Codes

Table 36 provides a reference for some of the established mobile country codes and mobile network codes in use today. When MNC codes are not available, only the country code is provided.

**Note** This table provides a list of some known MCC and MNC codes at the time of this publication. This list is subject to change as new service providers and countries are added. To find more information about MCC and MNC codes, see the ITU E.212 recommendation, *Identification Plan for Land Mobile Stations*.

***Table 36 List of Some Established MCC and MNC Values***

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Albania | AMC | 276 01 |
| Andorra | STA-Mobiland | 213 03 |
| Argentine Republic | | 722 |
| Armenia | Armentel | 283 01 |
| Australia | OptusTelecom | 505 02 |
| | Telstra | 505 01 |
| | Vodafone | 505 03 |
| Austria | Mobilkom Austria | 232 01 |
| | max.mobil. | 232 03 |
| | Connect Austria | 232 05 |
| Azerbaidjan | Azercell | 400 01 |
| | JV Bakcell | 400 02 |
| Bahrain | Batelco | 426 01 |
| Bangladesh | Grameen Phone Ltd | 470 01 |
| | TM International | 470 19 |
| | Sheba Telecom | 470 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Belgium | Proximus | 206 01 |
| | Mobistar | 206 10 |
| | KPN Orange | 206 20 |
| Bosnia | Cronet | 218 01 |
| | PTT Bosnia | 218 19 |
| Botswana | Mascom Wireless | 652 01 |
| Brunei | DSTCom | 528 11 |
| | Jabatan Telekom | 528 01 |
| Bulgaria | MobilTel AD | 284 01 |
| Burkina Faso | OnaTel | 613 |
| Cambodia | CamGSM | 456 01 |
| | Cambodia Samart | 456 02 |
| | Cambodia Shinawatra | 456 |
| Cameroon | PTT Cameroon Cellnet | 624 01 |
| Canada | Microcell | 302 37 |
| Cape Verde | Cabo Verde Telecom | 625 01 |
| Chile | Entel Telefonia | 730 |
| China | Guangdong MCC | 460 00 |
| | Beijing Wireless | 460 |
| | China Unicom | 460 01 |
| | Zhuhai Comms | 460 |
| | DGT MPT | 460 |
| | Jiaxing PTT | 460 |
| | Tjianjin Toll | 460 |
| | Liaoning PPTA | 460 02 |
| Congo | African Telecoms | 629 |
| | Congolaise Wireless | 629 |
| Croatia | HR Cronet | 219 01 |
| | Vipnet | 219 10 |
| Cyprus | CYTA | 280 01 |
| Czech Rep. | Eurotel Praha | 230 02 |
| | Radio Mobil | 230 01 |
| Denmark | Sonofon | 238 02 |
| | Tele Danmark Mobil | 238 01 |
| | Mobilix | 238 30 |
| | Telia | 238 20 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Egypt | MobiNil | 602 01 |
| | Click GSM | 602 02 |
| Estonia | EMT | 248 01 |
| | Radiolinja Eesti | 248 02 |
| | Q GSM | 248 03 |
| Ethiopia | ETA | 636 01 |
| Faroe Islands | Faroese Telecom | 288 |
| Fiji | Vodafone | 542 01 |
| Finland | Radiolinja | 244 05 |
| | Sonera | 244 91 |
| | Alands Mobiltelefon | 244 05 |
| | Telia | 244 03 |
| | Finnet | 244 09 |
| | Lnnen Puhelin | 244 09 |
| | Helsingin Puhelin | 244 09 |
| France | France Telecom | 208 01 |
| | SFR | 208 10 |
| | Bouygues Telekom | 208 20 |
| Fr.Polynesia | Tikiphone | 547 20 |
| Fr.W.Indies | Ameris | 340 01 |
| Georgia | Superphone | 282 |
| | Geocell | 282 01 |
| | Magticom | 282 02 |
| Germany | D1, DeTeMobil | 262 01 |
| | D2, Mannesmann | 262 02 |
| | E-Plus Mobilfunk | 262 03 |
| | Viag Interkom | 262 07 |
| Ghana | Franci Walker Ltd | 620 |
| | ScanCom | 620 01 |
| Gibraltar | GibTel | 266 01 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Great Britain | Cellnet | 234 10 |
| | Vodafone | 234 15 |
| | Jersey Telecom | 234 50 |
| | Guernsey Telecom | 234 55 |
| | Manx Telecom | 234 58 |
| | One2One | 234 30 |
| | Orange | 234 33 |
| Greece | Panafon | 202 05 |
| | STET | 202 10 |
| | Cosmote | 202 01 |
| Greenland | Tele Greenland | 290 |
| Guinea | Int'l Wireless | 611 |
| | Spacetel | 611 |
| | Sotelgui | 611 02 |
| Hong Kong | HK Hutchison | 454 04 |
| | SmarTone | 454 06 |
| | Telecom CSL | 454 00 |
| | P Plus Comm | 454 22 |
| | New World PCS | 454 10 |
| | Mandarin Comm | 454 16 |
| | Pacific Link | 454 18 |
| | Peoples Telephone | 454 12 |
| | SMC PCS | 454 22 |
| Hungary | Pannon GSM | 216 01 |
| | Westel 900 | 216 30 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| India | Airtel | 404 10 |
| | Essar | 404 11 |
| | Maxtouch | 404 20 |
| | BPLMobile | 404 21 |
| | Command | 404 30 |
| | Mobilenet | 404 31 |
| | Skycell | 404 40 |
| | RPG MAA | 404 41 |
| | Modi Telstra | 404 14 |
| | Sterling Cellular | 404 11 |
| | Mobile Telecom | 404 |
| | Airtouch | 404 |
| | BPL USWest | 404 |
| | Koshika | 404 |
| | Bharti Telenet | 404 |
| | Birla Comm | 404 |
| | Cellular Comms | 404 27 |
| | TATA | 404 07 |
| | Escotel | 404 12 |
| | JT Mobiles | 404 |
| | Evergrowth Telecom | 404 |
| | Aircel Digilink | 404 15 |
| | Hexacom India | 404 |
| | Reliance Telecom | 404 |
| | Fascel Limited | 404 |
| Indonesia | TELKOMSEL | 510 10 |
| | PT Satelit Palapa | 510 01 |
| | Excelcom | 510 11 |
| | PT Indosat | 510 |
| Iraq | Iraq Telecom | 418 |
| Iran | T.C.I. | 432 11 |
| | Celcom | 432 |
| | Kish Free Zone | 432 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Ireland | Eircell | 272 01 |
| | Digifone | 272 02 |
| | Meteor | 272 03 |
| Israel | Partner Communications | 425 01 |
| Italy | Omnitel | 222 10 |
| | Telecom Italia Mobile | 222 01 |
| | Wind | 222 88 |
| Ivory Coast | Ivoiris | 612 03 |
| | Telecel | 612 |
| | Comstar | 612 01 |
| | Loteny Telecom | 612 05 |
| Japan | | 440 |
| Jordan | MTS | 416 01 |
| Kenya | Kenya Telecom | 639 |
| Kuwait | MTCNet | 419 02 |
| Kyrgyz Rep | Bitel Ltd | 437 01 |
| La Reunion | SRR | 647 10 |
| Laos | Lao Shinawatra | 457 01 |
| Latvia | LMT | 247 01 |
| | BALTCOM GSM | 247 02 |
| Lebanon | Libancell | 415 03 |
| | Cellis | 415 01 |
| Lesotho | Vodacom | 651 01 |
| Liechtenstein | Natel-D | 228 01 |
| Lithuania | Omnitel | 246 01 |
| | Bite GSM | 246 02 |
| Luxembourg | P&T LUXGSM | 270 01 |
| | Millicom Lux' S.A | 270 77 |
| Macao | CTM | 455 01 |
| Macedonia | PTT Makedonija | 294 01 |
| Madagascar | Sacel | 646 03 |
| | Madacom | 646 01 |
| | SMM | 646 02 |
| Malawi | TNL | 650 01 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Malaysia | Celcom | 502 19 |
| | Maxis | 502 12 |
| | My BSB | 502 02 |
| | TM Touch | 502 13 |
| | Adam | 502 17 |
| | Digi Telecom | 502 16 |
| Malta | Advanced | 278 |
| | Telecell | 278 01 |
| Marocco | O.N.P.T | 604 01 |
| Mauritius | Cellplus | 617 01 |
| Monaco | France Telecom | 208 01 |
| | SFR | 208 10 |
| | Office des Telephones | 208 |
| Montenegro | Pro Monte | 220 02 |
| Mozambique | Telecom de Mocambique | 634 01 |
| | T.D.M GSM1800 | 634 |
| Namibia | MTC | 649 01 |
| Netherlands | PTT Netherlands | 204 08 |
| | Libertel | 204 04 |
| | Telfort Holding NV | 204 12 |
| | Ben | 204 16 |
| | Dutchtone | 204 20 |
| New Caledonia | Mobilis | 546 01 |
| New Zealand | Bell South | 530 01 |
| Nigeria | EMIS | 621 |
| Norway | NetCom | 242 02 |
| | TeleNor Mobil | 242 01 |
| Oman | General Telecoms | 422 02 |
| Pakistan | Mobilink | 410 01 |
| Papua | Pacific | 310 01 |
| Philippines | Globe Telecom | 515 02 |
| | Islacom | 515 01 |
| | Smart | 515 03 |
| Poland | Plus GSM | 260 01 |
| | ERA GSM | 260 02 |
| | IDEA Centertel | 260 03 |

*Table 36 List of Some Established MCC and MNC Values*

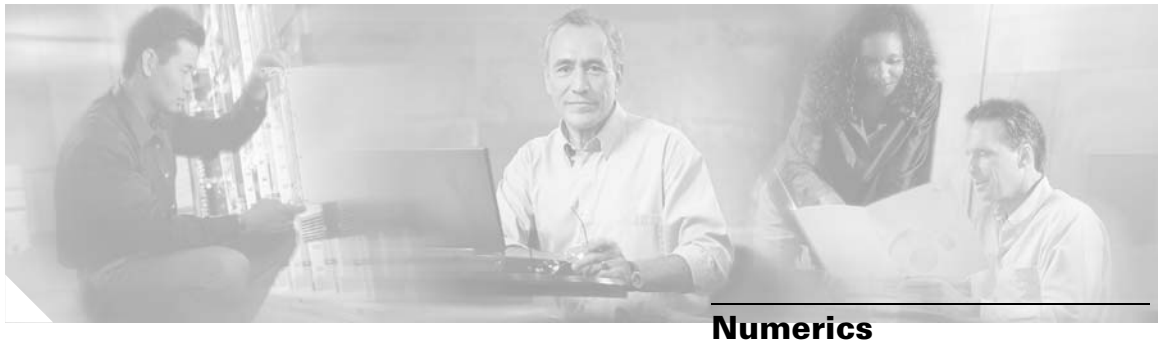
| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Portugal | Telecel | 268 01 |
| | TMN | 268 06 |
| | Main Road Telecoms | 268 |
| | Optimus | 268 03 |
| Qatar | Q-Net | 427 01 |
| Romania | MobiFon | 226 01 |
| | MobilRom | 226 10 |
| Russia | Mobile Tele... Moscow | 250 01 |
| | United Telecom Moscow | 250 |
| | NW GSM, St. Petersburg | 250 02 |
| | Dontelekom | 250 10 |
| | KB Impuls | 250 99 |
| | JSC Siberian Cellular | 250 |
| | BM Telecom | 250 07 |
| | Beeline | 250 |
| | Extel | 250 28 |
| | Far Eastern Cell | 250 12 |
| San Marino | Omnitel | 222 10 |
| | Telecom Italia Mobile | 222 01 |
| | Wind | 222 88 |
| Saudi Arabia | Al Jawal | 420 01 |
| | EAE | 420 07 |
| Senegal | Sonatel | 608 01 |
| Seychelles | SEZ SEYCEL | 633 01 |
| | Airtel | 633 10 |
| Serbia | Serbian PTT | 220 03 |
| Singapore | Singapore Telecom | 525 01 |
| | MobileOne | 525 03 |
| | Binariang | 525 |
| Slovak Rep | Eurotel | 231 02 |
| | Globtel | 231 01 |
| Slovenia | Mobitel | 293 41 |
| | Si.Mobil | 293 40 |
| South Africa | MTN | 655 10 |
| | Vodacom | 655 01 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Sri Lanka | MTN Networks Pvt Ltd | 413 02 |
| Spain | Airtel | 214 01 |
| | Telefonica Spain | 214 07 |
| | Amena | 214 03 |
| Sudan | Mobitel | 634 01 |
| Swaziland | | 653 |
| Sweden | Comviq | 240 07 |
| | Europolitan | 240 08 |
| | Telia Mobile | 240 01 |
| Switzerland | Swisscom 900 | 228 01 |
| | Swisscom 1800 | 228 01 |
| | diAx mobile | 228 02 |
| | Orange | 228 |
| Syria | SYR MOBILE | 417 09 |
| Taiwan | LDTA | 466 92 |
| | Mobitai | 466 93 |
| | TransAsia | 466 99 |
| | TWN | 466 97 |
| | Tuntex | 466 06 |
| | KGTelecom | 466 88 |
| | FarEasTone | 466 01 |
| | Chunghwa | 466 11 |
| Tanzania | Tritel | 640 01 |
| Thailand | TH AIS GSM | 520 01 |
| | Total Access Comms | 520 18 |
| | WCS | 520 10 |
| | Hello | 520 23 |
| Tunisia | Tunisian PTT | 605 02 |
| Turkey | Telsim | 286 02 |
| | Turkcell | 286 01 |
| UAE | UAE ETISALAT-G1 | 424 01 |
| | UAE ETISALAT-G2 | 424 02 |
| Uganda | Celtel Cellular | 641 01 |
| | MTN | 641 10 |

*Table 36 List of Some Established MCC and MNC Values*

| Country | Service Provider Name | MCC MNC |
|---|---|---|
| Ukraine | Mobile comms | 255 01 |
| | Golden Telecom | 255 05 |
| | Radio Systems | 255 02 |
| | Kyivstar JSC | 255 03 |
| USA | Bell South | 310 15 |
| | Sprint Spectrum | 310 02 |
| | Voice Stream | 310 26 |
| | Aerial Comms. | 310 31 |
| | Omnipoint | 310 16 |
| | Powertel | 310 27 |
| | Wireless 2000 | 310 11 |
| Uzbekistan | Daewoo GSM | 434 04 |
| | Coscom | 434 05 |
| | Buztel | 434 01 |
| Vatican | Omnitel | 222 10 |
| | Telecom Italia Mobile | 222 01 |
| | Wind | 222 88 |
| Venezuela | Infonet | 734 01 |
| | Digitel | 734 |
| Vietnam | MTSC | 452 01 |
| | DGPT | 452 02 |
| Yugoslavia | Mobile Telekom | 220 01 |
| | Promonte | 220 02 |
| | Telekom Serbia | 220 03 |
| Zaire | African Telecom Net | 630 |
| Zimbabwe | NET*ONE | 648 01 |
| | Telecel Zimbabwe | 648 04 |



## Numerics

| | |
|---|---|
| **B1R** | Cisco IOS Bridging and IBM Networking Command Reference, Volume 1 of 2 |
| **B2R** | Cisco IOS Bridging and IBM Networking Command Reference, Volume 2 of 2 |
| **DB** | Cisco IOS Debug Command Reference |
| **DR** | Cisco IOS Dial Technologies Command Reference |
| **FR** | Cisco IOS Configuration Fundamentals Command Reference |
| **IP1R** | Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services |
| **IP2R** | Cisco IOS IP Command Reference, Volume 2 of 3: Routing Protocols |
| **IP3R** | Cisco IOS IP Command Reference, Volume 3 of 3: Multicast |
| **IPv6R** | Cisco IPv6 Command Reference |
| **IR** | Cisco IOS Interface Command Reference |
| **MWR** | Cisco IOS Mobile Wireless Command Reference |
| **P2R** | Cisco IOS AppleTalk and Novell IPX Command Reference |
| **P3R** | Cisco IOS Apollo Domain, Banyan VINES, DECnet, ISO CLNS, and XNS Command Reference |
| **QR** | Cisco IOS Quality of Service Solutions Command Reference |
| **SR** | Cisco IOS Security Command Reference |
| **TR** | Cisco IOS Terminal Services Command Reference |
| **VR** | Cisco IOS Voice, Video, and Fax Command Reference |
| **WR** | Cisco IOS Wide-Area Networking Command Reference |
| **XR** | Cisco IOS Switching Services Command Reference |



## A

## B



## C

## D



## E



## F

## G

## H



## I

## K



## L



## M



## N

## P



## Q



## R

## S

## T



## U



## V



## W



## Y