



Configuring GGSN GTP Services

This chapter describes how to configure a Cisco router as a GGSN, and how to configure GTP options.

For a complete description of the GGSN commands in this chapter, refer to the *Cisco IOS Mobile Wireless Command Reference*.

To locate documentation of other commands that appear in this chapter, use the command reference master index or search online. See the “[Related Documents](#)” section on [page 3-3](#) for a list of the other Cisco IOS software documentation that might be helpful while configuring the GGSN.

This chapter includes the following sections:

- [Configuring the Router for GGSN Services, page 4-1](#)
- [Configuring Echo Timing on the GGSN, page 4-3](#)
- [Customizing the GGSN Configuration, page 4-13](#)
- [Monitoring and Maintaining GTP on the GGSN, page 4-19](#)
- [Configuration Examples, page 4-19](#)

GTP Overview

GTP is the protocol used to tunnel multi-protocol packets through the GPRS/UMTS network. It is defined on the Gn interface as the protocol between GSNs in the GPRS/UMTS backbone network.

With GGSN 4.0, the Cisco GGSN supports both GTP Version 0 (GTP v0) and GTP Version 1 (GTP v1) simultaneously. GPRS R97/R98 uses GTP Version 0 and UMTS R99 uses GTP v1.

The GGSN automatically selects the GTP version to use according to the capabilities of the SGSN. In the case of a network-initiated PDP activation, the GGSN sends a PDU Notification Request message with GTP v1. If an ICMP error message is received, GGSN immediately resends the message with GTP v0.

Configuring the Router for GGSN Services

The Cisco IOS GGSN software uses a logical interface called a virtual template interface to configure the router as a GGSN. This section describes the primary tasks you need to complete when configuring the router for GGSN services. Once the router has been configured as a GGSN, the subsequent configuration tasks describe how to establish connectivity from the GGSN to the SGSN and PDNs.

The following requirements must be met when configuring the GGSN on a Cisco router:

- Configure only a single GGSN entity on each router using the **service gprs ggsn** global configuration command.
- Configure only a single virtual template interface (as virtual template number 1) with GTP encapsulation on the GGSN.

GGSN Services Configuration Task List

To configure the router for GGSN services, perform the following tasks:

- [Enabling GGSN Services, page 4-2](#)
- [Creating a Loopback Interface, page 4-2](#)
- [Creating a Virtual Template Interface for GGSN, page 4-3](#)

Enabling GGSN Services

Configure only a single GGSN entity on each router using the **service gprs ggsn** global configuration command.

To enable GGSN services on the router, use the following command in global configuration mode:

Command	Purpose
Router(config)# service gprs ggsn	Specifies that the router functions as a GGSN.

Creating a Loopback Interface

Rather than directly configuring an IP address on the virtual template, Cisco recommends that you create a loopback interface and then associate the loopback interface IP address to the virtual template used for GTP encapsulation. Cisco recommends that you configure the virtual template interface as unnumbered, and associate its IP numbering with a loopback interface.

A loopback interface is a software-only interface that emulates an interface that is always up. It is a virtual interface supported on all platforms. The interface-number is the number of the loopback interface that you want to create or configure. There is no limit on the number of loopback interfaces you can create. The GGSN uses loopback interfaces to support the configuration of several different features.

To create a loopback interface, use the following commands in global configuration mode:

	Command	Purpose
Step 1	Router(config)# interface loopback <i>number</i>	Creates a loopback interface. A loopback interface is a virtual interface that is always up.
Step 2	Router(config-if)# ip address <i>ip-address mask</i>	Assigns an IP address to the loopback interface.

Creating a Virtual Template Interface for GGSN

Configure only a single virtual template interface (as virtual template number 1) with GTP encapsulation on the GGSN.

To create a virtual template interface for GGSN, use the following command beginning in global configuration mode:

	Command	Purpose
Step 3	Router(config)# interface virtual-template <i>number</i>	Creates a virtual template interface, where <i>number</i> identifies the virtual template interface. This command enters you into interface configuration mode. Note The GGSN supports only a single virtual template for the GTP virtual interface.
Step 4	Router(config-if)# ip unnumber <i>loopback number</i>	Assigns the previously defined loopback IP address to the virtual template interface.
Step 5	Router(config-if)# encapsulation gtp	Specifies GTP as the encapsulation type for packets transmitted over the virtual template interface.
Step 6		

Configuring Echo Timing on the GGSN

The GGSN uses echo timing to determine whether an SGSN or external charging gateway is active.

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.

This section describes the different methods of echo timing that are supported on the GGSN and how to configure them. It includes the following topics:

- [Overview of the Echo Timing Methods on the GGSN, page 4-4](#)
- [Echo Timing Configuration Task List, page 4-9](#)
- [Verifying the Echo Timing Configuration, page 4-11](#)
- [Dynamic Echo Timer Configuration Example, page 4-20](#)

Overview of the Echo Timing Methods on the GGSN

The GGSN supports two different methods of echo timing—the default echo timer and the dynamic echo timer. Only a single method can be in use at any time on the GGSN. The following sections describe these two methods:

- [Overview of the Default Echo Timer, page 4-4](#)
- [Overview of the Dynamic echo timer, page 4-6](#)



Note

For simplicity, this document describes the operation of echo timing between the GGSN and an SGSN. If an external charging gateway is in use in the GPRS/UMTS network, the GGSN uses the same echo timing methods to maintain the charging gateway path.

Overview of the Default Echo Timer

The default echo timer is enabled on the GGSN automatically. However, you can choose to enable the dynamic echo timing method as an alternative.

When you are using the default echo timer on the GGSN, the following commands apply:

- **gprs gtp n3-requests**—Specifies the 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 for a response from an SGSN or external charging gateway, and after receiving a response, the number of second the GGSN waits before sending the next echo-request message. The default is 60 seconds.
- **gprs gtp t3-response**—Specifies the the initial number of seconds that the GGSN waits before resending a signaling request message when a response to a request has not been received. This time is doubled for every retry. The default is 1 second.

Figure 4-1 shows the default echo request sequence when a response is successfully received within the specified path echo interval. 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.

Figure 4-1 Default GTP Path Echo Interval Request Sequence in Path Success Mode

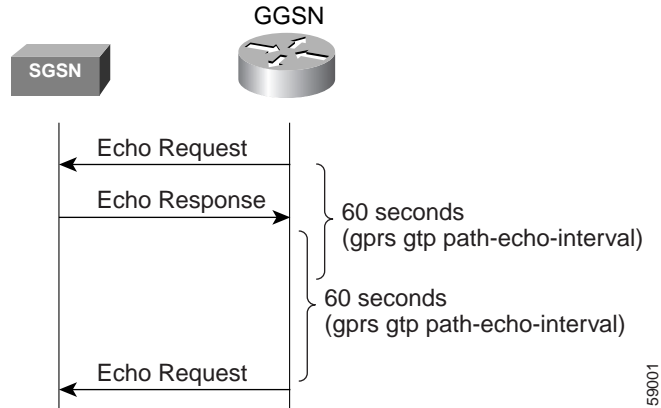
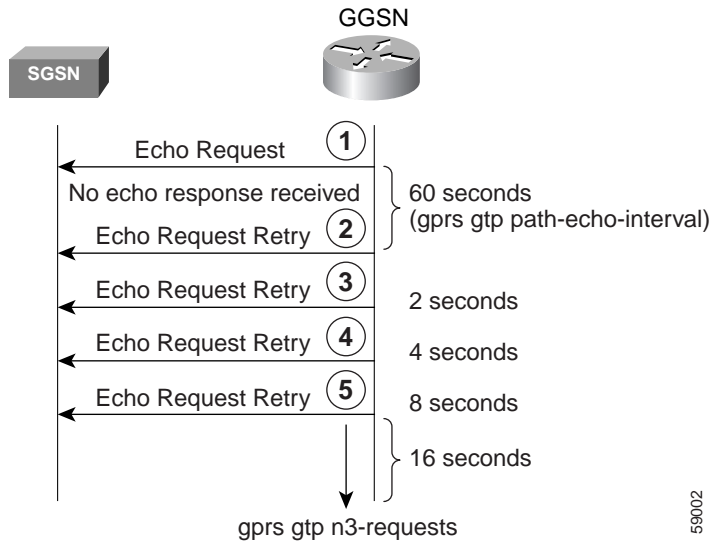


Figure 4-2 shows the default echo request sequence when the GGSN fails to receive a response to its echo request within the specified path echo interval. If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it resends echo request messages until the N3-requests 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).

Figure 4-2 Default Echo Timing Request Sequence in Path Failure Mode



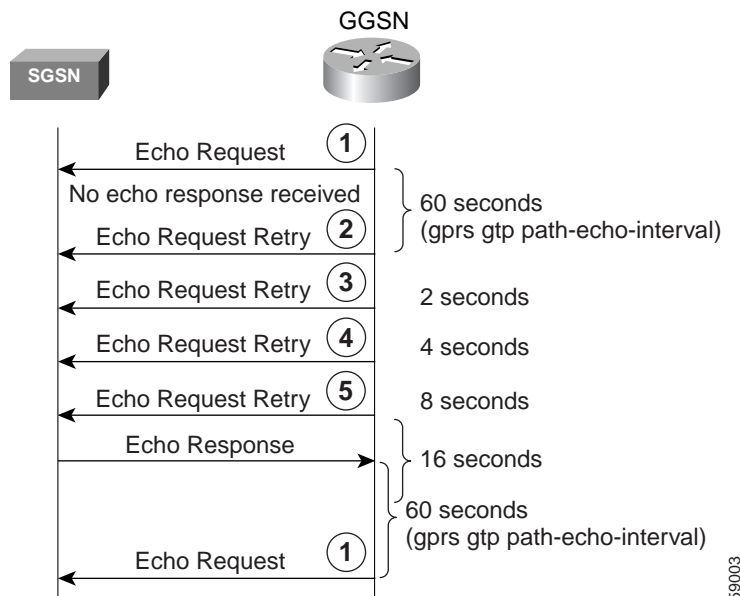
For example, if N3 is set to the default of 5, and T3 is set to the default of 1 second, the GGSN will resend 4 echo request messages (the initial request + 4 retries=5). If the GGSN does not receive an echo response from the SGSN during the 60-second path echo interval, then the GGSN immediately sends the first echo request retry message at the expiration of the path echo interval. The T3 time increments for each additional echo request, by a factor of 2 seconds, as long as the GGSN does not receive an echo response. So, the GGSN resends another message in 2 seconds, 4 seconds, and 8 seconds. After the 5th message, the GGSN waits for a final period of 16 seconds for an echo response.

If the GGSN fails to receive an echo response message from the SGSN within the time period of the N3-requests counter, it deletes all of the PDP contexts and clears the GTP path. For this example, the total elapsed time from when the first request message is sent to when PDP contexts are 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. The path is cleared after another 60-second period, or 150 seconds.

If the GGSN receives an echo response within the $N3 \times T3$ transmission period, it goes back to success mode for its echo request sequences.

Figure 4-3 shows the GGSN receiving an echo response message within $N3 \times T3$ retransmissions of an echo request. In this scenario, the GGSN sent an initial echo request followed by 4 retries for a total of 5 N3 requests. The GGSN receives the echo response after the 5th and final retry, within the remaining 16 seconds. Now the GGSN is back in success mode, and it waits 60 seconds (the value of the `gprs gtp path-echo-interval` command) before sending the next echo request message.

Figure 4-3 Default Echo Timing with Echo Response Received Within $N3 \times T3$ Retransmissions



Overview of the Dynamic echo timer

The GGSN's default echo timer cannot 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.

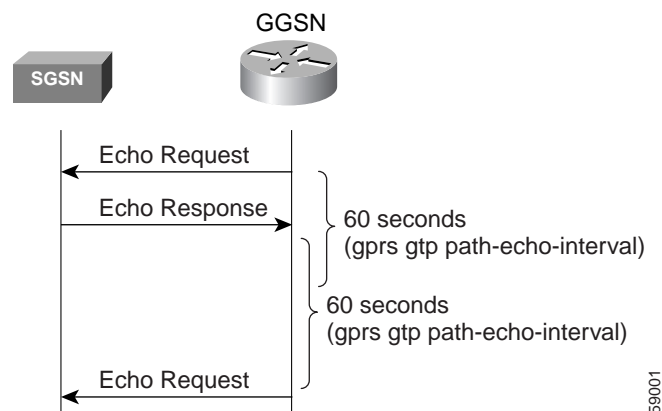
The dynamic echo timer method is different from the default echo timer method on the GGSN because it uses a calculated round-trip timer (RTT), as well as a configurable factor or multiplier to be applied to the RTT statistic. Different paths can have a different RTT, so the dynamic echo timer can vary for different paths.

When you are using the dynamic echo timer on the GGSN, the following commands apply:

- **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 multiplied by the smooth factor is less than this value, the GGSN uses the value set in this command. The default is 5 seconds.
- **gprs gtp echo-timer dynamic smooth-factor**—Specifies 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. The default is 2.
- **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 that the GGSN waits, after receiving a response from an SGSN or external charging gateway, before sending the next echo-request message. The default is 60 seconds.

Figure 4-4 shows the dynamic echo request sequence when a response is successfully received within the specified path echo interval. Just as in the default echo timing method, 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.

Figure 4-4 Dynamic GTP Path Echo Interval Request Sequence in Path Success Mode



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 (see Figure 4-5); 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.

Figure 4-5 Dynamic Echo Timing Request Sequence RTT Calculation

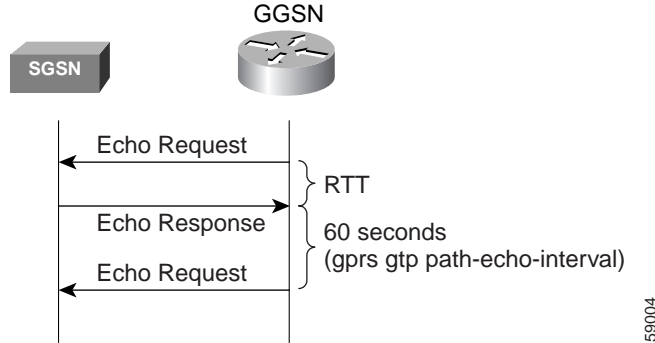
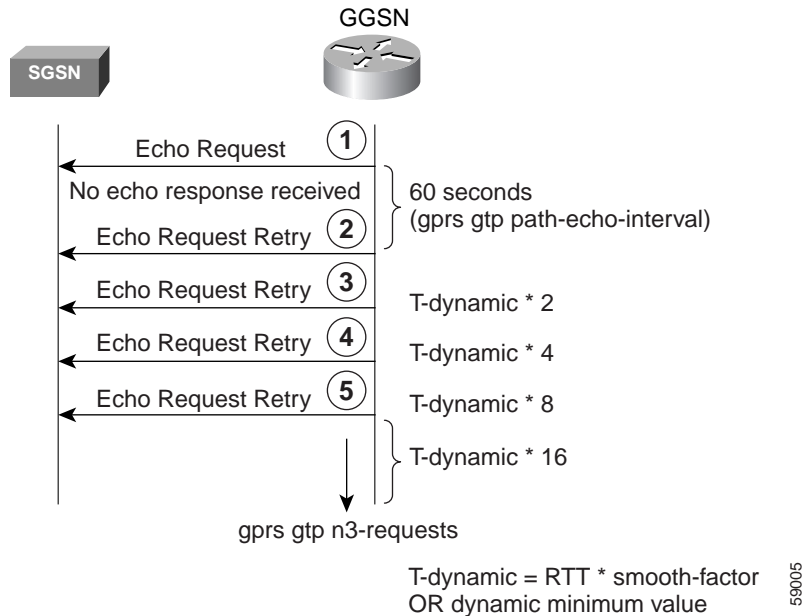


Figure 4-6 shows the dynamic echo timing request sequence in path failure mode. If the GGSN fails to receive an echo response message from the SGSN within the path echo interval, it goes into retransmission, or path failure mode. During path failure mode, the GGSN uses a value referred to as the T-dynamic. The T-dynamic is the greater of either the dynamic minimum, or the RTT statistic multiplied by the smooth factor.

Figure 4-6 Dynamic Echo Timing Request Sequence in Path Failure Mode



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, the dynamic minimum is 5 seconds, N3 is set to 5, and the smooth factor is set to 3, the GGSN will resend up to 4 echo request messages (the initial request + 4 retries=5) in path failure mode. If the GGSN does not receive an echo response from the SGSN during the 60-second path echo interval, then the GGSN immediately sends the first echo request retry message at the expiration of the path echo interval. The RTT x smooth factor equals 18 seconds (6 x 3), which is greater than the dynamic minimum of 5 seconds, so the dynamic minimum value is not used. The

T-dynamic value is 18 (RTT x smooth factor), so the GGSN sends another retry echo request message in 36 seconds (18 x 2), 72 seconds (18 x 4), and 144 seconds (18 x 8). After the 5th message, the GGSN waits for a final period of 288 seconds (18 x 16) for an echo response.

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 PDP contexts are 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. The path is cleared after another 60-second period, or 660 seconds.

If the GGSN receives an echo response within the N3 x T-dynamic transmission period, it goes back to success mode for its echo request sequences. In success mode, the GGSN begins echo requests and awaits responses according to the specified path echo interval as shown in [Figure 4-4](#).

Sequence Numbering for Retransmissions

The GGSN does not increment the sequence number of an echo request message during retransmissions. Therefore, during the period when an echo response has not been received by the GGSN, the GGSN continues to use the same sequence number for all echo request retries until the N3 requests limit has been reached, or until a response has been received. When a response is received, the sequence number of the next echo request message is incremented by 1.

If the GGSN has sent an echo request message with a higher sequence number, but still receives echo responses for sequence numbers lower than the current echo request message, the response is ignored.

Echo Timing Configuration Task List

This section describes the tasks required to customize the default echo timing method, or to enable and configure the dynamic echo timing method on the GGSN. By default, the GGSN activates the default echo timing method.

To configure echo timing on the GGSN, perform the following tasks:

- [Customizing the Default Echo Timer, page 4-10](#) (Recommended, if used)
- [Configuring the Dynamic Echo Timer, page 4-10](#) (Optional)
- [Disabling the Echo Timer, page 4-11](#) (Optional)

Customizing the Default Echo Timer

The default echo timing method is enabled automatically on the GGSN. If you want to use the default echo timer, Cisco Systems recommends that you modify the following commands to optimize your network as necessary.

To customize the default echo timing method on the GGSN, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>Router(config)# gprs gtp n3-requests requests</code>	(Optional) Specifies the maximum number of times that the GGSN attempts to send a signaling request to an SGSN. The default is 5.
Step 2	<code>Router(config)# gprs gtp path-echo-interval interval</code>	(Optional) Specifies the number of seconds that the GGSN waits, after receiving a response from an SGSN or external charging gateway, before sending the next echo-request message. The default is 60 seconds.
Step 3	<code>Router(config)# gprs gtp t3-response response-interval</code>	(Optional) Specifies the the initial time that the GGSN waits before resending a signaling request message when a response to a request has not been received. This time is doubled for every retry. The default is 1 second.

Configuring the Dynamic Echo Timer

To activate the dynamic echo timing method on the GGSN, you must enable the dynamic echo timer. After you activate the dynamic echo timer, you can modify the corresponding options to optimize the timing parameters for your network.

To configure the dynamic echo timing method on the GGSN, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>Router(config)# gprs gtp echo-timer dynamic enable</code>	Enables the dynamic echo timer on the GGSN.
Step 2	<code>Router(config)# gprs gtp echo-timer dynamic minimum number</code>	(Optional) Specifies the minimum time period used by the dynamic echo timer. The default is 5 seconds.
Step 3	<code>Router(config)# gprs gtp echo-timer dynamic smooth-factor number</code>	(Optional) Specifies the multiplier that the GGSN uses to calculate the time to wait to send retries of the dynamic echo timer. The default is 2.
Step 4	<code>Router(config)# gprs gtp n3-requests requests</code>	(Optional) Specifies the maximum number of times that the GGSN attempts to send a signaling request to an SGSN. The default is 5.
Step 5	<code>Router(config)# gprs gtp path-echo-interval interval</code>	(Optional) Specifies the number of seconds that the GGSN waits, after receiving a response from an SGSN or external charging gateway, before sending the next echo-request message. The default is 60 seconds.

Disabling the Echo Timer

If for some reason you need to disable the GGSN from performing echo processing with an SGSN or external charging gateway, you can specify 0 seconds for the path echo interval.

To disable the echo timer, use the following command in global configuration mode:

Command	Purpose
Router (config)# gprs gtp path-echo-interval 0	(Optional) Specifies a path interval of 0 seconds, which disables the GGSN from performing echo processing.

Verifying the Echo Timing Configuration

This section describes how to verify the echo timing method on the GGSN. It includes the following topics:

- [Verifying Echo Timing Parameters, page 4-11](#)
- [Verifying the Dynamic Echo Timer by GTP Path, page 4-12](#)

Verifying Echo Timing Parameters

To verify the parameters in use by the GGSN for echo timing, you can use the **show gprs gtp parameters** or **show running-config** privileged EXEC commands.

The GGSN automatically sets default values for those parameters applicable to the dynamic echo timer, even when the dynamic echo timer is not enabled. Therefore, the **show gprs gtp parameters** command does not indicate which echo timing method is currently activated.

Verifying Default Echo Timing Parameters

To verify the parameters in use by the default echo timer, use the **show gprs gtp parameters** privileged EXEC command and observe the following parameters highlighted in bold below:

```
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
```

Verifying Dynamic Echo Timing Parameters

To verify the parameters in use by the dynamic echo timer, use the **show gprs gtp parameters** privileged EXEC command and observe the parameters highlighted in bold below:

```
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
```

Verifying the Dynamic Echo Timer by GTP Path

You can use the **show running-config** privileged EXEC command to verify whether the dynamic echo timer is enabled.

The value of the dynamic echo timer varies for each GTP path on the GGSN. To verify whether the dynamic echo timer is enabled on the GGSN, and to verify the value (in seconds) of the dynamic echo timer (T-dynamic), use the **show gprs gtp path** privileged EXEC command.

If the dynamic echo timer is not activated, the word “Disabled” appears beside the corresponding path in the Dynamic echo timer output field.

- Step 1** To verify that the dynamic echo timer is enabled, use the **show running-config** command and verify that the **gprs gtp dynamic echo-timer enable** command appears as shown in bold toward the end of the following sample output:

```
Router# show running-config

Current configuration : 6769 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service internal
service gprs ggsn
!
. . .
!

interface loopback 1
 ip address 10.41.41.1 255.255.255.0
!!
interface Virtual-Template1
 ip unnumber loopback 1
 encapsulation gtp
 gprs access-point-list gprs
!
. . .
!
gprs access-point-list gprs
 access-point 1
  access-point-name gprs.cisco.com
 exit
```

```

!
access-point 2
access-point-name gprt.cisco.com
access-mode non-transparent
aaa-group authentication test2
aaa-group accounting test2
ip-address-pool dhcp-proxy-client
dhcp-server 10.65.0.1
dhcp-gateway-address 10.65.0.1
exit
!
!
gprs ms-address exclude-range 10.21.1.0 10.21.1.5
gprs gtp echo-timer dynamic enable
gprs gtp echo-timer dynamic smooth-factor 5
gprs gtp echo-timer dynamic minimum 10
gprs gtp response-message wait-accounting
!
. . .
!
end

```

Step 2 To verify the T-dynamic values for the corresponding GTP paths, use the **show gprs gtp path all** privileged EXEC command.

The following example indicates that the dynamic echo timer is enabled on the GGSN, and shows that the T-dynamic values of 5 seconds and 2 seconds are in use for the corresponding paths:

```

Router# show gprs gtp path all
      Total number of path : 2

Local address      Remote address      GTP version      Dynamic echo timer
10.41.41.1(3386)   10.18.18.200(3386)  0                 5
10.10.10.1(2123)   10.10.10.4(2123)    1                 2

```

Customizing the GGSN Configuration

This section describes some of the options that you can configure on the GGSN to further customize the default configuration.

For information about configuring GPRS/UMTS charging options, see the [“Customizing the Charging Gateway”](#) section on page 5-6 in the [“Configuring Charging on the GGSN”](#) chapter.

This section includes the following topics:

- [Configuring GTP Signaling Options, page 4-14](#)
- [Configuring the Maximum Number of PDP Contexts on the GGSN, page 4-15](#)
- [Controlling Idle Sessions on the GGSN, page 4-16](#)
- [Configuring Flow Control for GTP Error Messages, page 4-18](#)

Configuring GTP Signaling Options

In addition to the commands used to configure the router for GGSN support, the GGSN feature supports several optional commands that you can use to customize your GTP configuration.

For certain GTP processing options, the default values represent recommended values. Other optional commands also are set to default values, but Cisco Systems recommends modifying these commands to optimize your network as necessary, or according to your router hardware. This section describes some of the commands that you should consider optimizing for GTP signaling.

To optimize your GTP signaling configuration, use the following commands beginning in global configuration mode:

Command	Purpose
Router(config)# gprs gtp n3-requests <i>requests</i>	(Optional) Specifies the maximum number of times that the GGSN attempts to send a signaling request. The default is 5.
Router(config)# gprs gtp path-echo-interval <i>interval</i>	(Optional) Specifies the number of seconds that the GGSN waits before sending an echo-request message to check for GTP path failure. The default is 60 seconds.
Router(config)# gprs gtp t3-response <i>response_interval</i>	(Optional) Specifies the the initial number of seconds that the GGSN waits before resending a signaling request message when a response to a request has not been received. This time is doubled for every retry. The default is 1 second.



Note

These GTP signaling commands are also used to support echo timing on the GGSN. For more information about echo timing on the GGSN, see the [“Configuring Echo Timing on the GGSN” section on page 4-3](#).

Configuring Other GTP Signaling Options

This section describes some of the other GTP signaling options that you can modify as necessary to support your network needs.

To configure some of the other GTP signaling options, use the following commands beginning in global configuration mode:

Command	Purpose
Router(config)# gprs gtp map signalling tos <i>tos-value</i>	(Optional) Specifies an IP ToS mapping for GTP signaling packets. The default is 5.
Router(config)# gprs gtp n3-buffer-size <i>bytes</i>	(Optional) Specifies the size of the receive buffer that the GGSN uses to receive GTP signaling messages and packets sent through the tunneling protocol. The default is 8192 bytes.

Configuring the Maximum Number of PDP Contexts on the GGSN

The practical upper limit for the maximum number of PDP contexts supported on the GGSN varies by router platform, amount of memory installed, 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). The default maximum is 10000.

The following list shows the maximum number of PDP contexts that are supported on the GGSN according to the memory and router series in use when a method of PPP has not been configured:

- Cisco 7206 VXR NPE-300 router with 256 Mb RAM—80,000 PDP contexts.
- Cisco 7206 VXR NPE-400 router with 512 Mb RAM—135,000 PDP contexts.

For information on the maximum number of PDP contexts supported on the GGSN when a method of PPP has been configured, see “[Overview of PPP Support on the GGSN](#)” section on page 7-1.



Note

When the maximum allowable number of PDP contexts is reached, the GGSN refuses new PDP contexts (mobile sessions) until sessions are available.

To configure the maximum number of PDP contexts on the GGSN, use the following command beginning in global configuration mode:

Command	Purpose
Router(config)# <code>gprs maximum-pdp-context-allowed</code> <i>pdp-contexts</i>	Specifies the maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN.

Configuring the Maximum Number of PDP Contexts When Using DFP with Load Balancing

If you use Dynamic Feedback Protocol (DFP) with GPRS/UMTS load balancing, you must also specify a maximum number of PDP contexts for each GGSN. 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/UMTS load-balancing environment.



Note

For more information about configuring GPRS/UMTS 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>

To configure the maximum number of PDP contexts on the GGSN for DFP, use the following command beginning in global configuration mode:

Command	Purpose
Router(config)# <code>gprs maximum-pdp-context-allowed</code> 45000	Specifies 45000 as the maximum number of PDP contexts (mobile sessions) that can be activated on the GGSN.

Controlling Idle Sessions on the GGSN

GPRS/UMTS provides always-on services for mobile users. Sessions can be established with the GGSN that provide network connectivity, even though no activity may be occurring over that session. Once a PDP context is established on the GGSN, whether there is activity over the session or not, resources are being used by the GGSN. Therefore, you might want to control the amount of time that a mobile session can remain inactive on the GGSN before the PDP context is cleared. The GGSN can only support a certain number of PDP contexts. The number of PDP contexts supported depends upon the configuration and memory resources of the router.

This section describes how you can configure the idle timer on the GGSN to control when the GGSN deletes idle PDP contexts. It includes the following topics:

- [Overview of the Idle Timer on the GGSN, page 4-16](#)
- [Configuring the Idle Timer Globally on the GGSN, page 4-17](#) (Optional)
- [Configuring the Idle Timer for an Access Point on the GGSN, page 4-17](#) (Optional)
- [Disabling the Idle Timer on the GGSN, page 4-17](#)
- [Verifying the Idle Timer Configuration, page 4-18](#)

Overview of the Idle Timer on the GGSN

The GGSN allows you to control the clearing of inactive PDP contexts by configuring an idle timer. The idle timer specifies the amount of time that the GGSN waits before purging idle mobile sessions. When the session reaches the timeout value, the PDP context is deleted. By default, the GGSN clears any idle session after 72 hours.

You can configure the idle timer globally on the GGSN for sessions occurring on all access points, and you can configure an idle timer for a particular access point. In addition to the idle timer that you can configure on the GGSN, RADIUS servers can also specify session timeout attributes for a PDP context.

The following list describes the order in which the GGSN implements the idle timer:

1. 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 sets the session idle timeout value based on that sent from the RADIUS server. The RADIUS server timeout attribute is in seconds. If the value returned by the RADIUS server is less than 3600 seconds, the GGSN sets the session timeout value to 3600 seconds. If the value is greater than 3600 seconds, the GGSN sets the session timeout value to the same value returned by the RADIUS server.
2. 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, then the GGSN uses the value that you specified for the **session idle-time** command.
3. Global timer—If the GGSN does not receive a session idle timeout value from the RADIUS server or the access point, then it uses the value that you specified in the **gprs idle-pdp-context purge-timer** command.

In summary, the idle timeout value from the RADIUS server takes precedence over the idle timer configuration on the GGSN, and the idle timer for a particular access point takes precedence over the globally configured idle timer.

The **session idle-time** command value overrides the value configured in the **gprs idle-pdp-context purge-timer** command for that access-point.

Configuring the Idle Timer Globally on the GGSN

To configure the amount of time that the GGSN waits before purging idle sessions on the GGSN for all access points, use the following command beginning in global configuration mode:

Command	Purpose
Router(config)# gprs idle-pdp-context purge-timer <i>hours</i>	Specifies the time (between 0 and 255 hours) that the GGSN waits before purging idle mobile sessions for all access points. The default value is 72 hours.

Configuring the Idle Timer for an Access Point on the GGSN

To configure the amount of time that the GGSN waits before purging idle sessions on the GGSN for a particular access point, use the following command beginning in access-point configuration mode:

Command	Purpose
Router(config-access-point)# session idle-time <i>hours</i>	Specifies the time (between 1 and 168 hours) that the GGSN waits before purging idle mobile sessions at the access point. The idle timer at an access point is disabled by default.



Note

When you enable the session idle timer, any G-CDRs triggered for the termination of a PDP context because of the expiration of the purge timer will have a cause value of “normal.”

Disabling the Idle Timer on the GGSN

By default, the GGSN purges idle mobile session after 72 hours for all access points. If you want to allow mobile sessions to remain inactive for an indefinite period of time, or if you want to specify the idle timer individually at each access point, you can disable the global idle timer by specifying a value of 0 in the **gprs idle-pdp-context purge-timer** command. By default, the access-point level idle timer is disabled by default with a value of 0.

To disable the idle timer on the GGSN for all access points, use the following command beginning in global configuration mode:

Command	Purpose
Router(config)# gprs idle-pdp-context purge-timer 0	Specifies 0 hours for the idle timer, which means that the GGSN does not delete idle PDP contexts.

Verifying the Idle Timer Configuration

To display idle timer information for a particular PDP context, you can use the **show gprs gtp pdp-context** command using the **tid** or **imsi** keywords. The following example shows sample output for the **show gprs gtp pdp-context tid** command for a PDP context with an idle timer value of 200 hours. The idle timer value is displayed in the **gtp pdp idle time** field shown in bold:

```
Router# show gprs gtp pdp-context tid 1234567812345678
TID           MS Addr      Source  SGSN Addr      APN
1234567812345678 10.106.0.119 Radius  10.40.40.2     www.pdn.com

current time :Jan 04 2002 02:18:12
user_name (IMSI): 214365872143658      MS address: 10.106.0.119
MS International PSTN/ISDN Number (MSISDN): 9987876565
sgsn_addr_signal: 10.40.40.2           ggsn_addr_signal: 10.29.29.1
signal_sequence: 1                     seq_tpdu_up: 0
seq_tpdu_down: 0
upstream_signal_flow: 39                upstream_data_flow: 40
downstream_signal_flow: 1               downstream_data_flow: 1
RAupdate_flow: 0
pdp_create_time: Jan 04 2002 02:18:02
last_access_time: Jan 04 2002 02:18:02
mnrflag: 0                             tos mask map: 40
gtp pdp idle time: 200
gprs qos_req: 091101                   canonical Qos class(req.): 03
gprs qos_neg: 0A1101                   canonical Qos class(neg.): 03
effective bandwidth: 800
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
charging_id: 222452491
pdp reference count: 2
ntwk_init_pdp: 0
```

Configuring Flow Control for GTP Error Messages

By default, the GGSN disables flow control for GTP error messages. You can enable flow control for transmission of GTP error messages using the **gprs gtp error-indication-throttle** global configuration command. This command sets the initial value of a counter which is decremented each time an error indication message is sent. When the counter reaches zero, the GGSN stops transmitting error indication messages. The GGSN resets this counter to the configured throttle value after one second.

To configure flow control for GTP error messages, use the following command beginning in global configuration mode:

Command	Purpose
Router(config)# gprs gtp error-indication-throttle window-size size	(Optional) Specifies the maximum number of error indication messages that the GGSN sends out in one second, where size is an integer between 0 and 256. There is no default value.

Monitoring and Maintaining GTP on the GGSN

This section provides a summary list of the **show** commands that you can use to monitor GTP on the GGSN.

The following privileged EXEC commands are used to monitor and maintain GTP on the GGSN:

Command	Purpose
Router# show gprs gtp parameters	Displays information about the current GTP configuration on the GGSN.
Router# show gprs gtp path {remote-address ip-address [remote-port-num] version gtp-version all}	Displays information about one or more GTP paths between the GGSN and other GPRS/UMTS devices.
Router# 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}	Displays a list of the currently active PDP contexts (mobile sessions). Note The show gprs gtp pdp-context command options vary depending on the type of QoS method that is enabled on the GGSN.
Router# show gprs gtp ms {imsi imsi access-point access-point-index all}	Displays a list of the currently active MSs on the GGSN.
Router# show gprs gtp statistics	Displays the current GTP statistics for the GGSN (such as IE, GTP signaling, and GTP PDU statistics).
Router# show gprs gtp status	Displays information about the current status of GTP on the GGSN.

Configuration Examples

This section includes the following examples:

- [GGSN Configuration Example, page 4-19](#)
- [Dynamic Echo Timer Configuration Example, page 4-20](#)

GGSN Configuration Example

The following example shows part of a sample GGSN configuration with some of the commands that you use to configure basic GGSN GTP services:

```
Router# show running-config

Current configuration : 3521 bytes
!
version 12.2
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
! Enables GGSN services
```

```

!
service gprs ggsn
!
. . .
!
! Configures a loopback interface
!
interface loopback 1
 ip address 10.40.40.3 255.255.255.0
!
! Defines the virtual-template interface
! with GTP encapsulation
!
interface Virtual-Template1
 ip unnumber loopback 1
 encapsulation gtp
 gprs access-point-list gprs
!
. . .
!
gprs access-point-list gprs
!
  access-point 1
    access-point-name gprs.cisco.com
    exit
!
  access-point 2
    access-point-name gpvt.cisco.com
    exit
!
  access-point 3
    access-point-name gpvt.cisco.com
    access-mode non-transparent
    aaa-group authentication foo
    exit
!
! Configures GTP parameters
!
gprs maximum-pdp-context-allowed 90000
gprs gtp path-echo-interval 0
gprs default charging-gateway 10.15.15.1
!
. . .
!
end

```

Dynamic Echo Timer Configuration Example

The following example shows part of a sample GGSN configuration for the dynamic echo timer. In this example, the dynamic echo timer is enabled, the smooth factor is changed from the default of 2 to 5, and the dynamic minimum value is changed from the default of 5 seconds to 10 seconds:

```

Router# show running-config

Current configuration : 6769 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log uptime

```

```
no service password-encryption
service internal
service gprs ggsn
!
. . .
!
interface loopback 1
 ip address 10.41.41.1 255.255.255.0
!
interface Virtual-Template1
 ip unnumber loopback 1
 encapsulation gtp
 gprs access-point-list gprs
!
. . .
!
gprs access-point-list gprs
 access-point 1
  access-point-name gprs.cisco.com
  exit
!
 access-point 2
  access-point-name gprr.cisco.com
  access-mode non-transparent
  aaa-group authentication test2
  aaa-group accounting test2
  ip-address-pool dhcp-proxy-client
  dhcp-server 10.65.0.1
  dhcp-gateway-address 10.65.0.1
  exit
!
! Enables the dynamic echo timer
!
gprs gtp echo-timer dynamic enable
!
! Configures a smooth factor of 5
!
gprs gtp echo-timer dynamic smooth-factor 5
!
! Configures the dynamic minimum as 10 seconds
!
gprs gtp echo-timer dynamic minimum 10
gprs gtp response-message wait-accounting
!
end
```

