

# Configuring Generic Traffic Shaping

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This chapter describes the tasks for configuring QoS Generic Traffic Shaping (GTS) on a router. For a complete description of the commands mentioned in this chapter, refer to the *Quality of Service Solutions Command Reference*; the commands are listed alphabetically within that guide. To locate documentation of specific commands, use the command reference, master index, or search online.

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**Note** GTS is not supported on Integrated Services Digital Networks (ISDNs), dialup interfaces, or generic routing encapsulation (GRE) tunnel interfaces on the Cisco 7500 series router. Traffic shaping is not supported with flow switching.

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## Generic Traffic Shaping Configuration Task List

To configure GTS, perform the tasks in the following sections:

- Configure Generic Traffic Shaping
- Configure Generic Traffic Shaping for an Access List
- Configure Adaptive Generic Traffic Shaping for Frame Relay Networks
- Monitor the GTS Configuration

The section “GTS Configuration Examples” later in this chapter contains examples of these configuration tasks.

## Configure Generic Traffic Shaping

To configure GTS for outbound traffic on an interface or subinterface, use the following command in interface configuration mode:

Command	Purpose
<code>traffic-shape rate bit-rate [burst-size [excess-burst-size]]</code>	Configure traffic shaping for outbound traffic on an interface.

## Configure Generic Traffic Shaping for an Access List

To configure GTS for outbound traffic on an access list, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	<b>access-list</b> <i>access-list-number</i>	Assign traffic to an access list
2	<b>interface</b> <i>interface-type interface-number</i>	Enter interface configuration mode.
3	<b>traffic-shape group</b> <i>access-list bit-rate [burst-size [excess-burst-size]]</i>	Configure traffic shaping for outbound traffic on an interface for the specified access list.

Repeat Steps 1 through 3 for each type of traffic you want to rate-limit.

## Configure Adaptive Generic Traffic Shaping for Frame Relay Networks

If traffic shaping is performed on a Frame Relay network using the **traffic-shape rate** command, you can also use the **traffic-shape adaptive** command to specify the minimum bit rate to which the traffic is shaped.

To configure adaptive GTS for outbound traffic on an interface or subinterface, use the following commands in interface configuration mode:

Step	Command	Purpose
1	<b>traffic-shape rate</b> <i>bit-rate [burst-size [excess-burst-size]]</i>	Enable traffic shaping for outbound traffic on an interface.
2	<b>traffic-shape adaptive</b> [ <i>bit-rate</i> ]	Configure minimum bit rate to which traffic is shaped when backward explicit congestion notifications (BECNs) are received on an interface.
3	<b>traffic-shape fecn-adapt</b>	Configure reflection of forward explicit congestion notifications (FECNs) as BECNs.

With adaptive GTS, the router uses backward explicit congestion notifications (BECNs) to estimate the available bandwidth and adjust the transmission rate accordingly. The actual maximum transmission rate will be between the rate specified in the **traffic-shape adaptive** command and the rate specified in the **traffic-shape rate** command.

Configure these commands on both ends of the link, enabling the router at the high-speed end to detect and adapt to congestion even when traffic is flowing primarily in one direction.

## Monitor the GTS Configuration

To monitor the current traffic shaping configuration and statistics, use any of the following commands in EXEC mode:

Command	Purpose
<b>show traffic-shape</b> [ <i>interface-name</i> ]	Show the current traffic-shaping configuration.
<b>show traffic-shape statistics</b> [ <i>interface-name</i> ]	Show the current traffic-shaping statistics.

## GTS Configuration Examples

This section provides the following examples of GTS configurations:

- Enable GTS on the Interface Example
- Constrained Access Rate Example
- Differing Controlled Rates through an IP Internet Example
- Frame Relay Adaptability to Congestion Example
- Accommodating Differing Access Speeds Example

### Enable GTS on the Interface Example

This example shows the configuration of two traffic-shaped interfaces on a router. Ethernet 0 is configured to limit User Datagram Protocol (UDP) traffic to 1 Mbps. Ethernet 1 is configured to limit all output to 5 Mbps.

```
access-list 101 permit udp any any
interface Ethernet0
  traffic-shape group 101 1000000 125000 125000
!
interface Ethernet1
  traffic-shape rate 5000000 625000 625000
```

The following is a sample display for the **show traffic-shape** command for the example shown:

```
Router# show traffic-shape

Interface Ethernet0

      Access Target   Byte  Sustain  Excess  Interval  Increment  Adapt
VC    List  Rate      Limit bits/int bits/int  (ms)      (bytes)    Active
-     101  1000000  31250  125000  125000   125       15625     -

Interface Ethernet1

      Access Target   Byte  Sustain  Excess  Interval  Increment  Adapt
VC    List  Rate      Limit bits/int bits/int  (ms)      (bytes)    Active
-           5000000  156250  625000  625000   125       78125     -
```

The following is a sample display for the **show traffic-shape statistics** command for the example shown:

```
Router# show traffic-shape statistics

      Access Queue   Packets  Bytes   Packets  Bytes   Shaping
I/F   List  Depth    Packets Bytes   Delayed  Delayed  Active
Et0   101    0         2      180    0        0       no
Et1           0         0        0    0        0        0       no
```

### Constrained Access Rate Example

In this example, a customer may use all of a T1 line for 30 seconds in a burst, but the long-term average is limited to 64 kbps. This configuration restricts the amount of load the system can induce on the outbound network interface.

```
interface <his interface or sub-interface>
  traffic-shape rate 64000 8000 46080000
```

If you need to restrict the amount of load the system can induce both outbound and inbound, and therefore the total load the system can induce on the Internet Service Provider (ISP), configure traffic shaping on both the inbound and outbound interfaces, as in the following example:

```
interface <serial interface or sub-interface>
  traffic-shape rate 64000 8000 46320000
interface <LAN interface>
  traffic-shape rate 64000 8000 46320000
```

## Differing Controlled Rates through an IP Internet Example

Perhaps you need to restrict the flow of NNTP to each of some set of sites across an intervening backbone to 64 kbps. This example illustrates how to configure that control and provide one site with 256 kbps:

```
access-list 101 permit <nntp to hither>
access-list 102 permit <nntp to thither>
access-list 103 permit <nntp to yon>
!
interface <the (sub-)interface leading to the above places>
  traffic-shape group 101 64000
  traffic-shape group 102 64000
  traffic-shape group 103 256000
```

Separate token buckets are maintained for each access list, and traffic not matching any access list is not shaped at all.

## Frame Relay Adaptability to Congestion Example

This example does not restrict flow across a Frame Relay subinterface that has been layered onto a single DLC. However, in the presence of BECN bits from the network, the flow is throttled back to the committed information rate (CIR). The access rate of the interface is assumed to be 1544 kbps, and the CIR is 64 kbps.

```
interface <relevant sub-interface>
  traffic-shape rate 1544000
  traffic-shape adaptive 64000
  traffic-shape fecn-adapt
```

If the **traffic-shape fecn-adapt** command is configured at both ends of the link, the far end will reflect received FECNs as BECNs in Q.922 TEST RESPONSE messages.

## Accommodating Differing Access Speeds Example

Frame Relay networks are often asymmetrical, that is, the access rate at one site may differ from the access rate at another. In such cases, it may be worthwhile to configure the faster rate to shape to the access rate of the slower, as well as to respond to BECNs. Using the previous example as a starting point, in which the access rate is 1544 kbps and the CIR is 64 kbps, and the access rate at the far end is 128 kbps, the configuration of the subinterfaces would be as follows:

```
interface <relevant sub-interface>
  traffic-shape rate 128000
  traffic-shape adaptive 64000
```