Regulating Packet Flow on a Per-Interface Basis Using Generic Traffic Shaping

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Packet flow on a network can be regulated using a traffic shaping mechanism. One such traffic shaping mechanism is a Cisco feature called Generic Traffic Shaping (GTS). Generic Traffic Shaping allows you to regulate the flow of packets going out an interface or subinterface, matching the packet flow to the speed of the interface. This module describes the concepts and tasks related to configuring Generic Traffic Shaping.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the "Feature Information for Generic Traffic Shaping" section on page 11.

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

Contents

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Prerequisites for Configuring Generic Traffic Shaping

- Be familiar with the concepts in the "Regulating Packet Flow Using Traffic Shaping" module.
- Use Feature Navigator to determine if the platform in use supports GTS. Access Cisco Feature Navigator at http://www.cisco.com/go/fn.

Restrictions for Configuring Generic Traffic Shaping

- GTS is not supported on the following interfaces:
  - Multilink PPP (MLP) interfaces
  - Integrated Services Digital Networks (ISDNs), dialer interfaces, or generic routing encapsulation (GRE) tunnel interfaces on the Cisco 7500 series router
- GTS is not supported with flow switching.

Information About Configuring Generic Traffic Shaping

Generic Traffic Shaping Functionality

GTS is a traffic shaping mechanism (also known as a "traffic shaper"). A traffic shaper typically delays excess traffic using a buffer, or queueing mechanism, to hold packets and shape the flow when the data rate of the source is higher than expected. It holds and shapes traffic to a particular bit rate by using the token bucket mechanism. See the "Regulating Packet Flow Using Traffic Shaping" module.

Note GTS is similar to Class-Based Traffic Shaping. Although Class-Based Traffic Shaping is the Cisco-recommended mechanism, GTS is still supported.

GTS supports traffic shaping on most media and encapsulation types on the router.

GTS works with a variety of Layer 2 technologies, including Frame Relay, ATM, Switched Multimegabit Data Service (SMDS), and Ethernet.

GTS performs the following tasks:

- Applies traffic shaping on a per-interface basis and uses access control lists (ACLs) to select the traffic to shape.
- On a Frame Relay subinterface, dynamically adapts to available bandwidth by integrating backward explicit congestion notification (BECN) signals, or shapes to a specified rate. This is known as adaptive GTS.
- On an ATM/ATM Interface Processor (AIP) interface, responds to the Resource Reservation Protocol (RSVP) feature signalled over statically configured ATM permanent virtual circuits (PVCs).

Adaptive Generic Traffic Shaping on Frame Relay Networks

If adaptive GTS is configured 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.

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

For more information about configuring adaptive GTS, see the "Configuring Adaptive Generic Traffic Shaping for Frame Relay Networks" section on page 7.

Access Control List Functionality and Generic Traffic Shaping

Access control lists filter network traffic by controlling whether routed packets are forwarded or blocked at the router interface. When configured with GTS, the router examines each packet to determine how to shape the traffic on the basis of the criteria you specified for the access control list.

Access control list criteria could be the source address of the traffic, the destination address of the traffic, the upper-layer protocol, or other information. Note that sophisticated users can sometimes successfully evade or fool basic access control lists because no authentication is required.

Benefits of Generic Traffic Shaping

All of the benefits associated with traffic shaping also apply to GTS. For information about the benefits of traffic shaping, see the "Regulating Packet Flow Using Traffic Shaping" module.

How to Configure Generic Traffic Shaping

Configuring Generic Traffic Shaping on an Interface

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **traffic-shape rate** *bit-rate* [*burst-size*] [*excess-burst-size*] [*buffer-limit*]
5. **end**
6. **show traffic-shape** [*interface-type interface-number*]
7. **show traffic-shape statistics** [*interface-type interface-number*]
8. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface s4/0`	Configures an interface (or subinterface) type and enters interface configuration mode. • Enter the interface type number.
Step 4	**traffic-shape rate** *bit-rate* [*burst-size*] [*excess-burst-size*] [*buffer-limit*] **Example:** `Router(config-if)# traffic-shape rate 128000`	Enables traffic shaping for outbound traffic on an interface based on the bit rate specified. • Enter the bit rate.
Step 5	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 6	**show traffic-shape** [*interface-type interface-number*] **Example:** `Router# show traffic-shape serial4/0`	(Optional) Displays the current traffic-shaping configuration.
	show traffic-shape statistics [*interface-type interface-number*] **Example:** `Router# show traffic-shape statistics serial4/0`	(Optional) Displays the current traffic-shaping statistics.
Step 7	**exit** **Example:** `Router# exit`	(Optional) Exits privileged EXEC mode.

Configuring Generic Traffic Shaping Using an Access Control List

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **access-list** *access-list-number* {**deny** | **permit**} *source* [*source-wildcard*]

4. **interface** *type number*
5. **traffic-shape group** *access-list bit-rate* [*burst-size* [*excess-burst-size*]]
6. **end**
7. **show traffic-shape** [*interface-type interface-number*]
8. **show traffic-shape statistics** [*interface-type interface-number*]
9. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**access-list** *access-list-number* {**deny** | **permit**} *source* [*source-wildcard*] **Example:** `Router(config)# access-list 1 permit 192.5.34.0 0.0.0.255`	Shapes traffic according to specified access list. • Enter the access list number, one of the required keywords, and the source information.
Step 4	**interface** *type number* **Example:** `Router(config)# interface s4/0`	Configures an interface (or subinterface) type and enters interface configuration mode. • Enter the interface type number.
Step 5	**traffic-shape group** *access-list bit-rate* [*burst-size* [*excess-burst-size*]] **Example:** `Router(config-if)# traffic-shape group 101 128000`	Enables traffic shaping based on a specific access list for outbound traffic on an interface. • Enter the access list number and the bit rate.
Step 6	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 7	**show traffic-shape** [*interface-type interface-number*] **Example:** `Router# show traffic-shape serial4/0`	(Optional) Displays the current traffic-shaping configuration.
Step 8	**show traffic-shape statistics** [*interface-type interface-number*] **Example:** `Router# show traffic-shape statistics serial4/0`	(Optional) Displays the current traffic-shaping statistics.
Step 9	**exit** **Example:** `Router# exit`	(Optional) Exits privileged EXEC mode.

Note Repeat the above procedure for each additional type of traffic you want to shape.

Configuring Adaptive Generic Traffic Shaping for Frame Relay Networks

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **traffic-shape rate** *bit-rate* [*burst-size*] [*excess-burst-size*] [*buffer-limit*]
5. **traffic-shape adaptive** bit-rate
6. **traffic-shape fecn-adapt**
7. **end**
8. **show traffic-shape** [*interface-type interface-number*]
9. **show traffic-shape statistics** [*interface-type interface-number*]
10. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface s4/0`	Configures an interface (or subinterface) type and enters interface configuration mode. • Enter the interface type number.
Step 4	**traffic-shape rate** *bit-rate* [*burst-size*] [*excess-burst-size*] [*buffer-limit*] **Example:** `Router(config-if)# traffic-shape rate 128000`	Enables traffic shaping for outbound traffic on an interface based on the bit rate specified. • Enter the bit rate.
Step 5	**traffic-shape adaptive** bit-rate **Example:** `Router(config-if)# traffic-shape adaptive 64000`	Configures a Frame Relay subinterface to estimate the available bandwidth when BECNs are received. • Enter the bit rate.

	Command or Action	Purpose
Step 6	**traffic-shape fecn-adapt** **Example:** `Router(config-if)# traffic-shape fecn-adapt`	Configures reflection of forward explicit congestion notifications (FECNs) as BECNs.
Step 7	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 8	**show traffic-shape** [*interface-type interface-number*] **Example:** `Router# show traffic-shape serial4/0`	(Optional) Displays the current traffic-shaping configuration.
Step 9	**show traffic-shape statistics** [*interface-type interface-number*] **Example:** `Router# show traffic-shape statistics serial4/0`	(Optional) Displays the current traffic-shaping statistics.
Step 10	**exit** **Example:** `Router# exit`	(Optional) Exits privileged EXEC mode.

Configuration Examples for Generic Traffic Shaping

Example: Generic Traffic Shaping on an Interface Configuration

The following is an example of GTS configured on serial interface s4/0:

```
enable
configure terminal
 interface s4/0
  traffic-shape rate 128000
  end
```

Example: Generic Traffic Shaping Using an Access Control List Configuration

The following is an example of GTS configured using an ACL. In this example, GTS is configured for the outbound traffic on ACL 1.

```
enable
configure terminal
 access-list 1 permit 192.5.34.0 0.0.0.255
 interface s4/0
  traffic-shape group 101 128000
  end
```

Example: Adaptive Generic Traffic Shaping for a Frame Relay Network Configuration

The following is an example of adaptive GTS configured on Frame Relay network. In this example, adaptive GTS is configured using the **traffic-shape rate** command. The **traffic-shape adaptive** command specifies the minimum bit rate to which the traffic is shaped. 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.

```
enable
configure terminal
 interface s4/0
  traffic-shape rate 128000
  traffic-shape adaptive 64000
  traffic-shape fecn-adapt
  end
```

Where to Go Next

To configure Class-Based Traffic Shaping, see the "Regulating Packet Flow on a Per-Class Basis Using Class-Based Traffic Shaping" module.

To configure Frame Relay Traffic Shaping (FRTS), see the "MQC-Based Frame Relay Traffic Shaping" module.

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	*Cisco IOS Master Commands List, All Releases*
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Quality of Service Solutions Command Reference*
Overview information about using traffic shaping to regulate packet flow on a network	"Regulating Packet Flow Using Traffic Shaping" module
Class-Based Traffic Shaping	"Regulating Packet Flow on a Per-Class Basis Using Class-Based Traffic Shaping" module
FRTS	"MQC-Based Frame Relay Traffic Shaping" module

Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported, and support for existing RFCs has not been modified.	—

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Generic Traffic Shaping

Table 1 lists the release history for this feature

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 1 lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 1 Feature Information for Generic Traffic Shaping

Feature Name	Software Releases	Feature Configuration Information
Generic Traffic Shaping	12.2(1) 15.0(1)S Cisco IOS XE 3.1.0 SG	This feature was introduced. This feature was integrated into the Cisco IOS Release 15.0(1)S. In Cisco IOS XE 3.1.0 SG, this feature was integrated.