Adaptive Frame Relay Traffic Shaping for Interface Congestion

Last Updated: October 6, 2011

Feature History

Release	Modification
12.2(4)T	This feature was introduced.

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 Table at the end of this document.

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

Feature Overview

The Adaptive Frame Relay Traffic Shaping for Interface Congestion feature enhances Frame Relay traffic shaping functionality by adjusting permanent virtual circuit (PVC) sending rates based on interface congestion. When this new feature is enabled, the traffic-shaping mechanism monitors interface congestion.

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When the congestion level exceeds a configured value called *queue depth* , the sending rate of all PVCs is reduced to the minimum committed information rate (minCIR). As soon as interface congestion drops below the queue depth, the traffic-shaping mechanism changes the sending rate of the PVCs back to the committed information rate (CIR). This process guarantees the minCIR for PVCs when there is interface congestion.

Note The sum of the minCIR values for all PVCs on the interface must be less than the usable interface bandwidth.

This new feature works in conjunction with backward explicit congestion notification (BECN) and Foresight functionality. If interface congestion exceeds the queue depth when adaptive shaping for interface congestion is enabled along with BECN or ForeSight, then the PVC sending rate is reduced to the minCIR. When interface congestion drops below the queue depth, then the sending rate is adjusted in response to BECN or ForeSight.

Before the introduction of this feature, interface congestion caused packets to be delayed or dropped at the interface. The Adaptive Frame Relay Traffic Shaping for Interface Congestion feature helps ensure that packet drop occurs at the virtual circuit (VC) queues. When used with FRF.12 fragmentation, this feature also ensures that packets are dropped before fragmentation occurs.

Benefits

The Adaptive Frame Relay Traffic Shaping for Interface Congestion feature:

- Guarantees minCIR for PVCs when there is interface congestion, as long as the sum of the minCIR values for the PVCs is less than the usable interface bandwidth.
- Increases the useful data rate by ensuring that packets are dropped before FRF.12 fragmentation.
- Enables intelligent packet drop by ensuring that packets are dropped at the VC queue rather than the interface.

Restrictions

This feature is supported on terminated and switched PVCs. It is not supported on switched virtual circuits (SVCs).

Related Features and Technologies

- Frame Relay traffic shaping

Related Documents

- *Cisco IOS Quality of Service Solutions Configuration Guide* , Release 12.2
- *Cisco IOS Quality of Service Solutions Command Reference* , Release 12.2
- *Cisco IOS Wide-Area Network Configuration Guide* , Release 12.2

- *Cisco IOS Wide-Area Network Command Reference* , Release 12.2

Supported Platforms

- Cisco 2500 series
- Cisco 2600 series
- Cisco 3600 series
- Cisco 7200 series

Platform Support Through Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Feature Navigator. Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image.

To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of May 2001, Feature Navigator supports M, T, E, S, and ST releases. You can access Feature Navigator at the following URL:

http://www.cisco.com/go/fn

Supported Standards and MIBs and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

In order to use the Adaptive Frame Relay Traffic Shaping for Interface Congestion feature, Frame Relay traffic shaping must be enabled on the interface.

Configuration Tasks

Configuring Frame Relay Adaptive Traffic Shaping

To configure a map class for adaptive traffic shaping for interface congestion, use the following commands beginning in global configuration mode:

SUMMARY STEPS

1. Router(config)# **map-class frame-relay** *map-class-name*
2. Router(config-map-class)# **frame-relay cir** {**in** | **out**} *bps*
3. Router(config-map-class)# **frame-relay mincir** {**in** | **out**} *bps*
4. Router(config-map-class)# **frame-relay adaptive-shaping interface-congestion** [*queue-depth*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	Router(config)# **map-class frame-relay** *map-class-name*	Specifies a map class to define quality of service (QoS) values.
Step 2	Router(config-map-class)# **frame-relay cir** {**in** | **out**} *bps*	(Optional) Specifies the incoming or outgoing CIR for a Frame Relay VC. The default is 56,000 bps.
Step 3	Router(config-map-class)# **frame-relay mincir** {**in** | **out**} *bps*	(Optional) Specifies the minimum acceptable incoming or outgoing CIR for a Frame Relay VC. The default is CIR/2.
Step 4	Router(config-map-class)# **frame-relay adaptive-shaping interface-congestion** [*queue-depth*]	Enables adaptive traffic shaping for interface congestion and sets the queue depth.

Verifying Frame Relay Adaptive Traffic Shaping

SUMMARY STEPS

1. Use the **show frame-relay pvc** command to verify that Frame Relay adaptive traffic shaping for interface congestion is enabled. If it is enabled, the value IF_CONG will be displayed in the "Adaptive Shaping" field.
2. Use the **show interfaces serial**command to verify that Frame Relay adaptive traffic shaping for interface congestion is working correctly. If it is working correctly, the number of packets in the output queue will equal or be close to the queue depth value.

DETAILED STEPS

Step 1 Use the **show frame-relay pvc** command to verify that Frame Relay adaptive traffic shaping for interface congestion is enabled. If it is enabled, the value IF_CONG will be displayed in the "Adaptive Shaping" field.

The following is sample output from the **show frame-relay pvc** command:

Example:

```
Router# show frame-relay pvc 41
PVC Statistics for interface Serial1 (Frame Relay DTE)
DLCI = 41, DLCI USAGE = LOCAL, PVC STATUS = DELETED, INTERFACE = Serial1.1
  input pkts 0            output pkts 0            in bytes 0
  out bytes 0             dropped pkts 0           in FECN pkts 0
  in BECN pkts 0          out FECN pkts 0          out BECN pkts 0
  in DE pkts 0            out DE pkts 0
  out bcast pkts 0        out bcast bytes 0
  pvc create time 4d22h, last time pvc status changed 4d22h
  cir 56000     bc 7000      be 0         byte limit 875    interval 125
  mincir 28000     byte increment 875   Adaptive Shaping IF_CONG
  pkts 0         bytes 0         pkts delayed 0         bytes delayed 0
  shaping inactive
  traffic shaping drops 0
  Queueing strategy:fifo
  Output queue 0/40, 0 drop, 0 dequeued
```

Step 2 Use the **show interfaces serial**command to verify that Frame Relay adaptive traffic shaping for interface congestion is working correctly. If it is working correctly, the number of packets in the output queue will equal or be close to the queue depth value.

Note The number of packets in the output queue changes between CIR and minCIR, so at a specific point in time the value may not equal the queue depth. However, the "average" number of packets in the output queue should equal the queue depth.

The following is sample output from the **show interfaces serial** command for an interface that is configured with adaptive traffic shaping for interface congestion with a queue depth of 10 packets. The "Output queue" field indicates 10 packets in the interface queue.

Router# **show interfaces serial 2**

Example:

```
Serial2 is up, line protocol is up
  Hardware is HD64570
  Internet address is 2.0.0.2/8
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 10/255, rxload 10/255
  Encapsulation FRAME-RELAY, loopback not set
  Keepalive not set
  FR SVC disabled, LAPF state down
  Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
  Last input 00:06:55, output 00:00:00, output hang never
  Last clearing of "show interface" counters 00:11:01
  Queueing strategy:fifo
  Output queue 10/40, 6731 drops; input queue 24/75, 0 drops
 .
 .
 .
```

Note For a description of each output display field, refer to the **show interfaces serial** command reference page in the *Cisco IOS Interface Command Reference* .

Configuration Examples

Example Frame Relay Adaptive Traffic Shaping for Interface Congestion

In the following example, the rate of traffic destined for PVC 200 will be reduced to the minCIR if the number of packets in the interface queue exceeds 10. When the number of packets in the interface queue drops below 10, then the traffic rate will immediately return to the CIR.

```
interface serial0
 encapsulation frame-relay
 frame-relay traffic-shaping
 frame-relay interface-dlci 200
 class adjust_vc_class_rate
!
map-class frame-relay adjust_vc_class_rate
 frame-relay cir 64000
 frame-relay mincir 32000
 frame-relay adaptive-shaping interface-congestion 10
```

Glossary

BECN --backward explicit congestion notification. Bit set by a Frame Relay network in frames traveling in the opposite direction of frames encountering a congested path. DTE receiving frames with the BECN bit set can request that higher-level protocols take flow control action as appropriate.

CIR --committed information rate. The rate at which a Frame Relay network agrees to transfer information under normal conditions, averaged over a minimum increment of time. CIR, measured in bits per second, is one of the key negotiated traffic metrics.

ForeSight --A network traffic control feature used in Cisco switches. When the ForeSight feature is enabled on the switch, the switch will periodically send out a ForeSight message. When a Cisco router receives a ForeSight message indicating that certain data-link connection identifiers (DLCIs) are experiencing congestion, the router reacts by activating its traffic-shaping function to slow down the output rate.

FRF.12 --An implementation agreement developed to allow long data frames to be fragmented into smaller pieces and interleaved with real-time frames. In this way, real-time voice and nonreal-time data frames can be carried together on lower-speed links without causing excessive delay to the real-time traffic.

minCIR --The minimum acceptable incoming or outgoing committed information rate (CIR) for a Frame Relay virtual circuit.

PVC --permanent virtual circuit or connection. A virtual circuit that is permanently established. PVCs save bandwidth associated with circuit establishment and teardown in situations where certain virtual circuits must exist all the time.

SVC --switched virtual circuit. Virtual circuit that is dynamically established on demand and is torn down when transmission is complete. SVCs are used in situations where data transmission is sporadic.