Frame Relay Traffic Policing

This feature module describes the Frame Relay Traffic Policing feature. It includes information on the benefits of this new feature, supported platforms, related documents, and commands.

This document includes the following sections:

Feature Overview

Frame Relay Traffic Policing provides a mechanism to rate-limit packets on switched PVCs using a “leaky-bucket” implementation. When enabled, Traffic Policing prevents traffic congestion by discarding or setting the Discard Eligible (DE) bit on packets that exceed specified traffic parameters. Traffic Policing parameters can be specified per DCE interface, or per switched PVC, using the 'map class' mechanisms.

The Frame Relay Traffic Policing prevents traffic congestion by treating traffic as either *committed* or *excess*. This section describes the parameters used to configure the way data is handled with Frame Relay Traffic Policing.

- *Committed* traffic is that which fits within the committed burst allowed within a given time interval.
- *Excess* traffic is traffic which does not fit within the committed burst allowed within a given time interval.

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Note Some excess traffic can be configured to be allowed through.

Parameter Descriptions

Frame Relay Traffic Policing parameters can be specified per interface, or per switched PVC, using the "map class" mechanisms. The following parameters are used by Traffic Policing:

- *Tc*
  A (computed or configured) time interval during which committed and excess traffic is measured and monitored. This time interval is defined in the following ways:
  - The committed burst size (*Bc*) for a Frame Relay virtual circuit divided by the committed information rate (*CIR*).
  - The excess burst size (*Be*) for a Frame Relay virtual circuit divided by the excess information rate (*EIR*).
- *Bc*
  The committed burst size, in bits. This configured parameter specifies how many bits of committed traffic are permitted during any given *Tc* interval.
- *Be*
  The excess burst size, in bits. This configured parameter specifies how many bits of excess traffic are permitted during any given *Tc* interval.
- *CIR*
  The committed information rate, in bits per second. This configured parameter specifies the long-term average committed traffic rate to enforce.
- *EIR*
  The excess information rate, in bits per second. This computed value shows the long-term average excess traffic rate being enforced.

Packet Handling with Traffic Policing

The following actions are taken, on a per-packet, per switched PVC basis, by Frame Relay Traffic Policing:

Step 1 If the Discard Eligible (DE) bit is set in the packet when it arrives, the packet is automatically treated as excess: the *Bc* test in Step 2 is skipped and the packet proceeds to Step 3.

Step 2 If the DE bit is *not* set when the packet arrives, and the byte count in the packet is within *Bc* for the past *Tc*, then the packet is allowed through. If the packet is *not* within *Bc* for the past *Tc*, the packet proceeds to Step 3.

Step 3 If the number of bytes in the packet falls within *Be+Bc* for the past *Tc*, the DE bit in the header is set (if it is not already set) and the packet is allowed through. If the packet does *not* fall within *Be+Bc* for the past *Tc*, the packet is dropped.

Note Be+Bc in this context relates to situations where much of the traffic arrives with the DE bit set. Step 3 allows the otherwise unused Bc bandwidth to be used for DE traffic.

Benefits

Frame Relay Traffic Policing provides a mechanism to rate-limit packets on a per-switched-PVC basis using a "leaky-bucket" implementation. When enabled, Traffic Policing prevents traffic congestion by discarding or setting the DE bit on packets that exceed specified traffic parameters.

Restrictions

- The information in this document applies to Frame Relay Traffic Policing for switched PVCs only Traffic Policing does not apply to terminated PVCs. Rate limiting of traffic on terminated PVCs is done by other mechanisms such as CAR and/or PIRC.
- Frame Relay Extended Addressing is *not* supported with Traffic Policing. Traffic Policing is supported on DCE interfaces only, (Extended Addressing is supported on NNI interfaces).

Related Documents

- *Frame Relay Switching Enhancements*, Release 12.1
- *Frame Relay Commands* (this manual is part of the *Cisco IOS Wide-Area Networking Command Reference*)
- *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.1
- *Cisco IOS Wide-Area Networking Command Reference*, Release 12.1
- *Frame Relay Extended Addressing*, Release 12.0S

Supported Platforms

Frame Relay Traffic Policing described in this document is supported on Engine 0, 1 and 2 line cards on the Cisco 12000 series Gigabit Switch Routers.

Supported Standards, 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.

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on Cisco Connection Online (CCO) at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

- Frame Relay switching must be enabled on the router before you can configure any of the Frame Relay switching enhancements. To enable Frame Relay switching, use the **frame-relay switching** global command.
- Frame Relay policing must be enabled before you can configure Traffic Policing parameters. To enable Frame Relay policing, use the **frame-relay policing** interface command. See the "Configuration Tasks" and "Command Reference" sections for information on the use of this command.
- Switched PVCs must be created using the **connect** command. This command supersedes the **frame-relay route** command.

Configuration Tasks

This section contains instructions to configure Frame Relay Traffic Policing. These tasks can be completed in any order, but all tasks must be completed for the feature to be enabled.

Note Refer to *Frame Relay Commands* in the *Cisco IOS Wide-Area Networking Command Reference* and *Frame Relay Switching Enhancements*, Release 12.1 for additional information on the use of these commands.

This section contains the following sections:

- Enable Frame Relay Policing on the Interface.
- Identifying a PVC As Switched.
- Create Switched PVCs.
- Configure Frame Relay Policing Parameters.

Note You can associate the map class with the interface or individual switched PVCs.

Note Switched PVCs that are not associated with a map class will inherit policing parameters from the interface.

Enable Frame Relay Policing on the Interface

To enable Frame Relay policing on an interface, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# frame-relay policing`	Enables Frame Relay policing on all switched PVC s on the interface.

Identifying a PVC As Switched

Before you can associate a map class with a switched PVC, you must identify the PVC as being switched. To identify a PVC as switched, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# frame-relay interface-dlci dlci [switched]`	Identifies the PVC as switched.
`Router(config-if)# class map-class`	Assigns a map-class to a DLCI.

Create Switched PVCs

To create switched PVCs, use the following command in global configuration mode:

Command	Purpose
`Router(config)# connect connection-name interface dlci interface dlci`	Defines the connections between the Frame Relay PVCs.

Configure Frame Relay Policing Parameters

To configure policing parameters in a Frame Relay map class, identify the map class, then specify one or more of the following parameters:

Command	Purpose
`Router(config)# map-class frame-relay map-class-name`	Specify a map class name to define policing values.
`Router(config-map-class)# frame-relay cir bps`	Sets the CIR for a Frame Relay PVC.
`Router(config-map-class)# frame-relay bc bits`	Sets the committed burst size for a Frame Relay PVC.
`Router(config-map-class)# frame-relay be bits`	Sets the excess burst size for a Frame Relay PVC.
`Router(config-map-class)# frame-relay tc milliseconds`	Sets the measurement interval for policing incoming traffic on a PVC when the CIR is zero.

Verify Frame Relay Policing

To verify Frame Relay policing, use the following command in privileged EXEC mode:

Command	Purpose
`Router# show frame-relay pvc [interface interface] [dlci]`	Displays statistics about PVCs for Frame Relay interfaces.
`Router# show connect {all|elements|name|id|port{T1|E1} slot/port}}`	Displays information about the switched PVC routes. Note: Switched PVC routes configured with the **connect** command are only displayed by **show connect**.

Monitoring and Maintaining Frame Relay Policing

To monitor Frame Relay policing, use the following commands:

Command	Purpose
Router# **show frame-relay pvc** [**interface** *interface*] [*dlci*]	Displays statistics about PVCs for Frame Relay interfaces.
Router# **show interfaces serial** *number*	Displays information about the configuration and queue at the interface.
Router# **show connect** {all|elements|name|id|port{T1|E1} *slot/port*}}	Displays information about the switched PVC routes. Note: Switched PVC routes configured with the **connect** command are only displayed by **show connect**.

Configuration Examples

This section provides the following configuration examples:

- Configuring Traffic Policing on a UNI DCE Example

Configuring Traffic Policing on a UNI DCE Example

In the following example, incoming traffic is being policed on serial interface 1. The interface uses policing parameters configured in map class “police256K.” PVC 100/16 inherits policing parameters from the interface. PVC 200/17 uses policing parameters configured in “police64K.”

```
frame-relay switching
!
interface serial0
  encapsulation frame-relay
  frame-relay intf-type dce
!
interface serial1
  encapsulation frame-relay
  frame-relay policing
  frame-relay class police256K
  frame-relay intf-type dce
  frame-relay interface-dlci 200 switched
    class police64K
!
connect one serial0 16 serial1 100
connect two serial0 17 serial1 200
!
map-class frame-relay police256K
  frame-relay cir 256000
  frame-relay bc 256000
  frame-relay be 0
!
map-class frame-relay police64K
  frame-relay cir 64000
  frame-relay bc 64000
  frame-relay be 64000
```

Command Reference

No new or modified commands were introduced with this feature for the 12.0(17)S release.

For additional information on the commands used with Frame Relay Traffic Policing, refer to:

- *Frame Relay Switching Enhancements*, Release 12.1.
- *Frame Relay Commands* in the *Cisco IOS Wide-Area Networking Command Reference*.

Glossary

Bc—Committed burst size (bits): number of bytes of committed traffic allowed to flow through a given PVC during any given time interval Tc.

Be—Excess burst size (bits): number of bytes of excess traffic allowed to flow through a given PVC during any given time interval Tc.

CIR—committed information rate. Rate at which a Frame Relay network agrees to transfer information under normal conditions, averaged over a minimum increment of time.

Committed Traffic—Frame Relay traffic which is within the committed burst allowed within any given time interval.

DCE—data circuit-terminating equipment. Devices and connections of a communications network that make up the network end of the user-to-network interface. The DCE provides a physical connection to the network, forwards traffic, and provides a clocking signal used to synchronize data transmission between DCE and DTE devices.

DE bit—Discard Eligible bit, part of the Frame Relay header; used by this feature to distinguish between committed (DE = 0) and excess (DE = 1) traffic. If the network is congested, DE traffic may be dropped to ensure delivery of higher priority traffic. Frames with the DE bit set are considered Be excess data.

DLCI—data-link connection identifier. Value that specifies a permanent virtual circuit (PVC) in a Frame Relay network.

EA—Extended Addressing: using 23-bit DLCIs (as opposed to the usual 10 bits) populated within a 4-byte FR header (as opposed to the usual 2-byte FR header).

EIR—Excess Information Rate (bits/second): the average rate at which excess traffic is to be policed; this number is computed based on Bc, Be, CIR and Tc.

Excess Traffic—Frame Relay traffic which exceeds the committed burst allowed within any given time interval.

LMI—Local Management Interface. Set of enhancements to the basic Frame Relay specification. LMI includes support for a keepalive mechanism, a multicast mechanism, global addressing, and a status mechanism.

NNI—Network-to-Network Interface. The interface between two Frame Relay switches that are both located in a private network or are both located in a public network. The interface between a public switch and private one is defined by the UNI standard (see below).

PVC—Permanent (i.e. configured) Virtual Connection. A Frame Relay logical link, whose endpoints and class of service are defined by network management. A PVC consists of the originating Frame Relay network element address, originating data link control identifier, terminating frame relay network element address, and termination data link control identifier. Originating refers to the access interface from which the PVC is initiated. Terminating refers to the access interface at which the PVC stops. Many data network customers require a PVC between two points. Data terminating equipment with a need for continuous communication use PVCs.

Switched PVC—A PVC which does not terminate on the interface in question.

RP—Route Processor.

Tc—Time interval (seconds) during which, on a given PVC, Bc + Be bytes are allowed to flow.

Terminated PVC—A PVC which terminates on the interface in question.

UNI—User-Network Interface. The interface between two Frame Relay switches when one is located in a private network and other is located within the public carrier networks.