Frame Relay PVC Interface Priority Queueing

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The Frame Relay PVC Interface Priority Queueing feature provides an interface-level priority queueing scheme in which prioritization is based on destination permanent virtual circuit (PVC) rather than packet contents.

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.

Prerequisites for Frame Relay PVC Interface Priority Queueing

- PVCs should be configured to carry a single type of traffic.
- The network should be configured with adequate call admission control to prevent starvation of any of the priority queues.

Restrictions for Frame Relay PVC Interface Priority Queueing

- FR PIPQ is not supported on loopback or tunnel interfaces, or interfaces that explicitly disallow priority queueing.
- FR PIPQ is not supported with hardware compression.
- FR PIPQ cannot be enabled on an interface that is already configured with queueing other than FIFO queueing. FR PIPQ can be enabled if WFQ is configured, as long as WFQ is the default interface queueing method.

Information About Frame Relay PVC Interface Priority Queueing

Feature Overview

The FR PIPQ feature provides an interface-level priority queueing scheme in which prioritization is based on destination permanent virtual circuit (PVC) rather than packet contents. For example, FR PIPQ allows you to configure a PVC transporting voice traffic to have absolute priority over a PVC transporting signalling traffic, and a PVC transporting signalling traffic to have absolute priority over a PVC transporting data.

FR PIPQ provides four levels of priority: high, medium, normal, and low. The Frame Relay packet is examined at the interface for the data-link connection identifier (DLCI) value. The packet is then sent to the correct priority queue based on the priority level configured for that DLCI.

Note When using FR PIPQ, configure the network so that different types of traffic are transported on separate PVCs. FR PIPQ is not meant to be used when an individual PVC carries different traffic types that have different quality of service (QoS) requirements.

You assign priority to a PVC within a Frame Relay map class. All PVCs using or inheriting that map class will be classed according to the configured priority. If a PVC does not have a map class associated with it, or if the map class associated with it does not have priority explicitly configured, then the packets on that PVC will be queued on the default "normal" priority queue.

If you do not enable FR PIPQ on the interface using the **frame-relay interface-queue priority**command in interface configuration mode, configuring PVC priority within a map class will not be effective. At this time you have the option to also set the size (in maximum number of packets) of the four priority queues.

FR PIPQ works with or without Frame Relay traffic shaping (FRTS) and FRF.12. The interface-level priority queueing takes the place of the FIFO queueing or dual FIFO queueing normally used by FRTS and FRF.12. PVC priority assigned within FR PIPQ takes precedence over FRF.12 priority, which means that all packets destined for the same PVC will be queued on the same interface queue whether they were fragmented or not.

Note Although high priority PVCs most likely will transport only small packets of voice traffic, you may want to configure FRF.12 on these PVCs anyway to guard against any unexpectedly large packets.

Benefits

FR PIPQ provides four levels of PVC priority: high, medium, normal, and low. This method of queueing ensures that time/delay-sensitive traffic such as voice has absolute priority over signalling traffic, and that signalling traffic has absolute priority over data traffic, providing different PVCs are used for the different types of traffic.

How to Configure Frame Relay PVC Interface Priority Queueing

Configuring PVC Priority in a Map Class

To configure PVC priority within a map class, 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 interface-queue priority** {**high** | **medium**| **normal** | **low**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	Router(config)# **map-class frame-relay** *map-class-name*	Specifies a Frame Relay map class.
Step 2	Router(config-map-class)# **frame-relay interface-queue priority** {**high**	**medium**| **normal**	**low**}	Assigns a PVC priority level to a Frame Relay map class.

Enabling FR PIPQ and Setting Queue Limits

To enable FR PIPQ and set the priority queue sizes, use the following commands beginning in global configuration mode:

SUMMARY STEPS

1. Router(config)# **interface** *type number* [*name-tag*]
2. Router(config-if)# **encapsulation frame-relay**[**cisco** | **ietf**]
3. Router(config-if)# **frame-relay interface-queue priority** [*high-limit medium-limit normal-limit low-limit*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	Router(config)# **interface** *type number* [*name-tag*]	Configures an interface type and enters interface configuration mode.
Step 2	Router(config-if)# **encapsulation frame-relay**[**cisco**	**ietf**]	Enables Frame Relay encapsulation.
Step 3	Router(config-if)# **frame-relay interface-queue priority** [*high-limit medium-limit normal-limit low-limit*]	Enables FR PIPQ and sets the priority queue limits.

Assigning a Map Class to a PVC

To assign a map class to a specific PVC, use the following commands beginning in interface configuration mode:

SUMMARY STEPS

1. Router(config-if)# **frame-relay interface-dlci** *dlci*
2. Router(config-fr-dlci)# **class** *map-class-name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	Router(config-if)# **frame-relay interface-dlci** *dlci*	Specifies a single PVC on a Frame Relay interface.
Step 2	Router(config-fr-dlci)# **class** *map-class-name*	Associates a map class with a specified PVC.

Verifying FR PIPQ

To verify the configuration of FR PIPQ, use one or more of the following commands in privileged EXEC mode:

Command	Purpose
Router# **show frame-relay pvc** [**interface** *interface*][*dlci*]	Displays statistics about PVCs for Frame Relay interfaces.
Router# **show interfaces** [*type number*][*first*] [*last*]	Displays the statistical information specific to a serial interface.

Command	Purpose
Router# **show queueing** [**custom** | **fair** | **priority** | **random-detect** [**interface** *atm_subinterface* [**vc** [[*vpi/*] *vci*]]]]	Lists all or selected configured queueing strategies.

Monitoring and Maintaining FR PIPQ

To monitor and maintain FR PIPQ, use one or more of the following commands in privileged EXEC mode:

Command	Purpose
Router# **debug priority**	Debugs priority output queueing.
Router# **show frame-relay pvc** [**interface** *interface*][*dlci*]	Displays statistics about PVCs for Frame Relay interfaces.
Router# **show interfaces** [*type number*][*first*] [*last*]	Displays the statistical information specific to a serial interface.
Router# **show queue** *interface-name interface-number* [**vc** [*vpi/*] *vci*][*queue-number*]	Displays the contents of packets inside a queue for a particular interface or VC.
Router# **show queueing** [**custom** | **fair** | **priority** | **random-detect** [**interface** *atm_subinterface* [**vc** [[*vpi/*] vci]]]]	Lists all or selected configured queueing strategies.

Configuration Examples for Frame Relay PVC Interface Priority Queuing

FR PIPQ Configuration Example

This example shows the configuration of four PVCs on serial interface 0. DLCI 100 is assigned high priority, DLCI 200 is assigned medium priority, DLCI 300 is assigned normal priority, and DLCI 400 is assigned low priority.

The following commands configure Frame Relay map classes with PVC priority levels:

```
Router(config)# map-class frame-relay HI
Router(config-map-class)# frame-relay interface-queue priority high
Router(config-map-class)# exit
Router(config)# map-class frame-relay MED
```

```
Router(config-map-class)# frame-relay interface-queue priority medium
Router(config-map-class)# exit
Router(config)# map-class frame-relay NORM
Router(config-map-class)# frame-relay interface-queue priority normal
Router(config-map-class)# exit
Router(config)# map-class frame-relay LOW
Router(config-map-class)# frame-relay interface-queue priority low
Router(config-map-class)# exit
```

The following commands enable Frame Relay encapsulation and FR PIPQ on serial interface 0. The sizes of the priority queues are set at a maximum of 20 packets for the high priority queue, 40 for the medium priority queue, 60 for the normal priority queue, and 80 for the low priority queue.

```
Router(config)# interface Serial0
Router(config-if)# encapsulation frame-relay
Router(config-if)# frame-relay interface-queue priority 20 40 60 80
```

The following commands assign priority to four PVCs by associating the DLCIs with the configured map classes:

```
Router(config-if)# frame-relay interface-dlci 100
Router(config-fr-dlci)# class HI
Router(config-fr-dlci)# exit
Router(config-if)# frame-relay interface-dlci 200
Router(config-fr-dlci)# class MED
Router(config-fr-dlci)# exit
Router(config-if)# frame-relay interface-dlci 300
Router(config-fr-dlci)# class NORM
Router(config-fr-dlci)# exit
Router(config-if)# frame-relay interface-dlci 400
Router(config-fr-dlci)# class LOW
Router(config-fr-dlci)# exit
```

Additional References

Related Documents

Related Topic	Document Title
WAN commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Wide-Area Networking Command Reference*

Standards

Standard	Title
No new or modified standards are supported by this functionality.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS XE software 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 by this functionality.	--

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Feature Information for Frame Relay PVC Interface Priority Queueing

The following table provides release information about the feature or features described in this module. This table 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.

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Table 1　　　*Feature Information for Frame Relay PVC Interface Priority Queueing*

Feature Name	Releases	Feature Information
Frame Relay PVC Interface Priority Queueing	Cisco IOS XE Release 2.1	The FR PIPQ feature provides an interface-level priority queueing scheme in which prioritization is based on destination permanent virtual circuit (PVC) rather than packet contents. For example, FR PIPQ allows you to configure a PVC transporting voice traffic to have absolute priority over a PVC transporting signalling traffic, and a PVC transporting signalling traffic to have absolute priority over a PVC transporting data.

Glossary

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

FIFO queueing -- First-in, first-out queueing. FIFO involves buffering and forwarding of packets in the order of arrival. FIFO embodies no concept of priority or classes of traffic. There is only one queue, and all packets are treated equally. Packets are sent out an interface in the order in which they arrive.

Frame Relay traffic shaping --See FRTS.

FRF.12 --The FRF.12 Implementation Agreement was 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.

FRTS --Frame Relay traffic shaping. FRTS uses queues on a Frame Relay network to limit surges that can cause congestion. Data is buffered and then sent into the network in regulated amounts to ensure that the traffic will fit within the promised traffic envelope for the particular connection.

PIPQ --Permanent virtual circuit (PVC) interface priority queueing. An interface-level priority queueing scheme in which prioritization is based on destination PVC rather than packet contents.

quality of service --Measure of performance for a transmission system that reflects its transmission quality and service availability.

WFQ --weighted fair queueing. Congestion management algorithm that identifies conversations (in the form of traffic streams), separates packets that belong to each conversation, and ensures that capacity is shared fairly among these individual conversations. WFQ is an automatic way of stabilizing network behavior during congestion and results in increased performance and reduced retransmission.

WRED --Weighted Random Early Detection. Combines IP Precedence and standard Random Early Detection (RED) to allow for preferential handling of voice traffic under congestion conditions without exacerbating the congestion. WRED uses and interprets IP Precedence to give priority to voice traffic over data traffic, dropping only data packets.