Voice over Frame Relay Queuing Enhancement

Voice quality on Voice over Frame Relay calls can be affected when data bursts exceed the Committed Information Rate of the PVC. This enhancement provides a special queue for VoFR packets at the Frame Relay PVC level. This special queue is designed to prevent queueing problems that can reduce voice quality.

Feature Overview

When there are multiple sets of flows being handled by weighted fair queueing (WFQ), the algorithm provides the low weight/reserved queued voice packets with higher priority but only until some of the other data packets have waited enough time and therefore it is now their turn to be dequeued. Even if interleaving is active, the WFQ algorithm will not dequeue a voice packet until these data packets are transmitted. This causes voice quality problems.

The solution consists of adding a special queue at the PVC level where all VoFR packets will be queued. This special queue runs in parallel to the WFQ and is serviced before any of the WFQs.

As of this release, reserved queues are no longer required to support VoFR.

Benefits

Improved Voice Quality on VoFR Calls

By servicing the queue for VoFR packets before data packets in weighted fair queueing, delays that can impact voice quality are reduced.

Restrictions

None.

Related Documents

For more information about Voice over Frame Relay configuration, see the online feature module *Voice over Frame Relay Using FRF.11 and FRF.12* for Cisco IOS Release 12.0(4)T.

Supported Platforms

- Cisco 2600 series routers
- Cisco 3600 series routers
- Cisco MC3810 series multiservice access concentrators
- Cisco 7200 series routers (tandeming only)

Supported Standards, MIBs, and RFCs

None.

Prerequisites

Before you can configure a Cisco router to use Voice over Frame Relay, you must do the following:

- Complete your company's dial plan.
- Establish a working Frame Relay network. For more information about configuring Frame Relay, refer to the Cisco IOS *Wide-Area Networking Configuration Guide*.
- Establish a working telephony network based on your company's dial plan:
- Integrate your dial plan and telephony network into your existing Frame Relay network topology. Make routing and/or dialing transparent to the user---for example, avoid secondary dial tones from secondary switches, where possible.
- Contact your PBX vendor for instructions about how to reconfigure the appropriate PBX interfaces.

After you have analyzed your dial plan and decided how to integrate it into your existing Frame Relay network, you are ready to configure your network devices to support Voice over Frame Relay.

Configuration Tasks

For complete information about Voice over Frame Relay configuration, see the online feature module *Voice over Frame Relay Using FRF.11 and FRF.12* for Cisco IOS Release 12.0(4)T.

See the following section for configuration tasks for the Voice over Frame Relay Queuing Enhancement.

Configure a Frame Relay Map Class to Support Voice Traffic

The queuing enhancement for Voice over Frame Relay is configured when you configure the map class to support voice traffic.

To configure a Frame Relay map class to support voice traffic on a single DLCI or a group of DLCIs, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	`router(config)# map-class frame-relay` *map-class-name*	Create a map-class name you will assign to a group of PVCs. The map-class name must be unique.
2	`router(config-map-class)# frame-relay voice bandwidth` *bps* [**queue** *depth*]	Enter the bandwidth in bits per second, which will determine the number of voice calls allowed on the DLCIs where this map class is associated to. Cisco recommends that this value be set to no higher than the minimum CIR if you do not want to impact voice quality when burst is being transmitted. The valid range is from 8000 to 45,000,000 bps. This command must be configured for voice calls to take place. The default for this command is 0, which disables all voice calls. When this command is entered, a special queue is created for voice packets only so that time-sensitive voice packets have preference over data packets. The optional **queue** *depth* keyword allows you to specify the size of this voice queue. The default size is 100. For more information on determining the amount of voice bandwidth to set, see the section "Configuring Voice Bandwidth" after this procedure. **Note** This command does not apply if configuring the **frame-relay interface-dlci voice-encap** command on the Cisco MC3810.

For complete procedures for configuring Voice over Frame Relay, see the 12.0(4)T document *Voice over Frame Relay Using FRF.11 and FRF.12*.

Calculating Voice Bandwidth

The **frame-relay voice-bandwidth** map-class command is used to configure how much bandwidth is reserved for voice traffic. If there is not enough reserved voice bandwidth remaining on the PVC, then any new call attempted will be rejected.

When considering the amount of voice bandwidth to allocate to voice, the overall bandwidth calculation must include the voice packetization overhead and not just the raw compressed speech CODEC bandwidth. For VoFR voice packets, there are a total of 6 or 7 bytes total overhead per packet (including standard Frame Relay headers and flags). For subchannels (CIDs) less than number 64, the overhead is 6 bytes. For subchannels greater than or equal to number 64, the overhead is 7 bytes. Add one additional byte if voice sequence numbers are enabled in the voice packets.

To determine the required voice bandwidth, use the following calculation:

required_bandwidth = codec_bandwidth * (1 + overhead/payload_size)

This calculation addresses the amount of bandwidth consumed on the physical network interface. This does not necessarily represent the amount of connection bandwidth used within the Frame Relay network itself, which may be higher due to the overhead of switching small packets.

When using 30-millisecond duration voice packets, an approximate rule-of-thumb is to add 2000 bps overhead to the raw voice compressed speech CODEC rate. With the 32 kbps G.726 ADPCM speech coder, a 30-millisecond speech frame uses 120 bytes voice payload plus 6-7 bytes overhead, and the overall bandwidth requirement is around 34 kbps for each call.

Monitoring and Maintaining the Special VoFR Voice Queue

Command	Purpose
`Router# show frame-relay pvc`	Displays statistics for PVCs associated with Frame Relay interfaces.
`Router# show frame-relay traffic queue`	Displays information about the elements queued at the VC level.

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications. This section includes information on the following modified commands:

- **frame-relay voice bandwidth**
- **show frame-relay pvc**
- **show traffic-shape queue**

In Cisco IOS Release 12.0(1)T or later, you can search and filter the output for **show** and **more** commands. This functionality is useful when you need to sort through large amounts of output, or if you want to exclude output that you do not need to see.

To use this functionality, enter a **show** or **more** command followed by the "pipe" character (|), one of the keywords **begin**, **include**, or **exclude**, and an expression that you want to search or filter on:

command **|** {**begin** | **include** | **exclude**} *regular-expression*

Following is an example of the **show atm vc** command in which you want the command output to begin with the first line where the expression "PeakRate" appears:

show atm vc | begin PeakRate

For more information on the search and filter functionality, refer to the Cisco IOS Release 12.0(1)T feature module titled *CLI String Search*.

frame-relay voice bandwidth

To specify how much bandwidth should be reserved for voice traffic on a specific data link connection identifier (DLCI), use the **frame-relay voice bandwidth** command. Use the **no** form of this command to release the bandwidth previously reserved for voice traffic.

frame-relay voice bandwidth *bps* **[queue** *depth*]
no frame-relay voice bandwidth

Syntax Description

bps_reserved	The bandwidth in bps reserved for voice traffic for the specified map class. The range is from 8000 to 45000000 bps; the default is 0, which disables voice calls.
queue *depth*	(Optional) The queue reserved strictly for voice packets.The *depth* value represents the depth of the queue reserved strictly for voice packets. The default is 100, and the valid range is 30-1000.

Defaults

Disabled (zero)

Command Modes

Map-class configuration

Command History

Release	Modification
12.0(3)XG	This command was first introduced.
12.0(5)T	The queue *depth* option was added. Also, as of this release, reserve queues are no longer required for Voice over Frame Relay.

Usage Guidelines

To use this command, you must first associate a Frame Relay map class with a specific data link connection identifier (DLCI), then enter map-class configuration mode and set the amount of bandwidth to be reserved for voice traffic for that map class.

If a call is attempted and there is not enough remaining bandwidth reserved for voice to handle the additional call, the call will be rejected. For example, if 64 kbps is reserved for voice traffic, and a CODEC and payload size is being used that requires 10 kbps of bandwidth for each call, then the first 6 calls attempted will be accepted, but the 7th call will be rejected.

Note Cisco strongly recommends that you set voice bandwidth to a value less than the CIR if Frame Relay traffic shaping is configured. Cisco also strongly recommends that you set the minimum CIR (using the **frame-relay mincir** command) to be at least equal to or greater than the voice bandwidth.

When setting the **queue** *depth* option, the depth should be kept small. Queueing packets on the voice queue indicates that there is some congestion on the PVC. Queueing too many packets on this queue indicates that there are more voice calls allowed on this PVC than it can handle. In this situation, it is recommended that you decrease the number of calls allowed on the PVC. Note that heavy data congestion may cause some voice packets to be queued, but given the priority of servicing the voice queue, the congestion will not cause the voice queue to be too deep.

Calculating Required Bandwidth

The bandwidth required for a voice call depends on the bandwidth of the CODEC, the voice packetization overhead, and the voice frame payload size. The smaller the voice frame payload size, the higher the bandwidth required for the call. To make the calculation, use the following formula:

required_bandwidth = codec_bandwidth x (1 + overhead / payload_size)

As an example, the overhead for VoFR voice packet is between 6 and 8 bytes: a 2-byte Frame Relay header, a 1- or 2-byte FRF.11 header (depending on the CID value), a 2-byte CRC, and a 1-byte trailing flag. If voice sequence numbers are enabled in the voice packets, there is an additional 1-byte sequence number. Table 1 shows the required voice bandwidth for the G.729 8000 bps speech coder for various payload sizes.

Table 1 Required Voice Bandwidth Calculations for G.729

CODEC	CODEC Bandwidth	Voice Frame Payload Size	Required Bandwidth per Call (6 byte OH)	Required Bandwidth per Call (8 byte OH)
G.729	8000 bps	120 bytes	8400 bps	8534 bps
G.729	8000 bps	80 bytes	8600 bps	8800 bps
G.729	8000 bps	40 bytes	9200 bps	9600 bps
G.729	8000 bps	30 bytes	9600 bps	10134 bps
G.729	8000 bps	20 bytes	10400 bps	11200 bps

To configure the payload size for the voice frames, use the **codec** command from dial-peer configuration mode.

Examples

The following example shows how to reserve 64 kbps for voice traffic for the “vofr” Frame Relay map class on a Cisco 2600 series, 3600 series, or 7200 series router or on an MC3810 concentrator, starting from global configuration mode:

```
router(config)# interface serial 1/1
router(config-if)# frame-relay interface-dlci 100
router(config-fr-dlci)# class vofr
router(config-fr-dlci)# exit
router(config)# map-class frame-relay vofr
router(config-map-class)# frame-relay voice bandwidth 64000
router(config-map-class)#
```

Related Commands

Command	Description
class	Associates a map class with a specified data link connection identifier (DLCI).
codec (dial-peer)	Specifies the voice coder rate of speech for a dial peer.
frame-relay fair-queue	Enables weighted fair queuing for one or more Frame Relay PVCs.
frame-relay fragment	Enables fragmentation of Frame Relay frames for a Frame Relay map class.
frame-relay interface-dlci	Assigns a data link connection identifier (DLCI) to a specified Frame Relay subinterface.
map-class frame-relay	Specifies a Frame Relay map class for the purpose of defining quality of service (QoS) parameter values for a PVC.

show frame-relay pvc

To display statistics about PVCs for Frame Relay interfaces, use the **show frame-relay pvc** command from privileged EXEC mode.

show frame-relay pvc [**interface** *interface* [*dlci*]]

Syntax Description

interface	(Optional) Indicates a specific interface for which PVC information will be displayed.
interface	(Optional) Interface number containing the DLCI(s) for which you wish to display PVC information.
dlci	(Optional) A specific DLCI number used on the interface. Statistics for the specified PVC display when a DLCI is also specified.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was first introduced.
12.0(3)XG	This command was modified to include the fragmentation type and size associated with a particular PVC when fragmentation is enabled on the PVC.
12.0(5)T	This command was modified to include information on the special voice queue that is created using the **queue** keyword of the **frame-relay voice bandwidth** command.

Usage Guidelines

When “vofr” or “vofr cisco” have been configured on the PVC, and a voice bandwidth has been allocated to the class associated with this PVC, configured voice bandwidth and used voice bandwidth are also displayed.

Statistics Reporting

To obtain statistics about PVCs on all Frame Relay interfaces, use this command with no arguments.

Per VC counters are not incremented at all when either autonomous or SSE switching is configured; therefore, PVC values will be inaccurate if either switching method is used.

Traffic Shaping

Congestion control mechanisms are currently not supported, but the switch passes forward explicit congestion notification (FECN) bits, backward explicit congestion notification (BECN) bits, and discard eligibility (DE) bits unchanged from entry to exit points in the network.

If an LMI status report indicates that a PVC is not active, then it is marked as inactive. A PVC is marked as deleted if it is not listed in a periodic LMI status message.

Examples

The various displays in this section show sample output for a variety of different PVCs. Some of the PVCs carry data only; some carry a combination of voice and data.

Below is sample output from the **show frame-relay pvc** command for a PVC carrying Voice over Frame Relay configured via the **vofr cisco** command. The **frame-relay voice bandwidth** command has been configured on the class associated with this PVC, as has fragmentation. The fragmentation employed is Cisco proprietary.

A sample configuration for this scenario is shown first; then the output for the **show frame-relay pvc** command.

```
interface serial 0
     encapsulation frame-relay
     frame-relay traffic-shaping
     frame-relay interface-dlci 108
       vofr cisco
       class vofr-class
   map-class frame-relay vofr-class
     frame-relay fragment 100
     frame-relay fair-queue
     frame-relay cir 64000
     frame-relay voice bandwidth 25000

Router# show frame-relay pvc 108
PVC Statistics for interface Serial0 (Frame Relay DTE)

DLCI = 108, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial0

  input pkts 1260          output pkts 1271         in bytes 95671
  out bytes 98604          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 1271       out bcast bytes 98604
  pvc create time 09:43:17, last time pvc status changed 09:43:17
  Service type VoFR-cisco
  configured voice bandwidth 25000, used voice bandwidth 0
  fragment type VoFR-cisco         fragment size 100
  cir 64000     bc 64000     be 0         limit 1000   interval 125
  mincir 32000     byte increment 1000  BECN response no
  pkts 2592      bytes 205140    pkts delayed 1296      bytes delayed 102570
  shaping inactive
  shaping drops 0
  Voice Queueing Stats: 0/100/0 (size/max/dropped)
  Current fair queue configuration:
   Discard     Dynamic      Reserved
   threshold   queue count  queue count
   64          16           2
  Output queue size 0/max total 600/drops 0
```

Note that the “fragment type” field in the **show frame-relay pvc** display can have the following entries:

- VoFR-cisco—Indicates that fragmented packets will contain the Cisco proprietary header
- VoFR—Indicates that fragmented packets will contain the FRF.11 Annex C header
- end-to-end—Indicates that pure FRF.12 fragmentation is carried on this virtual circuit

Below is sample output from the **show frame-relay pvc** command for an application employing pure FRF.12 fragmentation. A sample configuration for this scenario is shown first; then the output for the **show frame-relay pvc** command.

```
interface serial 0
     encapsulation frame-relay
     frame-relay traffic-shaping
     frame-relay interface-dlci 110
       class frag
   map-class frame-relay frag
     frame-relay fragment 100
     frame-relay fair-queue
     frame-relay cir 64000

Router# show frame-relay pvc 110
PVC Statistics for interface Serial0 (Frame Relay DTE)

DLCI = 110, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial0

  input pkts 0             output pkts 243          in bytes 0
  out bytes 7290           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 243        out bcast bytes 7290
  pvc create time 04:03:17, last time pvc status changed 04:03:18
  fragment type end-to-end         fragment size 100
  cir 64000     bc 64000     be 0         limit 1000   interval 125
  mincir 32000     byte increment 1000  BECN response no
  pkts 486       bytes 14580     pkts delayed 243       bytes delayed 7290
  shaping inactive
  shaping drops 0
  Current fair queue configuration:
   Discard     Dynamic      Reserved
   threshold   queue count  queue count
   64          16           2
  Output queue size 0/max total 600/drops 0
```

Note that when voice is not configured, voice bandwidth output is not displayed.

The following is sample output from the **show frame-relay pvc** command for multipoint subinterfaces carrying data only. The output displays both the subinterface number and the DLCI. This display is the same whether the PVC is configured for static or dynamic addressing. Note that neither fragmentation nor voice is configured on this PVC.

```
Router# show frame-relay pvc
DLCI = 300, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.103

input pkts 10  output pkts 7  in bytes 6222
out bytes 6034  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
outbcast pkts 0  outbcast bytes 0
pvc create time 0:13:11  last time pvc status changed 0:11:46

DLCI = 400, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.104

input pkts 20  output pkts 8  in bytes 5624
out bytes 5222  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
outbcast pkts 0  outbcast bytes 0
pvc create time 0:03:57  last time pvc status changed 0:03:48
```

The following is sample output from the **show frame-relay pvc** command for a PVC carrying voice and data traffic with a special queue specifically for voice traffic created using the **frame-relay voice bandwidth** command **queue** keyword:

```
Router#show frame-relay pvc interface serial 1 45

 PVC Statistics for interface Serial1 (Frame Relay DTE)

 DLCI = 45, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial1

   input pkts 85            output pkts 289          in bytes 1730
   out bytes 6580           dropped pkts 11          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 00:02:09, last time pvc status changed 00:02:09
   Service type VoFR
   configured voice bandwidth 25000, used voice bandwidth 22000
   fragment type VoFR         fragment size 100
   cir 20000     bc   1000      be 0         limit 125    interval 50
   mincir 20000     byte increment 125   BECN response no
   fragments 290       bytes 6613      fragments delayed 1         bytes delayed 33
   shaping inactive
   traffic shaping drops 0
    Voice Queueing Stats: 0/100/0 (size/max/dropped)
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   Current fair queue configuration:
    Discard     Dynamic      Reserved
    threshold   queue count  queue count
    64          16           2
   Output queue size 0/max total 600/drops 0
```

Table 2 provides a listing of the fields in these displays and a description of each field.

Table 2 Show Frame-Relay PVC Field Descriptions

Field	Description
DLCI	One of the data link connection identifier (DLCI) numbers for the PVC.
DLCI USAGE	Lists SWITCHED when the router or access server is used as a switch, or LOCAL when the router or access server is used as a DTE.
PVC STATUS	Status of the PVC: ACTIVE, INACTIVE, or DELETED.
INTERFACE	Specific subinterface associated with this DLCI.
input pkts	Number of packets received on this PVC.
output pkts	Number of packets sent on this PVC.
in bytes	Number of bytes received on this PVC.
out bytes	Number of bytes sent on this PVC.
dropped pkts	Number of incoming and outgoing packets dropped by the router at the Frame Relay level.
in FECN pkts	Number of packets received with the FECN bit set.
in BECN pkts	Number of packets received with the BECN bit set.
out FECN pkts	Number of packets sent with the FECN bit set.
out BECN pkts	Number of packets sent with the BECN bit set.
in DE pkts	Number of DE packets received.
out DE pkts	Number of DE packets sent.
out bcast pkts	Number of output broadcast packets.
out bcast bytes	Number of output broadcast bytes.
pvc create time	Time the PVC was created.
last time pvc status changed	Time the PVC changed status (active to inactive).
Service-type	Type of service performed by this PVC. Can be VoFR or VoFR-cisco.
configured voice bandwidth	Amount of bandwidth in bits per second reserved for voice traffic on this PVC.
used voice bandwidth	Amount of bandwidth in bits per second currently being used for voice traffic.
voice reserved queues	Queue numbers reserved for voice traffic on this PVC. This field was removed in Cisco IOS Release 12.0(5)T.
fragment type	Type of fragmentation configured for this PVC. Possible types are: • VoFR-cisco—Fragmented packets contain the Cisco proprietary header • VoFR—Fragmented packets contain the FRF.11 Annex C header • end-to-end—Fragmented packets contain the standard FRF.12 header
fragment size	Size of the fragment payload in bytes.
cir	Current committed information rate (CIR), in bits per second.
bc	Current committed burst size, in bits.
be	Current excess burst size, in bits.
limit	Maximum number of bytes transmitted per internal interval (excess plus sustained).
interval	Interval being used internally (may be smaller than the interval derived from Bc/CIR; this happens when the router determines that traffic flow will be more stable with a smaller configured interval).

Table 2 Show Frame-Relay PVC Field Descriptions (continued)

Field	Description
mincir	Minimum committed information rate (CIR) for the PVC.
byte increment	Number of bytes that will be sustained per internal interval.
BECN response	Frame Relay has BECN Adaptation configured.
pkts	Number of packets associated with this PVC that have gone through the traffic shaping system.
bytes	Number of bytes associated with this PVC that have gone through the traffic shaping system.
pkts delayed	Number of packets associated with this PVC that have been delayed by the traffic shaping system.
bytes delayed	Number of bytes associated with this PVC that have been delayed by the traffic shaping system.
shaping	Shaping will be active for all PVCs that are fragmenting data; otherwise, shaping will be active if the traffic being sent exceeds the CIR for this circuit.
shaping drops	Number of packets dropped by the traffic shaping process.
Voice Queueing Stats	Statistics showing the size of packets, the maximum number of packets, and the number of packets dropped in the special voice queue created using the **frame-relay voice bandwidth** command **queue** keyword.
Discard threshold	Maximum number of packets that can be stored in each packet queue. If additional packets are received after a queue is full, they will be discarded.
Dynamic queue count	Number of packet queues reserved for best-effort traffic.
Reserved queue count	Number of packet queues reserved for voice traffic.
Output queue size	Size in bytes of each output queue.
max total	Maximum number of packets of all types that can be queued in all queues.
drops	Number of frames dropped by all output queues.

Related Commands

Command	Description
show dial-peer voice	Displays configuration information and call statistics for dial peers.
show frame-relay fragment	Displays information about the Frame Relay fragmentation occurring in the Cisco device.
show frame-relay vofr	Displays information about the FRF.11 subchannels associated with VoFR DLCIs.
show interfaces serial	Displays information about a serial interface.
show traffic-shape queue	Displays information about the elements queued at the VC level.

show traffic-shape queue

To display information about the elements queued at a particular time at the VC (DLCI) level, use the **show traffic-shape queue** command from privileged EXEC mode.

show traffic-shape queue [*interface* [*dlci*]]

Syntax Description

interface	(Optional) The interface containing the DLCI(s) for which you wish to display information about queued elements.
dlci	(Optional) The specific DLCI for which you wish to display information about queued elements.

Command Modes

EXEC or Privileged EXEC

Command History

Release	Modification
11.2	This command was first introduced.
12.0(3)XG	The *dlci* option was added.
12.0(5)T	This command was modified to include information on the special voice queue that is created using the **queue** keyword of the **frame-relay voice bandwidth** command.

Usage Guidelines

When no parameters are specified with this command, the output displays information for all interfaces and DLCIs containing queued elements. When a specific interface and DLCI are specified, information is displayed about the queued elements for that DLCI only.

Examples

The following is sample output for the **show traffic-shape queue** command when weighted fair queuing is configured on the map-class associated with DLCI 16:

```
router# show traffic-shape queue Serial1/1 dlci 16
Traffic queued in shaping queue on Serial1.1 dlci 16
  Queuing strategy: weighted fair
  Queuing Stats: 1/600/64/0 (size/max total/threshold/drops)
     Conversations  0/16 (active/max total)
     Reserved Conversations 0/2 (active/allocated)
  (depth/weight/discards) 1/4096/0
  Conversation 5, linktype: ip, length: 608

source: 172.21.59.21, destination: 255.255.255.255, id: 0x0006, ttl: 255,
  TOS: 0 prot: 17, source port 68, destination port 67
```

The following is sample output for the **show traffic-shape queue** command when priority queuing is configured on the map-class associated with DLCI 16:

```
router# show traffic-shape queue Serial1/1 dlci 16
Traffic queued in shaping queue on Serial1.1 dlci 16
  Queuing strategy: priority-group 4
  Queuing Stats: low/1/80/0 (queue/size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command when first-come-first-serve queuing is configured on the map-class associated with DLCI 16:

```
router# show traffic-shape queue Serial1/1 dlci 16
Traffic queued in shaping queue on Serial1.1 dlci 16
  Queuing strategy: fcfs
  Queuing Stats: 1/60/0 (size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command showing statistics for the special queue for voice traffic that is created automatically when the **frame-relay voice bandwidth** command is entered:

```
Router#show traffic-shape queue serial 1 dlci 45
 Voice queue attached to traffic shaping queue on Serial1 dlci 45
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    Voice Queueing Stats: 0/100/0 (size/max/dropped)
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
 Traffic queued in shaping queue on Serial1 dlci 45
   Queueing strategy: weighted fair
   Queueing Stats: 0/600/64/0 (size/max total/threshold/drops)
      Conversations  0/16 (active/max total)
      Reserved Conversations 0/2 (active/allocated)
```

Table 3 describes the fields shown in these displays.

Table 3 Show Traffic-Shape Queue Field Descriptions

Field	Description
Queuing strategy	When Frame Relay traffic shaping is configured, the queuing type can be weighted fair, custom-queue, priority-group, or fcfs (first-come-first-serve), depending on what is configured on the Frame Relay map-class for this DLCI. The default is fcfs for Frame Relay traffic shaping. When generic traffic shaping is configured, the only queuing type available is weighted fair queuing.
Queuing Stats	Statistics for the configured queuing strategy: • size—Current size of the queue. • max total—Maximum number of packets of all types that can be queued in all queues. • threshold—For weighted fair queuing, the number of packets in the queue after which new packets for high-bandwidth conversations will be dropped. • drops—Number of packets discarded during this interval.
Conversations active	Number of currently active conversations.
Conversations max total	Maximum allowed number of concurrent conversations.
Reserved Conversations active	Number of currently active conversations reserved for voice.

Field	Description
Reserved Conversations allocated	Maximum configured number of conversations reserved.
depth	Number of packets currently queued.
weight	Number used to classify and prioritize the packet.
discards	Number of packets discarded from queues.
Packet	Number of queued packet.
linktype	Protocol type of the queued packet. (cdp = Cisco Discovery Protocol)
length	Number of bytes in the queued packet.
flags	Number of flag characters in the queued packet.
source	Source IP address.
destination	Destination IP address.
id	Packet ID.
ttl	Time to live count.
TOS	IP type of service.
prot	Layer 4 protocol number. Refer to RFC 943 for a list of protocol numbers. (17 = UDP)
source port	Port number of source port.
destination port	Port number of destination port.

Related Commands

Command	Description
show frame-relay fragment	Displays information about the Frame Relay fragmentation occurring in the Cisco device.
show frame-relay pvc	Displays statistics for PVCs associated with Frame Relay interfaces.
show frame-relay vofr	Displays information about the FRF.11 subchannels associated with VoFR DLCIs.