Distributed Frame Relay Switching

The Distributed Frame Relay Switching feature allows Frame Relay switching, Modular QoS CLI (MQC) traffic shaping, MQC policing, and end-to-end FRF.12 fragmentation to occur locally on the Versatile Interface Processor (VIP) line cards, relieving the Route Switch Processor (RSP) of involvement in the switching and packet-handling processes.

Feature Specifications for Distributed Frame Relay Switching

Feature History	
Release	**Modification**
12.0(25)S	This feature was introduced.
Supported Platforms	
Cisco 7500 series	

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for Distributed Frame Relay Switching

Distributed CEF must be enabled globally.

Frame Relay switching must be enabled.

Restrictions for Distributed Frame Relay Switching

Policing (configured with the **police** command) and shaping (configured with the **shape** command) are the only supported MQC features. Any attempt to configure an MQC policy map with any other feature will be rejected by the CLI.

An MQC policy map can be configured with the class-default class only. Named classes are not supported by the Distributed Frame Relay Switching feature because Layer 3 packet classification is not supported for Frame-Relay-to-Frame-Relay connections. An attempt to configure a policy map with a named class will be rejected by the CLI.

The distributed traffic shaping mechanism is restricted to a FIFO queue.

Note Restrictions that are specific to a particular configuration task are listed in the configuration task section.

Information About Distributed Frame Relay Switching

To configure distributed Frame Relay switching, you need to understand the following concepts:

- Distributed Frame Relay Switching, page 2
- Benefits of Distributed Frame Relay Switching, page 3

Distributed Frame Relay Switching

The Distributed Frame Relay Switching feature allows the Frame Relay switching process, which switches packets on the basis of the data-link connection identifier (DLCI), to occur locally on VIP line cards, relieving the RSP of involvement in the switching and packet-handling processes.

Distributed Frame Relay switching supports the following switching arrangements:

- Intra-VIP switching—a pair of switched interfaces reside on the same VIP line card.
- Inter-VIP switching—a pair of switched interfaces reside on separate VIP line cards.
- VIP-RSP switching— one interface of a switched circuit is on a VIP line card and the other on an RSP-controlled line card.

The Distributed Frame Relay Switching feature enables the following QoS features to support distributed Frame Relay switching: MQC traffic shaping, MQC policing, and FRF.12 end-to-end fragmentation. These QoS features run on the VIP.

Benefits of Distributed Frame Relay Switching

The Distributed Frame Relay Switching feature prevents RSP performance issues by allowing Frame Relay switching processes and QoS for Frame Relay switching to be performed locally on the VIP line cards.

How to Configure Distributed Frame Relay Switching

This section contains the following tasks:

Configuring the Shaping Policy for Distributed Frame Relay Switching

Perform this task to configure the traffic-shaping policy for distributed Frame Relay switching.

Restrictions

Only the class-default class can be configured for shaping. Named classes will be rejected by the CLI.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map*
4. **class class-default**
5. **shape** [**average** | **peak**] *mean-rate* [[*burst-size*] [*excess-burst-size*]]
6. **end**

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	**policy-map** *policy-map* **Example:** `Router(config)# policy-map SHAPE`	Specifies the name of the policy map to be created or modified. • Use this command to define the shaping policy.
Step 4	**class class-default** **Example:** `Router(config-pmap)# class class-default`	Specifies the default class so that you can configure or modify its policy.
Step 5	**shape** [**average** | **peak**] *mean-rate* [[*burst-size*] [*excess-burst-size*]] **Example:** `Router(config-pmap-c)# shape average 60000`	Shapes traffic to the indicated bit rate according to the algorithm specified.
Step 6	**end** **Example:** `Router(config-pmap-c)# end`	Returns to privileged EXEC mode.

Configuring the Policing Policy for Distributed Frame Relay Switching

Perform this task to configure the traffic-policing policy for distributed Frame Relay switching.

Restrictions

Only the class-default class can be configured for policing. Named classes will be rejected by the CLI.

The conform, exceed, and violate actions of the **police** command are restricted to the **transmit** and **drop** options. If you do not configure conform, exceed, or violate actions, the “no action” behavior occurs.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map*
4. **class class-default**

5. **police** *bps* [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*]
6. **end**

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	**policy-map** *policy-map* **Example:** `Router(config)# policy-map police`	Specifies the name of the policy map to be created or modified. • Use this command to define the policing policy.
Step 4	**class class-default** **Example:** `Router(config-pmap)# class class-default`	Specifies the default class so that you can configure or modify its policy.
Step 5	**police** *bps* [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*] **Example:** `Router(config-pmap-c)# police 8000`	Configures traffic policing. • Valid values for the *action* argument are **transmit** and **drop**.
Step 6	**end** **Example:** `Router(config-pmap-c)# end`	Returns to privileged EXEC mode.

Configuring a Frame Relay Map Class for Distributed Policing, Shaping, and FRF.12 Fragmentation

Perform this task to configure the Frame Relay map class to which the policing and shaping policies will be attached.

Restrictions

Only input policing policies can be attached to a Frame Relay map class.

Only output shaping policies can be attached to a Frame Relay map class.

Only shaping and policing policies can be attached to a Frame Relay map class by using the **service-policy** command. A policy with anything other than shaping or policing functions (such as fair queueing) will be rejected by the CLI.

Only Frame Relay fragmentation (configured by using the **fragment** command) can be configured in the map class. No other Frame Relay features are supported for configuration in the map class.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **map-class frame-relay** *map-class-name*
4. **service-policy input** *policy-map-name*
5. **service-policy output** *policy-map-name*
6. **frame-relay fragment** *fragment-size* [**switched**]
7. **end**

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	**map-class frame-relay** *map-class-name* **Example:** `Router(config) map-class frame-relay class1`	Specifies a Frame Relay map class to define quality of service (QoS) values.
Step 4	**service-policy input** *policy-map-name* **Example:** `Router(config-map-class)#service-policy input police`	Attaches a policy map to a class to be used by an input interface or input PVC. • Attach the policing policy here.
Step 5	**service-policy output** *policy-map-name* **Example:** `Router(config-map-class)# service-policy output shape`	Attaches a policy map to a class to be used by an output interface or output PVC. • Attach the shaping policy here.

	Command or Action	Purpose
Step 6	**frame-relay fragment** *fragment-size* [**switched**] **Example:** `Router(config-map-class)# frame-relay fragment 80 switched`	Enables fragmentation of Frame Relay frames for a Frame Relay map class.
Step 7	**end** **Example:** `Router(config-map-class)# end`	Returns to privileged EXEC mode.

Configuring Distributed Frame Relay Switching

Perform this task to configure distributed Frame Relay switching.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip cef distributed**
4. **frame-relay switching**
5. **interface** *type number*
6. **encapsulation frame-relay** [**cisco** | **ietf**]
7. **frame-relay interface-dlci** *dlci* **switched**
8. **class** *name*
9. **exit**
10. Repeat Steps 5 through 9 for each switched PVC.
11. **connect** *connection-name interface dlci interface dlci*
12. end

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.

	Command or Action	Purpose
Step 3	**ip cef distributed** **Example:** `Router(config)# ip cef distributed`	Enables distributed CEF operation.
Step 4	**frame-relay switching** **Example:** `Router(config)# frame-relay switching`	Enables PVC switching on a Frame Relay DCE device or a Network-to-Network Interface (NNI).
Step 5	**interface** *type number* **Example:** `Router(config)# interface serial 0`	Specifies an interface and enters interface configuration mode.
Step 6	**encapsulation frame-relay** [**cisco** | **ietf**] **Example:** `Router(config-if)# encapsulation frame-relay`	Enables Frame Relay encapsulation. • The default is **cisco** encapsulation.
Step 7	**frame-relay interface-dlci** *dlci* **switched** **Example:** `Router(config-if)# frame-relay interface-dlci 100 switched`	Creates a switched PVC and enters Frame Relay DLCI configuration mode.
Step 8	**class** *name* **Example:** `Router(config-fr-dlci)# class class1`	(Optional) Associates a map class with a specified data-link connection identifier (DLCI). • Attach the map class configured with shaping and policing policies here.
Step 9	**exit**	Exits to interface configuration mode.
Step 10	`Repeat Steps 5 through 9 for each switched PVC.`	
Step 11	`Router(config)#` **connect** *connection-name interface dlci interface dlci* **Example:** `Router# connect connection1 serial0 100 serial1 101`	Defines connections between Frame Relay PVCs.
Step 12	**end**	Returns to privileged EXEC mode.

Monitoring and Maintaining Distributed Frame Relay Switching

Perform this task to monitor and maintain distributed Frame Relay switching.

SUMMARY STEPS

1. **enable**
2. **show frame-relay pvc**
3. **debug frame-relay ipc**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show frame-relay pvc** [**interface** *type number*] [*dlci*] **Example:** `Router# show frame-relay pvc 100`	Displays statistics about PVCs for Frame Relay interfaces.
Step 3	**debug frame-relay ipc** **Example:** `Router# debug frame-relay ipc`	Displays Frame Relay-specific IPC messages that are exchanged between the VIP and RSP.. • Information regarding the creation, deletion, and change in status of terminated and switched Frame Relay circuits is displayed.

Configuration Examples for Distributed Frame Relay Switching

Distributed Frame Relay Switching: Example

The following example shows the configuration of Frame Relay switching with distributed shaping and policing:

```
policy-map out-policy-map
  class class-default
    shape average 64000

policy-map in-policy-map
  class class-default
   police cir 128000
!
interface Serial0
 encapsulation frame-relay
 frame-relay interface-dlci 100 switched
  class myclass
!
interface Serial1
 encapsulation frame-relay
 frame-relay interface-dlci 101 switched
  class myclass
!
map-class frame-relay myclass
 service-policy input in-policy-map
 service-policy output out-policy-map
!
connect connection1 Serial0 100 Serial1 101
```

Additional References

The following references provide additional information related to distributed Frame Relay switching.

Related Documents

Related Topic	Document Title
Frame Relay switching configuration tasks	*Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2
Frame Relay switching commands	*Cisco IOS Wide-Area Networking Command Reference*, Release 12.2
MQC configuration tasks	*Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2
MQC commands	*Cisco IOS Quality of Service Solutions Command Reference*, Release 12.2

Standards

Standards	Title
No new or modified standards are supported. Support for existing standards has not been modified.	—

MIBs

MIBs	MIBs Link
No new or modified MIBS are supported. 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

RFCs	Title
No new or modified RFCs are supported. Support for existing RFCs has not been modified.	—

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **debug frame-relay ipc**
- **show frame-relay pvc**

debug frame-relay ipc

To display Frame Relay-specific IPC messages that are exchanged between the VIP and the RSP consoles, use the **debug frame-relay ipc** command in privileged EXEC mode. To stop displaying IPC messages, use the **no** form of this command.

debug frame-relay ipc

no debug frame-relay ipc

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(25)S	This command was introduced.

Usage Guidelines

Using the **debug frame-relay ipc** command in privileged EXEC mode displays messages sent from the RSP to the VIP line card. Information regarding the creation, deletion, and change in status of terminated and switched Frame Relay circuits is displayed.

Examples

Debug Messages for Switched Frame Relay Connections

The following debug messages are displayed when a switched Frame Relay connection goes down:

```
02:47:42:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/0/1:0:dFRS (DOWN)
02:47:42:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/1/1:0:dFRS (DOWN)
```

The following debug messages are displayed when a switched Frame Relay connection comes up:

```
02:48:12:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/0/1:0:dFRS (UP)
02:48:12:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/1/1:0:dFRS (UP)
```

The following debug messages are displayed when a switched Frame Relay connection is deleted:

```
02:51:17:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/0/1:0:dFRS (DOWN)
02:51:17:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/1/1:0:dFRS (DOWN)
02:51:17:IPC-FR:RP:tx DELETE:DLCI 100 :Serial2/0/0/1:0:dFRS (DOWN)
02:51:17:IPC-FR:RP:tx DELETE:DLCI 100 :Serial2/0/1/1:0:dFRS (DOWN)
```

Debug Messages for Terminated Frame Relay Connections

The following debug message is displayed when a terminated Frame Relay connection goes down:

```
03:00:13:IPC-FR:RP:tx DELETE:DLCI 100 :Serial2/0/0/1:0:USAGE 1
```

The following debug message is displayed when a terminated Frame Relay connection comes up:

```
02:56:33:IPC-FR:RP:tx UPDATE:DLCI 100 :Serial2/0/0/1:0:USAGE 1
```

The following debug message is displayed when a terminated Frame Relay connection is deleted:

```
03:06:00:IPC-FR:RP:tx DELETE:DLCI 100 :Serial2/0/0/1:0:USAGE 1
```

Table 1 describes the significant fields shown in the display.

Table 1 debug frame-relay ipc Field Descriptions

Field	Description
IPC-FR	Frame Relay-specific IPC message.
RP	Indicates that the message is from the Route Processor.
tx	Indicates that the message was sent (rather than received).
UPDATE	Indicates that the connection has changed status (up or down).
DLCI	Data-link connection identifier of the switched or terminated circuit.
dFRS	Distributed Frame Relay switching.
DELETE	Indicates that the connection has been deleted.

show frame-relay pvc

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

show frame-relay pvc [*type*] **[***number*] [*dlci*]

Syntax Description

type	(Optional) Interface type.
number	(Optional) Interface number.
dlci	(Optional) One of the specific DLCI numbers used on the interface. Statistics for the specified PVC display when a DLCI is also specified.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(12)S	This command was modified to display reasons for packet drops and complete PVC status information for switched PVCs.
12.0(25)S	This command was modified to display distributed policing- and traffic-shaping statistics for switched PVCs on VIP line cards.

Usage Guidelines

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.

DCE, DTE, and Logical Interfaces

When the interface is configured as a DCE and the data-link connection identifier (DLCI) usage is SWITCHED, the value displayed in the PVC STATUS field is determined by the status of outgoing interfaces (up or down) and the status of the outgoing PVC. The status of the outgoing PVC is updated in the Local Management Interface (LMI) message exchange. PVCs terminated on a DCE interface use the status of the interface to set the PVC STATUS.

In the case of a hybrid DTE switch, the PVC status on the DTE side is determined by the PVC status reported by the external Frame Relay network through the LMI.

If the outgoing interface is a tunnel, the PVC status is determined by what is learned from the tunnel.

Traffic Shaping

Congestion-control mechanisms are currently not supported on switched PVCs, 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

Switched PVC: Example

The following is sample output from the **show frame-relay pvc** command for a switched Frame Relay PVC:

```
Router # show frame-relay pvc 16

PVC Statistics for interface POS5/0 (Frame Relay NNI)

DLCI = 16, DLCI USAGE = SWITCHED, PVC STATUS = INACTIVE, INTERFACE = POS5/0
LOCAL PVC STATUS = INACTIVE, NNI PVC STATUS = ACTIVE

  input pkts 0              output pkts 0            in bytes 0
  out bytes 0               dropped pkts 100         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
  switched pkts 0
  Detailed packet drop counters:
  no out intf 0             out intf down 100        no out PVC 0
  in PVC down 0             out PVC down 0           pkt too big 0
  pvc create time 00:25:32, last time pvc status changed 00:06:31
```

Table 2 describes the fields shown in the display that are relevant to switched PVCs.

Table 2 show frame-relay pvc Field Descriptions for Switched PVCs

Field	Description
PVC STATUS	Status of the PVC. The DCE device reports the status, and the DTE device receives the status. The PVC status is exchanged using the LMI protocol: • ACTIVE— The PVC is operational and can transmit packets. • INACTIVE—The PVC is configured, but down. • DELETED—The PVC is not present (DTE device only), which means that no status is received from the LMI protocol. If the **frame-relay end-to-end keepalive** command is used, the end-to-end keepalive (EEK) status is reported in addition to the LMI status. For example: • ACTIVE (EEK UP) —The PVC is operational according to LMI and end-to-end keepalives. • ACTIVE (EEK DOWN)—The PVC is operational according to LMI, but end-to-end keepalive has failed.
LOCAL PVC STATUS[1]	Status of PVC locally configured on the NNI interface.
NNI PVC STATUS[1]	Status of PVC learned over the NNI link.
no out intf[2]	Number of packets dropped because there is no output interface.
out intf down[2]	Number of packets dropped because the output interface is down.
no out PVC[2]	Number of packets dropped because the outgoing PVC is not configured.
in PVC down[2]	Number of packets dropped because the incoming PVC is inactive.
out PVC down[2]	Number of packets dropped because the outgoing PVC is inactive.
pkt too big[2]	Number of packets dropped because the packet size is greater than media MTU[3].

1 The LOCAL PVC STATUS and NNI PVC STATUS fields are displayed only for PVCs configured on Frame Relay NNI interface types. These fields are not displayed if the PVC is configured on DCE or DTE interface types.

2 The detailed packet drop fields are displayed for switched Frame Relay PVCs only. These fields are not displayed for terminated PVCs.

3 MTU = maximum transmission unit.

DCE Interface with Traffic Shaping: Example

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

```
Router# show frame-relay pvc
    PVC Statistics for interface Serial (Frame Relay DCE)

DLCI = 22, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial3/1:1.1

input pkts 9   output pkts 300008   in bytes 2754
out bytes 161802283   dropped pkts 0   in FECN pkts 0
in BECN pkts 1   out FECN pkts 0   out BECN pkts 0
in DE pkts 0   out DE pkts 0
outbcast pkts 0   outbcast bytes 0
  Shaping adapts to ForeSight   in ForeSight signals 1304
  pvc create time 1d05h, last time pvc status changed 00:11:00
```

If the circuit is configured for shaping to adapt to BECN, it is indicated in the display:

```
Shaping adapts to BECN
```

If traffic shaping on the circuit does not adapt to either BECN or ForeSight, nothing extra shows:

```
DLCI = 100, DLCI USAGE = SWITCHED, PVC STATUS = ACTIVE

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
outbcast pkts 0   outbcast bytes 0
pvc create time 0:03:03 last time pvc status changed 0:03:03
      Num Pkts Switched 0
```

Multipoint Subinterfaces: Example

The following is sample output from the **show frame-relay pvc** command for multipoint subinterfaces. 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.

```
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
```

Table 3 describes the fields shown in the displays.

Table 3 show frame-relay pvc Field Descriptions

Field	Description
DLCI	One of the 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. The DCE device reports the status, and the DTE device receives the status. When you disable the Local Management Interface (LMI) mechanism on the interface (by using the **no keepalive** command), the PVC status is STATIC. Otherwise, the PVC status is exchanged using the LMI protocol: • STATIC—LMI is disabled on the interface. • ACTIVE— The PVC is operational and can transmit packets. • INACTIVE—The PVC is configured, but down. • DELETED—The PVC is not present (DTE device only), which means that no status is received from the LMI protocol. If the **frame-relay end-to-end keepalive** command is used, the end-to-end keepalive (EEK) status is reported in addition to the LMI status. For example: • ACTIVE (EEK UP) —The PVC is operational according to LMI and end-to-end keepalives. • ACTIVE (EEK DOWN)—The PVC is operational according to LMI, but end-to-end keepalive has failed.
INTERFACE = Serial0.103	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.
out bytes	Number of bytes sent.
dropped pkts	Number of packets dropped by the router at Frame Relay level because an active outbound DLCI was not found.
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.
outbcast pkts	Number of output broadcast packets.
outbcast bytes	Number of output broadcast bytes.
pvc create time	Time the PVC was created.

Table 3 show frame-relay pvc Field Descriptions

Field	Description
last time pvc status changed	Time the PVC changed status (active to inactive).
Num Pkts Switched	Number of packets switched within the router or access server; this PVC is the source PVC.

1 DLCI = data-link connection identifier.

DTE Interface Without Traffic Shaping: Example

The following is sample output from the **show frame-relay pvc** command with no traffic shaping configured on the interface.

```
Router# show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

DLCI = 100, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1

  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
```

DTE Interface With Traffic Shaping: Example

The following is sample output from the **show frame-relay pvc** command when traffic shaping is in effect:

```
Router# show frame-relay pvc

PVC Statistics for interface Serial1 (Frame Relay DTE)

DLCI = 101, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial1
input pkts 14046    output pkts 4339    in bytes 960362
  out bytes 675566    dropped pkts 0           in FECN pkts 0
  in BECN pkts 148    out FECN pkts 0          out BECN pkts 0
  in DE pkts 44       out DE pkts 0
  out bcast pkts 4034          out bcast bytes 427346
pvc create time 11:59:29, last time pvc status changed 11:59:29
CIR 64000         BC 8000         BE 1600     limit 2000      interval 125
mincir 32000      byte incremen 500           BECN response yes
pkts 9776         bytes 838676     pkts delayed 0         bytes delayed 0
shaping inactive

List   Queue  Args
1      4      byte-count 100
  Output queues: (queue #: size/max/drops)
     0: 0/20/0 1: 0/20/0 2: 0/20/0 3: 0/20/0 4: 0/20/0
     5: 0/20/0 6: 0/20/0 7: 0/20/0 8: 0/20/0 9: 0/20/0
     10: 0/20/0 11: 0/20/0 12: 0/20/0 13: 0/20/0 14: 0/20/0
     15: 0/20/0 16: 0/20/0
```

Table 4 describes the additional fields shown in the display when traffic shaping is in effect.

Table 4 show frame-relay pvc Field Descriptions with Traffic Shaping in Effect

Field	Description
CIR	Current CIR[1], in bits per second.
BC	Current Bc[2], in bits.
BE	Current Be[3], 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).
mincir	Minimum CIR for the PVC.
incremen	Number of bytes that will be sustained per internal interval.
BECN response	Frame Relay has BECN Adaptation configured.
List Queue Args	Identifier and parameter values for a custom queue list defined for the PVC. These identifiers and values correspond to the command **queue-list 1 queue 4 byte-count 100**.
Output queues	Output queues used for the PVC, with the current size, the maximum size, and the number of dropped frames shown for each queue.

1 CIR = committed information rate.

2 Bc = committed burst size.

3 Be = excess burst size.