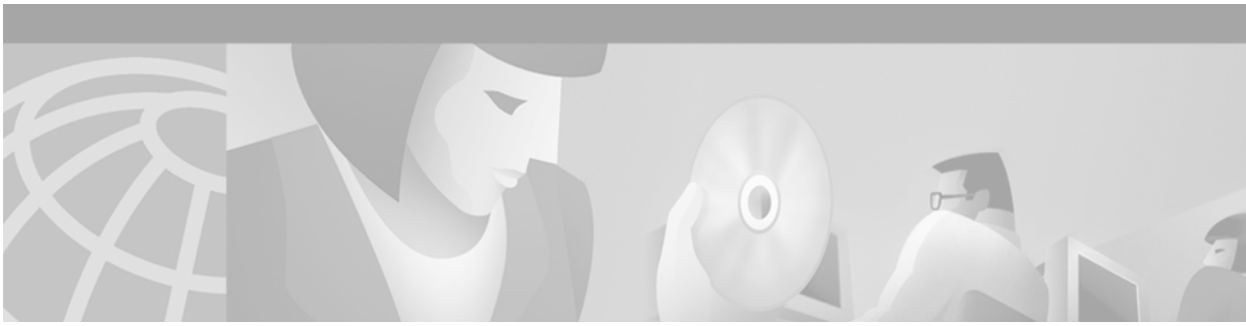

Frame Relay Commands

Use the commands described in this chapter to configure access to Frame Relay networks.

For Frame Relay configuration information and examples, refer to the chapter “Configuring Frame Relay” in the *Cisco IOS Wide-Area Networking Configuration Guide*.

For a description of the commands used to configure Frame Relay-ATM Interworking, refer to the chapter “Frame Relay-ATM Interworking Commands” later in this book.

For information about how to configure FRF.5 Frame Relay-ATM Network Interworking and FRF.8 Frame Relay-ATM Service Interworking, refer to the chapter “Configuring Frame Relay-ATM Interworking” of the *Cisco IOS Wide-Area Networking Configuration Guide*.

class (map-list)

To associate a map class with a protocol-and-address combination, use the **class** map-list configuration command.

protocol protocol-address **class** *map-class* [**broadcast**] [**trigger**] [**ietf**]

Syntax Description

protocol	Supported protocol, bridging, or logical link control keywords: **appletalk**, **bridging**, **clns**, **decnet**, **dlsw**, **ip**, **ipx**, **llc2**, **rsrb**, **vines**, and **xns**.
protocol-address	Protocol address. The **bridge** and **clns** keywords do not use protocol addresses.
map-class	Name of the map class from which to derive quality of service (QoS) information.
broadcast	(Optional) Allows broadcasts on this SVC.
trigger	(Optional) Enables a broadcast packet to trigger an SVC. If an SVC already exists that uses this map class, the SVC will carry the broadcast. This keyword can be configured only if **broadcast** is also configured.
ietf	(Optional) Specifies RFC 1490 encapsulation. The default is Cisco encapsulation.

Defaults

No protocol, protocol address, and map class are defined. If the **ietf** keyword is not specified, the default is Cisco encapsulation. If the **broadcast** keyword is not specified, no broadcasts are sent.

Command Modes

Map-list configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

This command is used for Frame Relay switched virtual circuits (SVCs); the parameters within the map class are used to negotiate for network resources. The class is associated with a static map that is configured under a map list.

Examples

In the following example, if IP triggers the call, the SVC is set up with the QoS parameters defined within the class hawaii. However, if AppleTalk triggers the call, the SVC is set up with the QoS parameters defined in the class rainbow. An SVC triggered by either protocol results in two SVC maps, one for IP and one for AppleTalk. Two maps are set up because these protocol-and-address combinations are heading for the same destination, as defined by the **dest-addr** keyword and the values following it in the **map-list** command.

```
map-list bermuda source-addr E164 14085551212 dest-addr E164 15085551212
 ip 131.108.177.100 class hawaii
 appletalk 1000.2 class rainbow
```

In the following example, the **trigger** keyword allows AppleTalk broadcast packets to trigger an SVC:

```
ip 172.21.177.1 class jamaica broadcast ietf
appletalk 1000.2 class jamaica broadcast trigger ietf
```

Related Commands

Command	Description
map-class frame-relay	Specifies a map class to define QoS values for an SVC.
map-list	Specifies a map group and link it to a local E.164 or X.121 source address and a remote E.164 or X.121 destination address for Frame Relay SVCs.

class (virtual circuit)

To associate a map class with a specified data-link connection identifier (DLCI), use the **class** virtual circuit configuration command. To remove the association between the DLCI and the map class, use the **no** form of this command.

class *name*

no class *name*

Syntax Description

name	Name of map class to associate with this DLCI.

Defaults

No map class is defined.

Command Modes

Virtual circuit configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

This command applies to DLCIs. The class parameter values are specified with the **map-class frame-relay** command.

Examples

The following example shows how to define map class “slow_vcs’ and apply it to DLCI 100:

```
interface serial 0.1 point-to-point
 frame-relay interface-dlci 100
  class slow_vcs

map-class frame-relay slow_vcs
frame-relay cir out 9600
```

The following example shows how to apply a map class to a DLCI for which a **frame-relay map** statement exists. The **frame-relay interface-dlci** command must also be used.

```
interface serial 0.2 point-to-multipoint
 frame-relay map ip 131.26.13.2 100
 frame-relay interface-dlci 100
  class slow_vcs

interface serial 0
 frame-relay interface-dlci 100
  class fast_vc

map-class frame-relay fast_vc
 frame-relay traffic-rate 56000 128000
 frame-relay idle-timer 30
```

Related Commands

Command	Description
frame-relay interface-dlci	Assigns a DLCI to a specified Frame Relay subinterface on the router or access server.
frame-relay map	Defines mapping between a destination protocol address and the DLCI used to connect to the destination address.
map-class frame-relay	Specifies a map class to define QoS values for an SVC.

clear frame-relay-inarp

To clear dynamically created Frame Relay maps, which are created by the use of Inverse Address Resolution Protocol (ARP), use the **clear frame-relay-inarp** EXEC command.

clear frame-relay-inarp

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following example clears dynamically created Frame Relay maps:

```
clear frame-relay-inarp
```

Related Commands

Command	Description
frame-relay inverse-arp	Reenables Inverse ARP on a specified interface or subinterface, if the Inverse ARP was previously disabled on a router or access server configured for Frame Relay.
show frame-relay map	Displays the current map entries and information about the connections.

connect (Frame Relay)

To define connections between Frame Relay PVCs, use the **connect** global configuration command. To remove connections, use the **no** form of this command.

connect *connection-name interface dlci interface dlci*

no connect *connection-name interface dlci interface dlci*

Syntax Description

connection-name	A name for this connection.
interface	Interface on which a PVC connection will be defined.
dlci	Data-link connection identifier (DLCI) number of the PVC that will be connected.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

When Frame Relay switching is enabled, the **connect** command creates switched PVCs in Frame Relay networks.

Examples

The following example shows how to enable Frame Relay switching and define a connection called "one" between DLCI 16 on serial interface 0 and DLCI 100 on serial interface 1.

```
frame-relay switching
connect one serial0 16 serial1 100
```

Related Commands

Command	Description
frame-relay switching	Enables PVC switching on a Frame Relay DCE or NNI.

encapsulation frame-relay

To enable Frame Relay encapsulation, use the **encapsulation frame-relay** interface configuration command. To disable Frame Relay encapsulation, use the **no** form of this command.

encapsulation frame-relay [**cisco** | **ietf**]

no encapsulation frame-relay [**ietf**]

Syntax Description

cisco	(Optional) Uses Cisco's own encapsulation, which is a 4-byte header, with 2 bytes to identify the data-link connection identifier (DLCI) and 2 bytes to identify the packet type.
ietf	(Optional) Sets the encapsulation method to comply with the Internet Engineering Task Force (IETF) standard (RFC 1490). Use this keyword when connecting to another vendor's equipment across a Frame Relay network.

Defaults

The default is **cisco** encapsulation.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use this command with no keywords to restore the default Cisco encapsulation, which is a 4-byte header with 2 bytes for the DLCI and 2 bytes to identify the packet type.

You should shut down the interface prior to changing encapsulation types. Although this is not required, shutting down the interface ensures the interface is reset for the new encapsulation.

Examples

The following example configures Cisco Frame Relay encapsulation on interface serial 1:

```
interface serial 1
 encapsulation frame-relay
```

Use the **ietf** keyword if your router or access server is connected to another vendor's equipment across a Frame Relay network to conform with RFC 1490:

```
interface serial 1
 encapsulation frame-relay ietf
```

fr-atm connect dlci

To connect a Frame Relay data-link connection identifier (DLCI) to an ATM virtual circuit descriptor for FRF.5 Frame Relay-ATM Interworking (currently only available for the Cisco MC 3810), use the **fr-atm connect dlci** interface configuration command. The encapsulation type of the current interface must be Frame Relay or Frame Relay 1490 Internet Engineering Task Force (IETF). To remove the DLCI-to-VCD connection, use the **no** form of this command.

fr-atm connect dlci *dlci atm-interface* [**pvc** *name* | [**pvc** *vpi/*]*vci*] [**clp-bit** {**map-de | 0** | **1**}] [**de-bit** {**no-map-clp** | **map-clp**}]

no fr-atm connect dlci *dlci atm-interface* [**pvc** *name* | [**pvc** *vpi/*]*vci*] [**clp-bit** {**map-de | 0** | **1**}] [**de-bit** {**no-map-clp** | **map-clp**}]

Syntax Description

dlci	Frame Relay DLCI number.
atm-interface	The ATM interface connected to the DLCI.
pvc *name*	(Optional) The ATM PVC name.
pvc *vpi/vci*	(Optional) The ATM PVC virtual path identifier (VPI)/virtual channel identifier (VCI). The default value for *vpi* is 0 if no value is entered. When specifying the ATM PVC, enter one of the following PVC designations: • The *name* value • The *vpi* value alone • The *vpi/vci* combination
clp-bit {**map-de	0**	**1**}	(Optional) Sets the mode of Discard Eligibility/Cell Loss Priority (DE/CLP) mapping in the Frame Relay to ATM direction. The default is **map-de**. **map-de**—Specifies Mode 1 (as described in section 4.4.2 of FRF.5). **0** or **1**—Specifies Mode 2 (as described in section 4.4.2 of FRF.5).
de-bit {**no-map-clp**	**map-clp**}	(Optional) Sets the mode of DE/CLP mapping in the ATM to Frame Relay direction. The default is **map-clp**. **map-clp**—Specifies Mode 1 (as described in section 4.4.2 of FRF.5). **no-map-clp**—Specifies Mode 2 (as described in section 4.4.2 of FRF.5).

Defaults

No Frame Relay-ATM connection is configured.

Command Modes

Interface configuration

Command History

Release	Modification
11.3 MA	This command was introduced.

Release	Modification
12.0 PVC	Management CLI support was added.
12.0(7)T	This command was implemented in Cisco IOS Release 12.0 T. The **clp-bit** and **de-bit** keywords were added.

Usage Guidelines

This command only applies to Frame Relay-ATM Network Interworking (FRF.5) on the Cisco MC3810.

Note The Cisco MC3810 provides only *network interworking* (FRF.5). The Cisco MC3810 can be used with *service interworking* (FRF.8), which is provided by the carrier's ATM network equipment.

Examples

The following example configures a Frame Relay-ATM Interworking connection on FR-ATM interface 20, in which Frame Relay DLCI 100 is connected to ATM VPI/VCI 100/200 for ATM interface 0:

```
interface fr-atm 20
 fr-atm connect dlci 100 atm0 100/200 clp-bit map-de de-bit map-clp
```

The following example configures a Frame Relay-ATM Interworking connection on FR-ATM interface 10, in which Frame Relay DLCI 150 is connected to ATM VPI/VCI 0/150 for ATM interface 0:

```
interface fr-atm 10
 fr-atm connect dlci 150 atm0 0/150 clp-bit map-de de-bit map-clp
```

Related Commands

Command	Description
frame-relay traps-maximum dlci-status-change	Creates a Frame Relay-ATM Interworking interface on the Cisco MC3810 multiservice concentrator.

frame-relay accounting adjust

To enable byte count adjustment at the permanent virtual circuit (PVC) level so that the number of bytes sent and received at the PVC corresponds to the actual number of bytes sent and received on the physical interface, use the **frame-relay accounting adjust** command in interface configuration mode. To disable byte count adjustment, use the **no** form of this command.

frame-relay accounting adjust

no frame-relay accounting adjust [**frf9**]

Syntax Description

frf9	(Optional) Payload compression using the Stacker method.

Note Use the **frf9** keyword only with the **no** form of this command.

Defaults

Byte count adjustment is enabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.2	This command was introduced.

Usage Guidelines

Use this command to return the number of bytes shown at the PVC level back to the number of bytes received at the PVC level without any adjustments. This command takes into consideration any dropped packets as well as compression and decompression that may occur after initial processing.

If you use the **no frame-relay accounting adjust frf9** command, then byte count includes dropped packets and traffic shaping, but not compression and decompression savings from FRF.9.

Examples

The following example enables Frame-Relay accounting adjustment:

```
Router# configure terminal
Router(config)# interface serial3/0
Router(config-if) frame-relay accounting adjust
```

The following example disables Frame-Relay accounting adjustment:

```
Router# configure terminal
Router(config)# interface serial3/0
Router(config-if) no frame-relay accounting adjust
Router(config-if)# end
```

The following example verifies that Frame-Relay accounting adjustment is disabled:

```
Router# show run interface serial3/0
```

```
Building configuration...

Current configuration :266 bytes
!
interface Serial3/0
 no ip address
 encapsulation frame-relay
 no frame-relay accounting adjust
end
```

Related Commands

Command	Description
show frame-relay pvc	Displays the total input and output bytes for a PVC and an interface as equal. **Note** In order for the PVC and the interface input and output byte count to be equal, no other PVCs or network traffic can be passing data. Otherwise the interface shows aggregate totals for PVCs, the Local Management Interface (LMI), and other network traffic.

frame-relay adaptive-shaping

To select the type of backward notification you want to use, use the **frame-relay adaptive-shaping** map-class configuration command. To disable backward notification, use the **no** form of the command.

frame-relay adaptive-shaping {**becn** | **foresight**}

no frame-relay adaptive-shaping

Syntax Description

becn	Enables rate adjustment in response to backward explicit congestion notification (BECN).
foresight	Enables rate adjustment in response to ForeSight and BECN messages.

Defaults

Disabled

Command Modes

Map-class configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

This command replaces the **frame-relay becn-response-enable** command. If you use the **frame-relay becn-response-enable** command in scripts, you should replace it with the **frame-relay adaptive-shaping** command.

The **frame-relay adaptive-shaping** command configures a router to respond to either BECN or ForeSight backward congestion notification messages. When BECN is enabled, Frame Relay traffic shaping will adapt to BECN messages. When ForeSight is enabled, Frame Relay traffic shaping will adapt to ForeSight and BECN messages.

Include this command in a map-class definition and apply the map class to either the main interface or to a subinterface.

Examples

This example shows the map-class definition for a router configured with traffic shaping and Router ForeSight enabled:

```
interface Serial0
 no ip address
 encapsulation frame-relay
 frame-relay traffic-shaping
 frame-relay class control-A
 map-class frame-relay control-A
  frame-relay adaptive-shaping foresight
  frame-relay cir 56000
  frame-relay bc 64000
```

Related Commands

Command	Description
frame-relay traffic-shaping	Enables both traffic shaping and per-VC queueing for all PVCs and SVCs on a Frame Relay interface.
map-class frame-relay	Specifies a map class to define QoS values for an SVC.

frame-relay address registration auto-address

To enable a router to automatically select a management IP address for ELMI address registration, use the **frame-relay address registration auto-address** global configuration command. To disable automatic address selection, use the **no** form of this command.

frame-relay address registration auto-address

no frame-relay address registration auto-address

Syntax Description

This command has no arguments or keywords.

Defaults

Auto address selection is enabled.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

During system initialization, if no management IP address is configured, then the router automatically selects the IP address of one of the interfaces. The router will choose an Ethernet interface first and then serial and other interfaces. If you do not want the router to select a management IP address during system initialization, you can store the **no** form of this command in the configuration.

When automatic address selection is disabled and an IP address has not been configured using the **frame-relay address registration ip** global configuration command, the IP address for ELMI address registration will be set to 0.0.0.0.

The **no frame-relay address registration ip** command will set the IP address to 0.0.0.0, even when Frame Relay automatic address selection is enabled.

If you configure the IP address using the **frame-relay address registration ip** global configuration command, the IP address you configure will overwrite the IP address chosen automatically by the router.

If you enable automatic address selection after configuring the IP address using the **frame-relay address registration ip** global configuration command, the IP address chosen automatically by the router will overwrite the IP address you originally configured.

Examples

The following example shows ELMI enabled on serial interface 0. The automatic IP address selection mechanism is disabled, and no other management IP address has been configured, so the device will share a valid ifIndex and a management IP address of 0.0.0.0.

```
interface Serial 0
 no ip address
 encapsulation frame-relay
 frame-relay lmi-type ansi
 frame-relay qos-autosense
```

```
!
no frame-relay address registration auto-address
```

Related Commands

Command	Description
frame-relay address-reg enable	Enables ELMI address registration on an interface.
frame-relay address registration ip	Configures the IP address to be used for ELMI address registration.
frame-relay qos-autosense	Enables ELMI on the Cisco router.

frame-relay address registration ip

To configure the IP address for ELMI address registration, use the **frame-relay address registration ip** global configuration command. To set the IP address to 0.0.0.0, use the **no** form of this command.

frame-relay address registration ip *address*

no frame-relay address registration ip

Syntax Description

address	IP address to be used for ELMI address registration.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

A management IP address configured by using the **frame-relay address registration ip** command will overwrite the IP address chosen by the router when automatic address selection is enabled.

The **no frame-relay address registration ip** command will disable automatic IP address selection and set the management IP address to 0.0.0.0.

If you enable automatic address selection with the **frame-relay address registration auto-address** global command after configuring the IP address using the **frame-relay address registration ip** global configuration command, the IP address chosen automatically by the router will overwrite the IP address you originally configured.

Examples

The following example shows ELMI enabled on serial interface 0. The IP address to be used for ELMI address registration is configured, so automatic IP address selection is disabled by default.

```
interface Serial 0
 no ip address
 encapsulation frame-relay
 frame-relay lmi-type ansi
 frame-relay qos-autosense
!
frame-relay address registration ip address 139.85.242.195
```

Related Commands

Command	Description
frame-relay address-reg enable	Enables ELMI address registration on an interface.
frame-relay address registration auto-address	Enables a router to automatically select the IP address to be used for ELMI address registration.
frame-relay qos-autosense	Enables ELMI on a Cisco router.

frame-relay address-reg enable

To enable ELMI address registration on an interface, use the **frame-relay address-reg enable** interface configuration command. To disable ELMI address registration, use the **no** form of this command.

frame-relay address-reg enable

no frame-relay address-reg enable

Syntax Description

This command has no arguments or keywords.

Defaults

ELMI address registration is enabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Usage Guidelines

ELMI address registration is enabled by default when ELMI is enabled.

Examples

The following example shows ELMI address registration disabled on serial interface 0.

```
interface Serial 0
 no ip address
 encapsulation frame-relay
 frame-relay lmi-type ansi
 frame-relay qos-autosense
 no frame-relay address-reg enable
```

Related Commands

Command	Description
frame-relay address registration auto-address	Enables a router to automatically select the IP address to be used for ELMI address registration.
frame-relay address registration ip	Configures the IP address to be used for ELMI address registration.
frame-relay qos-autosense	Enables ELMI on a Cisco router.

frame-relay bc

To specify the incoming or outgoing committed burst size (Bc) for a Frame Relay virtual circuit, use the **frame-relay bc** map-class configuration command. To reset the committed burst size to the default, use the **no** form of this command.

frame-relay bc {**in** | **out**} *bits*

no frame-relay bc {**in** | **out**} *bits*

Syntax Description

in | **out**	Incoming or outgoing; if neither is specified, both in and out values are set.
bits	Committed burst size, in bits.

Defaults

7000 bits

Command Modes

Map-class configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The Frame Relay committed burst size is specified within a map class to request a certain burst rate for the circuit. Although it is specified in bits, an implicit time factor is the sampling interval *Tc* on the switch, which is defined as the burst size divided by the committed information rate (CIR).

Examples

In the following example, the serial interface already has a basic configuration, and a map group called "bermuda" has already been defined. The example shows a map-list configuration that defines the source and destination addresses for bermuda, provides IP and IPX addresses, and ties the map list definition to the map class called "jamaica". Then traffic-shaping parameters are defined for the map class.

```
map-list bermuda local-addr X121 31383040703500 dest-addr X121 31383040709000
 ip 172.21.177.26 class jamaica ietf
 ipx 123.0000.0c07.d530 class jamaica ietf

map-class frame-relay jamaica
 frame-relay cir in 2000000
 frame-relay mincir in 1000000
 frame-relay cir out 15000
 frame-relay mincir out 10000
 frame-relay bc in 15000
 frame-relay bc out 9600
 frame-relay be in 10000
 frame-relay be out 10000
 frame-relay idle-timer 30
```

Related Commands

Command	Description
frame-relay be	Sets the incoming or outgoing excess burst size (Be) for a Frame Relay VC.
frame-relay cir	Specifies the incoming or outgoing CIR for a Frame Relay VC.

frame-relay be

To set the incoming or outgoing excess burst size (Be) for a Frame Relay virtual circuit, use the **frame-relay be** map-class configuration command. To reset the excess burst size to the default, use the **no** form of this command.

frame-relay be {**in** | **out**} *bits*

no frame-relay be {**in** | **out**} *bits*

Syntax Description

in | **out**	Incoming or outgoing.
bits	Excess burst size, in bits.

Defaults

7000 bits

Command Modes

Map-class configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

The Frame Relay excess burst size is specified within a map class to request a certain burst rate for the circuit. Although it is specified in bits, an implicit time factor is the sampling interval *Tc* on the switch, which is defined as the burst size divided by the committed information rate (CIR).

Examples

In the following example, the serial interface already has a basic configuration, and a map group called "bermuda" has already been defined. The example shows a map-list configuration that defines the source and destination addresses for bermuda, provides IP and IPX addresses, and ties the map list definition to the map class called "jamaica". Then traffic-shaping parameters are defined for the map class.

```
map-list bermuda local-addr X121 31383040703500 dest-addr X121 31383040709000
 ip 172.21.177.26 class jamaica ietf
 ipx 123.0000.0c07.d530 class jamaica ietf

map-class frame-relay jamaica
 frame-relay cir in 2000000
 frame-relay mincir in 1000000
 frame-relay cir out 15000
 frame-relay mincir out 10000
 frame-relay bc in 15000
 frame-relay bc out 9600
 frame-relay be in 10000
 frame-relay be out 10000
 frame-relay idle-timer 30
```

Related Commands

Command	Description
frame-relay bc	Specifies the incoming or outgoing committed burst size (Bc) for a Frame Relay VC.
frame-relay cir	Specifies the incoming or outgoing CIR for a Frame Relay VC.

frame-relay becn-response-enable

This **frame-relay becn-response-enable** command has been replaced by the **frame-relay adaptive-shaping** command. See the description of the **frame-relay adaptive-shaping** command for more information.

frame-relay broadcast-queue

To create a special queue for a specified interface to hold broadcast traffic that has been replicated for transmission on multiple data-link connection identifiers (DLCIs), use the **frame-relay broadcast-queue** interface configuration command.

frame-relay broadcast-queue *size byte-rate packet-rate*

Syntax Description

size	Number of packets to hold in the broadcast queue.
byte-rate	Maximum number of bytes to be sent per second.
packet-rate	Maximum number of packets to be sent per second.

Defaults

size—64 packets

byte-rate—256000 bytes per second

packet-rate—36 packets per second

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

For purposes of the Frame Relay broadcast queue, *broadcast traffic* is defined as packets that have been replicated for transmission on multiple DLCIs. However, the broadcast traffic does not include the original routing packet or service access point (SAP) packet, which passes through the normal queue. Because of timing sensitivity, bridged broadcasts and spanning-tree packets are also sent through the normal queue. The Frame Relay broadcast queue is managed independently of the normal interface queue. It has its own buffers and a configurable service rate.

A broadcast queue is given a maximum transmission rate (throughput) limit measured in bytes per second and packets per second. The queue is serviced to ensure that only this maximum is provided. The broadcast queue has priority when transmitting at a rate below the configured maximum, and hence has a guaranteed minimum bandwidth allocation. The two transmission rate limits are intended to avoid flooding the interface with broadcasts. The actual limit in any second is the first rate limit that is reached.

Given the transmission rate restriction, additional buffering is required to store broadcast packets. The broadcast queue is configurable to store large numbers of broadcast packets.

The queue size should be set to avoid loss of broadcast routing update packets. The exact size will depend on the protocol being used and the number of packets required for each update. To be safe, set the queue size so that one complete routing update from each protocol and for each DLCI can be stored. As a general rule, start with 20 packets per DLCI. Typically, the byte rate should be less than both of the following:

- *N/4* times the minimum remote access rate (measured in *bytes* per second), where *N* is the number of DLCIs to which the broadcast must be replicated.
- 1/4 the local access rate (measured in *bytes* per second).

The packet rate is not critical if you set the byte rate conservatively. Set the packet rate at 250-byte packets.

Examples

The following example specifies a broadcast queue to hold 80 packets, to have a maximum byte transmission rate of 240,000 bytes per second, and to have a maximum packet transmission rate of 160 packets per second:

```
frame-relay broadcast-queue 80 240000 160
```

frame-relay cir

To specify the incoming or outgoing committed information rate (CIR) for a Frame Relay virtual circuit, use the **frame-relay cir** map-class configuration command. To reset the CIR to the default, use the **no** form of this command.

frame-relay cir {**in** | **out**} *bps*

no frame-relay cir {**in** | **out**} *bps*

Syntax Description

in | **out**	Incoming or outgoing.
bps	CIR in bits per second.

Defaults

56000 bits per second

Command Modes

Map-class configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use this command to specify a CIR for an SVC. The specified CIR value is sent through the SETUP message to the switch, which then attempts to provision network resources to support this value.

Examples

The following example sets a higher committed information rate for incoming traffic than for outgoing traffic (which is going out on a slow WAN line):

```
frame-relay cir in 2000000
frame-relay cir out 9600
```

Related Commands

Command	Description
frame-relay bc	Specifies the incoming or outgoing committed burst size (Bc) for a Frame Relay VC.
frame-relay be	Sets the incoming or outgoing excess burst size (Be) for a Frame Relay VC.

frame-relay class

To associate a map class with an interface or subinterface, use the **frame-relay class** interface configuration command. To remove the association between the interface or subinterface and the named map class, use the **no** form of this command.

frame-relay class *name*

no frame-relay class *name*

Syntax Description

name	Name of the map class to associate with this interface or subinterface.

Defaults

No map class is defined.

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

This command can apply to interfaces or subinterfaces.

All relevant parameters defined in the *name* map class are inherited by each virtual circuit created on the interface or subinterface. For each virtual circuit, the precedence rules are as follows:

1. Use the map class associated with the virtual circuit if it exists.
2. If not, use the map class associated with the subinterface if the map class exists.
3. If not, use map class associated with interface if the map class exists.
4. If not, use the interface default parameters.

Examples

The following example associates the slow_vcs map class with the serial 0.1 subinterface and the slow_vcs map class is defined to have an outbound CIR value of 9600:

```
interface serial 0.1
 frame-relay class slow_vcs

map-class frame-relay slow_vcs
 frame-relay cir out 9600
```

If a virtual circuit exists on the serial 0.1 interface and is associated with some other map class, the parameter values of the second map class override those defined in the slow_vc map class for that virtual circuit.

Related Commands

Command	Description
map-class frame-relay	Specifies a map class to define QoS values for an SVC.

frame-relay congestion-management

To enable Frame Relay congestion management functions on all switched permanent virtual circuits (PVCs) on an interface, and to enter Frame Relay congestion management configuration mode, use the **frame-relay congestion-management** interface configuration command. To disable Frame Relay congestion management, use the **no** form of this command.

frame-relay congestion-management

no frame-relay congestion-management

Syntax Description

This command has no arguments or keywords.

Defaults

Frame Relay congestion management is not enabled on switched PVCs.

Command Modes

Interface configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

You must enable Frame Relay switching, using the **frame-relay switching** global command, before you can configure Frame Relay congestion management.

Frame Relay congestion management is supported only when the interface is configured with FIFO queueing, weighted fair queueing (WFQ), or PVC interface priority queueing (PIPQ).

Examples

In the following example, the **frame-relay congestion-management** command enables Frame Relay congestion management on serial interface 1. The command also enters Frame Relay congestion management configuration mode so that congestion threshold parameters can be configured.

```
interface serial1
 encapsulation frame-relay
 frame-relay intf-type dce
 frame-relay congestion-management
  threshold ecn be 0
  threshold ecn bc 20
  threshold de 40
```

Related Commands

Command	Description
frame-relay congestion threshold de	Configures the threshold at which DE-marked packets are discarded from the traffic-shaping queue of a switched PVC.
frame-relay congestion threshold ecn	Configures the threshold at which ECN bits are set on packets in the traffic-shaping queue of a switched PVC.
threshold de	Configures the threshold at which DE-marked packets are discarded from switched PVCs on the output interface.
threshold ecn	Configures the threshold at which ECN bits are set on packets in switched PVCs on the output interface.

frame-relay congestion threshold de

To configure the threshold at which discard-eligible (DE)-marked packets will be discarded from the traffic-shaping queue of a switched permanent virtual circuit (PVC), use the **frame-relay congestion threshold de** map-class configuration command. To reconfigure the threshold, use the **no** form of this command.

frame-relay congestion threshold de *percentage*

no frame-relay congestion threshold de *percentage*

Syntax Description

percentage	Threshold at which DE-marked packets will be discarded, specified as a percentage of the maximum queue size.

Defaults

100%

Command Modes

Map-class configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

The **frame-relay congestion threshold de** command applies only to default FIFO traffic-shaping queues.

You must enable Frame Relay switching, using the **frame-relay switching** global command, before Frame Relay congestion management parameters will be effective on switched PVCs.

Examples

The following example illustrates the configuration of the DE congestion threshold in the Frame Relay map class called perpvc_congestion:

```
map-class frame-relay perpvc_congestion
 frame-relay congestion threshold de 50
```

Related Commands

Command	Description
frame-relay congestion-management	Enables Frame Relay congestion management functions on all switched PVCs on an interface, and enters congestion management configuration mode.
frame-relay congestion threshold ecn	Configures the threshold at which ECN bits are set on packets in the traffic-shaping queue of a switched PVC.

Command	Description
threshold de	Configures the threshold at which DE-marked packets are discarded from switched PVCs on the output interface.
threshold ecn	Configures the threshold at which ECN bits are set on packets in switched PVCs on the output interface.

frame-relay congestion threshold ecn

To configure the threshold at which explicit congestion notice (ECN) bits will be set on packets in the traffic-shaping queue of a switched permanent virtual circuit (PVC), use the **frame-relay congestion threshold ecn** map-class configuration command. To reconfigure the threshold, use the **no** form of this command.

frame-relay congestion threshold ecn *percentage*

no frame-relay congestion threshold ecn *percentage*

Syntax Description

percentage	Threshold at which ECN bits will be set on packets, specified as a percentage of the maximum queue size.

Defaults

100%

Command Modes

Map-class configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

The **frame-relay congestion threshold ecn** command applies only to default FIFO traffic-shaping queues.

One ECN threshold applies to all traffic on a traffic-shaping queue. You cannot configure separate thresholds for committed and excess traffic.

You must enable Frame Relay switching, using the **frame-relay switching** global command, before the **frame-relay congestion threshold ecn** command will be effective on switched PVCs.

Examples

The following example illustrates the configuration of the ECN congestion threshold in the Frame Relay map class called perpvc_congestion:

```
map-class frame-relay perpvc_congestion
 frame-relay congestion threshold ecn 50
```

Related Commands

Command	Description
frame-relay congestion-management	Enables Frame Relay congestion management functions on all switched PVCs on an interface, and enters congestion management configuration mode.
frame-relay congestion threshold de	Configures the threshold at which DE-marked packets are discarded from the traffic-shaping queue of a switched PVC.

Command	Description
threshold de	Configures the threshold at which DE-marked packets are discarded from switched PVCs on the output interface.
threshold ecn	Configures the threshold at which ECN bits are set on packets in switched PVCs on the output interface.

frame-relay custom-queue-list

To specify a custom queue to be used for the virtual circuit queueing associated with a specified map class, use the **frame-relay custom-queue-list** map-class configuration command. To remove the specified queueing from the virtual circuit and cause it to revert to the default first-come, first-served queueing, use the **no** form of this command.

frame-relay custom-queue-list *list-number*

no frame-relay custom-queue-list *list-number*

Syntax Description

list-number	Custom queue list number.

Defaults

If this command is not entered, the default queueing is first come, first served.

Command Modes

Map-class configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Definition of the custom queue takes place in the existing manner (through **queue-list** commands).

Only one form of queueing can be associated with a particular map class; subsequent definitions overwrite previous ones.

Examples

The following example configures a custom queue list for the fast_vcs map class:

```
map-class frame-relay fast_vcs
 frame-relay custom-queue-list 1

queue-list 1 queue 4 byte-count 100
```

Related Commands

Command	Description
map-class frame-relay	Specifies a map class to define QoS values for an SVC.

frame-relay de-group

To specify the discard eligibility (DE) group number to be used for a specified data-link connection identifier (DLCI), use the **frame-relay de-group** interface configuration command. To disable a previously defined group number assigned to a specified DLCI, use the **no** form of the command with the relevant keyword and arguments.

frame-relay de-group *group-number dlci*

no frame-relay de-group [*group-number*] [*dlci*]

Syntax Description

group-number	DE group number to apply to the specified DLCI number, between 1 and 10.
dlci	DLCI number.

Defaults

No DE group is defined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

To disable all previously defined group numbers, use the **no** form of this command with no arguments.

This command requires that Frame Relay be enabled.

Frame Relay DE group functionality works on process-switched packets only.

The DE bit is not set or recognized by the Frame Relay switching code, but must be recognized and interpreted by the Frame Relay network.

Examples

The following example specifies that group number 3 will be used for DLCI 170:

```
frame-relay de-group 3 170
```

Related Commands

Command	Description
frame-relay de-list	Defines a DE list specifying the packets that have the DE bit set and thus are eligible for discarding during congestion on the Frame Relay switch.

frame-relay de-list

To define a discard eligibility (DE) list specifying the packets that have the DE bit set and thus are eligible for discarding when congestion is experienced on the Frame Relay switch, use the **frame-relay de-list** global configuration command. To delete a portion of a previously defined DE list, use the **no** form of this command.

frame-relay de-list *list-number* {**protocol** *protocol* | **interface** *type number*} *characteristic*

no frame-relay de-list *list-number* {**protocol** *protocol* | **interface** *type number*} *characteristic*

Syntax Description

list-number	Number of the DE list.
protocol *protocol*	One of the following keywords corresponding to a supported protocol or device: **arp**—Address Resolution Protocol **apollo**—Apollo Domain **appletalk**—AppleTalk **bridge**—bridging device **clns**—ISO Connectionless Network Service **clns_es**—CLNS end systems **clns_is**—CLNS intermediate systems. **compressedtcp**—Compressed Transmission Control Protocol (TCP) **decnet**—DECnet **decnet_node**—DECnet end node **decnet_router-L1**—DECnet Level 1 (intra-area) router **decnet_router-L2**—DECnet Level 2 (interarea) router **ip**—Internet Protocol **ipx**—Novell Internet Packet Exchange Protocol **vines**—Banyan VINES **xns**—Xerox Network Systems
interface *type*	One of the following interface types: **serial**, **null**, or **ethernet**.
number	Interface number.
characteristic	One of the following: **fragments**—Fragmented IP packets **gt** *bytes*—Sets the DE bit for packets larger than the specified number of bytes (including the 4 byte Frame Relay Encapsulation) **list** *access-list-number*—Previously defined access list number **lt** *bytes*—Sets the DE bit for packets smaller than the specified number of bytes (including the 4 byte Frame Relay Encapsulation) **tcp** *port*—TCP packets to or from a specified port **udp** *port*—User Datagram Protocol (UDP) packets to or from a specified port

Defaults

Discard eligibility is not defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

To remove an entire DE list, use the **no** form of this command with no options and arguments.

This prioritizing feature requires that the Frame Relay network be able to interpret the DE bit as indicating which packets can be dropped first in case of congestion, or which packets are less time sensitive, or both.

When you calculate packet size, include the data packet size, the ICMP header, the IP header, and the Frame Relay encapsulation bytes. For example, count 92 bytes of data, 8 bytes for the ICMP header, 20 bytes for the IP header, and 4 bytes for the Frame Relay encapsulation, which equals 124 bytes.

Examples

The following example specifies that IP packets larger than 512 bytes (including the 4-byte Frame Relay Encapsulation) will have the DE bit set:

```
frame-relay de-list 1 protocol ip gt 512
```