



FRF.5 Enhancement for the Cisco MC3810

Feature Overview

The Frame Relay-ATM Network Interworking (FRF.5) feature that was introduced in 11.3(1)MA has been enhanced to allow setting the mode of the Discard Eligibility and Cell Loss Priority fields as defined in the FRF.5 implementation agreement.

Benefits

This feature allows mapping of FR/ATM PVCs to specifically support Mode 2. Previously, the mapping occurred internally, but wasn't configurable.

Restrictions

None.

Related Features and Technologies

There are two types of ATM-Frame Relay interworking, Network Interworking as described in this document, and Service Interworking, which is also supported on the Cisco MC3810 multiservice access concentrator.

Network Interworking (FRF.5) allows the transparent tunneling of Frame Relay user traffic and PVCs over ATM. This function is often used to link Frame Relay networks over an ATM backbone. The most distant nodes must be configured to interoperate with one another—in contrast to Service Interworking—because intact Frame Relay frames are sent over the ATM network. The ATM backbone is used as an alternative to a leased line, and provides cost savings over leased lines. There can be a one-to-one relationship between Frame Relay and ATM PVCs, or multiple Frame Relay PVCs can be multiplexed into a single ATM PVC.

In contrast, Service Interworking (FRF.8) works to convert the components of the two different transmission methods. In addition, there is always a one-to-one relationship between Frame Relay and ATM PVCs. For more information about Service Interworking (FRF.8), see the online 12.0(5)XK and 12.0(7)T document “FRF.8 on the Cisco MC3810.”

Platforms Supported

This feature is supported only on the Cisco MC3810.

Prerequisites

The Frame Relay-ATM Network Interworking enhancements require specific software, hardware, and preliminary configuration:

- Cisco IOS Software Release 12.0(5)XK, 12.0(7)T or later
- ATM and Frame Relay networks equipped with Cisco MC3810s.

Supported MIBs and RFCs

Frame Relay Implementation Agreement FRF.5.

Configuration Task

To configure the Frame Relay-ATM Network Interworking interface to support the Discard Eligibility and Cell Loss Priority mapping options, perform the following steps, beginning in global configuration mode:

Step	Command	Purpose
1	<code>(router-config)# interface fr-atm number</code>	<p>Create a Frame Relay-ATM Interworking interface. The <i>number</i> value is a number between 0 and 20. Repeat this step for each Frame Relay-ATM Interworking interface configured. The number assigned is unique on each Cisco MC3810. The default interface created is FR-ATM20.</p> <p>Do not enter a space between fr-atm and the Frame Relay-ATM Interworking interface number.</p> <p>The Frame Relay-ATM interworking interface is a virtual interface that can be added dynamically. This interface is not a physical interface, but can perform operations similar to that of a physical interface. You can configure up to 21 Frame Relay-ATM interworking virtual interfaces.</p>
2	<code>(router-config-fr-atm)# fr-atm connect dlci dlci atm0 pvc [name] [vpi/vci] [clp-bit {map-de 0 1}] [de-bit {no-map-clp map-clp}]</code>	<p>Map a Frame Relay DLCI to an ATM PVC name or Virtual Path Identifier/Virtual Channel Identifier. The encapsulation type of the current interface must be Frame Relay or Frame Relay 1490 (IETF). The ATM interface on the Cisco MC3810 must be set to ATM 0.</p> <p>Specify the desired options for the clp-bit and de-bit suboptions.</p>
3	<code>(router-config-fr-atm)# exit</code>	Exit interface configuration mode.

For complete information about how to configure Frame Relay-ATM Network Interworking (FRF.5), see the Cisco IOS 12.0 *Voice, Video, and Home Applications Configuration Guide*.

Command Reference

This chapter describes the commands that have been modified to support the Frame Relay-ATM Network Interworking enhancement:

- **encapsulation**
- **fr-atm connect dlci**

encapsulation

To configure the ATM adaptation layer (AAL) and encapsulation type for an ATM PVC class, use the **encapsulation** command in ATM virtual circuit configuration mode. Use the **no** form of this command to remove an encapsulation from a PVC.

encapsulation *aal-encap*
no encapsulation *aal-encap*

Syntax Description

aal-encap

ATM adaptation layer (AAL) and encapsulation type. When **aal5mux** is specified, a protocol is required. Possible values for **aal-encap** are as follows:

aal5mux frame-relay—For a MUX-type virtual circuit for Frame Relay-ATM Network Interworking (FRF.5) on the Cisco MC3810.

aal5mux fr-atm-srv—For a MUX-type virtual circuit for Frame Relay-ATM Service Interworking (FRF.8) on the Cisco MC3810.

aal5mux voice—For a MUX-type virtual circuit for Voice over ATM on the Cisco MC3810.

aal5snap—The only encapsulation supported for Inverse ARP. Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram.

Defaults

The global default encapsulation is **aal5snap**. See the “Usage Guidelines” section for other default characteristics.

Command Mode

Interface-ATM-VC configuration (for an ATM PVC or SVC)

Command History

Release	Modification
11.3(3)T	This command was introduced.
12.0	This command superseded the encapsulation atm command for the Cisco MC3810, and the aal5mux frame and aal5mux voice suboptions appeared.
12.0(5)XK and 12.0(7)T	The aal5mux fr-atm-srv suboption appeared for the Cisco MC3810. The aal5mux frame suboption was changed to aal5mux frame-relay .

Usage Guidelines

Use one of the **aal5mux** encapsulation options to dedicate the specified PVC to a single protocol; use the **aal5snap** encapsulation option to multiplex two or more protocols over the same PVC. Whether you select **aal5mux** or **aal5snap** encapsulation may depend on practical considerations, such as the type of network and the pricing offered by the network. If the network's pricing depends on the number of PVCs set up, **aal5snap** may be appropriate. If pricing depends on the number of bytes transmitted, **aal5mux** may be appropriate because it has slightly less overhead.

If you specify virtual template parameters after the ATM PVC is configured, you should issue a **shutdown** command followed by a **no shutdown** command on the ATM subinterface to restart the interface, causing the newly configured parameters (such as an IP address) to take effect.

Examples

The following example configures a PVC to support encapsulation for Voice over ATM on the Cisco MC3810:

```
pvc 20
 encapsulation aal5mux voice
```

The following example configures a PVC to support encapsulation for Frame Relay-ATM Network Interworking (FRF.5) on the Cisco MC3810:

```
pvc 21
 encapsulation aal5mux frame-relay
```

The following example configures a PVC to support encapsulation for Frame Relay-ATM Service Interworking (FRF.8) on the Cisco MC3810:

```
pvc 22
 encapsulation aal5mux fr-atm-srv
```

fr-atm connect dlci

To connect a Frame Relay DLCI to an ATM virtual circuit for the FRF.5 Frame Relay-ATM interworking function on the Cisco MC3810, use the **fr-atm connect dlci** interface configuration command. The encapsulation type of the current interface must be Frame Relay or Frame Relay 1490 (IETF). Use the **no** form of this command to remove the DLCI-to-VCD connection.

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

Syntax Description

<i>dlci</i>	Frame Relay DLCI number.
<i>atm-interface</i>	The ATM interface connected to the DLCI. <ul style="list-style-type: none"> On a Cisco MC3810 running Cisco IOS Release 11.3 MA, the interface is serial port 2 with ATM encapsulation. On a Cisco MC3810 running Cisco IOS Release 12.0 and later, the interface is ATM 0.
<i>name</i>	The ATM PVC name.
<i>vpi/vci</i>	The ATM virtual path identifier (VPI)/virtual channel identifier (VCI). The default value for <i>vpi</i> is 0 if no value is entered. When specifying the ATM PVC, enter one of the following PVC designations: <ul style="list-style-type: none"> The <i>name</i> value The <i>vpi</i> value alone. The <i>vpi/vci</i> 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, which is described in 4.4.1 of FRF.5. The Discard Eligibility (DE) field in the Q.922 core frame is copied unchanged into the DE field in the FR-SSCS PDU header and mapped to the ATM Cell Loss Priority (CLP) of every ATM cell generated by the segmentation process of that frame. 0 or 1 —Specifies Mode 2 described in 4.4.1 of FRF.5. The DE field in the Q.922 core frame is copied unchanged in the DE field in the FR-SSCS PDU header, and the ATM Cell Loss Priority of every ATM cell generated by the segmentation process of that frame is set to a constant value (either 0 or 1). The value is used for all cells generated from the segmentation process of every frame.
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, which is described in 4.4.2 of FRF.5. If one or more ATM cells belonging to a frame has its CLP field set to 1, or if the DE field of the FR-SSCS-PDU is set to 1, the Interworking Function (IWF) sets the DE field of the Q.922 core frame. no-map-clp —Specifies Mode 2 described in 4.4.2 of FRF.5. The DE field is set to a constant value (either 0 or 1). No mapping is performed from the ATM layer to the Q.922 core layer. The FR-SSCS PDU DE field is copied unchanged to the Q.922 core frame DE field, independent of the CLP indication(s) received at the ATM layer.

fr-atm connect dlci

Defaults

No Frame Relay-ATM connection is configured.

Command Mode

Interface configuration

Command History

Release	Modification
11.3 MA	This command was first introduced.
12.0	PVC management CLI support was added.
12.0(5)XK and 12.0(7)T	The clp-bit and de-bit options were added.

Usage Guidelines

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

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
interface fr-atm	Creates a Frame Relay-ATM Interworking interface on the Cisco MC3810 and enters Frame Relay-ATM Interworking configuration mode

Glossary

AAL—ATM Adaptation Layer. Service-dependent sublayer of the data link layer. The AAL accepts data from different applications and presents it to the ATM layer in the form of 48-byte ATM payload segments. AALs consist of two sublayers: convergence sublayer (CS) and segmentation and reassembly (SAR). AALs differ on the basis of the source-destination timing used, whether they use constant bit rate (CBR) or variable bit rate (VBR), and whether they are used for connection-oriented or connectionless mode data transfer. At present, the four types of AAL recommended by the ITU-T are AAL1, AAL2, AAL3/4, and AAL5.

AAL1—ATM adaptation layer 1. One of four AALs recommended by the ITU-T. AAL1 is used for connection-oriented, delay-sensitive services requiring constant bit rates, such as uncompressed voice.

ATM—Asynchronous Transfer Mode. International standard for cell relay in which multiple service types (such as voice, video, or data) are conveyed in fixed-length (53-byte) cells. Fixed-length cells allow cell processing to occur in hardware, thereby reducing transit delays. ATM is designed to take advantage of high-speed transmission media such as E3, SONET, and T3.

BECN—backward explicit congestion notification. Bit set by a Frame Relay network in frames traveling in the opposite direction of frames encountering a congested path. DTE receiving frames with the BECN bit set can request that higher-level protocols take flow control action as appropriate.

CBR—constant bit rate. QoS class defined by the ATM Forum for ATM networks. CBR is used for connections that depend on precise clocking to ensure undistorted delivery.

DLCI—data-link connection identifier. Value that specifies a PVC or SVC in a Frame Relay network. In the basic Frame Relay specification, DLCIs are locally significant (connected devices might use different values to specify the same connection). In the LMI extended specification, DLCIs are globally significant (DLCIs specify individual end devices).

EFCI—Explicit Forward Congestion Indication. In ATM, one of the congestion feedback modes allowed by ABR service. A network element in an impending congestion state or in a congested state can set the EFCI. The destination end-system can implement a protocol that adaptively lowers the cell rate of the connection based on the value of the EFCI.

FECN—forward explicit congestion notification. Bit set by a Frame Relay network to inform DTE receiving the frame that congestion was experienced in the path from source to destination. DTE receiving frames with the FECN bit set can request that higher-level protocols take flow-control action as appropriate.

PDU—protocol data unit

PVC—permanent virtual circuit. Virtual circuit that is permanently established. PVCs save bandwidth associated with circuit establishment and tear down in situations where certain virtual circuits must exist all the time. In ATM terminology, called a permanent virtual connection.

SONET—Synchronous Optical Network. High-speed (up to 2.5 Gbps) synchronous network specification developed by Bellcore and designed to run on optical fiber. STS-1 is the basic building block of SONET.

SVC—switched virtual circuit. Virtual circuit that is dynamically established on demand and is torn down when transmission is complete. SVCs are used in situations where data transmission is sporadic. Called a switched virtual connection in ATM terminology.

VC—virtual circuit. Logical circuit created to ensure reliable communication between two network devices. A virtual circuit is defined by a VPI/VCI pair, and can be either permanent (PVC) or switched (SVC). Virtual circuits are used in Frame Relay and X.25. In ATM, a virtual circuit is sometimes called a virtual channel.

VCI—virtual channel identifier. 16-bit field in the header of an ATM cell. The VCI, together with the virtual path identifier (VPI), is used to identify the next destination of a cell as it passes through a series of ATM switches on its way to its destination. ATM switches use the VPI/VCI fields to identify the next network virtual channel link (VCL) that a cell needs to transit on its way to its final destination.

VPI—virtual path identifier. 8-bit field in the header of an ATM cell. The VPI, together with the VCI, is used to identify the next destination of a cell as it passes through a series of ATM switches on its way to its destination. ATM switches use the VPI/VCI fields to identify the next VCL that a cell needs to transit on its way to its final destination.