



## **Configuring an ATM Interface**

Version: 3314

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# Router Installation and Configuration Manual/Configuring an ATM Interface

This chapter describes how to configure the ImageStream router ATM WAN interfaces and includes the following topics:

- ◇ WAN Port Uses
- ◇ Understanding the Network Interface Configuration File
- ◇ Configuring an ATM Master Interface
- ◇ Default ATM Interface Configuration
- ◇ Customizing the Configuration
- ◇ Setting ATM Master Interface Parameters
- ◇ Configuring an ATM Subinterface

Before configuring the WAN interface, you must make the appropriate cabling connection for your needs. Refer to the hardware installation guide for your ImageStream product for information on making the WAN connection. See the Technical Notes section on the ImageStream Web site or the Command Reference for more detailed command descriptions, examples and instructions.

## WAN Port Uses

WAN ports uses has been explained in Chapter 7, Router Installation and Configuration Manual/Configuring a Synchronous Serial WAN Interface and in Chapter 31 Router Installation and Configuration Manual/Basic Networking.

## Understanding the Network Interface Configuration File

The **wan.conf** file is explained in detail in Chapter 5, Router Installation and Configuration Manual/Configuring a LAN Interface, and in Chapter 31, Router Installation and Configuration Manual/Basic Networking.

## Configuring an ATM Master Interface

Asynchronous Transfer Mode (ATM) is a network protocol designed to facilitate the simultaneous transfer of various types of traffic streams (voice, data, video) on public and private networks over the same physical connection. By always using 53-byte cells, ATM simplifies the design of hardware, enabling it to quickly determine the destination address of each cell. This allows simple switching of network traffic at much higher speeds than are easily accomplished using protocols with variable sizes of transfer units, such as Frame Relay and TCP/IP.

ATM relies on the concepts of virtual paths and virtual circuits. A virtual path, represented by a specific virtual path identifier (VPI), establishes a route between two devices in a network. Each VPI can contain multiple virtual circuits, each represented by a virtual circuit identifier (VCI).

On an ImageStream router, each VPI/VCI pair is defined on the physical ATM interface as a subinterface. A subinterface is a logical (virtual) interface and is a part of a physical interface, such as an ATM DS3. Each physical ATM interface can be logically divided into as many as 64,000 different logical subinterfaces, depending on the card used.

The ATM port on each end of the connection must be configured prior to use. If your WAN interface does not support ATM encapsulations, please See Chapter 7, Router Installation and Configuration Manual/Configuring a Synchronous Serial WAN Interface or Chapter 8, Router Installation and Configuration Manual/Configuring an Integrated CSU/DSU WAN Interface. Attempting to configuring non-ATM encapsulations on an ATM card will result in errors.

```
Configuration menu
1. AAA (Password) Configuration
2. Global configuration
3. Network interface configuration
4. Firewall and QOS configuration
5. Service configuration
6. Dynamic routing configuration
7. Save configuration to flash
0. ISis-Router main menu
```

From the "Configuration menu", select menu option 2, Network interface configuration, and press **Enter**. This will open the ImageStream router's primary configuration file, **wan.conf** in the default editor. The **wan.conf** file is also accessible from the command line in the **/usr/local/sand** directory.

## Default ATM WAN Card Configuration

The default values of cards equipped with an ATM interface are as follows:

ATM WAN interfaces default to the following values:

- ◇ C-bit framing (for DS3)
- ◇ PLCP mode
- ◇ DS3 transport
- ◇ No line buildout
- ◇ ATM cell scrambling configured
- ◇ Equalizer gain limit (EGL) off
- ◇ SONET interface mode (for OC-3, OC-12)

All cards use external (also known as "line" or "network") clocking. No port description is configured for any port.

Classical IP over ATM encapsulation is enabled. Bridging is not configured.

**Remember that default settings are not necessarily shown in the configuration file.**

## Customizing the Configuration

To customize the WAN port configurations, complete the following sections. The ordering of the commands is done by convention, but a specific order is not required. Likewise, all configurations are indented to make configurations easy to read, but indentation is not required. In general, ImageStream follows this ordering convention:

1. Comments
2. Port description
3. Bandwidth scaling statement
4. ATM interface settings
5. Other optional settings
6. IP address/netmask
7. Secondary IP addresses/netmasks
8. Subinterface configurations

## Setting the Port Description

You can assign description to all WAN ports. Although this feature is optional, it may be particularly useful to assign names to facilitate administration. Setting a description does not change the operation or name of the port.

To assign a description to a port, enter this command in the wan.conf file in the Serial interface configuration section:

**description** *string*

Using the router's default configuration below, we have modified the description for Serial0:

```
!
interface Serial0
shutdown
description ATM connection to branch offices encapsulation hdlc
ip address 192.168.10.1 255.255.255.252
!
```

## Setting the IP Address and Netmask

The ATM master interface does not contain IP addressing information. All IP addresses are contained in the subinterfaces (logical interfaces) configured on the master interface. Using the default configuration below, we have deleted the **ip address** line.

```
!
interface Serial0
shutdown
description ATM connection to branch offices encapsulation hdlc
!
```

## Setting Serial Transport Encapsulation

The serial transport encapsulation must be set to an ATM encapsulation for an ATM interface. No other encapsulation types may be specified. The syntax of this command is:

**encapsulation** *atm:*

In the default configuration below, we have changed the encapsulation to Classical IP over ATM. This encapsulation type corresponds to "encapsulation aal5" on a Cisco router. Alternately, you may specify an encapsulation type of aal5snap for SNAP encapsulated ATM

connections. See the ImageStream Technical Support Web site for additional ATM configuration examples.

```
!
interface Serial0
shutdown
description ATM connection to branch offices
encapsulation atm
!
```

## Setting ATM DS3/E3 Circuit Transport

ImageStream's ATM DS3/E3 card supports either DS3 or E3 transport. By default, the card uses DS3 transport. The transport type can be set using the **transport** command. The syntax of this command is:

```
transport { ds3 | e3 }:
```

In the default configuration below, we have set the default transport type of DS3.

```
!
interface Serial0
shutdown
description ATM connection to branch offices encapsulation atm
transport ds3
!
```

## Setting ATM OC-3/OC-12 Circuit Transport

ImageStream's ATM OC-3 and OC-12 cards support either SONET or SDH as the underlying network transport for the ATM traffic. By default, the cards use SONET mode. The mode can be set using the **service-module { oc-3 | oc-12 } mode** command and specifying a value of either sonet or sdh.

## Enabling or Disabling a Serial Interface

To disable an interface, use the **shutdown** interface configuration command. Unlike other command line interfaces, the **wan.conf** file does not require a "no" version of a command to reverse the operation. Entering "no" followed by a command will be ignored by SAND.

By default, Serial0 is disabled in the default configuration below because the **shutdown** command has been entered. Disabling a master interface will also disable all subinterfaces configured on the master device.

```
!
interface Serial0
shutdown
description ATM connection to branch offices encapsulation atm
transport ds3
!
```

To enable Serial0 in the configuration, remove the **shutdown** command. Do not use "no shutdown", as this will be ignored by SAND. It is not necessary to enter "no" and a command to negate the command. Simply remove the command from the configuration file.

### Adding Comments to a Serial Configuration

Comments may be added to the Serial configuration, or anywhere in the **wan.conf** file by inserting a line that begins with the # symbol. The contents of the line will be ignored by SAND. Comments may be used to place contact information, ticket numbers, circuit IDs or any other information into the **wan.conf** file. There are no limits on the number or length of comments that may be inserted.

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices e
transport ds3
!
```

### Scaling The Connection Speed Calculation

For some media, such as Ethernet and Token Ring, the bandwidth is fixed; for other media, such as serial lines, you can change the actual **bandwidth** by adjusting the hardware. For both classes of media, you can use the **bandwidth** configuration command to communicate the current **bandwidth** to the router's statistical output program and other programs. The **bandwidth** command sets an informational parameter only to communicate the current bandwidth to other programs.

The **bandwidth** command does not adjust the actual bandwidth of an interface. ATM ports automatically calculate the bandwidth value based on the type of ATM device configured and the bandwidths of the subinterfaces. The syntax of the bandwidth command is:

**bandwidth** *bits per second*:

In the default example below, we have added a bandwidth equal to 10 Mbps line (less overhead) to the Serial0 interface. This value is calculated automatically, so this command is optional:

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices b
encapsulation atm
!
```

### Setting ATM DS3/E3 Master Interface Parameters

The **service-module** command is used to configure the master interface for the ATM card. In most cases, the defaults provided on the card will match the network configuration. Check with your line provider to determine if your line settings differ from the default configuration. The configurations in the interface configuration must match in three places: on the router, on the ATM switch, and at the remote end. If these settings do not match, your serial interface will not function correctly.

## Configuring the DS3/E3 Line Clocking Source

One and only one clock source should be configured on a line. In most cases, your line provider will provide a clock source for the ATM circuit. The ATM DS3/E3 card can also be configured to provide a clock source. The syntax of this command is:

```
service-module { ds3 | e3 } clock source { line | internal }
```

The *line* or *internal* keyword specifies the type of clocking to use on this interface. Line (also known as "network" or "external") timing is the default value. Using the *internal* keyword will enable the card's internal clock and will instruct the card to place this clock source on the line. Configuring more than one clock source, or having no clock source, can cause a line to have synchronization problems resulting in framing errors and data loss. Check with your line provider before enabling internal clocking to ensure that this

setting is needed. We have specified the default value in the default configuration below:

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices bandwidth
encapsulation atm
service-module ds3 clock source line
!
```

## Configuring DS3/E3 Cell Mode

By default, DS3 and E3 ATM interfaces add a special header for the Physical Layer Convergence Protocol (PLCP). This mode can be disabled allowing the interface to operate in direct cell mapping mode (DCM) and eliminating the PLCP header. To enable DCM, include the command:

```
service-module { ds3 | e3 } mode dcm :
```

in the interface configuration. Cisco router configurations may refer to Direct Cell Mapping as ATM Direct Cell Mapping or ADM.

## Configuring DS3 Line Buildout

The DS3 interface has a setting for line buildout. The line buildout setting is used to set the signal attenuation factor due to the impedance of copper cabling. The line buildout setting is used on when the connection between the integrated CSU/DSU and the line provider demarcation point is greater than 225 feet. By default, the DS3 interfaces use the shortest setting (none). To turn on line buildout, use the command:

```
service-module ds3 lbo
```

In E3 transport mode, the line buildout command is invalid.

## Configuring the DS3/E3 Equalizer Gain Limiter

The DS3/E3 interface has an equalizer gain limiter. This setting is used to turn on the receiver gain limiter to overcome impedance of copper cabling. The gain limiter should be turned on when the connection between the integrated CSU/DSU and the line provider demarcation point is greater than 225 feet. By default, the DS3/E3 interfaces do not enable the gain limiter. To enable the equalizer gain limiter, add the command **service-module { ds3 | e3 } egl** to the interface configuration. This command is normally used in conjunction with the line buildout command.

## Configuring DS3 Framing

By default, ATM DS3 interfaces use c-bit parity for framing. This command is not valid in E3 transport mode. To explicitly configure ESF framing, include the framing statement in the interface configuration for the serial device:

```
service-module ds3 framing cbit :
```

You can configure the m23 format as an alternative. To have the interface use the m23 framing format, include the framing statement in the interface configuration, specifying the m23 option. In the default configuration below, we have specified the default c-bit framing:

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices b
encapsulation atm
service-module ds3 clock source line
service-module ds3 framing cbit
!
```

## Configuring DS3/E3 Cell Scrambling

By default, DS3/E3 ATM interfaces enable cell scrambling. Scrambling cells randomizes the ATM cell payload frames to avoid continuous non-variable bit patterns and improves the efficiency of ATM's cell delineation algorithms. Normally, the default setting for this command is sufficient.

To explicitly configure cell scrambling, include the scrambling statement in the interface configuration for the serial device:

```
service-module { ds3 | e3 } scrambling on :
```

You can turn off scrambling as an alternative. To have the interface disable cell scrambling, include the scrambling statement in the interface configuration, specifying the off option. This setting must match the remote router or your ATM master interface will not function correctly. In the default configuration below, we have specified the default "scrambling":

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices b
encapsulation atm
```

```
service-module ds3 clock source line service-module ds3 framing cbit
service-module ds3 scrambling on
!
```

## Setting ATM OC-3/OC-12 Master Interface Parameters

The **service-module** command is used to configure the master interface for the ATM card. In most cases, the defaults provided on the card will match the network configuration. Check with your line provider to determine if your line settings differ from the default configuration. The configurations in the interface configuration must match in three places: on the router, on the ATM switch, and at the remote end. If these settings do not match, your serial interface will not function correctly.

### Configuring the OC-3/OC-12 Line Clocking Source

One and only one clock source should be configured on a line. In most cases, your line provider will provide a clock source for the ATM circuit. The ATM OC-3/OC-12 card can also be configured to provide a clock source. The syntax of this command is:

```
service-module { oc3 | oc12 } clock source { line | internal }
```

The line or internal keyword specifies the type of clocking to use on this interface. Line (also known as "network" or "external") timing is the default value. Using the internal keyword will enable the card's internal clock and will instruct the card to place this clock source on the line. Configuring more than one clock source, or having no clock source, can cause a line to have synchronization problems resulting in framing errors and data loss. Check with your line provider before enabling internal clocking to ensure that this setting is needed. We have specified the default value in the default configuration below:

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices bandwidth
encapsulation atm
service-module oc3 clock source line
!
```

### Configuring OC-3/OC-12 Cell Scrambling

By default, OC-3/OC-12 ATM interfaces enable cell scrambling. Scrambling cells randomizes the ATM cell payload frames to avoid continuous non-variable bit patterns and improves the efficiency of ATM's cell delineation algorithms. Normally, the default setting for this command is sufficient.

To explicitly configure cell scrambling, include the scrambling statement in the interface configuration for the serial device:

```
service-module { oc3 | oc12 } scrambling on
```

You can turn off scrambling as an alternative. To have the interface disable cell scrambling, include the scrambling statement in the interface configuration, specifying the off option. This setting must match the remote router or your ATM master interface will not function correctly. In the default configuration below, we have specified the default cell scrambling:

```

!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices b
encapsulation atm
service-module oc3 clock source line service-module oc12 scrambling on
!
    
```

## Configuring an ATM Subinterface

This section will use the example configuration from the ATM DS3 configuration section above.

ATM subinterfaces provide a mechanism for supporting partially meshed ATM networks. Most protocols assume transitivity on a logical network; that is, if station A can talk to station B, and station B can talk to station C, then station A should be able to talk to station C directly. Transitivity is true on LAN's, but not on ATM networks unless A is directly connected to C.

Additionally, certain protocols, such as AppleTalk and transparent bridging, cannot be supported on partially meshed networks because they require "split horizon" in which a packet received on an interface cannot be transmitted out the same interface even if the packet is received and transmitted on different virtual circuits.

Configuring ATM subinterfaces ensures that a single physical interface is treated as multiple virtual interfaces. This capability allows us to overcome split horizon rules. Packets received on one virtual interface can now be forwarded out another virtual interface, even if they are configured on the same physical interface.

SubInterfaces provide a way to subdivide an ATM network into a number of smaller, fully meshed (or point-to-point) subnetworks. Each subnetwork is assigned its own network number (Virtual Circuit Identifier, or VCI) and appears to the protocols as if it is reachable through a separate interface. Note that point-to-point subinterfaces can be unnumbered for use with IP, reducing the addressing burden that might otherwise result.

### Adding an ATM Subinterface to a Configuration

Each virtual interface (ATM Permanent Virtual Circuit, or PVC) is configured using a subinterface in the **wan.conf** file. Although the order of the devices in the file does not matter, ImageStream by convention keeps the interfaces in order.

ATM subinterfaces are configured in the same manner as Serial0 in our example configuration. Add an additional **interface** command for each ATM serial interface, separating each section with a ! symbol. The syntax of the **interface** command is:

```
interface DeviceName.subinterface#
```

This command creates an ATM subinterface under the specified interface name. A subinterface is treated as a separate interface dedicated for an ATM PVC to a remote site. In the example below, "Serial0" indicates that the subinterface belongs to the physical Serial0 interface and "1" is the unique

subinterface ID number. The subinterface ID number can be any unique value between zero and 64,000 and does not have to be in any particular order (i.e. it is not necessary to begin with 1 and sequentially progress with 2, 3, 4, etc.). To reduce confusion, ImageStream recommends sequential progression or identifying a subinterface with the same number as the VPI/VCI used on that subinterface.

In the default example below, we have added a two ATM subinterfaces.

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices bandwidth
encapsulation atm
service-module ds3 clock source line
service-module ds3 framing cbit
service-module ds3 scrambling on
!
interface Serial0.1
description Connection to NYC office encapsulation atm
!
interface Serial0.2
description Connection to Dallas office encapsulation atm
!
```

## Configuring the VPI and VCI for an ATM Subinterface

The configuration above is not yet complete. Each subinterface must contain a unique identifier used to send traffic across the ATM network. ATM networks are connection oriented. Before information is transferred from the router to the network, a logical/virtual connection is set. When you are using ATM encapsulation on an interface, you must map each subinterface to a virtual circuit identifier (VCI) and a virtual path identifier (VPI) assigned by your ATM line provider.

To configure a VCI and a VPI on a point-to-point ATM subinterface, include the **pvc** statement in the subinterface configuration. The syntax of the **pvc** command is:

```
pvc { vpi }/{ vci }
```

For each subinterface, you must configure the VCI and VPI identifiers. On many networks, your line provider will not specify a VPI. Use a value of 0 as this is the most common VPI value. Your line provider will assign a unique VCI to each PVC. In the default example below, we have added **pvc** statements. **NOTE:** These settings must match those used on the ATM network by your line provider or the ATM interface will not function correctly.

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices bandwidth
encapsulation atm
service-module ds3 clock source line
service-module ds3 framing cbit
service-module ds3 scrambling on
!
interface Serial0.1
description Connection to NYC office encapsulation atm
pvc 0/10
!
```

```
interface Serial0.2
description Connection to Dallas office encapsulation atm
pvc 1/22
!
```

## Setting the IP Address and Netmask

During the subinterface setup process, you will set the IP address and netmask for the subinterface. To change the IP address and netmask of the Serial subinterface, modify the **ip address** command. The syntax of this command is:

```
ip address ipaddress netmask
```

Set the IP address to the address to be used by the ATM subinterface of the router on your network. If you have divided your network into subnets, enter the subnet mask that identifies how your network addresses are divided between the network portion and the host portion.

Using the default configuration below, we have set the Serial0.1 IP address to 25.0.0.1 with a netmask of 255.255.255.252. We have also set Serial0.2 to use an IP address of 30.0.0.1 and a /30 subnet mask. Often, with numbered point-to-point Serial links, the netmask will be a /30 (a subnet with 2 valid addresses). **NOTE:** You will need to substitute your address and netmask for your network.

```
!
interface Serial0
#NOC phone: 800-555-1212 - Our account #58935 description ATM connection to branch offices b
encapsulation atm
service-module ds3 clock source line
service-module ds3 framing cbit
service-module ds3 scrambling on
!
interface Serial0.1
description Connection to NYC office encapsulation atm
pvc 0/10
ip address 25.0.0.1 255.255.255.252
!
interface Serial0.2
description Connection to Dallas office encapsulation atm
pvc 1/22
ip address 30.0.0.1 255.255.255.252
!
```

## Adding Secondary Serial Addresses

Although rarely necessary, depending on your network configuration, you may need to configure more than one address on a subinterface. This task is accomplished by adding the **secondary** keyword to the **ip address** line used previously. The **secondary** keyword is used for all addresses on a Serial device other than the primary address. Only one primary address can be configured on a Serial device.

**NOTE:** Configuring more than one primary address or leaving the **secondary** keyword off of a secondary address configuration will cause the last primary IP address to be used when the port is configured by SAND.

Using the default configuration below, we have added two secondary IP addresses to Serial0.1. Only a portion of the previous configuration is shown.

```
!  
interface Serial0.1  
description Connection to NYC office encapsulation atm  
pvc 0/10  
ip address 25.0.0.1 255.255.255.252  
ip address 20.0.1.1 255.255.255.0 secondary  
!
```

**Note: You must save the settings to the router's non-volatile flash memory! If the router is rebooted before saving, your changes will be lost! See Chapter 26, "Backup/Restore Menu: Managing Configurations" for more information.**