42 Managing Cell Switching Modules (CSMs)

Cell Switching Modules (CSMs) support point-to-point and point-to-multipoint connections over OC-3c/STM-1 and OC-12c/STM-4c connections. Virtual Paths and Virtual Channels may be configured on any CSM port. Each virtual circuit may be configured as a private UNI connection to an ATM End System (ES), a PNNI connection that supports the routing features in PNNI version 1.0, or as an IISP connection that supports static routes via the IISP routing protocol.

CSM ports and the virtual circuits associated with those ports are configured through commands on the ATM menu. These commands allow you to specify Quality of Service (QoS) and traffic management parameters for each virtual circuit. Software configuration commands are described in this chapter.

CSM modules must be used with the ATM cell switching backplane. They can reside in an OmniSwitch chassis with other CSM modules or with frame-based modules, such as Ethernet, Fast Ethernet, Token Ring, and FDDI modules. Descriptions of ATM switch hardware can be found in Chapter 41 of this manual, "Cell Switching Modules (CSMs)."

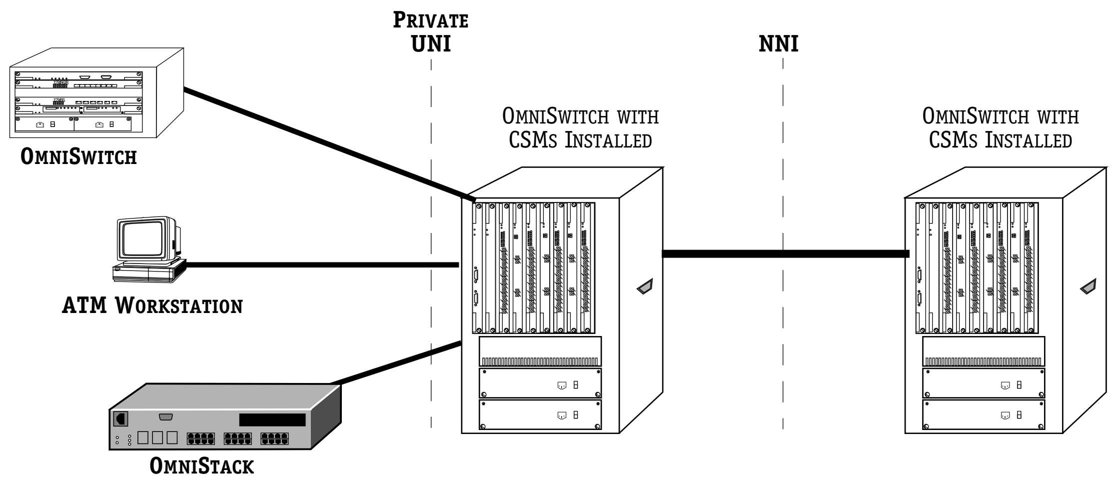
All CSM modules support ATM User-Network Interface (UNI) specification versions 3.0 and 3.1. If you have installed the optional software for multiple-peer group PNNI, then you can configure CSM modules for UNI signalling specification 4.0. (See Chapter 45, "Configuring and Monitoring PNNI," for more information on the optional software for multiple-peer group PNNI.)

This chapter describes the initial configuration of CSM ports, Virtual Paths, and Virtual Channels. It provides background on how Quality of Service, Traffic Descriptors, Leaky Buckets, and Flow Control are handled by the OmniSwitch and CSM modules. In addition, it provides step-by-step instructions for configuring CSM port and circuit parameters. Information on the PNNI routing protocol and how to configure PNNI parameters can be found in Chapter 45, "Configuring and Monitoring PNNI."

♦ Special Note ♦

The chapter assumes familiarity with ATM concepts. The focus of the chapter is not to explain ATM concepts, but to describe the OmniSwitch implementation of various ATM switch features.

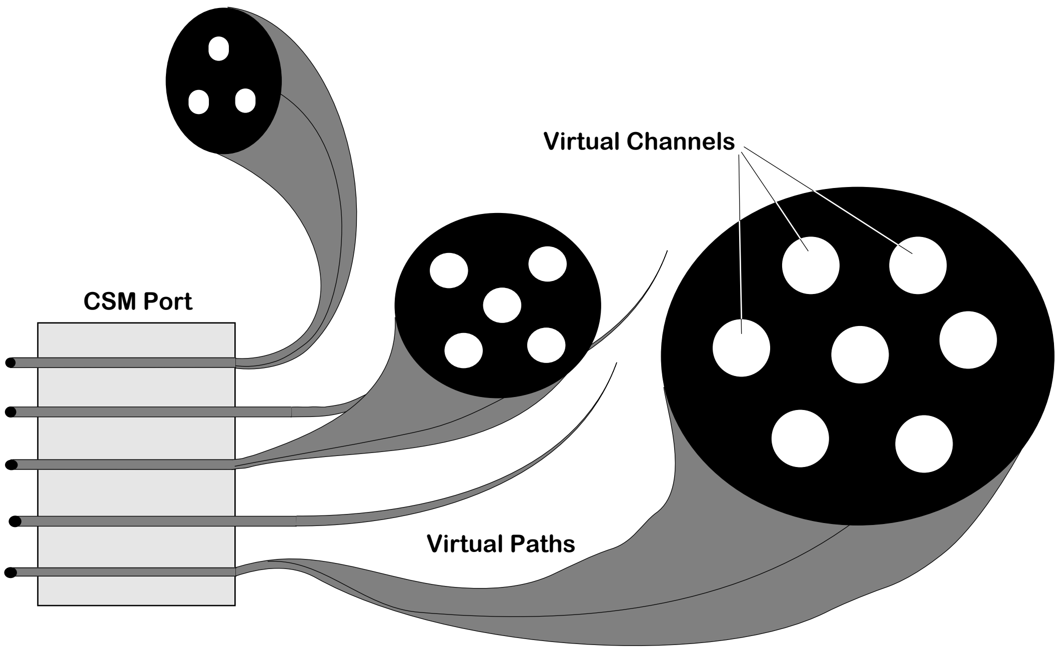
The following figure shows a typical OmniSwitch/CSM module configuration. Note that CSM modules can connect directly to ATM end stations, LAN switches, or to other OmniSwitches.



Typical OmniSwitch ATM Switch Network Configuration

Virtual Circuits

Each CSM port supports a number of virtual circuits. A virtual circuit is the connection on which data is transmitted over the ATM network. In addition, Quality of Service and traffic management parameters are defined on a virtual circuit basis. The OmniSwitch supports point-to-point and point-to-multipoint virtual circuits. These connections can be either Virtual Paths (VPs) or Virtual Channels (VCs). A Virtual Path is a path through the ATM network representing a group of Virtual Channels. Virtual Channels are independent connections that are part of a Virtual Path. The following diagram illustrates this hierarchy.



Virtual Paths and Virtual Channels

Each Virtual Path Connection or Virtual Channel Connection has a defined traffic contract. This traffic contract includes a description of the type of traffic that will use the circuit, the Quality of Service expected on that circuit, and traffic descriptors that quantify the cell rate and a burst size allowed. More detailed information on the traffic contract and traffic management parameters can be found in *Traffic Management* on page 42-12.

Note on Terminology

The term, “virtual circuit,” refers to either a Virtual Path Connection or a Virtual Channel Connection.

VPIs and VCIs

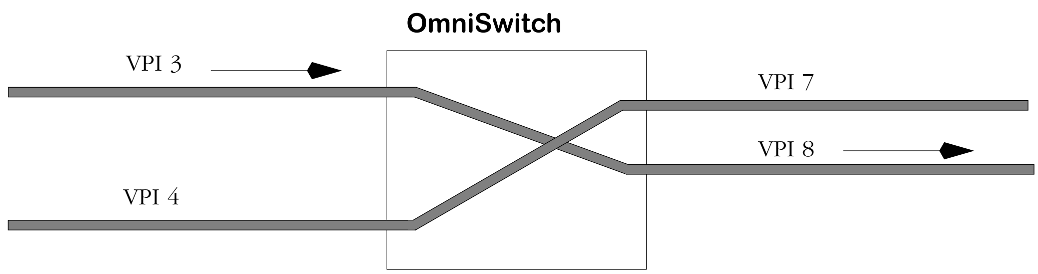
Virtual Paths and Virtual Channels are identified by their Virtual Path Identifier (VPI) and Virtual Channel Identifier (VCI). The VPI and VPI/VCI act as an address for a connection. They do not describe the specific address of an ATM end device, but they do describe the connection that leads to the device.

Note on Terminology

A "VPI" indentifies a Virtual Path and a "VPI/VCI" identifies a Virtual Channel. A Virtual Channel requires both the VPI and VCI values.

Each switch contains a table of VPI and VPI/VCI values relating to each physical link. Each incoming VPI/VCI is joined with an outgoing VPI/VCI. If an incoming cell passes through the switch it is switched to the outgoing VPI/VCI. The incoming and outgoing VPI or VPI/VCI may or may not have the same value. In fact, when a cell is received by a switch and transmitted further along the connection, the cell's VPI/VCI is sometimes changed. The cell is still on the same logical connection, but each switch may use different numbers to identify that connection.

For example, in the diagram below, incoming cells to the OmniSwitch on VPI 3 are internally switched to VPI 8. (This process is referred to as "label swapping.") VPI 3 and VPI 8 identify the same logical connection; the switches that establish the links just use different names.



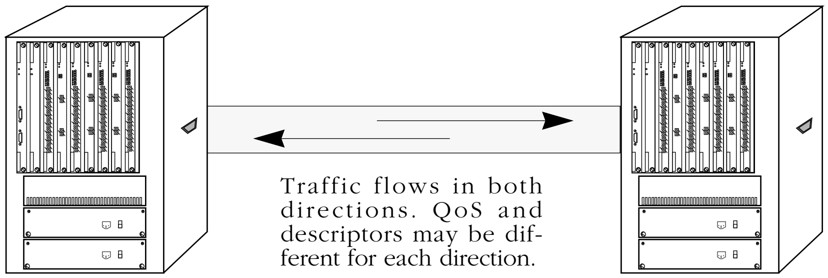
VPI/VCI Values May Not Be Consistent Along a Connection

The VPI value of zero (0) is used for management and ATM uplink (e.g., LANE) connections. Within all Virtual Paths, VCI values ranging from 0 to 31 are reserved for circuit management.

Point-to-Point Virtual Circuits

A point-to-point virtual circuit is a single logical connection between two switches. Each switch may use different VPI and VPI/VCI values to identify the connection. Traffic can flow in both directions on a point-to-point circuit. However, Quality of Service and traffic descriptors can be configured differently for each direction on the circuit.

Each physical port on a CSM-155 module supports up to 4096 point-to-point virtual circuits, and each port on a CSM-622 module supports up to 65,536 point-to-point virtual circuits.



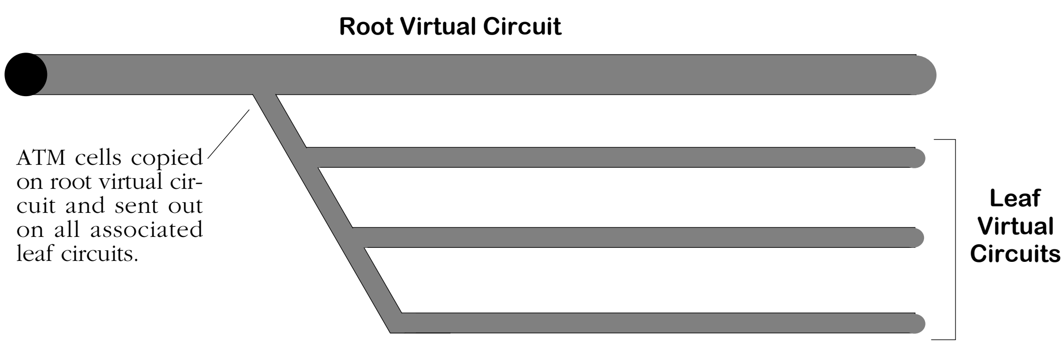
A Point-to-Point Virtual Circuit

Point-to-Multipoint Virtual Circuits

Point-to-multipoint virtual circuits, also referred to as “multicast” virtual circuits, may be configured on any virtual circuit. Within a point-to-multipoint virtual circuit, one circuit is the primary, or “root,” circuit and the others are “leaf” circuits. Quality of Service (QoS) and other traffic parameters are set up for the root circuit and these same parameters are inherited by all leaf circuits.

An entire CSM-155 module supports 8192 point-to-multipoint virtual circuits, and a CSM-622 module supports up to 16,384 point-to-multipoint connections.

Functionally a point-to-multipoint virtual circuit operates by copying a cell for each output leaf circuit and sending that copied cell out each circuit. Data traffic flows from root to leaf, but not from leaf to root. Leaf virtual circuits do not communicate directly with each other on a point-to-multipoint connection.



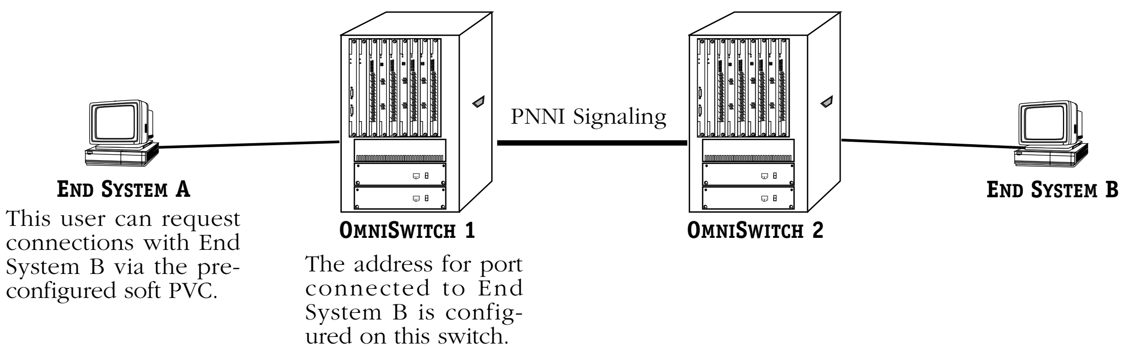
A Point-to-Multipoint Virtual Circuit

PVCs, SVCs, and Soft PVCs

Virtual circuits may be permanent or switched. Permanent Virtual Circuits, or PVCs, must be configured through the **cvc** command, which is described in *Creating a Permanent Virtual Circuit* on page 42-31. PVC information is stored in flash memory on the MPM module; if you restart the switch, the PVC would be restored. Switched Virtual Circuits, or SVCs, are learned by the OmniSwitch through communication with the ATM attached devices. SVCs are built up and taken down based on demands for virtual connections by ATM end devices. If an SVC connection is lost or the switch is restarted, then the circuit is lost and the source device must request the connection again.

The OmniSwitch also supports “soft PVCs.” Like standard PVCs, soft PVCs require some user configuration. However, like SVCs, use PNNI signaling to establish connections. The **scvc** command is used to set up soft PVCs (see Chapter 43, “Advanced CSM Management”). Configuration data for soft PVCs is saved; if the OmniSwitch is restarted the soft PVCs still exist.

The following diagram illustrates a soft PVC configuration. The soft PVC actually stretches from the port connected to End System A to the port connected to End System B; the destination address is the address of the port connected to End System B. You can find the address of this port through the **vap** command.



Soft PVC Configuration

The following table outlines the differences between the three types of virtual circuits:

Characteristics of PVCs, SVCs, and Soft PVCs

Type of Virtual Circuit	User Configured?	Command Used to Configure	Information Saved On Restart?	Connection Always Up?
PVC	Yes	cvc	Yes	Yes
SVC	No	N/A	No	No
Soft PVC	Yes	scvc	Yes	No

ATM Traffic Types

ATM can support data, voice, and video traffic. Each type of traffic uses the standard 53-byte cell with a 5-byte header, but the bandwidth and QoS requirements for each type of traffic may be different. Some traffic types are time-dependent and very sensitive to delays in the transmission of cells. Other traffic types are content-dependent and very sensitive to cell loss.

Time-dependent traffic, also called “isochronous” traffic, includes voice, video, and multimedia traffic. For example, real-time video requires that cells be received in order with little space between them. Loss of non-critical cells for a video might lower the quality of the video somewhat, but variation in the speed at which video traffic is received might result in jitter that would render the received cells useless.

Content-dependent traffic, such as data traffic, requires that a high amount of the original transfer be received. Data traffic is sensitive to cell loss, but can tolerate variations in the time of cell delivery over the network. For example, a file transfer can withstand a delay of a second or two, but loss of data would mean that the resulting data would not meet the demands of the application and retransmission would be required.

Because ATM can deal with the demands of different types of traffics, several categories of traffic have been defined. These types are as follows.

Constant Bit Rate (CBR)

Constant Bit Rate (CBR) traffic is the most time-dependent of the traffic types. CBR traffic consists of a continuous stream of bits flowing at a predefined constant rate. Once transmission of CBR traffic begins it must be continued uninterrupted, end-to-end, until its completion. In addition, buffering on both ends of the connection must ensure proper ordering of traffic. CBR traffic may include circuit emulation (i.e., transport of an entire T1 or E1 circuit), voice, video, or PABX traffic.

Real-Time Variable Bit Rate (rt-VBR)

There are two types of Variable Bit Rate (VBR) traffic—real-time and non-real-time. Both types, like CBR traffic, require guaranteed delivery service. However, the data rate at which VBR traffic can flow may vary; cell traffic does not have to be constant as with CBR traffic. Real-time VBR (rt-VBR) traffic is more sensitive to transit delays and jitter than non-real-time VBR (nrt-VBR) traffic. Real-time VBR traffic may include compressed video, compressed voice with silence suppression, or HDLC link emulation with idle removal.

Some VBR encoding schemes mark essential cells (i.e., cells that are required to keep up the quality of the application) and less essential cells (i.e., optional cells that simply improve the voice or picture quality) differently. In marking high and low priority cells differently, the lower priority cells can be discarded under congested conditions.

Non-Real-Time Variable Bit Rate (nrt-VBR)

Non-real-time Variable Bit Rate (nrt-VBR) traffic is similar to real-time VBR traffic but it has more tolerance for transit delay and jitter. Non-real-time VBR traffic may include frame relay traffic.

Available Bit Rate (ABR)

Available Bit Rate (ABR) traffic requires guaranteed delivery service for applications that can tolerate a wide variation in transmission delay. Services for ABR traffic reduce cell loss but only use bandwidth as it becomes available after other higher-priority traffic types (i.e., traffic requiring guaranteed delivery and low transit delay, such as CBR and VBR) have been supported. ABR traffic typically includes data traffic, which is not tolerant to cell loss, but can tolerate variations in the speed of transit.

ABR traffic uses Resource Management (RM) cells to dynamically control the rate of traffic as network conditions change. The network and ATM End Systems (ESs) communicate via RM cells about the ability of each End System to receive traffic at a given rate and about general network conditions. The network informs the ES of congestion on the network and the rate at which to send data. The OmniSwitch supports Explicit Rate Resource Management flow control for ABR traffic, but Resource Management is not yet supported by end user adapter cards so this feature is not utilized at this time. Resource Management is discussed further in *Flow Control* on page 42-11.

Unspecified Bit Rate (UBR)

All LAN traffic sent today uses Unspecified Bit Rate (UBR) traffic. The ATM network makes its "best effort" to deliver UBR traffic. Delivery is not guaranteed and is normally only transferred after other traffic types have been serviced. Under congestion conditions, UBR traffic will be discarded before other traffic types. However, with OmniSwitch's buffer management, congestion will be avoided. When congestion does occur Partial packet Discard (PPD) and Random Early Discard (RED) can provide high throughput for UBR traffic.

Quality of Service (QoS)

The different types of network traffic that ATM supports (voice, video, and data) require different treatment by the network. As discussed in *ATM Traffic Types* on page 42-7, each traffic type varies in its tolerance for cell loss, cell transfer delay, and cell delay variation. These differences translate to different service levels.

Each service level has certain transmission characteristics. These transmission characteristics include Cell Loss Ratio (CLR), Cell Delay Variation (CDV), and Cell Transfer Delay (CTD). The CLR is a measure of the number of cells lost as a percentage of the total number of transmitted cells. The CDV, also referred to as "jitter," is the change in cell spacing as traffic moves from one switch to another switch. CTD is a measure of the amount of delay that can be expected from the time a cell is sent from one node to another, or from the first node in a Virtual Path to the end node in the path. The CLR, CDV, and CTD are defaulted for each service level; they are not user-configurable on the OmniSwitch in this release.

Each service level additionally requires a different traffic contract and uses a different Generic Cell Rate Algorithm (GCRA). The traffic contract and GCRAs can be partially controlled by the user. See *Traffic Policing and Leaky Bucket Algorithms* on page 42-17 for more information on the traffic contract and GCRAs.

A service level is definable at the virtual circuit level through the **cvc** or **scvc** commands. A Class of Service must be specified for each virtual circuit (Virtual Path or Virtual Channel).

The ATM Forum defines four (4) different service classes and one unspecified service class. The OmniSwitch is compliant with the ATM Forum classes and expands on these service levels by providing up to sixteen (16) user-configurable priority levels. The priority level is definable on a per virtual circuit basis and provides an additional layer of granularity in defining traffic priority. For example, circuits with the same Class of Service may contain different priority values; the circuit with higher priority will be given preference over the other circuits during times of congestion even if the two circuits use the same Class of Service. The OmniSwitch supports the following classes of service.

Class 1: Constant Bit Rate (CBR)

Class 1 supports Constant Bit Rate (CBR) traffic. It provides the service and performance of a private digital line. Traffic support may be CBR or CBR from a primary reference source, which is given the highest priority. Class 1 service guarantees zero cell loss. It may include real-time VBR traffic when a traffic contract requiring a Maximum Burst Size (MBS) of 2 or less is used. If a virtual connection is created for real-time VBR traffic and an MBS parameter greater than 2 is specified, then Class 1 will additionally support VBR traffic for real-time applications. Otherwise, Class 1 service includes only CBR traffic.

Class 2: Real-Time Variable Bit Rate (rt-VBR)

Class 2 supports Variable Bit Rate (VBR) traffic for real-time applications such as audio and video. It may include support for packetized video and audio in teleconferencing and multimedia applications.

Class 3: Non-Real-Time Variable Bit Rate (nrt-VBR)

Class 3 supports VBR traffic for non-real time, connection-oriented traffic. This may include traffic that is sensitive to cell loss but not sensitive to transit delays, such as frame relay traffic.

Class 4: Available Bit Rate (ABR) and Unspecified Bit Rate (UBR)

Class 4 supports Available Bit Rate (ABR) and Unspecified Bit Rate (UBR) traffic. This may include traffic from connectionless data protocols such as IP and LAN Emulation.

Unspecified Class: Unspecified Bit Rate (UBR)

The QoS class for Unspecified Bit Rate (UBR) traffic is transmitted on a “best effort” basis. The highest speed will be achieved after traffic in other classes have been serviced.

Flow Control

The OmniSwitch supports two forms of flow control: Explicit Rate Resource Management (RM) and the Explicit Forward Congestion Indicator (EFCI). These flow control mechanisms are used to prevent congestion by informing ATM End Systems about congestion conditions before they worsen. Resource management is used to control the flow of Available Bit Rate (ABR) traffic through the use of RM cells. EFCI notifies network devices of congestion through the use of a bit within the header of an ATM cell.

Resource Management

The OmniSwitch supports Resource Management Explicit Rate processing for point-to-point and point-to-multipoint virtual circuits. In the explicit rate method of flow control, the network continuously provides ATM end stations with instant information on the availability of bandwidth along the virtual circuit path. Through the use of Resource Management (RM) cells, end stations learn the maximum current rate (in cells/second) at which cells can be transmitted. This information leads to more efficient link utilization.

After a connection is set up, the OmniSwitch sends an RM cell to the source end station. More RM cells are sent at set intervals. The RM cells contain an Explicit Rate (ER) value that the OmniSwitch may update to reduce the allowed rate.

Resource management is only available for connections reserved for ABR traffic. Such flow control is not useful for traffic types that require a constant or nearly constant bit rate, such as CBR and VBR traffic. Flow control is not used with CBR traffic because the rate of flow must always be constant. VBR traffic rates do vary, but variations are caused by characteristics of the VBR traffic itself rather than external flow controls.

The OmniSwitch currently allows you to configure resource management parameters at the VPI or VPI/VCI level. However, since resource management is not currently supported on ATM adapter boards it is not fully functional. This feature requires support on both the ATM switch and the ATM end device.

Explicit Forward Congestion Indication (EFCI)

An ATM cell header contains a congestion-control bit called the Explicit Forward Congestion Indication (EFCI). As an ATM switch, the OmniSwitch sets this bit on cells during times of congestion. When an ATM End System, such as a LAN switch, sees the EFCI bit set it knows that congestion is occurring on the virtual circuit. That LAN switch may then adjust cell flow downward until cells without the EFCI bit set are received.

In addition to setting EFCI, the OmniSwitch provides statistics on the number of EFCI cells received and forwarded.

Traffic Management

The OmniSwitch uses a variety of methods to manage traffic on its virtual circuits. The goal of traffic management is to prevent congestion. Congestion can lead to traffic queuing, decreased performance, and cell discarding. The OmniSwitch provides the following methods for preventing congestion and managing traffic:

- Buffer management
- Traffic Contract Parameters
- Class of Service
- Virtual Circuit Priority

The OmniSwitch buffer management scheme is the first level of traffic management. Buffer management is handled automatically within the hardware cell switching fabric and does not require user configuration. The buffer management scheme used by the ATM cell switching fabric is described in Chapter 41, “Cell Switching Modules (CSMs).”

Each virtual circuit has a set of parameters and algorithms that comprise the “traffic contract.” These parameters, called “traffic descriptors,” describe how fast data can flow on the circuit and the maximum size of a burst allowed on the circuit. When traffic violates these parameters, it is subject to a policing algorithm referred to as the Generic Cell Rate Algorithm (GCRA). The GCRA may tag cells for discard eligibility or simply discard cells that violate the traffic contract.

The traffic contract and GCRA affect only traffic on the virtual circuit for which they are defined. Within a Virtual Path or a single physical link, some virtual circuits will have a higher priority than others due to their Class of Service and User Priority—two variables that can be configured through OmniSwitch software. If congestion reached levels that could not be managed by buffers or GCRAs, the OmniSwitch would use Class of Service and User Priority to determine which traffic would receive priority on the physical link.

The OmniSwitch with ATM switching functionality uses the following information to determine how to police, tag, and discard traffic:

- Cell Loss Priority (CLP)
- Traffic Contract Descriptors
- Traffic Contract Enforcement Methods

Some ATM cells within a single virtual circuit may have a higher priority than other cells in the same circuit. The priority level of a cell is determined by its Cell Loss Priority (CLP) bit setting. The OmniSwitch uses this priority bit to decide whether some cells will be discarded under certain conditions.

The traffic contract is comprised of combinations of traffic descriptors that specify maximum rates of data flow along the circuit. When there is a violation of one or more of these parameters, the GCRAs use several different enforcement methods to police the traffic.

Cell Loss Priority (CLP) and Policing

The Cell Loss Priority (CLP) bit is a 1-bit field in the ATM cell header that indicates the relative priority of the cell. It can be used during times of congestion to discard cells with a low priority and keep cells with a high priority. Cells with a CLP bit set to 0 (CLP=0) are high priority and cells with a CLP bit set to 1 (CLP=1) are low priority.

The CLP bit is also used by the OmniSwitch as an identifier. Some traffic descriptors and policing algorithms will only monitor high priority or low priority cells. Sometimes, the OmniSwitch will monitor both types of cells; when both types of cell flows are monitored the identifier “CLP=0+1” is used.

The cell flows monitored, or policed, by the switch will depend on the Class of Service for a virtual circuit and the traffic descriptor specified for the circuit. There are four possible police modes and they are summarized in the table below.

Cell Flows Monitored in Each Police Mode

Policing Mode	Cell Flow Monitored	Explanation
No Policing	None	No policing done. This mode is not used in the switch.
Police 1	CLP=0	Policing only on the CLP=0, or high priority, cell flow. This mode is used only in the second leaky bucket.
Police 2	CLP=1	Policing only on the CLP=1, or low priority, flow. This mode is not used in the switch.
Police 3	CLP=0+1	Policing on both CLP=0 (high priority) and CLP=1 (low priority) cell flows. This mode is used in the first leaky bucket for all traffic types.

In the current release only two policing options are used (Police 1 and Police 3) and these two options are not user-selectable. Depending on the traffic descriptor chosen and the GCRA employed, either the Police 1 or Police 3 mode will be used.

The cell flow monitored for all traffic types is detailed in a series of tables in the section, *The ATM Menu* on page 42-24.

Tagging Based on CLP

During times of congestion, the Generic Cell Rate Algorithm (GCRA) (described in *Traffic Policing and Leaky Bucket Algorithms* on page 42-17) may use a technique called “tagging” to change the CLP bit value. Depending on the parameters of a traffic contract, congestion may cause the OmniSwitch to change CLP=0 cells to CLP=1 cells, changing their status from high priority to low priority. The traffic contract may also cause the cell to be discarded.

Traffic Contract Descriptors

Each Virtual Circuit—either a Virtual Path Connection or Virtual Channel Connection—has a defined traffic contract. This traffic contract includes a description of the type of traffic that will use the circuit, the Class of Service expected on that circuit, and a traffic descriptor that quantifies the cell rate allowed.

Traffic descriptors are defined for each direction of a connection—from source to destination and from destination to source. It is possible for traffic descriptor values to be different in each direction. Values for the following traffic descriptor parameters can be specified through software.

Peak Cell Rate (PCR). The maximum number of cells per second allowed on the virtual circuit. The PCR is specified for all types of ATM traffic.

Sustainable Cell Rate (SCR). The maximum average cell rate (in cells per second) allowed for traffic. The SCR is always less than the Peak Cell Rate. The SCR is not specified for Constant Bit Rate (CBR) traffic as this traffic requires a steady data flow at all times. For CBR traffic, the PCR is equal to the SCR.

Maximum Burst Size (MBS). The maximum number of cells that can be sent in a burst at the Peak Cell Rate. The MBS is not specified for CBR traffic. CBR traffic is constant and continuous, not bursty.

The PCR, SCR, and MBS parameters are combined into six (6) traffic descriptors. These traffic descriptors also include information on policing and enforcement modes. (See *3) Requested Tx Traffic Descriptor Type* on page 42-38 for descriptions of the six traffic descriptors.) Different Classes of Service require different traffic descriptors. For example, as discussed earlier, CBR traffic does not require setting the SCR or MBS traffic parameters. In addition, other types of traffic may require setting all traffic parameters, but the parameters may apply to only CLP=0 cells or to the combined CLP=0+1 cell flow.

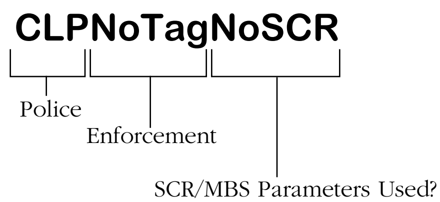
The following table outlines the cell flow(s) checked, or policed, by the PCR, SCR, and MBS parameters for each traffic descriptor. The traffic descriptor names used in the table are the same ones used in User Interface software.

Traffic Checked for Each Traffic Descriptor Bundle

Traffic Descriptor	Peak Cell Rate (PCR) Check	Sustained Cell Rate (SCR) Check	Maximum Burst Size (MBS) Check
NoCLPNoSCR	CLP=0+1	Not Checked	Not Checked
CLPNoTagNoSCR	CLP=0+1 and CLP=0	Not Checked	Not Checked
CLPTagNoSCR	CLP=0+1 and CLP=0	Not Checked	Not Checked
NoCLPSCR	CLP=0+1	CLP=0+1	CLP=0+1
CLPNoTagSCR	CLP=0+1	CLP=0	CLP=0
CLPTagSCR	CLP=0+1	CLP=0	CLP=0

Understanding Traffic Descriptor Names

Each traffic descriptor name contains three (3) parts. The first part indicates the police mode, the second indicates the enforcement mode, and third indicates traffic descriptor parameters that can be set. The following diagram identifies these three parts.



The first part tells you something about the type of traffic being checked, or policed, by leaky buckets. This part will be either **NoCLP** or **CLP**. **NoCLP** means that only the aggregate of CLP=0+1 traffic will be checked. **CLP** means that CLP=0 traffic will be checked and CLP=0+1 traffic may also be checked.

The second part of the traffic descriptor name tells you something about the traffic enforcement method. The options are **Tag** and **NoTag**. (Some traffic descriptors do not list either **Tag** or **NoTag**; in these cases, the implied option is **NoTag**.) **Tag** means that for CBR and VBR traffic during periods of no congestion cells will be tagged when the traffic contract is violated. (UBR traffic is always tagged during times of no congestion.)

The third part indicates whether Sustained Cell Rate (SCR) and Maximum Burst Size (MBS) parameters are used as part of the traffic contract. **SCR** means you can specify an SCR and MBS parameters, and **NoSCR** means you only specify a Peak Cell Rate (PCR) parameter.

Traffic Contract Enforcement

Traffic descriptors indicate the cell flow to monitor and the parameters to check cell flows against. Once traffic violates any of the specified parameters, some form of traffic enforcement will take place. The GCRA, or leaky bucket, determines the type of enforcement option used. Generally, traffic that violates the specified contract will either be tagged for discard eligibility or it will be discarded.

The OmniSwitch uses enhanced GCRAs that employ congestion-based traffic enforcement in addition to standard static enforcement. Congestion-based traffic enforcement discards cells only when there is congestion; it does not discard cells when there is plenty of bandwidth on a connection. Static traffic enforcement discards any cells that violate traffic contract parameters even when there is available bandwidth to support the transporting of these cells. The OmniSwitch provides an option for static enforcement but also provides three congestion-based enforcement methods.

The following table outlines what happens to cells that violate the traffic contract during times of no congestion and times of congestion under the four enforcement options:

What Happens to Traffic Exceeding the Traffic Contract

Enforcement of Contract Tightens

Enforcement Option	During Congestion		No Congestion	
	CLP=0	CLP=1	CLP=0	CLP=1
Congestion 1	Tag	Discard	Tag	Tag
Congestion 2	Discard	Discard	Tag	Tag
Congestion 3	Discard	Discard	Tag	Discard
Static	Discard	Discard	Discard	Discard

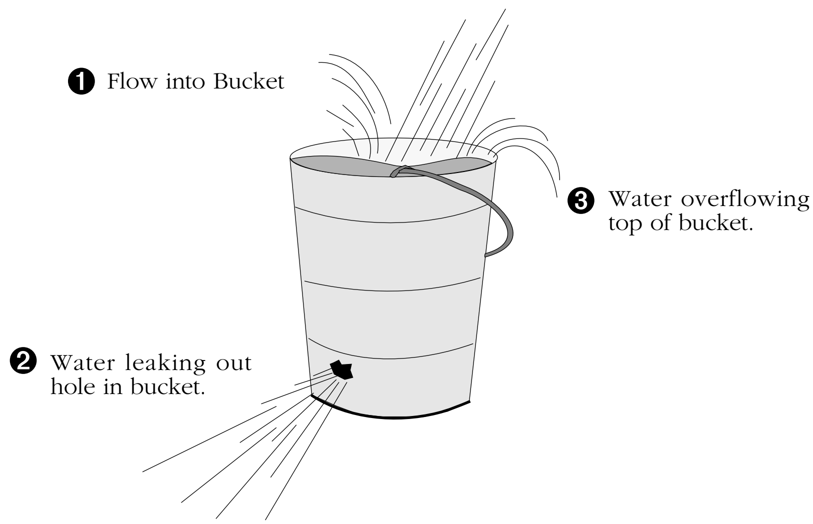
The status of congestion is determined by the amount of available input and output buffers. The congestion method used depends on the Class of Service and traffic descriptor. A different enforcement method may be used for each GCRA. See *The ATM Menu* on page 42-24 for information on the traffic enforcement method used for each Class of Service.

In the current release only two enforcement options are used (Congestion 2 and Static) and these two options are not user-selectable. Depending on the GCRA employed, either the Congestion 2 or static traffic enforcement method will be used.

Traffic Policing and Leaky Bucket Algorithms

Traffic management for CSM modules involves traffic policing algorithms referred to as Generic Cell Rate Algorithms (GCRAs). These algorithms control what happens to different types of traffic during times of congestion and times of no congestion. These algorithms are also referred to as "leaky buckets" because water flowing through a leaky bucket provides a good analogy for data traffic on a virtual circuit.

It is important to note that the leaky bucket is not a queue and does not buffer, store, or slow down data on a virtual circuit. It is just a model for understanding the traffic contract and what happens to traffic that violates that contract. There are several parts to the leaky bucket that are important. The illustration below points them out:



Leaky Bucket

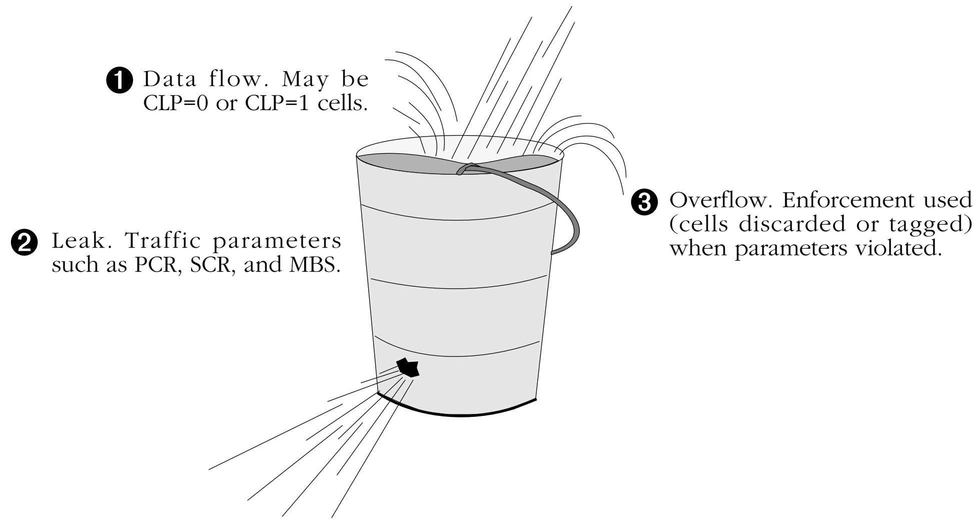
The size and speed of the flow into the bucket (❶ above) depend on the amount of water coming from the source. This water flow is an analogy for the data traffic received on an ATM virtual circuit. The amount of flow will vary depending on buffer management and use of the circuit by ATM devices.

If a bucket has a hole, water will eventually leak out. While this may not be a good thing if you are carrying the water bucket, it is a good thing on an ATM virtual circuit. The hole in the bucket (❷ above) is analogous to the traffic parameters for the virtual circuit that measure traffic compliance. These parameters—Peak Cell Rate (PCR), Sustaining Cell Rate (SCR), and Maximum Burst Size (MBS)—specify how fast and how much traffic can flow through the leaky bucket. These parameters are described in *Traffic Contract Descriptors* on page 42-14.

The leaky bucket and the hole do not slow down traffic or imply that traffic is queued; they just indicate how much traffic can flow on the circuit without violating the traffic contract. The larger the hole in the bucket, the larger the traffic parameters.

There may be times on a virtual circuit when traffic is so heavy that it fills the bucket before the rest of the traffic can drain through the hole in the bucket. This case where traffic "overflows" the bucket indicates a violation of the traffic contract (❸ above). When traffic overflows the bucket, it is subject to the traffic contract enforcement method used for the particular leaky bucket. Essentially, violating traffic will either be discarded or tagged as eligible for discard. Tagging for discard means changing a cell's CLP bit to the lower priority (i.e., CLP=1), which means this cell may be discarded during times of congestion. For more information on the CLP bit, see *Cell Loss Priority (CLP) and Policing* on page 42-13.

The illustration below shows the same leaky bucket with the ATM equivalents for flow into the bucket (❶), the leak or traffic parameters (❷), and overflow or traffic enforcement (❸). These three attributes are used by the leaky bucket algorithm, or Generic Cell Rate Algorithm (GCRA), to measure traffic compliance on the virtual circuit.



The Leaky Bucket as a Traffic Policer

The leaky bucket algorithm is essentially a two-step process—policing and enforcing. In the first step, policing, traffic is checked against traffic parameters defined for the virtual circuit. This step involves ❶ and ❷ in the above illustration. A traffic monitor keeps track of the number of cells exceeding the traffic contract. Depending on the Class of Service and traffic descriptors, one or both of the CLP flows (CLP=0 and CLP=1) will be checked for compliance with the traffic descriptors. The section *Traffic Contract Descriptors* on page 42-14 describes the cell flows that are checked for each traffic parameter.

When cells are not in compliance with the traffic descriptors, the second step of the leaky bucket algorithm, enforcement, begins. Enforcement is the action that the leaky bucket algorithm takes when traffic violates the contract. This step involves ❸ in the above illustration. The enforcement action taken will either be to tag the cell for discard eligibility or to discard the cell. OmniSwitch leaky buckets can be congestion-based, which means the algorithm will consider congestion conditions before taking action. The different enforcement options are described in *Traffic Contract Enforcement* on page 42-16.

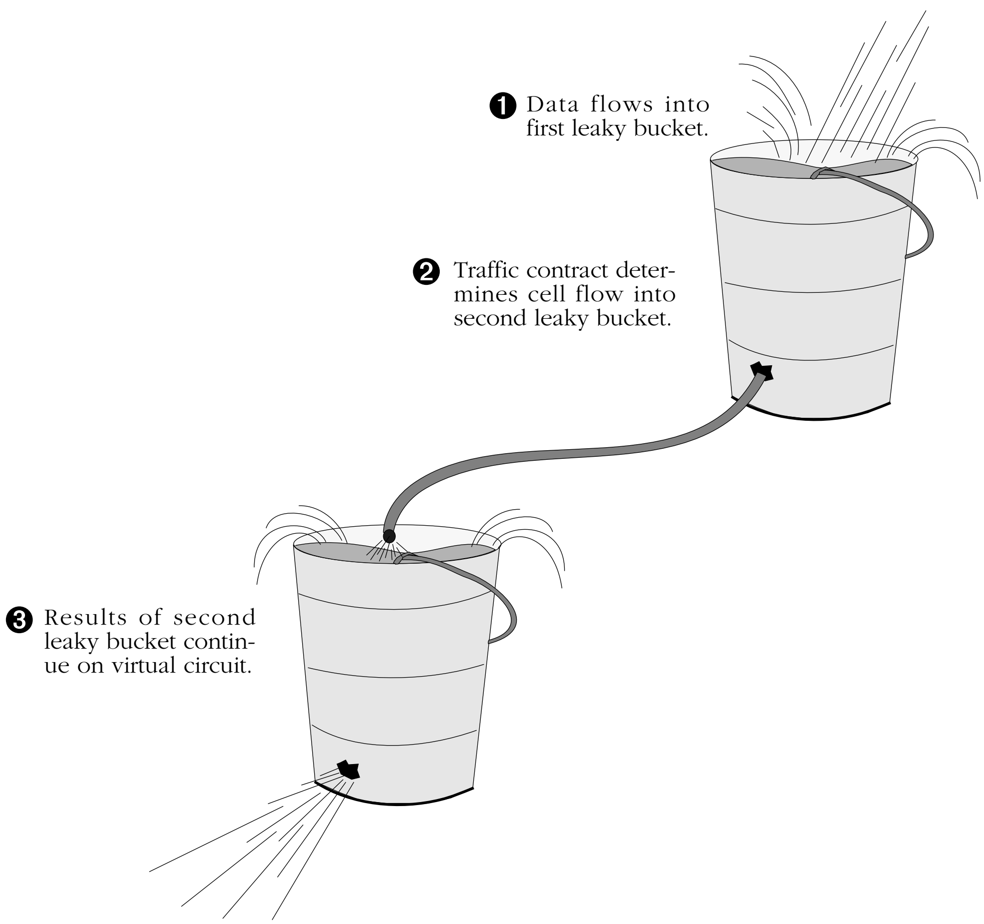
Dual Leaky Buckets

The OmniSwitch actually uses two leaky buckets on each virtual circuit. The second leaky bucket provides an extra check for compliance with the traffic contract. The results of the first leaky bucket flow into the second leaky bucket.

Typically, each leaky bucket monitors a different cell flow and may use a different traffic contract enforcement method. In the first leaky bucket, traffic contract parameters (PCR, SCR, MBS) check the combined cell flow (i.e., CLP=0+1).

In the second leaky bucket, either the combined flow (CLP=0+1) or the high priority flow (CLP=0) is checked. The cell flow that is checked in the second leaky bucket depends on the Class of Service and traffic descriptor selected. See *The ATM Menu* on page 42-24 for the cell flows checked for each Class of Service on the second leaky bucket.

The following illustration shows how the dual leaky buckets function on a virtual circuit.



Dual Leaky Buckets on Each Virtual Circuit

Leaky Buckets and Class of Service

The type of policing and enforcement used by a leaky bucket is determined by the Class of Service and traffic descriptors specified for the virtual circuit. Leaky buckets are not user-configurable in this release.

Within each Class of Service, the policing and enforcement methods are consistent for the first leaky bucket. The first leaky bucket monitors the combined CLP=0+1 cell flow for the Peak Cell Rate (PCR) traffic parameter only.

The second leaky bucket monitors CLP=0 cells or the combined CLP=0+1 cell flow depending on the traffic descriptor and Class of Service selected. The enforcement method used for the second leaky bucket also depends on the traffic descriptor chosen.

The traffic parameters monitored and the enforcement method used in each leaky bucket is detailed for each Class of Service in tables on the following pages.

Class of Service Profiles

This section provides profiles on the cell flows policed, the enforcement method used, and the default priority assigned to virtual circuits for each traffic descriptor/Class of Service combination. A row is provided for each of the six selectable traffic descriptors (see *3) Requested Tx Traffic Descriptor Type* on page 42-38 for descriptions of the six traffic descriptor bundles). The "Police" column indicates the cell flow monitored by traffic parameters. The "Enforce" column indicates the enforcement method used (see *Traffic Contract Enforcement* on page 42-16 for a description of enforcement methods). The "Priority" column indicates the user priority value (0-15) assigned to virtual circuits (a lower priority values means higher priority).

Constant Bit Rate (CBR)

Policing and Enforcement in Each Leaky Bucket for Class of Service 1(CBR)

Traffic Descriptor Specified	Leaky Bucket 1 (GCRA A)			Leaky Bucket 2 (GCRA B)		
	Police	Enforce	Priority	Police	Enforce	Priority
None	CLP=0+1	Static	4	CLP=0+1	Static	4
NoCLPNoSCR	CLP=0+1	Static	4	CLP=0+1	Static	4
CLPNoTagNoSCR	CLP=0+1	Static	4	CLP=0	Static	4
CLPTagNoSCR	CLP=0+1	Congestion 3	4	CLP=0	Congestion 2	4
NoCLPSCR	Not Applicable. SCR and MBS parameters are not used with CBR traffic.					
CLPNoTagSCR						
CLPTagSCR						

Variable Bit Rate, Real Time (rt_VBR)

Policing and Enforcement in Each Leaky Bucket for Class of Service 2 (rt_VBR)

Traffic Descriptor Specified	Leaky Bucket 1 (GCRA A)			Leaky Bucket 2 (GCRA B)		
	Police	Enforce	Priority	Police	Enforce	Priority
None	CLP=0+1	Static	8	CLP=0+1	Static	8
NoCLPNoSCR	CLP=0+1	Static	8	CLP=0+1	Static	8
CLPNoTagNoSCR	CLP=0+1	Static	8	CLP=0	Static	8
CLPTagNoSCR	CLP=0+1	Congestion 3	8	CLP=0	Congestion 2	8
NoCLPSCR	CLP=0+1	Static	8	CLP=0+1	Static	8
CLPNoTagSCR	CLP=0+1	Static	8	PCR: CLP=0+1 SCR/MBS: CLP=0	Static	8
CLPTagSCR	CLP=0+1	Congestion 3	8	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	8

Variable Bit Rate, Non-Real Time (nrt_VBR)

Policing and Enforcement in Each Leaky Bucket for Class of Service 3 (nrt_VBR)

Traffic Descriptor Specified	Leaky Bucket 1 (GCRA A)			Leaky Bucket 2 (GCRA B)		
	Police	Enforce	Priority	Police	Enforce	Priority
None	CLP=0+1	Static	8	CLP=0+1	Static	8
NoCLPNoSCR	CLP=0+1	Static	8	CLP=0+1	Static	8
CLPNoTagNoSCR	CLP=0+1	Static	8	CLP=0	Static	8
CLPTagNoSCR	CLP=0+1	Congestion 3	8	CLP=0	Congestion 2	8
NoCLPSCR	CLP=0+1	Static	8	CLP=0+1	Static	8
CLPNoTagSCR	CLP=0+1	Static	8	PCR: CLP=0+1 SCR/MBS: CLP=0	Static	8
CLPTagSCR	CLP=0+1	Congestion 3	8	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	8

Available Bit Rate (ABR)

Policing and Enforcement in Each Leaky Bucket for Class of Service 4 (ABR)

Traffic Descriptor Specified	Leaky Bucket 1 (GCRA A)			Leaky Bucket 2 (GCRA B)		
	Police	Enforce	Priority	Police	Enforce	Priority
None	CLP=0+1	Congestion 2	10	CLP=0+1	Congestion 2	10
NoCLPNoSCR	CLP=0+1	Congestion 2	10	CLP=0+1	Congestion 2	10
CLPNoTagNoSCR	CLP=0+1	Congestion 2	10	CLP=0	Congestion 2	10
CLPTagNoSCR	CLP=0+1	Congestion 2	10	CLP=0	Congestion 2	10
NoCLPSCR	CLP=0+1	Congestion 2	10	CLP=0+1	Congestion 2	10
CLPNoTagSCR	CLP=0+1	Congestion 2	10	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	10
CLPTagSCR	CLP=0+1	Congestion 2	10	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	10

Unspecified Bit Rate (UBR)

Policing and Enforcement in Each Leaky Bucket for Unspecified Class of Service (UBR)

Traffic Descriptor Specified	Leaky Bucket 1 (GCRA A)			Leaky Bucket 2 (GCRA B)		
	Police	Enforce	Priority	Police	Enforce	Priority
None	CLP=0+1	Congestion 2	15	CLP=0+1	Congestion 2	15
NoCLPNoSCR	CLP=0+1	Congestion 2	15	CLP=0+1	Congestion 2	15
CLPNoTagNoSCR	CLP=0+1	Congestion 2	15	CLP=0	Congestion 2	15
CLPTagNoSCR	CLP=0+1	Congestion 2	15	CLP=0	Congestion 2	15
NoCLPSCR	CLP=0+1	Congestion 2	15	CLP=0+1	Congestion 2	15
CLPNoTagSCR	CLP=0+1	Congestion 2	15	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	15
CLPTagSCR	CLP=0+1	Congestion 2	15	PCR: CLP=0+1 SCR/MBS: CLP=0	Congestion 2	15

The ATM Menu

User Interface commands for configuring and monitoring CSM modules are in the ATM menu. The ATM menu displays as shown below:

```
Command         ATM Management Menu
---------------  -------------------------------------------------------
vap             View the list of atm ports configurations
map             Modify an atm port configuration
vvc             View virtual channel connections
cvc             Create a virtual channel connection
mvc             Modify a virtual channel connection
dvc             Delete a virtual channel connection
vva             View virtual atm addresses
cva             Create a virtual atm address
mva             Modify a virtual atm address
dva             Delete a virtual atm address
vlat            View ATM LANE LE_ARP table
vat             View ATM CIP Arp table
aat             Add static ATM Arp entry for CIP
dat             Delete static ATM Arp entry for CIP
vss             View ATM Service statistics
vls             View atm layer statistics table
vlrs            View atm layer rx error statistics table
vlts            View atm layer tx error statistics table
vcs             View atm connection statistics table
vcrs            View atm connection rx error statistics table
vcts            View atm connection tx error statistics table
vbwg            View the bandwidth group table
mbwg            Modify the bandwidth group table
vgptovc         View group to VC mapping table (Scaling)
cvpt            Create VP Tunnel
dvpt            Delete VP Tunnel
mvpt            Modify VP Tunnel
lvpt            List VP Tunnel(s)
svvc            View the Soft PVC Connections
scvc            Create Soft PVC Connection
masrt           Modify entries in ATM Service Registry Table
mclk            Modify CSM clock configuration
vclka           View CSM clock configuration of all ports on the system
vclk            View CSM clock configuration on configured ports only
mcst            Modify CSM clock switching time
vcac            View CSM Port Auto Configuration information
mcac            Modify CSM Port Auto Configuration Parameters
imce            Enable Intelligent Multicast feature
imcr            Disable Intelligent Multicast feature
imci            Display Gain with Intelligent Multicast Enabled
imcd            Display Intelligent Multicast tree

      Main       File       Summary     VLAN       Networking
      Interface  Security   System      Services   Help
```

This menu contains commands that can be used with ATM uplink modules (ASM modules for the OmniSwitch and ASXs for the Omni Switch/Router), the Frame-to-Cell Switching module (FCSM module), and Cell Switching Modules (CSM modules). The commands in the menu operate differently for ASM, FCSM, and CSM modules.

Several of the commands can be used only with ASM and FCSM modules and are not available for CSM modules. ATM address commands (**vva**, **cva**, **mva**, and **dva**), Classical IP commands (**vat**, **aat**, **dat**), the LAN Emulation command (**vlat**), and the traffic shaping commands (**vbwg** and **mbwg**) are used only with ASM and FCSM modules since they control ATM uplink, or access, connections. In addition, the informational commands **vss**, **vlts**, **vcts,** **vps**, **vpis**, and **vgptovc** are available only for ASM and FCSM modules.

This chapter describes basic ATM menu commands as they apply to CSM modules. The commands are different when used with ASM modules or with FCSM internal ports. See Chapter 35, "Managing ATM Access Modules," for information on how these commands apply to ATM access modules (ASMs and ASXs) and FCSM modules. For special information on how FCSM ports are handled by ATM menu commands see *FCSM Modules in ATM Menu Commands* on page 42-26.

♦ Note ♦

The commands for ATM clocking on CSM modules (**mclk**, **vclka**, **vclk**, and **mcst**) are described in Chapter 47, "Clocking ATM Networks.

For more advanced ATM commands as they apply to CSM modules, see Chapter 43, "Advanced CSM Management." This chapter contains the documentation for Soft PVC commands (**svvc** and **scvc**), Virtual Path (VP) tunneling commands (**cvpt**, **dvpt**, **mvpt**, and **lvpt**), ATM layer statistics commands (**vls** and **vlrs**), ATM connection statistics commands (**vcs** and **vcrs**), intelligent multicast replication commands (**imce**, **imcr**, **imci**, and **imcd**), and the **masrt** command, which is used to configure LANE Configuration Server (LECS) ATM addresses on a CSM.

FCSM Modules in ATM Menu Commands

The FCSM module, which serves as a link between the frame bus and cell matrix, contains an "internal" logical port that is functionally the same as an ASM uplink port. You can obtain statistics on this port and configure ATM services on this port. The FCSM logical port will display as port 1 for the slot in which the FCSM port is installed. For example, if the FCSM is installed in slot 3, then its uplink port will display as port **3/1**.

Half of this internal port 1 on the FCSM module is a CSM port. The CSM half of the port is functionally the same as an OC-3c/STM-1 (FCSM I) port or OC-12c/STM-4c (FCSM II) port, and is directly connected to the ASM half of the port. LAN traffic comes in on the ASM half of this internal port and enters the cell switching fabric on the CSM half of the port.

ATM menu commands that display statistics will show information on the ASM half of the FCSM port and on the CSM half. When viewing these commands keep in mind that these displays reveal information on two halves of the same port.

The following table summarizes the functions of each FCSM port:

FCSM Ports

	Port 1 (FCSM I)	Port 1 (FCSM II)	Port 2 (FCSM I)
ASM half	ATM Services Port	ATM Services Port and Management Data (ILMI, UNI signaling, PNNI)	Management Data (ILMI, UNI signaling, PNNI)
CSM half	Connects ATM Service Port to Cell Matrix	Connects ATM Service Port to Cell Matrix and Management Data (ILMI, UNI signaling, PNNI)	Management Data (ILMI, UNI signaling, PNNI)

The Second FCSM I Port

Both the ASM half of the port and the CSM half of Port 1 on the FCSM module are user-configurable. In some command displays you may also note that there is a *second* FCSM port on the FCSM I. (The FCSM II has only one internal port.) If the FCSM I were installed in slot 2, this second port would display as port **2/2**.

This second internal port also contains an ATM access half and a CSM half. It is used to pass control signals. Unlike the first FCSM I port, this second port is only partially configurable (i.e., SAR and frame buffer sizes only). Virtual channels will by default be set up on this second port for signaling and ILMI. If PNNI is enabled on this port, then an additional channel will be set up for PNNI.

Modifying a Port Configuration

You can use the **map** command to alter CSM port configuration settings. Ports are configured with default settings until you modify them using the **map** command. To use this command, enter **map** followed by the slot and port number of the CSM port you want to modify. For example, to change settings for port 3 on the CSM module in slot 3, you would enter:

map 3/3

A screen similar to the following displays:

```
Slot 3 Port 3 Configuration

1)  Description (30 chars max)         : CSM PORT
2)  ESI (12 hex-chars)                 : 000000000000
    NetPrefix (3903488001bc900001017dee30)
3)  Max VPI bits (1..11)               : 2
4)  Max VCI bits (1..11)               : 10
5)  I/F Type { Pub UNI (1), Priv UNI (2),
        PNNI (3), IISP netw (4),
        IISP user (5)                  : Private
6)  Phy Protocol {SONET (1), SDH (2): SONET
7)  Signaling Ver
          {3.0 (1), 3.1 (2), 4.0 (3) }   : 3.1
8)  ILMI Enable { False (1), True (2) } : True
    80) CSM Port Auto Cfg
          { Enable (1), Disable (2) } : Enable
    81) ILIMI Polling {Off (1), On (2) }  : On
9)  Timing Mode {Local (1), Loop (2) }: Local
    90)    Local { Osc (1), Bus (2) }    : Osc
14) Signaling Status (Disable (1)
                      Enable (2)        : Enable
15) Phy Loopback {none (0), diag (1),
                    line (2) }          : None

Enter (option=value/save/cancel) : cancel
```

You change a value in the field by entering the line number for the variable you want to change, an equal sign (**=**), and then the new value for the variable. (Please note that the values for variables 5-9 are represented by option numbers.) For example, to change the **Signaling Ver** field variable to "3.0," you would enter a 7 (the line number for **Signaling Ver**), an equal sign, and then the option number for the new value, as follows:

7=1

When you are done entering all new values, type **save** at the colon prompt (:) and all new parameters will be saved. If you want to cancel your changes, enter **cancel**. The variables in the **map** command screen are explained in the following sections.

Description

A textual description of this CSM port. The description may be up to 30 characters long. This identifier will be used in displays for other software commands.

ESI

The 20-octet hex ATM address for this CSM port.

Max VPI bits

The maximum number of bits that can be used for Virtual Path Identifiers (VPIs) created on this CSM port. CSM modules support up to 12 bits per VPI. This setting affects the maximum number of Virtual Paths that can be configured on this port. The maximum number of Virtual Paths is 2^n-1 where n is the **Max VPI Bits**. For example, if the **Max VPI Bits** is 4, then the maximum number of Virtual Paths on this port will be 15.

♦ Note ♦

The total bits available for VPIs and VPI/VCIs is 12. You can specify how many bits are allotted for VPIs and how many are for VCIs, but the total must be 12.

Max VCI bits

The maximum number of bits that can be used for Virtual Channel Identifiers (VCIs) created on this CSM port. CSM modules support up to 12 bits per VPI. This setting affects the maximum number of Virtual Channels that can be configured on this port. The maximum number of Virtual Channels is 2^n-1 where n is the **Max VCI Bits**. For example, if the **Max VCI Bits** is 8, then the maximum number of Virtual Channels on this port will be 256.

I/F Type

Specifies the type of ATM interface that this CSM port supports. The options are as follows:

Pub UNI Public UNI. This ATM port will be used for connections to public ATM service carrier switches, such as those used by Telcos.

Priv UNI Private UNI. The port is used for private UNI uplinks. Such a port would connect either directly to an ATM workstation, LAN switch, or ATM attached router.

PNNI 1.0 Private Network-to-Network Interface (PNNI). The port will support PNNI version 1.0 ATM routing, which includes support for a single peer group mapping.

♦ Important Note ♦

If your software version is prior to 4.1, then you *must* reboot the switch when you change the **I/F Type** from **PNNI 1.0** to **Pub UNI**.

IISP Interim Interswitch Signaling Protocol. Typically an IISP port would be part of an intermediate ATM node that did not support the PNNI routing protocol. It is used primarily for establishing static routes using the IISP protocol. The two types of IISP ports are network (**IISP netw**) and user (**IISP user**). See Chapter 46, “Managing IISP and PNNI Routes” for further information.

♦ Important Note ♦

If you want to configure and connect two IISP ports having PNNI and ILMI 4.0 capabilities, you must disable CSM port auto configuration and manually configure the ports instead. According to the ATM Forum ILMI 4.0, the two IISP ports will configure themselves as PNNI if you do not disable port auto configuration in this instance. For more information, see Chapter 46, “Managing IISP and PNNI Static Routes.”

Phy Protocol

The type of physical media standard used for this port. In North America ATM broadband services are delivered over Synchronous Optical Network (SONET) facilities. SONET is a high-speed fiber optic system that uses Synchronous Transfer Signal Level 1 (STS-1).

Outside North America, ATM broadband services use Synchronous Digital Hierarchy (SDH). SDH is a high-speed fiber optic system that uses Synchronous Transfer Mode (STM-1). The OmniSwitch supports both SONET and SDH fiber systems. You select the system with which you want this port to be compatible.

Signaling Ver

The version of the User-to-Network Interface (UNI) used on this port. The switch is compliant with ATM Forum UNI specifications version 3.0 and 3.1. If you have installed the software for multiple-peer group PNNI, then you can also set the signaling version to 4.0.

ILMI Enable

Indicates whether or not you want to enable the Integrated Local Management Interface (ILMI) on this port. Normally, you want to enable ILMI to allow the switch to discover attached ATM End Systems (ESs). If you disable ILMI, then you must configure a static route between this port and all attached ESs. If you want to enable ILMI, select the **True** option. If you want to disable ILMI, select the **False** option.

CSM Port Auto Configuration. Indicates whether or not you want to enable auto configuration on this port.

ILMI Polling. The ILMI status messages sent out at regular intervals (about every 3-5 seconds) from this port. If you want to enable ILMI polling, select the **On** option. If you want to disable ILMI polling, select the **Off** option. The default value for **ILMI Polling** is **On**.

Timing Mode

The clock source from which modules derive their timing. Two transmit timing modes are available: **local timing** and **loop timing**.

Local Timing. For local timing mode, you set which source a port is to use to drive its transmit data. The options are:

- The local oscillator (**Osc**). Using the local oscillator (located on the CSM module) will provide the backplane with a Stratum 4-level clock.
- The bus backplane (**Bus**). You can select either the 8 kHz or 19 MHz bus, depending upon the port type. Select this option if you are planning to provide a single reference clock across the network.

Loop Timing. Typically implemented with public network connections. In loop timing, the reference clock is derived from the receive data, then fed back out with the transmit data.

Signaling Status

Indicates whether or not you want to enable the Service-Specific Connection Oriented Protocol (SSCOP). SSCOP operates on the ATM control plane and is a peer-to-peer protocol that helps set up connections, detect errors in connection, and correct connection errors.

Phy Loopback

The loopback configuration for this port. In live network situations, use the **none** option, which is the default. The other two loopback configurations, **diag** and l**ine**, are intended mainly for debugging or test situations. The following provides more detail on the three loopback configurations:

None	No loopback occurs between receive and transmission paths.
Diag	Interface transmission path is connected to receive path at the connectors. The port receives its own transmission rather than the signal coming over the cable.
Line	The interface receive path is looped to the transmission path at the connectors. The signal on the receive connector is not passed into the UNI and processed.

Creating a Permanent Virtual Circuit

The **cvc** command allows you to create a Permanent Virtual Circuit (PVC) for a physical port and logical VPI or VPI/VCI that you specify. It contains several suboptions for configuring multicast virtual circuits and traffic contract parameters. This section is divided into several subprocedures, all of which are part of the **cvc** command. The subprocedures are as follows:

- Setting Up Basic VC Parameters
- Setting Up Multicast Virtual Circuits
- Configuring Traffic Parameters
- Configuring Statistics and Priority Parameters

You cannot configure Switched Virtual Circuits (SVCs) or Soft PVCs through the **cvc** command. SVCs are set up automatically by the ATM network and Soft PVCs are configured through the **scvc** command. See Chapter 43, "Advanced CSM Management," for information on configuring soft PVCs.

Setting Up Basic VC Parameters

To begin setting up the virtual circuit, enter **cvc** followed by the slot number, a slash (/), and the port number where you want to set up the virtual circuit. After the slot and port number, leave a space, then specify the Virtual Path Identifier (VPI), a slash (/), and then the Virtual Channel Identifier (VCI). (You do not have to include the VCI if you are setting up a Virtual Path only.) For example, the following command specifies a virtual circuit with a VCI of 100, and VPI of 2 on the first port on the module in slot 5:

```
cvc 5/1 2/100
```

Note that these values indicate the *input* port and *input* VPI/VCI for this virtual circuit on this OmniSwitch. Output parameters are specified later through **cvc** screen options.

The following message displays for a moment:

```
creating csm connection, please wait .....
```

The initial message will be followed by a screen of options similar to the following:

```
Slot 4 Port 1 Connection VPI 0 VCI 256 Configuration

Available bandwidth: Tx=353208 Rx=353208

1)  Description (30 chars max)       : Connection 256
2)  Outgoing Slot (1-9)              : 4
3)  Outgoing Port (1-08)             : 1
4)  Outgoing VPI (1-0015)            : 0
5)  Outgoing VCI (1-0255)            : 256

6)  Channel Type { vc-nni(3), vc-uni(4) }                  : VC-UNI
7)  Transport Priority {CBR(1), CBR_PRS(2), VBR_RT(3),     : UBR
                        VBR_NRT(4), ABR(5), UBR(6) }
8)  Multicast Enable { disable(0), enable(1) }             : Disabled
10) AAL5 Discard Continue { disable(0), enable(1) }        : Disabled

11) Traffic Parameters
13) Advanced Parameters

Enter (option=value/save/cancel) :
```

You make changes by entering the line number for the option you want to change, an equal sign (**=**), and then the value for the new parameter. When you are done entering all new values, type **save** at the colon prompt (:) and all new parameters will be saved. The following sections describe the options you can alter through this menu.

1) Description

A textual description of this virtual circuit. You can use up to 30 characters to describe a virtual circuit. For example, if this VC will be used primarily to carry traffic for multimedia workstations, you may want to describe it as "Building #1 VC."

2) Outgoing Slot

The slot number for the module on which output traffic is forwarded along the virtual circuit path.

3) Outgoing Port

The port number on which output traffic is forwarded along the virtual circuit path.

4) Outgoing VPI

The Virtual Path Identifier (VPI) on which output traffic is forwarded along the virtual circuit path.

5) Outgoing VCI

The Virtual Channel Identifier (VCI) on which output traffic is forwarded along the virtual circuit path. This field only displays if you are setting up a Virtual Channel Connection; a VCI is not required if you are setting up just a Virtual Path.

6) Channel Type

The type of connection supported by this channel. Normally, this circuit will connect to a user device, such as an ATM workstation, or to another ATM switch, such as an OmniSwitch. When connected directly to a user device, this connection would be considered a UNI connection (option 4). When connected to another ATM switch, this connection would be considered an NNI connection (option 3).

7) Transport Priority

Indicates the type of traffic and its priority on this connection. Some traffic types require higher priority than others because any disruption in the connection will cause unacceptable results. For example, a circuit emulating a private digital line requires a continuous flow of traffic. Circuit emulation requires Constant Bit Rate (CBR) transport and is given a higher priority than other less sensitive traffic. On the other hand, data connections can tolerate some delay in the connection. Data traffic usually requires Unspecified Bit Rate (UBR) transport. UBR is the default value for this option.

When you set this option, the Class of Service and Priority level of the circuit are automatically selected in **cvc** submenus. The following transport values are available:

CBR (1)	Constant Bit Rate
CBR_PRS (2)	Constant Bit Rate with Primary Reference Source
VBR_RT (3)	Variable Bit Rate, Real Time
VBR_NRT (4)	Variable Bit Rate, Non-Real Time
ABR (5)	Available Bit Rate
UBR (6)	Unspecified Bit Rate

The numbering on the screen indicates the priority level of the traffic except in the case of the two CBR traffic types: **CBR_PRS (2)** is given a higher priority than standard **CBR traffic (1)**.

8) Multicast Enable

Enables multicast, or point-to-multipoint, virtual circuits on this primary virtual circuit. If you enable multicast support, you will receive additional prompts to indicate the identifier values (VPI or VPI/VCI) for multicast virtual circuits. Multicast virtual circuits are leaves of the primary, or root, virtual circuit. In addition, multicast virtual circuits inherit QoS and traffic parameters from the root virtual circuit. See *Point-to-Multipoint Virtual Circuits* on page 42-5 for more information on the multicast virtual circuits. The steps for setting up individual point-to-multipoint virtual circuit are described later in *Configuring Point-to-Multipoint Virtual Circuits* on page 42-35.

10) AAL5 Discard

Indicates how AAL5 PDU cells are discarded. Configuration of this option varies, depending on the following two factors:

1. The **Transport Priority** value entered in option 7. CBR, CBR_PRS, and VBR_RT traffic types do not carry AAL5 PDU cells and are therefore not configurable for AAL5 Discard. See *7) Transport Priority* on page 42-33 for available traffic types.

2. The IOP chip version on the CSM board where you are creating a virtual circuit. The IOP (Input Output Processor) chip is a cell routing engine on CSM boards. IOP1, the older chip version does not support Early Packet Discard (EPD) and Partial Packet Discard (PPD). IOP2, the newer chip version, supports EPD and PPD for UBR, VBR_NRT, and ABR traffic types.

You can view AAL5 Discard configurations on a virtual circuit through the **vcc** command. The following describes the possible displays for the AAL5 Discard field:

- If an older chip version (IOP1) is installed, option 10 displays as follows for all **Transport Priority** values:

  10) AAL5 Discard Continue {disable (0), enable (1) } : disabled

  Enabling AAL5 Discard (which also enables "Partial Packet Discard") increases overall frame throughput for AAL5 traffic during times of congestion. The default for this option is disabled.

- If a newer chip version (IOP2) is installed and UBR, VBR_NRT, or ABR is the **Transport Priority** traffic type entered in option 7, the screen displays as follows:

  10) AAL5 Discard { Disable (0), EPD (1), PPD (2) } :EPD

  Descriptions of these options are as follows:

  Disable (0). Enter **0** to randomly discard cells associated with AAL5 PDU during congestion conditions. Cells are marked when the GCRA contract is violated.

  EPD (1). Enter **1** to enable EPD (Early Packet Discard). EPD allows the switch to selectively discard cells associated with AAL5 PDU during congestion conditions. In this mode, the cells of the whole packet are either passed or discarded. At congestion time, if the first cell of a packet has already passed, then the rest of the packet will be passed. When congestion ends, the first cell of a new packet will be passed. Cells are marked when the GCRA contract has been violated.

  PPD (2). Enter **2** to enable PPD (Partial Packet Discard). PPD allows the switch to selectively discard cells associated with AAL5 PDU during congestion conditions. In this mode, the cells of the rest of the packet—except for the very last cell—are discarded. When congestion ends, the first cell of a new packet will be passed. Cells are marked when the GCRA contract is violated.

- If a newer chip version (IOP2) is installed and VBR_RT, CBR, or CBR_PRS is the **Transport Priority** traffic type entered in option 7, the screen displays as follows:

  10) AAL5 Discard : Disabled

  CBR, CBR_PRS, and VBR_RT traffic types do not carry AAL5 PDU cells and are therefore not configurable for AAL5 Discard. The **AAL5 Discard** option for these traffic types remains at the default value of **disabled**.

11) Traffic Parameters

This option enters a screen of suboptions for configuring traffic descriptors and Quality of Service parameters. This screen and its options are described later in *Configuring Traffic Parameters* on page 42-37.

13) Advanced Parameters

This option enters a screen of suboptions for configuring the priority level for this circuit and for controlling statistics output. This screen and its options are described later in *Configuring Statistics and Priority Parameters* on page 42-42.

Configuring Point-to-Multipoint Virtual Circuits

While configuring a virtual circuit through the **cvc** command, you can configure multicast circuits to be associated with the primary circuit. Multicast circuits are leaves of the root virtual circuit and inherit its traffic properties. Cells on the root circuit are copied to all leaf circuits you specify. See *Point-to-Multipoint Virtual Circuits* on page 42-5 for descriptive information on point-to-multipoint connections.

Option 8 in the **cvc** command allows you to set up point-to-multipoint virtual circuits. Follow these steps:

1. At the bottom of the main **cvc** screen, you will find the following prompt.

   ```
   Enter (option=value/save/cancel) :
   ```

   Enter **8=1** at this prompt to enable multicast support on this virtual circuit. The **cvc** screen re-displays with an additional option under the **Multicast Enable** option, as follows.

   ```
   Enter (option=value/save/cancel) : 8=1

   Slot 5 Port 1 Connection VPI 2 VCI 100 Configuration

           Available bandwidth: Tx=353209 Rx=353209

   1)  Description (30 chars max)       : Connection 100
   2)  Outgoing Slot (1-9)              : 5
   3)  Outgoing Port (1-64)             : 1
   4)  Outgoing VPI (1-0015)            : 2
   5)  Outgoing VCI (1-0255)            : 100

   6)  Channel Type { vc-nni(3), vc-uni(4) }                  : VC-UNI
   7)  Transport Priority {CBR(1), CBR_PRS(2), VBR_RT(3),     : CBR
                           VBR_NRT(4), ABR(5), UBR(6) }
   8)  Multicast Enable { disable(0), enable(1) }             : enable
     20) Add/Delete Multicast { add(1), delete(2) }
            Slot  Port  VPI  VCI       Slot  Port  VPI  VCI
            ------ ------ ----- ----     ------ ------- ----- -----
   10) AAL5 Discard Continue { disable(0), enable(1) }        : disable

   11) Traffic Parameters
   13) Advanced Parameters

   Enter (option=value/save/cancel) :
   ```

2. Enter **20=1** at the **Enter** prompt to add a virtual circuit. When adding leaves to the root, define the branching point on the switch closest to the leaves so as to maximize network resources.

3. The following prompt displays:

   ```
   Enter (slot/port/vpi/vci) to add :
   ```

   Enter the slot, port, VPI, and VCI (if applicable) for this leaf virtual circuit. Separate each identifier with a slash and do not include a space between any of the identifiers. For example, to create a leaf virtual circuit with a VPI of 2 and a VCI of 200 on port 1 of the module in slot 5, you would enter:

   ```
   5/1/2/200
   ```

4. Press **<Enter>**. The **cvc** screen re-displays with information on the virtual circuit you just added. The following shows a sample of what you may see:

```
8)  Multicast Enable { disable(0), enable(1) }              : enable
    20) Add/Delete Multicast { add(1), delete(2) }
        Slot Port  VPI  VCI     Slot  Port  VPI  VCI
        ------ ------  -----  ----      ------ ------- -----  -----
         5     1      8    7
```

5. Continue adding multicast connections by repeating steps 2 through 4. The maximum number of multicast circuits is 8000 per CSM-155 module and 16,000 per CSM-622 module.

♦ **Note** ♦

You can improve the performance of point-to-multi-point connections on OC-3 modules with intelligent multicast replication, which is described in Chapter 43, "Advanced CSM Management."

Configuring Traffic Parameters

The **cvc** command contains a sub-option for configuring traffic parameters, such as traffic descriptors and Quality of Service (QoS) parameters. Option 11 on the main **cvc** screen provides the link to this submenu. Enter **11** at the **Enter** prompt at the bottom of the main **cvc** screen and you will see the following screen of sub-options:

```
Slot 5 Port 1 Connection VPI 2 VCI 200 Configuration

    Available bandwidth: Tx=353210 Rx=353210


1)  Requested Tx QoS Class { Unspecified(0),                : Class 3
       Class1(1), Class2(2), Class3(3), Class4(4)}
2)  Requested TX Best Effort { False (1), True (2) }        : False
3)  Requested Tx Traffic Descriptor Type { None(1),         : CLP Tag SCR
       NoCLPNoSCR(2), CLPNoTagNoSCR(3), CLPTagNoSCR(4),
       NoCLPSCR(5), CLPNoTagSCR(6), CLPTagSCR(7) }
    20)  Peak Cell Rate (cells/sec) for CLP=0+1             : 3
    21)  Sustaining Cell Rate (cells/sec) for CLP=0         : 2
    22)  Maximum Burst Rate (cells) for CLP=0               : 1

4)  Requested Rx QoS Class                                  : Class 3
5)  Requested RX Best Effort { False (1), True (2) }        : False
6)  Requested Rx Traffic Descriptor Type                    : CLP Tag SCR
    30)  Peak Cell Rate (cells/sec) for CLP=0+1             : 3
    31)  Sustaining Cell Rate (cells/sec) for CLP=0         : 2
    32)  Maximum Burst Rate (cells) for CLP=0               : 1

7)   Bi-directional Traffic Params { Off (1), On (2) }      : On


Enter (option=value/save/cancel) :
```

The following sections describe the options on this screen.

1) Requested Tx QoS Class

The Quality of Service (QoS) for cells transmitted (from source to destination) on this VPI or VPI/VCI. The QoS can be Unspecified (**0**), Class 1 (**1**), Class 2 (**2**), Class 3 (**3**), or Class 4 (**4**). Each of these five classes is described in *Quality of Service (QoS)* on page 42-9 and they are listed below. The QoS Class that you select affects the priority of this Virtual Circuit and the Generic Cell Rate Algorithm (GCRA) used to police traffic. See *The ATM Menu* on page 42-24 for more information on the interaction of QoS and GCRAs.

Unspecified Best Effort for data traffic (UBR)

Class 1 Circuit Emulation, Constant Bit Rate Traffic (CBR)

Class 2 Variable Bit Rate for Real Time Audio and Video Traffic (rt-VBR)

Class 3 VBR for Connection-Oriented Protocols Such as Frame Relay (nrt-VBR)

Class 4 Available Bit Rate for Connectionless Data Protocols Such as IP (ABR)

2) Requested Tx Best Effort

Indicates whether to use the Peak Cell Rate (PCR) setting—specified later in this procedure—to determine the amount of bandwidth allocated or to use all available bandwidth. Setting this field to **True** specifies this circuit to use all available bandwidth. Setting this field to **False** specifies the circuit to use the PCR to determine the amount of bandwidth; if bandwidth is not available to support the PCR then this connection will be disabled.

3) Requested Tx Traffic Descriptor Type

The traffic descriptor bundle to be used with this Class of Service. The traffic descriptor bundle you choose here determines which traffic parameters you will specify. The traffic parameters will include the Peak Cell Rate (PCR) and may also include the Sustained Cell Rate (SCR) and Maximum Burst Size (MBS). Each traffic descriptor bundle available is described in *Traffic Contract Descriptors* on page 42-14.

The traffic descriptor along with the Class of Service you choose determines the Generic Cell Rate Algorithm (GCRA), or "leaky bucket," that will be used to police this connection. See *The ATM Menu* on page 42-24 for more information on the relationship between Class of Service, traffic descriptors, and GCRA. The following traffic descriptor bundles and prompts are available:

None No traffic enforcement imposed. No prompts for any traffic parameters.

NoCLPNoSCR Prompts for the Peak Cell Rate (PCR). Option 20 will display as follows:

```
3) Requested Tx Traffic Descriptor Type { None (1),                : NoCLP NoSCR
      NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
      NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
   20) Peak Cell Rate (cells/sec) for CLP=0+1                      : 3
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 traffic. Both the minimum and default setting for PCR is 3 cells per second.

CLPNoTagNoSCR Prompts for the Peak Cell Rate (PCR). Options 20 and 21 will display as follows:

```
3) Requested Tx Traffic Descriptor Type { None (1),                : CLP NoTag NoSCR
      NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
      NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
   20) Peak Cell Rate (cells/sec) for CLP=0+1                      : 3
   21) Peak Cell Rate (cells/sec) for CLP=0                        : 3
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 (CLP=0+1) traffic and separately on CLP=0 traffic. The default setting for PCR on CLP=0+1 traffic is 3 cells per second. The default setting for PCR on CLP=0 traffic is 3 cells per second.

CLPTagNoSCR Prompts for the Peak Cell Rate (PCR). Options 20 and 21 will display as follows:

```
3) Requested Tx Traffic Descriptor Type { None (1),                : CLP_Tag_NoSCR
      NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
      NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
   20) Peak Cell Rate (cells/sec) for CLP=0+1                      : 3
   21) Peak Cell Rate (cells/sec) for CLP=0                        : 3
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 (CLP=0+1) traffic and separately on CLP=0 traffic. The default setting for PCR on CLP=0+1 traffic is 3 cells per second. The default setting for PCR on CLP=0 traffic is 3 cells per second.

NoCLPSCR Prompts for the Peak Cell Rate (PCR), Sustained Cell Rate (SCR), and Maximum Burst Size (MBS). Options 20, 21, and 22 displays as follows:

```
3) Requested Tx Traffic Descriptor Type { None (1),              : NoCLP SCR
     NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
     NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
  20) Peak Cell Rate (cells/sec) for CLP=0+1                     : 3
  21) Sustaining Cell Rate (cells/sec) for CLP+0+1               : 2
  22) Maximum Burst Size                                         : 1
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 (CLP=0+1) traffic. The default setting for PCR is 3 cells per second. The SCR will be checked on the aggregate of CLP=0 and CLP=1 traffic. Both the minimum value and the default setting for SCR is 2 cells per second. SCR must be less than PCR. The MBS will be checked on the aggregate of CLP=0+1 traffic. The MBS default setting is 1 cell.

CLPNoTagSCR Prompts for the Peak Cell Rate (PCR), Sustained Cell Rate (SCR), and Maximum Burst Size (MBS). Options 20, 21, and 22 will display as follows:

```
3) Requested Tx Traffic Descriptor Type { None (1),              : CLP NoTag SCR
     NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
     NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
  20) Peak Cell Rate (cells/sec) for CLP=0+1                     : 3
  21) Sustaining Cell Rate (cells/sec) for CLP=0                 : 2
  22) Maximum Burst Size (cells) for CLP=0                       : 1
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 (CLP=0+1) traffic. The default setting for PCR is 3 cells per second. The SCR will be checked on CLP=0 traffic. The default setting for SCR is 2 cells per second. The MBS will be checked on CLP=0 traffic; the MBS default setting is 1 cell.

CLPTagSCR Prompts for the Peak Cell Rate (PCR), Sustained Cell Rate (SCR), and Maximum Burst Size (MBS).

```
3) Requested Tx Traffic Descriptor Type { None (1),              : CLP Tag SCR
     NoCLPNoSCR (2), CLPNoTagNoSCR (3) CLPTagNoSCR (4),
     NoCLPSCR (5), CLPNo tagSCR (6), CLPTagSCR (7) }
  20) Peak Cell Rate (cells/sec) for CLP=0+1                     : 3
  21) Sustaining Cell Rate (cells/sec) for CLP=0                 : 2
  22) Maximum Burst Size (cells) for CLP=0                       : 1
```

The PCR will be checked on the aggregate of CLP=0 and CLP=1 (CLP=0+1) traffic. The default setting for PCR is 3 cells per second. The SCR will be checked on CLP=0 traffic. The default setting for SCR is 2 cells per second. The MBS will be checked on CLP=0 traffic The MBS default setting is 1 cell.

The following sections describe the traffic parameter prompts that display after you select a traffic descriptor bundle.

Peak Cell Rate

The following is a sample prompt display:

```
20)  Peak Cell Rate (cells/sec) for CLP=0+1      : 3
```

In this field, you specify the Peak Cell Rate (PCR), in cells per second allowed on this VPI or VPI/VCI. The PCR is the fastest cell rate allowed on the connection. The switch will use this parameter as part of the traffic contract for this virtual circuit. A cell rate above the rate you indicate here will denote a violation of the traffic contract and the leaky bucket algorithm will determine which enforcement action take. Note that the PCR will be enforced on CLP=0+1 or CLP=0 cell flows; this prompt will indicate which cell flow is checked.

Sustaining Cell Rate

The following is a sample prompt display:

```
21)  Sustaining Cell Rate (cells/sec) for CLP=0+1    : 2
```

In this field, you specify the Sustaining Cell Rate (SCR), in cells per second allowed on this VPI or VPI/VCI. The SCR is highest average cell rate allowed on the circuit. The switch will use the parameter as part of the traffic contract for this virtual circuit. An average cell rate above the rate you indicate here will denote a violation of the traffic contract and the leaky bucket algorithm will determine which enforcement action take. Note that the SCR will be enforced on CLP=0+1 or CLP=0 cell flows; this prompt indicates which cell flow is checked.

Maximum Burst Rate

The following is a sample prompt display:

```
22)  Maximum Burst Rate (cells) for CLP=0+1      : 1
```

In this field, you specify the Maximum Burst Size (MBS), in cells allowed on this VPI or VPI/VCI. The MBS is the largest single burst of cells allowed on the connection. The switch will use this parameter as part of the traffic contract for this virtual circuit. A burst size above the value you indicate here will denote a violation of the traffic contract and the leaky bucket algorithm will determine which enforcement action to take. Note that the MBS will be enforced on CLP=0+1 or CLP=0 cell flows; this prompt indicates which cell flow is checked.

4) Requested Rx QoS Class

The Quality of Service (QoS) for cells received from the destination at the source on this VPI or VPI/VCI. The QoS can be Unspecified (**0**), Class 1 (**1**), Class 2 (**2**), Class 3 (**3**), or Class 4 (**4**). Each of these five classes is described in *Quality of Service (QoS)* on page 42-9 and they are listed below. The QoS Class that you select affects the priority of this Virtual Circuit and the Generic Cell Rate Algorithm (GCRA) used to police traffic. See *The ATM Menu* on page 42-24 for more information on the interaction of QoS and GCRAs.

Unspecified	Best Effort for data traffic (UBR)
Class 1	Circuit Emulation, Constant Bit Rate Traffic (CBR)
Class 2	Variable Bit Rate for Audio and Video Traffic (rt-VBR)
Class 3	VBR for Connection-Oriented Protocols Such as Frame Relay (nrt-VBR)
Class 4	Available Bit Rate for Connectionless Data Protocols Such as IP (ABR)

5) Requested Rx Best Effort

Indicates whether to use the Peak Cell Rate (PCR) setting—specified later in this procedure—to determine the amount of bandwidth allocated or to use all available bandwidth. Setting this field to **True** specifies this circuit to use all available bandwidth. Setting this field to **False** specifies the circuit to use the PCR to determine the amount of bandwidth; if bandwidth is not available to support the PCR then this connection will be disabled.

6) Requested Rx Traffic Descriptor Type

The traffic descriptor bundle to be used with this Class of Service. The traffic descriptor bundle you choose here determines which traffic parameters you will specify. The traffic parameters will include the Peak Cell Rate (PCR) and may also include the Sustained Cell Rate (SCR) and Maximum Burst Size (MBS). Each traffic descriptor bundle available is described in *Traffic Contract Descriptors* on page 42-14. In addition, please refer to *3) Requested Tx Traffic Descriptor Type* on page 42-38 for information on the traffic descriptor options included in this software option.

7) Bi-directional Traffic Params

Indicates whether you want to use the same traffic parameters for the transmit and receive sides of this virtual circuit. If you enter a **Yes** in this field then the Tx traffic parameters (fields 1 to 3) will match the Rx traffic parameters (fields 4 to 6).

Configuring Statistics and Priority Parameters

The **cvc** command contains a sub-option for configuring the Priority level and the statistics that display for this connection. Option 12 on the main **cvc** screen provides the link to this submenu. Enter **12** at the **Enter** prompt at the bottom of the main **cvc** screen and you will see the following screen of sub-options:

```
Slot 5 Port 1 Connection VPI 2 VCI 200 Configuration

     Available bandwidth: Tx=353209 Rx=353209

1)  User Priority (0-15)                          : 4
2)  CDV (10us-10000us)                            : 1000

Enter (option=value/save/cancel) :
```

The options in this screen are described below.

User Priority

The priority level assigned to this virtual circuit. This priority is used to decide which virtual circuit's traffic is discarded first in a situation where congestion occurs. The priority level for a virtual circuit can range from 0 to 15, with 0 being the highest priority and 15 being the lowest. A default value is supplied for User Priority based on the type of traffic you specified under the **Traffic Priority** option on the main **cvc** screen (Option 7). The following defaults are supplied for each traffic type:

Traffic Type and Priority

Traffic Type	Default Priority Level
CBR	4
VBR	8
ABR	8
UBR	15

You can fine tune these priorities through this option. For example, some CBR circuits can be given higher priority than other CBR circuits by assigning a User Priority of 1, 2, or 3 rather than CBR default of 4.

CDV

Cell Delay Variation in microseconds. Also referred to as "jitter," this value is the change that occurs in cell spacing from the time cells leave one node and arrive at another node.

Configuring VP Switching

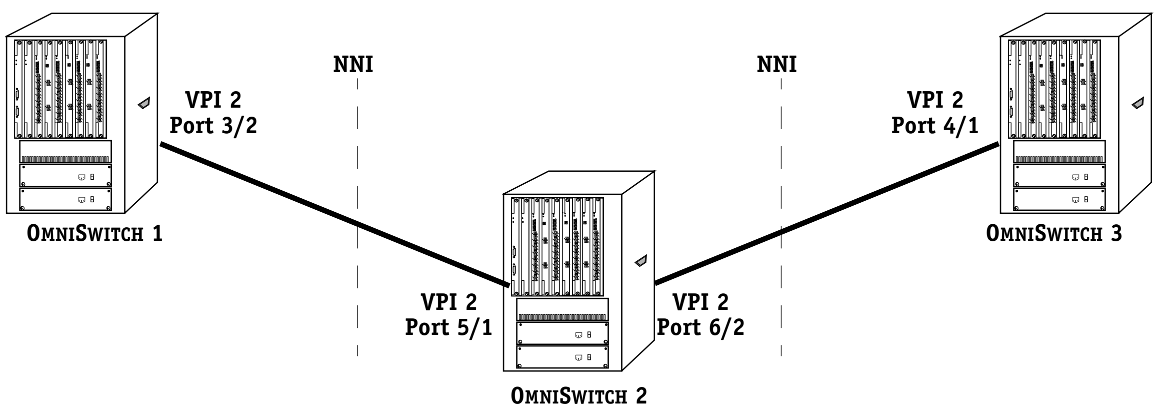
You can set up virtual path (VP) switching on an OmniSwitch with the **cvc** command by configuring separate incoming and outgoing ports. In addition, you can set up a VP with incoming and outgoing ports on separate switching modules.

You can configure VP switching on any CSM module. For example, you can configure an incoming port on a CSM-AB-IMA submodule and an outgoing port on a CSM-155 module. However, you *cannot* configure VP switching on an ASM module.

♦ Note ♦

When configuring VP switching, you need to consider the range of VPIs supported by the CSM ports used. For example, if one CSM port supports VPIs 0 to 2 and the other CSM port supports VPIs 0 to 4, then you must use only VPIs 0 to 2.

As shown in the figure below, OmniSwitch 2 has been configured for VP switching. CSM port 5/1 on OmniSwitch 2 has been configured as the incoming port and CSM port 6/2 has been configured as the outgoing port.



VP Switching on an NNI Connection

Follow the steps below to configure a switch for VP switching.

1. Enter cvc followed by the slot number of the incoming port, a slash (/), the port number of the incoming port, and the VPI number. For example, to configure VP switching on incoming VPI No. 2 on Slot 5, Port 1, enter

```
cvc 5/1 2
```

A screen similar to the following will be displayed.

```
Slot 5 Port 1 Connection VPI 2 VCI 100 Configuration

        Available bandwidth: Tx=353209 Rx=353209

1)  Description (30 chars max)      : Connection 100
2)  Outgoing Slot (1-9)             : 5
3)  Outgoing Port (1-08)            : 1
4)  Outgoing VPI (1-0015)           : 2
5)  Outgoing VCI (1-0255)           : 100

6)  Channel Type { vc-nni(3), vc-uni(4) }                   : VC-UNI
7)  Transport Priority {CBR(1), CBR_PRS(2), VBR_RT(3),      : UBR
             VBR_NRT(4), ABR(5), UBR(6) }
8)  Multicast Enable { disable(0), enable(1) }              : disable
10) AAL5 Discard Continue { disable(0), enable(1) }         : enable

11) Traffic Parameters
13) Advanced Parameters

Enter (option=value/save/cancel) :
```

2. Enter **2**, followed by **=**, and followed by the slot number to set the outgoing slot. For example, to set the outgoing slot to 6, enter

   2=6

   at the prompt.

3. Enter **3**, followed by **=**, and followed by the port number to set the outgoing port. For example, to set the outgoing port to 2, enter

   3=2

   at the prompt.

4. Enter **4**, followed by **=**, and followed by the VPI number to set the outgoing VPI. For example, to set the outgoing VPI to 2, enter

   4=2

   at the prompt.

5. Enter

   6=2

   at the prompt to set the channel type to NNI.

6. Enter

   save

   at the system prompt to save your settings.

Modifying a Virtual Circuit

You can modify any parameters for a virtual circuit that you previously configured. The **mvc** command enables you to modify a virtual circuit, including soft PVCs. It uses the same screens and allows you to change the same parameters as the **cvc** and **scvc** commands. Use of **mvc** is essentially the same as the corresponding configuration command (**cvc** or **scvc**).

To begin modifying a virtual circuit, enter **mvc** followed by the slot number, a slash (/), and the port number for the input virtual circuit. After the slot and port number, leave a space, then specify the Virtual Path Identifier (VPI), a slash (/), and then the Virtual Channel Identifier (VCI). (Do not include the VCI if you are modifying a Virtual Path only.) For example, the following command specifies to modify a virtual circuit with a VCI of 7 and a VPI of 6 on the first port on the module in slot 5:

mvc 5/1 6/7

For more information on the **mvc** screens and parameters, see *Creating a Permanent Virtual Circuit* on page 42-31 for PVCs and Chapter 43, "Advanced CSM Management" for soft PVCs.

Deleting a Virtual Circuit

You can delete a virtual circuit using the **dvc** command. When you delete the circuit, the VPI or VPI/VCI parameters are deleted and any reserved bandwidth is released.

To delete a virtual path or virtual channel enter **dvc** followed by the slot number of the CSM module where the circuit was set up, the physical port number for the circuit, and the VPI and/or VCI of the circuit. For example, if wanted to delete virtual channel 7 on virtual path 4 and port 1 of the CSM module in slot 5, you would enter:

dvc 5/1 4/7

Note that there is a space between the slot/port specification and the VPI/VCI specification. You can also specify to delete just a virtual path. In this case, you would simply leave out the VCI at the end of the command. For example, to delete Virtual Path 3 on port 1 on the CSM module in slot 5, you would enter:

dvc 5/1 3

Again note that there is a space between the slot/port numbers and the VPI.

After you specify to delete a circuit, you will receive a message asking you to confirm the deletion:

Remove CSM Slot 5 Port 1 Connection VPI 7 VCI 7 (n)? :

Stop the deletion by pressing **<Enter>** or entering **N** at this prompt. A message similar to the following displays:

CSM Slot 5 Port 1 Connection VPI 7 VCI 7 not removed

Confirm the deletion by entering a **Y** at the confirmation prompt. The VPI or VCI will be removed and a message similar to the following displays:

Removing CSM Slot 5 Port 1 Connection VPI 7 VCI 7, please wait...

CSM Slot 5 Port 1 Connection VPI 7 VCI 7 removed

CSM Port Auto Configuration

Auto configuration allows you to directly connect an X-Cell CSM port to another switch's ATM port without requiring manual configuration. When you enable auto configuration procedures on a specified port, the port automatically configures the interface type and signaling version of a connected peer port. User interface commands to configure and view CSM auto port configuration parameters are described in the sections that follow.

Modifying CSM Port Auto Configuration

The **mcac** command allows you to modify port auto configuration parameters on a single CSM port, a specified list of CSM ports, all ports on a single CSM board, or all CSM ports in an OmniSwitch chassis. To modify all CSM ports in a switch, enter the **mcac** command at the system prompt. A screen similar to the following displays:

```
CSM Port Auto Configuration Parameters

1)  CSM Auto Configuration { Enable (1), Disable (2) }: Enable
2)  Trigger CSM Auto Configuration By
    { Physical Link Up(1), Logic Link Up(2), Both(3) }: Both
3)  Default Interface Type { Pub UNI(1), Pri UNI(2),
    PNNI(3), IISP netw(4), IISP user(5) }:Private UNI
4)  Default Sig Version { 3.0(1), 3.1(2), 4.0 (3) } : 3.1

Enter (option=value/save/cancel) :
```

You change a value in the field by entering the line number for the variable you want to change, an equal sign (**=**), and then the option number for the new value. For example, if you wanted to change the **Default Sig Version** field variable to 3.0, you would enter a 4 (the line number for **Default Sig Version**), an equal sign, and then the option number for the new value as follows:

```
4=1
```

When you are done entering all new values, type **save** at the colon prompt (:) and all new parameters will be saved. If you want to cancel your changes, enter **cancel**. The following sections describe the options you can alter through the **mcac** command.

CSM Auto Configuration

This option enables or disables auto configuration on the port(s) you are modifying. In Release 4.1 and later, the default for auto configuration is **disabled**; however, if you load new software on your switch, it will not disable auto configuration if it is already enabled.

♦ Note ♦

A redundant ATM uplink may be incorrectly configured if port auto configuration was initially enabled but then became disabled. If your primary ATM uplink goes down, then you should verify the ATM uplink's port configuration through the **vap** command.

Trigger CSM Auto Configuration By

This option sets up the conditions for triggering auto configuration procedures. Possible values are as follows:

Physical link up. Physical link up refers to the physical connectivity established with another port. Physical connectivity, indicated by a green light on the CSM link LED, occurs when the cable from another switch is plugged into the specific port or when a connected switch turns on. If you choose this option, auto configuration procedures will be triggered only once, after the physical link connectivity is established. ILMI trap messages from a peer port (i.e., a logical link up) will not trigger auto configuration.

Logical link up. Logical link up refers to the ILMI trap messages sent from a peer port. Trap messages are sent whenever a peer port changes its operating parameters or resets itself. Trap messages trigger ILMI auto configuration procedures in the peer port. The logical link up option will enable a port to dynamically adapt to the changes of its peer port. For example, if an ASM port is connected to a CSM port and the user changes the ASM port UNI version from 3.0 to 3.1, the CSM port will detect the change and automatically switch its UNI version to 3.1.

♦ Note ♦

Non-ILMI 4.0 implementation or vendor specific implementations might send out erroneous traps. In such cases, you may want to disable the logical link up in order to avoid de-stabilizing CSM ports.

Both. This is the default value for this option. If you choose this option, auto configuration procedures will be triggered in both Physical Link Up and Logical Link Up situations described above.

Default Interface Type

This option sets up the default interface type used on this port(s) if auto configuration procedures cannot determine the interface type. The default setting is private Network-to-Node Interface (PNNI), unless otherwise configured by the user. If auto configuration procedures cannot determine the interface type, the port(s) will support the default interface type specified in this menu.

♦ Important Note ♦

In Release 4.1 and later, changing the interface type will take place immediately after you save your changes. You do not need to reboot the switch.

Default Sig Version

This option sets up the default signaling version used on this port(s) if auto configuration procedures cannot determine the signaling version. The default setting is 3.1, unless otherwise configured by the user. If auto configuration procedures cannot determine the interface type, the port(s) will support the default signaling version specified in this menu.

♦ Important Note ♦

In Release 4.1 and later, changing the signaling version will take place immediately after you save your changes. You do not need to reboot the switch.

Modifying One or More CSM Boards

The **mcac** command allows you to modify port auto configuration information on one or more CSM boards. To modify port auto configuration information on a single board, you enter the **mcac** command along with the slot number for the CSM board, as follows:

mcac <slot>

where **<slot>** is the slot number where the CSM board is installed. For example, if you wanted to modify information on the board in slot 4, you would enter:

mcac 4

This specification allows you to modify all the ports on the board in slot 4. Additionally, if you wanted to modify port auto configuration information on more than one CSM board, you would enter the **mcac** command followed by a list of the slot numbers for which you want to view information as follows:

mcac <slot list>

where **<slot list>** is a list of the slots for the CSM boards on which you want to modify port auto configuration information. Use the **<slot>/<port>** format and separate the slot range with the tilde sign (**~**). For example, if you wanted to modify the boards in slots 3 through 5, you would enter:

mcac 3~5

This specification allows you to modify all the ports in boards 3 through 5. If you wanted to modify a list of non-consecutive slots, separate slot specifications with a comma, as follows:

mcac 3,5,7

You may use both syntaxes in your slot list, as follows:

mcac 3,5~7

Note that there are no spaces between slot specifications.

Modifying One or More Ports

The **mcac** command allows you to modify port auto configuration information on one or more CSM ports. To modify a single port, you enter the **mcac** command along with the slot number for the CSM board and the port number for which you want to receive information, as follows:

mcac <slot>/<port>

where **<slot>** is the slot number where the CSM board is installed and **<port>** is the port number on the CSM board. For example, if you wanted to modify information for port 1 on the CSM module in slot 4, you would enter:

mcac 4/1

Additionally, if you wanted to modify port auto configuration for more than one port, you would enter the **mcac** command followed by a list of the port numbers for which you want to modify, as follows:

mcac <port list>

where **<port list>** is a list of CSM ports on which you want to modify port auto configuration information. Use the **<slot>/<port>** format and separate the range of port specifications with the tilde sign (**~**). For example, if you wanted to modify ports 2 through 7 in slot 4, you would enter:

vcac 4/2~4/7

If the ports you modify are not all on the same CSM board, use the **<slot>/<port>** and separate port specifications with a comma. The following is an example of a port list specification of ports on different CSM boards:

vcac 3/1,3/7,4/3

Note that there are no spaces between port specifications.

You may also view information on the specific instance number for a single port on a CSM board by entering:

mcac <slot>/<port> <instance>

where **<slot>** is the slot number where the CSM board is installed, **<port>** is the port number on the CSM board, and **<instance>** is the instance number of the port. Note that there is a space separating **<slot>/<port>** and instance number. For example, if you wanted to view basic information for instance 2 on port 1, in slot 3, you would enter:

mcac 3/1 2

Viewing CSM Port Auto Configuration

The **vcac** command allows you to view auto configuration information on a single CSM port, a specified list of CSM ports, all ports on a single CSM board, or all CSM ports in an OmniSwitch chassis. To view all CSM ports in a switch, enter the **vcac** command at the system prompt. The following is a sample display.

ATM Port Table

Abs Port	Slot	Port	Inst	Enable Auto Cfg	Trigger Auto Cfg	Current I/F Type	Current Sig Ver	Default I/F Type	Default Sig Ver
64	2	1	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
72	2	2	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
192	4	1	0	Enabled	Phy&Logic	PNNI	- - - -	Pri UNI	UNI3.1
200	4	2	0	Disabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
208	4	3	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
216	4	4	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
224	4	5	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
232	4	6	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
240	4	7	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1
248	4	8	0	Enabled	Phy&Logic	Pri UNI	UNI3.0	Pri UNI	UNI3.1

Abs Port	Auto Cfg Status	Peer UNI Typ	Peer Dev Typ	Peer Uni Ver	Peer NNI Sig	Peer ILMI Ver
64	Cfg Done	Private	User	UNI3.0	Unsupported	ILMI4.0
72	Idle	n/a	n/a	n/a	n/a	n/a
192	Idle	n/a	n/a	n/a	n/a	n/a
200	Idle	n/a	n/a	n/a	n/a	n/a
208	Idle	n/a	n/a	n/a	n/a	n/a
216	Idle	n/a	n/a	n/a	n/a	n/a
224	Idle	n/a	n/a	n/a	n/a	n/a
232	Idle	n/a	n/a	n/a	n/a	n/a
240	Idle	n/a	n/a	n/a	n/a	n/a
248	Idle	n/a	n/a	n/a	n/a	n/a

Abs Port. An internal port assignment used by CSM software to identify ports. You might use this number for the sake of comparison when viewing displays for PNNI-specific commands, which are found in the PNNI sub-menu. Additionally, the absolute port number may be used for tracing auto configuration debugging messages.

Slot/Port. Indicates the CSM module and the port for which auto configuration is provided. Each row in the table gives information for a single CSM port.

Inst. Indicates the instance of the virtual UNI/NNI on this particular CSM port. A physical CSM port has an instance of zero. Any virtual ports configured through VP tunneling will have an instance that is greater than zero.

Enable Auto Cfg. Indicates whether or not you want to enable auto configuration on this port.

Trigger Auto Cfg. Indicates whether auto configuration of this port is triggered by a physical link up, a logical link up, or both. Physical link up refers to the physical layer connection established by a plugged in cable or a switch re-boot. Logical link up refers to situations such as a peer port re-setting or logical link connectivity (ILMI) being re-established. A logical link connection is indicated by an ILMI trap message from a peer port. The physical connection should always be up during a logical link up.

Current I/F Type. Specifies the type of ATM interface that this port supports. The options are described below:

Pub UNI Public UNI. This port will be used for connections to public ATM service carrier switches, such as those used by Telcos.

Priv UNI Private UNI. This port is used for private UNI uplinks. Such a port would connect either directly to an ATM workstation, LAN switch, or ATM attached router.

PNNI 1.0 Private Network-to-Network Interface (PNNI). The port will support PNNI version 1.0 ATM routing, which includes support for a single peer group mapping.

♦ Important Note ♦

If your software version is prior to 4.1, then you *must* reboot the switch when you change the **I/F Type** from **PNNI 1.0** to **Pub UNI**.

IISP Interim Interswitch Signaling Protocol. Typically an IISP port would be part of an intermediate ATM node that did not support the PNNI routing protocol. It is used primarily for establishing static routes using the IISP protocol. See Chapter 46, "Managing IISP and PNNI Static Routes" for further information.

♦ Important Note ♦

If you want to configure and connect two IISP ports having PNNI and ILMI 4.0 capabilities, you must disable CSM port auto configuration and manually configure the ports instead. According to the ATM Forum ILMI 4.0, the two IISP ports will configure themselves as PNNI if you do not disable port auto configuration in this instance,. For more information, see Chapter 46, "Managing IISP and PNNI Static Routes."

Current Sig Ver. The version of the User-to-Network Interface (UNI) used on this port. OmniSwitch is compliant with ATM Forum UNI specifications versions 3.0 and 3.1. If you have installed the software for multiple-peer group PNNI, then you can also set the signaling version to 4.0. You select which version your ATM network supports.

Default I/F Type. Specifies the default type of ATM interface that this port supports if auto configuration procedures cannot determine the interface type. The default setting is private Network-to-Node Interface (PNNI), unless otherwise configured by the user.

Default Sig Ver. The default version used on this port if auto configuration procedures cannot determine the signaling version. The default setting is private User-to-Network Interface (pri UNI) 3.1, unless otherwise configured by the user.

Auto Cfg Status. Indicates the status of auto configuration on this port. An **Idle** status means that auto configuration on this port is not active. A **Done** status means that auto configuration procedures on this port have completed. An **In progress** status means that auto configuration is currently running.

Peer UNI Typ. The type of the ATM User-to-Network Interface (UNI) used on the peer port. The two possible types are private and public.

Peer Dev Typ. The type of device used on the peer port. The two possible device types are User or Network.

Peer UNI Ver. The version of the ATM User-to-Network Interface used on the peer port. The version number corresponds to the ATM Forum Specification with which this UNI implementation complies. The OmniSwitch is compliant with UNI versions 3.1 and 3.0.

Peer NNI Sig. The version of the Network-to-Network interface (NNI) used on the peer port.

Peer ILMI Ver. The version (4.0) of the Integrated Local Management Interface (ILMI) used on the peer port.

Information on the Ports for One or More CSM Boards

To view **vcac** port auto configuration information on one or more CSM boards, you enter the **vcac** command along with the slot number for the CSM board, as follows:

vcac <slot>

where **<slot>** is the slot number where the CSM board is installed. For example, if you wanted to view information on the board in slot 4, you would enter:

vcac 4

This command displays a screen similar to the following:

Abs Port	Slot	Port	Inst	Enable Auto Cfg	Trigger Auto Cfg	Current I/F Type	Current Sig Ver	Default I/F Type	Default Sig Ver
192	4	1	0	Enabled	Phy&Logic	PNNI	- - - -	Pri UNI	UNI3.1
200	4	2	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
208	4	3	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
216	4	4	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
224	4	5	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
232	4	6	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
240	4	7	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1
248	4	8	0	Disabled	Phy&Logic	Pri Uni	Uni3.0	Pri Uni	UNI 3.1

Abs Port	Auto Cfg Status	Peer UNI Typ	Peer Dev Typ	Peer Uni Ver	Peer NNI Sig	Peer ILMI Ver
192	Idle	n/a	n/a	n/a	n/a	n/a
200	Idle	n/a	n/a	n/a	n/a	n/a
208	Idle	n/a	n/a	n/a	n/a	n/a
216	Idle	n/a	n/a	n/a	n/a	n/a
224	Idle	n/a	n/a	n/a	n/a	n/a
232	Idle	n/a	n/a	n/a	n/a	n/a
240	Idle	n/a	n/a	n/a	n/a	n/a
248	Idle	n/a	n/a	n/a	n/a	n/a

Additionally, if you wanted to view auto configuration information on more than one CSM board, you would enter the **vcac** command followed by a list of the slot numbers for which you want to view information as follows:

vcac <slot list>

where **<slot list>** is a list of the slots for the CSM boards on which you want to view port auto configuration information. If you wanted to view a range of consecutive slots, separate the slot range with the tilde sign (**~**), as follows:

vcac 3~5

If you wanted to view a list of non-consecutive slots, separate slot specifications with a comma, as follows:

vcac 3,5,7

You may use both syntaxes in your slot list, as follows:

vcac 3,5~7

Note that there are no spaces between slot specifications.

Descriptions of the columns included in the above display are described earlier in *Viewing Virtual Connections* on page 42-71.

Information on One or More Single Ports

To view port auto configuration information on one or more single CSM ports, you enter the **vcac** command along with the slot number for the CSM board and the port number for which you want to receive information, as follows:

vcac <slot>/<port>

where **<slot>** is the slot number where the CSM board is installed and **<port>** is the port number on the CSM board. For example, if you wanted to view information for port 1 on the CSM module in slot 4, you would enter:

vcac 4/1

This command displays a screen similar to the following:

Abs Port	Slot	Port	Inst	Enable Auto Cfg	Trigger Auto Cfg	Current I/F Type	Current Sig Ver	Default I/F Type	Default Sig Ver
====	====	====	====	========	==========	=======	=======	=======	======
192	4	1	0	Enabled	Phy&Logic	PNNI	- - - -	Pri UNI	UNI3.1

Abs Port	Auto Cfg Status	Peer UNI Typ	Peer Dev Typ	Peer Uni Ver	Peer NNI Sig	Peer ILMI Ver
====	========	=======	=======	=======	===========	========
192	Idle	n/a	n/a	n/a	n/a	n/a

Additionally, if you wanted to view more than one port, you would enter the **vcac** command followed by a list of the port numbers for which you want to receive information, as follows:

vcac <port list>

where **<port list>** is a list of CSM ports on which you want to view port auto configuration information. Use the **<slot>/<port>** format and separate port specifications by a comma, as follows:

vcac 3/1,3/7,4/3

If you wanted to view a range of consecutive ports in the same module, separate the port range with the tilde sign (**~**), as follows:

vcac 3/1~3/7

You may use both syntaxes, as follows:

vcac 3/1~3/7,4/3

Note that there are no spaces between port specifications.

Descriptions of the columns included in the above display are described earlier in *Viewing Virtual Connections* on page 42-71.

Information on One Virtual Instance

To view auto configuration information on a single virtual UNI/NNI instance, you enter the **vcac** command along with the slot number for the CSM board, the port number, and the **Inst** number for the UNI/NNI instance on which you want information, as follows:

vcac <slot>/<port> <instance>

where **<slot>** is the slot number where the CSM board is installed, **<port>** is the port number on the CSM board, and **<instance>** is the virtual UNI/NNI instance on the physical port. Note that there is a space separating **<slot>/<port>** and **<instance>**. For example, if you wanted to view information for the board in slot 3, port 1, instance 2, you would enter:

vcac 3/1 2

Note that there is a space between the port specification and the instance number. This command displays a screen similar to the following:

```
Abs                     Enable     Trigger    Current  Current  Default  Default
Port Slot Port Inst   Auto Cfg   Auto Cfg   I/F Type Sig Ver  I/F Type Sig Ver
==== ==== ==== ==== ======== ========== ======= ======= ======= ======
192  4    1    1     Enabled   Phy&Logic  PNNI       ----   Pri UNI  UNI3.1

Abs   Auto Cfg   Peer     Peer     Peer       Peer        Peer
Port   Status   UNI Typ  Dev Typ  Uni Ver    NNI Sig    ILMI Ver
==== ======== ======= ======= ======= =========== ========
192  Idle       n/a      n/a      n/a      n/a          n/a
```

Descriptions of the columns included in this display are described earlier in *Viewing Virtual Connections* on page 42-71.

Viewing Port Configurations

The **vap** command allows you to view basic information on a single CSM port, all ports on a single CSM board, or all CSM ports in an OmniSwitch chassis. In addition, it will also display information on ATM uplink module (ASM) ports (if present) and the internal FCSM ports. The following is a sample display.

ATM Port Table

Slot	Port	ATM Port Description	Conn Type	Tran Type	Media Type	UNI Typ	Max VCC	VCI bits
2	1	ATM PORT	SVC	- -	- -	Pri	1023	10
2	2	ATM PORT	PVC	- -	- -	Pri	1023	10
5	1	ATM PORT	SVC	STS12	Multi	Pri	1023	10
6	1	ATM PORT	SVC	STS3c	Multi	Pri	1023	10

Slot	Port	Loopback Cfg	Tx Clk Source
2	1	NoLoop	LocalTiming
2	2	NoLoop	LocalTiming
5	1	NoLoop	LocalTiming
6	1	NoLoop	LocalTiming

Slot	Port	ATM Network Prefix	End System Identifier	Sig Ver	Sig VCI	ILMI Enable	ILMI VCI	ILMI Poll
2	1	3903488001bc90000101dbd400	0020da98e910	3.0	5	True	16	Off
2	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	1	3903488001bc90000101dbcfa0	0020dace0660	3.1	5	True	16	Off
5	1	00000000000000000000000000	0020dab344f0	3.0	5	True	16	Off

Status
=======

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
2	1	WED SEP 29 10:03:37 1999	WED SEP 29 10:03 :32 1999	2	1	Up
2	2	- - - - - - - -	- - - - - - - -	0	0	Down
5	1	WED SEP 29 10:10:53 1999	WED SEP 29 10:10 :46 1999	50	49	Up
6	1	- - - - - - - -	- - - - - - - -	0	0	Down

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
2	1	WED SEP 29 10:03:30 1999	- - - - - - - -	1	0	Up
2	2	- - - - - - - -	- - - - - - - -	0	0	Down
5	1	WED SEP 29 10:02:51 1999	- - - - - - - -	1	0	Up
6	1	- - - - - - - -	- - - - - - - -	0	0	Down

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
2	1	WED SEP 29 10:02:11 1999	- - - - - - - -	1	0	Enb (SVC)
2	2	WED SEP 29 10:01:46 1999	- - - - - - - -	1	0	Enb (CTL)
5	1	WED SEP 29 10:02:25 1999	- - - - - - - -	1	0	Enb (PVC)
6	1	- - - - - - - -	- - - - - - - -	0	0	Dis (R)

Slot	Port	Tx SegSz	Rx Seg Sz	Tx Buff Sz	Rx Buff Sz
2	1	16384	16384	4600	4600
2	2	8192	8192	8192	8192
5	1	131072	131072	4600	4600
6	1	131072	131072	4600	4600

Slot	Port	Primary	ATM HSM3 Secondary	Redundant FailOver	Port Status	Reason of Last Failover
5	1	Active	Inactive	0		

— Output continues on next page —

CSM Port Table

Slot	Port	CSM Port Description	Tran Type	Media Type	Intrf Type	Uni Ver	#Bits VPI	#Bits VCI
2	1	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
2	2	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
3	1	CSM PORT	STS3c	Multi	PNNI	---	2	10
3	2	CSM PORT	STS3c	Multi	PNNI	---	2	10
3	3	CSM PORT	STS3c	Multi	PNNI	---	2	10
3	4	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
3	5	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
3	6	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
3	7	CSM PORT	STS3c	Multi	PNNI	---	2	10
3	8	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	1	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	2	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	3	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	4	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	5	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	6	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	7	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	8	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10

Slot	Port	ATM Address	Max VPCs	Max VCCs	Cfgd VPCs	Cfgd VCI
2	1	3903488001bc9000010176fd600020da0000c000	3	1022	0	3
2	2	3903488001bc9000010176fd600020da0000c800	3	1022	0	9
3	1	3903488001bc9000010176fd600020da0000d000	3	1022	0	0
3	2	3903488001bc9000010176fd600020da0000d800	3	1022	0	2
3	3	3903488001bc9000010176fd600020da0000e000	3	1022	0	11
3	4	3903488001bc9000010176fd600020da0000e800	3	1022	0	0
3	5	3903488001bc9000010176fd600020da0000f000	3	1022	0	0
3	6	3903488001bc9000010176fd600020da0000f800	3	1022	0	0
3	7	3903488001bc9000010176fd600020da00010000	3	1022	0	0
3	8	3903488001bc9000010176fd600020da00010800	3	1022	0	0
4	1	3903488001bc9000010176fd600020da00011000	3	1022	0	0
4	2	3903488001bc9000010176fd600020da00011800	3	1022	0	0
4	3	3903488001bc9000010176fd600020da00012000	3	1022	0	0
4	4	3903488001bc9000010176fd600020da00012800	3	1022	0	0
4	5	3903488001bc9000010176fd600020da00013000	3	1022	0	0
4	6	3903488001bc9000010176fd600020da00013800	3	1022	0	0
4	7	3903488001bc9000010176fd600020da00014000	3	1022	0	0
4	8	3903488001bc9000010176fd600020da00016000	3	1022	0	0

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
2	1	WED SEP 29 10:03:37 1999	WED SEP 29 10:03:24 1999	2	1	Up
2	2	- - - - - - - -	- - - - - - - -	0	0	Down
3	1	- - - - - - - -	- - - - - - - -	0	0	Down
3	2	- - - - - - - -	- - - - - - - -	0	0	Down
3	3	WED SEP 29 10:03:21 1999	- - - - - - - -	1	0	Up
3	4	- - - - - - - -	- - - - - - - -	0	0	Down
3	5	- - - - - - - -	- - - - - - - -	0	0	Down
3	6	- - - - - - - -	- - - - - - - -	0	0	Down
3	7	- - - - - - - -	- - - - - - - -	0	0	Down
3	8	- - - - - - - -	- - - - - - - -	0	0	Down
4	1	- - - - - - - -	- - - - - - - -	0	0	Down
4	2	- - - - - - - -	- - - - - - - -	0	0	Down
4	3	- - - - - - - -	- - - - - - - -	0	0	Down
4	4	- - - - - - - -	- - - - - - - -	0	0	Down
4	5	- - - - - - - -	- - - - - - - -	0	0	Down
4	6	- - - - - - - -	- - - - - - - -	0	0	Down
4	7	- - - - - - - -	- - - - - - - -	0	0	Down
4	8	-- - - - - - -	- - - - - - - -	0	0	Down

— Output continues on next page —

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
2	1	WED SEP 29 10:03:30 1999	--------	1	0	Up
2	2	--------	--------	0	0	Down
3	1	--------	--------	0	0	Down
3	2	--------	--------	0	0	Down
3	3	--------	--------	0	0	Down
3	4	--------	--------	0	0	Down
3	5	--------	--------	0	0	Down
3	6	--------	--------	0	0	Down
3	7	--------	--------	0	0	Down
3	8	--------	--------	0	0	Down
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
2	1	WED SEP 29 10:03:18 1999	--------	1	0	En
2	2	WED SEP 29 10:03:18 1999	--------	1	0	En
3	1	--------	WED SEP 29 10:03:18 1999	0	1	Dis
3	2	--------	WED SEP 29 10:03:19 1999	0	1	Dis
3	3	WED SEP 29 10:03:19 1999	--------	1	0	En
3	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	7	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	1	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	2	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	3	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	7	--------	WED SEP 29 10:03:211999	0	1	Dis
4	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis

Slot	Port	Mode	Phy Protocol	Signaling	ILMI ------------ Enable/ Poll	CSM Port Auto Cfg
2	1	Normal	SONET	Enb	Enable/Off	Enabled
2	2	Normal	SONET	Enb	Enable/Off	Enabled
3	1	Normal	SONET	Enb	Enable/On	Enabled
3	2	Normal	SONET	Enb	Enable/On	Enabled
3	3	Normal	SONET	Enb	Enable/On	Enabled
3	4	Normal	SONET	Enb	Enable/On	Enabled
3	5	Normal	SONET	Enb	Enable/On	Enabled
3	6	Normal	SONET	Enb	Enable/On	Enabled
3	7	Normal	SONET	Enb	Enable/On	Enabled
3	8	Normal	SONET	Enb	Enable/On	Enabled
4	1	Normal	SONET	Enb	Enable/On	Enabled
4	2	Normal	SONET	Enb	Enable/On	Enabled
4	3	Normal	SONET	Enb	Enable/On	Enabled
4	4	Normal	SONET	Enb	Enable/On	Enabled
4	5	Normal	SONET	Enb	Enable/On	Enabled
4	6	Normal	SONET	Enb	Enable/On	Enabled
4	7	Normal	SONET	Enb	Enable/On	Enabled
4	8	Normal	SONET	Enb	Enable/On	Enabled

— Output continues on next page —

			Clock Source	
Slot	Port	Timing Mode	Configured Source	Current Source
3	1	Local	Oscillator	Oscillator
3	2	Local	Oscillator	Oscillator
3	3	Local	Oscillator	Oscillator
3	4	Local	Oscillator	Oscillator
3	5	Local	Oscillator	Oscillator
3	6	Local	Oscillator	Oscillator
3	7	Local	Oscillator	Oscillator
3	8	Local	Oscillator	Oscillator
4	1	Local	Oscillator	Oscillator
4	2	Local	Oscillator	Oscillator
4	3	Local	Oscillator	Oscillator
4	4	Local	Oscillator	Oscillator
4	5	Local	Oscillator	Oscillator
4	6	Local	Oscillator	Oscillator
4	7	Local	Oscillator	Oscillator
4	8	Local	Oscillator	Oscillator

			Cell Error Statistics	
Slot	Port	Cell Count	Correctable Cell Count	Uncorrectable Cell Count
3	1	0	0	0
3	2	0	0	0
3	3	358	0	0
3	4	0	0	0
3	5	0	0	0
3	6	0	0	0
3	7	0	0	0
3	8	0	0	0
4	1	0	0	0
4	2	0	0	0
4	3	0	0	0
4	4	0	0	0
4	5	0	0	0
4	6	0	0	0
4	7	0	0	0
4	8	0	0	0

The columns under the **ATM Port Table** heading include information on ASM module ports and FCSM internal ports. An FCSM includes two internal ports. The first port is user-configurable; half of this port is the same as an ASM “uplink” port and half is a CSM OC-3c/STM-1 port. The second FCSM port is not user-configurable; it is used for communication between the frame bus and cell matrix. The second FCSM port also has an ASM half and a CSM half. Descriptions of these columns can be found in Chapter 35, “Managing ATM Access Modules.”

Descriptions of the CSM part of the display are as follows.

Slot/Port. The slot within the chassis and the port on that module for which information will be displayed. This command displays information for a single port in one row.

CSM Port Description. A description of this port entered during port configuration using the **map** command. The port description can be up to 30 characters long.

Tran Type. The type of ATM port. This type will either be an OC-3c/STM-1 port (**STS-3c**) or an OC-12c/STM-4c port (**STS-12c**).

Media Type. The type of fiber cable used on this port. The type will either be multimode (**Multi**) or single mode (**Single**).

Intrf Type. The type of ATM logical connection used to service this port. The UNI type will be Private (**PrUNI**), Public (**PbUNI**), Interim Inter-Switch Protocol (**IISP**), or Private Network-to-Network Interface (**PNNI**). These options are explained in the section, *Modifying a Port Configuration* on page 42-27.

UNI Ver. The version used for the ATM User-to-Network Interface. The version number corresponds to the ATM Forum Specification with which this UNI implementation complies. The OmniSwitch is compliant with UNI versions 3.1 and 3.0. If you have installed the software for multiple-peer group PNNI, then you can also set the signaling version to 4.0.

VPI Bits. The number of bits used for the Virtual Path Identifiers (VPIs) set up on this ATM port. All CSM ports can support up to 12 bits. The number of VPI bits is set through the **map** command.

VCI Bits. The number of bits used for the Virtual Channel Identifiers (VCIs) set up on this ATM port. All CSM ports can support up to 12 bits. The number of VCI bits is set through the **map** command.

ATM Address. The ATM address defined for this CSM port. This address is defined through the **map** command.

Max VPCs. The maximum number of Virtual Path Connections supported on this port. The maximum number depends on the number of bits specified for the VPI under **VPI Bits**. For example, the default number of bits for VPIs is 4, which means the maximum number of VPCs will be 15. If you selected the **VPI Bits** to be 2, then the maximum number of VPCs would be 3.

Max VCCs. The maximum number of Virtual Channel Connections supported by this port per Virtual Path. The maximum number depends on the number of bits specified for the VCI under **VCI Bits**. For example, the default number of bits for VCIs is 8, which means the maximum number of VCCs will be 254. If you selected the **VCI Bits** to be 10, then the maximum number of VCCs would be 1022.

Cfgd VPCs. The number of Virtual Path Connections (VPCs) configured on this CSM port. VPCs are configured through the **cvc** and **scvc** commands.

Cfgd VCCs. The number of Virtual Channel Connections (VCCs) on this CSM port. VCCs are configured through the **cvc** and **scvc** commands. This value includes non-user-configured switched virtual circuits (SVCs).

The following column headings fall under the table heading labeled **Status**.

SSCOP. The current state of the Service-Specific Connection Oriented Protocol (SSCOP). SSCOP operates on the ATM control plane and is a peer-to-peer protocol that helps set up connections and provides a reliable transport mechanism for signaling. The **Sscop Up** and **Sscop Down** columns will indicate the last time SSCOP last came up and went down, respectively. The **Up** and **Down** columns will indicate the number of times SSCOP came up and went down, respectively. The SSCOP **Status** column will indicate Up or Down.

ILMI. The Integrated Local Management Interface (ILMI) enabled on this port. The **Ilmi Up** and **Ilmi Down** columns will indicate the last time ILMI last came up and went down, respectively. The **Up** and **Down** columns will indicate the number of times ILMI came up and went down, respectively. The ILMI **Status** column will indicate Up or Down.

PHY. The operational status of the port. The **Phy Up** and **Phy Down** columns will indicate the last time PHY last came up and went down, respectively. The **Up** and **Down** columns will indicate the number of times PHY came up and went down, respectively. The PHY **Status** column will indicate whether the port is **Enabled** or **Disabled**. The port will be enabled if the port is connected on this end and the far end. If there is a disconnection at either end, then the operational status will be **Disabled**.

Mode. The port mode used for the IOP ASIC on this CSM module. This mode will be **Normal**. Other modes will be supported in later releases.

Phy Protocol. The type of physical media standard used for this port. In North America ATM broadband services are delivered over Synchronous Optical Network (SONET) facilities. Outside North America, ATM broadband services use Synchronous Digital Hierarchy (SDH).

Signaling. Indicates whether or not the Service-Specific Connection Protocol (SSCOP) is enabled. SSCOP

ILMI Enable. Indicates whether the Integrated Local Management Interface (ILMI) is enabled on this port.

CSM Port Auto Cfg. Indicates whether or not auto port configuration is enabled on this port.

The columns under the **Clock Source** heading include information on the clocking source for all CSM ports on the system.

Timing Mode. This field has two options: **Loop** and **Local**. **Loop**, means the port is deriving its clocking directly from the receive data. **Local**, means the port is deriving its clocking from the bus.

Configured Source. Indicates that the current source for the port is either its local oscillator (the default setting), or one of the buses.

Current Source. Indicates that the configured source for the port is either its local oscillator (the default setting), or one of the buses.

♦ Note ♦

If Configured Source and Current Source are different, it is a probable indicator that the port's configured source has failed.

The columns under the **Cell Error Statistics** heading include information on the RX Cell Statistics for the SUNI chip installed on all CSM ports in the system.

Cell Count. Indicates the total number of cells received on the CSM port.

Correctable Cell Count. Indicates the number of cells received with 1-bit HCS error on the CSM port.

Uncorrectable Cell Count. Indicates the number of cells received with more than 1-bit HCS errors.

Information on the Ports for One CSM Board

To view information on all CSM ports in a single CSM board, you enter the **vap** command along with the slot number for the CSM board, as follows:

vap <slot>

where **<slot>** is the slot number where the CSM board is installed. For example, if you wanted to obtain status information for the board in slot 4, you would enter:

vap 4

This command displays a screen similar to the following:

CSM Port Table

Slot	Port	CSM Port Description	Tran Type	Media Type	Intrf Type	Uni Ver	#Bits VPI	VCI
4	1	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	2	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	3	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	4	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	5	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	6	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	7	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	8	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10

Slot	Port	ATM Address	Max VPCs	Max VCCs	Cfgd VPCs	Cfgd VCI
4	1	3903488001bc9000010176fd600020da00011000	3	1022	0	0
4	2	3903488001bc9000010176fd600020da00011800	3	1022	0	3
4	3	3903488001bc9000010176fd600020da00012000	3	1022	0	1
4	4	3903488001bc9000010176fd600020da00012800	3	1022	0	0
4	5	3903488001bc9000010176fd600020da00013000	3	1022	0	0
4	6	3903488001bc9000010176fd600020da00013800	3	1022	0	0
4	7	3903488001bc9000010176fd600020da00014000	3	1022	0	0
4	8	3903488001bc9000010176fd600020da00016000	3	1022	0	0

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
4	1	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	2	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	3	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	7	--------	WED SEP 29 10:03:211999	0	1	Dis
4	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis

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Slot	Port	Mode	Phy Protocol	Signaling	ILMI Enable/ Poll	CSM Port Auto Cfg
4	1	Normal	SONET	Enb	Enable/On	Enabled
4	2	Normal	SONET	Enb	Enable/On	Enabled
4	3	Normal	SONET	Enb	Enable/On	Enabled
4	4	Normal	SONET	Enb	Enable/On	Enabled
4	5	Normal	SONET	Enb	Enable/On	Enabled
4	6	Normal	SONET	Enb	Enable/On	Enabled
4	7	Normal	SONET	Enb	Enable/On	Enabled
4	8	Normal	SONET	Enb	Enable/On	Enabled

Slot	Port	Timing Mode	Clock Source Configured Source	Clock Source Current Source
4	1	Local	Oscillator	Oscillator
4	2	Local	Oscillator	Oscillator
4	3	Local	Oscillator	Oscillator
4	4	Local	Oscillator	Oscillator
4	5	Local	Oscillator	Oscillator
4	6	Local	Oscillator	Oscillator
4	7	Local	Oscillator	Oscillator
4	8	Local	Oscillator	Oscillator

Slot	Port	Cell Count	Cell Error Statistics Correctable Cell Count	Cell Error Statistics Uncorrectable Cell Count
4	1	0	0	0
4	2	0	0	0
4	3	0	0	0
4	4	0	0	0
4	5	0	0	0
4	6	0	0	0
4	7	0	0	0
4	8	0	0	0

Descriptions of the columns included in this display are described earlier in *Viewing Port Configurations* on page 42-55.

Information of One Port

To view information on a single CSM port, you enter the **vap** command along with the slot number for the CSM board and the port number for which you want to receive information, as follows:

vap <slot>/<port>

where **<slot>** is the slot number where the CSM board is installed and **<port>** is the port number on the CSM board. For example, if you wanted to view basic information for port 1 on the CSM module in slot 4, you would enter:

vap 4/1

This command displays a screen similar to the following:

CSM Port Table

Slot	Port	CSM Port Description	Tran Type	Media Type	Intrf Type	Uni Ver	#Bits VPI	#Bits VCI
4	1	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10

Slot	Port	ATM Address	Max VPCs	Max VCCs	Cfgd VPCs	Cfgd VCI
4	1	3903488001bc9000010176fd600020da00011000	3	1022	0	0

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
4	1	- - - - - - - -	- - - - - - - -	0	0	Down

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
4	1	- - - - - - - -	- - - - - - - -	0	0	Down

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
4	1	- - - - - - - -	WED SEP 29 10:03:21 1999	0	1	Dis

Slot	Port	Mode	Phy Protocol	Signaling	ILMI Enable/ Poll	CSM Port Auto Cfg
4	1	Normal	SONET	Enb	Enable/On	Enabled

Slot	Port	Timing Mode	Clock Source: Configured Source	Clock Source: Current Source
4	1	Local	Oscillator	Oscillator

Slot	Port	Cell Count	Cell Error Statistics: Correctable Cell Count	Cell Error Statistics: Uncorrectable Cell Count
4	1	0	0	0

Descriptions of the columns included in this display are described earlier in *Viewing Port Configurations* on page 42-55.

Viewing SSCOP, ILMI, and PHY

You can view general and detailed Service-Specific Connection Oriented Protocol (SSCOP), Integrated Local Management Interface (ILMI), and Physical information on all CSM ports in a switch, a single CSM board, and individual ports. The **vap** command is used to provide this information.

Viewing SSCOP, ILMI, and PHY Information on All Ports

To view SSCOP, ILMI, and PHY information on all CSM ports in a switch, you enter the **vap** command along with the following parameters:

vap sip

where **s** indicates SSCOP, **i** indicates ILMI, and **p** indicates PHY. This command displays a screen similar to the following:

CSM Port Table

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
2	1	WED SEP 29 10:03:37 1999	WED SEP 29 10:03:24 1999	2	1	Up
2	2	--------	--------	0	0	Down
3	1	--------	--------	0	0	Down
3	2	--------	--------	0	0	Down
3	3	WED SEP 29 10:03:21 1999	--------	1	0	Up
3	4	--------	--------	0	0	Down
3	5	--------	--------	0	0	Down
3	6	--------	--------	0	0	Down
3	7	--------	--------	0	0	Down
3	8	--------	--------	0	0	Down
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
2	1	WED SEP 29 10:03:30 1999	--------	1	0	Up
2	2	--------	--------	0	0	Down
3	1	--------	--------	0	0	Down
3	2	--------	--------	0	0	Down
3	3	--------	--------	0	0	Down
3	4	--------	--------	0	0	Down
3	5	--------	--------	0	0	Down
3	6	--------	--------	0	0	Down
3	7	--------	--------	0	0	Down
3	8	--------	--------	0	0	Down
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

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Slot	Port	Phy Up	Phy Down	Up	Dn	Status
2	1	WED SEP 29 10:03:18 1999	--------	1	0	En
2	2	WED SEP 29 10:03:18 1999	--------	1	0	En
3	1	--------	WED SEP 29 10:03:18 1999	0	1	Dis
3	2	--------	WED SEP 29 10:03:19 1999	0	1	Dis
3	3	WED SEP 29 10:03:19 1999	--------	1	0	En
3	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	7	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	1	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	2	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	3	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	7	--------	WED SEP 29 10:03:211999	0	1	Dis
4	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis

			Cell Error Statistics	
Slot	Port	Cell Count	Correctable Cell Count	Uncorrectable Cell Count
3	1	0	0	0
3	2	0	0	0
3	3	358	0	0
3	4	0	0	0
3	5	0	0	0
3	6	0	0	0
3	7	0	0	0
3	8	0	0	0
4	1	0	0	0
4	2	0	0	0
4	3	0	0	0
4	4	0	0	0
4	5	0	0	0
4	6	0	0	0
4	7	0	0	0
4	8	0	0	0

Additionally, you may enter the parameters for SSCOP, ILMI, and PHY in any order and combination. For example, if you wanted to view only the ILMI and PHY, you would enter the **vap** command along with the respective parameters as follows:

vap ip

or

vap pi

This command displays a screen similar to the following:

CSM Port Table

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
2	1	WED SEP 29 10:03:30 1999	--------	1	0	Up
2	2	--------	--------	0	0	Down
3	1	--------	--------	0	0	Down
3	2	--------	--------	0	0	Down
3	3	--------	--------	0	0	Down
3	4	--------	--------	0	0	Down
3	5	--------	--------	0	0	Down
3	6	--------	--------	0	0	Down
3	7	--------	--------	0	0	Down
3	8	--------	--------	0	0	Down
4	1	--------	--------	0	0	Down
4	2	--------	--------	0	0	Down
4	3	--------	--------	0	0	Down
4	4	--------	--------	0	0	Down
4	5	--------	--------	0	0	Down
4	6	--------	--------	0	0	Down
4	7	--------	--------	0	0	Down
4	8	--------	--------	0	0	Down

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
2	1	WED SEP 29 10:03:18 1999	--------	1	0	En
2	2	WED SEP 29 10:03:18 1999	--------	1	0	En
3	1	--------	WED SEP 29 10:03:18 1999	0	1	Dis
3	2	--------	WED SEP 29 10:03:19 1999	0	1	Dis
3	3	WED SEP 29 10:03:19 1999	--------	1	0	En
3	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	7	--------	WED SEP 29 10:03:21 1999	0	1	Dis
3	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	1	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	2	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	3	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	7	--------	WED SEP 29 10:03:211999	0	1	Dis
4	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis

Cell Error Statistics

Slot	Port	Cell Count	Correctable Cell Count	Uncorrectable Cell Count
3	1	0	0	0
3	2	0	0	0
3	3	358	0	0
3	4	0	0	0
3	5	0	0	0
3	6	0	0	0
3	7	0	0	0
3	8	0	0	0
4	1	0	0	0
4	2	0	0	0
4	3	0	0	0
4	4	0	0	0
4	5	0	0	0
4	6	0	0	0
4	7	0	0	0
4	8	0	0	0

Descriptions of the columns included in the two displays above are described earlier in *Viewing Port Configurations* on page 42-55.

Viewing SSCOP, ILMI, and PHY Information on One CSM Board

To view SSCOP, ILMI, and PHY information on a single CSM board in a switch, you enter the **vap** command along with the slot number for the CSM board and the following parameters:

vap <slot> sip

where **<slot>** is the slot number where the CSM board is installed, **s** indicates SSCOP, **i** indicates ILMI, and **p** indicates PHY. For example, if you wanted to view SSCOP, ILMI, and PHY information for the board in slot 4, you would enter:

vap 4 sip

This command displays a screen similar to the following:

CSM Port Table

Slot	Port	CSM Port Description	Tran Type	Media Type	Intrf Type	Uni Ver	#Bits VPI	#Bits VCI
4	1	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	2	CSM PORT	STS3c	Multi	PrUNI	3.1	2	10
4	3	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	4	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	5	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	6	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	7	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10
4	8	CSM PORT	STS3c	Multi	PrUNI	3.0	2	10

Slot	Port	ATM Address	Max VPCs	Max VCCs	Cfgd VPCs	Cfgd VCCs
4	1	3903488001bc90000101dbd4000020da0000c000	3	1022	0	0
4	2	3903488001bc90000101dbd4000020da0000c800	3	1022	0	0
4	3	3903488001bc90000101dbd4000020da0000d000	3	1022	0	0
4	4	3903488001bc90000101dbd4000020da0000d800	3	1022	0	0
4	5	3903488001bc90000101dbd4000020da0000e000	3	1022	0	0
4	6	3903488001bc90000101dbd4000020da0000e800	3	1022	0	0
4	7	3903488001bc90000101dbd4000020da0000f000	3	1022	0	0
4	8	3903488001bc90000101dbd4000020da0000f800	3	1022	0	0

Slot	Port	Sscop Up	Sscop Down	Up	Dn	Status
4	1	- - - - - - - -	- - - - - - - -	0	0	Down
4	2	- - - - - - - -	- - - - - - - -	0	0	Down
4	3	- - - - - - - -	- - - - - - - -	0	0	Down
4	4	- - - - - - - -	- - - - - - - -	0	0	Down
4	5	- - - - - - - -	- - - - - - - -	0	0	Down
4	6	- - - - - - - -	- - - - - - - -	0	0	Down
4	7	- - - - - - - -	- - - - - - - -	0	0	Down
4	8	- - - - - - - -	- - - - - - - -	0	0	Down

Slot	Port	Ilmi Up	Ilmi Down	Up	Dn	Status
4	1	- - - - - - - -	- - - - - - - -	0	0	Down
4	2	- - - - - - - -	- - - - - - - -	0	0	Down
4	3	- - - - - - - -	- - - - - - - -	0	0	Down
4	4	- - - - - - - -	- - - - - - - -	0	0	Down
4	5	- - - - - - - -	- - - - - - - -	0	0	Down
4	6	- - - - - - - -	- - - - - - - -	0	0	Down
4	7	- - - - - - - -	- - - - - - - -	0	0	Down
4	8	- - - - - - - -	- - - - - - - -	0	0	Down

— Output continues on next page —

Slot	Port	Phy Up	Phy Down	Up	Dn	Status
====	====	========================	========================	=====	=====	======
4	1	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	2	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	3	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	4	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	5	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	6	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	7	--------	WED SEP 29 10:03:21 1999	0	1	Dis
4	8	--------	WED SEP 29 10:03:21 1999	0	1	Dis

					ILMI	
					------------	CSM Port
Slot	Port	Mode	Phy Protocol	Signaling	Enable/ Poll	Auto Cfg
====	====	===========	============	=========	===========	=========
4	1	Normal	SONET	Enb	Enable/On	Enabled
4	2	Normal	SONET	Enb	Enable/On	Enabled
4	3	Normal	SONET	Enb	Enable/On	Enabled
4	4	Normal	SONET	Enb	Enable/On	Enabled
4	5	Normal	SONET	Enb	Enable/On	Enabled
4	6	Normal	SONET	Enb	Enable/On	Enabled
4	7	Normal	SONET	Enb	Enable/On	Enabled
4	8	Normal	SONET	Enb	Enable/On	Enabled

			Clock Source	

			Configured	Current
Slot	Port	Timing Mode	Source	Source
====	====	===========	===========	===========
4	1	Local	Oscillator	Oscillator
4	2	Local	Oscillator	Oscillator
4	3	Local	Oscillator	Oscillator
4	4	Local	Oscillator	Oscillator
4	5	Local	Oscillator	Oscillator
4	6	Local	Oscillator	Oscillator
4	7	Local	Oscillator	Oscillator
4	8	Local	Oscillator	Oscillator

			Cell Error Statistics	

			Correctable	Uncorrectable
Slot	Port	Cell Count	Cell Count	Cell Count
====	====	=========	============	=============
4	1	0	0	0
4	2	0	0	0
4	3	0	0	0
4	4	0	0	0
4	5	0	0	0
4	6	0	0	0
4	7	0	0	0
4	8	0	0	0

Additionally, you may enter the parameters for SSCOP, ILMI, and PHY in any order and combination. For example, if you wanted to view the statistics for only SSCOP and ILMI for a single board, you would enter the **vap** command along with the slot number and the respective parameters as follows:

vap <slot> si

or

vap <slot> is

Descriptions of the columns included in the display above are described earlier in *Viewing Port Configurations* on page 42-55.

Viewing SSCOP, ILMI, and PHY Information on One Port

To view SSCOP, ILMI, and PHY information on a single CSM port, you enter the **vap** command along with the slot number for the CSM board, the port number for which you want to receive information, and the following parameters:

vap <slot>/<port> sip

where **<slot>** is the slot number where the CSM board is installed, **<port>** is the port number on the CSM board, **s** indicates SSCOP, **i** indicates ILMI, and **p** indicates PHY. For example, if you wanted to view SSCOP, ILMI, and PHY information for port 8 on the CSM module in slot 4, you would enter:

vap 4/8 sip

This command displays a screen similar to the following:

```
                         CSM Port Table

                                              Tran    Media   Intrf   Uni    #Bits
Slot  Port        CSM Port Description        Type    Type    Type    Ver   VPI  VCI
==== ==== ========================= ======= ======= ====== == = === ===
4     8     CSM PORT                          STS3c   Multi    PrUNI   3.0   2    10

                                                            Max    Max   Cfgd   Cfgd
Slot  Port           ATM Address                            VPCs   VCCs  VPCs   VCCs
==== ==== =========================== ===== ======== ==== ==== ===== ====
4     8     3903488001bc90000101dbd4000020da0000f800        3      1022  0      0


                         CSM Port Table

Slot  Port           Sscop Up                        Sscop Down            Up    Dn    Status
==== ==== ======================== ======================== ===== ===== ======
4     8              --------                         --------             0     0     Down

Slot  Port           Ilmi Up                         Ilmi Down             Up    Dn    Status
==== ==== ======================== ======================== ===== ===== ======
4     8              --------                         --------             0     0      --

Slot  Port           Phy Up                          Phy Down              Up    Dn    Status
==== ==== ======================== ======================== ===== ===== ======
4     8              --------                  WED FEB 17 16:00:10 1999    0     1     Dis

                                                          ILMI
                                                     ------------  CSM Port
Slot  Port      Mode       Phy Protocol   Signaling  Enable/ Poll   Auto Cfg
==== ==== =========== ============ ========= =========== =========
4     8     Normal         SONET         Enb        Enable/On     Enabled

                          Clock Source
                        ----------------
                          Configured     Current
Slot  Port  Timing Mode     Source        Source
==== ==== =========== ============ ============
4     8     Local        Oscillator     Oscillator

                                       Cell Error Statistics
                                       -----------------
                              Correctable         Uncorrectable
Slot  Port   Cell Count   Cell Count        Cell Count
==== ==== ========= ============ =============

4     8     0            0                 0
```

Additionally, you may enter the parameters for SSCOP, ILMI, and PHY in any order and combination. For example, if you wanted to view the statistics for only SSCOP and PHY for a single CSM port, you would enter the **vap** command along with the slot number, the port number for which you want to receive information, and the respective parameters as follows:

vap <slot>/<port> sp

or

vap <slot>/<port> ps

Descriptions of the columns included in this display are described earlier in *Viewing Port Configurations* on page 42-55.

Viewing Virtual Connections

The **vvc** command allows you to view information on all virtual circuits in an OmniSwitch chassis. The **vvc** display is comprised of two parts. The first part of the display provides information on all VPI/VCIs associated with a given FCSM internal logical port or ATM uplink port (ASM module port). The second part displays information on all VPIs and VPI/VCIs associated with a given CSM port.

Information on All Virtual Circuits in a Switch

To view status information on all CSM virtual circuits in a switch, you enter the **vvc** command without any parameters as follows:

vvc

The following is sample of the output from the first part of the display for FCSM and ASM modules ports. Descriptions of the columns included in this display can be found in Chapter 35, “Managing ATM Access Modules.”

ATM Connections

Slot	Port	VPI	VCI	Connection Description	Conn Type	Circuit Type	Operational Status
2	1	0	5	Connection 5	VCC	PVC	LocalUp End2endUnknown
2	1	0	16	Connection 16	VCC	PVC	LocalUp End2endUnknown
2	2	0	1015	Connection 1015	VCC	PVC	LocalUp End2endUnknown
2	2	0	1016	Connection 1016	VCC	PVC	LocalUp End2endUnknown
2	2	0	1017	Connection 1017	VCC	PVC	LocalUp End2endUnknown
2	2	0	1018	Connection 1018	VCC	PVC	LocalUp End2endUnknown
2	2	0	1019	Connection 1019	VCC	PVC	LocalUp End2endUnknown
2	2	0	1021	Connection 1021	VCC	PVC	LocalUp End2endUnknown
2	2	0	1022	Connection 1022	VCC	PVC	LocalUp End2endUnknown
5	1	0	5	Connection 5	VCC	PVC	LocalUp End2endUnknown
5	1	0	16	Connection 16	VCC	PVC	LocalUp End2endUnknown

Slot	Port	VPI	VCI	Up Time	Down Time	Tx Max Frame Sz	Rx Max Frame Sz
2	1	0	5	WED SEP 29 10:02:11		4600	4600
2	1	0	16	WED SEP 29 10:02:11		4600	4600
2	2	0	1015	WED SEP 29 10:03:24		4600	4600
2	2	0	1016	WED SEP 29 10:03:24		4600	4600
2	2	0	1017	WED SEP 29 10:03:19		8192	8192
2	2	0	1018	WED SEP 29 10:03:21		4600	4600
2	2	0	1019	WED SEP 29 10:03:21		4600	4600
2	2	0	1021	WED SEP 29 10:03:18		4600	4600
2	2	0	1022	WED SEP 29 10:03:18		4600	4600
5	1	0	5	WED SEP 29 10:02:25		4600	4600
5	1	0	16	WED SEP 29 10:02:25		4600	4600

Actual Tx Traffic Information

Slot	Port	VPI	VCI	Tx Traffic Descrip Type		Peak Cell Rate	Tx QoS	Best Effort
2	1	0	5	NoCLP	NoSCR	353208	Uns	True
2	1	0	16	NoCLP	NoSCR	353208	Uns	True
2	2	0	1015	NoCLP	NoSCR	353208	Uns	True
2	2	0	1016	NoCLP	NoSCR	353208	Uns	True
2	2	0	1017	NoCLP	NoSCR	353208	Uns	True
2	2	0	1018	NoCLP	NoSCR	353208	Uns	True
2	2	0	1019	NoCLP	NoSCR	353208	Uns	True
2	2	0	1021	NoCLP	NoSCR	353208	Uns	True
2	2	0	1022	NoCLP	NoSCR	353208	Uns	True
5	1	0	5	NoCLP	NoSCR	0	Uns	True
5	1	0	16	NoCLP	NoSCR	0	Uns	True

— Output continues on next page —

Actual Rx Traffic Information

Slot	Port	VPI	VCI	Rx Traffic Descrip	Type	Peak Cell Rate	Rx QoS	Best Effort
2	1	0	5	NoCLP	NoSCR	353208	Uns	True
2	1	0	16	NoCLP	NoSCR	353208	Uns	True
2	2	0	1015	NoCLP	NoSCR	353208	Uns	True
2	2	0	1016	NoCLP	NoSCR	353208	Uns	True
2	2	0	1017	NoCLP	NoSCR	353208	Uns	True
2	2	0	1018	NoCLP	NoSCR	353208	Uns	True
2	2	0	1019	NoCLP	NoSCR	353208	Uns	True
2	2	0	1021	NoCLP	NoSCR	353208	Uns	True
2	2	0	1022	NoCLP	NoSCR	353208	Uns	True
5	1	0	5	NoCLP	NoSCR	0	Uns	True
5	1	0	16	NoCLP	NoSCR	0	Uns	True

+ ==> PVC Connections
* ==> SVC Connections which cannot be modified by the user
@ ==> Soft PVC Connections
& ==> Control Connections

CSM Connections

Incoming Slot	Port	VPI	VCI	Outgoing Slot	Port	VPI	VCI	Connection Description	Chan Type	Transport Priority	
2	1	0	5	7	2	0	1022	Connection 5	VC UNI	UBR	&
2	1	0	16	7	2	0	1021	Connection 16	VC UNI	UBR	&
2	1	0	18	7	2	0	1020	Connection18	VC UNI	UBR	&
2	2	0	1014	7	1	0	18	Connection 1014	VC UNI	UBR	&
2	2	0	1015	7	1	0	16	Connection 1015	VC UNI	UBR	&
2	2	0	1016	7	1	0	5	Connection 1016	VC UNI	UBR	&
2	2	0	1017	3	3	0	18	Connection 1017	VC UNI	UBR	&
2	2	0	1018	7	3	0	16	Connection 1018	VC UNI	UBR	&
2	2	0	1019	7	3	0	5	Connection 1019	VC UNI	UBR	&
2	2	0	1020	7	1	0	18	Connection 1020	VC UNI	UBR	&
2	2	0	1021	7	1	0	16	Connection 1021	VC UNI	UBR	&
2	2	0	1022	7	1	0	5	Connection 1022	VC UNI	UBR	&
3	2	0	402	7	3	0	32	fcsm_con	VC UNI	UBR	@
3	2	0	405	5	3	0	33	csm_conn	VC UNI	UBR	@
3	3	0	5	5	2	0	1019	Connection 5	VC UNI	UBR	&
3	3	0	16	5	2	0	1018	Connection 16	VC UNI	UBR	&
3	3	0	18	5	2	0	1017	Connection 18	VC UNI	UBR	&
3	3	0	32	5	2	1	402		VC UNI	UBR	*
3	3	0	33	5	2	1	405		VC UNI	UBR	*
3	3	0	34	5	3	1	401		VC UNI	UBR	*
3	3	0	35	5	3	1	403		VC UNI	UBR	*
3	3	1	36	5	3	1	404		VC UNI	UBR	*
3	3	1	401	5	3	0	34	Connection 401	VC UNI	UBR	@
3	3	1	403	5	3	0	35	Connection 403	VC UNI	UBR	@
3	3	1	404	5	3	0	36	csm_conn	VC UNI	UBR	@

— Output continues on next page —

Slot	Port	VPI	VCI	Up Time	Down Time	User Pri.	Statistics Mode
2	1	0	5	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
2	1	0	16	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
2	1	0	18	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
2	2	0	1014	WED SEP 29 10:03:23	WED SEP 29 10:03:23	15	CntGcra, PsCell
2	2	0	1015	WED SEP 29 10:03:23	WED SEP 29 10:03:23	15	CntGcra, PsCell
2	2	0	1016	WED SEP 29 10:03:23	WED SEP 29 10:03:23	15	CntGcra, PsCell
2	2	0	1017	WED SEP 29 10:03:20	WED SEP 29 10:03:20	15	CntGcra, PsCell
2	2	0	1018	WED SEP 29 10:03:20	WED SEP 29 10:03:20	15	CntGcra, PsCell
2	2	0	1019	WED SEP 29 10:03:20	WED SEP 29 10:03:20	15	CntGcra, PsCell
2	2	0	1020	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
2	2	0	1021	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
2	2	0	1022	WED SEP 29 10:03:19	WED SEP 29 10:03:19	15	CntGcra, PsCell
3	2	1	402	WED SEP 29 10:03:13	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	2	1	405	WED SEP 29 10:03:13	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	0	5	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	16	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	18	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	32	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	33	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	34	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	35	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	36	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	1	401	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	403	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	404	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell

Tx Traffic Information

Slot	Port	VPI	VCI	Tx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Tx QoS	Best Effort
2	1	0	5	NoCLP NoSCR	589			Uns	False
2	1	0	16	NoCLP NoSCR	589			Uns	False
2	1	0	18	NoCLP NoSCR	589			Uns	False
2	2	0	1014	NoCLP NoSCR	589			Uns	False
2	2	0	1015	NoCLP NoSCR	589			Uns	False
2	2	0	1016	NoCLP NoSCR	589			Uns	False
2	2	0	1017	NoCLP NoSCR	589			Uns	False
2	2	0	1018	NoCLP NoSCR	589			Uns	False
2	2	0	1019	NoCLP NoSCR	589			Uns	False
2	2	0	1020	NoCLP NoSCR	589			Uns	False
2	2	0	1021	NoCLP NoSCR	589			Uns	False
2	2	0	1022	NoCLP NoSCR	589			Uns	False
3	2	1	402	NoCLP NoSCR	1000			Uns	True
3	2	1	405	NoCLP NoSCR	1000			Uns	True
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True
3	3	1	401	NoCLP NoSCR	1000			Uns	True
3	3	1	403	NoCLP NoSCR	1000			Uns	True
3	3	1	404	NoCLP NoSCR	1000			Uns	True

— Output continues on next page —

Rx Traffic Information

Slot	Port	VPI	VCI	Rx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Rx QoS	Best Effort
2	1	0	5	NoCLP NoSCR	589			Uns	False
2	1	0	16	NoCLP NoSCR	589			Uns	False
2	1	0	18	NoCLP NoSCR	589			Uns	False
2	2	0	1014	NoCLP NoSCR	589			Uns	False
2	2	0	1015	NoCLP NoSCR	589			Uns	False
2	2	0	1016	NoCLP NoSCR	589			Uns	False
2	2	0	1017	NoCLP NoSCR	589			Uns	False
2	2	0	1018	NoCLP NoSCR	589			Uns	False
2	2	0	1019	NoCLP NoSCR	589			Uns	False
2	2	0	1020	NoCLP NoSCR	589			Uns	False
2	2	0	1021	NoCLP NoSCR	589			Uns	False
2	2	0	1022	NoCLP NoSCR	589			Uns	False
3	2	1	402	NoCLP NoSCR	1000			Uns	True
3	2	1	405	NoCLP NoSCR	1000			Uns	True
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True
3	3	1	401	NoCLP NoSCR	1000			Uns	True
3	3	1	403	NoCLP NoSCR	1000			Uns	True
3	3	1	404	NoCLP NoSCR	1000			Uns	True

						Multicast		
Slot	Port	VPI	VCI	gcra a enf mode	gcra a enf mode	grp id	enable	ingrs / egrss
2	1	0	5	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	1	0	16	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	1	0	18	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1014	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1015	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1016	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1017	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1018	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1019	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1020	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1021	no cong dx clpl	no cong dx clpl	4095	disable	ingress
2	2	0	1022	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	2	1	402	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	2	1	405	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	5	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	16	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	18	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	32	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	33	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	34	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	35	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	36	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	401	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	403	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	404	no cong dx clpl	no cong dx clpl	4095	disable	ingress

— Output continues on next page —

```
Slot  Port VPI VCI    AAL5 Discard
==== ==== === ===    ===============
2     1    0   5      Disabled
2     1    0   16     Disabled
2     1    0   18     Disabled
2     2    0   1014   Disabled
2     2    0   1015   Disabled
2     2    0   1016   Disabled
2     2    0   1017   Disabled
2     2    0   1018   Disabled
2     2    0   1019   Disabled
2     2    0   1020   Disabled
2     2    0   1021   Disabled
2     2    0   1022   Disabled
3     2    1   402    Disabled
3     2    1   405    Disabled
3     3    0   5      Disabled
3     3    0   16     Disabled
3     3    0   18     Disabled
3     3    0   32     Disabled
3     3    0   33     Disabled
3     3    0   34     Disabled
3     3    0   35     Disabled
3     3    0   36     Disabled
3     3    1   401    Disabled
3     3    1   403    Disabled
3     3    1   404    Disabled
```

The legend at the top of the CSM port display indicates the symbols used to differentiate the four virtual circuit types. A symbol is placed after the **Transport Priority** column to indicate whether the circuit is a Permanent Virtual Circuit (PVC) configured through the **cvc** command (**+**), a Switched Virtual Circuit (SVC) configured dynamically by the ATM network (*), a soft PVC configured through the **scvc** command (**@**), or a management connection (**&**).

Incoming Port, **Outgoing Port**, **Connection Description**, **Chan Type**, and **Transport Priority**. These variables are described earlier in *Setting Up Basic VC Parameters* on page 42-31.

Up Time. The date and time that this virtual circuit went up.

Down Time. The date and time that a disabled virtual circuit went down.

User Pri., **Statistics Mode**. These variables are described earlier in *Configuring Statistics and Priority Parameters* on page 42-42.

Tx Traffic Information, **Rx Traffic Information**. These variables are described earlier in *Configuring Statistics and Priority Parameters* on page 42-42. Note that for SVCs, the Peak Cell Pate (PCR) is incorrectly displayed as 1; PVCs display the actual configured PCR value.

gcra a mode, **gcra b mode**. The type of algorithm used for the Generic Cell Rate Algorithm (GCRA), or “leaky bucket,” with this virtual circuit. By default, this column will read **no cong dx clp1**, meaning that only CLP=1 cells will be discarded.

Multicast grp id. The group identification number for this multicast virtual circuit. This number is not user-configurable and is used internally by the switch.

Multicast enable. Indicates whether multicast leaf virtual circuits are associated with this root virtual circuit.

Multicast ingres/egress. Indicates whether this is the ingress or egress point for this multicast virtual circuit.

AAL5 Discard. Indicates how AAL5 PDU cells are discarded during times of congestion. Possible values are as follows:

Disabled. During congestion conditions, cells associated with AAL5 PDU are randomly discarded. Cells are marked when the GCRA contract is violated.

EPD. Early Packet Discard. The switch selectively discards cells associated with AAL5 PDU during congestion conditions. In this mode, the cells of the whole packet are either passed or discarded. At congestion time, if the first cell of a packet has already passed, then the rest of the packet will be passed. When congestion ends, the first cell of a new packet will be passed. Cells are marked when the GCRA contract has been violated.

PPD. Partial Packet Discard. The switch selectively discards cells associated with AAL5 PDU during congestion conditions. In this mode, the cells of the rest of the packet—except for the very last cell—are discarded. When congestion ends, the first cell of a new packet will be passed. Cells are marked when the GCRA contract is violated.

Information on the Ports for One CSM Virtual Circuit

To view status information on virtual circuits in a single CSM board, you enter the **vvc** command along with the slot number for the CSM board, as follows:

vvc <slot>

where **<slot>** is the slot number where the CSM board is installed. For example, if you wanted to view status information for the board in slot 5, you would enter:

vvc 3

This command displays a screen similar to the following:

CSM Connections

Incoming				Outgoing						
Slot	Port	VPI	VCI	Slot	Port	VPI	VCI	Connection Description	Chan Type	Transport Priority
3	2	0	402	7	3	0	32	fcsm_con	VC UNI	UBR @
3	2	0	405	5	3	0	33	csm_conn	VC UNI	UBR @
3	3	0	5	5	2	0	1019	Connection 5	VC UNI	UBR &
3	3	0	16	5	2	0	1018	Connection 16	VC UNI	UBR &
3	3	0	18	5	2	0	1017	Connection 18	VC UNI	UBR &
3	3	0	32	5	2	1	402		VC UNI	UBR *
3	3	0	33	5	2	1	405		VC UNI	UBR *
3	3	0	34	5	3	1	401		VC UNI	UBR *
3	3	0	35	5	3	1	403		VC UNI	UBR *
3	3	1	36	5	3	1	404		VC UNI	UBR *
3	3	1	401	5	3	0	34	Connection 401	VC UNI	UBR @
3	3	1	403	5	3	0	35	Connection 403	VC UNI	UBR @
3	3	1	404	5	3	0	36	csm_conn	VC UNI	UBR @

Slot	Port	VPI	VCI	Up Time	Down Time	User Pri.	Statistics Mode
3	2	1	402	WED SEP 29 10:03:13	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	2	1	405	WED SEP 29 10:03:13	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	0	5	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	16	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	18	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	32	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	33	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	34	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	35	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	36	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	1	401	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	403	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	404	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell

Tx Traffic Information

Slot	Port	VPI	VCI	Tx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Tx QoS	Best Effort
3	2	1	402	NoCLP NoSCR	1000			Uns	True
3	2	1	405	NoCLP NoSCR	1000			Uns	True
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True
3	3	1	401	NoCLP NoSCR	1000			Uns	True
3	3	1	403	NoCLP NoSCR	1000			Uns	True
3	3	1	404	NoCLP NoSCR	1000			Uns	True

— Output continues on next page —

Rx Traffic Information

Slot	Port	VPI	VCI	Rx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Rx QoS	Best Effort
3	2	1	402	NoCLP NoSCR	1000			Uns	True
3	2	1	405	NoCLP NoSCR	1000			Uns	True
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True
3	3	1	401	NoCLP NoSCR	1000			Uns	True
3	3	1	403	NoCLP NoSCR	1000			Uns	True
3	3	1	404	NoCLP NoSCR	1000			Uns	True

						Multicast		
Slot	Port	VPI	VCI	gcra a enf mode	gcra a enf mode	grp id	enable	ingrs / egrss
3	2	1	402	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	2	1	405	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	5	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	16	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	18	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	32	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	33	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	34	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	35	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	36	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	401	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	403	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	1	404	no cong dx clpl	no cong dx clpl	4095	disable	ingress

Slot	Port	VPI	VCI	AAL5 Discard
3	2	1	402	Disabled
3	2	1	405	Disabled
3	3	0	5	Disabled
3	3	0	16	Disabled
3	3	0	18	Disabled
3	3	0	32	Disabled
3	3	0	33	Disabled
3	3	0	34	Disabled
3	3	0	35	Disabled
3	3	0	36	Disabled
3	3	1	401	Disabled
3	3	1	403	Disabled
3	3	1	404	Disabled

Descriptions of the columns included in this display are described earlier in *Viewing Virtual Connections* on page 42-71.

Information on One Port

To view status information on virtual circuits in a single CSM port, you enter the **vvc** command along with the slot number for the CSM board and the port number for which you want to receive information, as follows:

vvc <slot>/<port>

where **<slot>** is the slot number where the CSM board is installed and **<port>** is the port number on the CSM board. For example, if you wanted to view status information for port 3 on the CSM module in slot 3, you would enter:

vvc 3/3

This command displays a screen similar to the following:

CSM Connections

Incoming				Outgoing				Connection	Chan	Transport
Slot	Port	VPI	VCI	Slot	Port	VPI	VCI	Description	Type	Priority
3	3	0	5	5	2	0	1019	Connection 5	VC UNI	UBR &
3	3	0	16	5	2	0	1018	Connection 16	VC UNI	UBR &
3	3	0	18	5	2	0	1017	Connection 18	VC UNI	UBR &
3	3	0	32	5	2	1	402		VC UNI	UBR *
3	3	0	33	5	2	1	405		VC UNI	UBR *
3	3	0	34	5	3	1	401		VC UNI	UBR *
3	3	0	35	5	3	1	403		VC UNI	UBR *
3	3	0	36	5	3	1	404		VC UNI	UBR *
3	3	1	401	5	3	0	34	Connection 401	VC UNI	UBR @
3	3	1	403	5	3	0	35	Connection 403	VC UNI	UBR @
3	3	1	404	5	3	0	36	csm_conn	VC UNI	UBR @

Slot	Port	VPI	VCI	Up Time	Down Time	User Pri.	Statistics Mode
3	3	0	5	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	16	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	18	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	32	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	33	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	34	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	35	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	36	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	1	401	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	403	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell
3	3	1	404	WED SEP 29 10:03:21	WED SEP 29 10:03:13	15	CntGcra, PsCell

Tx Traffic Information

Slot	Port	VPI	VCI	Tx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Tx QoS	Best Effort
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True
3	3	1	401	NoCLP NoSCR	1000			Uns	True
3	3	1	403	NoCLP NoSCR	1000			Uns	True
3	3	1	404	NoCLP NoSCR	1000			Uns	True

— Output continues on next page —

Rx Traffic Information

Slot	Port	VPI	VCI	Rx Traffic Descrip Type		Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Rx QoS	Best Effort
3	3	0	5	NoCLP	NoSCR	589			Uns	False
3	3	0	16	NoCLP	NoSCR	589			Uns	False
3	3	0	18	NoCLP	NoSCR	589			Uns	False
3	3	0	32	NoCLP	NoSCR	353207			Uns	True
3	3	0	33	NoCLP	NoSCR	353207			Uns	True
3	3	0	34	NoCLP	NoSCR	353207			Uns	True
3	3	0	35	NoCLP	NoSCR	353207			Uns	True
3	3	0	36	NoCLP	NoSCR	353207			Uns	True
3	3	1	401	NoCLP	NoSCR	1000			Uns	True
3	3	1	403	NoCLP	NoSCR	1000			Uns	True
3	3	1	404	NoCLP	NoSCR	1000			Uns	True

												Multicast		
Slot	Port	VPI	VCI	gcra	a enf	mode		gcra	a enf	mode		grp id	enable	ingrs / egrss
3	3	0	5	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	16	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	18	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	32	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	33	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	34	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	35	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	0	36	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	1	401	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	1	403	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress
3	3	1	404	no	cong	dx	clpl	no	cong	dx	clpl	4095	disable	ingress

Slot	Port	VPI	VCI	AAL5 Discard
3	3	0	5	Disabled
3	3	0	16	Disabled
3	3	0	18	Disabled
3	3	0	32	Disabled
3	3	0	33	Disabled
3	3	0	34	Disabled
3	3	0	35	Disabled
3	3	0	36	Disabled
3	3	1	401	Disabled
3	3	1	403	Disabled
3	3	1	404	Disabled

Descriptions of the columns included in this display are described earlier in *Viewing Virtual Connections* on page 42-71.

Information on One Virtual Path

To view status information on a single virtual path, you enter the **vvc** command along with the slot number for the CSM board, the port number, and the VPI number for the virtual path on which you want information, as follows:

vvc <slot>/<port> <vpi>

where **<slot>** is the slot number where the CSM board is installed, **<port>** is the port number on the CSM board, and **<vpi>** is the virtual path identifier. For example, if you wanted to view status information for the board in slot 3, port 3, VPI 0, you would enter:

vvc 3/3 0

This command displays a screen similar to the following:

CSM Connections

Incoming Slot	Port	VPI	VCI	Outgoing Slot	Port	VPI	VCI	Connection Description	Chan Type	Transport Priority
3	3	0	5	5	2	0	1019	Connection 5	VC UNI	UBR &
3	3	0	16	5	2	0	1018	Connection 16	VC UNI	UBR &
3	3	0	18	5	2	0	1017	Connection 18	VC UNI	UBR &
3	3	0	32	5	2	1	402		VC UNI	UBR *
3	3	0	33	5	2	1	405		VC UNI	UBR *
3	3	0	34	5	3	1	401		VC UNI	UBR *
3	3	0	35	5	3	1	403		VC UNI	UBR *
3	3	0	36	5	3	1	404		VC UNI	UBR *

Slot	Port	VPI	VCI	Up Time	Down Time	User Pri.	Statistics Mode
3	3	0	5	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	16	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	18	WED SEP 29 10:03:21	WED SEP 29 10:03:20	15	CntGcra, PsCell
3	3	0	32	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	33	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	34	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	35	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell
3	3	0	36	WED SEP 29 10:03:48	WED SEP 29 10:03:48	15	CntGcra, PsCell

Tx Traffic Information

Slot	Port	VPI	VCI	Tx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Tx QoS	Best Effort
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True

Rx Traffic Information

Slot	Port	VPI	VCI	Rx Traffic Descrip Type	Peak Cell Rate	Sustain Cell Rate	Maximum Burst Sz	Rx QoS	Best Effort
3	3	0	5	NoCLP NoSCR	589			Uns	False
3	3	0	16	NoCLP NoSCR	589			Uns	False
3	3	0	18	NoCLP NoSCR	589			Uns	False
3	3	0	32	NoCLP NoSCR	353207			Uns	True
3	3	0	33	NoCLP NoSCR	353207			Uns	True
3	3	0	34	NoCLP NoSCR	353207			Uns	True
3	3	0	35	NoCLP NoSCR	353207			Uns	True
3	3	0	36	NoCLP NoSCR	353207			Uns	True

— Output continues on next page —

						Multicast		
Slot	Port	VPI	VCI	gcra a enf mode	gcra a enf mode	grp id	enable	ingrs / egrss
3	3	0	5	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	16	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	18	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	32	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	33	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	34	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	35	no cong dx clpl	no cong dx clpl	4095	disable	ingress
3	3	0	36	no cong dx clpl	no cong dx clpl	4095	disable	ingress

Slot	Port	VPI	VCI	AAL5 Discard
3	3	0	5	Disabled
3	3	0	16	Disabled
3	3	0	18	Disabled
3	3	0	32	Disabled
3	3	0	33	Disabled
3	3	0	34	Disabled
3	3	0	35	Disabled
3	3	0	36	Disabled

Descriptions of the columns included in this display are described earlier in *Viewing Virtual Connections* on page 42-71.

Information on One Virtual Channel

To view status information one a single virtual channel, you enter the **vvc** command along with the slot number for the CSM board, the port number, the VPI number, and VCI number for the virtual path on which you want information, as follows:

vvc <slot>/<port> <vpi>/<vci>

where **<slot>** is the slot number where the CSM board is installed, **<port>** is the port number on the CSM board, **<vpi>** is the virtual path identifier, and **<vci>** is the virtual channel identifier. For example, if you wanted to view status information for the board in slot 3, port 3, VPI 0, and VCI 5, you would enter:

vvc 3/3 0/5

This command displays a screen similar to the following:

```
                              CSM Connections

   Incoming            Outgoing
 ----------------   ---------------- Connection              Chan    Transport
 Slot Port VPI VCI  Slot Port VPI VCI  Description             Type    Priority
 ==== ==== === ===  ==== ==== === ==== ==================== ====== =========
 3    3    0   5    5    2    0   1019 Connection 5           VC UNI  UBR    &

                                                               User
 Slot Port VPI VCI        Up Time              Down Time        Pri.  Statistics Mode
 ==== ==== === ===  ================== ================== ==== ==============
 3    3    0   5    WED SEP 29 10:03:21  WED SEP 29 10:03:20  15    CntGcra, PsCell

                              Tx Traffic Information

                    Tx Traffic               Peak       Sustain  Maximum    Tx     Best
 Slot Port VPI VCI  Descrip Type            Cell Rate   Cell Rate  Burst Sz  QoS    Effort
 ==== ==== === ===  ================== =========  ========= ========  ===    ======
 3    3    0   5    NoCLP  NoSCR               589                            Uns    False

                              Rx Traffic Information

                    Rx Traffic               Peak       Sustain  Maximum    Rx     Best
 Slot Port VPI VCI  Descrip Type            Cell Rate   Cell Rate  Burst Sz  QoS    Effort
 ==== ==== === ===  ================== =========  ========= ========  ===    ======
 3    3    0   5    NoCLP  NoSCR               589                            Uns    False

                                                              Multicast
                                                  -------------------------
 Slot Port VPI VCI  gcra a enf mode   gcra a enf mode  grp id   enable   ingrs / egrss
 ==== ==== === ===  ==============   ==============  ======   =======  ==========
 3    3    0   5    no  cong  dx clpl  no  cong  dx clpl 4095   disable  ingress


 Slot Port VPI VCI  AAL5 Discard
 ==== ==== === ===  ==============
 3    3    0   5    Disabled
```

Descriptions of the columns included in this display are described earlier in *Viewing Virtual Connections* on page 42-71.