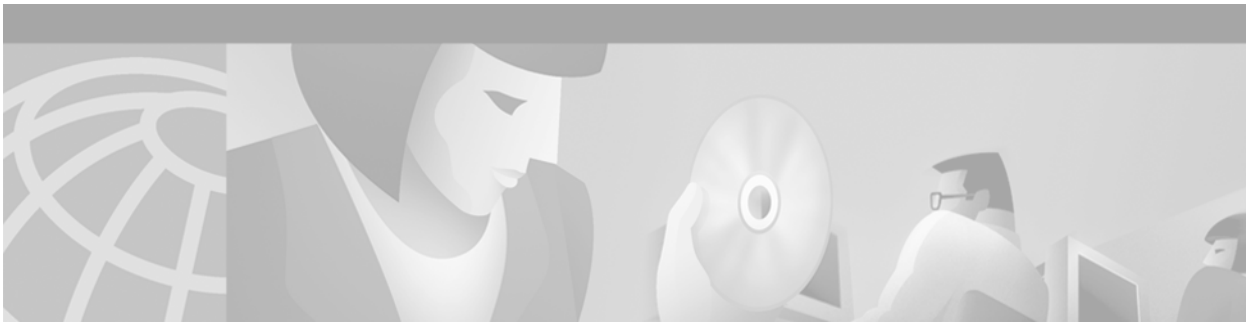


OC-3/STM-1 ATM Circuit Emulation Service Network Module

The following sections are provided:

- Feature Overview
- Supported Platforms
- Supported Standards, MIBs, and RFCs
- Prerequisites
- Configuration Tasks
- Configuration Examples
- Command Reference
- Glossary

Feature Overview

This document describes how to configure the following 1-port OC-3/STM-1 ATM Circuit Emulation Service network modules with circuit emulation service for the Cisco 3600 series of modular access routers:

Table 1 Models of OC-3/STM-1 ATM CES Network Modules

Network Module	Description
NM-1A-OC3MM-1V=	Single port OC-3/STM-1 ATM Circuit Emulation Service multimode network module.
NM-1A-OC3SMI-1V=	Single port OC-3/STM-1 ATM Circuit Emulation Service single-mode, intermediate reach network module.
NM-1A-OC3SML-1V=	Single port OC-3/STM-1 ATM Circuit Emulation Service single-mode, long reach network module.

All modules provide connectivity to an OC-3/STM-1fiber for high-bandwidth data applications and voice-data integration applications. The circuit emulation service deck enables the network module to carry voice traffic, such as telephone calls and faxes, video, or any other legacy TDM traffic over an ATM network simultaneously with data traffic. The circuit emulation service deck supports ATM AAL1

structured and unstructured Circuit Emulation Service (CES). The circuit emulation service deck also supports echo cancellation for a full T1/E1 trunk, allowing digital ISDN calls and analog modem calls over a single digital network interface.

You need both an OC-3/STM-1 ATM Circuit Emulation Service network module and a 1- or 2-port T1 or E1 multiflex trunk interface card (VWIC-1MFT-T1=, VWIC-1MFT-E1=, VWIC-2MFT-T1=, VWIC-2MFT-E1=, VWIC-2MFT-T1-DI=, VWIC-2MFT-E1-DI=) for a voice connection. You can install one multiflex trunk interface card (providing up to two voice ports) in the circuit emulation service deck on the OC-3/STM-1 ATM Circuit Emulation Service network module. To install a multiflex trunk interface card in a network module, see the *Cisco WAN Interface Cards Hardware Installation Guide* publication.

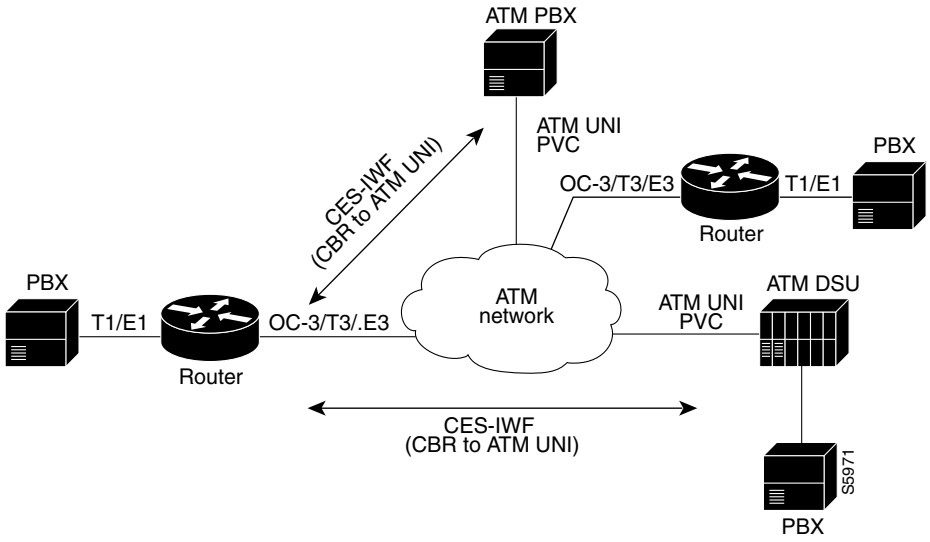
Note 1- or 2-port T1 or E1 multiflex trunk interface cards that support G.703 (VWIC-1MFT-G703=, VWIC-2MFT-G703=) are not supported in the OC-3/STM-1 ATM Circuit Emulation Service network module.

Circuit Emulation Service Overview

Circuit emulation is a service based on ATM Forum standards that allows communications to occur between AAL1 CES and ATM UNI interfaces, that is, between non-ATM telephony devices (such as classic PBXs or TDMs) and ATM devices (such as Cisco 3600 series routers). Thus, a Cisco 3600 series router equipped with an OC-3/STM-1 ATM Circuit Emulation Service network module offers a migration path from classic T1/E1 data communications service to emulated CES T1/E1 unstructured (clear channel) services or structured (N x 64) services in an ATM network.

Figure 1 shows a simplified representation of CES functions in an ATM network.

Figure 1 Typical CES-IWF Operations in an ATM Network



Circuit emulation service allows you to interconnect existing T1 or E1 interfaces and other kinds of constant bit rate (CBR) equipment. Circuit emulation service includes such features as PBX interconnect, consolidated voice and data traffic, and video conferencing.

With circuit emulation, data received from an external device at the edge of an ATM network is converted to ATM cells, sent through the network, reassembled into a bit stream, and passed out of the ATM network to its destination. T1/E1 circuit emulation does not interpret the contents of the data stream. All the bits flowing into the input edge port of the ATM network are reproduced at one corresponding output edge port.

An emulated circuit is carried across the ATM network on a PVC, which is configured through the network management system or the router command line interface (CLI).

The target application of the OC-3/STM-1 ATM Circuit Emulation Service network module is access to a broadband public or private ATM network where multiservice consolidation of legacy TDM, voice, video, and data traffic over a single ATM link is a requirement.

Clocking Overview

For your OC-3/STM-1 ATM Circuit Emulation Service network module to function properly, clocking must be carefully set up. Clock sources and modes must be properly configured. This overview describes the following:

- Clocking Sources
- Clocking Types

Clocking Sources

Clocking at the physical interface is used to control the speed with which data is transmitted on the physical connection. This is important in delay-sensitive data types, such as voice and video, because these types of data must be received and transmitted at the same rate at every step, or hop, in a connection. To accomplish this, all the interfaces involved must be synchronized so that within a given time window the same amount of data is transmitted or forwarded at every point in the connection. If synchronization is not present, data can be lost because of buffer overflow or underflow at some point along the way. Real-time, delay-sensitive data is intolerant of such loss.

The OC-3/STM-1 ATM Circuit Emulation Service network module can use internal clock sources or it can extract clocking from an external signal. An external source is one derived from a signal coming into the ATM switch router. These can include:

- Another ATM switch
- A PBX which, in turn, can extract its clocking from a public telephone network
- A Building Integrated Timing Supply (BITS) source supplied to the network clock module using a T1 or E1 connection

In many cases, using a clocking signal from a telephone company is the simplest and best solution for a stable and reliable clocking signal, especially in those instances where you are already connecting to telephone equipment using circuit emulation service (CES).

For example, to meet its own need for internal consistency, a telephone company typically distributes a timing signal to govern its own networking operations. Therefore, the telephone company has already addressed timing requirements similar to those that an ATM switch router user must address in relation to their own CES operations. Consequently, a private branch exchange (PBX) can serve as a ready means for providing a timing signal to any user CES device.

A primary reference source (PRS) refers to a precision reference timing signal that must be made available, wherever required, to synchronize the flow of CES data from its source to its destination. A major telephone carrier is often the source of the timing signal of choice, because such signals are

known to be highly stable, reliable, and accurate. If the clock frequency is not the same at both the ingress and egress nodes of the circuit, the data queues and buffers in the network will either overflow or underflow, resulting in periodic line errors.

Clocking Types

The OC-3/STM-1 ATM Circuit Emulation Service network module is capable of using three clocking modes to meet the timing requirements of CBR data:

- Synchronous—The default clocking mode for CES. If you have a single PRS, such as a clock signal from a telephone company, you should use synchronous mode. If you are using structured CES, you *must* use synchronous mode. In the event that the priority 1 PRS fails for any reason, the network clock synchronization service automatically recovers network timing by using a priority 2 PRS available from another source.
- Synchronous residual time stamp (SRTS)—Allows equipment at the edges of a network to use a clocking signal that is different (and completely independent) from the clocking signal being used in the ATM network. SRTS mode also allows two CPEs to have different clocks.
- Adaptive—Typically used when it is not possible to implement either synchronous or SRTS mode. This is the least precise and least recommended method. Adaptive clocking requires neither the network clock synchronization service nor a global PRS for effective handling of CES traffic. Rather than using a clocking signal to convey CES traffic through an ATM network, adaptive clocking infers appropriate timing for data transport by calculating an average data rate for the CES traffic.

Table 2 summarizes, in order of preference, the characteristics of the three clocking modes you can configure on a CES module.

Table 2 Characteristics of CES Clocking Modes

Clocking Mode	Advantages	Limitations
Synchronous	Supports both unstructured (clear channel) and structured CBR traffic. Exhibits superior control of wander and jitter.	Requires a PRS and network clock synchronization services. Ties the CES interface to the network clock synchronization services clocking signal (PRS).
SRTS	Conveys externally generated user clocking signal through an ATM network, providing an independent clocking signal for each CES circuit.	Requires a PRS and network clock synchronization services. Supports only unstructured (clear channel) CBR traffic. Exhibits moderate control of wander and jitter.
Adaptive	Does not require a PRS or network clock synchronization services.	Supports only unstructured (clear channel) CBR traffic. Exhibits poorest control of wander and jitter.

Although the wander and jitter characteristics of these clocking modes differ, all clocking modes preserve the integrity of your CES data, ensuring error-free data transport from source to destination. The differences among the three modes are further described in the following sections.

Benefits

The OC-3/STM-1 ATM Circuit Emulation Service network module allows the connection of ATM networks and legacy TDM T1 and E1 lines. This functionality provides the following benefits:

- Robust Circuit Emulation Service for seamless migration of TDM equipment to a common multi-service ATM infrastructure
- Optimizes investment protection by taking advantage of ATM's inherent QoS capabilities
- Cost-effective consolidation of previously separate voice, video, and data networks
- Substantial network savings are realized through reduction in leased line charges, network support, and administrative costs
- Reduces overall network complexity

Restrictions

The OC-3/STM-1 ATM CES network module can be configured with the following restrictions:

- On-hook detection is not supported.
- If you configure an ABR VC, either in a vc-class or in vcmode, the MCR value you enter is ignored, and an MCR of 0 is used, although this is not apparent from the configuration. Additionally, ABR PCR values are configurable in a range from 0 to line rate. The MCR is honored, however. Currently, the OC-3/STM-1 ATM CES network module rounds the configured value down to one of the following values:
  - 64 Kbit/sec
  - 384 K
  - 768 K
  - 1,534 K
  - 2 M
  - 4 M
  - 10 M
  - 16 M
  - 25.6 M
  - 44 M
  - 75 M
  - 100 M
  - 125 M
  - 149 M
- When you configure a UBR+ VC, the Cisco CLI requires that you specify a PCR. Because of a hardware limitation, any value you enter is ignored by the OC-3/STM-1 ATM CES network module and a value of 155 Mbits per second is used.
- The OC-3/STM-1 ATM CES network module does not allow configuring interfaces and sub-interfaces by using the **traffic-shape** parameter. That is because theOC-3/STM-1 ATM CES network module supports traffic shaping through native ATM means by making a traffic class for UBR, UBR+, ABR, VBR-rt, VBR-ntr, and CBR.

If you are still having trouble, enable ATM debug mode using the **debug atm errors** command.

Note Using debug commands may generate enormous amounts of data, which may cause significant degradation in performance.

Related Documents

- *ATM OC-3 Network Module for the Cisco 3600 Series Routers* Cisco IOS Release 12.0 online document
- *Configuring 1- and 2-Port T1/E1 Multiflex Voice/WAN Interface Cards on Cisco 2600 and 3600 Series Routers* Cisco IOS Release 12.0(5)XK online document
- Cisco IOS Release12.1 *Wide-Area Networking Configuration Guide* and *Wide-Area Networking Command Reference*
- Cisco IOS Release12.1 *Voice, Video, and Home Applications Configuration Guide, and the Voice, Video, and Home Applications Command Reference.*

Supported Platforms

- Cisco 3620
- Cisco 3640
- Cisco 3661
- Cisco 3662

Supported Standards, MIBs, and RFCs

Standards

- ATM Forum UNI 3.0, 3.1, and 4.0, signaling
- ATM Forum CES 1.0 AF-SAA-0032.000, interoperability specification
- ATM Forum CES 2.0 AF-VTOA-0078.000, interoperability specification

MIBs

- ATM Forum MIB
- AToM MIB
- CISCO-AAL5-MIB
- CISCO-ATM-IF-PHYS-MIB
- CISCO-BUS-MIB
- CISCO-LECS-MIB
- CISCO-LES-MIB
- Chassis MIB
- ILMI MIB

- Interface MIB
- LAN-EMULATION-CLIENT-MIB
- SONET MIB

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

- RFC 1483, *encapulation for bridged and routed traffic*
- RFC 1577, classical IP and ARP over ATM
- RFC 2022, Multicast over UNI 3.0/3.1 based ATM Networks - UNI 3.0
- RFC 2383, *ST2+ over ATM Protocol Specification - UNI 3.1*
- RFC 1695, Definitions of Managed Objects for ATM Management Version 8.0 using SMIv2

Prerequisites

The OC-3/STM-1 ATM Circuit Emulation Service network module requires Cisco IOS Release 12.1(2)T or later.

Before you configure an interface, have the following information available:

- Protocols you plan to route on the new interface
- IP addresses, subnet masks, network numbers, zones, or other information related to the routing protocol
- Permanent virtual circuit (PVC) connections and their attributes
- Static address mappings (address lists)

Timesaver Obtain this information from your system administrator or network plan before you begin router configuration.

Configuration Tasks

See the following sections for configuration tasks for the OC-3/STM-1 ATM Circuit Emulation Service network module. Each task in the list indicates if the task is optional or required.

- Configuring the ATM Interface
- Configuring the T1/E1 Controller
- Activating the Connection

Configuring the ATM Interface

The ATM interface on the OC-3/STM-1 ATM Circuit Emulation Service network module allows access to an ATM network, which provides the benefits of circuit switching (constant transmission delay and guaranteed capacity) with those of packet switching (flexibility and efficiency for intermittent traffic). To configure the ATM interface on the OC-3/STM-1 ATM Circuit Emulation Service network module, use the following procedures:

- Configuring PVCs
- Configuring SVCs
- Configuring Virtual Path Shaping

This document does not explain all possible ATM interface configuration options. For complete information, see the Cisco IOS Release 12.1 *Wide-Area Networking Configuration Guide* and *Wide-Area Networking Command Reference*.

Configuring PVCs

To use a permanent virtual circuit (PVC), you must configure the PVC into both the router and the ATM switch. PVCs remain active until the circuit is removed from either configuration.To configure the ATM interface with PVCs, follow this procedure starting in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm slot/port`	Select the ATM interface to configure by entering the **interface** command, followed by the interface type and slot and unit number.
Step 2	`Router(config-if)# pvc [name] vpi/vci [ces]`	Configure a new ATM PVC by assigning a name (optional) and VPI/VCI numbers. Enter interface-ATM-VC configuration mode. Optionally specify CES encapsulation. Specifying CES is equivalent to creating a CBR class of service.
Step 3	`Router(config-if-ces-vc)# ces-cdv time`	Configure the cell delay variation. The configuration command has the format **ces-cdv** <time> where the time is the maximum tolerable cell arrival jitter with a range of 1 to 65535 microseconds.
Step 4	`Router(config-if-ces-vc)# exit`	Exit back to interface configuration mode.
Step 5	`Router(config-if)# exit`	Return to global configuration mode.

Configuring SVCs

ATM switched virtual circuit (SVC) services are created and released dynamically, providing user bandwidth on demand. This service requires a signaling protocol between the router and the switch. To configure the ATM interface with SVCs, follow this procedure starting in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm slot/port`	Select the ATM interface to configure by entering the **interface** command, followed by the interface type and slot and unit number
Step 2	`Router(config-if)# pvc name vpi/vci [qsaal | ilmi]`	Configure a new ATM PVC for signaling. One dedicated PVC is required between the router and the ATM switch, over which all SVC call establishment and call termination requests flow.Assign a name (optional) and VPI/VCI numbers. Specifiy **qsaal** to configure a signaling PVC. Specify **ilmi** to configure a PVC for communication with the Integrated Local Management Interface (ILMI). Enter interface-ATM-VC configuration mode.
Step 3	`Router(config-if-atm-vc)# exit`	Exit back to interface configuration mode.

Step 4	`Router(config-if)# svc [name] nsap address ces`
	
	`Router(config-if)# svc [name] ces`
		Configure the active SVC and the ATM network service access point (NSAP) address.
		
		A passive SVC can be configured to only receive calls. The SVC name is required for this command.
		
		Enter interface-ATM-VC configuration mode.

Step 5	`Router(config-if-atm-vc)# ces-cdv time`	Configure the cell delay variation. The configuration command has the format **ces-cdv** *time* where the time is the maximum tolerable cell arrival jitter with a range of 1 to 65535 microseconds.
Step 6	`Router(config-if-atm-vc)# atm esi-address esi.selector`	If the switch is capable of delivering the NSAP address prefix to the router via ILMI and the router is configured with a PVC for communication with the switch via ILMI, you can configure the endstation ID (ESI) and selector fields.
Step 7	`Router(config-if-atm-vc)# exit`	Exit back to interface configuration mode
Step 8	`Router(config-if)# exit`	Return to global configuration mode.

Configuring Virtual Path Shaping

The OC-3/STM-1 ATM Circuit Emulation Service network module supports multiplexing of one or more PVCs over a virtual path (VP) that is shaped at a constant bandwidth. To use this feature, you configure a permanent virtual path (PVP) with a specific virtual path identifier (VPI). Any PVCs that are created subsequently with the same VPI are multiplexed onto this VP; the traffic parameters of individual PVCs are ignored.

The traffic shaping conforms to the peak rate that is specified when you create the VP. Any number of data PVCs can be multiplexed onto a VP.

Note The number of CES PVCs that are multiplexed depends on the bandwidth requirement. Because of this requirement, the CES PVCs cannot be oversubscribed. The CES PVC will fail if there is no bandwidth available. Data PVCs use the bandwidth that is unused by the CES PVCs.

To create a PVP, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm slot/port`	Select the ATM interface to configure by entering the **interface** command, followed by the interface type and slot and unit number
Step 2	`Router(config-if)# atm pvp vpi [peak-rate]`	Create a PVP and optionally specify the peak rate.
Step 3	`Router(config-if)# pvc [name] vpi/vci`	Optionally, create a PVC with a VPI that matches the VPI specified in Step 2.
Step 4	`Router(config-if)# exit`	Exit interface configuration mode.

Configuring the T1/E1 Controller

The T1/E1 controller on the OC-3/STM-1 ATM Circuit Emulation Service network module provides T1 or E1 connectivity to PBXs or to a central office (CO). To configure the T1 or E1 controller on the OC-3/STM-1 ATM Circuit Emulation Service network module, use the following procedures:

- Configuring the CES Clock
- Configuring Unstructured Circuit Emulation Service
- Configuring Structured Circuit Emulation Service
- Configuring Channel Associated Signaling for Structured CES
- Configuring Echo Cancellation

For more information about configuring the T1/E1 interface on the OC-3/STM-1 ATM Circuit Emulation Service network module, see the *Configuring 1- and 2-Port T1/E1 Multiflex Voice/WAN Interface Cards on Cisco 2600 and 3600 Series Routers* Cisco IOS Release 12.0(5)XK online document.

Configuring the CES Clock

The OC-3/STM-1 ATM Circuit Emulation Service network module uses the CES clock and passes the clocking information to the T1 controller and ATM interface. The clock must be set up on the CES interface, and then the T1 controller and ATM interface must be configured to use either its own

physical loop or the clocking information that is passed. Some examples of the CES clock settings are shown at the end of this section. To configure the CES clock, follow this procedure starting in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# ces slot/port`	Configure the CES interface by entering the **ces** command, followed by the slot and port number. The prompt changes again to show that you are in CES configuration mode. The *port* value is always set to **0**
Step 2	`Router(config-ces)# clock-select priority-no interface slot/port`	Select the source and priority for the CES clock.
Step 3	`Router(config-ces)# exit`	Type exit to return to global configuration mode.
Step 4	`Router(config)# controller {T1 | E1}slot/port`	Enter controller configuration mode for the T1 or E1 controller at the specified *slot/port* location. The prompt changes again to show that you are in controller configuration mode.
Step 5	`Router(config-controller)# clock source {line | internal}`	Specify which end of the circuit provides clocking for the T1 or E1 interface. The clock source should be set to use internal clocking when the installed VWIC uses the clocking designated by the CES clock setting. When set to **internal**, the network module uses the clock source set from the CES clock.
Step 6	`Router(config-controller)# exit`	Type exit to return to global configuration mode.
Step 7	`Router(config)# interface atm slot/port`	Configure the clocking on the ATM interface. The prompt changes again to show that you are in interface configuration mode.
Step 8	`Router(config-if)# atm clock internal`	Specify which end of the circuit provides clocking for the ATM interface. The clock source should be set to use internal clocking when the CES clock is set to anything other than ATM. The **no atm clock internal** command should be set if using the ATM physical loop for clocking
Step 9	`Router(config-if)# exit`	Type exit to return to global configuration mode.

Examples of CES Clock Configuration

Table 3shows allowable combinations for CES clocking configuration.

Table 3 CES Clock Configuration Combinations

T1 Controller	ATM Interface	CES Clock	Network Module Status
clock source internal	no atm clock internal	clock-select 1 ATM x/0	slave to ATM
clock source internal	atm clock internal	clock-select 2 T1 x/0	slave to T1
clock source internal	atm clock internal	clock-select 1 Local Oscillator	master clock

The following sample configurations can be used for CES clock settings.

Network Module Slave to T1 Clock

In this example the OC-3/STM-1 ATM CES network is using the T1 clock.

```
ces 1/0
  clock-select 1 T1 1/0
controller T1 1/0
  clock source internal
interface ATM 1/0
  atm clock internal
```

Network Module is Master Clock

In this example the OC-3/STM-1 ATM CES network module is providing the clock.

```
ces 1/0
  clock-select 1 Local Oscillator
controller T1 1/0
  clock source internal
interface ATM 1/0
  atm clock internal
```

Network Module Slave to ATM Clock

In this example the OC-3/STM-1 ATM CES network module is using the ATM clock.

```
ces 1/0
  clock-select 1 ATM 1/0
controller T1 1/0
  clock source internal
interface ATM 1/0
  no atm clock internal
```

Configuring Unstructured Circuit Emulation Service

This circuit consumes the entire bandwidth of the port, which is provisioned manually at the time you set up the unstructured circuit and remains dedicated to that port, whether that port is actively transmitting data or not.

A CES module converts non-ATM telephony traffic into ATM cells for propagation through an ATM network. The ATM cell stream is directed to an outgoing ATM port or non-ATM telephony port.

To configure the T1/E1 port for unstructured CES, follow this procedure starting in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# controller {T1 | E1}slot/port`	Enter controller configuration mode for the T1 or E1 controller at the specified *slot/port* location. The prompt changes again to show that you are in controller configuration mode.
Step 2	`Router(config-controller)# ces-clock [adaptive|srts|synchronous]`	Select the clock method. The default is synchronous.
Step 3	`Router(config-controller)# tdm-group tdm-group-no unstructured`	Configure a TDM channel group for the T1 interface.

	Command	Purpose
Step 4	`Router(config-controller)# exit`	Type exit to return to global configuration mode.
Step 5	`Router(config)# connect` *connection-name* `atm` *slot/port* [*name of PVC/SVC*|*vpi/vci*] `T1` *slot/port TDM-group-number*	The connection is set to be activated with the connect command.
Step 6	`Router(config-connect)# exit`	After exiting the config-connect mode, the connection is activated.

Configuring Structured Circuit Emulation Service

Structured CES differs from unstructured CES services in that the structured services allow you to allocate the bandwidth in a highly flexible and efficient manner. With the structured services, you use only the bandwidth actually required to support the active structured circuit(s) that you configure.

To configure the T1/E1 port for structured CES, follow this procedure starting in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# controller {T1 | E1}`*slot/port*	Enter controller configuration mode for the T1 or E1 controller at the specified *slot/port* location. The prompt changes again to show that you are in controller configuration mode.
Step 2	`Router(config-controller)# clock source {line | internal}`	Specify which end of the circuit provides clocking for the T1 or E1 interface. The clock source can be set to use internal clocking for most applications.

Step 3	`Router(config-controller)# framing {sf | esf}`
	or
	`Router(config-controller)# framing {crc4 | no-crc4} [australia]`
		Set the framing to SuperFrame (SF) or Extended SuperFrame (ESF) format, according to service provider requirements.
		Set the framing to cyclic redundancy check 4 (CRC4) or no CRC4, according to service provider requirements. The **australia** optional keyword specifies Australian Layer 1 Homologation for E1 framing.

Step 4	`Router(config-controller)# linecode {b8zs | ami | hdb3}`	Set the line encoding according to your service provider's instructions. Bipolar-8 zero substitution (B8ZS), available only for T1 lines, encodes a sequence of eight zeros in a unique binary sequence to detect line coding violations. Alternate mark inversion (AMI), available for T1 or E1 lines, represents zeros using a 01 during each bit cell, and ones are represented by 11 or 00, alternately, during each bit cell. AMI requires that the sending device maintain ones density. Ones density is not maintained independent of the data stream. For E1, set the line coding to either AMI or high-density bipolar 3 (HDB3), the default.

	Command	Purpose
Step 5	`Router(config-controller)# ces-clock synchronous`	Specify the type of clocking used for T1 interfaces using structured CES. Only synchronous clocking can be used with structured CES.
Step 6	`Router(config-controller)# tdm-group` *tdm-group-no* `unstructured`	Configure a TDM channel group for the T1 interface.
Step 7	`Router(config-controller)#exit`	Type exit to return to global configuration mode.
Step 8	`Router(config)#connect` *connection-name* `atm` *slot/port* [*name of PVC/SVC*|*vpi/vci*] `T1` *slot/port TDM-group-number*	The connection is set to be activated with the connect command.
Step 9	`Router(config-connect)# exit`	After exiting the config-connect mode, the connection is activated.

Configuring Channel Associated Signaling for Structured CES

Because the CES deck emulates constant bit rate services over ATM networks, it is capable of providing support for handling channel-associated signaling (CAS) information introduced into structured CES circuits by PBXs and time-division multiplexing (TDM) devices.

Note Only structured CES can support CAS.

The signaling supported depends on the WAN/voice interface card that is inserted in the CES deck. The signaling method depends on the connection that you are making:

- The E&M interface allows connection for PBX trunk lines (tie lines) and telephone equipment. The wink and delay settings both specify confirming signals between the transmitting and receiving ends, whereas the immediate setting stipulates no special offhook/onhook signals.
- The FXO interface is for connection of a central office (CO) to a standard PBX interface where permitted by local regulations; the interface is often used for off-premises extensions.
- The FXS interface allows connection of basic telephone equipment and PBXs.

To configure the T1/E1 port for channel associated signaling, first perform the tasks in the "Configuring Structured Circuit Emulation Service" section and then perform the following tasks beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# controller {T1 | E1}slot/port`	Enter controller configuration mode for the T1 or E1 controller at the specified *slot/port* location. The prompt changes again to show that you are in controller configuration mode.
Step 2	`Router(config-controller)# tdm-group tdm-group-no timeslots timeslot-list type [e&m | fxs [loop-start | ground-start] fxo [loop-start | ground-start]`	Configure a TDM channel group for the T1 interface, including the signaling type. *tdm-group-no* is a value from 0 to 23 for T1 and from 0 to 30 for E1; it identifies the group. *timeslot-list* is a single number, numbers separated by commas, or a pair of numbers separated by a hyphen to indicate a range of timeslots. The valid range is from 1 to 24 for T1. For E1, the range is from 1 to 31. **Note** The group numbers for controller groups must be unique. For example, a TDM group should not have the same ID number as a DS0 group or channel group.
Step 3	`Router(config-controller)# exit`	Type exit to return to global configuration mode.
Step 4	`Router(config)# connect connection-name atm slot/port [name of PVC/SVC|vpi/vci] T1 slot/port TDM-group-number`	The connection is set to be activated with the connect command.
Step 5	`Router(config-connect)# exit`	After exiting the config-connect mode, the connection is activated.

Configuring Echo Cancellation

Echo cancellation adds to the quality of voice transmissions by adjusting the echo that occurs on the interface because of impedance mismatches. Some echo is reassuring; echo over 25 milliseconds can cause problems. To configure the T1/E1 port for echo cancellation, perform the following tasks beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# controller {T1 | E1}slot/port`	Enter controller configuration mode for the T1 or E1 controller at the specified *slot/port* location. The prompt changes again to show that you are in controller configuration mode.
Step 2	`Router(config-controller)# echo-cancel enable`	Enable the echo cancellation feature.

	Command	Purpose
Step 3	`Router(config-controller)# echo-cancel coverage time`	Adjust the coverage size of the echo canceller. The *time* parameter is the number of milliseconds (ms) the echo-canceller covers on a given signal. Valid values are 24, 32, 48, 64, 80, 96, 112, and 128 ms.
Step 4	`Router(config-controller)# echo-cancel compensation`	(Optional) Add attenuation control to the voice port.
Step 5	`Router(config-controller)# echo-cancel comfort-noise`	(Optional) Specify that background noise should be generated.
Step 6	`Router(config-controller)# echo-cancel loopback`	(For testing only) Place the echo cancellation processor in loopback mode.
Step 7	`Router(config-controller)# exit`	Type exit to return to global configuration mode.

Activating the Connection

Once the ATM interface and T1 or E1 controllers are configured, activate the connection by performing the following task beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# connect connection-name atm slot/port [name of PVC/SVC|vpi/vci] T1 slot/port TDM-group-number`	The connection is set to be activated with the connect command.
Step 2	`Router(config-connect)# exit`	After exiting the config-connect mode, the connection is activated.

Monitoring and Maintaining the OC-3/STM-1 ATM Circuit Emulation Service Network Module

To get detailed information about the OC-3/STM-1 ATM Circuit Emulation Service network module configuration, use the following show commands:

add show atm vc

show controller type port slot

Command	Purpose
`Router# show ces [slot/port]`	Show detailed information about the CES connection
`Router# show ces [slot/port] clock-select`	Display the setting of the network clock for the specified port.
`Router# show connection all`	Show detailed information about the connections created by the **connect** command.
`Router# show controllers`	Display all network modules and their interfaces.

Command	Purpose
`Router# show interfaces [type slot/port]`	Specify an interface and verify that the first line of the display shows the interface with the correct slot and port number, and that the interface and line protocol are in the correct state, up or down.
`Router# show protocols`	Display the protocols configured for the entire router and for individual interfaces.
`Router# show version`	Display the router hardware configuration. Check that the list includes the new interface.

Configuration Examples

This section contains the following examples:

- PVC-to-TDM CES Connection Example
- Video Traffic Configuration Example

PVC-to-TDM CES Connection Example

In the following example, the ATM interface clock is being used. The PVC is used by AAL1 CES and is connected to a TDM group to form a CES connection. The CES connection is between ATM interface 1/0 and T1 controller 1/0 using CES PVC 1/101 and TDM group 0. TDM Group 0 has four timeslots.

```
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname vpd2005
!
logging buffered 4096 debugging
no logging console
!
!
ces 1/0
clock-select 1 em1/0
! this is the default

!
ip subnet-zero
ip host lab 172.18.207.11
ip host rtplab 172.18.207.11
ip host rtpss20 172.18.207.11
ip host dev 172.18.207.10
ip host rtpdev 172.18.207.10
!
isdn voice-call-failure 0
cns event-service server
!
!
controller T1 1/0
 clock source internal
 tdm-group 0 timeslots 4-8
!
controller T1 1/1
 clock source internal
 tdm-group 1 timeslots 1
!
!
interface Ethernet0/0
 ip address 172.18.193.220 255.255.255.0
 no ip directed-broadcast
!
interface Ethernet0/1
 no ip address
 no ip directed-broadcast
!
interface Ethernet0/2
 no ip address
 no ip directed-broadcast
!
interface Ethernet0/3
 no ip address
 no ip directed-broadcast
!
interface ATM1/0
 ip address 7.7.7.7 255.255.255.0
 no ip directed-broadcast
 no atm ilmi-keepalive
 pvc 1/101 ces
```

```
 pvc 1/200
  protocol ip 7.7.7.8 broadcast
!
ip classless
ip route 0.0.0.0 0.0.0.0 Ethernet0/0
ip route 0.0.0.0 0.0.0.0 172.18.193.1
ip route 12.0.0.0 255.0.0.0 1.1.1.1
no ip http server
!

connect test ATM1/0 1/101 T1 1/0 0
!
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 password lab
 login
!
end
```

Video Traffic Configuration Example

In the following example, theOC-3/STM-1 ATM Circuit Emulation Service network module is configured for video traffic.

```
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname 3640
!
ces 1/0
 clock-select 1 ATM1/0
!
ip subnet-zero
no ip routing
!
cns event-service server
!!
!
controller T1 1/0
 framing esf
 clock source internal
 linecode b8zs
 cablelength short 133
 tdm-group 0 timeslots 1-6
!
controller T1 1/1
!
interface Ethernet0/0
 ip address 1.2.60.127 255.255.0.0
 ip broadcast-address 1.2.255.255
 no ip route-cache
 no ip mroute-cache
!
interface ATM1/0
 no ip address
 no ip route-cache
 no ip mroute-cache
 no atm ilmi-keepalive
 pvc 0 0/41 ces
!
ip default-gateway 1.2.0.1
ip classless
ip route 223.255.254.0 255.255.255.0 1.2.0.1
no ip http server
!

connect video-1 ATM1/0 0/41 T1 1/0 0
!
!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

- **ces**
- **ces-cdv**
- **ces-clock**
- **clock-select**
- **connect**
- **echo-cancel comfort-noise**
- **echo-cancel coverage**
- **echo-cancel enable**
- **echo-cancel loopback**
- **pvc**
- **svc**
- **tdm-group**

ces

To configure Circuit Emulation Service (CES) on a router port and enter controller configuration mode, use the **ces** global configuration command.

ces *slot/port*

Syntax Description

slot/port	Backplane slot number and port number on the interface. The port value is always 0 as the interface configuration applies to all ports in the slot.

Defaults

No ces interface is configured.

Command Modes

Global configuration

Command History

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

Usage Guidelines

This command is used on Cisco 3600 series routers that have OC-3/STM-1 ATM CES network modules.

Examples

The following example configures the CES interface in slot 2:

```
ces 2/0
```

Related Commands

Command	Description
clock-select	Allows the selection of clock sources and priority.

ces-cdv

To set the cell delay variation, use the **ces-cdv** interface configuration command.

ces-cdv *time*

Syntax Description

time	The time is the maximum tolerable cell arrival jitter with a range of 1 to 65535 microseconds

Defaults

The default *time* parameter is 5000.

Command Modes

Interface-ATM-VC

Command History

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

Usage Guidelines

This command is used on Cisco 3600 series routers that have OC-3/STM-1 ATM CES network modules.

Examples

The following example configures the maximum tolerable cell arrival jitter at 7500 microseconds:

```
ces-cdv 7500
```

Related Commands

Command	Description
interface atm	Configures the ATM interface
svc	Configures the SVC

ces-clock

To configure the clock for the CES interface, use the **ces-clock** controller configuration command.

```
ces-clock [adaptive|srts|synchronous]
```

Syntax Description

adaptive	Adjusts output clock on a received AAL1 on first-in, first-out basis. Use in unstructured mode.
srts	Sets the clocking mode to synchronous residual time stamp.
synchronous	Configures the timing recovery to synchronous for structured mode.

Defaults

The default setting is *synchronous.*

Command Modes

Controller configuration

Command History

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

Usage Guidelines

This command is used on Cisco 3600 series routers that have OC-3/STM-1 ATM CES network modules.

Examples

The following example configures the CES clock mode for synchronous residual time stamp:

```
ces-clock srts
```

Related Commands

Command	Description
controller {**T1** | **E1**}	Configures the T1 or E1 controller.

clock-select

To establish the sources and priorities of the requisite clocking signals for the OC-3/STM-1 ATM Circuit Emulation Service network module, use the **clock-select** CES configuration command.

clock-select *priority-no interface slot/port*

Syntax Description

priority-no	Priority of the clock source. Values are 1 (high priority) to 4 (low priority).
interface	Specifies the interface to supply the clock source.
slot/port	Backplane slot number and port number on the interface.

Defaults

No default behavior or values.

Command Modes

CES configuration

Command History

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

Usage Guidelines

This command is used on Cisco 3600 series routers that have OC-3/STM-1 ATM CES network modules.

To support synchronous or synchronous residual time stamp (SRTS) clocking modes, you must specify a primary reference source to synchronize the flow of CBR data from its source to its destination.

You can specify up to four clock priorities. The highest priority active interface in the router supplies primary reference source to all other interfaces that require network clock synchronization services. The fifth priority is the local oscillator on the network module.

Use the **show ces** *slot/port* **clock-select** command to display the currently configured clock priorities on the router.

Examples

The following example defines two clock priorities on the router:

```
clock-select 1 cbr 2/0
clock-select 2 atm 2/0
```

Related Commands

Command	Description
ces-clock	Configures the timing recovery clock for the CES interface.
clock source	Configures a transmit clock source for the CES interface.
show ces *slot/port* **clock**	Displays which ports are designated as network clock sources.

connect

To define connections between T1 or E1 controller ports and the ATM interface, enter the **connect** global configuration command.This command is used after all interfaces are configured.

connect *connection-name* **atm** *slot/port-1 [name of PVC/SVC|vpi/vci]* {**T1** | **E1**} *slot/port-2 TDM-group-number*

Syntax Description

connection-name	A name for this connection.
atm	Specifies the ATM interface.
slot/port-1	The location of the ATM controller to be connected.
name of PVC/SVC	Specifies the permanent or switched virtual circuit.
vpi/vci	Specifies a virtual path identifier (VPI) and virtual channel identifier (VCI).
T1	Specifies a T1 port.
E1	Specifies an E1 port.
slot/port-2	The location of the T1 or E1 controller to be connected.
TDM-group-number	The number identifier of the time-division multiplexing (TDM) group associated with the T1 or E1 controller port and created by using the **tdm-group** command. Valid values are from 0 to 23 for T1 and from 0 to 30 for E1.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

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

Usage Guidelines

This command is used on Cisco 3600 series routers to provide connections between T1/E1 interfaces, between T1/E1 and ATM interfaces, and for drop-and-insert capabilities.

Examples

The following example shows how the ATM PVC and T1 TDM group are set up and then connected:

```
Router(config)# interface atm 1/0
Router(config-if)pvc pvc1 0/100 ces
Router(config-if)exit
Router(config)# controller T1 1/1
Router(config-controller)tdm-group 3 timeslots 13-24 type e&m
Router(config-controller)exit
Router(config)connect tdm1 atm 1/0 pvc1 0/100 T1 1/1 3
```

Related Commands

Command	Description
tdm-group	This controller configuration command creates TDM groups that can be connected.

echo-cancel comfort-noise

To specify that background noise should be generated, use the **echo-cancel comfort-noise** controller configuration command. Use the no form of this command to disable this feature.

```
echo-cancel comfort-noise

no echo-cancel comfort-noise
```

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

Controller configuration

Command History

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

Usage Guidelines

Use the **echo-cancel comfort-noise** command to generate background noise to fill silent gaps during calls if VAD is activated. If comfort noise is not enabled and VAD is enabled at the remote end of the connection, the user hears nothing or silence when the remote party is not speaking.

The configuration of comfort noise only affects the silence generated at the local interface; it does not affect the use of VAD on either end of the connection or the silence generated at the remote end of the connection.

For the OC-3/STM-1 ATM Circuit Emulation Service network module, echo cancellation must be enabled.

Examples

The following example enables comfort noise on a T1 controller:

```
controller T10/0
 echo-cancel enable
 echo-cancel comfort-noise
```

Related Commands

Command	Description
voice port	Specifies which port is used for voice traffic.
echo-cancel enable	Enables echo cancellation on a voice port.

echo-cancel compensation

To set attenuation for loud signals, use the **echo-cancel compensation** controller configuration command. Use the no form of this command to disable this feature.

```
echo-cancel compensation

no echo-cancel compensation
```

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

Controller configuration.

Command History

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

Usage Guidelines

Use the **echo-cancel compensation** command to add attenuation control to the T1 or E1 controller. When this command is enabled, -6 dB is inserted if the signal level from the receive direction is loud. When loud signals are not received, the attenuation is removed.

For the OC-3/STM-1 ATM Circuit Emulation Service network module, echo cancellation must be enabled.

Examples

The following example enables comfort noise on a T1 controller:

```
controller T1 0/0
 echo-cancel enable
 echo-cancel compensation
```

Related Commands

Command	Description
voice port	Specifies which port is used for voice traffic
echo-cancel enable	Enables echo cancellation on a voice port.

echo-cancel coverage

To adjust the size of the maximum echo delay compensation, use the **echo-cancel coverage** controller configuration command. Use the no form of this command to reset this command to the default value.

echo-cancel coverage *time*

no echo-cancel coverage *time*

Syntax Description

time	Number of milliseconds (ms) the echo-canceller covers on a given signal. Valid values are 24, 32, 48, 64, 80, 96, 112, and 128 ms.

Defaults

64 ms

Command Modes

Controller configuration.

Command History

Release	Modification
12.1(2)T	This command is supported on the OC-3/STM-1 ATM Circuit Emulation Service network module on the Cisco 3600 series routers.

Usage Guidelines

Use the **echo-cancel coverage** command to adjust the size of the maximum echo delay compensation. This command enables cancellation of voice that is sent out of the interface and received back on the same interface within the configured amount of time. If the local loop (the distance from the analog interface to the connected equipment producing the echo) is longer, the configured value of this command should be extended.

If you configure a longer value for this command, the echo canceller takes longer to converge; in this case, the user might hear a slight echo when the connection is initially set up. If the configured value for this command is too short, the user might hear some echo for the duration of the call because the echo canceller is not cancelling the longer delay echoes.

There is no echo or echo cancellation on the IP side of the connection.

Note This command is valid only if the echo cancel feature has been enabled. For more information, refer to the echo-cancel enable command.

Examples

The following example adjusts the size of the echo canceller to 32 ms:

```
controller T1 0/0
 echo-cancel enable
 echo-cancel coverage 32
```

Related Commands

Command	Description
echo-cancel enable	Enables echo cancellation on a voice port.

echo-cancel enable

To enable the echo cancel feature, use the **echo-cancel enable** controller configuration command. Use the **no** form of this command to disable this feature..

```
echo-cancel enable

no echo-cancel enable
```

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled for all interface types.

Command Modes

Controller configuration

Command History

Release	Modification
12.1(2)T	This command is supported on the OC-3/STM-1 ATM Circuit Emulation Service network module on the Cisco 3600 series routers.

Usage Guidelines

The **echo-cancel enable** command enables cancellation of voice that is sent out of the interface and is received back on the same interface. Disabling echo cancellation might cause the remote side of a connection to hear an echo. Because echo cancellation is an invasive process that can minimally degrade voice quality, this command should be disabled if it is not needed.

The echo-cancel command does not affect the echo heard by the user on the analog side of the connection.

Note This command is valid only if the **echo-cancel coverage** command has been configured. For more information, refer to the **echo-cancel coverage** command.

Examples

The following example enables the echo cancel featureon a T1 controller:

```
controller T1 0/0
 echo-cancel enable
 echo-cancel coverage 32
```

Related Commands

Command	Description
echo-cancel coverage	Specifies the amount of coverage for echo cancellation
voice port	Configures the voice port

echo-cancel loopback

To place the echo cancellation processor in loopback mode, use the **echo-cancel loopback** controller configuration command. To disable, use the **no** form of this command.

```
echo-cancel loopback

no echo-cancel loopback
```

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

Controller configuration

Command History

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

Usage Guidelines

You can use an **echo-cancel loopback** test on lines to detect and distinguish equipment malfunctions caused either by line or by the interface. If correct echo cancellation is not possible when an interface is in loopback mode, the interface is the source of the problem.

Examples

On a Cisco 3600 series router, the following example sets up echo cancellation loopback diagnostics:

```
controller T1 0/0
 echo-cancel enable
 echo-cancel coverage 32
echo-cancel loopback
```

Related Commands

Command	Description
echo-cancel enable	Enables echo cancellation on a voice port.

pvc

To create or assign a name to an ATM permanent virtual circuit (PVC), specify the encapsulation type on an ATM PVC, or enter interface-ATM-VC configuration mode, use the **pvc** command in interface or subinterface configuration mode. To remove an ATM PVC, use the **no** form of this command.

pvc [*name*] *vpi*/*vci* [**ilmi** | **qsaal** | **smds** | **ces**]

no pvc [*name*] *vpi*/*vci* [**ilmi** | **qsaal** | **smds** | **ces**]

Syntax Description

name	(Optional) The name of the PVC or map. The name can be up to 16 characters long.
vpi/	ATM network virtual path identifier (VPI) for this PVC. The absence of the "/" and a *vpi* value defaults the *vpi* value to 0. On the Cisco 7200 and 7500 series routers, this value ranges from 0 to 255; on the Cisco 4500 and 4700 routers, this value ranges from 0 to 1 less than the quotient of 8192 divided by the value set by the **atm vc-per-vp** command. The arguments *vpi* and *vci* cannot both be set to 0; if one is 0, the other cannot be 0.
vci	ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the **atm vc-per-vp** command. Typically, lower values 0 to 31 are reserved for specific traffic (for example, F4 OAM, SVC signalling, ILMI, and so on) and should not be used. The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only. The arguments *vpi* and *vci* cannot both be set to 0; if one is 0, the other cannot be 0.
ilmi	(Optional) Used to set up communication with the ILMI; the associated *vpi* and *vci* values ordinarily are 0 and 16, respectively.
qsaal	(Optional) A signalling-type PVC used for setting up or tearing down SVCs; the associated *vpi* and *vci* values ordinarily are 0 and 5, respectively.
smds	(Optional) Encapsulation for SMDS networks. If you are configuring an ATM PVC on the ATM Interface Processor (AIP), you must configure AAL3/4SMDS using the **atm aal aal3/4** command before specifying **smds** encapsulation. If you are configuring an ATM network processor module (NPM), the **atm aal aal3/4** command is not required. SMDS encapsulation is not supported on the ATM port adapter.
ces	(Optional) Specify CES encapsulation. Specifying CES is equivalent to creating a CBR class of service

Defaults

No PVC is defined. When a PVC is defined, the global default of the **encapsulation** command applies (*aal-encap* = **aal5snap**).

Command Modes Interface or subinterface configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.1(2)T	This command is supported on the OC-3/STM-1 ATM Circuit Emulation Service network module on the Cisco 3600 series routers.

Usage Guidelines

Creating and Configuring PVCs

The **pvc** command replaces the **atm pvc** command, which, although still supported and available, will become obsolete in the near future. Use the **pvc** command to configure a single ATM VC only, not a VC that is a bundle member. We recommend that you use the **pvc** command in conjunction with the **encapsulation** and **random-detect attach** commands instead of the **atm pvc** command.

The **pvc** command creates a PVC and attaches it to the VPI and VCI specified. Both the *vpi* and *vci* arguments cannot be simultaneously specified as 0; if one is 0, the other cannot be 0.

When configuring an SVC, use the **pvc** command to configure the PVC that handles SVC call setup and termination. In this case, specify the **qsaal** keyword. See the second example that follows.

ATM PVC Names

Once you specify a *name* for a PVC, you can reenter interface-ATM-VC configuration mode by simply entering the **pvc** *name* command. You can remove a PVC and any associated parameters by entering **no pvc** *name* or **no pvc** *vpi*/*vci*.

Note After configuring the parameters for an ATM PVC, you must exit the interface-ATM-VC configuration mode in order to create the PVC and enable the settings.

Encapsulation Types on ATM PVCs

Specify ILMI, QSAAL, SMDS, or CES as the encapsulation type on an ATM PVC. (To configure other encapsulations types, see the **encapsulation** command.)

Rate Queues

The Cisco IOS software dynamically creates rate queues as necessary to satisfy the requests of the **pvc** commands.

Default Configurations

If **ilmi**, **qsaal**, **smds**, or **ces** encapsulation is not explicitly configured on the ATM PVC, the PVC inherits the following default configuration (listed in order of next highest precedence):

- Configuration of the **encapsulation** command in a VC class assigned to the PVC itself.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM subinterface of the PVC.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM main interface of the PVC.
- Global default: The global default of the **encapsulation** command applies (*aal-encap* = **aal5snap**).

Examples

The following example creates a PVC with VPI 0 and VCI 16, and communication is set up with the ILMI:

```
pvc cisco 0/16 ilmi
 exit
```

The following example creates a PVC used for ATM signalling for an SVC. It specifies VPI 0 and VCI 5:

```
pvc cisco 0/5 qsaal
 exit
```

The following example configures the PVC called cisco to use class-based weighted fair queueing (CBWFQ). It attaches a policy map called policy1 to the PVC. The classes comprising policy1 determine the service policy for the PVC:

```
pvc cisco 0/5
 service-policy output policy1
vbr-nrt 2000 2000
encap aal5snap
```

Related Commands

Command	Description
atm vc-per-vp	Sets the maximum number of VCIs to support per VPI.
pvc-bundle	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.

show ces clock-select

To display the setting of the network clock for the specified port, use the **show ces clock-select** privileged EXEC command.

show ces *slot*/*port* **clock-select**

Syntax Description

slot	Backplane slot number.
port	Interface port number.

Command Modes

Privileged EXEC

Command History

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

Examples

The following is sample output from the **show ces clock-select** command for slot 1, port 0:

```
router# show ces 1/0 clock-select
Priority 1 clock source:not configured
Priority 2 clock source:not configured
Priority 3 clock source:ATM1/0 UP
Priority 4 clock source:Local oscillator
Current clock source:ATM1/0, priority:3
```

Related Commands

Command	Description
clock-select	Establishes the sources and priorities of the requisite clocking signals for the OC-3/STM-1 ATM Circuit Emulation Service network module.

SVC

To create an ATM switched virtual circuit (SVC) on a main interface or subinterface, use the **svc** interface configuration command. To disable the SVC, use the **no** form of this command.

svc [*name*] {**nsap** *address* | **ces**}

no svc [*name*] {**nsap** *address* | **ces**}

Syntax Description

name	(Optional) The name of the SVC and map. The name can be up to 16 characters long.
nsap *address*	The destination ATM network service access point (NSAP) address. Must be exactly 40 hexadecimal digits long and in the correct format. See the "Usage Guidelines" section below.
ces	A passive SVC can be configured to only receive calls using circuit emulation service (CES). The SVC name is required for this command.

Defaults

No NSAP address is defined.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.1(2)T	This command is supported on the OC-3/STM-1 ATM Circuit Emulation Service network module on the Cisco 3600 series routers.

Usage Guidelines

Once you specify a *name* for an SVC, you can reenter the interface-ATM-VC configuration mode by simply entering **svc** *name*. You can remove an NSAP address any associated parameters by entering **no svc** *name* or **no svc** *nsap address*.

Note After configuring the parameters for an ATM SVC, you must exit the interface-ATM-VC configuration mode in order to enable the SVC settings.

Examples

The following example creates an SVC with the name lion and specifies the 40-digit hexadecimal destination ATM NSAP address:

```
svc lion nsap 47.0091.81.000000.0040.0B0A.2501.ABC1.3333.3333.05
```

tdm-group

To configure a list of time slots for creating clear channel groups (pass-through) for Time Division Multiplexing (TDM) cross-connect, use the **tdm-group** controller configuration command. Use the **no** form of this command to delete a clear channel group.

tdm-group *tdm-group-no* **timeslot** *timeslot-list* **[[type** {**e&m** | **fxs** [**loop-start** | **ground-start**] | **fxo** [**loop-start** | **ground-start**] | **r2-digital**| **r2-analog** | **r2-pulse**}] | **unstructured**]

no tdm-group *tdm-group-no*

Syntax Description

tdm-group-no	Time Division Multiplexing (TDM) group number.
timeslot	Timeslot number.
timeslot-list	Timeslot list. The valid range is from 1-24 for T1, and from 1-15 and 17-31 for E1.
type	(Optional) (Valid only when the **mode cas** command is enabled.) Specifies the voice signaling type of the voice port. If configuring a TDM group for data traffic only, do not specify the **type** option. Choose from one of the following options: • **e&m**—for E&M signaling • **fxo**—for Foreign Exchange Office signaling (optionally, you can also specify loop-start or ground-start) • **fxs**—for Foreign Exchange Station signaling (optionally, you can also specify loop-start or ground-start) • **e1 has melcas stuff** • •
unstructured	Allows the framing to be set for unstructured circuits

Defaults

No TDM group is configured.

Command Modes

Controller configuration

Command History

Release	Modification
11.3 MA	This command was introduced.
12.1(2)T	This command was modified for the OC-3/STM-1 ATM Circuit Emulation Service network module on the Cisco 3600 series routers.

Usage Guidelines

This command applies to Voice over Frame Relay, Voice over ATM, and Voice over HDLC on the Cisco MC3810 and Cisco 3600 series routers.

Note Channel groups, CAS voice groups, and TDM groups all use group numbers. All group numbers configured for channel groups, CAS voice groups, and TDM groups must be unique on the local router. For example, you cannot use the same group number for a channel group and for a TDM group.

Examples

The following example configures TDM group number 20 on controller T1 1 to support FXO ground-start:

```
controller T1 1
 tdm-group 20 timeslot 20 type fxs ground-start
```

Glossary

ABR—Available Bit Rate service, provides a feedback path in VCs using RM cells to indicate buffer congestion and automatically decrease/increase data rate on a VC.

ATM —Asynchronous Transfer Mode (NOT Automatic Teller Machine)

CES—Circuit Emulation Service

CBR—Constant Bit Rate interfaces usually run at T1 or E1 speed and are used mostly to connect PBXs or video equipment

OC3—optical carrier level 3, the optical interface designed with synchronous transport signal (STS-3) rate in SONET.

PRS—primary reference source

PVC—permanent virtual circuit made between two data terminal equipment (DTE) lines established by configuration.

SAR—Segmentation and Reassembly, a circuit device that converts packets into cells and visa-versa.

SVC—switched virtual circuit established across a network on as-need basis.

SONET—synchronous optical network

STM-1—Synchronous Transfer Mode level 1

UBR—Unspecified Bit Rate service category for ATM traffic. This is intended for non-real time burst applications which do not require a guarantee of traffic characteristics such as bandwidth, cell delay and cell delay

VBR—variationvariable bit rate

VC—Virtual Circuit

VCI—Virtual Channel Identifier

VPI—Virtual Path Identifier

rt-VBR—Real time Variable Bit Rate traffic service category for ATM traffic.

nrt-VBR—Non-real time Variable Bit Rate traffic service category for ATM traffic.