

Configuring Circuit Emulation Services

This chapter describes circuit emulation services (CES) and how to configure the CES T1/E1 port adapters in the Catalyst 8540 MSR, Catalyst 8510 MSR, and LightStream 1010 ATM switch routers. You can use CES T1/E1 port adapters for links that require constant bit rate (CBR) services.

Note This chapter provides advanced configuration instructions for the Catalyst 8540 MSR, Catalyst 8510 MSR, and LightStream 1010 ATM switch routers. For an overview of CES applications and operation, refer to the *Guide to ATM Technology*. For complete descriptions of the commands mentioned in this chapter, refer to the *ATM Switch Router Command Reference* publication. For hardware installation and cabling instructions, refer to the *ATM Port Adapter and Interface Module Installation Guide*.

This chapter includes the following sections:

- Overview of CES T1/E1 Interfaces
- Configuring CES T1/E1 Interfaces
- General Guidelines for Creating Soft PVCs for Circuit Emulation Services
- Configuring T1/E1 Unstructured Circuit Emulation Services
- Configuring T1/E1 Structured (n x 64) Circuit Emulation Services
- Reconfiguring a Previously Established Circuit
- Deleting a Previously Established Circuit
- Configuring SGCP

Overview of CES T1/E1 Interfaces

You can use CES T1/E1 port adapters for links that require CBR services, such as interconnecting Private Branch Exchanges (PBXs), time-division multiplexers (TDMs), and video conference equipment over campus, public, or private networks.

This section provides an overview of the hardware features and functions supported on the CES T1/E1 port adapters.

Clocking Options

You can configure each interface on the port adapter to support the following clocking options:

- Self-timing based on a Stratum 4 level clock
- Loop timing from the received data stream—ideal for public network connections
- Timing synchronized to a selected master clock port—required to distribute a single clock across a network

Interfaces Supported

The number of CES T1/E1 interfaces you can configure is platform dependent:

- Catalyst 8540 MSR—up to 64 CES T1/E1 interfaces
- Catalyst 8510 MSR and LightStream 1010—up to 32 CES T1/E1 interfaces

Connectors Supported

The CES T1 port adapters support UTP connectors and the CES E1 port adapters support UTP, foil twisted-pair (FTP), or 75-ohm BNC connectors. Status and carrier-detect LEDs on each port give quick, visual indications of port status and operation. For detailed network management support, comprehensive statistics gathering and alarm monitoring capabilities are provided.

Functions Supported by CES Modules

The functions supported by a CES module include the following:

- Circuit emulation services interworking function (CES-IWF), which enables communication between CBR and ATM UNI interfaces
- T1/E1 CES unstructured services
- T1/E1 CES structured services

Framing Formats and Line Coding Options for CES Modules

The CES modules support the framing formats and line coding options shown in Table 18-1.

Table 18-1 CES Module Framing and Line Coding Options

Module	Framing Options/Description	Line Coding Options
CES T1 port adapter	<ul style="list-style-type: none"> • Super Frame (SF) • Extended Super Frame (ESF) 	ami or b8zs (b8zs is the default)
CES E1 port adapter (120-ohm) and CES E1 port adapter (BNC)	<ul style="list-style-type: none"> • E1 CRC multiframe (e1_crc_mf_lt). Configures the line type to e1_crc_mf, without channel associated signalling (CAS) enabled. • E1 CRC multiframe (e1_crc_mfCAS_lt). Configures the line type to e1_crc_mf, with CAS enabled. • E1 (e1_lt). Configures the line type to e1_lt. • E1 multiframe (e1_mfCAS_lt). Configures the line type to e1_mf, with CAS enabled. 	ami or hdb3 (hdb3 is the default)

Default CES T1/E1 Interface Configuration

The following defaults are assigned to all CES T1/E1 interfaces:

- Loopback = no loopback
- Signalling mode = no signalling
- Transmit clock source = network-derived
- Data format = clear channel
- Line build-out (LBO) = 0 to 110 feet
- Cell delay variation = 2000 microseconds
- Channel associated signalling (CAS) = FALSE
- Partial fill = 47
- AAL1 service type = unstructured
- AAL1 clock mode = synchronous

The following defaults are assigned to CES T1 port adapters:

- Framing = ESF
- Line coding = B8ZS

The following defaults are assigned to CES E1 port adapters:

- Framing = E1_LT
- Line coding = HDB3
- International bits = 0x3

- National bits = 0x1f
- Multiframe spare bits = 0xb

Configuring CES T1/E1 Interfaces

To manually change any of the CES T1/E1 default configuration values, enter the **interface cbr** global configuration command to specify a CBR interface, as follows:

```
interface cbr card/subcard/port
```

To configure the CES T1/E1 interfaces perform the following command, beginning in global configuration mode:

Command	Purpose
ces aal1 clock { adaptive srts synchronous }	Configures the type of clocking. Note For structured CES, the default is synchronous.
ces aal1 service { structured unstructured }	Configures the service type. The default is unstructured.
ces circuit <i>circuit-id</i> [cas] [cdv max-req] [circuit-name <i>name</i>] [partial-fill <i>number</i>] [shutdown] [timeslots <i>number</i>] [on-hook-detect <i>pattern</i>]	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> • Circuit id number. <ul style="list-style-type: none"> — For unstructured service, use 0. — For CES T1 structured service, use 1 through 24. — For CES E1 structured service, use 1 through 31. • Enables channel-associated signalling for structured service only. The default is no cas. • Enables the peak-to-peak cell delay variation requirement. The range is 1 through 65535 milliseconds. The default is 2000 milliseconds. • Sets the ASCII name for the CES-IWF circuit. The maximum characters is 64. The default is CBRx/x/x:0. • Enables the partial AAL1 cell fill service for structured service only. The range is 20 through 47. The default is 47. • Disables the circuit. The default is no shutdown. • Configures the time slots for the circuit for structured service only. <ul style="list-style-type: none"> — For CES T1, the range is 1 through 24. — For CES E1, the range is 1 through 31. • Configures on-hook detection.
ces dsx1 clock source { loop-timed network-derived }	Configures the clock source. The default is network-derived.

Command	Purpose
<ul style="list-style-type: none"> For T1 framing: <code>ces dsx1 framing {sf esf}</code> For E1 framing: <code>ces dsx1 framing {e1_crc_mfCAS_lt e1_crc_mf_lt e1_lt e1_mfCAS_lt}</code> 	Configures the framing type. <ul style="list-style-type: none"> For CES T1, the default is esf. For CES E1, the default is e1_lt.
<code>ces dsx1 lbo {0_110 110_220 220_330 330_440 440_550 550_660 660_above square_pulse}</code>	Configures the line build-out. The default is 0_110.
<code>ces dsx1 linecode {ami b8zs hdb3}</code>	Configures the line code type. <ul style="list-style-type: none"> For CES T1, the default is b8zs. For CES E1, the default is hdb3.
<code>ces dsx1 loopback {line noloop payload}</code>	Configures the loopback test method. The default is noloop.
<code>ces dsx1 signalmode robbedbit</code>	Configures the signal mode to robbedbit. The default is no.
<ul style="list-style-type: none"> To configure the destination port for the circuit and configure a hard PVC: <code>ces pvc circuit-id {interface atm card/subcard/port vpi vpi vci vci}</code> To configure the destination port for the circuit and configure a soft PVC: <code>ces pvc circuit-id {dest-address atm-address [vpi vpi vci vci] [retry-interval [first retry-interval] [maximum retry-interval]]}</code> 	Configures the destination port for the circuit and configures a hard PVC , as follows: <ul style="list-style-type: none"> Specifies the circuit identification. <ul style="list-style-type: none"> For unstructured service, use 0. For T1 structured service, use 1 through 24. For E1 structured service, use 1 through 31. Specifies the card/subcard/port number of the ATM interface. Specifies the virtual path identifier of the destination PVC. Specifies the virtual channel identifier of the destination PVC. Configures the destination port for the circuit and configures the soft PVC , as follows: <ul style="list-style-type: none"> Specifies the circuit identification. <ul style="list-style-type: none"> For unstructured service, use 0. For T1 structured service, use 1 through 24. For E1 structured service, use 1 through 31. Specifies the destination address of the soft PVC. Specifies the virtual path identifier of the destination PVC. Specifies the virtual channel identifier of the destination PVC. Configures retry interval timers for a soft PVC, as follows: <ul style="list-style-type: none"> Specifies in milliseconds, the retry interval after the first failed attempt. The range is 100 to 3,600,000 milliseconds. The default is 5,000 milliseconds. Specifies in seconds, the maximum retry interval between any two attempts. The range is 1 to 65,535. The default is 60.

Examples

The following example shows how to change the default cell delay variation for circuit 0 to 30,000, using the **ces circuit** command:

```
Switch# configure terminal
Switch(config)# interface cbr 3/0/0
Switch(config-if)# shutdown
Switch(config-if)# ces circuit 0 cdv 3000
Switch(config-if)# no shutdown
```

Note You might have to use the **shutdown** command to shut down the interface before you can modify the circuit. After modifying the circuit, use the **no shutdown** command to reenable the interface.

The following example shows how to change the default CBR interface framing mode to super frame, using the **ces dsx1 framing** command:

```
Switch# configure terminal
Switch(config)# interface cbr 3/0/0
Switch(config-if)# ces dsx1 framing sf
```

The following example shows how to change the default CBR interface line build-out to 330 to 440 feet, using the **ces dsx1 lbo** command:

```
Switch# configure terminal
Switch(config)# interface cbr 3/0/0
Switch(config-if)# ces dsx1 lbo 330_440
```

The following example shows how to change the default CBR interface line code method to binary 8 zero suppression, using the **ces dsx1 linecode** command:

```
Switch# configure terminal
Switch(config)# interface cbr 3/0/0
Switch(config-if)# ces dsx1 linecode b8zs
```

The following example shows how to change the default CBR interface loopback method to payload, using the **ces dsx1 loopback** command:

```
Switch# configure terminal
Switch(config)# interface cbr 3/0/0
Switch(config-if)# ces dsx1 loopback payload
```

See the section “Troubleshooting the Interface Configuration” in the chapter “Configuring Interfaces” to confirm your interface configuration.

General Guidelines for Creating Soft PVCs for Circuit Emulation Services

You can create either hard private virtual circuits (PVCs) or soft PVCs for unstructured or structured CES, depending on your particular CES application requirements. The main difference between hard and soft PVCs is rerouting in case of failure, as follows:

- A hard PVC on a CES T1/E1 port—Should a failure occur in a midpoint switch, hard PVCs are not automatically rerouted.
- A soft PVC on a CES T1/E1 port—Should a failure occur in a midpoint switch, soft PVCs are rerouted automatically, assuming another route is available.

This section provides general guidelines for configuring soft PVCs for CES modules. For specific instructions for configuring both hard and soft PVCs, see the following sections:

- Configuring T1/E1 Unstructured Circuit Emulation Services
- Configuring T1/E1 Structured (n x 64) Circuit Emulation Services

Note The steps in these guidelines assume that you have already used the **ces circuit** commands to configure circuits on the CES interfaces. If you have not yet configured circuits on the CES interfaces, the **show ces address** command will not display any addresses. For simplicity, the steps in these guidelines describe how to create a soft PVC between interface modules in the same ATM switch router.

To configure soft PVCs for either unstructured or structured circuit emulation services, follow these steps:

Step 1 Determine which CES interfaces are currently configured in your ATM switch router chassis, using the **show ces status** command in privileged EXEC mode.

```

CESwitch# show ces status
  Interface      IF      Admin      Port  Channels in
  Name          Status  Status     Type  use
-----
  CBR3/0/0      UP      UP         T1    0
  CBR3/0/1      DOWN   UP         T1    0
  CBR3/0/2      DOWN   UP         T1    0
  CBR3/0/3      UP      UP         T1    0
    
```

Step 2 Determine which two ports you want to define as participants in the soft PVC.

Step 3 Decide which of the two ports you want to designate as the destination (or passive) side of the soft PVC.

Note This is an arbitrary decision—you can choose either port as the destination end of the circuit. However, you must decide which port is to function in this capacity and proceed accordingly.

Step 4 Configure the destination (passive) side of the soft PVC. You must configure the destination end of the soft PVC first, as this end defines a CES-IWF ATM address for that circuit.

Note If the interface is up, you might have to disable it, using the **shutdown** command, before you can configure the circuit. After configuring the circuit, use the **no shutdown** command to reenble the interface.

```

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/1
CESwitch(config-if)# ces circuit 0 circuit-name CBR-PVC-B
    
```

- Step 5** Retrieve the CES-IWF ATM address of the soft PVC's destination end, using the **show ces address** command. The following example shows how to display the CES-IWF ATM address and VPI/VCI for a CES circuit:

```
CESwitch# show ces address

CES-IWF ATM Address(es):
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1030.10 CBR-PVC-A vpi 0 vci 16
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1030.20 CBR-PVC-AC vpi 0 vci 1056
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 CBR-PVC-B vpi 0 vci 1040
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1038.10 CBR-PVC-CA vpi 0 vci 3088
```

- Step 6** Configure the source (active) end of the soft PVC last, using the information derived from Step 5. You must configure the source end of the soft PVC last, because that end not only defines the configuration information for the source port, but also requires you to enter the CES-IWF ATM address and VPI/VCI values for the destination circuit.

Note If the interface is up, you might have to disable it, using the **shutdown** command, before you can configure the circuit. After configuring the circuit, use the **no shutdown** command to reenables the interface.

```
CESwitch(config)# interface cbr 3/0/0
CESwitch(config)# ces circuit 0
CESwitch(config-if)# ces pvc 0 dest-address
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 vpi 0 vci 1040
```

- Step 7** To verify that the CES circuits are up on both sides (source and destination), run the **show ces interface** command. To verify that the soft PVC was established between two switches, run the **show atm vc interface** command.

Configuring T1/E1 Unstructured Circuit Emulation Services

This section provides an overview of unstructured (clear channel) circuit emulation services and describes how to configure CES modules for unstructured circuit emulation services.

Overview of Unstructured Circuit Emulation Services

Unstructured circuit emulation services in an ATM switch router network emulate point-to-point connections over T1/E1 leased lines. This service maps the entire bandwidth necessary for a T1/E1 leased line connection across the ATM network, allowing users to interconnect PBXs, TDMs, and video conferencing equipment.

For a detailed description of unstructured circuit emulation services, refer to the *Guide to ATM Technology*.

The circuit you set up on a CBR port for unstructured service is always identified as circuit 0, because you can establish only one unstructured circuit on any given CBR port. An unstructured circuit uses the entire bandwidth of a T1 port (1.544 Mbps) or an E1 port (2.048 Mbps).

The procedures for configuring CES modules for unstructured circuit emulation services are described in the following subsections:

- Configuring a Hard PVC for Unstructured CES
- Verifying a Hard PVC for Unstructured CES
- Configuring a Soft PVC for Unstructured CES
- Verifying a Soft PVC for Unstructured CES

Configuring Network Clocking for Unstructured CES

Circuit emulation services require that the network clock be configured properly. Unstructured services can use synchronous, Synchronous Residual Time Stamp (SRTS), or adaptive clocking mode. For instructions on configuring network clocking, see the section “Configuring Network Clocking” in the chapter “Initially Configuring the ATM Switch Router.” For a discussion of clocking issues and network examples, refer to the network clock synchronization and network clocking for CES topics in the *Guide to ATM Technology*.

Configuring Synchronous Clocking With an OC-12c Interface Module

When synchronous clocking is being used and propagated via an OC-12c interface module, be sure to use the following configurations:

- For the Catalyst 8540 MSR, use the optional clocking module.
- For the Catalyst 8510 MSR and LightStream 1010 ATM switch routers, use feature card per flow queueing (FC-PFQ).

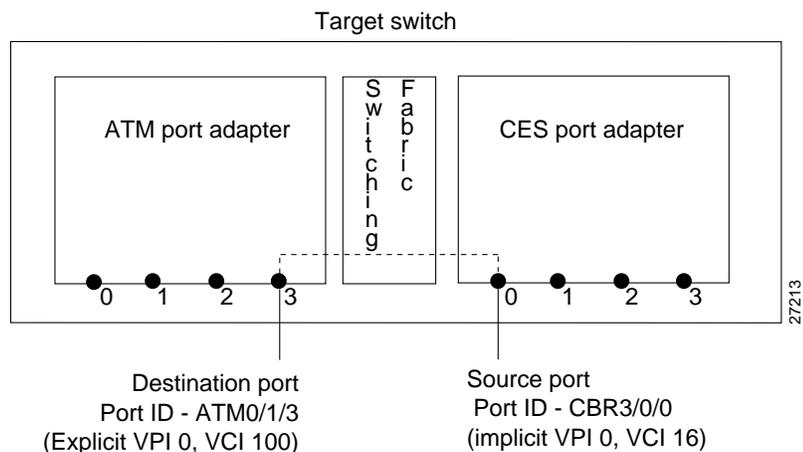
Configuring a Hard PVC for Unstructured CES

A CES module converts CBR traffic into ATM cells for propagation through an ATM network. CBR traffic arriving on a CES module port must first be segmented into ATM cells. This cell stream is then directed to an outgoing ATM or CBR port.

Note As a general rule when configuring a hard PVC, you must interconnect a CBR port and an ATM port in the same ATM switch router chassis.

Figure 18-1 displays unstructured circuit emulation services configured on an ATM switch router, using ATM and CES interface modules to create a hard PVC. In this example, the hard PVC also uses adaptive clocking, and this CES circuit enables bidirectional, unstructured CBR traffic to flow between these two modules.

Figure 18-1 Hard PVC Configured for Unstructured CES



To configure a hard PVC for unstructured CES, follow these steps, beginning in privileged EXEC mode.

Step	Command	Purpose
1	<code>show ces status</code>	Displays information about the current CBR interfaces. Use this command to choose the source CBR port.
2	<code>show atm status</code>	Displays information about the current ATM interfaces. Use this command to choose the destination ATM port. Note The interface must be up.
3	<code>configure terminal</code>	At the privileged EXEC prompt, enters global configuration mode.
4	<code>interface cbr card/subcard/port</code>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the <code>shutdown</code> command) before you can configure the circuit. After you configure the circuit, run the <code>no shutdown</code> command to reenables the interface.
5	<code>ces aal1 clock {adaptive srts synchronous}</code>	Configures the AAL1 clock mode.
6	<code>ces aal1 service {structured unstructured}</code>	Configures the CES interface AAL1 service type.
7	<code>ces circuit circuit-id circuit-name name</code>	Configures the CES interface circuit identifier and circuit name. Note For unstructured service, use 0 for the circuit identifier.
8	<code>ces pvc circuit-id interface atm card/subcard/port vpi vci vci</code>	Configures the hard PVC to the ATM interface and VPI/VCI. Note The VPI/VCI are arbitrary here. They are not fixed, whereas the VPI/VCI described in the “General Guidelines for Creating Soft PVCs for Circuit Emulation Services” section are fixed.

Example

The following example shows how to configure the hard PVC for unstructured CES (shown in Figure 18-1):

```
CESwitch# show ces status
```

Interface Name	IF Status	Admin Status	Port Type	Channels in use
CBR3/0/0	UP	UP	T1	
CBR3/0/1	DOWN	UP	T1	
CBR3/0/2	DOWN	UP	T1	
CBR3/0/3	UP	UP	T1	

```
CESwitch# show atm status
```

```
NUMBER OF INSTALLED CONNECTIONS: (P2P=Point to Point, P2MP=Point to MultiPoint, MP2P=Multipoint to Point)
```

Type	PVCs	SoftPVCs	SVCs	TVCs	PVPs	SoftPVPs	SVPs	Total
P2P	27	2	13	0	0	0	0	42
P2MP	0	0	2	0	0	0	0	2
MP2P	0	0	0	0	0	0	0	0
TOTAL INSTALLED CONNECTIONS =								44

```
PER-INTERFACE STATUS SUMMARY AT 18:12:45 UTC Thu Jul 22 1999:
```

Interface Name	IF Status	Admin Status	Auto-Cfg Status	ILMI Reg	Addr State	SSCOP State	Hello State
ATM0/0/1	DOWN	down	waiting		n/a	Idle	n/a
ATM0/0/5	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/6	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/7	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/ima1	UP	up	done	UpAndNormal		Active	2way_in
ATM0/1/0	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/1	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/2	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/3	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/7	DOWN	down	waiting		n/a	Idle	n/a
ATM0/1/ima2	UP	up	done	UpAndNormal		Active	2way_in
ATM1/0/0	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/1	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/2	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/3	UP	up	done	UpAndNormal		Active	n/a
ATM1/1/0	UP	up	done	UpAndNormal		Active	n/a
ATM1/1/1	DOWN	down	waiting		n/a	Idle	n/a
ATM1/1/2	DOWN	down	waiting		n/a	Idle	n/a
ATM1/1/3	DOWN	down	waiting		n/a	Idle	n/a
ATM2/0/0	UP	up	n/a	UpAndNormal		Idle	n/a
ATM-P3/0/3	UP	up	waiting		n/a	Idle	n/a
ATM3/1/0	DOWN	down	waiting		n/a	Idle	n/a
ATM3/1/1	UP	up	done	UpAndNormal		Active	2way_in
ATM3/1/1.99	UP	up	done	UpAndNormal		Active	2way_in
ATM3/1/2	DOWN	down	waiting		n/a	Idle	n/a
ATM3/1/3	DOWN	down	waiting		n/a	Idle	n/a
ATM-P4/0/0	UP	up	waiting		n/a	Idle	n/a

```
CESwitch# configure terminal
```

```
CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces aall clock adaptive
CESwitch(config-if)# ces aall service unstructured
CESwitch(config-if)# ces circuit 0 circuit-name CBR-PVC-A
CESwitch(config-if)# ces pvc 0 interface atm 0/1/3 vpi 0 vci 100
```

Verifying a Hard PVC for Unstructured CES

To verify the hard PVC configuration, use the following privileged EXEC commands:

Command	Purpose
show ces circuit	Shows configuration information for the hard PVC.
show ces circuit interface cbr <i>card/subcard/port</i> <i>circuit-id</i>	Shows detailed interface configuration information for the hard PVC.

Examples

The following example shows how to display the basic information about the hard PVC shown in Figure 18-1, using the **show ces circuit** command:

```

CESwitch# show ces circuit
Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
-----  -
CBR3/0/0  0         HardPVC      ATM0/1/3    0      100   UP
    
```

The output from this command verifies the source (CBR 3/0/0) and destination (ATM 0/1/3) port IDs of the hard PVC and indicates that the circuit is up.

The following example shows how to display detailed information about the hard PVC shown in Figure 18-1, using the **show ces circuit interface** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 0
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 0, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_ADAPT
Channel in use on this port: 1-24
Channels used by this circuit: 1-24
Cell-Rate: 4107, Bit-Rate 1544000
cas OFF, cell_header 0x100 (vci = 16)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow 903952, OverFlow 0
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcAlarm, maxQueueDepth 827, startDequeueDepth 437
Partial Fill: 47, Structured Data Transfer 0
HardPVC
src: CBR3/0/0 vpi 0, vci 16
Dst: ATM0/1/3 vpi 0, vci 100
    
```

The output from this command verifies the following configuration information:

- The circuit named CBR-PVC-A is in an UP state.
- The interface CBR 3/0/0 has a circuit id of 0 (because the entire bandwidth of the port is dedicated to that circuit).
- The AAL1 clocking method is adaptive clocking.
- The source port for the hard PVC is CBR 3/0/0. The destination port is ATM 0/1/3.

Configuring a Soft PVC for Unstructured CES

In a soft PVC, as well as a hard PVC, you configure both ends of the CES circuit. However, a soft PVC typically involves CES modules at opposite edges of an ATM network, so a soft PVC can be set up between any two CES modules anywhere in your network.

The destination address of a soft PVC can point to either of the following:

- Any ATM switch router external ATM port in the network
- A port in any other CES module in the network

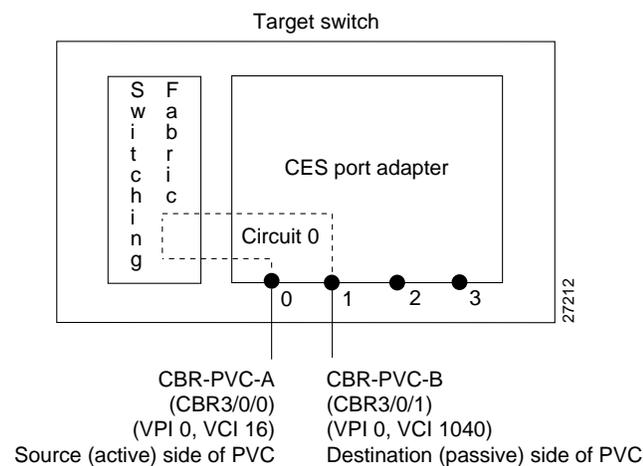
For example, to set up a soft PVC involving a local node and a destination node at the opposite edge of the network, you need to determine the CES-IWF ATM address of the port in the destination node to complete soft PVC setup.

To obtain the destination address (dest-address) for a port already configured in a CES port adapter, log into the remote ATM switch router containing that module. Then use the **show ces address** command to display all the CES-IWF ATM addresses currently configured for that node.

Figure 18-2 displays a soft PVC configured for unstructured CES. The soft PVC uses adaptive clocking and the source clock is network-derived.

Note Typically you will configure a soft PVC between CES modules anywhere in your network. For simplicity, this example and the accompanying procedure describe how to create a soft PVC between modules in the same ATM switch router chassis.

Figure 18-2 Soft PVC Configured for Unstructured CES



Configuring a soft PVC for unstructured CES is a two-phase process:

- Phase 1—Configuring the Destination (Passive) Side of the Soft PVC
- Phase 2—Configuring the Source (Active) Side of the Soft PVC

Phase 1—Configuring the Destination (Passive) Side of the Soft PVC

To configure the destination (passive) side of a soft PVC destination port, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	<code>show ces status</code>	Displays information about current CBR interfaces. Use this command to choose the destination port.
2	<code>configure terminal</code>	At the privileged EXEC prompt, enters global configuration mode.
3	<code>interface cbr <i>card/subcard/port</i></code>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
4	<code>ces aal1 clock {adaptive srts synchronous}</code>	Configures the CES interface AAL1 clock mode.
5	<code>ces aal1 service {structured unstructured}</code>	Configures the CES interface AAL1 service type.
6	<code>ces dsx1 clock source {loop-timed network-derived}</code>	Configures the CES interface clock source.
7	<code>ces circuit <i>circuit-id</i> circuit-name <i>name</i></code>	Configures the CES interface circuit identifier and circuit name. Note For unstructured service, use 0 for the circuit identifier.

Example

The following example shows how to configure the destination (passive) side of a soft PVC, as shown in Figure 18-2:

```

CESwitch# show ces status

      Interface      IF      Admin      Port  Channels in
      Name           Status  Status     Type  use
-----
      CBR3/0/0       UP      UP         T1
      CBR3/0/1       UP      UP         T1
      CBR3/0/2       UP      UP         T1
      CBR3/0/3       UP      UP         T1

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/1
CESwitch(config-if)# ces aal1 clock synchronous
CESwitch(config-if)# ces aal1 service unstructured
CESwitch(config-if)# ces dsx1 clock source network-derived
CESwitch(config-if)# ces circuit 0 circuit-name CBR-PVC-B
    
```

Note If you do not specify the circuit name and logical name parameters in the command line, the system automatically assigns a unique default name in the form CBR*x/y/z*:# for the circuit being configured. For example, the default name for this particular circuit is CBR3/0/1:0.

Phase 2—Configuring the Source (Active) Side of the Soft PVC

To configure the source (active) side of a soft PVC destination port, follow these tasks, beginning in privileged EXEC mode:

Step	Command	Purpose
1	show ces address	Shows the CES address and VPI/VCI for the destination end of the circuit. Use this command to retrieve the destination's VPI/VCI.
2	configure terminal	At the privileged EXEC prompt, enters global configuration mode.
3	interface cbr card/subcard/port	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
4	ces circuit circuit-id circuit-name name	Configures the CES interface circuit identifier and circuit name. Note For unstructured service, use 0 for the circuit identifier.
5	ces pvc circuit-id dest-address remote_atm_address vpi vpi vci vci	Configures the soft PVC to the destination CES-IWF ATM addresses and VPI/VCI of the circuit. Note Use the destination's VPI/VCI, which you retrieved in Step 1.

Example

The following example shows how to configure the source (active) side of a soft PVC, as shown in Figure 18-2:

```

CESwitch# show ces address

CES-IWF ATM Address(es):
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 CBR-PVC-B

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/0
CESwitch(config)# ces circuit 0 circuit-name CBR-PVC-A
CESwitch(config-if)# ces pvc 0 dest-address 47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 vpi 0
vci 1040
    
```

Verifying a Soft PVC for Unstructured CES

To verify the soft PVC configuration, use the following privileged EXEC commands:

Command	Purpose
show ces circuit	Shows the soft PVC configuration information.
show ces circuit interface cbr <i>card/subcard/port circuit-id</i>	Shows the detailed soft PVC interface configuration information.

Examples

The following example shows how to display the soft PVC configured in the previous section (shown in Figure 18-2), using the **show ces circuit** command:

```

CESwitch# show ces circuit
Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
-----
CBR3/0/0  0        Active SoftVC ATM-P3/0/3  0      16    UP
CBR3/0/1  0        Passive SoftVC ATM-P3/0/3  0      1040  UP
    
```

The following example shows how to display the detailed circuit information for CBR 3/0/1, the destination (passive) side of the soft PVC (shown in Figure 18-2), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/1 0
Circuit: Name CBR-PVC-B, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/1, Circuit_id 0, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-24
Channels used by this circuit: 1-24
Cell-Rate: 4107, Bit-Rate 1544000
cas OFF, cell_header 0xC100 (vci = 3088)
Configured CDV 2000 usecs, Measured CDV 2378 usecs
De-jitter: UnderFlow 137, OverFlow 0
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth      823, startDequeueDepth      435
Partial Fill:      47, Structured Data Transfer 0
Passive SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 vpi 0, vci 1040
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.00
    
```

The following example shows how to display the detailed circuit information for CBR 3/0/0, the source (active) side of the soft PVC (shown in Figure 18-2), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 0
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 0, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-24
Channels used by this circuit: 1-24
Cell-Rate: 4107, Bit-Rate 1544000
cas OFF, cell_header 0x100 (vci = 16)
Configured CDV 2000 usecs, Measured CDV 326 usecs
De-jitter: UnderFlow 1, OverFlow 0
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcAlarm, maxQueueDepth      823, startDequeueDepth      435
Partial Fill:      47, Structured Data Transfer 0
Active SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.10 vpi 0, vci 16
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10
    
```

Configuring T1/E1 Structured (n x 64) Circuit Emulation Services

This section provides an overview of structured (n x 64 Kbps) circuit emulation services and describes how to configure CES modules for structured circuit emulation services.

Overview of Structured Circuit Emulation Services

An important distinction between structured and unstructured circuit emulation services is that structured circuit emulation services allow you to allocate T1/E1 bandwidth. Structured circuit emulation services only use the T1/E1 bandwidth actually required to support the active structured circuit(s) you configure.

For example, configuring a CES module for structured services allows you to define multiple hard PVCs or soft PVCs for any CES T1 or E1 port. In both module types, any bits not available for structured circuit emulation services are used for framing and out-of-band control.

n x 64 refers to a circuit bandwidth (data transmission speed) provided by the aggregation of n x 64-Kbps channels, where n is an integer greater than or equal to 1. The 64-Kbps data rate, or the DS0 channel, is the basic building block of the T carrier systems (T1, T2, and T3).

The T1/E1 structured (n x 64) circuit emulation services enable a CES module to function in the same way as a classic digital access and crossconnect system (DACS) switch.

The Simple Gateway Control Protocol (SGCP) provides similar functionality by controlling structured CES circuits for voice over ATM. For additional information see the section “Configuring SGCP” later in this chapter.

For a detailed description of structured circuit emulation services, refer to the *Guide to ATM Technology*.

Configuring Network Clocking for Structured CES

Circuit emulation services require that the network clock be configured properly. For structured services, synchronous clocking is required. For instructions on configuring network clocking, see the section “Configuring Network Clocking” in the chapter “Initially Configuring the ATM Switch Router.” For a discussion of clocking issues and network examples, refer to the network clock synchronization and network clocking for CES topics in the *Guide to ATM Technology*.

Configuring Synchronous Clocking With an OC-12c Interface Module

When synchronous clocking is being used and propagated via an OC-12c interface module, be sure to use the following configurations:

- For the Catalyst 8540 MSR, use the optional clocking module.
- For the Catalyst 8510 MSR and LightStream 1010 ATM switch routers, use feature card per flow queueing (FC-PFQ).

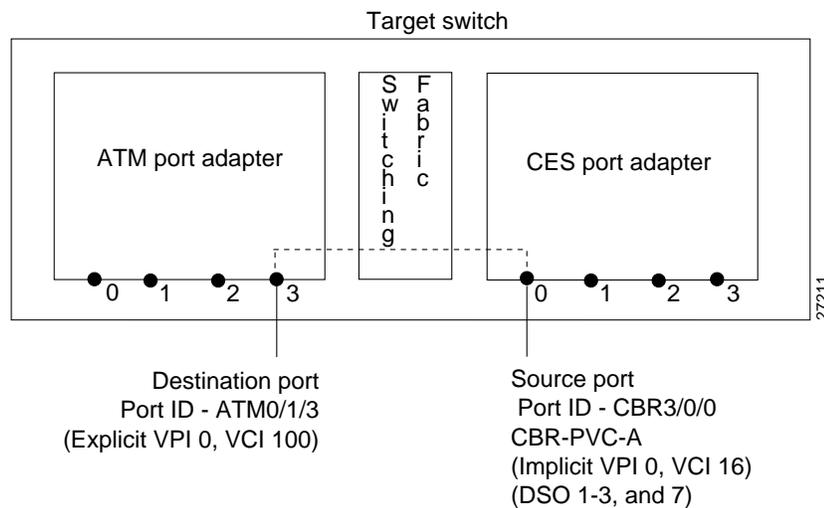
Configuring a Hard PVC for Structured CES

This section describes how to configure a hard PVC for structured circuit emulation services.

Figure 18-3 shows that the hard PVC for structured CES connection is configured with the following parameters:

- Four time slots (DS0 channels 1 to 3, and 7) are configured for a circuit named CBR-PVC-A.
- ATM port 0/1/3 in the ATM switch router is designated as the destination port of the hard PVC.
- The CES AAL1 service is structured and the clock source is network-derived.
- The framing is esf and the line code is b8zs.

Figure 18-3 Hard PVC Configured for Structured CES



To configure the CES port for structured CES, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	show ces status	Displays information about current CBR interfaces. Use this command to choose the source port.
2	show atm status	Displays information about current ATM interfaces. Use this command to choose the destination port.
3	configure terminal	At the privileged EXEC prompt, enters global configuration mode.
4	interface cbr card/subcard/port	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.

Step	Command	Purpose
5	<code>ces aal1 service {structured unstructured}</code>	Configures the CES interface AAL1 service type.
6	<code>ces dsx1 clock source {loop-timed network-derived}</code>	Configures the CES interface clock source.
7	<ul style="list-style-type: none"> For T1 framing: <code>ces dsx1 framing {sf esf}</code> For E1 framing: <code>ces dsx1 framing {e1_crc_mfCAS_lt e1_crc_mf_lt e1_lt e1_mfCAS_lt}</code> 	Configures the CES line type.
8	<ul style="list-style-type: none"> For T1 line coding: <code>ces dsx1 linecode {ami b8zs}</code> For E1 line coding: <code>ces dsx1 linecode {ami hdb3}</code> 	Configures the line coding.
9	<code>ces circuit circuit-id timeslots number</code>	<p>Configures the following CES connection attributes for the circuit:</p> <ul style="list-style-type: none"> Circuit id number. <ul style="list-style-type: none"> For CES T1 structured service, use 1 through 24. For CES E1 structured service, use 1 through 31. <p>Note The 0 circuit identifier is reserved for unstructured service.</p> <ul style="list-style-type: none"> Time slots for the circuit for structured service only. <ul style="list-style-type: none"> For CES T1, the range is 1 through 24. For CES E1, the range is 1 through 31.
10	<code>ces circuit circuit-id circuit-name name</code>	Configures the CES circuit name.
11	<code>ces pvc circuit-id interface atm card/subcard/port vpi vci vci</code>	Configures the hard PVC to the ATM interface and VPI/VCI.

Example

The following example shows how to configure the hard PVC for structured T1 CES, as shown in Figure 18-3:

```
CESwitch# show ces status
```

Interface Name	IF Status	Admin Status	Port Type	Channels in use
CBR3/0/0	UP	UP	T1	
CBR3/0/1	UP	UP	T1	
CBR3/0/2	UP	UP	T1	
CBR3/0/3	UP	UP	T1	

Configuring T1/E1 Structured (n x 64) Circuit Emulation Services

```
CESwitch# show atm status
```

```
NUMBER OF INSTALLED CONNECTIONS: (P2P=Point to Point, P2MP=Point to MultiPoint,
MP2P=Multipoint to Point)
```

Type	PVCs	SoftPVCs	SVCs	TVCs	PVPs	SoftPVPs	SVPs	Total
P2P	27	2	13	0	0	0	0	42
P2MP	0	0	2	0	0	0	0	2
MP2P	0	0	0	0	0	0	0	0
TOTAL INSTALLED CONNECTIONS =								44

```
PER-INTERFACE STATUS SUMMARY AT 18:12:45 UTC Thu Jul 22 1999:
```

Interface Name	IF Status	Admin Status	Auto-Cfg Status	ILMI Reg	Addr State	SSCOP State	Hello State
ATM0/0/1	DOWN	down	waiting		n/a	Idle	n/a
ATM0/0/5	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/6	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/7	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/0/imal	UP	up	done	UpAndNormal		Active	2way_in
ATM0/1/0	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/1	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/2	DOWN	shutdown	waiting		n/a	Idle	n/a
ATM0/1/3	UP	up	done	UpAndNormal		Active	n/a
ATM0/1/7	DOWN	down	waiting		n/a	Idle	n/a
ATM0/1/ima2	UP	up	done	UpAndNormal		Active	2way_in
ATM1/0/0	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/1	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/2	DOWN	down	waiting		n/a	Idle	n/a
ATM1/0/3	UP	up	done	UpAndNormal		Active	n/a
ATM1/1/0	UP	up	done	UpAndNormal		Active	n/a
ATM1/1/1	DOWN	down	waiting		n/a	Idle	n/a
ATM1/1/2	DOWN	down	waiting		n/a	Idle	n/a
ATM1/1/3	DOWN	down	waiting		n/a	Idle	n/a
ATM2/0/0	UP	up	n/a	UpAndNormal		Idle	n/a
ATM-P3/0/3	UP	up	waiting		n/a	Idle	n/a
ATM3/1/0	DOWN	down	waiting		n/a	Idle	n/a
ATM3/1/1	UP	up	done	UpAndNormal		Active	2way_in
ATM3/1/1.99	UP	up	done	UpAndNormal		Active	2way_in
ATM3/1/2	DOWN	down	waiting		n/a	Idle	n/a
ATM3/1/3	DOWN	down	waiting		n/a	Idle	n/a
ATM-P4/0/0	UP	up	waiting		n/a	Idle	n/a

```
CESwitch# configure terminal
```

```
CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces aall service structured
CESwitch(config-if)# ces dsx1 clock source network-derived
CESwitch(config-if)# ces dsx1 framing esf
CESwitch(config-if)# ces dsx1 linecode b8zs
CESwitch(config-if)# ces circuit 1 timeslots 1-3,7
CESwitch(config-if)# ces circuit 1 circuit-name CBR-PVC-A
CESwitch(config-if)# ces pvc 1 interface atm 0/1/3 vpi 0 vci 100
```

Note If you do not specify the circuit name and logical name parameters in the command line, the system automatically assigns a unique default name in the form CBRx/y/z:# for the circuit being configured. For example, the default name for this particular circuit is CBR3/0/0:1. For structured CES, the circuit number sequence always begins at 1 for each port in a CES module.

The VPI/VCI values shown in the example (*vpi 0 vci 100*) are for demonstration purposes only. The service provider you select gives you a virtual path for your data, but you must decide which VCI number to assign to the circuit.

Verifying a Hard PVC for Structured CES

To verify the hard PVC configured with structured services, use the following privileged EXEC commands:

Command	Purpose
show ces circuit	Shows the configuration information for the hard PVC.
show ces circuit interface cbr <i>card/subcard/port circuit-id</i>	Shows the detailed interface configuration information for the hard PVC.

Examples

The following example shows the details of the hard PVC, shown in Figure 18-3, using the **show ces circuit** command:

```

CESwitch# show ces circuit
Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
CBR3/0/0  1        HardPVC      ATM0/1/3    0      100   UP

```

The output from this command verifies the source (CBR 3/0/0) and destination (ATM 0/1/3) port IDs of the hard PVC and indicates that the circuit is up.

The following example shows the interface details for port CBR 3/0/0 (shown in Figure 18-3), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 1
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-3, 7
Channels used by this circuit: 1-3, 7
Cell-Rate: 4107, Bit-Rate 1544000
cas OFF, cell_header 0x100 (vci = 16)
Configured CDV 2000 usecs, Measured CDV 326 usecs
De-jitter: UnderFlow 1, Overflow 0
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcAlarm, maxQueueDepth 823, startDequeueDepth 435
Partial Fill: 47, Structured Data Transfer 1
HardPVC
Src: CBR3/0/0 vpi 0, vci 16
Dst: ATM0/1/3 vpi 0, vci 100

```

The output from this command verifies the following configuration information:

- The circuit named CBR-PVC-A is in an UP state.
- The interface CBR 3/0/0 has a circuit id of 1 (because structured CES services always begin at 1 for each port in a CES module).
- The channels being used by this circuit are 1-3 and 7.
- The source port for the hard PVC is CBR 3/0/0. The destination port is ATM 0/1/3.

Configuring a Hard PVC for Structured CES with a Shaped VP Tunnel

A shaped VP tunnel is a VP tunnel that, by default, carries only VCs of the CBR service category with a peak cell rate (PCR). However, it is possible to configure a shaped VP tunnel to carry VCs of other service categories. The overall output of the shaped VP tunnel is rate-limited, by hardware, to the PCR of the tunnel.

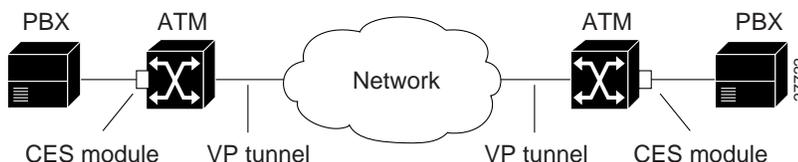
This section describes how to configure a hard PVC for structured CES with a shaped VP tunnel, which is a two-phase process, as follows:

- Phase 1—Configuring a Shaped VP Tunnel
- Phase 2—Configuring a Hard PVC

For more information about configuring shaped VP tunnels, refer to the section “Configuring VP Tunnels” in the chapter “Configuring Virtual Connections.”

Figure 18-4 shows an example of a how a structured CES circuit can be configured with a shaped VP tunnel.

Figure 18-4 Structured CES Circuit Configured with a Shaped VP Tunnel



Phase 1—Configuring a Shaped VP Tunnel

To configure a shaped VP tunnel, follow these steps:

Step	Command	Purpose
1	<code>configure terminal</code>	At the privileged EXEC prompt, enters global configuration mode.
2	<code>interface atm card/subcard/port</code>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenble the interface.
3	<code>atm connection-traffic-table-row [index row-index] cbr pcr rate</code>	Configures the connection-traffic-table-row for the desired PVP CBR cell rate.

Step	Command	Purpose
4	<code>atm pvp vpi [hierarchical shaped] [rx-cttr index] [tx-cttr index]</code>	Configures a shaped VP tunnel, as follows: <ul style="list-style-type: none"> • Specifies whether the tunnel is hierarchical or shaped. <p>Note To configure a shaped VP tunnel to carry PVCs of other (non-CBR) service categories, the VP tunnel must be configured as a hierarchical tunnel.</p> <ul style="list-style-type: none"> • Specifies the connection traffic table row in the received direction. The default is 1. • Specifies the connection traffic table row in the transmitted direction. The default is 1.
5	<code>interface atm card/subcard/port.subinterface#</code>	Configures a subinterface. <p>Note You cannot create a subinterface on the route processor interface ATM 0.</p>
6	<code>exit</code>	Exits subinterface mode.

Note Even though the shaped VP tunnel is defined as CBR, it can carry PVCs of another service category by substituting the new service category after the tunnel interface has been initially configured. For information about configuring VP tunnels with other (non-CBR) service categories, see the section “Configure Interface Service Category Support” in the chapter “Configuring Resource Management.”

Example

The following example shows how to configure a shaped VP tunnel.

```

CESwitch# configure terminal
CESwitch(config)# interface atm 0/0/0
CESwitch(config)# atm connection-traffic-table-row index 10 cbr pcr 4000
CESwitch(config-if)# atm pvp 1 shaped rx-cttr 10 tx-cttr 10
CESwitch(config-if)# interface atm 0/0/0.1
CESwitch(config-subif)# exit
    
```

Note A shaped VP tunnel is defined as a CBR VP with a PCR. A maximum of 64 shaped VP tunnels can be defined on each of the following interface groups: (0/0/x, 1/0/x), (0/1/x, 1/1/x), (2/0/x, 3/0/x), (2/1/x, 3/1/x), (9/0/x, 10/0/x), (9/1/x, 10/1/x), (11/0/x, 12/0/x) and (11/1/x, 12/1/x). For further limitations on shaped VP tunnels, refer to the “Configuring a Shaped VP Tunnel” section of the “Configuring Virtual Connections” chapter.

Phase 2—Configuring a Hard PVC

To configure a hard PVC, follow these steps:

Step	Command	Purpose
1	show ces status	Displays information about the current CBR interfaces. Use this command to choose the source CBR port.
2	show atm status	Displays information about the current ATM interfaces. Use this command to choose the destination ATM port. Note The interface must be up.
3	configure terminal	At the privileged EXEC prompt, enters global configuration mode.
4	interface cbr <i>card/subcard/port</i>	Selects the physical interface to be configured. If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenable the interface.
5	ces aal1 service { structured unstructured }	Configures the CES interface AAL1 service type.
6	ces circuit <i>circuit-id</i> [timeslots <i>number</i>]	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> • Circuit id number. <ul style="list-style-type: none"> — For CES T1 structured service, use 1 through 24. — For CES E1 structured service, use 1 through 31. <p>Note The 0 circuit identifier is reserved for unstructured service.</p> <ul style="list-style-type: none"> • Time slots for the circuit for structured service only. <ul style="list-style-type: none"> — For CES T1, the range is 1 through 24. — For CES E1, the range is 1 through 31.
7	ces pvc <i>circuit-id</i> interface atm <i>card/subcard/port vpi vpi vci vci</i>	Configures the destination port for the circuit and configures a hard PVC, as follows: <ul style="list-style-type: none"> • Specifies the circuit identification. (Use the circuit id from the previous step.) • Specifies the card/subcard/port number of the ATM interface. • Specifies the VPI of the destination PVC. • Specifies the VCI of the destination PVC.

Example

The following example shows how to configure hard PVCs for the shaped VP tunnel.

```

CESwitch# show ces status
CESwitch# show atm status
CESwitch(config)# interface cbr 3/1/0
CESwitch(config-if)# ces aall service structured
CESwitch(config-if)# ces circuit 1 timeslots 1
CESwitch(config-if)# ces pvc 1 interface atm 0/0/0.1 vpi 1 vci 101

CESwitch(config-if)# ces circuit 2 timeslots 2
CESwitch(config-if)# ces pvc 2 interface atm 0/0/0.1 vpi 1 vci 102

CESwitch(config-if)# ces circuit 3 timeslots 3
CESwitch(config-if)# ces pvc 3 interface atm 0/0/0.1 vpi 1 vci 103
    
```

Verifying a Hard PVC for Structured CES with a Shaped VP Tunnel

To verify the hard PVC configuration, use the following privileged EXEC commands:

Command	Purpose
show ces circuit	Shows configuration information for the hard PVC.
show ces circuit interface cbr <i>card/subcard/port</i> <i>circuit-id</i>	Shows detailed interface configuration information for the hard PVC.

Examples

The following example shows how to display the basic information about the hard PVC shown in Figure 18-4, using the **show ces circuit** command:

```

CESwitch# show ces circuit

Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
CBR3/1/0  1        HardPVC      ATM0/0/0.1  1      101   DOWN
CBR3/1/0  2        HardPVC      ATM0/0/0.1  1      102   DOWN
CBR3/1/0  3        HardPVC      ATM0/0/0.1  1      103   DOWN
CBR3/1/3  0        Active SoftVC  UNKNOWN    0      0     DOWN
    
```

The following example shows how to display detailed information about the hard PVC shown in Figure 18-4, using the **show ces circuit interface cbr 3/1/0** command:

```

CESwitch# show ces circuit interface cbr 3/1/0

Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
CBR3/1/0  1        HardPVC      ATM0/0/0.1  1      101   DOWN
CBR3/1/0  2        HardPVC      ATM0/0/0.1  1      102   DOWN
CBR3/1/0  3        HardPVC      ATM0/0/0.1  1      103   DOWN
    
```

Configuring a Soft PVC for Structured CES

In a soft PVC, as well as a hard PVC, you configure both ends of the CES circuit. However, a soft PVC typically involves CES modules at opposite edges of an ATM network, so a soft PVC can be set up between any two CES modules anywhere in your network.

The destination address of a soft PVC can point to either of the following:

- Any ATM switch router external ATM port in the network
- A port in any other CES module in the network

For example, to set up a soft PVC involving a local node and a destination node at the opposite edge of the network, you need to determine the CES-IWF ATM address of the port in the destination node to complete a soft PVC setup.

To obtain the destination address for an already configured port in a CES module, log into the remote ATM switch router containing that module. Then use the **show ces address** command to display all the CES-IWF ATM addresses currently configured for that node.

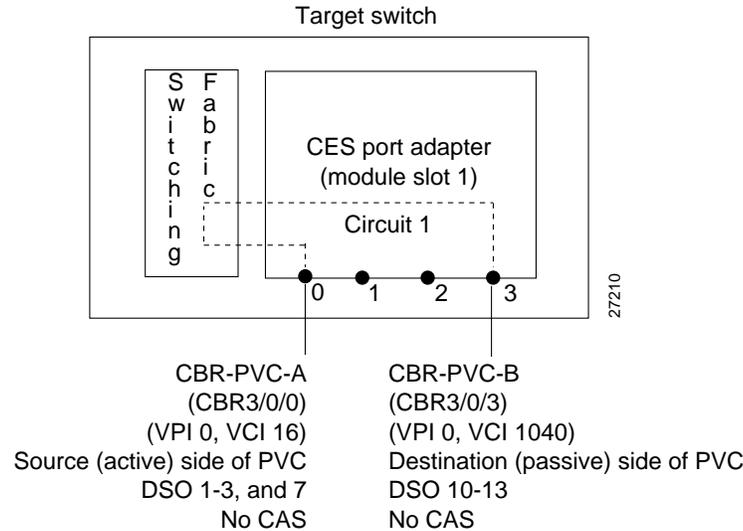
Note Typically you will configure a soft PVC between CES modules anywhere in your network. For simplicity, this example and the accompanying procedure describe how to create a soft PVC between modules in the same ATM switch router chassis.

This section describes how to configure a soft PVC for structured service based on the following assumptions:

- The source (active) side of the soft PVC is named CBR-PVC-A.
- The destination (passive) side of the soft PVC is named CBR-PVC-B.
- Four time slots (DS0 channels) are configured for the soft PVC, as follows:
 - For circuit CBR-PVC-A: DS0 channels 1 to 3 and 7 are used on port CBR 3/0/0.
 - For circuit CBR-PVC-B: DS0 channels 10 to 13 are used on port CBR 3/0/3.
- Channel associated signalling (CAS) is not enabled. For information about configuring a soft PVC with CAS, see the “Configuring a Soft PVC for Structured CES” section.
- CES AAL1 service is structured and the clock source is network-derived.
- CES framing is esf and the line code is b8zs.

Figure 18-5 shows an example of a soft PVC configured for structured CES.

Figure 18-5 Soft PVC Configured for Structured CES



Configuring a soft PVC for structured CES is a two-phase process:

- Phase 1—Configuring the Destination (Passive) Side of a Soft PVC
- Phase 2—Configuring the Source (Active) Side of a Soft PVC

Phase 1—Configuring the Destination (Passive) Side of a Soft PVC

To configure a destination (passive) side of a soft PVC for structured CES, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	<code>show ces status</code>	Displays information about the current CBR interfaces Use this command to choose the destination port.
2	<code>configure terminal</code>	At the privileged EXEC prompt, enters global configuration mode.
3	<code>interface cbr card/subcard/port</code>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenble the interface.
4	<code>ces aal1 service {structured unstructured}</code>	Configures the CES interface AAL1 service type.
5	<code>ces dsx1 clock source {loop-timed network-derived}</code>	Configures the clock source.

Step	Command	Purpose
6	<ul style="list-style-type: none"> For T1 framing: <code>ces dsx1 framing {sf esf}</code> For E1 framing: <code>ces dsx1 framing {e1_crc_mfCAS_lt e1_crc_mf_lt e1_lt e1_mfCAS_lt}</code> 	Configures the framing type. <ul style="list-style-type: none"> For CES T1, the default is esf. For CES E1, the default is e1_lt.
7	<code>ces dsx1 linecode {ami b8zs hdb3}</code>	Configures the line code type. <ul style="list-style-type: none"> For CES T1, the default is b8zs. For E1, the default is hdb3.
8	<code>ces circuit circuit-id timeslots number</code>	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> Circuit id number. <ul style="list-style-type: none"> For CES T1 structured service, use 1 through 24. For CES E1 structured service, use 1 through 31. <p>Note The 0 circuit identifier is reserved for unstructured service.</p> <ul style="list-style-type: none"> Time slots for the circuit for structured service only. <ul style="list-style-type: none"> For CES T1, the range is 1 through 24. For CES E1, the range is 1 through 31.
9	<code>ces circuit circuit-id circuit-name name</code>	Configures the CES interface circuit name.

Example

The following example shows how to configure the destination (passive) side of a soft PVC for structured T1 CES, as shown in Figure 18-5:

```

CESwitch# show ces status

      Interface      IF      Admin      Port  Channels in
      Name           Status  Status     Type  use
-----
      CBR3/0/0       UP      UP         T1    1
      CBR3/0/1       UP      UP         T1    1
      CBR3/0/2       UP      UP         T1    1
      CBR3/0/3       UP      UP         T1    1

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/3
CESwitch(config-if)# ces aall service structured
CESwitch(config-if)# ces dsx1 clock source network-derived
CESwitch(config-if)# ces dsx1 framing esf
CESwitch(config-if)# ces dsx1 linecode b8zs
CESwitch(config-if)# ces circuit 1 timeslots 10-13
CESwitch(config-if)# ces circuit 1 circuit-name CBR-PVC-B
    
```

Phase 2—Configuring the Source (Active) Side of a Soft PVC

To configure the source (active) side of a soft PVC for structured CES, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	show ces address	Shows the CES address for the destination end of the circuit. Use this command to retrieve the VPI/VCI of the destination port.
2	configure terminal	At the privileged EXEC prompt, enters global configuration mode.
3	interface cbr <i>card/subcard/port</i>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
4	ces circuit <i>circuit-id</i> timeslots <i>number</i>	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> • Circuit id number. <ul style="list-style-type: none"> — For CES T1 structured service, use 1 through 24. — For CES E1 structured service, use 1 through 31. • Time slots for the circuit for structured service only. <ul style="list-style-type: none"> — For CES T1, the range is 1 through 24. — For CES E1, the range is 1 through 31. <p>Note The 0 circuit identifier is reserved for unstructured service.</p>
5	ces circuit <i>circuit-id</i> circuit-name <i>name</i>	Configures the CES interface circuit name.
6	ces pvc <i>circuit-id</i> dest-address <i>remote_atm_address</i> vpi <i>vpi</i> vci <i>vci</i>	Configures the soft PVC to the destination CES-IWF ATM addresses and VPI/VCI of the circuit. Use the VPI/VCI of the destination port that was retrieved in Step 1.

Example

The following example shows how to configure the source (active) side of a soft PVC for structured CES, as shown in Figure 18-5:

```

CESwitch# show ces address

CES-IWF ATM Address(es):
47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 CBR3/0/3:1 vpi 0 vci 3088

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces circuit 1 timeslots 1-3, 7
CESwitch(config-if)# ces circuit 1 circuit-name CBR-PVC-A
CESwitch(config-if)# ces pvc 1 dest-address
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 vpi 0 vci 16
    
```

If you do not specify the circuit name and logical name parameters in the command line, the system automatically assigns a unique default name in the form CBRx/y/z:# for the circuit being configured. For example, the default name for this particular circuit is CBR3/0/0:1. For structured circuit emulation services, the circuit number sequence always begins at 1 for each port in a CES module.

Verifying a Soft PVC for Structured CES

To verify the soft PVC configured with structured CES, use the following EXEC commands:

Command	Purpose
show ces circuit	Shows the configuration information for the soft PVC.
show ces circuit interface cbr <i>card/subcard/port</i> <i>circuit-id</i>	Shows the detailed interface configuration information for the soft PVC.

Examples

The following example shows the details of the CES circuit (shown in Figure 18-5), using the **show ces circuit** command:

```

CESwitch# show ces circuit

Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
-----
CBR3/0/0   1        Active SoftVC ATM-P3/0/3   0      3088  UP
CBR3/0/3   1        Passive SoftVC ATM-P3/0/3   0      16    UP
    
```

The following example shows the interface details for the source port (CBR 3/0/0) (shown in Figure 18-5), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 1
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-3,7
Channels used by this circuit: 1-3,7
Cell-Rate: 698, Bit-Rate 256000
cas OFF, cell_header 0x100 (vci = 16)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, OverFlow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth      45, startDequeueDepth      28
Partial Fill:      47, Structured Data Transfer 98
Active SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.10 vpi 0, vci 16
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10

```

The following example shows the interface details for the destination port (CBR 3/0/3) (shown in Figure 18-5), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/3 1
Circuit: Name CBR-PVC-B, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/3, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 10-13
Channels used by this circuit: 10-13
Cell-Rate: 698, Bit-Rate 256000
cas OFF, cell_header 0xC100 (vci = 3088)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, OverFlow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth      45, startDequeueDepth      28
Partial Fill:      47, Structured Data Transfer 98
Passive SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 vpi 0, vci 3088
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.00

```

Configuring a Soft PVC for Structured CES with CAS Enabled

Since the CES T1/E1 port adapter emulates CBR services over ATM networks, it must be able to support channel-associated signalling (CAS) information that is introduced into structured CES circuits by PBXs and TDMs. An optional CAS feature for the CES T1/E1 port adapter meets this requirement.

CAS information carried in a CBR bit stream can be configured with a CES module, as follows:

- The optional CAS feature is not enabled (the default state). For information about configuring a soft PVC for structured CES without CAS enabled, see the “Configuring a Soft PVC for Structured CES” section.
- The optional CAS feature is enabled, but without the optional, Cisco-proprietary on-hook detection feature enabled. This option is described in the following procedure.
- Both the optional CAS and on-hook detection features are enabled. For information about configuring a soft PVC for structured CES with both CAS and on-hook detection enabled, see the “Configuring a Soft PVC for Structured CES with CAS and On-Hook Detection Enabled” section.

Note For a detailed description of CAS operation and the on-hook detection feature, refer to the circuit emulation services topic in the *Guide to ATM Technology*.

This section describes how to configure a soft PVC for structured CES with channel-associated signalling (CAS) enabled.

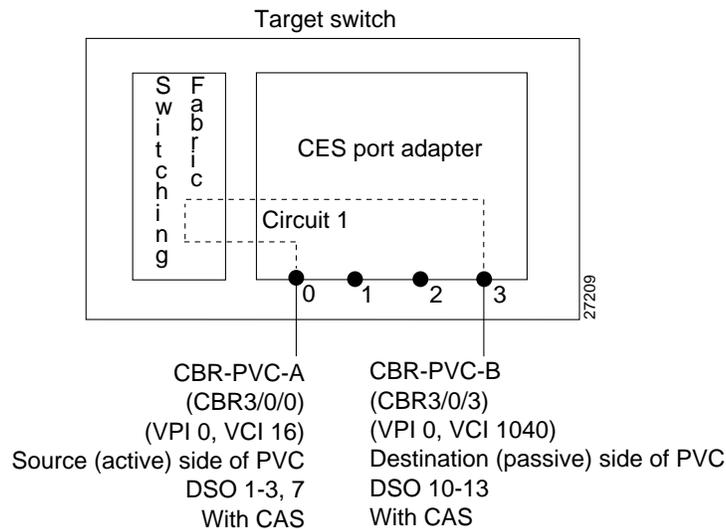
Note Typically you will configure a soft PVC between CES modules anywhere in your network. For simplicity, this example and the accompanying procedure describe how to create a soft PVC between modules in the same ATM switch router chassis.

The following procedure is based on the following assumptions:

- The source (active) side of the soft PVC (CBR-PVC-A) remains as previously configured.
- The destination (passive) side of the soft PVC (CBR-PVC-B) remains as previously configured.
- Four time slots (DS0 channels) remain as previously configured for the soft PVC:
 - For circuit CBR-PVC-A: DS0 channels 1 to 3 and 7 are used on port CBR3/0/0.
 - For circuit CBR-PVC-B: DS0 channels 10 to 13 are used on port CBR3/0/3.
- CAS is enabled for the circuit.
- The signalling mode for the CBR ports is set to “robbedbit.”

Figure 18-6 shows a soft PVC configured for structured CES with CAS enabled.

Figure 18-6 Soft PVC Configured for Structured CES with CAS Enabled



To configure a soft PVC for structured CES with CAS enabled, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	show ces status	Displays information about the current CBR interfaces. Use this command to choose the ports to be configured with CAS enabled.
2	configure terminal	At the privileged EXEC mode prompt, enters global configuration mode.
3	interface cbr <i>card/subcard/port</i>	Selects the source interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenble the interface.
4	ces dsx1 signalmode robbedbit	Configures the signal mode to robbedbit.
5	ces circuit <i>circuit-id cas</i>	Enables channel-associated signalling.
6	exit	Returns to global configuration mode.
7	interface cbr <i>card/subcard/port</i>	Selects the destination interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenble the interface.
8	ces dsx1 signalmode robbedbit	Configures the signal mode to robbedbit.
9	ces circuit <i>circuit-id cas</i>	Enables channel-associated signalling.

Example

The following example shows how to enable channel-associated signalling on the soft PVC configured (see Figure 18-6):

```

CESwitch# show ces status

Interface      IF      Admin      Port  Channels in
  Name        Status  Status     Type  use
-----
  CBR3/0/0      UP      UP         T1    1-3,7
  CBR3/0/1     DOWN    UP         T1
  CBR3/0/2     DOWN    UP         T1
  CBR3/0/3      UP      UP         T1    10-13

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces dsx1 signalmode robbedbit
CESwitch(config-if)# ces circuit 1 cas
CESwitch(config-if)# exit
CESwitch(config)# interface cbr 3/0/3
CESwitch(config-if)# ces dsx1 signalmode robbedbit
CESwitch(config-if)# ces circuit 1 cas
    
```

Verifying a Soft PVC for Structured CES with CAS Enabled

To verify the soft PVC with structured CES and CAS enabled, use the following EXEC commands:

Command	Purpose
show ces circuit	Shows the configuration information for the soft PVC.
show ces circuit interface cbr <i>card/subcard/port</i> <i>circuit-id</i>	Shows the detailed interface configuration information for the soft PVC.

Examples

The following example displays the details of the CES circuit (shown in Figure 18-6), using the **show ces circuit** command at the privileged EXEC mode prompt:

```

CESwitch# show ces circuit

Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
-----
CBR3/0/0   0         Active SoftVC ATM-P3/0/3   0       16    UP
CBR3/0/1   0         Passive SoftVC ATM-P3/0/3   0       1040  UP
    
```

The following example displays the CAS status for the source port CBR 3/0/0 (shown in Figure 18-6):

```

CESwitch# show ces circuit interface cbr 3/0/0 1
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-3,7
Channels used by this circuit: 1-3,7
Cell-Rate: 698, Bit-Rate 256000
→ cas ON, cell_header 0x100 (vci = 16)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, OverFlow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth 45, startDequeueDepth 28
Partial Fill: 47, Structured Data Transfer 98
Active SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.10 vpi 0, vci 16
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10
    
```

The following example displays the CAS status for the destination port CBR 3/0/3 (shown in Figure 18-6):

```

CESwitch# show ces circuit interface cbr 3/0/3 1
Circuit: Name CBR-PVC-B, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/3, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 10-13
Channels used by this circuit: 10-13
Cell-Rate: 698, Bit-Rate 256000
→ cas ON, cell_header 0xC100 (vci = 3088)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, OverFlow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth 45, startDequeueDepth 28
Partial Fill: 47, Structured Data Transfer 98
Passive SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 vpi 0, vci 3088
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.00
    
```

Configuring a Soft PVC for Structured CES with CAS and On-Hook Detection Enabled

This section outlines the additional steps that you must take to activate the on-hook detection (bandwidth-release) feature in a 1 x 64 structured CES circuit.

To configure a soft PVC for structured CES with CAS and on-hook detection enabled, follow these steps, beginning in global configuration mode:

Step	Command	Purpose
1	interface cbr <i>card/subcard/port</i>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenble the interface.
2	ces circuit <i>circuit-id</i> [cas] [on-hook-detect <i>pattern</i>]	Configures channel-associated signalling and on-hook detection on the CES circuit.

Example

The following example shows how to configure on-hook detection on the soft PVC with structured CES and CAS enabled in the previous section “Configuring a Soft PVC for Structured CES with CAS Enabled” (shown in Figure 18-6):

```

CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces circuit 1 cas on-hook-detect 2
    
```

Note The four ABCD bits in the CAS mechanism are device-specific, depending on the manufacturer of the voice/video telephony device that generates the CBR traffic. The ABCD bits of the CAS mechanism are user-configurable.

Verifying a Soft PVC for Structured CES with CAS and On-Hook Detection Enabled

To show the on-hook detection configuration of a soft PVC configured with structured CES and CAS enabled, use the following EXEC command:

Command	Purpose
show ces circuit interface cbr <i>card/subcard/port</i> <i>circuit-id</i>	Shows the detailed interface configuration information for the soft PVC.

Example

The following example shows the soft PVC with CAS and on-hook detection enabled as hexadecimal number 2 (shown in Figure 18-6):

```
CESwitch# show ces circuit interface cbr 3/0/3 1
Circuit: Name CBR-PVC-B, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/3, Circuit_id 1, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 10-13
Channels used by this circuit: 10-13
Cell-Rate: 698, Bit-Rate 256000
→ cas ON, cell_header 0xC100 (vci = 3088)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, OverFlow unavailable
→ ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x2
state: VcActive, maxQueueDepth 45, startDequeueDepth 28
Partial Fill: 47, Structured Data Transfer 98
Passive SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 vpi 0, vci 3088
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.00
```

Creating Multiple Structured Soft PVCs on the Same CES Port

This section describes how to create more than one structured soft PVC on the same CES T1/E1 port. Figure 18-7 shows how you can configure multiple CES circuits on a single T1/E1 port.

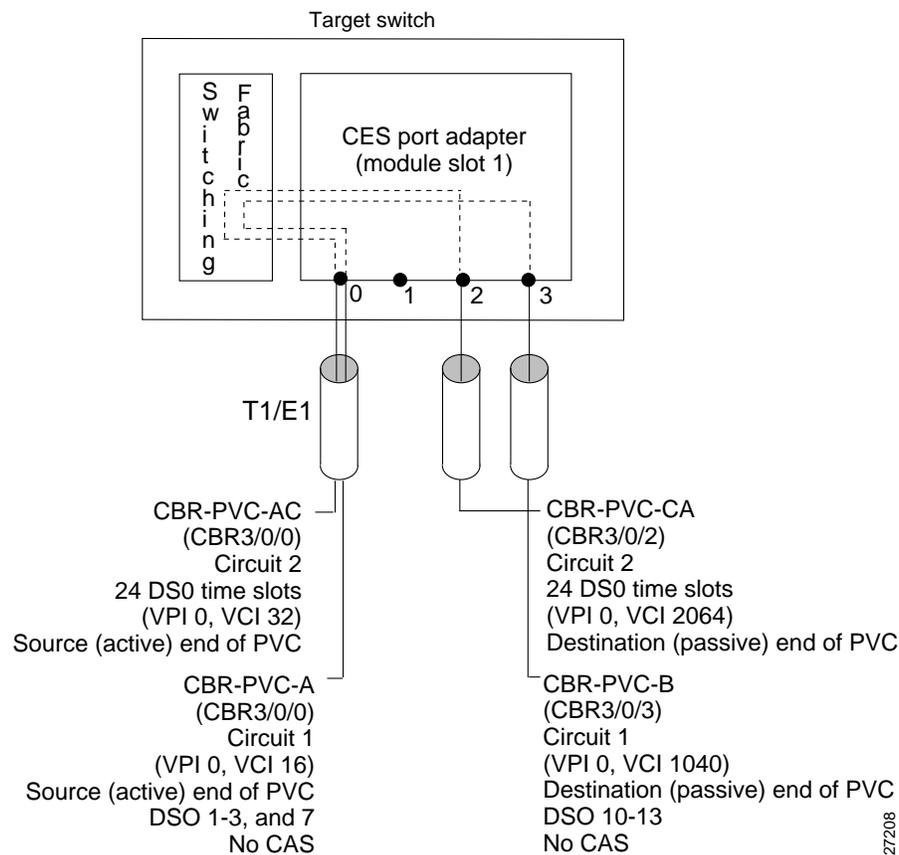
Note Typically you will configure a soft PVC between CES modules anywhere in your network. For simplicity, this example and the accompanying procedure describe how to create a soft PVC between modules in the same ATM switch router chassis.

Assume that certain configuration information has already been established for a soft PVC (see Figure 18-6) and that you are to create an additional soft PVC involving the same CES module.

The following assumptions apply to creating multiple soft PVCs on the same T1/E1 port (see Figure 18-7):

- The source (active) side of a soft PVC named CBR-PVC-A is already created on port CBR 3/0/0.
- The destination (passive) side of a soft PVC named CBR-PVC-B is already created on port CBR 3/0/3.
- A new source (active) side of a soft PVC named CBR-PVC-AC will be created on port CBR 3/0/0 of the CES module, thereby creating a multiple CES circuit on this particular port.
- A new destination (passive) side of a soft PVC named CBR-PVC-CA will be created on port CBR 3/0/2 of the CES module.
- The CES AAL1 service is structured and the clock source is network-derived.
- The CES framing is esf and the line code is b8zs.

Figure 18-7 Configuring Multiple Structured Soft PVCs on the Same CES T1/E1 Port



Configuring multiple soft PVCs for structured CES is a two-phase process:

- Phase 1—Configuring the Destination (Passive) Side of Multiple Soft PVCs
- Phase 2—Configuring the Source (Active) Side of Multiple Soft PVCs

Phase 1—Configuring the Destination (Passive) Side of Multiple Soft PVCs

To configure multiple soft PVCs on the destination (passive) side of the same port, follow these steps, beginning in global configuration mode:

Step	Command	Purpose
1	<code>interface cbr card/subcard/port</code>	Selects the physical interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
2	<code>ces aal1 service {structured unstructured}</code>	Configures the CES interface AAL1 service type.
3	<code>ces dsx1 clock source {loop-timed network-derived}</code>	Configures the clock source.

Step	Command	Purpose
4	<ul style="list-style-type: none"> For T1 framing: <code>ces dsx1 framing {sf esf}</code> For E1 framing: <code>ces dsx1 framing {e1_crc_mfCAS_lt e1_crc_mf_lt e1_lt e1_mfCAS_lt}</code> 	Configures the framing type. <ul style="list-style-type: none"> For CES T1, the default is esf. For CES E1, the default is e1_lt.
5	<code>ces dsx1 linecode {ami b8zs hdb3}</code>	Configures the line code type. <ul style="list-style-type: none"> For CES T1, the default is b8zs. For E1, the default is hdb3.
6	<code>ces circuit circuit-id [circuit-name name] [timeslots number]</code>	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> Circuit id number. <ul style="list-style-type: none"> For CES T1 structured service, use 1 through 24. For CES E1 structured service, use 1 through 31. <p>Note The 0 circuit identifier is reserved for unstructured service.</p> <ul style="list-style-type: none"> Configures the CES interface circuit name. Configures the time slots for the circuit for structured service only. <ul style="list-style-type: none"> For CES T1, the range is 1 through 24. For CES E1, the range is 1 through 31.

Example

The following example shows how to configure multiple soft PVCs on the destination (passive) side of the same port (shown in Figure 18-7):

```

CESwitch(config)# interface cbr 3/0/2
CESwitch(config-if)# ces aall service structured
CESwitch(config-if)# ces dsx1 clock source network-derived
CESwitch(config-if)# ces dsx1 framing esf
CESwitch(config-if)# ces dsx1 linecode b8zs
CESwitch(config-if)# ces circuit 2 timeslots 24 circuit-name CBR-PVC-CA
    
```

Note If you do not specify the circuit name and logical name parameters in the command line, the system automatically assigns a unique default name in the form CBRx/y/z:# for the circuit being configured. For example, the default name for this particular circuit is CBR3/0/2:1. For structured circuit emulation services, the circuit number sequence always begins at 1 for each port in a CES module.

Phase 2—Configuring the Source (Active) Side of Multiple Soft PVCs

To configure multiple soft PVCs on the source (active) side of the same port, follow these steps, beginning in global configuration mode:

Step	Command	Purpose
1	interface cbr <i>card/subcard/port</i>	Selects the source interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
2	ces circuit <i>circuit-id</i> [circuit-name <i>name</i>] [timeslots <i>number</i>]	Configures the following CES connection attributes for the circuit: <ul style="list-style-type: none"> • Circuit id number. <ul style="list-style-type: none"> — For CES T1 structured service, use 1 through 24. — For CES E1 structured service, use 1 through 31. Note The 0 circuit identifier is reserved for unstructured service. <ul style="list-style-type: none"> • Configures the CES interface circuit name. • Configures the time slots for the circuit for structured service only. <ul style="list-style-type: none"> — For CES T1, the range is 1 through 24. — For CES E1, the range is 1 through 31.
3	end	Exits interface configuration mode.
4	show ces address	Shows the CES address for the destination end of the circuit. Use this command to retrieve the VPI/VCI of the destination port.
5	configure terminal	At the privileged EXEC prompt, enters configuration mode.
6	interface cbr <i>card/subcard/port</i>	Selects the destination interface to be configured. Note If the interface is up, you might have to disable it (using the shutdown command) before you can configure the circuit. After you configure the circuit, run the no shutdown command to reenables the interface.
7	ces pvc <i>circuit-id</i> dest-address <i>remote_atm_address</i> vpi <i>vpi</i> vci <i>vci</i>	Configures the soft PVC to the destination CES-IWF ATM addresses and VPI/VCI of the circuit. Use the VPI/VCI of the destination port that was retrieved in Step 4.

Example

The following example shows how to configure multiple soft PVCs on the source (active) side of the same port (shown in Figure 18-7):

```

CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# ces circuit 2 timeslots 24
CESwitch(config-if)# ces circuit 2 circuit-name CBR-PVC-AC
CESwitch(config-if)# end
CESwitch# show ces address

CES-IWF ATM Address(es):
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1030.10 CBR-PVC-A
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1030.20 CBR-PVC-AC
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1034.10 CBR-PVC-B
47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1038.10 CBR-PVC-CA

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/2
CESwitch(config-if)# ces pvc 2 dest-address
    47.0091.8100.0000.0060.5c71.1f01.4000.0c80.1038.10 vpi 0 vci 2064
    
```

If you do not specify the circuit name and logical name parameters in the command line, the system automatically assigns a unique default name in the form CBRx/y/z:# for the circuit being configured. For example, the default name for this particular circuit is CBR3/0/2:1. For structured circuit emulation services, the circuit number sequence always begins at 1 for each port in a CES module.

Verifying the Creation of Multiple Structured Soft PVCs on the Same CES Port

To verify multiple structured soft PVCs with CAS enabled, use the following EXEC commands:

Command	Purpose
show ces circuit	Shows the configuration information for the soft PVC.
show ces address	Shows the CES address for the destination end of the circuit.
show ces circuit interface cbr card/subcard/port circuit-id	Shows the detailed interface configuration information for the soft PVC.

Examples

The following example displays the circuit details for the soft PVCs that you created in the previous procedure (shown in Figure 18-7) using the **show ces circuit** command in privileged EXEC mode:

```

CESwitch# show ces circuit
Interface  Circuit  Circuit-Type  X-interface  X-vpi  X-vci  Status
-----
CBR3/0/0  1        Active SoftVC ATM-P3/0/3   0      3088  UP
CBR3/0/0  2        Active SoftVC ATM-P3/0/3   0      2080  UP
CBR3/0/2  2        Passive SoftVC ATM-P3/0/3   0       32   UP
CBR3/0/3  1        Passive SoftVC ATM-P3/0/3   0       16   UP
    
```

The following example displays the CES-IWF addresses of the soft PVCs that you configured (shown in Figure 18-7), using the **show ces address** command in privileged EXEC mode:

```

CESwitch# show ces address

CES-IWF ATM Address(es):
47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.10 CBR3/0/0:1 vpi 0 vci 16
47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.20 CBR3/0/0:2 vpi 0 vci 32
47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8038.20 CBR3/0/2:2 vpi 0 vci 2080
47.0091.8100.0000.00e0.4fac.b401.4000.0c81.803c.10 CBR3/0/3:1 vpi 0 vci 3088
    
```

The following example displays the interface details for the new circuit 2 soft PVC that you set up on port CBR 3/0/0 (shown in Figure 18-7), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 2
Circuit: Name CBR-PVC-AC, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/0, Circuit_id 2, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 24
Channels used by this circuit: 24
Cell-Rate: 172, Bit-Rate 64000
cas OFF, cell_header 0x200 (vci = 32)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, Overflow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth      81, startDequeueDepth      64
Partial Fill:      47, Structured Data Transfer 1
Active SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.20 vpi 0, vci 32
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8038.20
    
```

The following example displays the interface details for the new circuit 1 soft PVC that you configured on port CBR3/0/2 (shown in Figure 18-7), using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/2 2
Circuit: Name CBR-PVC-CA, Circuit-state ADMIN_UP / oper-state UP
Interface CBR3/0/2, Circuit_id 2, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 24
Channels used by this circuit: 24
Cell-Rate: 172, Bit-Rate 64000
cas OFF, cell_header 0x8200 (vci = 2080)
Configured CDV 2000 usecs, Measured CDV unavailable
De-jitter: UnderFlow unavailable, Overflow unavailable
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcActive, maxQueueDepth      81, startDequeueDepth      64
Partial Fill:      47, Structured Data Transfer 1
Passive SoftVC
Src: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8038.20 vpi 0, vci 2080
Dst: atm addr 47.0091.8100.0000.00e0.4fac.b401.4000.0c81.8030.00
    
```

Reconfiguring a Previously Established Circuit

Once you have configured a circuit, you cannot change the circuit's configuration while the circuit is up. You must first bring the interface down. Then you can change the circuit's configuration. After entering these configuration changes, you must bring the interface back up. To change an enabled circuit's configuration, follow these steps:

Step	Command	Purpose
1	interface cbr <i>card/subcard/port</i>	Selects the physical interface to be configured.
2	shutdown	Disables the CES interface.
3	Enter the command for the configuration parameter to be changed. For example, to specify the clock source as network-derived and to change the AAL1 clocking mode from adaptive to synchronous, enter: ces dsx1 clock source network-derived ces aal1 clock synchronous	Configures the clock source as network-derived and reconfigures the AAL1 clock mode to synchronous.
4	no shutdown	Enables the CES interface.
5	show ces circuit interface cbr <i>card/subcard/port circuit-id</i>	Shows detailed interface configuration information for the circuit. Use this command to verify your configuration changes.

Note The **no ces circuit *circuit-id* shutdown** command *deletes* the circuit. If you use this command, you must reenter all of the configuration information for the circuit. Do not use this command unless you intend to delete the circuit.

Examples

The following example disables interface cbr 3/0/0, specifies the clock source as network-derived, changes the AAL1 clocking method to synchronous, and reenables the interface.

```

CESwitch# interface cbr 3/0/0
CESwitch(config-if)# shutdown
CESwitch(config-if)# ces dsx1 clock source network-derived
CESwitch(config-if)# ces aal1 clock synchronous
CESwitch(config-if)# no shutdown
    
```

The following example displays the changed configuration information for the circuit, using the **show ces circuit interface cbr** command:

```

CESwitch# show ces circuit interface cbr 3/0/0 0
Circuit: Name CBR-PVC-A, Circuit-state ADMIN_UP /
Interface CBR3/0/0, Circuit_id 0, Port-Type T1, Port-State UP
Port Clocking network-derived, aall Clocking Method CESIWF_AAL1_CLOCK_SYNC
Channel in use on this port: 1-24
Channels used by this circuit: 1-24
Cell-Rate: 4107, Bit-Rate 1544000
cas OFF, cell_header 0x100 (vci = 16)
cdv 2000 usecs, Measured cdv 350 usecs
ErrTolerance 8, idleCircuitdetect OFF, onHookIdleCode 0x0
state: VcAlarm, maxQueueDepth      879, startDequeueDepth      491
Partial Fill:      47, Structured Data Transfer 0
HardPVC
src: CBR3/0/0 vpi 0, vci 16
Dst: ATM0/1/3 vpi 0, vci 100

```

The output from this command verifies the following configuration information:

- The circuit named CBR-PVC-A is UP.
- The clock source is network-derived.
- The AAL1 clocking method is synchronous.

Deleting a Previously Established Circuit

This section describes how to delete a previously established circuit.

To delete a previously established circuit, follow these steps, beginning in privileged EXEC mode:

Step	Command	Purpose
1	show ces circuit	Shows the configuration information for the circuit.
2	configure terminal	At the privileged EXEC prompt, enters global configuration mode from the terminal.
3	interface cbr <i>card/subcard/port</i>	Selects the physical interface where the circuit is to be deleted.
4	no ces circuit <i>circuit-id</i>	Deletes the CES circuit.
5	interface cbr <i>card/subcard/port</i>	Selects the other physical interface where the circuit is to be deleted.
6	no ces circuit <i>circuit-id</i>	Deletes the other end of CES circuit.

Example

The following example shows how to delete a previously established circuit:

```

CESwitch# show ces circuit

Interface  Circuit  Circuit-Type X-interface X-vpi X-vci Status
CBR3/0/0   0        HardPVC      ATM0/0     0     100  UP
CBR3/0/3   0        HardPVC      ATM0/0     0     101  UP

CESwitch# configure terminal
CESwitch(config)# interface cbr 3/0/0
CESwitch(config-if)# no ces circuit 0
CESwitch(config-if)# exit
CESwitch(config)# interface cbr 3/0/3
CESwitch(config-if)# no ces circuit 0
    
```

Verifying Deletion of a Previously Established Circuit

To verify the deletion of a previously configured circuit, use the following privileged EXEC commands:

Command	Purpose
<code>show ces circuit</code>	Shows the configuration information for the circuit.
<code>show ces address</code>	Shows the configuration information for any CES addresses.

Examples

The following example displays the configuration of any CES circuits:

```

CESwitch# show ces circuit
    
```

The absence of output verifies that all CES circuits are deleted.

The following example displays the configuration of any CES addresses:

```

CESwitch# show ces address

CES-IWF ATM Address(es):
    
```

The absence of output verifies that all CES circuits are deleted.

Configuring SGCP

The Simple Gateway Control Protocol (SGCP) controls voice-over-IP gateways by an external call control element (called a call-agent). This has been adapted to allow SGCP to control ATM switch router circuit emulation services (CES) circuits (called endpoints in SGCP). The resulting system (call-agents and gateways) allows for the call-agent to engage in common channel signalling (CCS) over a 64-Kbps CES circuit, governing the interconnection of bearer channels on the CES interface. In this system the ATM switch router acts as a voice-over-ATM gateway.

For overview information about configuring the SCGP feature, refer to the *Guide to ATM Technology*.

Operation

The network operator can globally enable or disable SGCP operation for the switch. By default, SGCP is disabled. When SGCP is enabled, the ATM switch router begins listening on the well-known User Datagram Protocol (UDP) port for SGCP packets. The endpoint ID in an SGCP packet identifies the CES circuit. The CES circuit endpoint can be used by SGCP if the following conditions exist:

- The parent CES interface is enabled, and the LineState is NoAlarm (determined via the **show ces interface** command).
- The CES circuit is allocated a single time slot.
- The CES circuit is enabled (not shut).
- The CES circuit is not configured as an active soft PVC.
- The CES circuit is not configured as part of a hard PVC.

The following sections describe SGCP configuration tasks:

- Configuring SGCP on the Entire Switch
- Displaying SGCP
- Configuring CES Circuits for SGCP
- Displaying SGCP Endpoints
- Displaying SGCP Connections
- Configuring SGCP Request Handling
- Configuring Call-Agent Address
- Shutting Down SGCP

Configuring SGCP on the Entire Switch

To enable SGCP operations for the entire switch, use the following global configuration command:

Command	Purpose
sgcp	Enables or disables SGCP operations for the entire switch.

Example

The following example shows how to enable SGCP for the entire switch:

```
Switch(config)# sgcp
```

Displaying SGCP

To display SGCP configuration, operational state, and a summary of connection activity, use the following privileged EXEC command:

Command	Purpose
show sgcp	Displays the global SGCP configuration.

Example

The following example displays the SGCP configuration:

```
Switch# show sgcp

SGCP Admin State ACTIVE, Oper State ACTIVE
SGCP call-agent:none , SGCP graceful-shutdown enabled? FALSE
SGCP request timeout 2000, SGCP request retries 6
74 CES endpoint connections created
74 CES endpoints in active connections
```

Configuring CES Circuits for SGCP

Any single time slot (64 Kbps) allocated to a circuit on a CES T1/E1 interface can be configured for SGCP with these restrictions:

- CES is not the active source end of a soft PVC.
- CES is not part of a hard PVC.

Note Configuration on the call-agent can restrict the range of circuits designated for signalling on a CES circuit interface.

When you configure a CES circuit for SGCP, signalling should be given the proper time slot. For T1 CES circuits, a time slot can be given a number from 1 to 24; for E1 CES, a number from 1 to 31.

Although no keyword identifies a CES circuit as allocatable by SGCP, there is normally a simple configuration rule to ensure that signalling allocates the proper time slot:

circuit *x* is allocated time slot *x*, $1 \leq x \leq 24$ (or 31 for E1).

Note The endpoint specifier used by SGCP refers to the CES circuit ID (not the time slot). If a time slot is not allocated to a circuit, that time slot cannot be used by SGCP (or CES, either).

To configure SGCP operation on a CES circuit interface, follow these steps, beginning in global configuration mode:

Step	Command	Purpose
1	interface cbr <i>card/subcard/port</i>	Selects the physical interface to be configured.
2	ces aal1 service structured	Configures the AAL1 service type.
3	ces circuit <i>circuit-id timeslot number</i>	Allocates a time slot number to the circuit identifier.

Example

The following example shows how to configure the CES port for structured CES with all time slots available for SGCP. CES circuit 16 is configured for common channel signalling and specified as a soft PVC to a circuit on the CES port adapter connected to the call-agent.

```
Switch(config)# interface cbr 1/1/2
Switch(config-if)# ces aall service structured
Switch(config-if)# ces circuit 1 timeslot 1
Switch(config-if)# ces circuit 2 timeslot 2
Switch(config-if)# ces circuit 3 timeslot 3
Switch(config-if)# ces circuit 4 timeslot 4
Switch(config-if)# ces circuit 5 timeslot 5
Switch(config-if)# ces circuit 6 timeslot 6
Switch(config-if)# ces circuit 7 timeslot 7
Switch(config-if)# ces circuit 8 timeslot 8
Switch(config-if)# ces circuit 9 timeslot 9
Switch(config-if)# ces circuit 10 timeslot 10
Switch(config-if)# ces circuit 11 timeslot 11
Switch(config-if)# ces circuit 12 timeslot 12
Switch(config-if)# ces circuit 13 timeslot 13
Switch(config-if)# ces circuit 14 timeslot 14
Switch(config-if)# ces circuit 15 timeslot 15
Switch(config-if)# ces circuit 16 timeslot 16
Switch(config-if)# ces pvc 16 dest-address
47.0091.8100.0000.0060.3e64.fd01.4000.0c80.1038.10 vpi 0 vci 2064
Switch(config-if)# ces circuit 17 timeslot 17
Switch(config-if)# ces circuit 18 timeslot 18
Switch(config-if)# ces circuit 19 timeslot 19
Switch(config-if)# ces circuit 20 timeslot 20
Switch(config-if)# ces circuit 21 timeslot 21
Switch(config-if)# ces circuit 22 timeslot 22
Switch(config-if)# ces circuit 23 timeslot 23
Switch(config-if)# ces circuit 24 timeslot 24
Switch(config-if)# end
```

Displaying SGCP Endpoints

SGCP endpoints are all the CES circuits that might be eligible for SGCP connections. To display SGCP endpoints, use the following EXEC command:

Command	Purpose
<code>show sgcp endpoint [interface cbr card/subcard/port [circuit-id]]</code>	Displays the SGCP endpoints.

Note SGCP cannot allocate a CES circuit to a connection if it is already part of a hard or soft PVC.

Example

The following example displays the possible SGCP endpoints on CES interface CBR 1/1/0:

```
Switch> show sgcp endpoint interface cbr 1/1/0

Endpt          Timeslots Conn State          Call ID
CBR1.1.0/1     1         no connection
CBR1.1.0/2     1         no connection
CBR1.1.0/3     1         no connection
CBR1.1.0/4     1         no connection
CBR1.1.0/5     1         no connection
CBR1.1.0/6     1         no connection
CBR1.1.0/7     1         no connection
CBR1.1.0/8     1         no connection
CBR1.1.0/9     1         no connection
CBR1.1.0/10    1         no connection
CBR1.1.0/11    1         active
CBR1.1.0/12    1         no connection
CBR1.1.0/14    1         active             1234abc
CBR1.1.0/15    1         active             2234abc
CBR1.1.0/16    1         active             3234abc
CBR1.1.0/17    1         active             4234abc
CBR1.1.0/18    1         active             5234abc
CBR1.1.0/19    1         active             6234abc
CBR1.1.0/20    1         active             7234abc
CBR1.1.0/21    1         active             8234abc
CBR1.1.0/22    1         active             9234abc
CBR1.1.0/23    1         active             a234abc
CBR1.1.0/24    1         active             b234abc
```

Displaying SGCP Connections

To display SGCP connections (either globally or per single interface), use the following EXEC command:

Command	Purpose
<code>show sgcp connection [interface cbr card/subcard/port]</code>	Displays the SGCP connections.

Example

The following example displays all SGCP connections created on the ATM switch router:

```
Switch> show sgcp connection

Conn Endpt          Soft VC State          Call Id
CBR0.0.0/1         Dest- active VC       d234ab
CBR0.0.0/2         Dest- active VC       12345bc
CBR0.0.0/3         Dest- active VC       1284ab
CBR0.0.0/4         Dest- active VC       9234abc
```

Configuring SGCP Request Handling

When the ATM switch router initiates an SGCP request (for example, to disconnect the circuit), default request timer and request retry values are in operation. To change the default value of SGCP requests, use the global configuration commands, as shown in the following table:

Command	Purpose
<code>sgcp request timeout <i>msecs</i></code>	Configures the SGCP request timeout value.
<code>sgcp request retries <i>number</i></code>	Configures the SGCP request retry value.

Examples

The following example shows how to change the request timeout to 2000 milliseconds:

```
Switch(config)# sgcp request timeout 2000
```

The following example shows how to change the request retry value to 5:

```
Switch(config)# sgcp request retries 5
```

Configuring Call-Agent Address

By default the SGCP call agents perform the following tasks:

- The ATM switch router sends a response to an SGCP request in a UDP packet with the destination address the same as the source address of the request UDP packet.
- To send a DeleteConnection request for a connection that exists, the ATM switch router specifies the destination address of the UDP packet as the source UDP address in the CreateConnection request.

To alter this behavior, and send responses and requests to a specific IP address and UDP port, use the following global configuration command:

Command	Purpose
<code>sgcp call-agent <i>ip-address udp-port</i></code>	Configures the call-agent IP address and UDP port.

Note If the IP address is specified without the UDP port number, the well-known SGCP port 2427 is used.

Example

The following example shows how to set the call-agent with IP address 133.20.5.122 and UDP port 12000:

```
Switch(config)# sgcp call-agent 133.20.5.122 12000
```

Shutting Down SGCP

When SGCP is disabled with the **no sgcp** command, active SGCP connections are terminated; however DeleteConnection requests are not sent to the call-agent for these active connections. To notify call-agent and perform a graceful SGCP shutdown, use the following global configuration command:

Command	Purpose
sgcp graceful-shutdown	Shuts down SGCP and notifies call-agent.

Example

The following example shows how to perform a graceful shutdown:

```
Switch(config)# sgcp graceful-shutdown
```