



# Configuring Access Circuit Redundancy

This chapter provides information about the Access Circuit Redundancy (ACR) feature on the Cisco ASR 903 Router.

- [New and Changed Information](#), on page 1
- [Prerequisites for Configuring ACR](#), on page 1
- [Restrictions for Configuring ACR](#), on page 2
- [Information About ACR](#), on page 3
- [How to Configure ACR](#), on page 3
- [Troubleshooting the ACR configuration](#), on page 20
- [Additional References](#), on page 21

## New and Changed Information

Feature	ASR 903 RSP1 Module	ASR 903 RSP2 Module	ASR 902 Router	Where Documented
CEM ACR	Cisco IOS XE Release 3.10S	Cisco IOS Release 3.14S	Cisco IOS XE Release 3.12S	
ATM ACR	Cisco IOS XE Release 3.12	NA	Cisco IOS XE Release 3.12S	

## Prerequisites for Configuring ACR

- When configured as a part of the ACR group, the Working and Protect interfaces should be of same framing type.
- When Circuit Emulation (CEM) interfaces are created, they are not ACR enabled. You must configure CEM only under the virtual Synchronous Optical Networking (SONET) controller to enable ACR.

## Restrictions for Configuring ACR

- Physical or soft IM OIR causes the APS switchover time to be higher (500 to 600 ms). Shut or no shut of the port and removal of the active working or protect also cause the APS switchover time to be high. To overcome these issues, force the APS switchover.
- On the RSP3 module, it takes a long time (more than half an hour) to copy scale configuration (8064 VT CEP) from bootflash to running configuration. To overcome this issue, you can copy the configuration one by one from the CLI.

## Restrictions for CEM ACR

- ACR configuration is only supported with a Single Router Automatic Protection Switching (SR-APS) configuration. For more information about APS, see Time Division Multiplexing Guide
- Maximum of 12 ACR groups are supported on the router. A single IM supports only 2 ACR groups.
- Only one virtual controller is available for every ACR group.
- An ACR group supports only two member interfaces; Working interface and Protect interface.
- CEM-ACR interfaces cannot simultaneously support both Circuit Emulation Services over Packet (CESoP) and Structure-Agnostic Time Division Multiplexing over Packet (SATO P).
- Quality of Service (QoS) is not supported on a CEM-ACR interface except for default experimental bits (EXP) marking for Multiprotocol Label Switching (MPLS) pseudowires.
- CEM ACR is not supported on the RSP3 module in Cisco IOS XE Release 3.16.1S.

## Restrictions for ATM ACR

- ATM ACR is not supported on the RSP3 module in Cisco IOS XE Release 3.16.1S.
- ACR configuration is only supported with a Single Router Automatic Protection Switching (SR-APS) configuration. For more information about APS, see.
- Maximum of 12 ACR groups are supported on the router. A single IM supports only 2 ACR groups.
- Only one virtual controller is available for every ACR group.
- An ACR group supports only two member interfaces; Working interface and Protect interface.
- Quality of Service (QoS) is not supported on a ATM-ACR interface except for default experimental bits (EXP) marking for Multiprotocol Label Switching (MPLS) pseudowires.
- For successful ATM ACR switchover, configuration of VCs must be the same for both working and protect interfaces. The switchover time is less than 200 ms.
- ATM-ACR PVP mode is *not* supported in Cisco IOS XE Release 3.12S.
- A delay of 8 seconds per PVC is required between every ACR switchover. For N number of PVCs, N\*8 seconds of delay is required between every ACR switchover. Following are the trigger for ACR switchover:
  - Reloading the IM with ACR port configuration
  - Executing shutdown command followed by a no shutdown command
  - Flapping of active port link
  - Removing or inserting a cable of active port.

- The maximum number of ACR-ATM interfaces supported in SONET mode is 84.
- The maximum number of ACR-ATM interfaces supported in SDH mode is 63.
- Configuring ATM followed by ACR-ATM configuration results in Standby RSP crashes. To migrate the ATM configuration to ACR-ATM or vice-versa, perform the following:
  - Remove the ATM configuration
  - Save the configuration and perform a reload
  - Upload a new image on the router
  - Configure the ACR-ATM feature
- Unidirectional traffic may drop after multiple ACR switchovers and when SSO is performed.
- Maintenance tasks such as performing **shutdown** followed by a **no shutdown** at the virtual controller or interface are not allowed.

## Information About ACR

### CEM ACR

ACR enables local switching for CEM interfaces by creating a virtual CEM-ACR interface. All configuration changes made on the virtual CEM-ACR interface are applied automatically on both the working and protect interfaces. Switching from working to protect or protect to working interface occurs within 250 milliseconds at different scaled levels with line rate traffic.

The virtual CEM-ACR interface provides the simplicity of a single point of configuration and the flexibility of not running a backup pseudowire for the protect interface in a failure.

### ATM ACR

ATM ACR interfaces are created at the ACR controller and the PVC are created at the virtual ACR interface. For each virtual interface one working and one protect interface (physical) exist. At any instance, only one interface is active.

The virtual interface state represents the active interface state. PVC's are created in the virtual interfaces.

## How to Configure ACR

### Configuring ACR (SONET Framing)

#### Procedure

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Router> <b>enable</b>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Router# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet slot/subslot/port</b> <b>Example:</b> Router (config)# <b>controller sonet 0/1/0</b>	Selects the work controller to configure and enters controller configuration mode. <ul style="list-style-type: none"> <li>• <i>slot/subslot/port</i>—Specifies the location of the interface.</li> </ul>
<b>Step 4</b>	<b>framing sonet</b> <b>Example:</b> Router (config-controller)# <b>framing sonet</b>	Configures the framing mode. <ul style="list-style-type: none"> <li>• <i>sonet</i>—Enables SONET framing.</li> </ul>
<b>Step 5</b>	<b>clock source {internal   line}</b> <b>Example:</b> Router (config-controller)# <b>clock source internal</b>	Sets the clock source. <p><b>Note</b> The clock source is set to internal if the opposite end of the connection is set to line and the clock source is set to line if the opposite end of the connection is set to internal.</p> <ul style="list-style-type: none"> <li>• <i>internal</i>—Specifies that the internal clock source is used.</li> <li>• <i>line</i>—Specifies that the network clock source is used. This is the default for T1 and E1.</li> </ul>
<b>Step 6</b>	<b>aps group acr acr-no</b> <b>Example:</b> Router (config-controller)# <b>aps group acr 1</b>	Configures the APS group for the controller. <ul style="list-style-type: none"> <li>• <i>acr</i>—Configures the ACR group on top of APS.</li> <li>• <i>acr-no</i>—A group number that is valid between 1 and 96. Any group number exceeding this range is not supported.</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>• For Cisco ASR 900 RSP1 Module, the valid group number is between 1 and 96.</li> <li>• For Cisco ASR 900 RSP2 Module, the valid group number is between 1 and 192.</li> </ul> <p>The APS group can be either active or inactive:</p> <ul style="list-style-type: none"> <li>• <i>Active</i>—The interface that is currently sending and receiving data.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>Inactive—The interface that is currently standing by to take over when the active fails.</li> </ul>
<b>Step 7</b>	<b>aps working</b> <i>circuit-number</i> <b>Example:</b> Router (config-controller)# <b>aps working 1</b>	Identifies the interface as the Working interface. <ul style="list-style-type: none"> <li>circuit-number—Identification number for this particular channel in the APS pair. Since the interface only supports 1 + 1 redundancy, the only valid and the default value for working interface is 1.</li> </ul>
<b>Step 8</b>	<b>exit</b> <b>Example:</b> Router (config-controller)# <b>exit</b>	Exits controller configuration mode.
<b>Step 9</b>	<b>controller sonet</b> <i>slot/subslot/port</i> <b>Example:</b> Router (config)# <b>controller sonet 0/2/0</b>	Selects the protect controller to configure and enters controller configuration mode. <p><b>Note</b> The controller selected for protect must be different from the work controller.</p> <ul style="list-style-type: none"> <li><i>slot/subslot/port</i>—Specifies the location of the interface.</li> </ul>
<b>Step 10</b>	<b>aps group acr</b> <i>acr-no</i> <b>Example:</b> Router (config-controller)# <b>aps group acr 1</b>	Configures the APS group for the controller. <ul style="list-style-type: none"> <li>acr—Configures the ACR group on top of APS.</li> <li>acr-no—A group number that is valid between 1 and 96. Any group number exceeding this range is not supported.</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>For Cisco ASR 900 RSP1 Module, the valid group number is between 1 and 96.</li> <li>For Cisco ASR 900 RSP2 Module, the valid group number is between 1 and 192.</li> </ul> <p>The APS group can be either active or inactive:</p> <ul style="list-style-type: none"> <li>Active—The interface that is currently sending and receiving data.</li> <li>Inactive—The interface that is currently standing by to take over when the active fails.</li> </ul>
<b>Step 11</b>	<b>aps protect</b> <i>circuit-number ip-address</i>	Identifies the interface as the Protect interface.

	Command or Action	Purpose
	<b>Example:</b>  Router(config-controller)# <b>aps protect 1 4.1.1.1</b>	<ul style="list-style-type: none"> <li>• <i>circuit-number</i> —Identification number for this particular channel in the APS pair. Because only 1+1 redundancy is supported, the only valid value is 1, and the Protect interface defaults to 1.</li> <li>• <i>ip-address</i> —IP address for the loopback interface. The Protect interface uses this IP address to communicate with the Working interface.</li> </ul>
<b>Step 12</b>	<b>aps revert</b> <i>minutes</i>  <b>Example:</b>  Router(config-controller)# <b>aps revert 2</b>	(Optional) Configures the ACR interface as revert. <ul style="list-style-type: none"> <li>• <i>minutes</i>—Specifies the time, in minutes, after which the revert process begins.</li> </ul> <b>Note</b> Use the <code>aps revert</code> command only under the <code>protect</code> member of the ACR group.
<b>Step 13</b>	<b>exit</b>  <b>Example:</b>  Router (config-controller)# <b>exit</b>	Exits controller configuration mode.

### What to do next

The following is a sample configuration of ACR using SONET framing:

```

Router# Configure terminal
Router(config)# Controller sonet 0/1/0
Router(config-controller)# aps group acr 1
Router(config-controller)# aps working 1
Router(config-controller)# exit
Router(config)# controller sonet 0/2/0
Router(config-controller)# aps group acr 1
Router(config-controller)# aps protect 1 4.1.1.1
Router(config-controller)# do show ip interface brief | incl Loop
Loopback0          4.1.1.1          YES NVRAM  up
Router(config-controller)#end
  
```

## Configuring ACR (SDH Framing)

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b>  Router> <b>enable</b>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>

	Command or Action	Purpose
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Router# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet slot/subslot/port</b> <b>Example:</b> Router (config)# <b>controller sonet 0/0/2</b>	Selects the work controller to configure and enters controller configuration mode. <ul style="list-style-type: none"> <li>• <i>slot/subslot/port</i>—Specifies the location of the interface.</li> </ul>
<b>Step 4</b>	<b>framing sdh</b> <b>Example:</b> Router (config-controller)# <b>framing sdh</b>	Configures the framing mode. <ul style="list-style-type: none"> <li>• <i>sdh</i>—Enables SDH framing for STM rates.</li> </ul>
<b>Step 5</b>	<b>clock source {internal   line}</b> <b>Example:</b> Router (config-controller)# <b>clock source internal</b>	Sets the clock source. <p><b>Note</b> The clock source is set to internal if the opposite end of the connection is set to line and the clock source is set to line if the opposite end of the connection is set to internal.</p> <ul style="list-style-type: none"> <li>• <i>internal</i>—Specifies that the internal clock source is used.</li> <li>• <i>line</i>—Specifies that the network clock source is used. This is the default for T1 and E1.</li> </ul>
<b>Step 6</b>	<b>aps group acr acr-no</b> <b>Example:</b> Router (config-controller)# <b>aps group acr 1</b>	Configures the APS group for the controller. <ul style="list-style-type: none"> <li>• <i>acr</i>—Configures the ACR group on top of APS.</li> <li>• <i>acr-no</i>—A group number that is valid between 1 and 96. Any group number exceeding this range is not supported.</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>• For Cisco ASR 900 RSP1 Module, the valid group number is between 1 and 96.</li> <li>• For Cisco ASR 900 RSP2 Module, the valid group number is between 1 and 192.</li> </ul> <p>The APS group can be either active or inactive.</p> <ul style="list-style-type: none"> <li>• <i>Active</i>—The interface that is currently sending and receiving data.</li> </ul>

	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>Inactive—The interface that is currently standing by to take over when the active fails.</li> </ul>
<b>Step 7</b>	<b>aps working</b> <i>circuit-number</i> <b>Example:</b> <pre>Router (config-controller)# <b>aps working 1</b></pre>	Identifies the interface as the Working interface. <ul style="list-style-type: none"> <li><i>circuit-number</i>—Identification number for this particular channel in the APS pair. Since the interface only supports 1 + 1 redundancy, the only valid and the default value for working interface is 1.</li> </ul>
<b>Step 8</b>	<b>exit</b> <b>Example:</b> <pre>Router (config-controller)# exit</pre>	Exits controller configuration mode.
<b>Step 9</b>	<b>controller sonet</b> <i>slot/subslot/port</i> <b>Example:</b> <pre>Router (config)# <b>controller sonet 0/2/0</b></pre>	Selects the protect controller to configure and enters controller configuration mode. <p><b>Note</b> The controller selected for protect must be different from the work controller.</p> <ul style="list-style-type: none"> <li><i>slot/subslot/port</i>—Specifies the location of the interface.</li> </ul>
<b>Step 10</b>	<b>aps group acr</b> <i>acr-no</i> <b>Example:</b> <pre>Router (config-controller)# <b>aps group acr 1</b></pre>	Configures the APS group for the controller. <ul style="list-style-type: none"> <li><i>acr</i>—Configures the ACR group on top of APS.</li> <li><i>acr-no</i>—A group number that is valid between 1 and 96. Any group number exceeding this range is not supported.</li> </ul> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>For Cisco ASR 900 RSP1 Module, the valid group number is between 1 and 96.</li> <li>For Cisco ASR 900 RSP2 Module, the valid group number is between 1 and 192.</li> </ul> <p>The APS group can be either active or inactive:</p> <ul style="list-style-type: none"> <li>Active—The interface that is currently sending and receiving data.</li> <li>Inactive—The interface that is currently standing by to take over when the active fails.</li> </ul>
<b>Step 11</b>	<b>aps protect</b> <i>circuit-number ip-address</i>	Identifies the interface as the Protect interface.



	Command or Action	Purpose
	<b>Example:</b> <pre>Router(config-controller)# <b>aps protect 1 4.1.1.1</b></pre>	<ul style="list-style-type: none"> <li>• <i>circuit-number</i> —Identification number for this particular channel in the APS pair. Because only 1+1 redundancy is supported, the only valid value is 1, and the Protect interface defaults to 1.</li> <li>• <i>ip-address</i> —IP address for the loopback interface. The Protect interface uses this IP address to communicate with the Working interface.</li> </ul>
<b>Step 12</b>	<b>aps revert</b> <i>minutes</i> <b>Example:</b> <pre>Router(config-controller)# <b>aps revert 2</b></pre>	(Optional) Configures the ACR interface as revert. <ul style="list-style-type: none"> <li>• <i>minutes</i>—Specifies the time, in minutes, after which the revert process begins.</li> </ul> <b>Note</b> Use the <code>aps revert</code> command only under the <code>protect</code> member of the ACR group.
<b>Step 13</b>	<b>exit</b> <b>Example:</b> <pre>Router (config-controller)# <b>exit</b></pre>	Exits controller configuration mode.

### What to do next

The following is a sample configuration of ACR interface using SDH framing:

```
Router# configure terminal
Router(config)# controller sonet 0/0/2
Router(config-controller)# framing sdh
Router(config-controller)# clock source internal
Router(config-controller)# aps group acr 10
Router(config-controller)# aps working 1
Router(config-controller)# exit
Router# configure terminal
Router(config)# controller sonet 0/0/3
Router(config-controller)# framing sdh
Router(config-controller)# clock source internal
Router(config-controller)# aps group acr 10
Router(config-controller)# aps protect 1 22.22.22.22
Router(config-controller)# exit
```

## Configuring CEM (SONET Framing)

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>	Enables privileged EXEC mode.

	Command or Action	Purpose
	<b>Example:</b> Router> enable	<ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Router# <b>configure terminal</b>	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet-acr <i>acr_no</i></b> <b>Example:</b> Router (config)# <b>controller sonet-acr 1</b>	Selects the controller to configure. <ul style="list-style-type: none"> <li><i>acr_no</i>—Specifies the controller unit number.</li> </ul>
<b>Step 4</b>	<b>sts-1 <i>number</i></b> <b>Example:</b> Router (config-controller)# <b>sts-1 1</b>	Specifies the STS identifier.
<b>Step 5</b>	<b>vtg <i>vtg-number</i> t1 <i>t1-line-number</i> cem-group <i>group number</i> unframed</b> <b>Example:</b> Router (config-ctrlr-sts1)# <b>vtg 1 t1 1 cem-group 1 unframed</b>	Creates a single Structure-Agnostic TDM over Packet (SAToP) CEM group. <ul style="list-style-type: none"> <li><b>vtg</b>—Specifies the vtg number from 1-7.</li> <li><b>t1-line-number</b>—Identifies the T1 line number from 1 to 4.</li> <li><b>cem-group</b>—Creates a circuit emulation channel from one or more timeslots of a T1 or E1 line.</li> <li><b>group-number</b>—Identifies the channel number to be used for this channel from 0-215.</li> <li><b>unframed</b>—Specifies that a single CEM channel is being created including all timeslots and the framing structure of the line.</li> </ul>
<b>Step 6</b>	OR, <b>Example:</b> <b>vtg <i>vtg-number</i> t1 <i>t1-line-number</i> cem-group <i>group number</i> timeslots <i>timeslot-range</i></b> <b>Example:</b> Router (config-ctrlr-sts1)# <b>vtg 1 t1 1 cem-group 1 timeslots 1-10</b>	Creates a Circuit Emulation Services over Packet Switched Network (CESoPSN) CEM group. <ul style="list-style-type: none"> <li><b>timeslots</b>—Specifies the timeslots to be included in the CEM channel.</li> <li><b>timeslot-range</b>—Specifies the timeslots range from 1 to 24.</li> </ul>

	Command or Action	Purpose
<b>Step 7</b>	<b>exit</b> <b>Example:</b> Router (config-ctrlr-sts1)# <b>exit</b>	Exits controller configuration mode.

**What to do next**

The following is a sample configuration of CEM interface using SONET framing:

```
Router# Configure terminal
Router(config)# controller sonet-acr 1
Router(config-ctrlr-sts1)# sts-1 1
Router(config-ctrlr-sts1)# vtg 1 t1 1 cem-group 1 timeslots 1-10
Router(config-ctrlr-sts1)# end
```

## Configuring CEM (SDH Framing)

**Procedure**

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet-acr acr_no</b> <b>Example:</b> Router (config)# controller sonet-acr 1	Selects the virtual controller to configure and enters controller configuration mode. <ul style="list-style-type: none"> <li>• acr_no—A group number that is valid between 1 and 96. Any group number exceeding this range is not supported.</li> </ul>
<b>Step 4</b>	<b>framing sdh</b> <b>Example:</b> Router (config-controller)# <b>framing sdh</b>	Configures the framing mode. <ul style="list-style-type: none"> <li>• sdh—Enables SDH framing for STM rates.</li> </ul>
<b>Step 5</b>	<b>aug mapping au-4</b> <b>Example:</b>	Selects AU-4 Administrative Unit Group (AUG) mapping.

	Command or Action	Purpose
	<pre>Router (config-controller)# aug mapping au-4</pre>	
<b>Step 6</b>	<p><b>au-4</b> <i>au-4-number</i> <b>tug-3</b> <i>tug-3-number</i></p> <p><b>Example:</b></p> <pre>Router (config-controller)# <b>au-4 1</b> <b>tug-3 2</b></pre>	<p>Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4.</p> <ul style="list-style-type: none"> <li>• au-4—Specifies administrative unit</li> <li>• au-4-number—A number in the range of 1 to 3.</li> <li>• tug-3—Specifies tributary unit group</li> <li>• tug-3-number—A number in the range of 1 to 7.</li> </ul>
<b>Step 7</b>	<p>Do one of the following:</p> <ul style="list-style-type: none"> <li>• <b>tug-2</b> <i>tug-2 number</i> <b>e1</b> <i>e1-line-number</i> <b>cem-group</b> <i>group number</i> <b>timeslots</b> <i>timeslot-range</i></li> </ul> <p><b>Example:</b></p> <pre>Router (config-controller)# <b>tug-2 1 e1</b> <b>2 cem-group 1 timeslots 1-8</b></pre> <p><b>Example:</b></p> <pre><b>tug-2</b> <i>tug-2 number</i> <b>e1</b> <i>e1-line-number</i> <b>cem-group</b> <i>group number</i> <b>unframed</b></pre> <p><b>Example:</b></p> <pre>Router (config-controller)# <b>tug-2 1 e1</b> <b>2 cem-group 1 unframed</b></pre> <p><b>Example:</b></p> <pre><b>tug-2</b> <i>tug-2 number</i> <b>e1</b> <i>e1-line-number</i> <b>framing unframed</b></pre>	<p>Creates a CEM group for the AU-4. Valid E1 values are from 1 to 3.</p>
<b>Step 8</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Router (config-controller)# exit</pre>	<p>Exits controller configuration mode.</p>

**What to do next**

The following is an example for configuring CEM interface using SDH framing (AU-4):

```
Router# configure terminal
Router(config)# controller sonet-acr 1
Router(config-ctrlr-sts1)# framing sdh
Router(config-ctrlr-sts1)# aug mapping au-4
Router(config-ctrlr-sts1)# au-4 1 tug-3 1
Router(config-ctrlr-sts1)# tug-2 1 e1 1 cem-group 0 timeslots 1-31
Router(config-ctrlr-sts1)# end
```

The following is an example for configuring CEM interface using SDH framing (AU-3):

```
Router# configure terminal
Router(config)# controller sonet 0/2/1
Router(config-ctrlr-sts1)# framing sdh
Router(config-ctrlr-sts1)# aug mapping au-3
Router(config-ctrlr-sts1)# aps group acr 1
Router(config-ctrlr-sts1)# aps working 1
Router(config-ctrlr-sts1)# end
Router# configure terminal
Router(config)# controller sonet 0/2/2
Router(config-controller)# framing sdh
Router(config-controller)# clock source internal
Router(config-controller)# aps group acr 1
Router(config-controller)# aps protect 1 22.22.22.22
Router(config-controller)# end
Router# configure terminal
Router(config)# controller sonet-acr 1
Router(config-ctrlr-sts1)# au-3 1
Router(config-ctrlr-sts1)# tug-2 1 t1 1 cem-group 0 timeslot 1-24
Router(config-ctrlr-sts1)# end
Router(config-controller)# do show ip interface brief | incl Loop
Loopback0 22.22.22.22 YES NVRAM up up
Router(config-controller)# end
```

**Configuring ATM-ACR on ATM VC Interface for SDH Mode****Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	configure terminal <b>Example:</b> Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet-acr</b> <i>acr_no</i> <b>Example:</b>	Configures ACR controller level. <ul style="list-style-type: none"> <li>• <i>acr_no</i> —Specifies the controller unit number.</li> </ul>

	Command or Action	Purpose
	Router (config)# <b>controller sonet-acr 1</b>	
<b>Step 4</b>	<b>au-4 au-4-number tug-3 tug-3-number</b> <b>Example:</b> Router (config-controller)# <b>au-4 1 tug-3 2</b>	Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. <ul style="list-style-type: none"> <li>• au-4—Specifies administrative unit</li> <li>• au-4-number—A number in the range of 1 to 3.</li> <li>• tug-3—Specifies tributary unit group</li> <li>• tug-3-number—A number in the range of 1 to 7.</li> </ul>
<b>Step 5</b>	<b>tug-2 tug-2 number e1 e1-line-number atm</b> <b>Example:</b> Router (config-controller)# <b>tug-2 1 e1 2 atm</b> <b>Example:</b>	Creates a group for the AU-4. Valid E1 values are from 1 to 3.
<b>Step 6</b>	<b>interface atm-acr atm-acr-interface-number</b> <b>Example:</b> Router (config)# <b>interface atm-acr 1.1/1/1/1</b>	Configures the ATM-ACR interface level.
<b>Step 7</b>	<b>pvc vpi/vpc</b> <b>Example:</b> Router (config-if)# <b>pvc 1/99 l2transport</b>	Configures a PVC for the interface and assigns the PVC a VPI and VCI. Do not specify 0 for both the VPI and VCI.
<b>Step 8</b>	<b>xconnect peer-router-id vcid encapsulation mpls</b> <b>Example:</b> Router (config-if)# <b>xconnect 2.2.2.2 15 encapsulation mpls</b>	Configures a pseudowire to transport the data across the MPLS network. <ul style="list-style-type: none"> <li>• <i>peer-router-id</i>—IP address of the remote provider edge (PE) peer router.</li> <li>• <i>vcid</i>—A 32-bit identifier to assign to the pseudowire. The same vcid must be used for both ends of the pseudowire. The valid vcid values are 1-4294967295.</li> <li>• <b>encapsulation mpls</b>—Sets MPLS for tunneling mode.</li> </ul>
<b>Step 9</b>	<b>exit</b> <b>Example:</b> Router (config-if)# <b>exit</b>	Exits controller configuration mode.

**What to do next**

The following example show ACR virtual interface for ATM PVC in SR-APS environment

```
Router(config)# controller SONET-ACR 10
Router(config-controller)# au-4 1 tu 1
Router(config-ctrlr-tug3)# tu 1 e1 1 atm
Router(config)# interface ATM-ACR1.1/1/1/1
Router(config-if)# pvc 1/99 l2transport
Router(config-if)# xconnect 2.2.2.2 15 encapsulation mpls
Router(config-if)# exit
```

**Configuring ATM-ACR on ATM VC Interface for SONET Mode****Procedure**

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Router> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	configure terminal <b>Example:</b>  Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>controller sonet-acr <i>acr_no</i></b> <b>Example:</b>  Router (config)# <b>controller sonet-acr</b> <b>1</b>	Configures ACR controller level.  • <i>acr_no</i> —Specifies the controller unit number.
<b>Step 4</b>	<b>sts-1 number</b> <b>Example:</b>  Router (config-controller)# <b>sts-1 1</b>	Specifies the STS identifier.
<b>Step 5</b>	<b>vtg vtg-number t1 t1-line-number atm</b> <b>Example:</b>  Router (config-ctrlr-sts1)# <b>vtg 1 t1 1</b> <b>atm</b>	Creates a single Structure-Agnostic TDM over ATM.  • <b>vtg</b> —Specifies the vtg number from 1-7. • <b>t1-line-number</b> —Identifies the T1 line number from 1 to 4.
<b>Step 6</b>	<b>interface atm-acr atm-acr-interface-number</b> <b>Example:</b>  Router(config)# <b>interface atm-acr</b> <b>1.1/1/1</b>	Specifies the ATM-ACR interface and enters interface configuration mode.

	Command or Action	Purpose
<b>Step 7</b>	<p><b>pvc vpi/vpc</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# pvc 1/99 l2transport</pre>	Configures a PVC for the interface and assigns the PVC a VPI and VCI. Do not specify 0 for both the VPI and VCI.
<b>Step 8</b>	<p><b>xconnect peer-router-id vcid encapsulation mpls</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# xconnect 2.2.2.2 15 encapsulation mpls</pre>	<p>Configures a pseudowire to transport the data across the MPLS network.</p> <ul style="list-style-type: none"> <li>• <i>peer-router-id</i>—IP address of the remote provider edge (PE) peer router.</li> <li>• <i>vcid</i>—A 32-bit identifier to assign to the pseudowire. The same vcid must be used for both ends of the pseudowire. The valid vcid values are 1-4294967295.</li> <li>• <b>encapsulation mpls</b>—Sets MPLS for tunneling mode.</li> </ul>
<b>Step 9</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# exit</pre>	Exits controller configuration mode.

### What to do next

The following example show ACR virtual interface for ATM PVC in SR-APS environment

```
Router(config)# controller SONET-ACR 10
Router(config-controller)# sts-1 1
Router(config-ctrlr-tug3)# vtg 1 e1 1 atm
Router(config)# interface atm-acr1.1/1/1
Router(config-if)# pvc 1/99 l2transport
Router(config-if)# xconnect 2.2.2.2 15 encapsulation mpls
Router(config-if)# exit
```

## Verifying ACR Configurations

This section includes show commands for ACR:

The following example shows the acr groups that have been configured or deleted:

```
Router# show acr group
ACR Group      Working I/f      Protect I/f      Currently Active      Status
-----
1              SONET 4/1/0     SONET 3/1/0     SONET 4/1/0
The following example shows the configured working and protect cem interfaces under the ACR controller:
Router# show acr group 1 detail cem
ACR Group      Working I/f      Protect I/f      Currently Active      Status
-----
CE1            CEM4/1/0        CEM3/1/0        CEM4/1/0
CEM CKT Details
Cktid  State on Working      State on Protect
```



```

1      Provision Success   Provision Success
The following example shows the configuration under the ACR controller:
Example of a configuration using CESoP:

```

```

Router# show running-config | sec SONET-ACR 1
controller SONET-ACR 1
framing sdh
aug mapping au-4
!
au-4 1 tug-3 1
    tug-2 1 e1 1 cem-group 0 timeslots 1-31

```

Example of a configuration using SAToP:

```

Router# show running-config | sec SONET-ACR 2
controller SONET-ACR 2
framing sdh
aug mapping au-4
!
au-4 1 tug-3 1
    tug-2 1 e1 1 cem-group 1001 unframed

```

The following example shows the loopback ip address for the router:

```

Router# show ip interface brief | i Loopback
Loopback0          22.22.22.22    YES NVRAM  up

```

The following example shows the cem-acr circuit status:

```

Router# show cem circuit

```

CEM Int.	ID	Ctrlr	Admin	Circuit	AC
CEM-ACR1	1	UP	UP	Active	UP
CEM-ACR1	2	UP	UP	Active	UP
CEM-ACR1	3	UP	UP	Active	UP
CEM-ACR1	4	UP	UP	Active	UP
CEM-ACR1	5	UP	UP	Active	UP
CEM-ACR1	6	UP	UP	Active	UP
CEM-ACR1	7	UP	UP	Active	UP
CEM-ACR1	8	UP	UP	Active	UP

The following example shows the cem-acr circuit details for cem-group 0 under the CEM-ACR interface:

```

Router# show cem circuit int cem-acr 1 0
CEM-ACR1, ID: 0, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, T1/E1 state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 8 (In use: 0)
Payload Size: 32
Framing: Framed (DS0 channels: 1)
CEM Defects Set
None
Signalling: No CAS
RTP: No RTP
Ingress Pkts:    774186          Dropped:          0
Egress Pkts:    774187          Dropped:          0
CEM Counter Details
Input Errors:    0              Output Errors:    0
Pkts Missing:    0              Pkts Reordered:  0
Misorder Drops:  0              JitterBuf Underrun: 0
Error Sec:       0              Severly Errored Sec: 0
Unavailable Sec: 0              Failure Counts:   0
Pkts Malformed: 0              JitterBuf Overrun: 0

```

The following example shows the cem-acr circuit details for cem-group 1001 under the CEM-ACR interface:

```

Router# show cem circuit int cem-acr 1 1001
CEM-ACR1, ID: 1001, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, T1/E1 state: up
Idle Pattern: 0xFF, Idle CAS: 0x8

```

```

Dejitter: 5 (In use: 0)
Payload Size: 256
Framing: Unframed
CEM Defects Set
None
Signalling: No CAS
RTP: No RTP
Ingress Pkts:    3096748          Dropped:          0
Egress Pkts:    3096748          Dropped:          0
CEM Counter Details
Input Errors:    0                Output Errors:    0
Pkts Missing:   0                Pkts Reordered:  0
Misorder Drops: 0                JitterBuf Underrun: 0
Error Sec:      0                Severly Errored Sec: 0
Unavailable Sec: 0              Failure Counts:   0
Pkts Malformed: 0              JitterBuf Overrun: 0

```

The following example shows the mpls l2 transport vc details for the specified vc. In this case it is the vc with vc-id = 1001:

```

Router# show mpls l2 vc 1001 det
Local interface: CE1 up, line protocol up, CESoPSN Basic 0 up
  Destination address: 66.66.66.66, VC ID: 1001, VC status: up
  Output interface: Te0/2/0, imposed label stack {1629}
  Preferred path: not configured
  Default path: active
  Next hop: 61.1.1.2
Create time: 03:28:57, last status change time: 03:27:37
  Last label FSM state change time: 00:51:41
Signaling protocol: LDP, peer 66.66.66.66:0 up
  Targeted Hello: 22.22.22.22(LDP Id) -> 66.66.66.66, LDP is UP
  Graceful restart: configured and enabled
  Non stop routing: not configured and not enabled
  Status TLV support (local/remote)   : enabled/supported
  LDP route watch                     : enabled
  Label/status state machine          : established, LruRru
  Last local dataplane status rcvd: No fault
  Last BFD dataplane status rcvd: Not sent
  Last BFD peer monitor status rcvd: No fault
  Last local AC circuit status rcvd: No fault
  Last local AC circuit status sent: No fault
  Last local PW i/f circ status rcvd: No fault
  Last local LDP TLV status sent: No fault
  Last remote LDP TLV status rcvd: No fault
  Last remote LDP ADJ status rcvd: No fault
MPLS VC labels: local 586, remote 1629
Group ID: local 0, remote 0
MTU: local 0, remote 0
Remote interface description:
Sequencing: receive disabled, send disabled
Control Word: On (configured: autosense)
SSO Descriptor: 66.66.66.66/1001, local label: 586
Dataplane:
  SSM segment/switch IDs: 1410842/2339386 (used), PWID: 571
VC statistics:
  transit packet totals: receive 3119684, send 3112390
  transit byte totals:  receive 155984200, send 130720380
  transit packet drops:  receive 0, seq error 0, send 0

```

The following example shows the mpls l2 transport vc details for the specified vc. In this case it is the vc with vc-id = 5001:

```

Router# show mpls l2 vc 5001 det

```

```

Local interface: CE1 up, line protocol up, SATOP E1 1001 up
  Destination address: 66.66.66.66, VC ID: 5001, VC status: up
  Output interface: Te0/2/0, imposed label stack {1613}
  Preferred path: not configured
  Default path: active
  Next hop: 61.1.1.2
Create time: 03:29:05, last status change time: 03:27:45
  Last label FSM state change time: 00:51:49
Signaling protocol: LDP, peer 66.66.66.66:0 up
  Targeted Hello: 22.22.22.22(LDP Id) -> 66.66.66.66, LDP is UP
  Graceful restart: configured and enabled
  Non stop routing: not configured and not enabled
  Status TLV support (local/remote) : enabled/supported
    LDP route watch : enabled
    Label/status state machine : established, LruRru
  Last local dataplane status rcvd: No fault
  Last BFD dataplane status rcvd: Not sent
  Last BFD peer monitor status rcvd: No fault
  Last local AC circuit status rcvd: No fault
  Last local AC circuit status sent: No fault
  Last local PW i/f circ status rcvd: No fault
  Last local LDP TLV status sent: No fault
  Last remote LDP TLV status rcvd: No fault
  Last remote LDP ADJ status rcvd: No fault
MPLS VC labels: local 865, remote 1613
Group ID: local 0, remote 0
MTU: local 0, remote 0
  Remote interface description:
Sequencing: receive disabled, send disabled
Control Word: On (configured: autosense)
SSO Descriptor: 66.66.66.66/5001, local label: 865
Dataplane:
  SSM segment/switch IDs: 2176983/3482449 (used), PWID: 850
VC statistics:
  transit packet totals: receive 12488973, send 12445403
  transit byte totals: receive 3347044764, send 3285586392
  transit packet drops: receive 0, seq error 0, send 0

```

The following example shows the currently configured APS groups on the router:

```

Router# show aps
SONET 0/5/2 APS Group 25: protect channel 0 (Inactive) (HA)
  Working channel 1 at 1.1.1.1 (Enabled) (HA)
  bidirectional, non-revertive
  PGP timers (extended for HA): hello time=1; hold time=10
    hello fail revert time=120
  SDH framing; SDH MSP signalling by default
  Received K1K2: 0x00 0x05
    No Request (Null)
  Transmitted K1K2: 0x00 0x00
    No Request (Null)
  Remote APS configuration: (null)
SONET 0/0/2 APS Group 25: working channel 1 (Active) (HA)
  Protect at 1.1.1.1
  PGP timers (from protect): hello time=1; hold time=10
  SDH framing
  Remote APS configuration: (null)

```

The following example shows ATM ACR configuration on the router:

```

Router# show running-config | sec ACR
controller SONET-ACR 1
  framing sdh

```



# Additional References

## Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases

## Standards

Standard	Title
None	—

## MIBs

MIB	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

RFC	Title
None	—

## Technical Assistance

RFC	Title
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

