Configuring the ATM SPAs

This chapter provides information about configuring the ATM SPAs on the Cisco ASR 1000 Series Aggregation Services Routers. It includes the following sections:

For information about managing your system images and configuration files, refer to the following publications:

- *Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide*
- *Cisco IOS XE Configuration Fundamentals Configuration Guide, Release 2*

For information about configuration of other features supported in the Cisco IOS XE software on the Cisco ASR 1000 Series Aggregation Services Routers, and the commands used in this chapter, see the "Related Documentation" section on page xxxiii.

Configuration Tasks

This section describes the most common configurations for the ATM SPAs on Cisco ASR 1000 Series Router. It contains procedures for the following configurations:

Required Configuration Tasks

Some of the required configuration commands implement default values that might or might not be appropriate for your network. If the default value is correct for your network, then you do not need to configure the command.

To perform the basic configuration on a primary ATM interface, complete the following steps beginning in global configuration mode:

Note No data path is supported on the primary ATM interface for ATM SPAs on the Cisco ASR 1000 Series Aggregation Services Routers.

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/port*	Enters interface configuration mode for the indicated port on the specified ATM SPA.
Step 2	Router(config-if)# **atm clock internal**	(Required in back-to-back router configuration) Configures the interface for internal clocking. The default clocking on all ATM interfaces is line clocking, or retrieval of the clock signal from the receive data stream. Therefore, you must configure an internal clock when the ATM link is in back-to-back configuration between two routers. In this case, one end of the link must be configured to use the internal clock. You do not need to configure clocking when the router is connected to a switch, which also uses line clocking by default.
Step 3	Router(config-if)# **no atm ilmi-keepalive**	Integrated Local Management Interface (ILMI) is not supported on ATM SPAs on the Cisco ASR 1000 Series Aggregation Services Routers. This command is the default for all ATM SPAs on the Cisco ASR 1000 Series Aggregation Services Routers.
Step 4	Router(config-if)# **description** *string*	(Optional) Assigns an arbitrary string, up to 80 characters long, to the interface. This string can identify the purpose or owner of the interface, or any other information that might be useful for monitoring and troubleshooting.
Step 5	Router(config-if)# **no shutdown**	Enables the interface.
	Note Repeat Step 1 through Step 5for each port on the ATM SPA to be configured.	
Step 6	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

To perform the basic configuration on each subinterface, use the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*sub-interface* [**point-to-point** | **multipoint**]	Enters subinterface configuration mode pertaining to the specified subinterface, where: • **point-to-point**—(Optional) Specifies a point-to-point subinterface for a single PVC configuration. • **multipoint**—(Optional) Specifies a multipoint subinterface to support PVCs for multiple routers.
Step 2	Router(config-subif)# **ip address** *address mask* [**secondary**]	Assigns the specified IP address and subnet mask to the interface. Repeat the command with the optional **secondary** keyword to assign additional, secondary IP addresses to the port.
Step 3	Router(config-if)# **pvc** [*name*] *vpi*/*vci*	Configures a new ATM PVC by assigning its VPI/VCI numbers and enters ATM VC configuration mode. The valid values for *vpi*/*vci* are: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the virtual path identifier (VPI) ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.
	Note When using the **pvc** command, remember that the *vpi*/*vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi*/*vci* combination that has been used on another subinterface, the Cisco IOS software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.	
Step 4	Router(config-subif)# **description** *string*	(Optional) Assigns an arbitrary string, up to 80 characters long, to the interface. This string can identify the purpose or owner of the interface, or any other information that might be useful for monitoring and troubleshooting.
Step 5	Router(config-subif)# **no shutdown**	Enables the interface.
Step 6	**Note** Repeat Step 1 through Step 5for each ATM SPA subinterface to be configured.	
Step 7	Router(config-subif)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Specifying the Interface Address on a SPA

Up to four ATM SPAs can be installed in a SIP. SPA interface ports begin numbering with "0" from left to right. Single-port SPAs use only the port number 0. To configure or monitor SPA interfaces, you need to specify the physical location of the SIP, SPA, and interface in the CLI. The interface address format is *slot*/*subslot*/*port*, where:

- *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed.
- *subslot*—Specifies the secondary slot of the SIP where the SPA is installed.
- *port*—Specifies the number of the individual interface port on a SPA.

The following example shows how to specify the first interface (0) on a SPA installed in the first subslot of a SIP (0) installed in chassis slot 3:

```
Router(config)# interface serial 3/0/0
```

This command shows a serial SPA as a representative example, however the same *slot*/*subslot*/*port* format is similarly used for other SPAs (such as ATM and POS) and other non-channelized SPAs.

For more information about identifying slots and subslots, see Chapter 4, "Identifying Slots and Subslots for the SIPs and SPAs".

Modifying the Interface MTU Size

The maximum transmission unit (MTU) values might need to be reconfigured from their defaults on the ATM SPAs to match the values used in your network.

Note In the Cisco ASR 1000 Series Route Processor 1 (RP1), 2RU and 2RU-Fixed chassis, the MTU size for the Management Ethernet interface (interface gigabitethernet 0) is limited to 2370 bytes.

Interface MTU Configuration Guidelines

When configuring the interface MTU size on an ATM SPA, consider the following guidelines.

The Cisco IOS software supports several types of configurable MTU options at different levels of the protocol stack. You should ensure that all MTU values are consistent to avoid unnecessary fragmentation of packets. These MTU values are the following:

- Interface MTU—Configured on a per-interface basis and defines the maximum packet size (in bytes) that is allowed for traffic received on the network. The ATM SPA checks traffic coming in from the network and drops packets that are larger than this maximum value. Because different types of Layer 2 interfaces support different MTU values, choose a value that supports the maximum possible packet size that is possible in your particular network topology.
- IP MTU—Configured on a per-interface or per-subinterface basis and determines the largest maximum IP packet size (in bytes) that is allowed on the IP network without being fragmented. If an IP packet is larger than the IP MTU value, the ATM SPA fragments it into smaller IP packets before forwarding it on to the next hop.

- Multiprotocol Label Switching (MPLS) MTU—Configured on a per-interface or per-subinterface basis and defines the MTU value for packets that are tagged with MPLS labels or tag headers. When an IP packet that contains MPLS labels is larger than the MPLS MTU value, the ATM SPA fragments it into smaller IP packets. When a non-IP packet that contains MPLS labels is larger than the MPLS MTU value, the ATM SPA drops it.

  All devices on a particular physical medium must have the same MPLS MTU value to allow proper MPLS operation. Because MPLS labels are added on to the existing packet and increase the packet's size, choose appropriate MTU values so as to avoid unnecessarily fragmenting MPLS-labeled packets.

If the IP MTU or MPLS MTU values are currently the same size as the interface MTU, changing the interface MTU size also automatically sets the IP MTU or MPLS MTU values to the new value. Changing the interface MTU value does not affect the IP MTU or MPLS MTU values if they are not currently set to the same size as the interface MTU.

Different encapsulation methods and the number of MPLS MTU labels add additional overhead to a packet. For example, Subnetwork Access Protocol (SNAP) encapsulation adds an 8-byte header, and each MPLS label adds a 4-byte header. Consider the maximum possible encapsulations and labels that are to be used in your network when choosing the MTU values.

Tip The MTU values on the local ATM SPA interfaces must match the values being used in the ATM network and remote ATM interface. Changing the MTU values on an ATM SPA does not reset the local interface, but be aware that other platforms and ATM SPAs do reset the link when the MTU value changes. This could cause a momentary interruption in service, so we recommend changing the MTU value only when the interface is not being used.

Note The interface MTU value on the ATM SPA also determines which packets are recorded as "giants" in the **show interfaces atm** command. The interface considers a packet to be a giant packet when it is more than 24 bytes larger than the interface MTU size. For example, if using an MTU size of 1500 bytes, the interface increments the giants counter when it receives a packet larger than 1524 bytes.

Interface MTU Configuration Task

To change the MTU values on the ATM SPA interfaces, use the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port* or Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface*	Enters interface configuration mode for the indicated port on the specified ATM SPA, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-if)# **mtu** *bytes*	(Optional) Configures the maximum transmission unit (MTU) size for the interface. The valid range for *bytes* is from 64 to 9216 bytes, with a default of 4470 bytes. As a general rule, do not change the MTU value unless you have a specific application need to do so. **Note** If the IP MTU or MPLS MTU values are currently the same size as the interface MTU, changing the interface MTU size also automatically sets the IP MTU or MPLS MTU values to the same value.
Step 3	Router(config-if)# **ip mtu** *bytes*	(Optional) Configures the MTU value, in bytes, for IP packets on this interface. The valid range for an ATM SPA is 64 to 9288, with a default value equal to the MTU value configured in Step 2.
Step 4	Router(config-if)# **mpls mtu** *bytes*	(Optional) Configures the MTU value, in bytes, for MPLS-labeled packets on this interface. The valid range for an ATM SPA is 64 to 9216 bytes, with a default value equal to the MTU value configured in Step 2.
	Note Repeat Step 1 through Step 4 for each port on the ATM SPA to be configured.	
Step 5	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Verifying the MTU Size

To verify the MTU sizes for an interface, use the **show interfaces**, **show ip interface**, and **show mpls interface** commands, as in the following examples:

Note The output of the **show interfaces atm** command can display configuration of AAL5 encapsulation, but only AAL0 is supported on the Cisco ASR 1000 Series Aggregation Services Routers.

```
Router# show interfaces atm 0/2/2

ATM0/2/2 is up, line protocol is up
  Hardware is SPA-3XOC3-ATM-V2, address is 001a.3044.7522 (bia 001a.3044.7522)
  MTU 4470 bytes, sub MTU 4470, BW 149760 Kbit, DLY 80 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ATM, loopback not set
  Keepalive not supported
  Encapsulation(s): AAL5 AAL0
  4095 maximum active VCs, 1 current VCCs
  VC Auto Creation Disabled.
  VC idle disconnect time: 300 seconds
  4 carrier transitions
  Last input never, output 00:04:11, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     5 packets input, 540 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     5 packets output, 540 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out

Router# show ip interface atm 0/2/2.1

ATM0/2/2.1 is up, line protocol is up
  Internet address is 10.4.0.2/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 4470 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP is enabled
  Local Proxy ARP is disabled
  Security level is default
  Split horizon is disabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP Flow switching is disabled
  IP CEF switching is enabled
  IP Distributed switching is disabled
  IP CEF switching turbo vector
  IP Null turbo vector
  Associated unicast routing topologies:
        Topology "base", operation state is UP
  IP multicast fast switching is enabled
  IP multicast distributed fast switching is disabled
  IP route-cache flags are Fast, CEF
  Router Discovery is disabled
  IP output packet accounting is disabled
  IP access violation accounting is disabled
  TCP/IP header compression is disabled
  RTP/IP header compression is disabled
  Probe proxy name replies are disabled
  Policy routing is disabled
```

```
  Network address translation is disabled
  BGP Policy Mapping is disabled
  Input features: MCI Check
  WCCP Redirect outbound is disabled
  WCCP Redirect inbound is disabled
  WCCP Redirect exclude is disabled

Router# show mpls interface atm 0/3/2.1

Interface              IP            Tunnel   BGP Static Operational
ATM0/3/2.1             Yes (ldp)     No       No  No     Yes

CE1#sh mpls int atm0/3/2.1 det
Interface ATM0/3/2.1:
        IP labeling enabled (ldp):
          Interface config
        LSP Tunnel labeling not enabled
        BGP labeling not enabled
        MPLS operational
        MTU = 4470
```

To view the maximum possible size for datagrams passing out the interface using the configured MTU value, use the **show atm interface atm** command:

```
Router# show atm interface atm 0/2/2
Interface ATM0/2/2:
AAL enabled: AAL0, Maximum VCs: 4095, Current VCCs: 1

Max. Datagram Size: 4528
PLIM Type: SONET - 155000Kbps, TX clocking: LINE
Cell-payload scrambling: ON
sts-stream scrambling: ON
5 input, 5 output, 0 IN fast, 0 OUT fast, 0 out drop
 Avail bw = 149760
Config. is ACTIVE
```

Creating a Permanent Virtual Circuit

To use a permanent virtual circuit (PVC), configure the PVC in both the router and the ATM switch. PVCs remain active until the circuit is removed from either configuration. To create a PVC on the ATM interface and enter interface ATM VC configuration mode, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface*	Enters subinterface configuration mode pertaining to the specified port on the ATM SPA, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-if)# **ip address** *address mask*	Assigns the specified IP address and subnet mask to the interface or subinterface.
Step 3	Router(config-if)# **atm tx-latency** *milliseconds*	(Optional) Configures the default transmit latency for VCs on this ATM SPA interface. The valid range for *milliseconds* is from 1 to 200, with a default of 100 milliseconds.
Step 4	Router(config-if)# **pvc** [*name*] *vpi*/*vci*	Configures a new ATM PVC by assigning its VPI/VCI numbers and enters ATM VC configuration mode. The valid values for *vpi*/*vci* are: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the VPI ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.

Note When using the **pvc** command, remember that the *vpi*/*vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi*/*vci* combination that has been used on another subinterface, the Cisco IOS software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.

	Command or Action	Purpose
Step 5	Router(config-if-atm-vc)# **protocol** *protocol* {*protocol-address* | **inarp**} [[**no**] **broadcast**]	Configures the PVC for a particular protocol and maps it to a specific *protocol-address*. • *protocol*—Typically set to **ip** or **pppoe**, but other values are possible. **Note** PPP is not supported on the Cisco ASR 1000 Series Aggregation Services Routers, and PPPoE is supported beginning in Cisco IOS XE Release 2.5. • *protocol-address*—Destination address or virtual interface template for this PVC (if appropriate for the *protocol*). • **inarp**—Specifies that the PVC uses Inverse ARP to determine its address. • [**no**] **broadcast**—(Optional) Specifies that this mapping should (or should not) be used for broadcast packets.
Step 6	Router(config-if-atm-vc)# **inarp** *minutes*	(Optional) If using Inverse ARP, configures how often the PVC transmits Inverse ARP requests to confirm its address mapping. The valid range is 1 to 60 minutes, with a default of 15 minutes.
Step 7	Router(config-if-atm-vc)# **encapsulation** {**aal5mux** *protocol* | **aal5nlpid**| **aal5snap**}	(Optional) Configures the ATM adaptation layer (AAL) and encapsulation type, where: • **aal5mux** *protocol*—AAL and encapsulation type for multiplex (MUX)-type VCs. A protocol must be specified when you use this encapsulation type. Possible values for the *protocol* argument are as follows: • **aal5nlpid**—AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs) that are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. • **aal5snap**—AAL and encapsulation type that supports Inverse Address Resolution Protocol (ARP). Logical link control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram. This is the default.
Step 8	Router(config-if-atm-vc)# **tx-limit** *buffers*	(Optional) Specifies the number of transmit buffers for this VC. The valid range is from 1 to 57343, with a default value that is based on the current VC line rate and on the latency value that is configured with the **atm tx-latency** command.
	Note Repeat Step 4 through Step 7 for each PVC to be configured on this interface.	
Step 9	Router(config-if-atm-vc)# **end**	Exits ATM VC configuration mode and returns to privileged EXEC mode.

Verifying a PVC Configuration

To verify the configuration of a particular PVC, use the **show atm pvc** command:

```
Router# show atm pvc

           VCD /                                          Peak Av/Min Burst
Interface  Name         VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
0/2/2.1    1              2    32 PVC     SNAP       UBR  149760              UP
```

Tip To verify the configuration and current status of all PVCs on a particular interface, you can also use the **show atm vc interface atm** command.

Creating a PVC on a Point-to-Point Subinterface

Use point-to-point subinterfaces to provide each pair of routers with its own subnet. When you create a PVC on a point-to-point subinterface, the router assumes it is the only point-to-point PVC that is configured on the subinterface, and it forwards all IP packets with a destination IP address in the same subnet to this VC. To configure a point-to-point PVC, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface* **point-to-point**	Creates the specified point-to-point subinterface on the given port on the specified ATM SPA, and enters subinterface configuration mode, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-subif)# **ip address** *address mask*	Assigns the specified IP address and subnet mask to this subinterface.
Step 3	Router(config-subif)# **pvc** [*name*] *vpi*/*vci*	Configures a new ATM PVC by assigning its VPI/VCI numbers and enters ATM VC configuration mode. The valid values for *vpi*/*vci* are: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the VPI ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.

	Command or Action	Purpose
	Note When using the **pvc** command, remember that the *vpi*/*vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi*/*vci* combination that has been used on another subinterface, the Cisco IOS XE software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.	
Step 4	Router(config-if-atm-vc)# **protocol** *protocol protocol-address* [[**no**] **broadcast**]	Configures the PVC for a particular protocol and maps it to a specific *protocol-address*. • *protocol*—Typically set to **ip** or **pppoe** for point-to-point subinterfaces, but other values are possible. **Note** PPP is not supported on the Cisco ASR 1000 Series Aggregation Services Routers, and PPPoE is supported beginning in Cisco IOS XE Release 2.5. • *protocol-address*—Destination address or virtual template interface for this PVC (as appropriate pertaining to the specified *protocol*). • [**no**] **broadcast**—(Optional) Specifies that this mapping should (or should not) be used for broadcast packets. The **protocol** command also has an **inarp** option, but this option is not meaningful on point-to-point PVCs that use a manually configured address.
Step 5	Router(config-if-atm-vc)# **encapsulation** {**aal5mux** *protocol* | **aal5nlpid**| **aal5snap**}	(Optional) Configures the ATM adaptation layer (AAL) and encapsulation type, where: • **aal5mux** *protocol*—AAL and encapsulation type for multiplex (MUX)-type VCs. A protocol must be specified when you use this encapsulation type. • **aal5nlpid**—(IP only) AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs) that are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. • **aal5snap**—AAL and encapsulation type that supports Inverse Address Resolution Protocol (ARP). Logical link control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram. This is the default.
	Note Repeat Step 1 through Step 5 for each point-to-point subinterface to be configured on this ATM SPA.	
Step 6	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Tip To verify the configuration and current status of all PVCs on a particular interface, you can also use the **show atm vc interface atm** command.

Configuring a PVC on a Multipoint Subinterface

Creating a multipoint subinterface allows you to create a point-to-multipoint PVC that can be used as a broadcast PVC for all multicast requests. To create a PVC on a multipoint subinterface, use the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface* **multipoint**	Creates the specified point-to-multipoint subinterface on the given port on the specified ATM SPA, and enters subinterface configuration mode, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-subif)# **ip address** *address mask*	Assigns the specified IP address and subnet mask to this subinterface.
Step 3	Router(config-subif)# **no ip directed-broadcast**	(Optional) Disables the forwarding of IP directed broadcasts, which are sometimes used in denial of service (DOS) attacks.
Step 4	Router(config-subif)# **pvc** [*name*] *vpi*/*vci*	Configures a new ATM PVC by assigning its VPI/VCI numbers and enters ATM VC configuration mode. The valid values for *vpi*/*vci* are: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the VPI ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.

Note When using the **pvc** command, remember that the *vpi*/*vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi*/*vci* combination that has been used on another subinterface, the Cisco IOS XE software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.

	Command or Action	Purpose
Step 5	Router(config-if-atm-vc)# **protocol** *protocol* {*protocol-address* | **inarp**} **broadcast**	Configures the PVC for a particular protocol and maps it to a specific *protocol-address*. • *protocol*—Typically set to **ip** or **pppoe**, but other values are possible. **Note** PPP is not supported on the Cisco ASR 1000 Series Aggregation Services Routers, and PPPoE is supported beginning in Cisco IOS XE Release 2.5. • *protocol-address*—Destination address or virtual template interface for this PVC (if appropriate for the *protocol*). • **inarp**—Specifies that the PVC uses Inverse ARP to determine its address. • **broadcast**— Specifies that this mapping should be used for multicast packets.
Step 6	Router(config-if-atm-vc)# **inarp** *minutes*	(Optional) If using Inverse ARP, configures how often the PVC transmits Inverse ARP requests to confirm its address mapping. The valid range is 1 to 60 minutes, with a default of 15 minutes.
Step 7	Router(config-if-atm-vc)# **encapsulation** {**aal5mux** *protocol* | **aal5nlpid**| **aal5snap**}	(Optional) Configures the ATM adaptation layer (AAL) and encapsulation type, where: • **aal5mux** *protocol*—AAL and encapsulation type for multiplex (MUX)-type VCs. A protocol must be specified when you use this encapsulation type. • **aal5nlpid**—(IP only) AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs) that are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only. • **aal5snap**—AAL and encapsulation type that supports Inverse Address Resolution Protocol (ARP). Logical link control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram. This is the default.
	Note Repeat Step 1 through Step 7 for each multipoint subinterface to be configured on this ATM SPA.	
Step 8	Router(config-if-atm-vc)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Verifying a Multipoint PVC Configuration

To verify the configuration of a particular PVC, use the **show atm pvc** command:

```
Router# show atm pvc 1/120

ATM3/1/0.120: VCD: 1, VPI: 1, VCI: 120
UBR, PeakRate: 149760
```

```
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC status: Not Managed
ILMI VC status: Not Managed
InARP frequency: 15 minutes(s)
Transmit priority 3
InPkts: 1394964, OutPkts: 1395069, InBytes: 1833119, OutBytes: 1838799
InPRoc: 1, OutPRoc: 1, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 94964, OutAS: 95062
InPktDrops: 0, OutPktDrops: 0
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0, LengthViolation: 0, CPIErrors: 0
Out CLP=1 Pkts: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0
OAM cell drops: 0
Status: UP
```

Note To verify the configuration and current status of all PVCs on a particular interface, you can also use the **show atm vc interface atm** command.

Configuring a Range of PVCs on a Multipoint Subinterface

Beginning in Cisco IOS XE Release 2.5, you can configure a range of PVCs on an ATM multipoint subinterface.

To create a range of PVCs on a multipoint subinterface, use the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface* **multipoint**	Creates the specified point-to-multipoint subinterface on the given port on the specified ATM SPA, and enters subinterface configuration mode, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-subif)# **range** [*range-name*] **pvc** [*start-vpi*/]*start-vci* [*end-vpi*/]*end-vci*	Configures multiple PVCs in the specified range and enters ATM PVC range configuration mode, where: • *range-name*—(Optional) Identifies this PVC range with a text string. • *start-vpi*—(Optional) Specifies the beginning VPI ID in the range from 0 to 255. The default is 0. • *start-vci*—Specifies the beginning VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used. • *end-vpi*—(Optional) Specifies the ending VPI ID in the range from 0 to 255. If you don't specify an *end-vpi* value, the *end-vpi* value defaults to the *start-vpi* value. • *end-vci*—Specifies the ending VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used.
Step 3	Once you configure the PVC range, you can configure other commands, such as the **protocol** command, for all PVCs in the specified range, and you also can go on to define options for individual PVCs using the **pvc-in-range**	
Step 4	Router(config-if-atm-range-pvc)# **pvc-in-range** [*name*] [*vpi*/*vci*]	(Optional) Defines an individual PVC within a PVC range, where: • *name*—(Optional) Identifies a name for the PVC. The PVC name can have a maximum of 15 characters. • *vpi*/*vci*—(Optional) VPI for this PVC, from 0 to 255. The default is 0. The VCI value can be in range from 32 to 65535.
Step 5	Once you specify a specific PVC in the range, you can continue to configure options that are specific to that PVC, such as the **class-vc** command.	
Step 6	Router(config-if-atm-vc-range-pvc)# **end**	Exits ATM PVC range configuration mode and returns to privileged EXEC mode.

Configuring Traffic Parameters for PVCs

After creating a PVC, you can also configure it for the type of traffic quality of service (QoS) class to be used over the circuit:

- Constant Bit Rate (CBR)—Configures the CBR service class and specifies the average cell rate for the PVC.
- Unspecified Bit Rate (UBR)—Configures the UBR service class and specifies the output peak rate (PCR) for the PVC. This is the default configuration.
- Variable Bit Rate–Non-real Time (VBR-nrt)—Configures the VBR-nrt service class and specifies the output PCR, output sustainable cell rate (SCR), and output maximum burst size (MBS) for the PVC.
- Variable Bit Rate–Real Time (VBR-rt)—Configures the VBR-rt service class and the peak rate and average rate burst for the PVC.

Each service class is assigned a different transmit priority, which the Cisco ASR 1000 Series Router uses to determine which queued cell is chosen to be transmitted out of an interface during any particular cell time slot. This ensures that real-time QoS classes have a higher likelihood of being transmitted during periods of congestion. Table 6-1 lists the ATM QoS classes and their default transmit priorities.

Table 6-1 Example

Service Category	Transmit Priority
CBR	0 (highest)
VBR-rt	1
VBR-nrt	2
UBR	3

You can configure a PVC for only one QoS service class. If you enter more than one type, only the most recently configured QoS class takes effect on the circuit.

To configure the traffic parameters for a PVC, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port* or Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface* [**multipoint** | **point-to-point**]	Enters interface or subinterface configuration mode for the indicated port on the specified ATM SPA, where: • *slot*—Specifies the chassis slot number in the Cisco ASR 1000 Series Router where the SIP is installed. • *subslot*—Specifies the secondary slot of the SIP where the SPA is installed. • *port*—Specifies the number of the individual interface port on a SPA. • *subinterface*—Specifies the number of the subinterface.
Step 2	Router(config-if)# **pvc** [*name*] *vpi*/*vci*	Specifies the PVC to be configured, and enters PVC configuration mode, where: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the VPI ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.
	Note When using the **pvc** command, remember that the *vpi*/*vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi*/*vci* combination that has been used on another subinterface, the Cisco IOS XE software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.	
Step 3	Router(config-if-atm-vc)# **cbr** *rate*	Configures constant bit rate (CBR) quality of service (QoS) and average cell rate for the PVC: • *rate*—Average cell rate in kbps. The valid range is 48 to 149760 (OC-3) or 599040 (OC-12).
	or	
	Router(config-if-atm-vc)# **ubr** *output-pcr*	Configures unspecified bit rate (UBR) quality of service (QoS) and peak cell rate (PCR) for the PVC: • *output-pcr*—Output PCR in kbps. The valid range is 48 to 149760 (OC-3) or 599040 (OC-12).
	or	

	Command or Action	Purpose
	Router(config-if-atm-vc)# **vbr-nrt** *output-pcr output-scr output-mbs*	Configures the variable bit rate–nonreal time (VBR-nrt) QoS, the peak cell rate (PCR), sustainable cell rate (SCR), and maximum burst cell size (MBS) for the PVC: • *output-pcr*—Output PCR in kbps. The valid range is 48 to 149760 (OC-3) or 599040 (OC-12). • *output-scr*—Output SCR in kbps. The valid range is 48 to PCR, and typically is less than the PCR value. • *output-mbs*—Output MBS in number of cells. The valid range is 1 to 65535, depending on the PCR and SCR values. If the PCR and SCR are configured to the same value, the only valid value for MBS is 1.
	or	
	Router(config-if-atm-vc)# **vbr-rt** *pcr scr burst*	Configures the variable bit rate–real time (VBR-rt) QoS, and the PCR, average cell rate (ACR), and burst cell size (BCS) for the PVC: • *pcr*—PCR in kbps. The valid range is 48 to 149760 (OC-3) or 599040 (OC-12). • *scr*—SCR in kbps. The valid range is 48 to PCR, and typically is less than the PCR value. • *burst*—Burst size in number of cells. The valid range is 1 to 65535, depending on the PCR and SCR values. If the PCR and SCR are configured to the same value, the only valid value for *burst* is 1.
	Note Repeat Step 2 through Step 3 for each PVC to be configured.	
Step 4	Router(config-if-atm-vc)# **end**	Exits PVC configuration mode and returns to privileged EXEC mode.

Verifying the Traffic Parameter Configuration

Use the **show atm vc** command to verify the configuration of the traffic parameters for a PVC:

```
Router# show atm vc

Codes: DN - DOWN, IN - INACTIVE

           VCD /                                              Peak Av/Min Burst
Interface  Name         VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
0/2/2.1    1              2    32 PVC     SNAP       UBR  149760              UP
```

To verify the configuration of all PVCs on an interface, use the **show atm vc interface atm** command:

```
Router# show atm vc interface atm 0/2/2.1
VCD /                                          Peak Av/Min Burst
Interface  Name         VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
0/2/2.1    1              2    32 PVC     SNAP       UBR  149760              UP
```

Configuring Virtual Circuit Classes

When multiple PVCs use the same or similar configurations, you can simplify the Cisco ASR 1000 Series Router's configuration file by creating virtual circuit (VC) classes. Each VC class acts as a template, which you can apply to an ATM subinterface, or to individual PVCs.

When you apply a VC class to an ATM subinterface, all PVCs created on that subinterface inherit the VC class configuration. When you apply a VC class to an individual PVC, that particular PVC inherits the class configuration.

You can then customize individual PVCs with further configuration commands. Any commands that you apply to individual PVCs take precedence over those of the VC class that were applied to the interface or to the PVC.

To create and configure a VC class, and then apply it to a subinterface or individual PVC, use the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **vc-class atm** *vc-class-name*	Creates an ATM virtual circuit (VC) class and enters VC-class configuration mode. • *vc-class-name*—Arbitrary name to identify this particular VC class.
Step 2	Router(config-vc-class)# *configuration-commands*	Enter any PVC configuration commands for this VC class.
Step 3	Router(config-vc-class)# **interface atm** *slot/subslot/port* or Router(config-vc-class)# **interface atm** *slot/subslot/port.subinterface* [**multipoint** | **point-to-point**]	Enters subinterface configuration mode pertaining to the specified ATM subinterface.
Step 4	Router(config-if)# **class-int** *vc-class-name* or Router(config-subif)# **class-int** *vc-class-name*	(Optional) Applies a VC class on the ATM subinterface. This class then applies to all PVCs that are created on that interface. • *vc-class-name*—Name of the VC class that was created in Step 1.
Step 5	Router(config-if)# **pvc** [*name*] *vpi/vci* or for a subinterface: Router(config-subif)# **pvc** [*name*] *vpi/vci*	Specifies the PVC to be configured, and enters PVC configuration mode, where: • *name*—(Optional) An arbitrary string that identifies this PVC. • *vpi*—Specifies the VPI ID. The valid range is 0 to 255. • *vci*—Specifies the VCI ID. The valid range is 32 to 65535. Values 1 to 31 are reserved and should not be used, except for 5 for the QSAAL PVC and 16 for the ILMI PVC. ILMI is unsupported on the Cisco ASR 1000 Series Aggregation Services Routers.
	Note When using the **pvc** command, remember that the *vpi/vci* combination forms a unique identifier for the interface and all of its subinterfaces. If you specify a *vpi/vci* combination that has been used on another subinterface, the Cisco IOS XE software assumes that you want to modify that PVC's configuration and automatically switches to its parent subinterface.	

	Command or Action	Purpose
Step 6	Router(config-if-atm-vc)# **class-vc** *vc-class-name*	Assigns the specified VC class to this PVC. • *vc-class-name*—Name of the VC class that was created in Step 1.
Step 7	Router(config-if-atm-vc)# *configuration-commands*	Any other VC configuration commands to be applied to this particular PVC. Commands that are applied to the individual PVC supersede any conflicting commands that were specified in the VC class.
Step 8	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Verifying the Virtual Circuit Class Configuration

To verify the virtual circuit class configuration, use the **show atm vc** command:

```
Router# show atm vc

Codes: DN - DOWN, IN - INACTIVE

           VCD /                                          Peak Av/Min Burst
Interface  Name         VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
0/2/2.1    1              2    32 PVC     SNAP       UBR  149760              UP
```

Configuring SONET and SDH Framing

The default framing on the ATM OC-3 SPAs is SONET, but the interfaces also support SDH framing.

Note In ATM environments, the key difference between SONET and SDH framing modes is the type of cell transmitted when no user or data cells are available. The ATM forum specifies the use of idle cells when unassigned cells are not being generated. More specifically, in Synchronous Transport Module-X (STM-X) mode, an ATM interface sends idle cells for cell-rate decoupling. In Synchronous Transport Signal-Xc (STS-Xc) mode, the ATM interface sends unassigned cells for cell-rate decoupling.

To change the framing type and configure optional parameters, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/port*	Enters interface configuration mode for the indicated port on the specified ATM SPAs.
Step 2	Router(config-if)# **atm clock internal**	(Optional) Configures the interface to use its own internal (onboard) clock to clock transmitted data. The default (**no atm clock internal**) configures the interface to use the transmit clock signal that is recovered from the receive data stream, allowing the switch to provide the clocking source.
Step 3	Router(config-if)# **atm framing** {**sdh** | **sonet**}	(Optional) Configures the interface for either SDH or SONET framing. The default is SONET.

	Command or Action	Purpose
Step 4	Router(config-if)# [**no**] **atm sonet report** {**all** | **b1-tca** | **b2-tca** | **b3-tca** | **default** | **lais** | **lrdi** | **pais** | **plop** | **pplm** | **prdi** | **ptim** | **puneq** | **sd-ber** | **sf-ber** | **slof** | **slos**}	(Optional) Enables ATM SONET alarm reporting on the interface. The default is for all reports to be disabled. You can enable an individual alarm, or you can enable all alarms with the **all** keyword. This command also supports a **none** [**ignore**] option, which cannot be used with any of the other options. See the "Configuring AToM VP Cell Mode Relay Support" section on page 6-23
Step 5	Router(config-if)# [**no**] **atm sonet-threshold** {**b1-tca** *value* | **b2-tca** *value* | **b3-tca** *value* | **sd-ber** *value* | **sf-ber** *value*}	(Optional) Configures the BER threshold values on the interface. The value specifies a negative exponent to the power of 10 (10 to the power of minus *value*) for the threshold value. The default values are the following: • **b1-tca** = 6 (10e–6) • **b2-tca** = 6 (10e–6) • **b3-tca** = 6 (10e–6) • **sd-ber** = 6 (10e–6) • **sf-ber** = 3 (10e–3)
Step 6	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Verifying the SONET and SDH Framing Configuration

To verify the framing configuration, use the **show controllers atm** command:

```
Router# show controllers atm 0/2/2
Interface ATM0/2/2 (SPA-3XOC3-ATM-V2[0/2]) is up
 Framing mode: SONET OC3 STS-3c
SONET Subblock:
SECTION
  LOF = 0          LOS    = 1                            BIP(B1) = 0
LINE
  AIS = 0          RDI    = 1          FEBE = 55         BIP(B2) = 0
PATH
  AIS = 0          RDI    = 1          FEBE = 21         BIP(B3) = 0
  LOP = 1          NEWPTR = 0          PSE  = 0          NSE     = 0

Active Defects: None
Active Alarms:  None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

ATM framing errors:
  HCS (correctable):   0
  HCS (uncorrectable): 0

APS
 not configured
  COAPS = 0          PSBF = 0
  State: PSBF_state = False
  Rx(K1/K2): 00/00  Tx(K1/K2): 00/00
  Rx Synchronization Status S1 = 00
  S1S0 = 00, C2 = 13
```

```
PATH TRACE BUFFER : STABLE

BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

  Clock source:  line
```

Configuring AToM VP Cell Mode Relay Support

To configure Any Transport over MPLS (AToM) Cell Mode Relay, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot*/*subslot*/*port*.*subinterface* **multipoint**	Enters interface configuration mode for the indicated port on the specified ATM SPA
Step 2	Router(config-if)# **no ip address** *ip-address mask*	Removes the IP address that is assigned to this interface (if one has been configured).
Step 3	Router(config-if)# **atm pvp** *vpi* **l2transport**	Creates a permanent virtual path (PVP) used to multiplex (or bundle) one or more virtual circuits (VCs).
Step 4	Router(config-if)# **xconnect** *peer-ip-address vc-id* {**encapsulation mpls** | **pw-class** *pw-class-name*}	Routes Layer 2 packets over a specified point-to-point VC by using ATM over multiprotocol label switching (AToM).
Step 5	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

VP Mode Configuration Guidelines

When configuring ATM Cell Relay over MPLS in VP mode, use the following guidelines:

- You do not need to enter the **encapsulation aal0** command in VP mode, but only AAL0 encapsulation is supported with MPLS l2transport.
- One ATM interface can accommodate multiple types of ATM connections. VP cell relay and VC cell relay can coexist on one ATM interface.
- If a VPI is configured for VP cell relay, you cannot configure a PVC using the same VPI.
- VP trunking (mapping multiple VPs to one emulated VC label) is not supported in this release. Each VP is mapped to one emulated VC.
- Each VP is associated with one unique emulated VC ID. The AToM emulated VC type is ATM VP Cell Transport.
- The AToM control word is supported. However, if a peer PE does not support the control word, it is disabled. This negotiation is done by LDP label binding.
- VP mode (and VC mode) drop idle cells.

VP Mode Configuration Example

The following example transports single ATM cells over a virtual path:

```
Router(config)# pseudowire-class vp-cell-relay
```

```
Router(config-pw)# encapsulation mpls
Router(config-pw)# exit
Router(config)# interface atm 1/2/0.1 multipoint
Router(config-if)#  atm pvp 1 l2transport
Router(config-if)# xconnect 10.0.0.1 123 pw-class vp-cell-relay
```

Verifying ATM Cell Relay VP Mode

The following **show atm vp** command shows that the interface is configured for VP mode cell relay:

```
Router# show atm vp 1
ATM5/0  VPI: 1, Cell Relay, PeakRate: 149760, CesRate: 0, DataVCs: 1, CesVCs: 0, Status:
ACTIVE
VCD    VCI   Type   InPkts   OutPkts   AAL/Encap     Status
6      3     PVC    0        0         F4 OAM        ACTIVE
7      4     PVC    0        0         F4 OAM        ACTIVE
TotalInPkts: 0, TotalOutPkts: 0, TotalInFast: 0, TotalOutFast: 0,
TotalBroadcasts: 0 TotalInPktDrops: 0, TotalOutPktDrops: 0
```

Configuring QoS Features on ATM SPAs

The Cisco ASR1000-SIP10 and the ATM SPAs on the Cisco ASR 1000 Series Aggregation Services Routers support the following two areas of QoS:

- ATM SPA QoS—QoS on the ATM SPA is implemented in the segmentation and reassembly (SAR) function using the ATM traffic classes (CBR, VBR-nrt, VBR-rt, and UBR) configured with PCR and SCR values.
- Modular QoS CLI (MQC)—Supports per-VC policy maps with class-based weighted fair queueing (CBWFQ), weighted random early detection (WRED), priority, shaping, bandwidth remaining ratio, bandwidth remaining percent, and policing.

For more information about configuring QoS features in Cisco IOS XE software on the Cisco ASR 1000 Series Aggregation Services Routers, refer to the Cisco IOS XE Quality of Service Solutions Configuration Guide, Release 2.

Configuring PPPoEoA on ATM SPAs

Beginning in Cisco IOS XE Release 2.5, you can configure PPP over Ethernet (PPPoE) on ATM (PPPoEoA) to connect a network of hosts over a simple bridging-access device to a remote access concentrator. For more information about this feature, refer to the "PPPoE on ATM" feature from the New Features in Cisco IOS XE Release 2.5 at:

http://www.cisco.com/en/US/products/ps9587/products_feature_guides_list.html

For a sample configuration, see the "PPPoEoA VC Class and PVC Range Configuration Example" section on page 6-30.

Saving the Configuration

To save your running configuration to nonvolatile random-access memory (NVRAM), use the following command in privileged EXEC configuration mode:

Note To permanently save your configuration changes, you must write them to the nonvolatile RAM (NVRAM) by entering the **copy running-config startup-config** command in privileged EXEC mode.

Command	Purpose
Router# **copy running-config startup-config**	Writes the new configuration to NVRAM.

For more information about managing configuration files, refer to the *Cisco IOS XE Configuration Fundamentals Configuration Guide*, Release 2, and *Cisco IOS Configuration Fundamentals Command Reference* publications for your specific software.

Shutting Down and Restarting an Interface on a SPA

Shutting down an interface puts it into the administratively down mode and takes it offline, stopping all traffic that is passing through the interface. Shutting down an interface, though, does not change the interface configuration.

As a general rule, you do not need to shut down an interface if you are removing it and replacing it with the same exact model of SPA in an online insertion and removal (OIR) operation. However, we recommend shutting down an interface whenever you are performing one of the following tasks:

- When you do not need to use the interface in the network.
- Preparing for future testing or troubleshooting.
- Changing the interface configuration in a way that would affect the traffic flow, such as changing the encapsulation.
- Changing the interface cables.
- Removing a SPA that you do not expect to replace.
- Replacing an interface card with a different model of card.

Shutting down the interface in these situations prevents anomalies from occurring when you reinstall the new card or cables. It also reduces the number of error messages and system messages that might otherwise appear.

Note If you plan to replace an existing ATM port adapter with an ATM SPA in the Cisco ASR 1000 Series Router and want to use the same configuration, save the slot's configuration before physically replacing the hardware. This is because all slot configuration is lost when you replace one card type with another card type, even if the two cards are functionally equivalent. You can then re-enter the previous configuration after you have inserted the ATM SPA.

To shut down an interface, perform the following procedure beginning in global configuration mode:

	Command or Action	Purpose
Step 1	Router(config)# **interface atm** *slot/subslot/port*	Enters interface configuration mode for the indicated port on the specified ATM SPA.
Step 2	Router(config-if)# **shutdown**	Shuts down the interface.
Step 3	Router(config-if)# **end**	Exits interface configuration mode and returns to privileged EXEC mode.

Tip When you shut down an interface, the **show interface** command indicates that the interface is administratively down until the SPA is physically removed from the chassis or until the SPA is re-enabled.

The following shows a typical example of shutting down an ATM SPA interface:

```
Router> enable
Router# configure terminal
Router(config)# interface atm 0/2/2
Router(config-if)# shutdown
Router(config-if)# end
Router# show interface atm 0/2/2

ATM0/2/2 is administratively down, line protocol is down
  Hardware is SPA-3XOC3-ATM, address is 000d.2959.d5ca (bia 000d.2959.d5ca)
  Internet address is 10.10.10.16/24
  MTU 4470 bytes, sub MTU 4470, BW 599040 Kbit, DLY 80 usec,
     reliability 255/255, txload 42/255, rxload 1/255
  Encapsulation ATM, loopback not set
  Encapsulation(s): AAL0
  4095 maximum active VCs, 1 current VCCs
  VC idle disconnect time: 300 seconds
  0 carrier transitions
  Last input 01:01:16, output 01:01:16, output hang never
  Last clearing of "show interface" counters 01:10:21
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/0 (size/max)
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 702176000 bits/sec, 1415679 packets/sec
     1000 packets input, 112000 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     2948203354 packets output, 182788653886 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Verifying the Interface Configuration

See the following sections to obtain configuration and operational information about the ATM SPA and its interfaces:

- Verifying Per-Port Interface Status, page 6-27
- Monitoring Per-Port Interface Statistics, page 6-28

For additional information on using these and other commands to obtain information about the configuration and operation of the ATM SPAs and interfaces, see Chapter 8, "Troubleshooting the ATM SPAs".

Verifying Per-Port Interface Status

Use the **show interfaces atm** command to display detailed status information about an interface port in an ATM SPA that is installed in a Cisco ASR 1000 Series Router. The following example provides sample output for interface port 1 (the second port) on the ATM SPA that is located in subslot 2, of the SIP that is installed in slot 0 of a Cisco ASR 1000 Series Router:

Note The output of the **show interfaces atm** command can display configuration of AAL5 encapsulation, but only AAL0 is supported on the Cisco ASR 1000 Series Aggregation Services Routers.

```
Router# show interfaces atm 0/2/2

ATM0/2/2 is up, line protocol is up
  Hardware is SPA-3XOC3-ATM-V2, address is 001a.3044.7522 (bia 001a.3044.7522)
  MTU 4470 bytes, sub MTU 4470, BW 149760 Kbit, DLY 80 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ATM, loopback not set
  Keepalive not supported
  Encapsulation(s): AAL5 AAL0
  4095 maximum active VCs, 1 current VCCs
  VC Auto Creation Disabled.
  VC idle disconnect time: 300 seconds
  4 carrier transitions
  Last input never, output 00:04:11, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     5 packets input, 540 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     5 packets output, 540 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Monitoring Per-Port Interface Statistics

Use the **show controllers atm** command to display detailed status and statistical information on a per-port basis for an ATM SPA. The following example provides sample output for interface port 2 on the ATM SPA that is located in subslot 2 of the SIP that is installed in slot 0 of a Cisco ASR 1000 Series Router:

```
Router# show controllers atm 0/2/2

Interface ATM0/2/2 (SPA-3XOC3-ATM-V2[0/2]) is up
 Framing mode: SONET OC3 STS-3c
SONET Subblock:
SECTION
  LOF = 0          LOS    = 1                           BIP(B1) = 0
LINE
  AIS = 0          RDI    = 1          FEBE = 55        BIP(B2) = 0
PATH
  AIS = 0          RDI    = 1          FEBE = 21        BIP(B3) = 0
  LOP = 1          NEWPTR = 0          PSE  = 0         NSE     = 0

Active Defects: None
Active Alarms:  None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

ATM framing errors:
  HCS (correctable):   0
  HCS (uncorrectable): 0

APS
 not configured
  COAPS = 0          PSBF = 0
  State: PSBF_state = False
  Rx(K1/K2): 00/00  Tx(K1/K2): 00/00
  Rx Synchronization Status S1 = 00
  S1S0 = 00, C2 = 13
PATH TRACE BUFFER : STABLE

BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

  Clock source:  line
```

Configuration Examples

This section includes the following configuration examples for the ATM SPAs:

Basic Interface Configuration Example

```
!
interface ATM5/1/0
 mtu 9216
 no ip address
 atm clock INTERNAL
!
interface ATM5/1/0.1 point-to-point
 mtu 9216
 ip address 10.1.1.1 255.255.0.0
 pvc 52/100
!
interface ATM5/1/1
 mtu 9216
 no ip address
 atm clock INTERNAL
!
interface ATM5/1/1.1 point-to-point
 mtu 9216
 ip address 10.2.1.1 255.255.0.0
 pvc 53/100
!
!
interface ATM5/1/2
 no ip address
 atm clock INTERNAL
!
interface ATM5/1/3
 no ip address
 atm clock INTERNAL
!
```

MTU Configuration Example

```
!
interface ATM5/0/0.9 point-to-point
 mtu 4474
 bandwidth 7000
 ip address 192.168.100.13 255.255.255.0
 ip mtu 4470
```

PVC on a Point-to-Point Subinterface Configuration Example

```
interface ATM5/0/0.9 point-to-point
 mtu 4474
 bandwidth 34000
 ip vrf forwarding vrfexample
 ip address 192.168.196.18 255.255.255.252
 ip mtu 4470
 pvc 11/105
  ubr 38
  oam-pvc manage
  encapsulation aal5snap
 !
interface ATM5/0/0.11 point-to-point
 mtu 4474
 bandwidth 7000
 ip address 192.168.252.141 255.255.255.252
```

```
 ip mtu 4470
 pvc 100/50
  cbr 7000
  encapsulation aal5snap
  service-policy input Leased_Line_Ingress
  max-reserved-bandwidth 100
```

PVC Ranges on a Multipoint Subinterface for PPPoEoA Configuration Example

Note Multipoint subinterfaces, PVC ranges, and PPPoEoA support is introduced for the Cisco ASR 1000 Series Aggregation Services Routers in Cisco IOS XE Release 2.5.

```
interface atm0/0/0.65000 multipoint
 range pvc 1/32 1/4031
  protocol pppoe group bba_group1
  pvc-in-range 1/32
   class-vc pvcr_bba_vc_class
!
  pvc-in-range 1/33
   class-vc pvcr_bba_vc_class
!
  pvc-in-range 1/34
   class-vc pvcr_bba_vc_class
!
  pvc-in-range 1/35
   class-vc pvcr_bba_vc_class
!
  pvc-in-range 1/36
   class-vc pvcr_bba_vc_class
!
```

AToM VP Cell Mode Relay Configuration Example

```
pseudowire-class vp-cell-relay
 encapsulation mpls
 exit
interface atm 1/2/0.1 multipoint
 atm pvp 1 l2transport
 xconnect 10.0.0.1 123 pw-class vp-cell-relay
```

PPPoEoA VC Class and PVC Range Configuration Example

```
bba-group pppoe bba_group1
 virtual-template 1
!
vpdn enable
no vpdn logging
!
no virtual-template snmp
!
bba-group pppoe bba_group1
 virtual-template 1
  sessions per-mac limit 4000
!
vc-class atm pvcr_bba_vc_class
```

```
  protocol pppoe group bba_group1
  create on-demand
  idle-timeout 30
  vbr-nrt 1000 1000 1
!
 interface atm0/0/0
  atm clock internal
  no shutdown
!
interface atm0/0/0.65000 multipoint
  range pvc 1/32 1/4031
   protocol pppoe group bba_group1
    pvc-in-range 1/32
     class-vc pvcr_bba_vc_class
!
    pvc-in-range 1/33
     class-vc pvcr_bba_vc_class
!
    pvc-in-range 1/34
     class-vc pvcr_bba_vc_class
!
    pvc-in-range 1/35
     class-vc pvcr_bba_vc_class
!
    pvc-in-range 1/36
     class-vc pvcr_bba_vc_class
!
interface virtual-template 1
  no snmp trap link-status
  keepalive 60
  ppp ipcp address required
  ip unnumbered loopback1
  peer default ip address pool local_pool1
  ppp mtu adaptive
  ppp authentication pap
  no logging event link-status
```

SONET and SDH Framing Configuration Example

```
!
interface ATM0/2/2
 description Example of SONET framing-“atm framing sonet” is default and doesn’t appear
 ip address 10.16.2.2 255.255.255.0
 logging event link-status
 atm sonet report all
 atm sonet threshold sd-ber 3
 atm sonet threshold sf-ber 6
 atm sonet overhead c2 0x00
!
```