



## RSVP Support for ATM/PVCs

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This document describes Cisco Resource Reservation Protocol (RSVP) support for the Asynchronous Transfer Mode/permanent virtual circuits (ATM/PVCs) feature. It identifies the supported platforms, provides configuration examples, and lists related IOS command line interface (CLI) commands.

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## Feature Overview

Network administrators use queueing to manage congestion on a router interface or a permanent virtual circuit (PVC). In an ATM environment, the congestion point might not be the interface itself, but the PVC because of the traffic parameters, including the available bit rate (ABR), the constant bit rate (CBR), and the variable bit rate (VBR) associated with the PVC. For real-time traffic, such as voice flows, to be transmitted in a timely manner, the data rate must not exceed the traffic parameters, or packets might be dropped, thereby affecting voice quality. Fancy queueing such as class-based weighted fair queueing (CBWFQ), low latency queueing (LLQ), or weighted fair queueing (WFQ), can run on the PVC to provide the quality of service (QoS) guarantees for the traffic.

In previous releases, RSVP reservations were not constrained by the traffic parameters of the flow's outbound PVC. As a result, oversubscription could occur when the sum of the RSVP traffic and other traffic exceeded the PVC's capacity.



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The RSVP support for ATM/PVCs feature allows RSVP to function with per-PVC queueing for voice-like flows. Specifically, RSVP can install reservations on PVCs defined at the interface and subinterface levels. There is no limit to the number of PVCs that can be configured per interface or subinterface.

## RSVP Bandwidth Allocation and Modular QoS Command Line Interface (CLI)

RSVP can use an interface (or a PVC) queueing algorithm, such as WFQ, to ensure QoS for its data flows.

### Admission Control

When WFQ is running, RSVP can co-exist with other QoS features on an interface (or PVC) that also reserve bandwidth and enforce QoS. When you configure multiple bandwidth-reserving features (such as RSVP, LLQ, CB-WFQ, and **ip rtp priority**), portions of the interface's (or PVC's) available bandwidth may be assigned to each of these features for use with flows that they classify.

An internal interface-based (or PVC-based) bandwidth manager prevents the amount of traffic reserved by these features from oversubscribing the interface (or PVC).

When you configure features such as LLQ and CB-WFQ, any classes that are assigned a bandwidth reserve their bandwidth at the time of configuration, and deduct this bandwidth from the bandwidth manager. If the configured bandwidth exceeds the interface's capacity, the configuration is rejected.

When RSVP is configured, no bandwidth is reserved. (The amount of bandwidth specified in the **ip rsrvp bandwidth** command acts as a strict upper limit, and does **not** guarantee admission of any flows.) Only when an RSVP reservation arrives does RSVP attempt to reserve bandwidth out of the remaining pool of available bandwidth (that is, the bandwidth that has not been dedicated to traffic handled by other features.)

### Data Packet Classification

By default, RSVP performs an efficient flow-based, datapacket classification to ensure QoS for its reserved traffic. This classification runs prior to queueing consideration by **ip rtp priority** or CB-WFQ. Thus, the use of a CB-WFQ class or **ip rtp priority** command is **not** required in order for RSVP data flows to be granted QoS. Any **ip rtp priority** or CB-WFQ configuration will not match RSVP flows, but they will reserve additional bandwidth for any non-RSVP flows that may match their classifiers.

If you do **not** want RSVP to perform per-flow classification, but prefer DiffServ classification instead, then you can configure RSVP to exclude itself from data packet classification, and configure LLQ for classification. For more information, see the “RSVP Scalability Enhancements” feature regarding DiffServ integration.

## Benefits of RSVP Support for ATM/PVCs

### Accurate Admission Control

RSVP performs admission control based on the PVC's average cell rate, sustainable cell rate, or minimum cell rate, depending on the type of PVC that is configured, instead of the amount of bandwidth available on the interface.

**Recognition of Layer 2 Overhead**

RSVP automatically takes the Layer 2 overhead into account when admitting a flow. For each flow, RSVP determines the total amount of bandwidth required, including Layer 2 overhead, and uses this value for admission control with the WFQ bandwidth manager.

**Improved QoS**

RSVP provides QoS guarantees for high-priority traffic by reserving resources at the point of congestion (that is, the ATM PVC instead of the interface).

**Flexible Configurations**

RSVP provides support for point-to-point and multipoint interface configurations, thus enabling deployment of services such as voice over IP (VoIP) in ATM environments with QoS guarantees.

**Prevention of Bandwidth Oversubscription**

RSVP, CBWFQ, and ip rtp priority do not oversubscribe the amount of bandwidth available on the interface or the PVC even when they are running simultaneously. Prior to admitting a reservation, these features check an internal bandwidth manager to avoid oversubscription.

**IP QoS Features Integration into ATM Environments**

IP QoS features can now be integrated seamlessly from IP into ATM environments with RSVP providing admission control on a per PVC basis.

## Restrictions

- Interface-level generic traffic shaping (GTS) is not supported.
- VC-level queueing and interface-level queueing on the same interface are not supported.
- Nonvoice RSVP flows are not supported.
- Multicast flows are not supported.
- ATM/PVCs must be preconfigured in the network.

## Supported Platforms

- Cisco 3600 series (Cisco 3620, 3640, and 3660)
- Cisco 3810 multiservice access concentrator
- Cisco 7200 series

## Prerequisites

The network must support the following Cisco IOS features before RSVP support for ATM/PVCs is enabled:

- Resource Reservation Protocol (RSVP)
- Weighted fair queueing (WFQ)

## Configuration Tasks

See the following sections for configuration tasks for the RSVP support for ATM/PVCs feature. Each task in the list indicates whether the task is optional or required.

- [Creating a PVC](#) (Required)
- [Defining ATM QoS Traffic Parameters for a PVC](#) (Required)
- [Defining a Policy Map for WFQ](#) (Required)
- [Applying a Policy Map to a PVC](#) (Required)
- [Enabling RSVP on an Interface](#) (Required)
- [Configuring a Path](#) (Optional)
- [Configuring a Reservation](#) (Optional)

### Creating a PVC

To create a PVC, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>pvc</b> [name] vpi/vci [ilmi   qsaal   smds]	Assigns a name and identifier to a PVC.

### Defining ATM QoS Traffic Parameters for a PVC



#### Note

In order for RSVP to reserve bandwidth, the ATM/PVC traffic parameters must be available bit rate (ABR), variable bit rate non real-time (VBR-NRT), or real-time variable bit rate (VBR). You can specify only one of these parameters per PVC connection; therefore, if you enter a new parameter, it will replace the existing one.

To configure ATM PVC traffic parameters, use *one* of the following commands beginning in interface-ATM-VC configuration mode:

Command	Purpose
Router(config-if-atm-vc)# <b>abr</b> output-pcr output-mcr	Configures the available bit rate (ABR). (ATM-CES port adapter and multiport T1/E1 ATM network module only.)
Router(config-if-atm-vc)# <b>vbr-nrt</b> output-pcr output-scr output-mbs	Configures the variable bit rate-non real time (VBR-NRT) QoS.
Router(config-if-atm-vc)# <b>vbr-rt</b> peak-rate average-rate burst	Configures the real-time variable bit rate (VBR). (Cisco MC3810 and multiport T1/E1 ATM network module only.)

The arguments used here are as follows:

- *-pcr*—peak cell rate

- *-mcr*—minimum cell rate
- *-scr*—sustainable cell rate
- *-mbs*—maximum burst size
- *output-mcr*, *output-scr*, and *average-rate*— reservable bandwidth pool on the PVC

All features running on the PVC, including RSVP, CBWFQ, and LLQ, can use up to 75 percent of the reservable bandwidth pool.

## Defining a Policy Map for WFQ

To define a policy map for WFQ, use the following commands, beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>policy-map</b> <i>policy-name</i>	Specifies the policy map name; for example, wfq-voip.
Step 2	Router(config-pmap)# <b>class</b> <i>class-name</i>	Specifies the name of a previously defined class map, such as class-default.
Step 3	Router(config-pmap-c) <b>fair-queue</b> <i>number-of-queues</i>	Specifies the number of queues to be reserved for the default class.

## Applying a Policy Map to a PVC

To apply a policy map to a PVC, use the following command, beginning in interface-ATM-VC configuration mode:

Command	Purpose
Router(config-if-atm-vc)# <b>service-policy output</b> <i>policy-name</i>	Applies a policy map to the output direction of the interface.

## Enabling RSVP on an Interface

To enable RSVP on an interface, use the following command in interface configuration mode:

Command	Purpose
Router(config-if)# <b>ip rsvp bandwidth</b> [ <i>interface-kbps</i> ] [ <i>single-flow-kbps</i> ]	Enables RSVP on an interface.

## Configuring a Path

To configure an RSVP path, use the following command in global configuration mode:

Command	Purpose
<pre>Router(config)# ip rsvp sender session-ip-address sender-ip-address [tcp   udp   ip-protocol] session-dport sender-sport previous-hop-ip-address previous-hop-interface [bandwidth] [burst-size]</pre>	Specifies the RSVP path parameters, including the destination and source addresses, the protocol, the destination and source ports, the previous hop address, the average bit rate, and the burst size.

## Configuring a Reservation

To configure an RSVP reservation, use the following command in global configuration mode:

Command	Purpose
<pre>Router(config)# ip rsvp reservation session-ip-address sender-ip-address [tcp   udp   ip-protocol] session-dport sender-sport next-hop-ip address nexthop-interface {ff   se   wf} {rate   load} [bandwidth] [burst-size]</pre>	Specifies the RSVP reservation parameters, including the destination and source addresses, the protocol, the destination and source ports, the next hop address, the next hop interface, the reservation style, the service type, the average bit rate, and the burst size.

## Verifying RSVP Support for ATM/PVCs Configuration

### Multipoint Configuration

To verify RSVP support for ATM/PVCs multipoint configuration, use this procedure:

- Step 1** Enter the **show ip rsvp installed** command to display information about interfaces, subinterfaces, PVCs, and their admitted reservations. The output in the following example shows that the ATM 6/0.1 subinterface has four reservations:

```
Router# show ip rsvp installed
```

```
RSVP:ATM6/0.1
BPS    To          From          Protoc DPort  Sport  Weight Conversation
10K    145.30.30.213 145.40.40.214 UDP    101   101    0      40
15K    145.20.20.212 145.40.40.214 UDP    100   100    6      41
15K    145.30.30.213 145.40.40.214 UDP    100   100    6      41
10K    145.20.20.212 145.40.40.214 UDP    101   101    0      40
```



**Note**

Weight 0 is assigned to voice-like flows, which proceed to the priority queue (PQ).

- Step 2** Enter the **show ip rsvp installed detail** command to display additional information about interfaces, subinterfaces, PVCs, and their current reservations.



**Note**

In the following output, the first flow has a weight = 0 and gets the PQ; the second flow has a weight > 0 and gets a reserved queue.

```
Router# show ip rsvp installed detail
```

```

RSVP:ATM6/0 has the following installed reservations

RSVP:ATM6/0.1 has the following installed reservations
RSVP Reservation. Destination is 145.30.30.213, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 101, Source port is 101
  Reserved bandwidth:10K bits/sec, Maximum burst:1K bytes, Peak rate:10K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514
  Resource provider for this flow:
    WFQ on ATM PVC 100/101 on AT6/0: PRIORITY queue 40.  Weight:0, BW 10 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 48 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 100, Source port is 100
  Reserved bandwidth:15K bits/sec, Maximum burst:1K bytes, Peak rate:15K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514
  Resource provider for this flow:
    WFQ on ATM PVC 100/201 on AT6/0: RESERVED queue 41.  Weight:6, BW 15 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 200 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.30.30.213, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 100, Source port is 100
  Reserved bandwidth:15K bits/sec, Maximum burst:1K bytes, Peak rate:15K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514
  Resource provider for this flow:
    WFQ on ATM PVC 100/101 on AT6/0: RESERVED queue 41.  Weight:6, BW 15 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 60 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 101, Source port is 101
  Reserved bandwidth:10K bits/sec, Maximum burst:1K bytes, Peak rate:10K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514
  Resource provider for this flow:
    WFQ on ATM PVC 100/201 on AT6/0: PRIORITY queue 40.  Weight:0, BW 10 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 163 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort

```

## Point-to-Point Configuration

To verify RSVP support for ATM/PVCs point-to-point configuration, use this procedure:

- Step 1** Enter the **show ip rsvp installed** command to display information about interfaces, subinterfaces, PVCs, and their admitted reservations. The output in the following example shows that the ATM 6/0.1 subinterface has two reservations, and the ATM 6/0.2 subinterface has one reservation:

```

Router# show ip rsvp installed

RSVP:ATM6/0.1
BPS      To          From          Protoc DPort  Sport  Weight Conversation

```

```

15K  145.30.30.213  145.40.40.214  UDP  100  100  0  40
20K  145.30.30.213  145.40.40.214  UDP  101  101  6  41

```

```

RSVP:ATM6/0.2
BPS   To           From           Protoc DPort  Sport  Weight Conversation
150K  145.20.20.212  145.40.40.214  UDP    12    12    6    42
Router#

```

**Note**


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Weight 0 is assigned to voice-like flows, which proceed to the PQ.

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**Step 2**

Enter the **show ip rsvp installed detail** command to display additional information about interfaces, subinterfaces, PVCs, and their current reservations.

**Note**


---

In the following output, the first flow with a weight = 0 gets the PQ, and the second flow with a weight > 0 gets a reserved queue.

---

```

Router# show ip rsvp installed detail

RSVP:ATM6/0 has the following installed reservations

RSVP:ATM6/0.1 has the following installed reservations
RSVP Reservation. Destination is 145.30.30.213, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 101, Source port is 101
  Reserved bandwidth:15K bits/sec, Maximum burst:1K bytes, Peak rate:15K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow:
    WFQ on ATM PVC 100/101 on AT6/0: PRIORITY queue 40.  Weight:0, BW 15 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 48 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 100, Source port is 100
  Reserved bandwidth:15K bits/sec, Maximum burst:1K bytes, Peak rate:15K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow:
    WFQ on ATM PVC 100/201 on AT6/0: RESERVED queue 41.  Weight:6, BW 15 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 200 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.30.30.213, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 100, Source port is 100
  Reserved bandwidth:20K bits/sec, Maximum burst:1K bytes, Peak rate:20K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow:
    WFQ on ATM PVC 100/101 on AT6/0: RESERVED queue 41.  Weight:6, BW 20 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 60 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort

RSVP:ATM6/0.2 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.40.40.214,
  Protocol is UDP, Destination port is 101, Source port is 101
  Reserved bandwidth:150K bits/sec, Maximum burst:1K bytes, Peak rate:150K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes

```

```

Resource provider for this flow:
  WFQ on ATM PVC 100/201 on AT6/0: PRIORITY queue 40.  Weight:0, BW 150 kbps
Conversation supports 1 reservations
Data given reserved service:0 packets (0M bytes)
Data given best-effort service:0 packets (0 bytes)
Reserved traffic classified for 163 seconds
Long-term average bitrate (bits/sec):0M reserved, 0M best-effort

```

## Monitoring and Maintaining RSVP Support for ATM/PVCs

To monitor and maintain RSVP support for ATM/PVCs, use the following commands in EXEC mode:

Command	Purpose
Router# <b>show ip rsvp installed</b>	Displays information about interfaces and their admitted reservations.
Router# <b>show ip rsvp installed detail</b>	Displays additional information about interfaces, PVCs, and their admitted reservations.
Router# <b>show queueing</b> [ <b>custom</b>   <b>fair</b>   <b>priority</b>   <b>random-detect</b> ] [ <b>interface</b> <i>serial-number</i> ]	Displays all or selected configured queueing strategies and available bandwidth for RSVP reservations.
Router# <b>show atm pvc</b> [ <i>vpi/vci</i>   <i>name</i>   <b>interface atm</b> <i>interface-number</i> ]	Displays all ATM PVCs and related traffic information.

## Configuration Examples

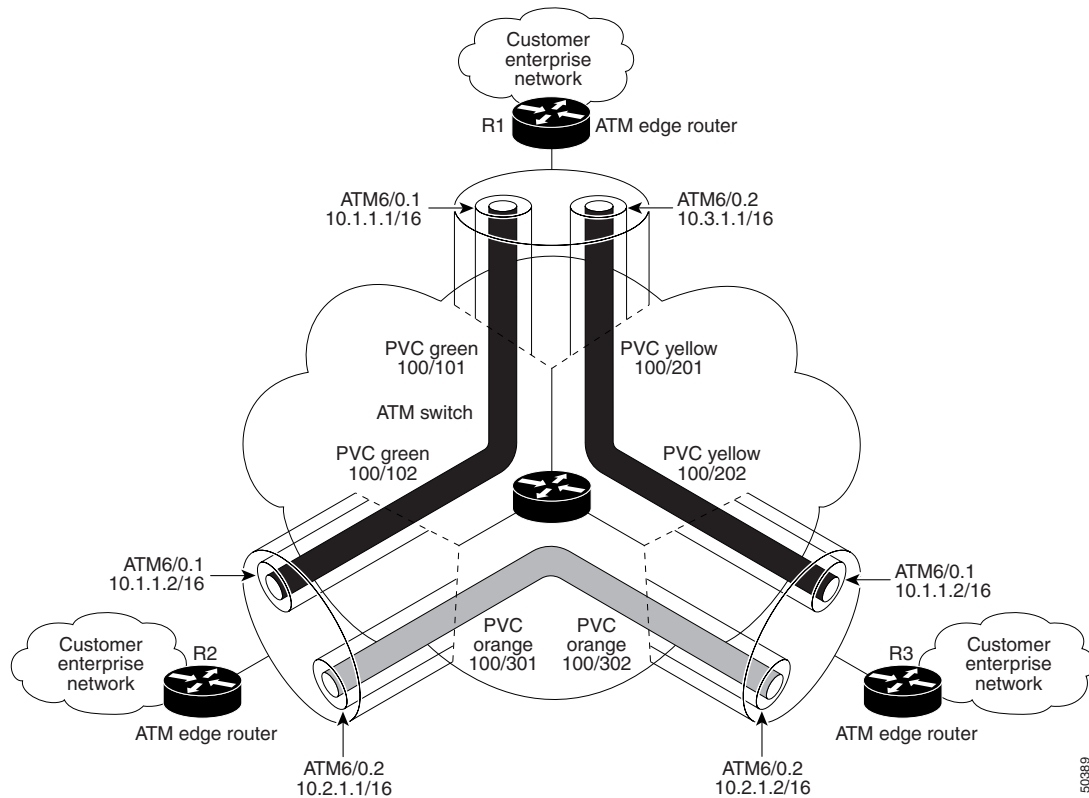
This section provides point-to-point and multipoint configuration examples for the RSVP support for ATM/PVCs feature.

### Point-to-Point Configuration

[Figure 1](#) shows a sample point-to-point interface configuration commonly used in ATM environments in which one PVC per subinterface is configured at router R1.

Three small clouds represent office branches that are connected through PVCs over an ATM network.

**Figure 1 Point-to-Point Interface Configuration**



Here is sample output for a point-to-point configuration:

```

Router#
policy-map wfq-voip
  class class-default
    fair-queue

interface ATM6/0
  no ip address
  ip rsvp bandwidth 112320 112320

interface ATM6/0.1 point-to-point
  ip address 10.1.1.1 255.0.0.0
  pvc green 100/101
    vbr-rt 400 300 200
  inarp 1
  broadcast
  service-policy output wfq-voip
  ip rsvp bandwidth 1250 1250
  ip rsvp resource-provider wfq pvc

interface ATM6/0.2 point-to-point
  ip address 10.3.1.1 255.0.0.0
  pvc yellow 100/201
    vbr-nrt 500 400 1000
  inarp 1
  broadcast
  service-policy output wfq-voip
  ip rsvp bandwidth 1250 1250
  ip rsvp resource-provider wfq pvc

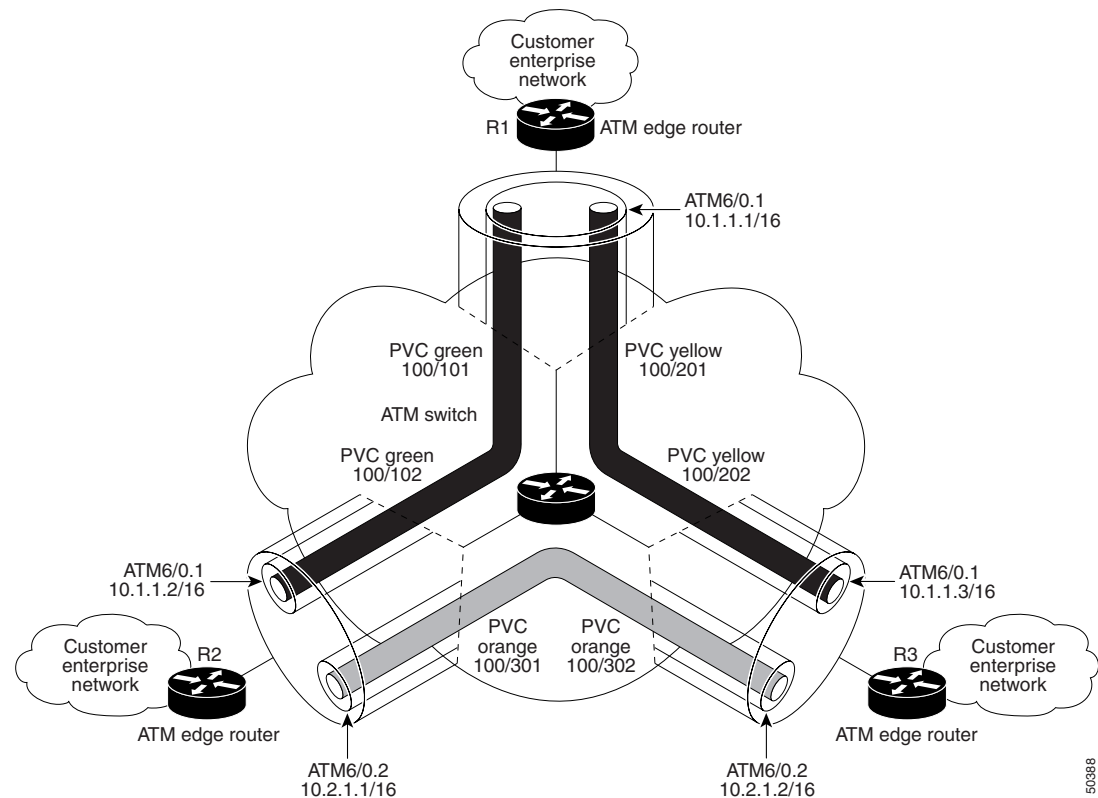
```

## Multipoint Configuration

Figure 2 shows a multipoint interface configuration commonly used in ATM environments in which multiple PVCs are configured on the same subinterface at router R1.

The customer enterprise network that includes R1 is the headquarters of a company with PVC connections to each remote office.

**Figure 2** Multipoint Interface Configuration



Here is sample output for a multipoint configuration:

```
Router#
policy-map wfq-voip
  class class-default
    fair-queue

interface ATM6/0
  no ip address
  ip rsvp bandwidth 112320 112320

interface ATM6/0.1 multipoint
  ip address 10.1.1.1 255.0.0.0
  pvc green 100/101
    vbr-rt 400 300 200
    inarp 1
    broadcast
    service-policy output wfq-voip

  pvc yellow 100/201
```

## Additional References

```
vbr-nrt 500 400 1000
inarp 1
broadcast
service-policy output wfq-voip

ip rsvp bandwidth 1250 1250
ip rsvp resource-provider wfq pvc
```

## Additional References

The following sections provide references related to the RSVP support for ATM/PVCs feature.

## Related Documents

Related Topic	Document Title
RSVP commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<a href="#">Cisco IOS Quality of Service Solutions Command Reference</a>
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
Information about LLQ	“Configuring Weighted Fair Queueing” module
Information about traffic policing	“Policing and Shaping Overview” module

## Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

## MIBs

MIB	MIBs Link
RFC 2206 (RSVP Management Information Base using SMIV2)	To locate and download MIBs for selected platforms, Cisco IOS 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
RFC 2205	<i>Resource ReSerVation Protocol (RSVP)—Version 1 Functional Specification</i>

## Technical Assistance

Description	Link
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>

## Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS Quality of Service Solutions Command Reference* at [http://www.cisco.com/en/US/docs/ios/qos/command/reference/qos\\_book.html](http://www.cisco.com/en/US/docs/ios/qos/command/reference/qos_book.html). For information about all Cisco IOS commands, use the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or a Cisco IOS master commands list.

- **debug ip rsvp traffic-control**
- **debug ip rsvp wfq**
- **ip rsvp layer2 overhead**
- **ip rsvp resource-provider**
- **show ip rsvp installed**
- **show ip rsvp interface**
- **show queueing**

**Note**

You can use **debug ip rsvp traffic-control** and **debug ip rsvp wfq** simultaneously. Use the **show debug** command to see which debugging commands are enabled.

# Glossary

**AAL**—ATM adaptation layer. AAL defines the conversion of user information into cells. AAL1 and AAL2 handle isochronous traffic, such as voice and video; AAL3/4 and AAL5 pertain to data communications through the segmentation and reassembly of packets.

**ABR**—Available bit rate. A QoS class defined by the ATM Forum for ATM networks. ABR is used for connections that do not require timing relationships between source and destination. ABR provides no guarantees in terms of cell loss or delay, providing only best-effort service. Traffic sources adjust their transmission rate in response to information they receive describing the status of the network and its capability to successfully deliver data.

**admission control**—The process in which an RSVP reservation is accepted or rejected based on end-to-end available network resources.

**Asynchronous Transfer Mode**—See ATM.

**ATM**—Asynchronous Transfer Mode. A cell-based data transfer technique in which channel demand determines packet allocation. This is an international standard for cell relay in which multiple service types (such as voice, video, or data) are conveyed in fixed-length (53-byte) cells. Fixed-length cells allow cell processing to occur in hardware, thereby reducing transit delays. ATM is designed to take advantage of high-speed transmission media such as E3, SONET, and T3.

**available bit rate**—See ABR.

**bandwidth**—The difference between the highest and lowest frequencies available for network signals. This term also describes the rated throughput capacity of a given network medium or protocol.

**CBR**—Constant bit rate. A QoS class defined by the ATM Forum for ATM networks. CBR is used for connections that depend on precise clocking to ensure undistorted delivery.

**CBWFQ**—Class-based weighted fair queueing. A queueing mechanism that extends the standard WFQ functionality to provide support for user-defined traffic classes.

**Class-based weighted fair queueing**—See CBWFQ.

**constant bit rate**—See CBR.

**flow**—A stream of data traveling between two endpoints across a network (for example, from one LAN station to another). Multiple flows can be transmitted on a single circuit.

**ILMI**—Interim Local Management Interface. Described in the ATM Forum's UNI specification, ILMI allows end users to retrieve basic information, such as status and configuration about virtual connections and addresses, for a particular UNI.

**Interim Local Management Interface**—See ILMI.

**latency**—The delay between the time a device receives a packet and the time that the packet is forwarded out the destination port.

**MUX**—A multiplexing device that combines multiple signals for transmission over a single line. The signals are demultiplexed, or separated, at the receiving end.

**payload**—The portion of a cell, frame, or packet that contains upper-layer information (data).

**permanent virtual circuit**—See PVC.

**point-to-multipoint connection**—One of two fundamental connection types. It is a unidirectional connection in which a single source end system (known as a root node) connects to multiple destination end systems (known as leaves).

**point-to-point connection**—One of two fundamental connection types. It is a unidirectional or bidirectional connection between two end systems.

**PQ**—Priority queue. A routing feature in which frames in an output queue are assigned priority based on various characteristics such as packet size and interface type.

**priority queue**—See PQ.

**PVC**—Permanent virtual circuit or connection. A virtual circuit that is permanently established. PVCs save bandwidth associated with circuit establishment and teardown in situations where certain virtual circuits must exist all the time.

**QoS**—Quality of service. A measure of performance for a transmission system that reflects its transmission quality and service availability.

**quality of service**—See QoS.

**reservable bandwidth pool**—The amount of bandwidth on a link that features can set aside in order to provide QoS guarantees.

**Resource Reservation Protocol**—See RSVP.

**RSVP**—Resource Reservation Protocol. A protocol for reserving network resources to provide quality of service guarantees to application flows.

**SNAP**—Subnetwork Access Protocol. An Internet protocol that operates between a network entity in the subnetwork and a network entity in the end system. SNAP specifies a standard method of encapsulating IP datagrams and ARP messages on IEEE networks. The SNAP entity in the end system makes use of the services of the subnetwork and performs three key functions: data transfer, connection management, and QoS selection.

**subnetwork access protocol**—See SNAP.

**SVC**—Switched virtual circuit or connection. A virtual circuit that is dynamically established on demand and is torn down when transmission is complete. SVCs are used in situations where data transmission is sporadic.

**switched virtual circuit**—See SVC.

**variable bit rate**—See VBR.

**VBR**—Variable bit rate. A QoS class defined by the ATM Forum for ATM networks. VBR is subdivided into a real time (RT) class and a non-real time (NRT) class. VBR (RT) is used for connections in which there is a fixed timing relationship between samples. VBR (NRT) is used for connections where there is no fixed timing relationship between samples, but where a guaranteed QoS is still needed.

**VC**—Virtual circuit. A logical circuit created to ensure reliable communication between two network devices. A virtual circuit can be either permanent (PVC) or switched (SVC).

**virtual circuit**—See VC.

**Voice over IP**—See VoIP.

**VoIP**—Voice over IP. The ability to carry normal telephony-style voice over an IP-based internet maintaining telephone-like functionality, reliability, and voice quality.

**weighted fair queueing**—See WFQ.

**WFQ**—Weighted fair queueing. A queue management algorithm that provides a certain fraction of link bandwidth to each of several queues, based on relative bandwidth applied to each of the queues.

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