RSVP Scalability Enhancements

Feature History

Release	Modification
12.2(2)T	This feature was introduced.
12.2(14)S	This feature was integrated into Cisco IOS Release 12.2(14)S.

This document describes the Cisco Resource Reservation Protocol (RSVP) scalability enhancements. It identifies the supported platforms, provides configuration examples, and lists related Cisco IOS command line interface (CLI) commands.

This document includes the following major sections:

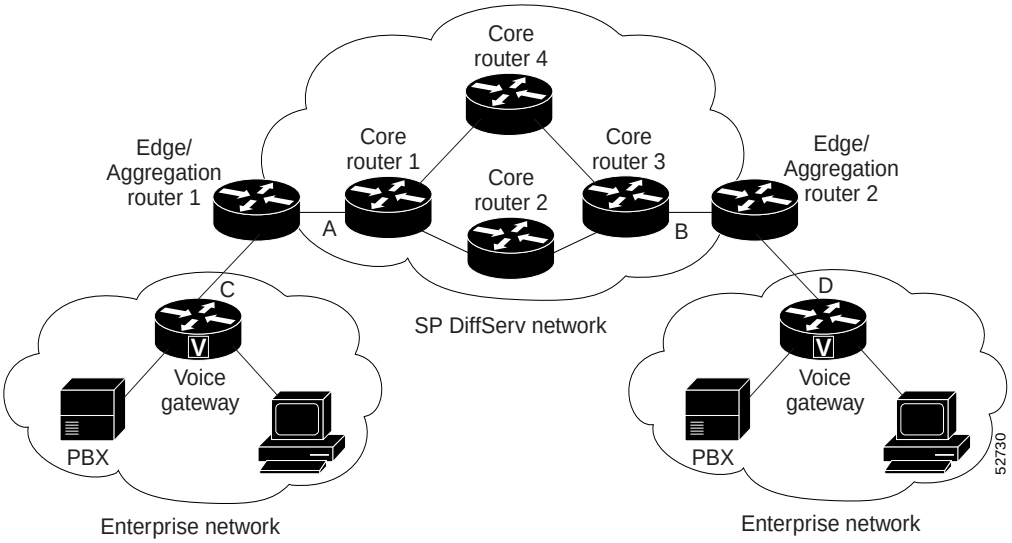
Feature Overview

RSVP typically performs admission control, classification, policing, and scheduling of data packets on a per-flow basis and keeps a database of information for each flow. RSVP scalability enhancements let you select a resource provider (formerly called a quality of service (QoS) provider) and disable data packet classification so that RSVP performs admission control only. This facilitates integration with service provider (differentiated services (DiffServ)) networks and enables scalability across enterprise networks.

Class-based weighted fair queueing (CBWFQ) provides the classification, policing, and scheduling functions. CBWFQ puts packets into classes based on the differentiated services code point (DSCP) value in the packet's IP header, thereby eliminating the need for per-flow state and per-flow processing.

Figure 1 shows two enterprise networks interconnected through a service provider (SP) network. The SP network has an IP backbone configured as a DiffServ network. Each enterprise network has a voice gateway connected to an SP edge/aggregation router via a WAN link. The enterprise networks are connected to a private branch exchange (PBX).

Figure 1 RSVP/DiffServ Integration Topology



The voice gateways are running classic RSVP, which means RSVP is keeping a state per flow and also classifying, marking, and scheduling packets on a per-flow basis. The edge/aggregation routers are running classic RSVP on the interfaces (labeled C and D) connected to the voice gateways and running RSVP for admission control only on the interfaces connected to core routers 1 and 3. The core routers in the DiffServ network are not running RSVP, but are forwarding the RSVP messages to the next hop. The core routers inside the DiffServ network implement a specific per hop behavior (PHB) for a collection of flows that have the same DSCP value.

The voice gateways identify voice data packets and set the appropriate DSCP in their IP headers such that the packets are classified into the priority class in the edge/aggregation routers and in core routers 1, 2, 3 or 1, 4, 3.

The interfaces or the edge/aggregation routers (labeled A and B) connected to core routers 1 and 3 are running RSVP, but are doing admission control only per flow against the RSVP bandwidth pool configured on the DiffServ interfaces of the edge/aggregation routers. CBWFQ is performing the classification, policing, and scheduling functions.

Benefits

Enhanced Scalability

RSVP scalability enhancements handle similar flows on a per-class basis instead of a per-flow basis. Since fewer resources are required to maintain per-class QoS guarantees, faster processing results, thereby enhancing scalability.

Improved Router Performance

RSVP scalability enhancements improve router performance by reducing the cost for data packet classification and scheduling, which decrease CPU resource consumption. The saved resources can then be used for other network management functions.

Restrictions

- Sources should not send marked packets without an installed reservation.
- Sources should not send marked packets that exceed the reserved bandwidth.
- Sources should not send marked packets to a destination other than the reserved path.

Related Features and Technologies

The RSVP scalability enhancements are related to QoS features such as signalling, classification, and congestion management. (See the section on "Related Documents".)

Related Documents

The following documents provide additional information:

- *Cisco IOS Release 12.0 Quality of Service Solutions Configuration Guide*
- *Cisco IOS Release 12.0 Quality of Service Solutions Command Reference*

Supported Platforms

- Cisco 7200 series
- Cisco 7400 series
- Cisco 7500 series

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To obtain updated information about platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. In the release section, you can compare releases side by side to display both the features unique to each software release and the features that releases have in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by thie feature.

MIBs

RFC 2206, *RSVP Management Information Base using SMIv*

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

- RFC 2205, *Resource Reservation Protocol*

Prerequisites

The network must support the following Cisco IOS features before the RSVP scalability enhancements are enabled:

- Resource Reservation Protocol (RSVP)
- Class-based weighted fair queueing (CBWFQ)

Configuration Tasks

See the following sections for configuration tasks for the RSVP scalability enhancements. Each task in the list indicates whether the task is optional or required.

- Enabling RSVP on an Interface (required)

- Setting the Resource Provider (required)
- Disabling Data Packet Classification (required)
- Configuring Class and Policy Maps (required)
- Attaching a Policy Map to an Interface (required)

Enabling RSVP on an Interface

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

Command	Purpose
`Router(config-if)# ip rsvp bandwidth [interface-kbps] [single-flow-kbps]`	Enables RSVP on an interface.

Note The bandwidth that you configure on the interface must match the bandwidth that you configure for the CBWFQ priority queue. See the section on "Configuration Examples".

Setting the Resource Provider

Note Resource provider was formerly called QoS provider.

To set the resource provider, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# ip rsvp resource-provider none`	Sets the resource provider to none.

Note Setting the resource provider to none instructs RSVP to *not* associate any resources, such as WFQ queues or bandwidth, with a reservation.

Disabling Data Packet Classification

To turn off (disable) data packet classification, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# ip rsvp data-packet classification none`	Disables data packet classification.

Note Disabling data packet classification instructs RSVP *not* to process every packet, but to perform admission control only.

Configuring Class and Policy Maps

To configure class and policy maps, use the following commands in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# class-map class-map-name`	Specifies the name of the class for which you want to create or modify class map match criteria.
Step 2	`Router(config)# policy-map policy-map-name`	Specifies the name of the policy map to be created, added to, or modified before you can configure policies for classes whose match criteria are defined in a class map.

Attaching a Policy Map to an Interface

To attach a policy map to an interface, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# service-policy {input | output} policy-map-name`	Attaches a single policy map to one or more interfaces to specify the service policy for those interfaces.

Note If at the time you configure the RSVP scalability enhancements, there are existing reservations that use classic RSVP, no additional marking, classification, or scheduling is provided for these flows. You can also delete these reservations after you configure the RSVP scalability enhancements.

Verifying RSVP Scalability Enhancements Configuration

To verify RSVP scalability enhancements, use this procedure:

Step 1 Enter the **show ip rsvp interface detail** command to display information about interfaces, subinterfaces, resource providers, and data packet classification. The output in the following example shows that the ATM 6/0 interface has resource provider none configured and data packet classification is turned off:

```
Router# show ip rsvp interface detail

 AT6/0:
   Bandwidth:
     Curr allocated: 190K bits/sec
     Max. allowed (total): 112320K bits/sec
     Max. allowed (per flow): 112320K bits/sec
   Neighbors:
     Using IP encap: 1.  Using UDP encaps: 0
   DSCP value used in Path/Resv msgs: 0x30
   RSVP Data Packet Classification is OFF
   RSVP resource provider is: none
```

Note The last two lines in the preceding output verify that the RSVP scalability enhancements (disabled data packet classification and resource provider none) are present.

Step 2 Enter the **show ip rsvp installed detail** command to display information about interfaces, subinterfaces, their admitted reservations, bandwidth, resource providers, and data packet classification.

```
Router# show ip rsvp installed detail

RSVP: Ethernet3/3 has no installed reservations

RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 0 packets (0 bytes)
  Data given best-effort service: 0 packets (0 bytes)
```

```
  Reserved traffic classified for 54 seconds
  Long-term average bitrate (bits/sec): 0M reserved, 0M best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 0 packets (0 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 80 seconds
  Long-term average bitrate (bits/sec): 0M reserved, 0M best-effort
```

Step 3 Wait for a while, then enter the **show ip rsvp installed detail** command again. In the following output, notice there is no increment in the number of packets classified:

```
Router# show ip rsvp installed detail

RSVP: Ethernet3/3 has no installed reservations

RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 0 packets (0 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 60 seconds
  Long-term average bitrate (bits/sec): 0 reserved, OM best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 0 packets (0 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 86 seconds
  Long-term average bitrate (bits/sec): OM reserved, 0M best-effort
```

Monitoring and Maintaining RSVP Scalability Enhancements

To monitor and maintain RSVP scalability enhancements, use the following commands in EXEC mode:

Command	Purpose
`Router# show ip rsvp installed`	Displays information about interfaces and their admitted reservations.
`Router# show ip rsvp installed detail`	Displays additional information about interfaces and their admitted reservations.
`Router# show ip rsvp interface`	Displays RSVP-related interface information.
`Router# show ip rsvp interface detail`	Displays additional RSVP-related interface information.
`Router# show queueing [custom | fair | priority | random-detect [interface serial-number]]`	Displays all or selected configured queueing strategies and available bandwidth for RSVP reservations.

Configuration Examples

This section provides the following configuration examples:

- Configuring CBWFQ to Accommodate Reserved Traffic
- Configuring the Resource Provider as None with Data Classification Turned Off

Configuring CBWFQ to Accommodate Reserved Traffic

The following output shows a class map and a policy map being configured for voice:

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)# class-map match-all voice

Router(config-cmap)# match access-group 100

Router(config-cmap)# exit

Router(config)# policy-map wfq-voip

Router(config-pmap)# class voice

Router(config-pmap-c)# priority 24

Router(config-pmap-c)# end
```

Note The bandwidth that you configured for the CBWFQ priority queue (24 kbps) must match the bandwidth that you configured for the interface. See the section "Enabling RSVP on an Interface".

The following output shows an access list being configured:

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)# access-list 100 permit udp any any range 16384 32500
```

The following output shows a class being applied to the outgoing interface:

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)# int atm6/0

Router(config-if)# service-policy output wfq-voip
```

The following output shows bandwidth being configured on an interface:

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# int atm6/0

Router(config-if)# ip rsvp bandwidth 24
```

Note The bandwidth that you configure for the interface (24 kbps) must match the bandwidth that you configured for the CBWFQ priority queue.

Configuring the Resource Provider as None with Data Classification Turned Off

The **show run** command displays the current configuration in the router:

```
Router# show run int atm6/0

 class-map match-all voice
  match access-group 100
!
policy-map wfq-voip
  class voice
    priority 24
  class class-default
   fair-queue
!
interface ATM6/0
 ip address 20.20.22.1 255.255.255.0
 no ip redirects
 no ip proxy-arp
 no ip route-cache cef
 atm uni-version 4.0
 atm pvc 1 0 5 qsaal
 atm pvc 2 0 16 ilmi
 atm esi-address 111111111181.00
 no atm auto-configuration
 no atm ilmi-keepalive
 pvc blue 200/100
  abr 700 600
  inarp 1
  broadcast
  encapsulation aal5snap
  service-policy output wfq-voip
 !
 ip rsvp bandwidth 24 24
```

```
 ip rsvp signalling dscp 48
access-list 100 permit udp any any range 16384 32500
```

Here is output from the **show ip rsvp interface detail** command before resource provider none is configured and data-packet classification is turned off:

```
Router# show ip rsvp interface detail

 AT6/0:
   Bandwidth:
     Curr allocated: 190K bits/sec
     Max. allowed (total): 112320K bits/sec
     Max. allowed (per flow): 112320K bits/sec
   Neighbors:
     Using IP encap: 1.  Using UDP encaps: 0
   DSCP value used in Path/Resv msgs: 0x30
```

Here is output from the **show queueing** command before resource provider none is configured and data packet classification is turned off:

```
Router# show queueing int atm6/0

  Interface ATM6/0 VC 200/100
  Queueing strategy: weighted fair
  Output queue: 63/512/64/3950945 (size/max total/threshold/drops)
     Conversations  2/5/64 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 450 kilobits/sec
```

Note New reservations do not reduce the available bandwidth (450 kilobits/sec shown above). Instead RSVP performs admission control only by using the bandwidth limit configured in the **ip rsvp bandwidth** command. The bandwidth configured in this command should match the bandwidth configured in the CBWFQ class that you set up to handle the reserved traffic.

The following output shows resource provider none being configured:

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# int atm6/0

Router(config-if)# ip rsvp resource-provider none

Router(config-if)# end
```

The following output shows data packet classification being turned off:

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# int atm6/0

Router(config-if)# ip rsvp data-packet classification none

Router(config-if)# end
```

Here is output from the **show ip rsvp interface detail** command after resource provider none has been configured and data packet classification has been turned off:

```
Router# show ip rsvp interface detail

 AT6/0:
   Bandwidth:
     Curr allocated: 190K bits/sec
     Max. allowed (total): 112320K bits/sec
     Max. allowed (per flow): 112320K bits/sec
   Neighbors:
     Using IP encap: 1.  Using UDP encaps: 0
   DSCP value used in Path/Resv msgs: 0x30
   RSVP Data Packet Classification is OFF
   RSVP resource provider is: none
```

The following output from the **show ip rsvp installed detail** command verifies that resource provider none is configured and data packet classification is turned off:

```
Router# show ip rsvp installed detail

RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 3192 packets (1557696 bytes)
  Data given best-effort service: 42 packets (20496 bytes)
  Reserved traffic classified for 271 seconds
  Long-term average bitrate (bits/sec): 45880 reserved, 603 best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 1348 packets (657824 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 296 seconds
  Long-term average bitrate (bits/sec): 17755 reserved, 0M best-effort
```

The following output shows no increments in packet counts after the source sends data packets that match the reservation:

```
Router# show ip rsvp installed detail

RSVP: Ethernet3/3 has no installed reservations

RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 3192 packets (1557696 bytes)
  Data given best-effort service: 42 packets (20496 bytes)
  Reserved traffic classified for 282 seconds
  Long-term average bitrate (bits/sec): 44051 reserved, 579 best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
```

```
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 1348 packets (657824 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 307 seconds
  Long-term average bitrate (bits/sec): 17121 reserved, 0M best-effort
```

The following output shows that data packet classification is enabled again:

```
Router# configure terminal

Router(config)# int atm6/0

Router(config-if) no ip rsvp data-packet classification

Router(config-if)# end
```

The following output verifies that data packet classification is occurring:

```
Router# show ip rsvp installed detail

Enter configuration commands, one per line.  End with CNTL/Z.
RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 3683 packets (1797304 bytes)
  Data given best-effort service: 47 packets (22936 bytes)
  Reserved traffic classified for 340 seconds
  Long-term average bitrate (bits/sec): 42201 reserved, 538 best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 1556 packets (759328 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 364 seconds
  Long-term average bitrate (bits/sec): 16643 reserved, 0M best-effort
```

Here is output from the **show run** command after you have performed all the previous configuration tasks:

```
Router# show run int atm6/0

 class-map match-all voice
  match access-group 100
!
policy-map wfq-voip
  class voice
    priority 24
  class class-default
   fair-queue
!
interface ATM6/0
 ip address 20.20.22.1 255.255.255.0
```

```
 no ip redirects
 no ip proxy-arp
 no ip route-cache cef
 atm uni-version 4.0
 atm pvc 1 0 5 qsaal
 atm pvc 2 0 16 ilmi
 atm esi-address 111111111181.00
 no atm auto-configuration
 no atm ilmi-keepalive
 pvc blue 200/100
  abr 700 600
  inarp 1
  broadcast
  encapsulation aal5snap
  service-policy output wfq-voip
 !
 ip rsvp bandwidth 24 24
 ip rsvp signalling dscp 48
 ip rsvp data-packet classification none
 ip rsvp resource-provider none

access-list 100 permit udp any any range 16384 32500
```

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications.

New Commands

- **ip rsvp data-packet classification none**
- **ip rsvp resource-provider**

Modified Commands

- **debug ip rsvp traffic-control**
- **debug ip rsvp wfq**
- **show ip rsvp installed**
- **show ip rsvp interface**
- **show queueing**

debug ip rsvp traffic-control

To display debug messages for traffic control, use the **debug ip rsvp traffic-control** command in EXEC mode. To disable the **debug ip rsvp traffic-control** command, use the **no** form of this command.

debug ip rsvp traffic-control

no debug ip rsvp traffic-control

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.

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command History

Release	Modification
12.0	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Examples

Here is an example of output from the **debug ip rsvp traffic-control** command:

```
Router# debug ip rsvp traffic-control

RSVP debugging is on

Router# show debugging

IP RSVP debugging is on
IP RSVP debugging (Traffic Control events) is on
Router#
03:03:56:RSVP-TC:Attempting to remove QoS for rsb 6268A538
03:03:56:RSVP-TC:tcsb 00001A01 found for rsb 6268A538
03:03:56:RSVP-TC:Deleting tcsb 00001A01
03:04:15:RSVP-TC:Attempting to install QoS for rsb 6268A538
03:04:15:RSVP-TC:Adding new tcsb 00001E01 for rsb 6268A538
03:04:15:RSVP-TC:Assigning WFQ QoS to tcsb 00001E01
03:04:15:RSVP-TC:Consulting policy for tcsb 00001E01
03:04:15:RSVP-TC:Policy granted QoS for tcsb 00001E01
03:04:15:RSVP-TC:Requesting QoS for tcsb 00001E01
03:04:15:RSVP-TC:    ( r = 12500      bytes/s   M = 1514       bytes
03:04:15:RSVP-TC:      b = 1000       bytes     m = 0          bytes )
03:04:15:RSVP-TC:      p = 12500      bytes/s   Service Level = non-priority
03:04:15:RSVP-TC:Allocation succeeded for tcsb 00001E01
```

Related Commands

Command	Description
show debug	Displays active debug output.

debug ip rsvp wfq

To display debug messages for weighted fair queueing (WFQ), use the **debug ip rsvp wfq** command in EXEC mode. To disable the **debug ip rsvp wfq** command, use the **no** form of this command.

debug ip rsvp wfq

no debug ip rsvp wfq

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.

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command History

Release	Modification
12.1(3)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Examples

Here is an example of output from the **debug ip rsvp wfq** command:

```
Router# show debugging

Router# debug ip rsvp wfq

RSVP debugging is on

Router# show debugging

IP RSVP debugging is on
IP RSVP debugging (Traffic Control events) is on
IP RSVP debugging (WFQ events) is on
Router#
03:03:23:RSVP-TC:Attempting to install QoS for rsb 6268A538
03:03:23:RSVP-TC:Adding new tcsb 00001A01 for rsb 6268A538
03:03:23:RSVP-TC:Assigning WFQ QoS to tcsb 00001A01
03:03:23:RSVP-TC:Consulting policy for tcsb 00001A01
03:03:23:RSVP-TC:Policy granted QoS for tcsb 00001A01
03:03:23:RSVP-TC:Requesting QoS for tcsb 00001A01
03:03:23:RSVP-TC:    ( r = 12500      bytes/s   M = 1514       bytes
03:03:23:RSVP-TC:      b = 1000       bytes     m = 0          bytes )
03:03:23:RSVP-TC:      p = 12500      bytes/s   Service Level = non-priority
03:03:23:RSVP-WFQ:Requesting a RESERVED queue on Et0/1 for tcsb 00001A01
03:03:23:RSVP-WFQ:Queue 265 allocated for tcsb 00001A01
03:03:23:RSVP-TC:Allocation succeeded for tcsb 00001A01
Router#
Router# no debug ip rsvp

RSVP debugging is off
```

Related Commands

Command	Description
show debug	Displays active debug output.

ip rsvp data-packet classification none

To turn off (disable) Resource Reservation Protocol (RSVP) data packet classification, use the **ip rsvp data-packet classification none** command in interface configuration mode. To turn on (enable) data-packet classification, use the **no** form of the command.

ip rsvp data-packet classification none

no ip rsvp data-packet classification

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(2)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Use the **ip rsvp data-packet classification none** command when you do not want RSVP to process every packet. This, in turn, eliminates overhead and improves network performance and scalability.

Examples

In the following example, data packet classification is turned off (disabled):

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# int atm6/0

Router(config-if)# ip rsvp data-packet classification none
```

In the following example, data packet classification is turned on (enabled):

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(conf)# int atm6/0

Router(conf-if)# no ip rsvp data-packet classification
```

Related Commands

Command	Description
show ip rsvp interface	Displays RSVP-related interface information.

ip rsvp resource-provider

To configure a resource provider for an aggregate flow, use the **ip rsvp resource-provider** command in interface configuration mode. To disable the **ip rsvp resource-provider** command, use the **no** form of the command.

ip rsvp resource-provider {*none* | *wfq interface* | *wfq pvc*}

no ip rsvp resource-provider

Note Resource provider was formerly called QoS provider.

Syntax Description

none	(Optional) Specifies no resource provider regardless of whether or not there is one configured on the interface.
wfq interface	(Optional) Specifies WFQ as the resource provider on the interface. This is the default resource provider that RSVP configures on the interface.
wfq pvc	(Optional) Specifies WFQ as the resource provider on the permanent virtual circuit or connection (PVC).

Defaults

This command has no default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(2)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

Use the **ip rsvp resource-provider** command to configure the resource provider with which you want RSVP to interact when it installs a reservation.

To ensure that a flow receives QoS guarantees when using WFQ on a per-flow basis, configure *wfq interface* or *wfq pvc* as the resource provider. To ensure that a flow receives QoS guarantees when using CBWFQ for data packet processing, configure *none* as the resource provider.

Examples

Here is an example of the **ip rsvp resource-provider** command:

```
Router# configure terminal

Router(config)# int atm6/0

Router(config-if)# ip rsvp resource-provider none

Router(config-if)# end
```

Related Commands

Command	Description
show ip rsvp interface	Displays RSVP-related interface information.

show ip rsvp installed

To display information about interfaces and their admitted reservations, use the **show ip rsvp installed** command in EXEC mode.

show ip rsvp installed [**detail**][*interface-type interface-number*]

Syntax Description

detail	(Optional) Specifies additional information about interfaces and their reservations.
interface-type	(Optional) Specifies the type of the interface
interface-number	(Optional) Specifies the number of the interface.

Defaults

This command has no default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

The **show ip rsvp installed** command displays information about interfaces and their reservations. Enter the optional keyword, **detail**, for additional information, including the reservation's traffic parameters, downstream hop, and resources used by RSVP to ensure QoS for this reservation.

Examples

Here is sample output from the **show ip rsvp installed** command on an ATM interface:

```
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 has no installed reservations
```

Table 1 describes the significant fields shown in the display.

Table 1 show ip rsvp installed Field Descriptions

Field	Description
BPS	Bits per second; reserved rate of reservation
To	The session's (receiver's) IP address
From	The sender's IP address
Protoc	The protocol used by the sender
DPort	Destination port; session
Sport	Source port; sender
Weight	Weight assigned to the reservation; 0 = PQ
Conversation	Traffic stream number

Here is sample output from the **show ip rsvp installed detail** command on an ATM interface:

```
Router# show ip rsvp installed detail

RSVP: ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 14, Source port is 14
  Reserved bandwidth: 50K bits/sec, Maximum burst: 1K bytes, Peak rate: 50K bits/sec
  Min Policed Unit: 0 bytes, Max Pkt Size: 1514 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations
  Data given reserved service: 699 packets (341112 bytes)
  Data given best-effort service: 6 packets (2928 bytes)
  Reserved traffic classified for 54 seconds
  Long-term average bitrate (bits/sec): 50200 reserved, 430 best-effort
RSVP Reservation. Destination is 145.20.20.212, Source is 145.10.10.211,
  Protocol is UDP, Destination port is 10, Source port is 10
  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: None
  Conversation supports 1 reservations
  Data given reserved service: 400 packets (195200 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 80 seconds
  Long-term average bitrate (bits/sec): 19466 reserved, 0M best-effort
```

show ip rsvp interface

To display Resource Reservation Protocol (RSVP)-related interface information, use the **show ip rsvp interface** command in EXEC mode.

show ip rsvp interface [*interface-type interface-number*] [**detail**]

Syntax Description

interface-type	(Optional) The type of the interface.
interface-number	(Optional) The number of the interface.
detail	(Optional) Specifies additional information about interfaces.

Defaults

This command has no default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.2(2)T	This command was modified to include the **detail** keyword.
12.2(14)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

Use the **show ip rsvp interface** command to display the current allocation budget and maximum available bandwidth. Enter the optional **detail** keyword for additional information, including resource provider, data classification, and differentiated services code point (DSCP) value, if you configured them.

Examples

In the following output from the **show ip rsvp interface** command, a flow for 15 kbps is admitted on subinterface AT6/0.1:

```
Router# show ip rsvp interface

interface    allocated  i/f max  flow max pct UDP  IP   UDP_IP   UDP M/C
AT6/0        15K        116250K  116250K  0   0    0    0        0
AT6/0.1      15K        1250K    1250K    2   0    1    0        0
AT6/0.2      0M         1250K    1250K    0   0    1    0        0
```

Table 2 describes the significant fields shown in the preceding output.

Table 2 show ip rsvp interface Field Descriptions

Field	Description
interface	Interface name
allocated	Current allocation budget

Table 2 show ip rsvp interface Field Descriptions (continued)

Field	Description
i/f max	Maximum allocated bandwidth
flow max	Maximum flow possible on this interface
pct	Percent of bandwidth used
UDP	Number of neighbors sending UDP-encapsulated RSVP
IP	Number of neighbors sending IP-encapsulated RSVP
UDP_IP	Number of neighbors sending both
UDP M/C	Router configured for UDP on this interface

Here is output from the **show ip rsvp interface detail** command showing that resource provider none has been configured and data packet classification has been turned off:

```
Router# show ip rsvp interface detail

 AT6/0:
   Bandwidth:
     Curr allocated: 190K bits/sec
     Max. allowed (total): 112320K bits/sec
     Max. allowed (per flow): 112320K bits/sec
   Neighbors:
     Using IP encap: 1.  Using UDP encaps: 0
   DSCP value used in Path/Resv msgs: 0x30
   RSVP Data Packet Classification is OFF
   RSVP resource provider is: none
```

show queueing

To display the current state of the queues, use the **show queueing** command in EXEC mode.

show queueing [**custom** | **fair** | **priority** | **random-detect** [**interface** *serial-number*]]

Syntax Description

custom	(Optional) Shows status of custom queueing list configuration.
fair	(Optional) Shows status of the fair queueing configuration. This is the default.
priority	(Optional) Shows status of priority queueing list configuration.
random-detect	(Optional) Shows status of the weighted random early detection (WRED) and distributed WRED (DWRED) configuration, including configuration of flow-based WRED.
interface *serial-number*	(Optional) Displays the WRED parameters of every virtual circuit (VC) with WRED enabled on the specified serial interface.

Defaults

Fair queueing configuration

Command Modes

EXEC

Command History

Release	Modification
10.3	This command was introduced.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2 (2)T.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

Use the **show queueing** command to verify that Resource Reservation Protocol (RSVP), class-based weighted fair queueing (CBWFQ, and the **ip rtp priority** command contact the bandwidth manager. Initiate RSVP flows by using the **ip rsvp sender** and the **ip rsvp reservation** commands and verify that the value in the last line of the following output (available bandwidth) decreases as RSVP flows are admitted if the resource provider is WFQ.

Examples

Note You can observe the changes in interface bandwidth when interface-level WFQ is enabled.

```
Router# show queueing interface atm6/0

Interface ATM6/0 VC 0/5
  Queueing strategy: fifo
  Output queue 0/40, 0 drops per VC
  Interface ATM6/0 VC 0/16
  Queueing strategy: fifo
  Output queue 0/40, 0 drops per VC
  Interface ATM6/0 VC 100/101
  Queueing strategy: weighted fair
```

```
  Total output drops per VC: 0
  Output queue: 0/512/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 225 kilobits/sec
  Interface ATM6/0 VC 100/201
  Queueing strategy: weighted fair
  Total output drops per VC: 0
  Output queue: 0/512/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/1 (allocated/max allocated)
     Available Bandwidth 300 kilobits/sec
```

Admit a flow of 15 kbps on the AT6/0.1 subinterface:

```
Router# show ip rsvp interface

interface    allocated  i/f max  flow max pct UDP  IP   UDP_IP   UDP M/C
AT6/0        15K        116250K  116250K  0   0    0    0        0
AT6/0.1      15K        1250K    1250K    2   0    1    0        0
AT6/0.2      0M         1250K    1250K    0   0    1    0        0
```

Notice that the available bandwidth on the ATM6/0 VC 100/101 interface decreases from 225 kbps to 210 kbps:

```
Router# show queueing interface atm6/0

Interface ATM6/0 VC 0/5
  Queueing strategy: fifo
  Output queue 0/40, 0 drops per VC
  Interface ATM6/0 VC 0/16
  Queueing strategy: fifo
  Output queue 0/40, 0 drops per VC
  Interface ATM6/0 VC 100/101
  Queueing strategy: weighted fair
  Total output drops per VC: 0
  Output queue: 0/512/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 210 kilobits/sec
  Interface ATM6/0 VC 100/201
  Queueing strategy: weighted fair
  Total output drops per VC: 0
  Output queue: 0/512/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/1 (allocated/max allocated)
     Available Bandwidth 300 kilobits/sec
```

Glossary

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

aggregate—A collection of packets with the same DSCP.

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.

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.

differentiated services—See DiffServ.

differentiated services code point—See DSCP.

DiffServ—An architecture based on a simple model where traffic entering a network is classified and possibly conditioned at the boundaries of the network. The class of traffic is then identified with a DS code point or bit marking in the IP header. Within the core of the network, packets are forwarded according to the per-hop behavior associated with the DS code point.

DSCP—differentiated services code point. The six most significant bits of the 1-byte IP type of service (ToS) field. The per-hop behavior represented by a particular DSCP value is configurable. DSCP values range between 0 and 63.

enterprise network—A large and diverse network connecting most major points in a company or other organization.

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.

packet—A logical grouping of information that includes a header containing control information and (usually) user data. Packets most often refer to network layer units of data.

PBX—private branch exchange. A digital or analog telephone switchboard located on the subscriber premises and used to connect private and public telephone networks.

PHB—per-hop behavior. A DiffServ concept that specifies how specifically marked packets are to be treated by each DiffServ router.

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.

Resource Reservation Protocol—See RSVP.

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

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.