JUNOS® Internet Software

MPLS Network Operations Guide Log Reference

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JUNOS™ Internet Software MPLS Network Operations Guide Log Reference

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YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. The JUNOS Software has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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About This Guide

This preface provides the following guidelines for using the *JUNOS™ Internet Software MPLS Network Operations Guide Log Reference*:

Objectives

This guide provides descriptions of MPLS status and error messages that appear in the output of the **show mpls lsp extensive** command. The guide also describes how and when to configure Constrained Shortest Path First (CSPF) and RSVP trace options, and how to examine a CSPF or RSVP failure in a sample network. This guide is not directly related to any particular release of the JUNOS Internet software.

For information about configuration statements and guidelines related to the commands described in this reference, see the following configuration guides:

- *JUNOS MPLS Applications Configuration Guide*—Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols..
- *JUNOS Feature Guide*—Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.

For information about related tasks performed by Network Operations Center (NOC) personnel, see the following network operations guides:

- *JUNOS MPLS Fast Reroute Network Operations Guide*
- *JUNOS MPLS Log Reference Network Operations Guide*
- *JUNOS Baseline Network Operations Guide*
- *JUNOS Interfaces Network Operations Guide*

NOTE: To obtain the most current version of this manual, see the product documentation page on the Juniper Networks Web site, located at http://www.juniper.net/.

Audience

This guide is designed for Network Operations Center (NOC) personnel who monitor a Juniper Networks M Series or T Series routing platform.

To use this guide, you need a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. You must also be familiar with one or more of the following Internet routing protocols:

- Border Gateway Protocol (BGP)
- Routing Information Protocol (RIP)
- Intermediate System-to-Intermediate System (IS-IS)
- Open Shortest Path First (OSPF)
- Internet Control Message Protocol (ICMP) router discovery
- Internet Group Management Protocol (IGMP)
- Distance Vector Multicast Routing Protocol (DVMRP)
- Protocol-Independent Multicast (PIM)
- Multiprotocol Label Switching (MPLS)
- Resource Reservation Protocol (RSVP)
- Simple Network Management Protocol (SNMP)

Supported Routing Platforms

For the features described in this manual, JUNOS Software currently supports the following routing platforms:

- M Series
- T Series

Using the Index

This guide contains a complete index. For a list and description of glossary terms, see the *JUNOS Comprehensive Index and Glossary*.

Document Conventions

Table 1 on page xxi defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

List of Technical Publications

Table 2 on page xxi lists the software and hardware guides and release notes for Juniper Networks M-series, MX-series, and T-series routing platforms and describes the contents of each document. Table 3 on page xxv lists the books included in the *Network Operations Guide* series. Table 4 on page xxvi lists the manuals and release notes supporting JUNOS software for J-series and SRX-series platforms. All documents are available at http://www.juniper.net/techpubs/.

Table 5 on page xxvii lists additional books on Juniper Networks solutions that you can order through your bookstore. A complete list of such books is available at http://www.juniper.net/books.

Table 2: Technical Documentation for Supported Routing Platforms

Book	Description
JUNOS Software for Supported Routing Platforms	
Access Privilege	Explains how to configure access privileges in user classes by using permission flags and regular expressions. Lists the permission flags along with their associated command-line interface (CLI) operational mode commands and configuration statements.
Broadband Subscriber Management Solutions	Describes residential subscriber management and how you can deploy solutions that include multisubscriber IP address assignment, service provisioning, authentication, authorization, accounting, and dynamic request services in your network
Class of Service	Provides an overview of the class-of-service (CoS) functions of the JUNOS software and describes how to configure CoS features, including configuring multiple forwarding classes for transmitting packets, defining which packets are placed into each output queue, scheduling the transmission service level for each queue, and managing congestion through the random early detection (RED) algorithm.

Table 2: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
CLI User Guide	Describes how to use the JUNOS command-line interface (CLI) to configure, monitor, and manage Juniper Networks routing platforms. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Feature Guide	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.
High Availability	Provides an overview of hardware and software resources that ensure a high level of continuous routing platform operation and describes how to configure high availability (HA) features such as nonstop active routing (NSR) and graceful Routing Engine switchover (GRES).
MPLS Applications	Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.
Multicast Protocols	Provides an overview of multicast concepts and describes how to configure multicast routing protocols.
Multiplay Solutions	Describes how you can deploy IPTV and voice over IP (VoIP) services in your network.
MX-series Layer 2 Configuration Guide	Provides an overview of the Layer 2 functions of the MX-series routers, including configuring bridging domains, MAC address and VLAN learning and forwarding, and spanning-tree protocols. It also details the routing instance types used by Layer 2 applications. All of this material was formerly covered in the *JUNOS Routing Protocols Configuration Guide*.
MX-series Layer 2 Solutions Guide	Describes common configuration scenarios for the Layer 2 features supported on the MX-series routers, including basic bridged VLANs with normalized VLAN tags, aggregated Ethernet links, bridge domains, Multiple Spanning Tree Protocol (MSTP), and integrated routing and bridging (IRB).
Network Interfaces	Provides an overview of the network interface functions of the JUNOS software and describes how to configure the network interfaces on the routing platform.
Network Management	Provides an overview of network management concepts and describes how to configure various network management features, such as SNMP and accounting options.
Policy Framework	Provides an overview of policy concepts and describes how to configure routing policy, firewall filters, and forwarding options.
Protected System Domain	Provides an overview of the JCS 1200 platform and the concept of Protected System Domains (PSDs). The JCS 1200 platform, which contains up to six redundant pairs of Routing Engines running JUNOS software, is connected to a T320 router or to a T640 or T1600 routing node. To configure a PSD, you assign any number of Flexible PIC concentrators (FPCs) in the T-series routing platform to a pair of Routing Engines on the JCS 1200 platform. Each PSD has the same capabilities and functionality as a physical router, with its own control plane, forwarding plane, and administration.

Table 2: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
Routing Protocols	Provides an overview of routing concepts and describes how to configure routing instances, and unicast routing protocols.
Secure Configuration Guide for Common Criteria and JUNOS-FIPS	Provides an overview of secure Common Criteria and JUNOS-FIPS protocols for the JUNOS software and describes how to install and configure secure Common Criteria and JUNOS-FIPS on a routing platform.
Services Interfaces	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the router.
Software Installation and Upgrade Guide	Describes the JUNOS software components and packaging and explains how to initially configure, reinstall, and upgrade the JUNOS system software. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Subscriber Access	Provides an overview of the subscriber access features of the JUNOS software and describes how to configure subscriber access support on the router, including dynamic profiles, class of service, AAA, and access methods.
System Basics	Describes Juniper Networks routing platforms and explains how to configure basic system parameters, supported protocols and software processes, authentication, and a variety of utilities for managing your router on the network.
VPNs	Provides an overview and describes how to configure Layer 2 and Layer 3 virtual private networks (VPNs), virtual private LAN service (VPLS), and Layer 2 circuits. Provides configuration examples.
JUNOS References	
Hierarchy and RFC Reference	Describes the JUNOS configuration mode commands. Provides a hierarchy reference that displays each level of a configuration hierarchy, and includes all possible configuration statements that can be used at that level. This material was formerly covered in the *JUNOS System Basics Configuration Guide*.
Interfaces Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot interfaces.
Routing Protocols and Policies Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot routing policies and protocols, including firewall filters.
System Basics and Services Command Reference	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot system basics, including commands for real-time monitoring and route (or path) tracing, system software management, and chassis management. Also describes commands for monitoring and troubleshooting services such as class of service (CoS), IP Security (IPsec), stateful firewalls, flow collection, and flow monitoring.

Table 2: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
System Log Messages Reference	Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message.
J-Web User Guide	
J-Web Interface User Guide	Describes how to use the J-Web graphical user interface (GUI) to configure, monitor, and manage Juniper Networks routing platforms.
JUNOS API and Scripting Documentation	
JUNOScript API Guide	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routing platforms.
JUNOS XML API Configuration Reference	Provides reference pages for the configuration tag elements in the JUNOS XML API.
JUNOS XML API Operational Reference	Provides reference pages for the operational tag elements in the JUNOS XML API.
NETCONF API Guide	Describes how to use the NETCONF API to monitor and configure Juniper Networks routing platforms.
JUNOS Configuration and Diagnostic Automation Guide	Describes how to use the commit script and self-diagnosis features of the JUNOS software. This guide explains how to enforce custom configuration rules defined in scripts, how to use commit script macros to provide simplified aliases for frequently used configuration statements, and how to configure diagnostic event policies.
Hardware Documentation	
Hardware Guide	Describes how to install, maintain, and troubleshoot routing platforms and components. Each platform has its own hardware guide.
PIC Guide	Describes the routing platform's Physical Interface Cards (PICs). Each platform has its own PIC guide.
DPC Guide	Describes the Dense Port Concentrators (DPCs) for all MX-series routers.
JUNOScope Documentation	
JUNOScope Software User Guide	Describes the JUNOScope software graphical user interface (GUI), how to install and administer the software, and how to use the software to manage routing platform configuration files and monitor routing platform operations.
Advanced Insight Solutions (AIS) Documentation	
Advanced Insight Solutions Guide	Describes the Advanced Insight Manager (AIM) application, which provides a gateway between JUNOS devices and Juniper Support Systems (JSS) for case management and intelligence updates. Explains how to run AI-Scripts on Juniper Networks devices.

Table 2: Technical Documentation for Supported Routing Platforms *(continued)*

Book	Description
Release Notes	
JUNOS Release Notes	Summarize new features and known problems for a particular software release, provide corrections and updates to published JUNOS, JUNOScript, and NETCONF manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures.
Hardware Release Notes	Describe the available documentation for the routing platform and summarize known problems with the hardware and accompanying software. Each platform has its own release notes.
JUNOScope Release Notes	Contain corrections and updates to the published JUNOScope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures.
AIS Release Notes	Summarize AIS new features and guidelines, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide initial setup, upgrade, and downgrade procedures.
AIS AI-Scripts Release Notes	Summarize AI-Scripts new features, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide instructions for automatic and manual installation, including deleting and rolling back.

Table 3: JUNOS Software Network Operations Guides

Book	Description
Baseline	Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling JUNOS software, gathering basic system management information, verifying your network topology, and searching log messages.
Interfaces	Describes tasks for monitoring interfaces. Tasks include using loopback testing and locating alarms.
MPLS	Describes tasks for configuring, monitoring, and troubleshooting an example MPLS network. Tasks include verifying the correct configuration of the MPLS and RSVP protocols, displaying the status and statistics of MPLS running on all routing platforms in the network, and using the layered MPLS troubleshooting model to investigate problems with an MPLS network.
MPLS Log Reference	Describes MPLS status and error messages that appear in the output of the show mpls lsp extensive command. The guide also describes how and when to configure Constrained Shortest Path First (CSPF) and RSVP trace options, and how to examine a CSPF or RSVP failure in a sample network.
MPLS Fast Reroute	Describes operational information helpful in monitoring and troubleshooting an MPLS network configured with fast reroute (FRR) and load balancing.

Table 3: JUNOS Software Network Operations Guides *(continued)*

Book	Description
Hardware	Describes tasks for monitoring M-series and T-series routing platforms.

To configure and operate a J-series Services Router or an SRX-series Services Gateway running JUNOS software, you must also use the configuration statements and operational mode commands documented in JUNOS configuration guides and command references. To configure and operate a WX Integrated Services Module, you must also use WX documentation.

Table 4: JUNOS Software for J-series Services Routers and SRX-series Services Gateways Documentation

Book	Description
J-series and SRX-series Platforms	
JUNOS Software Interfaces and Routing Configuration Guide	Explains how to configure SRX-series and J-series interfaces for basic IP routing with standard routing protocols, ISDN service, firewall filters (access control lists), and class-of-service (CoS) traffic classification.
JUNOS Software Security Configuration Guide	Explains how to configure and manage SRX-series and J-series security services such as stateful firewall policies, IPsec VPNs, firewall screens, Network Address Translation (NAT), Public Key Cryptography, chassis clusters, Application Layer Gateways (ALGs), and Intrusion Detection and Prevention (IDP).
JUNOS Software Administration Guide	Shows how to monitor SRX-series and J-series devices and routing operations, firewall and security services, system alarms and events, and network performance. This guide also shows how to administer user authentication and access, upgrade software, and diagnose common problems.
JUNOS Software CLI Reference	Provides the complete configuration hierarchy available on SRX-series and J-series devices. This guide also describes the configuration statements and operational mode commands unique to these devices.
Network and Security Manager: Configuring J Series Services Routers and SRX Series Services Gateways Guide	Explains how to configure, manage, and monitor J-series Services Routers and SRX-series services gateways through NSM.
JUNOS Release Notes	Summarize new features and known problems for a particular release of JUNOS software, including JUNOS software for J-series and SRX-series devices.The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions for JUNOS software.
J-series Only	

Table 4: JUNOS Software for J-series Services Routers and SRX-series Services Gateways Documentation *(continued)*

Book	Description
JUNOS Software Design and Implementation Guide	Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running JUNOS software.
J Series Services Routers Quick Start	Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity.
J Series Services Routers Hardware Guide	Provides an overview, basic instructions, and specifications for J-series Services Routers. This guide explains how to prepare a site, unpack and install the router, replace router hardware, and establish basic router connectivity. This guide contains hardware descriptions and specifications.
JUNOS Software Migration Guide	Provides instructions for migrating an SSG device running ScreenOS software to JUNOS software or upgrading a J-series device to a later version of the JUNOS software.
WXC Integrated Services Module Installation and Configuration Guide	Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration.

Table 5: Additional Books Available Through http://www.juniper.net/books

Book	Description
Interdomain Multicast Routing	Provides background and in-depth analysis of multicast routing using Protocol Independent Multicast sparse mode (PIM SM) and Multicast Source Discovery Protocol (MSDP); details any-source and source-specific multicast delivery models; explores multiprotocol BGP (MBGP) and multicast IS-IS; explains Internet Gateway Management Protocol (IGMP) versions 1, 2, and 3; lists packet formats for IGMP, PIM, and MSDP; and provides a complete glossary of multicast terms.
JUNOS Cookbook	Provides detailed examples of common JUNOS software configuration tasks, such as basic router configuration and file management, security and access control, logging, routing policy, firewalls, routing protocols, MPLS, and VPNs.
MPLS-Enabled Applications	Provides an overview of Multiprotocol Label Switching (MPLS) applications (such as Layer 3 virtual private networks [VPNs], Layer 2 VPNs, virtual private LAN service [VPLS], and pseudowires), explains how to apply MPLS, examines the scaling requirements of equipment at different points in the network, and covers the following topics: point-to-multipoint label switched paths (LSPs), DiffServ-aware traffic engineering, class of service, interdomain traffic engineering, path computation, route target filtering, multicast support for Layer 3 VPNs, and management and troubleshooting of MPLS networks.
OSPF and IS-IS: Choosing an IGP for Large-Scale Networks	Explores the full range of characteristics and capabilities for the two major link-state routing protocols: Open Shortest Path First (OSPF) and IS-IS. Explains architecture, packet types, and addressing; demonstrates how to improve scalability; shows how to design large-scale networks for maximum security and reliability; details protocol extensions for MPLS-based traffic engineering, IPv6, and multitopology routing; and covers troubleshooting for OSPF and IS-IS networks.

Table 5: Additional Books Available Through http://www.juniper.net/books *(continued)*

Book	Description
Routing Policy and Protocols for Multivendor IP Networks	Provides a brief history of the Internet, explains IP addressing and routing (Routing Information Protocol [RIP], OSPF, IS-IS, and Border Gateway Protocol [BGP]), explores ISP peering and routing policies, and displays configurations for both Juniper Networks and other vendors' routers.
The Complete IS-IS Protocol	Provides the insight and practical solutions necessary to understand the IS-IS protocol and how it works by using a multivendor, real-world approach.

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- Document name
- Document part number
- Page number
- Software release version (not required for Network Operations Guides [NOGs])

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- Use the Case Management tool in the CSC at http://www.juniper.net/cm/ .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

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Part 1
Examining the LSP Event Log

Chapter 1

Understanding LSP Status Events

This chapter lists and describes many LSP status events. Descriptions generally include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take. The LSP events are organized alphabetically.

LSP Status Events

Problem Label-switched path (LSP) status events occur in the history log of the show mpls lsp extensive command output, and provide detailed information that can help pinpoint the problem with an LSP. This table provides links and commands for many LSP status events. Descriptions generally include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any

possible actions that you can take. The LSP events are organized alphabetically. (See Table 6 on page 4.)

Table 6: LSP Status Events

Understanding LSP Status Events Tasks	Possible Action or Command
"Displaying LSP Status Events" on page 5	show mpls lsp extensive
1. Call Was Cleared by RSVP Event on page 7	Not applicable.
2. Change in Active Path Event on page 8	Not applicable.
3. Clear Call Event on page 8	Not applicable.
4. Deselected as Active Event on page 9	Analyze this event, and refer to events on either side of this event to determine the appropriate action.
5. Down Event on page 9	Analyze this event, and refer to events on either side of this event to determine the appropriate action.
6. Fast Reroute Detour Down Event on page 9	Analyze this event, and refer to events on either side of this event to determine the appropriate action.
7. Fast Reroute Detour Up Event on page 10	Not applicable.
8. Link Protection Down Event on page 11	Include the family mpls statement for all alternate paths for the LSP at the [edit interfaces type-*fpc/pic/port*.*unit*] hierarchy level.
9. Link Protection Up Event on page 12	Not applicable.
10. Originate Call Event on page 13	[edit protocols rsvp] set traceoptions file rsvp.log set traceoptions flag packets file show /var/log/rsvp.log
11. Originate Make-Before-Break Call Event on page 13	Not applicable.
12. Record Route Event on page 14	Not applicable.
13. ResvTear Received Event on page 15	Analyze this event, and refer to events on either side of this event to determine the appropriate action.
14. RSVP Disabled Event on page 15	[edit protocols] activate rsvp [edit protocols rsvp] set interface type-*fpc/pic/port*
15. RSVP Error Event on page 16	[edit protocols] activate rsvp
16. Selected as Active Path Event on page 16	Not applicable.

Table 6: LSP Status Events *(continued)*

Understanding LSP Status Events Tasks	Possible Action or Command
17. Session Preempted Event on page 17	Not applicable.
18. Up Event on page 17	Not applicable.

Displaying LSP Status Events

Purpose Display extensive information about LSPs, including the 50 most recent history events and the reasons why an LSP might have failed.

Action To examine status messages, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

```
user@host> show mpls lsp extensive
```

Sample Output 1

```
user@R1# run show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                    State: Dn
    Will be enqueued for recomputation in 3 second(s).
   68 Jan  5 10:02:56 CSPF failed: no route toward 10.0.0.6[9 times]
   67 Jan  5 09:58:33  Deselected as active
   66 Jan  5 09:58:33 CSPF failed: no route toward 10.0.0.6
   65 Jan  5 09:58:33  Clear Call
   64 Jan  5 09:58:33  Session preempted
   63 Jan  5 09:58:33 Down
   62 Jan  5 09:58:32 CSPF failed: no route toward 10.0.0.6[2 times]
   61 Jan  5 09:57:55 10.1.36.2: Explicit Route: wrong delivery
   60 Jan  5 09:57:34 CSPF failed: no route toward 10.0.0.6[2 times]
   59 Jan  5 09:57:28 CSPF: link down/deleted
10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
   58 Jan  5 09:54:37 Selected as active path
   57 Jan  5 09:54:37  Record Route:  10.1.13.2 10.1.36.2
   56 Jan  5 09:54:37 Up
   55 Jan  5 09:54:37 Originate Call
   54 Jan  5 09:54:37 CSPF: computation result accepted
   53 Jan  4 18:11:28 CSPF failed: no route toward 10.0.0.6[2 times]
   52 Jan  4 18:10:44  Deselected as active
   51 Jan  4 18:10:44 CSPF failed: no route toward 10.0.0.6
   50 Jan  4 18:10:44 CSPF: link down/deleted
10.1.13.1(R1.00/10.0.0.1)->10.1.13.2(R3.00/10.0.0.3)
   49 Jan  4 18:10:44  RSVP Disabled
   48 Jan  4 18:10:44  RSVP error , subcode 4: protocol shutdown
   47 Jan  4 18:10:44  Down
   46 Jan  4 18:06:15  Up
   45 Jan  4 18:06:15 Down
   44 Jan  4 18:06:10  Selected as active path
   43 Jan  4 18:06:09 Record Route:  10.1.13.2 10.1.36.2
```

```
   42 Jan  4 18:06:09 Up
   41 Jan  4 18:06:09  Originate Call
   40 Jan  4 18:06:09 CSPF: computation result accepted
   39 Jan  4 18:05:40 CSPF failed: no route toward 10.0.0.6[2 times]
   38 Jan  4 18:04:57 Deselected as active
   37 Jan  4 18:04:57 CSPF failed: no route toward 10.0.0.6
   36 Jan  4 18:04:57 CSPF: link down/deleted
10.1.13.1(R1.00/10.0.0.1)->10.1.13.2(R3.00/10.0.0.3)
   35 Jan  4 18:04:57 CSPF failed: no route toward 10.0.0.6
   34 Jan  4 18:04:57 Clear Call
   33 Jan  4 18:04:57 Explicit Route: bad strict route
   32 Jan  4 18:04:57 No Route toward dest
   31 Jan  4 18:04:57 Down
   30 Dec 28 13:47:29 Selected as active path
   29 Dec 28 13:47:29 Record Route:  10.1.13.2 10.1.36.2
   28 Dec 28 13:47:29 Up
   27 Dec 28 13:47:29 Originate Call
   26 Dec 28 13:47:29 CSPF: computation result accepted
   25 Dec 28 13:46:59 CSPF failed: no route toward 10.0.0.6
   24 Dec 28 13:46:39 Deselected as active
   23 Dec 28 13:46:39 CSPF failed: no route toward 10.0.0.6
   22 Dec 28 13:46:39 Clear Call
   21 Dec 28 13:46:39  ResvTear received
   20 Dec 28 13:46:39 Down
   19 Dec 28 13:46:39 10.1.13.2:  Session preempted
Created: Mon Dec 13 11:47:18 2004
Total 1 displayed, Up 0, Down 1
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
*Primary use-TOKYO       State: Up, No-decrement-ttl
     Received RRO:
          10.222.28.2(flag=0x9) 10.222.4.2(flag=0x1) 10.222.44.2
    7 Sep 20 18:13:45 Record Route: 10.222.28.2(flag=0x9)
10.222.4.2(flag=0x1) 10.222.44.2
    6 Sep 20 18:13:45 Record Route: 10.222.28.2(flag=0x9)
10.222.4.2 10.222.44.2
    5 Sep 20 18:13:45 Fast-reroute Detour Up
    4 Sep 20 18:13:42 Selected as active path
     3 Sep 20 18:13:42 Record Route: 10.222.28.2 10.222.4.2
10.222.44.2
    2 Sep 20 18:13:42 Up
    1 Sep 20 18:13:42 Originate Call
```

Sample Output 3

```
user@R1> show mpls lsp extensive
[...Output truncated...]
*Primary   long             State: Up, COS: 6
    Bandwidth per class: <ct0 20Mbps> <ct1 2Mbps> <ct2 3Mbps>
    OptimizeTimer: 250
    Reoptimization in 237 second(s).
     Computed ERO
 (S [L] denotes strict [loose] hops): (CSPF metric: 50)
           10.35.38.2 S 192.168.135.29
  S 10.35.39.1 S 10.35.40.2 S 10.35.41.1 S
     Received RRO
 (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node
10=SoftPreempt):
           10.35.38.2 (flag=0x09) 192.168.135.29 (flag=0x10) 10.35.39.1
```

```
   (flag=0x01) 10.35.40.2 (flag=0x01) 10.35.41.1 (flag=0x01)
[...Output truncated...]
```

Meaning Sample Output 1 from ingress router R1 shows extensive ingress LSP information, including LSP events that led to an LSP failure and the 50 most recent state events.

LSP events in bold are described in this topic. Descriptions include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

For completeness, events not included in this example output are also described in this topic to show LSP events that did not occur in the example network configuration, but might occur in your network. The LSP events are organized alphabetically.

Sample Output 2 shows the state of the route received in the Received Record Route (Received RRO) created by fast reroute configurations in the network. The Received RRO indicates a series of hops. Each hop has an address followed by a flag. For more information on flags, see the *JUNOS MPLS Network Operations Guide*. In most cases, the Received RRO is the same as the computed Explicit Route Object (ERO).

Sample Output 3 shows a Computed ERO and a Received RRO. In this instance they are the same. However, if Received RRO is different from the Computed ERO, there is a topology change in the network, and the route is taking a detour.

Call Was Cleared by RSVP Event

LSP Event Call was cleared by RSVP

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
ActivePath: (none)
LoadBalance: Random
Encoding type: Packet, Switching type: Packet, GPID: IPv4
Primary State: Dn
Will be enqueued for recomputation in 10 second(s).
11 Jan 26 14:58:32 CSPF failed: no route toward 10.0.0.6
10 Jan 26 14:58:25 Deselected as active
9 Jan 26 14:58:25 CSPF failed: no route toward 10.0.0.6
8 Jan 26 14:58:25  Call was cleared by RSVP
7 Jan 26 14:58:25 Session preempted
6 Jan 26 14:58:25 Down
[...Output truncated...]
```

Meaning This LSP event indicates that the Resource Reservation Protocol (RSVP) session corresponding to the LSP path was preempted and the corresponding RSVP state deleted.

Cause This LSP event is occurs when you issue the clear rsvp session command or trigger preemption of an RSVP session at the ingress router. Depending on the timer value, Constrained Shortest Path First (CSPF) recomputes the path and the LSP comes up again.

Action Not applicable.

Change in Active Path Event

LSP Event Change in active path

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
13 Sep 19 00:02:20 Deselected as active
12 Sep 19 00:02:20 ResvTear received
11 Sep 19 00:02:20 Down
10 Sep 19 00:02:20  Change in active path
9 Sep 19 00:02:20
8 Sep 19 00:02:20 10.222.28.2: Explicit Route: bad strict routeChange in active
path
7 Sep 19 00:02:20 CSPF failed: no route toward 192.168.32.1
6 Sep 19 00:02:20 10.222.28.2: No Route toward dest
5 Sep 19 00:00:54 Selected as active path
4 Sep 19 00:00:54 Record Route: 10.222.28.2 10.222.4.2 10.222.44.2
3 Sep 19 00:00:54 Up
2 Sep 19 00:00:54 Originate Call
1 Sep 19 00:00:54 CSPF: computation result accepted
[...Output truncated...]
```

Meaning This LSP event indicates that even though the active physical path has changed, the LSP stays up. Because this network configuration has an alternate (fast-reroute) path available, the event is a Change in active path rather than a Session preempted event.

Cause The active path might have failed.

Action Not applicable.

Clear Call Event

LSP Event Clear call

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   65 Jan  5 09:58:33  Clear Call
   64 Jan  5 09:58:33 Session preempted
   63 Jan  5 09:58:33 Down
[...Output truncated...]
```

Meaning This LSP event indicates that the LSP was disconnected and restarted.

Cause The clear mpls lsp command was issued on the ingress router to disconnect existing RSVP sessions, release the routes and states associated with the LSP, and then start a new LSP. Issuing this command might impact traffic travelling along the LSP, because a time lag might occur between tearing down the old path and setting up a new path.

Action Not applicable.

Deselected as Active Event

LSP Event Deselected as active

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   Will be enqueued for recomputation in 18 second(s).
   53 Jan  4 18:11:28 CSPF failed: no route toward 10.0.0.6[2 times]
   52 Jan  4 18:10:44  Deselected as active
   51 Jan  4 18:10:44 CSPF failed: no route toward 10.0.0.6
   50 Jan  4 18:10:44 CSPF: link down/deleted
[...Output truncated...]
```

Meaning This LSP event indicates that the LSP is no longer the active path.

Cause Typically, other events, similar to those in lines 50 and 51, indicate the reason that the LSP is no longer the active path.

Action Refer to events on either side of this event to determine the appropriate action.

Down Event

LSP Event Down

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   48 Jan  4 18:10:44 RSVP error, subcode 4: protocol shutdown
   47 Jan  4 18:10:44  Down
   46 Jan  4 18:06:15 Up
   45 Jan  4 18:06:15 Down
[...Output truncated...]
```

Meaning This LSP event indicates the state of the LSP on January 4 at 1800 hours, 10 minutes, and 44 seconds. The LSP had failed or was down.

Cause Not applicable.

Action Refer to events on either side of the Down event to determine why the LSP was down.

Fast Reroute Detour Down Event

LSP Event Fast reroute detour down

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 0, LSPname: R1-R6-3
  ActivePath:  (primary)
  FastReroute desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
```

```
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.15.2 S 10.1.56.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

         10.1.15.2(flag=1) 10.1.56.2
    9 Feb 15 20:52:56 Fast-reroute Detour Up
    8 Feb 15 20:52:53  Fast-reroute Detour Down
    7 Feb 15 20:50:00 Record Route:  10.1.15.2(flag=1) 10.1.56.2
    6 Feb 15 20:50:00 Fast-reroute Detour Up
    5 Feb 15 20:49:57 Selected as active path
    4 Feb 15 20:49:57 Record Route:  10.1.15.2 10.1.56.2
    3 Feb 15 20:49:57 Up
    2 Feb 15 20:49:56 Originate Call
    1 Feb 15 20:49:56 CSPF: computation result accepted
  Created: Tue Feb 15 20:49:56 2005
Total 3 displayed, Up 3, Down 0
[...Output truncated...]
```

Meaning This LSP event applies only to detours on the router and indicates that the one-to-one (1:1) fast reroute detour to bypass the next downstream node is down.

Cause This LSP event is caused by a failure or configuration change that deletes or resignals the fast reroute detour path. For example, a detour path interface or primary link may be deactivated.

Action Analyze the status to determine if this is the required behavior. If this is not the required behavior, verify the surrounding LSP events to identify the cause of the problem.

Fast Reroute Detour Up Event

LSP Event Fast-reroute Detour Up

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 0, LSPname: R1-R6-3
  ActivePath:  (primary)
  FastReroute desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.15.2 S 10.1.56.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

         10.1.15.2(flag=1) 10.1.56.2
    7 Feb 15 20:50:00 Record Route:  10.1.15.2(flag=1) 10.1.56.2
    6 Feb 15 20:50:00  Fast-reroute Detour Up
    5 Feb 15 20:49:57 Selected as active path
    4 Feb 15 20:49:57 Record Route:  10.1.15.2 10.1.56.2
    3 Feb 15 20:49:57 Up
    2 Feb 15 20:49:56 Originate Call
    1 Feb 15 20:49:56 CSPF: computation result accepted
  Created: Tue Feb 15 20:49:57 2005
```

```
Total 3 displayed, Up 3, Down 0
[...Output truncated...]
```

Sample Output 2

```
[edit protocols mpls]
user@R1# show
label-switched-path R1-R6-3 {
    to 10.0.0.6;
     fast-reroute;
}
[...Output truncated...]
```

Meaning This LSP event only applies to detours on this route, and indicates that a fast reroute detour path is up. Sample Output 1 shows the fast reroute event. Sample Output 2 shows the configuration of fast reroute on ingress router R1.

Cause This LSP event is caused by the correct configuration of a one-to-one (1:1) fast reroute detour, resulting in the successful signaling of a fast reroute detour.

Action Not applicable.

Link Protection Down Event

LSP Event Link protection down

Sample Output 1

```
user@R1> show configuration protocols mpls
label-switched-path R1-to-R6 {
    to 10.0.0.6;
     link-protection;
}
interface fxp0.0 {
    disable;
}
interface all;
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 1, LSPname: R1-to-R6
  ActivePath:  (primary)
  Link protection desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 2)
 10.1.13.2 S 10.1.36.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.13.2(flag=1 Label=101936) 10.1.36.2(Label=3)
   70 Feb 10 11:01:56 Link-protection Up
   69 Feb 10 11:01:56 Selected as active path
   68 Feb 10 11:01:56 Link-protection Down
   67 Feb 10 11:01:56 Link-protection Up
   66 Feb 10 11:01:56 Record Route:  10.1.13.2(flag=1 Label=101936)
10.1.36.2(Label=3)
   65 Feb 10 11:01:56 Up
   64 Feb 10 11:01:56 Originate Call
```

```
   63 Feb 10 11:01:56 CSPF: computation result accepted
   62 Feb 10 11:01:56 Clear Call
   61 Feb 10 11:01:56 Deselected as active
   60 Feb 10 11:01:56 Link-protection Down
   59 Feb 10 10:57:58 Record Route:  10.1.13.2(flag=1 Label=101920)
10.1.36.2(Label=3)
   58 Feb 10 10:57:56 Link-protection Up
   57 Feb 10 10:56:58 Selected as active path
   56 Feb 10 10:56:58 Record Route:  10.1.13.2(Label=101920) 10.1.36.2(Label=3)
   55 Feb 10 10:56:58 Up
   54 Feb 10 10:56:58 Originate Call
   53 Feb 10 10:56:58 CSPF: computation result accepted
   52 Feb 10 10:56:58 Clear Call
   51 Feb 10 10:56:58 Deselected as active
   50 Feb 10 10:56:58 Link-protection Down
   49 Feb 10 10:56:35 10.1.56.2: MPLS label allocation failure[2 times]
   48 Feb 10 10:48:32 Link-protection Up
   47 Feb 10 10:48:32 Selected as active path
[...Output truncated...]
```

Meaning Sample Output 1 shows the MPLS link-protection configuration on R1 for the LSP R1-to-R6.

Sample Output 2 shows that link protection came up and down several times. Link protection comes up when the LSP signals. Line 60 shows the result when RSVP is disabled on all alternate paths out of R6. Lines 68 to 70 are the result when the clear mpls lsp command is issued.

Cause This LSP event is caused by a failure or configuration change that deletes or resignals the bypass LSP. For example, you clear the LSP using the clear mpls lsp command, or you disable RSVP on all alternate paths for the LSP. The bypass LSP does not use the primary path, instead it looks for an alternate path.

Action Include the family mpls statement for all alternate paths for the LSP at the [edit interfaces type-fpc/pic/port.unit] hierarchy level.

Link Protection Up Event

LSP Event Link protection up

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 1, LSPname: R1-to-R6
  ActivePath:  (primary)
  Link protection desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 2)
 10.1.15.2 S 10.1.56.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.15.2(flag=1 Label=100048) 10.1.56.2(Label=3)
   48 Feb 10 10:48:32 Link-protection Up
   47 Feb 10 10:48:32 Selected as active path
```

```
   46 Feb 10 10:48:32 Link-protection Down
   45 Feb 10 10:48:32  Link-protection Up
   44 Feb 10 10:48:32 Record Route:  10.1.15.2(flag=1 Label=100048)
10.1.56.2(Label=3)
   43 Feb 10 10:48:32 Up
   42 Feb 10 10:48:32 Originate Call
   41 Feb 10 10:48:32 CSPF: computation result accepted
   40 Feb 10 10:48:32 Clear Call
[...Output truncated...]
```

Meaning This LSP event indicates that the bypass LSP used to provide local protection (link or node protection) was successfully signaled at the first hop.

Cause Not applicable.

Action Not applicable.

Originate Call Event

LSP Event Originate call

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   43 Jan  4 18:06:09 Record Route:  10.1.13.2 10.1.36.2
   42 Jan  4 18:06:09 Up
   41 Jan  4 18:06:09  Originate Call
   40 Jan  4 18:06:09 CSPF: computation result accepted
   39 Jan  4 18:05:40 CSPF failed: no route toward 10.0.0.6[2 times]
[...Output truncated...]
```

Meaning This LSP event indicates that the router is issuing an RSVP Path message.

Cause A Path message is transmitted by the ingress router toward the egress router to establish an LSP.

Action To analyze the contents of the Path message, enable RSVP tracing. To configure RSVP tracing, include the traceoptions statement at the [edit protocols rsvp] hierarchy level. Use the file statement to specify the name of the file that receives the output of the tracing operation. All files are placed in the directory /var/log. We recommend that you place RSVP tracing output in the file rsvp-log. To examine the contents of the rsvp-log file, issue the file show /var/log/rsvp-log command. For more information about the output of the tracing operation, see “Configuring CSPF Tracing” on page 71. For more information about RSVP messages see the *JUNOS MPLS Applications Configuration Guide*

Originate Make-Before-Break Call Event

LSP Event Originate make-before-break call

Sample Output

```
user@R1# run show mpls lsp extensive
Ingress LSP: 3 sessions

10.0.0.3
```

```
  From: 10.0.0.1, State: Up, ActiveRoute: 5, LSPname: R1-to-R3
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 1
  Autobandwidth
  MinBW: 155Mbps MaxBW: 155Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 392bps, Bandwidth Adjustment in 101 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                   State: Up
    Bandwidth: 140Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 10)
  10.1.13.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.13.2
   13 Feb 17 21:23:51 Manual Autobw adjustment failed
   12 Feb 17 21:23:51 CSPF failed: no route toward 10.0.0.3
   11 Feb 17 21:16:06 Record Route:  10.1.13.2
   10 Feb 17 21:16:06 Up
    9 Feb 17 21:16:06 Manual Autobw adjustment succeeded
    8 Feb 17 21:16:06  Originate make-before-break call
    7 Feb 17 21:16:06 CSPF: computation result accepted
    6 Feb 17 21:14:51 Selected as active path
    5 Feb 17 21:14:51 Record Route:  10.1.13.2
    4 Feb 17 21:14:51 Up
    3 Feb 17 21:14:51 Originate Call
    2 Feb 17 21:14:51 CSPF: computation result accepted
    1 Feb 17 21:14:22 CSPF failed: no route toward 10.0.0.3[4 times]
[...Output truncated...]
```

Meaning This LSP event indicates that a make-before-break operation is in progress, in which the label-switched router (LSR) signals a new path for the LSP and switches over to this path, tearing down the existing path.

Cause In an adaptive LSP, this LSP event is caused by a change in bandwidth or ERO. For an active LSP path, this LSP is caused by a change in reoptimization or autobandwidth adjustment.

Action Not applicable.

Record Route Event

LSP Event Record route

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
   58 Jan  5 09:54:37 Selected as active path
   57 Jan  5 09:54:37  Record Route:  10.1.13.2 10.1.36.2
   56 Jan  5 09:54:37 Up
   55 Jan  5 09:54:37 Originate Call
[...Output truncated...]
```

Meaning This LSP event indicates that the recorded route for the session was taken from the Record Route Object (RRO). Address 10.1.13.2 is the IP address of the transit router R3, and address 10.1.36.2 is the IP address of the egress router.

Cause Not applicable.

Action Not applicable.

ResvTear Received Event

LSP Event ResvTear received

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
    23 Dec 28 13:46:39 CSPF failed: no route toward 10.0.0.6
   22 Dec 28 13:46:39 Clear Call
   21 Dec 28 13:46:39  ResvTear received
   20 Dec 28 13:46:39 Down
   19 Dec 28 13:46:39 10.1.13.2: Session preempted
   18 Dec 28 13:42:07 Selected as active path
[...Output truncated...]
```

Meaning This LSP event indicates that an RSVP ResvTear message was received. ResvTear messages remove RSVP reservation states along a path. These messages travel upstream toward senders of the session. This message usually appears in the middle of a run of messages that tear the LSP down.

Cause In some cases, an ResvTear event is received because a router's reservation state times out. In other cases, when the downstream link fails, the upstream node must eliminate all RSVP states and initiates a ResvTear event. If you are running Fast ReRoute, the upstream node initiates a PathErr message, not a ResvTear message. It is beyond the scope of this document to include all possible reasons for an ResvTear event.

Action Analyze the status to determine if this is the required behavior. If this is not the required behavior, verify the surrounding LSP events to identify the cause of the problem.

RSVP Disabled Event

LSP Event RSVP disabled

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   49 Jan  4 18:10:44  RSVP Disabled
   48 Jan  4 18:10:44 RSVP error, subcode 4: protocol shutdown
   47 Jan  4 18:10:44 Down
[...Output truncated...]
```

Meaning This LSP event indicates that the RSVP was specifically disabled, as opposed to not configured.

Cause This is a local router error message indicating that the RSVP protocol was either disabled at the [edit protocols] hierarchy level, or an interface was omitted from the RSVP configuration.

Action To enable the RSVP protocol if it was disabled, enter the activate rsvp command at the [edit protocols] hierarchy level. If an interface was omitted from the RSVP configuration, include the interface at the edit protocols rsvp] hierarchy level.

RSVP Error Event

LSP Event RSVP error

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   50 Jan  4 18:10:44 CSPF: link down/deleted
10.1.13.1(R1.00/10.0.0.1)->10.1.13.2(R3.00/10.0.0.3)
   49 Jan  4 18:10:44 RSVP Disabled
   48 Jan  4 18:10:44  RSVP error
 , subcode 4: protocol shutdown
   47 Jan  4 18:10:44 Down
   46 Jan  4 18:06:15 Up
   45 Jan  4 18:06:15 Down
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
9 Jan 14 14:21:01 Deselected as active
8 Jan 14 14:21:01  10.0.22.2: RSVP error, subcode 4: protocol shutdown
7 Jan 14 14:21:01 ResvTear received
6 Jan 14 14:21:01 Down
5 Jan 14 12:35:16 Selected as active path
4 Jan 14 12:35:16 Record Route: 10.0.21.2 10.0.22.2 10.0.29.2
3 Jan 14 12:35:16 Up
2 Jan 14 12:35:16 Originate Call
1 Jan 14 12:35:16 CSPF: computation result accepted
[...Output truncated...]
```

Meaning This LSP event indicates that an RSVP error object was received and RSVP was disabled. For a list of error codes, see Table 22 on page 143. For more information on RSVP error codes, see RFC 2205, *Resource ReSerVation Protocol (RSVP), Version 1*, *Functional Specification,* or RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels*.

Cause Sample Output 1 shows that the protocol was disabled on the ingress router. Sample Output 2 shows that the router with the IP address 10.0.22.2 notified the ingress router that RSVP was disabled.

Action To bring the LSP back up, enable RSVP at the [edit protocols] hierarchy level.

Selected as Active Path Event

LSP Event Selected as active path

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   44 Jan  4 18:06:10  Selected as active path
   43 Jan  4 18:06:09 Record Route:  10.1.13.2 10.1.36.2
[...Output truncated...]
```

Meaning This LSP event indicates that the LSP is up and selected as the active path. Conversely, an LSP can be up, but not active. See "Up Event" on page 17 for more information.

Cause Not applicable.

Action Not applicable.

Session Preempted Event

LSP Event Session preempted

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
    21 Dec 28 13:46:39 ResvTear received
   20 Dec 28 13:46:39 Down
   19 Dec 28 13:46:39  10.1.13.2:   Session preempted
   18 Dec 28 13:42:07 Selected as active path
   17 Dec 28 13:42:07 Record Route:  10.1.13.2 10.1.36.2
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   66 Jan  5 09:58:33 CSPF failed: no route toward 10.0.0.6
   65 Jan  5 09:58:33 Clear Call
   64 Jan  5 09:58:33  Session preempted
   63 Jan  5 09:58:33 Down
   62 Jan  5 09:58:32  CSPF failed
 : no route toward 10.0.0.6[2 times]
61 Jan  5 09:57:55 10.1.36.2: Explicit Route: wrong delivery
   60 Jan  5 09:57:34 CSPF failed: no route toward 10.0.0.6[2 times]
   59 Jan  5 09:57:28 CSPF: link down/deleted
10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
[...Output truncated...]
```

Meaning This LSP event indicates that the LSP session was taken over. Sample Output 1 shows the IP address (10.1.13.2) included with the event, indicating the IP address of the router that sent the message. Sample Output 2 does not include an IP address, indicating that the message originated on the ingress router.

Cause The state of the network might have changed, as shown in Sample Output 1, or an LSP with a higher priority might be using the bandwidth of the LSP.

Action Refer to the events preceding this event in the history log for more information on what might have caused the preemption. For example, in line 62, the CSPF failed message may indicate that you specified a disable constrained-path (no-cspf) LSP and an explicit route address that is strict and not directly connected. Additionally, the egress router might have changed its configuration, making the destination address unreachable.

Up Event

LSP Event Up

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   48 Jan  4 18:10:44 RSVP error, subcode 4: protocol shutdown
   47 Jan  4 18:10:44 Down
   46 Jan  4 18:06:15  Up
   45 Jan  4 18:06:15 Down
[...Output truncated...]
```

Meaning This LSP event indicates the state of the LSP on January 4 at 1800 hours, 6 minutes, and 15 seconds. The LSP was able to forward traffic, but was not necessarily the active path, it was simply up. For example, an LSP can be up but not active when it is a secondary LSP configured with the standby statement at the [edit protocols mpls] hierarchy level. Similarly, a primary LSP may have failed while waiting for two retry intervals before the LSP reverts back from the secondary LSP to the primary LSP.

Cause Not applicable.

Action Not applicable.

Chapter 2

Understanding General LSP Error Events

This chapter describes general label-switched path (LSP) error events that might occur in the output of the show mpls lsp extensive command. Various network configurations demonstrate LSP error events. Descriptions typically include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

- Unknown Object Type Event on page 37
- Unsupported Traffic Class Event on page 38

LSP General Events

Problem This table provides the links and commands for general label-switched path (LSP) error events that might occur in the output of the show mpls lsp extensive command. Various network configurations demonstrate LSP error events. Descriptions typically include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take. (See Table 7 on page 20.)

Table 7: LSP General Events

Understanding LSP General Events Tasks	Possible Action or Command
"Displaying General LSP Error Events" on page 21	show mpls lsp extensive
1. Admission Control Failure Event on page 22	Not applicable.
2. Explicit Route: Bad Loose Route Event on page 22	Check the LSP configuration at the [edit protocols mpls] hierarchy level.
3. Explicit Route: Bad Strict Route Event on page 24	Examine the strict hop address, remove the no-cspf statement, or examine the path and verify that RSVP is enabled on each interface.
4. Explicit Route: Format Error Event on page 25	Analyze this event, and refer to events on either side to determine the appropriate action.
5. Explicit Route: Wrong Delivery Event on page 26	Take appropriate action: ■ Include the loopback (lo0) interface at the [edit protocols isis] hierarchy level. ■ Change the definition of the strict path at the [edit protocols mpls path path-name] hierarchy level. ■ Verify the validity of all IP addresses listed in the named path referenced by the LSP hop by hop.
6. Invalid Destination Address Event on page 27	Verify that the LSP destination address is not the local router's loopback address, and check that the addresses on the local router are correctly configured.
7. Invalid Filter for Policing Event on page 27	Not available.
8. MPLS Graceful Restart: Recovery Failed Event on page 28	Check the MPLS logs for more details about the failure.
9. MPLS Label Allocation Failure Event on page 28	Include interfaces at the [edit protocols mpls] hierarchy level, or include the family mpls statement at the [edit interfaces *type-fpc/pic/port*] hierarchy level.
10. Non-RSVP Capable Router Detected Event on page 29	Configure the router in question with RSVP.
11. No Route Toward Destination Event on page 29	Enable RSVP on the transit router's egress interface, or examine the IP configuration of the relevant router.

Table 7: LSP General Events *(continued)*

Understanding LSP General Events Tasks	Possible Action or Command
12. PathErr Received Event on page 30	Not available.
13. Path MTU Change Event on page 31	Not available.
14. Path Name Undefined or Disabled Event on page 31	Define the named path.
15. Requested Bandwidth Unavailable Event on page 32	Lower the bandwidth of the ingress LSP or traffic-engineer other LSPs off the path.
16. Requested Bandwidth Unavailable: Re-optimized Path on page 33	Provision more bandwidth for the LSP or lower the bandwidth of the ingress LSP or traffic-engineer other LSPs off the path.
17. Routing Loop Detected Event on page 33	Examine the strict hop addresses or examine the path in the ERO to determine the cause of the loop.
18. RSVP Error, Subcode 1: Bad Session Destination Address Event on page 34	Not available.
19. RSVP Error, Subcode 4: Protocol Shutdown Event on page 34	Check the RSVP configuration on the router in question.
20. RSVP Error, Subcode 6: No Non-lsp Route Event on page 35	Find the node with the error and confirm that the ERO route to the next hop takes an LSP next hop. Also, you can configure strict hops to avert the problem. For information about configuring strict hops, see the *JUNOS MPLS Applications Configuration Guide*.
21. TTL Expired Event on page 35	Not available.
22. Tunnel Local Repaired Event on page 36	Not available.
23. Unknown Object Class Event on page 37	Not available.
24. “Unknown Object Type Event” on page 37	Not available.
25. Unsupported Traffic Class Event on page 38	Not available.

Displaying General LSP Error Events

Purpose Display extensive information about LSPs, including the 50 most recent history events and the possible reasons why an LSP failed.

Action To examine error messages, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

```
user@host> show mpls lsp extensive
```

Sample Output

```
user@R1# run show mpls lsp extensive
Ingress LSP: 1 sessions
```

```
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn, No-decrement-ttl
    Bandwidth: 100Mbps
   14 Jan 21 15:43:39 Requested bandwidth unavailable[3 times]
   13 Jan 21 15:43:21 Deselected as active
   12 Jan 21 15:43:21  Requested bandwidth unavailable
   11 Jan 21 15:43:21 Clear Call
   10 Jan 21 15:42:32 Selected as active path
    9 Jan 21 15:42:32 Record Route:  10.1.12.2 10.1.26.2
    8 Jan 21 15:42:32 Up
[...Output truncated...]
```

Meaning The sample output from ingress router R1 is a section from the complete output. Typically, the output includes LSP events that led to an LSP failure and the 50 most recent state events. Only one example of a general LSP error event is displayed because it is impossible to provide all of the events described in this topic in one sequence of log history. For a detailed description of this error event, see "Requested Bandwidth Unavailable Event" on page 32.

For completeness, events not generated by the example network used throughout this book are described to show LSP events that might occur in your network. The output for these events includes the prompt user@host rather than the usual user@R1 prompt.

Admission Control Failure Event

LSP Event Admission control failure

Sample Output Not available.

Meaning This LSP error event indicates that a Resource Reservation Protocol (RSVP) Admission control failure occurred along the LSP path. This event is logged because of on an error notification (PathErr message) received from RSVP for the label-switched path.

Cause This LSP event is caused by inadequate bandwidth on a link along the LSP path. The available bandwidth could not satisfy the requested traffic parameters and no other sessions were pre-emptied to accommodate this request.

Action This error event is not generated by Juniper Networks routers. However, when this event is received by a Juniper Networks router, it appears in the log output of the show mpls lsp extensive command.

Explicit Route: Bad Loose Route Event

LSP Event Explicit Route: bad loose route

Sample Output 1

```
user@R1# run show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
From: 10.0.0.1, State: up, ActiveRoute: 0, LSPname: R1-R6-3
ActivePath: R6-3-1 (secondary)
LoadBalance: Random
Encoding type: Packet, Switching type: Packet,GPID: IPv4
Primry R6-3 State: Dn
10 Feb 15 21:21:58 Explicit Route: bad loose route[2 times]
9 Feb 15 21:21:52 Deselected as active
8 Feb 15 21:21:51 Explicit route: bad loose route
7 Feb 15 21:21:51 10.1.15.1: MPLS label allocation failure
6 Feb 15 21:21:51 MPLS label allocation failure
5 Feb 15 21:21:51 Down
4 Feb 15 21:20:55 Selected as active pathe
3 Feb 15 21:20:55 Record Route: 10.1.15.2 10.1.56.2
2 Feb 15 21:20:55 Up
1 Feb 15 21:20:55 Originate Call
*Secondary R6-3-1 State: Up
Received RRO (ProtectionFlag 1 = Available 2 = InUse 4 = B/W 8 = Node
10 = SoftPreempt):
10.1.12.2 10.1.26.2
4 Feb 15 21:21:52 Selected as active path
3 Feb 15 21:21:52 Record Route: 10.1.12.2 10.1.26.2
2 Feb 15 21:21:52 Up
1 Feb 15 21:21:52 Originate Call
Created: Tue Feb 15 21:20:55 2005
Total 3 displayed, Up 2, Down 1
```

Sample Output 2

```
user@R1# run show protocols mpls
label-switched-path R1-to-R6 {
to 10.0.0.6;
no-cspf;
link-protection;
primary to-R6;
}
label-switched-path R1-to-R6-2 {
to 10.0.0.6;
link-protection;
auto-bandwidth {
adjust-interval 300;
minimum-bandwidth 1;
maximum-bandwidth 1k;
}
}
label-switched-path R1-R6-3 {
to 10.0.0.6;
no-cspf;  <--Allows a loose ERO
primary R6-3;
secondary R6-3-1;
}
path to-R6 {
10.1.15.2 strict;
10.1.56.2 strict;
}
path R6-3 {
10.1.15.2 loose;   <--Loose ERO
}
path R6-3-1 {
```

```
10.1.12.2;
}
interface fxp0.0 {
disable;
}
interface all;
```

Meaning This LSP error event indicates that there is an error in the loose hop specified in the Explicit Route Object (ERO) of a Path message received by a label-switched router (LSR) along the LSP path, indicating an LSP setup failure.

Cause This LSP error event is caused by control plane unreachability or data plane incompatibility.

Action Check the LSP configuration at the [edit protocols mpls] hierarchy level.

Explicit Route: Bad Strict Route Event

LSP Event Explicit route: bad strict route

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   36 Jan  4 18:04:57 CSPF: link down/deleted 10.1.13.1(R1.00/10.0.0.1)
->10.1.13.2(R3.00/10.0.0.3)
   35 Jan  4 18:04:57 CSPF failed: no route toward 10.0.0.6
   34 Jan  4 18:04:57 Clear Call
   33 Jan  4 18:04:57  Explicit Route: bad strict route
   32 Jan  4 18:04:57 No Route toward dest
   31 Jan  4 18:04:57 Down
[...Output truncated...]
```

Sample Output 2

```
user@host> show mpls lsp extensive
Ingress LSP: 34 sessions

10.172.2.99
From: 10.172.162.18, State: Up, ActiveRoute: 3726, LSPname:
dcr2.den_to_dcr1.chd_P
ActivePath: P1_dcr2.den_to_dcr1.chd (primary)
LoadBalance: Random
Metric: 25
Encoding type: Packet, Switching type: Packet, GPID: IPv4
*Primary P1_dcr2.den_to_dcr1.chd State: Up
Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node
10=SoftPreempt):
10.70.192.134
16 Jun 28 18:27:51 Selected as active path
15 Jun 28 18:27:51 Record Route: 10.70.192.134
14 Jun 28 18:27:51 Up
13 Jun 28 18:27:29 Deselected as active
12 Jun 28 18:27:28 No Route toward dest
11 Jun 28 18:27:28 Down
10 Jun 18 03:52:18 Selected as active path
9 Jun 18 03:52:18 Record Route: 10.70.192.134
8 Jun 18 03:52:18 Up
7 Jun 18 03:52:18 Originate Call
6 Jun 18 03:52:18 Clear Call
5 Jun 18 03:52:18 Deselected as active
```

```
4 Jun 18 02:56:25 Selected as active path
3 Jun 18 02:56:25 Record Route: 10.70.192.134
2 Jun 18 02:56:25 Up
1 Jun 18 02:56:25 Originate Call
Standby B1_dcr2.den_to_dcr1.chd State: Dn
18 Jun 29 12:49:21 10.70.192.26: Routing loop detected[4798 times]
17 Jun 27 00:53:42 10.70.192.77:
Explicit Route: bad strict route
[20 times]
16 Jun 27 00:39:49 204.70.192.26:  Routing loop detected  [3370 times]
[...Output truncated...]
```

Meaning This LSP event indicates that a poorly formed ERO was generated. Sample Outputs 1 and 2 show that this LSP event was caused by different situations described below.

Cause This LSP event can be caused by several factors:

- A strict hop address specified for an LSP on a link that does not have RSVP enabled.
- The no-cspf statement included in the LSP configuration.
- An error with the configuration of constraints on a Constrained Shortest Path First (CSPF) LSP generates the CSPF: No route towards dest message, followed by the Explicit Route: bad strict route event.
- An ERO that causes a routing loop. See Sample Output 2.

Action Examine the strict hop address, remove the no-cspf statement, or examine the path and verify that RSVP is enabled on each interface.

Explicit Route: Format Error Event

LSP Event Explicit route: format error

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary   to-R6            State: Dn, No-decrement-ttl
    5 Jan 21 14:37:06 10.1.34.2:  Explicit Route: format error [2 times]
    4 Jan 21 14:37:03 Originate Call
    3 Jan 21 14:37:03 Clear Call
[...Output truncated...]
```

Meaning This LSP event indicates an LSP setup failure in which a Path message error in the the ERO was received by a router along the LSP path.

Cause This LSP event can be caused by several factors:

- An incorrectly formed ERO in the RSVP Path message.
- A strict hop address specified in the middle of an ERO that is not contiguous.

- An unsupported subobject in the ERO of a router along the LSP path.
- The hop indicated by the RSVP hop object does not match the hop indicated by the ERO.

Action Examine the strict hop address configuration and make any necessary changes.

Explicit Route: Wrong Delivery Event

LSP Event Explicit route: wrong delivery

Sample Output 1

```
user@host> show mpls lsp extensive
[...Output truncated...]
Primary use-TOKYO State: Dn, No-decrement-ttl
   3 Sep 19 00:25:45  10.222.45.2: Explicit Route: wrong delivery
   2 Sep 19 00:25:34 No Route[8 times]
   1 Sep 19 00:23:01 Originate Call
[...Output truncated...]
```

Sample Output 2

```
user@host> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary   to-R6            State: Dn
   40 Jan 26 16:35:26  10.1.36.2: Explicit Route: wrong delivery [2 times]
   39 Jan 26 16:35:23 Originate Call
   38 Jan 26 16:35:23 Clear Call
[...Output truncated...]
```

Sample Output 3

```
user@R1> show configuration protocols mpls
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    no-cspf;
    primary to-R6;
}
path to-R6 {
    10.1.13.2 strict;
     10.1.56.1 strict;      <<< IP address not directly connected to 10.1.13.2
    10.1.26.1 strict;
```

Meaning This LSP event indicates that a RSVP message with an ERO arrived at the wrong router, even though a strict route was specified. The receiving router determines that the address is inconsistent with the ERO, and generates the error message. Note that the IP address of the sending router precedes the error event; for example, 10.222.45.2 in Sample Output 1, and 10.1.36.2 in Sample Output 2.

Cause This LSP event can be caused by several factors:

- The loopback (lo0) interface on the ingress router is not configured at the [edit protocols isis] hierarchy level. After the loopback (lo0) interface is included in the Intermediate System-to-Intermediate System (IS-IS) configuration, and while IS-IS is forming adjacencies, an RSVP packet is forwarded to an incorrect destination, 10.222.45.2, as shown in Sample Output 1.

- A strict path is configured to a directly connected router, then another strict path is configured to an IP address that is not directly connected. For example, Sample Output 3 shows that the path to-R6 includes three IP addresses, one of which (10.1.56.1) is not directly connected to the other IP addresses in the path.

Action Take appropriate action. On the ingress router, include the loopback (lo0) interface at the [edit protocols isis] hierarchy level, change the definition of the strict path at the [edit protocols mpls path *path-name*] hierarchy level, or verify the validity of all IP addresses listed in the named path referenced by the LSP hop by hop.

Invalid Destination Address Event

LSP Event Invalid Dest addr

Sample Output

```
user@R1> show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.1
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Metric: 100
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
    4 Apr 22 10:22:15  Invalid Dest Addr
    3 Apr 22 10:22:15 Originate Call
    2 Apr 22 10:22:15 Invalid Dest Addr
    1 Apr 22 10:22:15 Originate Call
  Created: Fri Apr 22 10:22:16 2005
Total 1 displayed, Up 0, Down 1
```

Meaning This LSP event indicates that the to address configured at the [edit protocols mpls labeled-switched-path *name*] hierarchy level is invalid.

Cause This LSP event is caused when the to address of the LSP is the loopback address of the ingress router. A contributing factor may be that the no-cspf statement is included in the LSP configuration.

Action Verify that the LSP destination address is not the local router's loopback address, and check that the addresses on the local router are correctly configured.

Invalid Filter for Policing Event

LSP Event Invalid filter for policing

Sample Output Not available. This LSP event indicates an abnormal condition and is difficult to recreate.

Meaning Although a policer was configured on the LSP, the corresponding firewall filter index was not found, indicating a failure in the routing protocol process (rpd) or the firewall process (dfwd).

Cause A possible cause is that the routing protocol process (rpd) or the firewall process (dfwd) were restarted in a situation in which the LSP was established.

Action Not applicable.

MPLS Graceful Restart: Recovery Failed Event

LSP Event MPLS graceful restart: recovery failed

Sample Output Not available.

Meaning This LSP event indicates unsuccessful recovery of an LSP path after graceful restart, resulting in potential traffic loss.

Cause This LSP event is caused by several factors:

- MPLS graceful restart procedures may have been aborted by this LSR.
- MPLS graceful restart is disabled, by configuration, during the recovery period.
- An MPLS LSP path is disabled either due to a configuration change or due to an error during the recovery period.
- CSPF computation failed for the restarted LSP path with parameters and constraints preserved across the restart.
- A signaling failure occurred and an RSVP PathErr was received on the LSP path signaled after a restart.
- A network failure occurred on some hop that the LSP was traversing during the recovery period.

Action Check the MPLS logs for more details about the failure.

MPLS Label Allocation Failure Event

LSP Event MPLS label allocation failure

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   24 Jan 20 09:25:35 CSPF failed: no route toward 10.0.0.6
   23 Jan 20 09:25:35 Clear Call
   22 Jan 20 09:25:35 Deselected as active
   21 Jan 20 09:25:35  10.1.13.1: MPLS label allocation failure
   20 Jan 20 09:25:34  MPLS label allocation failure
   19 Jan 20 09:25:34 Down
[...Output truncated...]
```

Meaning This LSP event indicates that the MPLS protocol or the family mpls statement were not configured properly. When the LSP event is preceded by an IP address, the address is typically the router that has the MPLS configuration error.

Cause This LSP event is caused by the omission of interfaces at the [edit protocols mpls] hierarchy level or failure to configure the family mpls statement at the [edit interfaces

type-fpc/pic/port] hierarchy level. The family mpls statement specifies to the interface ASICs to permit protocol code 0x8847 (unicast MPLS) into the router.

Action Include interfaces at the [edit protocols mpls] hierarchy level, or include the family mpls statement at the [edit interfaces *type-fpc/pic/port*] hierarchy level. You must configure the family mpls statement, in the same way that you must configure the family iso statement for IS-IS.

NOTE: Do not configure the family mpls statement on the loopback (lo0) interface.

Non-RSVP Capable Router Detected Event

LSP Event Non-RSVP capable router detected

Sample Output

```
user@host> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                    State: Dn, No-decrement-ttl
   19 Jan 21 15:05:37 10.1.24.2:  Non-RSVP capable router detected
   18 Jan 21 15:04:52 10.1.26.2:  Non-RSVP capable router detected [4 times]
   17 Jan 21 15:04:34 Originate Call
   16 Jan 21 15:04:34 Clear Call
[...Output truncated...]
```

Meaning This LSP event indicates that a router, forwarding packets to the egress router, was not configured for RSVP.

Cause This LSP event might be caused when a router not configured for RSVP forwards an RSVP packet toward the egress router without decrementing the Send_TTL value in the RSVP common header. The next downstream router detects that the Send_TTL value and the IP_TTL value are different, and generates this LSP event. Note that two different routers generated the same error message at different times.

Action Configure the router in question with RSVP.

No Route Toward Destination Event

LSP Event No route toward destination

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
   35 Oct 26 22:48:36 Down
   34 Oct 26 22:48:29 CSPF failed: no route toward 10.0.0.1[4 times]
   33 Oct 26 22:47:25 CSPF: link down/deleted
10.1.13.2(R3.00/10.0.0.3)->10.1.13.1(R1.00/10.0.0.1)
   32 Oct 26 22:47:25 CSPF failed: no route toward 10.0.0.1
   31 Oct 26 22:47:25  10.1.36.1: No Route toward dest
```

```
   30 Oct 26 22:33:54 Selected as active path
   29 Oct 26 22:33:53 Record Route:  10.1.36.1 10.1.13.1
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
   From: 10.0.0.1 , State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
    Will be enqueued for recomputation in 7 second(s).
   13 Oct 25 16:29:28 Deselected as active
   12 Oct 25 16:29:27 CSPF failed: no route toward 10.0.0.6
   11 Oct 25 16:29:27 CSPF: link down/deleted
10.1.13.1(R1.00/10.0.0.1)->10.1.13.2(R3.00/10.0.0.3)
   10 Oct 25 16:29:27 CSPF failed: no route toward 10.0.0.6
    9 Oct 25 16:29:27 Clear Call
    8 Oct 25 16:29:27 Explicit Route: bad strict route
    7 Oct 25 16:29:27  No Route toward dest
    6 Oct 25 16:29:27 Down
[...Output truncated...]
```

Meaning This LSP event indicates that the router at address 10.1.36.1 in Sample Output 1 does not have a route to the specified destination. Sample Output 2 shows that the local router, ingress router 10.0.0.1, does not have a route to the specified destination.

Cause This LSP event is caused by different factors. The egress interface of a transit router might not have RSVP enabled, or IP reachability to the destination (either the egress router or the next address in the ERO) does not exist.

Action Enable RSVP on the transit router's egress interface, or examine the IP configuration of the relevant router.

PathErr Received Event

LSP Event PathErr received

Sample Output Not available.

Meaning This LSP error event indicates that an RSVP signaling error occurred along the LSP path and a PathErr message was sent back to the ingress LSR reporting the problem. If the failed link can be determined, depending on the RSVP signaling error reported, the failed link is not used while a new path is computed. This is an asynchronous event, occurring the first time the LSP is set up or after the LSP has been set up for some time.

Cause An RSVP signaling failure along the LSP path.

Action Not available.

Path MTU Change Event

LSP Event Path MTU change

Sample Output Not available.

Meaning This LSP event indicates that the RSVP path maximum transmission unit (MTU) value has changed and the MTU on the next hop was updated.

Cause Not available.

Action Not available.

Path Name Undefined or Disabled Event

LSP Event Path name undefined or disabled

Sample Output 1

```
user@host> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 0.0.0.0, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary   to-R6            State: Dn
        No computed ERO.
    1 Jan 26 16:40:49  Path name undefined or disabled [4 times]
[...Output truncated...]
```

Sample Output 2

```
user@host> show configuration protocols mpls
[...Output truncated...]
label-switched-path R1-to-R6 {
    to 10.0.0.6;
     primary to-R6;  <<< the path to-R6 is not defined
}
[...Output truncated...]
```

Sample Output 3

```
user@R1> show configuration protocols mpls
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    primary to-R6;
}
path to-R6;     <<< the path is now defined
[...Output truncated...]
```

Meaning This LSP event indicates that the ingress router referenced a named path, but did not define it. The configuration was committed, but with a warning message.

Cause This LSP event is caused when you configure a primary LSP, primary/secondary LSP, or static LSP, and do not define the named path. For example, the LSP path primary to-R6 (shown in Sample Output 2), is not defined at the [edit protocols mpls] hierarchy level. RSVP does not signal this message.

Action Define the named path at the [edit protocols mpls] hierarchy level, as shown in Sample Output 3. For each path, specify some or all transit routers in the path, or leave the path empty, as shown in Sample Output 3. For more information on the configuration of named paths, see the *JUNOS MPLS Applications Configuration Guide*.

Requested Bandwidth Unavailable Event

LSP Event Requested Bandwidth Unavailable

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn, No-decrement-ttl
    Bandwidth: 100Mbps
   14 Jan 21 15:43:39 Requested bandwidth unavailable[3 times]
   13 Jan 21 15:43:21 Deselected as active
   12 Jan 21 15:43:21  Requested bandwidth unavailable
   11 Jan 21 15:43:21 Clear Call
   10 Jan 21 15:42:32 Selected as active path
    9 Jan 21 15:42:32 Record Route:  10.1.12.2 10.1.26.2
    8 Jan 21 15:42:32 Up
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn, No-decrement-ttl
    Bandwidth: 100Mbps
   31 Jan 21 15:47:40   10.1.12.2: Requested bandwidth unavailable [2 times]
   30 Jan 21 15:47:37 Originate Call
   29 Jan 21 15:47:37 Clear Call
   28 Jan 21 15:47:37 Deselected as active
   27 Jan 21 15:45:12 Record Route:  10.1.12.2 10.1.26.2
   26 Jan 21 15:45:12 Up
[...Output truncated...]
```

Meaning This LSP event indicates that a router could not supply the requested bandwidth. Sample Output 1 was generated by the ingress router, while Sample Output 2 was generated by router 10.1.12.1, since the IP address precedes the LSP event.

Cause This LSP event is caused by the LSP requesting bandwidth that is not available in a router along the paths to the egress router.

Action Lower the bandwidth assignment of the ingress LSP below the amount of bandwidth available along the path to the egress router, or traffic-engineer other LSPs off the path that you want the ingress LSP to follow, freeing up the necessary bandwidth.

Requested Bandwidth Unavailable: Re-optimized Path

LSP Event Requested Bandwidth Unavailable: Re-optimized Path

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
11 Oct  4 18:12:01.437 192.168.38.22 Requested bandwidth
unavailable: re-optimized path
   10 Oct  4 18:11:37.395 Originate make-before-break call
    9 Oct  4 18:11:37.395 CSPF: computation result accepted
192.168.38.22 192.168.38.51
    8 Oct  4 18:11:37.395 CSPF: Reroute due to re-optimization
[...Output truncated...]
```

Meaning When an LSP path is re-optimized, the ingress router tries to establish the LSP on the optimized path. In some cases, path setup on the optimized path can fail due to call admission control (CAC) failure.

Cause This LSP event is caused by insufficient bandwidth over the LSP for the optimized path.

Action Take one of the following actions:

- Lower the bandwidth assignment of the ingress LSP below the amount of bandwidth available along the path to the egress router.
- Traffic-engineer other LSPs off the path that you want the ingress LSP to follow, freeing up the necessary bandwidth.
- Provision more bandwidth for the LSP.

Routing Loop Detected Event

LSP Event Routing loop detected

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary   to-R6            State: Dn, No-decrement-ttl
   10 Jan 21 14:40:19 10.1.12.1: Routing loop detected
    9 Jan 21 14:40:19 Originate Call
    8 Jan 21 14:40:19 Clear Call
    7 Jan 21 14:40:16  10.1.12.1: Routing loop detected
    6 Jan 21 14:40:16 Clear Call
[...Output truncated...]
```

Meaning This LSP error event indicates that the RSVP message has looped. The IP address of the router that detected the loop precedes the LSP event.

Cause The LSP error event is generated as part of a PathErr or ResvErr RSVP message when the packet goes through a router that is already listed in the Record Route Object

(RRO). The RRO keeps a record of every address that the RSVP Path or Resv message transits.

Action Examine the strict hop addresses or examine the path in the ERO to determine the cause of the loop.

RSVP Error, Subcode 1: Bad Session Destination Address Event

LSP Event RSVP error, subcode 1: Bad sess dst addr

Sample Output Not available.

Meaning This LSP error event is a Juniper Networks proprietary error that indicates failure of the RSVP session destination address at the egress LSR.

Cause This LSP error event can be caused by a number of situations. For example, the RSVP session destination is a link, and that link is down.

Action Not available.

RSVP Error, Subcode 4: Protocol Shutdown Event

LSP Event RSVP error, subcode 4: protocol shutdown

Sample Output

```
user@R1> show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Metric: 100
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                    State: Dn
    Will be enqueued for recomputation in 27 second(s).
   164 May 10 18:50:50 CSPF failed: no route toward 10.0.0.6[3 times]
   163 May 10 18:49:52 Clear Call
   162 May 10 18:49:52 CSPF: link down/deleted:
10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
   161 May 10 18:49:52 Deselected as active
   160 May 10 18:49:52  10.1.13.2: RSVP error, subcode 4: protocol shutdown
   159 May 10 18:49:52 ResvTear received
   158 May 10 18:49:52 Down
   157 May 10 18:48:19 Selected as active path
   156 May 10 18:48:19 Record Route:  10.1.13.2 10.1.36.2
   155 May 10 18:48:19 Up
[...Output truncated...]
  Created: Fri Apr 29 10:38:54 2005
Total 1 displayed, Up 0, Down 1
```

Meaning This LSP event is a Juniper Networks proprietary error and indicates that the RSVP control plane on an LSR along the path is terminated.

Cause This LSP event is caused when you disable an RSVP configuration, restart the routing protocol process (rpd), or load a new image on an LSR along the LSP path.

Action Check the RSVP configuration on the router in question.

RSVP Error, Subcode 6: No Non-lsp Route Event

LSP Event RSVP error, subcode 6: No non-lsp route

Sample Output

```
user@host> show mpls lsp extensive
Ingress LSP: 1 sessions

192.168.28.1
From: 192.168.0.1, State: Dn, ActiveRoute: 0, LSPname: sj-to-lo
ActivePath: (none)
LoadBalance: Random
Encoding type: Packet, Switching type: Packet, GPID: IPv4
Primary State: Dn
87 Sep 18 08:23:12 Deselected as active
86 Sep 18 08:23:12  RSVP error, subcode 6: No non-lsp route
85 Sep 18 08:23:12 Down
84 Sep 18 08:23:12 RSVP error, subcode 6: No non-lsp route
83 Sep 18 08:23:07 Selected as active path
82 Sep 18 08:23:07 Record Route: 10.0.1.1 10.0.24.2 10.0.29.1
81 Sep 18 08:23:07 Up
80 Sep 18 08:22:27 Deselected as active
79 Sep 18 08:22:27 RSVP error, subcode 6: No non-lsp route
78 Sep 18 08:22:27 Down
77 Sep 18 08:22:27 RSVP error, subcode 6: No non-lsp route
76 Sep 18 08:22:22 Selected as active path
75 Sep 18 08:22:22 Record Route: 10.0.1.1 10.0.24.2 10.0.29.1
74 Sep 18 08:22:22 Up
[...Output truncated...]
```

Meaning This LSP event indicates that RSVP Path messages for one LSP are tunneled into another RSVP LSP along the LSP path. Non-adjacent RSVP signaling is not currently supported on Juniper Networks LSRs, resulting in a path setup failure. This error is reported only by a Juniper Networks LSR.

Cause This LSP event is most likely to occur when an LSP configured with the no-cspf statement and loose hops is in a Multiprotocol Label Switching (MPLS) network configured with interior gateway protocol (IGP) shortcuts or LSP advertisements.

Action Find the node with the error and confirm that the ERO route to the next hop takes an LSP next hop. Also, you can configure strict hops to avert the problem. For information about configuring strict hops, see the *JUNOS MPLS Applications Configuration Guide*.

TTL Expired Event

LSP Event TTL expired

Sample Output Not available.

Meaning This LSP error event indicates that the time to live (TTL) in the RSVP header of a received Path message is zero.

Cause Not available.

Action Not available.

Tunnel Local Repaired Event

LSP Event Tunnel local repaired

Sample Output

```
10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 0, LSPname: R1-R6-3
  ActivePath:  (primary)
  FastReroute desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.12.2 S 10.1.26.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.12.2(flag=1) 10.1.26.2
   24 Feb 15 20:56:12 Record Route:  10.1.12.2(flag=1) 10.1.26.2
   23 Feb 15 20:56:11 Fast-reroute Detour Up
   22 Feb 15 20:56:09 Record Route:  10.1.12.2 10.1.26.2
   21 Feb 15 20:56:09 Up
   20 Feb 15 20:56:09 CSPF: computation result accepted
   19 Feb 15 20:56:09 CSPF: link down/deleted
10.1.15.1(R1.00/10.0.0.1)->10.1.15.2(R5.00/10.0.0.5)
   18 Feb 15 20:56:09 Record Route:  10.1.12.2 10.1.26.2
   17 Feb 15 20:56:09 Up
   16 Feb 15 20:56:08 CSPF: computation result accepted
   15 Feb 15 20:56:08  Tunnel local repaired
   14 Feb 15 20:56:08 CSPF: computation result accepted
   13 Feb 15 20:56:08 10.1.15.1: MPLS label allocation failure
   12 Feb 15 20:56:08 MPLS label allocation failure
   11 Feb 15 20:56:08 Record Route:  10.1.13.2 10.1.36.2
   10 Feb 15 20:56:08 Down
    9 Feb 15 20:52:56 Fast-reroute Detour Up
    8 Feb 15 20:52:53 Fast-reroute Detour Down
    7 Feb 15 20:50:00 Record Route:  10.1.15.2(flag=1) 10.1.56.2
    6 Feb 15 20:50:00 Fast-reroute Detour Up
    5 Feb 15 20:49:57 Selected as active path
    4 Feb 15 20:49:57 Record Route:  10.1.15.2 10.1.56.2
    3 Feb 15 20:49:57 Up
    2 Feb 15 20:49:56 Originate Call
    1 Feb 15 20:49:56 CSPF: computation result accepted
  Created: Tue Feb 15 20:49:56 2005
Total 3 displayed, Up 2, Down 1
```

Meaning This LSP error event indicates to the head-end (ingress) router that a local protection path was used when a link or node failed along the protected LSP path. Also, the LSR received a PathErr message from RSVP for the label-switched path.

Cause This LSP error event is caused by a network failure along an LSP path that is locally protected with either a bypass LSP or fast reroute detour. In this case, the failure occurred when the primary link was deactivated, resulting in the fast reroute detour repairing the tunnel.

Action Not available.

Unknown Object Class Event

LSP Event Unknown object class

Sample Output Not available. This LSP event indicates an abnormal condition and is difficult to recreate.

Meaning This LSP error event indicates that the LSR received a PathErr message from RSVP for the label-switched path.

Cause This LSP error event is caused when an LSR along the LSP path receives an RSVP object with a class number that is unsupported by the LSR.

Action Not available.

Unknown Object Type Event

LSP Event Unknown Object type: recovery label

Sample Output

```
user@R1> show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 100
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.15.2 S 10.1.56.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.15.2 10.1.56.2
   17 Mar 29 20:36:07 Selected as active path
   16 Mar 29 20:36:07 Record Route:  10.1.15.2 10.1.56.2
   15 Mar 29 20:36:07 Up
   14 Mar 29 20:36:07 Originate Call
   13 Mar 29 20:36:07 CSPF: computation result accepted
   12 Mar 29 20:35:37 CSPF failed: no route toward 10.0.0.6
   11 Mar 29 20:35:37 Clear Call
   10 Mar 29 20:35:37 Deselected as active
    9 Mar 29 20:35:37 Session preempted
    8 Mar 29 20:35:37 Down
    7 Mar 29 20:34:49 10.1.15.2:  Unknown Object type:recovery label
    6 Mar 29 20:29:09 Selected as active path
    5 Mar 29 20:29:09 Record Route:  10.1.15.2 10.1.56.2
```

Meaning This LSP error event indicates that the LSR received a PathErr message from RSVP for the label-switched path.

Cause This LSP event is caused when an LSR receives an RSVP object with a class type that the LSR does not support.

Action Not available.

Unsupported Traffic Class Event

LSP Event Unsupported traffic class

Sample Output Not available. This LSP event indicates an abnormal condition and is difficult to recreate.

Meaning This LSP error event is a Juniper Networks proprietary error, indicating that a DiffServ-traffic engineering (TE) LSP was signaled with one or more traffic classes with values greater than the four traffic classes currently supported.

Cause Not available.

Action Not available.

Chapter 3

Understanding CSPF Events

This chapter lists and describes Constrained Shortest Path First (CSPF) events that occur in the output of the show mpls lsp extensive command, including sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take to remedy the situation.

MPLS CSPF Events

Problem This table provides links and commands that describe Constrained Shortest Path First (CSPF) events that occur in the output of the show mpls lsp extensive command, including sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take to remedy the situation. (See Table 8 on page 39.)

Table 8: MPLS CSPF Events

Understanding CSPF Events Tasks	Possible Action or Command
"Displaying CSPF Events" on page 40	show mpls lsp extensive
1. CSPF Failed: No Route Toward Event on page 41	show ted database detail Determine if there is a route to the destination. [edit protocols mpls label-switched-path *lsp-path-name*] no-cspf

Table 8: MPLS CSPF Events *(continued)*

Understanding CSPF Events Tasks	Possible Action or Command
2. CSPF: Link Down/Deleted Event on page 43	Investigate possible causes for the link failure.
3. CSPF: Computation Result Accepted Event on page 43	Not applicable.
4. CSPF: Computation Result Ignored Event on page 43	Not applicable.
5. CSPF: Could Not Determine Self Event on page 44	Take appropriate action: ■ Enable traffic engineering ■ Configure the family iso statement or address statement ■ Include interfaces at the [edit interfaces], [edit protocols mpls], or [edit protocols isis] hierarchy level
6. CSPF: Can't Find Non-Overlapping Path Event on page 45	Not applicable.
7. CSPF: Reroute Due to Re-Optimization Event on page 45	Not applicable.
8. Retry Limit Exceeded Event on page 46	clear mpls lsp
9. CSPF Failed: Empty Route Event on page 47	Enter the correct IP address at the [edit protocols mpls label-switched-path *lsp-path-name*] hierarchy level.

Displaying CSPF Events

Purpose The ingress router determines the physical path for each LSP by applying a CSPF algorithm to the information in the traffic engineering database (TED). CSPF is a shortest-path-first (SPF) algorithm that has been modified to take into account specific restrictions when calculating the shortest path across a network. Links that do not comply with the restrictions are removed from the tree and cannot be factored into the resulting SPF calculations. When compliant routes cannot be found, the output of the CSPF algorithm is a CSPF event or error message that can appear in the output of the show mpls lsp extensive command.

Action To display CSPF messages, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

user@host> **show mpls lsp extensive**

Sample Output

```
user@R1# run show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
    Will be enqueued for recomputation in 3 second(s).
```

```
   68 Jan  5 10:02:56  CSPF failed: no route toward 10.0.0.6[9 times]
   67 Jan  5 09:58:33  Deselected as active
   66 Jan  5 09:58:33 CSPF failed: no route toward 10.0.0.6
   65 Jan  5 09:58:33 Clear Call
   64 Jan  5 09:58:33 Session preempted
   63 Jan  5 09:58:33 Down
   62 Jan  5 09:58:32 CSPF failed: no route toward 10.0.0.6[2 times]
   61 Jan  5 09:57:55 10.1.36.2: Explicit Route: wrong delivery
   60 Jan  5 09:57:34 CSPF failed: no route toward 10.0.0.6[2 times]
   59 Jan  5 09:57:28  CSPF: link down/deleted
10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
   58 Jan  5 09:54:37 Selected as active path
   57 Jan  5 09:54:37 Record Route:  10.1.13.2 10.1.36.2
   56 Jan  5 09:54:37 Up
   55 Jan  5 09:54:37 Originate Call
   54 Jan  5 09:54:37  CSPF: computation result accepted
[...Output truncated...]
```

Meaning The sample output from ingress router R1 shows extensive ingress LSP information, including LSP events that led to an LSP failure, with the most recent events at the top. The last line before the history log begins indicates the length of time the router waits before attempting to re-signal the LSP, three seconds in this instance.

LSP events in bold are described in this topic. Descriptions include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

For completeness, events not included in this example output are also described in this topic to show LSP events that did not occur in the example network configuration, but might occur in your network. The output for these events includes the prompt user@host rather than the usual user@R1 prompt.

CSPF Failed: No Route Toward Event

LSP Event CSPF failed: no route toward ip-address

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
Will be enqueued for recomputation in 3 second(s).
   68 Jan  5 10:02:56  CSPF failed: no route toward 10.0.0.6
[9 times]
   67 Jan  5 09:58:33  Deselected as active
   66 Jan  5 09:58:33 CSPF failed: no route toward 10.0.0.6
[...Output truncated...]
```

Meaning This LSP event indicates that the CSPF calculation on the ingress router R1 failed to find a route to the destination, in this case the egress router.

Cause The CSPF calculation to the destination can fail for many reasons, and failures occur frequently. The failures include, but are not limited to:

- A downstream node not configured for the Resource Reservation Protocol (RSVP) or Multiprotocol Label Switching (MPLS).
- The family mpls statement not configured on routers along the LSP path.

- The loopback (lo0) interface not configured at the [edit protocols isis] hierarchy level on the ingress or egress routers
- A faulty Explicit Route Object (ERO) that causes a loop or contains a bad address.

This event always includes an address it cannot reach. The listed address may be the LSP egress address, an ERO address, or an intermediate address.

Action Determine if the node is listed in the traffic engineering database with the show ted database detail command. If necessary, compare the LSP constraints of all links that lead to the address to determine if there is a route to the destination.

NOTE: The CSPF algorithm prunes the database of links that do not comply with LSP constraints, then computes the shortest path from the remaining links.

A ping to an address that is unreachable by CSPF follows the interior gateway protocol (IGP) shortest path, not the CSPF constraints. Therefore, using the ping command to verify the connection does not provide information about why CSPF failed.

To verify whether the problem is a constraint issue, configure your LSP with the no-cspf statement at the [edit protocols mpls label-switched-path *lsp-path-name*] hierarchy level, then determine if the router signals the LSP successfully. If it does, the traffic engineering database contains links that do not comply with your constraints for the LSP.

The CSPF algorithm follows these steps to select a path:

1. Compute LSPs one at a time, beginning with the highest priority LSP (the one with the lowest setup priority value). Among LSPs of equal priority, CSPF starts with those that have the highest bandwidth requirement.
2. Prune the traffic engineering database of all links that are not full duplex and do not have sufficient reservable bandwidth.
3. If the LSP configuration includes the include statement, prune all links that do not share any included colors.
4. If the LSP configuration includes the exclude statement for the LSP, prune all links that contain excluded colors and do not contain a color.
5. Find the shortest path towards the LSP's egress router, taking into account explicit-path constraints. For example, if the path must pass through Router A, two separate SPFs are computed, one from the ingress router to Router A, the other from Router A to the egress router.
6. If several paths have equal cost, choose the path whose last-hop address is the same as the LSP's destination.
7. If several equal-cost paths remain, select the path with the fewest number of hops.
8. If several equal-cost paths remain, apply the CSPF load-balancing rule configured on the LSP (least-fill, most-fill, or random).

CSPF: Link Down/Deleted Event

LSP Event CSPF: link down/deleted

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
60 Jan  5 09:57:34 CSPF failed: no route toward 10.0.0.6[2 times]
   59 Jan  5 09:57:28  CSPF: link down/deleted
 10.1.36.1(R3.00/10.0.0.3)->10.1.36.2(R6.00/10.0.0.6)
[...Output truncated...]
```

Meaning This LSP event indicates that the traffic engineering database no longer includes this link.

Cause CSPF: computation result accepted

The link probably failed.

Action Investigate possible causes for the link failure. For more information on checking the physical layer, see the *JUNOS MPLS Network Operations Guide*.

CSPF: Computation Result Accepted Event

LSP Event CSPF: computation result accepted

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
  57 Jan  5 09:54:37 Record Route:  10.1.13.2 10.1.36.2
   56 Jan  5 09:54:37 Up
   55 Jan  5 09:54:37 Originate Call
   54 Jan  5 09:54:37  CSPF: computation result accepted
[...Output truncated...]
```

Meaning This LSP event indicates that CSPF pruned the traffic engineering database of noncompliant links and found a shortest path. CSPF generated an ERO, which was then passed to the RSVP.

Cause Not applicable.

Action Not applicable

CSPF: Computation Result Ignored Event

LSP Event CSPF: computation result ignored

Sample Output

```
user@host> show mpls lsp extensive
[...Output truncated...]
34 May  8 13:27:39 CSPF failed: no route toward 10.11.2.10
   33 May  8 13:27:39 CSPF: link down/deleted
0.0.0.0(eagle.04/0.0.0.0)->0.0.0.0(papst.00/10.255.11.215)
   32 May  8 13:27:12  CSPF: computation result ignored
 [16 times]
```

```
   31 May  8 13:19:35 Record Route:  10.11.1.9(flag=9 Label=100064)
10.11.1.2(flag=9 Label=100048) 10.11.2.1(flag=1 Label=100048)
[...Output truncated...]
```

Meaning This LSP event indicates that during reoptimization, a CSPF path computation for a potential optimal path is performed. Various checks are carried out to evaluate whether the new path is better than the existing one. If the new path is not considered to be better, the CSPF computation results for the new path are ignored and the new path is not signaled.

Cause There can be various reasons for ignoring computation of a potential optimal path:

- The optimization is purely metric based, so switching to the new path could increase bandwidth congestion on links.
- Switching to the new path could cause preemption.
- The metric of the new path is higher than that of the existing path.
- The metric is the same on the new and existing paths, but the number of hops in the new path is higher than on the existing path.

Action Not applicable.

CSPF: Could Not Determine Self Event

LSP Event CSPF: could not determine self

Sample Output 1

```
user@host# run show ted database extensive
TED database: 10 ISIS nodes
9 INET nodes NodeID: HongKong.00(192.168.16.1)
Type
: --- , Age: 148 secs, LinkIn: 1, LinkOut: 0
```

Sample Output 2

```
user@R1# run show ted database detail
TED database: 6 ISIS nodes 6 INET nodes
NodeID: R1.00(10.0.0.1)
  Type: ---, Age: 654 secs, LinkIn: 3, LinkOut: 0
NodeID: R2.00(10.0.0.2)
   Type: Rtr
 , Age: 642 secs, LinkIn: 3, LinkOut: 4
  Protocol: IS-IS(2)
```

Sample Output 3

```
user@host> show mpls lsp extensive
[...Output truncated...]
192.168.32.1
   From: 0.0.0.0 , State: Dn, ActiveRoute: 0, LSPname: HK->AM
  ActivePath: (none)
  FastReroute desired
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary use-TOKYO State: Dn, No-decrement-ttl
  Will be enqueued for recomputation in 22 second(s).
  1 Sep 19 00:16:22  CSPF: could not determine self
[...Output truncated...]
```

Meaning This LSP event indicates that the traffic engineering database cannot determine the address of the local router. Sample Outputs 1 and 2 show the entry in the traffic engineering database where the node entry Type: — does not indicate a type of router (Rtr) or pseudonode (Net) address. Since the node does not know what type it is, it cannot know its own address.

Cause This LSP event can be caused by several factors. Traffic engineering might not be configured for OSPF, the loopback (lo0) interface might not have the family ISO or an ISO address configured, or the loopback interface might not be included at the [edit interfaces] hierarchy level.

Note that in Sample Output 3, the source address of the LSP is 0.0.0.0 since the node does not know its own address. When the From address is 0.0.0.0, it can indicate that interfaces are not included at the [edit protocols mpls] or the [edit protocols isis] hierarchy level.

Action Take the corrective action appropriate to the situation: enable traffic engineering, configure the family iso statement or address statement, or include interfaces at the [edit interfaces], [edit protocols mpls], or [edit protocols isis] hierarchy level.

CSPF: Can't Find Non-Overlapping Path Event

LSP Event CSPF: Can't find non-overlapping path to *ip-address*

Sample Output

```
user@host> show mpls lsp extensive
[...Output truncated...]
Standby    test1           State: Dn
     Bandwidth: 80Mbps
     Will be enqueued for recomputation in 22 second(s).
     1 Apr 9 21:10:47  CSPF: Can't find non-overlapping path to 10.0.3.4
 [2 times]
  Created: Wed Apr 9 20:40:16 2003
Total 1 displayed, Up 1, Down 0
[...Output truncated...]
```

Meaning This LSP event indicates that CSPF needed to compute an alternate path that did not intersect any other path.

Cause This error appears when running the adaptive feature to run shared explicit (SE)-style reservations, where no nonoverlapping paths are possible.

Action Not applicable.

CSPF: Reroute Due to Re-Optimization Event

LSP Event CSPF: Reroute due to re-optimization

Sample Output

```
user@host> show mpls lsp extensive
[...Output truncated...]
9 Dec 11 17:32:35  Up
    8 Dec 11 17:32:35  Clear Call
    7 Dec 11 17:32:35  CSPF: computation result accepted
```

```
    6 Dec 11 17:32:35   CSPF: Reroute due to re-optimization
    5 Dec 11 17:28:29  CSPF: computation result ignored
    4 Dec 11 17:24:23  Record Route:  10.35.38.2 S 192.168.135.29 S
10.35.39.1 S 10.35.40.2 S 10.35.41.1 S
    3 Dec 11 17:24:23  Up
[...Output truncated...]
```

Meaning This LSP event indicates that CSPF found an optimal path for LSP traffic, and switched over to the new path.

Cause This is a periodic or one-time reoptimization event.

Action Not applicable.

Retry Limit Exceeded Event

LSP Event Retry limit exceeded

Sample Output 1

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
     RetryCount: 13
     RetryLimit: 1
   12 Jan 14 15:39:30 Clear Call
   11 Jan 14 15:39:30  Retry limit exceeded
   10 Jan 14 15:39:10 10.1.12.1: MPLS label allocation failure[11 times]
[...Output truncated...]
```

Sample Output 2

```
user@R1> show mpls lsp extensive
[...Output truncated...]
10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
   14 Jan 14 15:44:07 10.1.12.1: MPLS label allocation failure[3 times]
   13 Jan 14 15:43:58 Originate Call
   12 Jan 14 15:39:30 Clear Call
   11 Jan 14 15:39:30  Retry limit exceeded
   10 Jan 14 15:39:10 10.1.12.1: MPLS label allocation failure[11 times]
[...Output truncated...]
```

Meaning This LSP event indicates that the number of CSPF path computations for a particular path exceeded a configured retry limit. After this point, the path is not recomputed or signaled, unless the user intervenes.

Cause The number of CSPF path computations for an LSP path exceeded the configured non-zero retry limit. Sample Output 1 shows that a configured retry limit of 1 was exceeded by the retry count of 13.

Action Enter the clear mpls lsp command to disconnect and restart the LSP. Sample Output 2 shows that events 13 and 14 were generated after the clear mpls lsp command was issued. This operation disconnects existing RSVP sessions on the ingress router, releases the routes and states associated with the LSPs, and starts a new LSP. Issuing this command might impact traffic travelling along the LSP, because of a time lag that can occur between the old path being torn down and the new path being set up.

CSPF Failed: Empty Route Event

LSP Event CSPF failed: empty route

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
From: 10.0.0.1 , State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                    State: Dn
    Will be enqueued for recomputation in 23 second(s).
    1 Jan 13 12:59:47  CSPF failed: empty route 10.0.0.1
  Created: Thu Jan 13 12:59:48 2005
Total 1 displayed, Up 0, Down 1
[...Output truncated...]
```

Meaning This LSP event indicates that the destination route for the LSP is incorrect.

Cause The IP address in the to statement at the [edit protocols mpls label-switched-path *lsp-path-name*] hierarchy level is incorrectly configured as the loopback (lo0) interface of this router itself, as indicated by the From address (10.0.0.1) which is identical to the empty route address (10.0.0.1).

Action Enter the correct IP address for the egress router at the [edit protocols mpls label-switched-path *lsp-path-name*] hierarchy level.

Chapter 4

Understanding Autobandwidth Events

Multiprotocol Label Switching (MPLS) autobandwidth automatically adjusts the bandwidth size of an MPLS traffic-engineered tunnel based on the actual traffic flowing through the tunnel. Autobandwidth success and failure is logged in the output of the show mpls lsp extensive command. For more information on autobandwidth, see the *JUNOS MPLS Applications Configuration Guide*.

This chapter lists and describes autobandwidth events that occur in the output of the show mpls lsp extensive command, including sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any specific actions that you can take to remedy the situation.

MPLS Autobandwidth Events

This table provides links and commands for working with autobandwidth events that occur in the output of the show mpls lsp extensive command, including sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any specific actions that you can take to remedy the situation.

Table 9 on page 49 provides commands for understanding autobandwidth events.

Table 9: MPLS Autobandwidth Events

Understanding Autobandwidth Events Tasks	Possible Action or Command
"Displaying Autobandwidth Events" on page 50	show mpls lsp extensive
"Manual Autobandwidth Adjustment" on page 53	
1. Manual Autobandwidth Adjustment Failed Event on page 53	Take the corrective action appropriate to the situation: ■ Verify the MPLS and RSVP configurations on all available paths to the LSP endpoint. ■ Check available bandwidth on alternate paths using the show rsvp interface command.
2. Manual Autobandwidth Adjustment Succeeded Event on page 54	Not applicable.
"Automatic Autobandwidth Adjustment" on page 55	

Table 9: MPLS Autobandwidth Events *(continued)*

Understanding Autobandwidth Events Tasks	Possible Action or Command
1. Automatic Autobandwidth Adjustment Failed Event on page 56	Take action appropriate to the situation: ■ Verify the MPLS and RSVP configurations on all available paths to the LSP endpoint. ■ Check available bandwidth on alternate paths using the show rsvp interface command.
2. Automatic Autobandwidth Adjustment Succeeded Event on page 57	Not applicable.

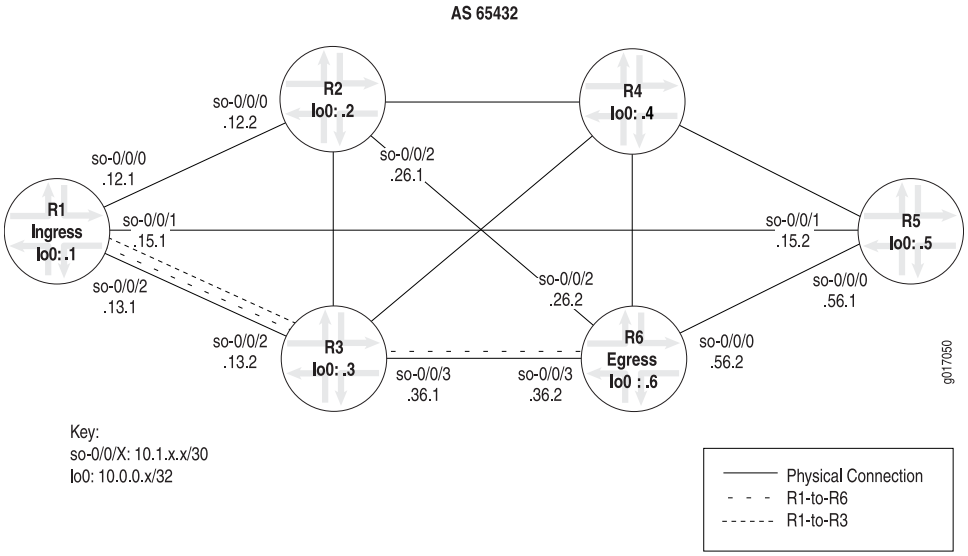
Displaying Autobandwidth Events

Purpose Automatic autobandwidth allocation allows an MPLS tunnel to automatically adjust its bandwidth allocation based on the volume of traffic flowing through the tunnel. Bandwidth allocation is adjusted according to a specified time interval when current maximum average bandwidth usage is compared with the allocated bandwidth for the LSP. If the bandwidth needs adjustment, a path with the new adjusted bandwidth is computed. The LSP's traffic is routed through the new path and the old path is removed.

Manual autobandwidth adjustment is used on the active LSP path when you do not wish to wait for the specified time interval to trigger an autobandwidth adjustment. The minimum specified time interval is 5 minutes (300 seconds) for MPLS LSP automatic bandwidth allocation adjustment. For more information on configuring autobandwidth, see the *JUNOS MPLS Applications Configuration Guide*.

Autobandwidth success and failure is logged in the output of the show mpls lsp extensive command. Figure 1 on page 51 illustrates the example MPLS network used in this chapter to demonstrate autobandwidth LSP events.

Figure 1: MPLS Network Topology Configured with Autobandwidth



The MPLS network in Figure 1 on page 51 illustrates a router-only network with SONET interfaces that consists of the following components:

- A full-mesh interior BGP (IBGP) topology, using AS 65432.
- MPLS is enabled on all routers.
- Autobandwidth is configured on ingress router R1.
- To produce the autobandwidth events, Resource Reservation Protocol (RSVP) is disabled on interfaces that could provide an alternate route for the LSP.
- A policy is configured on ingress router R1 that advertises new routes into the network.
- An LSP is established between routers R1 and R3, R1-to-R3.
- An LSP is established between router R1 and R6, R1-to-R6.

The network shown in Figure 1 on page 51 is a BGP full-mesh network. Since route reflectors and confederations are not used to propagate BGP learned routes, each router must have a BGP session with every other router running BGP.

Action To display autobandwidth events, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

```
user@host> show mpls lsp extensive
```

Sample Output 1

```
user@R1# run show mpls lsp extensive
Ingress LSP: 3 sessions

10.0.0.3
  From: 10.0.0.1, State: Up, ActiveRoute: 5, LSPname: R1-to-R3
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 1
  Autobandwidth
```

```
  MinBW: 155Mbps MaxBW: 155Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 392bps, Bandwidth Adjustment in 101 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Bandwidth: 140Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 10)
 10.1.13.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.13.2
   13 Feb 17 21:23:51  Manual Autobw adjustment failed
   12 Feb 17 21:23:51 CSPF failed: no route toward 10.0.0.3
   11 Feb 17 21:16:06 Record Route:  10.1.13.2
   10 Feb 17 21:16:06 Up
    9 Feb 17 21:16:06  Manual Autobw adjustment succeeded
    8 Feb 17 21:16:06 Originate make-before-break call
    7 Feb 17 21:16:06 CSPF: computation result accepted
    6 Feb 17 21:14:51 Selected as active path
    5 Feb 17 21:14:51 Record Route:  10.1.13.2
    4 Feb 17 21:14:51 Up
    3 Feb 17 21:14:51 Originate Call
    2 Feb 17 21:14:51 CSPF: computation result accepted
    1 Feb 17 21:14:22 CSPF failed: no route toward 10.0.0.3[4 times]
[...Output truncated...]
```

Sample Output 2

```
user@R1>
 show configuration protocols mplsstatistics {
    file auto-bw.log;
    interval 5;
    auto-bandwidth;
}
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    auto-bandwidth {
        adjust-interval 300;
        adjust-threshold 10;
        minimum-bandwidth 5m;
        maximum-bandwidth 80m;
    }
}
label-switched-path R1-to-R3 {
    to 10.0.0.3;
    auto-bandwidth {
        adjust-interval 300;
        adjust-threshold 10;
        minimum-bandwidth 155m;
        maximum-bandwidth 155m;
    }
}
```

Meaning Sample Output 1 from ingress router R1 shows extensive ingress LSP information, including LSP events that led to an LSP failure, with the most recent events at the top.

The autobandwidth LSP events in bold are described in this chapter. Descriptions include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any specific actions that you can take.

For completeness, autobandwidth events not included in this example output are also described in this chapter.

Sample Output 2 shows the configuration of autobandwidth on ingress router R1. LSP R1-to-R3 is configured with 155 MB of bandwidth, and LSP R1-to-R6 is configured with 5 MB of bandwidth. The autobandwidth failure events described in this chapter are created as follows:

- RSVP is disabled on all links except for the links used for the LSP.
- Traffic is sent along LSP R1-to-R6.
- The adjust interval for the LPS R1-to-R3 expires, resulting in no valid usable paths, except for the existing path configured with 155 MB of bandwidth.

Manual Autobandwidth Adjustment

Manual autobandwidth adjustment is used on the active LSP path when you wish to trigger an autobandwidth adjustment before the next specified automatic bandwidth adjustment.

NOTE: Request for manual autobandwidth adjustment is a feature introduced in JUNOS software Release 7.0.

To manually trigger a bandwidth allocation adjustment, use the request mpls lsp adjust-autobandwidth command. You can trigger the command for all affected LSPs on the router, or you can specify a particular LSP. Once you execute the request mpls lsp adjust-autobandwidth command, the automatic bandwidth adjustment validation process is triggered. If all the criteria for adjustment are met, the LSP's active path bandwidth is adjusted to the set bandwidth value determined during the validation process.

For more information on configuring autobandwidth, see the *JUNOS MPLS Applications Configuration Guide*.

Autobandwidth success and failure is logged in the output of the show mpls lsp extensive command. The following manual autobandwidth adjustment events are included in this section:

Manual Autobandwidth Adjustment Failed Event

LSP Event Manual Autobw adjustment failed

Sample Output

```
user@R1> show mpls lsp extensive
Ingress LSP: 3 sessions

10.0.0.3
  From: 10.0.0.1, State: Up, ActiveRoute: 5, LSPname: R1-to-R3
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 1
```

```
  Autobandwidth
  MinBW: 155Mbps MaxBW: 155Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 392bps, Bandwidth Adjustment in 101 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Bandwidth: 140Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 10)
 10.1.13.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

         10.1.13.2
    13 Feb 17 21:23:51  Manual Autobw adjustment failed
   12 Feb 17 21:23:51 CSPF failed: no route toward 10.0.0.3
   11 Feb 17 21:16:06 Record Route:  10.1.13.2
   10 Feb 17 21:16:06 Up
[...Output truncated...]
```

Meaning This LSP event indicates that autobandwidth adjustment was triggered manually for the LSP using the request mpls lsp adjust-autobandwidth name *name* command. This adjustment failed, and the LSP continued on the existing path with its current bandwidth. Manual autobandwidth adjustment is a JUNOS Release 7.0 feature that enables you to issue the request mpls lsp adjust-autobandwidth name *name* command to manually adjust the bandwidth.

Cause This LSP event is caused by a Constrained Shortest Path First (CSPF) computation failure or a signaling failure on the new path. When you issue the request mpls lsp adjust-autobandwidth name *name* command, the current maximum average bandwidth usage is compared to the allocated bandwidth for the LSP. If the LSP needs more bandwidth, an attempt is made to set up a new path where bandwidth is equal to the current maximum average usage. If the attempt is successful, traffic on the LSP is routed through the new path and the old path is removed in a make-before-break fashion. If the attempt fails, the traffic on the LSP continues to use its current path.

Action Take the corrective action appropriate to the situation:

- Verify the MPLS and RSVP configurations on all available paths to the LSP endpoint. For more information on verifying the MPLS and RSVP configurations, see the *JUNOS MPLS Network Operations Guide*.
- Check available bandwidth on alternate paths using the show rsvp interface command. If not enough bandwidth is available on any available paths, adjust the minimum-bandwidth parameter for the LSP in order to establish or adjust the priority to allow the LSP to preempt another LSP of lesser priority. For an LSP to be preempted, its hold priority must be lower than the LSP you are trying to establish.

Manual Autobandwidth Adjustment Succeeded Event

LSP Event Manual Autobw adjustment succeeded

Sample Output

```
user@R1> show mpls lsp extensive
[...Output truncated...]
user@R1> request mpls lsp adjust-autobandwidth name R1-to-R6
```

```
user@R1> show mpls lsp extensive
Ingress LSP: 3 sessions

10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 4, LSPname: R1-to-R6
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 1
  Autobandwidth
  MinBW: 5Mbps MaxBW: 80Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 736bps, Bandwidth Adjustment in 65 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Bandwidth: 5Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.13.2 S 10.1.36.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

         10.1.13.2 10.1.36.2
   11 Feb 17 21:16:22 Record Route:  10.1.13.2 10.1.36.2
   10 Feb 17 21:16:22 Up
    9 Feb 17 21:16:22  Manual Autobw adjustment succeeded
    8 Feb 17 21:16:22 Originate make-before-break call
    7 Feb 17 21:16:22 CSPF: computation result accepted
    6 Feb 17 21:14:51 Selected as active path
    5 Feb 17 21:14:51 Record Route:  10.1.13.2 10.1.36.2
    4 Feb 17 21:14:51 Up
    3 Feb 17 21:14:51 Originate Call
    2 Feb 17 21:14:51 CSPF: computation result accepted
    1 Feb 17 21:14:22 CSPF failed: no route toward 10.0.0.6[4 times]
[...Output truncated...]
```

Meaning This LSP event indicates that the autobandwidth adjustment is triggered manually for the LSP using the request mpls lsp adjust-autobandwidth command. A new path for the LSP with the adjust bandwidth is successfully computed and signaled, resulting in the LSP (and traffic) switching over to the new adjusted path

Cause When the CLI command to trigger the manual adjustment is issued, the autobandwidth adjustment validation runs. The current maximum average bandwidth usage is compared to the allocated bandwidth for the LSP. If the LSP needs more bandwidth, an attempt is made to set up a new path where bandwidth is equal to the current maximum average usage. If the attempt is successful, the LSP's traffic is routed through the new path and the old path is removed in a make-before-break fashion. If the attempt fails, the LSP continues to use its current path.

Action No action needed. Manual autobandwidth adjustment succeeded.

Automatic Autobandwidth Adjustment

Automatic autobandwidth allocation allows an MPLS tunnel to automatically adjust its bandwidth allocation based on the volume of traffic flowing through the tunnel. Bandwidth allocation is adjusted according to a specified time interval. At the end of the time interval specified at the [edit protocols mpls label-switched-path auto-bandwidth] hierarchy level, the current maximum average bandwidth usage is compared with the allocated bandwidth for the LSP. If the LSP needs more bandwidth,

an attempt is made to set up a new path where bandwidth is equal to the current maximum average usage. If the attempt is successful, the LSP's traffic is routed through the new path and the old path is removed. If the attempt fails, the LSP continues to use its current path.

For more information on configuring autobandwidth, see the *JUNOS MPLS Applications Configuration Guide*.

Autobandwidth success and failure is logged in the output of the show mpls lsp extensive command. The following manual autobandwidth adjustment events are included in this section:

Automatic Autobandwidth Adjustment Failed Event

LSP Event Autobw adjustment failed

Sample Output 1

```
user@R1> show configuration protocols mpls
statistics {
    file auto-bw.log;
    interval 5;
    auto-bandwidth;
}
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    auto-bandwidth {
        adjust-interval 300;
        adjust-threshold 10;
        minimum-bandwidth 5m;
        maximum-bandwidth 80m;
    }
}
label-switched-path R1-to-R3 {
    to 10.0.0.3;
    auto-bandwidth {
        adjust-interval 300;
        adjust-threshold 10;
        minimum-bandwidth 155m;
        maximum-bandwidth 155m;
    }
}
```

Sample Output 2

```
user@R1> show mpls lsp extensive
Ingress LSP: 3 sessions

10.0.0.3
  From: 10.0.0.1, State: Up, ActiveRoute: 5, LSPname: R1-to-R3
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 1
  Autobandwidth
  MinBW: 155Mbps MaxBW: 155Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 192bps, Bandwidth Adjustment in 219 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 10)
 10.1.13.2 S
```

```
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.13.2
     7 Feb 17 15:41:12  Autobw adjustment failed
     6 Feb 17 15:41:12 CSPF failed: no route toward 10.0.0.3
     5 Feb 17 15:36:23 Selected as active path
     4 Feb 17 15:36:23 Record Route:  10.1.13.2
     3 Feb 17 15:36:23 Up
     2 Feb 17 15:36:23 Originate Call
     1 Feb 17 15:36:23 CSPF: computation result accepted
  Created: Thu Feb 17 15:36:23 2005
[...Output truncated...]
```

Meaning This LSP event indicates that a periodic (timer-based) autobandwidth adjustment for the LSP is triggered at the end of the adjust interval. The adjustment fails, and the LSP stays up on the existing path with its current bandwidth.

Cause Adjustment failure may be due to a path CSPF computation failure with the adjust bandwidth or a signaling failure on the new path.

At the end of the time interval specified at the [edit protocols mpls label-switched-path auto-bandwidth] hierarchy level, the current maximum average bandwidth usage is compared to the allocated bandwidth for the LSP. If the LSP needs more bandwidth, an attempt is made to set up a new path where bandwidth is equal to the current maximum average usage. If the attempt is successful, the LSP's traffic is routed through the new path and the old path is removed. If the attempt fails, the LSP continues to use its current path.

Action Take action appropriate to the situation:

- Verify the MPLS and RSVP configuration on all available paths to the LSP endpoint.
- Check available bandwidth on alternate paths using the show rsvp interface command. If not enough bandwidth is available on any available paths, adjust the minimum-bandwidth parameter for the LSP in order to establish or adjust the priority to allow the LSP to preempt another LSP of lesser priority. For an LSP to be preempted, its hold priority must be lower than the LSP you are trying to establish.

Automatic Autobandwidth Adjustment Succeeded Event

LSP Event Autobw adjustment succeeded

Sample Output 1

```
user@R1> show configuration protocols mpls
statistics {
    file auto-bw.log;
    interval 5;
    auto-bandwidth;
}
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    auto-bandwidth {
        adjust-interval 300;
        adjust-threshold 10;
        minimum-bandwidth 10m;
```

```
        maximum-bandwidth 80m;
    }
}
```

Sample Output 2

```
user@host> show mpls lsp extensive
[...Output truncated...]
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath:  (primary)
  LoadBalance: Random
  Autobandwidth
  MinBW: 10Mbps MaxBW: 80Mbps
  AdjustTimer: 300 secs AdjustThreshold: 10%
  Max AvgBW util: 0bps, Bandwidth Adjustment in 282 second(s).
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Bandwidth: 10Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.13.2 S 10.1.36.2 S
   Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

         10.1.13.2 10.1.36.2
    9 Feb 17 14:41:12 Record Route:  10.1.13.2 10.1.36.2
    8 Feb 17 14:41:12 Up
    7 Feb 17 14:41:12  Autobw adjustment succeeded
    6 Feb 17 14:41:12 CSPF: computation result accepted
    5 Feb 17 14:36:29 Selected as active path
    4 Feb 17 14:36:29 Record Route:  10.1.13.2 10.1.36.2
    3 Feb 17 14:36:29 Up
    2 Feb 17 14:36:29 Originate Call
    1 Feb 17 14:36:29 CSPF: computation result accepted
  Created: Thu Feb 17 14:36:29 2005
Total 1 displayed, Up 1, Down 0
[...Output truncated...]
```

Meaning This LSP event indicates that a periodic (timer-based) autobandwidth adjustment for the LSP is triggered at the end of the adjust interval. A new path for the LSP, with the adjusted bandwidth, is successfully computed and signaled. The LSP (and traffic) switches over to the new adjusted path.

Cause At the end of the time interval specified at the [edit protocols mpls label-switched-path auto-bandwidth] hierarchy level, the current maximum average bandwidth usage is compared to the allocated bandwidth for the LSP. If the LSP needs more bandwidth, an attempt is made to set up a new path where bandwidth is equal to the current maximum average usage. If the attempt is successful, the LSP's traffic is routed through the new path and the old path is removed. If the attempt fails, the LSP continues to use its current path.

Action No action required. Automatic autobandwidth adjustment succeeded.

Chapter 5

Understanding DiffServ-Aware Traffic-Engineered LSP Events

This chapter lists and describes label-switched path (LSP) events that might occur in the output of the show mpls lsp extensive command for DiffServ-aware traffic-engineered LSPs. Descriptions typically include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

MPLS DiffServ-Aware Traffic-Engineered LSP Events

This table provides the links and commands for label-switched path (LSP) events that might occur in the output of the show mpls lsp extensive command for DiffServ-aware traffic-engineered LSPs. Descriptions typically include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take. (See Table 10 on page 59.)

Table 10: MPLS DiffServ-Aware Traffic-Engineered LSP Events

Understanding DiffServ-Aware Traffic Engineered LSP Events Tasks	Possible Action or Command
"Displaying DiffServ-Aware Traffic-Engineered LSP Events" on page 60	
1. Unsupported Traffic Class Event on page 60	Not available.
2. Traffic Class Value Out of Allowed Range Event on page 61	Not available.
3. The Combination of Setup Priority and Traffic Class Is Not One of the Configured TE Classes Event on page 61	Correct the configuration depending on supported traffic engineering classes.

Table 10: MPLS DiffServ-Aware Traffic-Engineered LSP Events *(continued)*

Understanding DiffServ-Aware Traffic Engineered LSP Events Tasks	Possible Action or Command
4. The Combination of Hold Priority and Traffic Class Is Not One of the Configured TE Classes Event on page 61	Correct the configuration depending on supported traffic engineering classes.

Displaying DiffServ-Aware Traffic-Engineered LSP Events

Purpose A DiffServ-aware traffic-engineered LSP is configured with a bandwidth reservation for a specific class type, and carries traffic for a single class type. On the packets, the class type is specified by the experimental (EXP) bits (also known as the class-of-service bits) and the per-hop behavior (PHB) associated with the EXP bits. The mapping between the EXP bits and the PHB is static, instead of being signaled in Resource Reservation Protocol (RSVP).

The class type must be configured consistently across the DiffServ domain, and must be consistent from router to router in the network. You can unambiguously map a class type to a queue. On each node router, the class-of-service queue configuration for an interface translates to the available bandwidth for a particular class type on that link. For more information about forwarding classes and class of service, see the JUNOS Class of Service Configuration Guide. For more information about differentiated services, see RFC 3270, *JUNOS MPLS Applications Configuration Guide Support of Differentiated Services.*

When the configuration of a DiffServ-aware traffic-engineered LSP is incorrect, an even or error message might occur in the output of the show mpls lsp extensive command.

Action To display LSP events that can occur with a DiffServ-aware LSP, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

```
user@host> show mpls lsp extensive
```

Sample Output Not available.

Unsupported Traffic Class Event

LSP Event Unsupported traffic class

Sample Output Not available.

Meaning This LSP error event is a Juniper Networks proprietary error indicating that a Diffserv traffic engineering LSP was signaled with one or more traffic classes with values greater than the four traffic classes currently supported by the JUNOS software.

Cause Not available.

Action Not available.

Traffic Class Value Out of Allowed Range Event

LSP Event Traffic class value out of allowed range

Sample Output Not available.

Meaning This LSP error event is a Juniper Networks proprietary error indicating that a single class, IETF-style DiffServ traffic engineering LSP was signaled with a traffic class value of zero, which is invalid.

Cause Not available.

Action Not available.

The Combination of Setup Priority and Traffic Class Is Not One of the Configured TE Classes Event

LSP Event The combination of setup-priority and traffic class is not one of the configured TE-classes

Sample Output Not available.

Meaning This LSP error event is a Juniper Networks proprietary error that indicates the setup priority signaled in the Path message for the LSP does not match the supported Diffserv traffic engineering classes configured on a label-switching router (LSR) along the LSP path.

Cause This LSP error event is caused by incorrect configuration of the LSP setup priority on the ingress LSR, or the incorrect configuration of a DiffServ traffic engineering class on an LSR along the LSP path.

Action Correct the configuration depending on the supported traffic engineering classes.

The Combination of Hold Priority and Traffic Class Is Not One of the Configured TE Classes Event

LSP Event The combination of hold priority and traffic class is not one of the configured traffic engineering classes

Sample Output Not available.

Meaning This LSP event is a Juniper Networks proprietary error indicating that the hold priority signaled in the Path message for the LSP does not match the supported DiffServ traffic engineering classes configured on an LSR along the LSP path.

Cause This LSP event is caused by the incorrect configuration of the LSP hold priority at the ingress LSR, or the incorrect configuration of the DiffServ traffic engineering class on an LSR along the LSP path.

Action Correct the configuration depending on the supported traffic engineering classes.

Chapter 6

Understanding GMPLS Events

This chapter describes Generalized Multiprotocol Label Switching (GMPLS) error events that might occur in the output of the show mpls lsp extensive command. Descriptions typically include sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

MPLS GMPLS Events

Problem This table provides the links and commands for Generalized Multiprotocol Label Switching (GMPLS) error events that might occur in the output of the show mpls lsp extensive command. Descriptions typically include sample output of the label-switched path (LSP) event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take. (See Table 11 on page 63.)

Table 11: GMPLS Events

Understanding GMPLS Events Tasks	Possible Action or Command
"Displaying GMPLS Events" on page 64	show mpls lsp extensive
1. RSVP Error, Subcode 7, Signal Type Does Not Match Link Encoding Event on page 65	Make sure that the configured bandwidth and the encoding type of the traffic engineering link match in the LSP configuration.
2. RSVP Error, Subcode 8, Tspec Invalid for Encoding/Switching Type Requested Event on page 65	Not available.
3. Unacceptable Label Value Event on page 65	Not available

Table 11: GMPLS Events *(continued)*

Understanding GMPLS Events Tasks	Possible Action or Command
4. Unsupported Encoding Type Event on page 66	Not available.
5. Unsupported Switching Type Event on page 66	Not available.
6. Update LSP Encoding Type Event on page 66	Not available.

Displaying GMPLS Events

Purpose GMPLS generalizes MPLS by defining labels for switching varying types of Layer 1, Layer 2, or Layer 3 traffic. LSPs must start and end on links with the same switching capability. For example, routers can establish packet-switched LSPs with other routers. LSPs might be carried over a Time-Division Multiplexing (TDM)-switched LSP between SONET add/drop multiplexers (ADMs), which in turn might be carried over a lambda-switched LSP. GMPLS signaling requires strict paths, and you must disable Constrained Shortest Path First (CSPF) with the no-cspf statement. For more information on GMPLS, see the *JUNOS MPLS Applications Configuration Guide*.

When the configuration of an GMPLS LSP is incorrect, an event or error message can appear in the output of the show mpls lsp extensive command.

Action To display GMPLS events, enter the following JUNOS command-line interface (CLI) operational mode command from the ingress router:

```
user@host> show mpls lsp extensive
```

Sample Output

```
user@host> show mpls lsp extensive
Ingress LSP: 1 sessions

10.255.255.40
  From: 10.255.255.35, State: Up, ActiveRoute: 0, LSPname: gmpls-lsp1
  Bidirectional
  ActivePath: path-lsp1 (primary)
  LoadBalance: Random
  Signal type: STM-1
  Encoding type: SDH/SONET, Switching type: Fiber, GPID: PPP
 *Primary   path-lsp1             State: Up
    Bandwidth: 155.52Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 2)
          10.35.100.1 S 10.35.150.1 S 10.35.200.1 S
    Received RRO:
          10.35.100.1 10.35.150.1 10.35.200.1
    7 Nov  7 15:47:11  Selected as active path
    6 Nov  7 15:47:11  Record Route:  10.35.100.1 10.35.150.1 10.35.200.1
    5 Nov  7 15:47:11  Up
    4 Nov  7 15:47:11   Update LSP Encoding Type
    3 Nov  7 15:47:11  Originate Call
    2 Nov  7 15:47:11  CSPF: computation result accepted
    1 Nov  7 15:46:41  CSPF failed: no route toward 10.255.255.40
  Created: Thu Nov  7 15:46:38 2002
Total 1 displayed, Up 1, Down 0
[...Output truncated...]
```

Meaning The sample output from ingress router R1 shows extensive ingress LSP information, including LSP events that led to an LSP failure, with the most recent events at the top. The last line before the history log begins indicates the length of time the router waits before attempting to re-signal the LSP, three seconds in this instance.

LSP events in bold are described in this chapter. Descriptions include sample output of the LSP event, an explanation of what the event means, the possible cause of the event, and any possible actions that you can take.

For completeness, events not included in this example output are also described in this chapter to show LSP events that did not occur in the example network configuration, but might occur in your network. The output for these events includes the prompt user@host rather than the usual user@R1 prompt.

RSVP Error, Subcode 7, Signal Type Does Not Match Link Encoding Event

LSP Event RSVP error, subcode 7, signal-type does not match link encoding

Sample Output Not available

Meaning This LSP error event is a Juniper Networks proprietary error reported for GMPLS LSPs when the configured signal bandwidth does not match the encoding type of the traffic engineering link selected on the first hop.

Cause An incorrect Sender Tspec is used with a particular LSP switching or encoding type.

Action Not available.

RSVP Error, Subcode 8, Tspec Invalid for Encoding/Switching Type Requested Event

LSP Event RSVP error, subcode 8, Tspec invalid for encoding/switching type requested

Sample Output Not available.

Meaning This LSP error event is a Juniper Networks proprietary error reported for GMPLS LSPs as a result of validation of the signaled traffic parameters against the generalized label request for the LSP.

Cause An incorrect Sender Tspec is used with a particular LSP switching or encoding type.

Action Not available.

Unacceptable Label Value Event

LSP Event Unacceptable label value event

Sample Output Not available.

Meaning This LSP error event indicates that the label value signaled in either the Path or Resv message was unacceptable to a label-switched router (LSR) along the LSP path.

Cause For GMPLS LSPs, this LSP error event is generated by incorrect label mapping configured on one of the LSRs, or by deletion of a resource that was being used by an LSP.

Action Not available.

Unsupported Encoding Type Event

LSP Event Unsupported encoding type

Sample Output Not available.

Meaning This LSP error event indicates that the LSP encoding type requested in the generalized label request for a GMPLS LSP is unsupported on the corresponding selected traffic engineering link.

Cause Not available.

Action Not available.

Unsupported Switching Type Event

LSP Event Unsupported switching type

Sample Output Not available.

Meaning This LSP error event indicates that the switching type requested in the generalized label request for a GMPLS LSP is unsupported on the corresponding selected traffic engineering link.

Cause Not available.

Action Not available.

Update LSP Encoding Type Event

LSP Event Update Encoding Type

Sample Output

```
user@host> show mpls lsp extensive
Ingress LSP: 1 sessions

10.255.255.40
  From: 10.255.255.35, State: Up, ActiveRoute: 0, LSPname: gmpls-lsp1
  Bidirectional
  ActivePath: path-lsp1 (primary)
  LoadBalance: Random
  Signal type: STM-1
```

```
  Encoding type: SDH/SONET, Switching type: Fiber, GPID: PPP
 *Primary   path-lsp1             State: Up
    Bandwidth: 155.52Mbps
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 2)
          10.35.100.1 S 10.35.150.1 S 10.35.200.1 S
    Received RRO:
          10.35.100.1 10.35.150.1 10.35.200.1
    7 Nov  7 15:47:11  Selected as active path
    6 Nov  7 15:47:11  Record Route:  10.35.100.1 10.35.150.1 10.35.200.1
    5 Nov  7 15:47:11  Up
    4 Nov  7 15:47:11   Update LSP Encoding Type
    3 Nov  7 15:47:11  Originate Call
    2 Nov  7 15:47:11  CSPF: computation result accepted
    1 Nov  7 15:46:41  CSPF failed: no route toward 10.255.255.40
  Created: Thu Nov  7 15:46:38 2002
Total 1 displayed, Up 1, Down 0
```

Meaning This LSP event indicates that the encoding type was updated based on the traffic engineering link selected as the first hop.

Cause This LSP event occurs when the encoding type is not configured on a non-packet LSP. In this case, the encoding type is derived from the traffic engineering link that was selected as the first hop.

Action Not available.

Part 2

Examining the CSPF Log

Chapter 7

Configuring CSPF Tracing

The chapter describes how and when to configure Multiprotocol Label Switching (MPLS) Constrained Shortest Path First (CSPF) tracing. With each flag that you configure, more granular information about CSPF calculations is provided by the CSPF log file output.

Checklist for Configuring CSPF Tracing

The checklist provides links and command to configure Multiprotocol Label Switching (MPLS) Constrained Shortest Path First (CSPF) tracing. With each flag that you configure, more granular information about CSPF calculations is provided by the CSPF log file output.

Table 12 on page 71 provides commands for configuring CSPF tracing.

Table 12: Checklist for Configuring CSPF Tracing

Tasks	Possible Action or Command
"Understanding CSPF" on page 72	
"Configuring CSPF Tracing" on page 73	[edit] edit protocols mpls [edit protocols mpls] set traceoptions file *filename* set traceoptions flag cspf set traceoptions flag cspf-link set traceoptions flag cspf-node show commit
"Examining the CSPF Log File" on page 74	
1. Trace Only CSPF Computations on page 75	[edit protocols mpls] run monitor start *filename* run show log *filename*
2. Trace Nodes Visited During CSPF Computations on page 77	[edit protocols mpls] run monitor start *filename* run show log *filename*

Table 12: Checklist for Configuring CSPF Tracing *(continued)*

Tasks	Possible Action or Command
3. Trace Links Visited During CSPF Computations on page 78	[edit protocols mpls] run monitor start *filename* run show log *filename* show ted database

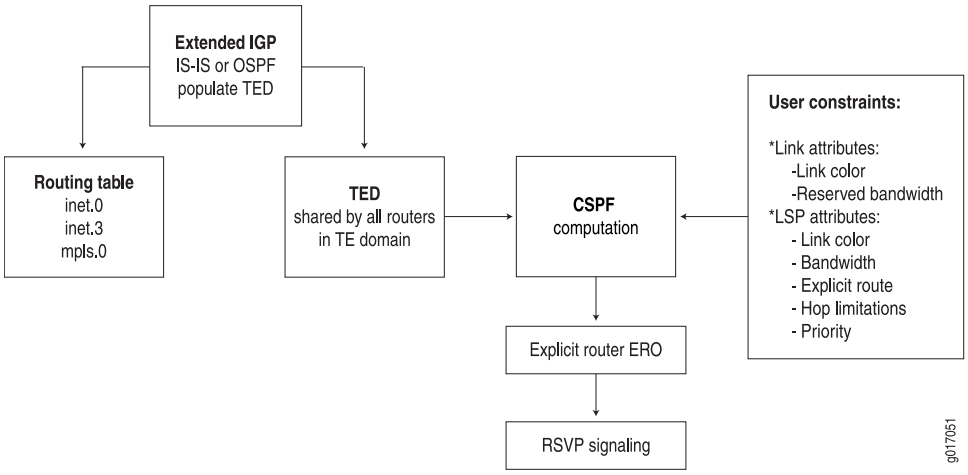
Understanding CSPF

CSPF is a link-state algorithm used in computing paths for label-switched paths (LSPs) that are subject to multiple constraints. When computing paths for LSPs, CSPF considers not only the topology of the network, but also the attributes of the LSP and the links, and attempts to minimize congestion by balancing the network load.

After pruning paths that do not meet the configured constraints from the shortest-path-first (SPF) tree, CSPF derives the best available path based on the information in the traffic engineering database (TED). Based on the best available path, CSPF produces a strict Explicit Route Object (ERO) which the Resource Reservation Protocol (RSVP) uses to signal the LSP.

The CSPF algorithm is a modified version of the SPF algorithm used within the link-state databases of Intermediate System-to-Intermediate System (IS-IS) and Open Shortest Path First (OSPF) protocols. CSPF operates on the traffic engineering database, which is constructed through extensions to IS-IS and OSPF. Figure 2 on page 72 illustrates the various components that contribute to the CSPF computation.

Figure 2: CSPF Components



To select a path, CSPF follows these steps:

1. Computes LSPs one at a time, beginning with the highest priority LSP (the one with the lowest setup priority value). Among LSPs of equal priority, CSPF starts with those that have the highest bandwidth requirement.
2. Prunes the traffic engineering database of all links that are not full duplex and do not have sufficient reservable bandwidth.
3. If the LSP configuration includes the include statement, prunes all links that do not share any included colors.
4. If the LSP configuration includes the exclude statement, prunes all links that contain excluded colors. If the link does not have a color, it is accepted.
5. Finds the shortest path toward the LSP's egress router, taking into account explicit-path constraints. For example, if the path must pass through Router A, two separate SPFs are computed, one from the ingress router to Router A, and the other from Router A to the egress router.
6. If several paths have equal cost, chooses the path whose last-hop address is the same as the LSP's destination.
7. If several equal-cost paths remain, selects the path with the fewest number of hops.
8. If several equal-cost paths remain, applies the CSPF load-balancing rule configured on the LSP (least fill, most fill, or random).

The result of the above steps is a strict-hop ERO that details each hop along the calculated path. The ERO is passed to the RSVP protocol process, where it is used to signal and establish the LSP in the network.

To determine how and when to configure and examine MPLS CSPF tracing, follow these steps:

Configuring CSPF Tracing

Purpose When the output of the show mpls lsp extensive command indicates that the CSPF algorithm has failed, configuring CSPF tracing on the ingress router can often provide more information about the problem.

Action On the ingress router, to configure a log file and specify MPLS tracing flags, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit protocols mpls
```

2. Configure a log file:

```
[edit protocols mpls]
user@host# set traceoptions file filename
```

3. Depending on your situation, specify all or one of the following CSPF-specific tracing flags:

```
[edit protocols mpls]
user@host# set traceoptions flag cspf
user@host# set traceoptions flag cspf-link
user@host# set traceoptions flag cspf-node
```

4. Verify and commit the configuration:

```
user@host# show
user@host# commit
```

Sample Output

```
[edit protocols mpls]
user@R1#  show
traceoptions {
     file cspf;
    flag cspf;
    flag cspf-link;
    flag cspf-node;
}
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0;
```

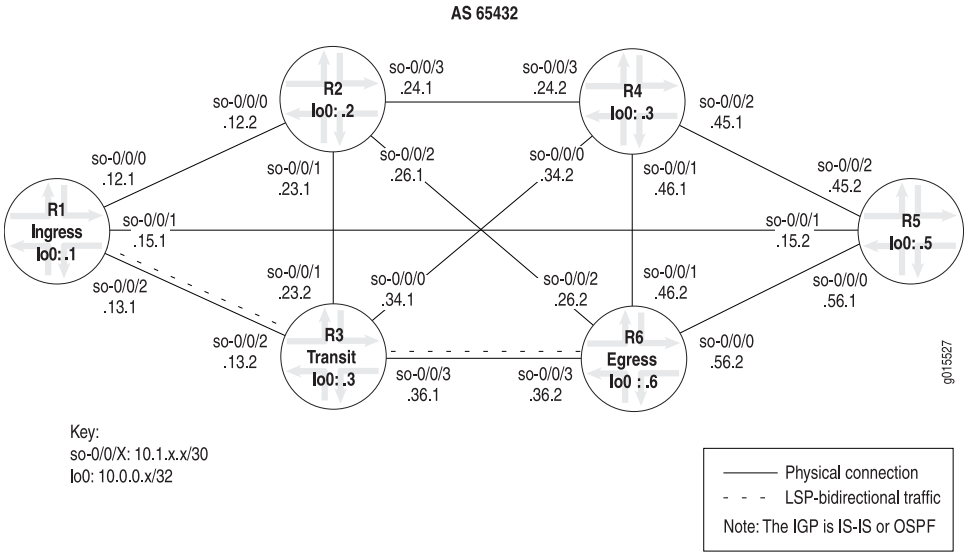
Meaning The sample output shows a typical CSPF tracing configuration. The log file cpsf contains all the information gathered for each configured flag. Each flag provides slightly different information about CSPF computations. The cspf flag traces CSPF computations only; the cspf-link flag traces links visited during CSPF computations, and the cspf-node flag traces nodes visited during CSPF computations. See “Examining the CSPF Log File” on page 74 for information about examining a CSPF log file.

Examining the CSPF Log File

Purpose The CSPF log file provides useful information about the steps taken by the CSPF algorithm to calculate the shortest path from the ingress router to the egress router. The following steps and output illustrate the CSPF algorithm in the successful establishment of an LSP. With each flag that you configure, starting with the cspf flag, then the cspf-node flag, and finally the cspf-link flag, more granular information about CSPF calculations is provided by the output in the CSPF log file configured to gather the information.

Figure 3 on page 75 illustrates the example network topology used in this section. The example MPLS network uses IS-IS Level 2 and a policy to create traffic. However, IS-IS Level 1 or an OSPF area can be used and the policy omitted if the network has existing Border Gateway Protocol (BGP) traffic.

Figure 3: MPLS Network Topology



The MPLS network in Figure 3 on page 75 is a router-only network with SONET interfaces that consist of the following components:

- A full-mesh interior BGP (IBGP) topology, using AS 65432
- MPLS and RSVP enabled on all routers
- A send-statics policy on routers R1 and R6 that allows a new route to be advertised into the network
- Two unidirectional LSPs between R1 and R6, which allow bidirectional traffic

See the *JUNOS MPLS Applications Configuration Guide* for information on configuring an MPLS network. The ingress router R1 is configured with CSPF tracing, and the output examined in the following three steps is taken from R1.

To examine the CSPF log file, follow these steps:

- Configuring CSPF Tracing on page 73
- Understanding CSPF on page 72
- Configuring CSPF Tracing on page 73
- Trace Only CSPF Computations on page 75
- Trace Nodes Visited During CSPF Computations on page 77
- Trace Links Visited During CSPF Computations on page 78

Trace Only CSPF Computations

Purpose The cspf flag provides an overview of the CSPF computations performed and the resulting ERO for the LSP. Details about nodes or links visited during CSPF computations are not included in this log file.

Action To run trace CSPF computations and examine the CSPF log file, enter the following JUNOS command-line interface (CLI) commands:

```
[edit protocols mpls]
user@R1# run monitor start filename
user@R1# run show log filename
```

NOTE: To stop monitoring CSPF, issue the monitor stop command. If you are working in configuration mode, issue the run monitor stop command.

Sample Output 1

```
[edit protocols mpls]
user@R1# show
traceoptions {
    file cspf;
    flag cspf;
}
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0;
```

Sample Output 2

```
[edit protocols mpls]

user@R1> show log cspf
Apr 29 11:35:59 trace_on: Tracing to "/var/log/cspf" started
Apr 29 13:22:52 RPD_MPLS_LSP_DOWN: MPLS LSP R1-to-R6 down on primary()
Apr 29 13:22:52 RPD_MPLS_PATH_DOWN: MPLS path down on LSP R1-to-R6
Apr 29 13:22:52 CSPF adding path R1-to-R6(primary) to CSPF queue 1
Apr 29 13:22:52 CSPF creating CSPF job
Apr 29 13:22:52
Apr 29 13:22:52 CSPF for path R1-to-R6(primary), begin at R1.00, starting
Apr 29 13:22:52         bandwidth: CT0=0bps; setup priority: 0; random
Apr 29 13:22:52 CSPF final destination 10.0.0.6
Apr 29 13:22:52 CSPF starting from R1.00 (10.0.0.1) to 10.0.0.6, hoplimit 254
Apr 29 13:22:52 CSPF Reached target
Apr 29 13:22:52 CSPF completed in 0.000106s
Apr 29 13:22:52 CSPF ERO for R1-to-R6(primary) (2 hops)
Apr 29 13:22:52         node 10.1.15.2/32
Apr 29 13:22:52         node 10.1.56.2/32
Apr 29 13:22:52 CSPF for R1-to-R6 done!
Apr 29 13:22:52 RPD_MPLS_PATH_UP: MPLS path up on LSP R1-to-R6
Apr 29 13:22:52 RPD_MPLS_LSP_UP: MPLS LSP R1-to-R6 up on primary() Route 10.1.15.2
 10.1.56.2
monitor stop
```

Meaning Sample Output 1 shows the configuration of the cspf file and cspf flag at the [edit protocols mpls traceoptions] hierarchy level. See "Configuring CSPF Tracing" on page 73 for steps to configure CSPF tracing.

Sample Output 2 shows the contents of the cspf file in the /var/log/ directory on ingress router R1. The cspf file contains the CSPF computations obtained when the cspf flag is configured at the [edit protocols mpls traceoptions] hierarchy level and after the run monitor start cspf and run show log cspf commands were issued.

Each line of output describes the steps taken by the CSPF algorithm to calculate the shortest path between the ingress and egress routers. The result of the CSPF algorithm is formed into a strict-hop ERO that details each hop along the calculated path. For example, the ERO for the LSP R1-to-R6 contains two hops that pass through nodes 10.1.15.2/32 and 10.1.56.2.32. When the ERO is completed, CSPF for R1-to-R6 done!, the ERO is passed to the RSVP protocol process, where it is used for signaling and establishing the LSP in the network. The output shows RPD_MPLS_LSP_UP, indicating that the LSP was established successfully.

Trace Nodes Visited During CSPF Computations

Purpose The configuration of the cspf-node flag provides details in the log file about the nodes visited during CSPF computations. The node information is in addition to the overview information provided by the cspf flag. Details about links visited during CSPF computations are not included in the log file.

Action To trace nodes visited during CSPF computations and to examine the CSPF log file, enter the following JUNOS CLI commands:

```
[edit protocols mpls]
user@R1# run monitor start filename
user@R1# run show log filename
```

NOTE: To stop monitoring CSPF, issue the monitor stop command. If you are working in configuration mode, as shown in the sample output, issue the run monitor stop command.

Sample Output 1

```
[edit protocols mpls]
user@R1# show
traceoptions {
    file cspf-node1;
    flag cspf;
    flag cspf-node;
}
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0;
```

Sample Output 2

```
[edit protocols mpls]
user@R1# run show log cspf-node1 | no-more
Apr 29 13:39:08 trace_on: Tracing to "/var/log/cspf-node1"
 started
Apr 29 13:40:43 RPD_MPLS_LSP_DOWN: MPLS LSP R1-to-R6 down on primary()
Apr 29 13:40:43 RPD_MPLS_PATH_DOWN: MPLS path down on LSP R1-to-R6
Apr 29 13:40:43 CSPF adding path R1-to-R6(primary) to CSPF queue 1
Apr 29 13:40:43 CSPF creating CSPF job
Apr 29 13:40:43
Apr 29 13:40:43 CSPF for path R1-to-R6(primary), begin at R1.00, starting
Apr 29 13:40:43         bandwidth: CT0=0bps; setup priority: 0; random
Apr 29 13:40:43 CSPF final destination 10.0.0.6
```

```
Apr 29 13:40:43 CSPF starting from R1.00 (10.0.0.1) to 10.0.0.6, hoplimit 254
Apr 29 13:40:43     Node R1.00 (10.0.0.1) metric 0, hops 0, avail 32000 32000
32000 32000
Apr 29 13:40:43     Node R3.00 (10.0.0.3) metric 10, hops 1, avail 32000 32000
32000 32000
Apr 29 13:40:43     Node R5.00 (10.0.0.5) metric 10, hops 1, avail 32000 32000
32000 32000
Apr 29 13:40:43     Node R2.00 (10.0.0.2) metric 10, hops 1, avail 32000 32000
32000 32000
Apr 29 13:40:43     Node R4.00 (10.0.0.4) metric 20, hops 2, avail 32000 32000
32000 32000
Apr 29 13:40:43     Node R6.00 (10.0.0.6) metric 20, hops 2, avail 32000 32000
32000 32000
Apr 29 13:40:43 CSPF Reached target
Apr 29 13:40:43 CSPF completed in 0.000304s
Apr 29 13:40:43 CSPF ERO for R1-to-R6(primary) (2 hops)
Apr 29 13:40:43         node 10.1.12.2/32
Apr 29 13:40:43         node 10.1.26.2/32
Apr 29 13:40:43 CSPF for R1-to-R6 done!
Apr 29 13:40:43 RPD_MPLS_PATH_UP: MPLS path up on LSP R1-to-R6
Apr 29 13:40:43 RPD_MPLS_LSP_UP: MPLS LSP R1-to-R6 up on primary() Route 10.1.12.2
 10.1.26.2
[...Output truncated...]
```

Sample Output 2

```
[edit protocols mpls]
user@R1# run monitor stop
```

Meaning Sample Output 1 shows the configuration of the cspf-node file, cspf flag and cspf-node flag at the [edit protocols mpls traceoptions] hierarchy level. See "Configuring CSPF Tracing" on page 73 for steps to configure CSPF tracing.

Sample Output 2 shows the contents of the cspf-node file in the /var/log/ directory on ingress router R1. The cspf-node file contains the CSPF computations logged when the cspf and cspf-node flags are configured at the [edit protocols mpls traceoptions] hierarchy level and after the run monitor start cspf and run show log cspf commands are issued.

Each line of output describes the steps taken by the CSPF algorithm to calculate the shortest path between the ingress and egress routers. Because the cspf-node flag is configured, the output shows the nodes visited during the calculations performed by the CSPF algorithm. For example, all nodes in the network shown in Figure 3 on page 75 are included.

The result of the CSPF algorithm is formed into a strict-hop ERO. For example, the ERO for the LSP R1-to-R6 contains two hops that pass through nodes 10.1.12.2/32 and 10.1.26.2.32. When the ERO is completed, CSPF for R1-to-R6 done!, the ERO is passed to the RSVP protocol process, where it is used for signaling and establishing the LSP in the network. The output shows RPD_MPLS_LSP_UP, indicating that the LSP was established successfully.

Trace Links Visited During CSPF Computations

Purpose The configuration of the cspf-link flag provides details in the log file about the links visited during CSPF computations. The link information is in addition to the overview

information provided by the cspf flag, and the node information provided by the cpsf-node flag.

Action To run trace links visited during CSPF computations and examine the CSPF log file, enter the following JUNOS CLI commands:

```
[edit protocols mpls]
user@R1# run monitor start filename
user@R1# run show log filename
user@R1# run show ted database
```

NOTE: To stop monitoring CSPF, issue the monitor stop command. If you are working in configuration mode, as shown in the sample output, issue the run monitor stop command.

Sample Output 1

```
[edit protocols mpls]
user@R1# show
traceoptions {
    file cspf-link;
    flag cspf;
    flag cspf-link;
}
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0;
```

Sample Output 2

```
[edit protocols mpls]
user@R1# run show log cspf-link | no-more
Apr 29 13:29:52 trace_on: Tracing to "/var/log/cspf-link" started
Apr 29 13:30:27 RPD_MPLS_LSP_DOWN: MPLS LSP R1-to-R6 down on primary()
Apr 29 13:30:27 RPD_MPLS_PATH_DOWN: MPLS path down on LSP R1-to-R6
Apr 29 13:30:27 CSPF adding path R1-to-R6(primary) to CSPF queue 1
Apr 29 13:30:27 CSPF creating CSPF job
Apr 29 13:30:27
Apr 29 13:30:27 CSPF for path R1-to-R6(primary), begin at R1.00, starting
Apr 29 13:30:27  bandwidth: CT0=0bps; setup priority: 0; random
Apr 29 13:30:27 CSPF final destination 10.0.0.6
Apr 29 13:30:27 CSPF starting from R1.00 (10.0.0.1) to 10.0.0.6, hoplimit 254
Apr 29 13:30:27   Node R1.00 (10.0.0.1) metric 0, hops 0, avail 32000 32000 32000
 32000
Apr 29 13:30:27      Link 10.1.13.1->10.1.13.2(R3.00/10.0.0.3) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.13.1->10.1.13.2 is
10.1.13.2->10.1.13.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27          encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27      Link 10.1.12.1->10.1.12.2(R2.00/10.0.0.2) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.12.1->10.1.12.2 is
10.1.12.2->10.1.12.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
```

```
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27      Link 10.1.15.1->10.1.15.2(R5.00/10.0.0.5) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.15.1->10.1.15.2 is
10.1.15.2->10.1.15.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27     Node R3.00 (10.0.0.3) metric 10, hops 1, avail 32000 32000
32000 32000
Apr 29 13:30:27      Link 10.1.13.2->10.1.13.1(R1.00/10.0.0.1) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.34.1->10.1.34.2(R4.00/10.0.0.4) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.34.1->10.1.34.2 is
10.1.34.2->10.1.34.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27      Link 10.1.23.2->10.1.23.1(R2.00/10.0.0.2) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.23.2->10.1.23.1 is
10.1.23.1->10.1.23.2
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 20 vs 10; hops: 2 vs 1; avail: 32000 32000 32000
32000
Apr 29 13:30:27      Link 10.1.36.1->10.1.36.2(R6.00/10.0.0.6) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.36.1->10.1.36.2 is
10.1.36.2->10.1.36.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27     Node R5.00 (10.0.0.5) metric 10, hops 1, avail 32000 32000
32000 32000
Apr 29 13:30:27      Link 10.1.15.2->10.1.15.1(R1.00/10.0.0.1) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.45.2->10.1.45.1(R4.00/10.0.0.4) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.45.2->10.1.45.1 is
10.1.45.1->10.1.45.2
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 20 vs 20; hops: 2 vs 2; avail: 32000 32000 32000
32000
Apr 29 13:30:27        Better path: random wins
Apr 29 13:30:27      Link 10.1.56.1->10.1.56.2(R6.00/10.0.0.6) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.56.1->10.1.56.2 is
10.1.56.2->10.1.56.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 20 vs 20; hops: 2 vs 2; avail: 32000 32000 32000
32000
```

```
Apr 29 13:30:27        Old path is better
Apr 29 13:30:27   Node R2.00 (10.0.0.2) metric 10, hops 1, avail 32000 32000 32000
 32000
Apr 29 13:30:27      Link 10.1.12.2->10.1.12.1(R1.00/10.0.0.1) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.23.1->10.1.23.2(R3.00/10.0.0.3) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.24.1->10.1.24.2(R4.00/10.0.0.4) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.24.1->10.1.24.2 is
10.1.24.2->10.1.24.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 20 vs 20; hops: 2 vs 2; avail: 32000 32000 32000
32000
Apr 29 13:30:27        Old path is better
Apr 29 13:30:27      Link 10.1.26.1->10.1.26.2(R6.00/10.0.0.6) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.26.1->10.1.26.2 is
10.1.26.2->10.1.26.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 20 vs 20; hops: 2 vs 2; avail: 32000 32000 32000
32000
Apr 29 13:30:27        Old path is better
Apr 29 13:30:27   Node R4.00 (10.0.0.4) metric 20, hops 2, avail 32000 32000 32000
 32000
Apr 29 13:30:27      Link 10.1.34.2->10.1.34.1(R3.00/10.0.0.3) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.24.2->10.1.24.1(R2.00/10.0.0.2) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.45.1->10.1.45.2(R5.00/10.0.0.5) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        skipped: end point already visited
Apr 29 13:30:27      Link 10.1.46.1->10.1.46.2(R6.00/10.0.0.6) metric 10 color
0x00000000 bw 155.52Mbps
Apr 29 13:30:27        Reverse Link for 10.1.46.1->10.1.46.2 is
10.1.46.2->10.1.46.1
Apr 29 13:30:27        link's interface switch capability descriptor #1
Apr 29 13:30:27         encoding: Packet, switching: Packet
Apr 29 13:30:27        link passes constraints
Apr 29 13:30:27        metric: 30 vs 20; hops: 3 vs 2; avail: 32000 32000 32000
32000
Apr 29 13:30:27     Node R6.00 (10.0.0.6) metric 20, hops 2, avail 32000 32000
32000 32000
Apr 29 13:30:27 CSPF Reached target
Apr 29 13:30:27 CSPF completed in 0.001880s
Apr 29 13:30:27 CSPF ERO for R1-to-R6(primary) (2 hops)
Apr 29 13:30:27           node 10.1.13.2/32
Apr 29 13:30:27           node 10.1.36.2/32
Apr 29 13:30:27 CSPF for R1-to-R6 done!
Apr 29 13:30:27 RPD_MPLS_PATH_UP: MPLS path up on LSP R1-to-R6
Apr 29 13:30:27 RPD_MPLS_LSP_UP: MPLS LSP R1-to-R6 up on primary() Route 10.1.13.2
 10.1.36.2
```

Sample Output 3

```
user@R1# run show ted database | no-more
TED database: 6 ISIS nodes 6 INET nodes
ID                          Type Age(s) LnkIn LnkOut Protocol
R1.00(10.0.0.1)             Rtr     148     3      3 IS-IS(2)
    To: R3.00(10.0.0.3), Local: 10.1.13.1, Remote: 10.1.13.2
    To: R5.00(10.0.0.5), Local: 10.1.15.1, Remote: 10.1.15.2
    To: R2.00(10.0.0.2), Local: 10.1.12.1, Remote: 10.1.12.2
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R3.00(10.0.0.3), Local: 10.1.13.1, Remote: 10.1.13.2
    To: R5.00(10.0.0.5), Local: 10.1.15.1, Remote: 10.1.15.2
    To: R2.00(10.0.0.2), Local: 10.1.12.1, Remote: 10.1.12.2
ID                          Type Age(s) LnkIn LnkOut Protocol
R2.00(10.0.0.2)             Rtr     580     4      4 IS-IS(2)
    To: R1.00(10.0.0.1), Local: 10.1.12.2, Remote: 10.1.12.1
    To: R3.00(10.0.0.3), Local: 10.1.23.1, Remote: 10.1.23.2
    To: R4.00(10.0.0.4), Local: 10.1.24.1, Remote: 10.1.24.2
    To: R6.00(10.0.0.6), Local: 10.1.26.1, Remote: 10.1.26.2
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R1.00(10.0.0.1), Local: 10.1.12.2, Remote: 10.1.12.1
    To: R3.00(10.0.0.3), Local: 10.1.23.1, Remote: 10.1.23.2
    To: R4.00(10.0.0.4), Local: 10.1.24.1, Remote: 10.1.24.2
    To: R6.00(10.0.0.6), Local: 10.1.26.1, Remote: 10.1.26.2
ID                          Type Age(s) LnkIn LnkOut Protocol
R3.00(10.0.0.3)             Rtr     390     4      4 IS-IS(2)
    To: R1.00(10.0.0.1), Local: 10.1.13.2, Remote: 10.1.13.1
    To: R4.00(10.0.0.4), Local: 10.1.34.1, Remote: 10.1.34.2
    To: R2.00(10.0.0.2), Local: 10.1.23.2, Remote: 10.1.23.1
    To: R6.00(10.0.0.6), Local: 10.1.36.1, Remote: 10.1.36.2
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R1.00(10.0.0.1), Local: 10.1.13.2, Remote: 10.1.13.1
    To: R4.00(10.0.0.4), Local: 10.1.34.1, Remote: 10.1.34.2
    To: R2.00(10.0.0.2), Local: 10.1.23.2, Remote: 10.1.23.1
    To: R6.00(10.0.0.6), Local: 10.1.36.1, Remote: 10.1.36.2
ID                          Type Age(s) LnkIn LnkOut Protocol
R4.00(10.0.0.4)             Rtr     677     4      4 IS-IS(2)
    To: R3.00(10.0.0.3), Local: 10.1.34.2, Remote: 10.1.34.1
    To: R5.00(10.0.0.5), Local: 10.1.45.1, Remote: 10.1.45.2
    To: R2.00(10.0.0.2), Local: 10.1.24.2, Remote: 10.1.24.1
    To: R6.00(10.0.0.6), Local: 10.1.46.1, Remote: 10.1.46.2
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R3.00(10.0.0.3), Local: 10.1.34.2, Remote: 10.1.34.1
    To: R5.00(10.0.0.5), Local: 10.1.45.1, Remote: 10.1.45.2
    To: R2.00(10.0.0.2), Local: 10.1.24.2, Remote: 10.1.24.1
    To: R6.00(10.0.0.6), Local: 10.1.46.1, Remote: 10.1.46.2
ID                          Type Age(s) LnkIn LnkOut Protocol
R5.00(10.0.0.5)             Rtr     609     3      3 IS-IS(2)
    To: R1.00(10.0.0.1), Local: 10.1.15.2, Remote: 10.1.15.1
    To: R4.00(10.0.0.4), Local: 10.1.45.2, Remote: 10.1.45.1
    To: R6.00(10.0.0.6), Local: 10.1.56.1, Remote: 10.1.56.2
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R1.00(10.0.0.1), Local: 10.1.15.2, Remote: 10.1.15.1
    To: R4.00(10.0.0.4), Local: 10.1.45.2, Remote: 10.1.45.1
    To: R6.00(10.0.0.6), Local: 10.1.56.1, Remote: 10.1.56.2
ID                          Type Age(s) LnkIn LnkOut Protocol
R6.00(10.0.0.6)
              Rtr     633     4      4 IS-IS(2)
```

```
    To: R3.00(10.0.0.3), Local: 10.1.36.2, Remote: 10.1.36.1
    To: R4.00(10.0.0.4), Local: 10.1.46.2, Remote: 10.1.46.1
    To: R5.00(10.0.0.5), Local: 10.1.56.2, Remote: 10.1.56.1
    To: R2.00(10.0.0.2), Local: 10.1.26.2, Remote: 10.1.26.1
ID                          Type Age(s) LnkIn LnkOut Protocol
                                                     OSPF(0.0.0.0)
    To: R3.00(10.0.0.3), Local: 10.1.36.2, Remote: 10.1.36.1
    To: R4.00(10.0.0.4), Local: 10.1.46.2, Remote: 10.1.46.1
    To: R5.00(10.0.0.5), Local: 10.1.56.2, Remote: 10.1.56.1
    To: R2.00(10.0.0.2), Local: 10.1.26.2, Remote: 10.1.26.1
```

Meaning Sample Output 1 shows the configuration of the cspf-link file, cspf flag, and cspf-link flag at the [edit protocols mpls traceoptions] hierarchy level. See "Configuring CSPF Tracing" on page 73 for steps to configure CSPF tracing.

Sample Output 2 shows the contents of the cspf-link file in the /var/log/ directory on ingress router R1. The cspf-link file contains the CSPF computations logged when the cspf and cspf-link flags are configured at the [edit protocols mpls traceoptions] hierarchy level and after the run monitor start cspf and run show log cspf commands are issued.

Each line of output describes the steps taken by the CSPF algorithm to calculate the shortest path between the ingress and egress routers. Because the cspf-link flag is configured, the output shows the node and link information included in the calculations performed by the CSPF algorithm. For example, R1 (ingress router) has three links with three possible paths to the egress router (R6), Link 10.1.13.1->10.1.13.2, Link 10.1.12.1->10.1.12.2, and Link 10.1.15.1->10.1.15.2. In this instance, the CSPF algorithm selects the 10.1.13.1->10.1.13.2 link as the shortest path to the egress router.

The result of the CSPF algorithm is formed into a strict-hop ERO. For example, the ERO for the LSP R1-to-R6 contains two hops that pass through nodes 10.1.13.2/32 and 10.1.36.2.32. When the ERO is completed, CSPF for R1-to-R6 done!, the ERO is passed to the RSVP protocol process, where it is used for signaling and establishing the LSP in the network. The output shows RPD_MPLS_LSP_UP, indicating that the LSP was established successfully

Sample Output 3 shows a brief summary of the contents of the traffic engineering database. (For more detailed information, use the detail or extensive options.) When CSPF tracing is configured, the contents of the specified CSPF log file should correlate to the contents of the traffic engineering database; that is, the links shown in the output for the show log *filename* command should also appear in the output for the show ted database command. In the example network shown in Figure 3 on page 75, the six nodes and all links associated with those nodes appear in the output of both commands.

The traffic engineering database is built through link–state routing protocol extensions that allow for the flooding of information regarding available link bandwidth, link coloring, and so on. Also, the traffic engineering database includes information contained in the OSPF and IS-IS databases. For example, R1 has three links configured at IS-IS Level 2, and the same three links configured in OPSF area 0.0.0.0.

For a more detailed examination of the traffic engineering database, see "Examining a CSPF Failure" on page 85.

Chapter 8

Examining a CSPF Failure

The ingress router determines the physical path for each label-switched path (LSP) by applying a Constrained Shortest Path First (CSPF) algorithm to the information in the traffic engineering database (TED). This chapter describes a real-world scenario in which the CSPF algorithm fails because of the incorrect association of links with administrative groups (also known as link coloring). It discusses some basic approaches to monitoring and examining a CSPF failure, including how, when, and why you use specific commands. This chapter also includes an examination of an example CSPF log file, traffic engineering database, and corrective action for the example scenario.

Checklist for Examining a CSPF Failure

Problem The ingress router determines the physical path for each label-switched path (LSP) by applying a Constrained Shortest Path First (CSPF) algorithm to the information in the traffic engineering database (TED). This checklist provides the links and commands for a real-world scenario in which the CSPF algorithm fails because of the incorrect association of links with administrative groups (also known as link coloring). The links point to discussions of some basic approaches to monitoring and examining a CSPF failure, including how, when, and why you use specific commands. The links also point to an examination of an example CSPF log file, traffic engineering database, and corrective action for the example scenario. (See Table 13 on page 85.)

Table 13: Checklist for Examining a CSPF Failure

Tasks	
"Case Study for a CSPF Failure" on page 86	
1. Verify That the LSP Is Established on page 87	show mpls lsp extensive
2. Check the Administrative Group Configuration on page 88	show configuration protocols mpls show mpls interface show ted database extensive *nodeID*
"Examining a CSPF Failure" on page 92	
1. Verify the CSPF Failure on page 92	clear mpls lsp show mpls lsp extensive

Table 13: Checklist for Examining a CSPF Failure *(continued)*

Tasks		
2.	Examine the CSPF Log File on page 93	monitor start *filename* show log *filename* monitor stop
3.	Examine the Traffic Engineering Database on page 95	show ted database extensive For output filtered for color: show ted database extensive *nodeID* | match "(NodeID | To: | Color)"
4.	Check the Administrative Group Configuration on R5 on page 98	edit [edit protocols mpls] show delete interface so-0/0/1 admin-group set interface so-0/0/0 admin-group red show commit

Case Study for a CSPF Failure

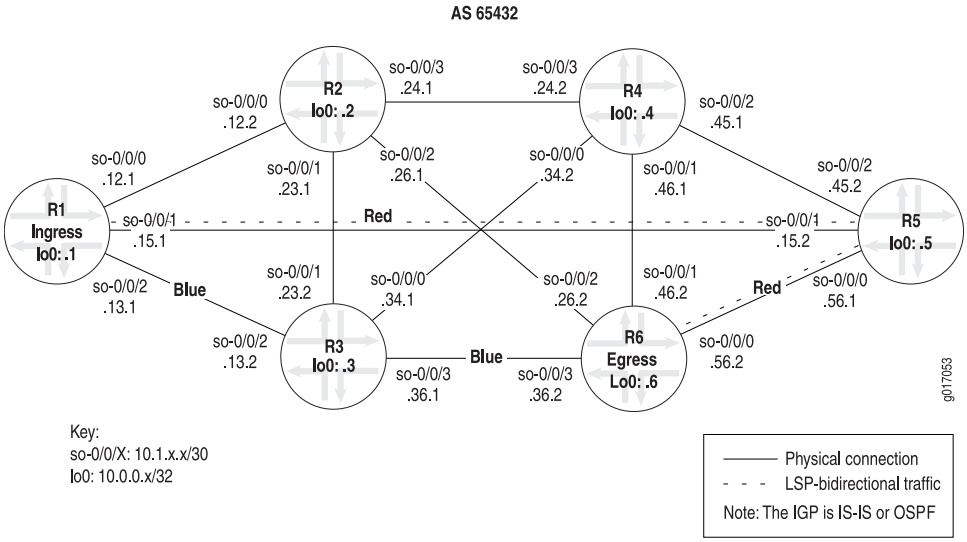
Purpose This case study presents a Multiprotocol Label Switching (MPLS) network topology and CSPF failure scenario designed to demonstrate techniques and commands that are particularly useful when addressing CSPF problems in your network. The focus of the study is the incorrect association of user-provided constraints, specifically administrative groups (also known as link coloring).

When calculating a path, the CSPF algorithm factors in user–provided constraints. The ingress router determines the physical path for each LSP by applying a CSPF algorithm to the information in the traffic engineering database. CSPF is a shortest-path-first (SPF) algorithm that has been modified to take into account constraints when calculating the shortest path across the network. Links that do not comply with the restrictions are removed from the tree and cannot be factored into the resulting SPF calculations.

CSPF integrates topology link-state information that is learned from interior gateway protocol (IGP) traffic engineering extensions and is maintained in the traffic engineering database. The information stored in the traffic engineering database includes attributes associated with the state of network resources.

The network topology shown in Figure 4 on page 87 illustrates a network in which the LSP is constrained by administrative group coloring (also known as link coloring), and CSPF tracing is configured on the ingress router R1. In this example, the LSP is forced to transit R5 in accordance with the restrictions imposed.

Figure 4: CSPF Topology with Administrative Group Coloring



The network shown in Figure 4 on page 87 is an MPLS router-only network with SONET interfaces. For more details about the MPLS network topology, see "Configuring CSPF Tracing" on page 71.

The MPLS network shown in Figure 4 on page 87 is configured with administrative group coloring as follows:

- The LSP R1-to-R6 is established with R1 as the ingress router and R6 as the egress router.
- The required path to R6 transits R5 on the redlinks. The inclusion of red coloring is not strictly necessary. To force the LSP to transit R5,you could color the links on R3 and R2 blue and then exclude the blue links.
- Both red and blue colors are used with the include and exclude statements to ensure that the LSP always transits R5. For information on configuring administrative group coloring, see the *JUNOS MPLS Applications Configuration Guide*.

To check that the network is configured correctly and the LSP is established, follow these steps:

1. Verify That the LSP Is Established on page 87
2. Check the Administrative Group Configuration on page 88

Verify That the LSP Is Established

Purpose Check that the LSP shown in Figure 4 on page 87 is established and traversing the path from R1 to R6 through the red links.

Action To verify that the LSP is established, enter the following JUNOS command-line interface (CLI) operational mode command:

```
user@host> show mpls lsp extensive
```

user@host> **show mpls lsp**

Sample Output

```
user@R1>  show mpls lsp extensive | no-more
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 1, LSPname: R1-to-R6
  ActivePath:  (primary)
  LoadBalance: Random
  Metric: 100
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
           Include: red    Exclude: blue
     Computed ERO
 (S [L] denotes strict [loose] hops): (CSPF metric: 20)
  10.1.15.2 S 10.1.56.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node 10=SoftPreempt):

          10.1.15.2 10.1.56.2
    6 May 11 19:31:42 Selected as active path
    5 May 11 19:31:42 Record Route:  10.1.15.2 10.1.56.2
    4 May 11 19:31:42 Up
    3 May 11 19:31:42 Originate Call
    2 May 11 19:31:42  CSPF: computation result accepted
    1 May 11 19:31:12 CSPF failed: no route toward 10.0.0.6[5 times]
  Created: Wed May 11 19:29:17 2005
Total 1 displayed, Up 1, Down 0
[...Output truncated...]
```

Sample Output 2

```
[edit protocols mpls]
user@R5# run show mpls lsp
Ingress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

Egress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

Transit LSP: 2 sessions
To              From            State   Rt Style Labelin Labelout LSPname
10.0.0.1        10.0.0.6        Up       1  1 FF  100352        3 R6-to-R1
10.0.0.6        10.0.0.1        Up       1  1 FF  100384        3 R1-to-R6
Total 2 displayed, Up 2, Down 0
```

Meaning Sample Output 1 from ingress router R1 shows that LSP R1-to-R6 is successfully established as indicated by the Explicit Route Object (ERO) 10.1.15.2 S 10.1.56.2 S, the log message CSPF: computation result accepted, and State: Up. Also, the LSP is routing packets correctly over the red links, avoiding the blue links or the links without any coloring. See Step 3 in "Configuring CSPF Tracing" on page 71 for information on the steps CSPF takes to select a path.

Sample Output 2 from transit router R5 shows that LSP R1-to-R6 is transiting R5 as expected.

Check the Administrative Group Configuration

Purpose Check that the administrative group coloring is correct and the relevant interfaces are associated with each administrative group correctly

Action To check the administrative group configuration, enter the following JUNOS CLI operational mode commands, or issue the show command at the [edit protocols mpls] hierarchy level, as shown in the example below:

```
user@host> show configuration protocols mpls
user@host> show mpls interface
user@host> show ted database extensive nodeID
```

Sample Output 1

```
[edit protocols mpls]
user@R1#  show
traceoptions {
    file cspf;
    flag cspf;
    flag cspf-node;
    flag cspf-link;
}
admin-groups {
    blue 4;
    red 8;
}
label-switched-path R1-to-R6 {
    to 10.0.0.6;
    metric 100;
     admin-group {
        include red;
        exclude blue;
    }
}
interface so-0/0/0.0;
interface so-0/0/1.0 {
    admin-group red;
}
interface so-0/0/2.0 {
    admin-group blue;
}
interface fxp0.0 {
    disable;
}

[edit protocols mpls]
user@R3#  show
admin-groups {
    blue 4;
}
interface fxp0.0 {
    disable;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0 {
interface so-0/0/3.0 {
    admin-group blue;
}

[edit protocols mpls]
user@R5# show
admin-groups {
    red 8;
}
interface fxp0.0 {
    disable;
```

```
}
interface so-0/0/0.0 {
    admin-group red;
}
interface so-0/0/1.0;
interface so-0/0/2.0;

[edit protocols mpls]
user@R6# show
admin-groups {
    blue 4;
    red 8;
}
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
interface so-0/0/0.0 {
    admin-group red;
}
interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0 {
    admin-group blue;
}
```

Sample Output 2

```
useruser@R1> show mpls interface
show mpls interface
Interface        State       Administrative groups
so-0/0/0.0       Up          <none>
so-0/0/1.0       Up          red
so-0/0/2.0       Up          blue

user@R1> show mpls interface
Interface        State       Administrative groups
so-0/0/0.0       Up          <none>
so-0/0/1.0       Up          red
so-0/0/2.0       Up          blue

user@R3> show mpls interface
Interface        State       Administrative groups
so-0/0/0.0       Up          <none>
so-0/0/1.0       Up          <none>
so-0/0/2.0       Up          <none>
so-0/0/3.0       Up          blue

user@R5> show mpls interface
Interface        State       Administrative groups
so-0/0/0.0       Up          red
so-0/0/1.0       Up          <none>
so-0/0/2.0       Up          <none>

user@R6> show mpls interface
Interface        State       Administrative groups
so-0/0/0.0       Up          red
so-0/0/1.0       Up          <none>
so-0/0/2.0       Up          <none>
so-0/0/3.0       Up          blue
```

Sample Output 3

```
user@R1>  show ted database extensive R1
TED database: 6 ISIS nodes 6 INET nodes
```

```
NodeID: R1.00(10.0.0.1)
  Type: Rtr, Age: 665 secs, LinkIn: 3, LinkOut: 3
  Protocol: IS-IS(2)
    To: R2.00(10.0.0.2), Local: 10.1.12.1, Remote: 10.1.12.2
       Color: 0 <none>
      Metric: 10
      Static BW: 155.52Mbps
      Reservable BW: 155.52Mbps
      Available BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
    To: R5.00(10.0.0.5), Local: 10.1.15.1, Remote: 10.1.15.2
       Color: 0x100 red
      Metric: 10
      Static BW: 155.52Mbps
      Reservable BW: 155.52Mbps
      Available BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
    To: R3.00(10.0.0.3), Local: 10.1.13.1, Remote: 10.1.13.2
       Color: 0x10 blue
      Metric: 10
      Static BW: 155.52Mbps
      Reservable BW: 155.52Mbps
      Available BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
```

Meaning Sample Output 1 shows that administrative group coloring is correctly configured on all relevant routers. Administrative groups redand blue are configured at the [edit protocols mpls] hierarchy level, and relevant interfaces are associated with each administrative group correctly.

R3 is configured with blue coloring and the include and exclude statements are included in the configuration of R1 to ensure that LSP R1-to-R6 always transits R5. The inclusion of red coloring is not strictly necessary. To force the LSP to transit R5,you could color the links on R2 and R3 blue and then exclude the blue links. Red coloring is included in this example to demonstrate the fact that the CSPF algorithm excludes links that do not have a color configured, when the include statement is configured at the [edit protocols mpls] hierarchy level.

In addition, ingress router R1 has CSPF tracing configured in preparation for gathering information when the CSPF algorithm fails later in this example.

Sample Output 2 shows that the correct interfaces are associated with the red and blue administration groups on R1, R3, R5, and R6.

Sample Output 3 confirms that link coloring is correctly reported in the traffic engineering database for R1. Not shown is the traffic engineering database output for the remaining routers, which is similar to the R1 output, and correct.

Examining a CSPF Failure

When a local CSPF failure indicates that no path meets the constraints configured for the LSP, you must perform CSPF-based tracing and be familiar with the contents of the traffic engineering database to resolve the problem. See "Examine the Traffic Engineering Database" on page 95 for an analysis of the traffic engineering database.

NOTE: If an LSP does not establish immediately, wait at least a minute or so before taking diagnostic or corrective action. This is because the RSVP retry timer is set to a 30-second default, resulting in a slight delay before the correct state of the LSP is available.

To examine a CSPF failure, follow these steps:

Verify the CSPF Failure

Purpose To simulate a configuration error on the network, router R5 has the administrative group coloring removed from interface so-0/0/0. The result is a CSPF failure at R5 because there is no longer a path between R1 and R6 that includes the red color.

Action To confirm that the LSP is down and verify the configuration on routers R1 and R5, enter the following JUNOS CLI operational mode commands:

```
user@host>  clear mpls lsp
user@host>  show mpls lsp extensive
```

Sample Output 1

```
user@R1> clear mpls lsp
[edit protocols mpls]
user@R1#  run show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 0.0.0.0,  State: Dn
 , ActiveRoute: 0, LSPname: R1-to-R6
   ActivePath: (none)
  LoadBalance: Random
```

```
  Metric: 100
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                  State: Dn
          Include: red    Exclude: blue
    Will be enqueued for recomputation in 24 second(s).
     9 May 11 20:12:28 CSPF failed: no route toward 10.0.0.6
    8 May 11 20:12:28 Clear Call
    7 May 11 20:12:28 Deselected as active
    6 May 11 19:31:42 Selected as active path
    5 May 11 19:31:42 Record Route:  10.1.15.2 10.1.56.2
    4 May 11 19:31:42 Up
    3 May 11 19:31:42 Originate Call
    2 May 11 19:31:42 CSPF: computation result accepted
    1 May 11 19:31:12 CSPF failed: no route toward 10.0.0.6[5 times]
  Created: Wed May 11 19:29:17 2005
Total 1 displayed, Up 0, Down 1
[...Output truncated...]
```

Sample Output 2

```
[edit protocols mpls]
user@R5#  run show mpls lsp
Ingress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

Egress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

Transit LSP: 1 sessions
To              From            State   Rt Style Labelin Labelout LSPname
10.0.0.1        10.0.0.6        Up       1  1 FF  100352        3 R6-to-R1
Total 1 displayed, Up 1
 , Down 0
```

Meaning Sample Output 1 from ingress router R1 shows that the clear mpls lsp command was issued to confirm that R1 cannot reestablish LSP R1-to-R6. The sample output from the show mpls lsp extensive command shows that LSP R1-to-R6 is down, State: Dn and ActivePath: (None); and that the CSPF has failed, CSPF failed: no route toward 10.0.0.6.

Sample Output 2 from transit router R5 shows that LSP R1-to-R6 is not included in the output, indicating that the LSP is not transiting R5.

Most network problems appear as a local CSPF failure, as shown in the sample output. The CSPF failure indicates that no path meeting the constraints for the LSP can be found in the router's traffic engineering database. To resolve these problems effectively, use CSPF tracing on the ingress router, and analyze the traffic engineering database to locate the node that should meet the constraints.

Examine the CSPF Log File

Purpose After you have confirmed that the LSP is down, obtain more information about the possible cause of the failure.

NOTE: To obtain useful information from the CSPF log file, make sure that CSPF tracing is configured on the ingress router. For more information on configuring CSPF tracing, see "Configuring CSPF Tracing" on page 71.

Action To examine the CSPF log file, enter the following JUNOS CLI operational mode commands:

user@host> **monitor start** *filename*
user@host> **show log** *filename*

NOTE: To stop monitoring CSPF, issue the monitor stop command.

Sample Output

```
user@R1> monitor start cspf

[edit protocols mpls]
user@R1#  run show log cspf-failed3
May 27 10:22:23 trace_on:  Tracing to "/var/log/cspf"
  started
May 27 10:22:29 CSPF adding path R1-to-R6(primary ) to CSPF queue 1
May 27 10:22:29 CSPF creating CSPF job
May 27 10:22:29
May 27 10:22:29 CSPF for path R1-to-R6(primary ), begin at R1.00 , starting
May 27 10:22:29          path include: 0x00000100
 << administration group red
May 27 10:22:29          path exclude: 0x00000010
 << administration group blue
May 27 10:22:29         bandwidth: CT0=0bps ; setup priority: 0; random
May 27 10:22:29 CSPF final destination 10.0.0.6
May 27 10:22:29 CSPF starting from R1.00 (10.0.0.1) to 10.0.0.6, hoplimit 254
May 27 10:22:29         constraint include 0x00000100
May 27 10:22:29         constraint exclude 0x00000010
May 27 10:22:29   Node R1.00 (10.0.0.1) metric 0, hops 0, avail 32000 32000 32000
 32000
May 27 10:22:29      Link 10.1.12.1->10.1.12.2(R2.00/10.0.0.2) metric 10 color
0x00000000 bw 155.52Mbps
May 27 10:22:29         Reverse Link for 10.1.12.1->10.1.12.2 is
10.1.12.2->10.1.12.1
May 27 10:22:29         link fails include 0x00000100
May 27 10:22:29      Link 10.1.15.1->10.1.15.2(R5.00/10.0.0.5) metric 10 color
0x00000100 bw 155.52Mbps
May 27 10:22:29         Reverse Link for 10.1.15.1->10.1.15.2 is
10.1.15.2->10.1.15.1
May 27 10:22:29         link's interface switch capability descriptor #1
May 27 10:22:29           encoding: Packet, switching: Packet
May 27 10:22:29          link passes constraints
May 27 10:22:29      Link 10.1.13.1->10.1.13.2(R3.00/10.0.0.3) metric 10 color
0x00000010 bw 155.52Mbps
May 27 10:22:29         Reverse Link for 10.1.13.1->10.1.13.2 is
10.1.13.2->10.1.13.1
May 27 10:22:29         link fails include 0x00000100
May 27 10:22:29    Node R5.00 (10.0.0.5) metric 10, hops 1, avail 32000 32000
32000 32000
May 27 10:22:29      Link 10.1.15.2->10.1.15.1(R1.00/10.0.0.1) metric 10 color
0x00000100 bw 155.52Mbps
May 27 10:22:29         skipped: end point already visited
```

```
May 27 10:22:29      Link 10.1.45.2->10.1.45.1(R4.00/10.0.0.4) metric 10 color
0x00000000 bw 155.52Mbps
May 27 10:22:29         Reverse Link for 10.1.45.2->10.1.45.1 is
10.1.45.1->10.1.45.2
May 27 10:22:29         link fails include 0x00000100
May 27 10:22:29      Link 10.1.56.1->10.1.56.2(R6.00/10.0.0.6) metric 10 color
0x00000000 bw 155.52Mbps
May 27 10:22:29          Reverse Link for 10.1.56.1->10.1.56.2 is
10.1.56.2->10.1.56.1
May 27 10:22:29          link fails include 0x00000100
May 27 10:22:29 CSPF completed in 0s
May 27 10:22:29 CSPF couldn't find a route to 10.0.0.6
May 27 10:22:29 CSPF for R1-to-R6 done!
monitor stop
```

Meaning The sample output shows that the monitor start cspf command was issued to start displaying entries in the cspf log file in real time. The cspf log file is generated by the routing protocol process after the file is configured with the traceoptions statement at the [edit protocols mpls] hierarchy level. In this example, the cspf log file is configured with the cspf, cspf-node, and cspf-link flags to provide the most granular information about the steps taken by the CSPF algorithm. For information on configuring CSPF tracing, see "Configuring CSPF Tracing" on page 71.

The only link that passes the color constraint is between R1 and R5, 10.1.15.0/32. The CSPF algorithm is a locally run algorithm, which makes its calculations on a given router. When the CSPF algorithm runs on R5, it prunes 10.1.15.2 and selects 10.1.56.1 to send the message to R6.The link between R5 and R6 10.1.56.0/32 does not pass the color constraints, indicating a problem with R5. At this stage, it is useful to examine the traffic engineering database to determine which link on R5 should be associated with the red color.

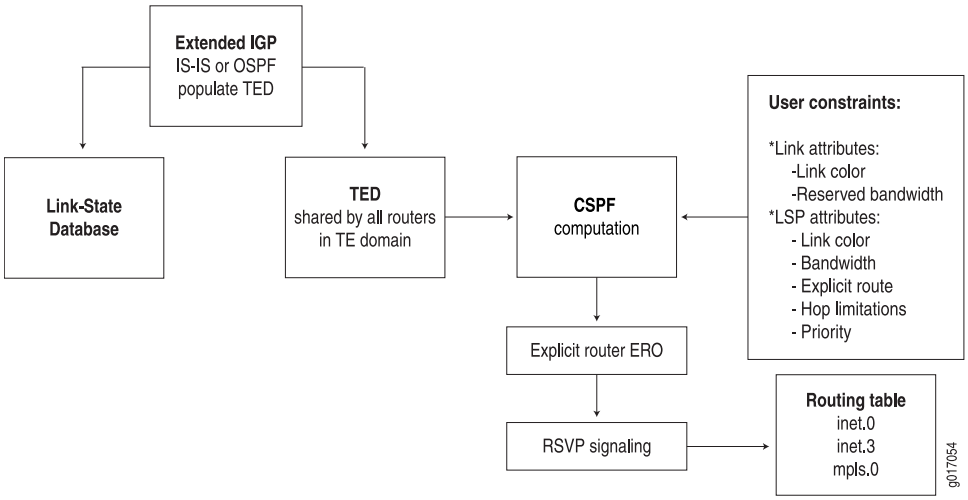
Examine the Traffic Engineering Database

Purpose Examining the traffic engineering database is another way to locate the node that should meet the constraints but does not. Once identified, you can concentrate your troubleshooting efforts on why that node is not being represented accurately in the database.

The contents of the traffic engineering database are consistent among all routers within a given traffic engineering domain. Therefore, you can issue the show ted database command from any router in the same traffic engineering domain to obtain more granular information about the CSPF failure.

CSPF integrates topology link-state information that is learned from the IGP traffic engineering extensions and maintained in the traffic engineering database. The information stored in the traffic engineering database includes attributes associated with the state of the network resources (such as total link bandwidth, reserved link bandwidth, available link bandwidth, and link color). When calculating a path, the CSPF algorithm factors in user–provided information such as bandwidth requirements, maximum allowed hop count, and administrative groups, all of which are obtained from user configuration. (See Figure 5 on page 96).

Figure 5: User–Provided Constraints



Action To examine the traffic engineering database, enter the following JUNOS CLI operational mode commands:

```
user@host>  show ted database extensive
user@host> show ted database extensive NodeID | match "(NodeID|To:|Color)"
```

Sample Output 1

```
[edit protocols mpls]
user@R1#  run show ted database extensive
TED database: 6 ISIS nodes 6 INET nodes
[...Output truncated...]
NodeID: R5.00(10.0.0.5)
   Type: Rtr , Age: 103 secs, LinkIn: 3, LinkOut: 3
   Protocol: IS-IS(2)
    To: R1.00(10.0.0.1), Local: 10.1.15.2, Remote: 10.1.15.1
      Color: 0x100 red
      Metric: 10
      Static BW: 155.52Mbps
      Reservable BW: 155.52Mbps
      Available BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
     To: R4.00(10.0.0.4) , Local: 10.1.45.2, Remote: 10.1.45.1
      Color: 0 <none>
      Metric: 10
      Static BW: 155.52Mbps
      Reservable BW: 155.52Mbps
      Available BW [priority] bps:
          [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
          [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
      Interface Switching Capability Descriptor(1):
        Switching type: Packet
        Encoding type: Packet
        Maximum LSP BW [priority] bps:
```

```
            [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
            [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
        To: R6.00(10.0.0.6), Local: 10.1.56.1, Remote: 10.1.56.2
          Color: 0 <none>
          Metric: 10
          Static BW: 155.52Mbps
          Reservable BW: 155.52Mbps
          Available BW [priority] bps:
              [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
              [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
          Interface Switching Capability Descriptor(1):
            Switching type: Packet
            Encoding type: Packet
            Maximum LSP BW [priority] bps:
              [0] 155.52Mbps   [1] 155.52Mbps  [2] 155.52Mbps  [3] 155.52Mbps
              [4] 155.52Mbps   [5] 155.52Mbps  [6] 155.52Mbps  [7] 155.52Mbps
[...Output truncated...]
```

Sample Output 2

```
[edit protocols]
user@R1#  run show ted database extensive R5.00 | match "(NodeID|To:|Color)"
NodeID: R5.00(10.0.0.5)
    To: R1.00(10.0.0.1), Local: 10.1.15.2, Remote: 10.1.15.1
      Color: 0x100 red
    To: R4.00(10.0.0.4), Local: 10.1.45.2, Remote: 10.1.45.1
      Color: 0 <none>
    To: R6.00(10.0.0.6), Local: 10.1.56.1, Remote: 10.1.56.2
      Color: 0 <none>
    To: R1.00(10.0.0.1), Local: 10.1.15.2, Remote: 10.1.15.1
      Color: 0x100 red
    To: R4.00(10.0.0.4), Local: 10.1.45.2, Remote: 10.1.45.1
      Color: 0 <none>
     To: R6.00(10.0.0.6), Local: 10.1.56.1, Remote: 10.1.56.2
      Color: 0 <none>
```

Meaning

Sample Output 1 from ingress router R1 shows a wealth of information on each node in the network, although only a portion is included in this example. The output shows the total number of IS-IS and INET nodes in the traffic engineering domain. The portion of the traffic engineering database shown represents a node (R5), and the Type field indicates Rtr (router). The Type field could also indicate Net (network) if the node were a pseudo node. The node (R5) has three input and output links that are running IS-IS Level 2, Protocol: IS-IS(2). The links lead to nodes R1, R4, and R6. The local address and remote address for each link is specified. The information on each node includes administrative groups (Color:), metrics, static bandwidth, reservable bandwidth, and available bandwidth priority level. The information contained in the traffic engineering database should be the same across all routers in the same traffic engineering domain. For a detailed description of the fields in the output of the show ted database extensive command, see the *JUNOS Routing Protocols and Policies Command Reference*.

Sample Output 2 shows filtered output that allows you to focus on exactly what is missing or incorrect.

Both outputs confirm that the link between R1 and R5, 10.1.15.0/32, is associated with the red color, while the link between R5 and R6, 10.1.56.0/32, is not associated with a color. In the network shown in Figure 4 on page 87, for the LSP to establish correctly, link 10.1.56.1 must be associated with the red color.

Check the Administrative Group Configuration on R5

Purpose Focus on R5 to determine which interfaces are associated with the red color, and make any necessary corrections.

Action To check the administrative group configuration on R5 and make any necessary corrections, enter the following JUNOS CLI commands:

```
user@R5> edit
[edit protocols mpls]
user@R5# show
user@R5# delete interface so-0/0/1 admin-group
user@R5# set interface so-0/0/0 admin-group red
user@R5# show
user@R5# commit
```

Sample Output 1

```
user@R5> edit
Entering configuration mode

[edit protocols mpls]
user@R5# show
admin-groups {
    red 8;
}
interface fxp0.0 {
    disable;
}
interface so-0/0/0.0;
interface so-0/0/1.0 { <<<incorrect interface configured with admin-group
    admin-group red;
}
interface so-0/0/2.0;
```

Sample Output 2

```
[edit protocols mpls]
user@R5# delete interface so-0/0/1 admin-group

[edit protocols mpls]
user@R5# set interface so-0/0/0 admin-group red

[edit protocols mpls]
user@R5# show
admin-groups {
    red 8;
    blue 4;
}
interface fxp0.0 {
    disable;
}
interface so-0/0/0.0 { <<<correct interface configured with admin-group
    admin-group red;
}
interface so-0/0/1.0;
interface so-0/0/2.0;

[edit protocols mpls]
user@R5# commit
commit complete
```

Sample Output 3

```
user@R1> show mpls lsp
Ingress LSP: 1 sessions
To              From            State Rt ActivePath       P     LSPname
10.0.0.6        10.0.0.1        Up     1                  *     R1-to-R6
Total 1 displayed, Up 1, Down 0

Egress LSP: 1 sessions
To              From            State   Rt Style Labelin Labelout LSPname
10.0.0.1        10.0.0.6        Up       0  1 FF       3        - R6-to-R1
Total 1 displayed, Up 1, Down 0

Transit LSP: 0 sessions
Total 0 displayed, Up 0, Down 0
```

Meaning

Sample Output 1 from transit router R5 shows that at the [edit protocols mpls] hierarchy level, interface so-0/0/1 is incorrectly configured with the admin-group red statement. The so-0/0/0 interface should be configured with the admin-group red statement.

Sample Output 2 shows the steps taken to correct the configuration. The administration group has been deleted from so-0/0/1 and so-0/0/0 is now associated with the red color.

Sample Output 3 shows that LSP R1-to-R6 is established.

Part 3

Examining the RSVP Log

Chapter 9

Understanding the Structure of RSVP

Understanding the RSVP Structure

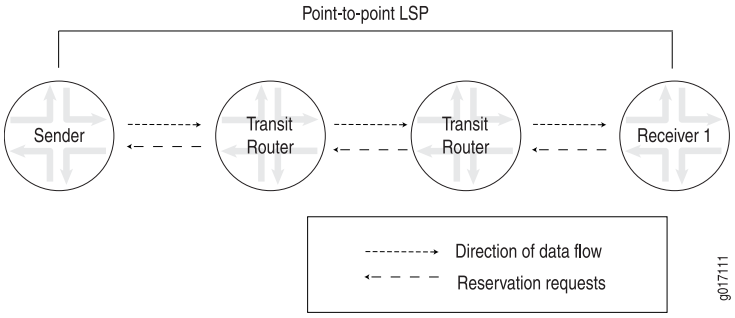
Considering that Resource Reservation Protocol (RSVP)-signaled label-switched paths (LSPs) are primarily established using RSVP Path and Resv messages, it is useful to understand the structure of RSVP when you examine a problem with an LSP. This chapter discusses the following topics:

RSVP Overview

The RSVP protocol is used by routers to deliver quality-of-service (QoS) requests to all nodes along data flow path(s) and to establish and maintain state for the requested service. RSVP requests generally result in resource reservations in each node along the data path. RSVP has the following attributes:

- Makes resource reservations for unidirectional data flows.
- Allows the receiver of a data flow to initiate and maintain the resource reservation used for that flow, as shown in Figure 6 on page 104.
- Maintains a soft state in routers and hosts, providing graceful support for dynamic membership changes and automatic adaptation to routing changes.
- Depends upon present and future routing protocols, but is not a routing protocol itself.
- Provides several reservation models or styles to fit a variety of applications.
- Supports both IPv4 and IPv6. Note, you can configure the JUNOS software to tunnel IPv6 over an MPLS-based IPv4 network. For more information, see the *JUNOS MPLS Applications Configuration Guide*.

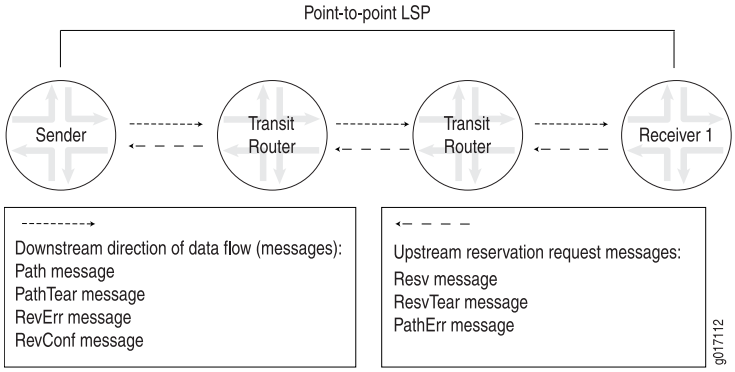
Figure 6: RSVP Reservation Request and Data Flow



RSVP Session Overview

RSVP creates independent sessions to handle each data flow. It is important to note that each session is simplex, even though bidirectional messages (Path and Resv) create the simplex session. A session is identified by a combination of the destination address, an optional destination port, and a protocol. Within a session, there can be one or more senders. Each sender is identified by a combination of its source address and source port. Figure 7 on page 104 shows a simplified overview of an RSVP point-to-point session. For information on point-to-multipoint LSPs, see the *JUNOS MPLS Applications Configuration Guide*.

Figure 7: RSVP Session



A typical RSVP session involves the following sequence of events:

- A potential sender (ingress router) starts sending RSVP Path messages to the session address (egress router).
- The receiver receives the Path messages.
- The receiver sends appropriate Resv messages toward the sender. These messages carry a flow descriptor, which is used by routers along the path to make reservations in their link-layer media.
- The sender receives the Resv message, then starts sending application data.

RSVP Message Structure

RSVP was extended by various Requests for Comments (RFCs) to function as a signaling protocol to create Multiprotocol Label Switching (MPLS) LSPs. The signaling occurs with RSVP messages which are encapsulated directly with IP datagrams using a protocol ID of 46. Each RSVP message uses a common header followed by various objects, as shown in Figure 8 on page 105.

Figure 8: RSVP Common Header

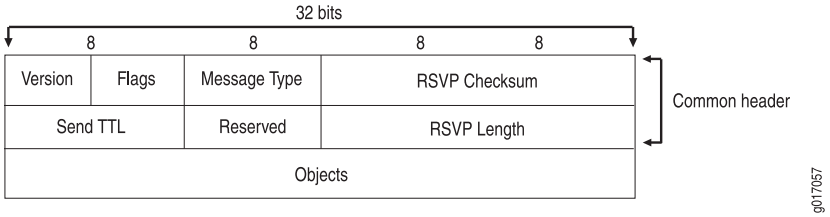


Table 14 on page 105 lists and describes the fields in the RSVP common header.

Table 14: Fields in the RSVP Common Header

Field Name	Defined	Descrip
Version	4 bit	JUNOS s
Flags	4 bits Ox01 to 0x08 0x01: Refresh overhead reduction 0x02 to 0x08: Reserved	Used to extensi

Table 14: Fields in the RSVP Common Header *(continued)*

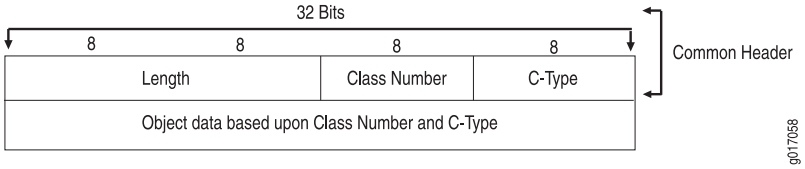
Field Name	Defined	Descrip
Message Type	1 Path (RFC 2205) 2 Resv (RFC 2205) 3 PathErr (RFC 2205) 4 ResvErr (RFC 2205) 5 PathTear (RFC 2205) 6 ResvTear (RFC 2205) 7 ResvConf (RFC 2205) 12 Bundle (RFC 2961) 13 Ack (RFC 2961) 15 SRefresh (RFC 2961) 20 Hello (RFC 3209) 25 Integrity Challenge (RFC 3097) 26 Integrity Response (RFC 3097)	Displays messag detailed types, s Messag RSVP E
RSVP Checksum	16 bits	Displays entire R checksu assume
Send TTL	8 bits	Derived (TTL). If the valu previou
Reserved	8 bits	This fiel 0x00.
RSVP Length	16 bits	Displays includin attache
Objects	Variable	This var more R descript Structur

RSVP Objects Structure

RSVP objects carry the information that comprises the contents of RSVP messages. Different combinations of objects define the information necessary for RSVP to

signal LSPs. Each object is represented by a fixed-length header and a variable-length data field, as shown in Figure 9 on page 107.

Figure 9: RSVP Object Header



The maximum object content length is 65,528 bytes. The Class-Num and C-Type fields may be used together as a 16-bit number to define a unique type for each object. Table 15 on page 107 lists and describes the fields in the RSVP object header.

Table 15: Fields in the RSVP Object Header

Field Name	Defined	D
Length	16 bits	C o a 4
Class-Num	The values of this field are defined in Appendix A, RFC 2205, *Resource ReSerVation Protocol (RSVP), Version 1, Functional Specification*.	Ic cl S in o T
C-Type	For a breakdown of the C-Type associated with each RSVP object, see Appendix A, RFC 2205.	C a c (C e
Object Data	The Class-Num and C-Type may be used to define a unique object. C-Type is the object type and is used to accommodate different Internet address families, such as those corresponding to IPv4 and IPv6 [44]. Currently, C-Type 1 is assigned to IPv4 and C-Type 2 is used for IPv6. The structure and format of the objects may change from one family to another.	C ic C fi in d p

The setup and maintenance of an RSVP session requires information that is encoded in multiple objects used in the various RSVP message types. Table 16 on page 108 lists and describes some RSVP objects, the messages in which they are used, and the RFC to which you can refer for further information. The objects are listed in alphabetical order.

Table 16: RSVP Objects

Object Name	RSVP Message	RFC	Description
Adspec	Path	2205	Carries a summary of available and bandwidth estimates, and c parameters used by specific Qo services. The summary is comp Adspec passes each hop. The JU uses the Adspec field for maximu unit (MTU) negotiation.
Detour	Path		Used in one-to-one backup to id LSPs. For more information on object, see Internet draft draft-ietf-mpls-rsvp-lsp-fastrerou *Reroute Extensions to RSVP-TE f*
Error	PathErr, ResvErr, ResvConf	2205	Specifies an error in a PathErr o message, or a confirmation in a message.
Explicit route	Path	3209	Specifies a strict or loose path in topology.
FastReroute	Path		Used to control the backup for a The fast reroute object specifies hold priorities, the session attrib the bandwidth to be used for pr allows a specific local protection be requested. For more informa reroute object, see Internet draf draft-ietf-mpls-rsvp-lsp-fastrerou *Reroute Extensions to RSVP-TE f*
Filter	Resv ResvTear ResvErr		Defines the source of the sessio
FilterSpec	Resv	2205, 3209	Defines a subset of session data should receive the desired QoS flow specification object.
FlowSpec	Resv	2205, 2210	Defines a desired QoS.
Hello	Hello	3209	Can be a request or a reply. Every generate a reply.
Hop	Path, Resv	2205	Carries the IP address of the RSV that sent the message, and a log interface.
Integrity	All message types	2205, 2747, 3097	Carries cryptographic data to au originating node and verify the RSVP message.
Label	Resv	3209	Contains the label value (for exa that is mapped to the LSP identi session value.

Table 16: RSVP Objects *(continued)*

Object Name	RSVP Message	RFC	Description
LabelRequest	Path	3209	Indicates, to the next downstrea label assignment is requested.
Null			Has a class number of zero, and ignored. Its length must be at le be any multiple of 4. A NULL obj anywhere in a sequence of obje contents will be ignored by the
Policy data	Path, Resv, PathErr, ResvErr	2205	Carries information that allows module to decide whether an as reservation is administratively p use of policy data objects is not at this time.
Properties		Juniper only	Specifies a Juniper Networks pro used to carry information about
RecRoute	Path, Resv	3209	Indicates the list of addresses th message has transited.
RestartCap	Hello	3473	Indicates the sender node's grac capability.
ResvConf	Resv, ResvConf	2205	Response to confirm a reservati
Scope	Resv, ResvErr, ResvTear	2205	Carries an explicit list of sender which the information in the me forwarded.
Sender	Path	2205, 3209	Contains a sender IP address and additional demultiplexing inform a sender.
Session	All message types	2205, 3209	Contains the IP destination addr (DestAddress), the IP protocol ID, of generalized destination port, specific session for the other obj
SessionAttribute	Path	3209	Indicates a variety of parameters priority, hold priority, flags, nam session name.
SrcRoute	Path		Contains the list of addresses in Route Object (ERO).
Style	Resv	2205, 3209	Defines the reservation style, plu information that is not in flow s filter specification objects.
Time	Path, Resv	2205	Contains the value for the refres by the creator of the message.

Table 16: RSVP Objects *(continued)*

Object Name	RSVP Message	RFC	Description
Tspec	Path	2205	Defines the traffic characteristic data flow.

Chapter 10

Working with RSVP Tracing

This chapter describes how and when to configure tracing for a Resource Reservation Protocol (RSVP) signaled label-switched path (LSP) in a Multiprotocol Label Switched (MPLS) network. With each flag that you configure, different kinds of information about RSVP are provided by the RSVP log file output.

Checklist for Working with RSVP Tracing

Problem This checklist provides the links and commands about how and when to configure tracing for a Resource Reservation Protocol (RSVP) signaled label-switched path (LSP) in a Multiprotocol Label Switched (MPLS) network. With each flag that you configure, different kinds of information about RSVP are provided by the RSVP log file output. (See "Checklist for Working with RSVP Tracing" on page 111.)

Table 17: Checklist for Working with RSVP Tracing

Tasks	Possible Action or Command
"Enabling RSVP Tracing" on page 112	
1. Configure RSVP Tracing on page 113	[edit] edit protocols rsvp [edit protocols rsvp] set traceoptions file *filename* set traceoptions flag *flag* show commit
2. Display the RSVP Log File on page 115	
a. (Optional) Clear the RSVP Session and Log File on page 115	clear rsvp session clear log *filename*
b. Display Real-Time RSVP Log Entries on page 115	monitor start *filename* monitor stop
c. View the RSVP Log File on page 116	show log *filename*

Table 17: Checklist for Working with RSVP Tracing *(continued)*

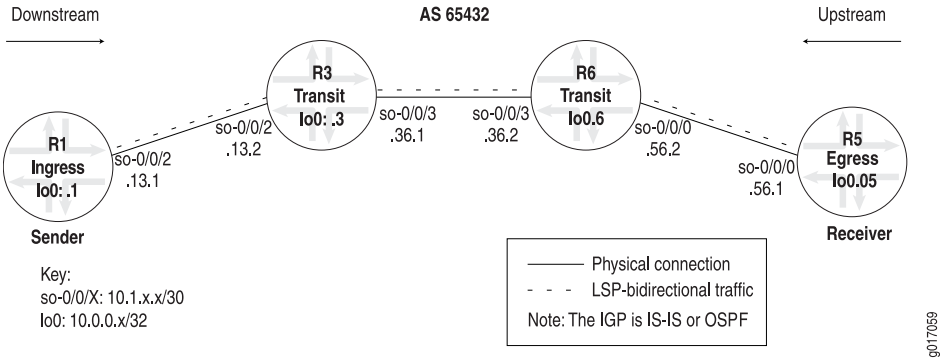
Tasks	Possible Action or Command
d. Deactivate and Reactivate RSVP Tracing on page 117	[edit protocols rsvp] deactivate traceoptions activate traceoptions

Enabling RSVP Tracing

Problem When the output of the show mpls lsp extensive command indicates that there is a problem with the LSP, you can enable RSVP tracing on the routers included in the LSP, especially the ingress and egress routers, and examine the RSVP log file to obtain more detailed information and solve the problem faster.

Solution Figure 10 on page 112 illustrates the example network topology used throughout the RSVP section. The example MPLS network uses Intermediate System-to-Intermediate System (IS-IS) Level 2 and a policy to create traffic. However, IS-IS Level 1 or an Open Shortest Path First (OSPF) area can be used and the policy omitted if the network has existing Border Gateway Protocol (BGP) traffic.

Figure 10: MPLS Network Topology



The MPLS network shown in Figure 10 on page 112 is a router-only network with SONET interfaces that consist of the following components:

- A full-mesh interior BGP (IBGP) topology, using AS 65432.
- MPLS and RSVP enabled on all routers.
- A send-statics policy on router R1 that allows a new route to be advertised into the network.
- Two unidirectional LSPs between R1 and R5, allowing bidirectional traffic.

See the *JUNOS MPLS Network Operations Guide* for information on configuring an MPLS network.

To enable RSVP tracing, follow these steps:

Configure RSVP Tracing

Action To configure a log file and specify RSVP tracing flags, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host#   edit protocols rsvp
   ```

2. Configure a log file:

   ```
   [edit protocols rsvp]
   user@host#   set traceoptions file filename
   ```

3. Depending on your situation, specify the appropriate RSVP-specific tracing flag from Table 18 on page 114. For example:

   ```
   [edit protocols mpls]
   user@host# set traceoptions flag path detail
   ```

4. Verify and commit the configuration:

   ```
   user@host# show
   user@host# commit
   ```

Sample Output

```
user@R1> edit
Entering configuration mode

[edit]
user@R1# edit protocols rsvp

[edit protocols rsvp]
user@R1# set traceoptions file rsvp-log

[edit protocols rsvp]
user@R1# set traceoptions flag error detail

[edit protocols rsvp]
user@R1# set traceoptions flag path detail

[edit protocols rsvp]
user@R1# set traceoptions flag pathtear detail

[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface so-0/0/2.0;
```

```
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R1# commit
commit complete
```

Meaning The sample output shows the configuration of RSVP tracing on ingress router R1. The log file rsvp-log contains all the information gathered for the configured flags. In the sample output, three flags are configured: error, path, and pathtear. All flags are configured with the detail option. Each flag that you configure provides slightly different information about RSVP traffic. The error flag traces all detected error conditions, the path flag traces all Path messages, and the pathtear flag traces PathTear messages. The detail option shows granular details about the flag included in the configuration.

NOTE: Use the tracing flags detail and all with caution. These flags may cause the central processing unit (CPU) to become very busy.

Table 18 on page 114 shows the tracing flags you can configure at the [edit protocols rsvp traceoptions] hierarchy level.

Table 18: RSVP Tracing Flags

Flag	Description
all	All tracing operations
error	All detected error conditions
event	RSVP-related events
lmp	RSVP-LMP interactions
packets	All RSVP packets
path	All Path messages
pathtear	PathTear messages
resv	Resv messages
resvtear	ResvTear messages
route	Routing information
state	Session state transitions

For information about examining an RSVP log file, see “Examining RSVP Log Messages” on page 119 and “Examining RSVP Error Messages” on page 137.

Display the RSVP Log File

Purpose There are at least two ways to display the RSVP log file. After you configure and commit the tracing configuration, information is immediately sent to the log file. The log information can be displayed in real time on your computer screen with the monitor start command, or you can issue the show log *filename* command to display the entries already gathered in the log file.

Also, you may need to issue clear commands to ensure that your records are current. However, if your network is large with many LSPs and RSVP sessions, this may not be advisable. For more information about the clear rsvp session command, see the *JUNOS Routing Protocols and Policies Command Reference.*

To display the RSVP log file, follow these steps:

1. (Optional) Clear the RSVP Session and Log File on page 115
2. Display Real-Time RSVP Log Entries on page 115
3. View the RSVP Log File on page 116
4. Deactivate and Reactivate RSVP Tracing on page 117

(Optional) Clear the RSVP Session and Log File

Purpose To ensure that the entries in the log file are current.

Action To clear the RSVP session and log file, enter the following JUNOS command-line interface (CLI) operational mode commands:

```
user@host>  clear rsvp session
user@host>  clear log filename
```

Sample Output

```
user@R1> clear rsvp session

user@R1> clear log rsvp-log
```

Meaning The sample output shows that the clear commands were issued correctly, with the following results:

- The RSVP sessions were reset and restarted. For more information about options for the clear rsvp session command that can limit the impact to your network, see the *JUNOS Routing Protocols and Policies Command Reference.*
- The contents of the log file were removed. For more information about the clear log command, see *JUNOS System Basics and Services Command Reference.*

Display Real-Time RSVP Log Entries

Purpose To examine the RSVP log file in real-time to obtain more detailed information about the problem with the LSP.

Action To display real-time log entries on your computer screen, enter the following JUNOS CLI operational mode command:

user@host> **monitor start** *filename*

NOTE: To stop displaying real-time RSVP log entries on your computer screen, issue the monitor stop command. The monitor stop command does not stop tracing information from going into the RSVP log file.

Sample Output

```
user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
Jun 16 17:12:23 R1 clear-log[9511]: logfile cleared
Jun 16 18:34:51 trace_on: Tracing to "/var/log/rsvp-log" started
Jun 16 18:35:09 RSVP send Path 10.0.0.1->10.0.0.5 Len=216 so-0/0/2.0
Jun 16 18:35:09   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 16 18:35:09   Hop      Len 12 10.1.13.1/0x08678198
Jun 16 18:35:09   Time     Len  8 30000 ms
Jun 16 18:35:09   SrcRoute Len 28  10.1.13.2 S 10.1.36.2 S 10.1.56.1 S
Jun 16 18:35:09   LabelRequest Len  8 EtherType 0x800
Jun 16 18:35:09   Properties Len 12 Primary path
Jun 16 18:35:09   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jun 16 18:35:09   Sender7  Len 12 10.0.0.1(port/lsp ID  3)
Jun 16 18:35:09   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 16 18:35:09   ADspec   Len 48 MTU 1500
Jun 16 18:35:09   RecRoute Len 12  10.1.13.1
Jun 16 18:35:27 RSVP recv Path 10.0.0.5->10.0.0.1 Len=216 so-0/0/2.0
Jun 16 18:35:27   Session7 Len 16 10.0.0.1(port/tunnel ID 23942) Proto 0
Jun 16 18:35:27   Hop      Len 12 10.1.13.2/0x08680198
Jun 16 18:35:27   Time     Len  8 30000 ms
Jun 16 18:35:27   SrcRoute Len 12  10.1.13.1 S
Jun 16 18:35:27   LabelRequest Len  8 EtherType 0x800
Jun 16 18:35:27   Properties Len 12 Primary path
Jun 16 18:35:27   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R5-to-R1"
Jun 16 18:35:27   Sender7  Len 12 10.0.0.5(port/lsp ID  2)
Jun 16 18:35:27   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 16 18:35:27   ADspec   Len 48 MTU 1500
Jun 16 18:35:27   RecRoute Len 28  10.1.13.2 10.1.36.2 10.1.56.1
monitor stop
```

Meaning The sample output shows real-time tracing information displayed on your computer screen (*** rsvp-log ***), and that display to the computer screen was started (monitor start) and then stopped (monitor stop). Even though you have stopped displaying log file entries on your screen, the tracing is still occurring on the router configured with trace options. The log file displays a Path message that was sent from R1 to R5, and another that R1 received from R5, indicating that the two unidirectional LSPs between R1 and R5 are established. For more information about Path messages, see "Examining RSVP Log Messages" on page 119.

If you stop monitoring to your screen and want to view the contents of the log file, use the show log *filename* command. For steps to view the log file, see "Examining RSVP Log Messages" on page 119.

View the RSVP Log File

Purpose To examine the entries already gathered in the RSVP log file to obtain more detailed information about the problem with the LSP.

Action To view the contents of the RSVP log file, enter the following JUNOS CLI operational mode command:

user@host> **show log** *filename*

Sample Output

```
user@R1> show log rsvp-log
Jun 16 17:12:23 R1 clear-log[9511]: logfile cleared
Jun 16 18:34:51 trace_on: Tracing to "/var/log/rsvp-log" started
Jun 16 18:35:09 RSVP send Path 10.0.0.1->10.0.0.5 Len=216 so-0/0/2.0
Jun 16 18:35:09   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 16 18:35:09   Hop      Len 12 10.1.13.1/0x08678198
Jun 16 18:35:09   Time     Len  8 30000 ms
Jun 16 18:35:09   SrcRoute Len 28  10.1.13.2 S 10.1.36.2 S 10.1.56.1 S
Jun 16 18:35:09   LabelRequest Len  8 EtherType 0x800
Jun 16 18:35:09   Properties Len 12 Primary path
Jun 16 18:35:09   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jun 16 18:35:09   Sender7  Len 12 10.0.0.1(port/lsp ID  3)
Jun 16 18:35:09   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 16 18:35:09   ADspec   Len 48 MTU 1500
Jun 16 18:35:09   RecRoute Len 12  10.1.13.1
Jun 16 18:35:27 RSVP recv Path 10.0.0.5->10.0.0.1 Len=216 so-0/0/2.0
Jun 16 18:35:27   Session7 Len 16 10.0.0.1(port/tunnel ID 23942) Proto 0
Jun 16 18:35:27   Hop      Len 12 10.1.13.2/0x08680198
Jun 16 18:35:27   Time     Len  8 30000 ms
Jun 16 18:35:27   SrcRoute Len 12  10.1.13.1 S
Jun 16 18:35:27   LabelRequest Len  8 EtherType 0x800
Jun 16 18:35:27   Properties Len 12 Primary path
Jun 16 18:35:27   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R5-to-R1"
Jun 16 18:35:27   Sender7  Len 12 10.0.0.5(port/lsp ID  2)
Jun 16 18:35:27   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 16 18:35:27   ADspec   Len 48 MTU 1500
Jun 16 18:35:27   RecRoute Len 28  10.1.13.2 10.1.36.2 10.1.56.1
```

Meaning The sample output shows the tracing information in the rsvp-log file. The first entry shows that the log file was cleared, and the second entry shows that tracing is going to the rsvp-log file in the /var/log/ directory.

The log file displays a Path message that was sent from R1 to R5, and another that R1 received from R5, indicating that the two unidirectional LSPs between R1 and R5 are established. For more information about Path messages, see "Examining RSVP Log Messages" on page 119.

Deactivate and Reactivate RSVP Tracing

Purpose When you configure and commit a tracing configuration, tracing information is immediately sent to the configured log file. The tracing activity goes on in the background and can create additional activity on the CPU. In this case, it is good practice to deactivate trace options, and then reactivate it when you need more tracing information.

NOTE: Implementing trace options consumes CPU resources and affects the packet processing performance.

Action To deactivate and then reactivate tracing, enter the following JUNOS CLI operational mode command:

```
[edit protocols rsvp]
user@host# deactivate traceoptions
user@host# activate traceoptions
```

Sample Output

```
[edit protocols rsvp]
user@R1# deactivate traceoptions

[edit protocols rsvp]
user@R1# show
inactive: traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R1# commit
commit complete

[edit protocols rsvp]
user@R1# activate traceoptions

[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R1# commit
commit complete
```

Meaning The sample output shows that trace options was deactivated and then reactivated.

In a configuration, you can deactivate statements and identifiers so that they do not take effect when you issue the commit command. Any deactivated statements and identifiers are marked with the inactive: tag. They remain in the configuration, but are not activated when you issue a commit command.

Chapter 11

Examining RSVP Log Messages

The Resource Reservation Protocol (RSVP) uses the messages listed in Table 19 on page 120 to establish and remove paths for data flows, establish and remove reservation information, and confirm the establishment of reservations. The RSVP tracing log file provides useful information about RSVP traffic in the network.

This topic describes the purpose of each RSVP message (except the PathErr and ResvErr messages) that can appear in the output of the rsvp-log file configured at the [edit protocols rsvp traceoptions] hierarchy level.

For information on RSVP PathErr and ResvErr messages, see "Examining RSVP Error Messages" on page 137.

NOTE: To display tracing output, make sure that RSVP trace options are enabled. See "Working with RSVP Tracing" on page 111, for information on configuring RSVP trace options.

Checklist for Examining RSVP Log Messages

This checklist provides the links and commands that show the purpose of each RSVP message (except the PathErr and ResvErr messages) that can appear in the output of the rsvp-log file configured at the [edit protocols rsvp traceoptions] hierarchy level. (See

For information on RSVP PathErr and ResvErr messages, see "Examining RSVP Error Messages" on page 137.

The Resource Reservation Protocol (RSVP) uses the messages listed in Table 19 on page 120 to establish and remove paths for data flows, establish and remove reservation information, and confirm the establishment of reservations. The RSVP tracing log file provides useful information about RSVP traffic in the network.

NOTE: To display tracing output, make sure that RSVP trace options are enabled. See "Working with RSVP Tracing" on page 111, for information on configuring RSVP trace options.

provides commands for examining RSVP log messages.

Table 19: Checklist for Examining RSVP Log Messages

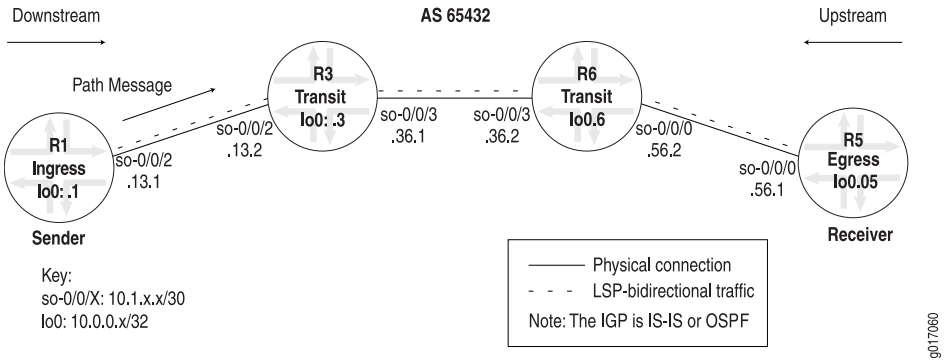
Tasks	Possible Action or Command
"Examining the Path Message" on page 120	monitor start *filename* monitor stop
"Examining the Resv Message" on page 125	monitor start *filename* monitor stop
"Examining the PathTear Message" on page 127	monitor start *filename* monitor stop
"Examining the ResvTear Message" on page 130	monitor start *filename* monitor stop
"Examining the Hello Message" on page 132	monitor start *filename* monitor stop
"About ResvConfirm Messages" on page 135	Not applicable.

Examining the Path Message

Purpose Each sender host transmits Path messages downstream along the routes provided by the unicast and multicast routing protocols. Path messages follow the exact paths of application data, creating path states in the routers along the way, and enabling routers to learn the previous-hop and next-hop node for the session. Path messages are sent periodically to refresh path states.

Figure 11 on page 121 shows an RSVP Path message that flows downstream from ingress router R1 to egress router R5, and transits routers R3 and R6. The originating router (R1) sets the IP router-alert option so that intermediate routers look at the contents of the Path message.

Figure 11: RSVP Path Message



A Path message can contain the following objects: Adspec, Detour, Explicit route, FastReroute, Hop, Integrity, LabelRequest, Policy data, Properties, record route (RecRoute), Sender, Session, SessionAttribute, source route (SrcRoute), Time, and Tspec. For more information on RSVP message objects, see Table 16 on page 108.

To ensure that Path messages are displayed in the output, include the path flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine the Path message, enter the following JUNOS command-line interface (CLI) command:

```
user@R1>  monitor start filename
```

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
    flag path detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
Jun 16 18:36:48  RSVP send Path 10.0.0.1->10.0.0.5 Len=216 so-0/0/2.0
Jun 16 18:36:48   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 16 18:36:48   Hop      Len 12 10.1.13.1/0x08678198
Jun 16 18:36:48   Time     Len  8 30000 ms
Jun 16 18:36:48   SrcRoute Len 28  10.1.13.2 S 10.1.36.2 S 10.1.56.1 S
Jun 16 18:36:48   LabelRequest Len  8 EtherType 0x800
Jun 16 18:36:48   Properties Len 12 Primary path
Jun 16 18:36:48   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jun 16 18:36:48   Sender7  Len 12 10.0.0.1(port/lsp ID  4)
Jun 16 18:36:48   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
```

```
Jun 16 18:36:48   ADspec   Len 48 MTU 1500
Jun 16 18:36:48   RecRoute Len 12  10.1.13.1
monitor stop
```

Meaning Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and path flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of the rsvp-log output indicates that this is a Path message. The source address of the IP packet is 10.0.0.1 (R1). The IP destination address is 10.0.0.5 (R5). The outgoing interface on this router is so-0/0/2.0.

All subsequent lines of sample output indicate object values for this Path message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0

  The Session object (Session7) indicates that this is C-Type 7 for LSP tunnel IPv4, defined in RFC 3209. The RSVP session is defined by three values: the destination IP address (10.0.0.5), a 16-bit field that indicates the tunnel ID (26619) and is unique for the length of the RSVP session, and the protocol number (Proto 0).

- Hop Len 12 10.1.13.1/0x08678198

  The Hop object indicates the IP address of the interface (10.1.13.1) on the router (R1) sending the Path message. At the next node, the Hop object contains the previous hop IP address.

- Time Len 8 30000 ms

  The Time object indicates how long before RSVP must refresh the session state (30000 ms). By default, the value is recorded in milliseconds. RFC 3209 states that a router can refresh the state within plus or minus 50 percent of the time. In this case, RFC 3209 allows a router to refresh the state between 15 and 45 seconds.

- SrcRoute Len 28 10.1.13.2 S 10.1.36.2 S 10.1.56.1 S

  The source route (SrcRoute) object is the list of addresses in the Explicit Route Object (ERO). The S indicates a strict next hop, as shown in the example. An L indicates a loose next hop.

- LabelRequest Len 8 EtherType 0x800

  The LabelRequest object indicates, to the next downstream node, that a label assignment is requested. Ethertype 0x800 indicates that a label for an IP packet is required.

- Properties Len 12 Primary path

The Properties object is a Juniper Networks proprietary object used to carry information about the label-switched path (LSP). In this case, the object indicates that the Path message is signaling a primary physical path.

- SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"

  The SessionAttribute object indicates a variety of parameters:

- The setup priority of the RSVP session is 7 [Prio (7,0)]. The setup priority determines the resources used by this session, and can be in the range from 0 through 7. The value 0 is the highest priority. The setup priority is used to decide whether this session can preempt another session.

- The hold priority is 0 [Prio (7,0)]. The hold priority of a session determines resources held by other sessions, and can be in the range from 0 through 7. The value 0 is the highest priority. The hold priority is used to decide whether this session can be preempted by another session.

- The 8-bit flag field (flag 0x0) has no bits turned on (correlating to the hexadecimal value 0).

Table 20 on page 123 shows the SessionAttribute object flags.

Table 20: Session Attribute Object Flags

Flag	Description
Bit 0 (value 0x1)	Local protection requested—Permits transit routers to use a local repair mechanism which may result in violation of the ERO. When a fault is detected on an adjacent downstream link or node, a transit router can reroute traffic for fast service restoration.
Bit 1 (value 0x2)	Label recording requested—Indicates that label information is included with a route record.
Bit 2 (value 0x4)	Shared explicit (SE) style requested—Indicates that the ingress node may reroute this tunnel without tearing it down. A tunnel egress node should use the SE style when responding with an Resv message.
Bit 3 (value 0x08)	Bandwidth protection requested—Indicates to the point of local repair (PLR) along the protected LSP path that a backup path with a bandwidth guarantee is requested. If no fast reroute object is included in the Path message, the bandwidth guaranteed is that of the protected LSP. If a fast reroute object is in the Path message, then the bandwidth specified must be guaranteed.
Bit 4 (value 0x10)	Node protection requested—Indicates to the PLRs along a protected LSP path that a backup path is requested. The backup path must bypass at least the next node of the protected LSP.
Bit 5 (value 0x20)	ERO expansion—Indicates that a new ERO expansion is requested.

Table 20: Session Attribute Object Flags *(continued)*

Flag	Description
Bit 6 (value 0x40)	Soft preemption requested—Indicates that soft preemption is used if the LSP is preempted.
Bit 7 (value 0x80)	Undefined.

- Sender7 Len 12 10.0.0.1(port/lsp ID 4)

  The Senderobject defines the source of session 10.0.0.1 (R1). The number (7) after sender indicates that this is C-Type 7 for IPv4, defined in RFC 3209. The sender is defined by the source IP address (10.0.0.1) and the LSP ID (4). The LSP ID changes, depending on the signaling path.

- Tspec Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500

  The traffic specification (Tspec) object indicates the allocated bandwidth. This RSVP session uses the default of 0, no bandwidth is reserved. The Tspec object includes two different types of RSVP bandwidth allocations: controlled load and guaranteed delivery.

- Controlled load specifies a maximum transmission rate and a maximum burst size. The peak value is always set to infinity (Inf), unless guaranteed delivery is specified. RFC 3209 recommends support only for null service and controlled load bandwidth services. Guaranteed delivery is not currently recommended, so there should never be a value for Inf in the Tspec object.

- Guaranteed delivery specifies a peak transmission rate. The JUNOS software does not support guaranteed delivery. Instead you can specify a maximum transmission rate; for example, 45 Mbps. Because it is possible to burst at the maximum rate, the size parameter indicates a maximum burst size of 45 Mbps. The lowercase m (m20) and uppercase M (M 1500) indicate the minimum and maximum sizes for the RSVP maximum transmission unit (MTU) rate. RSVP treats any packet smaller than m20 as 20 bytes, and any packet larger than M1500 as 1500 bytes.

- ADspec Len 48 MTU 1500

  The ADspec object carries a summary of available services, delay and bandwidth estimates, and operating parameters (MTU 1500) used by specific quality-of-service (QoS) control services.

- RecRoute Len 12 10.1.13.1

  The record route object (RecRoute) indicates the list of addresses that this Path message has transited, in this case, 10.1.13.1.

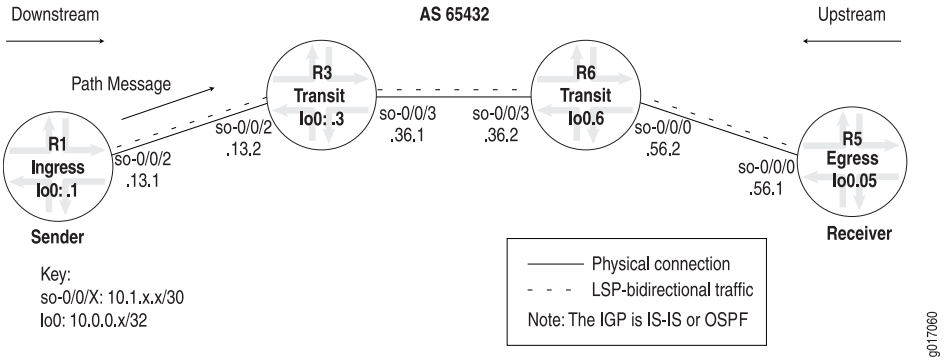
For information on objects that can appear in the Path message but do not appear in the sample output, such as Detour, Explicit route, FastReroute, and Integrity, see Table 16 on page 108.

Examining the Resv Message

Purpose Each receiver host sends reservation request (Resv) messages upstream toward senders and sender applications. Resv messages must follow exactly the reverse path of Path messages. Resv messages create and maintain a reservation state in each router along the way. Resv messages are sent periodically to refresh reservation states.

Figure 12 on page 125 shows an RSVP Resv message that flows upstream from R3 toward the destination interface address (10.1.13.1) on ingress router R1, ensuring that the network allocates resources along the reverse path that the downstream messages followed.

Figure 12: RSVP Resv Message



To ensure that Resv messages are displayed in the output, include the resv flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine the Resv message, enter the following JUNOS CLI command:

user@R1> **monitor start** *filename*

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
    flag resv detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1>  monitor start rsvp-log

user@R1>
*** rsvp-log ***
```

```
Jun 29 15:57:19  RSVP recv Resv 10.1.13.2->10.1.13.1 Len=136 so-0/0/2.0
Jun 29 15:57:19   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 29 15:57:19   Hop      Len 12 10.1.13.2/0x08678198
Jun 29 15:57:19   Time     Len  8 30000 ms
Jun 29 15:57:19   Style    Len  8 FF
Jun 29 15:57:19   Flow     Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 29 15:57:19   Filter7  Len 12 10.0.0.1(port/lsp ID  5)
Jun 29 15:57:19   Label    Len  8  100624
Jun 29 15:57:19   RecRoute Len 28  10.1.13.2 10.1.36.2 10.1.56.1
monitor stop
```

Meaning Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and resv flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of the rsvp-log output indicates that this is an Resv message. The source address of the IP packet is 10.1.13.2 (R3). The destination address of the IP packet is 10.1.13.1 (R1). The incoming interface on R1 is interface so-0/0/2.

All subsequent lines of sample output indicate object values for this Resv message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0

  The Session object (Session7) indicates that this is C-Type 7 for LSP tunnel IPv4, defined in RFC 3209. The RSVP session is defined by three values: the destination IP address (10.0.0.5), a 16-bit field that indicates the tunnel ID (26619) and is unique for the length of the RSVP session, and the protocol number (Proto 0). Note that the Session object in the Path message on [xref target has no title] is the same as in the Resv message.

- Hop Len 12 10.1.13.2/0x08678198

  The Hop object indicates the IP address of the interface (10.1.13.2) on the router (R3) sending the Resv message.

- Time Len 8 30000 ms

  The Time object indicates how long before RSVP must refresh the session state (30000 ms). By default the value is recorded in milliseconds. RFC 3209 dictates that a router can refresh the state within plus or minus 50 percent of the time. In this case, RFC 3209 allows a router to refresh the state between 15 and 45 seconds.

- Style Len 8 FF

  The Style object indicates the reservation style. The reservation style for this ResvTear message is fixed filter (FF), indicating that the bandwidth allocation in a Resv message cannot be shared with any other session or sender/filter combination. Each different physical path is identified by an LSP ID, listed in

the filter object. A reservation message that indicates a fixed filter style consists of distinct reservations among explicit senders. For this session, the router cannot share the bandwidth with any other RSVP LSP signaling messages that share the same session ID and have different LSP IDs.

Other available reservation styles are shared explicit (SE) and wildcard filter (WF). For more information on reservation styles, see the *JUNOS MPLS Applications Configuration Guide*.

- Flow Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500

  The Flow object indicates the allocated bandwidth and is the same information contained in the Tspec object in the Path message. This RSVP session uses the default of 0, no bandwidth is reserved. The Flow object includes two different types of RSVP bandwidth allocations: controlled load and guaranteed delivery.

- Controlled load specifies a maximum transmission rate and a maximum burst size. The peak value is always set to infinity (Inf), unless guaranteed delivery is specified. RFC 3209 recommends support only for null service and controlled load bandwidth services. Guaranteed delivery is not currently recommended, so there should never be a value for Inf in the Flow object.

- Guaranteed delivery specifies a peak transmission rate; for example, 45 Mbps. The JUNOS software does not support guaranteed delivery. Instead you can specify a maximum transmission rate; for example, 45 Mbps. Because it is possible to burst at the maximum rate, the size parameter indicates a maximum burst size of 45 Mbps. The lowercase m (m20) and uppercase M (M 1500) indicate the minimum and maximum sizes for the RSVP MTU rate. RSVP treats any packet smaller than m20 as 20 bytes, and any packet larger than M1500 as 1500 bytes.

- Filter7 Len 12 10.0.0.1(port/lsp ID 5)

  The Filter object defines the source of the session 10.0.0.1 (R1). The number (7) after Filter indicates that this is C-Type 7 for IPv4, defined in RFC 3209. The Filter object contains the source address of the LSP and the LSP ID. The LSP ID changes, depending on the signaling path. The Filter object contains the same information as the Sender object of the Path message.

- Label Len 8 100624

  The Label object contains the label value (100624) that is mapped to the LSP identified by the session value.

- RecRoute Len 28 10.1.13.2 10.1.36.2 10.1.56.1

  The record route object (RecRoute) contains the list of IP addresses through which this Resv message passed.

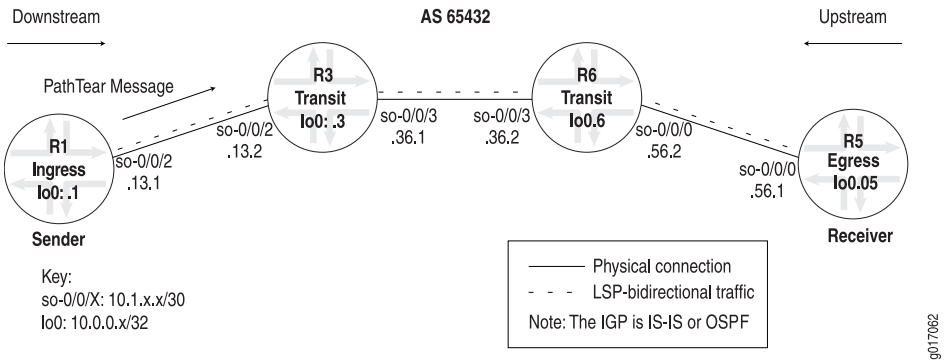
Examining the PathTear Message

Purpose PathTear messages remove (tear down) path states as well as dependent reservation states in any routers along a path. PathTear messages follow the same path as Path messages. A PathTear message typically is initiated by a sender application or a router when its path state times out.

PathTear messages are not required, but they enhance network performance because they release network resources quickly. If PathTear messages are lost or not generated, path states eventually time out when they are not refreshed, and the resources associated with the path are released.

Figure 13 on page 128 show an RSVP PathTear message that flows downstream from ingress router R1 (10.0.0.1) towards egress router R5 (10.0.0.5). PathTear messages set the IP router-alert option so that intermediate routers check the contents of the PathTear message, ensuring that the network removes the allocation of resources along the path that the downstream Path message followed.

Figure 13: RSVP PathTear Message



To ensure that PathTear messages are displayed in the output, include the pathtear flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine the PathTear message, enter the following JUNOS CLI command:

user@R1> **monitor start** *filename*

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
    flag pathtear detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
[...Output truncated...]
Jun 30 10:05:25  RSVP send PathTear 10.0.0.1->10.0.0.5 Len=84 so-0/0/2.0
Jun 30 10:05:25   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 30 10:05:25   Hop      Len 12 10.1.13.1/0x08678198
```

```
Jun 30 10:05:25   Sender7  Len 12 10.0.0.1(port/lsp ID  10)
Jun 30 10:05:25   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
monitor stop
```

Meaning Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and pathtear flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of the rsvp-log output indicates that this is a PathTear message originating from address 10.0.0.1 and destined for 10.0.0.5. The outgoing interface is so-0/0/2.0 on R1. When a Path message containing an route record object (RRO) is received by an intermediate router, the router stores a copy of it in the path state block. The PathTear message deletes state information for the specified RSVP session from the path state blocks for all routers with knowledge of this MPLS tunnel.

All subsequent lines of sample output indicate object values for this PathTear message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0

  The Session object (Session7) indicates that this is C-Type 7 for LSP tunnel IPv4, defined in RFC 3209. The RSVP session is defined by three values: the destination IP address (10.0.0.5), a 16-bit field that indicates the tunnel ID (26619) and is unique for the length of the RSVP session, and the protocol number (Proto 0).

- Hop Len 12 10.1.13.1/0x08678198

  The Hop object indicates the IP address of the last interface (10.1.13.1) that this RSVP PathTear message visited.

- Sender7 Len 12 10.0.0.1(port/lsp ID 10)

  The Sender object defines the source of the session 10.0.0.1 (R1). The number (7) after sender indicates that this is C-Type 7 for IPv4, defined in RFC 3209. The Sender is defined by the source IP address and the LSP ID. The LSP ID changes, depending on the signaling path.

- Tspec Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500

  The traffic specification (Tspec) object indicates the allocated bandwidth. This RSVP session uses the default of 0, no bandwidth is reserved. The Tspec object includes two different types of RSVP bandwidth allocations: controlled load and guaranteed delivery.

- Controlled load specifies a maximum transmission rate and a maximum burst size. The peak value is always set to infinity (Inf), unless guaranteed delivery is specified. RFC 3209 recommends support only for null service and controlled load bandwidth services. Guaranteed delivery is not currently recommended, so there should never be a value for Inf in the Tspec object.

- Guaranteed delivery specifies a peak transmission rate. The JUNOS software does not support guaranteed delivery. Instead you can specify a maximum transmission rate; for example, 45 Mbps. Because it is possible to burst at the maximum rate, the size parameter indicates a maximum burst size of 45 Mbps. The lowercase m (m20) and uppercase M (M 1500) indicate the minimum and maximum sizes for the RSVP MTU rate. RSVP treats any packet smaller than m20 as 20 bytes, and any packet larger than M1500 as 1500 bytes.

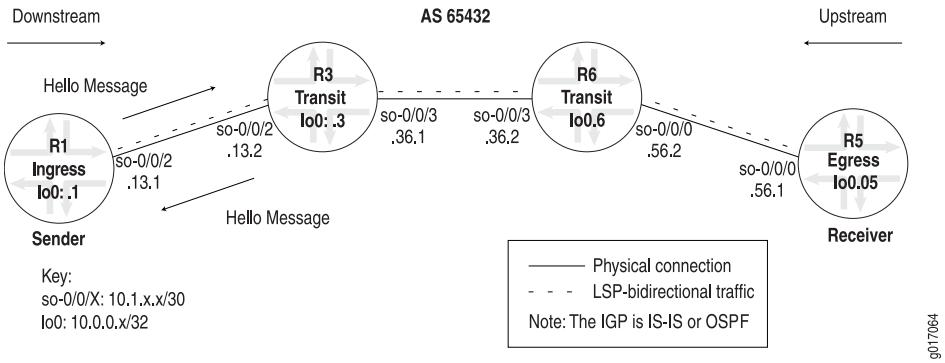
Examining the ResvTear Message

Purpose ResvTear messages remove reservation states along a path, travelling upstream toward senders of the session. In a sense, ResvTear messages do the opposite of Resv messages. ResvTear messages typically are initiated by a receiver application or a router when its reservation state times out.

ResvTear messages are not required, but they enhance network performance because they release network resources quickly. If ResvTear messages are lost or not generated, reservation states eventually time out when they are not refreshed, and the resources associated with the reservation are released.

Figure 14 on page 130 shows an RSVP ResvTear message that flows upstream from router R3 to R1, ensuring that the network removes resources allocated along the reverse path that the downstream messages followed.

Figure 14: RSVP ResvTear Message



To ensure that ResvTear messages are displayed in the output, include the resvtear flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine the ResvTear message, enter the following JUNOS CLI command:

user@R1> **monitor start** *filename*

Sample Output 1

```
[edit protocols rsvp]
user@R1#  show
traceoptions {
    file rsvp-log;
    flag packets detail;
    flag resvtear detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
[...Output truncated...]
Jun 30 09:27:43  RSVP recv ResvTear 10.1.13.2->10.1.13.1 Len=56 so-0/0/2.0
Jun 30 09:27:43   Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0
Jun 30 09:27:43   Hop      Len 12 10.1.13.2/0x08678198
Jun 30 09:27:43   Style    Len  8 FF
Jun 30 09:27:43   Filter7  Len 12 10.0.0.1(port/lsp ID  7)
monitor stop
```

Meaning

Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and resvtear flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of the rsvp-log output indicates that this is an ResvTear message from R3 (10.1.13.2) to R1 (10.0.0.1). The outgoing interface is so-0/0/2.0 on R3. When a Path message containing an RRO is received by an intermediate router, the router stores a copy of it in the path state block. The ResvTear message deletes state information for the specified RSVP session from the reservation state blocks of routers with knowledge of this MPLS tunnel.

All subsequent lines of sample output indicate object values for this ResvTear message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 26619) Proto 0

  The Session object (Session7) indicates that this is C-Type 7 for LSP tunnel IPv4, defined in RFC 3209. The RSVP session is defined by three values: the destination IP address (10.0.0.5), a 16-bit field that indicates the tunnel ID (26619) and is unique for the length of the RSVP session, and the protocol number (Proto 0).

- Hop Len 12 10.1.13.1/0x08678198

  The Hop object indicates the last IP address (10.1.13.1) that this RSVP ResvTear message visited.

- Style Len 8 FF

  The Style object indicates the reservation style. The reservation style for this ResvTear message is fixed filter (FF), indicating that the bandwidth allocation in a Resv message cannot be shared with any other session, or sender/filter combination. Each different physical path is identified by an LSP ID, listed in the Filter object. A reservation message that indicates a fixed filter style consists of distinct reservations among explicit senders. For this session, the router cannot share the bandwidth with any other RSVP LSP signaling messages that share the same session ID and have different LSP IDs.

  Other available reservation styles are shared explicit (SE) and wildcard filter (WF). For more information on reservation styles, see the *JUNOS MPLS Applications Configuration Guide*.

- Filter7 Len 12 10.0.0.1(port/lsp ID 7)

  The Filterobject defines the source of the session 10.0.0.1 (R1). The number after Filter (Filter7) indicates that this is C-Type 7 for IPv4, defined in RFC 3209. It contains the source address of the LSP and the LSP ID. The LSP ID changes, depending on the signaling path. The Filter object contains the same information as the Sender object of the Path message.

Examining the Hello Message

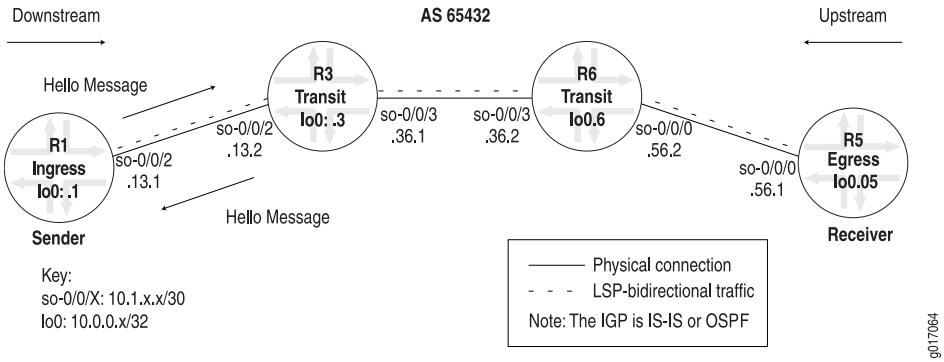
Purpose RSVP monitors the status of the interior gateway protocol (IGP) (Intermediate System-to-Intermediate System [ISIS] or Open Shortest Path First [OSPF]) neighbors and relies on the IGP protocols to detect when a node fails. If an IGP protocol declares a neighbor down (because Hello messages are no longer being received), RSVP also brings down that neighbor. However, the IGP protocols and RSVP still act independently when bringing a neighbor up.

RSVP Hello messages are exchanged between neighbors. The destination address is the neighbor node. RSVP Hello messages are used to determine loss of interface more quickly than determined by the RSVP state timeout.

NOTE: RSVP Hello messages are required to establish the protocol or to maintain adjacency information. RSVP Hello messages do not establish state.

Figure 15 on page 133 shows two RSVP Hello messages exchanged between routers R1 and R3.

Figure 15: RSVP Hello Message



To ensure that Hello messages are displayed in the output, include the packets flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine the Hello message, enter the following JUNOS CLI command:

```
user@R1> monitor start filename
```

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
[...Output truncated...]
Jun 29 15:48:59  RSVP send Hello New 10.1.13.1->10.1.13.2 Len=32 so-0/0/2.0
Jun 29 15:48:59   HelloReq Len 12
Jun 29 15:48:59   RestartCap Len 12 restart time 0, recovery time 0
Jun 29 15:48:59  RSVP recv Hello New 10.1.13.2->10.1.13.1 Len=32 so-0/0/2.0
Jun 29 15:48:59   HelloRply Len 12
Jun 29 15:48:59   RestartCap Len 12 restart time 0, recovery time 0
monitor stop
```

Meaning Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets flag is included at the [edit protocols rsvp traceoptions] hierarchy level to provide information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flag.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped. The rsvp-log output shows two RSVP Hello messages exchanged between R1 and R3.

The first Hello message in the rsvp-log output is a request sent from R1 (10.1.13.1) to R3 (10.1.13.2). The outgoing interface is so-0/0/2.0 on R1. The second Hello message was a reply sent from R3 to R1, also through the outgoing interface so-0/0/2.0 on R3.

The next two lines of output indicate object values for the two Hello messages, and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- HelloReq Len 12

  The Hello request (HelloReq) object indicates that this is a Hello request. RFC 3209 defines the RSVP Hello message. An RSVP Hello message can either be a request or a reply. Every request should generate a reply.

- RestartCap Len 12 restart time 0, recovery time 0

  The restart object (RestartCap) indicates the graceful restart capability of the sender node. The restart time of 0 milliseconds is the length of time that this node takes to restart its RSVP traffic engineering functionality. At the end of this time, the node can send and receive RSVP messages again. The recovery time of 0 milliseconds indicates the length of time the LSR retains MPLS forwarding information. A recovery time of 0 in this case indicates that no forwarding state was preserved across a restart. Because both values are set to 0, graceful restart was not enabled for this RSVP session.

- HelloRply Len 12

  The Hello reply (HelloRply) object indicates that this is an RSVP Hello message sent from R3 to R1 out of interface so-0/0/2.0.

In standard RSVP, node failure detection occurs as a consequence of the RSVP soft-state timeout model. However, detection typically requires several minutes to time out the soft state. Hello packets allow the detection of the neighboring node state changes more quickly.

In JUNOS software, RSVP Hello messages are optional and are backward-compatible with RSVP implementations that do not support Hello messages. For neighboring routers that do not support Hello messages or on which RSVP Hello is disabled, RSVP uses the soft-state timeout for loss detection and cannot benefit from fast IGP Hello detection.

Configuring a short time for the IS-IS or OSPF Hello timers allows these protocols to detect node failures more quickly. RSVP also benefits from early detection by the IGP protocols. It is not necessary to explicitly configure a short RSVP Hello timer. If you do configure the RSVP Hello timer, you can configure a longer value and can still expect the failure of a neighboring router to be quickly detected by IGP.

Between Hello-capable neighbors, Hello messages are sent unicast toward each other. A loss of (2 x keep-multiplier + 1) consecutive Hello messages causes the neighbor's

state to go down, and all RSVP sessions to and from that neighbor are declared to be down.

By default, RSVP sends Hello messages every 9 seconds. For information on how to configure the RSVP Hello message timer, see the *JUNOS MPLS Applications Configuration Guide*.

About ResvConfirm Messages

Purpose Receivers can request confirmation of a reservation request, and this confirmation is sent with a ResvConfirm message. Because of the complex RSVP flow-merging rules, a confirmation message does not necessarily provide end-to-end confirmation of the entire path. Therefore, ResvConfirm messages are an indication, not a guarantee, of potential success.

Juniper Networks routers never request confirmation using the ResvConfirm message; however, a Juniper Networks router can send a ResvConfirm message if it receives a request from another vendor's equipment.

Chapter 12

Examining RSVP Error Messages

The Resource Reservation Protocol (RSVP) uses the messages listed in Table 21 on page 138 to report errors in a Multiprotocol Label Switching (MPLS) network. The RSVP tracing log file provides useful information about RSVP traffic in the network. This chapter describes the purpose of each RSVP error message that can appear in the output of the rsvp-log file configured at the [edit protocols rsvp traceoptions] hierarchy level.

For information on RSVP log messages, see "Examining RSVP Log Messages" on page 119.

NOTE: To display tracing output, make sure that RSVP trace options are enabled. See "Working with RSVP Tracing" on page 111, for information on configuring RSVP tracing.

Checklist for Examining RSVP Error Messages

This checklist provides the links and commands that show the purpose of each RSVP error message that can appear in the output of the rsvp-log file configured at the [edit protocols rsvp traceoptions] hierarchy level.

For information on RSVP log messages, see "Examining RSVP Log Messages" on page 119.

The Resource Reservation Protocol (RSVP) uses the messages listed in Table 21 on page 138 to report errors in a Multiprotocol Label Switching (MPLS) network. The RSVP tracing log file provides useful information about RSVP traffic in the network.

NOTE: To display tracing output, make sure that RSVP trace options are enabled. See "Working with RSVP Tracing" on page 111, for information on configuring RSVP tracing.

Table 21 on page 138 provides commands for examining RSVP error messages.

Table 21: Checklist for Examining RSVP Error Messages

Tasks	Possible Action or Command
"Examining the PathErr Message" on page 138	monitor start *filename* monitor stop
"Examining the ResvErr Message" on page 140	monitor start *filename* monitor stop

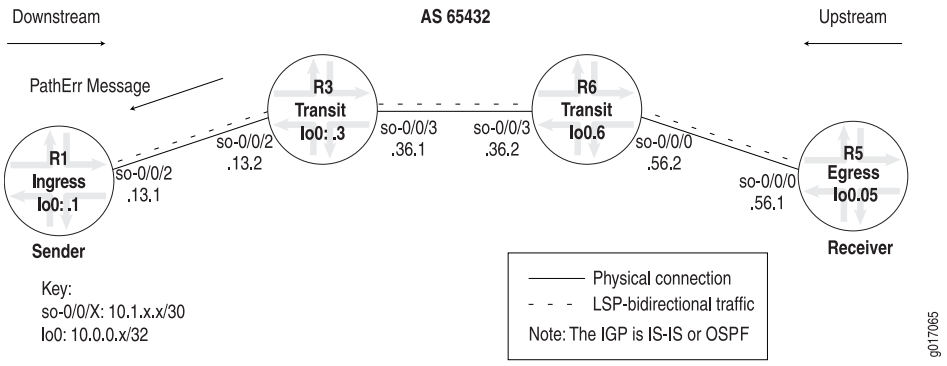
NOTE: To display tracing output, make sure that RSVP trace options are enabled. See "Working with RSVP Tracing" on page 111, for information on configuring RSVP tracing.

Examining the PathErr Message

Purpose When path errors occur (usually because of parameter problems in a Path message), the router sends a unicast PathErr message to the sender that issued the Path message. PathErr messages are advisory; these messages do not alter any path state along the way.

Figure 16 on page 138 shows an RSVP PathErr message that flows upstream toward the destination address (10.1.13.1) on ingress router (R1). From the perspective of the upstream flow, the destination address is the next-hop interface (so-0/0/2 on R1). This message notifies the sending node (R1) that an error occurred during label-switched path (LSP) signaling. This RSVP PathErr message originates at R3 (even though R1 had the problem), and is destined for R1.

Figure 16: RSVP PathErr Message



To ensure that PathErr messages are displayed in the output, include the error flag at the [edit protocols rsvp traceoptions] hierarchy level.

Action To examine PathErr messages, enter the following JUNOS command-line interface (CLI) command:

```
user@R1> monitor start filename
```

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
    flag error detail;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
[...Output truncated...]
Jun 30 13:52:30  RSVP recv PathErr 10.1.13.2->10.1.13.1 Len=160 so-0/0/2.0
Jun 30 13:52:30   Session7 Len 16 10.0.0.5(port/tunnel ID 26679) Proto 0
Jun 30 13:52:30    Error    Len 12 code 24 value 7 flag 0 by 10.1.36.1
Jun 30 13:52:30   Sender7  Len 12 10.0.0.1(port/lsp ID  2)
Jun 30 13:52:30   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jun 30 13:52:30   ADspec   Len 48 MTU 1500
Jun 30 13:52:30   RecRoute Len 28  10.1.36.2 10.1.36.1 10.1.13.1
```

Meaning

Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and error flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of the output from the rsvp-log file indicates that this is a PathErr message. The source address of the IP packet is 10.1.13.2 (R3). The destination address of the IP packet is 10.1.13.1 (R1). The incoming interface on R1 is so-0/0/2.0.

All subsequent lines of sample output indicate object values for this PathErr message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 26679) Proto 0

  The Session object indicates the session ID for the LSP that experienced the error condition (R1-to-R5). The session ID consists of the destination IP address (10.0.0.5) of the LSP, a protocol value (Proto 0), and a 16-bit tunnel ID (26679).

- Error Len 12 code 24 value 7 flag 0 by 10.1.36.1

  The Error object indicates the error (code 24 value 7) and the source IP address (10.1.36.1) of the interface with the error. In this case, R3 has a routing problem (24) in which the record route object (RRO), in the output of the show mpls lsp extensive command, indicates a routing loop (07). For more information on error codes, see Table 22 on page 143.

PathErr messages report a wide variety of problems by means of different code and subcode numbers. You can find a complete list of these PathErr messages in RFC 2205, *Resource Reservation Protocol (RSVP), Version 1*, *Functional Specification;* and RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels.*

- Sender7 Len 12 10.0.0.1(port/lsp ID 2)

  The Sender object indicates the sender of the message. The number 7 indicates the C-Type defined in RFC 3209. This object contains the source address of the LSP (10.0.0.1) and the LSP ID (2). The LSP ID can change, depending upon the signaling path.

- Tspec Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500

  The Tspec object indicates the allocated bandwidth and is the same information contained in the Tspec object in the Path message. This RSVP session uses the default of 0, no bandwidth is reserved. The Tspec object includes two different types of RSVP bandwidth allocations: controlled load and guaranteed delivery.

- Controlled load specifies a maximum transmission rate and a maximum burst size. The peak value is always set to infinity (Inf), unless guaranteed delivery is specified. RFC 3209 recommends support only for null service and controlled load bandwidth services. Guaranteed delivery is not currently recommended, so there should never be a value for Inf in the Tspec object.

- Guaranteed delivery specifies a peak transmission rate. The JUNOS software does not support guaranteed delivery. Instead you can specify a maximum transmission rate; for example, 45 Mbps. Because it is possible to burst at the maximum rate, the size parameter indicates a maximum burst size of 45 Mbps. The lowercase m (m20) and uppercase M (M 1500) indicate the minimum and maximum sizes for the RSVP maximum transmission unit (MTU) rate. RSVP treats any packet smaller than m20 as 20 bytes, and any packet larger than M1500 as 1500 bytes.

- ADspec Len 48 MTU 1500

  The Adspec object carries a summary of available services, delay and bandwidth estimates, and operating parameters (MTU 1500) used by specific quality-of-service (QoS) control services.

- RecRoute Len 28 10.1.36.2 10.1.36.1 10.1.13.1

  The record route object (RecRoute) indicates the list of addresses this Path message has transited, in this case, 10.1.36.1 (R6), to 10.1.36.1 (R3), to 10.1.13.1 (R1).

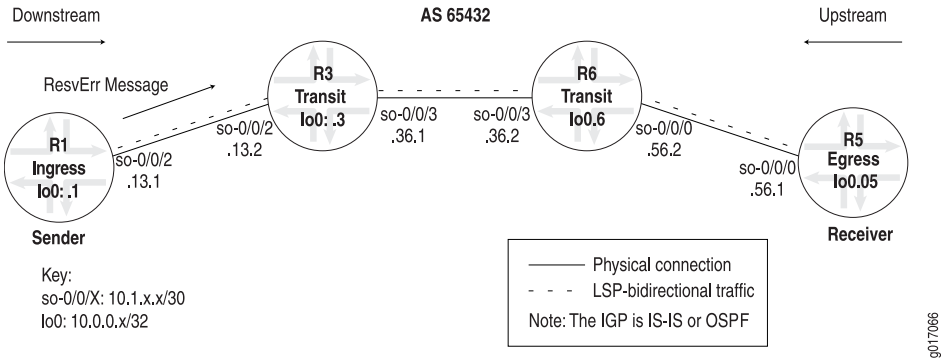
Examining the ResvErr Message

Purpose When a reservation request fails, a ResvErr error message is delivered to all the receivers involved. ResvErr messages are advisory; these messages do not alter any reservation state along the way.

Figure 17 on page 141 shows an RSVP ResvErr message that flows downstream to the destination address of the LSP 10.0.0.5 (R5), indicating that an error with the

reservation allocation occurred while sending Resv messages back to the ingress node. The destination address of the ResvErr message is the interface from R1 to R3 (so-0/0/2.0), which the Resv message just left.

Figure 17: RSVP ResvErr Message



Action To examine the ResvErr message, enter the following JUNOS CLI command:

user@R1> **monitor start** *filename*

Sample Output 1

```
[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag packets detail;
....flag error detail ;
}
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
user@R1> clear log rsvp-log

user@R1> monitor start rsvp-log

user@R1>
*** rsvp-log ***
[...Output truncated...]
Jan 15 15:44:57  RSVP send ResvErr 10.1.13.1->10.0.13.2 Len=104 so-0/0/2.0
Jan 15 15:44:57  Session7 Len 16 10.0.0.5(port/tunnel ID 13527) Proto 0
Jan 15 15:44:57  Hop Len 12 10.0.13.1/0x08554198
Jan 15 15:44:57  Error Len 12 code 4 value 0 flag 0 by 10.0.16.1
Jan 15 15:44:57  Style   Len  8 FF
Jan 15 15:44:57  Flow Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jan 15 15:44:57  Filter7 Len 12 10.0.0.1(port/lsp ID  2)
monitor stop
```

Meaning Sample Output 1 shows the configuration of RSVP tracing on ingress router R1. The packets and error flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information

about RSVP tracing flags, see Table 18 on page 114. The detail option is included to show granular details about the configured flags.

Sample Output 2 shows clear commands, the output for the rsvp-log file, and that monitoring was started and then stopped.

The first line of sample output from the rsvp-log file indicates that this is a ResvErr message. The source address of the IP packet is 10.1.13.1 (R1) and the destination address is 10.1.13.2 (R3). The outgoing interface on R1 is interface so-0/0/2.0. The ResvErr message is in response to a Resv message indicating an error with the reserved LSP allocation.

All subsequent lines of sample output indicate object values for this ResvErr message and are indented in the output. To facilitate this discussion, each line of output for each object is displayed before the corresponding explanation.

- Session7 Len 16 10.0.0.5(port/tunnel ID 13527) Proto 0

  The Session object indicates the session ID for the LSP (R1-to-R5) that experienced the error condition (R5). The session ID consists of the destination IP address (10.0.0.5) of the LSP, a protocol value (Proto 0), and a 16-bit tunnel ID (13527).

- Hop Len 12 10.0.13.1/0x08554198

  The Hop object indicates the last IP address (10.1.13.1) visited by this ResvErr message.

- Error Len 12 code 4 value 0 flag 0 by 10.0.16.1

  The Error object indicates the error code for the message. In this case, error code 4 value 0 flag 0 is defined by RFC 2205, *Resource ReSerVation Protocol (RSVP), Version 1, Functional Specification*. The definition specifies that there is no sender information for this Resv message. Although there is path state for this session, it does not include the sender matching some flow descriptor contained in the Resv message. Therefore, the Resv message cannot be forwarded.

- Style Len 8 FF

  The Style object indicates the reservation style. The reservation style for this ResvErr message is fixed filter (FF), indicating that the bandwidth allocation in an Resv message cannot be shared with any other session, or sender/filter combination. Each different physical path is identified by an LSP ID, listed in the Filter object. A reservation message that indicates a fixed filter style consists of distinct reservations among explicit senders. For this session, the router cannot share the bandwidth with any other RSVP LSP signaling messages that share the same session ID and have different LSP IDs.

  Other available reservation styles are shared explicit (SE) and wildcard filter (WF). For more information on reservation styles, see the *JUNOS MPLS Applications Configuration Guide*.

- Flow Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500

  The Flow object indicates the allocated bandwidth and is the same information contained in the Tspec object in the Path message. In the upstream direction (the direction in which the Resv message flowed), the flow object indicates the

bandwidth requested and the minimum and maximum packet sizes. In this case, this RSVP session uses the default of 0, no bandwidth is reserved. The flow object includes two different types of RSVP bandwidth allocations: controlled load and guaranteed delivery.

- Controlled load specifies a maximum transmission rate and a maximum burst size. The peak value is always set to infinity (Inf), unless guaranteed delivery is specified. RFC 3209 recommends support only for null service and controlled load bandwidth services. Guaranteed delivery is not currently recommended, so there should never be a value for Inf in the Flow object.

- Guaranteed delivery specifies a peak transmission rate. The JUNOS software does not support guaranteed delivery. Instead you can specify a maximum transmission rate; for example, 45 Mbps. Because it is possible to burst at the maximum rate, the size parameter indicates a maximum burst size of 45 Mbps. The lowercase m (m20) and uppercase M (M 1500) indicate the minimum and maximum sizes for the RSVP MTU rate. RSVP treats any packet smaller than m20 as 20 bytes, and any packet larger than M1500 as 1500 bytes.

- Filter7 Len 12 10.0.0.1(port/lsp ID 2)

  The Filter object defines the source (ingress) of the session 10.0.0.1 (R1). The number 7 after Filter indicates that this is C-Type 7 for IPv4, defined in RFC 3209. It contains the source address of the LSP and the LSP ID. The LSP ID changes, depending on the signaling path. The Filter object contains the same information as the Sender object of the Path message.

Understanding RSVP Error Message Codes

Table 22 on page 143 lists and describes the RSVP error message codes from RFC 2205, *Resource ReSerVation Protocol (RSVP), Version 1, Functional Specification* and RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels*. The following error codes appear predominantly in the error object of the ResvErr message. A few of these error codes appear in the PathErr message.

Table 22: RSVP Error Codes

Error Code	Name	Meaning/Value
00	Confirmation	Value = 00
01	Admission Control Failure Subcode: ■ 1 Delay bound cannot be met ■ 2 Requested bandwidth unavailable ■ 3 MTU in flowspec larger than interface MTU	Reservation request was rejected b admission control due to unavailabl resources. The 16 bits of the Error Value field are ssur cccc cccc cccc. If ssur = 0, the lo order bits contain a subcode.

Table 22: RSVP Error Codes *(continued)*

Error Code	Name	Meaning/Value
02	Policy Control Failure	Path or Resv message rejected for administrative reason; for example preemption.
03	No Path Information	No Path state exists for this session Resv message cannot be forwarded
04	No Sender Information	Path state does not include sender information that matches the flow descriptor; Resv message cannot be forwarded.
05	Conflicting	Reservation style conflicts with existing reservation style; Resv message cannot be forwarded.
06	Unknown Reservation Style	Reservation style unknown; Resv message cannot be forwarded.
07	Conflicting Destination Port	RSVP sessions with identical destination address and protocol values have zero and non-zero destination port values.
08	Conflicting Sender Ports	RSVP sessions with identical destination address and protocol values have zero and non-zero sende ports.
09 to 11	Reserved	
12	Service Preempted Subcode: Reserved for future definition	The service request defined by the style object and the flow descriptor has been administratively preempted Value=ssur cccc cccc cccc. If ssur=0 low order bits contain subcode.
13	Unknown Object Class	Contains a 16-bit value composed o Class-Num and C-Type of the unknow object. This error is sent only if RSV will reject the message, as determined by the high-order bits o the Class-Num.
14	Unknown Object C-Type	Comprised of Class_Num, C-Type of object.
15-19	Reserved	
20	Reserved for API	Contains an API error code that wa detected asynchronously and must be reported by upcall.

Table 22: RSVP Error Codes *(continued)*

Error Code	Name	Meaning/Value
21	Traffic Control Error Subcode: ■ 01 Service Conflict—Trying to merge two incompatible service requests. ■ 02 Service Unsupported—Traffic control can't provide requested service or acceptable replacement. ■ 03 Bad Flowspec—Malformed or unreasonable request. ■ 04 Bad Tspec— Malformed or unreasonable request. ■ 05 Bad Adspec—Malformed or unreasonable request.	Traffic control failed due to format o parameters. Path or Resv message cannot be forwarded. Value=ss00 cccc cccc cccc; ss bits=00.
22	Traffic Control System Error	System error detected; RSVP is not expected to interpret this value.
23	RSVP System Error	Implementation-dependent value; RSVP is not expected to interpret thi value.
24	Routing Problem Subcode: ■ 01 Bad Explicit Route Object ■ 02 Bad Strict node ■ 03 Bad loose node ■ 04 Bad initial sub-object ■ 05 No route available toward destination ■ 06 Unacceptable label value ■ 07 RRO indicated routing loops ■ 08 MPLS being negotiated, but non-RSVP capable router stands in the path ■ 09 MPLS label allocation failure ■ 10 Unsupported L3PID	For information on this error code, see RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels.*
25	Notify Error subcode: ■ 01 RRO too large for MTU ■ 02 RRO notification ■ 03 Tunnel locally required	For information on this error code, see RFC 3209, *RSVP-TE: Extensions to RSVP for LSP Tunnels.*

Chapter 13

Examining an RSVP Failure

The Resource Reservation Protocol (RSVP) is a signaling protocol that provides reservation setup and control. This chapter describes a real-world scenario in which RSVP fails because links in the network are incorrectly configured. It discusses some basic approaches to monitoring and examining an RSVP failure, including how, when, and why you use specific commands. This chapter also includes an examination of the RSVP log file and corrective action for the specific scenario.

Checklist for Examining an RSVP Failure

Problem The Resource Reservation Protocol (RSVP) is a signaling protocol that provides reservation setup and control. This checklist provides the links and commands for a real-world scenario in which RSVP fails because links in the network are incorrectly configured. The links lead to information about some basic approaches to monitoring and examining an RSVP failure, including how, when, and why you use specific commands. This topic also includes an examination of the RSVP log file and corrective action for the specific scenario. (See Table 23 on page 147.)

Table 23: Checklist for Examining an RSVP Failure

Tasks	
"Case Study for an RSVP Failure" on page 148	
1. Verify the RSVP Session on page 149	show rsvp session ingress detail
2. Ping the Egress Router on page 150	ping *ip-address-interface*
3. Enable RSVP Tracing on Transit Routers on page 150	edit [edit] edit protocols rsvp [edit protocols rsvp] set traceoptions file *filename* set traceoptions flag *flag* show commit

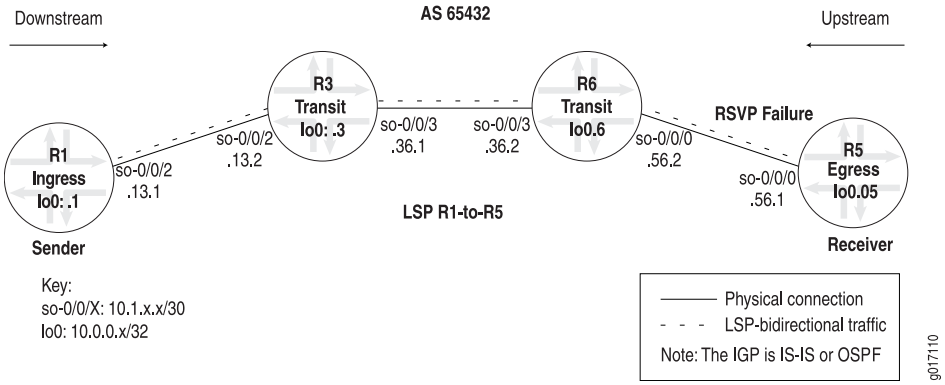
Table 23: Checklist for Examining an RSVP Failure *(continued)*

Tasks	
4. View the RSVP Log File on Transit Routers on page 152	clear rsvp session (Optional) clear log *filename* (Optional) show log *filename*
5. Check the RSVP Log File on the Egress Router on page 154	show log rsvp-log
6. Determine and Correct the Problem on the Egress Router on page 154	The following sequence of commands addresses the specific problem described in this section: show configuration protocols rsvp edit [edit protocols rsvp] rename interface so-0/0/3 to interface so-0/0/0 show commit run show rsvp session ingress detail
7. Remove the Tracing Configuration on page 155	edit [edit protocols rsvp] show delete traceoptions show commit

Case Study for an RSVP Failure

This case study presents a Multiprotocol Label Switching (MPLS) network topology and RSVP failure scenario designed to demonstrate techniques and commands that are particularly useful when addressing RSVP problems in your network. The focus of the study is an unconstrained RSVP label-switched path (LSP) from R1 to R5, which uses a strict path through R3. In this case, the RSVP failure occurs when interface so-0/0/0 on R5 is configured incorrectly. (See Figure 18 on page 149.)

Figure 18: RSVP Failure in an MPLS Network Topology



The MPLS network in Figure 18 on page 149 is a router-only network with SONET interfaces that consists of the following components:

- A full-mesh interior Border Gateway Protocol (IBGP) topology, using AS 65432.
- MPLS and RSVP enabled on all routers.
- A send-statics policy on routers R1 and R6, that allows a new route to be advertised into the network.
- Two unidirectional LSPs between routers R1 (ingress) and R5 (egress), which allow bidirectional traffic.
- The no-cspf statement included at the [edit protocols mpls label-switched-path *path-name*] hierarchy level, indicating that the Constrained Shortest Path First (CSPF) algorithm is not used to compute the LSP path.
- A strict path configured for both unidirectional LSPs, R1-to-R5 and R5-to-R1, at the [edit protocols mpls] hierarchy level.

To examine the RSVP failure, follow these steps:

1. Verify the RSVP Session on page 149
2. Ping the Egress Router on page 150
3. Enable RSVP Tracing on Transit Routers on page 150
4. View the RSVP Log File on Transit Routers on page 152
5. Check the RSVP Log File on the Egress Router on page 154
6. Determine and Correct the Problem on the Egress Router on page 154
7. Remove the Tracing Configuration on page 155

Verify the RSVP Session

Purpose In this case study, the unconstrained RSVP LSP from router R1 to R5 uses a strict path through R3, r1-r3-r5.

Action To verify that the RSVP session is established, enter the following JUNOS command-line interface (CLI) operational mode command:

user@host> **show rsvp session ingress detail**

Sample Output

```
user@R1> show rsvp session ingress detail
Ingress RSVP: 1 sessions

10.0.0.5
  From: 10.0.0.1, LSPstate: Dn, ActiveRoute: 0
  LSPname: R1-to-R5, LSPpath: Primary
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: -
  Resv style: 0 -, Label in: -, Label out: -
  Time left:    -, Since: Tue Jul 19 20:42:20 2005
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 16 receiver 11956 protocol 0
  PATH rcvfrom: localclient
  Adspec: sent MTU 1500
  Path MTU: received 0
  PATH sentto: 10.1.13.2 (so-0/0/2.0) 3 pkts
  Explct route: 10.1.13.2
  Record route: <self> ...incomplete
Total 1 displayed, Up 0, Down 1
```

Meaning The sample output from ingress router R1 shows that the RSVP session has not been established (Down 1) through the explicit path (10.1.13.2). The Path message was sent to R3 (10.1.13.2) and dropped. In situations like this, you can ping the egress router (R5) to ensure operational communications in the network, and enable RSVP tracing on the router that dropped the packet (R3) to obtain valuable clues as to the nature of the problem.

Ping the Egress Router

Purpose Ping the egress router to confirm that communication over the network is operational.

Action To ping the egress router, enter the following JUNOS CLI operational mode command:

user@host> **ping** *ip-address-interface*

Sample Output

```
[edit protocols mpls]
user@R1# run ping 10.1.56.1
PING 10.1.56.1 (10.1.56.1): 56 data bytes
64 bytes from 10.1.56.1: icmp_seq=0 ttl=255 time=0.837 ms
64 bytes from 10.1.56.1: icmp_seq=1 ttl=255 time=0.792 ms
64 bytes from 10.1.56.1: icmp_seq=2 ttl=255 time=0.856 ms
^C
--- 10.1.56.1 ping statistics ---
3 packets transmitted, 3 packets received,  0% packet loss
round-trip min/avg/max/stddev = 0.792/0.828/0.856/0.027 ms
```

Meaning The sample output confirms that communication between router R1 and the IP address of the relevant interface on router R5 (10.1.56.1) is operational.

Enable RSVP Tracing on Transit Routers

Purpose RSVP tracing on transit routers (R3 and R6) can provide useful information about the problem.

Action To enable RSVP tracing on transit routers, follow these steps:

1. In configuration mode, go to the following hierarchy level:

   ```
   user@host> edit
   user@host# edit protocols rsvp
   ```

2. Configure a log file:

   ```
   [edit protocols rsvp]
   user@host# set traceoptions file filename
   ```

3. Depending on your situation, specify all or one of the following RSVP-specific tracing flags:

   ```
   [edit protocols rsvp]
   user@host# set traceoptions flag error detail
   user@host# set traceoptions flag path detail
   user@host# set traceoptions flag pathtear detail
   ```

4. Verify and commit the configuration:

   ```
   user@host# show
   user@host# commit
   ```

5. Complete the above steps on any other transit routers that might provide useful information towards resolution of the problem.

Sample Output

```
user@R3> edit
Entering configuration mode


[edit]
user@R3# edit protocols rsvp


[edit protocols rsvp]
user@R3# set traceoptions file rsvp-log

[edit protocols rsvp]
user@R3# set traceoptions flag error detail

[edit protocols rsvp]
user@R3# set traceoptions flag path detail

[edit protocols rsvp]
user@R3# set traceoptions flag pathtear detail

[edit protocols rsvp]
user@R1# show
traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface fxp0.0 {
    disable;
}
interface all;
```

```
[edit protocols rsvp]
user@R3# commit
commit complete
```

Meaning The sample output shows a configuration of RSVP tracing on transit router R3. The same tracing configuration is placed on R6 (not shown). Various flags are included at the [edit protocols rsvp traceoptions] hierarchy level to provide slightly different information about RSVP traffic. For more information about RSVP tracing flags, see Table 18 on page 114. With all configured flags, the detail option is included to show granular details about errors and paths.

NOTE: Use the trace options detail flag with caution because it may cause the CPU to become very busy. For information on removing a tracing configuration, see "Remove the Tracing Configuration" on page 155.

After you have configured tracing and issued the commit command, the routing protocol process (rpd) immediately starts monitoring RSVP. Any RSVP activity that relates to the configured flags is placed in the log file.

View the RSVP Log File on Transit Routers

Purpose Transit router messages that appear in the RSVP log file can help you analyze the problem with an RSVP session. You may need to issue the clear rsvp session and clear log *filename* commands to ensure that your records are current. However, if your network is large with many RSVP sessions, this may not be advisable because it may take a while for all sessions to reestablish. However, the clear rsvp session command has various options you can include to minimize the effect on your network. For more information about the clear rsvp session command, see the *JUNOS Routing Protocols and Policies Command Reference*.

Action To view the RSVP log file, enter the following JUNOS CLI operational mode commands:

```
user@host> clear rsvp session (Optional)
user@host> clear log filename (Optional)
user@host> show log  filename
```

Sample Output 1

```
user@R3> clear rsvp session

user@R3> clear log rsvp-log

user@R3> show log rsvp-log
Jul 21 16:51:23 R3 clear-log[30656]: logfile cleared
Jul 21 16:51:24  RSVP recv Path 10.0.0.1->10.0.0.5 Len=208 so-0/0/2.0
Jul 21 16:51:24   Session7 Len 16 10.0.0.5(port/tunnel ID 11956) Proto 0
Jul 21 16:51:24   Hop      Len 12 10.1.13.1/0x086cd198
Jul 21 16:51:24   Time     Len  8 30000 ms
Jul 21 16:51:24   SrcRoute Len 20  10.1.13.2 S 10.1.36.2 S
Jul 21 16:51:24   LabelRequest Len  8 EtherType 0x800
Jul 21 16:51:24   Properties Len 12 Primary path
Jul 21 16:51:24   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jul 21 16:51:24   Sender7  Len 12 10.0.0.1(port/lsp ID  32)
Jul 21 16:51:24   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jul 21 16:51:24   ADspec   Len 48 MTU 1500
```

```
Jul 21 16:51:24   RecRoute Len 12  10.1.13.1
Jul 21 16:51:24  RSVP send Path 10.0.0.1->10.0.0.5 Len=208 so-0/0/3.0
Jul 21 16:51:24   Session7 Len 16 10.0.0.5(port/tunnel ID 11956) Proto 0
Jul 21 16:51:24   Hop      Len 12 10.1.36.1/0x08680264
Jul 21 16:51:24   Time     Len  8 30000 ms
Jul 21 16:51:24   SrcRoute Len 12  10.1.36.2 S
Jul 21 16:51:24   LabelRequest Len  8 EtherType 0x800
Jul 21 16:51:24   Properties Len 12 Primary path
Jul 21 16:51:24   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jul 21 16:51:24   Sender7  Len 12 10.0.0.1(port/lsp ID  32)
Jul 21 16:51:24   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jul 21 16:51:24   ADspec   Len 48 MTU 1500
Jul 21 16:51:24    RecRoute Len 20  10.1.36.1 10.1.13.1
```

Sample Output 2

```
user@R6> clear rsvp session

user@R6> clear log rsvp-log

user@R6> show log rsvp-log
Jul 21 17:01:21 R6 clear-log[41496]: logfile cleared
Jul 21 17:01:23  RSVP recv Path 10.0.0.1->10.0.0.5 Len=208 so-0/0/3.0
Jul 21 17:01:23   Session7 Len 16 10.0.0.5(port/tunnel ID 11956) Proto 0
Jul 21 17:01:23   Hop      Len 12 10.1.36.1/0x08680264
Jul 21 17:01:23   Time     Len  8 30000 ms
Jul 21 17:01:23   SrcRoute Len 12  10.1.36.2 S
Jul 21 17:01:23   LabelRequest Len  8 EtherType 0x800
Jul 21 17:01:23   Properties Len 12 Primary path
Jul 21 17:01:23   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jul 21 17:01:23   Sender7  Len 12 10.0.0.1(port/lsp ID  32)
Jul 21 17:01:23   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jul 21 17:01:23   ADspec   Len 48 MTU 1500
Jul 21 17:01:23    RecRoute Len 20  10.1.36.1 10.1.13.1
Jul 21 17:01:23  RSVP send Path 10.0.0.1->10.0.0.5 Len=204 so-0/0/0.0
Jul 21 17:01:23   Session7 Len 16 10.0.0.5(port/tunnel ID 11956) Proto 0
Jul 21 17:01:23   Hop      Len 12 10.1.56.2/0x086f9000
Jul 21 17:01:23   Time     Len  8 30000 ms
Jul 21 17:01:23   LabelRequest Len  8 EtherType 0x800
Jul 21 17:01:23   Properties Len 12 Primary path
Jul 21 17:01:23   SessionAttribute Len 16 Prio (7,0) flag 0x0 "R1-to-R5"
Jul 21 17:01:23   Sender7  Len 12 10.0.0.1(port/lsp ID  32)
Jul 21 17:01:23   Tspec    Len 36 rate 0bps size 0bps peak Infbps m 20 M 1500
Jul 21 17:01:23   ADspec   Len 48 MTU 1500
Jul 21 17:01:23    RecRoute Len 28  10.1.56.2 10.1.36.1 10.1.13.1
```

Meaning Sample Output 1 from transit router R3 shows that R3 (so-0/0/2.0) correctly received a Path request message (recv Path) from R1, and correctly sent the Path message (send Path) through interface so-0/0/3.0 to R6. The route record object (RecRoute) indicates the list of addresses this Path message transited, in this case, 10 1.36.1 and 10.1.13.1.

Sample Output 2 from transit router R6 shows that R6 (so-0/0/3.0) correctly received a Path request message (recv Path) from R3, and correctly sent the Path message (send Path) through interface so-0/0/0 to R5. The route record object (RecRoute) indicates the list of addresses this Path message transited, in this case, 10.1.56.2, 10 1.36.1, and 10.1.13.1.

With the information above, the focus shifts to egress router R5 as the source of the problem, with indications that R5 ignored the RSVP message.

Check the RSVP Log File on the Egress Router

Purpose After placing an RSVP tracing configuration on router R5 similar to that on routers R3 and R6, display the RSVP log file for useful information about the problem on router R5. For steps to configure RSVP tracing, see "Enable RSVP Tracing on Transit Routers" on page 150.

Action To check the RSVP log file, enter the following JUNOS CLI operational mode command:

```
user@host>  show log rsvp-log
```

Sample Output

```
user@R5> show log rsvp-log
Jul 21 10:53:16 R5 clear-log[40071]: logfile cleared
Jul 21 11:02:37 trace_on: Tracing to "/var/log/rsvp-log" started
Jul 21 11:03:07 RSVP error, send to  DISABLED interface ? Hello New
10.1.56.1->10.1.56.2 Len=8  so-0/0/0.0
```

Meaning The sample output shows that R5 did not receive the Path message because of a disabled interface, so-0/0/0.0.

Determine and Correct the Problem on the Egress Router

Problem Check the configuration of interface so-0/0/0.0 on egress router R5 to determine the reason it was disabled.

Solution To determine the problem on R5, enter the following JUNOS CLI commands:

```
user@R5> show configuration protocols rsvp
user@R5> edit
[edit protocols rsvp]
user@R5# rename interface so-0/0/3 to interface so-0/0/0
user@R5# show
user@R5# commit
user@R5# run show rsvp session ingress detail
```

Sample Output 1

```
user@R5> show configuration protocols rsvp
traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface so-0/0/3.0;      <<< so-0/0/3 incorrectly included
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}
```

Sample Output 2

```
[edit protocols rsvp]
user@R5# rename interface so-0/0/3 to interface so-0/0/0

[edit protocols rsvp]
user@R5# show
traceoptions {
```

```
    file rsvp-log;
    flag packets detail;
    flag error detail;
}
interface so-0/0/0.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R5# commit
commit complete
```

Sample Output 3

```
[edit protocols mpls]
user@R5# run show rsvp session ingress detail
Ingress RSVP: 1 sessions
To              From            State   Rt Style Labelin Labelout LSPname
10.0.0.1        10.0.0.5        Up       1  1 FF       -   103104 R5-to-R1
Total 1 displayed, Up 1, Down 0
Egress RSVP: 1 sessions
To              From            State   Rt Style Labelin Labelout LSPname
10.0.0.5        10.0.0.1        Up       0  1 FF       3        - R1-to-R5
Total 1 displayed, Up 1, Down 0

Transit RSVP: 0 sessions
Total 0 displayed, Up 0, Down 0
```

Meaning Sample Output 1 from egress router R5 shows three interfaces configured at the [edit protocols rsvp] hierarchy level, non of which is so-0/0/0.0. On examination of the network topology, it is apparent that the so-0/0/0.0 interface was configured incorrectly as so-0/0/3.0.

Sample Output 2 shows the correct configuration of interfaces at the [edit protocols rsvp] hierarchy level, and the rename command issued to correct the configuration error.

Sample Output 3 shows that the RSVP-signaled LSP (R1-to-R5) is correctly established after the changes to the RSVP configuration are committed.

Remove the Tracing Configuration

Problem It is considered best practice to remove any configuration elements that are no longer required, such as tracing configurations.

Solution To remove the tracing configuration, enter the following JUNOS CLI commands:

```
user@R5> edit
[edit protocols rsvp]
user@R5# show
user@R5# delete traceoptions
user@R5# show
user@R5# commit
```

Sample Output

```
user@R5> edit
Entering configuration mode

[edit]
user@R5# edit protocols rsvp

[edit protocols rsvp]
user@R5# show
traceoptions {
    file rsvp-log;
    flag error detail;
    flag path detail;
    flag pathtear detail;
}
interface so-0/0/3.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R5#  delete traceoptions

[edit protocols rsvp]
user@R5#  show
interface so-0/0/3.0;
interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

[edit protocols rsvp]
user@R5# commit
commit complete
```

Meaning The sample output from egress router R5 shows that tracing is deleted from the R5 configuration. In addition, the tracing configuration was removed from all routers (not shown).

NOTE: Use the trace options detail flag with caution because it may cause the CPU to become very busy.

Part 5
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