

Chapter 9

Summary of MPLS Configuration Statements

This chapter shows the complete Multiprotocol Label Switching (MPLS) configuration statements. The statements are organized alphabetically.

adaptive

Syntax	adaptive;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	During reroute, do not double-count bandwidth on links shared by the old and new paths. Including this statement causes RSVP to use SE reservation styles and assists in smooth transition during rerouting.
Default	The configured object is disabled.
Usage Guidelines	See “Configuring Adaptive LSPs” on page 98.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

adjust-interval

Syntax	adjust-interval <i>seconds</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth]
Description	Specify the bandwidth reallocation interval.
Options	<i>seconds</i> —Bandwidth reallocation interval, in seconds Range: 300 through 4,294,967,295 seconds Default: 86,400 seconds
Usage Guidelines	See “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

adjust-threshold

Syntax	adjust-threshold <i>percent</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth]
Description	Specify how sensitive the automatic bandwidth adjustment for an LSP is to changes in bandwidth utilization.
Options	<i>percent</i> —Bandwidth demand for the current bandwidth adjustment interval is determined and compared to the LSP’s current bandwidth allocation. If the percentage difference in bandwidth is greater than or equal to the specified <i>adjust-threshold</i> percentage, the LSP’s bandwidth is adjusted to the current bandwidth demand.
Usage Guidelines	See “Configuring the Threshold for Automatic Bandwidth Adjustment” on page 90.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

admin-group

See the following sections:

admin-group (for Interfaces) on page 179

admin-group (for LSPs) on page 179

admin-group (for Interfaces)

Syntax	<code>admin-group [group-names];</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i>], [edit protocols mpls interface <i>interface-name</i>]
Description	Define administrative groups for an interface.
Options	<i>group-names</i> —One or more names of groups defined with the <code>admin-groups</code> statement.
Usage Guidelines	See “Configuring Administrative Groups” on page 93.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	<code>admin-groups</code> on page 180

admin-group (for LSPs)

Syntax	<code>admin-group { exclude [group-names]; include [group-names]; }</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	Define the administrative groups to include or exclude for an LSP and for a path’s primary and secondary paths.
Options	The statements are explained separately.
Usage Guidelines	See “Configuring Administrative Groups” on page 93.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

admin-groups

Syntax	admin-groups { <i>group-name group-value</i> ; }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Configure administrative groups to implement link coloring or resource classes.
Options	<i>group-name</i> —Name of the group. You can assign up to 32 names. The names and their corresponding values must be identical across all routers within a single domain. <i>group-value</i> —Value assigned to the group. The names and their corresponding values must be identical across all routers within a single domain. Range: 0 through 31
Usage Guidelines	See “Configuring Administrative Groups” on page 93.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	admin-group on page 178

advertise-hold-time

Syntax	advertise-hold-time <i>seconds</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Do not advertise when the LSP goes from up to down, for a certain period of time known as hold time.
Options	<i>seconds</i> —Hold time specified in seconds. Range: 0 through 65,535 seconds Default: 5 seconds
Usage Guidelines	See “Configuring LSP Hold Time” on page 104.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

allow-fragmentation

Syntax	allow-fragmentation;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls path-mtu], [edit protocols mpls path-mtu]
Description	Allow for IP packets to be fragmented before they are encapsulated in MPLS.
Usage Guidelines	See “Enabling Packet Fragmentation” on page 275.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

auto-bandwidth

Syntax	auto-bandwidth { adjust-interval <i>seconds</i> ; adjust-threshold <i>percent</i> ; maximum-bandwidth <i>bps</i> ; minimum-bandwidth <i>bps</i> ; monitor-bandwidth; }
Hierarchy Level	[edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Allow an MPLS tunnel to automatically adjust its bandwidth allocation based on the volume of traffic flowing through the tunnel.
Options	The statements are explained separately.
Usage Guidelines	See “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

auto-policing

Syntax	<pre> auto-policing { class all (drop loss-priority-high loss-priority-low); class <i>ctnumber</i> (drop loss-priority-high loss-priority-low); } </pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Enables the automatic policing of all the MPLS LSPs on the router or logical router.
Options	<p>class all—Apply the same policer action to all the class types (ct0, ct1, ct2, and ct3).</p> <p>class <i>ctnumber</i>—Configure a specific class type (ct0, ct1, ct2, or ct3) to apply a policer action to.</p> <p>policer actions—You can specify the following policer actions:</p> <ul style="list-style-type: none"> drop—Drop all packets. loss-priority-high—Set the packet loss priority (PLP) to high. loss-priority-low—Set the packet loss priority (PLP) to low. <p>Default: no action</p>
Usage Guidelines	See “Configuring Automatic Policers” on page 168.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
See Also	policing on page 212

bandwidth

Syntax	<pre>bandwidth <i>bps</i> { ct0 <i>bps</i>; ct1 <i>bps</i>; ct2 <i>bps</i>; ct3 <i>bps</i>; }</pre>
Hierarchy Level	<pre>[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]</pre>
Description	<p>When configuring an LSP, specify the traffic rate associated with the LSP.</p> <p>When configuring fast reroute, allocate bandwidth for the reroute path. By default, no bandwidth is reserved for the rerouted path. The fast reroute bandwidth does not need to be identical to that allocated for the LSP itself.</p> <p>When configuring a multiclass LSP, use the <i>ctnumber bandwidth</i> statements to specify the bandwidth to be allocated for each class type.</p>
Options	<p><i>bps</i>—Bandwidth, in bits per second. You can specify this as an integer value. You can also use the abbreviations k (for a thousand), m (for a million), or g (for a billion).</p> <p>Range: Any positive integer Default: 0 (no bandwidth is reserved)</p> <p><i>ctnumber bps</i>—Bandwidth, in bits per second for the specified class type. You can specify this as an integer value. If you do so, count your zeros carefully, or you can use the abbreviations k (for a thousand), m (for a million), or g (for a billion [also called a thousand million]).</p> <p>Range: Any positive integer Default: 0 (no bandwidth is reserved)</p>
Usage Guidelines	<p>See “Configuring Fast Reroute” on page 77, “Configuring the Path Bandwidth” on page 102, “Configuring a Traffic Engineered LSP” on page 138, and “Configuring a Multiclass LSP” on page 141.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.</p>

bandwidth-model

Syntax	bandwidth-model { extended-mam; mam; rdm; }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls diffserv-te], [edit protocols mpls diffserv-te]
Description	Configure the bandwidth model for differentiated services. Note that you cannot configure both bandwidth models at the same time.
Options	<p>extended-mam—The extended maximum allocation model (MAM) is a bandwidth model based on MAM.</p> <p> mam—The MAM is defined in Internet draft draft-ietf-tewg-diff-te-mam-03.txt, <i>Maximum Allocation Bandwidth Constraints Model for Diff-Serv-Aware MPLS Traffic Engineering</i>.</p> <p> rdm—The Russian dolls bandwidth allocation model (RDM) is defined in Internet draft draft-ietf-tewg-diff-te-russian-05.txt, <i>Russian Dolls Bandwidth Constraints Model for Diff-Serv-aware MPLS Traffic Engineering</i>. RDM makes efficient use of bandwidth by allowing the class types to share bandwidth.</p>
Usage Guidelines	See “Configuring the Bandwidth Model” on page 134.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

bandwidth-percent

Syntax	bandwidth-percent <i>percent</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute]
Description	Configure the percentage of bandwidth to reserve for the detour path in case the primary path for a traffic engineered LSP or a multiclass LSP fails. The percentage configured indicates the percentage of the protected path’s bandwidth that is reserved for the detour path.
Options	<i>percent</i> —The percentage of the protected path’s bandwidth that is reserved for the detour path.
Usage Guidelines	See “Configuring Fast Reroute for Traffic Engineered LSPs” on page 139 and “Configuring Fast Reroute for Multiclass LSPs” on page 143.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

class-of-service

Syntax	<code>class-of-service <i>cos-value</i>;</code>
Hierarchy Level	<pre>[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map default-route], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls static-path inet <i>address</i>], [edit protocols mpls], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map default-route], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls static-path inet <i>prefix</i>]</pre>
Description	<p>Class-of-service (CoS) value given to all packets in the LSP.</p> <p>The CoS value might affect the scheduling or queuing algorithm of traffic traveling along an LSP.</p>
Options	<p><i>cos-value</i>—CoS value. A higher value typically corresponds to a higher level of service.</p> <p>Range—0 through 7</p> <p>Default—If you do not specify a CoS value, the IP precedence bits from the packet's IP header are used as the packet's CoS value.</p>
Usage Guidelines	See “Configuring Class of Service for MPLS” on page 95, “Configuring the Ingress Router for Static LSPs” on page 146, and “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

default-route

Syntax	<pre>default-route { class-of-service <i>cos-value</i>; (next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>) (reject discard); (pop (swap <<i>out-label</i>>); preference <i>preference</i>; type <i>type</i>; }</pre>
Hierarchy Level	<pre>[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map], [edit protocols mpls interface <i>interface-name</i> label-map]</pre>
Description	<p>Process MPLS packets that have not been assigned label values and have no corresponding entry in the mpls.0 table.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See “Configuring MPLS Exception Monitoring” on page 111.
Required Privilege Level	<pre>routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.</pre>

description

Syntax	<pre>description <i>text</i>;</pre>
Hierarchy Level	<pre>[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]</pre>
Description	<p>Provides a textual description of the LSP. Enclose any descriptive text that includes spaces in quotation marks (" "). Any descriptive text you include is displayed in the output of the show mpls lsp detail command and has no effect on the operation of the LSP.</p>
Options	<i>text</i> —Provide a textual description of the LSP.
Usage Guidelines	See “Configuring the Description” on page 76.
Required Privilege Level	<pre>routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.</pre>

diffserv-te

Syntax	<pre> diffserv-te { bandwidth-model { extended-mam; mam; rdm; } te-class-matrix { tnumber { priority <i>priority</i>; traffic-class { ctnumber <i>priority priority</i>; } } } } </pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Specify properties for differentiated services in traffic engineering.
Options	The statements are explained separately.
Usage Guidelines	See “Configuring Differentiated-Services-Aware Traffic Engineering” on page 133.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

disable

Syntax	disable;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls], [edit protocols mpls interface <i>interface-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Disable the functionality of the configured object.
Default	The configured object is enabled (operational) unless explicitly disabled.
Usage Guidelines	See “Creating an LSP” on page 66.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

discard

Syntax	discard;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map default-route], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>]
Description	Do not forward packets that match the incoming label. Instead, drop the packets and do not send an ICMP unreachable message.
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

exclude

See the following sections:

exclude (for Administrative Groups) on page 188

exclude (for Fast Reroute) on page 189

exclude (for Administrative Groups)

Syntax	exclude [<i>group-names</i>];
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> admin-group], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i> admin-group], [edit protocols mpls label-switched-path <i>lsp-path-name</i> admin-group], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i> admin-group]
Description	Define the administrative groups to exclude for an LSP or for a path’s primary and secondary paths.
Options	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
Usage Guidelines	See “Configuring Administrative Groups” on page 93.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

exclude (for Fast Reroute)

Syntax	<code>(exclude [<i>group-names</i>] no-exclude);</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute]
Description	Control exclusion of administrative groups: <p style="margin-left: 40px;">exclude—Define the administrative groups to exclude for fast reroute.</p> <p style="margin-left: 40px;">no-exclude—Disable administrative group exclusion.</p>
Options	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
Usage Guidelines	See “Configuring Fast Reroute” on page 77.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

explicit-null

Syntax	<code>explicit-null;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Advertise label 0 to the egress router of an LSP.
Default	If you do not include the explicit-null statement in the MPLS configuration, label 3 (implicit null) is advertised.
Usage Guidelines	See “Configuring MPLS to Pop the Label on the Ultimate-Hop Router” on page 156.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

fast-reroute

Syntax	<pre>fast-reroute { bandwidth <i>bps</i>; bandwidth-percent <i>percent</i>; (exclude [<i>group-names</i>] no-exclude); hop-limit <i>number</i>; (include [<i>group-names</i>] no-include); }</pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Establish detours for the LSP so that if a node or link in the LSP fails, the traffic on the LSP can be rerouted with minimal packet loss.
Options	The statements are explained separately.
Usage Guidelines	See “Configuring Fast Reroute” on page 77.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

fate-sharing

Syntax	<pre>fate-sharing { group <i>group-name</i> { cost <i>value</i>; from <i>address</i> <to <i>address</i>>; } }</pre>
Hierarchy Level	<p>[edit logical-routers <i>logical-router-name</i> routing-options], [edit logical-routers <i>logical-router-name</i> routing-instances <i>routing-instance-name</i> routing-options], [edit routing-options], [edit routing-instances <i>routing-instance-name</i> routing-options]</p>
Description	<p>Specify groups of objects that share characteristics resulting in backup paths to be used if primary paths fail. All objects are treated as /32 host addresses. You specify one or more objects within a group. The objects can be LAN interfaces, router IDs, or point-to-point links. The sequence is insignificant.</p>
Options	<p>cost <i>value</i>—Cost assigned to the group. Range: 1 through 65,535 Default: 1</p> <p>from <i>address</i>—Address of the router or address of the LAN/NBMA interface. For example, an Ethernet network with four hosts in the same fate-sharing group would require you to list all four of the separate from addresses in the group.</p> <p>group <i>group-name</i>—Each fate-sharing group must have a name, which can have a maximum of 32 characters, including letters, numbers, periods (.), and hyphens (-). You can define up to 512 groups.</p> <p>to <i>address</i>—(Optional) Address of egress router. For point-to-point link objects, you must specify both a from and a to address.</p>
Usage Guidelines	<p>See “Configuring Alternate Backup Paths Using Fate Sharing” on page 104.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.</p>

from

Syntax	from <i>address</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Specify the source address to use for the LSP. The address you specify does not affect the outgoing interface used by the LSP.
Default	If you do not include this statement, the software automatically selects the loopback interface as the address.
Options	<i>address</i> —IP address.
Usage Guidelines	See “Configuring the Address of the Ingress Router” on page 72.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

gpip

Syntax	gpip (ethernet hdlc ipv4 ppp);
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> <i>lsp-attributes</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> <i>lsp-attributes</i>]
Description	Specifies the type of payload carried by the LSP. It can be any of the following: ethernet—Ethernet hdlc—High-level Data Link Control (HDLC) ipv4—Internet Protocol version 4 ppp—Point-to-Point Protocol (PPP)
Default	ipv4
Usage Guidelines	See “Configuring the GPID” on page 413.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

hop-limit

Syntax	hop-limit <i>number</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	For an LSP, the maximum number of routers that the LSP can traverse, including the ingress and egress routers. For fast reroute, how many more routers a detour is allowed to traverse compared with the LSP itself. For example, if an LSP traverses 4 routers, any detour for the LSP can be no more than 10 router hops, including the ingress and egress routers.
Options	<i>number</i> —Maximum number of hops. Range: 2 through 255 (for an LSP); 0 through 255 (for fast reroute) Default: 255 (for an LSP); 6 (for fast reroute)
Usage Guidelines	See “Configuring Fast Reroute” on page 77 and “Configuring the Maximum Path Length” on page 102.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

icmp-tunneling

Syntax	icmp-tunneling;
Hierarchy	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Enables ICMP tunneling, which can be used for debugging and tracing purposes.
Usage Guidelines	See “Configuring ICMP Message Tunneling” on page 124.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

include

See the following sections:

include (for Administrative Groups) on page 194

include (for Fast Reroute) on page 194

include (for Administrative Groups)

Syntax	include [<i>group-names</i>];
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> admin-group], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i> admin-group], [edit protocols mpls label-switched-path <i>lsp-path-name</i> admin-group], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i> admin-group]
Description	Define the administrative groups to include for an LSP or for a path's primary and secondary paths.
Options	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
Usage Guidelines	See “Configuring Administrative Groups” on page 93.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

include (for Fast Reroute)

Syntax	(include [<i>group-names</i>] no-include);
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute]
Description	Control inclusion of administrative groups: <ul style="list-style-type: none"> include—Define the administrative groups to include for fast reroute. no-include—Disable administrative group inclusion.
Options	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
Usage Guidelines	See “Configuring Fast Reroute” on page 77.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

install

Syntax	install { <i>destination-prefix/prefix-length</i> <active>; }
Hierarchy	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Associate one or more prefixes with an LSP. When the LSP is up, all the prefixes are installed as entries into the inet.3 routing table.
Options	active —(Optional) Install the route into the inet.0 routing table. This allows you to issue a ping or traceroute command on this address. <i>destination-prefix/prefix-length</i> —Address to associate with the LSP.
Usage Guidelines	See “Configuring Addresses to Associate with the LSP” on page 78.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

interface

Syntax	<pre> interface (<i>interface-name</i> all) { disable; admin-group [<i>group-name</i>]; } label-map <i>in-label</i> { class-of-service <i>cos-value</i>; default-route { class-of-service <i>cos-value</i>; (next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>) (reject discard); (pop (swap <<i>out-label</i>>)); preference <i>preference</i>; type <i>type</i>; } (next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>)) (reject discard); (pop (swap <<i>out-label</i>>)); preference <i>preference</i>; type <i>type</i>; } </pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Enable MPLS on one or more interfaces.
Options	<p><i>interface-name</i>—Name of the interface on which to configure MPLS. To configure all interfaces, specify all. For details about specifying interfaces, see the <i>JUNOS Network Interfaces and Class of Service Configuration Guide</i>.</p> <p>The remaining options are explained separately.</p>
Usage Guidelines	See “Minimum MPLS Configuration” on page 62 and “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

ipv6-tunneling

Syntax	ipv6-tunneling;
Hierarchy	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Allow IPv6 routes to be resolved over an MPLS network by converting all routes stored in the inet.3 routing table to IPv4-compatible IPv6 addresses and then copying them into the inet6.3 routing table. This routing table can be used to resolve next hops for inet6 and inet6-vpn routes.
Usage Guidelines	See “Enabling IPv6 Tunneling in MPLS” on page 123.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

label-map

Syntax	<pre>label-map { default-route { class-of-service <i>cos-value</i>; (next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>)) (reject discard); (pop swap <<i>out-label</i>> swap-push <<i>swap-label</i>>); preference <i>preference</i>; type <i>type</i>; } in-label { class-of-service <i>cos-value</i>; (next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>)) (reject discard); (pop swap <<i>out-label</i>> swap-push <<i>swap-label</i>>); preference <i>preference</i>; type <i>type</i>; } }</pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i>], [edit protocols mpls interface <i>interface-name</i>]
Description	For static MPLS only, the label to match.
Options	<p><i>in-label</i>—Label value.</p> <p>Range: 0 through 1,048,575. Dynamic MPLS assigns the labels 100,000 through 1,048,575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 and 10,000 through 99,999 only for static MPLS. Labels 0 through 15 are reserved and require special semantics. Labels 1024 through 9999 are reserved for future applications.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

label-switched-path

```

Syntax label-switched-path lsp-path-name {
  disable;
  adaptive;
  admin-group {
    exclude [ group-names ];
    include [ group-names ];
  }
  auto-bandwidth {
    adjust-interval seconds;
    adjust-threshold percent;
    maximum-bandwidth bps;
    minimum-bandwidth bps;
    monitor-bandwidth;
  }
  bandwidth bps {
    ct0 bps;
    ct1 bps;
    ct2 bps;
    ct3 bps;
  }
  class-of-service cos-value;
  description text;
  fast-reroute {
    bandwidth bps;
    bandwidth-percent percent;
    (exclude [ group-names ] | no-exclude);
    hop-limit number;
    (include [ group-names ] | no-include);
  }
  from address;
  hop-limit number;
  install {
    destination-prefix/prefix-length <active>;
  }
  ldp-tunneling;
  link-protection;
  lsp-attributes {
    gpid (ethernet | hdlc | ipv4 | ppp);
    signal-bandwidth type;
    switching-type type;
  }
  metric metric;
  no-cspf;
  no-decrement-ttl;
  node-link-protection;
  optimize-timer seconds;
  p2mp path-name;
  policing {
    filter filter-name;
    no-automatic-policing;
  }
  preference preference;
  priority setup-priority hold-priority;
}

```

```

primary path-name {
  adaptive;
  admin-group {
    include [ group-names ];
    exclude [ group-names ];
  }
  bandwidth bps {
    ct0 bps;
    ct1 bps;
    ct2 bps;
    ct3 bps;
  }
  class-of-service cos-value;
  hop-limit number;
  no-cspf;
  no-decrement-ttl;
  optimize-timer seconds;
  preference preference;
  priority setup-priority hold-priority;
  (record | no-record);
  retry-limit number;
  retry-timer seconds;
  select {
    manual;
    unconditional;
  }
  standby;
}
(random | least-fill | most-fill);
(record | no-record);
retry-limit number;
retry-timer seconds;
revert-timer seconds;
secondary path-name {
  adaptive;
  admin-group {
    include [ group-names ];
    exclude [ group-names ];
  }
  bandwidth bps{
    ct0 bps;
    ct1 bps;
    ct2 bps;
    ct3 bps;
  }
  class-of-service cos-value;
  hop-limit number;
  no-cspf;
  no-decrement-ttl;
  optimize-timer seconds;
  preference preference;
  priority setup-priority reservation-priority;
  (record | no-record);
  retry-limit number;
  retry-timer seconds;
}

```

```

        select {
            manual;
            unconditional;
        }
        standby;
    }
    soft-preemption {
        cleanup-timer seconds;
    }
    standby;
    to address;
    traceoptions {
        file filename <replace> <size size> <files number> <no-stamp>
        <(world-readable | no-world-readable)>;
        flag flag <flag-modifier> <disable>;
    }
}

```

Hierarchy Level [edit logical-routers *logical-router-name* protocols mpls],
[edit protocols mpls]

Description Configure an LSP to use in dynamic MPLS. When configuring an LSP, you must specify the address of the egress router in the to statement. All remaining statements are optional.

Options *lsp-path-name*—Name that identifies the LSP. The name can be up to 32 characters and can contain letters, digits, periods, and hyphens. To include other characters, enclose the name in quotation marks. The name must be unique within the ingress router.

The remaining statements are explained separately.

Usage Guidelines See “Creating an LSP” on page 66.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

ldp-tunneling

Syntax ldp-tunneling;

Hierarchy Level [edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-path-name*],
[edit protocols mpls label-switched-path *lsp-path-name*]

Description Enable the LSP to be used for Label Distribution Protocol (LDP) tunneling.

Usage Guidelines See “Enabling LDP over RSVP-Established LSPs” on page 332.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

least-fill

See random on page 216

log-updown

Syntax log-updown {
 (syslog | no-syslog);
 (trap | no-trap);
 trap-path-down;
 trap-path-up;
 }

Hierarchy Level [edit logical-routers *logical-router-name* protocols mpls],
 [edit protocols mpls]

Description Log a message or send a Simple Network Management Protocol (SNMP) trap whenever an LSP makes a transition from up to down, or vice versa, and whenever an LSP switches from one active path to another. Only the ingress router performs these operations.

Default There is no default behavior for this statement. If you do not specify the options, the configuration cannot be committed.

Options no-syslog—Do not log a message to the system log file.

no-trap—Do not send an SNMP trap.

syslog—Log a message to the system log file.

trap—Send an SNMP trap.

trap-path-down—Send an SNMP trap when an LSP path goes down.

trap-path-up—Send an SNMP trap when an LSP path comes up.

Usage Guidelines See “Controlling MPLS System Log Messages and SNMP Traps” on page 161 and the *JUNOS Network Management Configuration Guide*.

Required Privilege Level routing—To view this statement in the configuration.
 routing-control—To add this statement to the configuration.

See Also traceoptions on page 229

lsp-attributes

Syntax	lsp-attributes { gpip (ethernet hdlc ipv4 ppp); signal-bandwidth <i>type</i> ; switching-type <i>type</i> ; }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Define the parameters signaled during LSP setup. These usually determine the nature of the resource (label) allocated for the LSP. The options are explained separately.
Usage Guidelines	See “Configuring MPLS LSPs for GMPLS” on page 412.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

maximum-bandwidth

Syntax	maximum-bandwidth <i>bps</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth]
Description	Specify the maximum amount of bandwidth.
Options	<i>bps</i> —Bits per second.
Usage Guidelines	See “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

metric

Syntax	metric <i>metric</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Compare against another LSP or against an IGP route. To disable dynamic metric tracking, assign a fixed metric value to an LSP. If no metric is assigned, the LSP metric is dynamic and automatically tracks underlying IGP metrics.
Options	<i>metric</i> —LSP metric value. Default: No metric assigned (dynamic) Range: 1 through 65,535
Usage Guidelines	See “Configuring a Static LSP Metric” on page 80.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

minimum-bandwidth

Syntax	minimum-bandwidth <i>bps</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth]
Description	Set the minimum bandwidth for an LSP with automatic bandwidth allocation enabled.
Options	<i>bps</i> —Bits per second.
Usage Guidelines	See “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

monitor-bandwidth

Syntax	monitor-bandwidth;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth], [edit protocols mpls label-switched-path <i>lsp-path-name</i> auto-bandwidth]
Description	Do not automatically adjust bandwidth allocation. However, the maximum average bandwidth utilization is monitored on the LSP, and the information is recorded in the MPLS statistics file.
Usage Guidelines	See “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

most-fill

See random on page 216

mpls

Syntax	mpls { ... }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols], [edit protocols]
Description	Enable MPLS on the router.
Usage Guidelines	See “Minimum MPLS Configuration” on page 62.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

mtu-signaling

Syntax	mtu-signaling;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls path-mtu rsvp], [edit protocols mpls path-mtu rsvp]
Description	Enable MTU signaling in RSVP.
Usage Guidelines	See “Enabling MTU Signaling in RSVP” on page 275.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

next-hop

Syntax	<code>next-hop (address interface-name address/interface-name);</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route], [edit logical-routers <i>logical-router-name</i> protocols mpls static-path inet <i>address</i>], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route], [edit protocols mpls static-path inet <i>prefix</i>]
Description	IP address of the next hop to the destination, specified as the IP address of the next hop, the interface name (for point-to-point interfaces only), or the <i>address/interface-name</i> to specify an IP address on an operational interface.
Options	<i>address</i> —IP address of the next-hop router. <i>interface-name</i> —IP address of the outgoing interface. It must be a point-to point interface. The name can be a simple or fully qualified domain name.
Usage Guidelines	See “Configuring the Ingress Router for Static LSPs” on page 146 and “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

no-cspf

Syntax	no-cspf;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i> (primary secondary)], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	<p>Disable constrained-path LSP computation.</p> <p>An explicit-path LSP is completely configured through operator action. Once configured, it is initiated only along the explicitly specified path.</p> <p>A constrained-path LSP relies on an ingress router to compute the complete path. The ingress router takes into account the following information during the computation:</p> <ul style="list-style-type: none"> Interior gateway protocol (IGP) topology database Link utilization information from extensions in the IGP link-state database Administrative group information from extensions in the IGP link-state database LSP requirements, including bandwidth, hop count, and administrative group <p>Constrained-path LSPs can generally avoid link failures and congested links. They also permit recomputation (therefore, a new path) during topology changes or unsuccessful setup.</p>
Default	Constrained-path LSP computation enabled.
Usage Guidelines	See “Disabling Constrained-Path LSP Computation” on page 92 and “Configuring Explicit-Path LSPs” on page 152.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

no-decrement-ttl

Syntax	no-decrement-ttl;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	Disable normal TTL decrementing, which decrements the TTL field in the IP header by 1. This statement decrements the IP TTL by 1 before encapsulating the IP packet within an MPLS packet. When the penultimate router pops off the top label, it does not use the standard write-back procedure of writing the MPLS TTL into the IP TTL field. Therefore, the IP packet is decremented by 1. The ultimate router then decrements the packet by one more for a total cloud appearance of 2, thus hiding the network topology.
Default	Normal TTL decrementing enabled; the TTL field value is decremented by 1 as the packet passes through each label-switched router in the LSP.
Usage Guidelines	See “Disabling Normal TTL Decrementing” on page 85.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	no-propagate-ttl on page 208

no-exclude

See exclude on page 188

no-include

See include on page 194

no-propagate-ttl

Syntax	no-propagate-ttl;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Disable normal TTL decrementing. You configure this statement once per router, and it affects all RSVP- or LDP-signaled LSPs. When this router acts as an ingress router for an LSP, it pushes an MPLS header with a TTL value of 255, regardless of the IP packet TTL. When the router acts as the penultimate router, it pops the MPLS header without writing the MPLS TTL into the IP packet.
Default	Normal TTL decrementing enabled; the TTL field value is decremented by 1 as the packet passes through each label-switched router in the LSP.
Usage Guidelines	See “Disabling Normal TTL Decrementing” on page 85.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	no-decrement-ttl on page 207

no-record

See record on page 216

optimize-aggressive

Syntax	optimize-aggressive;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	If enabled, the LSP reoptimization is based solely on the IGP metric. The reoptimization process ignores the available bandwidth ratio calculations, the least-fill 10 percent congestion improvement rule, and the hop-counts rule. This statement makes reoptimization more aggressive than the default.
Default	Aggressive optimization is disabled.
Usage Guidelines	See “Optimizing Signaled LSPs” on page 100.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

optimize-timer

Syntax	optimize-timer <i>seconds</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i> (primary secondary)], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	<p>Enable periodic reoptimization of an LSP that is already set up. If topology changes occur, an existing path might become suboptimal, and a subsequent recomputation might be able to determine a better path. This option is useful only on LSPs for which constrained-path computation is enabled; that is, for which the no-cspf statement is not configured.</p> <p>To avoid extensive resource consumption that might result because of frequent path recomputations, or to avoid destabilizing the network as a result of constantly changing LSPs, we recommend that you either leave the timer value sufficiently large or disable the timer value.</p>
Default	The optimize timer is disabled.
Options	<i>seconds</i> —Length of the optimize timer, in seconds. Range: 0 through 65,535 seconds Default: 0 seconds (the optimize timer is disabled)
Usage Guidelines	See “Optimizing Signaled LSPs” on page 100.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

p2mp

Syntax	<code>p2mp path-name;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i>], [edit protocols mpls label-switched-path <i>lsp-name</i>]
Description	Specify an LSP as either a point-to-multipoint LSP or as a sub-LSP of a point-to-multipoint LSP by specifying the point-to-multipoint LSP path name.
Option	<i>path-name</i> —Name of the point-to-multipoint LSP path that identifies the sequence of nodes that form the point-to-multipoint LSP. The name can contain up to 32 characters and can include letters, digits, periods, and hyphens. To include other characters or use a longer name, enclose the name in quotation marks. The name must be unique within the ingress router.
Usage Guidelines	See “Configuring Point-to-Multipoint LSPs” on page 107.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

p2mp-lsp-next-hop

Syntax	<code>p2mp-lsp-next-hop point-to-multipoint-lsp-next-hop;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> routing-options static route <i>route-name</i>], [edit routing-options static route <i>route-name</i>]
Description	Specify the name of the point-to-multipoint LSP to be used as a next hop for the static route.
Option	<i>point-to-multipoint-lsp-next-hop</i> —Name of the point-to-multipoint LSP.
Usage Guidelines	See “Configuring Static Unicast Routes for Point-to-Multipoint LSPs” on page 151.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

path

Syntax	<code>path <i>path-name</i> { <i>address</i> <strict loose> }</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Create a named path and optionally specify the sequence of explicit routers that form the path. You must include this statement when configuring explicit LSPs.
Options	<p><i>address</i>—(Optional) IP address of each transit router in the LSP. You must specify the address or hostname of each transit router, although you do not need to list each transit router if its type is loose. As an option, you can include the ingress and egress routers in the path. Specify the addresses in order, starting with the ingress router (optional) or the first transit router, and continuing sequentially along the path until reaching the egress router (optional) or the router immediately before the egress router. Default: If you do not specify any routers explicitly, no routing limitations are imposed on the LSP.</p> <p><i>loose</i>—(Optional) Indicate that the next address in the path statement is a loose link. This means that the LSP can traverse through other routers before reaching this router. Default: strict</p> <p><i>path-name</i>—Name that identifies the sequence of nodes that form an LSP. The name can contain up to 32 characters and can include letters, digits, periods, and hyphens. To include other characters or use a longer name, enclose the name in quotation marks. The name must be unique within the ingress router.</p> <p><i>strict</i>—(Optional) Indicate that the LSP must go to the next address specified in the path statement without traversing other nodes. This is the default.</p>
Usage Guidelines	See “Creating a Named Path” on page 64.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	static-path on page 223

policing

Syntax	<pre>policing { filter <i>filter-name</i>; no-automatic-policing; }</pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-name</i>], [edit protocols mpls label-switched-path <i>lsp-name</i>]
Description	Specify the policing filter for the LSP.
Options	<p>filter—Specify the name of the policing filter.</p> <p>no-automatic-policing—Disable automatic policing on this LSP.</p>
Usage Guidelines	See “Configuring Policers for LSPs” on page 165.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
See Also	auto-policing on page 182

pop

Syntax	pop;
Hierarchy Level	<pre>[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map default-route], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>]</pre>
Description	Remove the label from the top of the label stack. If there is another label in the stack, that label becomes the label at the top of the label stack. Otherwise, the packet is forwarded as a native protocol packet (typically, as an IP packet).
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
See Also	swap on page 225

preference

Syntax	<code>preference preference;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map default-route], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls static-path inet <i>address</i>], [edit protocols mpls], [edit protocols mpls interface <i>interface-name</i> label-map default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls static-path inet <i>prefix</i>]
Description	Preference for the route. You can optionally configure multiple LSPs between the same pair of ingress and egress routers. This is useful for balancing the load among the LSPs because all LSPs, by default, have the same preference level. To prefer one LSP over another, set different preference levels for individual LSPs. The LSP with the lowest preference value is used. The default preference for LSPs is lower (more preferred) than all learned routes except direct interface routes.
Options	<i>preference</i> —Preference to assign to the route. A route with a lower preference value is preferred. Range: 1 through 255 Default: 5 for static MPLS LSPs, 7 for RSVP MPLS LSPs, 9 for LDP MPLS LSPs
Usage Guidelines	See “Configuring the LSP Preference” on page 95, “Configuring the Ingress Router for Static LSPs” on page 146, and “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

primary

Syntax `primary path-name {
 adaptive;
 admin-group {
 include [group-names];
 exclude [group-names];
 }
 bandwidth bps;
 class-of-service cos-value;
 hop-limit number;
 no-cspf;
 no-decrement-ttl;
 optimize-timer seconds;
 preference preference;
 priority setup-priority hold-priority;
 (record | no-record);
 retry-limit number;
 retry-timer seconds;
 select {
 manual;
 unconditional;
 }
 standby;
}`

Hierarchy Level [edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-path-name*],
 [edit protocols mpls label-switched-path *lsp-path-name*]

Description Specify the primary path to use for an LSP. You can configure only one primary path.

You can optionally specify preference, CoS, and bandwidth values for the primary path, which override any equivalent values that you configure for the LSP (at the [edit mpls label-switched-path *lsp-path-name*] hierarchy level).

Options *path-name*—Name of a path that you created with the path statement.

The remaining statements are explained separately.

Usage Guidelines See “Configuring the Primary and Secondary LSPs” on page 72.

Required Privilege Level routing—To view this statement in the configuration.
 routing-control—To add this statement to the configuration.

priority

Syntax	<code>priority setup-priority hold-priority;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	If, at session setup time, insufficient link bandwidth is encountered during session establishment, the setup priority is compared with existing established sessions on the link to determine whether some of them should be preempted to accommodate the new session. The session with the lower hold priority is preempted.
Options	<i>hold-priority</i> —Hold priority, used to keep a reservation after it has been set up. A smaller number has a higher priority. The priority must be greater than or equal to the setup priority to prevent preemption loops. Range: 0 through 7, where 0 is the highest and 7 is the lowest priority. Default: 0 (Once the session is set up, no other session can preempt it.) <i>setup-priority</i> —Setup priority. Range: 0 through 7, where 0 is the highest and 7 is the lowest priority. Default: 7 (The session cannot preempt any existing sessions.)
Usage Guidelines	See “Configuring Priority and Preemption” on page 99.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

push

Syntax	<code>push out-label;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls static-path inet <i>address</i>], [edit protocols mpls static-path inet <i>address</i>]
Description	Add a new label to the top of the label stack.
Options	<i>out-label</i> —Label value. Range: 0 through 1,048,575. Dynamic MPLS assigns the labels 100,000 through 1,048,575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 and 10,000 through 99,999 only for static MPLS. Labels 0 through 15 are reserved and require special semantics. Labels 1024 through 9999 are reserved for future applications.
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

random

Syntax	(random least-fill most-fill);
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Configure the preferred path when several equal-cost candidate paths to a destination exist, and prefer the path with the highest available bandwidth (with the largest minimum available bandwidth ratio). The available bandwidth ratio of a link is the available bandwidth on a link divided by the maximum reservable bandwidth on the link. least-fill—Prefer the path with the most available bandwidth (with the largest minimum available bandwidth ratio). most-fill—Prefer the path with the least available bandwidth (with the minimum available bandwidth ratio). The minimum available bandwidth ratio of a path is the smallest available bandwidth ratio belonging to any of the links in the path. random—Choose the path at random. Default: random
Usage Guidelines	See “Configuring CSPF Tie Breaking” on page 82.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

record

Syntax	(record no-record);
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	Specify whether an LSP should actively record the routes in the path. Recording routes requires that all transit routers support the RSVP Record Route object. Recording routes can be useful for diagnostics and loop detection.
Default	Record routes.
Usage Guidelines	See “Configuring Path Route Recording” on page 95.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

reject

Syntax	reject;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route]
Description	Do not forward a packet with the matching incoming label. Instead, drop the packet and, for IP packets, send an ICMP unreachable message to the packet's originator.
Usage Guidelines	See "Configuring the Intermediate and Egress Routers for Static LSPs" on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

retry-limit

Syntax	retry-limit <i>number</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> primary <i>path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> primary <i>path-name</i>]
Description	Maximum number of times the ingress router tries to establish the primary path. This counter is reset each time a primary path is created successfully. When the limit is exceeded, no more connection attempts are made. Intervention is then required to restart the connection.
Options	<i>number</i> —Maximum number of tries to establish the primary path. Range: 0 through 10,000 Default: 0 (The ingress node never stops trying to establish the primary path.)
Usage Guidelines	See "Configuring Path Connection Retry Information" on page 79.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

retry-timer

Syntax	<code>retry-timer seconds;</code>
Hierarchy Level	[edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> primary <i>path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> primary <i>path-name</i>]
Description	Amount of time the ingress router waits between attempts to establish the primary path.
Options	<i>seconds</i> —Amount of time between attempts to connect to the primary path. Range: 1 through 600 seconds Default: 30 seconds
Usage Guidelines	See “Configuring Path Connection Retry Information” on page 79.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

revert-timer

Syntax	<code>revert-timer seconds;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Specify the amount of time (in seconds) that an LSP must wait before it can revert traffic back onto a primary path. If during this time the primary path experiences any connectivity problem or stability problem, the timer is restarted. If you have configured a value of 0 seconds for the revert-timer statement and traffic is switched to the secondary path, the traffic remains on that path indefinitely. It is never switched back to the primary path unless you intervene.
Options	<i>seconds</i> —Time in seconds. Range: 0 through 65,535 seconds Default: 60 seconds
Usage Guidelines	See “Configuring the Revert Timer” on page 74.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

rsvp-error-hold-time

Syntax	rsvp-error-hold-time <i>seconds</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	<p>Amount of time MPLS retains RSVP PathErr messages and considers them for CSPF computations. The more time you configure, the more time a source node (ingress of the RSVP LSPs) can have to learn about the failures of its LSP by monitoring PathErr messages transmitted from downstream nodes.</p> <p>Information from the PathErr messages is incorporated into subsequent LSP computations, which can improve the accuracy and speed of LSP setup. Some PathErr messages are also used to update traffic engineering database (TED) bandwidth information, reducing inconsistencies between the TED and the network.</p>
Options	<p><i>seconds</i>—Amount of time MPLS retains RSVP PathErr messages and considers them for CSPF computations.</p> <p>Range: 0 through 240 seconds</p> <p>Default: 25 seconds</p>
Usage Guidelines	See “Improving TED Accuracy with RSVP PathErr Messages” on page 111.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

secondary

Syntax `secondary path-name {
 adaptive;
 admin-group {
 include group-names;
 exclude group-names;
 }
 bandwidth bps;
 class-of-service cos-value;
 hop-limit number;
 no-cspf;
 no-decrement-ttl;
 optimize-timer seconds;
 preference preference;
 priority setup-priority reservation-priority;
 (record | no-record);
 retry-limit number;
 retry-timer seconds;
 select {
 manual;
 unconditional;
 }
 standby;
}`

Hierarchy Level [edit logical-routers *logical-router-name* protocols mpls label-switched-path *lsp-path-name*],
 [edit protocols mpls label-switched-path *lsp-path-name*]

Description Specify one or more secondary paths to use for the LSP. You can configure more than one secondary path. All secondary paths are equal, and the first one that is available is chosen.

You can specify secondary paths even if you have not specified any primary paths.

Optionally, you can specify preference, CoS, and bandwidth values for the secondary path, which override any equivalent values that you configure for the LSP (at the [edit mpls label-switched-path] hierarchy level).

Options *path-name*—Name of a path that you created with the path statement.

The remaining statements are explained separately.

Usage Guidelines See “Configuring the Primary and Secondary LSPs” on page 72.

Required Privilege Level routing—To view this statement in the configuration.
 routing-control—To add this statement to the configuration.

select

Syntax	select { manual; unconditional; }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	You must specify either the manual option or the unconditional option. You cannot specify both.
Options	<p>manual—The path is selected for carrying traffic if it is up and stable for at least the revert timer window (potentially before the revert timer has elapsed). Traffic is sent to other working paths if the current path is down or degraded (receiving errors).</p> <p>unconditional—The path is selected for carrying traffic unconditionally, regardless of whether the path is currently down or degraded (receiving errors).</p>
Usage Guidelines	See “Specifying Path Selection” on page 75.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

signal-bandwidth

Syntax	signal-bandwidth <i>type</i> ;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> lsp-attributes], [edit protocols mpls label-switched-path <i>lsp-path-name</i> lsp-attributes]
Description	Specify the bandwidth encoding of the signal used for path computation and admission control.
Options	<i>type</i> —Configure the type of bandwidth encoding used on the LSP. It can be any of the following values: 10gige, ds-1, ds-3, e1, e3, ethernet, faste, gige, stm-1, stm-4, stm-16, stm-64, sts-1, vt1-5, or vt2.
Usage Guidelines	See “Configuring the Signal Bandwidth Type” on page 413.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

soft-preemption

Syntax	soft-preemption { cleanup-timer <i>seconds</i> ; }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Soft preemption attempts to establish a new path for a preempted LSP before tearing it down.
Options	cleanup-timer—Configure the length of time, in seconds, that the router should wait before initiating a hard preemption of the LSP.
Usage Guidelines	See “Configuring MPLS Soft Preemption” on page 87.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

standby

Syntax	standby;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>], [edit protocols mpls], [edit protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary secondary) <i>path-name</i>]
Description	Have the path remain up at all times to provide instant switchover if connectivity problems occur.
Usage Guidelines	See “Configuring the Standby State” on page 102.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

static-path

Syntax	static-path inet { <i>prefix</i> { class-of-service <i>cos-value</i> ; next-hop (<i>address</i> <i>interface-name</i> <i>address/interface-name</i>); preference <i>preference</i> ; push <i>out-label</i> ; } }
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Statically configure an LSP. You configure the LSP on the ingress router only. You can specify one or more static-path statements.
Options	<i>prefix</i> —IP address that matches the packet’s destination field. You can specify one or more addresses. You can specify the prefix in one of the following ways: IP address; for example, 10.0.0.2 Range of IP addresses; for example, 10.0.0.0/8 inet—Configure the path for packets with IPv4 destinations. The remaining statements are explained separately.
Usage Guidelines	See “Configuring the Ingress Router for Static LSPs” on page 146.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

statistics

Syntax	<pre>statistics { auto-bandwidth; file <i>filename</i> <size <i>size</i>> <files <i>number</i>> <no-stamp> <no-world-readable>; interval <i>seconds</i>; }</pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Enable MPLS statistics collection and reporting.
Options	<p>auto-bandwidth—Collect statistics related to automatic bandwidth.</p> <p>file <i>filename</i>—Name of the file to receive the output. We recommend that you place MPLS tracing output in the file <code>mpls-stat</code> in the <code>/var/log</code> directory.</p> <p>files <i>number</i>—Maximum number of trace files. When a trace file named <i>file</i> reaches its maximum size, it is renamed <i>file.0</i>, then <i>file.1</i>, and so on, until the maximum number of files is reached. Then, the oldest file is overwritten.</p> <p>If you specify a maximum number of files, you also must specify a maximum file size with the <code>size</code> option.</p> <p>Range: 2 or more Default: 2 files</p> <p>interval <i>seconds</i>—Interval at which to periodically collect statistics. Range: 1 through 65,535 Default: 300 seconds</p> <p>size <i>size</i>—Maximum size of each file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a file named <i>file</i> reaches this size, it is renamed <i>file.0</i>. When the <i>file</i> again reaches its maximum size, <i>file.0</i> is renamed <i>file.1</i> and <i>file</i> is renamed <i>file.0</i>. This renaming scheme continues until the maximum number of files is reached. Then the oldest trace file is overwritten.</p> <p>If you specify a maximum file size, you also must specify a maximum number of files with the <code>files</code> option.</p> <p>Syntax: <i>xk</i> to specify KB, <i>xm</i> to specify MB, or <i>xg</i> to specify GB Range: 10 KB through the maximum file size supported on your system Default: 1 MB</p>
Usage Guidelines	See “Configuring MPLS to Gather Statistics” on page 160, “Configuring Automatic Bandwidth Allocation” on page 88.
Required Privilege Level	<p>routing and trace—To view this statement in the configuration.</p> <p>routing-control and trace-control—To add this statement to the configuration.</p>

swap

Syntax	swap <out-label>;
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route]
Description	Remove the label at the top of the label stack and replace it with the specified label.
Options	<i>out-label</i> —(Optional) Label value. Range: 0 through 1,048,575. Dynamic MPLS assigns the labels 100,000 through 1,048,575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 and 10,000 through 99,999 only for static MPLS. Labels 0 through 15 are reserved and require special semantics. Labels 1024 through 9999 are reserved for future applications. Default: If you do not define the <i>out-label</i> option, the original label value remains unchanged.
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	pop on page 212

swap-push

Syntax	<code>swap-push <swap-label>;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>], [edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route]
Description	Replace the stack's top label and then push one more label on top of the stack.
Options	<i>swap-label</i> —(Optional) Label value. Range: 0 through 1,048,575. Dynamic MPLS assigns the labels 100,000 through 1,048,575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 and 10,000 through 99,999 only for static MPLS. Labels 0 through 15 are reserved and require special semantics. Labels 1024 through 9999 are reserved for future applications. Default: If you do not define the <i>swap-label</i> option, the original label value remains unchanged.
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
See Also	pop on page 212 and swap on page 225

switching-type

Syntax	<code>switching-type type;</code>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i> lsp-attributes], [edit protocols mpls label-switched-path <i>lsp-path-name</i> lsp-attributes]
Description	Switching method desired for the LSP.
Options	<i>type</i> —Switching method. It can be one the following values: fiber lambda psc-1 tdm
Default	packet
Usage Guidelines	See “Configuring MPLS LSPs for GMPLS” on page 412.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

te-class-matrix

Syntax	<pre> te-class-matrix { tnumber { priority <i>priority</i>; traffic-class { cnumber <i>priority priority</i>; } } } </pre>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls diffserv-te], [edit protocols mpls diffserv-te]
Description	Specify the traffic engineering class matrix for a multiclass LSP or a differentiated-services-aware traffic engineering LSP.
Options	<p><i>ctnumber</i>—Specify the number of the class type. It can be one of four values: ct0, ct1, ct2, or ct3.</p> <p><i>priority</i>—Specify the priority of the class type. It can be one of eight values from 0 through 7.</p> <p><i>tnumber</i>—Specify the number of the traffic engineering class. It can be one of eight values: te0, te1, te2, te3, te4, te5, te6, or te7. You must configure the traffic engineering classes in order, starting with te0.</p> <p><i>traffic-class</i>—Specify the traffic class for the traffic engineering class.</p>
Default	<p>The default traffic engineering class matrix is:</p> <pre> te-class-matrix { te0 traffic-class ct0 priority 7; te1 traffic-class ct1 priority 7; te2 traffic-class ct2 priority 7; te3 traffic-class ct3 priority 7; te4 traffic-class ct0 priority 0; te5 traffic-class ct1 priority 0; te6 traffic-class ct2 priority 0; te7 traffic-class ct3 priority 0; } </pre> <p>If you define any of the traffic engineering classes, all the default values are dropped.</p>
Usage Guidelines	See “Configuring Traffic Engineering Classes” on page 135.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

to

Syntax	<i>to address;</i>
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls label-switched-path <i>lsp-path-name</i>], [edit protocols mpls label-switched-path <i>lsp-path-name</i>]
Description	Specify the egress router of a dynamic LSP.
Options	<i>address</i> —Address of the egress router.
Usage Guidelines	See “Configuring the Address of the Egress Router” on page 71.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

traceoptions

- Syntax** traceoptions {
 file *filename* <replace> <size *size*> <files *number*> <no-stamp>
 <(world-readable | no-world-readable)>;
 flag *flag* <*flag-modifier*> <disable>;
 }
- Hierarchy Level** [edit logical-routers *logical-router-name* protocols mpls],
 [edit logical-routers *logical-router-name* protocols mpls label-switched-path
lsp-path-name],
 [edit protocols mpls],
 [edit protocols mpls label-switched-path *lsp-path-name*]
- Description** Configure MPLS tracing options at the protocol level or for a label-switched path.
- To specify more than one tracing operation, include multiple flag statements.
- Default** The default MPLS protocol-level tracing options are inherited from the routing protocols traceoptions statement included at the [edit routing-options] hierarchy level.
- Options** disable—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as all.
- filename*—Name of the file to receive the output of the tracing operation. All files are placed in the directory /var/log. We recommend that you place MPLS tracing output in the file mpls-log.
- files *number*—(Optional) Maximum number of trace files. When a trace file named *trace-file* reaches its maximum size, it is renamed as *trace-file.0*, then as *trace-file.1*, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.
- If you specify a maximum number of files, you also must specify a maximum file size with the size option.
- Range:** 2 to 1000
Default: 2 files

flag—Tracing operation to perform. To specify more than one tracing operation, include multiple *flag* statements.

MPLS Tracing Flags

connection—All circuit cross-connect (CCC) activity

connection-detail—Detailed CCC activity

cspf—CSPF computations

cspf-link—Links visited during CSPF computations

cspf-node—Nodes visited during CSPF computations

error—MPLS error packets

graceful-restart—Trace MPLS graceful restart events

lsping—Trace lsping packets and return codes

state—All LSP state transitions

Global Tracing Flags

all—All tracing operations

general—A combination of the normal and route trace operations

normal—All normal operations

Default: If you do not specify this option, only unusual or abnormal operations are traced.

policy—Policy operations and actions

route—Routing table changes

state—State transitions

task—Interface transactions and processing

timer—Timer usage

flag-modifier—(Optional) Modifier for the tracing flag. You can specify one or more of these modifiers:

detail—Detailed trace information

receive—Packets being received

send—Packets being transmitted

no-stamp—(Optional) Do not place timestamp information at the beginning of each line in the trace file.

Default: If you omit this option, timestamp information is placed at the beginning of each line of the tracing output.

no-world-readable—(Optional) Disallow any user to read the log file.

replace—(Optional) Replace an existing trace file if there is one.

Default: If you do not include this option, tracing output is appended to an existing trace file.

size *size*—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named *trace-file* reaches this size, it is renamed *trace-file.0*. When the *trace-file* again reaches its maximum size, *trace-file.0* is renamed *trace-file.1* and *trace-file* is renamed *trace-file.0*. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the *files* option.

Syntax: *xk* to specify KB, *xm* to specify MB, or *xg* to specify GB

Range: 10 KB through the maximum file size supported on your system

Default: 1 MB

world-readable—(Optional) Allow any user to read the log file.

Usage Guidelines See “Tracing MPLS and LSP Packets and Operations” on page 175.

Required Privilege Level routing and trace—To view this statement in the configuration.
routing-control and trace-control—To add this statement to the configuration.

traffic-engineering

Syntax	traffic-engineering (bgp bgp-igp bgp-igp-both-ribs mpls-forwarding);
Hierarchy Level	[edit logical-routers <i>logical-router-name</i> protocols mpls], [edit protocols mpls]
Description	Select whether MPLS performs traffic engineering on BGP destinations only or on both BGP and IGP destinations. Affects only LSPs originating from this router; not transit or egress LSPs.
Options	<p>bgp—On BGP destinations only. Ingress routes are installed in the inet.3 routing table.</p> <p>bgp-igp—On both BGP and IGP destinations. Ingress routes are installed in the inet.0 routing table. If IGP shortcuts are enabled, the shortcut routes are automatically installed in the inet.0 routing table.</p> <p>bgp-igp-both-ribs—On both BGP and IGP destinations. Ingress routes are installed in the inet.0 and inet.3 routing tables. This option is used to support VPNs.</p> <p>mpls-forwarding—On both BGP and IGP destinations. Use ingress routes for forwarding only, not for routing.</p> <p>Default: bgp</p>
Usage Guidelines	See “Configuring Traffic Engineering for LSPs” on page 157.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

type

Syntax	type <i>type</i> ;
Hierarchy Level	<p>[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>],</p> <p>[edit logical-routers <i>logical-router-name</i> protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route],</p> <p>[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i>],</p> <p>[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> default-route]</p>
Description	Type of traffic in the LSP.
Options	<i>type</i> —Traffic type. It can be inet (for IPv4 traffic).
Usage Guidelines	See “Configuring the Intermediate and Egress Routers for Static LSPs” on page 148.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>