

# Chapter 9

## Summary of MPLS Configuration Statements

This chapter shows the complete MPLS configuration statements. The statements are organized alphabetically.

### adaptive

<b>Syntax</b>	adaptive;
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	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.  Do not use the adaptive and fast-reroute statements in the same LSP configuration because fast-reroute requires FF reservation styles.
<b>Default</b>	The configured object is disabled (operational).
<b>Usage Guidelines</b>	See “Configure an LSP to be Adaptive” on page 57.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

### admin-group

<b>Syntax</b>	admin-group [ <i>group-names</i> ];
<b>Hierarchy Level</b>	[edit protocols mpls interface <i>interface-name</i> ]
<b>Description</b>	Define administrative groups for an interface.
<b>Options</b>	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
<b>Usage Guidelines</b>	See “Configure Administrative Groups” on page 53.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>See Also</b>	admin-groups on page 82

<b>Syntax</b>	admin-group { include [ <i>group-names</i> ]; exclude [ <i>group-names</i> ]; }
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ], [edit protocols mpls label-switched-path <i>lsp-path-name</i> (primary   secondary) path-name]
<b>Description</b>	Define the administrative groups to include or exclude for an LSP and for a path's primary and secondary paths.
<b>Options</b>	The statements are explained separately.
<b>Usage Guidelines</b>	See "Configure Administrative Groups" on page 53.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## admin-groups

<b>Syntax</b>	admin-groups { group-name <i>group-value</i> ; }
<b>Hierarchy Level</b>	[edit protocols mpls]
<b>Description</b>	Configure administrative groups to implement link coloring or resource classes.
<b>Options</b>	<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. <b>Range:</b> 0 through 31
<b>Usage Guidelines</b>	See "Configure Administrative Groups" on page 53.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>See Also</b>	admin-group on page 81

## advertise-hold-time

<b>Syntax</b>	advertise-hold-time <i>seconds</i> ;
<b>Hierarchy Level</b>	[edit protocols mpls]
<b>Description</b>	Do not advertise when the LSP goes from up to down, for a certain period of time known as hold time.
<b>Options</b>	<i>seconds</i> —Hold time specified in seconds. <b>Range:</b> 0 to 65535 seconds <b>Default:</b> 5 seconds
<b>Usage Guidelines</b>	See “Configure LSP Hold Time” on page 61.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## bandwidth

<b>Syntax</b>	bandwidth <i>bps</i> ;
<b>Hierarchy Level</b>	[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 label-switched-path <i>lsp-path-name</i> fast-reroute]
<b>Description</b>	When configuring an LSP, specify the traffic rate associated with the LSP.  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.
<b>Options</b>	<i>bps</i> —Bandwidth specified in bits per second. 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]). <b>Range:</b> Any positive integer <b>Default:</b> 0 (no bandwidth is reserved)
<b>Usage Guidelines</b>	See “Configure the Path Bandwidth” on page 60 and “Configure Fast Reroute” on page 45.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## class-of-service

<b>Syntax</b>	class-of-service <i>cos-value</i> ;
<b>Hierarchy Level</b>	[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 interface <i>interface-name</i> label-map <i>in-label</i> ], [edit protocols mpls static-path inet <i>address</i> ]
<b>Description</b>	CoS value given to all packets in the LSP.  The CoS value might affect the scheduling or queuing algorithm of traffic traveling along an LSP.
<b>Options</b>	<i>cos-value</i> —CoS value. A higher value typically corresponds to a higher level of service. <b>Range</b> —0 through 7 <b>Default</b> —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.
<b>Usage Guidelines</b>	See “Configure the MPLS CoS Value” on page 55, “Configure the Ingress Router for Static MPLS” on page 69, and “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## disable

<b>Syntax</b>	disable;
<b>Hierarchy Level</b>	[edit protocols mpls], [edit protocols mpls interface <i>interface-name</i> ], [edit protocols mpls path label-switched-path <i>lsp-path-name</i> ]
<b>Description</b>	Disable MPLS, an MPLS path, or an MPLS interface.
<b>Default</b>	The configured object is enabled (operational) unless explicitly disabled.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## discard

<b>Syntax</b>	discard;
<b>Hierarchy Level</b>	[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> ]
<b>Description</b>	Do not forward packets that the matching incoming label. Instead, drop the packets and do not send an ICMP unreachable message.
<b>Usage Guidelines</b>	See “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## exclude

<b>Syntax</b>	exclude [ <i>group-names</i> ];
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	Define the administrative groups to exclude for an LSP or for a path's primary and secondary paths.
<b>Options</b>	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
<b>Usage Guidelines</b>	See “Configure Administrative Groups” on page 53.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## fast-reroute

<b>Syntax</b>	fast-reroute { bandwidth <i>bps</i> ; hop-limit <i>number</i> ; include <i>group-names</i> ; exclude <i>group-names</i> ; }
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ]
<b>Description</b>	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.  Do not use the adaptive and fast-reroute statements in the same LSP configuration because it can cause errors.
<b>Options</b>	The statements are explained separately.
<b>Usage Guidelines</b>	See “Configure Fast Reroute” on page 45.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## fate-sharing

**Syntax** fate-sharing {  
     group *group-name*;  
     cost *value*;  
     from *address* <to *address*>;  
 }

**Hierarchy Level** [edit routing-options]

**Description** Specify a backup path in case the primary path becomes unusable.

You specify one or more objects within a group. The objects can be a LAN interface, a router ID, or a point-to-point link. Sequence is insignificant.

**Options** group *group-name*—Each fate-sharing group must have a name, which can be up to 32 characters long and can contain letters, digits, periods (.) and hyphens (-). You can define up to 512 groups.

cost *value*—Cost assigned to the group.

**Range:** 1 through 65,535

**Default:** 1

from *address*—Address of ingress router.

to *address*—Address of egress router. For point-to-point link objects, you must specify both a from and to address.

**Usage Guidelines** See “Configure Fate Sharing” on page 62.

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

## from

**Syntax** from *address*;

**Hierarchy Level** [edit protocols mpls label-switched-path *lsp-path-name*]

**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** *address*—IP address.

**Usage Guidelines** See “Configure the Address of the Ingress Router” on page 44.

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

## hop-limit

<b>Syntax</b>	hop-limit number ;
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ], [edit protocols mpls label-switched-path <i>lsp-path-name</i> fast-reroute]
<b>Description</b>	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 to the LSP itself. For example, if an LSP traverses four routers, any detour for the LSP can be no more than ten router hops, including the ingress and egress routers.
<b>Options</b>	<i>number</i> —Maximum number of hops. <b>Range:</b> 2 through 255 <b>Default:</b> 255 (for an LSP); 6 (for a detour)
<b>Usage Guidelines</b>	See “Configure Fast Reroute” on page 45 and “Configure the Maximum Path Length” on page 60.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## include

<b>Syntax</b>	include [ <i>group-names</i> ];
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	Define the administrative groups to include for an LSP or for a path’s primary and secondary paths.
<b>Options</b>	<i>group-names</i> —One or more names of groups defined with the admin-groups statement.
<b>Usage Guidelines</b>	See “Configure Administrative Groups” on page 53.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## install

**Syntax** install {  
     *destination-prefix/prefix-length* <active>;  
 }

**Hierarchy** [edit protocols mpls label-switched-path *lsp-path-name*]

**Description** Associate one or more prefixes with an LSP. When the LSP is up, all the prefixes are installed as entries into the routing table.

**Options** **active**—(Optional) Install the route into the forwarding table. Doing so allows you to issue a ping or traceroute command on this address.

*destination-prefix/prefix-length*—Address to associate with the LSP.

**Usage Guidelines** See “Configure Addresses to Associate with the LSP” on page 48.

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

## interface

**Syntax** interface *interface-name* {  
     disable;  
     admin-group {  
         *group-name*;  
     }  
     label-map *in-label* {  
         (next-hop address) | (reject | discard);  
         (pop | (swap <*out-label*>));  
         class-of-service *value*;  
         preference *preference*;  
         type *type*;  
     }  
 }

**Hierarchy Level** [edit protocols mpls]

**Description** Enable MPLS on one or more interfaces.

**Options** *interface-name*—Name of the interface on which to configure MPLS. To configure all interfaces, you can specify all. For details about specifying interfaces, see the *JUNOS Internet Software Configuration Guide: Interfaces and Chassis*.

The remaining options are explained separately.

**Usage Guidelines** See “Minimum MPLS Configuration” on page 37 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.

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

## label-map

<b>Syntax</b>	label-map <i>label</i> ;
<b>Hierarchy Level</b>	[edit protocols mpls interface interface-name]
<b>Description</b>	For static MPLS only, the label to match.
<b>Options</b>	<p><i>label</i>—Label value.</p> <p><b>Range:</b> 0 through 1048575. Dynamic MPLS assigns the labels 1024 through 1048575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 only for static MPLS. Labels 0 through 15 are reserved.</p>
<b>Usage Guidelines</b>	See “Minimum MPLS Configuration” on page 37 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

## label-switched-path

<b>Syntax</b>	<pre>label-switched-path <i>lsp-path-name</i> {   disable;   to <i>address</i>;   from <i>address</i>;   adaptive;   admin-group {     include <i>group-names</i>;     exclude <i>group-names</i>;   }   bandwidth <i>bps</i>;   class-of-service <i>cos-value</i>;   fast-reroute {     bandwidth <i>bps</i>;     hop-limit <i>number</i>;     include <i>group-names</i>;     exclude <i>group-names</i>;   }   hop-limit <i>number</i>;   ldp-tunneling;   metric <i>number</i>;   no-cspf;   no-decrement-ttl;   optimize-timer <i>seconds</i>;   preference <i>preference</i>;   priority <i>setup-priority hold-priority</i>;   (random   least-fill   most-fill);   (record   no-record);   retry-limit <i>number</i>;   retry-timer <i>seconds</i>;   standby;   primary <i>path-name</i> {     ...   }   secondary <i>path-name</i> {     ...   } }</pre>
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```

    }
    install {
        destination/prefix-length <active>;
    }
}

```

**Hierarchy Level** [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 “Create an LSP” on page 41.

**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 protocols mpls label-switched-path lsp-path-name]

**Description** Enable the LSP to be used for LDP tunneling.

**Usage Guidelines** See “Configure LDP Tunneling” on page 61.

**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 100

## log-updown

<b>Syntax</b>	log-updown { (syslog   no-syslog); (trap   no-trap); }
<b>Hierarchy Level</b>	[edit protocols mpls]
<b>Description</b>	Log a message or send a 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.
<b>Default</b>	When LSP transitions occur or paths switch, a message is logged to the system log file and an SNMP trap is sent.
<b>Options</b>	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.  <b>Default:</b> syslog and trap
<b>Usage Guidelines</b>	See “Control MPLS Syslog Messages and SNMP Traps” on page 78 and the <i>JUNOS Internet Software Configuration Guide: Installation and System Management</i> .
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>See Also</b>	traceoptions on page 106

## metric

<b>Syntax</b>	metric <i>metric</i> ;
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ]
<b>Description</b>	The metric of an LSP is used to 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, LSP metric is dynamic, and will automatically track underlying IGP metrics.
<b>Options</b>	<i>metric</i> —LSP metric value. <b>Default:</b> no metric assigned (dynamic) <b>Range:</b> 1 through 65535
<b>Usage Guidelines</b>	See “Configure the Dynamic LSP Metric” on page 49.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

most-fill

**See** random on page 100

mpls

**Syntax** mpls { ... }

**Hierarchy Level** [edit protocols]

**Description** Enable MPLS on the router.

**Usage Guidelines** See “Minimum MPLS Configuration” on page 37.

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

nexthop

**Syntax** nexthop (*address* | *interface-name* | *address/interface-name*)

**Hierarchy Level** [edit protocols mpls interface *interface-name* label-map *in-label*],  
[edit protocols mpls static-path inet *address*]

**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), and the *address/interface-name* to specify an IP address on an operational interface.

**Options** *address*—IP address of the next-hop router.

*interface-name*—IP address of the outgoing interface. It must be a point-to point interface. The name can be the simple name or a fully qualified domain name.

**Usage Guidelines** See “Configure the Ingress Router for Static MPLS” on page 69 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.

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

## no-cspf

<b>Syntax</b>	no-cspf;
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	<p>Disable constrained-path LSP computation.</p> <p>An explicit-path LSP is one that 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 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"> <li>IGP topology database</li> <li>Link utilization information from extensions in the IGP link-state database</li> <li>Administrative group information from extensions in the IGP link-state database</li> <li>LSP requirements, including bandwidth, hop count, and administrative group</li> </ul> <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>
<b>Default</b>	Constrained-path LSP computation enabled.
<b>Usage Guidelines</b>	See “Configure Explicit-Path LSPs” on page 75.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## no-decrement-ttl

<b>Syntax</b>	no-decrement-ttl;
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ]
<b>Description</b>	<p>Disable normal TTL decrementing, which decrements the TTL field value in the IP header by only 1 regardless of the number of label-switched routers in the LSP. Therefore, the MPLS cloud appears as a single hop, thus hiding the network topology. This JUNOS software proprietary feature is enabled per RSVP signalled LSP, not LDP.</p>
<b>Default</b>	Normal TTL decrementing enabled; the TTL field value is decremented by 1 as the packet passes through each label-switched router in the LSP.
<b>Usage Guidelines</b>	See “Disable Normal TTL Decrementing” on page 51.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>See Also</b>	no-propagate-ttl on page 94

## no-propagate-ttl

**Syntax** nopropagate-ttl;

**Hierarchy Level** [edit protocols mpls]

**Description** Disable normal TTL decrementing. This feature is enabled per-box, effective on all RSVP or LDP signalled LSPs. When this router behaves as an ingress of an LSP, it pushes an MPLS header with a TTL value of 255, regardless of the IP's TTL. When the router behaves as the penultimate router, it pops the MPLS header without writing the MPLS TTL into the IP.

**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 "Disable Normal TTL Decrementing" on page 51.

**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 93

## no-record

**See** record on page 100

## optimize-aggressive

**Syntax** optimize-aggressive;

**Hierarchy Level** [edit protocols mpls]

**Description** If enabled, the LSP reoptimization is based on the IGP metric alone, ignoring consideration of bandwidth, congestion and hop-counts. This statement makes reoptimization more aggressive than the default.

**Default** Aggressive optimization is disabled.

**Usage Guidelines** See "Optimize Signaled LSPs" on page 59.

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

## optimize-timer

<b>Syntax</b>	optimize-timer seconds ;
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	<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>
<b>Default</b>	The optimize timer is disabled.
<b>Options</b>	<p><i>seconds</i>—Length of the optimize timer.</p> <p><b>Range:</b> 0 through 65535</p> <p><b>Default:</b> 0 seconds (the optimize timer is disabled)</p>
<b>Usage Guidelines</b>	See “Optimize Signaled LSPs” on page 59.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

## path

**Syntax** path *path-name* {  
           *address* | *host name* <strict | loose>  
 }

**Hierarchy Level** [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 dynamic LSPs.

**Options** *address*—(Optional) IP address of each transit router in the LSP. You must specify the address or host name 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 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.

*loose*—(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

*path-name*—Name that identifies the sequence of nodes that form an LSP. The name can be up to 16 characters and can contain 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.

*strict*—(Optional) Indicate that the LSP must go to the next address specified in the path statement without traversing other nodes. This is the default.

**Usage Guidelines** See “Create a Named Path” on page 39.

**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 103

## pop

<b>Syntax</b>	pop;
<b>Hierarchy Level</b>	[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> ]
<b>Description</b>	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).
<b>Usage Guidelines</b>	See “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## preference

<b>Syntax</b>	preference <i>preference</i> ;
<b>Hierarchy Level</b>	[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 interface <i>interface-name</i> label-map <i>in-label</i> ], [edit protocols mpls static-path inet <i>address</i> ]
<b>Description</b>	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 of all LSPs is 7, which is lower (more preferred) than all learned routes except for direct interface routes.
<b>Options</b>	<i>preference</i> —Preference to assign to the route. A route with a lower preference value is preferred. <b>Range:</b> 1 through 255 <b>Default:</b> 7
<b>Usage Guidelines</b>	See “Configure the Ingress Router for Static MPLS” on page 69 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	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;  
 optimize-timer *seconds*;  
 preference *preference*;  
 priority *setup-priority hold-priority*;  
 (record | no-record);  
 standby;  
 }

**Hierarchy Level** [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 “Configure the Primary and Secondary LSPs” on page 45.

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

## priority

<b>Syntax</b>	<code>priority setup-priority hold-priority;</code>
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	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. For a session to be preempted, its hold priority must be lower.
<b>Options</b>	<i>setup-priority</i> —Setup priority. <b>Range:</b> 0 through 7, where 0 is the highest and 7 is the lowest priority <b>Default:</b> 7 (The session cannot preempt any existing sessions.)  <i>hold-priority</i> —Hold priority, which is 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. <b>Range:</b> 0 through 7 (0 is the highest and 7 is the lowest priority) <b>Default:</b> 0 (Once the session is set up, no other session can preempt it.)
<b>Usage Guidelines</b>	See “Configure Priority and Preemption” on page 58.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## push

<b>Syntax</b>	<code>push out-label;</code>
<b>Hierarchy Level</b>	[edit protocols mpls static-path inet <i>address</i> ]
<b>Description</b>	Add a new label to the top of the label stack.
<b>Options</b>	<i>out-label</i> —Label value. <b>Range:</b> 0 through 1048575 (Dynamic MPLS assigns the labels 1024 through 1048575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 only for static MPLS. Labels 0 through 15 are reserved.)
<b>Usage Guidelines</b>	See “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	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 protocols mpls label-switched-path *lsp-path-name*]

**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 “Configure CSPF Tie Breaking” on page 50.

**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 protocols mpls label-switched-path *lsp-path-name*],  
[edit protocols mpls label-switched-path *lsp-path-name* (primary | secondary) *path-name*]

**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 “Configure Whether to Record Path Routes” on page 55.

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

## reject

<b>Syntax</b>	reject;
<b>Hierarchy Level</b>	[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> ]
<b>Description</b>	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.
<b>Usage Guidelines</b>	See "Configure the Intermediate and Egress Routers for Static MPLS" on page 72.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## retry-limit

<b>Syntax</b>	retry-limit <i>number</i> ;
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	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.
<b>Options</b>	<i>number</i> —Maximum number of tries to establish the primary path. <b>Range:</b> 0 through 10000 <b>Default:</b> 0 (The ingress node never stops trying to establish the primary path.)
<b>Usage Guidelines</b>	See "Configure Path Connection Retry Information" on page 49.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## retry-timer

<b>Syntax</b>	retry-timer <i>seconds</i> ;
<b>Hierarchy Level</b>	[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> ]
<b>Description</b>	Amount of time the ingress router waits between attempts to establish the primary path.
<b>Options</b>	<i>seconds</i> —Amount of time between attempts to connect to the primary path. <b>Range:</b> 1 through 600 <b>Default:</b> 30 seconds
<b>Usage Guidelines</b>	See "Configure Path Connection Retry Information" on page 49.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## 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;  
 optimize-timer *seconds*;  
 preference *preference*;  
 priority *setup-priority reservation-priority*;  
 (record | no-record);  
 standby;  
 }

**Hierarchy Level** [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 “Configure the Primary and Secondary LSPs” on page 45.

**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 protocols mpls label-switched-path *lsp-path-name*],  
 [edit protocols mpls label-switched-path *lsp-path-name* (primary | secondary) *path-name*]

**Description** Have the path remain up at all times to provide instant switchover if connectivity problems occur.

**Usage Guidelines** See “Configure the Standby State” on page 60.

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

## static-path

<b>Syntax</b>	<pre>static-path inet {     prefix {         nexthop <i>address</i>;         push <i>out-label</i>;         preference <i>preference</i>;         class-of-service <i>value</i>;     } }</pre>
<b>Hierarchy Level</b>	[edit protocols mpls]
<b>Description</b>	<p>Statically configure an LSP. You configure the LSP on the ingress router only.</p> <p>You can specify one or more static-path statements.</p>
<b>Options</b>	<p><i>prefix</i>—IP address that matches the packet’s destination field. You can specify this option in one of the following ways:</p> <p>IP address—Example: 10.0.0.2</p> <p>Range of IP addresses—Example: 10.0.0.0/8</p> <p>You can specify one or more addresses.</p> <p>inet—Configure the path for packets with IPv4 destinations.</p> <p>The remaining options are explained separately.</p>
<b>Usage Guidelines</b>	See “Configure the Ingress Router for Static MPLS” on page 69.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>

## statistics

**Syntax** statistics {  
     file *filename* <size *size* files *number*>;  
     interval *seconds*;  
 }

**Hierarchy Level** [edit protocols mpls]

**Description** Enable MPLS statistics collection and reporting.

**Options** file *filename*—Name of the file to receive the output. We recommend that you place MPLS tracing output in the file mpls-stat in the /var/log directory.

files *number*—(Optional) Maximum number of trace files. When a trace file named *file* reaches its maximum size, it is renamed *file.0*, then *file.1*, and so on, until the maximum number of files is reached. Then, the oldest 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 or more

**Default:** 2 files

interval *seconds*—(Optional) Interval at which to periodically collect statistics.

**Range:** 1 through 65535

**Default:** 300 seconds

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

**Usage Guidelines** See “Configure MPLS to Gather Statistics” on page 77.

**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.

## swap

<b>Syntax</b>	<code>swap &lt;out-label&gt;;</code>
<b>Hierarchy Level</b>	[edit protocols mpls interface <i>interface-name</i> label-map <i>in-label</i> ]
<b>Description</b>	Remove the label at the top of the label stack and replace it with the specified label.
<b>Options</b>	<i>out-label</i> —(Optional) Label value. <b>Range:</b> 0 through 1048575 (Dynamic MPLS assigns the labels 1024 through 1048575, so if your network uses both static and dynamic MPLS, we recommend that you use labels 16 through 1023 only for static MPLS. Labels 0 through 15 are reserved.) <b>Default:</b> If you omit <i>out-label</i> , the original label value remains unchanged.
<b>Usage Guidelines</b>	See “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.

## to

<b>Syntax</b>	<code>to address;</code>
<b>Hierarchy Level</b>	[edit protocols mpls label-switched-path <i>lsp-path-name</i> ]
<b>Description</b>	Specify the egress router of a dynamic LSP.
<b>Options</b>	<i>address</i> —Address of the egress router.
<b>Usage Guidelines</b>	See “Configure the Address of the Egress Router” on page 44.
<b>Required Privilege Level</b>	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 protocols mpls]

**Description** Configure MPLS protocol-level tracing options.

To specify more than one tracing operation, include multiple flag statements.

**Default** The default MPLS protocol-level tracing options are those 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 is 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 errored packets

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 “Trace MPLS Protocol Packets and Operations” on page 79.

**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);

**Hierarchy Level** [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** bgp—on BGP destinations only. Ingress routes are installed in the inet.3 routing table.  
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 therefore automatically installed in the inet.0 routing table.

**Default:** bgp

**Usage Guidelines** See “Configure Traffic Engineering for LSPs” on page 77.

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

## type

**Syntax** type *type*;

**Hierarchy Level** [edit protocols mpls interface *interface-name* label-map *in-label*]

**Description** Type of traffic in the LSP.

**Options** *type*—Traffic type. It can be inet (for IPv4 traffic).

**Usage Guidelines** See “Configure the Intermediate and Egress Routers for Static MPLS” on page 72.

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