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

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 “Configure an LSP to be Adaptive” on page 71.

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 *seconds*;

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

Description Specify the bandwidth reallocation interval.

Options *seconds*—Bandwidth reallocation interval, in seconds
Range: 300 through 4,294,967,295 seconds
Default: 86,400 seconds

Usage Guidelines See “Configure Automatic Bandwidth Allocation” on page 64.

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 *percent*;

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

Description Specify how sensitive the automatic bandwidth adjustment for an LSP is to changes in bandwidth utilization.

Options percent

Usage Guidelines See “Configure the Threshold for Automatic Bandwidth Adjustment” on page 65.

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

admin-group

admin-group (for Interfaces)

Syntax admin-group [*group-names*];

Hierarchy Level [edit protocols mpls interface *interface-name*]

Description Define administrative groups for an interface.

Options *group-names*—One or more names of groups defined with the admin-groups statement.

Usage Guidelines See “Configure Administrative Groups” on page 67.

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

See Also admin-groups on page 113

admin-group (for LSPs)

Syntax
```
admin-group {
    include [group-names];
    exclude [group-names];
}
```

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

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 "Configure Administrative Groups" on page 67.

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 {
    group-name group-value;
}
```

Hierarchy Level [edit protocols mpls]

Description Configure administrative groups to implement link coloring or resource classes.

Options *group-name*—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.

group-value—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 "Configure Administrative Groups" on page 67.

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 112

advertise-hold-time

Syntax advertise-hold-time *seconds;*

Hierarchy Level [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 *seconds*—Hold time specified in seconds.
Range: 0 through 65,535 seconds
Default: 5 seconds

Usage Guidelines See “Configure LSP Hold Time” on page 76.

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 seconds;
    adjust-threshold percent;
    disable;
    maximum-bandwidth bps;
    minimum-bandwidth bps;
    monitor-bandwidth;
}
```

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

Description Automatic bandwidth allocation allows 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 “Configure Automatic Bandwidth Allocation” on page 64.

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

bandwidth

Syntax bandwidth *bps*;

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

Description 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.

Options *bps*—Bandwidth, 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]).
Range: Any positive integer
Default: 0 (no bandwidth is reserved)

Usage Guidelines See “Configure Fast Reroute” on page 54 and “Configure the Path Bandwidth” on page 75.

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

class-of-service

Syntax class-of-service *cos-value*;

Hierarchy Level [edit protocols mpls],
[edit protocols mpls interface *interface-name* label-map *in-label*],
[edit protocols mpls label-switched-path *lsp-path-name*],
[edit protocols mpls label-switched-path *lsp-path-name* (primary | secondary) *path-name*],
[edit protocols mpls static-path inet *address*]

Description 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.

Options *cos-value*—CoS value. A higher value typically corresponds to a higher level of service.
Range—0 through 7
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.

Usage Guidelines See “Configure the MPLS CoS Value” on page 70, “Configure the Ingress Router for Static MPLS” on page 91, and “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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

description

Syntax description *text*;

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

Description Allows you to provide 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.

Options *text*—Provide a textual description of the LSP.

Usage Guidelines See “Configure the Description” on page 53.

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 protocols mpls],
[edit protocols mpls interface *interface-name*],
[edit protocols mpls label-switched-path *lsp-path-name*],
[edit protocols mpls label-switched-path *lsp-path-name* auto-bandwidth]

Description Disables the functionality of the configured object.

Default The configured object is enabled (operational) unless explicitly disabled.

Usage Guidelines See “Create an LSP” on page 48.

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 protocols mpls interface *interface-name* label-map *in-label*]

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 “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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

exclude

exclude (for Administrative Groups)

Syntax exclude [*group-names*];

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

Description Define the administrative groups to exclude for an LSP or for a path's primary and secondary paths.

Options *group-names*—One or more names of groups defined with the admin-groups statement.

Usage Guidelines See "Configure Administrative Groups" on page 67.

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 (exclude [*group-name*] | no-exclude);

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

Description Control exclusion of administrative groups:

exclude—Define the administrative groups to exclude for fast reroute.

no-exclude—Disable administrative group exclusion.

Options *group-names*—One or more names of groups defined with the admin-groups statement.

Usage Guidelines See "Configure Fast Reroute" on page 54.

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

explicit-null

Syntax explicit-null;

Hierarchy Level [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 "Configure MPLS to Pop the Label on the Ultimate-Hop Router" on page 99.

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

fast-reroute

Syntax

```
fast-reroute {
    bandwidth bps;
    (exclude [ group-name ] | no-exclude);
    hop-limit number;
    (include [ group-name ] | no-include);
}
```

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

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 “Configure Fast Reroute” on page 54.

Required Privilege Level 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],
[edit routing-instances *routing-instance-name* routing-options]

Description Specify groups of objects which 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.

Options

cost *value*—Cost assigned to the group.
Range: 1 through 65,535
Default: 1

from *address*—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.

group *group-name*—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.

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

Usage Guidelines See “Configure Alternate Backup Paths Using Fate-Sharing” on page 76.

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 52.

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

gpid

Syntax gpid *type*;

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

Description Specifies the type of payload carried by the LSP.

Options *type*—Type of data sent over the LSP. It can be any of the following:
Default: ipv4

hdlc—High-level Data Link Control (HDLC)

ethernet—Ethernet

ipv4—Internet Protocol version 4

ppp—Point-to-Point Protocol (PPP)

Usage Guidelines See "Configure MPLS Label-Switched Paths for GMPLS" on page 270.

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 *number*;

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

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 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.

Options *number*—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 "Configure Fast Reroute" on page 54 and "Configure the Maximum Path Length" on page 74.

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

include

include (for Administrative Groups)

Syntax include [*group-names*];

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

Description Define the administrative groups to include for an LSP or for a path's primary and secondary paths.

Options *group-names*—One or more names of groups defined with the admin-groups statement.

Usage Guidelines See "Configure Administrative Groups" on page 67.

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 [*group-names*] | no-include);

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

Description Control inclusion of administrative groups:

include—Define the administrative groups to include for fast-reroute.

no-include—Disable administrative group inclusion.

Options *group-names*—One or more names of groups defined with the admin-groups statement.

Usage Guidelines See "Configure Fast Reroute" on page 54.

Required Privilege Level 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 inet.3 routing table.

Options active—(Optional) Install the route into the inet.0 routing 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 58.

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 | interface-name | address/interface-name)) | (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: Network Interfaces and Class of Service*.

The remaining options are explained separately.

Usage Guidelines See "Minimum MPLS Configuration" on page 44 and "Configure the Intermediate and Egress Routers for Static MPLS" on page 94.

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

ipv6-tunneling

Syntax ipv6-tunneling;

Hierarchy [edit protocols mpls]

Description Allow IPv6 routes to be resolved over an MPLS network.

Usage Guidelines See “Enable IPv6 Tunneling in MPLS” on page 89.

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

label-map

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

Hierarchy Level [edit protocols mpls interface *interface-name*]

Description For static MPLS only, the label to match.

Options *in-label*—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 to 9999 are reserved for future applications.

The remaining statements are explained separately.

Usage Guidelines See “Minimum MPLS Configuration” on page 44 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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;
    to address;
    from address;
    adaptive;
    admin-group {
        include group-names;
        exclude group-names;
    }
    auto-bandwidth {
        adjust-interval seconds;
        adjust-threshold percent;
        disable;
        maximum-bandwidth bps;
        minimum-bandwidth bps;
        monitor-bandwidth;
    }
    bandwidth bps;
    class-of-service cos-value;
    fast-reroute {
        bandwidth bps;
        hop-limit number;
        (include group-names | no-include);
        (exclude group-names | no-exclude);
    }
    hop-limit number;
    install {
        destination/prefix-length <active>;
    }
    ldp-tunneling;
    lsp-attributes {
        gpid type;
        signal-bandwidth type;
        switching-type type;
    }
    metric number;
    no-cspf;
    no-decrement-ttl;
    optimize-timer seconds;
    preference preference;
    priority setup-priority hold-priority;
    (random | least-fill | most-fill);
    (record | no-record);
    retry-limit number;
    retry-timer seconds;
    standby;
    primary path-name {
        ...
    }
    secondary path-name {
        ...
    }
}
```

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 48.

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 76.

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 136

log-updown

Syntax
```
log-updown {
    (syslog | no-syslog);
    (trap | no-trap);
}
```

Hierarchy Level [edit protocols mpls]

Description 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.

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.

Usage Guidelines See "Control MPLS System Log Messages and SNMP Traps" on page 103 and the *JUNOS Internet Software Configuration Guide: Network Management*.

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 143

lsp-attributes

Syntax
```
lsp-attributes {
    gpid type;
    signal-bandwidth type;
    switching-type type;
}
```

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

Description Define the parameters signaled during LSP setup. These usually determine the nature of the resource (label) allocated for the LSP.

Usage Guidelines See "Configure MPLS Label-Switched Paths for GMPLS" on page 270.

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 *bps*;

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

Description Specify the maximum amount of bandwidth.

Options *bps*—Bits per second.

Usage Guidelines See “Configure Automatic Bandwidth Allocation” on page 64.

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

metric

Syntax metric *metric*;

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

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, LSP metric is dynamic and automatically tracks underlying IGP metrics.

Options *metric*—LSP metric value.
Default: No metric assigned (dynamic)
Range: 1 through 65,535

Usage Guidelines See “Configure a Dynamic LSP Metric” on page 60.

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 *bps*;

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

Description Set the minimum bandwidth for an LSP with automatic bandwidth allocation enabled.

Options *bps*—Bits per second.

Usage Guidelines See “Configure Automatic Bandwidth Allocation” on page 64.

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 protocols mpls label-switched-path *lsp-path-name* 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 "Configure Automatic Bandwidth Allocation" on page 64.

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 136

mpls

Syntax mpls { ... }

Hierarchy Level [edit protocols]

Description Enable MPLS on the router.

Usage Guidelines See "Minimum MPLS Configuration" on page 44.

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

next-hop

Syntax next-hop (*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 a simple or fully qualified domain name.

Usage Guidelines See "Configure the Ingress Router for Static MPLS" on page 91 and "Configure the Intermediate and Egress Routers for Static MPLS" on page 94.

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

Description Disable constrained-path LSP computation.

An explicit-path LSP is one that is completely configured through operator action. Once configured, it is initiated only along the explicitly specified path.

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:

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

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.

Default Constrained-path LSP computation enabled.

Usage Guidelines See “Configure Explicit-Path LSPs” on page 97.

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

Description Disable normal TTL decrementing, which decrements the TTL field in the IP header by 1. This statement decrements the IP TTL by one 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 one. Then the ultimate router 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 “Disable Normal TTL Decrementing” on page 63.

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 130

no-exclude

See exclude on page 117

no-include

See include on page 121

no-propagate-ttl

Syntax no-propagate-ttl;

Hierarchy Level [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 “Disable Normal TTL Decrementing” on page 63.

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 130

no-record

See record on page 136

optimize-aggressive

Syntax optimize-aggressive;

Hierarchy Level [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% 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 "Optimize Signaled LSPs" on page 73.

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 *seconds*;

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

Description 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.

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.

Default The optimize timer is disabled.

Options *seconds*—Length of the optimize timer in seconds.
Range: 0 through 65,535 seconds
Default: 0 seconds (the optimize timer is disabled)

Usage Guidelines See "Optimize Signaled LSPs" on page 73.

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

path

Syntax
```
path path-name {
    address <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 explicit 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 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.

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 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.

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 46.

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 140.

pop

Syntax
```
pop;
```

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

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 “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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

preference

Syntax preference *preference*;

Hierarchy Level [edit protocols mpls],
[edit protocols mpls interface *interface-name* label-map *in-label*],
[edit protocols mpls label-switched-path *lsp-path-name*],
[edit protocols mpls label-switched-path *lsp-path-name* (primary | secondary) *path-name*]
[edit protocols mpls static-path inet *address*]

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 of all LSPs is 7, which is lower (more preferred) than all learned routes except for direct interface routes.

Options *preference*—Preference to assign to the route. A route with a lower preference value is preferred.
Range: 1 through 255
Default: 7

Usage Guidelines See “Configure the Ingress Router for Static MPLS” on page 91 and “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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;
    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 53.

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

priority

Syntax priority *setup-priority hold-priority*;

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

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. For a session to be preempted, its hold priority must be lower.

Options *hold-priority*—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.)

setup-priority—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 “Configure Priority and Preemption” on page 72.

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

push

Syntax push *out-label*;

Hierarchy Level [edit protocols mpls static-path inet *address*]

Description Add a new label to the top of the label stack.

Options *out-label*—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 1,023 and 10,000 through 99,999 only for static MPLS. Labels 0 through 15 are reserved and require special semantics. Labels 1,024 to 9,999 are reserved for future applications.

Usage Guidelines See “Configure the Intermediate and Egress Routers for Static MPLS” on page 94.

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 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 61.

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],
[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 69.

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 protocols mpls interface *interface-name* label-map *in-label*]

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 "Configure the Intermediate and Egress Routers for Static MPLS" on page 94.

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 *number*;

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 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 *number*—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 "Configure Path Connection Retry Information" on page 59.

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

retry-timer

Syntax retry-timer *seconds*;

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 Amount of time the ingress router waits between attempts to establish the primary path.

Options *seconds*—Amount of time between attempts to connect to the primary path.
Range: 1 through 600 seconds
Default: 30 seconds

Usage Guidelines See "Configure Path Connection Retry Information" on page 59.

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 *seconds*;

Hierarchy Level [edit protocols mpls]

Description Allows a source node (ingress of the RSVP LSPs) to learn from the failures of its LSP by monitoring PathErr messages transmitted from downstream nodes. 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.

Options *seconds*—Amount of time MPLS retains RSVP PathErr messages and considers them for CSPF computations.
Range: 0 through 240 seconds
Default: 25 seconds

Usage Guidelines See “Improve TED Accuracy with RSVP PathErr Messages” on page 79.

Required Privilege Level 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 53.

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 type;
```

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

Description Specifies the bandwidth encoding of the signal used for path computation and admission control.

Options *type*—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 “Configure MPLS Label-Switched Paths for GMPLS” on page 270.

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],
[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 75.

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 {
    prefix {
        next-hop address;
        push out-label;
        preference preference;
        class-of-service value;
    }
}
```

Hierarchy Level [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 *prefix*—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 "Configure the Ingress Router for Static MPLS" on page 91.

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

statistics

Syntax

```
statistics {
    auto-bandwidth;
    file filename <size size> <files number> <no-stamp>;
    interval seconds;
}
```

Hierarchy Level [edit protocols mpls]

Description Enable MPLS statistics collection and reporting.

Options auto-bandwidth—Collect statistics related to automatic bandwidth. See also "Configure Automatic Bandwidth Allocation" on page 64.

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*—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*—Interval at which to periodically collect statistics.
Range: 1 through 65,535
Default: 300 seconds

size *size*—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: *x*k to specify KB, *x*m to specify MB, or *x*g 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 102.

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

Syntax swap <*out-label*>;

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

Description Remove the label at the top of the label stack and replace it with the specified label.

Options *out-label*—(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 to 9999 are reserved for future applications.

Default: If you do not define the *out-label* option, the original label value remains unchanged.

Usage Guidelines See "Configure the Intermediate and Egress Routers for Static MPLS" on page 94.

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

switching-type

Syntax switching-type *type*;

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

Description Switching method desired for the LSP.

Options *type*—Switching method. It can be one the following values:

fiber

lambda

psc-1

tdm

Default packet

Usage Guidelines See "Configure MPLS Label-Switched Paths for GMPLS" on page 270.

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

to

Syntax to *address*;

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

Description Specify the egress router of a dynamic LSP.

Options *address*—Address of the egress router.

Usage Guidelines See "Configure the Address of the Egress Router" on page 52.

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 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 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 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

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: *x*k to specify KB, *x*m to specify MB, or *x*g 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 and LSP Packets and Operations" on page 104.

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);

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 automatically installed in the inet.0 routing table.

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.

mpls-forwarding—On both BGP and IGP destinations. Use ingress routes for forwarding only, not for routing.

Default: bgp

Usage Guidelines See "Configure Traffic Engineering for LSPs" on page 100.

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 94.

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