Chapter 11

Checking the MPLS Layer

This chapter describes how to check the Multiprotocol Label Switching (MPLS) layer of the layered MPLS model. (See Table 17.)

Table 17: Checklist for Checking the MPLS Layer

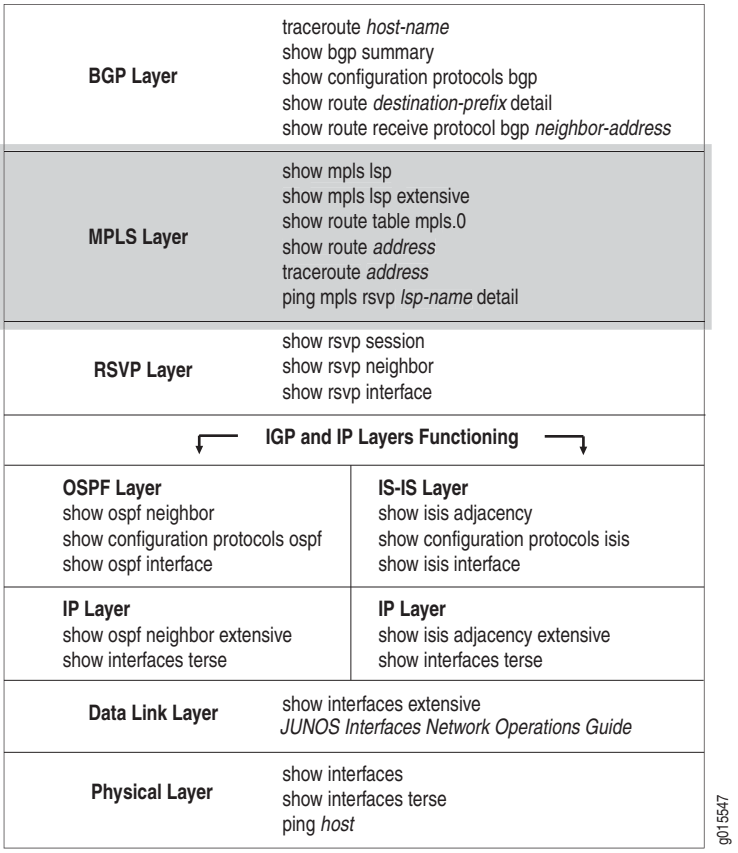
Checking the MPLS Layer Tasks	Command or Action
Checking the MPLS Layer on page 162	
1. Verify the LSP on page 164	show mpls lsp show mpls lsp extensive show mpls lsp name *name* show mpls lsp name *name* extensive
2. Verify the LSP Route on the Transit Router on page 166	show route table mpls.0
3. Verify the LSP Route on the Ingress Router on page 168	show route *destination*
4. Verify MPLS Labels with the traceroute Command on page 169	traceroute *hostname*
5. Verify MPLS Labels with the ping Command on page 170	On the egress router: [edit] edit interfaces lo0 unit *number* [edit interfaces lo0 unit *number*] set family inet address 127.0.0.1/32 show commit On the ingress router: ping mpls rsvp *lsp-name* detail
6. Verify the MPLS Configuration on page 171	show configuration protocols mpls show configuration interfaces
7. Take Appropriate Action on page 173	The following sequence of commands addresses the specific problem described in this section: edit edit protocols mpls [edit protocols mpls] show activate interface so-0/0/3.0 show commit
8. Verify the LSP Again on page 174	show mpls lsp extensive

Checking the MPLS Layer

Purpose After you have configured the label-switched path (LSP), issued the show mpls lsp command, and determined that there is an error, you might find that the error is not in the physical, data link, Internet Protocol (IP), interior gateway protocol (IGP), or Resource Reservation Protocol (RSVP) layers. Continue investigating the problem at the MPLS layer of the network.

Figure 21 illustrates the MPLS layer of the layered MPLS model.

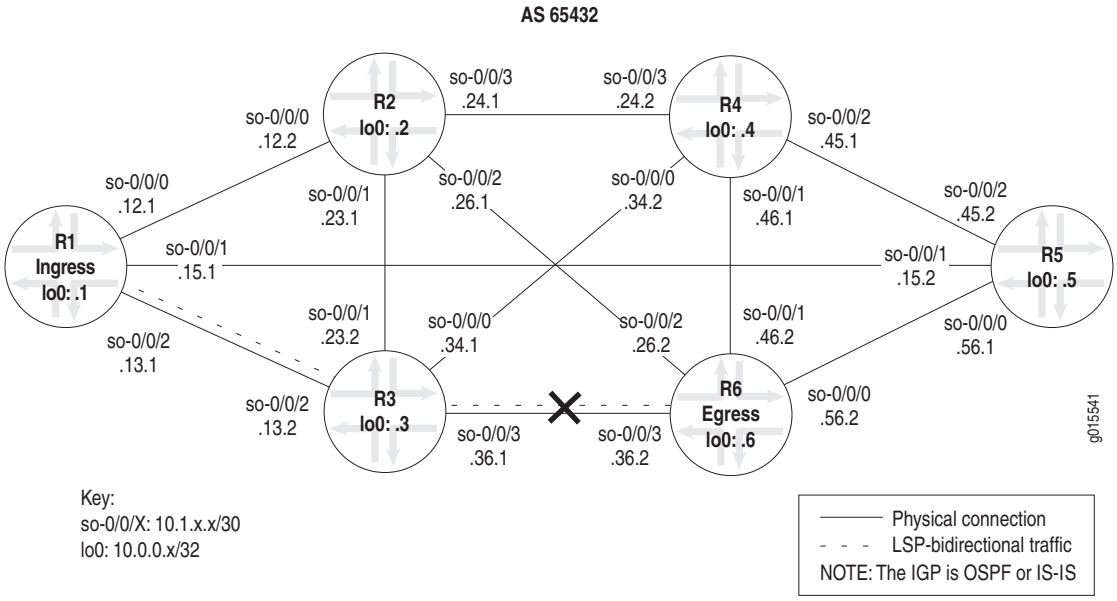
Figure 21: Checking the MPLS Layer



With the MPLS layer, you check whether the LSP is up and functioning correctly. If the network is not functioning at this layer, the LSP does not work as configured.

Figure 22 illustrates the MPLS network used in this chapter.

Figure 22: MPLS Network Broken at the MPLS Layer



The network shown in Figure 22 is a fully meshed configuration where every directly connected interface can receive and send packets to every other similar interface. The LSP in this network is configured to run from ingress router R1, through transit router R3, to egress router R6. In addition, a reverse LSP is configured to run from R6 through R3 to R1, creating bidirectional traffic.

However, in this example, the reverse LSP is down without a path from R6 to R1.

The cross shown in Figure 22 indicates where the LSP is broken. Some possible reasons the LSP is broken might include an incorrectly configured MPLS protocol, or interfaces that are incorrectly configured for MPLS.

In the network shown in Figure 22, a configuration error on egress router R6 prevents the LSP from traversing the network as expected.

Steps To Take To check the MPLS layer, follow these steps:

1. Verify the LSP on page 164
2. Verify the LSP Route on the Transit Router on page 166
3. Verify the LSP Route on the Ingress Router on page 168
4. Verify MPLS Labels with the traceroute Command on page 169
5. Verify MPLS Labels with the ping Command on page 170
6. Verify the MPLS Configuration on page 171
7. Take Appropriate Action on page 173
8. Verify the LSP Again on page 174

Step 1: Verify the LSP

Purpose Typically, you use the show mpls lsp extensive command to verify the LSP. However for quick verification of the LSP state, use the show mpls lsp command. If the LSP is down, use the extensive option (show mpls lsp extensive) as a follow-up. If your network has numerous LSPs, you might consider specifying the name of the LSP, using the name option (show mpls lsp name *name* or show mpls lsp name *name* extensive).

Action To verify that the LSP is up, enter some or all of the following commands from the ingress router:

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

Sample Output 1

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

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

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

user@R3> show mpls lsp
Ingress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

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

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

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

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

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

Sample Output 2

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

10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
```

```
    Will be enqueued for recomputation in 22 second(s).
    1 Nov  2 14:43:38 CSPF failed: no route toward 10.0.0.6[175 times]
  Created: Tue Nov  2 13:18:39 2004
Total 1 displayed, Up 0, Down 1

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

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

user@R3> show mpls lsp extensive
user@R3> show mpls lsp extensive
Ingress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

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

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

user@R6> show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.1
  From: 10.0.0.6, State: Dn, ActiveRoute: 0, LSPname: R6-to-R1
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
    Will be enqueued for recomputation in 13 second(s).
    1 Nov  2 14:38:12 CSPF failed: no route toward 10.0.0.1[177 times]
  Created: Tue Nov  2 13:12:22 2004
Total 1 displayed, Up 0, Down 1

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

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

Sample Output 3

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

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

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

Sample Output 4

```
user@R1> show mpls lsp name R1-to-R6 extensive
Ingress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, State: Dn, ActiveRoute: 0, LSPname: R1-to-R6
  ActivePath: (none)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
  Primary                   State: Dn
    Will be enqueued for recomputation in 10 second(s).
    1 Nov  2 14:51:53 CSPF failed: no route toward 10.0.0.6[192 times]
  Created: Tue Nov  2 13:18:39 2004
Total 1 displayed, Up 0, Down 1

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

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

What It Means

Sample Output 1 shows a brief description of the state of the LSP for the ingress, transit, and egress routers. Output from ingress router R1 and egress router R6 shows that both LSPs are down, R1-to-R6 and R6-toR1. With the configured LSPs on R1 and R6, we would expect egress LSP sessions on both R1 and R6. In addition, transit router R3 has no transit sessions.

Sample Output 2 shows all information about the LSPs, including all past state history and the reason why an LSP failed. Output from R1 and R6 indicates that there is no route to the destination because the Constrained Shortest Path First (CSPF) algorithm failed.

Sample Outputs 3 and 4 show examples of the output for the show mpls lsp name command with the extensive option. In this instance, the output is very similar to the show mpls lsp command because only one LSP is configured in the example network in Figure 22 on page 163. However, in a large network with many LSPs configured, the results would be quite different between the two commands.

Step 2: Verify the LSP Route on the Transit Router

Purpose

If the LSP is up, the LSP route should appear in the mpls.0 routing table. MPLS maintains an MPLS path routing table (mpls.0), which contains a list of the next label-switched router in each LSP. This routing table is used on transit routers to route packets to the next router along an LSP. If routes are not present in the output for the transit router, check the MPLS protocol configuration on the ingress and egress routers.

Action

To verify the LSP route on the transit router, enter the following command from the transit router:

```
user@host> show route table mpls.0
```

Sample Output 1

```
user@R3> show route table mpls.0

mpls.0: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

0                  *[MPLS/0] 16w2d 21:52:40, metric 1
                      Receive
1                  *[MPLS/0] 16w2d 21:52:40, metric 1
                      Receive
2                  *[MPLS/0] 16w2d 21:52:40, metric 1
                      Receive
```

Sample Output 2

```
user@R3> show route table mpls.0

mpls.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

0                  *[MPLS/0] 16w2d 22:26:08, metric 1
                      Receive
1                  *[MPLS/0] 16w2d 22:26:08, metric 1
                      Receive
2                  *[MPLS/0] 16w2d 22:26:08, metric 1
                      Receive
100864             *[RSVP/7] 00:07:23, metric 1
                    > via so-0/0/2.0, label-switched-path R6-to-R1
100864(S=0)        *[RSVP/7] 00:07:23, metric 1
                    > via so-0/0/2.0, label-switched-path R6-to-R1
100880             *[RSVP/7] 00:07:01, metric 1
                    > via so-0/0/3.0, label-switched-path R1-to-R6
100880(S=0)        *[RSVP/7] 00:07:01, metric 1
                    > via so-0/0/3.0, label-switched-path R1-to-R6
```

What It Means

Sample Output 1 from transit router R3 shows three route entries in the form of MPLS label entries. These MPLS labels are reserved MPLS labels defined in RFC 3032, and are always present in the mpls.0 routing table, regardless of the state of the LSP. The incoming labels assigned by RSVP to the upstream neighbor are missing from the output, indicating that the LSP is down. For more information on MPLS label entries, see “Verifying LSP Use” on page 77.

In contrast, Sample Output 2 shows the MPLS labels and routes for a correctly configured LSP. The three reserved MPLS labels are present, and the four other entries represent the incoming labels assigned by RSVP to the upstream neighbor. These four entries represent two routes. There are two entries per route because the stack values in the MPLS header may be different. For each route, the second entry 100864 (S=0) and 100880 (S=0) indicates that the stack depth is not 1, and additional label values are included in the packet. In contrast, the first entry, 100864 and 100880 has an inferred S = 1 value which indicates a stack depth of 1 and makes each label the last label in that particular packet. The dual entries indicate that this is the penultimate router. For more information on MPLS label stacking, see RFC 3032, *MPLS Label Stack Encoding*.

Step 3: Verify the LSP Route on the Ingress Router

Purpose Check whether the LSP route is included in the active entries in the inet.3 routing table for the specified address.

Action To verify the LSP route, enter the following command from the ingress router:

user@host> **show route** *destination*

Sample Output 1

```
user@R1> show route 10.0.0.6

inet.0: 27 destinations, 27 routes (27 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.6/32        *[IS-IS/18] 6d 01:41:37, metric 20
                      to 10.1.12.2 via so-0/0/0.0
                    > to 10.1.15.2 via so-0/0/1.0
                      to 10.1.13.2 via so-0/0/2.0

user@R6> show route 10.0.0.1

inet.0: 28 destinations, 28 routes (28 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.1/32        *[IS-IS/18] 5d 01:01:38, metric 20
                      to 10.1.56.1 via so-0/0/0.0
                    > to 10.1.26.1 via so-0/0/2.0
                      to 10.1.36.1 via so-0/0/3.0
```

Sample Output 2

```
user@R1> show route 10.0.0.6

inet.0: 28 destinations, 28 routes (27 active, 0 holddown, 1 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.6/32        *[IS-IS/18] 6d 02:13:42, metric 20
                      to 10.1.12.2 via so-0/0/0.0
                    > to 10.1.15.2 via so-0/0/1.0
                      to 10.1.13.2 via so-0/0/2.0

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.6/32        *[RSVP/7] 00:08:07, metric 20
                    > via so-0/0/2.0, label-switched-path R1-to-R6

user@R6> show route 10.0.0.1

inet.0: 29 destinations, 29 routes (28 active, 0 holddown, 1 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.1/32        *[IS-IS/18] 5d 01:34:03, metric 20
                      to 10.1.56.1 via so-0/0/0.0
                    > to 10.1.26.1 via so-0/0/2.0
                      to 10.1.36.1 via so-0/0/3.0

inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.0.0.1/32        *[RSVP/7] 00:10:39, metric 20
                    > via so-0/0/3.0, label-switched-path R6-to-R1
```

What It Means Sample Output 1 shows entries in the inet.0 routing table only. The inet.3 routing table is missing from the output because the LSP is not working. The inet.0 routing table is used by interior gateway protocols (IGPs) and Border Gateway Protocol (BGP) to store routing information. In this case, the IGP is Intermediate System-to-Intermediate System (IS-IS). For more information on the inet.0 routing table, see the *JUNOS MPLS Applications Configuration Guide*.

If the LSP was working, we would expect to see entries that include the LSP in the inet.3 routing table. The inet.3 routing table is used on ingress routers to route BGP packets to the destination egress router. BGP uses the inet.3 routing table on the ingress router to help resolve next-hop addresses. BGP is configured in the example network shown in Figure 22 on page 163.

Sample Output 2 shows output you should receive when the LSP is up. The output shows both the inet.0 and inet.3 routing tables, indicating that LSPs R1-to-R6 and R6-to-R1 are available.

Step 4: Verify MPLS Labels with the traceroute Command

Purpose Display the route packets take to a BGP destination where the BGP next hop for that route is the LSP egress address. By default, BGP uses the inet.0 and the inet.3 routing tables to resolve the next-hop address. When the next-hop address of the BGP route is not the router ID of the egress router, traffic is mapped to IGP routes, not to the LSP. Use the traceroute command as a debugging tool to determine whether the LSP is being used to forward traffic.

Action To verify MPLS labels, enter the following command from the ingress router:

user@host> **traceroute** *hostname*

Sample Output 1

```
user@R1> traceroute 100.100.6.1
traceroute to 100.100.6.1 (100.100.6.1), 30 hops max, 40 byte packets
 1  10.1.12.2 (10.1.12.2)  0.627 ms  0.561 ms  0.520 ms
 2  10.1.26.2 (10.1.26.2)  0.570 ms !N  0.558 ms !N  4.879 ms !N

user@R6> traceroute 100.100.1.1
traceroute to 100.100.1.1 (100.100.1.1), 30 hops max, 40 byte packets
 1  10.1.26.1 (10.1.26.1)  0.630 ms  0.545 ms  0.488 ms
 2  10.1.12.1 (10.1.12.1)  0.551 ms !N  0.557 ms !N  0.526 ms !N
```

Sample Output 2

```
user@R1> traceroute 100.100.6.1
traceroute to 100.100.6.1 (100.100.6.1), 30 hops max, 40 byte packets
 1  10.1.13.2 (10.1.13.2)  0.866 ms  0.746 ms  0.724 ms
     MPLS Label=100912 CoS=0 TTL=1 S=1
 2  10.1.36.2 (10.1.36.2)  0.577 ms !N  0.597 ms !N  0.546 ms !N

user@R6> traceroute 100.100.1.1
traceroute to 100.100.1.1 (100.100.1.1), 30 hops max, 40 byte packets
 1  10.1.36.1 (10.1.36.1)  0.802 ms  0.716 ms  0.688 ms
     MPLS Label=100896 CoS=0 TTL=1 S=1
 2  10.1.13.1 (10.1.13.1)  0.570 ms !N  0.568 ms !N  0.546 ms !N
```

What It Means Sample Output 1 shows that BGP traffic is not using the LSP, consequently MPLS labels do not appear in the output. Instead of using the LSP, BGP traffic is using the IGP (IS-IS, in the example network in Figure 22 on page 163) to reach the BGP next-hop LSP egress address. The JUNOS software default behavior uses LSPs for BGP traffic when the BGP next hop equals the LSP egress address.

Sample Output 2 is an example of output for a correctly configured LSP. The output shows MPLS labels, indicating that BGP traffic is using the LSP to reach the BGP next hop.

Step 5: Verify MPLS Labels with the ping Command

Purpose When you ping a specific LSP, you check that echo requests are sent over the LSP as MPLS packets. On the egress router (the router receiving the MPLS echo packets), you must configure the address 127.0.0.1/32 on its loopback (lo0) interface. If this is not configured, the egress router does not have this forwarding entry and therefore simply drops the incoming MPLS pings and replies with "ICMP host unreachable" messages.

Action To verify MPLS labels, follow these steps:

1. On the egress router, in configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit interfaces lo0 unit number
   ```

   For example:

   ```
   [edit]
   user@R6# edit interfaces lo0.0
   ```

2. Configure the loopback (lo0) interface with the following IP address:

   ```
   [edit interfaces lo0 unit number]
   user@host# set family inet address 127.0.0.1/32
   ```

3. Verify the configuration:

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

4. On the ingress router, in operational mode, enter the following command to ping the egress router:

   ```
   user@host> ping mpls rsvp lsp-name detail
   ```

   For example:

   ```
   user@R1> ping mpls rsvp R1-to-R6 detail
   ```

Sample Output 1

```
user@R1> ping mpls rsvp R1-to-R6 detail
LSP R1-to-R6 - LSP has no active path, exiting.

user@R6> ping mpls rsvp R6-to-R1 detail
LSP R6-to-R1 - LSP has no active path, exiting.
```

Sample Output 2

```
user@R1> traceroute 10.0.0.6
traceroute to 10.0.0.6 (10.0.0.6), 30 hops max, 40 byte packets
 1  10.1.15.2 (10.1.15.2)  0.708 ms  0.613 ms  0.576 ms
 2  10.0.0.6 (10.0.0.6)  0.763 ms  0.708 ms  0.700 ms

user@R1> ping mpls rsvp R1-to-R6 detail
Request for seq 1, to interface 69, label 100880
Reply for seq 1, return code: Egress-ok
Request for seq 2, to interface 69, label 100880
Reply for seq 2, return code: Egress-ok
Request for seq 3, to interface 69, label 100880
Reply for seq 3, return code: Egress-ok
Request for seq 4, to interface 69, label 100880
Reply for seq 4, return code: Egress-ok
Request for seq 5, to interface 69, label 100880
Reply for seq 5, return code: Egress-ok

--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss

user@R6> ping mpls rsvp R6-to-R1 detail
Request for seq 1, to interface 70, label 100864
Reply for seq 1, return code: Egress-ok
Request for seq 2, to interface 70, label 100864
Reply for seq 2, return code: Egress-ok
Request for seq 3, to interface 70, label 100864
Reply for seq 3, return code: Egress-ok
Request for seq 4, to interface 70, label 100864
Reply for seq 4, return code: Egress-ok
Request for seq 5, to interface 70, label 100864
Reply for seq 5, return code: Egress-ok

--- lsping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
```

What It Means Sample Output 1 shows that the LSP does not have an active path to forward echo requests, indicating that the LSP is down.

Sample Output 2 is an example of output you should receive when the LSP is up and forwarding packets.

Step 6: Verify the MPLS Configuration

Purpose After you have checked the transit and ingress routers, used the traceroute command to verify the BGP next hop, and used the ping command to verify the active path, you can check for problems with the MPLS configuration at the [edit protocols mpls] and [edit interfaces] hierarchy levels.

Action To verify the MPLS configuration, enter the following commands from the ingress, transit, and egress routers:

```
user@host> show configuration protocols mpls
user@host> show configuration interfaces
```

Sample Output 1

```
user@R1> show configuration protocols mpls
label-switched-path R1-to-R6 {
    to 10.0.0.6;
}
inactive: interface so-0/0/0.0;
inactive: interface so-0/0/1.0;
interface so-0/0/2.0;
interface fxp0.0 {
    disable;
}

user@R3> show configuration protocols mpls
interface fxp0.0 {
    disable;
}
inactive: interface so-0/0/0.0;
inactive: interface so-0/0/1.0;
interface so-0/0/2.0;
interface so-0/0/3.0;

user@R6> show configuration protocols mpls
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
inactive: interface so-0/0/0.0;
inactive: interface so-0/0/1.0;
inactive: interface so-0/0/2.0;
inactive: interface so-0/0/3.0;     <<< Incorrectly configured
```

Sample Output 2

```
user@R6> show configuration interfaces
so-0/0/0 {
    unit 0 {
        family inet {
            address 10.1.56.2/30;
        }
        family iso;
        family mpls;
    }
}
so-0/0/1 {
    unit 0 {
        family inet {
            address 10.1.46.2/30;
        }
        family iso;
        family mpls;
    }
}
so-0/0/2 {
    unit 0 {
        family inet {
            address 10.1.26.2/30;
        }
        family iso;
        family mpls;
    }
}
```

```
so-0/0/3 {
    unit 0 {
        family inet {
            address 10.1.36.2/30;
        }
        family iso;
        family mpls;
    }
}
fxp0 {
    unit 0 {
        family inet {
            address 192.168.70.148/21;
        }
    }
}
lo0 {
    unit 0 {
        family inet {
            address 10.0.0.6/32;
            address 127.0.0.1/32;
        }
        family iso {
            address 49.0003.1000.0000.0006.00;
        }
    }
}
```

What It Means Sample Output 1 from the ingress, transit, and egress routers shows that the configuration of interfaces on egress router R6 is incorrect. Interface so-0/0/3.0 is included as inactive at the [edit protocols mpls] hierarchy level, when it should be active because it is the interface through which the LSP travels.

Sample Output 2 shows that interfaces are correctly configured for MPLS on egress router R6. The interfaces are also correctly configured on the ingress and transit routers (not shown).

Step 7: Take Appropriate Action

Purpose Depending on the error you encountered in your investigation, you must take the appropriate action to correct the problem. In this example, an interface is incorrectly configured at the [edit protocols mpls] hierarchy level on egress router R6.

Action To correct the error in this example, follow these steps:

1. Activate the interface in the MPLS protocol configuration on egress router R6:

```
user@R6> edit
user@R6# edit protocols mpls
[edit protocols mpls]
user@R6# show
user@R6# activate interface so-0/0/3.0
```

2. Verify and commit the configuration:

```
[edit protocols mpls]
user@R6# show
user@R6# commit
```

Sample Output

```
user@R6> edit
Entering configuration mode

[edit]
user@R6# edit protocols mpls

[edit protocols mpls]
user@R6# show
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
inactive: interface so-0/0/0.0;
inactive: interface so-0/0/1.0;
inactive: interface so-0/0/2.0;
inactive: interface so-0/0/3.0;      <<< Incorrectly configured interface

[edit protocols mpls]
user@R6# activate interface so-0/0/3

[edit protocols mpls]
user@R6# show
label-switched-path R6-to-R1 {
    to 10.0.0.1;
}
inactive: interface so-0/0/0.0;
inactive: interface so-0/0/1.0;
inactive: interface so-0/0/2.0;
interface so-0/0/3.0;           <<< Correctly configured interface

[edit protocols mpls]
user@R6# commit
commit complete
```

What It Means The sample output shows that the incorrectly configured interface so-0/0/3.0 on egress router R6 is now activated at the [edit protocols mpls] hierarchy level. The LSP can now come up.

Step 8: Verify the LSP Again

Action To verify the LSP again, enter the following command from the ingress, transit, and egress routers:

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

Sample Output

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

10.0.0.6
  From: 10.0.0.1, State: Up, ActiveRoute: 1, LSPname: R1-to-R6
  ActivePath:  (primary)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
```

```
 10.1.13.2 S 10.1.36.2 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node
10=SoftPreempt):
          10.1.13.2 10.1.36.2
    6 Nov  2 15:48:52 Selected as active path
    5 Nov  2 15:48:52 Record Route:  10.1.13.2 10.1.36.2
    4 Nov  2 15:48:52 Up
    3 Nov  2 15:48:52 Originate Call
    2 Nov  2 15:48:52 CSPF: computation result accepted
    1 Nov  2 15:48:22 CSPF failed: no route toward 10.0.0.6[308 times]
  Created: Tue Nov  2 13:18:39 2004
Total 1 displayed, Up 1, Down 0

Egress LSP: 1 sessions

10.0.0.1
  From: 10.0.0.6, LSPstate: Up, ActiveRoute: 0
  LSPname: R6-to-R1, LSPpath: Primary
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: -
  Resv style: 1 FF, Label in: 3, Label out: -
  Time left:  159, Since: Tue Nov  2 15:48:30 2004
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 39106 protocol 0
  PATH rcvfrom: 10.1.13.2 (so-0/0/2.0) 10 pkts
  Adspec: received MTU 1500
  PATH sentto: localclient
  RESV rcvfrom: localclient
  Record route: 10.1.36.2 10.1.13.2 <self>
Total 1 displayed, Up 1, Down 0

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

user@R3> show mpls lsp extensive
Ingress LSP: 0 sessions
Total 0 displayed, Up 0, Down 0

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

Transit LSP: 2 sessions

10.0.0.1
  From: 10.0.0.6, LSPstate: Up, ActiveRoute: 1
  LSPname: R6-to-R1, LSPpath: Primary
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: 3
  Resv style: 1 FF, Label in: 100864, Label out: 3
  Time left:  123, Since: Tue Nov  2 15:35:41 2004
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 39106 protocol 0
  PATH rcvfrom: 10.1.36.2 (so-0/0/3.0) 10 pkts
  Adspec: received MTU 1500 sent MTU 1500
  PATH sentto: 10.1.13.1 (so-0/0/2.0) 10 pkts
  RESV rcvfrom: 10.1.13.1 (so-0/0/2.0) 10 pkts
  Explct route: 10.1.13.1
  Record route: 10.1.36.2 <self> 10.1.13.1

10.0.0.6
  From: 10.0.0.1, LSPstate: Up, ActiveRoute: 1
  LSPname: R1-to-R6, LSPpath: Primary
  Suggested label received: -, Suggested label sent: -
```

```
  Recovery label received: -, Recovery label sent: 3
  Resv style: 1 FF, Label in: 100880, Label out: 3
  Time left:  145, Since: Tue Nov  2 15:36:03 2004
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 48015 protocol 0
  PATH rcvfrom: 10.1.13.1 (so-0/0/2.0) 10 pkts
  Adspec: received MTU 1500 sent MTU 1500
  PATH sentto: 10.1.36.2 (so-0/0/3.0) 10 pkts
  RESV rcvfrom: 10.1.36.2 (so-0/0/3.0) 10 pkts
  Explct route: 10.1.36.2
  Record route: 10.1.13.1 <self> 10.1.36.2
Total 2 displayed, Up 2, Down 0

user@R6> show mpls lsp extensive
Ingress LSP: 1 sessions

10.0.0.1
  From: 10.0.0.6, State: Up, ActiveRoute: 1, LSPname: R6-to-R1
  ActivePath:  (primary)
  LoadBalance: Random
  Encoding type: Packet, Switching type: Packet, GPID: IPv4
 *Primary                    State: Up
    Computed ERO (S [L] denotes strict [loose] hops): (CSPF metric: 20)
 10.1.36.1 S 10.1.13.1 S
    Received RRO (ProtectionFlag 1=Available 2=InUse 4=B/W 8=Node
10=SoftPreempt):
          10.1.36.1 10.1.13.1
    6 Nov  2 15:41:44 Selected as active path
    5 Nov  2 15:41:44 Record Route:  10.1.36.1 10.1.13.1
    4 Nov  2 15:41:44 Up
    3 Nov  2 15:41:44 Originate Call
    2 Nov  2 15:41:44 CSPF: computation result accepted
    1 Nov  2 15:41:14 CSPF failed: no route toward 10.0.0.1[306 times]
  Created: Tue Nov  2 13:12:21 2004
Total 1 displayed, Up 1, Down 0

Egress LSP: 1 sessions

10.0.0.6
  From: 10.0.0.1, LSPstate: Up, ActiveRoute: 0
  LSPname: R1-to-R6, LSPpath: Primary
  Suggested label received: -, Suggested label sent: -
  Recovery label received: -, Recovery label sent: -
  Resv style: 1 FF, Label in: 3, Label out: -
  Time left:  157, Since: Tue Nov  2 15:42:06 2004
  Tspec: rate 0bps size 0bps peak Infbps m 20 M 1500
  Port number: sender 1 receiver 48015 protocol 0
  PATH rcvfrom: 10.1.36.1 (so-0/0/3.0) 11 pkts
  Adspec: received MTU 1500
  PATH sentto: localclient
  RESV rcvfrom: localclient
  Record route: 10.1.13.1 10.1.36.1 <self>
Total 1 displayed, Up 1, Down 0

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

What It Means Sample Output 1 from ingress router R1 shows that LSP R1-to-R6 has an active route to R6 and the state is up.

Sample Output 2 from transit router R3 shows that there are two transit LSP sessions, one from R1 to R6 and the other from R6 to R1. Both LSPs are up.

Sample Output 3 from egress router R6 shows that the LSP is up and the active route is the primary route. The LSP is now traversing the network along the expected path, from R1 through R3 to R6, and the reverse LSP, from R6 through R3 to R1.