Chapter 1 MPLS VPN Configuration

Lab 1-1 MPLS LDP Configuration

Learning Objectives

The objectives of this lab are to learn and understand:

- How to enable and disable MPLS
- How to enable and disable MPLS LDP
- How to configure LSPs using MPLS LDP
- How to configure the LDP LSP trigger policy on an MPLS router

Topology

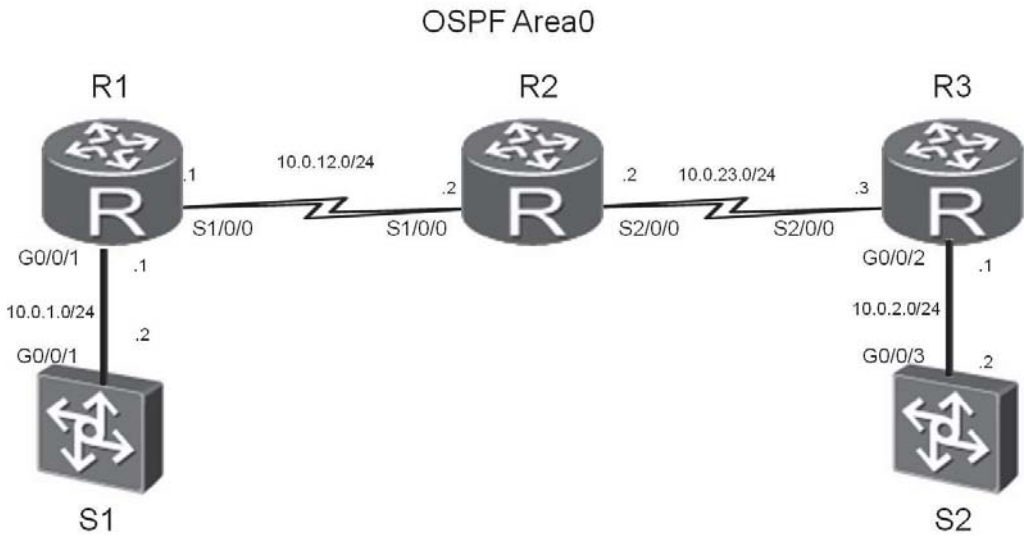

Figure 1-1 MPLS LDP topology

Scenario

Assume that you are a network administrator of an enterprise. Your enterprise uses an IP network with poor forwarding performance. You need to use MPLS to improve the forwarding rate of routers. Static LSPs are configured manually, while LDP is a protocol developed for label distribution. To perform flexible configuration, use LDP to set up MPLS LSPs.

Tasks

Step 1 **Perform basic configurations and configure IP addresses.**

Configure IP addresses and masks for all routers.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S1
[S1]interface Vlanif 1
[S1-Vlanif1]ip address 10.0.1.2 24

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R1
[R1]interface GigabitEthernet 0/0/1
[R1-GigabitEthernet0/0/1]ip address 10.0.1.1 24
[R1-GigabitEthernet0/0/1]quit
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]ip address 10.0.12.1 24
[R1-Serial1/0/0]quit
[R1]interface loopback 0
[R1-LoopBack0]ip address 2.2.2.2 24

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R2
[R2]interface Serial 1/0/0
[R2-Serial1/0/0]ip address 10.0.12.2 24
[R2-Serial1/0/0]quit
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]ip address 10.0.23.2 24
[R2-Serial2/0/0]quit
[R2]interface loopback 0
[R2-LoopBack0]ip address 3.3.3.3 24

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R3
[R3]interface GigabitEthernet 0/0/2
[R3-GigabitEthernet0/0/2]ip address 10.0.2.1 24
[R3-GigabitEthernet0/0/2]quit
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]ip address 10.0.23.3 24
```

```
[R3-Serial2/0/0]quit
[R3]interface loopback 0
[R3-LoopBack0]ip address 4.4.4.4 24

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname S2
[S2]interface Vlanif 1
[S2-Vlanif1]ip address 10.0.2.2 24
```

After the configurations are complete, test the connectivity of direct links.

Step 2 **Configure a single OSPF area.**

Add 10.0.12.0/24, 10.0.23.0/24, 10.0.1.0/24, and 10.0.2.0/24 to OSPF area 0.

```
[S1]ospf 1 router-id 1.1.1.1
[S1-ospf-1]area 0
[S1-ospf-1-area-0.0.0.0]network 10.0.1.0 0.0.0.255

[R1]ospf 1 router-id 2.2.2.2
[R1-ospf-1]area 0
[R1-ospf-1-area-0.0.0.0]network 10.0.1.0 0.0.0.255
[R1-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255
[R1-ospf-1-area-0.0.0.0]network 2.2.2.0 0.0.0.255

[R2]ospf 1 router-id 3.3.3.3
[R2-ospf-1]area 0
[R2-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 10.0.23.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 3.3.3.0 0.0.0.255

[R3]ospf 1 router-id 4.4.4.4
[R3-ospf-1]area 0
[R3-ospf-1-area-0.0.0.0]network 10.0.23.0 0.0.0.255
[R3-ospf-1-area-0.0.0.0]network 10.0.2.0 0.0.0.255
[R3-ospf-1-area-0.0.0.0]network 4.4.4.0 0.0.0.255

[S2]ospf 1 router-id 5.5.5.5
[S2-ospf-1]area 0
[S2-ospf-1-area-0.0.0.0]network 10.0.2.0 0.0.0.255
```

Check the routing table and test connectivity on the entire network.

```
[R2]ping 10.0.1.2
  PING 10.0.1.2: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.2: bytes=56 Sequence=1 ttl=253 time=36 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=253 time=31 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=253 time=31 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=253 time=31 ms
    Reply from 10.0.1.2: bytes=56 Sequence=5 ttl=253 time=31 ms

  --- 10.0.1.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 31/32/36 ms

[R2]ping 10.0.2.2
  PING 10.0.2.2: 56  data bytes, press CTRL_C to break
    Reply from 10.0.2.2: bytes=56 Sequence=1 ttl=253 time=38 ms
    Reply from 10.0.2.2: bytes=56 Sequence=2 ttl=253 time=33 ms
    Reply from 10.0.2.2: bytes=56 Sequence=3 ttl=253 time=33 ms
    Reply from 10.0.2.2: bytes=56 Sequence=4 ttl=253 time=33 ms
    Reply from 10.0.2.2: bytes=56 Sequence=5 ttl=253 time=33 ms

  --- 10.0.2.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
round-trip min/avg/max = 33/34/38 ms
```

Run the **display ip routing-table** command to check the OSPF routing table.

```
[R2]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 19        Routes : 19

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        2.2.2.2/32  OSPF    10   1562        D   10.0.12.1       Serial1/0/0
        3.3.3.0/24  Direct  0    0           D   3.3.3.3         LoopBack0
        3.3.3.3/32  Direct  0    0           D   127.0.0.1       InLoopBack0
      3.3.3.255/32  Direct  0    0           D   127.0.0.1       InLoopBack0
        4.4.4.4/32  OSPF    10   1562        D   10.0.23.3       Serial2/0/0
```

```
      10.0.1.0/24  OSPF    10   1563       D   10.0.12.1      Serial1/0/0
      10.0.2.0/24  OSPF    10   1563       D   10.0.23.3      Serial2/0/0
     10.0.12.0/24  Direct  0    0          D   10.0.12.2      Serial1/0/0
     10.0.12.1/32  Direct  0    0          D   10.0.12.1      Serial1/0/0
     10.0.12.2/32  Direct  0    0          D   127.0.0.1      InLoopBack0
   10.0.12.255/32  Direct  0    0          D   127.0.0.1      InLoopBack0
     10.0.23.0/24  Direct  0    0          D   10.0.23.2      Serial2/0/0
     10.0.23.2/32  Direct  0    0          D   127.0.0.1      InLoopBack0
     10.0.23.3/32  Direct  0    0          D   10.0.23.3      Serial2/0/0
   10.0.23.255/32  Direct  0    0          D   127.0.0.1      InLoopBack0
     127.0.0.0/8   Direct  0    0          D   127.0.0.1      InLoopBack0
     127.0.0.1/32  Direct  0    0          D   127.0.0.1      InLoopBack0
127.255.255.255/32  Direct  0    0          D   127.0.0.1      InLoopBack0
255.255.255.255/32  Direct  0    0          D   127.0.0.1      InLoopBack0
```

Step 3 **Configure MPLS LDP.**

Configure MPLS and LDP globally on MPLS routers.

```
[R1]mpls lsr-id 2.2.2.2
[R1]mpls
Info: Mpls starting, please wait... OK!
[R1-mpls]mpls ldp

[R2]mpls lsr-id 3.3.3.3
[R2]mpls
Info: Mpls starting, please wait... OK!
[R2-mpls]mpls ldp

[R3]mpls lsr-id 4.4.4.4
[R3]mpls
Info: Mpls starting, please wait... OK!
[R3-mpls]mpls ldp
```

Configure MPLS and LDP on interfaces of MPLS routers.

```
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]mpls
[R1-Serial1/0/0]mpls ldp

[R2]interface Serial 1/0/0
[R2-Serial1/0/0]mpls
[R2-Serial1/0/0]mpls ldp
[R2-Serial1/0/0]quit
```

```
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]mpls
[R2-Serial2/0/0]mpls ldp

[R3]interface Serial 2/0/0
[R3-Serial2/0/0]mpls
[R3-Serial2/0/0]mpls ldp
```

After the configurations are complete, run the **display mpls ldp session** command on Routers. You can see that the status of local LDP sessions between R1 and R2 and between R1 and R3 are **Operational**.

```
[R1]display mpls ldp session
 LDP Session(s) in Public Network
 Codes: LAM(Label Advertisement Mode), SsnAge Unit(DDDD:HH:MM)
 A '*' before a session means the session is being deleted.
 ------------------------------------------------------------------------------
 PeerID           Status     LAM  SsnRole  SsnAge     KASent/Rcv
 ------------------------------------------------------------------------------
 3.3.3.3:0        Operational DU   Passive  0000:00:10  41/41
 ------------------------------------------------------------------------------ TOTAL: 1
session(s) Found.

[R2]display mpls ldp session
 LDP Session(s) in Public Network
 Codes: LAM(Label Advertisement Mode), SsnAge Unit(DDDD:HH:MM)
 A '*' before a session means the session is being deleted.
 ------------------------------------------------------------------------------
 PeerID           Status     LAM  SsnRole  SsnAge     KASent/Rcv
 ------------------------------------------------------------------------------
 2.2.2.2:0        Operational DU   Active   0000:00:11  46/46
 4.4.4.4:0        Operational DU   Passive  0000:00:10  43/43
 ------------------------------------------------------------------------------
 TOTAL: 2 session(s) Found.

[R3]display mpls ldp session
 LDP Session(s) in Public Network
 Codes: LAM(Label Advertisement Mode), SsnAge Unit(DDDD:HH:MM)
 A '*' before a session means the session is being deleted.
 ------------------------------------------------------------------------------
 PeerID           Status     LAM  SsnRole  SsnAge     KASent/Rcv
 ------------------------------------------------------------------------------
 3.3.3.3:0        Operational DU   Active   0000:00:11  46/46
```

```
 ------------------------------------------------------------------------------
 TOTAL: 1 session(s) Found.
```

Step 4 **Establish LDP LSPs.**

All LSRs are triggered to establish LDP LSPs based on the host route, which is the default trigger policy.

Run the **display mpls ldp lsp** command on LSRs. All host routes are triggered to establish LDP LSPs.

```
[R1]display mpls ldp lsp
  LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel    UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
 2.2.2.2/32        3/NULL          3.3.3.3        127.0.0.1      InLoop0
*2.2.2.2/32        Liberal/1024                   DS/3.3.3.3
 3.3.3.3/32        NULL/3          -              10.0.12.2      S1/0/0
 3.3.3.3/32        1024/3          3.3.3.3        10.0.12.2      S1/0/0
 4.4.4.4/32        NULL/1025       -             10.0.12.2      S1/0/0
 4.4.4.4/32        1025/1025       3.3.3.3        10.0.12.2      S1/0/0
 ------------------------------------------------------------------------------
 TOTAL: 5 Normal LSP(s) Found.
 TOTAL: 1 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP

[R2]display mpls ldp lsp
 LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel    UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
 2.2.2.2/32        NULL/3        -             10.0.12.1      S1/0/0
 2.2.2.2/32        1024/3        2.2.2.2        10.0.12.1      S1/0/0
 2.2.2.2/32        1024/3        4.4.4.4        10.0.12.1      S1/0/0
*2.2.2.2/32        Liberal/1024                 DS/4.4.4.4
```

```
 3.3.3.3/32        3/NULL        2.2.2.2        127.0.0.1      InLoop0
 3.3.3.3/32        3/NULL        4.4.4.4        127.0.0.1      InLoop0
*3.3.3.3/32        Liberal/1024                 DS/2.2.2.2
*3.3.3.3/32        Liberal/1025                 DS/4.4.4.4
 4.4.4.4/32        NULL/3        -             10.0.23.3      S2/0/0
 4.4.4.4/32        1025/3        2.2.2.2        10.0.23.3      S2/0/0
 4.4.4.4/32        1025/3        4.4.4.4        10.0.23.3      S2/0/0
*4.4.4.4/32        Liberal/1025                 DS/2.2.2.2
 ------------------------------------------------------------------------------
 TOTAL: 8 Normal LSP(s) Found.
 TOTAL: 4 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP

[R3]display mpls ldp lsp
  LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel   UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
 2.2.2.2/32        NULL/1024     -             10.0.23.2      S2/0/0
 2.2.2.2/32        1024/1024     3.3.3.3        10.0.23.2      S2/0/0
 3.3.3.3/32        NULL/3        -             10.0.23.2      S2/0/0
 3.3.3.3/32        1025/3        3.3.3.3        10.0.23.2      S2/0/0
 4.4.4.4/32        3/NULL        3.3.3.3        127.0.0.1      InLoop0
*4.4.4.4/32        Liberal/1025                 DS/3.3.3.3
 ------------------------------------------------------------------------------
 TOTAL: 5 Normal LSP(s) Found.
 TOTAL: 1 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP
```

In most cases, the default trigger policy is used. The establishment of an LDP LSP is triggered in Host mode.

Change the trigger policy to All on LSRs so that all static routes and IGP entries can trigger the establishment of the LDP LSPs.

```
[R1]mpls
[R1-mpls]lsp-trigger all

[R2]mpls
[R2-mpls]lsp-trigger all

[R3]mpls
[R3-mpls]lsp-trigger all
```

After the configuration is complete, run the **display mpls ldp lsp** command on each node to view the established LDP LSPs.

```
[R1]display mpls ldp lsp
 LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel    UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
 2.2.2.0/24        3/NULL          3.3.3.3        2.2.2.2        Loop0
 2.2.2.2/32        3/NULL          3.3.3.3        127.0.0.1      InLoop0
*2.2.2.2/32        Liberal/1024                   DS/3.3.3.3
*3.3.3.0/24        Liberal/3                     DS/3.3.3.3
 3.3.3.3/32        NULL/3          -              10.0.12.2      S1/0/0
 3.3.3.3/32        1024/3          3.3.3.3        10.0.12.2      S1/0/0
 4.4.4.4/32        NULL/1025       -             10.0.12.2      S1/0/0
 4.4.4.4/32        1025/1025       3.3.3.3        10.0.12.2      S1/0/0
 10.0.1.0/24       3/NULL         3.3.3.3       10.0.1.1       GE0/0/1
*10.0.1.0/24       Liberal/1026                  DS/3.3.3.3
 10.0.2.0/24       NULL/1027       -              10.0.12.2      S1/0/0
 10.0.2.0/24       1027/1027      3.3.3.3        10.0.12.2      S1/0/0
 10.0.12.0/24      3/NULL         3.3.3.3        10.0.12.1      S1/0/0
*10.0.12.0/24      Liberal/3                      DS/3.3.3.3
 10.0.23.0/24      NULL/3          -             10.0.12.2      S1/0/0
 10.0.23.0/24      1026/3         3.3.3.3        10.0.12.2      S1/0/0
 ------------------------------------------------------------------------------
 TOTAL: 12 Normal LSP(s) Found.
 TOTAL: 4 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
```

```
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP

[R2]display mpls ldp lsp
  LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel    UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
*2.2.2.0/24        Liberal/3                  DS/2.2.2.2
 2.2.2.2/32        NULL/3        -           10.0.12.1      S1/0/0
 2.2.2.2/32        1024/3        2.2.2.2      10.0.12.1      S1/0/0
 2.2.2.2/32        1024/3        4.4.4.4      10.0.12.1      S1/0/0
*2.2.2.2/32        Liberal/1024               DS/4.4.4.4
 3.3.3.0/24        3/NULL        2.2.2.2      3.3.3.3        Loop0
 3.3.3.0/24        3/NULL        4.4.4.4      3.3.3.3        Loop0
 3.3.3.3/32        3/NULL        2.2.2.2      127.0.0.1      InLoop0
 3.3.3.3/32        3/NULL        4.4.4.4      127.0.0.1      InLoop0
*3.3.3.3/32        Liberal/1024               DS/2.2.2.2
*3.3.3.3/32        Liberal/1025               DS/4.4.4.4
*4.4.4.0/24        Liberal/3                  DS/4.4.4.4
 4.4.4.4/32        NULL/3        -           10.0.23.3      S2/0/0
 4.4.4.4/32        1025/3        2.2.2.2      10.0.23.3      S2/0/0
 4.4.4.4/32        1025/3        4.4.4.4      10.0.23.3      S2/0/0
*4.4.4.4/32        Liberal/1025               DS/2.2.2.2
 10.0.1.0/24       NULL/3        -           10.0.12.1      S1/0/0
 10.0.1.0/24       1026/3        2.2.2.2      10.0.12.1      S1/0/0
 10.0.1.0/24       1026/3        4.4.4.4      10.0.12.1      S1/0/0
*10.0.1.0/24       Liberal/1026               DS/4.4.4.4
 10.0.2.0/24       NULL/3        -           10.0.23.3      S2/0/0
 10.0.2.0/24       1027/3        2.2.2.2      10.0.23.3      S2/0/0
 10.0.2.0/24       1027/3        4.4.4.4      10.0.23.3      S2/0/0
*10.0.2.0/24       Liberal/1027               DS/2.2.2.2
 10.0.12.0/24      3/NULL        2.2.2.2      10.0.12.2      S1/0/0
 10.0.12.0/24      3/NULL        4.4.4.4      10.0.12.2      S1/0/0
*10.0.12.0/24      Liberal/3                  DS/2.2.2.2
*10.0.12.0/24      Liberal/1027               DS/4.4.4.4
 10.0.23.0/24      3/NULL        2.2.2.2      10.0.23.2      S2/0/0
 10.0.23.0/24      3/NULL        4.4.4.4      10.0.23.2      S2/0/0
*10.0.23.0/24      Liberal/1026               DS/2.2.2.2
*10.0.23.0/24      Liberal/3                  DS/4.4.4.4
 ------------------------------------------------------------------------------
 TOTAL: 20 Normal LSP(s) Found.
 TOTAL: 12 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
```

```
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP

[R3]display mpls ldp lsp
  LDP LSP Information
 ------------------------------------------------------------------------------
 DestAddress/Mask   In/OutLabel    UpstreamPeer    NextHop        OutInterface
 ------------------------------------------------------------------------------
 2.2.2.2/32        NULL/1024      -              10.0.23.2      S2/0/0
 2.2.2.2/32        1024/1024      3.3.3.3         10.0.23.2       S2/0/0
*3.3.3.0/24        Liberal/3                     DS/3.3.3.3
 3.3.3.3/32        NULL/3         -              10.0.23.2      S2/0/0
 3.3.3.3/32        1025/3         3.3.3.3         10.0.23.2       S2/0/0
 4.4.4.0/24        3/NULL         3.3.3.3         4.4.4.4        Loop0
 4.4.4.4/32        3/NULL         3.3.3.3         127.0.0.1       InLoop0
*4.4.4.4/32        Liberal/1025                   DS/3.3.3.3
 10.0.1.0/24       NULL/1026      -              10.0.23.2      S2/0/0
 10.0.1.0/24       1026/1026      3.3.3.3         10.0.23.2       S2/0/0
 10.0.2.0/24       3/NULL         3.3.3.3         10.0.2.1       GE0/0/2
*10.0.2.0/24       Liberal/1027                   DS/3.3.3.3
 10.0.12.0/24      NULL/3         -              10.0.23.2      S2/0/0
 10.0.12.0/24      1027/3         3.3.3.3         10.0.23.2       S2/0/0
 10.0.23.0/24      3/NULL         3.3.3.3         10.0.23.3       S2/0/0
*10.0.23.0/24      Liberal/3                      DS/3.3.3.3
 ------------------------------------------------------------------------------
 TOTAL: 12 Normal LSP(s) Found.
 TOTAL: 4 Liberal LSP(s) Found.
 TOTAL: 0 Frr LSP(s) Found.
 A '*' before an LSP means the LSP is not established
 A '*' before a Label means the USCB or DSCB is stale
 A '*' before a UpstreamPeer means the session is in GR state
 A '*' before a DS means the session is in GR state
 A '*' before a NextHop means the LSP is FRR LSP
```

Step 5 **Configure the LDP inbound policy.**

If labels received on R1 are not controlled, R1 will establish a large number of LSPs, consuming large memory.

After an inbound LDP policy is configured, R1 receives label mapping messages only from R2 and establishes LSPs to R2, saving resources.

Run the **display mpls lsp** command on R1. Information about established LSPs is displayed.

```
[R1]display mpls lsp
--------------------------------------------------------------------------------
              LSP Information: LDP LSP
--------------------------------------------------------------------------------
FEC              In/Out Label  In/Out IF                    Vrf Name
3.3.3.3/32        NULL/3       -/S1/0/0
3.3.3.3/32        1024/3       -/S1/0/0
2.2.2.2/32        3/NULL       -/-
4.4.4.4/32        NULL/1025     -/S1/0/0
4.4.4.4/32        1025/1025     -/S1/0/0
10.0.12.0/24      3/NULL       -/-
10.0.1.0/24       3/NULL       -/-
2.2.2.0/24        3/NULL       -/-
10.0.23.0/24      NULL/3       -/S1/0/0
10.0.23.0/24      1026/3       -/S1/0/0
10.0.2.0/24       NULL/1027     -/S1/0/0
10.0.2.0/24       1027/1027     -/S1/0/0
```

You can see that LSPs to R2 and R3 are established on R1. Configure the inbound policy on R1 to allow only the routes to R2.

```
[R1]ip ip-prefix prefix1 permit 10.0.12.0 24
[R1]mpls ldp
[R1-mpls-ldp]inbound peer 3.3.3.3 fec ip-prefix prefix1
[R1-mpls-ldp]quit
[R1]display mpls lsp
--------------------------------------------------------------------------------
              LSP Information: LDP LSP
--------------------------------------------------------------------------------
FEC              In/Out Label  In/Out IF                    Vrf Name
2.2.2.2/32        3/NULL       -/-
10.0.12.0/24      3/NULL       -/-
10.0.1.0/24       3/NULL       -/-
2.2.2.0/24        3/NULL       -/-
```

----End

Additional Exercise: Analysis and Verification

How can you configure R1 to receive Label Mapping messages from R1 to R3?