Computer networks and telecommunications (Additional chapters)

Labguide

Icons
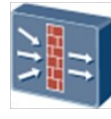
Router   Layer 3 switch   Layer 2 switch   Firewall   Network cloud

Ethernet cable   Serial cable

Hardware

Device Name	Device Model	Software Version
R1	AR2220E	V2R7
R2	AR2220E	V2R7
R3	AR2220E	V2R7
R4	AR2220E	V2R7
R5	AR2220E	V2R7
S1	S5720-36C-EI-AC	V2R8
S2	S5720-36C-EI-AC	V2R8
S3	S3700-28TP-EI-AC	V1R6C5
S4	S3700-28TP-EI-AC	V1R6C5
FW1	USG6330	V100R001C30

Content

Lab 1 - MPLS LDP configuration
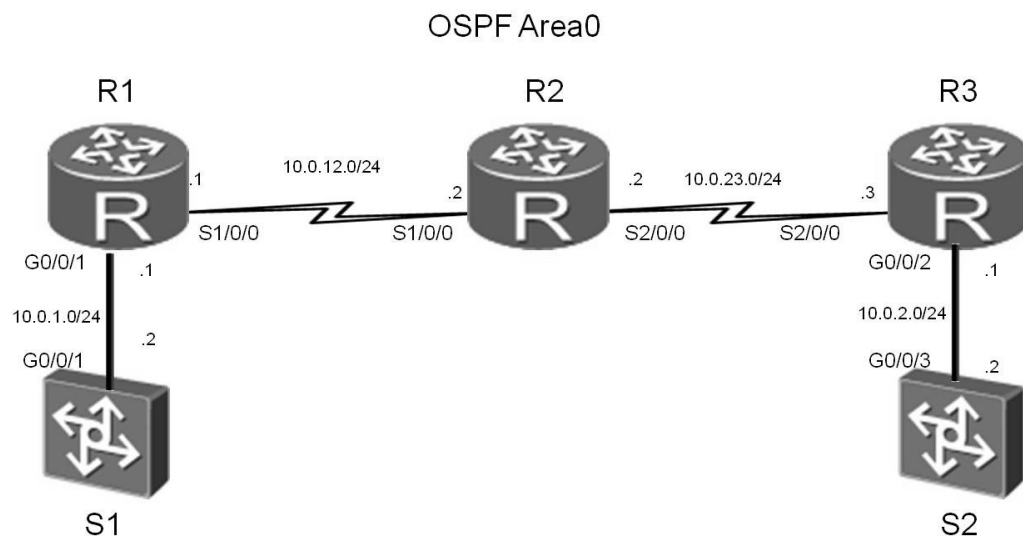
Topology

OSPF Area0

Figure. 1 Lab 1 network for configuring MPLS LDP

We recommend to use a device called *Roughter* as routers in the eNSP emulator

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
```

Check whether connections can be established on 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 tables and the ability to establish a connection on the entire laboratory 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
```

Run the **display mpls ldp session** command on Routers to 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
```

Switch the policy to **All** for all **LSR** so that all static routes and routes from dynamic routing protocols (IGP type) can be used to build **LDP LSPs** routes.

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

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

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

After completing the changes, run the **display mpls ldp lsp** command to see the changes to the **LDP LSPs** routes.

```
[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 are established on the R1 routes to R2 and R3. Configure the input policy on R1 to allow the route only to R2.
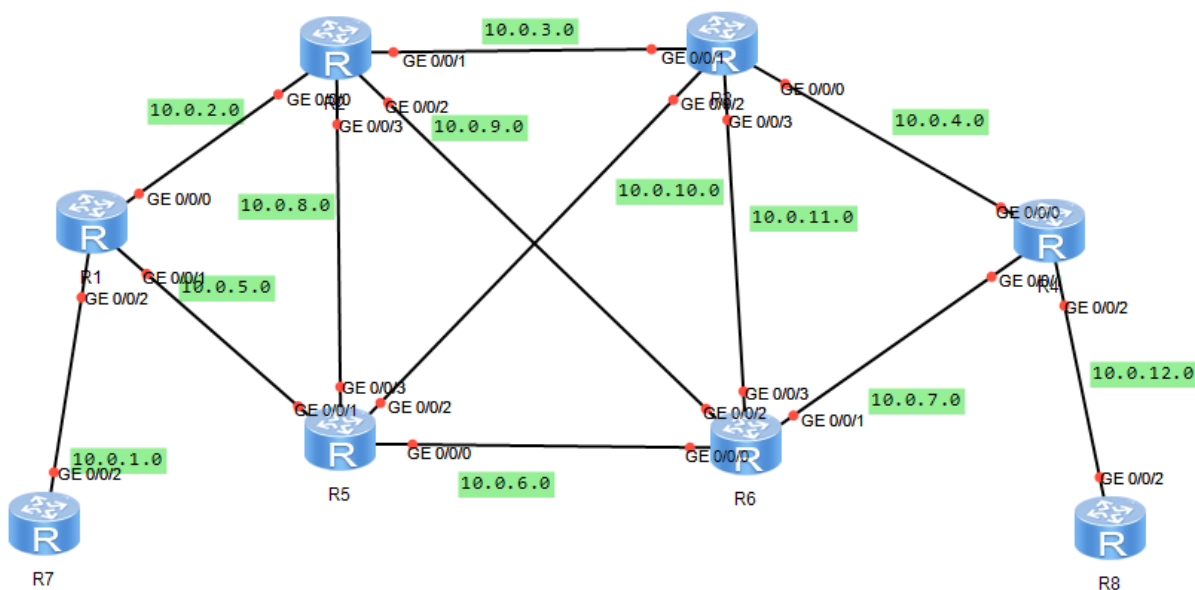
```
[R1]ip ip-prefix prefix1 permit 10.0.12.0 24
[R1]mpls ldp
[R1-mpls-ldp]inbound peer 3.3.3.3 fec ip-prefix prefix1
[R1-mpls-ldp]quit
[R1]display mpls lsp
----------------------------------------------------------------------------
                    LSP Information: LDP LSP
----------------------------------------------------------------------------
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          -/-
```

Individual work

Topology

Tasks

Group	Task	Report
1	Configure MPLS in such a way that the data is passed through the device 2-3-4-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
2	Configure MPLS in such a way that the data is passed through the device 2-5-6-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
3	Configure MPLS in such a way that the data is passed through the device 2-3-6-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
4	Configure MPLS in such a way that the data is passed through the device 2-5-4-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
5	Configure MPLS in such a way that the data is passed through the device 2-5-6-3-4-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task

| 6	Configure MPLS in such a way that the data is passed through the device 2-3-4-5-6-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
7	Configure MPLS in such a way that the data is passed through the device 2-3-5-6-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
8	Configure MPLS in such a way that the data is passed through the device 2-5-3-4-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
9	Configure MPLS in such a way that the data is passed through the device 2-3-4-6-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task
10	Configure MPLS in such a way that the data is passed through the device 2-5-6-4-7	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the *dis mpls ldp lsp* command on the network devices named in the task

Lab 2 - MPLS VPN configuration

Topology
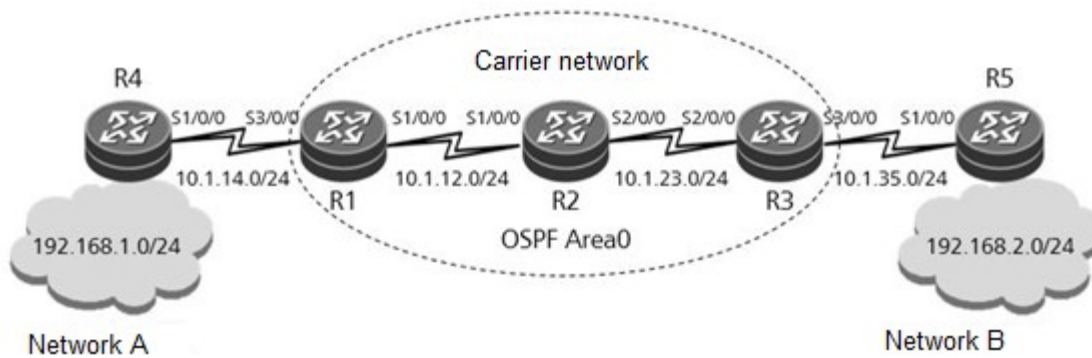
Figure. 2 Lab 2 network for MPLS VPN configuration

We recommend to use a device called *Roughter* as routers in the eNSP emulator

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 R1
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]ip address 10.1.12.1 24
[R1-Serial1/0/0]quit
[R1]interface Serial 3/0/0
[R1-Serial3/0/0]ip address 10.1.14.1 24
[R1-Serial3/0/0]quit
[R1]interface LoopBack 0
[R1-LoopBack0]ip address 1.1.1.1 32

<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 10.1.12.2 24
[R2-Serial1/0/0]quit
[R2]interface Serial 2/0/0
[R2-Serial2/0/0]ip address 10.1.23.2 24
[R1-Serial2/0/0]quit
[R2]interface LoopBack 0
[R2-LoopBack0]ip address 2.2.2.2 32

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R3
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]ip address 10.1.23.3 24
[R3-Serial2/0/0]quit
[R3]interface Serial 3/0/0
[R3-Serial3/0/0]ip address 10.1.35.3 24
[R3-Serial3/0/0]quit
[R3]interface LoopBack 0
[R3-LoopBack0]ip address 3.3.3.3 32

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R4
[R4]interface Serial 1/0/0
[R4-Serial1/0/0]ip address 10.1.14.4 24
[R4-Serial1/0/0]quit
[R4]interface LoopBack 0
[R4-LoopBack0]ip address 192.168.1.1 24

<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R5
[R5]interface Serial 1/0/0
[R5-Serial1/0/0]ip address 10.1.35.5 24
[R5-Serial1/0/0]quit
[R5]interface LoopBack 0
[R5-LoopBack0]ip address 192.168.2.1 24
```

After completing the configuration, check whether connections can be established

Step 2 Configure a single OSPF area on the carrier network.

Add 10.1.12.0/24, 10.1.23.0/24, and addresses of Loopback0 interfaces on the carrier network to OSPF area 0.

```
[R1]router id 1.1.1.1
[R1]ospf 1
[R1-ospf-1]area 0
[R1-ospf-1-area-0.0.0.0]network 10.1.12.0 0.0.0.255
[R1-ospf-1-area-0.0.0.0]network 1.1.1.1 0.0.0.0


[R2]router id 2.2.2.2
[R2]ospf 1
[R2-ospf-1]area 0
[R2-ospf-1-area-0.0.0.0]network 10.1.12.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 10.1.23.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 2.2.2.2 0.0.0.0


[R3]router id 3.3.3.3
[R3]ospf 1
[R3-ospf-1]area 0
[R3-ospf-1-area-0.0.0.0]network 10.1.23.0 0.0.0.255
[R3-ospf-1-area-0.0.0.0]network 3.3.3.3 0.0.0.0
```

Check the status of neighbor relationships installed by OSPF on devices R1, R2, and R3.

```
[R1]display ospf peer brief

        OSPF Process 1 with Router ID 1.1.1.1
                Peer Statistic Information
 ----------------------------------------------------------------------
 Area Id          Interface                    Neighbor id     State
 0.0.0.0          Serial1/0/0                  2.2.2.2         Full
 ----------------------------------------------------------------------
 Total Peer(s):     1


[R2]display ospf peer brief

        OSPF Process 1 with Router ID 2.2.2.2
                Peer Statistic Information
 ----------------------------------------------------------------------
 Area Id          Interface                    Neighbor id     State
 0.0.0.0          Serial1/0/0                  1.1.1.1         Full
 0.0.0.0          Serial2/0/0                  3.3.3.3         Full
 ----------------------------------------------------------------------
```

```
 Total Peer(s):      2


[R3]display ospf peer brief


        OSPF Process 1 with Router ID 3.3.3.3
               Peer Statistic Information
 -------------------------------------------------------------------------
 Area Id          Interface                    Neighbor id     State
 0.0.0.0          Serial2/0/0                  2.2.2.2         Full
 -------------------------------------------------------------------------
 Total Peer(s):     1
```

Step 3 Configure VPN instances on edge devices of the carrier network.

Configure VPN instances for network A and network B on R1 and R3 respectively. Set the VPN instance to **VPN1**, router distinguisher (RD) to 1:1, and route target to 1:2 for network A. Set the VPN instance to **VPN2**, RD to 2:2, and route target to 1:2 for network B.

```
[R1]ip vpn-instance VPN1
[R1-vpn-instance-VPN1]route-distinguisher 1:1
[R1-vpn-instance-VPN1-af-ipv4]vpn-target 1:2 both
[R1-vpn-instance-VPN1-af-ipv4]quit
[R1-vpn-instance-VPN1]quit
[R1]interface Serial 3/0/0
[R1-Serial3/0/0]ip binding vpn-instance VPN1
Info: All IPv4 related configurations on this interface are removed!
Info: All IPv6 related configurations on this interface are removed!
[R1-Serial3/0/0] ip address 10.1.14.1 24


[R3]ip vpn-instance VPN2
[R3-vpn-instance-VPN2]route-distinguisher 2:2
[R3-vpn-instance-VPN2-af-ipv4]vpn-target 1:2 both
[R3-vpn-instance-VPN2-af-ipv4]quit
[R3-vpn-instance-VPN2]quit
[R3]interface Serial 3/0/0
[R3-Serial3/0/0]ip binding vpn-instance VPN2
Info: All IPv4 related configurations on this interface are removed!
Info: All IPv6 related configurations on this interface are removed!
[R3-Serial3/0/0]ip address 10.1.35.3 24
```

Check the result of configuring VPN instances on R1 and R3 devices.

```
[R1]display ip vpn-instance verbose
 Total VPN-Instances configured      : 1
 Total IPv4 VPN-Instances configured : 1
 Total IPv6 VPN-Instances configured : 0

 VPN-Instance Name and ID : VPN1, 1
  Interfaces : Serial3/0/0
 Address family ipv4
  Create date : 2016/09/20 14:51:08
  Up time : 0 days, 00 hours, 09 minutes and 34 seconds
  Route Distinguisher : 1:1
  Export VPN Targets :  1:2
  Import VPN Targets :  1:2
  Label Policy : label per route
  Log Interval : 5


[R3]display ip vpn-instance verbose
 Total VPN-Instances configured      : 1
 Total IPv4 VPN-Instances configured : 1
 Total IPv6 VPN-Instances configured : 0

 VPN-Instance Name and ID : VPN2, 1
  Interfaces : Serial3/0/0
 Address family ipv4
  Create date : 2016/09/20 15:02:52
  Up time : 0 days, 00 hours, 05 minutes and 32 seconds
  Route Distinguisher : 2:2
  Export VPN Targets :  1:2
  Import VPN Targets :  1:2
  Label Policy : label per route
  Log Interval : 5
```

Step 4 Configure BGP to transmit routes on edge devices of the customer networks(CE) and carrier network(PE).

Use the following Autonomous system numbers (AS numbers) for network A, provider network, and network B - 14, 123, and 35, respectively. Establish BGP neighbor relationships between CE and PE to advertise customer VPN routes to PE using BGP.

```
[R1]bgp 123
[R1-bgp]ipv4-family vpn-instance VPN1
[R1-bgp-VPN1]peer 10.1.14.4 as-number 14
```

```
[R3]bgp 123
[R3-bgp]ipv4-family vpn-instance VPN2
[R3-bgp-VPN2]peer 10.1.35.5 as-number 35


[R4]bgp 14
[R4-bgp]peer 10.1.14.1 as-number 123
[R4-bgp]network 192.168.1.0 24


[R5]bgp 35
[R5-bgp]peer 10.1.35.3 as-number 123
[R5-bgp]network 192.168.2.0 24
```

Check that the OSPF neighbor relationship was established between devices R1 and R4 and between R3 and R5.

```
[R1]display bgp vpnv4 vpn-instance VPN1 peer
 BGP local router ID : 1.1.1.1
 Local AS number : 123
 VPN-Instance VPN1, Router ID 1.1.1.1:
 Total number of peers : 1          Peers in established state : 1

  Peer            V         AS  MsgRcvd  MsgSent  OutQ  Up/Down       State PrefRcv

  10.1.14.4       4         14       7        8     0 00:05:21 Established      0

[R4]display bgp peer
 BGP local router ID : 10.1.14.4
 Local AS number : 14
 Total number of peers : 1          Peers in established state : 1

  Peer            V         AS  MsgRcvd  MsgSent  OutQ  Up/Down       State PrefRcv

  10.1.14.1       4        123       4        6     0 00:02:56 Established      0

[R3]display bgp vpnv4 vpn-instance VPN2 peer
 BGP local router ID : 3.3.3.3
 Local AS number : 123
 VPN-Instance VPN2, Router ID 3.3.3.3:
 Total number of peers : 1          Peers in established state : 1

  Peer            V         AS  MsgRcvd  MsgSent  OutQ  Up/Down       State PrefRcv
```

```
     10.1.35.5        4         35        7        8       0 00:05:16 Established       0


[R5]display bgp peer
 BGP local router ID : 192.168.1.1
 Local AS number : 35
 Total number of peers : 1                   Peers in established state : 1


  Peer            V         AS  MsgRcvd  MsgSent  OutQ  Up/Down      State PrefRcv


    10.1.35.3       4        123        8       10       0 00:06:04 Established       0
```

Check the VPN routes received from the client's network in the VPN routing table of R1 and R3.

```
[R1]display ip routing-table vpn-instance VPN1
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: VPN1
         Destinations : 6       Routes : 6


Destination/Mask    Proto   Pre  Cost       Flags NextHop         Interface


     10.1.14.0/24   Direct  0    0          D     10.1.14.1       Serial3/0/0
     10.1.14.1/32   Direct  0    0          D     127.0.0.1       Serial3/0/0
     10.1.14.4/32   Direct  0    0          D     10.1.14.4       Serial3/0/0
   10.1.14.255/32   Direct  0    0          D     127.0.0.1       Serial3/0/0
   192.168.1.0/24   EBGP    255  0          D     10.1.14.4       Serial3/0/0
255.255.255.255/32  Direct  0    0          D     127.0.0.1       InLoopBack0


[R3]display ip routing-table vpn-instance VPN2
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: VPN2
         Destinations : 6       Routes : 6


Destination/Mask    Proto   Pre  Cost       Flags NextHop         Interface


     10.1.35.0/24   Direct  0    0          D     10.1.35.3       Serial3/0/0
     10.1.35.3/32   Direct  0    0          D     127.0.0.1       Serial3/0/0
     10.1.35.5/32   Direct  0    0          D     10.1.35.5       Serial3/0/0
   10.1.35.255/32   Direct  0    0          D     127.0.0.1       Serial3/0/0
   192.168.2.0/24   EBGP    255  0          D     10.1.35.5       Serial3/0/0
255.255.255.255/32  Direct  0    0          D     127.0.0.1       InLoopBack0
```

Step 5 Configure devices on the carrier network to transmit customer VPN routes using MP-BGP.

Establish the IBGP neighbor relationship between R1 and R3, and transmit customer VPN routes to the remote PE using MP-BGP.

```
[R1]bgp 123
[R1-bgp]peer 3.3.3.3 as-number 123
[R1-bgp]peer 3.3.3.3 connect-interface LoopBack 0
[R1-bgp]ipv4-family vpnv4 unicast
[R1-bgp-af-vpnv4]peer 3.3.3.3 enable

[R3]bgp 123
[R3-bgp]peer 1.1.1.1 as-number 123
[R3-bgp]peer 1.1.1.1 connect-interface LoopBack 0
[R3-bgp]ipv4-family vpnv4 unicast
[R3-bgp-af-vpnv4]peer 1.1.1.1 enable
```

Check the MP-BGP neighbor relationship on R1 and R3.

```
[R1]display bgp vpnv4 all peer
 BGP local router ID : 1.1.1.1
 Local AS number : 123
 Total number of peers : 2              Peers in established state : 2

  Peer            V          AS  MsgRcvd  MsgSent  OutQ  Up/Down       State PrefRcv

  3.3.3.3         4         123        4        7     0 00:02:10 Established      0

[R3]display bgp vpnv4 all peer
 BGP local router ID : 3.3.3.3
 Local AS number : 123
 Total number of peers : 2              Peers in established state : 2

  Peer            V          AS  MsgRcvd  MsgSent  OutQ  Up/Down       State PrefRcv

  1.1.1.1         4         123        5        6     0 00:03:22 Established      0
```

Step 6 Configure devices on the carrier network to forward customer VPN data using MPLS LDP.

Enable MPLS LDP on each device of the carrier network, and use labels to forward customer VPN data to isolate customer data from other network data.

```
[R1]mpls lsr-id 1.1.1.1
[R1]mpls
[R1-mpls]mpls ldp
[R1-mpls-ldp]quit
[R1]interface Serial 1/0/0
[R1-Serial1/0/0]mpls
[R1-Serial1/0/0]mpls ldp


[R2]mpls lsr-id 2.2.2.2
[R2]mpls
[R2-mpls]mpls ldp
[R2-mpls-ldp]quit
[R2]interface s1/0/0
[R2-Serial1/0/0]mpls
[R2-Serial1/0/0]mpls ldp
[R2-Serial1/0/0]quit
[R2]interface s2/0/0
[R2-Serial2/0/0]mpls
[R2-Serial2/0/0]mpls ldp


[R3]mpls lsr-id 3.3.3.3
[R3]mpls
[R3-mpls]mpls ldp
[R3-mpls-ldp]quit
[R3]interface Serial 2/0/0
[R3-Serial2/0/0]mpls
[R3-Serial2/0/0]mpls ldp
```

Check the MPLS LDP neighbor relationship on R1, R2, and R3.

```
[R1]display mpls ldp peer
 LDP Peer Information in Public network
 A '*' before a peer means the peer is being deleted.
 -------------------------------------------------------------------------
 PeerID                 TransportAddress   DiscoverySource
 -------------------------------------------------------------------------
 2.2.2.2:0              2.2.2.2            Serial1/0/0
 -------------------------------------------------------------------------
 TOTAL: 1 Peer(s) Found.


[R2]display mpls ldp peer
```

```
LDP Peer Information in Public network
A '*' before a peer means the peer is being deleted.
-------------------------------------------------------------------------
PeerID                  TransportAddress  DiscoverySource
-------------------------------------------------------------------------
1.1.1.1:0               1.1.1.1           Serial1/0/0
3.3.3.3:0               3.3.3.3           Serial2/0/0
-------------------------------------------------------------------------
TOTAL: 2 Peer(s) Found.


[R3]display mpls ldp peer
LDP Peer Information in Public network
A '*' before a peer means the peer is being deleted.
-------------------------------------------------------------------------
PeerID                  TransportAddress  DiscoverySource
-------------------------------------------------------------------------
2.2.2.2:0               2.2.2.2           Serial2/0/0
-------------------------------------------------------------------------
TOTAL: 1 Peer(s) Found.
```

Step 7 Test the connectivity between network A and network B on CEs.

Use the Loopback0 interface to emulate the user network on R4 and R5 devices, and run the *ping* command to verify that communication is established between networks A and B.

```
<R4>ping -a 192.168.1.1 192.168.2.1
  PING 192.168.2.1: 56  data bytes, press CTRL_C to break
    Reply from 192.168.2.1: bytes=56 Sequence=1 ttl=252 time=106 ms
    Reply from 192.168.2.1: bytes=56 Sequence=2 ttl=252 time=107 ms
    Reply from 192.168.2.1: bytes=56 Sequence=3 ttl=252 time=106 ms
    Reply from 192.168.2.1: bytes=56 Sequence=4 ttl=252 time=105 ms
    Reply from 192.168.2.1: bytes=56 Sequence=5 ttl=252 time=106 ms

  --- 192.168.2.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
round-trip min/avg/max = 105/106/107 ms


<R5>ping -a 192.168.2.1 192.168.1.1
  PING 192.168.1.1: 56  data bytes, press CTRL_C to break
```

```
    Reply from 192.168.1.1: bytes=56 Sequence=1 ttl=252 time=107 ms
    Reply from 192.168.1.1: bytes=56 Sequence=2 ttl=252 time=105 ms
    Reply from 192.168.1.1: bytes=56 Sequence=3 ttl=252 time=106 ms
    Reply from 192.168.1.1: bytes=56 Sequence=4 ttl=252 time=106 ms
    Reply from 192.168.1.1: bytes=56 Sequence=5 ttl=252 time=106 ms

  --- 192.168.1.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 105/106/107 ms
```

Check routes received from remote networks on R4 and R5 devices.

```
<R4>display ip routing-table
Route Flags: R - relay, D - download to fib
-------------------------------------------------------------------------------Routing
Tables: Public
         Destinations : 12       Routes : 12
Destination/Mask    Proto   Pre  Cost      Flags NextHop          Interface
      10.1.14.0/24  Direct  0    0           D   10.1.14.4        Serial1/0/0
      10.1.14.1/32  Direct  0    0           D   10.1.14.1        Serial1/0/0
      10.1.14.4/32  Direct  0    0           D   127.0.0.1        Serial1/0/0
    10.1.14.255/32  Direct  0    0           D   127.0.0.1        Serial1/0/0
      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
    192.168.1.0/24  Direct  0    0           D   192.168.1.1      LoopBack0
    192.168.1.1/32  Direct  0    0           D   127.0.0.1        LoopBack0
  192.168.1.255/32  Direct  0    0           D   127.0.0.1        LoopBack0
    192.168.2.0/24  EBGP    255  0           D   10.1.14.1        Serial1/0/0
255.255.255.255/32  Direct  0    0           D   127.0.0.1        InLoopBack0
<R5>display ip routing-table
Route Flags: R - relay, D - download to fib
-------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 12       Routes : 12
Destination/Mask    Proto   Pre  Cost      Flags NextHop          Interface
      10.1.35.0/24  Direct  0    0           D   10.1.35.5        Serial1/0/0
      10.1.35.3/32  Direct  0    0           D   10.1.35.3        Serial1/0/0
      10.1.35.5/32  Direct  0    0           D   127.0.0.1        Serial1/0/0
    10.1.35.255/32  Direct  0    0           D   127.0.0.1        Serial1/0/0
      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
```
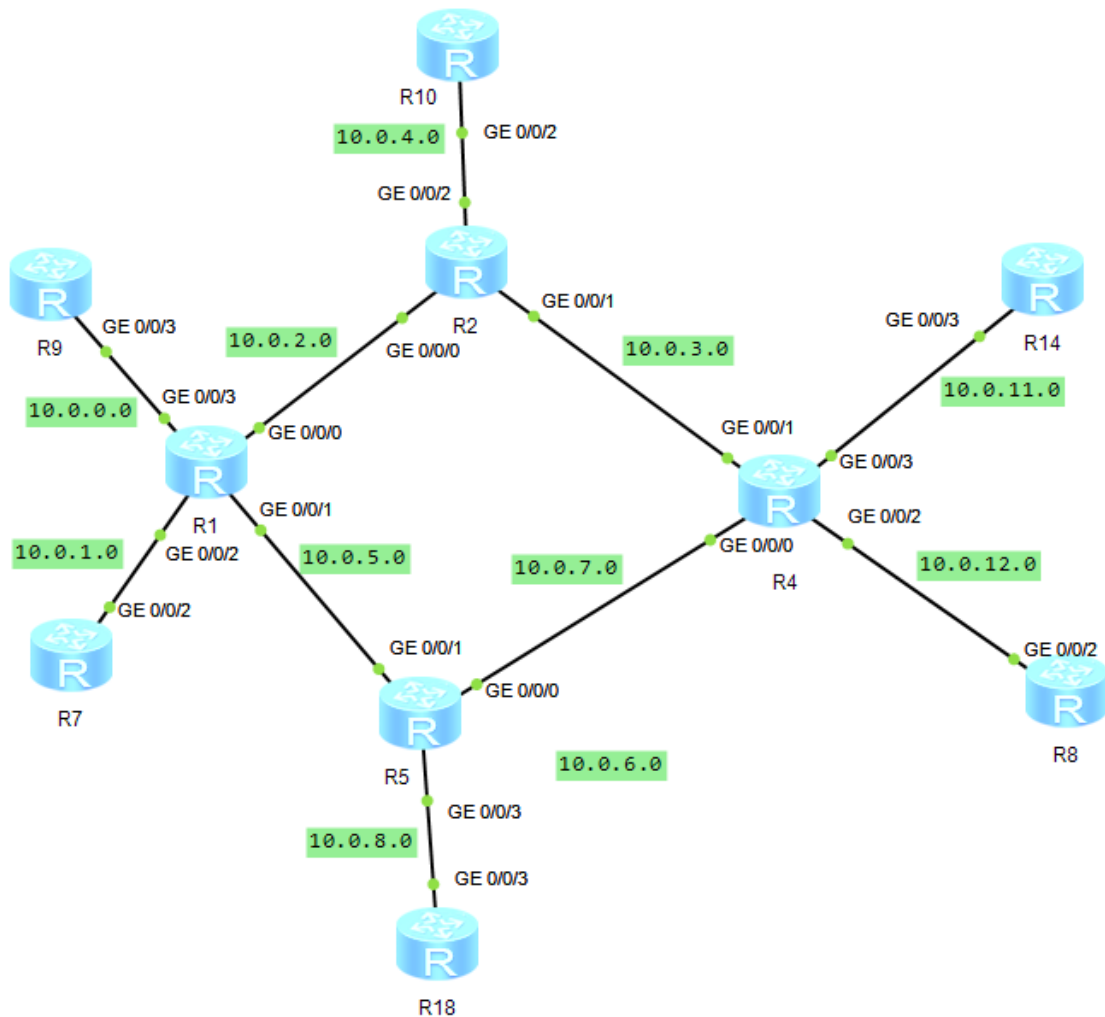
```
127.255.255.255/32  Direct  0    0          D   127.0.0.1     InLoopBack0
     192.168.1.0/24  EBGP    255  0          D   10.1.35.3     Serial1/0/0
     192.168.2.0/24  Direct  0    0          D   192.168.2.1   LoopBack0
     192.168.2.1/32  Direct  0    0          D   127.0.0.1     LoopBack0
   192.168.2.255/32  Direct  0    0          D   127.0.0.1     LoopBack0
255.255.255.255/32  Direct  0    0          D   127.0.0.1     InLoopBack0
```

Individual work

Topology

Tasks

Group	Task	Report
1	Configure MPLS VPN between R7 and R8 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
2	Configure MPLS VPN between R7 and	Prepare a screenshot of the current configuration of the provider's network devices and

	R14 devices	screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
3	Configure MPLS VPN between R7 and R18 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
4	Configure MPLS VPN between R7 and R10 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
5	Configure MPLS VPN between R9 and R8 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
6	Configure MPLS VPN between R9 and R14 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
7	Configure MPLS VPN between R9 and R18 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
8	Configure MPLS VPN between R9 and R10 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task
9	Configure MPLS VPN between R10 and R18 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls*

		ldp lsp on the PE used in the task
10	Configure MPLS VPN between R7, R10 and R8 devices	Prepare a screenshot of the current configuration of the provider's network devices and screenshots of the output of the command *dis mpls ldp lsp* on the PE used in the task