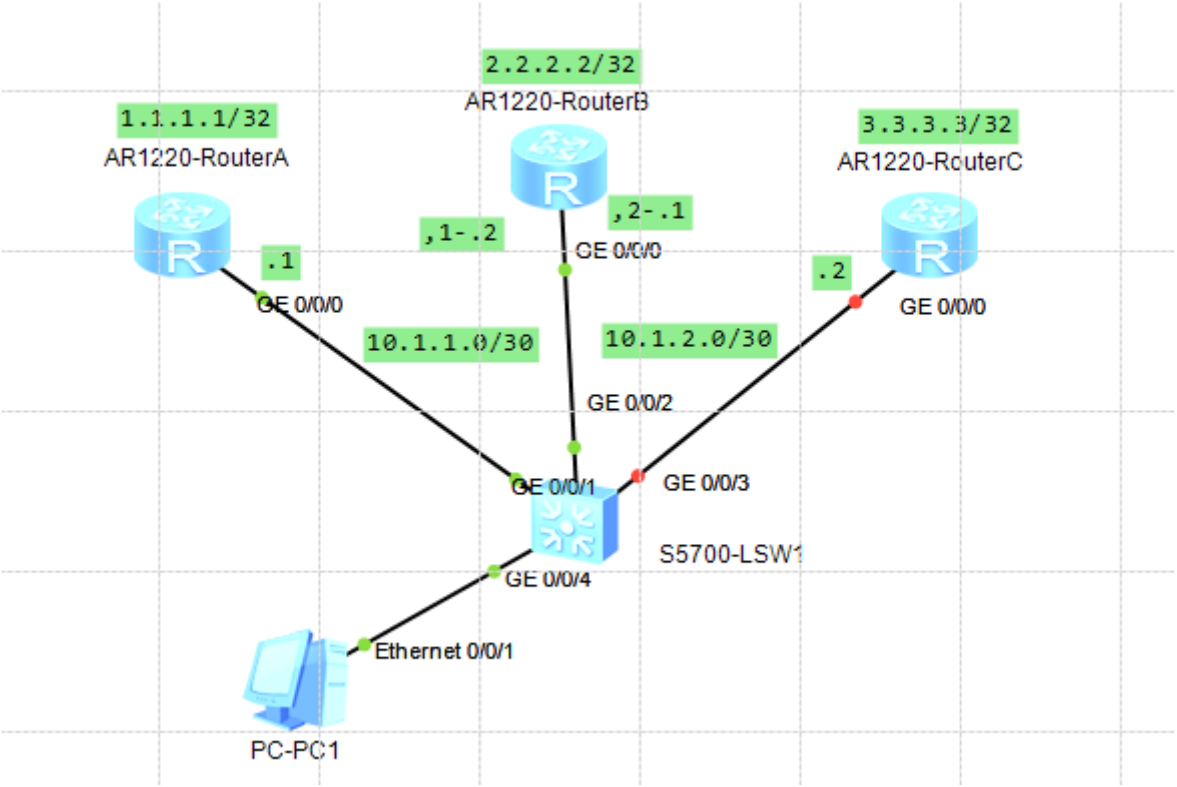
Ejercicio MPLS - LDP y OSPF

Partiendo de la configuración del ejercicio anterior, se borra la configuración de MPLS y los enrutamientos estáticos en los routers, Luego se configuran para que trabajen con LDP y OSPF. También se desactiva Penultimate Hop Popping (PHP).

Topología



RA y RB tienen una conexión point-to-point

RB y RC tienen una conexión point-to-point

La interfaz GE0/0/0 está particionada en:

- .0 conectado a RA
- .1 conectado a RC

Configuración

Router A

```
<RouterA>system-view
[RouterA]undo mpls
[RouterA]undo ip route-static 3.3.3.3 32

[RouterA]ospf 100
[RouterA-ospf-100-area-0.0.0.0]network 1.1.1.1 0.0.0.0
[RouterA-ospf-100-area-0.0.0.0]network 10.1.1.0 0.0.0.3
```

```
[RouterA]mpls
[RouterA-mpls]label advertise non-null
[RouterA-mpls]mpls ldp
[RouterA-mpls-ldp]interface GigabitEthernet 0/0/0
[RouterA-GigabitEthernet0/0/0]mpls
[RouterA-GigabitEthernet0/0/0]mpls ldp

<RouterA>save
```

Router B

```
<RouterB>system-view
[RouterB]undo mpls
[RouterB]ospf 100
[RouterB-ospf-100]area 0
[RouterB-ospf-100-area-0.0.0.0]network 2.2.2.2 0.0.0.0
[RouterB-ospf-100-area-0.0.0.0]network 10.1.1.0 0.0.0.3
[RouterB-ospf-100-area-0.0.0.0]network 10.1.2.0 0.0.0.3

[RouterB]mpls
[RouterB-mpls]label advertise non-null
[RouterB-mpls]mpls ldp
[RouterB-mpls-ldp]interface GigabitEthernet 0/0/0.1
[RouterB-GigabitEthernet0/0/0.1]mpls
[RouterB-GigabitEthernet0/0/0.1]mpls ldp

[RouterB]interface GigabitEthernet 0/0/0.2
[RouterB-GigabitEthernet0/0/0.2]mpls
[RouterB-GigabitEthernet0/0/0.2]mpls ldp

<RouterB>save
```

Router C

```
<RouterC>system-view
Enter system view, return user view with Ctrl+Z.
[RouterC]undo mpls
[RouterC]undo ip route-static 1.1.1.1 32

[RouterC]ospf 100
[RouterC-ospf-100]area 0
[RouterC-ospf-100-area-0.0.0.0]network 3.3.3.3 0.0.0.0
[RouterC-ospf-100-area-0.0.0.0]network 10.1.2.0 0.0.0.3

[RouterC]mpls
[RouterA-mpls]label advertise non-null
```

```
[RouterC-mpls]mpls ldp
[RouterC-mpls-ldp]interface GigabitEthernet 0/0/0
[RouterC-GigabitEthernet0/0/0]mpls
[RouterC-GigabitEthernet0/0/0]mpls ldp
```

Tablas OSPF y LSPs

Router A

```
<RouterA>display ospf routing

     OSPF Process 100 with Router ID 10.1.1.1
          Routing Tables

 Routing for Network
 Destination        Cost  Type       NextHop         AdvRouter       Area
 1.1.1.1/32         0     Stub       1.1.1.1         10.1.1.1
0.0.0.0
 10.1.1.0/30        1     Transit    10.1.1.1        10.1.1.1
0.0.0.0
 2.2.2.2/32         1     Stub       10.1.1.2        2.2.2.2
0.0.0.0
 3.3.3.3/32         2     Stub       10.1.1.2        10.1.2.2
0.0.0.0
 10.1.2.0/30        2     Transit    10.1.1.2        10.1.2.2
0.0.0.0

 Total Nets: 5
 Intra Area: 5  Inter Area: 0  ASE: 0  NSSA: 0

<RouterA>display mpls lsp
------------------------------------------------------------------------------
----
                  LSP Information: LDP LSP
------------------------------------------------------------------------------
----
FEC                 In/Out Label  In/Out IF                      Vrf Name
1.1.1.1/32          1024/NULL     -/-
2.2.2.2/32          NULL/1025     -/GE0/0/0
2.2.2.2/32          1025/1025     -/GE0/0/0
3.3.3.3/32          NULL/1026     -/GE0/0/0
3.3.3.3/32          1026/1026     -/GE0/0/0

<RouterA>display mpls route-state
Codes: B(BGP), I(IGP), L(Public Label BGP), O(Original BGP), U(Unknow)
------------------------------------------------------------------------------
-----
Dest/Mask           Next-Hop        Out-Interface              State LSP VRF
Type
------------------------------------------------------------------------------
-----
```

```
1.1.1.1/32         127.0.0.1       InLoop0                    READY 1   0
I

2.2.2.2/32         10.1.1.2        GE0/0/0                    READY 2   0
I

3.3.3.3/32         10.1.1.2        GE0/0/0                    READY 2   0
I
```

Router B

```
<RouterB>display ospf routing

     OSPF Process 100 with Router ID 2.2.2.2
          Routing Tables

 Routing for Network
 Destination        Cost  Type       NextHop         AdvRouter       Area
 2.2.2.2/32         0     Stub       2.2.2.2         2.2.2.2
0.0.0.0
 10.1.1.0/30        1     Transit    10.1.1.2        2.2.2.2
0.0.0.0
 10.1.2.0/30        1     Transit    10.1.2.1        2.2.2.2
0.0.0.0
 1.1.1.1/32         1     Stub       10.1.1.1        10.1.1.1
0.0.0.0
 3.3.3.3/32         1     Stub       10.1.2.2        10.1.2.2
0.0.0.0

 Total Nets: 5
 Intra Area: 5  Inter Area: 0  ASE: 0  NSSA: 0

<RouterB>display mpls lsp
------------------------------------------------------------------------------
----
                  LSP Information: LDP LSP
------------------------------------------------------------------------------
----
FEC                In/Out Label  In/Out IF                      Vrf Name
1.1.1.1/32         NULL/1024     -/GE0/0/0.1
1.1.1.1/32         1024/1024     -/GE0/0/0.1
2.2.2.2/32         1025/NULL     -/-
3.3.3.3/32         NULL/1026     -/GE0/0/0.2
3.3.3.3/32         1026/1026     -/GE0/0/0.2

<RouterB>display mpls route-state
Codes: B(BGP), I(IGP), L(Public Label BGP), O(Original BGP), U(Unknow)
------------------------------------------------------------------------------
-----
Dest/Mask          Next-Hop        Out-Interface              State LSP VRF
```

```
Type
------------------------------------------------------------------------------
-----

1.1.1.1/32         10.1.1.1        GE0/0/0.1                   READY 2   0
I
2.2.2.2/32         127.0.0.1       InLoop0                     READY 1   0
I
3.3.3.3/32         10.1.2.2        GE0/0/0.2                   READY 2   0
I
```

Router C

```
<RouterC>display ospf routing

     OSPF Process 100 with Router ID 10.1.2.2
          Routing Tables

 Routing for Network
 Destination        Cost  Type       NextHop         AdvRouter       Area
 3.3.3.3/32         0     Stub       3.3.3.3         10.1.2.2
0.0.0.0
 10.1.2.0/30        1     Transit    10.1.2.2        10.1.2.2
0.0.0.0
 1.1.1.1/32         2     Stub       10.1.2.1        10.1.1.1
0.0.0.0
 2.2.2.2/32         1     Stub       10.1.2.1        2.2.2.2
0.0.0.0
 10.1.1.0/30        2     Transit    10.1.2.1        10.1.1.1
0.0.0.0

 Total Nets: 5
 Intra Area: 5  Inter Area: 0  ASE: 0  NSSA: 0

<RouterC>display mpls lsp
------------------------------------------------------------------------------
----
                 LSP Information: LDP LSP
------------------------------------------------------------------------------
----
FEC                In/Out Label  In/Out IF                      Vrf Name
1.1.1.1/32         NULL/1024     -/GE0/0/0
1.1.1.1/32         1024/1024     -/GE0/0/0
2.2.2.2/32         NULL/1025     -/GE0/0/0
2.2.2.2/32         1025/1025     -/GE0/0/0
3.3.3.3/32         1026/NULL     -/-

<RouterB>display mpls route-state
Codes: B(BGP), I(IGP), L(Public Label BGP), O(Original BGP), U(Unknow)
------------------------------------------------------------------------------
-----
```

```
Dest/Mask          Next-Hop        Out-Interface              State LSP VRF
Type
-------------------------------------------------------------------------
-----

1.1.1.1/32         10.1.1.1        GE0/0/0.1                  READY 2   0
I
2.2.2.2/32         127.0.0.1       InLoop0                    READY 1   0
I
3.3.3.3/32         10.1.2.2        GE0/0/0.2                  READY 2   0
I

<RouterC>display mpls route-state
Codes: B(BGP), I(IGP), L(Public Label BGP), O(Original BGP), U(Unknow)
-------------------------------------------------------------------------
-----
Dest/Mask          Next-Hop        Out-Interface              State LSP VRF
Type
-------------------------------------------------------------------------
-----

1.1.1.1/32         10.1.2.1        GE0/0/0                    READY 2   0
I

2.2.2.2/32         10.1.2.1        GE0/0/0                    READY 2   0
I

3.3.3.3/32         127.0.0.1       InLoop0                    READY 1   0
I
```

LSPs generados (6)

```
R1 ------------------- R2 ------------------- R3
          '1026'                 '1026'
 |---------------------------------------->
          '1024'                 '1024'
 <----------------------------------------|
          '1025'                 '1025'
 |---------------------><---------------------|
          '1024'                 '1026'
 <---------------------||--------------------->
```

Ping Router A al Router C

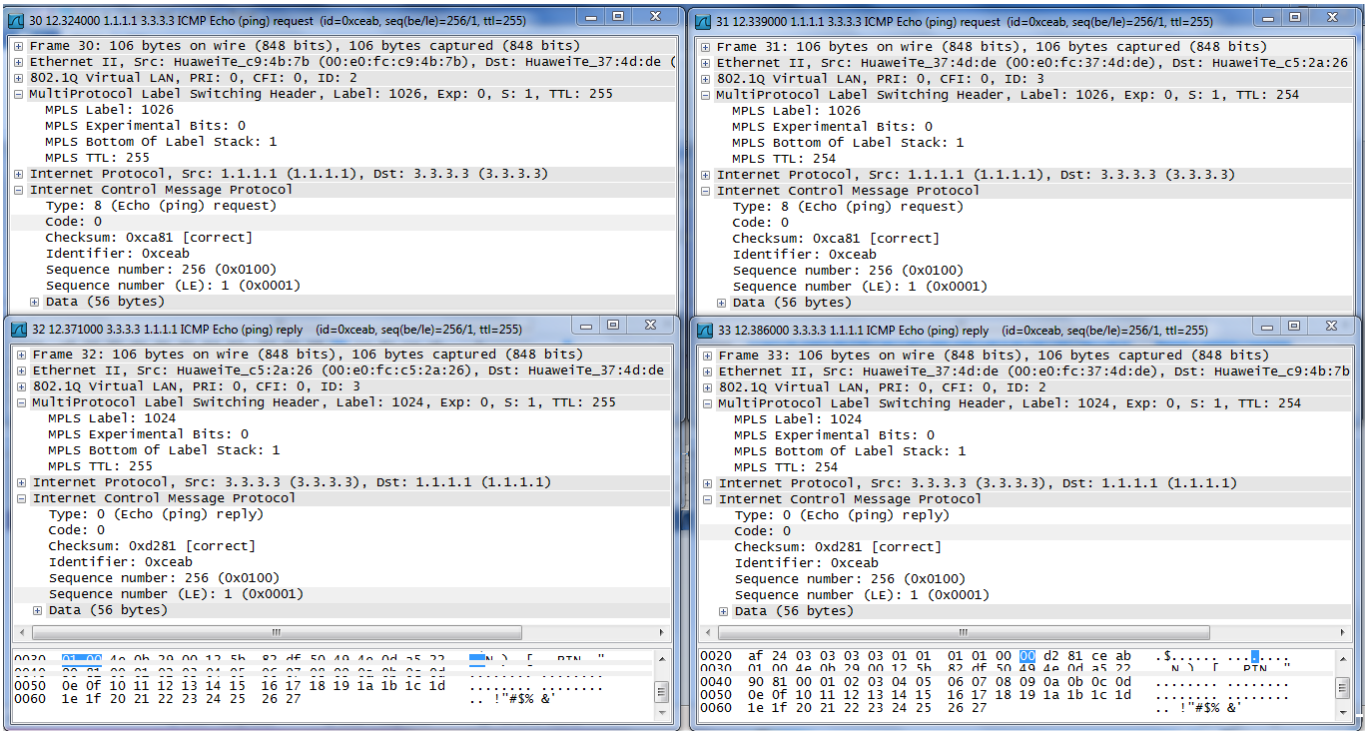
```
<RouterA>ping -a 1.1.1.1 3.3.3.3
  PING 3.3.3.3: 56  data bytes, press CTRL_C to break
    Reply from 3.3.3.3: bytes=56 Sequence=1 ttl=254 time=100 ms
    Reply from 3.3.3.3: bytes=56 Sequence=2 ttl=254 time=100 ms
    Reply from 3.3.3.3: bytes=56 Sequence=3 ttl=254 time=110 ms
```

```
Reply from 3.3.3.3: bytes=56 Sequence=4 ttl=254 time=90 ms
Reply from 3.3.3.3: bytes=56 Sequence=5 ttl=254 time=90 ms

--- 3.3.3.3 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 90/98/110 ms
```

Paquetes capturados con Wireshark en Router B

No.	Time	Source	Destination	Protocol	Info
30	12.324000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=256/1, ttl=255)
31	12.339000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=256/1, ttl=255)
32	12.371000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=256/1, ttl=255)
33	12.386000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=256/1, ttl=255)
34	12.839000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=512/2, ttl=255)
35	12.839000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=512/2, ttl=255)
36	12.885000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=512/2, ttl=255)
37	12.901000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=512/2, ttl=255)
38	13.353000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=768/3, ttl=255)
39	13.369000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=768/3, ttl=255)
40	13.400000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=768/3, ttl=255)
41	13.400000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=768/3, ttl=255)
42	13.853000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=1024/4, ttl=255)
43	13.837000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=1024/4, ttl=255)
44	13.884000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=1024/4, ttl=255)
45	13.884000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=1024/4, ttl=255)
47	14.336000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=1280/5, ttl=255)
48	14.336000	1.1.1.1	3.3.3.3	ICMP	Echo (ping) request (id=0xceab, seq(be/le)=1280/5, ttl=255)
49	14.367000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=1280/5, ttl=255)
50	14.383000	3.3.3.3	1.1.1.1	ICMP	Echo (ping) reply (id=0xceab, seq(be/le)=1280/5, ttl=255)



Los routers utilizan los dos primeros LSPs