

Module 3a – MPLS/LDP Configuration Lab

Objective: All the routers are pre-configured with basic interface and OSPF configuration according to the following topology diagram. As part of the exercise, you will need to enable MPLS LDP and observe its operation.

Prerequisites: Knowledge of IGP and routing.

The following will be the common topology and IP address plan used for this lab.

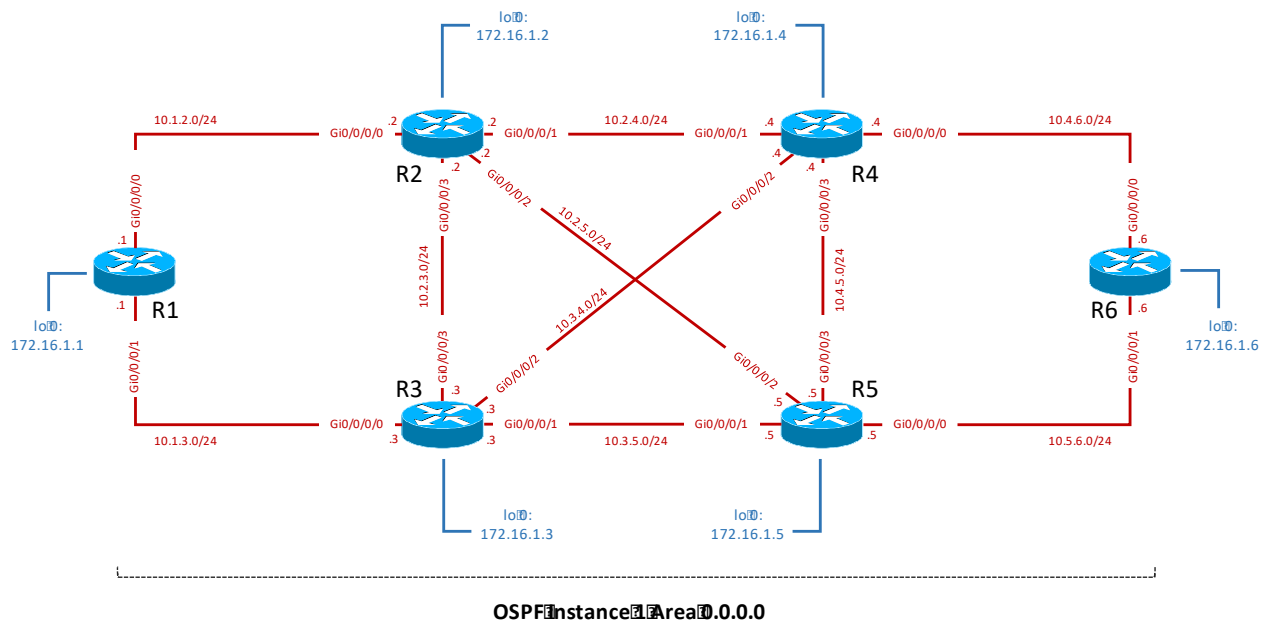


Figure 1 – MPLS LDP Lab Base Configuration

Lab Notes

The basic MPLS LDP lab topology comprises of 6 routers: R1, R2, R3, R4, R5 and R6. Multiple sets of identical topologies will be used. Workshop attendees will be split up into groups of 6 where each group member will be responsible for the configuration of a specific router.

All routers are running Cisco IOS-XRv 6.1.2 within GNS3. Login credentials are:

Username: cisco

Password: cisco

Please spend some time to be familiar with the network topology and addressing plan before you start building the configuration on the routers.

In module 3 all required configurations are done in a single part.

Base MPLS LDP configuration.

The following figure reflects the base MPLS LDP configuration.

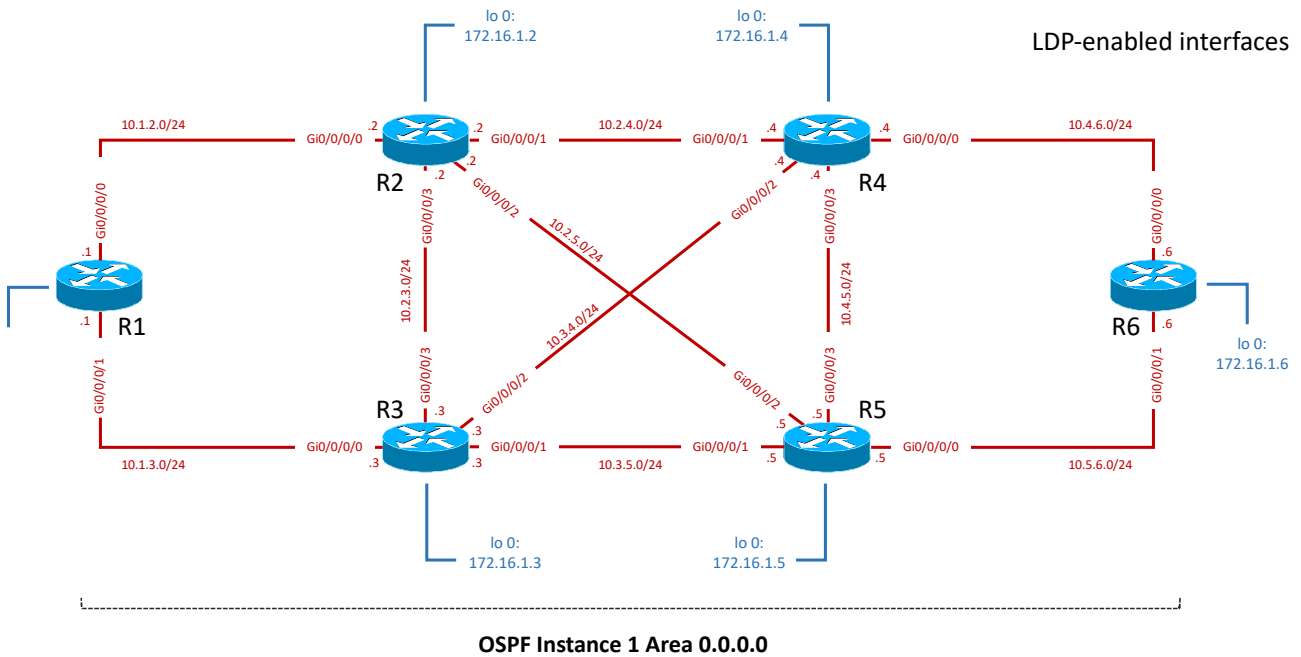


Figure 2 –Base LDP Configuration

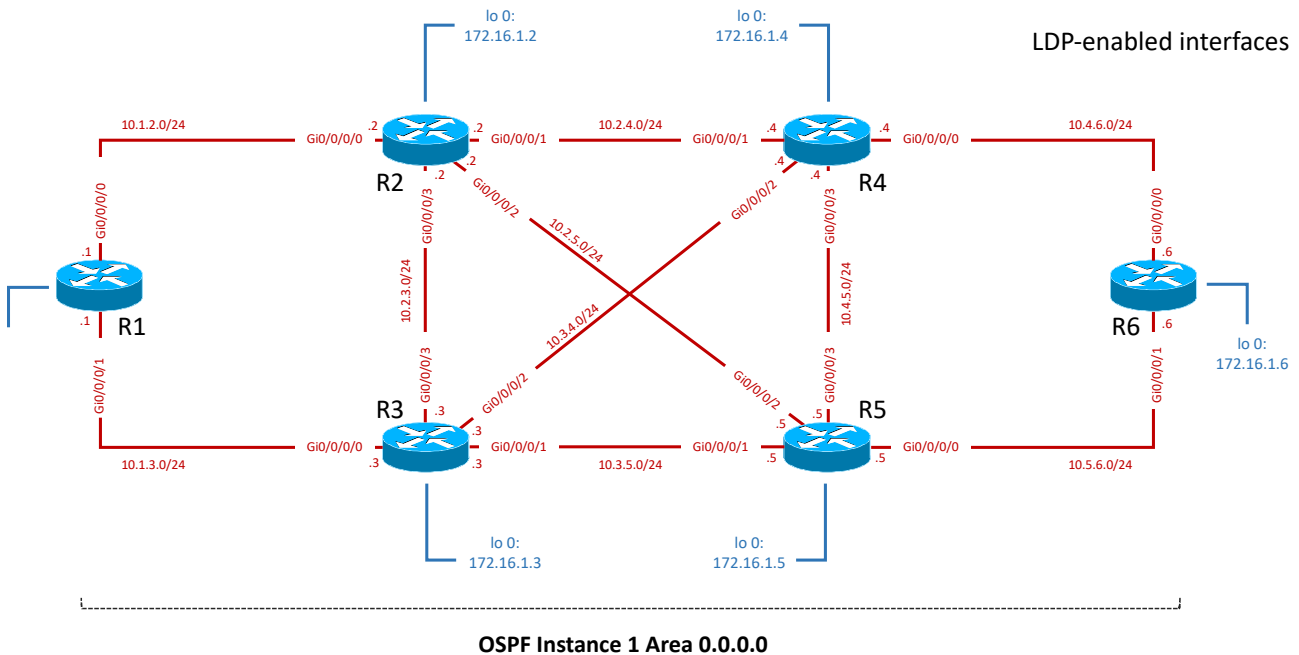
After the base MPLS LDP configuration there will be a number of LDP labels allocated as per the table below:

Loopbacks	Point-to-point
172.16.1.1/32	10.1.2.0/24
172.16.1.2/32	10.1.3.0/24
172.16.1.3/32	10.2.3.0/24
172.16.1.4/32	10.2.4.0/24
172.16.1.5/32	10.2.5.0/24
172.16.1.6/32	10.3.4.0/24
	10.3.5.0/24
	10.4.5.0/24
	10.4.6.0/24
	10.5.6.0/24

Lab Exercise

1. Base MPLS LDP configuration:

The following figure reflects the base MPLS LDP configuration.



Here is an example configuration for R1

```

config t
mpls label range table 0 16000 16999
! Configure a label range that can be easily identifiable for verification purposes

mpls ldp
router-id 172.16.1.1
! Enable LDP and set the LDP router ID to be the loopback address. PLEASE CHANGE THE
LOOPBACK ADDRESS TO CORRESPOND TO YOUR ASSIGNED ROUTER

interface GigabitEthernet0/0/0/0
!
interface GigabitEthernet0/0/0/1
! Enable LDP on all the relevant interfaces

end
  
```

Please wait for all routers in your group to be configured before you issue the following verification commands. Please also do not move to the next part until advised to do so by your instructors.

Verify your configuration:

Use the following commands to verify the operation of MPLS LDP:

```
show mpls label range
```

! Display the router's MPLS label range

```
show mpls ldp interface
```

! Display the router's LDP interfaces

```
show mpls ldp neighbor
```

! Display the router's LDP neighbours

```
show mpls ldp bindings brief
```

! Display and analyse all LDP label bindings

```
show mpls ldp forwarding
```

```
show mpls forwarding
```

```
show mpls label table detail
```

! Display and analyse the label forwarding table

```
show ip cef 172.16.1.6/32
```

! Display CEF entry for a loopback address for a router other than your own

```
ping mpls ipv4 172.16.1.6/32
```

! Ping a loopback address FEC for a router other than your own.

```
trace mpls ipv4 172.16.1.6/32
```

! Trace a loopback address FEC for a router other than your own.

Workshop templates for reference purpose only:

R1

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.1
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.6/32
ping mpls ipv4 172.16.1.6/32
trace mpls ipv4 172.16.1.6/32
```

R2

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.2
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
interface GigabitEthernet0/0/0/2
interface GigabitEthernet0/0/0/3
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.6/32
ping mpls ipv4 172.16.1.6/32
trace mpls ipv4 172.16.1.6/32
```

R3

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.3
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
interface GigabitEthernet0/0/0/2
interface GigabitEthernet0/0/0/3
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.6/32
ping mpls ipv4 172.16.1.6/32
trace mpls ipv4 172.16.1.6/32
```

R4

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.4
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
interface GigabitEthernet0/0/0/2
interface GigabitEthernet0/0/0/3
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.6/32
ping mpls ipv4 172.16.1.1/32
trace mpls ipv4 172.16.1.1/32
```


R5

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.5
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
interface GigabitEthernet0/0/0/2
interface GigabitEthernet0/0/0/3
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.6/32
ping mpls ipv4 172.16.1.1/32
trace mpls ipv4 172.16.1.1/32
```

R6

Base MPLS LDP configuration

```
config t
mpls label range table 0 16000 16999
mpls ldp
router-id 172.16.1.6
interface GigabitEthernet0/0/0/0
interface GigabitEthernet0/0/0/1
end
```

Verification Commands:

```
show mpls label range
show mpls ldp interface
show mpls ldp neighbor
show mpls ldp bindings brief
show mpls ldp forwarding
show mpls forwarding
show mpls label table detail
show ip cef 172.16.1.1/32
ping mpls ipv4 172.16.1.1/32
trace mpls ipv4 172.16.1.1/32
```