Module 11a – MPLS VPWS Configuration Lab (LDP)

Objective: All the routers are pre-configured with basic interface, OSPF, BGP, MPLS Label Distribution Protocol (LDP) configuration according the following topology diagram. Required LSPs are already built among the loopback interfaces of all the infrastructure routers. Need to configure MPLS VPWS from one side CPE routers to the other side CPE routers. This LAB module is using LDP as VPWS signal protocol and after finishing the MPLS VPWS configuration you can ping from one CE router to the other side CE router of the Layer 2 VPN tunnel. Please notice CPE side LAN IP address and it has been changed from the previous lab exercises.

Prerequisites: Knowledge of IGP, EGP, MPLS, LDP and MPLS VPWS are required.

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

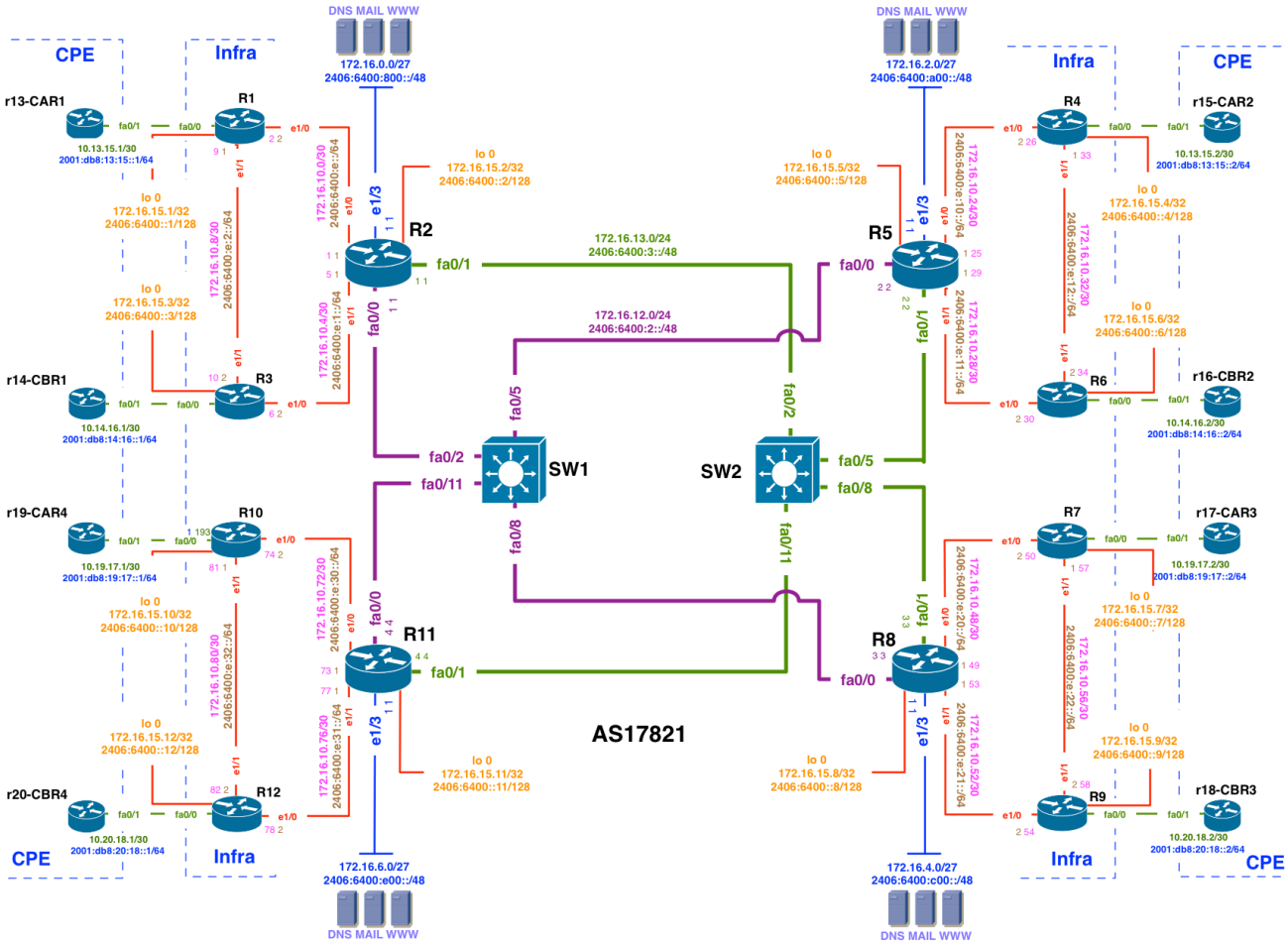

Figure 1 – ISP Lab Basic Configuration

Lab Notes

Out of all 20 routers on the above lab topology R1, R3, R4, R6, R7, R9, R10, R12 are PE (LER) routers. R2, R5, R8, R11 are P (LSR) routers and R13-20 are CE routers.

On this module, participants need to configure MPLS VPWS (signalled by LDP)

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Please spend some time to be familiar with the network topology and addressing plan.

Point-to-Point L2VPN will be set up between following routers:

1. r13-CAR1 ⇔ r15-CAR2
2. r14-CBR1 ⇔ r16-CBR2
3. r19-CAR4 ⇔ r17-CAR3
4. r20-CBR4 ⇔ r18-CBR3

Lab Exercise

1. PW and AC Configuration on PE routers:

Here is an example of PW and AC configuration for router R1:

```
config t
pseudowire-class R1_R4_CLASS
```

Create a pseudowire class that consists of configuration settings used by all the attachment circuits bound to the class.

```
encapsulation mpls
```

Specify the tunneling encapsulation of the pseudowire-class.

```
interworking Ethernet
```

Specify the type of pseudowire and the type of traffic that can flow across it.

```
exit
interface fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.4 1315 encapsulation mpls pw-class R1_R4_CLASS
```

Bind an attachment circuit to the created a pseudowire, use the **pw-class** parameter to specify the pseudowire class. Remote PE is 172.16.15.4, VC ID is 1315. VC ID of the both sides should be the same for one PW.

```
end
wr
```

2. Interface IP Address Configuration on CE routers:

Here is an example of interface IP address configuration for router R13:

```
config t
interface fa0/1
description Upstream L2VPN-R13-R15
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.13.15.1 255.255.255.252
ipv6 address 2001:db8:13:15::1/64
no shutdown
```

```
exit
exit
wr
```

Verify your VPWS configuration:

Command to show all the interfaces configured with MPLS and relevant protocol:

`show mpls ldp neighbor` [To display the status of Label Distribution Protocol (LDP) sessions.]

`show mpls l2transport binding` [To display virtual circuit (VC) label binding information.]

`show mpls l2transport vc` [To display information about Any Transport over MPLS (AToM) virtual circuits (VCs) and static pseudowires that have been enabled to route Layer 2 packets on a router.]

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Workshop templates for reference purpose only:

Xconnect R13 to R15

R1

```
config t
pseudowire-class R1_R4_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.4 1315 encapsulation mpls pw-class R1_R4_CLASS
end
wr
```

R4

```
config t
pseudowire-class R1_R4_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.1 1315 encapsulation mpls pw-class R1_R4_CLASS
end
wr
```

R13

```
config t
interface fa0/1
description Upstream L2VPN-R13-R15
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.13.15.1 255.255.255.252
ipv6 address 2001:db8:13:15::1/64
no shutdown
exit
exit
wr
```

R15

```
config t
interface fa0/1
description Upstream L2VPN-R13-R15
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
```

```
no ipv6 address
ip address 10.13.15.2 255.255.255.252
ipv6 address 2001:db8:13:15::2/64
no shutdown
exit
exit
wr
```


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Xconnect R14 to R16

R3

```
config t
pseudowire-class R3_R6_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.6 1416 encapsulation mpls pw-class R3_R6_CLASS
end
wr
```

R6

```
config t
pseudowire-class R3_R6_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.3 1416 encapsulation mpls pw-class R3_R6_CLASS
end
wr
```

R14

```
config t
interface fa0/1
description Upstream L2VPN-R14-R16
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.14.16.1 255.255.255.252
ipv6 address 2001:db8:14:16::1/64
no shutdown
exit
exit
wr
```

R16

```
config t
interface fa0/1
description Upstream L2VPN-R14-R16
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.14.16.2 255.255.255.252
ipv6 address 2001:db8:14:16::2/64
no shutdown
```

```
exit
exit
wr
```


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Xconnect R19 to R17

R10

```
config t
pseudowire-class R10_R7_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.7 1917 encapsulation mpls pw-class R10_R7_CLASS
end
wr
```

R7

```
config t
pseudowire-class R10_R7_CLASS
encapsulation mpls
interworking ethernet
exit
int fa0/0
no ip address
no ipv6 address
xconnect 172.16.15.10 1917 encapsulation mpls pw-class R10_R7_CLASS
end
wr
```

R19

```
config t
interface fa0/1
description Upstream L2VPN-R19-R17
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.19.17.1 255.255.255.252
ipv6 address 2001:db8:19:17::1/64
no shutdown
exit
exit
wr
```

R17

```
config t
interface fa0/1
description Upstream L2VPN-R19-R17
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.19.17.2 255.255.255.252
ipv6 address 2001:db8:19:17::2/64
no shutdown
exit
```

```
exit
wr
```


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Xconnect R20 to R18

R12

```
config t
pseudowire-class R12_R9_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.9 2018 encapsulation mpls pw-class R12_R9_CLASS
end
wr
```

R9

```
config t
pseudowire-class R12_R9_CLASS
encapsulation mpls
interworking ethernet
exit
int fastEthernet 0/0
no ip address
no ipv6 address
xconnect 172.16.15.12 2018 encapsulation mpls pw-class R12_R9_CLASS
end
wr
```

R20

```
config t
interface fa0/1
description Upstream L2VPN-R20-R18
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.20.18.1 255.255.255.252
ipv6 address 2001:db8:20:18::1/64
no shutdown
exit
exit
wr
```

R18

```
config t
interface fa0/1
description Upstream L2VPN-R20-R18
no ip redirects
no ip directed-broadcast
no ip unreachables
no ip address
no ipv6 address
ip address 10.20.18.2 255.255.255.252
ipv6 address 2001:db8:20:18::2/64
no shutdown
exit
```

```
exit
wr
```


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