



2.3. Configure and verify Layer 2 discovery protocols (Cisco Discovery Protocol and LLDP)

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2.4. Configure and verify (Layer 2/Layer3) EtherChannel (LACP)

Objective:

Configure and verify Layer 2 discovery protocols (CDP and LLDP) and set up an EtherChannel using LACP between two switches and two routers.

Topology

- **Router1** and **Router2** are connected via interfaces Gig0/0/0-1 ↔ Gig0/0/0-1.
- **Router1** connected to **Core1** via interface Gig0/0/2 ↔ Gig0/2.
- **Core1** connected to **Core2** via interfaces Fa0/23-24 ↔ Fa0/23-24.
- **Core1** & **Core2** connected to their Switches via interface Fa0/21 & Fa0/22
- All Switches connected to their Core switch via interface Fa0/22
- All switches connected to their neighboring switch via interface Fa0/23 & Fa0/24
- **PC1 (Engineering – VLAN 10) ↔ IP Phone (Voice - VLAN 30) on Switch1 Fa0/1**
- **PC2 (Engineering - VLAN 10) ↔ IP Phone (Voice - VLAN 30) on Switch2 Fa0/1**
- **PC3 (Sales VLAN 20) ↔ IP Phone (Voice - VLAN 30) on Switch2 Fa0/1**
- **PC4 (Sales VLAN 20) ↔ IP Phone (Voice - VLAN 30) on Switch2 Fa0/1**

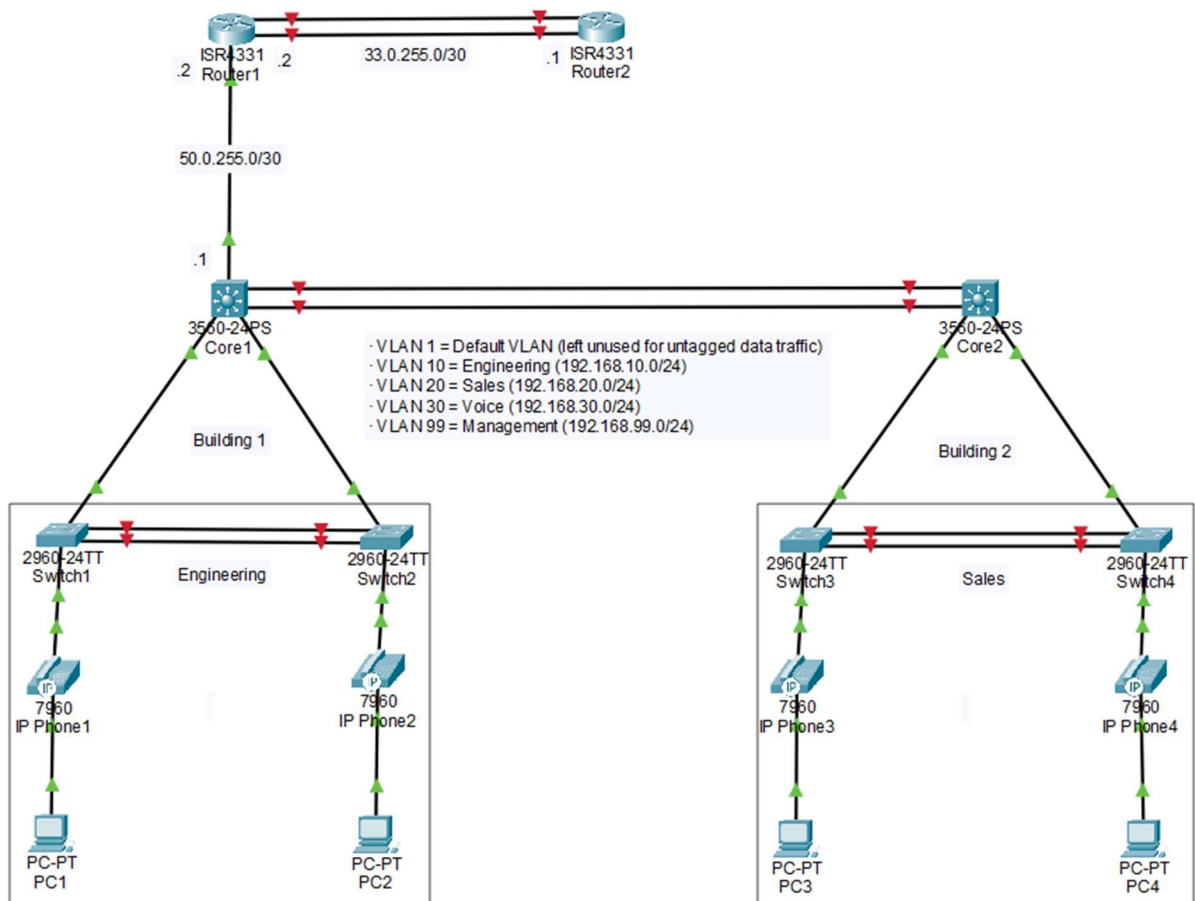
NOTE: Cisco Discovery Protocol (CDP) is enabled on network devices by default. For this scenario, when the network was deployed, CDP was disabled on all network

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devices. VLANs and their default gateways, and static routing for routers have also already been pre-configured. Those topics are covered in other labs.

VLAN Assignment

- **VLAN 1** = Default VLAN (left unused)
- **VLAN 10** = **Engineering** (192.168.10.0/24)
- **VLAN 20** = **Sales** (192.168.20.0/24)
- **VLAN 30** = **Voice** (192.168.30.0/24)
- **VLAN 99** = **Management** (192.168.99.0/24) (**Native VLAN/Management**)



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Lab Tasks

Step 1 – Create EtherChannel on Switch1 and Switch2 Using LACP:

- Use interface Fa0/23 & Fa0/24 on Switch1 and Switch2
- Trunk Port-Channel since there are multiple VLANs on this network
- Assign VLAN 99 as the native VLAN on the Port-Channel
- Once EtherChannel is created, bring up links on both switches
- Use 'Show' command to verify EtherChannel

NOTE: Repeat step 1 on Switch2 to complete aggregated link between Switch1 and Switch2. Then repeat on Switch3 and Switch4 to create their aggregated link.

Step 2 – Create EtherChannel between Core1 and Core2:

- Use interface Fa0/23 & Fa0/24 on Core1 and Core2
- Trunk Port-Channel since there are multiple VLANs on this network
- Assign VLAN 99 as the native VLAN on the Port-Channel
- Once EtherChannel is created, bring up links on both switches
- Use 'Show' command to verify EtherChannel
- Verify connectivity to 'Building 2' by pinging both Sales PC's from PC1 and PC2

Step 3 – Configure and Verify L3 EtherChannel:

Note: On routers, port-channels need to be created first, THEN interfaces can be aggregated.

- Create port-channel on Router1
- Use interface's Gig0/0/0 and Gig0/0/1 to assign the port-channel you created
- Assign IP address 33.0.255.2 255.255.255.252 to the port-channel interface created on Router1
- Bring up interfaces

- Do the same on Router2, BUT assign IP address 33.0.255.1 255.255.255.252 to that port-channel

Step 4 – Configure CDP and LLDP:

- On Router 2, disable CDP and LLDP globally
- On Router1, enable CDP on interface G0/0/2 **ONLY**. Disable LLDP globally
- On Core1 **AND** Core2, enable CDP **AND** LLDP globally
- On all switches, disable LLDP globally
- On Switch1 **AND** Switch2, enable CDP globally **EXCEPT** on their Fa0/1 interface
- On Switch3 **AND** Switch4, enable CDP **AND** LLDP globally
- Use 'Show' commands to verify proper configuration

Note: CDP updates by default every 60 seconds, while LLDP updates every 30 seconds by default, though these intervals can be adjusted by network administrators. LLDP also uses a hold time to determine how long a device should hold the received information before discarding it, with a default of 120 seconds, and a reinitialization delay, with a default of 2 seconds.

Step 5 – Verify Connectivity:

Note: All PC's have been pre-configured with IP addresses and default gateways. Router1 and Router2 have been pre-configured with loopback addresses. Static routes have also been pre-configured, so no additional configurations should be needed.

- Verify that all PC's can ping their default gateways and each other
- Verify that a PC from each building can reach outside of the network by pinging Router1's loopback address of 1.1.1.1 **AND** Router2's loopback of 2.2.2.2.

ANSWERS BEYOND THIS POINT.
LET'S SEE HOW YOU DID!.....

Solution Key

Step 1 – Create EtherChannel on Switch1 and Switch2 Using LACP:

```
Switch1> enable
```

```
Switch1# configure terminal
```

```
Switch1(config)# interface range fa0/23-24
```

```
Switch1(config-if-range)# channel-group 1 mode active
```

```
Switch1(config-if)# no shut
```

```
Switch1(config-if-range)# exit
```

```
Switch1(config)# interface port-channel 1
```

```
Switch1(config-if)# switchport mode trunk
```

```
Switch1(config-if)# switchport trunk native vlan 99
```

```
Switch1(config-if)# end
```

```
Switch1# show etherchannel summary
```

```
Switch1#show etherchannel summary
Flags:  D - down          P - in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port
```

```
Number of channel-groups in use: 1
Number of aggregators:          1
```

Group	Port-channel	Protocol	Ports
1	Po1 (SD)	LACP	Fa0/23 (D) Fa0/24 (D)

```
Switch1#
```

Step 2 – Create EtherChannel between Core1 and Core2:

```
Core1> enable
```

```
Core1# configure terminal
```

```
Core1(config)# interface range fa0/23-24
```

```
Core1(config-if-range)# channel-group 1 mode active

Core1(config-if)# no shut

Core1(config-if-range)# exit

Core1(config)# interface port-channel 1

Core1(config-if)# switchport trunk encapsulation dot1q

Core1(config-if)# switchport mode trunk

Core1(config-if)# switchport trunk native vlan 99

Core1(config-if)# end

Core1# show etherchannel summary
```

```
Core1#show etherchannel summary
Flags:  D - down          P - in port-channel
        I - stand-alone  s - suspended
        H - Hot-standby  (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

Number of channel-groups in use: 1
Number of aggregators:          1

Group  Port-channel  Protocol    Ports
-----+-----+-----+-----
1      Po1(SD)        LACP       Fa0/23(I) Fa0/24(I)
```

- Repeat steps above on Core2 to complete aggregated link between Core1 and Core2.
- Verify connectivity to 'Building 2' by pinging both Sales PC's from PC1 and PC2

```
C:\>ping 192.168.20.13

Pinging 192.168.20.13 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.13: bytes=32 time<1ms TTL=127
Reply from 192.168.20.13: bytes=32 time<1ms TTL=127
Reply from 192.168.20.13: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.20.13:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.20.14

Pinging 192.168.20.14 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.14: bytes=32 time=1ms TTL=127
Reply from 192.168.20.14: bytes=32 time<1ms TTL=127
Reply from 192.168.20.14: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.14:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Step 3 – Configure and Verify L3 EtherChannel:

Router1> enable

Router1# configure terminal

Router1(config)# port-channel 1

Router1(config)# interface range g0/0/0-1

Router1(config-if-range)# channel-group 1

Router1(config-if-range)# no shut

Router1(config-if-range)# exit

Router1(config)# interface port-channel 1

Router1(config-if)# ip address 33.0.255.2 255.255.255.252

- Repeat these steps on Router2 BUT assign IP address 30.0.255.1 255.255.255.252

Step 4 – Configure CDP and LLDP:

Router2> enable

Router2# configure terminal

Router2(config)# no cdp run

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Router2(config)# no lldp run

Router1> enable

Router1# configure terminal

Router1(config)# no lldp run

Router1(config)# cdp run

Router1(config)# interface range g0/0/0-1

Router1(config-if-range)# no cdp enable

Core1> enable

Core1# configure terminal

Core1(config)# lldp run

Core1(config)# cdp run

- Repeat the steps for Core1 on Core2, Switch3, and Switch4

Switch1> enable

Switch1# configure terminal

Switch1(config)# lldp run

Switch1(config)# cdp run

Switch1(config)# interface fa0/1

Switch1(config-if)# no cdp enable

Switch1(config-if)# no lldp receive

Switch1(config-if)# no lldp transmit

- Repeat the steps for Switch1 on Switch2

Step 5 – Verify Connectivity:

- Verify that all PC's can ping their default gateways and each other
- Verify that a PC from each building can reach outside of the network by pinging Router1's loopback address of 1.1.1.1 **AND** Router2's loopback of 2.2.2.2.

```
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time=1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.10.12

Pinging 192.168.10.12 with 32 bytes of data:

Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128
Reply from 192.168.10.12: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 192.168.20.13

Pinging 192.168.20.13 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.13: bytes=32 time<1ms TTL=127
Reply from 192.168.20.13: bytes=32 time<1ms TTL=127
Reply from 192.168.20.13: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.20.13:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.20.14

Pinging 192.168.20.14 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.14: bytes=32 time=1ms TTL=127
Reply from 192.168.20.14: bytes=32 time<1ms TTL=127
Reply from 192.168.20.14: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.14:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
C:\>ping 1.1.1.1

Pinging 1.1.1.1 with 32 bytes of data:

Reply from 1.1.1.1: bytes=32 time<1ms TTL=254
Reply from 1.1.1.1: bytes=32 time=1ms TTL=254
Reply from 1.1.1.1: bytes=32 time<1ms TTL=254
Reply from 1.1.1.1: bytes=32 time<1ms TTL=254

Ping statistics for 1.1.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 2.2.2.2

Pinging 2.2.2.2 with 32 bytes of data:

Reply from 2.2.2.2: bytes=32 time<1ms TTL=253
Reply from 2.2.2.2: bytes=32 time<1ms TTL=253
Reply from 2.2.2.2: bytes=32 time<1ms TTL=253
Reply from 2.2.2.2: bytes=32 time<1ms TTL=253

Ping statistics for 2.2.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```