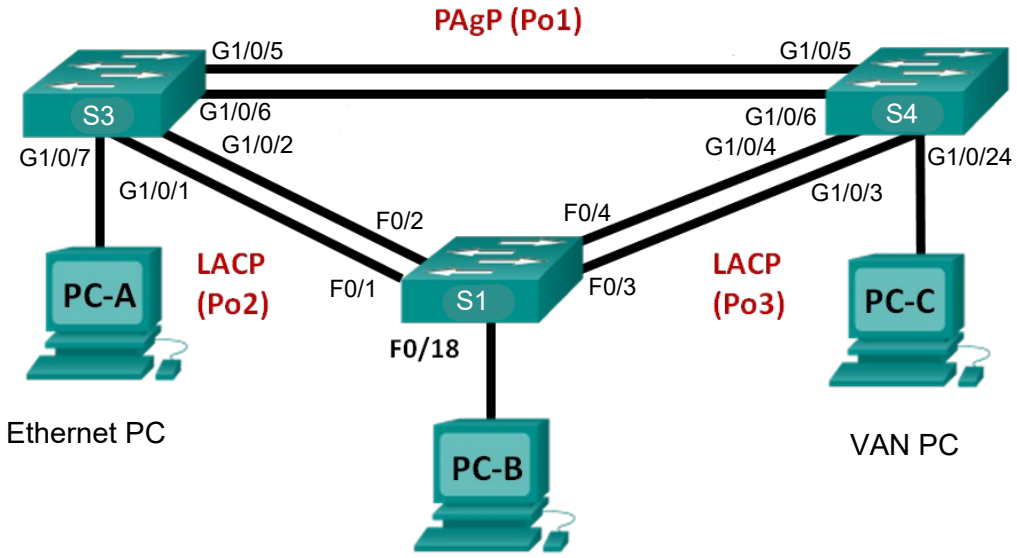
Lab – Configuring EtherChannel

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask
S1	VLAN 99	192.168.99.11	255.255.255.0
S3	VLAN 99	192.168.99.13	255.255.255.0
S4	VLAN 99	192.168.99.14	255.255.255.0
PC-A	NIC	192.168.10.1	255.255.255.0
PC-B	NIC	192.168.10.2	255.255.255.0
PC-C	NIC	192.168.10.3	255.255.255.0

VLAN Assignments

VLAN	Name
10	Staff
99	Management

Objectives

Part 1: Configure Basic Switch Settings

Part 2: Configure PAgP

Part 3: Configure LACP

Background / Scenario

Link aggregation allows the creation of logical links that are comprised of two or more physical links. This provides increased throughput beyond using only one physical link. Link aggregation also provides redundancy if one of the links fails.

In this lab, you will configure EtherChannel (a form of link aggregation used in switched networks) using both the Port Aggregation Protocol (PAgP) and the Link Aggregation Control Protocol (LACP).

Note: PAgP is a Cisco-proprietary protocol that you can only run on Cisco switches and on switches that are licensed vendors to support PAgP. LACP is a link aggregation protocol that is defined by IEEE 802.3ad, and it is not associated with any specific vendor.

LACP allows Cisco switches to manage Ethernet channels between switches that conform to the 802.3ad protocol. You can configure up to 16 ports to form a channel. Eight of the ports are in active mode and the other eight are in standby mode. When any of the active ports fail, a standby port becomes active. Standby mode works only for LACP, not for PAgP.

Note: Make sure that the switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Required Resources

- 3 Switches
- 3 Virtual PCs (if on-campus)
- Ethernet cables as shown in the topology

Part 1: Configure Basic Switch Settings

In Part 1, you will set up the network topology and configure basic settings, such as the interface IP addresses, device access, and passwords.

Step 1: Initialize and reload the switches.

Step 2: Validate the network topology.

Validate network devices are interconnected as shown in the topology diagram and cabled as necessary.

PCs are included in the topology diagram for your reference only. PCs will not be available when working online.

Step 3: Initialize and reload the switches.

Step 4: Configure basic settings for each switch.

a. Disable DNS lookup.

b. Configure the device name as displayed in the topology.

c. Create a MOTD banner warning users that unauthorized access is prohibited.

d. Configure **logging synchronous** to prevent console message from interrupting command entry.

e. Shut down all switch ports except the ports connected to PCs.

f. Configure VLAN numbers and names as per the configuration table

g. Configure the switch ports with attached hosts as access ports in the **Staff** VLAN.

h. Assign the IP addresses according to the Addressing Table.

Step 5: (on-campus tasks) Configure the PCs.

Assign IP addresses to the PCs according to the Addressing Table.

You may configure PC-B as a second Ethernet Virtual PC if you have access to another computer near you.

Part 2: Configure PAgP

PAgP is a Cisco proprietary protocol for link aggregation. In Part 2, a link between S3 and S4 will be configured using PAgP.

Step 1: Configure PAgP on S3 and S4.

For a link between S3 and S4, configure the ports on S3 with PAgP desirable mode and the ports on S4 with PAgP auto mode. Enable the ports after PAgP modes have been configured.

```
S3(config)# interface range g1/0/5-6
S3(config-if-range)# channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

S3(config-if-range)# no shutdown

S4(config)# interface range g1/0/5-6
S4(config-if-range)# channel-group 1 mode auto
Creating a port-channel interface Port-channel 1

S4(config-if-range)# no shutdown
*Mar  1 00:09:12.792: %LINK-3-UPDOWN: Interface GigabitEthernet0/5, changed state to
up
*Mar  1 00:09:12.792: %LINK-3-UPDOWN: Interface GigabitEthernet0/6, changed state to
up
S4(config-if-range)#
*Mar  1 00:09:15.384: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/5, changed state to up
*Mar  1 00:09:16.265: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/6, changed state to up
S4(config-if-range)#
*Mar  1 00:09:16.357: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up
*Mar  1 00:09:17.364: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1,
changed state to up
*Mar  1 00:09:44.383: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed
state to up
```

Step 2: Examine the configuration on the ports.

Currently the G1/0/5, G1/0/6, and Po1 (Port-channel1) interfaces on both S3 and S4 are in access operational mode with the administrative mode in dynamic auto. Verify the configuration using the **show run interface** *interface-id* and **show interfaces** *interface-id* **switchport** commands, respectively. The example configuration outputs for G1/0/5 on S3 are as follows:

```
S3# show run interface g1/0/5
Building configuration...

Current configuration : 103 bytes
!
interface GigabitEthernet1/0/5
 channel-group 1 mode desirable

S3# show interfaces g1/0/5 switchport
Name: Gi1/0/5
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access (member of bundle Po1)
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL

Protected: false
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
```

Step 3: Verify that the ports have been aggregated.

```
S3# show etherchannel summary
Flags:  D - down        P - bundled 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

        M - not in use, minimum links not met
        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(SU)          PAgP      Gi1/0/5(P)    Gi1/0/6(P)

S4# show etherchannel summary
Flags:  D - down        P - bundled 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

        M - not in use, minimum links not met
        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(SU)          PAgP      Gi1/0/5(P)    Gi1/0/6(P)
```

What do the flags, SU and P, indicate in the Ethernet summary?

SU: The interface is administratively up (S) and operationally up (U), meaning it is fully functional.
P: The interface is a member of a port-channel (EtherChannel).

Step 4: Configure trunk ports.

After the ports have been aggregated, commands applied at the port channel interface affect all the links that were bundled together. Manually configure the Po1 ports on S3 and S4 as trunk ports and assign them to native VLAN 99.

```
S3(config)# interface port-channel 1
S3(config-if)# switchport mode trunk
S3(config-if)# switchport trunk native vlan 99

S4(config)# interface port-channel 1
S4(config-if)# switchport mode trunk
S4(config-if)# switchport trunk native vlan 99
```

Step 5: Verify that the ports are configured as trunk ports.

a. Issue the **show run interface** *interface-id* commands on S3 and S4. What commands are listed for G1/0/5 and G1/0/6 on both switches? Compare the results to the running configuration for the Po1 interface? Record your observation.

switchport mode trunk, switchport trunk native vlan 99

Po1 Interface Config: Inherits trunk settings from member ports (G1/0/5 and G1/0/6). VLAN mismatch warning appeared due to different native VLANs.

b. Issue the **show interfaces trunk** and **show spanning-tree** commands on S3 and S4. What trunk port is listed? What is the native VLAN? What is concluding result from the output?

Trunk Port: Po1 on both switches.Native VLAN: 99 after configuration.Concluding Result: Native VLAN mismatch resolved.

From the **show spanning-tree** output, what is port cost and port priority for the aggregated link?

Port Cost: 4 (1 Gbps default).Port Priority: 128.5 for G1/0/5 and 128.6 for G1/0/6.

Part 3: Configure LACP

LACP is an open source protocol for link aggregation developed by the IEEE. In Part 3, the link between S3 and S1, and the link between S1 and S4 will be configured using LACP. Also, the individual links will be configured as trunks before they are bundled together as EtherChannels.

Step 1: Configure LACP between S3 and S1.

```
S3(config)# interface range g1/0/1-2
S3(config-if-range)# switchport mode trunk
S3(config-if-range)# switchport trunk native vlan 99
S3(config-if-range)# channel-group 2 mode active
Creating a port-channel interface Port-channel 2

S3(config-if-range)# no shutdown

S1(config)# interface range f0/1-2
S1(config-if-range)# switchport mode trunk
S1(config-if-range)# switchport trunk native vlan 99
S1(config-if-range)# channel-group 2 mode passive
Creating a port-channel interface Port-channel 2
```

```
S1(config-if-range)# no shutdown
```

Step 2: Verify that the ports have been aggregated.

What protocol is Po2 using for link aggregation? Which ports are aggregated to form Po2? Record the command used to verify.

LACP. S3: g1/0/1-2 ; S1: f0/1-2

Step 3: Configure LACP between S1 and S4.

a. Configure the link between S1 and S4 as Po3 and use LACP as the link aggregation protocol.

```
S1(config)# interface range f0/3-4
S1(config-if-range)# switchport mode trunk
S1(config-if-range)# switchport trunk native vlan 99
S1(config-if-range)# channel-group 3 mode active
Creating a port-channel interface Port-channel 3
S1(config-if-range)# no shutdown

S4(config)# interface range g1/0/3-4
S4(config-if-range)# switchport mode trunk
S4(config-if-range)# switchport trunk native vlan 99
S4(config-if-range)# channel-group 3 mode passive
Creating a port-channel interface Port-channel 3

S4(config-if-range)# no shutdown
```

b. Verify that the EtherChannel has formed.

Step 4: Verify end-to-end connectivity.

Verify that all switches can ping each other. If not, troubleshoot.

Would PCs be able to ping each other? Yes? No? Why? **yes**

Reflection

What could prevent EtherChannels from forming?

Mismatched Speed/Duplex: Ports must have matching speed and duplex settings.
VLAN Mismatch: Ports must be in the same VLAN or have matching native VLANs.
Different Interface Types: Only the same type of interfaces can be bundled.
Protocol Mismatch: Both sides must use the same EtherChannel protocol (LACP or PAgP).
Incorrect Port Channel Mode: Mismatched port modes (e.g., "on" vs. "desirable").
MTU Size Mismatch: MTU sizes must be the same across links.
STP Inconsistencies: Spanning Tree settings must match.
Incorrect Number of Ports: EtherChannel supports up to 8 ports.
Switch Configuration Issues: Missing configurations or commands.
Hardware Limitations: Some switches may not support EtherChannel.
Port Already in Another EtherChannel: Ports can't be part of multiple EtherChannels.