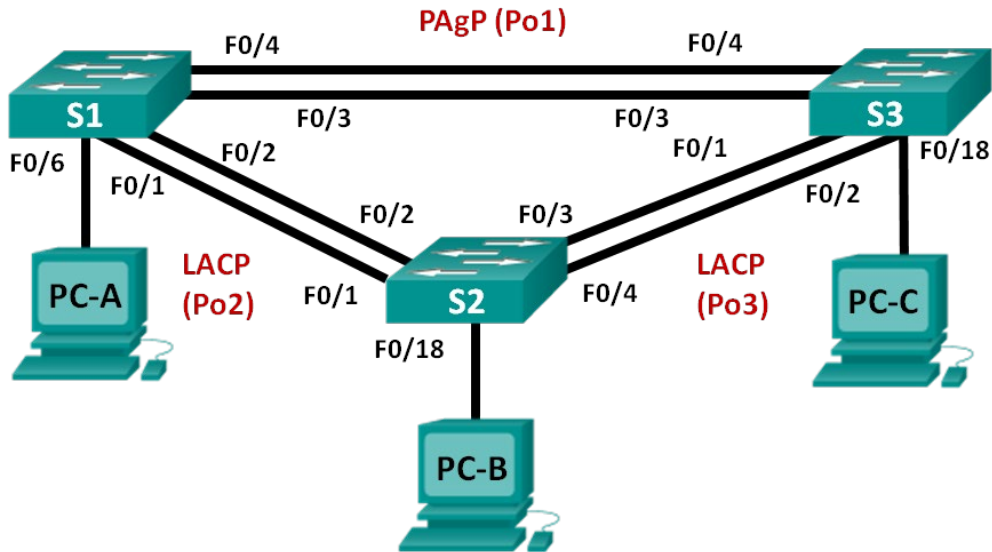


Lab 08 – Configuring EtherChannel

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask
S1	VLAN 99	192.168.99.11	255.255.255.0
S2	VLAN 99	192.168.99.12	255.255.255.0
S3	VLAN 99	192.168.99.13	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

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 comprised of two or more physical links. This provides increased throughput beyond using only one physical link and redundancy if one of the links fails.

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

Note: PAgP is a Cisco-proprietary protocol that can only be run on Cisco switches and switches licensed to support it. LACP is a link aggregation protocol defined by IEEE 802.3ad and 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 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: The switches used with CCNA hands-on labs are Cisco Catalyst 2960s with Cisco IOS Release 15.0(2) (lanbasek9 image). Other switches and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs.

Note: If you are using physical switches, as opposed to a Packet Tracer model, ensure the switches have been erased and have no startup configurations.

Required Resources

- 3 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 3 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- 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: Cable the network as shown in the topology.

Attach the devices as shown in the topology diagram and cable as necessary.

Step 2: Initialize and reload the switches.

Step 3: Configure basic settings for each switch.

Step 4: Configure VLANs and switch ports.

- a. Shut down all switch ports except the ports connected to PCs.
- b. Configure VLAN 99 and name it **Management**.
- c. Configure VLAN 10 and name it **Staff**.
- d. Configure the switch ports with attached hosts as access ports in VLAN 10.
- e. Assign the IP addresses according to the Addressing Table.
- f. Copy the running configuration to the startup configuration.

Step 5: Configure the PCs.

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

Part 2: Configure PAgP

PAgP is a Cisco proprietary protocol for link aggregation. In this part, a link between S1 and S3 will be configured using PAgP.

Step 1: Configure PAgP on S1 and S3.

For a link between S1 and S3, configure the ports on S1 with PAgP desirable mode and the ports on S3 with PAgP auto mode. Then, enable the ports after the PAgP modes have been configured.

```
S1(config)# interface range f0/3-4
S1(config-if-range)# channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

S1(config-if-range)# no shutdown

S3(config)# interface range f0/3-4
S3(config-if-range)# channel-group 1 mode auto
Creating a port-channel interface Port-channel 1

S3(config-if-range)# no shutdown
*Mar 1 00:09:12.792: %LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to up
*Mar 1 00:09:12.792: %LINK-3-UPDOWN: Interface FastEthernet0/4, changed state to up
S3(config-if-range)#
*Mar 1 00:09:15.384: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed
state to up
*Mar 1 00:09:16.265: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed
state to up
S3(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 of the ports.

Currently, the F0/3, F0/4, and Po1 (Port-channel1) interfaces on S1 and S3 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 F0/3 on S1 are as follows:

```
S1# show run interface f0/3
Building configuration...

Current configuration : 103 bytes
!
interface FastEthernet0/3
  channel-group 1 mode desirable
```

```
S1# show interfaces f0/3 switchport
```

```
Name: Fa0/3 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.

```
S1# 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
```

Lab – Configuring EtherChannel

```
Group Port-channel Protocol Ports
-----+-----+-----+-----
1 Po1 (SU) PAgP Fa0/3 (P) Fa0/4 (P)
```

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 Fa0/3 (P) Fa0/4 (P)
```

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

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 S1 and S3 as trunk ports and assign them to native VLAN 99.

```
S1(config)# interface port-channel 1
S1(config-if)# switchport mode trunk
S1(config-if)# switchport trunk native vlan 99
```

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

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

- Issue the **show run interface *interface-id*** commands on S1 and S3. What commands are listed for F0/3 and F0/4 on both switches? Compare the results to the running configuration for the Po1 interface? Record your observation.
-
-

Lab – Configuring EtherChannel

- b. Issue the **show interfaces trunk** and **show spanning-tree** commands on S1 and S3. What trunk port is listed? What is the native VLAN? What is the concluding result from the output?

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

Part 3: Configure LACP

LACP is an open-source protocol for link aggregation developed by the IEEE. In Part 3, the link between S1 and S2 and the link between S2 and S3 will be configured using LACP. The individual links will also be configured as trunks before they are bundled together as EtherChannels.

Step 1: Configure LACP between S1 and S2.

```
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 active
Creating a port-channel interface Port-channel 2
```

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

```
S2(config)# interface range f0/1-2
S2(config-if-range)# switchport mode trunk
S2(config-if-range)# switchport trunk native vlan 99
S2(config-if-range)# channel-group 2 mode passive
Creating a port-channel interface Port-channel 2
```

```
S2(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.

Step 3: Configure LACP between S2 and S3.

- a. Configure the link between S2 and S3 as Po3 and use LACP as the link aggregation protocol.

```
S2(config)# interface range f0/3-4
S2(config-if-range)# switchport mode trunk
S2(config-if-range)# switchport trunk native vlan 99
S2(config-if-range)# channel-group 3 mode active
Creating a port-channel interface Port-channel 3
S2(config-if-range)# no shutdown
```

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```
S3(config)# interface range f0/1-2
S3(config-if-range)# switchport mode trunk
S3(config-if-range)# switchport trunk native vlan 99
S3(config-if-range)# channel-group 3 mode passive
Creating a port-channel interface Port-channel 3
```

```
S3(config-if-range)# no shutdown
```

- b. Verify that the EtherChannel has formed.

Step 4: Verify end-to-end connectivity.

Verify that all devices can ping each other within the same VLAN. If not, troubleshoot until there is end-to-end connectivity.

Note: It may be necessary to disable the PC firewall to ping between PCs.

Reflection

What could prevent EtherChannels from forming?
