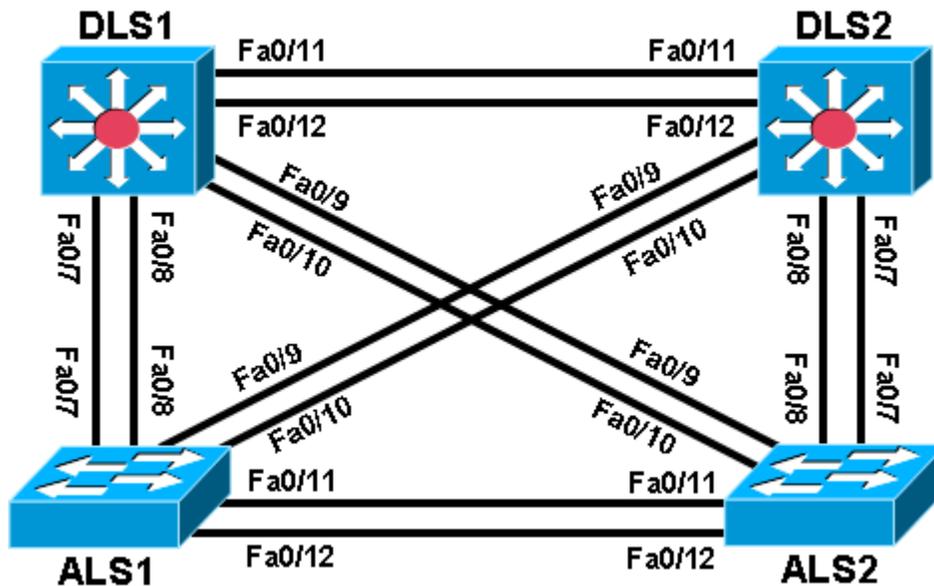


Chapter 2 Lab 2-2, Configuring EtherChannel

Topology



Objective

- Configure EtherChannel.

Background

Four switches have just been installed. The distribution layer switches are Catalyst 3560 switches, and the access layer switches are Catalyst 2960 switches. There are redundant uplinks between the access layer and distribution layer. Usually, only one of these links could be used; otherwise, a bridging loop might occur. However, using only one link utilizes only half of the available bandwidth. EtherChannel allows up to eight redundant links to be bundled together into one logical link. In this lab, you configure Port Aggregation Protocol (PAgP), a Cisco EtherChannel protocol, and Link Aggregation Control Protocol (LACP), an IEEE 802.3ad open standard version of EtherChannel.

Note: This lab uses Cisco WS-C2960-24TT-L switches with the Cisco IOS image c2960-lanbasek9-mz.122-46.SE.bin, and Catalyst 3560-24PS with the Cisco IOS image c3560-advipservicesk9-mz.122-46.SE.bin. You can use other switches (such as a 2950 or 3550) and Cisco IOS Software versions if they have comparable capabilities and features. Depending on the switch model and Cisco IOS Software version, the commands available and output produced might vary from what is shown in this lab.

Required Resources

- 2 switches (Cisco 2960 with the Cisco IOS Release 12.2(46)SE C2960-LANBASEK9-M image or comparable)
- 2 switches (Cisco 3560 with the Cisco IOS Release 12.2(46)SE C3560- ADVIPSERVICESK9-M image or comparable)

- Ethernet and console cables

Step 1: Prepare the switches for the lab.

Delete vlan.dat, erase the startup configuration, and reload all your switches. Refer to Lab 1-1, "Clearing a Switch," and Lab 1-2, "Clearing a Switch Connected to a Larger Network."

Step 2: Configure basic switch parameters.

- Assign each switch a hostname according to the topology diagram.
- Configure ports Fa0/7 through Fa0/12 as trunks. On the 3560 switches, you must first set the trunk encapsulation to 802.1Q. On the 2960s, only dot1q is supported, therefore the **switchport trunk encapsulation** command is unavailable, but the mode still needs to be changed to trunk.

Note: If the ports are configured with dynamic auto mode and you do not set the mode of the ports to trunk, the links do not form trunks and remain access ports. The default mode on a 3560 or 2960 switch is dynamic auto. The default mode on a 3550 or 2950 switch is dynamic desirable.

DLS1 example:

```
DLS1# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
DLS1(config)# interface range fastEthernet 0/7 - 12
DLS1(config-if-range)# switchport trunk encapsulation dot1q
DLS1(config-if-range)# switchport mode trunk
```

Step 3: Configure an EtherChannel with Cisco PAgP.

Note: When configuring EtherChannels, it is a recommended best practice to shutdown the physical ports being grouped on both devices before configuring them into channel groups. Otherwise, the EtherChannel Misconfig Guard may place these ports into err-disabled state. The ports and port channel can be re-enabled after the EtherChannel is configured.

- The first EtherChannel created for this lab aggregates ports Fa0/11 and Fa0/12 between ALS1 and ALS2. Make sure that you have a trunk link active for those two links with the **show interfaces trunk** command.

```
ALS1# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/7	on	802.1q	trunking	1
Fa0/8	on	802.1q	trunking	1
Fa0/9	on	802.1q	trunking	1
Fa0/10	on	802.1q	trunking	1
Fa0/11	on	802.1q	trunking	1
Fa0/12	on	802.1q	trunking	1

<output omitted>

- On both switches, add ports Fa0/11 and Fa0/12 to port channel 1 with the **channel-group 1 mode desirable** command. The **mode desirable** option indicates that you want the switch to actively negotiate to form a PAgP link.

```
ALS1(config)# interface range fastEthernet 0/11 - 12
ALS1(config-if-range)# channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1
```

- c. Configure the logical interface to become a trunk by first entering the **interface port-channel** *number* command and then the **switchport mode trunk** command. Add this configuration to both switches.

```
ALS1(config)# interface port-channel 1
ALS1(config-if)# switchport mode trunk
```

- d. Verify that EtherChannel is working by issuing the **show etherchannel summary** command on both switches. This command displays the type of EtherChannel, the ports utilized, and port states.

```
ALS1# 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(SU)	PAgP	Fa0/11(P) Fa0/12(P)

```
ALS2# 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(SU)	PAgP	Fa0/11(P) Fa0/12(P)

- e. If the EtherChannel does not come up, you might want to try “flapping” the physical interfaces on both ends of the EtherChannel. This involves using the **shut** command on those interfaces, followed by a **no shut** command a few seconds later.

The **show interfaces trunk** and **show spanning-tree** commands also show the port channel as one logical link.

```
ALS1# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/7	on	802.1q	trunking	1
Fa0/8	on	802.1q	trunking	1
Fa0/9	on	802.1q	trunking	1
Fa0/10	on	802.1q	trunking	1
Po1	on	802.1q	trunking	1

<output omitted>

ALS1# **show spanning-tree**

VLAN0001

Spanning tree enabled protocol ieee

```

Root ID      Priority      32769
             Address      0017.5a53.a380
             Cost        19
             Port        9 (FastEthernet0/9)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
    
```

```

Bridge ID    Priority      32769 (priority 32768 sys-id-ext 1)
             Address      001d.4635.0c80
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 300
    
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
Fa0/7	Altn	BLK	19	128.7	P2p
Fa0/8	Altn	BLK	19	128.8	P2p
Fa0/9	Root	FWD	19	128.9	P2p
Fa0/10	Altn	BLK	19	128.10	P2p
Pol	Desg	FWD	12	128.56	P2p

Step 4: Configure an 802.3ad LACP EtherChannel.

- In 2000, the IEEE passed 802.3ad, which is an open standard version of EtherChannel. Using the previous commands, configure the link between DLS1 and ALS1 on ports Fa0/7 and Fa0/8 as an LACP EtherChannel. You must use a different port channel number on ALS1 than 1, because you already used that in the previous step. To configure a port channel as LACP, use the interface-level command **channel-group number mode active**. Active mode indicates that the switch actively tries to negotiate that link as LACP, as opposed to PAgP.

```

ALS1(config)# interface range fastEthernet 0/7 - 8
ALS1(config-if-range)# channel-group 2 mode active
Creating a port-channel interface Port-channel 2
    
```

```

ALS1(config-if-range)# interface port-channel 2
ALS1(config-if)# switchport mode trunk
    
```

- Apply a similar configuration on DLS1. Verify the configuration with the **show etherchannel summary** command.

ALS1# **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: 2
Number of aggregators:          2
    
```

Group	Port-channel	Protocol	Ports	
1	Po1(SU)	PAGP	Fa0/11(P)	Fa0/12(P)
2	Po2(SU)	LACP	Fa0/7(P)	Fa0/8(P)

Step 5: Configure a Layer 3 EtherChannel.

In the previous steps, you configured EtherChannels as Layer 2 trunk connections between switches. You can also configure EtherChannels as Layer 3 (routed) connections on switches that support routed ports. Because DLS1 and DLS2 are both multilayer switches, they can support routed ports.

- Use the **no switchport** command on Fa0/11 and Fa0/12 to make them Layer 3 ports, and then add them to the channel group with the **channel-group number mode desirable** command. On the logical interface, issue the **no switchport** command to make it a Layer 3 port. Add the IP address 10.0.0.1 for DLS1 and 10.0.0.2 for DLS2. Configure both with a /24 subnet mask.

```
DLS1(config)# interface range fastEthernet 0/11 - 12
DLS1(config-if-range)# no switchport
DLS1(config-if-range)# channel-group 3 mode desirable
Creating a port-channel interface Port-channel 3
DLS1(config-if-range)# interface port-channel 3
DLS1(config-if)# no switchport
DLS1(config-if)# ip address 10.0.0.1 255.255.255.0
```

- Verify that you have Layer 3 connectivity by attempting to ping the other side of the link.

```
DLS1# ping 10.0.0.2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

- If you look at the output of the **show etherchannel summary** command, you see that it lists the port channel as a routed port, not a switched port. The RU in parentheses next to the name means routed and up, as opposed to switched and up (SU).

```
DLS1# 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: 2
Number of aggregators:          2
```

Group	Port-channel	Protocol	Ports	
2	Po2(SU)	LACP	Fa0/7(P)	Fa0/8(P)
3	Po3(RU)	PAGP	Fa0/11(P)	Fa0/12(P)

Step 6: Configure load balancing.

The switches can use different methods to load-balance traffic going through a port channel. The available methods as well as the default method used varies by hardware platform. By default, Cisco Catalyst 3560 and Catalyst 2960 switches load-balance using the source MAC address.

- a. You can view the current load-balancing configuration with the **show etherchannel load-balance** command.

```
DLS1# show etherchannel load-balance
EtherChannel Load-Balancing Operational State (src-mac):
Non-IP: Source MAC address
  IPv4: Source MAC address
  IPv6: Source IP address
```

Other methods of load balancing are based on the destination MAC address, both source and destination MAC addresses, source IP address, destination IP address, and both source and destination IP addresses. Some older platforms, such as the Cisco Catalyst 2950 and Catalyst 3550 switches, may not support all of these methods.

- b. For this scenario, configure ALS1 to load-balance by both source and destination MAC addresses using the global configuration command **port-channel load-balance method**, where the method is **src-dst-mac**.

```
ALS1(config)# port-channel load-balance src-dst-mac
```

- c. Verify the configuration with the **show etherchannel load-balance** command.

```
ALS1# show etherchannel load-balance
EtherChannel Load-Balancing Operational State (src-dst-mac):
Non-IP: Source XOR Destination MAC address
  IPv4: Source XOR Destination MAC address
  IPv6: Source XOR Destination IP address
```

Challenge

The topology still has redundant links that you can aggregate. Experiment with the other port channel modes using the question mark on the interface-level command **channel-group number mode ?**. Look at the descriptions and implement some port channels in different ways. If The port mode is set to desirable, auto, active or passive (when PAgP or LACP are used), the command **channel-protocol** can be used. It cannot be used with **channel-group number mode on** command. The “on” mode statically sets the EtherChannel protocol without negotiation.