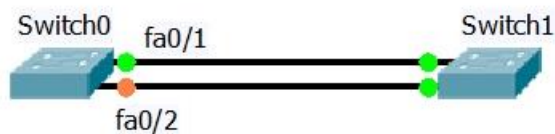


## EtherChannel Configuration Lab Exercise

EtherChannel allows multiple physical interfaces to be bundled together into a logical higher bandwidth interface called a port-channel. This exercise demonstrates the configuration and verifies operation of EtherChannel. Be sure to use the latest version of Packet Tracer (this exercise is completed on version 6.0.1.0011). Launch Packet Tracer and place two Catalyst 2960-24TT switches on the workspace. **You may complete the entire exercise on actual equipment.**

Complete preliminary coding of the switches such as hostname, no ip domain-lookup, etc. Activate rapid spanning-tree on both switches using the global configuration command **spanning-tree mode rapid-pvst** and then interconnect ports fa0/1 and fa0/2 using a crossover patch cable.



View spanning-tree on VLAN 1 using the **show spanning-tree** command. You might also review the port settings using the command **show interface switchport**.

```
Switch0> show spanning-tree
```

```
VLAN0001
```

```
Spanning tree enabled protocol rstp
```

```
Root ID    Priority  32769
```

```
Address    00D0.58DA.C78B
```

```
Cost      19
```

```
Port       1(FastEthernet0/1)
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID Priority  32769 (priority 32768 sys-id-ext 1)
```

```
Address     00E0.B011.2C83
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Aging Time 20
```

Interface	Role	Sts	Cost	Prio.Nbr	Type
-----					
Fa0/2	Altn	<b>BLK</b>	19	128.2	P2p
Fa0/1	Root	FWD	19	128.1	P2p

Switch0# **show interface fa0/1 switchport**

Name: Fa0/1

Switchport: Enabled

Administrative Mode: dynamic auto

**Operational Mode: static access**

Administrative Trunking Encapsulation: dot1q

Operational Trunking Encapsulation: native

Negotiation of Trunking: On

**Access Mode VLAN: 1** (default)

Trunking Native Mode VLAN: 1 (default)

< output omitted >

Trunking VLANs Enabled: ALL

Pruning VLANs Enabled: 2-1001

**Capture Mode Disabled**

Capture VLANs Allowed: ALL

**Protected: false**

Appliance trust: none

Note that the highlighted parameters should be the same on both fa0/1 and fa0/2. We can create a port-channel using the interface configuration command channel-group. We need to do this on both switches before the port-channel will activate. We can choose 1 thru 6 channel-groups on the Catalyst 2960. The channel-group numbers are local only to the switch and not need to be the same on each end of the EtherChannel. Other switches may allow more channel-groups (this is platform dependent).

Switch0(config)# **interface range fa0/1 – 2**

Switch0(config-if-range)# **channel-group 1 mode desirable** {other mode options are available}

Creating a port-channel interface Port-channel 1

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

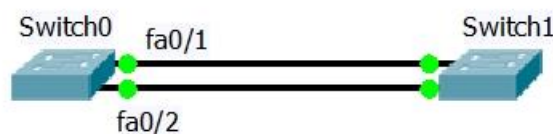
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

%LINK-5-CHANGED: Interface Port-channel 1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel 1, changed state to up

The interfaces go down and then come back up to facilitate assignment to the port-channel. Now if we view spanning-tree for VLAN 1 we see only the port-channel. Notice the spanning-tree cost and the port-channel is considered a spanning-tree type shared (not P2p). Feel free to delete one crossover patch cable and view the results. Add the patch cable back and view the results.



```
Switch0# show spanning-tree
```

```
VLAN0001
```

```
Spanning tree enabled protocol rstp
```

```
Root ID Priority 32769
```

```
Address 00D0.58DA.C78B
```

```
Cost 9
```

```
Port 27(Port-channel 1)
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
```

```
Address 00E0.B011.2C83
```

```
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
```

```
Aging Time 20
```

Interface	Role	Sts	Cost	Prio.	Nbr	Type
Po1	Root	FWD	9	128	27	Shr

You may add more physical ports to the port-channel using the interface configuration command **channel-group [1 – 6] mode [active | auto | desirable | on | passive]**. Active and passive activate LACP while auto and desirable activate PAgP. To force the interface to channel without a protocol to maintain or manage the bundle, use mode on.

Remember to do the same on both switches and that the interfaces must all have the same configuration within a port-channel. Try adding fa0/3 to the port-channel, review the spanning-tree cost, and then add fa0/4. Remove fa0/3 and fa0/4 by negating the channel-group command.

The logical port-channel is treated as a single port and we can configure the port-channel independently of the physical interfaces. You may access port-channel configuration from global configuration **interface port-channel [1 – 6]**.

Configure the port-channel as a dot1q trunk using the interface command **switchport mode trunk**. Repeat this command on both switches (DTP may automatically cause the port-channel to trunk with only one end configured but we should try to keep configurations similar on both switches).

```
Switch0(config)# interface port-channel 1
```

```
Switch0(config-if)#switchport mode trunk
```

```
Switch0# show interface trunk
```

Port	Mode	Encapsulation	Status	Native VLAN
Po1	on	802.1q	trunking	1

< output omitted >

View the running-configuration: do fa0/1 and fa0/2 have any new configuration? When entering configuration on the port-channel it is applied to all the ports in the port-channel. If you wished to test the trunk you might set a VTP domain and then create a few new VLANs. These VLANs should be advertised across the trunk via VTP to the partner switch.

Another protocol that runs over the port-channel is CDP. Note in the following show CDP neighbors output that my switches are using different port-channel numbers: Switch0 uses Po1 and Switch1 uses Po2.

Switch0# **show cdp neighbor**

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge  
S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone

Device ID	Local Intrfce	Holdtme	Capability	Platform	Port ID
Switch1	Por 1	172	S	2960	Fas 0/1
Switch1	Por 1	172	S	2960	Fas 0/2
Switch1	Por 1	172	S	2960	Por 2

To verify EtherChannel operation we use the **show etherchannel [summary | load-balance | port-channel]** command. The output below indicates "Group state = L2" indicating a layer-2 EtherChannel. Multilayer switches are capable of L3 channels. The channelling protocol we selected was PAgP when we use channel-group mode desirable. Load-balancing is default at source MAC for all frames.

Switch0# **show etherchannel**

Channel-group listing:

-----  
Group: 1

-----  
**Group state = L2**

Ports: 2 Maxports = 8

Port-channels: 1 Max Portchannels = 1

**Protocol: PAgP**

Switch0# **show etherchannel load-balance**

EtherChannel Load-Balancing Operational State (src-mac):

Non-IP: Source MAC address

IPv4: Source MAC address

IPv6: Source MAC address

We can change the default load-balancing via a global command **port-channel load-balance [dst-ip | dst-mac | src-dst-ip | src-dst-mac | src-ip | src-mac]**

In the following output the summary command provides information on each link in the bundle and flags fa0/1 and fa0/2 in port-channel. A port without link status would be listed as down. A port-channel would be listed as SD if none of the links were active. Try deleting the crossover cables one by one and view the etherchannel summary. Replace the cables once completed.

Switch0# **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	Fa0/1(P) Fa0/2(P)

After deleting both crossover cables we have the following output:

1	Po1(SD)	PAgP	Fa0/1(D) Fa0/2(D)
---	---------	------	-------------------

Another show etherchannel option provides the following output (note that Fa01 carries the PAgP messages for this port-channel):

Switch0# **show etherchannel port-channel**

Group: 1

-----

Port-channels in the group:

-----

Port-channel: Po1

-----

Age of the Port-channel = 00d:01h:22m:29s

Logical slot/port = 2/1      Number of ports = 2

GC = 0x00000000      HotStandBy port = null

Port state = Port-channel

Protocol = PAgP

Port Security = Disabled

Ports in the Port-channel:

Index	Load	Port	EC state	No of bits
0	00	Fa0/2	Desirable-S1	0
0	00	Fa0/1	Desirable-S1	0

Time since last port bundled: 00d:00h:37m:14s Fa0/1

The following **show interface etherchannel** command provides considerable detail about the EtherChannel bundle and the physical ports in the bundle.

Switch0# **show interface etherchannel**

FastEthernet0/1:

Port state = 1

Channel group = 1 Mode = Desirable-S1 Gcchange = 0

Port-channel = Po1 GC = 0x00000000 Pseudo port-channel = Po1

Port index = 0 Load = 0x00 Protocol = PAgP

Flags: S - Device is sending slow hello. C - Device is in Consistent state.

A - Device is in Auto mode. P - Device learns on physical port.

d - PAgP is down.

Timers: H - Hello timer is running. Q - Quit timer is running.

S - Switching timer is running. I - Interface timer is running.

Local information:

Port	Flags	State	Hello Timers	Partner Interval	PAgP Count	Learning Priority	Group Method	Ifindex
Fa0/1	d	U1/S1	H30s	1	0	128	Any	0

Age of the port in the current state: 00d:00h:20m:11s

----

FastEthernet0/2:

< output omitted >

----

Port-channel1: Port-channel1

Age of the Port-channel = 00d:02h:03m:52s

Logical slot/port = 2/1 Number of ports = 0

GC = 0x00000000 HotStandBy port = null

Port state =

Protocol = 2

Port Security = Disabled

## Conclusion

This has been an introduction to EtherChannel technology. Take the time to interconnect some real gear and use the commands to configure and verify EtherChannel. A more in depth study occurs in CCNP/CCIE literature. CCNA candidates should be able to bundle physical ports into a port-channel and have basic troubleshooting skills to resolve EtherChannel issues. It is most important that the physical ports are all configured identically and have the same operational parameters within a port-channel. Always start by reviewing the port settings. Next ensure both ends of the EtherChannel are using the same channeling protocol and the settings are compatible. You can access the port-channel itself and enter configuration commands that will applied to all the ports in the port-channel.

## Self-Test

1. By default how does EtherChannel distribute traffic across multiple physical ports? Port-channel load-balance (Src-mac) configuration
2. What is the global command we would use to change the load sharing method a switch uses for etherchannel? Port-channel load-balance
3. From interface configuration what is the command syntax to activate PAgP? Assume group 1. Channel-group 1 mode desirable
4. From interface configuration what is the command syntax to activate LACP? Assume group 2. Channel-group 2 mode passive
5. From interface configuration what is the command syntax to force channeling? Assume group 3. Channel-group 3 mode on
6. Indicate the common parameters that must be the same if the interfaces are to join a common etherchannel bundle. Switch port mode
7. A logical interface is created when we activate EtherChannel. From global configuration how would we access this logical interface to provide some configuration? hostname#config t  
hostname(config)#inter port-channel1
8. Which show commands would provide details on the ports within an etherchannel?
9. Explain the difference between "P" and "D" status of a port in an etherchannel bundle.
10. What is the spanning-tree cost for an etherchannel link that is assigned four physical ports?

8. show etherchannel summary, show etherchannel port-channel, show interface etherchannel

9. D indicates the etherchannel is down, P indicates that that interface is "in port-channel"

10. 9