

PRACTICAL 7

Aim : Packet Tracer – Configure EtherChannel

❖ What is EtherChannel ?



1. EtherChannel, also known as port channel or link aggregation, is a technology used in computer networking to combine multiple physical Ethernet links into a single logical link. This logical link provides increased bandwidth, fault tolerance, and load balancing.
2. In an EtherChannel configuration, multiple physical links between two network devices, such as switches or routers, are bundled together to form a single logical link.
3. The main purposes of EtherChannel include:
 - Increased Bandwidth
 - Fault Tolerance
 - Load Balancing

❖ Objectives :

Part 1: Configure Basic Switch Settings

Part 2: Configure an EtherChannel with Cisco PAgP

Part 3: Configure an 802.3ad LACP EtherChannel

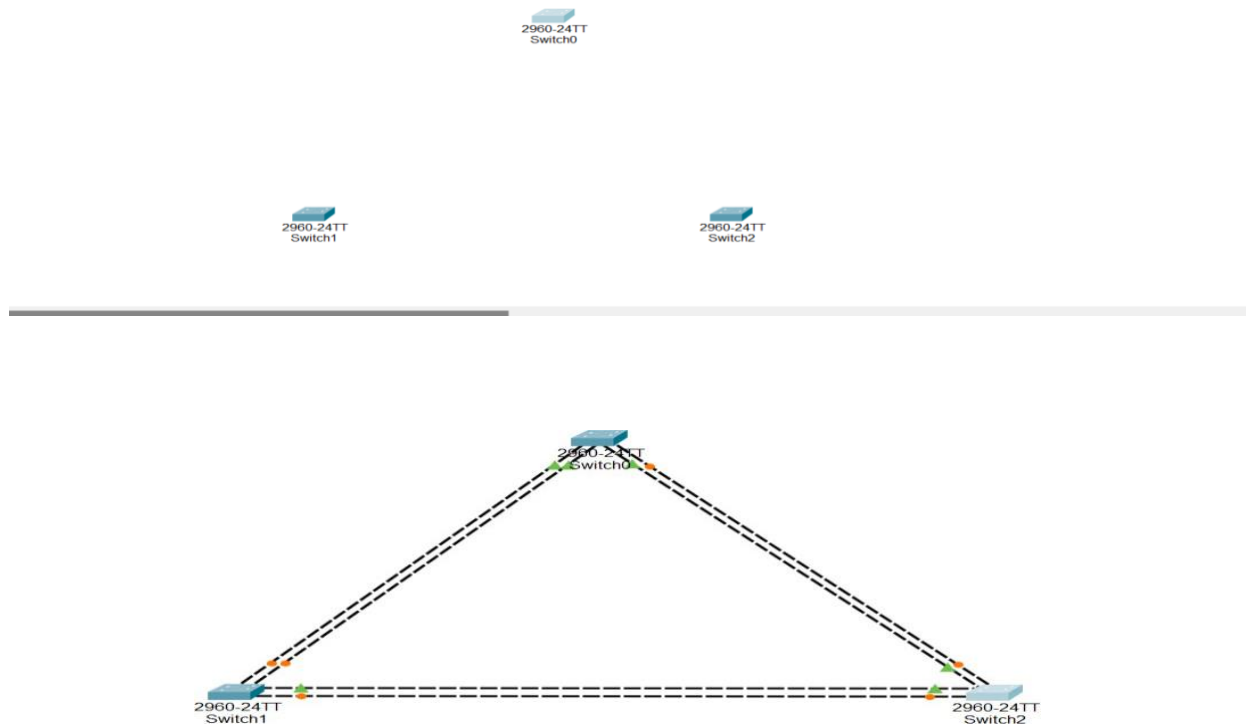
Part 4: Configure a Redundant EtherChannel Link

❖ Port Channel Table:

Channel Group	Ports	Protocol
1	S1 F0/21, F0/22 S3 F0/21, F0/22	PAgP
2	S1 G0/1, G0/2 S2 G0/1, G0/2	LACP
3	S2 F0/23, F0/24 S3 F0/23, F0/24	Negotiated LACP

❖ Configure Basic Switch Settings :

Switch Model : 2960-24TT



1. Assign each switch a hostname according to the topology diagram.

```
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to up

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#
```

2. Before beginning the link aggregation between switches, verify the existing configuration of the ports that connect the switches to ensure that the ports will successfully join the EtherChannels. Commands that provide information about the state of the switch ports include:

Open configuration window

S1# show interfaces | include Ethernet

S1# show interface status

S1# show interfaces trunk

```

S1#show inte
S1#show interfaces | in
S1#show interfaces | include Eth
S1#show interfaces | include Ether
S1#show interfaces | include Ethernet
FastEthernet0/1 is down, line protocol is down (disabled)
FastEthernet0/2 is down, line protocol is down (disabled)
FastEthernet0/3 is down, line protocol is down (disabled)
FastEthernet0/4 is down, line protocol is down (disabled)
FastEthernet0/5 is down, line protocol is down (disabled)
FastEthernet0/6 is down, line protocol is down (disabled)
FastEthernet0/7 is down, line protocol is down (disabled)
FastEthernet0/8 is down, line protocol is down (disabled)
FastEthernet0/9 is down, line protocol is down (disabled)
FastEthernet0/10 is down, line protocol is down (disabled)
FastEthernet0/11 is down, line protocol is down (disabled)
FastEthernet0/12 is down, line protocol is down (disabled)
FastEthernet0/13 is down, line protocol is down (disabled)
FastEthernet0/14 is down, line protocol is down (disabled)
FastEthernet0/15 is down, line protocol is down (disabled)
FastEthernet0/16 is down, line protocol is down (disabled)
FastEthernet0/17 is down, line protocol is down (disabled)
FastEthernet0/18 is down, line protocol is down (disabled)
FastEthernet0/19 is down, line protocol is down (disabled)
FastEthernet0/20 is down, line protocol is down (disabled)
FastEthernet0/21 is up, line protocol is up (connected)
FastEthernet0/22 is up, line protocol is up (connected)
FastEthernet0/23 is down, line protocol is down (disabled)
FastEthernet0/24 is down, line protocol is down (disabled)
GigabitEthernet0/1 is up, line protocol is up (connected)
GigabitEthernet0/2 is up, line protocol is up (connected)
S1#

```

```

GigabitEthernet0/2 is up, line protocol is up (connected)
S1#show inter
S1#show interfaces stat
S1#show interfaces status

```

Port	Name	Status	Vlan	Duplex	Speed	Type
Fa0/1		notconnect	1	auto	auto	10/100BaseTX
Fa0/2		notconnect	1	auto	auto	10/100BaseTX
Fa0/3		notconnect	1	auto	auto	10/100BaseTX
Fa0/4		notconnect	1	auto	auto	10/100BaseTX
Fa0/5		notconnect	1	auto	auto	10/100BaseTX
Fa0/6		notconnect	1	auto	auto	10/100BaseTX
Fa0/7		notconnect	1	auto	auto	10/100BaseTX
Fa0/8		notconnect	1	auto	auto	10/100BaseTX
Fa0/9		notconnect	1	auto	auto	10/100BaseTX
Fa0/10		notconnect	1	auto	auto	10/100BaseTX
Fa0/11		notconnect	1	auto	auto	10/100BaseTX
Fa0/12		notconnect	1	auto	auto	10/100BaseTX
Fa0/13		notconnect	1	auto	auto	10/100BaseTX
Fa0/14		notconnect	1	auto	auto	10/100BaseTX
Fa0/15		notconnect	1	auto	auto	10/100BaseTX
Fa0/16		notconnect	1	auto	auto	10/100BaseTX
Fa0/17		notconnect	1	auto	auto	10/100BaseTX
Fa0/18		notconnect	1	auto	auto	10/100BaseTX
Fa0/19		notconnect	1	auto	auto	10/100BaseTX
Fa0/20		notconnect	1	auto	auto	10/100BaseTX
Fa0/21		connected	1	auto	auto	10/100BaseTX
Fa0/22		connected	1	auto	auto	10/100BaseTX
Fa0/23		notconnect	1	auto	auto	10/100BaseTX
Fa0/24		notconnect	1	auto	auto	10/100BaseTX
Gig0/1		connected	1	auto	auto	10/100BaseTX
Gig0/2		connected	1	auto	auto	10/100BaseTX

```

S1#

```

```

Gig0/2 connected 1 auto auto 10/100BaseTX

```

```

S1#show interfaces trunk

```

```

S1#show interfaces trunk

```

❖ Configure an EtherChannel with Cisco PAgP

Step 1: Configure Port Channel 1.

S1 :

```

interface range f0/21 – 22
shutdown
channel-group 1 mode desirable
no shutdown

```

S2 :

interface range f0/21 – 22
shutdown
channel-group 1 mode desirable
no shutdown

IOS Command Li

```
% Invalid input detected at '^' marker.
S1(config)#interface range f0/21 - 22
S1(config-if-range)#shutdown

S1(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to down
S1(config-if-range)#channel
S1(config-if-range)#channel-gro
S1(config-if-range)#channel-group 1 ?
mode Etherchannel Mode of the interface
S1(config-if-range)#channel-group 1 mo
S1(config-if-range)#channel-group 1 mode ?
active Enable LACP unconditionally
auto Enable PAGP only if a PAGP device is detected
desirable Enable PAGP unconditionally
on Enable Etherchannel only
passive Enable LACP only if a LACP device is detected
S1(config-if-range)#channel-group 1 mode de
S1(config-if-range)#channel-group 1 mode desirable
S1(config-if-range)#
Creating a port-channel interface Port-channel 1
S1(config-if-range)#no shutdown

S1(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to up
```

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S3
S3(config)#interface range f0/21 - 22
S3(config-if-range)#shutdown

S3(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to down
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to down
S3(config-if-range)#channel-group 1 mode desirable
S3(config-if-range)#
Creating a port-channel interface Port-channel 1
S3(config-if-range)#no shutdown

S3(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/21, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/21, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to up
%LINK-5-CHANGED: Interface Port-channel1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1, changed state to up
S3(config-if-range)#|
```

S1 :
interface port-channel 1
switchport mode trunk

S3:
interface port-channel 1
switchport mode trunk

```
%LINK-5-CHANGED: Interface FastEthernet0/22, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/22, changed state to down

S3(config-if-range)#exit
S3(config)#interface port-channel 1
S3(config-if)#switchport mode trunk

S3(config-if)#
```

```
S1>en
S1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#interface port-channel 1
S1(config-if)#switchport mode trunk

S1(config-if)#
```

Step 2: Verify Port Channel 1 status.

1. Issue the `show etherchannel summary` command on S1 and S3 to verify that EtherChannel is working on both switches. This command displays the type of EtherChannel, the ports utilized, and the port states. Command output is shown for S1.

`show etherchannel summary`

```
S1#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)          PAgP        Fa0/21(D) Fa0/22(D)

S1#
```

Ctrl+F6 to exit CLI focus

2. If the EtherChannel does not come up, shut down the physical interfaces on both ends of the EtherChannel and then bring them back up again. The `show interfaces trunk` and `show spanning-tree` commands should show the port channel as one logical link.

Part 3: Configure an 802.3ad LACP EtherChannel :

Step 1: Configure Port Channel 2.

S1 :

`interface range g0/1 – 2`

`shutdown`

`channel-group 2 mode active`

no shutdown
interface port-channel 2
switchport mode trunk

S2 :
interface range g0/1 – 2
shutdown
channel-group 2 mode active
no shutdown
interface port-channel 2
switchport mode trunk

```
S1(config)#interface range g0/1 - 2
S1(config-if-range)#shutdown

S1(config-if-range)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to down
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to down
S1(config-if-range)#channel-group 2 mode active
S1(config-if-range)#
Creating a port-channel interface Port-channel 2
S1(config-if-range)#no shutdown

S1(config-if-range)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
S1(config-if-range)#interface port-channel 2

S2#en
S2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S2(config)#interface range g0/1 - 2
S2(config-if-range)#shutdown
S2(config-if-range)#channel-group 2 mode active
S2(config-if-range)#no shutdown

S2(config-if-range)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
%LINK-5-CHANGED: Interface Port-channel2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel2, changed state to up
S2(config-if-range)#interface port-channel 2
S2(config-if)#interface port-channel 2
S2(config-if)#
```

Ctrl+F6 to exit CLI focus

Step 2: Verify Port Channel 2 status.

S1 : show etherchannel summary

```
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#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 (SD)        PAgP        Fa0/21 (D) Fa0/22 (D)
2      Po2 (SU)        LACP        Gig0/1 (P)  Gig0/2 (P)
S1#
```

Part 4: Configure a Redundant EtherChannel Link

Step 1: Configure Port Channel 3.

S2 :

interface range f0/23 – 24

shutdown

channel-group 3 mode passive

no shutdown

interface port-channel 3

switchport mode trunk

```
S2(config-if)#interface port-channel 2
S2(config-if)#exit
S2(config)#interface range f0/23 - 24
S2(config-if-range)#channel-group 3 mode ?
active          Enable LACP unconditionally
auto           Enable PAgP only if a PAgP device is detected
desirable      Enable PAgP unconditionally
on             Enable Etherchannel only
passive        Enable LACP only if a LACP device is detected
S2(config-if-range)#shutdown

S2(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to down
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to administratively down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down
S2(config-if-range)#channel-group 3 mode passive
S2(config-if-range)#
Creating a port-channel interface Port-channel 3
S2(config-if-range)#no shutdown

S2(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet0/23, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/23, changed state to up
%LINK-5-CHANGED: Interface FastEthernet0/24, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up
S2(config-if-range)#interface port-channel 3
S2(config-if)#switchport mode trunk
S2(config-if)#
```

Step 2: Verify Port Channel 3 status.

1. Use the show commands from Part 1 Step 2 to verify the status of Port Channel 3. Look for the protocol used by each port.

S2 : show etherchannel summary


```

S2#
%SYS-5-CONFIG_I: Configured from console by console
S2#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        Gig0/1 (P) Gig0/2 (P)
3      Po3 (SD)        LACP        Fa0/23 (I) Fa0/24 (I)

```

2. Creating EtherChannel links does not prevent Spanning Tree from detecting switching loops. View the spanning tree status of the active ports on S1.

S1 : show spanning-tree active

```

S1#show spanning-tree active
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0000.0C78.87D9
             Cost        22
             Port        28 (Port-channel2)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769 (priority 32768 sys-id-ext 1)
             Address     000C.850B.D25D
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time   20

Interface       Role Sts Cost      Prio.Nbr Type
-----
Po2              Root FWD 3         128.28 Shr

```

Port Channel 2 is not operative because Spanning Tree Protocol placed some ports into blocking mode. Unfortunately, those ports were the Gigabit ports. In this topology, you can restore these ports by configuring S1 to be primary root for VLAN 1. You could also set the priority to 24576.

S1 : spanning-tree vlan 1 root primary

or

S1 : spanning-tree vlan 1 priority 24576

```

S1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#spanning-tree vlan 1 root primary

```

You may have to wait for STP to recalculate the tree topology. Press fast-forward if necessary. Use the show spanning-tree active command to verify that the Gigabit ports are now in the forwarding state.

❖ EtherChannel Configuration Guidelines and Restrictions

EtherChannel has some specific guidelines that must be followed in order to avoid configuration problems.

- 1) All Ethernet interfaces support EtherChannel up to a maximum of eight interfaces with no requirement that the interfaces be on the same interface module.
- 2) All interfaces within an EtherChannel must operate at the same speed and duplex.

- 3) EtherChannel links can function as either single VLAN access ports or as trunk links between switches.
- 4) All interfaces in a Layer 2 EtherChannel must be members of the same VLAN or be configured as trunks.
- 5) If configured as trunk links, Layer 2 EtherChannel must have the same native VLAN and have the same VLANs allowed on both switches connected to the trunk.
- 6) When configuring EtherChannel links, all interfaces should be shutdown prior to beginning the EtherChannel configuration.
When configuration is complete, the links can be re-enabled.
- 7) After configuring the EtherChannel, verify that all interfaces are in the up/up state.
- 8) It is possible to configure an EtherChannel as static, or for it to use either PAgP or LACP to negotiate the EtherChannel connection. The determination of how an EtherChannel is setup is the value of the channel-group number mode command.

Valid values are:

- active** LACP is enabled unconditionally
- passive** LACP is enabled only if another LACP-capable device is connected.
- desirable** PAgP is enabled unconditionally
- auto** PAgP is enabled only if another PAgP-capable device is connected.
- on** EtherChannel is enabled, but without either LACP or PAgP.

- 9) LAN ports can form an EtherChannel using PAgP if the modes are compatible. Compatible PAgP modes are:

desirable => desirable

desirable => auto

If both interfaces are in auto mode, an Etherchannel cannot form.

- 10) LAN ports can form an EtherChannel using LACP if the modes are compatible. Compatible LACP modes are:

active => active

active => passive

If both interfaces are in passive mode, an EtherChannel cannot form using LACP.

- 11) Channel-group numbers are local to the individual switch. Although this activity uses the same Channel-group number on

either end of the EtherChannel connection, it is not a requirement. Channel-group 1 (interface po1) on one switch can form an

EtherChannel with Channel-group 5 (interface po5) on another switch.