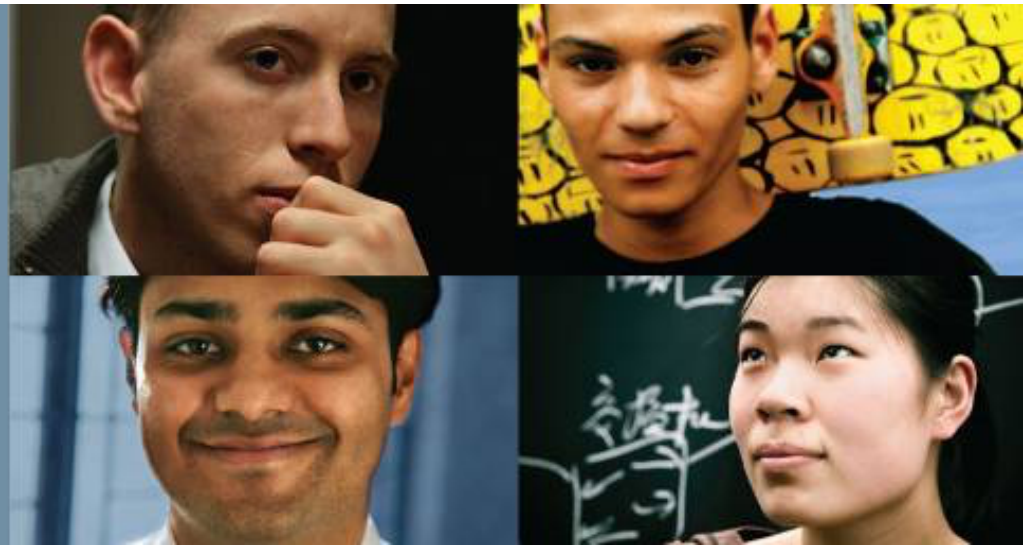
TNE10006/TNE60006: Networks and Switching



Link Aggregation

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Outline

- What is Link Aggregation
- Advantages and Disadvantages
- PAgP vs LACP
- Best Practice
- Troubleshooting

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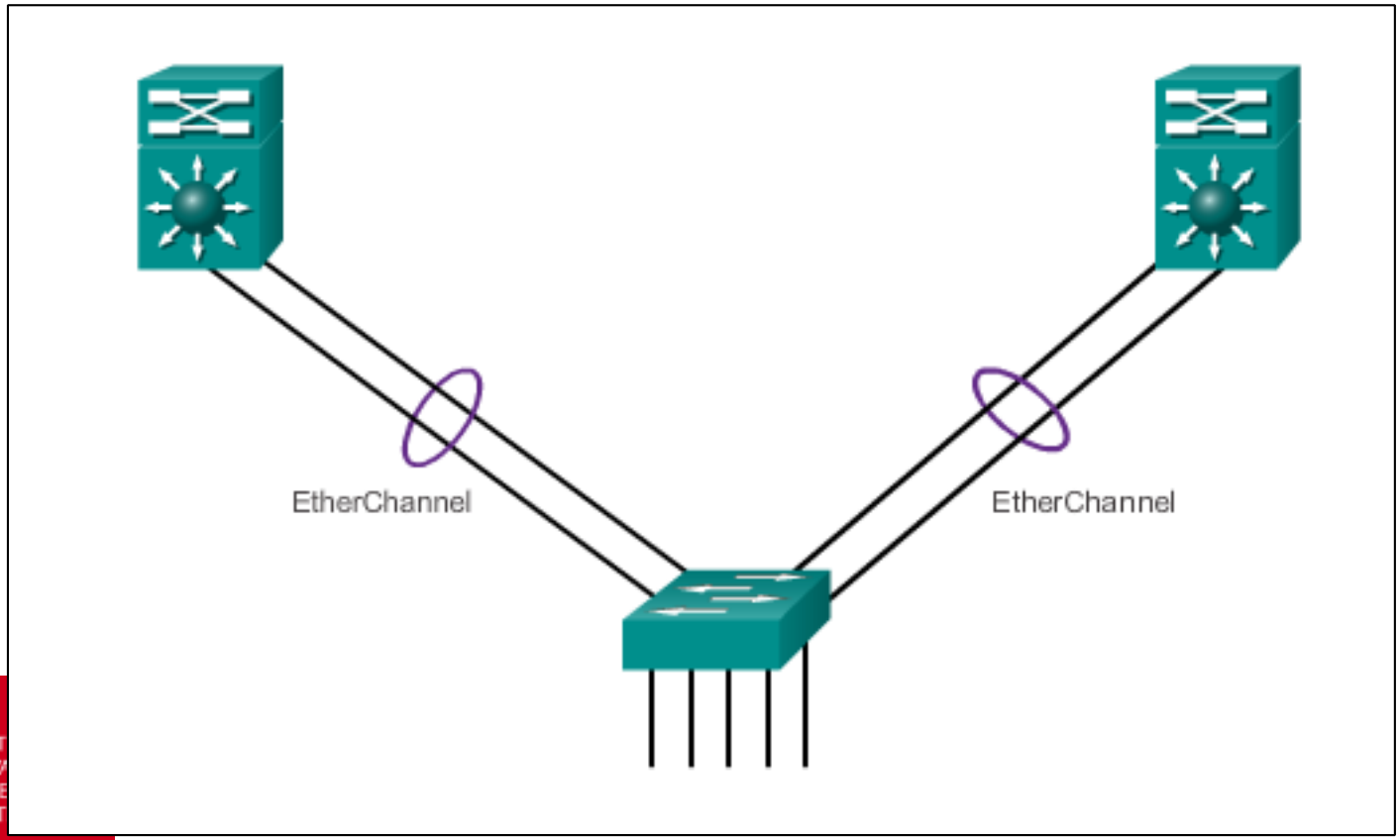
Introduction

- Link aggregation allows the creation of logical links made up of several physical links
- EtherChannel is a form of link aggregation used in switched networks



Advantages of EtherChannel

- Most configurations are done on the EtherChannel interface ensuring consistency throughout links
- Relies on existing switch ports – no need for upgrades
- Load-balances between links on the same EtherChannnel
- Aggregation viewed as one logical link by STP
- Redundancy – the overall link is viewed as one logical connection. If one physical link within channel goes down, this does not cause a change in the topology and does not require STP recalculation

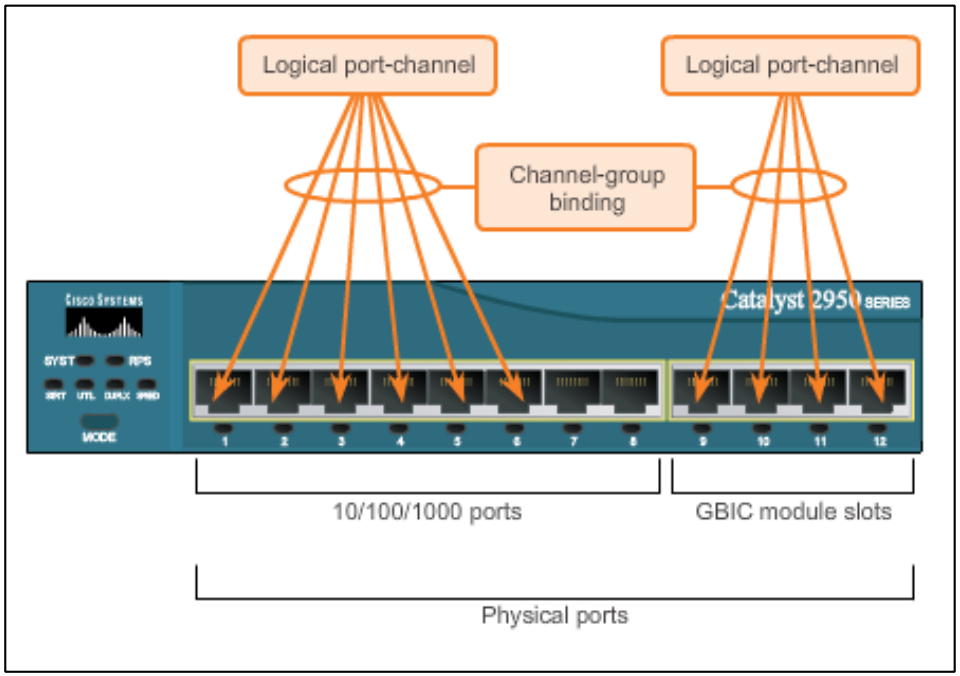
Restrictions of EtherChannel

- A logical link of higher bandwidth is still multiple links of lower bandwidth
- A single Ethernet frame will only be transmitted on one physical link
- Full throughput only happens when enough packets are queued to use all physical connections concurrently
- Serialisation delay is the same as for a single connection

EtherChannel Operation

Implementation Restrictions – Cisco

- Cisco – group multiple physical ports into one or more logical EtherChannel links
- Interface types cannot be mixed
- EtherChannel provides full-duplex bandwidth up to 800 Mb/s (Fast EtherChannel) or 8 Gb/s (Gigabit EtherChannel)
- EtherChannel can consist of up to 16 compatibly-configured Ethernet ports
- The Cisco IOS switch currently supports six EtherChannels



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Link Aggregation
Protocols

PAgP

- Cisco proprietary
- Cannot use with other equipment
- Recommended NOT to use

LACP

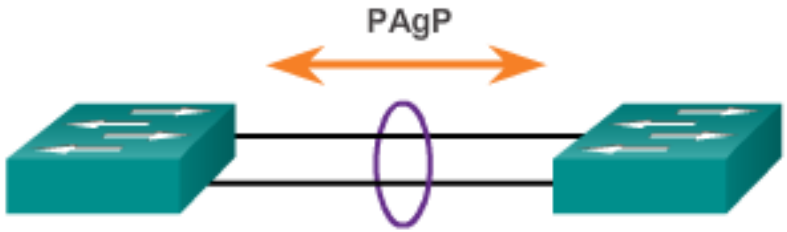
- IEEE 802.3ad standard
- Supported by multiple vendors
- 16 ports per channel, up to 8 active and 8 standby
- Recommended to use by Cisco

EtherChannel

Port Aggregation Protocol (PAgP)

PAgP modes:

- **On:** Channel member without negotiation (no protocol).
- **Desirable:** Actively asking if the other side can or will participate.
- **Auto:** Passively waiting for the other side.



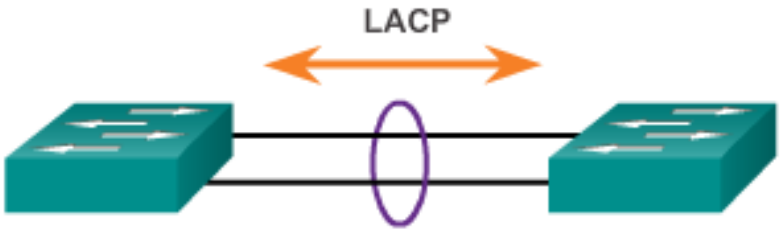
Switch 1	Switch 2	Channel Establishment
On	On	Yes
Auto/Desirable	Desirable	Yes
On/Auto/Desirable	Not Configured	No
On	Desirable	No
Auto/On	Auto	No

EtherChannel Operation

Link Aggregation Control Protocol (LACP)

LACP modes:

- **On:** Channel member without negotiation (no protocol).
- **Active:** Actively asking if the other side can or will participate.
- **Passive:** Passively waiting for the other side.



Switch 1	Switch 2	Channel Establishment
On	On	Yes
Active/Passive	Active	Yes
On/Active/Passive	Not Configured	No
On	Active	No
Passive/On	Passive	No

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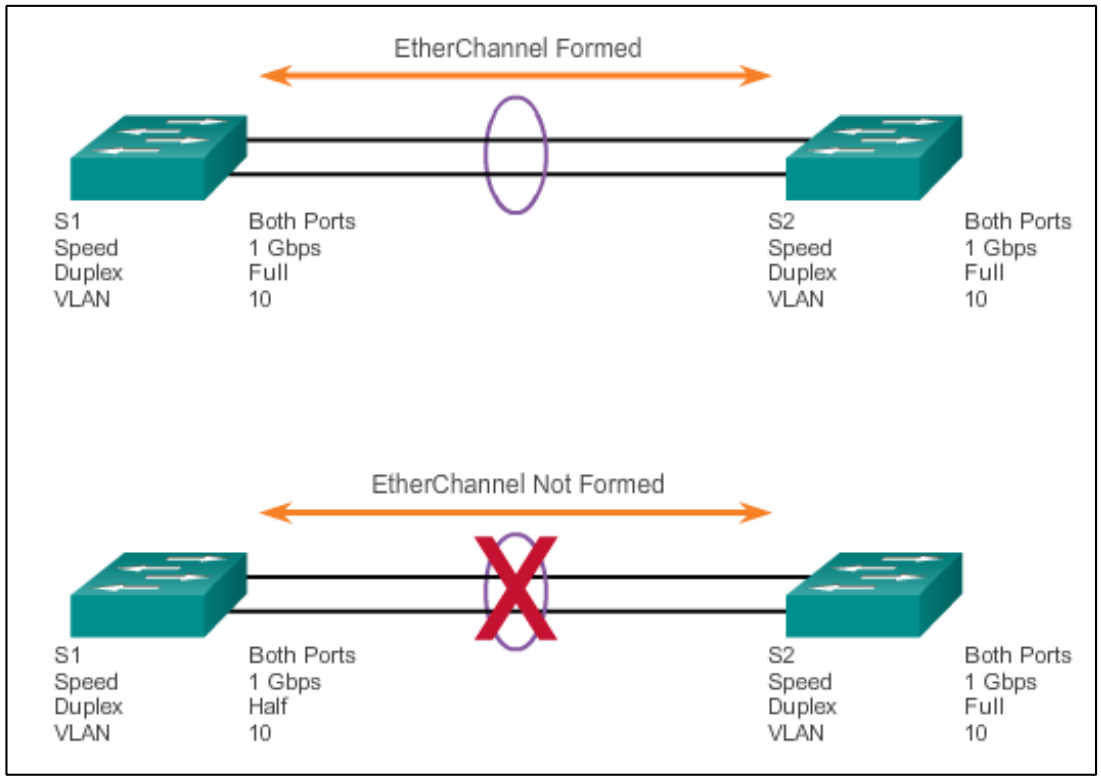
Configuration Guidelines

- EtherChannel must be supported
- Speed and duplex must match
- VLAN match – All interfaces are in the same VLAN
- Range of VLAN – Same range on all interfaces



EtherChannel

Configuration Best Practice

- Establish correct trunk operation first
- Shut down one side of the connection
- Aggregate ports into a channel
- Enable shutdown ports

- Channel numbers do **NOT** need to match on either side of link
- If half configured, ports may go into ***error-disable*** state

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Useful Commands

- **`show interface port-channel`** – Displays the general status of the EtherChannel interface.
- **`show etherchannel summary`** – Displays one line of information per port channel.
- **`show etherchannel port-channel`** – Displays information about a specific port channel interface.
- **`show interfaces etherchannel`** – Provides information about the role of the interface in the EtherChannel.

```
S1# show interface port-channel1
Port-channel1 is up, line protocol is up (connected)
  Hardware is EtherChannel, address is 0cd9.96e8.8a02 (bia
0cd9.96e8.8a02)
  MTU 1500 bytes, BW 200000 Kbit/sec, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
<Output omitted>
```

Verifies the interface status.

Summary

In this lecture, we covered:

- What is Link Aggregation
- Advantages and Disadvantages
- PAgP vs LACP
- Best Practice
- Troubleshooting