

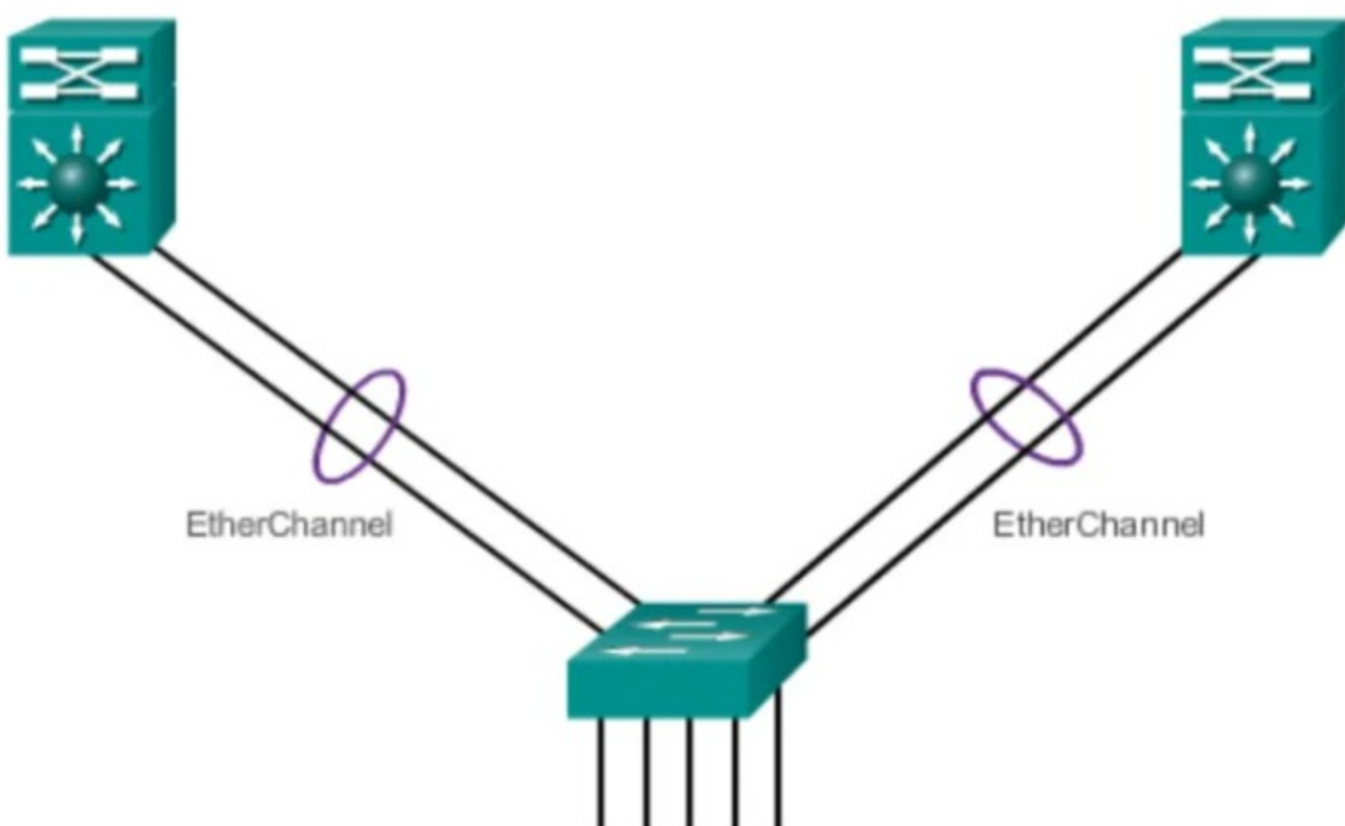
# Lecture 9a - Link Aggregation

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4. EthernetChannel Implementation Restrictions – Cisco
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## 1. 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
- The name given to the aggregated logical link is PortChannel



## 2. Advantages of EtherChannel

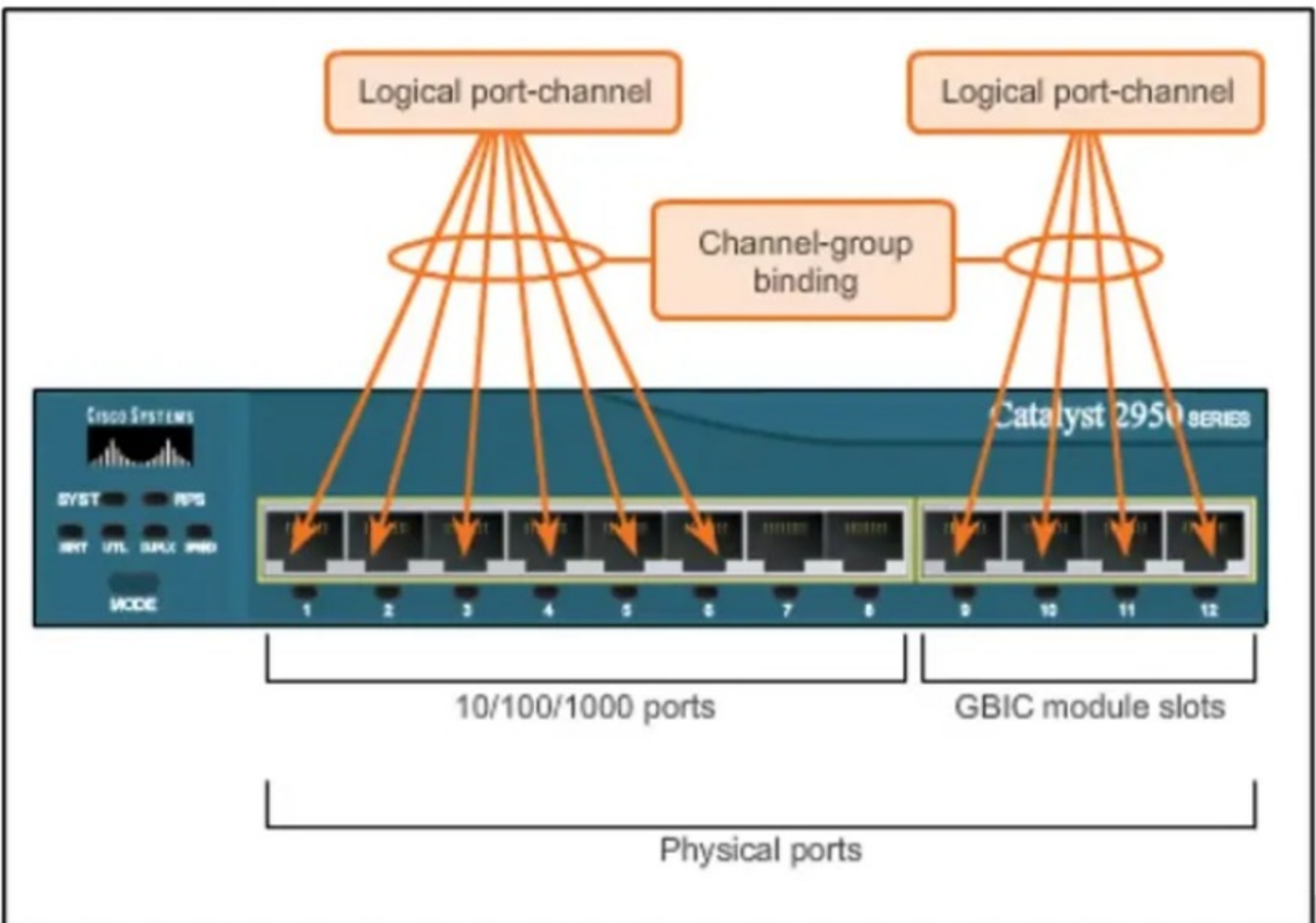
- Most configurations are done on the EtherChannel interface ensuring consistency throughout links
- Relies on existing switch ports – no need for upgrades
- Load-balances between links on the same EtherChannel
- Aggregation viewed as one logical link by STP
- Redundancy – the overall link is viewed 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

## 3. 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
- Serialization delay is the same as for a single connection

## 4. EthernetChannel 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
  - ⇒ Only 8 ports are active, the others will be on standby.
- The Cisco IOS switch currently supports six EtherChannels



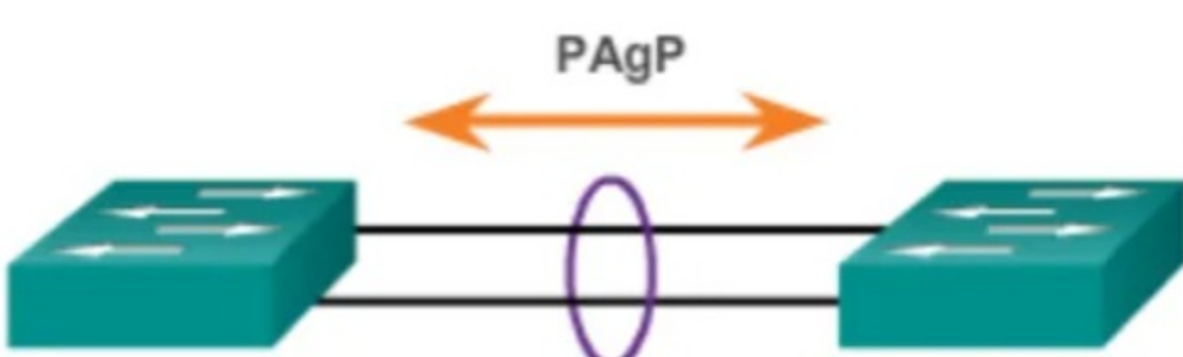
## 5. Link Aggregation Protocols

- 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
- Port Aggregation Protocol (PAgP)

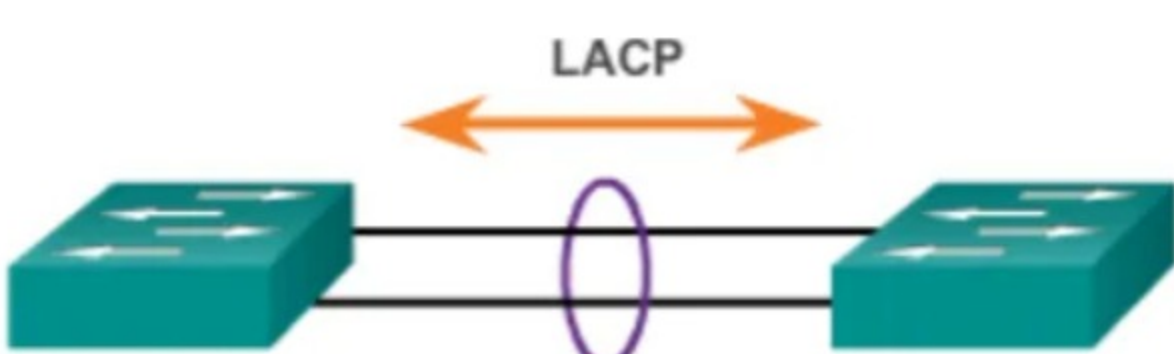
- PAgP modes:
- On: Channel member without negotiation (no protocol).
  - Desirable: Actively asking if the other side can or will participate.
  - Auto: Passively waiting for the other side.



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

- 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

## 6. Configuring EtherChannel

- 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
- 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 the link
  - If half configured, ports may go into error-disable state

## 7. Troubleshooting EtherChannel

- 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.

## 8. Quizzes

- On Cisco switches, the feature for link aggregation is called EtherChannel and the name given to the aggregated logical link is PortChannel.
- We can only observe the full aggregated throughput on an EtherChannel when at least one packet is being carried on each link.
  - ⇒ True
  - ⇒ On an EtherChannel, a single frame is transmitted on one physical link, hence it can only travel at the speed of one link, not the aggregated speed. Full throughput on an EtherChannel is only observed when all links are carrying at least one packet.