

# Day 23: EtherChannel

## CCNA 200-301 Study Guide: EtherChannel

### 1.0 EtherChannel: Definition and Strategic Purpose

EtherChannel (also known as a Port Channel or Link Aggregation Group - LAG) bundles multiple physical switch ports into a single logical link. This technology is essential for creating high-bandwidth, resilient backbones in campus networks.

#### 1.1 The Strategic Goals

- **Increased Bandwidth:** Aggregates the capacity of individual links (e.g., two 1Gbps links become a single 2Gbps logical channel).
- **Link Redundancy:** If one physical link in the bundle fails, traffic is automatically redistributed across the remaining active links without a total connection loss.
- **Load Balancing:** Uses a hashing algorithm to distribute traffic flows across all active members of the bundle.

#### 1.2 Interaction with Spanning Tree Protocol (STP)

Normally, parallel links between switches create a Layer 2 loop, causing STP to block all but one link. EtherChannel resolves this by presenting the bundle to STP as a single logical interface. STP allows the entire Port Channel to remain in a forwarding state, enabling all physical ports to contribute to the combined bandwidth.

# 2.0 Negotiation Protocols and Configuration Modes

EtherChannel can be configured statically or dynamically. LACP is the modern industry standard and is preferred for its vendor-neutral compatibility.

## 2.1 Protocol Comparison

Feature	LACP (Link Aggregation Control Protocol)	PAgP (Port Aggregation Protocol)
Standard	IEEE 802.3ad (Industry Standard)	Cisco Proprietary
Best Practice	Preferred (Multi-vendor support)	Use only between Cisco devices
Modes	Active / Passive	Desirable / Auto

## 2.2 Negotiation Outcomes

Protocol	Mode Combination	Result
LACP	Active + Active	Success
LACP	Active + Passive	Success
LACP	Passive + Passive	Failure
PAgP	Desirable + Desirable	Success
PAgP	Desirable + Auto	Success
PAgP	Auto + Auto	Failure

The "On" Mode: This mode forces the interface to bundle without negotiation. It is risky because it does not verify if parameters (speed, duplex, VLANs) match on the other end, which can lead to Layer 2 loops or packet loss.

# 3.0 Load Balancing Mechanism

EtherChannel does not use round-robin distribution. Instead, it uses a hash-based method to categorize traffic into "flows."

- Flow Consistency: All packets in a specific conversation (e.g., a single file transfer) are mapped to the same physical link.
- Prevention of Out-of-Order Delivery: By keeping a flow on one link, the switch ensures packets arrive in the correct sequence, preventing TCP performance degradation.
- Hashing Options: Switches can hash based on Source/Destination MAC, IP, or Port numbers.

## 4.0 Critical Configuration Guidelines

For a Port Channel to form, the following parameters must match on all member interfaces:

1. Speed and Duplex
2. VLAN Membership (Access VLAN or Allowed VLAN list for Trunks)
3. STP Settings

### 4.1 Link Limits

- PAgP: Up to 8 active links.
- LACP: Up to 16 links (8 active and 8 hot-standby).
- Channel Group Number: This ID is only locally significant; it does not need to match the number on the neighboring switch.

## 5.0 Implementation Workflow

### 5.1 Layer 2 EtherChannel (Switch-to-Switch)

```
SW1(config)# interface range g0/1 - 2
```

```
SW1(config-if-range)# channel-group 1 mode active
```

```
SW1(config-if-range)# exit
```

```
SW1(config)# interface port-channel 1
```

```
SW1(config-if)# switchport mode trunk
```

```
SW1(config-if)# switchport trunk allowed vlan 10,20
```

## 5.2 Layer 3 EtherChannel (Routed Port)

```
SW1(config)# interface range g0/1 - 2
```

```
SW1(config-if-range)# no switchport
```

```
SW1(config-if-range)# channel-group 1 mode active
```

```
SW1(config-if-range)# exit
```

```
SW1(config)# interface port-channel 1
```

```
SW1(config-if)# ip address 10.1.1.1 255.255.255.252
```

## 6.0 Verification and Troubleshooting

Command	Purpose
show etherchannel summary	Most Important. Shows Port Channel status and member port states.
show etherchannel load-balance	Displays the current hashing algorithm in use.
show interface port-channel <id>	Shows the logical interface status (Up/Down) and bandwidth.

### Common Status Codes in show etherchannel summary:

- (P): Bundled in Port Channel (Operational).
- (D): Down / Suspended (Mismatched parameters).

- (I): Stand-alone (Negotiation failed).
- SU: Layer 2 Port Channel, In Use.
- RU: Layer 3 Port Channel, In Use.

# TL;DR: CCNA Exam Cram

- Purpose: Aggregate links for Bandwidth (\$+\$) and Redundancy.
- Protocol: Use LACP (Active/Active) whenever possible.
- Logic: STP sees one link; Traffic is balanced by Flow Hashing.
- Requirement: Speed, Duplex, and VLANs must match on all ports.
- Verification: show etherchannel summary is your best friend.

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