EtherChannel (CCNA 200-301 – Topic 2.4)

Definition

- EtherChannel allows you to group multiple physical interfaces into a single logical interface — they behave as if they are one interface.

What These Notes Cover

- What EtherChannel is and the problem it solves (Spanning Tree Protocol)
- Methods of configuring both Layer 2 and Layer 3 EtherChannels

Layer 2 vs. Layer 3 EtherChannel

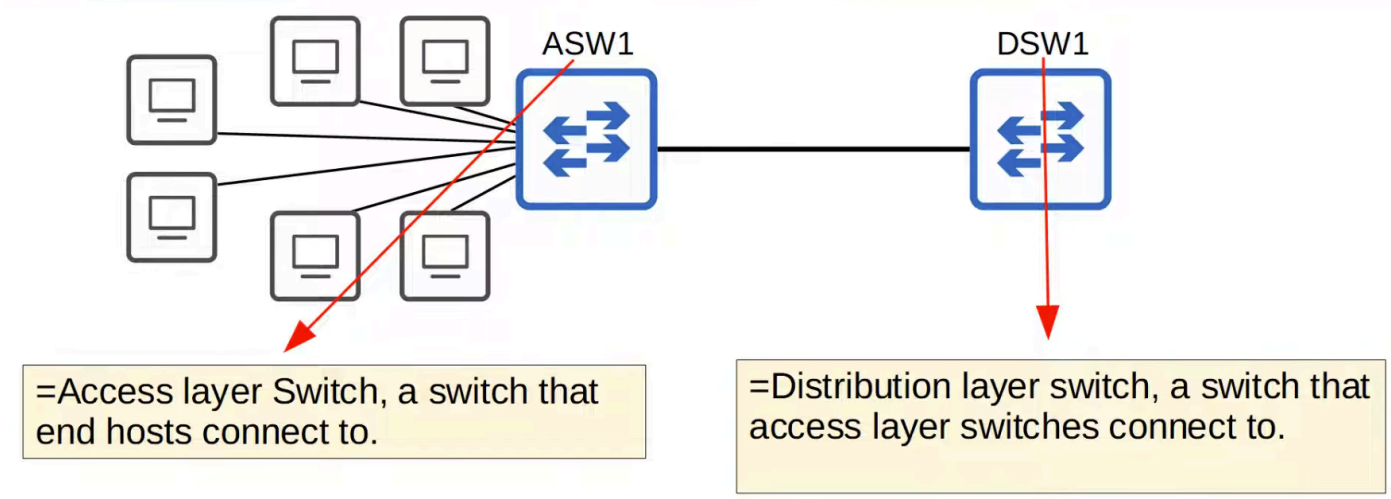
- **Layer 2 EtherChannel:** A group of switch ports operating as a single interface
- **Layer 3 EtherChannel:** A group of routed ports operating as a single interface, which you assign an IP address to (because it's Layer 3)

Exam Note

- This video covers **Topic 2.4** of the official exam topics: configure and verify Layer 2 and Layer 3 EtherChannel using **LACP (Link Aggregation Control Protocol)**

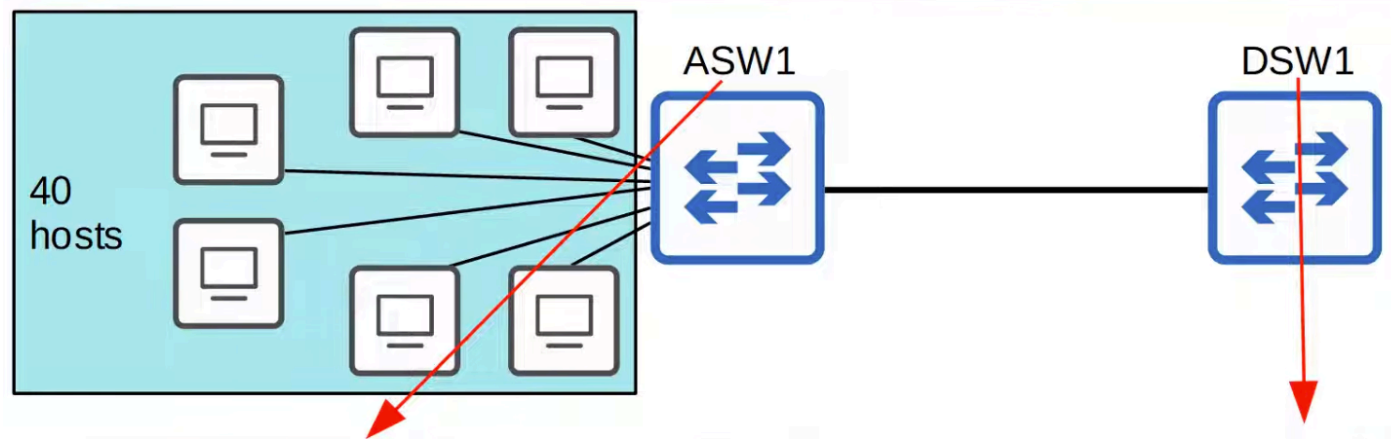
The Problem EtherChannel Solves

Network Design Terms

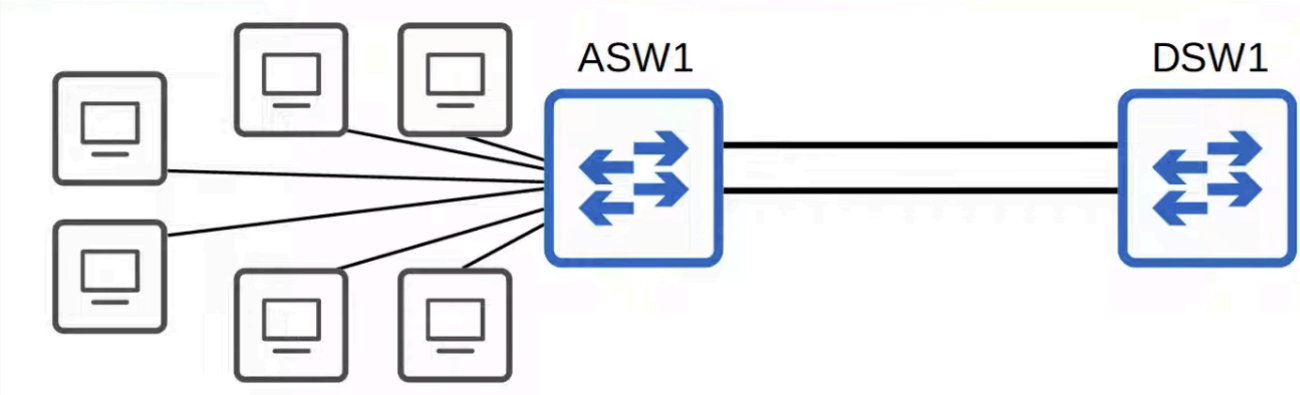


- **ASW (Access Switch):** A switch that end hosts like PCs and servers connect to
- **DSW (Distribution Layer Switch):** A switch that access layer switches connect to

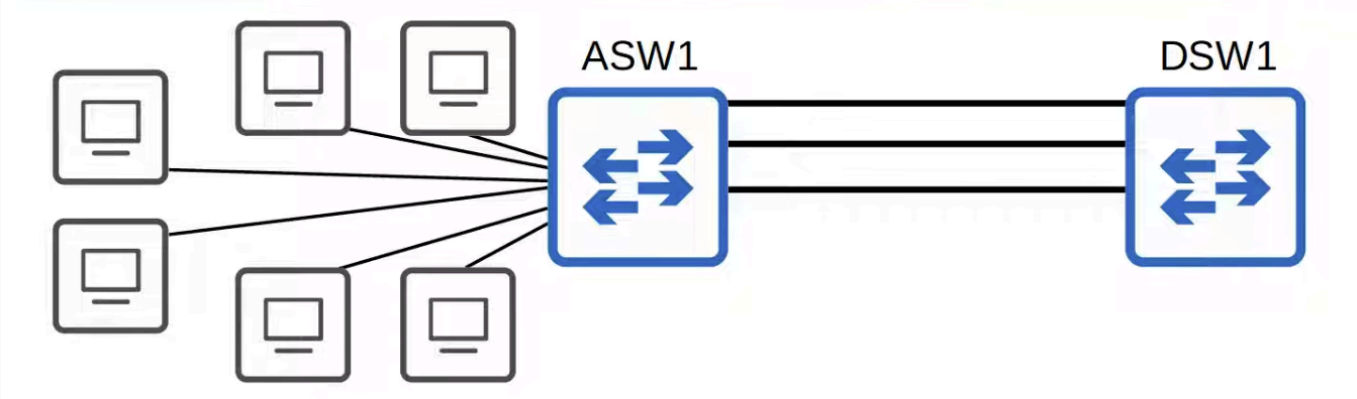
Scenario: Link Congestion



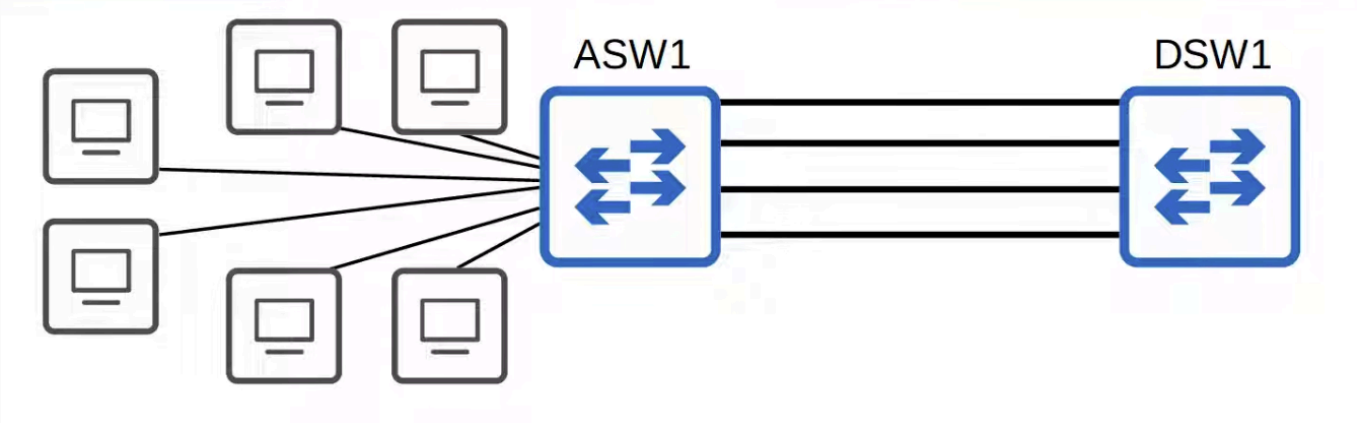
- ASW1 has 40 end hosts connected, all trying to access the Internet
- The single connection to DSW1 becomes congested



- The second connection to DSW1 is also congested



- The Third connection to DS1 is also congested



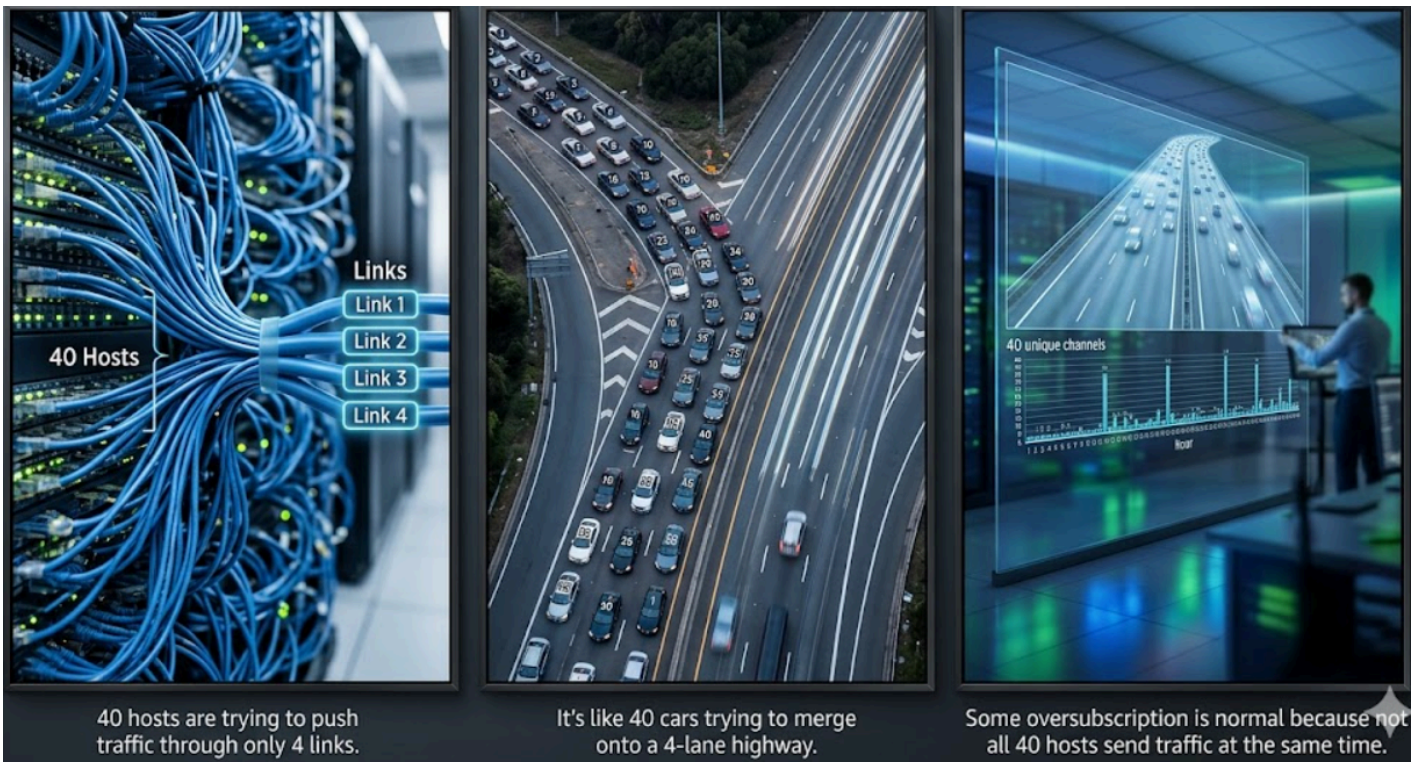
- The network admin adds more links (up to four total) between ASW1 and DSW1
- Congestion doesn't improve — why?

Key Concept: Oversubscription

- Occurs when the **total combined bandwidth** of interfaces connected to end hosts **exceeds** the bandwidth of the connection to the distribution switches
- **Example:** ASW1 has 40 end hosts connected. Even with three or four links to DSW1, the total bandwidth demand from those hosts is still greater than the uplink capacity
- **Not all hosts** send and receive Internet traffic at the same time, so some oversubscription is acceptable
- **However**, too much oversubscription will cause **congestion** and end users will experience problems
- **The Imbalance:**

    - **Downstream side:** 40 end hosts are sharing the interfaces on ASW1 — their combined traffic demand is very high
    - **Uplink side:** Only 4 connections going from ASW1 up to DSW1
    - The total traffic from those 40 end hosts is **greater than** what those 4 uplink connections can handle
- **That's oversubscription** — too much demand (from end hosts) vs. not enough capacity (uplink to DSW1)

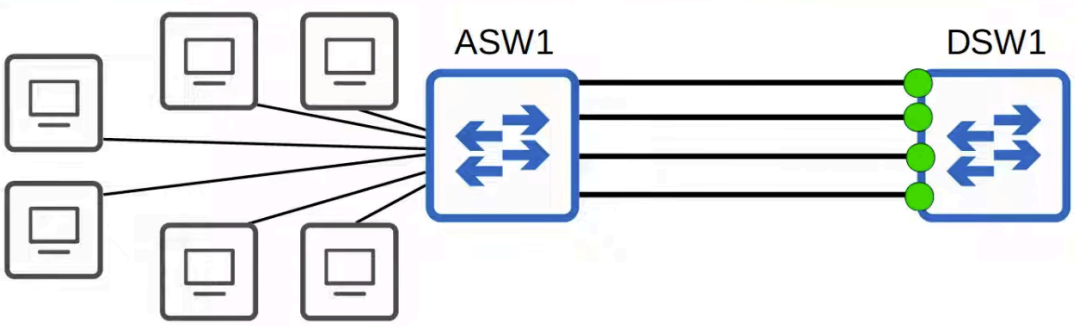
Simple way to think about it:



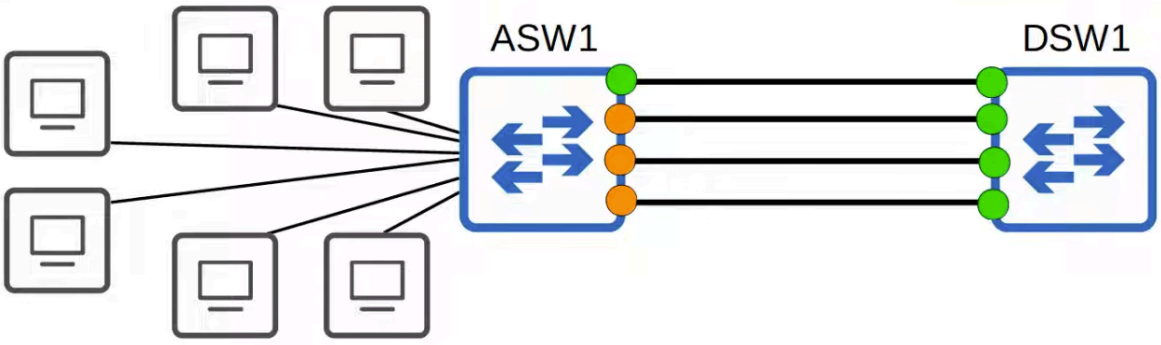
- 40 hosts are trying to push traffic through only 4 links
- It's like 40 cars trying to merge onto a 4-lane highway
- Some oversubscription is normal because not all 40 hosts send traffic at the same time
- But in this case, even 4 links aren't enough — the traffic is still congested

The Real Problem: Spanning Tree Protocol

- When checking port lights on DSW1:



    - All links are green (forwarding)
- When checking port lights on ASW1:



    - Only one link is **green** (forwarding)
    - The other three are **orange** (blocked by STP)
- STP disables all redundant links except one to prevent Layer 2 loops and broadcast storms
- The inactive links only activate if the active link fails
- **Result:** Three interfaces sit idle — a waste of bandwidth

The Solution: EtherChannel

- Groups the four physical interfaces into **one logical interface**
- Provides both **redundancy** and **increased bandwidth**
- STP sees the group as a single link, so it doesn't block any of the member interfaces

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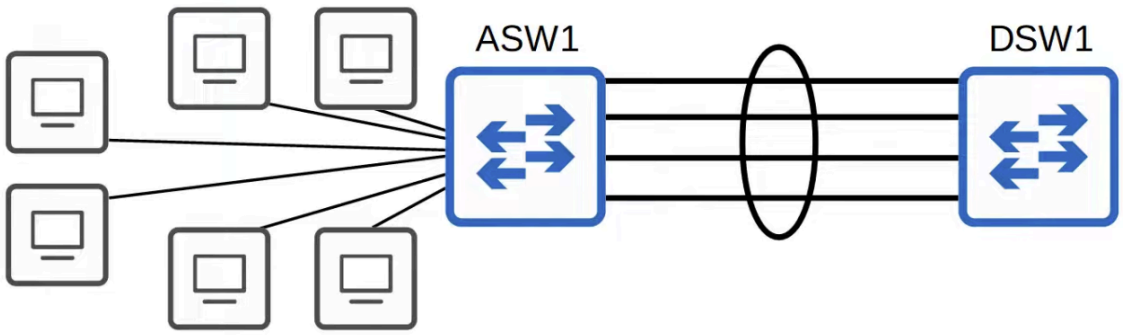
How EtherChannel Works

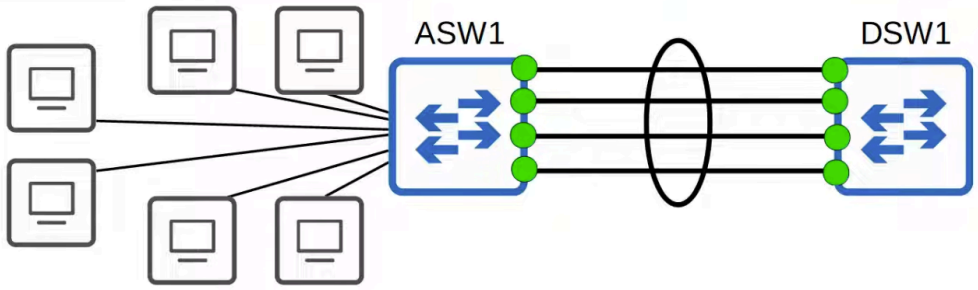
Network Diagram Representation



- EtherChannel is represented by drawing a **circle around the grouped interfaces**
- **EtherChannel groups multiple interfaces together to act as a single interface.**

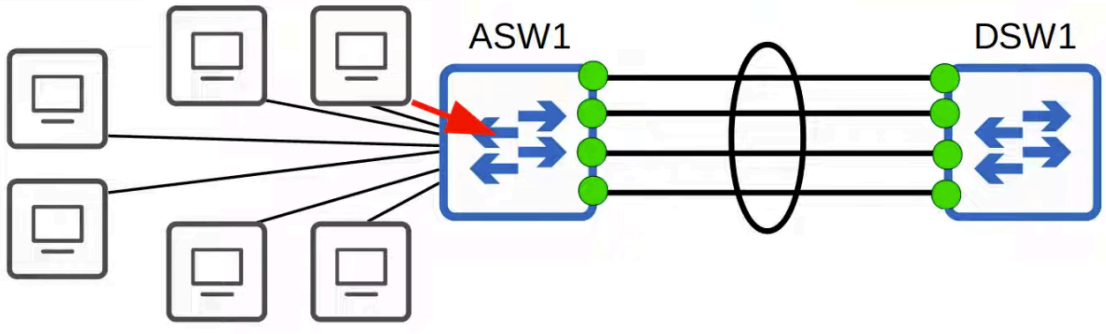
STP Behavior

- STP treats the EtherChannel group as a **single interface**

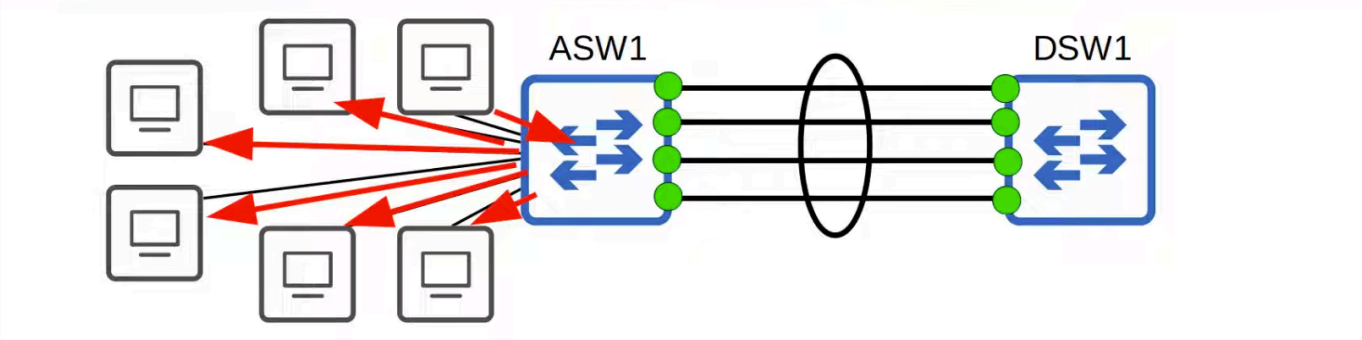


- After grouping, all link lights turn **green** — no ports are blocked
- **No Layer 2 loop is formed** because the group behaves as one link

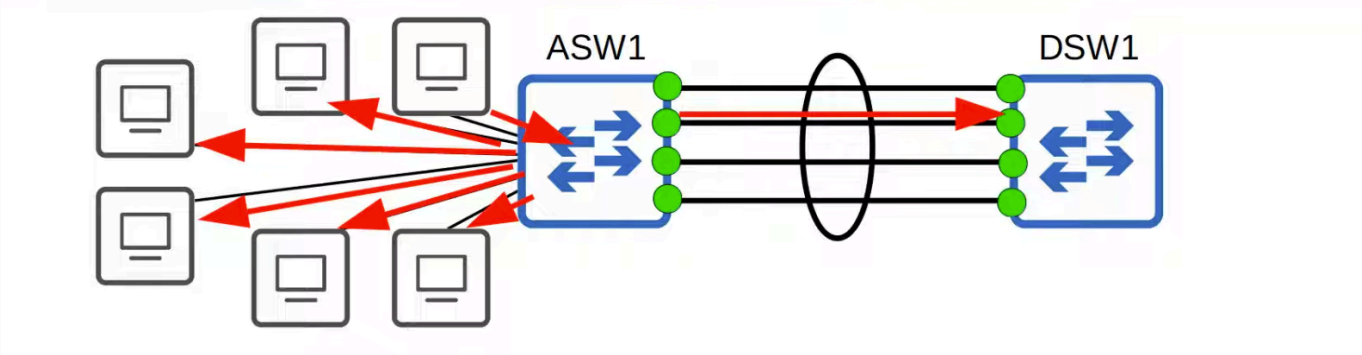
Broadcast Frame Example (Why No Loop Occurs)



1. A PC sends a broadcast frame

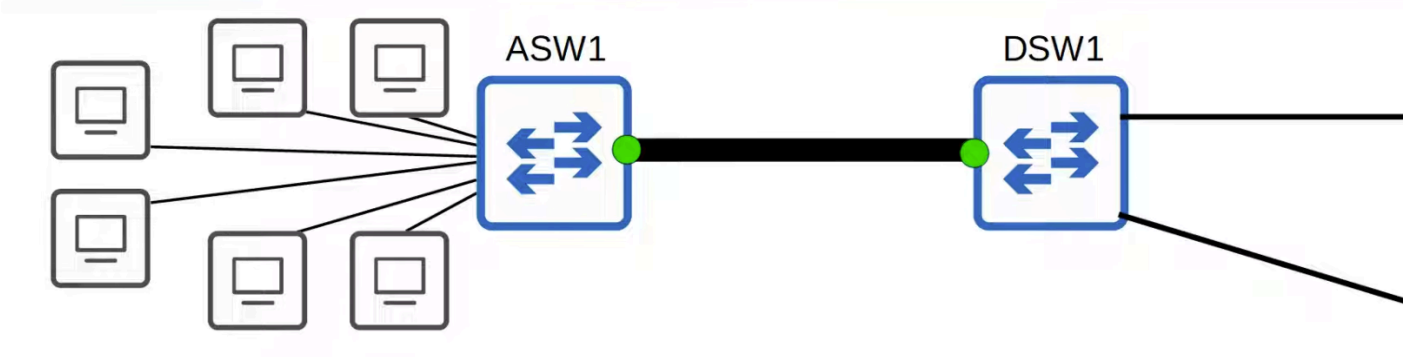


2. ASW1 floods it out all interfaces — all local PCs receive a copy



3. **How many copies does DSW1 receive?** Only **one** — even though there are four physical links, they behave as a single logical interface
4. DSW1 floods the broadcast out of all other interfaces, **except the one it was received on**
5. DSW1 does **not** forward the broadcast back to ASW1 — no loop

Think of It As



- Instead of four separate 1 Gbps interfaces, it's as if there is a **single 4 Gbps virtual interface**
- The bandwidth of all physical links is **combined** into one faster logical link

Physical vs. Logical/Virtual

- **VLANs:** Multiple PCs on the same switch are physically in the same LAN, but VLANs virtually divide them into separate LANs
- **EtherChannel:** Four separate physical interfaces form a **single virtual interface**
- Understanding the difference between physical and logical/virtual characteristics is essential as a network engineer

Other Names for EtherChannel

- **Port Channel**
- **LAG (Link Aggregation Group)**
- In Cisco IOS, different terms are used when configuring — you'll see all three

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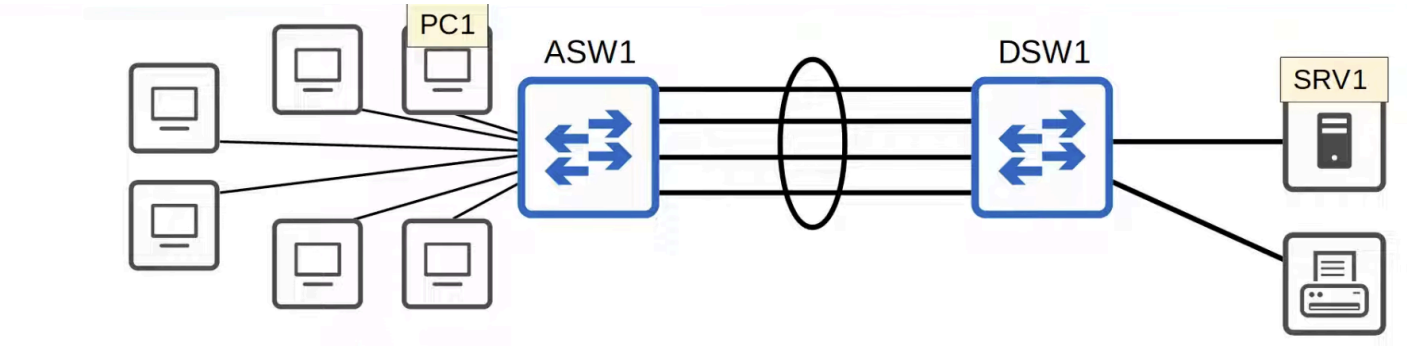
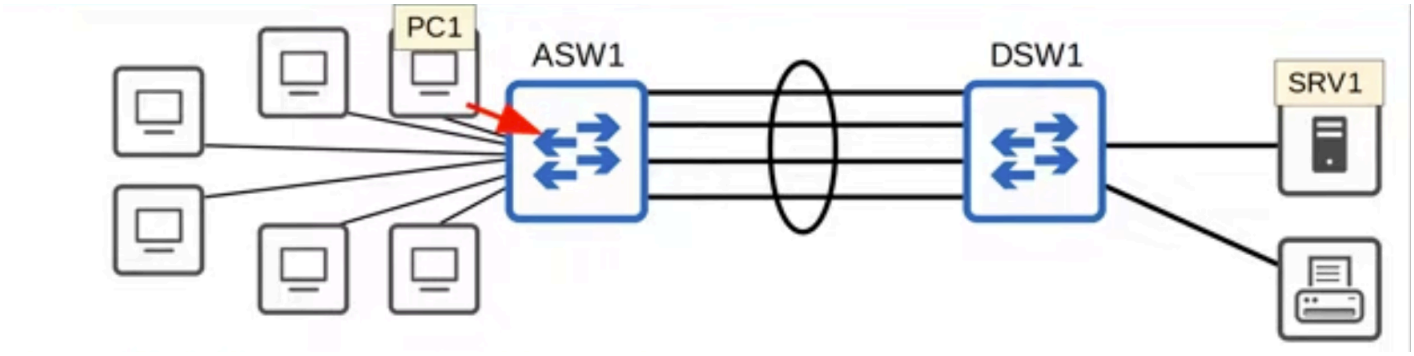
EtherChannel Load Balancing

Concept of a "Flow"

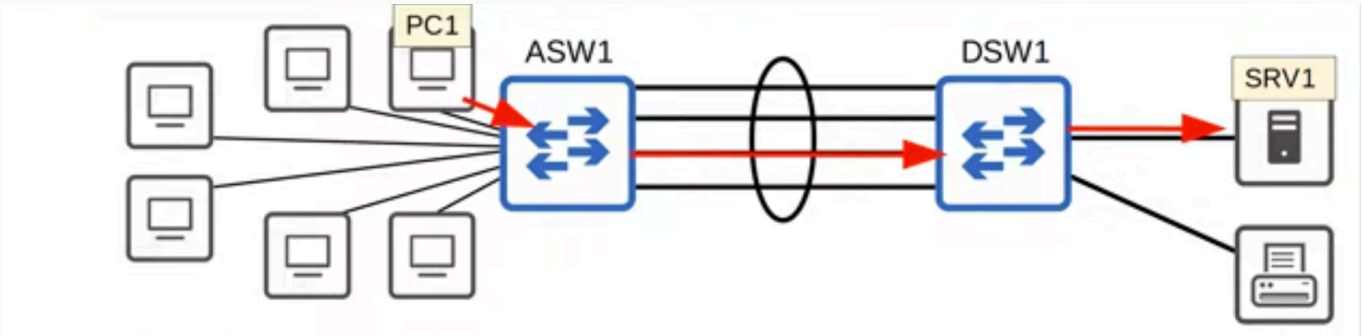


- A flow is a communication session between two nodes in the network (e.g., between PC1 and SRV1).
- **Rule:** Frames belonging to the same flow are **always forwarded over the same physical interface** within the EtherChannel.
- **Reason:** To prevent frames from arriving out of order, which can cause issues for some applications.

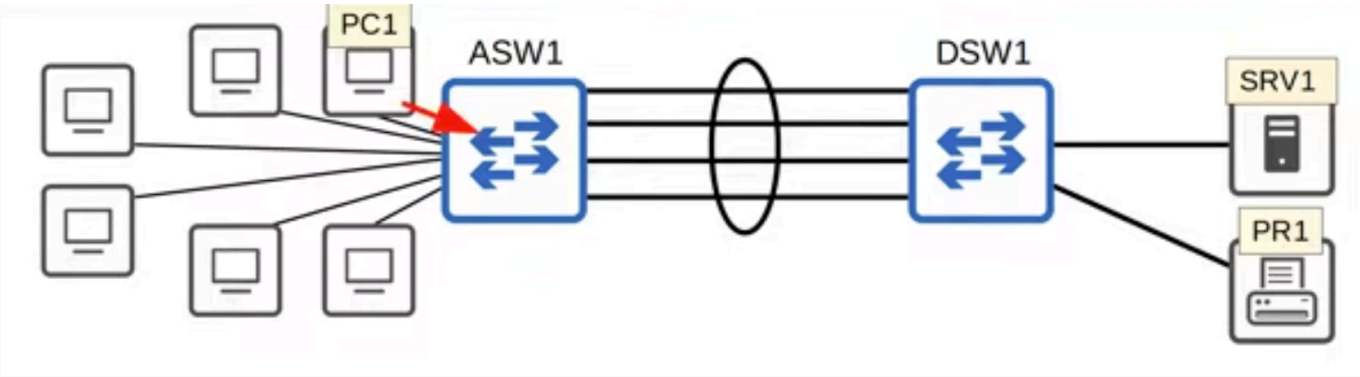
How It Works



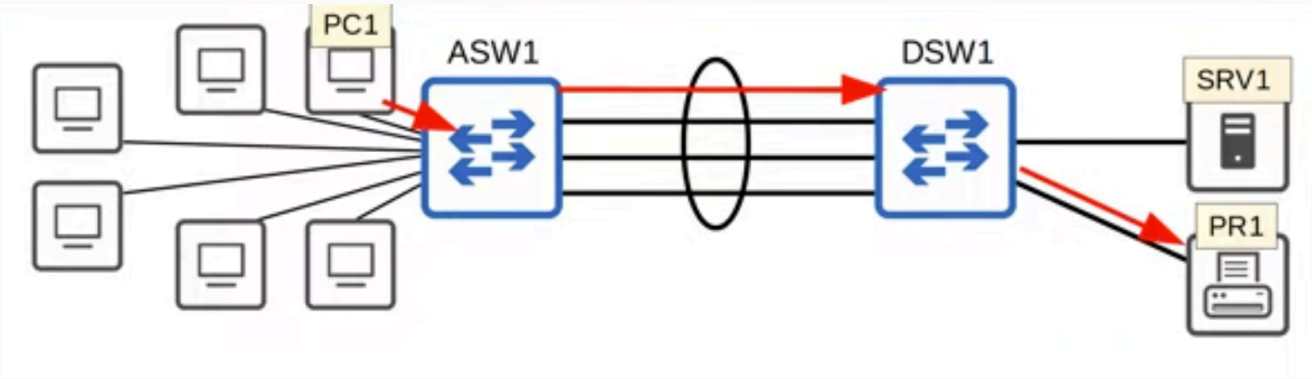
- PC1 initiates an exchange of data with SRV1
- A frame sent from PC1 to ASW1 Switch
- Assuming it knows the mac address of SRV1 it will forward the frame out of the port channel to DSW1
- However which physical interface will it use?



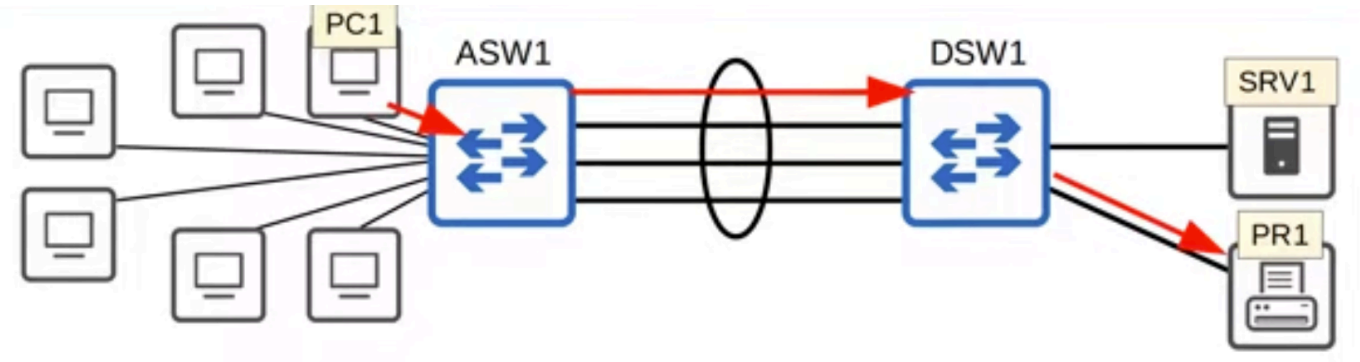
- An algorithm calculates which physical member interface should carry the traffic
- For example, it might select the third interface in the group
- Any subsequent frames from the same flow (e.g., more communication between PC1 and SRV1) will use that **same physical interface**
- **Key Rule:** All frames within a single flow are forwarded over the **same physical interface**
- **Why?** If frames in the same flow used different physical interfaces, they could arrive **out of order** at the destination
  - Some applications can handle out-of-order frames
  - Others cannot — which is why this consistency matters
- **Separate Flows, Separate Calculations**



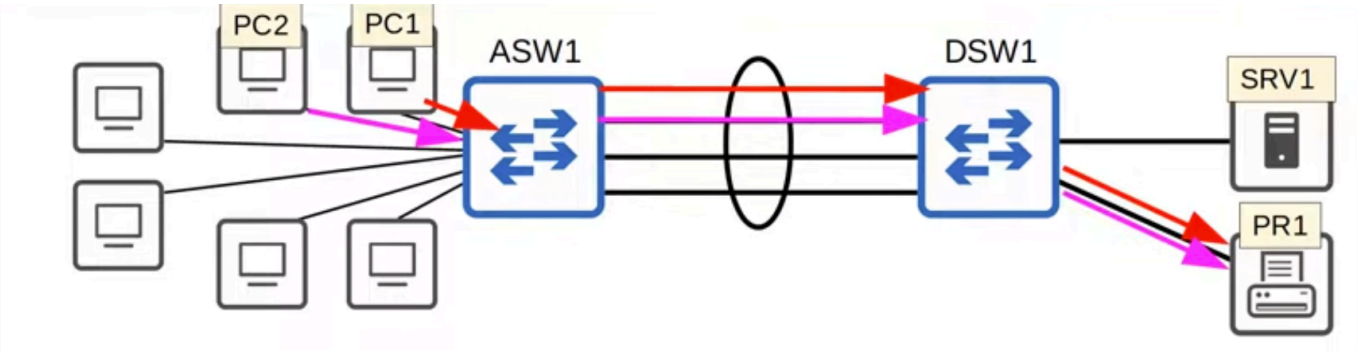
- When PC1 initiates a **new flow** (e.g., connecting to PR1):



  - ASW1 forwards the frame through its **virtual port-channel interface**.
  - It performs a **separate calculation** to determine which physical interface will be used for this flow.
  - For example, it might select a different interface than the one used for the PC1 ↔ SRV1 communication.



- Just like before, when PC1 sends another frame in that flow, the **same member interface** of the EtherChannel will be used to forward it.
- **How Different Flows are Balanced**



- **Flow 3 (PC2 ↔ PR1):** Algorithm calculates and selects Interface C.
- **Summary:** This is how EthernetChannel performs load balancing, by using different physical interfaces within the etherchannel for different flows, achieving load balancing across the link.

Load-Balancing Inputs (The Calculation) You can configure what parameters the algorithm uses to decide the physical interface:

- **MAC Address Based:**
  - **Source MAC:** All frames with the same source MAC use the same interface.
  - **Destination MAC:** All frames with the same destination MAC use the same interface.
    - Frames from PC1 to SRV1 will always use a certain Interface.
    - Frames from PC2 to SRV1 will always use a certain interface which might be the same or different than the one used for traffic from PC1 to SRV1.
    - Frames from PC1 to PR1 might use another different interface.
  - **Source and Destination MAC:** Calculation uses both addresses combined.
- **IP Address Based:**
  - **Source IP:** All frames with the same source IP use the same interface.
  - **Destination IP:** All frames with the same destination IP use the same interface.
  - **Source and Destination IP:** Calculation uses both addresses combined.
- **Layer 4 Port Numbers:**
  - Based on TCP or UDP port numbers (supported on some switch models).

Note:

- The available load-balancing methods depend on the **switch model**. Some support only MAC, some support MAC and IP, and others support all methods.
- The professor notes that servers/printers usually connect to the Access Layer, but they are shown on DSW1 in this diagram for simplicity.

Configuring and Verifying Load-Balancing

Check Current Load-Balancing Method

```
ASW1#show etherchannel load-balance
EtherChannel Load-Balancing Configuration:
        src-dst-ip

EtherChannel Load-Balancing Addresses Used Per-Protocol:
Non-IP: Source XOR Destination MAC address
  IPv4: Source XOR Destination IP address
  IPv6: Source XOR Destination IP address
```

- Use the command `show etherchannel load-balance` to view the current setting.
- The default method on this model is to load balance based on **source and destination IP addresses**.
- **Example:** All traffic from $10.0.0.1$ to destination $10.0.0.2$ will always use the same physical interface within the etherchannel.

Default Behavior Details

```
EtherChannel Load-Balancing Addresses Used Per-Protocol:
Non-IP: Source XOR Destination MAC address
  IPv4: Source XOR Destination IP address
  IPv6: Source XOR Destination IP address
```

- **IP Traffic (IPv4/IPv6):** Load-balanced based on source and destination IP addresses.
- **Non-IP Traffic:** Load-balanced based on source and destination MAC addresses (because no IP addresses are present).

Change Load-Balancing Method

```
ASW1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
ASW1(config)#port-channel load-balance src-dst-mac
ASW1(config)#do show etherchannel load-balance
EtherChannel Load-Balancing Configuration:
        src-dst-mac

EtherChannel Load-Balancing Addresses Used Per-Protocol:
Non-IP: Source XOR Destination MAC address
  IPv4: Source XOR Destination MAC address
  IPv6: Source XOR Destination MAC address

ASW1(config)#
```

- Enter global configuration mode.
- Use the command `port-channel load-balance` followed by the method.

On ASW1:

```
ASW1# show etherchannel load-balance
```

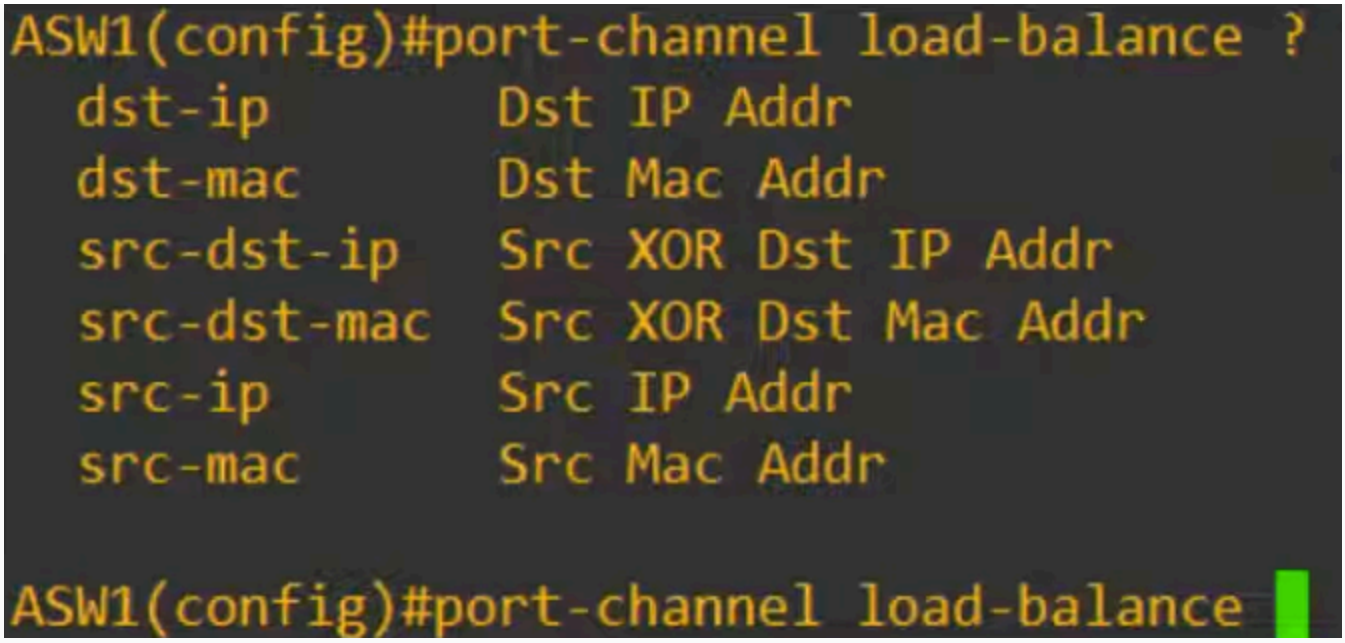
(Displays default: src-dst ip)

```
ASW1# configure terminal
ASW1(config)# port-channel load-balance src-dst-mac
ASW1(config)# end
ASW1# show etherchannel load-balance
```

(Verifies change to src-dst mac)

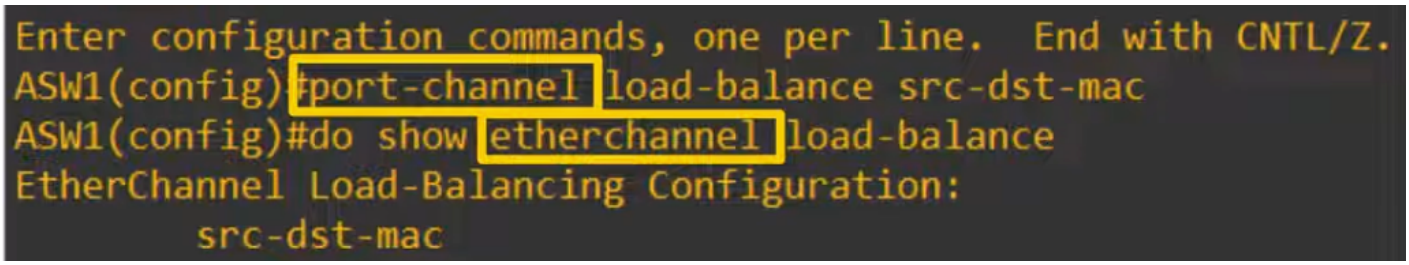
Available Methods

- Load balance based on MAC or IP addresses.
- Load balance based on source, destination, or both source and destination addresses.
- Examples:



- `dst-ip` — All frames with the same **destination IP address** use the same physical interface
- `dst-mac` — All frames with the same **destination MAC address** use the same physical interface
- `src-dst-ip` — Calculation uses both **source and destination IP addresses** combined
- `src-dst-mac` — Calculation uses both **source and destination MAC addresses** combined
- `src-ip` — All frames with the same **source IP address** use the same physical interface
- `src-mac` — All frames with the same **source MAC address** use the same physical interface

Cisco IOS Quirk (Note)



- **To configure:** Use keyword `port-channel`.
- **To verify:** Use keyword `etherchannel`.
- The professor notes this terminology inconsistency is frustrating.

Summary of Commands

1. `show etherchannel load-balance`: To check the method.
2. `port-channel load-balance [method]`: To configure the method.

Methods of Configuration

There are three methods to configure an EtherChannel.

PAgP (Port Aggregation Protocol)

- **Definition:** Cisco proprietary protocol (can only be used between Cisco switches).
- **Function:** Dynamically negotiates the creation and maintenance of the EtherChannel.
- **Comparison:** Functions similarly to DTP (Dynamic Trunking Protocol) which negotiates trunk formation.
- **Behavior:** Switches send frames to neighbors to agree on forming an EtherChannel.

LACP (Link Aggregation Control Protocol)

- **Definition:** Industry standard protocol (IEEE 802.3ad).
- **Vendor Support:** Works with switches from different vendors (e.g., Cisco, Juniper).
- **Function:** Dynamically negotiates the creation and maintenance of the EtherChannel.
- **Status:** Preferred method for configuring EtherChannels.
- **Exam Note:** The official exam topics list specifically mentions LACP, though familiarity with all methods is recommended.

Static EtherChannel

- **Definition:** No negotiation protocol is used.
- **Configuration:** Interfaces are statically configured to form an EtherChannel.
- **Drawback:** Usually avoided because the switch cannot dynamically maintain the group (e.g., it won't automatically remove an interface if a problem occurs).

EtherChannel Limits

- **Standard Limit:** Up to **8** interfaces can be active in a single EtherChannel.
- **LACP Exception:** LACP allows up to **16** interfaces.
  - **8** active interfaces.
  - **8** standby interfaces (ready to take over if an active interface fails).

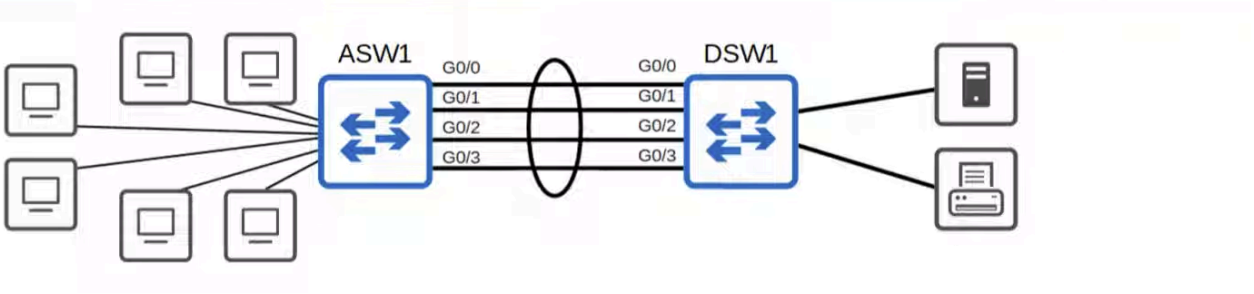
Configuration of EtherChannel Methods

General Configuration Approach

```
ASW1(config)#interface range g0/0 - 3
ASW1(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

ASW1(config-if-range)#channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1
```

- The configuration for each method (PAgP, LACP, Static) is almost identical, just with different keywords.
- It is best practice to use the `interface range` command to configure all member interfaces at once. This ensures that the configurations on each member interface match, which is a requirement for forming an EtherChannel.

PAgP Configuration



On ASW1:

```
ASW1# configure terminal
ASW1(config)# interface range GigabitEthernet 0/0 - 3
ASW1(config-if-range)# channel-group 1 mode desirable
```

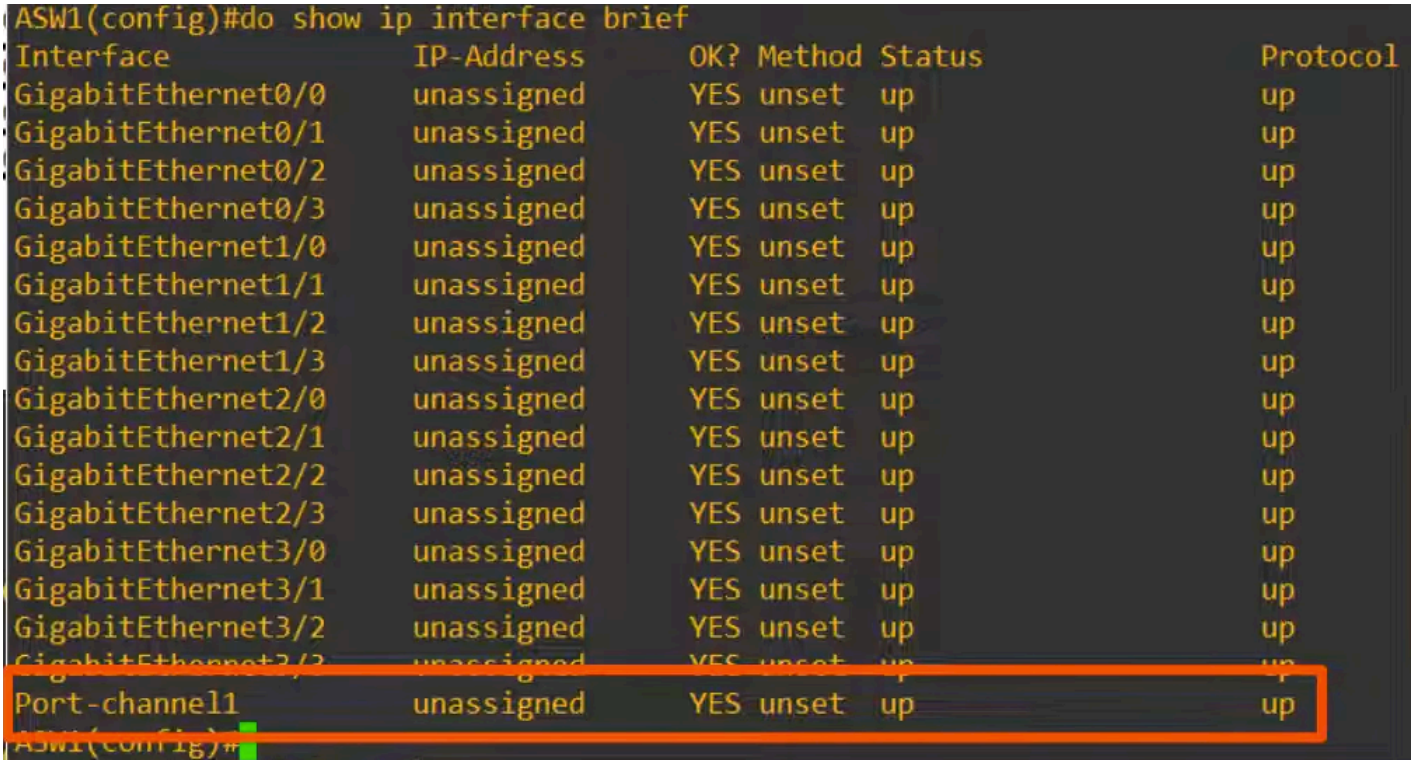
- The `channel-group` command creates the EtherChannel.
  - `1` is the number identifying the virtual interface.
  - `mode` determines the negotiation behavior.

PAgP Modes

- **Desirable:** Actively tries to form an EtherChannel.
- **Auto:** Passive; only forms an EtherChannel if the other side is set to desirable.
- **Summary:**
  - `Auto` + `Auto` = No EtherChannel.
  - `Desirable` + `Auto` = EtherChannel.
  - `Desirable` + `Desirable` = EtherChannel.

Verification

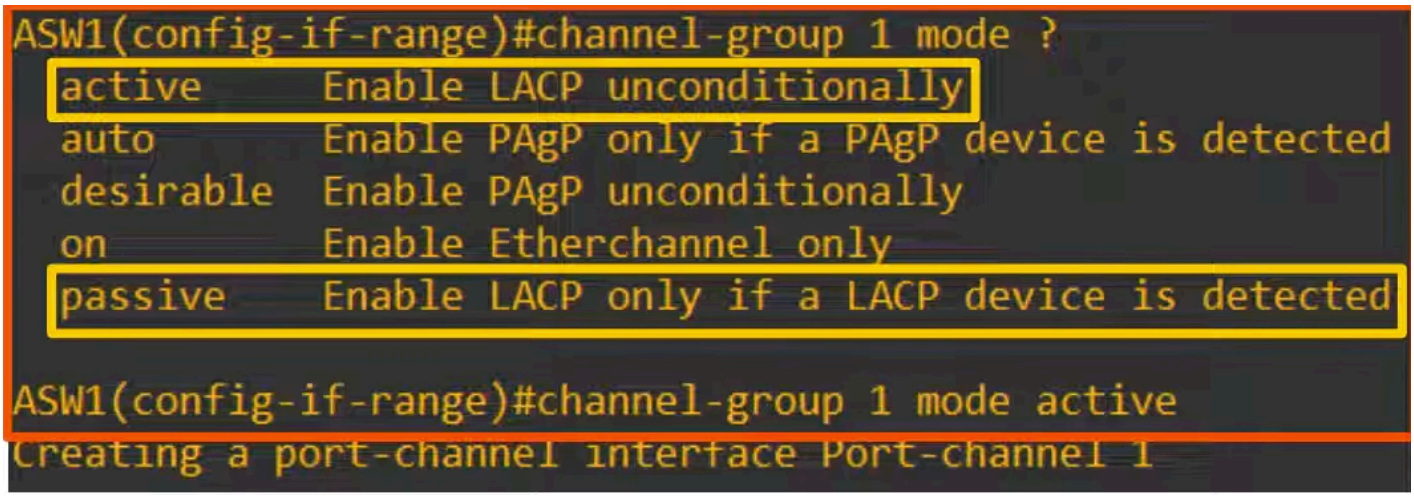
- The virtual interface is created as **Port-Channel 1**.
- `channel-group` number must match between interfaces on the **local** switch, but does not need to match the neighbor switch (e.g., ASW1 group 1 can connect to DSW1 group 2).




```
ASW1# show ip interface brief
```

LACP Configuration

On ASW1:




```
ASW1# configure terminal
ASW1(config)# interface range GigabitEthernet 0/0 – 3
```

```
ASW1(config-if-range)# channel-group 1 mode active
```

LACP Modes

- **Active:** Actively tries to form an EtherChannel (equivalent to PAgP's `desirable`).
- **Passive:** Passive; only forms an EtherChannel if the other side is set to active (equivalent to PAgP's `auto`).
- **Summary:**
  - `Passive` + `Passive` = No EtherChannel.
  - `Active` + `Passive` = EtherChannel.
  - `Active` + `Active` = EtherChannel.

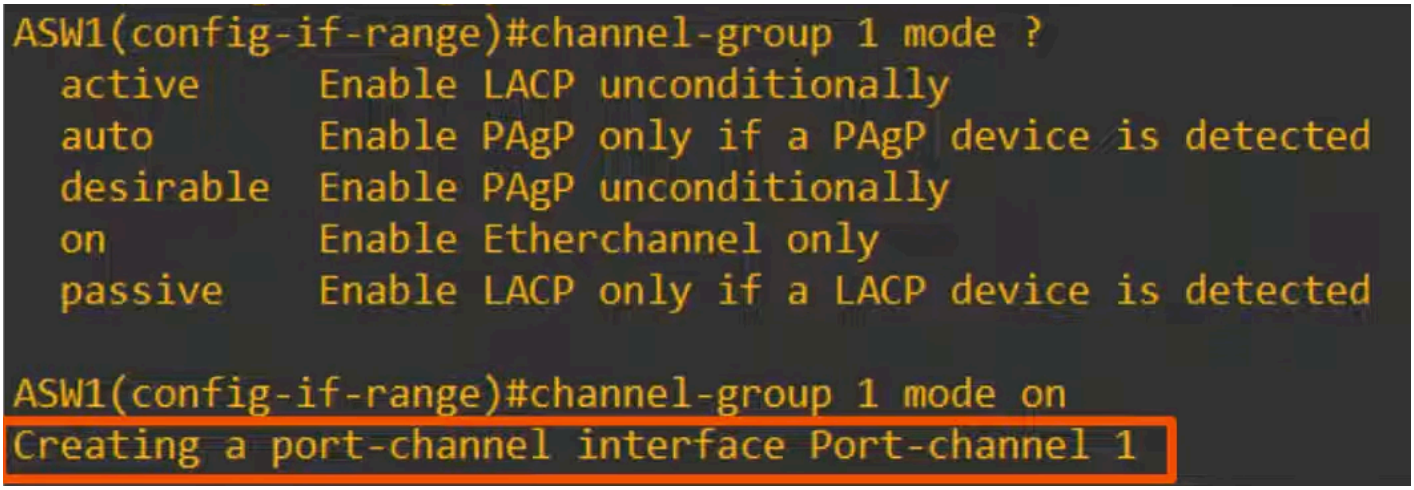
Note: Even if both sides are configured in `passive` mode, the virtual port-channel interface will still be created on each switch. However, it won't actually be functioning as an EtherChannel unless at least one side is in `active` mode.

Channel-Group Number

- The `channel-group` number must match between member interfaces on the **local** switch.
- It does **not** need to match the number on the neighbor switch.

Static EtherChannel Configuration

On ASW1:



```
ASW1# configure terminal
ASW1(config)# interface range GigabitEthernet 0/0 - 3
ASW1(config-if-range)# channel-group 1 mode on
```

Static Mode

- **Mode `on`:** Manually tells the interfaces to form an EtherChannel without any negotiation protocol.
- A **port-channel interface** is created automatically, just like with PAgP and LACP.

Compatibility Rules

- `on` + `on` = EtherChannel formed.
- `on` + `desirable` = **No** EtherChannel.
- `on` + `active` = **No** EtherChannel.

Note: You cannot mix static mode (`on`) with any negotiated mode (`desirable`, `auto`, `active`, `passive`). Both sides must use `on` for static EtherChannel to work.

The `channel-protocol` Command and Protocol Mismatch

Manual Protocol Selection

- You can manually set the negotiation protocol using `channel-protocol`.
- **Note:** This command is generally unnecessary because the mode automatically determines the protocol (e.g., `active` implies LACP, `desirable` implies PAgP).

Protocol Mismatch Verification

```
ASW1(config-if-range)#channel-protocol lacp
ASW1(config-if-range)#channel-group 1 mode desirable
Command rejected (Channel protocol mismatch for interface Gi0/0 in group 1): the interface can not be added to the channel group
```

- If you manually set `channel-protocol lacp`, you cannot use PAgP modes.

```
ASW1(config-if-range)#channel-group 1 mode desirable
Command rejected (Channel protocol mismatch for interface Gi0/0 in group 1): the interface can not be added to the channel group

% Range command terminated because it failed on GigabitEthernet0/0
```

- Attempting `channel-group 1 mode desirable` will be rejected because `desirable` is PAgP, but the interface is forced to LACP.

```
ASW1(config-if-range)#channel-group 1 mode on
Command rejected (Channel protocol mismatch for interface Gi0/0 in group 1): the interface can not be added to the channel group
```

- Attempting `channel-group 1 mode on` is also rejected in this context.

```
ASW1(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1
```

- `channel-group 1 mode active` is accepted because `active` is an LACP mode.

Configuring the Port-Channel Interface

```
ASW1(config)#interface port-channel 1
ASW1(config-if)#switchport trunk encapsulation dot1q
ASW1(config-if)#switchport mode trunk
ASW1(config-if)#do show interfaces trunk

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

Port        Vlans allowed on trunk
Po1         1-4094

Port        Vlans allowed and active in management domain
Po1         1

Port        Vlans in spanning tree forwarding state and not pruned
Po1         none
```

- After the physical interfaces are grouped, configure the virtual **Port-Channel** interface.
- This configuration applies to the entire bundle.

On ASW1:

```
ASW1# configure terminal
ASW1(config)# interface Port-channel 1
ASW1(config-if)# switchport mode trunk
```

On DSW1:

```
DSW1# configure terminal
DSW1(config)# interface Port-channel 1
```

```
DSW1(config-if)# switchport mode trunk
```

Verification

```
ASW1# show interfaces trunk
```

(Output shows `Po1` as the trunk interface, not the individual physical ports).

```
interface Port-channel1
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface GigabitEthernet0/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 media-type rj45
 negotiation auto
 channel-protocol lacp
 channel-group 1 mode active
!
interface GigabitEthernet0/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 media-type rj45
 negotiation auto
 channel-protocol lacp
 channel-group 1 mode active
!
interface GigabitEthernet0/2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 media-type rj45
 negotiation auto
 channel-protocol lacp
 channel-group 1 mode active
!
interface GigabitEthernet0/3
 switchport trunk encapsulation dot1q
 switchport mode trunk
 media-type rj45
 negotiation auto
 channel-protocol lacp
 channel-group 1 mode active
!
```

```
ASW1# show running-config
```

(Note: Trunk configuration on `Port-channel 1` is automatically applied to the member physical interfaces).

EtherChannel Member Interface Requirements

Configuration Matching

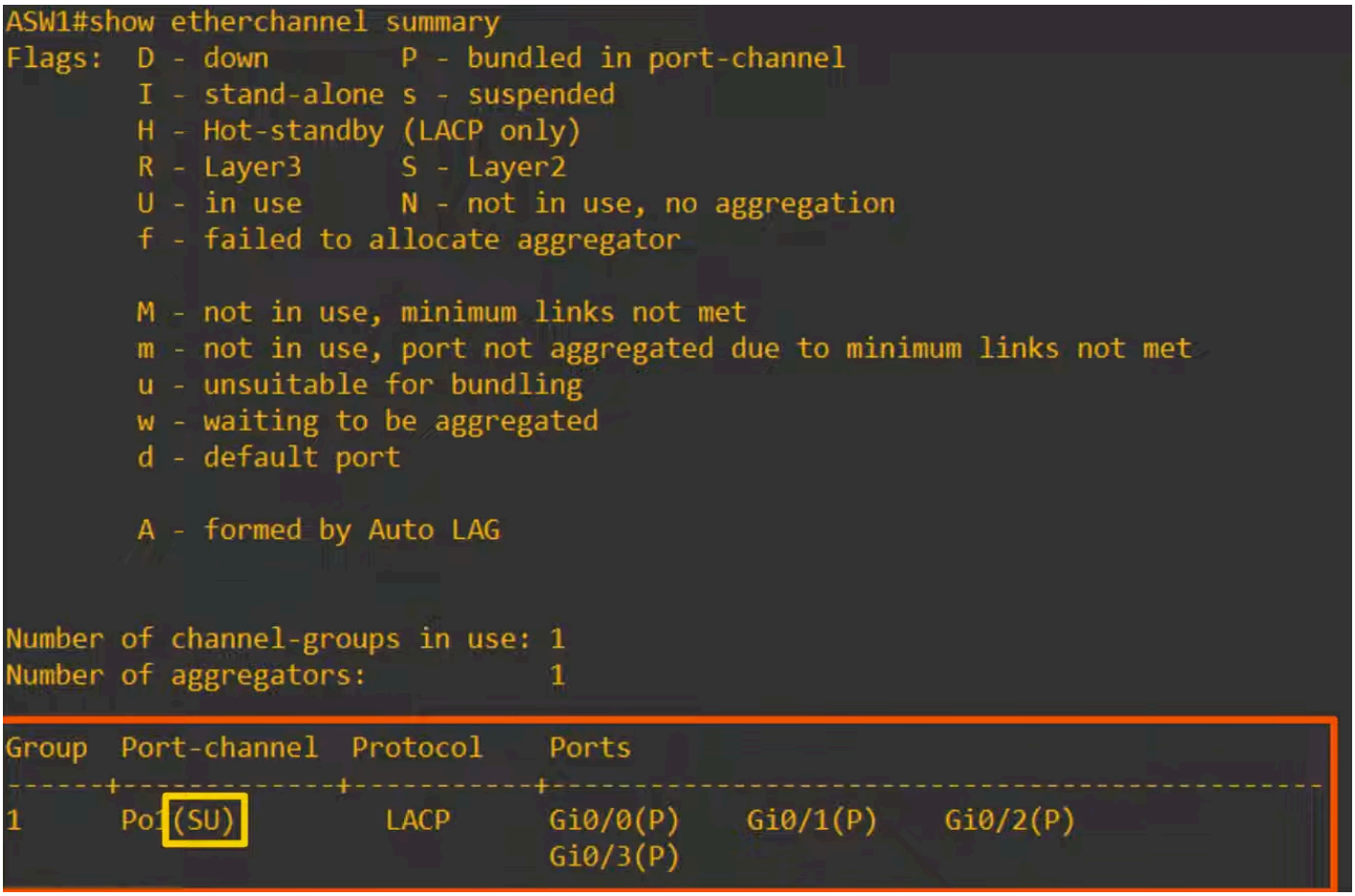
- Member interfaces, the physical interfaces in the EtherChannel, must have matching configurations.
- If an individual interface's configurations do not match the others, it will be **excluded** from the EtherChannel.

What Must Match:

- Same **duplex** setting (e.g., full-duplex)
- Same **speed** (e.g., 1 Gbps)
- Same **switchport mode** (both access or both trunk)
- If trunk: same **allowed VLANs** and same **native VLAN**

Note: Using the `interface range` command to configure all member interfaces at once ensures matching configurations and prevents an interface from being excluded.

Verifying EtherChannel Status



Primary Verification Command

- Use `show etherchannel summary` to view the status of all EtherChannels on the switch.

On ASW1:

```
ASW1# show etherchannel summary
```

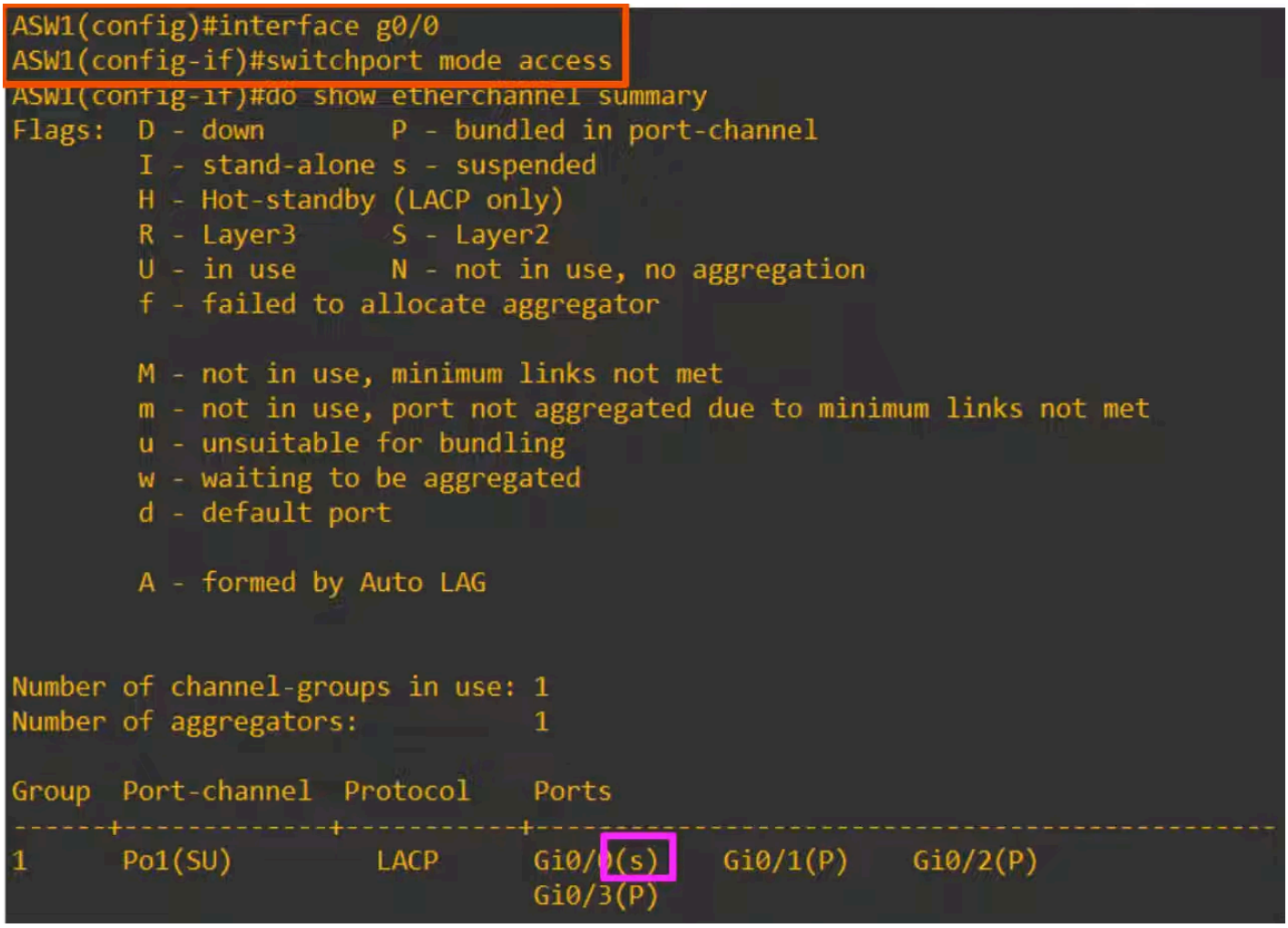
Flag Meanings (Legend)

- `S` **(Upper-case S):** Layer 2 EtherChannel. S stands for Switchport.
- `U` **(Upper-case U):** In Use. The EtherChannel is active and being used.
- `P`**:** Properly bundled in the port-channel. This is the ideal state for member interfaces.
- `D`**:** Down. The interface or EtherChannel is down (e.g., shutdown).
- `s` **(Lower-case s):** Suspended. The interface is excluded due to a configuration mismatch (e.g., wrong switchport mode). The EtherChannel continues to operate with the remaining matching interfaces.

Ideal Status for Layer 2 EtherChannel:

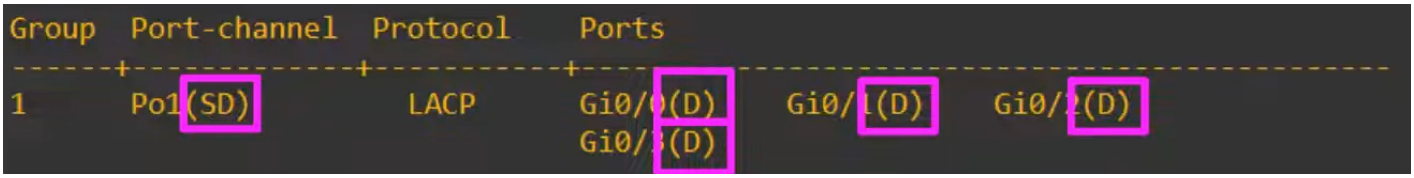
- Next to the Port-Channel interface: `S` and `U`.
- Next to the member physical interfaces: `P`.

Scenario: Mismatch Causes Suspension



- If a member interface is configured differently (e.g., changed to access mode while others are trunks), it will be suspended.
- **Example:** `GigabitEthernet0/0` shows `s`, while `GigabitEthernet0/1`, `G0/2`, and `G0/3` show `P`. The EtherChannel operates with three interfaces.

Scenario: Shutdown Interface

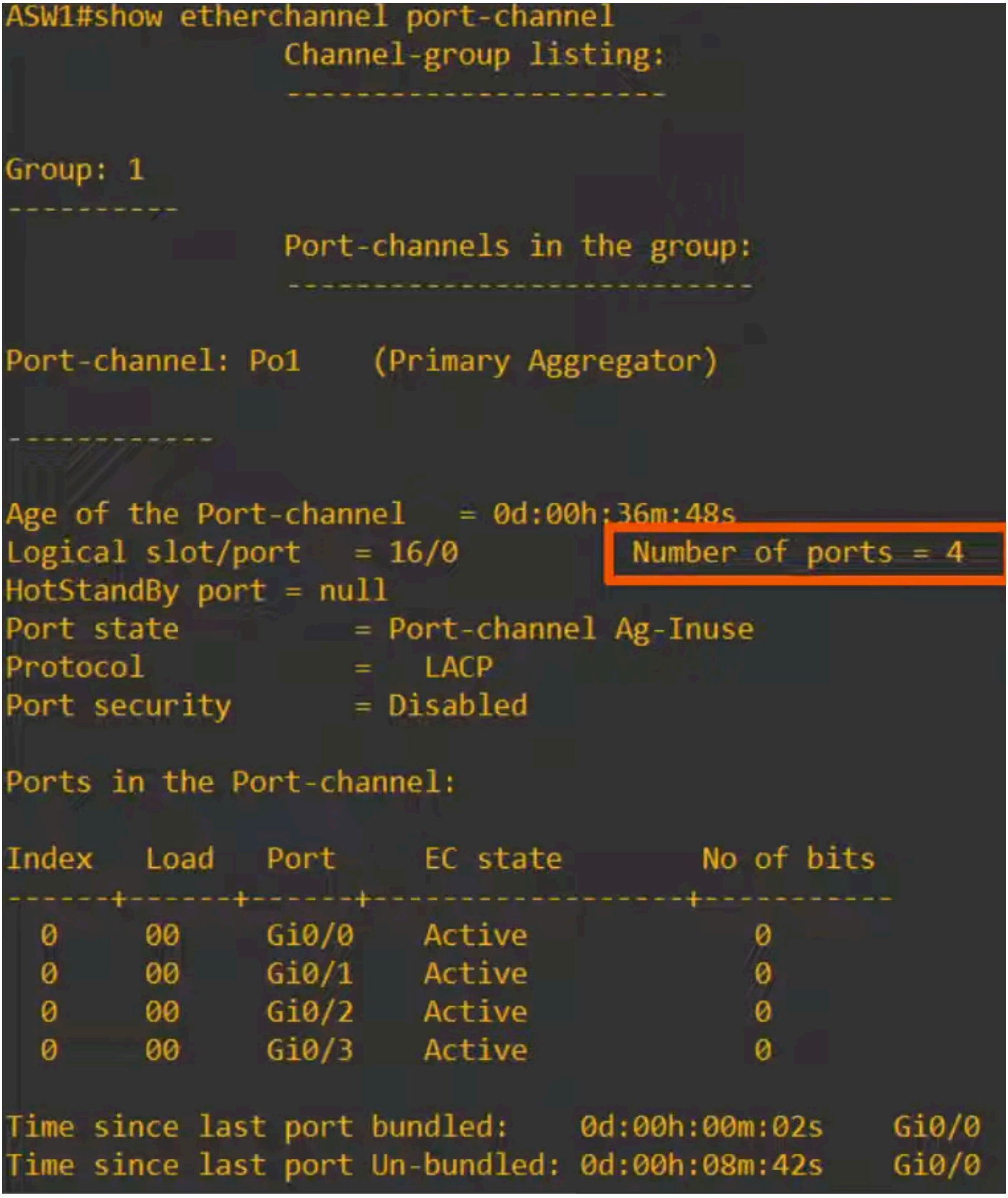


- If the port-channel interface is shut down, it and all its members will show the `D` flag.

```
ASW1# configure terminal
ASW1(config)# interface Port-channel 1
ASW1(config-if)# shutdown
ASW1(config-if)# no shutdown
```

Additional Verification: `show etherchannel port-channel`

```
ASW1# show etherchannel port-channel
```



- **Output Details:** Displays information such as the number of ports in the bundle, the protocol in use, etc.

- **Key Difference:** Unlike `show etherchannel summary`, this command displays the **Channel-Group Mode** (e.g., `active`).
- **Note:** `show etherchannel summary` is the most commonly used command, but this command is a good alternative for specific details.

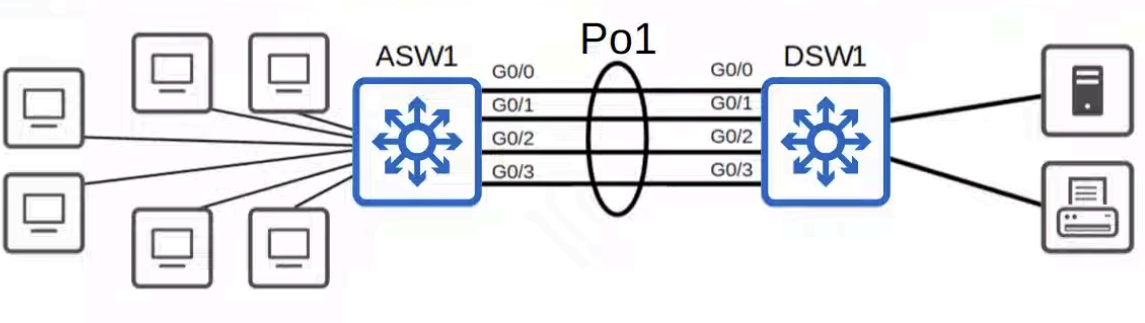
Spanning Tree Protocol Behavior

```
ASW1#show spanning-tree

VLAN0001
  Spanning tree enabled protocol rstp
  Root ID     Priority    32769
              Address     0c04.cf10.ea00
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0c04.cf10.ea00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Po1                 Desg FWD 3         128.65   Shr
```

- When verifying STP with EtherChannel configured, only the **Port-Channel** interface appears in the output (e.g., `show spanning-tree`).
- The individual physical interfaces are **hidden** from STP.
- **Result:** STP treats the group as a single logical interface. Instead of blocking redundant links, all links in the bundle forward traffic, fully utilizing the bandwidth with no risk of Layer 2 loops.

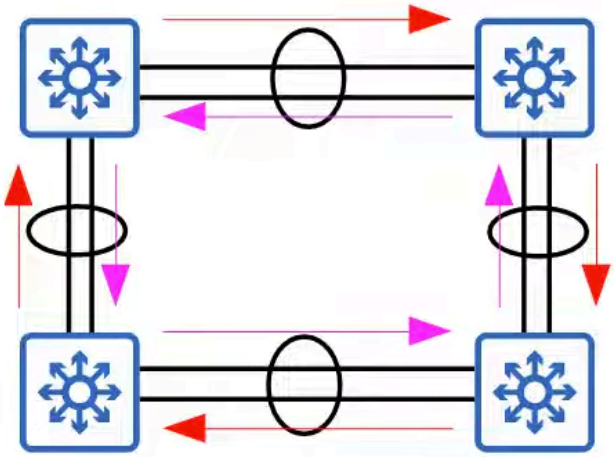
Layer 3 EtherChannel Configuration

Modern Network Design Context

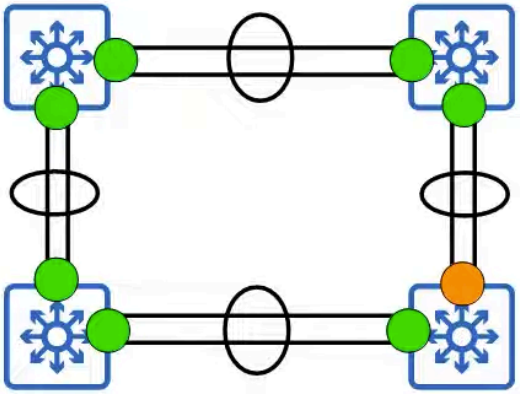


- Replaced ASW1 and DSW1 with multilayer switches.
- Layer 3 connections between switches are often preferred.
- **Benefit:** Spanning Tree Protocol (STP) is not required because routed ports do not forward Layer 2 broadcasts, preventing loops entirely.

Why EtherChannel alone isn't enough for complex topologies



- In a mesh of multiple switches, even with EtherChannel, STP still has to block one of the port-channel interfaces to prevent loops.



- Using Layer 3 routed ports allows **all** paths to be active and forwarding.

Step 1: Configure Member Interfaces as Routed Ports

```
ASW1(config)#int range g0/0 - 3
ASW1(config-if-range)#no switchport
ASW1(config-if-range)#channel-group 1 mode active
Creating a port-channel interface Port-channel 1
```

- Convert physical interfaces to Layer 3 routed ports using the `no switchport` command.
- Bundle them into the EtherChannel.

On ASW1:

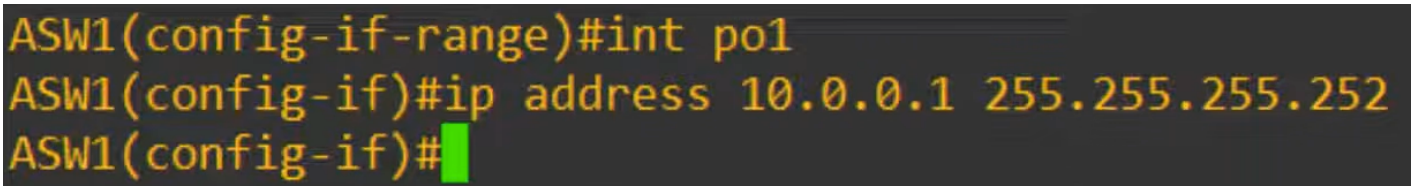
```
ASW1# configure terminal
ASW1(config)# interface range GigabitEthernet 0/0 - 3
ASW1(config-if-range)# no switchport
ASW1(config-if-range)# channel-group 1 mode active
```

Note: The `no switchport` command is applied to the `Port-Channel` interface automatically when configured on the physical members first.

Step 2: Configure the Port-Channel Interface

- Assign an IP address to the logical interface.

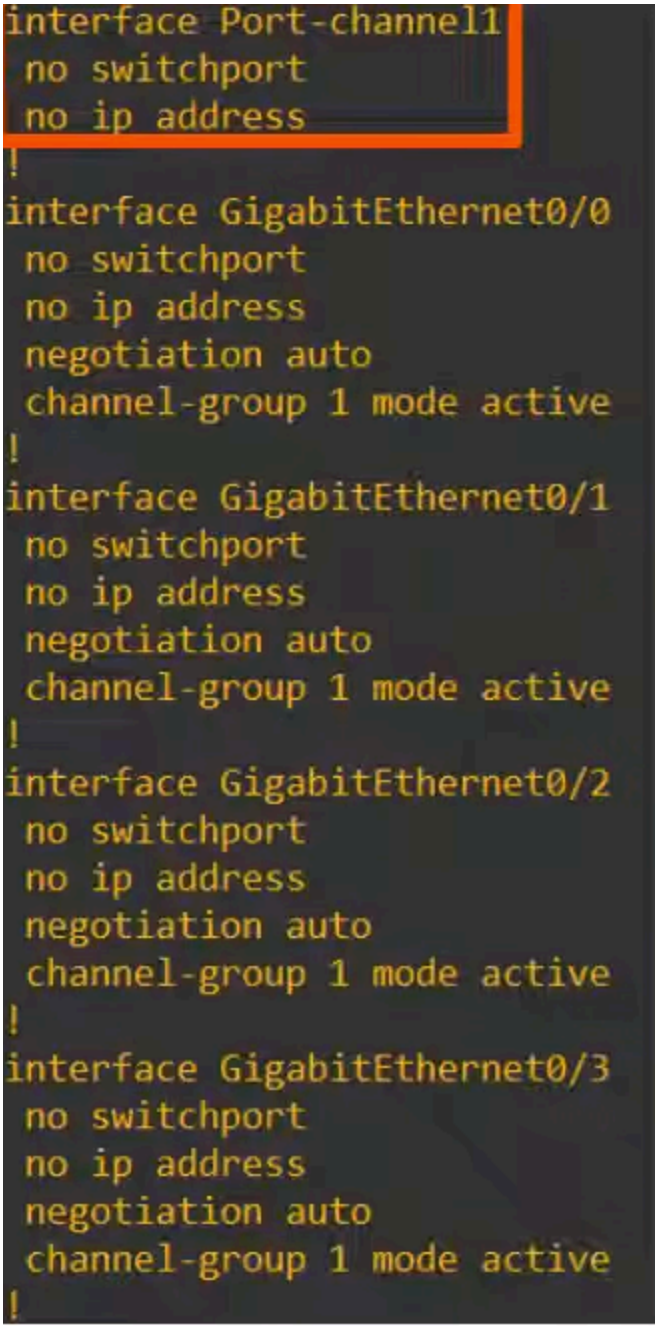
On ASW1:




```
ASW1(config)# interface Port-channel 1
ASW1(config-if)# ip address 10.0.0.1 255.255.255.0
```

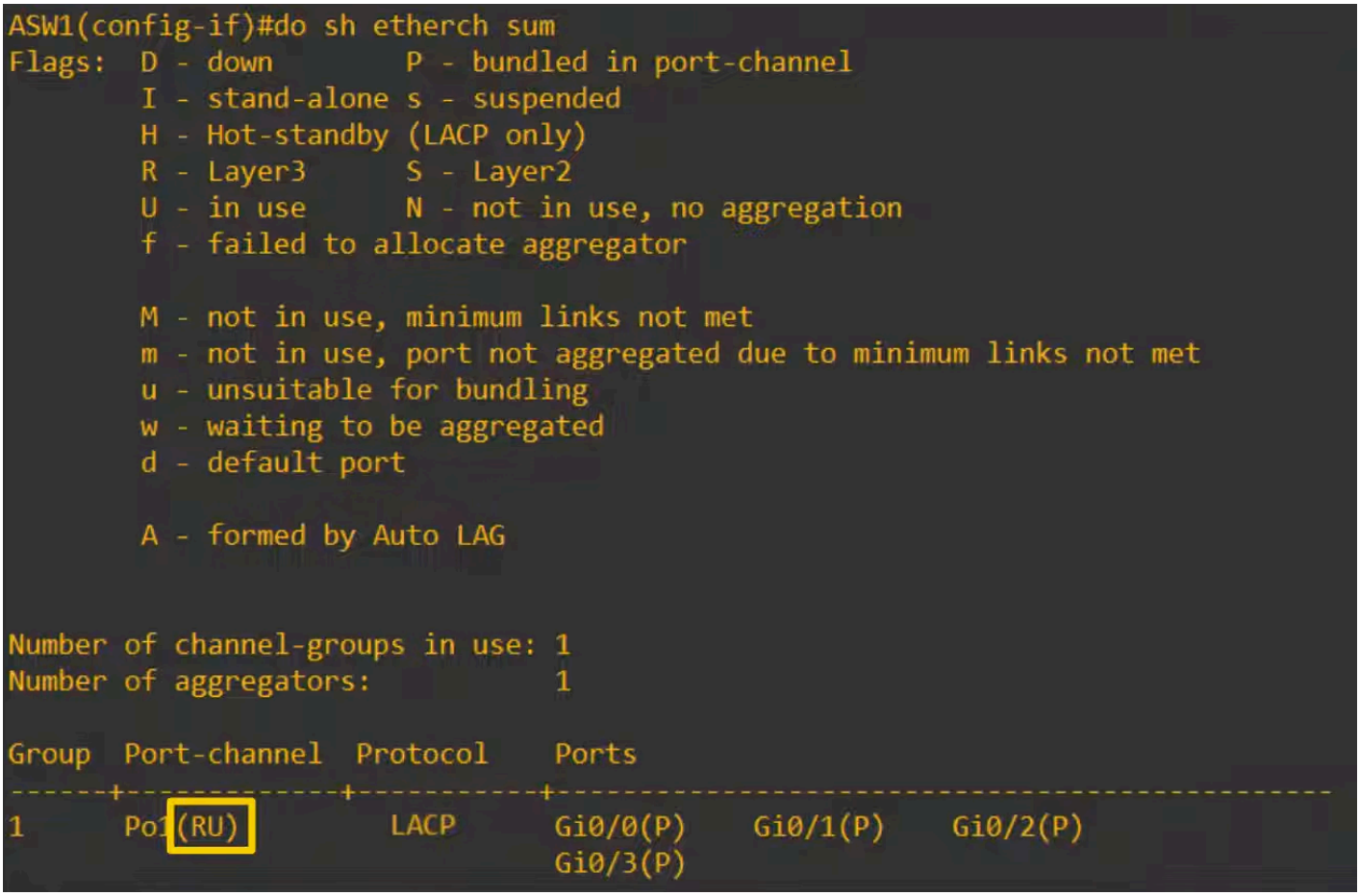
Verification

```
ASW1# show running-config
```



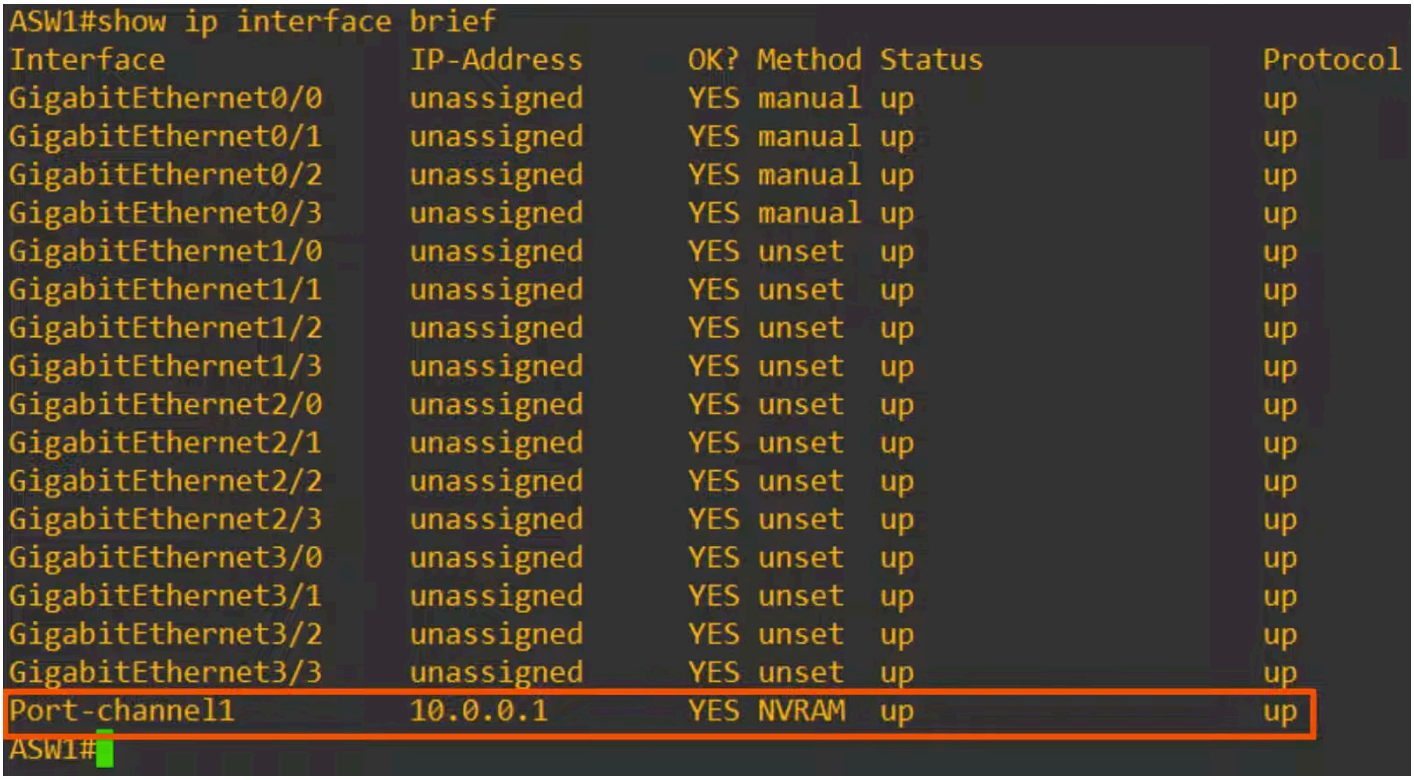
(Confirms `Port-Channel 1` *has* `no switchport` *and the IP address).*

```
ASW1# show etherchannel summary
```



- **Status Flag:** Look for `R` next to the port-channel interface.
- `R` stands for **Routed port**, indicating a Layer 3 EtherChannel (replaces `S` for Switchport).

```
ASW1# show ip interface brief
```



(Displays the IP address assigned to `Port-channel 1`*).*

Conclusion

- ASW1 and DSW1 now operate as routers connected at Layer 3.
- STP is not running on this connection.
- Traffic is load-balanced over the member interfaces.

Command Review

Load-Balancing Configuration

- `port-channel load-balance [mode]` — Configures the load-balancing method.
  - Depending on the switch model, this can be based on MAC addresses, IP addresses, or Layer 4 port numbers.
  - Can be set to use source, destination, or both.
- `show etherchannel load-balance` — Views the current load-balancing configuration.

EtherChannel Configuration

- `channel-group [number] mode [mode]` — Configures an interface to be part of an EtherChannel.

- **Modes available:** `desirable`, `auto`, `active`, `passive`, or `on`.

Verification Commands

- `show etherchannel summary` — The most useful show command. Displays a summary of all EtherChannels on the switch and their status flags.
- `show etherchannel port-channel` — Displays more detailed information about the port-channel interfaces on the switch.

Exam Note

- Understanding the basic purpose of EtherChannel, how to set them up, and how to verify their status is sufficient for the CCNA.