Ether Channel (Basic)

Safwan Muntasir (Sufi)
Networking Enthusiast

Contents

Introduction

EtherChannel, also known as port aggregation, is a technology used in networking to increase bandwidth, redundancy, and load balancing by bundling multiple Ethernet links together into a single logical link. It was developed to address some of the limitations of traditional Ethernet networking and is commonly associated with Cisco's implementation, though similar technologies exist from other networking equipment manufacturers.

Here is a timeline of the history of EtherChannel:

- 1993: Kalpana invents EtherChannel.
- 1994: Cisco Systems acquires Kalpana.
- 2000: The IEEE passes 802.3ad, which is an open standard version of EtherChannel.
- 2005: Cisco introduces EtherChannel for Layer 3 networks.
- 2010: Cisco introduces EtherChannel for 10 Gigabit Ethernet.
- 2014: Cisco introduces EtherChannel for 40 Gigabit Ethernet.
- 2016: Cisco introduces EtherChannel for 100 Gigabit Ethernet.

While Cisco's proprietary EtherChannel technology is still widely used, the IEEE 802.3ad standard (LACP) ensures interoperability and compatibility with a broader range of networking equipment from different vendors.

EtherChannel

- EtherChannel, also known as Link Aggregation Control Protocol (LACP), is a port link aggregation technology that allows multiple physical Ethernet links to be grouped together to form a single logical link. This logical link provides increased bandwidth, redundancy, and improved load balancing.
- **Oversubscription:** When the bandwidth of the interfaces connected to end hosts is greater that the bandwidth of the connection to the distribution switches, this is called oversubscription. Some oversubscription is acceptable, but to much will cause congestion.
- Look at the network below if we connect two switches together with multiple links, all except one will be disabled by spanning tree to avoid broadcast storms. Other links will be unused unless the active link fails. In that case, one of the inactive links will start forwarding. But it is a wastage of bandwidth also. By implementing EtherChannel, we can aggregate these links together and they will ac as a single interface. Thus network congestion problem will be solved. STP will treat this group as a single interface.

EtherChannel Basic   4
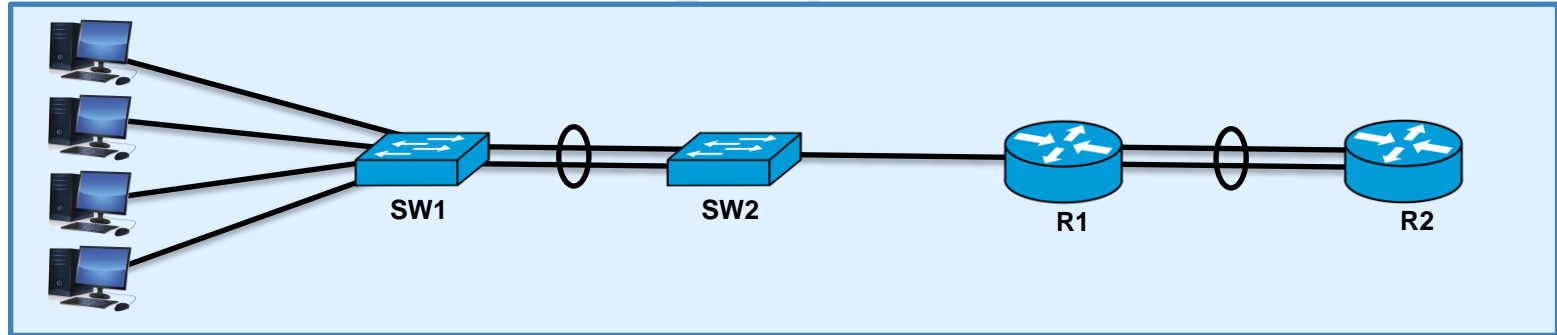
Load Balancing

- EtherChannel load balances based on flows.
- A flow is a communication between two nodes in the network.
- Frames in the same flow will be forwarded using the same physical interface.
- If frames in the same flow were forwarded using different physical interfaces, some frames may arrive at the destination out of order, which can cause problems.
- It will make a separate calculation to determine which physical interface will be used for the new flow of frames.

EtherChannel load balancing can be done using a variety of algorithms. Some layer-2 load balancing algorithms are-

- **Source MAC-Address Hashing**: Source-MAC address hashing is the simplest and most common load-balancing algorithm used with EtherChannel. With this algorithm, the source MAC address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.
- **Destination MAC-Address Hashing**: Destination-MAC address hashing is a more sophisticated load-balancing algorithm than source-MAC address hashing. With this algorithm, the destination MAC address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.
- **Source & Destination MAC-Address Hashing**: With this algorithm, both, the source and the destination MAC address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.

Load Balancing

Some layer-3 load balancing algorithms are-

- **Source IP Address Hashing**: With this algorithm, the source IP address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.

- **Destination IP Address Hashing**: With this algorithm, the destination IP address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.

- **Source & Destination IP Address Hashing**: With this algorithm, both, the source and the destination IP address of each packet is used to calculate a hash value. This hash value is then used to determine which physical link in the bundle the packet should be sent over.

***Some switches also support load balancing based on the layer 4 TCP or UCP port numbers to calculate hash value.

- Command to show EtherChannel load-balancing information-

    'SW# show etherchannel <load-balance>'

```
DSW#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
```

- Command to change EtherChannel load-balancing algorithm-

    'SW(config)# port-channel load-balance <input parameters>'

```
DSW(config)#port-channel load-balance ?
  dst-ip       Dst IP Addr
  dst-mac      Dst Mac Addr
  src-dst-ip   Src XOR Dst IP Addr
  src-dst-mac  Src XOR Dst Mac Addr
  src-ip       Src IP Addr
  src-mac      Src Mac Addr
```

Types & Modes

There are mainly **three types** of EtherChannel-

1. **PAgP (Port Aggregation Protocol):** PAgP is a Cisco proprietary protocol that allows EtherChannel bundles to be formed by negotiating between ports. Each port in the bundle sends PAgP packets to the other ports. The PAgP packets contain information about the port's capabilities, such as its speed, duplex mode, and VLAN membership. The ports then use this information to determine which ports can be bundled together. There are two modes in PAgP- **Desirable Mode** (the port will actively attempt to negotiate a PAgP connection) and **Auto Mode** (The port will respond to PAgP negotiation packets, but it will not start negotiations on its own).

2. **LACP (Link Aggregation Control Protocol):** LACP is an open standard protocol that allows EtherChannel bundles to be formed by negotiating between ports. LACP is similar to PAgP, but it is more widely supported and can converge more quickly. There are two mode in LACP- **Active Mode** (the port will start LACP negotiations with other ports that are in passive mode) and **Passive Mode** (the port will not start LACP negotiations, but it will respond to LACP negotiation packets from other ports).

3. **Static EtherChannel:** Static EtherChannel is a method of configuring EtherChannel bundles that does not require any negotiation between ports. The network administrator must manually specify which ports are in the bundle and which port is active. There is only **On Mode** in static EtherChannel. The port will be a part of the EtherChannel bundle, but no negotiation will take place.

***Up to 8 interfaces can be formed into a single EtherChannel. Though LACP allows up to 16 interfaces, but only 8 will be active, the other 8 will be in standby mode, waiting for an active interface to fail.

Negotiation Modes

- The following chart summarizes the resulting operational mode given different administrative modes in EtherChannel-

EtherChannel Type	SW1 Administrative Mode	SW2 Administrative Mode	Operational Mode
PAgP	Desirable	Desirable	EtherChannel
PAgP	Desirable	Auto	EtherChannel
PAgP	Auto	Auto	No EtherChannel
LACP	Active	Active	EtherChannel
LACP	Active	Passive	EtherChannel
LACP	Passive	Passive	No EtherChannel
Static	On	On	EtherChannel
Static	On	Desirable/Auto/Active/Passive	No EtherChannel

Topology
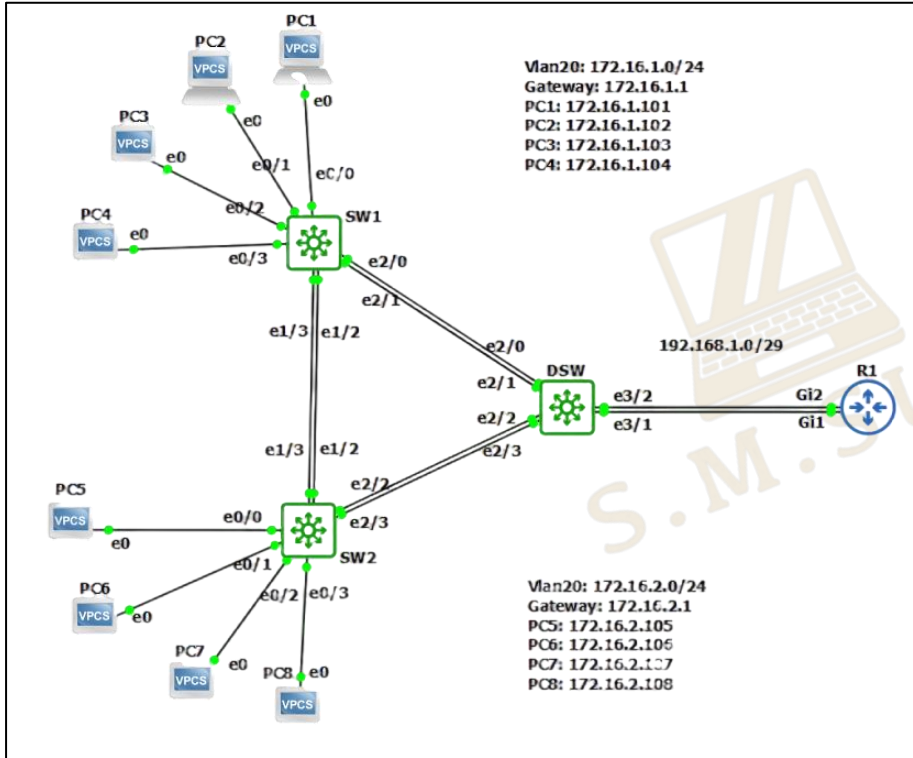
***This lab/topology was created in GNS3 2.2.43

***Routers: Cisco Catalyst 8300 Router

***Switches: L3 Cisco IOS Version 15.1

***PCs: GNS3 Default VPCS

EtherChannel Configuration

- Commands to create channel-group-

  'SW(config)# interface range <interfaces>'

  'SW(config-if)# channel-group <group no> mode <PoCh mode>'

```
SW1(config)#interface range e2/0-1
SW1(config-if-range)#channel-group ?
  <1-255>  Channel group number

SW1(config-if-range)#channel-group 1 ?
  mode  Etherchannel Mode of the interface

SW1(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

SW1(config-if-range)#channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

SW1(config-if-range)#
*Nov  8 04:36:29.459: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/
0, changed state to down
*Nov  8 04:36:29.459: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/
1, changed state to down
```

```
DSW(config)#interface range e2/0-1
DSW(config-if-range)#channel-group 10 mode active
Creating a port-channel interface Port-channel 10

DSW(config-if-range)#
*Nov  8 04:43:35.713: %EC-5-L3DONTBNDL2: Et2/0 suspended: LACP currently not ena
bled on the remote port.
*Nov  8 04:43:36.376: %EC-5-L3DONTBNDL2: Et2/1 suspended: LACP currently not ena
bled on the remote port.
DSW(config-if-range)#no channel-group 10 mode active
```

```
DSW(config-if-range)#channel-group 10 mode auto
Creating a port-channel interface Port-channel 10

DSW(config-if-range)#
*Nov  8 05:08:23.330: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/
1, changed state to down
DSW(config-if-range)#
*Nov  8 05:08:24.722: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet2/
1, changed state to up
DSW(config-if-range)#
*Nov  8 05:08:28.082: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el10, changed state to up
```

```
SW1#
*Nov  8 05:08:26.120: %LINK-3-UPDOWN: Interface Port-channel1, changed state to
up
*Nov  8 05:08:27.121: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el1, changed state to up
```

- **Channel-groups** is a technology that bundle multiple physical interfaces together to form a single logical interface.
- The **Channel-Group Number** has to match for member interfaces on the same switch. It doesn't have to match this channel-group number on the other switch. For example- In this topology channel-group 1 on SW1 can form an EtherChannel with channel-group 10 on DSW.

EtherChannel Configuration

- Commands to manually configure the EtherChannel protocol-

  'SW(config)# interface range <interfaces>'

  'SW(config-if)# channel-protocol <lacp/pagp>'

  'SW(config-if)# channel-group <group no> mode <PoCh mode>'

This command is isn't actually very useful. Because when we configure channel-group mode, it will automatically select EtherChannel protocol. Remember, if we configure different EtherChannel modes on neighbor switches, it will give error as protocol mismatch or soothing like this. It doesn't matter if we use different EtherChannel protocol on different port channel-groups in same switch.

- To configure its switchport mode use these commands-

  'SW(config)# interface port-channel <PoCh no>'

  'SW(config-if)# switchport trunk encapsulation <dot1q>'

  'SW(config-if)# switchport mode trunk'

  'SW(config-if)# no shutdown'

```
SW2(config)#interface range e2/2-3
SW2(config-if-range)#channel-protocol ?
  lacp  Prepare interface for LACP protocol
  pagp  Prepare interface for PAgP protocol

SW2(config-if-range)#channel-protocol lacp
SW2(config-if-range)#channel-group 2 mode active
Creating a port-channel interface Port-channel 2

SW2(config-if-range)#
*Nov  8 05:17:27.991: %EC-5-L3DONTBNDL2: Et2/2 suspended: LACP currently not ena
bled on the remote port.
*Nov  8 05:17:28.656: %EC-5-L3DONTBNDL2: Et2/3 suspended: LACP currently not ena
bled on the remote port.
```

```
DSW(config)#interface range e2/2-3
DSW(config-if-range)#channel-protocol lacp
DSW(config-if-range)#channel-group 20 mode passive
Creating a port-channel interface Port-channel 20

DSW(config-if-range)#
```

```
SW1(config)#interface port-channel 1
SW1(config-if)#switchport trunk encapsulation dot1q
SW1(config-if)#switchport mode trunk
SW1(config-if)#no shutdown
```

```
SW2(config)#interface port-channel 2
SW2(config-if)#switchport trunk encapsulation dot1q
SW2(config-if)#switchport mode trunk
SW2(config-if)#no shutdown
```

```
DSW(config)#interface port-channel 10
DSW(config-if)#switchport trunk encapsulation dot1q
DSW(config-if)#switchport mode trunk
DSW(config-if)#no shutdown
```

```
DSW(config)#interface port-channel 20
DSW(config-if)#switchport trunk encapsulation dot1q
DSW(config-if)#switchport mode trunk
DSW(config-if)#no shutdown
```

EtherChannel Configuration

Port-Channel/Ether-Channel binds multiple physical interfaces and act like a single interface. Thus, any configuration applied in port-channel interface will also be applied in corresponding physical interfaces also.

- Applying static EtherChannel on SW1 and SW2-

```
SW1(config)#interface range e1/2-3
SW1(config-if-range)#channel-group 3 mode on
Creating a port-channel interface Port-channel 3

SW1(config-if-range)#no shutdown
SW1(config-if-range)#
*Nov  8 16:30:39.222: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el3, changed state to up
SW1(config-if)#exit
SW1(config)#
SW1(config)#interface port-channel 3
SW1(config-if)#switchport trunk encapsulation dot1q
SW1(config-if)#switchport mode trunk
SW1(config-if)#no shutdown
```

```
SW2(config)#interface range e1/2-3
SW2(config-if-range)#channel-group 3 mode on
Creating a port-channel interface Port-channel 3

SW2(config-if-range)#no shutdown~
*Nov  8 16:31:05.623: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el3, changed state to up
SW2(config-if-range)#no shutdown
SW2(config)#interface port-channel 3
SW2(config-if)#switchport trunk encapsulation dot1q
SW2(config-if)#switchport mode trunk
SW2(config-if)#no shutdown
```

```
DSW#show running-config | begin interface
interface Port-channel20
 switchport
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface Port-channel10
 switchport
 switchport trunk encapsulation dot1q
 switchport mode trunk
!
interface Ethernet2/0
 switchport trunk encapsulation dot1q
 switchport mode trunk
 duplex auto
 channel-group 10 mode auto
!
interface Ethernet2/1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 duplex auto
 channel-group 10 mode auto
!
interface Ethernet2/2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 duplex auto
 channel-protocol lacp
 channel-group 20 mode passive
!
interface Ethernet2/3
 switchport trunk encapsulation dot1q
 switchport mode trunk
 duplex auto
 channel-protocol lacp
 channel-group 20 mode passive
!
```

Basic Configuration

Configuring ip addresses and VLANs to end devices and corresponding switch. Detailed discussion about VLANs are given in another material, please look into that if you don't understand VLAN.

```
SW2(config)#vlan 10
SW2(config-vlan)#name LAN1
SW2(config-vlan)#vlan 20
SW2(config-vlan)#name LAN2
SW2(config-vlan)#interface port-channel 2
SW2(config-if)#switchport trunk allowed vlan 10,20
SW2(config-if)#interface port-channel 3
SW2(config-if)#switchport trunk allowed vlan 10,20
```

```
DSW(config)#vlan 10
DSW(config-vlan)#name LAN1
DSW(config-vlan)#vlan 20
DSW(config-vlan)#name LAN2
DSW(config-vlan)#interface vlan 10
DSW(config-if)#ip address 172.16.1.1 255.255.255.0
DSW(config-if)#no shutdown
DSW(config-if)#interface vlan 20
DSW(config-if)#ip address 172.16.2.1 255.255.255.0
DSW(config-if)#no shutdown
DSW(config-if)#interface port-channel 10
DSW(config-if)#switchport trunk allowed vlan 10,20
DSW(config-if)#interface port-channel 20
DSW(config-if)#switchport trunk allowed vlan 10,20
```

```
PC1> ip 172.16.1.101/24 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.101 255.255.255.0 gateway 172.16.1.1
```

```
PC2> ip 172.16.1.102/24 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.102 255.255.255.0 gateway 172.16.1.1
```

```
PC3> ip 172.16.1.103/24 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.103 255.255.255.0 gateway 172.16.1.1
```

```
PC4> ip 172.16.1.104/24 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.104 255.255.255.0 gateway 172.16.1.1
```

```
PC5> ip 172.16.2.105/24 172.16.2.1
Checking for duplicate address...
PC1 : 172.16.2.105 255.255.255.0 gateway 172.16.2.1
```

```
PC6> ip 172.16.2.106/24 172.16.2.1
Checking for duplicate address...
PC1 : 172.16.2.106 255.255.255.0 gateway 172.16.2.1
```

```
PC7> ip 172.16.2.107/24 172.16.2.1
Checking for duplicate address...
PC1 : 172.16.2.107 255.255.255.0 gateway 172.16.2.1
```

```
PC8> ip 172.16.2.108/24 172.16.2.1
Checking for duplicate address...
PC1 : 172.16.2.108 255.255.255.0 gateway 172.16.2.1
```

```
SW1(config)#vlan 10
SW1(config-vlan)#name LAN1
SW1(config-vlan)#vlan 20
SW1(config-vlan)#name LAN2
SW1(config-vlan)#interface port-channel 1
SW1(config-if)#switchport trunk allowed vlan 10,20
SW1(config-if)#interface port-channel 3
SW1(config-if)#switchport trunk allowed vlan 10,20
```

Basic Configuration

- Commands to check trunk information-

  'SW# show interfaces trunk'

Notice that the individual physical interfaces aren't listed here. Only the

Port-Channel interface (Po), because it acts like a single interface.

```
SW1#show interfaces trunk

Port          Mode              Encapsulation  Status        Native vlan
Po3           on                802.1q         trunking      1
Po1           on                802.1q         trunking      1

Port          Vlans allowed on trunk
Po3           10,20
Po1           10,20

Port          Vlans allowed and active in management domain
Po3           10,20
Po1           10,20

Port          Vlans in spanning tree forwarding state and not pruned
Po3           10,20
Po1           10,20
```

```
DSW#show interfaces trunk

Port          Mode              Encapsulation  Status        Native vlan
Po10          on                802.1q         trunking      1
Po20          on                802.1q         trunking      1

Port          Vlans allowed on trunk
Po10          10,20
Po20          10,20

Port          Vlans allowed and active in management domain
Po10          10,20
Po20          10,20

Port          Vlans in spanning tree forwarding state and not pruned
Po10          10,20
Po20          none
```

```
SW2#show interfaces trunk

Port          Mode              Encapsulation  Status        Native vlan
Po3           on                802.1q         trunking      1
Po2           on                802.1q         trunking      1

Port          Vlans allowed on trunk
Po3           10,20
Po2           10,20

Port          Vlans allowed and active in management domain
Po3           10,20
Po2           10,20

Port          Vlans in spanning tree forwarding state and not pruned
Po3           10,20
Po2           10,20
```

***Member interfaces must have the following matching configurations-

- Duplex (half/full) and Speed

- Switchport Mode (Access/Trunk)

- Same allowed VLANs/Native VLAN (for trunk interfaces)

Spanning-Tree Summary

- Commands to check spanning tree summary-

  'SW# show spanning tree vlan <VLAN ID>'

Spanning-tree is also treating port-channel interfaces, each as a single interface, not physical interfaces. Details discussions about spaning-tree is given in another material. Please look onto that if you don't understand Spanning-Tree.

```
DSW#show spanning-tree vlan 10

VLAN0010
  Spanning tree enabled protocol rstp
  Root ID    Priority    32778
             Address     aabb.cc00.0100
             Cost        56
             Port        65 (Port-channel10)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768 sys-id-ext 10)
             Address     aabb.cc00.0400
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Po10                Root FWD 56        128.65   Shr Peer(STP)
Po20                Altn BLK 56        128.66   Shr Peer(STP)
```

```
DSW#show spanning-tree vlan 20

VLAN0020
  Spanning tree enabled protocol rstp
  Root ID    Priority    32788
             Address     aabb.cc00.0100
             Cost        56
             Port        65 (Port-channel10)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32788  (priority 32768 sys-id-ext 20)
             Address     aabb.cc00.0400
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Po10                Root FWD 56        128.65   Shr Peer(STP)
Po20                Altn BLK 56        128.66   Shr Peer(STP)
```

Layer-3 Configuration

- To enable routing in Multilayer switch use the command *'ip routing'* and to make an interface layer 3 port use the command *'no switchport'*.

- Generally in many device port-channel interface is created automatically after configuring channel-group on the binded interfaces. But the best practice is, at first create port-channel interface, then configure channel group on the interfaces. Commands to configure port-channel interface are-

  'SW(config)# interface port-channel <Po no>'

  'SW(config-if)# no switchport'

  'SW(config-if)# ip address <Po interface ip>'

  'SW(config-if)# no shutdown'

- As EtherChannel act as a single interface, ip address will be configured on the PortChannel interface, not on physical interfaces.

```
DSW(config)#ip routing
DSW(config)#interface port-channel ?
 <1-64>  Port-channel interface number

DSW(config)#interface port-channel 30
DSW(config-if)#no switchport
*Nov  8 14:14:39.250: %LINK-3-UPDOWN: Interface Port-channel30, changed state to
 down
*Nov  8 14:14:40.257: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el30, changed state to down
DSW(config-if)#no switchport
DSW(config-if)#ip address 192.168.1.1 255.255.255.248
DSW(config-if)#no shutdown
```

```
DSW(config-if)#interface range e3/1 - 2
DSW(config-if-range)#shutdown
DSW(config-if-range)#
*Nov  8 14:15:54.673: %LINK-5-CHANGED: Interface Ethernet3/1, changed state to a
dministratively down
*Nov  8 14:15:54.684: %LINK-5-CHANGED: Interface Ethernet3/2, changed state to a
dministratively down
*Nov  8 14:15:55.676: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
1, changed state to down
DSW(config-if-range)#
*Nov  8 14:15:55.685: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
2, changed state to down
DSW(config-if-range)#no switchport
DSW(config-if-range)#channel-group 30 mode active
DSW(config-if-range)#
*Nov  8 14:16:29.564: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
1, changed state to down
*Nov  8 14:16:29.564: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
2, changed state to down
```

- It is recommended to shut the physical interfaces down before configuring on the other end switch/router, sometimes it shows mismatch errors and doesn't work properly.

Layer-3 Configuration

This router supports only LACP protocol. That's why I have also configured LACP on the DSW. After configuring PortChannel on the router, I have applied *'no shutdown'* command on the DSW and immediately the port-channel interface including the physical interfaces went up without any mismatched error.

```
DSW(config-if-range)#no shutdown
DSW(config-if-range)#
*Nov  8 14:20:47.715: %LINK-3-UPDOWN: Interface Ethernet3/1, changed state to up
*Nov  8 14:20:47.716: %LINK-3-UPDOWN: Interface Ethernet3/2, changed state to up
*Nov  8 14:20:48.715: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
1, changed state to up
*Nov  8 14:20:48.716: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet3/
2, changed state to up
DSW(config-if-range)#
*Nov  8 14:20:50.369: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el30, changed state to up
```

```
R1(config-if)#
*Nov  8 14:19:50.851: %LINK-3-UPDOWN: Interface GigabitEthernet2, changed state
to up
*Nov  8 14:19:51.851: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEth
ernet2, changed state to up
R1(config-if)#
*Nov  8 14:20:49.337: %EC-5-MINLINKS_MET: Port-channel Port-channel3 is up as it
s bundled ports (1) meets min-links
*Nov  8 14:20:49.349: GigabitEthernet1 added as member-1 to port-channel3

*Nov  8 14:20:50.209: %EC-5-MINLINKS_MET: Port-channel Port-channel3 is up as it
s bundled ports (2) meets min-links
*Nov  8 14:20:50.220: GigabitEthernet2 added as member-2 to port-channel3
```

```
R1(config)#interface port-channel ?
  <1-64>  Port-channel interface number

R1(config)#interface port-channel 3
R1(config-if)#
*Nov  8 14:17:32.223: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-chann
el3, changed state to down
R1(config-if)#ip address 192.168.1.2 255.255.255.248
R1(config-if)#no shutdown
```

```
R1(config-if)#interface gi1
R1(config-if)#channel-group 3 mode ?
  active   Enable LACP unconditionally
  passive  Enable LACP only if a LACP device is detected
  <cr>     <cr>

R1(config-if)#channel-group 3 mode active
R1(config-if)#no shutdown
R1(config-if)#
R1(config-if)#interface gi2
R1(config-if)#channel-group 3 mode active
*Nov  8 14:19:30.846: %LINK-3-UPDOWN: Interface GigabitEthernet1, changed state
to up
*Nov  8 14:19:31.846: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEth

R1(config-if)#channel-group 3 mode active
R1(config-if)#no shutdown
R1(config-if)#
*Nov  8 14:19:50.851: %LINK-3-UPDOWN: Interface GigabitEthernet2, changed state
to up
*Nov  8 14:19:51.851: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEth
ernet2, changed state to up
```

Configuration Summary

- Commands to show EtherChannel Summary-

  'SW# show etherchannel details'

  'SW# show etherchannel port'

  'SW# show etherchannel port-channel'

  'SW# show etherchannel protocol'

  'SW# show etherchannel summary'

- The most useful is '*show etherchannel summary'*.

- *'show etherchannel detail'* shows the details information about everything, it covers all the show commands above.

- In the etherChannel summary, check the Flags carefully while troubleshooting.

```
DSW#show etherchannel ?
  <1-255>      Channel group number
  auto         Displays summary of auto formed etherchannel
  detail       Detail information
  load-balance Load-balance/frame-distribution scheme among ports in
               port-channel
  port         Port information
  port-channel Port-channel information
  protocol     protocol enabled
  summary      One-line summary per channel-group
  |            Output modifiers
  <cr>

DSW#show etherchannel summary
Flags:  D - down         P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG


Number of channel-groups in use: 3
Number of aggregators:           3

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
10     Po10(SU)       PAgP        Et2/0(P)    Et2/1(P)
20     Po20(SU)       LACP        Et2/2(P)    Et2/3(P)
30     Po30(RU)       LACP        Et3/1(P)    Et3/2(P)
```

Configuration Summary

- **'show etherchannel port-channel'** command displays information about the virtual port-channel interfaces on the switch.

```
SW1#show etherchannel port-channel
              Channel-group listing:
              ---------------------

Group: 1
----------
              Port-channels in the group:
              --------------------------


Port-channel: Po1
------------

Age of the Port-channel   = 0d:04h:49m:19s
Logical slot/port   = 16/0           Number of ports = 2
GC                  = 0x00010001       HotStandBy port = null
Port state          = Port-channel Ag-Inuse
Protocol            =    PAgP
Port security       = Disabled

Ports in the Port-channel:

Index   Load   Port    EC state          No of bits
------+------+------+-------------------+-----------
  0      00     Et2/0   Desirable-Sl        0
  0      00     Et2/1   Desirable-Sl        0

Time since last port bundled:    0d:02h:44m:13s     Et2/1
Time since last port Un-bundled: 0d:02h:44m:43s     Et2/1
```

```
Group: 3
----------
              Port-channels in the group:
              --------------------------


Port-channel: Po3
------------

Age of the Port-channel   = 0d:00h:33m:53s
Logical slot/port   = 16/0           Number of ports = 2
GC                  = 0x00000000       HotStandBy port = null
Port state          = Port-channel Ag-Inuse
Protocol            =    -
Port security       = Disabled

Ports in the Port-channel:

Index   Load   Port    EC state          No of bits
------+------+------+-------------------+-----------
  0      00     Et1/2   On                  0
  0      00     Et1/3   On                  0

Time since last port bundled:    0d:00h:33m:50s    Et1/3

SW1#
```

- In Po3 there is no protocol is shown, because it was configured statically, no protocol (LACP/PAgP) is used.

Configuration Summary

```
SW2#show etherchannel port-channel
                Channel-group listing:
                ----------------------

Group: 2
----------
                Port-channels in the group:
                ---------------------------

Port-channel: Po2    (Primary Aggregator)

-----------

Age of the Port-channel   = 0d:04h:11m:21s
Logical slot/port    = 16/0         Number of ports = 2
HotStandBy port = null
Port state          = Port-channel Ag-Inuse
Protocol         =    LACP
Port security        = Disabled

Ports in the Port-channel:

Index   Load   Port    EC state        No of bits
------+------+------+------------------+----------
  0     00    Et2/2   Active            0
  0     00    Et2/3   Active            0

Time since last port bundled:    0d:03h:30m:08s    Et2/3
Time since last port Un-bundled: 0d:03h:30m:15s    Et2/3
```

```
DSW#show ip int br
Interface           IP-Address      OK? Method Status                Protocol
Ethernet0/0         unassigned      YES unset  up                    up
Ethernet0/1         unassigned      YES unset  up                    up
Ethernet0/2         unassigned      YES unset  up                    up
Ethernet0/3         unassigned      YES unset  up                    up
Ethernet1/0         unassigned      YES unset  up                    up
Ethernet1/1         unassigned      YES unset  up                    up
Ethernet1/2         unassigned      YES unset  up                    up
Ethernet1/3         unassigned      YES unset  up                    up
Ethernet2/0         unassigned      YES unset  up                    up
Ethernet2/1         unassigned      YES unset  up                    up
Ethernet2/2         unassigned      YES unset  up                    up
Ethernet2/3         unassigned      YES unset  up                    up
Ethernet3/0         unassigned      YES unset  up                    up
Ethernet3/1         unassigned      YES manual up                    up
Ethernet3/2         unassigned      YES manual up                    up
Ethernet3/3         unassigned      YES unset  up                    up
Port-channel10      unassigned      YES unset  up                    up
Port-channel20      unassigned      YES unset  up                    up
Port-channel30      192.168.1.1     YES manual up                    up
Vlan1               unassigned      YES unset  administratively down down
Vlan10              172.16.1.1      YES manual up                    up
Vlan20              172.16.2.1      YES manual up                    up
```

- Why there is **Primary Aggregator** written in Po2 and not written in Po1 or Po3?? **Think of yourself!**

Configuration Summary

```
DSW#show interface status

Port       Name          Status      Vlan      Duplex  Speed Type
Et0/0                    connected   1           auto   auto unknown
Et0/1                    connected   1           auto   auto unknown
Et0/2                    connected   1           auto   auto unknown
Et0/3                    connected   1           auto   auto unknown
Et1/0                    connected   1           auto   auto unknown
Et1/1                    connected   1           auto   auto unknown
Et1/2                    connected   1           auto   auto unknown
Et1/3                    connected   1           auto   auto unknown
Et2/0                    connected   trunk       auto   auto unknown
Et2/1                    connected   trunk       auto   auto unknown
Et2/2                    connected   trunk       auto   auto unknown
Et2/3                    connected   trunk       auto   auto unknown
Et3/0                    connected   1           auto   auto unknown
Et3/1                    connected   routed      auto   auto unknown
Et3/2                    connected   routed      auto   auto unknown
Et3/3                    connected   1           auto   auto unknown
Po10                     connected   trunk       auto   auto
Po20                     connected   trunk       auto   auto
Po30                     connected   routed      auto   auto
```

```
DSW#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is not set

      172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
C        172.16.1.0/24 is directly connected, Vlan10
L        172.16.1.1/32 is directly connected, Vlan10
C        172.16.2.0/24 is directly connected, Vlan20
L        172.16.2.1/32 is directly connected, Vlan20
      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/29 is directly connected, Port-channel30
L        192.168.1.1/32 is directly connected, Port-channel30
```

Thank You ──────────

Feel free to reach out to me for any **suggestions** or **feedback** via **LinkedIn** or **Mail**

www.github.com/smsufi   www.linkedin.com/in/smsufi   safwanm.cse@gmail.com