INTERNETWORK expert

Building Cisco Multilayer Switched Networks (BCMSN)

EtherChannel

EtherChannel

- Used to aggregate bandwidth of multiple links together
  - Sometimes called "NIC Teaming" by other vendors
- Fools STP into thinking bonded links are one STP link
  - Technically redundant paths, but no loops
- Load balancing based on MAC address
  - More efficient bandwidth utilization than STP traffic engineering

EtherChannel Terms

- Port-Channel / Channel-Group
  - Logical EtherChannel interface that represents bonded links
- Member interfaces
  - Physical interfaces that belong to the group
  - Strict requirements about configuration compatibility between member interfaces
    - i.e. member port configs should be identical

Types of EtherChannels

- EtherChannel does not directly relate to the underlying type of member interface
- Can be used to aggregate both
  - Switchport
    - Access switchport
    - Trunk switchports
  - Routed ports
- Limitations of what and how many interfaces can channel together are per-platform
  - E.g StackWise vs modular platforms
 - See individual hardware release notes

EtherChannel Negotiation

- In order to ensure loop free topology, EtherChannel can be auto-negotiated two ways
- Port Aggregation Protocol (PAgP)
  - Cisco proprietary
- Link Aggregation Control Protocol (LACP)
  - IEEE 802.3ad
- In Cisco IOS, negotiation protocol determined by the channel "mode"
  - Desirable & Auto - PAgP
  - Active & Passive – LACP
  - On – neither
- Negotiation must be compatible otherwise loops can occur

EtherChannel Example
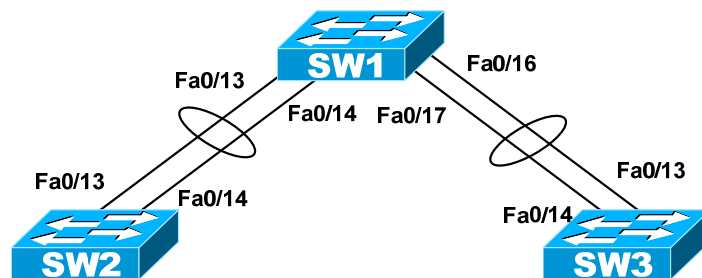
EtherChannel Configuration

```
SW1#                                        SW2#
interface FastEthernet0/13                  interface FastEthernet0/13
 switchport trunk encapsulation dot1q        switchport trunk encapsulation dot1q
 switchport mode trunk                       switchport mode trunk
 channel-group 1 mode desirable              channel-group 1 mode auto
!                                           !
interface FastEthernet0/14                  interface FastEthernet0/14
 switchport trunk encapsulation dot1q        switchport trunk encapsulation dot1q
 switchport mode trunk                       switchport mode trunk
 channel-group 1 mode desirable              channel-group 1 mode auto
!
interface FastEthernet0/16                  SW3#
 switchport trunk encapsulation isl         interface FastEthernet0/13
 switchport mode trunk                       switchport trunk encapsulation isl
 channel-group 2 mode active                 switchport mode trunk
!                                            channel-group 2 mode passive
interface FastEthernet0/17                  !
 switchport trunk encapsulation isl         interface FastEthernet0/14
 switchport mode trunk                       switchport trunk encapsulation isl
 channel-group 2 mode active                 switchport mode trunk
                                             channel-group 2 mode passive
```

EtherChannel Verification (cont.)

```
SW1#show etherchannel summary
Flags:  D - down        P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+---------------------------------------------
1      Po1(SU)       PAgP       Fa0/13(P)   Fa0/14(P)
2      Po2(SU)       LACP       Fa0/16(P)   Fa0/17(P)
```

EtherChannel Verification (cont.)

```
SW2#show etherchannel summary
Flags:  D - down         P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 1
Number of aggregators:           1

Group  Port-channel  Protocol    Ports
------+------------+-----------+----------------------------------------------
1      Po1(SU)         PAgP      Fa0/13(P)   Fa0/14(P)
```

EtherChannel Verification (cont.)

```
SW3#show etherchannel summary
Flags:  D - down         P - in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3       S - Layer2
        U - in use       f - failed to allocate aggregator
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port


Number of channel-groups in use: 1
Number of aggregators:           1

Group  Port-channel  Protocol    Ports
------+------------+-----------+----------------------------------------------
2      Po2(SU)         LACP      Fa0/13(P)   Fa0/14(P)
```

EtherChannel Verification (cont.)

```
SW1#show spanning-tree vlan 10

VLAN0010
  Spanning tree enabled protocol ieee
  Root ID    Priority    10
             Address       0019.aa7e.ea00
             Cost          12
             Port          72 (Port-channel1)
             Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority     32778  (priority 32768 sys-id-ext 10)
             Address       0019.56c8.4e80
             Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 15

Interface         Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1               Root FWD 12        128.72   P2p
Po2               Desg FWD 12        128.80   P2p
```

EtherChannel Verification (cont.)

```
SW2#show spanning-tree vlan 10

VLAN0010
  Spanning tree enabled protocol ieee
  Root ID    Priority    10
             Address       0019.aa7e.ea00
             This bridge is the root
             Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority     10     (priority 0 sys-id-ext 10)
             Address       0019.aa7e.ea00
             Hello Time    2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 15

Interface         Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/19            Desg FWD 19        128.21   P2p
Po1               Desg FWD 12        128.72   P2p
```

EtherChannel Verification (cont.)

```
SW3#show spanning-tree vlan 10

VLAN0010
  Spanning tree enabled protocol ieee
  Root ID    Priority    10
             Address     0019.aa7e.ea00
             Cost        24
             Port        65 (Port-channel2)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768 sys-id-ext 10)
             Address     000a.f4f3.e780
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 15

Interface         Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/19           Altn BLK 19        128.19   P2p
Po2              Root FWD 12        128.65   P2p
```

EtherChannel Q&A