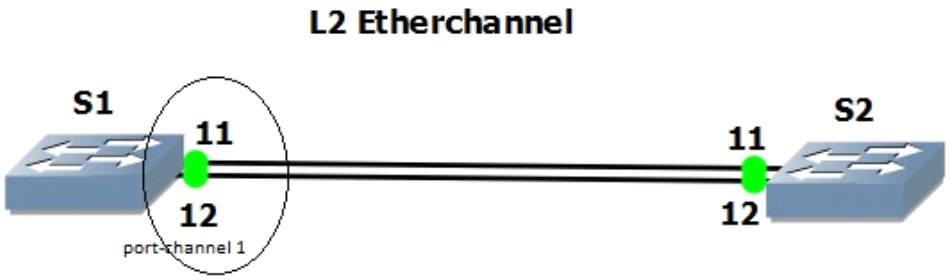
::::::::::::Notes::::::::::
(Etherchannel)
1.STP blocks redundant links whereas etherchannel can be used to load balance those links.
2. used to aggregate bandwidth of physical links forming a logical single link.
3.2950 supports max 8 ports to aggregate/max 8 interfaces can channel together (depends on platform)
4.Even servers now support etherchannel (LACP compliant/NIC teaming)
5.both switchports(access/trunk) and routed ports can be aggregated
--
(Two Negotiation Protocols)
1.Port Aggregation Protocol/PAgP(cisco proprietary/auto,desirable,on)
2.Link Aggregation Control Protocol/LACP/IEEE 802.3ad(industry standard/passive,active,on)
--
(Two ways to configure etherchannel)
1.Layer 2 Etherchannel
2.Layer3 Etherchannel
--
(Terminologies)
1.Port-Channel/Channel-Group is a logical Etherchannel Interface represents bonded links
2.Member Interfaces (individual interfaces) (actual physical links that belongs to a group)
--
(Etherchannel Negotiation)
1.On (no negotiation)
2.Desirable & Auto (desirable: initiate PAgP / auto: listen PAgP)
3.Active & Passive (active:initiate LACP / Passive: listen LACP)
--
(Etherchannel Mode Compatibility)
1.On-On
2.Desirable-Desirable
3.Desirable-Auto
4.Active-Active
5.Active-Passive
6.(auto-auto / passive-passive will not work)
--
(Best Practices)
1.All ports must be in the same speed and duplex
2.Interfaces in a bundle are redundant
3.No interfaces in a bundle can be SPAN ports
4.Interfaces in bundle must be in the same VLAN/Trunk
5.Any changes to port-channel affects all budnled ports
6.Any changes to individual ports changes only that port
--
::::::::::Commands::::::::::::
1.(To make a range of ports into trunk ports)
S1(config)#default interface fa 0/11 (puts the interface back to default settings)
S1(config)#default interface fa 0/12

```
S1(config)# interface range fastEthernet 0/11 - 12
S1(config-if-range)#shutdown  (better shutdown to avoid loops/order of
operations problem)
S1(config-if-range)# switchport trunk encapsulation dot1q
S1(config-if-range)# switchport mode trunk   (if one of the individual
ports is not trunk it won't form etherchannel/will shows suspended in
etherchannel summary)
--
```
2.(To group the ports to create a port channel for PAgP (L2 Etherchannel)/ you can't mix PAgP with LACP)
(could be auto or on mode aswell/Same commands for LACP but active, passive and on modes)
```
S1(config)# interface range fastEthernet 0/11 - 12
S1(config-if-range)# channel-group 1 mode desirable (use 'on' if the
question says no negotiation protocol)
(it creats a port-channel interface Port-channel 1)
S1(config-if-range)#no shut (do identical config on opposite side before
no shut)
--
```
->int range fa0/11 - 12 , po1
```
(if you want to make changes to the port channel its better to do it on
all rather than just po1 as sometimes it doesn't get replicated down to
individual interfaces)
```




```
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```
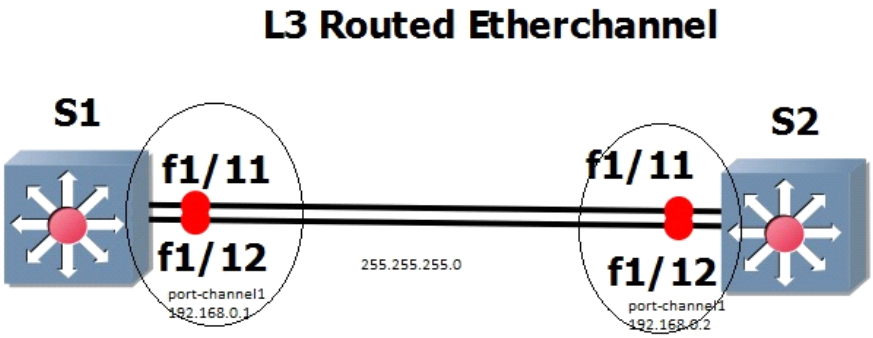
(L3 Routed Etherchannel with an IP address)
```
S1(config)#default int range fa1/11 - 12
S1(config)# interface range fastEthernet 1/11 - 12
S1(config-if-range)#shut
S1(config-if-range)# no switchport (use this command before channel-group
to avoid order of operation problem)
S1(config-if-range)# no ip address
S1(config-if-range)# channel-group 1 mode desirable
S1(config-if-range)#no shut
(it creates a port-channel interface as port-channel 1)
S1(config-if-range)# interface port-channel 1
S1(config-if)# no switchport
S1(config-if)# ip address 192.168.0.1 255.255.255.0
```

->same but opposite config on the S2



switch

:::::Verification/TSHOOT/Debug/Show commands::::::

(To see if etherchannel is working/To see as one logical link)
1.show etherchannel summary (U- in use / S- Layer2 / D- down / R-Layer3 / P- bundled in port-channel)
2.show etherchannel 1 port-channel
3.show etherchannel detail
4.show interfaces fa 0/12 etherchannel
5.show etherchannel
6.show etherchannel 1 detail
7.show pagp neighbor (or lacp)
8.show int po1 switchport
9.show int po1 (to check the combined bandwith)
(If one of the individual ports goes down in port-channel the the combined bandwith goes down and the stp cost is also changed for the port channel)
10.show int po1 etherchannel
11.show run int po1

12.show interfaces trunk
13.show spanning-tree (port channel interface run stp not individual ports)
14.show spa vlan 1 (if it shows individual ports that means it wasn't bundled in the channel)
15.show int status (could show suspended or error disbaled in case of incompatability in etherchannel ports)
16.show ip int bri
17.show ip route
18.show cdp nei
19.show arp
20.show mac address-table dynamic address aaaa.bbbb.cccc
21.clear pagp 1 counters (or lacp)

(By default, Cisco Catalyst 3560 and Catalyst 2960 switches load-balance using the source MAC address.
It could be dst-mac/dst-mac/src-dst-ip/src-dst-mac/src-ip/src-mac)

S1(config)# port-channel load-balance src-dst-mac

1.show etherchnannel load-balance (To view current etherchannel load

```
balance config)
2.show int fa0/11 | in load  (to check the load on individual ports to see
if its a good load balancing)
3.clear counters
4.show int fa0/11 | in packets input|packets output  (check on all
individual ports/do a ping to check)
5.show int fa0/12 | in packets (input|output)
----------
```

(to enable ip routing so that you can configure routing protocols)

```
S1(config)#ip routing
```

Diagrams: http://ccieccie.wordpress.com/2013/10/01/ine-volume-1-labs/

Layer 2 EtherChannel

Remove all previous configurations on the links connecting SW1, SW2, SW3, and SW4.

Configure all inter-switch links on SW2, SW3, and SW4 to be in dynamic auto state.

Configure all inter-switch links on SW1 to be in dynamic desirable state.

Configure Layer 2 EtherChannels on all inter-switch links between SW1 & SW2, SW1 & SW3, and SW1 & SW4.

Use Port-Channel numbers 12, 13, and 14 respectively.

These links should not use dynamic EtherChannel negotiation.

Configuration

```
SW1:
interface FastEthernet0/13
 switchport mode dynamic desirable
 channel-group 12 mode on
!
interface FastEthernet0/14
 switchport mode dynamic desirable
 channel-group 12 mode on
!
interface FastEthernet0/15
 switchport mode dynamic desirable
 channel-group 12 mode on
!
interface FastEthernet0/16
 switchport mode dynamic desirable
 channel-group 13 mode on
!
interface FastEthernet0/17
 switchport mode dynamic desirable
 channel-group 13 mode on
!
interface FastEthernet0/18
 switchport mode dynamic desirable
 channel-group 13 mode on
!
interface FastEthernet0/19
 switchport mode dynamic desirable
 channel-group 14 mode on
!
interface FastEthernet0/20
 switchport mode dynamic desirable
 channel-group 14 mode on
!
interface FastEthernet0/21
 switchport mode dynamic desirable
 channel-group 14 mode on
```

```
SW2:
interface FastEthernet0/13
 channel-group 12 mode on
!
interface FastEthernet0/14
 channel-group 12 mode on
!
interface FastEthernet0/15
 channel-group 12 mode on

SW3:
interface FastEthernet0/13
 channel-group 13 mode on
!
interface FastEthernet0/14
 channel-group 13 mode on
!
interface FastEthernet0/15
 channel-group 13 mode on

SW4:
interface FastEthernet0/13
 channel-group 14 mode on
!
interface FastEthernet0/14
 channel-group 14 mode on
!
interface FastEthernet0/15
 channel-group 14 mode on
```

```
Rack1SW1#show etherchannel summary
Rack1SW1#show interface trunk
Rack1SW1#show spanning-tree vlan 10
Rack1SW2#show etherchannel summary
Rack1SW2#show interface trunk
Rack1SW2#show spanning-tree vlan 10
Rack1SW3#show etherchannel summary
Rack1SW3#show interface trunk
Rack1SW3#show spanning-tree vlan 10
Rack1SW4#show etherchannel summary
Rack1SW4#show interface trunk
Rack1SW4#show spanning-tree vlan 10
```

Layer 2 EtherChannel with PAgP

Modify the previous EtherChannel configuration to use PAgP for dynamic negotiation.

SW1 should initiate negotiation and the other devices should respond.

Configuration

```
SW1:
interface FastEthernet0/13
 switchport mode dynamic desirable
 channel-group 12 mode desirable
!
interface FastEthernet0/14
 switchport mode dynamic desirable
 channel-group 12 mode desirable
!
interface FastEthernet0/15
 switchport mode dynamic desirable
 channel-group 12 mode desirable
!
interface FastEthernet0/16
 switchport mode dynamic desirable
 channel-group 13 mode desirable
!
interface FastEthernet0/17
 switchport mode dynamic desirable
 channel-group 13 mode desirable
!
interface FastEthernet0/18
 switchport mode dynamic desirable
 channel-group 13 mode desirable
!
interface FastEthernet0/19
 switchport mode dynamic desirable
 channel-group 14 mode desirable
!
interface FastEthernet0/20
 switchport mode dynamic desirable
 channel-group 14 mode desirable
!
interface FastEthernet0/21
 switchport mode dynamic desirable
 channel-group 14 mode desirable

SW2:
interface FastEthernet0/13
 channel-group 12 mode auto
!
interface FastEthernet0/14
 channel-group 12 mode auto
!
interface FastEthernet0/15
 channel-group 12 mode auto
```

```
SW3:
interface FastEthernet0/13
 channel-group 13 mode auto
!
interface FastEthernet0/14
 channel-group 13 mode auto
!
interface FastEthernet0/15
 channel-group 13 mode auto

SW4:
interface FastEthernet0/13
 channel-group 14 mode auto
!
interface FastEthernet0/14
 channel-group 14 mode auto
!
interface FastEthernet0/15
 channel-group 14 mode auto
```

```
Rack1SW1#show etherchannel summary
Rack1SW1#show interface trunk

Rack1SW1#show spanning-tree vlan 10

Rack1SW2#show etherchannel summary
Rack1SW2#show interface trunk

Rack1SW2#show spanning-tree vlan 10

Rack1SW3#show interface trunk

Rack1SW3#show spanning-tree vlan 10

Rack1SW4#show etherchannel summary
Rack1SW4#show interface trunk

Rack1SW4#show spanning-tree vlan 10
```

Layer 2 EtherChannel with LACP

Modify the previous EtherChannel configuration to use LACP for dynamic negotiation.

SW1 should initiate negotiation and the other devices should respond.

Configuration

```
SW1:
interface FastEthernet0/13
 switchport mode dynamic desirable
 channel-group 12 mode active
!
interface FastEthernet0/14
 switchport mode dynamic desirable
 channel-group 12 mode active
!
interface FastEthernet0/15
 switchport mode dynamic desirable
 channel-group 12 mode active
!
interface FastEthernet0/16
 switchport mode dynamic desirable
 channel-group 13 mode active
!
interface FastEthernet0/17
 switchport mode dynamic desirable
 channel-group 13 mode active
!
interface FastEthernet0/18
 switchport mode dynamic desirable
 channel-group 13 mode active
!
interface FastEthernet0/19
 switchport mode dynamic desirable
 channel-group 14 mode active
!
interface FastEthernet0/20
 switchport mode dynamic desirable
 channel-group 14 mode active
!
interface FastEthernet0/21
 switchport mode dynamic desirable
 channel-group 14 mode active

SW2:
interface FastEthernet0/13
 channel-group 12 mode passive
!
interface FastEthernet0/14
 channel-group 12 mode passive
!
interface FastEthernet0/15
 channel-group 12 mode passive
```

```
SW3:
interface FastEthernet0/13
 channel-group 13 mode passive
!
interface FastEthernet0/14
 channel-group 13 mode passive
!
interface FastEthernet0/15
 channel-group 13 mode passive

SW4:
interface FastEthernet0/13
 channel-group 14 mode passive
!
interface FastEthernet0/14
 channel-group 14 mode passive
!
interface FastEthernet0/15
 channel-group 14 mode passive
```

```
Rack1SW1#show etherchannel summary
Rack1SW1#show interface trunk
Rack1SW1#show spanning-tree vlan 10
Rack1SW2#show etherchannel summary
Rack1SW2#show interface trunk
Rack1SW2#show spanning-tree vlan 10
Rack1SW3#show etherchannel summary
Rack1SW3#show interface trunk
Rack1SW3#show spanning-tree vlan 10
Rack1SW4#show etherchannel summary
Rack1SW4#show interface trunk
Rack1SW4#show spanning-tree vlan 10
```

Layer 3 EtherChannel

Configure links Fa0/16 & Fa0/17 on SW4 and links Fa0/19 & Fa0/20 on SW2 to be bound together as a Layer 3 EtherChannel.

Use Port-Channel number 24 and the subnet 155.X.108.0/24 per the diagram.

Use an industry standard protocol to negotiate the Port-Channel configuration.

Ensure IP reachability is obtained between these devices over the segment.

Configuration

```
SW2:
interface Port channel24
 no switchport
 ip address 155.1.108.8 255.255.255.0
!
interface FastEthernet0/19
 no switchport
 channel group 24 mode passive
!
interface FastEthernet0/20
 no switchport
 channel-group 24 mode passive

SW4:
interface Port-channel24
 no switchport
 ip address 155.1.108.10 255.255.255.0
!
interface FastEthernet0/16
 no switchport
 channel-group 24 mode active
!
interface FastEthernet0/17
 no switchport
 channel-group 24 mode active
```

Rack1SW2#show etherchannel 24 summary

Rack1SW2#ping 155.1.108.10

```
Rack1SW2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Rack1SW2(config)#ip routing
Rack1SW2(config)#end
```

Rack1SW2#show ip route

Rack1SW4#show etherchannel 24 summary