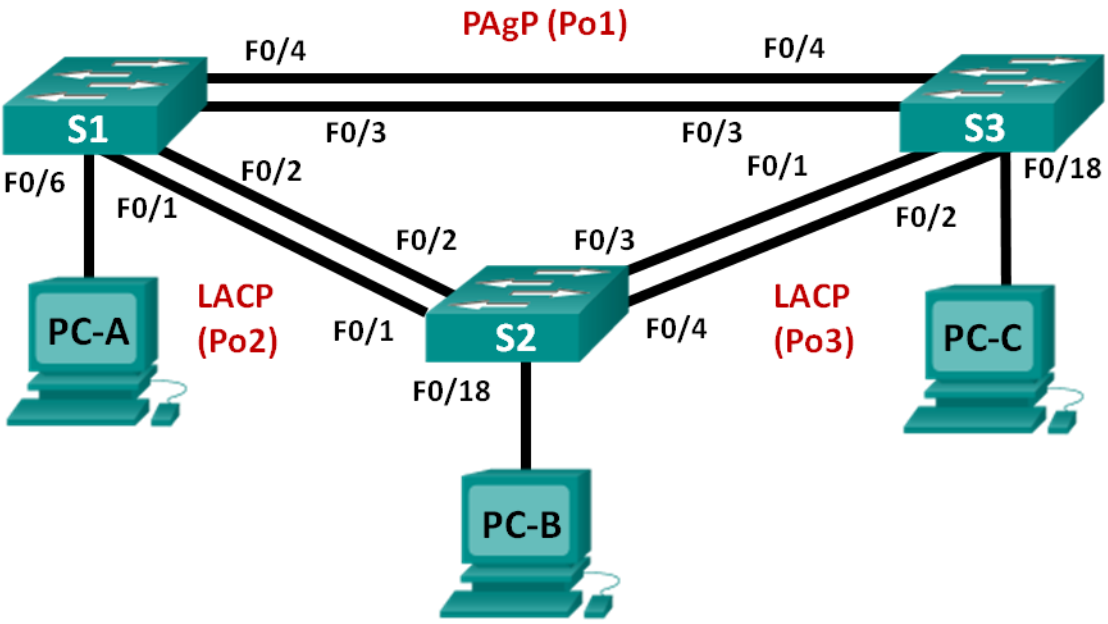
Lab – Configuring EtherChannel (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask
S1	VLAN 99	192.168.99.11	255.255.255.0
S2	VLAN 99	192.168.99.12	255.255.255.0
S3	VLAN 99	192.168.99.13	255.255.255.0
PC-A	NIC	192.168.10.1	255.255.255.0
PC-B	NIC	192.168.10.2	255.255.255.0
PC-C	NIC	192.168.10.3	255.255.255.0

Objectives

Part 1: Configure Basic Switch Settings

Part 2: Configure PAgP

Part 3: Configure LACP

Background / Scenario

Link aggregation allows the creation of logical links that are comprised of two or more physical links. This provides increased throughput beyond using only one physical link. Link aggregation also provides redundancy if one of the links fails.

In this lab, you will configure EtherChannel, a form of link aggregation used in switched networks. You will configure EtherChannel using Port Aggregation Protocol (PAgP) and Link Aggregation Control Protocol (LACP).

Note: PAgP is a Cisco-proprietary protocol that you can only run on Cisco switches and on switches that are licensed vendors to support PAgP. LACP is a link aggregation protocol that is defined by IEEE 802.3ad, and it is not associated with any specific vendor.

LACP allows Cisco switches to manage Ethernet channels between switches that conform to the 802.3ad protocol. You can configure up to 16 ports to form a channel. Eight of the ports are in active mode and the other eight are in standby mode. When any of the active ports fail, a standby port becomes active. Standby mode works only for LACP, not for PAgP.

Note: The switches used with CCNA hands-on labs are Cisco Catalyst 2960s with Cisco IOS Release 15.0(2) (lanbasek9 image). Other switches and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs.

Note: Make sure that the switches have been erased and have no startup configurations. If you are unsure, contact your instructor.

Instructor Note: Refer to the Instructor Lab Manual for the procedures to initialize and reload devices.

Required Resources

- 3 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 3 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet cables as shown in the topology

Part 1: Configure Basic Switch Settings

In Part 1, you will set up the network topology and configure basic settings, such as the interface IP addresses, device access, and passwords.

Step 1: Cable the network as shown in the topology.

Attach the devices as shown in the topology diagram, and cable as necessary.

Step 2: Initialize and reload the switches.

Step 3: Configure basic settings for each switch.

a. Disable DNS lookup.

b. Configure the device name as displayed in the topology.

c. Encrypt plain text passwords.

d. Create a MOTD banner warning users that unauthorized access is prohibited.

e. Assign **class** as the encrypted privileged EXEC mode password.

f. Assign **cisco** as the console and vty password and enable login.

g. Configure logging synchronous to prevent console message from interrupting command entry.

h. Shut down all switchports except the ports connected to PCs.

i. Configure VLAN 99 and name it **Management**.

j. Configure VLAN 10 and name it **Staff**.

k. Configure the switch ports with attached hosts as access ports in VLAN 10.

l. Assign the IP addresses according to the Addressing Table.

m. Copy the running configuration to startup configuration.

Step 4: Configure the PCs.

Assign IP addresses to the PCs according to the Addressing Table.

Part 2: Configure PAgP

PAgP is a Cisco proprietary protocol for link aggregation. In Part 2, a link between S1 and S3 will be configured using PAgP.

Step 1: Configure PAgP on S1 and S3.

For a link between S1 and S3, configure the ports on S1 with PAgP desirable mode and the ports on S3 with PAgP auto mode. Enable the ports after PAgP modes have been configured.

```
S1(config)# interface range f0/3-4
S1(config-if-range)# channel-group 1 mode desirable
Creating a port-channel interface Port-channel 1

S1(config-if-range)# no shutdown

S3(config)# interface range f0/3-4
S3(config-if-range)# channel-group 1 mode auto
Creating a port-channel interface Port-channel 1

S3(config-if-range)# no shutdown
*Mar  1 00:09:12.792: %LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to up
*Mar  1 00:09:12.792: %LINK-3-UPDOWN: Interface FastEthernet0/4, changed state to up
S3(config-if-range)#
*Mar  1 00:09:15.384: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3,
changed state to up
*Mar  1 00:09:16.265: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4,
changed state to up
S3(config-if-range)#
*Mar  1 00:09:16.357: %LINK-3-UPDOWN: Interface Port-channel1, changed state to up
*Mar  1 00:09:17.364: %LINEPROTO-5-UPDOWN: Line protocol on Interface Port-channel1,
changed state to up
*Mar  1 00:09:44.383: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed
state to up
```

Step 2: Examine the configuration on the ports.

Currently the F0/3, F0/4, and Po1 (Port-channel1) interfaces on both S1 and S3 are in access operational mode with the administrative mode in dynamic auto. Verify the configuration using the **show run interface** *interface-id* and **show interfaces** *interface-id* **switchport** commands, respectively. The example configuration outputs for F0/3 on S1 are as follows:

```
S1# show run interface f0/3
Building configuration...
```

```
Current configuration : 103 bytes
!
interface FastEthernet0/3
 channel-group 1 mode desirable

S1# show interfaces f0/3 switchport
Name: Fa0/3
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access (member of bundle Po1)
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL

Protected: false
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
```

Step 3: Verify that the ports have been aggregated.

```
S1# 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      f - failed to allocate aggregator

        M - not in use, minimum links not met
        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      Fa0/3(P)    Fa0/4(P)

S3# 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      f - failed to allocate aggregator

        M - not in use, minimum links not met
        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      Fa0/3(P)    Fa0/4(P)
```

What do the flags, SU and P, indicate in the Ethernet summary?

_____

_____

The flag P indicates that the ports are bundled in a port-channel. The flag S indicates that the port-channel is a Layer 2 EtherChannel. The U flag indicates that the EtherChannel is in use.

Step 4: Configure trunk ports.

After the ports have been aggregated, commands applied at the port channel interface affect all the links that were bundled together. Manually configure the Po1 ports on S1 and S3 as trunk ports and assign them to native VLAN 99.

```
S1(config)# interface port-channel 1
S1(config-if)# switchport mode trunk
S1(config-if)# switchport trunk native vlan 99

S3(config)# interface port-channel 1
S3(config-if)# switchport mode trunk
S3(config-if)# switchport trunk native vlan 99
```

Step 5: Verify that the ports are configured as trunk ports.

a. Issue the **show run interface** *interface-id* commands on S1 and S3. What commands are listed for F0/3 and F0/4 on both switches? Compare the results to the running configuration for the Po1 interface? Record your observation.

_____

_____

```
switchport trunk native vlan 99
switchport mode trunk
```

The commands related to trunk configuration are the same. When the trunk commands were applied to the EtherChannel, the commands also affected the individual links in the bundle.

```
S1# show run interface po1
Building configuration...

Current configuration : 92 bytes
!
interface Port-channel1
 switchport trunk native vlan 99
 switchport mode trunk
end

S1# show run interface f0/3
Building configuration...

Current configuration : 126 bytes
!
interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode desirable
end
```

b. Issue the **show interfaces trunk** and **show spanning-tree** commands on S1 and S3. What trunk port is listed? What is the native VLAN? What is concluding result from the output?

_____

The trunk port listed is Po1. The native VLAN is 99. After the links are bundled, only the aggregated interface is listed in some **show** commands.

From the **show spanning-tree** output, what is port cost and port priority for the aggregated link?

_____

The port cost for Po1 is 12, and the port priority is 128.

```
S1# show interfaces trunk

Port        Mode             Encapsulation  Status        Native vlan
Po1         on               802.1q         trunking      99

Port        Vlans allowed on trunk
Po1         1-4094
```

```
Port        Vlans allowed and active in management domain
Po1         1,10,99

Port        Vlans in spanning tree forwarding state and not pruned
Po1         1,10,99

S3# show interfaces trunk

Port        Mode             Encapsulation  Status        Native vlan
Po1         on               802.1q         trunking      99

Port        Vlans allowed on trunk
Po1         1-4094

Port        Vlans allowed and active in management domain
Po1         1,10,99

Port        Vlans in spanning tree forwarding state and not pruned
Po1         1,10,99

S1# show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID     Priority    32769
              Address     0cd9.96e8.7400
              Cost        12
              Port        64 (Port-channel1)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID   Priority    32769  (priority 32768 sys-id-ext 1)
              Address     0cd9.96e8.8a00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Po1                 Root FWD 12        128.64   P2p


VLAN0010
  Spanning tree enabled protocol ieee
  Root ID     Priority    32778
              Address     0cd9.96e8.7400
              Cost        12
              Port        64 (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     0cd9.96e8.8a00
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Fa0/6               Desg FWD 19        128.6    P2p
Po1                 Root FWD 12        128.64   P2p

VLAN0099
  Spanning tree enabled protocol ieee
  Root ID    Priority    32867
             Address     0cd9.96e8.7400
             Cost        12
             Port        64 (Port-channel1)
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32867  (priority 32768 sys-id-ext 99)
             Address     0cd9.96e8.8a00
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Po1                 Root FWD 12        128.64   P2p

S3# show spanning-tree

VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0cd9.96e8.7400
             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     0cd9.96e8.7400
             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 12        128.64   P2p


VLAN0010
  Spanning tree enabled protocol ieee
  Root ID    Priority    32778
```

```
              Address     0cd9.96e8.7400
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778  (priority 32768 sys-id-ext 10)
              Address     0cd9.96e8.7400
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time  300 sec

Interface           Role Sts Cost      Prio.Nbr Type
------------------- ---- --- --------- -------- --------------------------------
Fa0/18              Desg FWD 19        128.18   P2p
Po1                 Desg FWD 12        128.64   P2p


VLAN0099
  Spanning tree enabled protocol ieee
  Root ID    Priority    32867
              Address     0cd9.96e8.7400
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32867  (priority 32768 sys-id-ext 99)
              Address     0cd9.96e8.7400
              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 12        128.64   P2p
```

Part 3: Configure LACP

LACP is an open source protocol for link aggregation developed by the IEEE. In Part 3, the link between S1 and S2, and the link between S2 and S3 will be configured using LACP. Also, the individual links will be configured as trunks before they are bundled together as EtherChannels.

Step 1: Configure LACP between S1 and S2.

```
S1(config)# interface range f0/1-2
S1(config-if-range)# switchport mode trunk
S1(config-if-range)# switchport trunk native vlan 99
S1(config-if-range)# channel-group 2 mode active
Creating a port-channel interface Port-channel 2

S1(config-if-range)# no shutdown

S2(config)# interface range f0/1-2
S2(config-if-range)# switchport mode trunk
```

```
S2(config-if-range)# switchport trunk native vlan 99
S2(config-if-range)# channel-group 2 mode passive
Creating a port-channel interface Port-channel 2

S2(config-if-range)# no shutdown
```

Step 2: Verify that the ports have been aggregated.

What protocol is Po2 using for link aggregation? Which ports are aggregated to form Po2? Record the command used to verify.

_____

_____

Po2 is using LACP and F0/1 and F0/2 are aggregated to form Po2.

```
S1# 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      f - failed to allocate aggregator

        M - not in use, minimum links not met
        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      Fa0/3(P)    Fa0/4(P)
2      Po2(SU)          LACP      Fa0/1(P)    Fa0/2(P)

S2# 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      f - failed to allocate aggregator

        M - not in use, minimum links not met
        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      Fa0/1(P)    Fa0/2(P)
```

Step 3: Configure LACP between S2 and S3.

a. Configure the link between S2 and S3 as Po3 and use LACP as the link aggregation protocol.

```
S2(config)# interface range f0/3-4
S2(config-if-range)# switchport mode trunk
S2(config-if-range)# switchport trunk native vlan 99
S2(config-if-range)# channel-group 3 mode active
Creating a port-channel interface Port-channel 3
S2(config-if-range)# no shutdown

S3(config)# interface range f0/1-2
S3(config-if-range)# switchport mode trunk
S3(config-if-range)# switchport trunk native vlan 99
S3(config-if-range)# channel-group 3 mode passive
Creating a port-channel interface Port-channel 3

S3(config-if-range)# no shutdown
```

b. Verify that the EtherChannel has formed.

```
S2# 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      f - failed to allocate aggregator

        M - not in use, minimum links not met
        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
------+-------------+-----------+-----------------------------------------------
2      Po2(SU)         LACP      Fa0/1(P)    Fa0/2(P)
3      Po3(SU)         LACP      Fa0/3(P)    Fa0/4(P)

S3# 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      f - failed to allocate aggregator

            M - not in use, minimum links not met
            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      Fa0/3(P)    Fa0/4(P)
      3      Po3(SU)          LACP      Fa0/1(P)    Fa0/2(P)
```

Step 4: Verify end-to-end connectivity.

Verify that all devices can ping each other within the same VLAN. If not, troubleshoot until there is end-to-end connectivity.

Note: It may be necessary to disable the PC firewall to ping between PCs.

Reflection

What could prevent EtherChannels from forming?

_____

Configuration mismatch, such as trunk port on one end and access port at the other end, different aggregation protocols and different port speed/duplex, would prevent the formation of EtherChannel.

Device Configs

Switch S1

```
S1# show vlan brief

VLAN Name                                Status    Ports
---- ----------------------------------- --------- -------------------------------
1    default                             active    Fa0/5, Fa0/7, Fa0/8, Fa0/9
                                                   Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                   Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                   Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                   Fa0/22, Fa0/23, Fa0/24, Gi0/1
                                                   Gi0/2
10   Staff                               active    Fa0/6
99   Management                          active
1002 fddi-default                        act/unsup
1003 token-ring-default                  act/unsup
```

```
1004 fddinet-default                     act/unsup
1005 trnet-default                       act/unsup

S1# show run
Building configuration...

Current configuration : 2339 bytes
!
version 15.0
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname S1
!
boot-start-marker
boot-end-marker
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
system mtu routing 1500
!
!
no ip domain-lookup
!
!
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
vlan internal allocation policy ascending
!
!
!
!
!
!
interface Port-channel1
 switchport trunk native vlan 99
 switchport mode trunk
!
interface Port-channel2
```

```
 switchport trunk native vlan 99
 switchport mode trunk
!
interface FastEthernet0/1
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode active
!
interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode active
!
interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode desirable
!
interface FastEthernet0/4
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode desirable
!
interface FastEthernet0/5
 shutdown
!
interface FastEthernet0/6
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/7
 shutdown
!
interface FastEthernet0/8
 shutdown
!
interface FastEthernet0/9
 shutdown
!
interface FastEthernet0/10
 shutdown
!
interface FastEthernet0/11
 shutdown
!
interface FastEthernet0/12
 shutdown
!
interface FastEthernet0/13
```

```
 shutdown
!
interface FastEthernet0/14
 shutdown
!
interface FastEthernet0/15
 shutdown
!
interface FastEthernet0/16
 shutdown
!
interface FastEthernet0/17
 shutdown
!
interface FastEthernet0/18
 shutdown
!
interface FastEthernet0/19
 shutdown
!
interface FastEthernet0/20
 shutdown
!
interface FastEthernet0/21
 shutdown
!
interface FastEthernet0/22
 shutdown
!
interface FastEthernet0/23
 shutdown
!
interface FastEthernet0/24
 shutdown
!
interface GigabitEthernet0/1
 shutdown
!
interface GigabitEthernet0/2
 shutdown
!
interface Vlan1
 no ip address
!
interface Vlan99
 ip address 192.168.99.11 255.255.255.0
!
ip http server
ip http secure-server
```

```
!
!
banner motd ^C
   Unauthorized Access Prohibited.^C
!
line con 0
 password 7 0822455D0A16
 logging synchronous
 login
line vty 0 4
 password 7 0822455D0A16
 login
line vty 5 15
 password 7 1511021F0725
 login
!
end
```

Switch S2

```
S2# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/19, Fa0/20, Fa0/21
                                                Fa0/22, Fa0/23, Fa0/24, Gi0/1
                                                Gi0/2
10   Staff                            active    Fa0/18
99   Management                       active
1002 fddi-default                     act/unsup
1003 token-ring-default               act/unsup
1004 fddinet-default                  act/unsup
1005 trnet-default                    act/unsup

S2# show run
Building configuration...

Current configuration : 2333 bytes
!
version 15.0
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname S2
!
```

```
boot-start-marker
boot-end-marker
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
system mtu routing 1500
!
!
no ip domain-lookup
!
!
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
vlan internal allocation policy ascending
!
!
!
!
!
!
interface Port-channel2
 switchport trunk native vlan 99
 switchport mode trunk
!
interface Port-channel3
 switchport trunk native vlan 99
 switchport mode trunk
!
interface FastEthernet0/1
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode passive
!
interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 2 mode passive
!
interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport mode trunk
```

```
 channel-group 3 mode active
!
interface FastEthernet0/4
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 3 mode active
!
interface FastEthernet0/5
 shutdown
!
interface FastEthernet0/6
 shutdown
!
interface FastEthernet0/7
 shutdown
!
interface FastEthernet0/8
 shutdown
!
interface FastEthernet0/9
 shutdown
!
interface FastEthernet0/10
 shutdown
!
interface FastEthernet0/11
 shutdown
!
interface FastEthernet0/12
 shutdown
!
interface FastEthernet0/13
 shutdown
!
interface FastEthernet0/14
 shutdown
!
interface FastEthernet0/15
 shutdown
!
interface FastEthernet0/16
 shutdown
!
interface FastEthernet0/17
 shutdown
!
interface FastEthernet0/18
 switchport access vlan 10
 switchport mode access
```

```
!
interface FastEthernet0/19
 shutdown
!
interface FastEthernet0/20
 shutdown
!
interface FastEthernet0/21
 shutdown
!
interface FastEthernet0/22
 shutdown
!
interface FastEthernet0/23
 shutdown
!
interface FastEthernet0/24
 shutdown
!
interface GigabitEthernet0/1
 shutdown
!
interface GigabitEthernet0/2
 shutdown
!
interface Vlan1
 no ip address
!
interface Vlan99
 ip address 192.168.99.12 255.255.255.0
!
ip http server
ip http secure-server
!
banner motd ^C
   Unauthorized Access Prohibited.^C
!
line con 0
 password 7 060506324F41
 logging synchronous
 login
line vty 0 4
 password 7 060506324F41
 login
line vty 5 15
 password 7 121A0C041104
 login
!
end
```

Switch S3

```
S3# show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                 Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                 Fa0/17, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24, Gi0/1
                                                 Gi0/2
10   Staff                             active    Fa0/18
99   Management                        active
1002 fddi-default                      act/unsup
1003 token-ring-default                act/unsup
1004 fddinet-default                   act/unsup
1005 trnet-default                     act/unsup

S3# show run
Building configuration...

Current configuration : 2331 bytes
!
version 15.0
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname S3
!
boot-start-marker
boot-end-marker
!
enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2
!
no aaa new-model
system mtu routing 1500
!
!
no ip domain-lookup
!
!
!
!
!
!
!
!
```

```
spanning-tree mode pvst
spanning-tree extend system-id
!
vlan internal allocation policy ascending
!
!
!
!
!
!
interface Port-channel1
 switchport trunk native vlan 99
 switchport mode trunk
!
interface Port-channel3
 switchport trunk native vlan 99
 switchport mode trunk
!
interface FastEthernet0/1
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 3 mode passive
!
interface FastEthernet0/2
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 3 mode passive
!
interface FastEthernet0/3
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode auto
!
interface FastEthernet0/4
 switchport trunk native vlan 99
 switchport mode trunk
 channel-group 1 mode auto
!
interface FastEthernet0/5
 shutdown
!
interface FastEthernet0/6
 shutdown
!
interface FastEthernet0/7
 shutdown
!
interface FastEthernet0/8
 shutdown
```

```
!
interface FastEthernet0/9
 shutdown
!
interface FastEthernet0/10
 shutdown
!
interface FastEthernet0/11
 shutdown
!
interface FastEthernet0/12
 shutdown
!
interface FastEthernet0/13
 shutdown
!
interface FastEthernet0/14
 shutdown
!
interface FastEthernet0/15
 shutdown
!
interface FastEthernet0/16
 shutdown
!
interface FastEthernet0/17
 shutdown
!
interface FastEthernet0/18
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet0/19
 shutdown
!
interface FastEthernet0/20
 shutdown
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interface FastEthernet0/21
 shutdown
!
interface FastEthernet0/22
 shutdown
!
interface FastEthernet0/23
 shutdown
!
interface FastEthernet0/24
 shutdown
```

```
!
interface GigabitEthernet0/1
 shutdown
!
interface GigabitEthernet0/2
 shutdown
!
interface Vlan1
 no ip address
!
interface Vlan99
 ip address 192.168.99.13 255.255.255.0
!
ip http server
ip http secure-server
!
!
banner motd ^C
   Unauthorized Access Prohibited.^C
!
line con 0
 password 7 045802150C2E
 logging synchronous
 login
line vty 0 4
 password 7 110A1016141D
 login
line vty 5 15
 password 7 070C285F4D06
 login
!
end
```