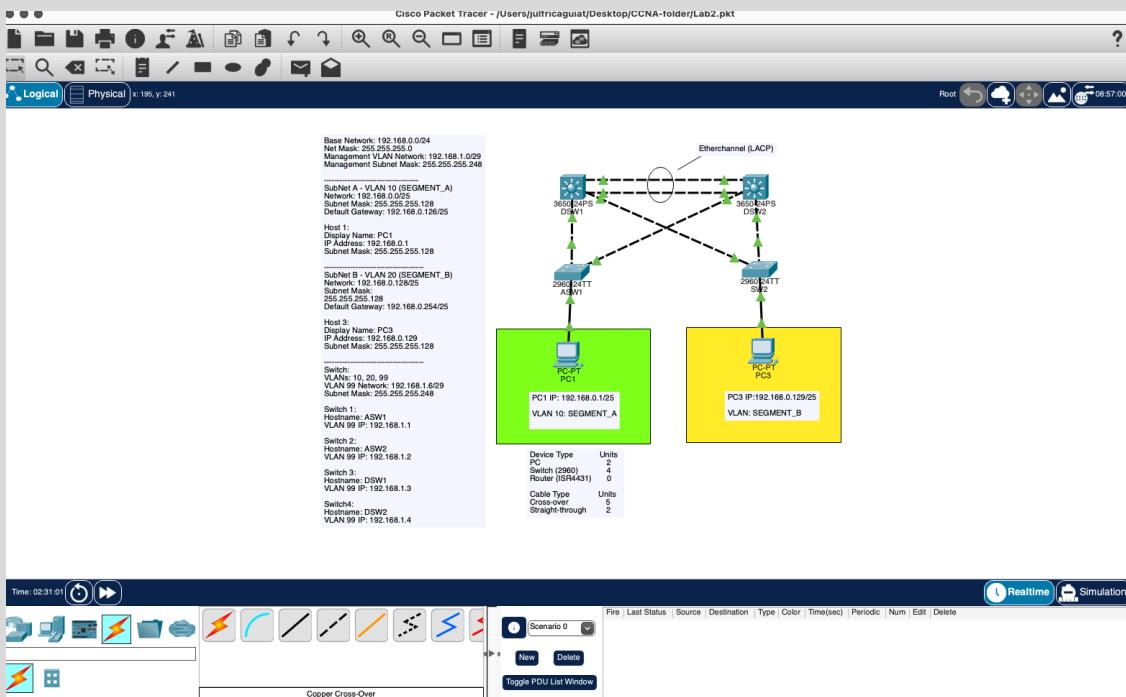


Lab 2: EtherChannel, VTP, and Spanning Tree Protocol (STP) Implementation

This lab focuses on implementing **EtherChannel (LACP)** for link aggregation and redundancy, centralizing VLAN management using **VTP**, and controlling Layer 2 loop prevention with **Rapid PVST+ Spanning Tree Protocol**. This lab builds on the previous VLAN and trunking setup by introducing switch hierarchy (Distribution and Access layers), **STP root bridge tuning**, and edge-port protections such as **PortFast**, **BPDG Guard**, and **disabling unused ports** to improve stability, resilience, and security.

Network Topology:



Network Addressing Plan (Subnetting):

Overall Network:

Parameter	Value
Base Network	192.168.0.0/24
Subnet Mask	255.255.255.0
Management VLAN Network	192.168.1.0/29
Management Subnet Mask	255.255.255.248

Subnet A – VLAN 10 (SEGMENT_A)

Parameter	Host 1 (PC1)
IP Address	192.168.0.1
Subnet Mask	255.255.255.128
Default Gateway	192.168.0.126
VLAN	10
Network	192.168.0.0/25

Subnet B – VLAN 20 (SEGMENT_B)

<u>Parameter</u>	<u>Host 3 (PC3)</u>
IP Address	192.168.0.129
Subnet Mask	255.255.255.128
Default Gateway	192.168.0.254
VLAN	20
Network	192.168.0.128/25

Switch 1 – ASW1

<u>Parameter</u>	<u>Value</u>
Hostname	ASW1
VLANs	10, 20, 99
SVI VLAN 99 IP Address	192.168.1.1 /29
Default Gateway	192.168.1.6

Switch 2 – ASW2

<u>Parameter</u>	<u>Value</u>
Hostname	ASW2
VLANs	10, 20, 99
SVI VLAN 99 IP	192.168.1.2 /29
Default Gateway	192.168.1.6

Switch 3 – DSW1

<u>Parameter</u>	<u>Value</u>
Hostname	DSW1
VLANs	10, 20, 99
SVI VLAN 99 IP	192.168.1.3 /29
Default Gateway	192.168.1.6

Switch 4 – DSW2

<u>Parameter</u>	<u>Value</u>
Hostname	DSW2
VLANs	10, 20, 99
SVI VLAN 99 IP	192.168.1.4 /29
Default Gateway	192.168.1.6

Initial Switch Setup (refer to Lab1) : Optional

- Configure hostnames
- Set system clock
- Configure NTP for time synchronization
- Secure device access (console & VTY)
- Save configurations

VLAN Creation (Centralized on DSW1 – VTP Server)

- Create user VLANs and management VLAN
- Assign VLAN names

on DSW1:

```
! Configure VTP Server
vtp mode server
vtp domain jcagLab
vtp version 2
! Create VLANs
vlan 10
  name SEGMENT_A
  exit
vlan 20
  name SEGMENT_B
  exit
vlan 99
  name MGMT
  exit
```

! Configure DSW2, ASW1, ASW2 to operate as VTP clients

```
vtp mode client
```

EtherChannel Configuration (DSW1 and DSW2 port-channel link)

- Bundle parallel trunk links
- Use LACP (mode active)
- Configure Port-Channel as trunk

on DSW1 & DSW2:

```
! Configure physical interfaces for DSW channel
interface range gigabitEthernet1/0/3 - 4
  channel-group 1 mode active
  exit
! Configure Port-Channel interface for DSW channel
interface po1
  sw trunk encapsulation dot1q
  sw mode trunk
  sw trunk native vlan 1000
  sw trunk allowed vlan 10,20,99
  exit
```

Manual Trunking + DTP Disabled (DSWs and trunk links)

- Configure trunk links between switches
- Set non-default native VLAN
- Disable DTP negotiation

On DSW1 & DSW2:

```
! Configure physical interface
int range g1/0/1-2
  sw mode trunk
```

```
sw nonegotiate
sw trunk native vlan 1000
sw trunk allowed vlan 10,20,99
exit
```

on ASW1 & ASW2:

! Configure physical interfaces

```
int range g0/1 - 2
  switchport mode trunk
  switchport nonegotiate
  switchport trunk native vlan 1000
  switchport trunk allowed vlan 10,20,99
exit
```

Spanning Tree Protocol (Rapid PVST+)

- Enable Rapid PVST+
- Manually define root bridge roles per VLAN

! Enable Rapid PVST+

```
spanning-tree mode rapid-pvst
```

! Root bridge configuration (DSW1)

```
spanning-tree vlan 10,99 root primary
spanning-tree vlan 20 root secondary
```

! Root bridge configuration (DSW2)

```
spanning-tree vlan 20 root primary
spanning-tree vlan 10,99 root secondary
```

Management VLAN (SVI Configuration)

- Configure management SVI on each switch
- Assign IP addresses from VLAN 99 subnet
- Set default gateway

! Configure management SVI

```
interface vlan 99
  ip address 192.168.1.1 255.255.255.248
  no shutdown
exit
```

! Set default gateway

```
ip default-gateway 192.168.1.6
```

! Configure DSW2, ASW1, ASW2: Increment IP addresses appropriately on ASW2, DSW1, DSW2

Access Port Configuration (End Devices)

- Assign access ports to VLANs
- Enable PortFast and BPDU Guard! Configure access port

on ASW1 & ASW2:

! Configure access port

```
interface f0/1
  switchport mode access
  switchport access vlan 10      → change vlan 10 to vlan 20 on ASW2
  spanning-tree portfast
```

```

spanning-tree bpduguard enable
! Shutdown unused ports
int range f0/1
    shutdown

```

!Repeat configuration on ASW2

Verification Commands

Command

```

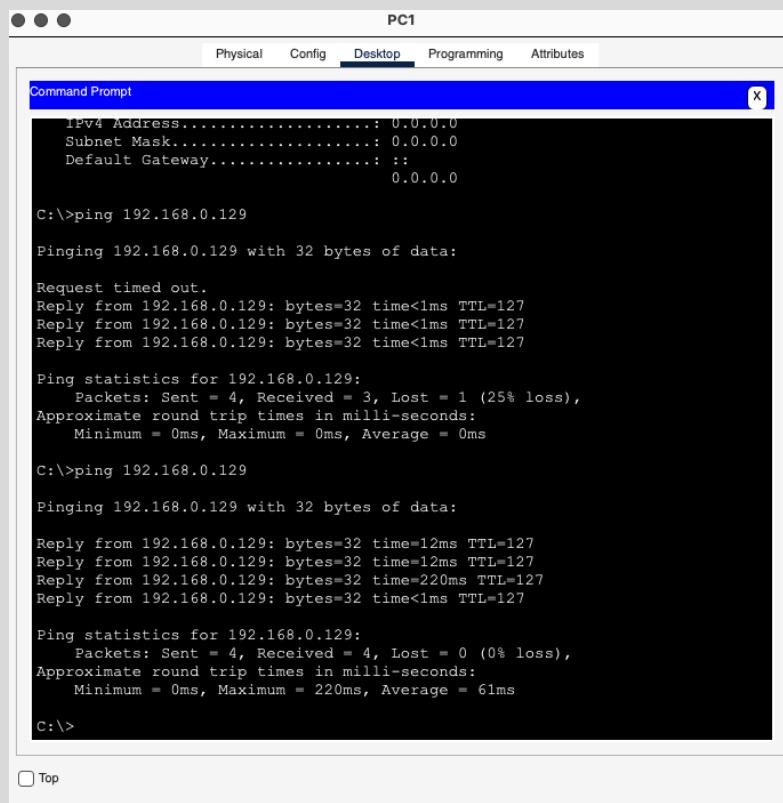
show vlan brief
show interfaces trunk
show etherchannel summary
show spanning-tree vlan 10
show spanning-tree vlan 20
show ip interface brief
show vtp status

```

What It Shows

VLAN IDs, names, status, and access ports per VLAN
Trunk ports, native VLAN, allowed and active VLANs
Port-channel status, protocol (LACP/PAgP), member ports
STP role, root bridge, port states for VLAN 10
STP role, root bridge, port states for VLAN 20
Interface IPs, admin status, and line protocol state
VTP mode, domain name, version, and revision number

Ping 192.168.0.129 (Successful)



The screenshot shows a Cisco Network Assistant window titled "PC1". The "Desktop" tab is selected. A "Command Prompt" window is open, showing the output of a ping command. The output indicates a successful ping to 192.168.0.129 with 32 bytes of data, showing round trip times and statistics.

```

IPv4 Address.....: 0.0.0.0
Subnet Mask.....: 0.0.0.0
Default Gateway....: ::

C:\>ping 192.168.0.129

Pinging 192.168.0.129 with 32 bytes of data:

Request timed out.
Reply from 192.168.0.129: bytes=32 time<1ms TTL=127
Reply from 192.168.0.129: bytes=32 time<1ms TTL=127
Reply from 192.168.0.129: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.129:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.0.129

Pinging 192.168.0.129 with 32 bytes of data:

Reply from 192.168.0.129: bytes=32 time=12ms TTL=127
Reply from 192.168.0.129: bytes=32 time=12ms TTL=127
Reply from 192.168.0.129: bytes=32 time=220ms TTL=127
Reply from 192.168.0.129: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.129:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 220ms, Average = 61ms

```

DSW1 Running Configuration

DSW1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
spanning-tree mode rapid-pvst
spanning-tree vlan 10,99 priority 24576
spanning-tree vlan 20 priority 28672
!
!
!
!
interface Port-channel1
switchport trunk native vlan 1000
switchport trunk allowed vlan 10,20,99
switchport mode trunk
switchport nonegotiate
!
interface GigabitEthernet1/0/1
switchport trunk native vlan 1000
switchport trunk allowed vlan 10,20,99
switchport mode trunk
switchport nonegotiate
!
interface GigabitEthernet1/0/2
switchport trunk native vlan 1000
switchport trunk allowed vlan 10,20,99
switchport mode trunk
switchport nonegotiate
!
interface GigabitEthernet1/0/3
switchport trunk native vlan 1000
switchport trunk allowed vlan 10,20,99
switchport mode trunk
switchport nonegotiate
channel-group 1 mode active
!
interface GigabitEthernet1/0/4
switchport trunk native vlan 1000
switchport trunk allowed vlan 10,20,99
switchport mode trunk
switchport nonegotiate
channel-group 1 mode active
!
interface GigabitEthernet1/0/5
!
DSW1#
```

Top

DSW1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
interface GigabitEthernet1/1/4
!
interface Vlan1
no ip address
shutdown
!
interface Vlan10
mac-address 0090.0cc3.9101
ip address 192.168.0.126 255.255.255.128
!
interface Vlan20
mac-address 0090.0cc3.9102
ip address 192.168.0.254 255.255.255.128
!
interface Vlan89
mac-address 0090.0cc3.9103
ip address 192.168.1.6 255.255.255.248
!
ip classless
!
ip flow-export version 9
!
!
!
```

Top