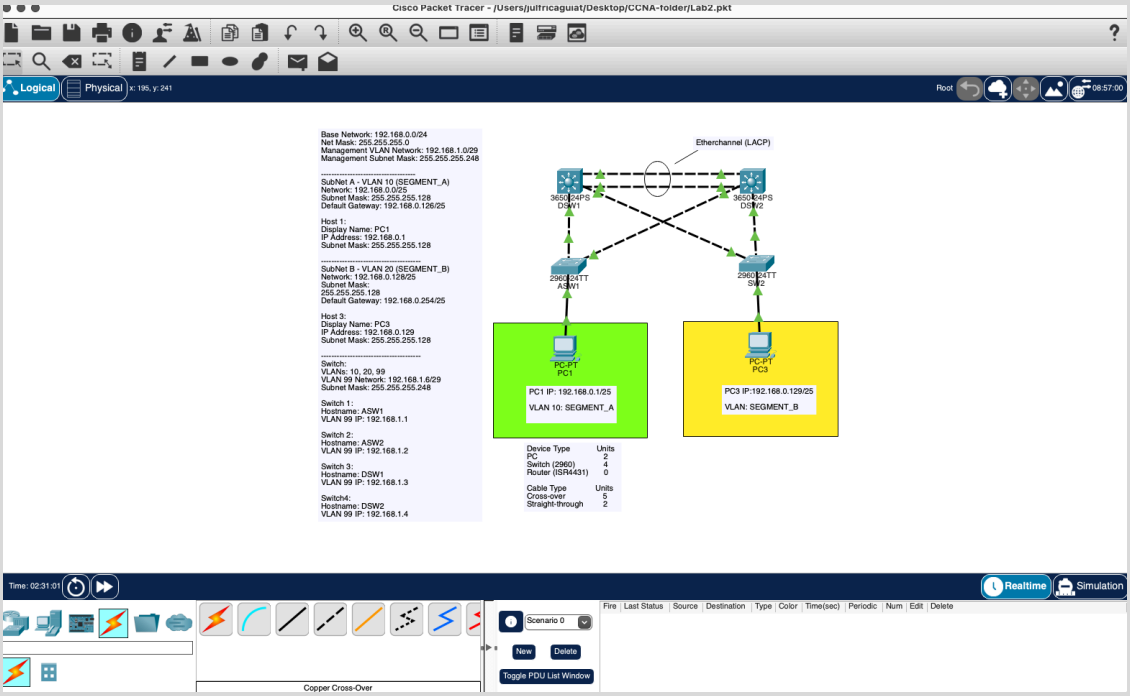
Lab 2: EtherChannel, VTP, and Spanning Tree Protocol (STP) Implementation

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**, **BPDU 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)

Parameter	Host 3 (PC3)
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

Parameter	Value
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

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

Switch 3 – DSW1

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

Switch 4 – DSW2

Parameter	Value
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
  spanning-tree portfast
```

→ change `vlan 10` to `vlan 20` on ASW2

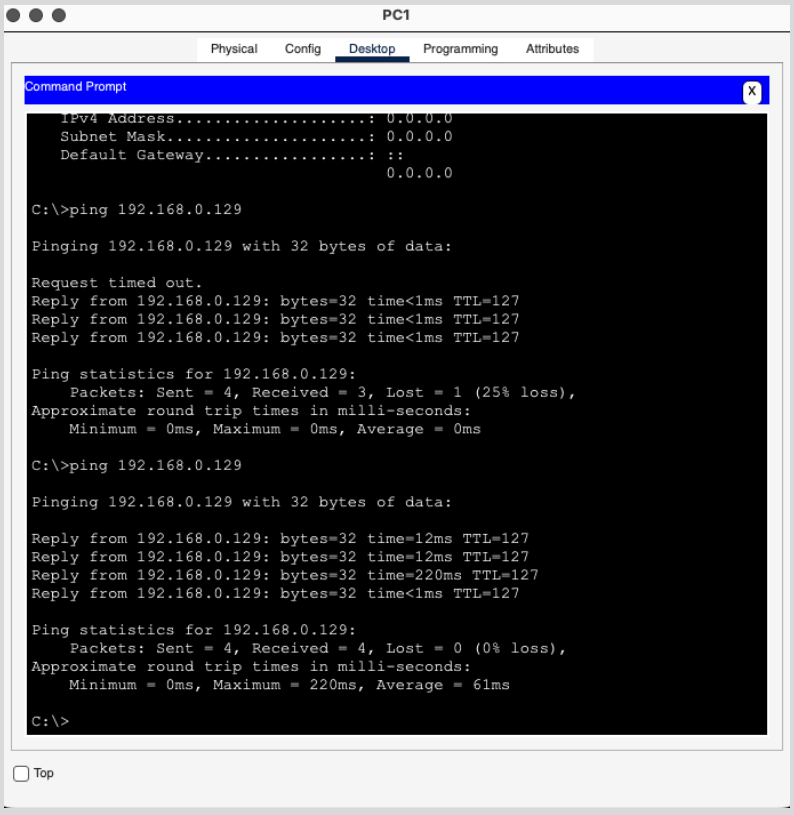
```
 spanning-tree bpduguard enable
```
! Shutdown unused ports
```
int range f0/1
  shutdown
```

!Repeat configuration on ASW2

Verification Commands

Command	What It Shows
`show vlan brief`	VLAN IDs, names, status, and access ports per VLAN
`show interfaces trunk`	Trunk ports, native VLAN, allowed and active VLANs
`show etherchannel summary`	Port-channel status, protocol (LACP/PAgP), member ports
`show spanning-tree vlan 10`	STP role, root bridge, port states for VLAN 10
`show spanning-tree vlan 20`	STP role, root bridge, port states for VLAN 20
`show ip interface brief`	Interface IPs, admin status, and line protocol state
`show vtp status`	VTP mode, domain name, version, and revision number

`Ping 192.168.0.129` (Successful)



DSW1 Running Configuration