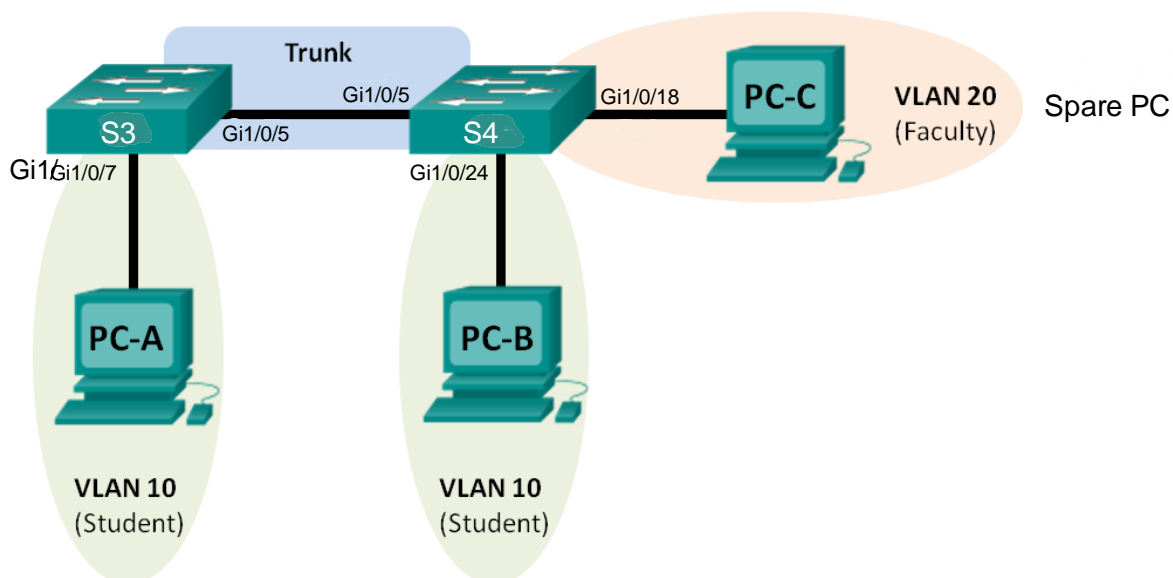# Lab - Configuring VLANs and Trunking

Topology Diagram

Modifications to Network Drawing

If you are working via **remote access**, the PCs in the diagram are just for reference and will not be connected to your lab topology.

If you are working on-campus, you will use test PCs as specified in the **On-campus tests** sections.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
S3	VLAN 99	192.168.1.11	255.255.255.0	N/A
S4	VLAN 99	192.168.1.12	255.255.255.0	N/A
PC-A	NIC	192.168.10.3	255.255.255.0	192.168.10.1
PC-B	NIC	192.168.10.4	255.255.255.0	192.168.10.1
PC-C	NIC	192.168.20.3	255.255.255.0	192.168.20.1

Objectives

Part 1: Build the Network and Configure Basic Device Settings Part 2:

Create VLANs and Assign Switch Ports

Part 3: Maintain VLAN Port Assignments and the VLAN Database Part

4: Configure an 802.1Q Trunk between the Switches

Part 5: Delete the VLAN Database

Background / Scenario

Modern switches use virtual local-area networks (VLANs) to improve network performance by separating large Layer 2 broadcast domains into smaller ones. VLANs can also be used as a security measure by controlling which hosts can communicate. In general, VLANs make it easier to design a network to support the goals of an organization.

VLAN trunks are used to span VLANs across multiple devices. Trunks allow the traffic from multiple VLANS to travel over a single link, while keeping the VLAN identification and segmentation intact.

In this lab, you will create VLANs on both switches in the topology, assign VLANs to switch access ports, verify that VLANs are working as expected, and then create a VLAN trunk between the two switches to allow hosts in the same VLAN to communicate through the trunk, regardless of which switch the host is actually attached to.

Note: The switches used are Cisco Catalyst 3650s with Cisco IOS Release 16.6.2 (universalk9 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: Ensure that the switches have been erased and have no startup configurations and default vlan database. If you are unsure contact your instructor.

Required Resources

- 2 Switches (Cisco 3650 with Cisco IOS Release 16.6.2 universalk9 image or comparable)
- 2 test PCs (when working on-campus)

Part 1:　Build the Network and Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic settings on the switches.

Step 1:　Interconnect the switches as shown in the topology.

Turn on the switches and verify the switch interconnection shown in the topology diagram (i.e. port Gi1/0/5 on both switches) is active.

Shutdown port Gi1/0/6 on both switches as we will be needing just one switch interconnection for this lab.
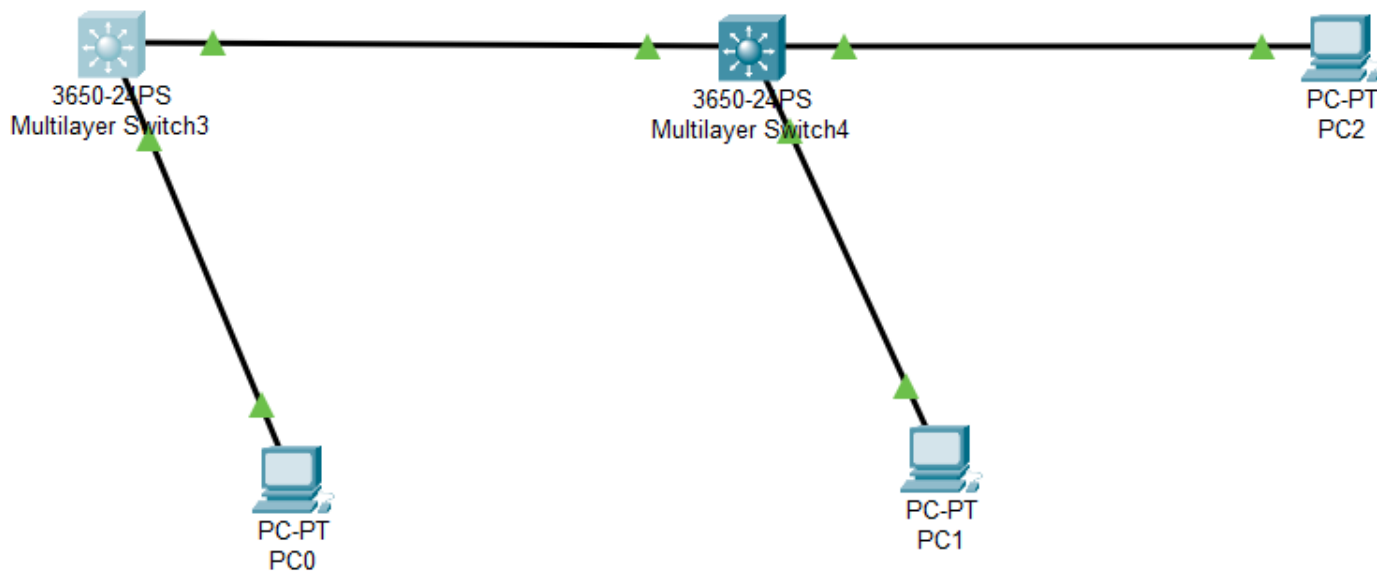
```
%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to administratively down
Switch(config-if)# exit
Switch(config)# exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch# show interfaces GigabitEthernet1/0/6
GigabitEthernet1/0/6 is administratively down, line protocol is down (disabled)
  Hardware is Lance, address is 0001.9758.7506 (bia 0001.9758.7506)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 1000Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     956 packets input, 193351 bytes, 0 no buffer
     Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     2357 packets output, 263570 bytes, 0 underruns
     0 output errors, 0 collisions, 10 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

```
S4(config)# interface GigabitEthernet1/0/6
S4(config-if)# shutdown

%LINK-5-CHANGED: Interface GigabitEthernet1/0/6, changed state to administratively down
S4(config-if)# exit
S4(config)# exit
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4# show interfaces GigabitEthernet1/0/6
GigabitEthernet1/0/6 is administratively down, line protocol is down (disabled)
  Hardware is Lance, address is 00d0.ff1c.1506 (bia 00d0.ff1c.1506)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 1000Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     956 packets input, 193351 bytes, 0 no buffer
     Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     2357 packets output, 263570 bytes, 0 underruns
     0 output errors, 0 collisions, 10 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Step 2:   Initialize and reload the switches as necessary.

Check that your switches are running with default settings and no existing VLAN configuration. If not, erase the startup-config, delete the vlan.dat and reload your switches.

Step 3:   Configure basic settings for each switch.

a. Disable DNS lookup.

```
S3> enable
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# no ip domain-lookup
S3(config)#
```

```
S4> enable
S4# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)# no ip domain-lookup
S4(config)#
```

b.   Configure device name as shown in the topology.

c.   Enable **ssh** login with the username **lab** and the password **ccna** to all 16 vty lines

```
S3(config)# line vty 0 15
S3(config-line)# login local
S3(config-line)# username lab password ccna

S4(config)# line vty 0 15
S4(config-line)# login local
S4(config-line)# username lab password ccna
```

d.   Configure **logging synchronous** for the console line.

```
S3(config)# line console 0
S3(config-line)# logging synchronous
S3(config-line)# exit

S4(config)# line console 0
S4(config-line)# logging synchronous
S4(config-line)# exit
```

e.   Configure a MOTD banner to warn users that unauthorized access is prohibited.

```
S3(config)# banner motd #
Enter TEXT message.  End with the character '#'.
#WARNING: Unauthorized access is prohibited!#

S4(config)# banner motd #
Enter TEXT message.  End with the character '#'.
#WARNING: Unauthorized access is prohibited!#
```

f.   Administratively deactivate all unused ports on the switch.

```
S3(config)# interface range Gi1/0/1-4
S3(config-if-range)# shutdown
S3(config-if-range)# exit
S3(config)# exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

```
S4(config)# interface range Gi1/0/1 - 4
S4(config-if-range)# shutdown
S4(config-if-range)# exit
S4(config)# exi
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#
```

Step 4:   Connectivity scenarios

If you connected PC-A, PC-B and PC-C as show in the Topology Diagram and configured them with the IP settings specified in the Addressing Table.

Note: ping between the switches can be tested. For all other questions, use your networking knowledge to provide an answer.

Would PC-A ping PC-B?	Yes
Would PC-A ping PC-C?	No
Would PC-A ping S3?	No
Would PC-B ping PC-C?	No
Would PC-B ping S4?	No
Would PC-C ping S4?	No
Can S3 ping S4?	No

If you answered no to any of the above questions, why would the pings be unsuccessful?

- **PC-A can ping PC-B: YES.** Both PC-A and PC-B are on the 192.168.10.0/24 network (subnet 192.168.10.x with a subnet mask of 255.255.255.0). They are in the same broadcast domain and can communicate directly via S3.

- Others no because they're on different networks, and there's no router to connect them

Step 5:   On-campus tests.

a. Connect the **VAN PC** to Gi1/0/24 on S4. Configure it with PC-B IP settings as per the Addressing Table.

b. Request instructor assistance to connect the **Ethernet PC** to port Gi1/0/7 on S3. Configure it with PC-A IP settings as per the Addressing Table.

Can PC-A ping PCB? _____

Can PC-A ping S3? _____

Can PC-B ping S4? _____

Are the results consistent with your answers to the questions in Step 4?

Part 2:   Create VLANs and Assign Switch Ports

In Part 2, you will create student, faculty, and management VLANs on both switches. You will then assign the VLANs to the appropriate interface. The **show vlan** command is used to verify your configuration settings.

Step 1:   Create VLANs on the switches.

a. Create the VLANs on S3.

S3(config)# **vlan 10**
S3(config-vlan)# **name Student** S3(config-
vlan)# **vlan 20** S3(config-vlan)# **name Faculty**
S3(config-vlan)# **vlan 99** S3(config-vlan)#
name Management S3(config-vlan)# **end**

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# vlan 10
S3(config-vlan)# name Student
S3(config-vlan)# vlan 20
S3(config-vlan)# name Faculty
S3(config-vlan)# vlan 99
S3(config-vlan)# name Management
S3(config-vlan)# end
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

b.   Create the same VLANs on S4.

```
S4> enable
S4# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)# vlan 10
S4(config-vlan)# name Student
S4(config-vlan)# vlan 20
S4(config-vlan)# name Faculty
S4(config-vlan)# vlan 99
S4(config-vlan)# name Management
S4(config-vlan)# end
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#
```

c.   Issue the **show vlan** command to view the list of VLANs on S3.

S3# **show vlan**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/7, Gi1/0/8 Gi1/0/9, Gi1/0/10, Gi1/0/11, Gi1/0/12 Gi1/0/13, Gi1/0/14, Gi1/0/15, Gi1/0/16 Gi1/0/17, Gi1/0/18, Gi1/0/19, Gi1/0/20 Gi1/0/21, Gi1/0/22, Gi1/0/23, Gi1/0/24 Gi1/1/1, Gi1/1/2, Gi1/1/3, Gi1/1/4
10	Student	active	
20	Faculty	active	
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
20	enet	100020	1500	-	-	-	-	-	0	0
99	enet	100099	1500	-	-	-	-	-	0	0

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

Remote SPAN VLANs

Primary	Secondary	Type		Ports

```
S3> enable
S3# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/7, Gig1/0/8
                                                Gig1/0/9, Gig1/0/10, Gig1/0/11, Gig1/0/12
                                                Gig1/0/13, Gig1/0/14, Gig1/0/15, Gig1/0/16
                                                Gig1/0/17, Gig1/0/18, Gig1/0/19, Gig1/0/20
                                                Gig1/0/21, Gig1/0/22, Gig1/0/23, Gig1/0/24
                                                Gig1/1/1, Gig1/1/2, Gig1/1/3, Gig1/1/4
10   Student                          active
20   Faculty                          active
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S3#


S4# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/7, Gig1/0/8
                                                Gig1/0/9, Gig1/0/10, Gig1/0/11, Gig1/0/12
                                                Gig1/0/13, Gig1/0/14, Gig1/0/15, Gig1/0/16
                                                Gig1/0/17, Gig1/0/18, Gig1/0/19, Gig1/0/20
                                                Gig1/0/21, Gig1/0/22, Gig1/0/23, Gig1/0/24
                                                Gig1/1/1, Gig1/1/2, Gig1/1/3, Gig1/1/4
10   Student                          active
20   Faculty                          active
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S4#
```

What is the default VLAN?

⇨　The default VLAN is VLAN 1

What ports are assigned to the default VLAN?

=> Ports range from Gig1/0/1 to Gig1/1/4

Step 2:　Assign VLANs to the correct switch interfaces.

　　a.　Assign VLANs to the interfaces on S3.

　　　　1)　Assign PC-A to the Student VLAN.

S3(config)# **interface g1/0/7**

S3(config-if)# **switchport mode access**

S3(config-if)# **switchport access vlan 10**

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface g1/0/7
S3(config-if)# switchport mode access
S3(config-if)# switchport access vlan 10
S3(config-if)#
```

2) Enable port security on interface **g1/0/7**

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface g1/0/7
S3(config-if)# switchport mode access
S3(config-if)# switchport access vlan 10
S3(config-if)# switchport port-security
S3(config-if)#
```

3) Configure the management virtual interface

S3(config)# **interface vlan 99**

S3(config-if)# **ip address 192.168.1.11 255.255.255.0**

S3(config-if)# **end**

```
S3(config)# interface vlan 99
S3(config-if)#
%LINK-5-CHANGED: Interface Vlan99, changed state to up

S3(config-if)# ip address 192.168.1.11 255.255.255.0
S3(config-if)# end
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

b. Issue the **show vlan brief** command and verify that the VLANs are assigned to the correct interfaces.

S3# **show vlan brief**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/8, Gi1/0/9
			Gi1/0/10, Gi1/0/11, Gi1/0/12, Gi1/0/13 Gi1/0/14, Gi1/0/15, Gi1/0/16, Gi1/0/17 Gi1/0/18, Gi1/0/19, Gi1/0/20, Gi1/0/21
			Gi1/0/22, Gi1/0/23, Gi1/0/24, Gi1/1/1 Gi1/1/2, Gi1/1/3, Gi1/1/4
10	Student	active	Gi1/0/7
20	Faculty	active	
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 vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/8, Gig1/0/9
                                                Gig1/0/10, Gig1/0/11, Gig1/0/12, Gig1/0/13
                                                Gig1/0/14, Gig1/0/15, Gig1/0/16, Gig1/0/17
                                                Gig1/0/18, Gig1/0/19, Gig1/0/20, Gig1/0/21
                                                Gig1/0/22, Gig1/0/23, Gig1/0/24, Gig1/1/1
                                                Gig1/1/2, Gig1/1/3, Gig1/1/4
10   Student                          active    Gig1/0/7
20   Faculty                          active
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S3#
```

    c.   Issue the **show ip interface brief** command.

```
S3# show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet1/0/1   unassigned      YES unset  administratively down down
GigabitEthernet1/0/2   unassigned      YES unset  administratively down down
GigabitEthernet1/0/3   unassigned      YES unset  administratively down down
GigabitEthernet1/0/4   unassigned      YES unset  administratively down down
GigabitEthernet1/0/5   unassigned      YES unset  up                    up
GigabitEthernet1/0/6   unassigned      YES unset  administratively down down
GigabitEthernet1/0/7   unassigned      YES unset  up                    up
GigabitEthernet1/0/8   unassigned      YES unset  administratively down down
GigabitEthernet1/0/9   unassigned      YES unset  administratively down down
GigabitEthernet1/0/10  unassigned      YES unset  administratively down down
GigabitEthernet1/0/11  unassigned      YES unset  administratively down down
GigabitEthernet1/0/12  unassigned      YES unset  administratively down down
GigabitEthernet1/0/13  unassigned      YES unset  administratively down down
GigabitEthernet1/0/14  unassigned      YES unset  administratively down down
GigabitEthernet1/0/15  unassigned      YES unset  administratively down down
GigabitEthernet1/0/16  unassigned      YES unset  administratively down down
GigabitEthernet1/0/17  unassigned      YES unset  administratively down down
GigabitEthernet1/0/18  unassigned      YES unset  administratively down down
GigabitEthernet1/0/19  unassigned      YES unset  administratively down down
GigabitEthernet1/0/20  unassigned      YES unset  administratively down down
GigabitEthernet1/0/21  unassigned      YES unset  administratively down down
GigabitEthernet1/0/22  unassigned      YES unset  administratively down down
GigabitEthernet1/0/23  unassigned      YES unset  administratively down down
GigabitEthernet1/0/24  unassigned      YES unset  administratively down down
GigabitEthernet1/1/1   unassigned      YES unset  administratively down down
GigabitEthernet1/1/2   unassigned      YES unset  administratively down down
GigabitEthernet1/1/3   unassigned      YES unset  administratively down down
GigabitEthernet1/1/4   unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
Vlan99                 192.168.1.11    YES manual up                    down
S3#
```

    d.   What is the status of VLAN 99? Why?

        => VLAN 99 is administratively up (enabled) but its protocol is down. This means the VLAN interface exists, but it's not fully functional at Layer 3. Likely causes are no IP address assigned to the VLAN interface (SVI), no ports assigned to the VLAN, or routing issues.

    e.   Use the Topology to assign VLANs to the appropriate ports on S4.

```
S4> enable
S4# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S4(config)# interface g1/0/24
S4(config-if)# switchport mode access
S4(config-if)# switchport access vlan 10
S4(config-if)# switchport port-security
S4(config-if)# exit
S4(config)# interface vlan 99
S4(config-if)#
%LINK-5-CHANGED: Interface Vlan99, changed state to up

S4(config-if)# 192.168.1.12 255.255.255.0
                      ^
% Invalid input detected at '^' marker.

S4(config-if)# ip address 192.168.1.12 255.255.255.0
S4(config-if)# end
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/7, Gig1/0/8
                                                Gig1/0/9, Gig1/0/10, Gig1/0/11, Gig1/0/12
                                                Gig1/0/13, Gig1/0/14, Gig1/0/15, Gig1/0/16
                                                Gig1/0/17, Gig1/0/18, Gig1/0/19, Gig1/0/20
                                                Gig1/0/21, Gig1/0/22, Gig1/0/23, Gig1/1/1
                                                Gig1/1/2, Gig1/1/3, Gig1/1/4
10   Student                          active    Gig1/0/24
20   Faculty                          active
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S4#
```

```
S4# show ip interface brief
Interface               IP-Address      OK? Method Status                Protocol
GigabitEthernet1/0/1    unassigned      YES unset  administratively down down
GigabitEthernet1/0/2    unassigned      YES unset  administratively down down
GigabitEthernet1/0/3    unassigned      YES unset  administratively down down
GigabitEthernet1/0/4    unassigned      YES unset  administratively down down
GigabitEthernet1/0/5    unassigned      YES unset  up                    up
GigabitEthernet1/0/6    unassigned      YES unset  administratively down down
GigabitEthernet1/0/7    unassigned      YES unset  administratively down down
GigabitEthernet1/0/8    unassigned      YES unset  administratively down down
GigabitEthernet1/0/9    unassigned      YES unset  administratively down down
GigabitEthernet1/0/10   unassigned      YES unset  administratively down down
GigabitEthernet1/0/11   unassigned      YES unset  administratively down down
GigabitEthernet1/0/12   unassigned      YES unset  administratively down down
GigabitEthernet1/0/13   unassigned      YES unset  administratively down down
GigabitEthernet1/0/14   unassigned      YES unset  administratively down down
GigabitEthernet1/0/15   unassigned      YES unset  administratively down down
GigabitEthernet1/0/16   unassigned      YES unset  administratively down down
GigabitEthernet1/0/17   unassigned      YES unset  administratively down down
GigabitEthernet1/0/18   unassigned      YES unset  up                    up
GigabitEthernet1/0/19   unassigned      YES unset  administratively down down
GigabitEthernet1/0/20   unassigned      YES unset  administratively down down
GigabitEthernet1/0/21   unassigned      YES unset  administratively down down
GigabitEthernet1/0/22   unassigned      YES unset  administratively down down
GigabitEthernet1/0/23   unassigned      YES unset  administratively down down
GigabitEthernet1/0/24   unassigned      YES unset  up                    up
GigabitEthernet1/1/1    unassigned      YES unset  administratively down down
GigabitEthernet1/1/2    unassigned      YES unset  administratively down down
GigabitEthernet1/1/3    unassigned      YES unset  administratively down down
GigabitEthernet1/1/4    unassigned      YES unset  administratively down down
Vlan1                   unassigned      YES unset  administratively down down
Vlan99                  192.168.1.12    YES manual up                    down
S4#
```

f.   Use the **show vlan brief** command to verify that the VLANs are assigned to the correct interfaces.

S4# **show vlan brief**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/7, Gi1/0/8 Gi1/0/9, Gi1/0/10, Gi1/0/11, Gi1/0/12 Gi1/0/13, Gi1/0/14, Gi1/0/15, Gi1/0/16 Gi1/0/17, Gi1/0/19, Gi1/0/20, Gi1/0/21

			Gi1/0/22, Gi1/0/23, Gi1/1/1, Gi1/1/2 Gi1/1/3, Gi1/1/4
10	Student	active	Gi1/0/24
20	Faculty	active	Gi1/0/18
99	Management	active	
1002 fddi-default		act/unsup	
1003 token-ring-default		act/unsup	
1004 fddinet-default		act/unsup	
1005 trnet-default		act/unsup	

```
S4# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- ------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/7, Gig1/0/8
                                                Gig1/0/9, Gig1/0/10, Gig1/0/11, Gig1/0/12
                                                Gig1/0/13, Gig1/0/14, Gig1/0/15, Gig1/0/16
                                                Gig1/0/17, Gig1/0/19, Gig1/0/20, Gig1/0/21
                                                Gig1/0/22, Gig1/0/23, Gig1/1/1, Gig1/1/2
                                                Gig1/1/3, Gig1/1/4
10   Student                          active    Gig1/0/24
20   Faculty                          active    Gig1/0/18
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S4#
```

Would PC-A be able to ping PC-B? Why?

⇨   Yes, because PC-A and PC-B have the same VLAN (VLAN 10)

Is S3 able to ping S4? Why?

⇨   No, because they do not have same VLAN

Step 3:   On-campus tests.

a. Can PC-A ping PC-B?   _____

b. Can S3 ping S4?   _____

c. Are the ping results consistent with your answers to the questions in Step 2? _____

Part 3:   Maintain VLAN Port Assignments and the VLAN Database

In Part 3, you will change VLAN assignments to ports and remove VLANs from the VLAN database.

Step 1:   Assign a VLAN to multiple interfaces.

a. On S3, assign interfaces Gi1/0/11 – 24 to VLAN 10.

S3(config)# **interface range g1/0/11-24** S3(config-if-range)#
switchport mode access S3(config-if-range)# **switchport access**
vlan 10 S3(config-if-range)# **end**

```
S3> enable
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface range g1/0/11 - 24
S3(config-if-range)# switchport mode access
S3(config-if-range)# switchport access vlan 10
S3(config-if-range)# end
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

b. Enable switch port security on all these interfaces

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface range g1/0/11 - 24
S3(config-if-range)# switchport port-security
S3(config-if-range)#
```

c. Issue the **show vlan brief** command to verify VLAN assignments.

```
S3# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/8, Gig1/0/9
                                                Gig1/0/10, Gig1/1/1, Gig1/1/2, Gig1/1/3
                                                Gig1/1/4
10   Student                          active    Gig1/0/7, Gig1/0/11, Gig1/0/12, Gig1/0/13
                                                Gig1/0/14, Gig1/0/15, Gig1/0/16, Gig1/0/17
                                                Gig1/0/18, Gig1/0/19, Gig1/0/20, Gig1/0/21
                                                Gig1/0/22, Gig1/0/23, Gig1/0/24
20   Faculty                          active
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S3#
```

d. Reassign Gi1/0/11 and Gi1/0/21 to VLAN 20.

```
S3# show vlan brief

VLAN Name                             Status     Ports
---- -------------------------------- ---------- ------------------------------
1    default                          active     Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                 Gig1/0/5, Gig1/0/6, Gig1/0/8, Gig1/0/9
                                                 Gig1/0/10, Gig1/1/1, Gig1/1/2, Gig1/1/3
                                                 Gig1/1/4
10   Student                          active     Gig1/0/7, Gig1/0/12, Gig1/0/13, Gig1/0/14
                                                 Gig1/0/15, Gig1/0/16, Gig1/0/17, Gig1/0/18
                                                 Gig1/0/19, Gig1/0/20, Gig1/0/22, Gig1/0/23
                                                 Gig1/0/24
20   Faculty                          active     Gig1/0/11, Gig1/0/21
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S3#
```

    e.   Verify that VLAN assignments are correct.

Step 2:   Remove a VLAN assignment from an interface.

    a.   Use the **no switchport access vlan** command to remove the VLAN 10 assignment to G1/0/24.

        S3(config)# **interface g1/0/24**

        S3(config-if)# **no switchport access vlan**

        S3(config-if)# **end**

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface g1/0/24
S3(config-if)# no switchport access vlan
S3(config-if)# end
S3#
%SYS-5-CONFIG_I: Configured from console by console

S3#
```

    b.   Verify that the VLAN change was made.

        Which VLAN is Gi1/0/24 is now associated with? => VLAN 1

Step 3:   Remove a VLAN ID from the VLAN database.

a.   Add VLAN 30 to interface Gi1/0/24 without issuing the VLAN command.

S3(config)# **interface g1/0/24**

S3(config-if)# **switchport access vlan 30**

% Access VLAN does not exist. Creating vlan 30

Note: Current switch technology no longer requires that the **vlan** command be issued to add a VLAN to the database. By assigning an unknown VLAN to a port, the VLAN adds to the VLAN database.

```
S3# config t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)# interface g1/0/24
S3(config-if)# switchport access vlan 30
% Access VLAN does not exist. Creating vlan 30
```

b.   Verify that the new VLAN is displayed in the VLAN table.

S3# **show vlan brief**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/8, Gi1/0/9 Gi1/0/10, Gi1/1/1, Gi1/1/2, Gi1/1/3 Gi1/1/4
10	Student	active	Gi1/0/7, Gi1/0/12, Gi1/0/13, Gi1/0/14 Gi1/0/15, Gi1/0/16, Gi1/0/17, Gi1/0/18 Gi1/0/19, Gi1/0/20, Gi1/0/21, Gi1/0/22 Gi1/0/23, Gi1/1/1, Gi1/1/2, Gi1/1/3 Gi1/1/4
20	Faculty	active	Gi1/0/11, Gi1/0/21
30	VLAN0030	active	Gi1/0/24
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

What is the default name of VLAN 30? => VLAN0030

c.   Use the **no vlan 30** command to remove VLAN 30 from the VLAN database.

S3(config)# **no vlan 30**

S3(config)# **end**

d.   Issue the **show vlan brief** command. Gi1/0/24 was assigned to VLAN 30.

After deleting VLAN 30, what VLAN is port Gi1/0/24 assigned to? What happens to the traffic destined to the host attached to Gi1/0/24?

_____

S3# **show vlan brief**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/8, Gi1/0/9 Gi1/0/10, Gi1/1/1, Gi1/1/2, Gi1/1/3

			Gi1/1/4
10	Student	active	Gi1/0/7, Gi1/0/12, Gi1/0/13, Gi1/0/14

Gi1/0/15, Gi1/0/16, Gi1/0/17, Gi1/0/18 Gi1/0/19,
Gi1/0/20, Gi1/0/21, Gi1/0/22 Gi1/0/23, Gi1/1/1, Gi1/1/2,
Gi1/1/3 Gi1/1/4

20	Faculty	active	Gi1/0/11, Gi1/0/21
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

e. Issue the **no switchport access vlan** command on interface Gi1/0/24.

```
S3(config-if)# no switchport access vlan
S3(config-if)# end
S3#
%SYS-5-CONFIG_I: Configured from console by console
```

f. Issue the **show vlan brief** command to determine the VLAN assignment for Gi1/0/24. To which VLAN is Gi1/0/24 assigned?

```
S3# show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gig1/0/1, Gig1/0/2, Gig1/0/3, Gig1/0/4
                                                Gig1/0/5, Gig1/0/6, Gig1/0/8, Gig1/0/9
                                                Gig1/0/10, Gig1/0/24, Gig1/1/1, Gig1/1/2
                                                Gig1/1/3, Gig1/1/4
10   Student                          active    Gig1/0/7, Gig1/0/12, Gig1/0/13, Gig1/0/14
                                                Gig1/0/15, Gig1/0/16, Gig1/0/17, Gig1/0/18
                                                Gig1/0/19, Gig1/0/20, Gig1/0/22, Gig1/0/23
20   Faculty                          active    Gig1/0/11, Gig1/0/21
99   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S3#
```

⇨ After issuing the no switchport access vlan command on interface Gi1/0/24, the interface is still associated with VLAN 1. Even though the specific VLAN assignment is removed, it defaults back to VLAN 1.

Note: Before removing a VLAN from the database, it is recommended that you reassign all the ports assigned to that VLAN.

Why should you reassign a port to another VLAN before removing the VLAN from the VLAN database?

⇨ Because reassigning ports before removing a VLAN prevents connectivity loss for connected devices.

_____

_____

Part 4: Configure an 802.1Q Trunk Between the Switches

In Part 4, you will configure interface Gi1/0/5 to use the Dynamic Trunking Protocol (DTP) to allow it to negotiate the trunk mode. After this has been accomplished and verified, you will disable DTP on interface Gi1/0/5 and manually configure it as a trunk.

Step 1:   **Use DTP to initiate trunking on Gi1/0/5.**

The default DTP mode of a 2960 switch port is dynamic auto. This allows the interface to convert the link to a trunk if the neighboring interface is set to trunk or dynamic desirable mode.

a.   Set Gi1/0/5 on S3 to negotiate trunk mode.

S3(config)# **interface g1/0/5**

S3(config-if)# **switchport mode dynamic desirable**

*Mar   1 05:07:28.746: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to down

*Mar   1 05:07:29.744: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

S3(config-if)#

*Mar   1 05:07:32.772: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S3(config-if)#

*Mar   1 05:08:01.789: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up

*Mar   1 05:08:01.797: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

You should also receive link status messages on S4.

S4#
*Mar 1 05:07:29.794: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
S4#
*Mar 1 05:07:32.823: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
S4#
*Mar 1 05:08:01.839: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99, changed state to up
*Mar 1 05:08:01.850: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

b. Issue the **show vlan brief** command on S3 and S4. Interface Gi1/0/5 is no longer assigned to VLAN 1. Trunked interfaces are not listed in the VLAN table.

S3# **show vlan brief**

VLAN	Name	Status	Ports
1	default	active	Gi1/0/1, Gi1/0/2, Gi1/0/3, Gi1/0/4, Gi1/0/6, Gi1/0/8, Gi1/0/9, Gi1/0/10 Gi1/0/24, Gi0/1, Gi0/2
10	Student	active	Gi1/0/7, Gi1/0/12, Gi1/0/13, Gi1/0/14 Gi1/0/15, Gi1/0/16, Gi1/0/17, Gi1/0/18 Gi1/0/19, Gi1/0/20, Gi1/0/22, Gi1/0/23
20	Faculty	active	Gi1/0/11, Gi1/0/21
99	Management	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

c. Issue the **show interfaces trunk** command to view trunked interfaces. Notice that the mode on S3 is set to desirable, and the mode on S4 is set to auto.

S3# **show interfaces trunk**

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/5	desirable	802.1q	trunking	1

Port	Vlans allowed on trunk Gi1/0/5
	1-4094

Port	Vlans allowed and active in management domain Gi1/0/5
	1,10,20,99

Port	Vlans in spanning tree forwarding state and not pruned Gi1/0/5
	1,10,20,99

S4# **show interfaces trunk**

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/5	auto	802.1q	trunking	1

Port	Vlans allowed on trunk Gi1/0/5
	1-4094

Port	Vlans allowed and active in management domain Gi1/0/5
	1,10,20,99

Port	Vlans in spanning tree forwarding state and not pruned Gi1/0/5
	1,10,20,99

Note: By default, all VLANs are allowed on a trunk. The **switchport trunk** command allows you to control what VLANs have access to the trunk. For this lab, keep the default settings which allows all VLANs to traverse Gi1/0/5.

d. Verify that VLAN traffic is traveling over trunk interface Gi1/0/5.

Can S3 ping S4?

⇨ Yes

Would PC-A ping PC-B?

⇨ Y e s

Would PC-A ping PC-C?

⇨ N o

Would PC-B ping PC-C?

⇨ No

Would PC-A ping S3?

⇨ No

Would PC-B ping S4?

⇨ No

Would PC-C ping S4?

=> No

If you answered no to any of the above questions, explain below.

⇨ The "no" answers are primarily due to VLAN segmentation. Trunks allow multiple VLANs to traverse a single link, but they do *not* automatically route traffic between those VLANs. Each VLAN remains a separate broadcast domain. To enable communication between VLANs (like VLAN 10 and VLAN 20), you need to configure inter-VLAN routing, typically using a router or a Layer 3 switch.

Step 2: On-campus tests.

Can S3 ping S4?   _____

Can PC-A ping PC-B?   _____

Can PC-A ping S3?   _____

Can PC-B ping S4?   _____

(Optional) Move and reconfigure the VAN PC as PC-C. Can PC-C ping any other device? _____

Are the results consistent with your answers to the questions in Step 2?

Step 3:   Manually configure trunk interface Gi1/0/5.

The **switchport mode trunk** command is used to manually configure a port as a trunk. This command should be issued on both ends of the link.

a.   Change the switchport mode on interface Gi1/0/5 to force trunking. Make sure to do this on both switches.

S3(config)# **interface g1/0/5**
S3(config-if)# **switchport mode trunk**

b. Issue the **show interfaces trunk** command to view the trunk mode. Notice that the mode changed from **desirable** to **on**.

S4# **show interfaces trunk**

Port	Mode	Encapsulation	Status	Native vlan
Gi1/0/5	on	802.1q	trunking	1

Port	Vlans allowed on trunk Gi1/0/5
	1-4094

Port	Vlans allowed and active in management domain Gi1/0/5
	1,10,20,99

Port	Vlans in spanning tree forwarding state and not pruned Gi1/0/5
	1,10,20,99

Why might you want to manually configure an interface to trunk mode instead of using DTP?

⇨ Manually configuring trunking provides better security by disabling DTP, offers greater control and predictability over link configuration, ensures compatibility with devices that may have DTP issues, and simplifies management for point-to-point links where trunking is always desired. It's generally considered a best practice for modern networks.

Part 5: Delete the VLAN Database

In Part 5, you will delete the VLAN Database from the switch. It is necessary to do this when initializing a switch back to its default settings.

Step 1: Determine if the VLAN database exists.

Issue the **show flash:** command to determine if a **vlan.dat** file exists in flash.

S3# **show flash:**
Directory of flash:/

2	-rwx	1285	Mar 1	1993	00:01:24	+00:00	config.text
3	-rwx	43032	Mar 1	1993	00:01:24	+00:00	multiple-fs
4	-rwx	5	Mar 1	1993	00:01:24	+00:00	private-config.text
5	-rwx	11607161	Mar 1	1993	02:37:06	+00:00	c2960-lanbasek9-mz.150-2.SE.bin
6	-rwx	736	Mar 1	1993	00:19:41	+00:00	vlan.dat

32514048 bytes total (20858880 bytes free)

Note: If there is a **vlan.dat** file located in flash, then the VLAN database does not contain its default settings.

Note: the contents of the flash will not be the same as shown in the output, as the output was taken on a different switch.

Step 2: Delete the VLAN database.

a. Issue the **delete vlan.dat** command to delete the vlan.dat file from flash and reset the VLAN database back to its default settings. You will be prompted twice to confirm that you want to delete the vlan.dat file. Press Enter both times.

S3# delete vlan.dat

Delete filename [vlan.dat]? Delete

flash:/vlan.dat? [confirm]

S3#

b.   Issue the **show flash** command to verify that the vlan.dat file has been deleted.

S3# **show flash**

Directory of flash:/

2	-rwx	1285	Mar	1	1993	00:01:24	+00:00	config.text
3	-rwx	43032	Mar	1	1993	00:01:24	+00:00	multiple-fs
4	-rwx	5	Mar	1	1993	00:01:24	+00:00	private-config.text
5	-rwx	11607161	Mar	1	1993	02:37:06	+00:00	c2960-lanbasek9-mz.150-2.SE.bin

32514048 bytes total (20859904 bytes free)

To initialize a switch back to its default settings, what other commands are needed?

⇨   Deleting the startup configuration (erase startup-config) and reloading the switch.

Reflection

1.   What is needed to allow hosts on VLAN 10 to communicate to hosts on VLAN 20?

⇨   A router or layer 3 switch to perform inter-VLAN routing.

2.   What are some primary benefits that an organization can receive through effective use of VLANs?

⇨   Improved network performance, enhanced security, simplified network management, and increased flexibility in network design.