

EE3009 Lab 3.1 (Router set : group) Sem B 2022/2023

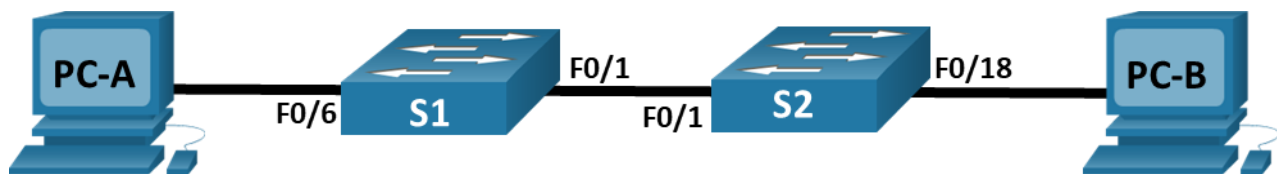
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3.4.6 - Configure VLANs and Trunking

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
S1	VLAN 1	192.168.1.11	255.255.255.0	N/A
S2	VLAN 1	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

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.

Required Resources

- 2 Switches (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
- 2 PCs (Windows with a 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

Instructions

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 PC hosts and switches.

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: Configure basic settings for each switch.

- Console into the switch and enable privileged EXEC mode.
`switch> enable`
- Enter configuration mode.
`switch# config terminal`
- Assign a device name to the switch.
`switch(config)# hostname S1`

`switch(config)# hostname S2`
- Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.
`S1(config)# no ip domain-lookup`

`S2(config)# no ip domain-lookup`
- Assign **class** as the privileged EXEC encrypted password.
`S1(config)# enable secret class`

`S2(config)# enable secret class`
- Configure the IP address listed in the Addressing Table for VLAN 1 on the switch.
`S1(config)# interface vlan 1`
`S1(config-if)# ip address 192.168.1.11 255.255.255.0`
`S1(config-if)# no shutdown`
`S1(config-if)# exit`

`S2(config)# interface vlan 1`
`S2(config-if)# ip address 192.168.1.12 255.255.255.0`
`S2(config-if)# no shutdown`

3.4.6 - Configure VLANs and Trunking

```
S2(config-if)# exit
```

- g. Shut down all interfaces that will not be used.

```
S1(config)# interface range f0/2-5, f0/7-24, g0/1-2
```

```
S1(config-if-range)# shutdown
```

```
S2(config)# interface range f0/2-17, f0/19-24, g0/1-2
```

```
S2(config-if-range)# shutdown
```

- h. Save the running configuration to the startup configuration file.

```
S1# copy running-config startup-config
```

```
S2# copy running-config startup-config
```

Step 3: Configure PC hosts.

Refer to the Addressing Table for PC host address information.

* Configure the *Realtek RTL8139/810x Family NIC* and disable the *Intel Ethernet Card*.

* Turn off the firewalls of both PC-A and PC-B

Step 4: Test connectivity.

Verify that the PC hosts can ping one another.

Can PC-A ping PC-B?

Can PC-A ping S1?

Can PC-B ping S2?

Can S1 ping S2?

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

Part 2: Create VLANs and Assign Switch Ports

In Part 2, you will create Management, Operations, Parking_Lot, and Native 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.

3.4.6 - Configure VLANs and Trunking

- a. Create the VLANs on S1.

```
S1(config)# vlan 10
S1(config-vlan)# name Operations
S1(config-vlan)# vlan 20
S1(config-vlan)# name Parking_Lot
S1(config-vlan)# vlan 99
S1(config-vlan)# name Management
S1(config-vlan)# vlan 1000
S1(config-vlan)# name Native
S1(config-vlan)# end
```

- b. Create the same VLANs on S2.

- c. Issue the **show vlan brief** command to view the list of VLANs on S1.

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 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, Fa0/18, Fa0/19, Fa0/20 Fa0/21, Fa0/22, Fa0/23, Fa0/24 Gi0/1, Gi0/2
10	Operations	active	
20	Parking_Lot	active	
99	Management	active	
1000	Native	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 VLAN?

What ports are assigned to the default VLAN?

Step 2: Assign VLANs to the correct switch interfaces.

- a. Assign VLANs to the interfaces on S1.

- 1) Assign PC-A to the Operation VLAN.

```
S1(config)# interface f0/6
S1(config-if)# switchport mode access
S1(config-if)# switchport access vlan 10
```

- 2) Move the switch IP address VLAN 99.

```
S1(config)# interface vlan 1
S1(config-if)# no ip address
S1(config-if)# interface vlan 99
S1(config-if)# ip address 192.168.1.11 255.255.255.0
```

3.4.6 - Configure VLANs and Trunking

```
S1(config-if)# end
```

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

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 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	Operations	active	Fa0/6
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	

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

```
S1# show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
Vlan1	unassigned	YES	unset	up	up
Vlan99	192.168.1.11	YES	manual	up	down
FastEthernet0/1	unassigned	YES	unset	up	up
FastEthernet0/2	unassigned	YES	unset	administratively down	down
FastEthernet0/3	unassigned	YES	unset	administratively down	down
FastEthernet0/4	unassigned	YES	unset	administratively down	down
FastEthernet0/5	unassigned	YES	unset	administratively down	down
FastEthernet0/6	unassigned	YES	unset	up	up
FastEthernet0/7	unassigned	YES	unset	administratively down	down

<output omitted>

What is the status of VLAN 99? Explain.

- d. Assign PC-B to the Operations VLAN on S2.

```
S2(config)# interface f0/18
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 10
```

- e. Remove the IP address for VLAN 1 on S2.

```
S2(config)# interface vlan 1
S2(config-if)# no ip address
```

- f. Configure an IP address for VLAN 99 on S2 according to the Addressing Table.

```
S2(config-if)# interface vlan 99
S2(config-if)# ip address 192.168.1.12 255.255.255.0
```

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

3.4.6 - Configure VLANs and Trunking

```
S2# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 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	Operations	active	Fa0/18
20	Parking_Lot	active	
99	Management	active	
1000	Native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

Is S1 able to ping S2? Explain.

Is PC-A able to ping PC-B? Explain.

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 S1, assign interfaces F0/11 – 24 to VLAN99.

```
S1(config)# interface range f0/11-24
S1(config-if-range)# switchport mode access
S1(config-if-range)# switchport access vlan 99
S1(config-if-range)# end
```

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

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Gi0/1, Gi0/2
10	Operations	active	Fa0/6
20	Parking_Lot	active	
99	Management	active	Fa0/11, Fa0/12, Fa0/13, Fa0/14 Fa0/15, Fa0/16, Fa0/17, Fa0/18 Fa0/19, Fa0/20, Fa0/21, Fa0/22

3.4.6 - Configure VLANs and Trunking

```

Fa0/23, Fa0/24
1000 Native                active
1002 fddi-default          act/unsup
1003 token-ring-default    act/unsup
1004 fddinet-default       act/unsup
1005 trnet-default         act/unsup
```

- c. Reassign F0/11 and F0/21 to VLAN 10.

```
S1(config)# interface range f0/11, f0/21
S1(config-if-range)# switchport access vlan 10
S1(config-if-range)# end
```

- d. Verify that VLAN assignments are correct.

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Gi0/1, Gi0/2
10	Operations	active	Fa0/6, Fa0/11, Fa0/21
20	Parking_Lot	active	
99	Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23, Fa0/24
1000	Native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

Step 2: Remove a VLAN assignment from an interface.

- a. Use the **no switchport access vlan** command to remove the VLAN 99 assignment to F0/24.

```
S1(config)# interface f0/24
S1(config-if)# no switchport access vlan
S1(config-if)# end
```

- b. Verify that the VLAN change was made.

Which VLAN is F0/24 now associated with?

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/24, Gi0/1, Gi0/2
10	Operations	active	Fa0/6, Fa0/11, Fa0/21
20	Parking_Lot	active	
99	Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23

3.4.6 - Configure VLANs and Trunking

```
1000 Native                active
1002 fddi-default          act/unsup
1003 token-ring-default    act/unsup
1004 fddinet-default       act/unsup
1005 trnet-default         act/unsup
```

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

- a. Add VLAN 30 to interface F0/24 without issuing the global VLAN command.

```
S1(config)# interface f0/24
S1(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 will be created and added to the VLAN database.

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

```
S1# show vlan brief
```

VLAN Name	Status	Ports
1 default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Gi0/1, Gi0/2
10 Operations	active	Fa0/6, Fa0/11, Fa0/21
20 Parking_Lot	active	
30 VLAN0030	active	Fa0/24
99 Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23
1000 Native	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?

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

```
S1(config)# no vlan 30
S1(config)# end
```

- d. Issue the **show vlan brief** command. F0/24 was assigned to VLAN 30.

After deleting VLAN 30 from the VLAN database, what VLAN is port F0/24 assigned to? What happens to the traffic destined to the host attached to F0/24?

```
S1# show vlan brief
```


3.4.6 - Configure VLANs and Trunking

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Gi0/1, Gi0/2
10	Operations	active	Fa0/6, Fa0/11, Fa0/21
20	Parking_Lot	active	
99	Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23
1000	Native	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 F0/24.

```
S1(config)# interface f0/24
S1(config-if)# no switchport access vlan
S1(config-if)# end
```

- f. Issue the **show vlan brief** command to determine the VLAN assignment for F0/24.

To which VLAN is F0/24 assigned?

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/24, Gi0/1, Gi0/2
10	Operations	active	Fa0/6, Fa0/11, Fa0/21
20	Parking_Lot	active	
99	Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23
1000	Native	active	
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

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?

Part 4: Configure an 802.1Q Trunk Between the Switches

In Part 4, you will configure interface F0/1 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 F0/1 and manually configure it as a trunk.

Step 1: Use DTP to initiate trunking on F0/1.

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 F0/1 on S1 to negotiate trunk mode.

```
S1(config)# interface f0/1
S1(config-if)# switchport mode dynamic desirable
Sep 19 02:51:47.257: %LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/1, changed state to up
Sep 19 02:51:47.291: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99,
changed state to up
```

You should also receive link status messages on S2.

```
S2#
Sep 19 02:42:19.424: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
Sep 19 02:42:21.454: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan99,
changed state to up
Sep 19 02:42:22.419: %LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/1, changed state to up
```

- b. Issue the **show vlan brief** command on S1 and S2. Interface F0/1 is no longer assigned to VLAN 1. Trunked interfaces are not listed in the VLAN table.

```
S1# show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/7, Fa0/8, Fa0/9, Fa0/10 Fa0/24, Gi0/1, Gi0/2
10	Operations	active	Fa0/6, Fa0/11, Fa0/21
20	Parking_Lot	active	
99	Management	active	Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/22, Fa0/23
1000	Native	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 S1 is set to desirable, and the mode on S2 is set to auto.

```
S1# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/1	desirable	802.1q	trunking	1

Port	Vlans allowed on trunk
Fa0/1	1-4094

Port	Vlans allowed and active in management domain
------	---

3.4.6 - Configure VLANs and Trunking

```
Fa0/1      1,10,20,99,1000
```

```
Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     1,10,20,99,1000
```

```
S2# show interfaces trunk
```

```
Port      Mode           Encapsulation  Status        Native vlan
Fa0/1     auto           802.1q         trunking      1
```

```
Port      Vlans allowed on trunk
Fa0/1     1-4094
```

```
Port      Vlans allowed and active in management domain
Fa0/1     1,10,20,99,1000
```

```
Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     1,10,20,99,1000
```

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 F0/1.

- d. Verify that VLAN traffic is traveling over trunk interface F0/1.

Can S1 ping S2? _____

Can PC-A ping PC-B? _____

Can PC-A ping S1? _____

Can PC-B ping S2? _____

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



Demonstrate PC-A and PC-B can ping each other and the results of part c to the instructor.

Step 2: Manually configure trunk interface F0/1.

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 F0/1 to force trunking. Make sure to do this on both switches.

```
S1(config)# interface f0/1
S1(config-if)# switchport mode trunk
```

3.4.6 - Configure VLANs and Trunking

```
S2(config)# interface f0/1
S2(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**.

```
S2# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/1	on	802.1q	trunking	1

Port	Vlans allowed on trunk
Fa0/1	1-4094

Port	Vlans allowed and active in management domain
Fa0/1	1,10,20,99,1000

Port	Vlans in spanning tree forwarding state and not pruned
Fa0/1	1,10,20,99,1000

- c. Modify the trunk configuration on both switches by changing the native VLAN from VLAN 1 to VLAN 1000.

```
S1(config)# interface f0/1
S1(config-if)# switchport trunk native vlan 1000
```

```
S2(config)# interface f0/1
S2(config-if)# switchport trunk native vlan 1000
```

- d. Issue the **show interfaces trunk** command to view the trunk. Notice the Native VLAN information is updated.

```
S2# show interfaces trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/1	on	802.1q	trunking	1000

Port	Vlans allowed on trunk
Fa0/1	1-4094

Port	Vlans allowed and active in management domain
Fa0/1	1,10,20,99,1000

Port	Vlans in spanning tree forwarding state and not pruned
Fa0/1	1,10,20,99,1000

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

Why might you want to change the native VLAN on a trunk?

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.

```
S1# show flash:

Directory of flash:/
   2  -rwx           59416   Mar 1 1993 01:20:12 +00:00  multiple-fs
   3  -rwx          15186645  Mar 1 1993 00:19:23 +00:00  c2960-lanbasek9-mz.152-
4.E8.bin
   5  -rwx             796   Sep 19 2019 02:48:04 +00:00  vlan.dat

61028352 bytes total (33762304 bytes free)
```

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

Step 2: Delete the VLAN database.

- 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.

```
S1# delete vlan.dat
Delete filename [vlan.dat]?
Delete flash:/vlan.dat? [confirm]
```

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

```
S1# show flash:

Directory of flash:/
   2  -rwx           59416   Mar 1 1993 01:20:12 +00:00  multiple-fs
   3  -rwx          15186645  Mar 1 1993 00:19:23 +00:00  c2960-lanbasek9-mz.152-4.E8.bin

61028352 bytes total (33763840 bytes free)
```

- Use the **erase startup-config** command to erase the startup configuration file from NVRAM. You are prompted to remove the configuration file. Press Enter to confirm.

```
Switch# erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue?
[confirm]
[OK]
Erase of nvram: complete
Switch#
```