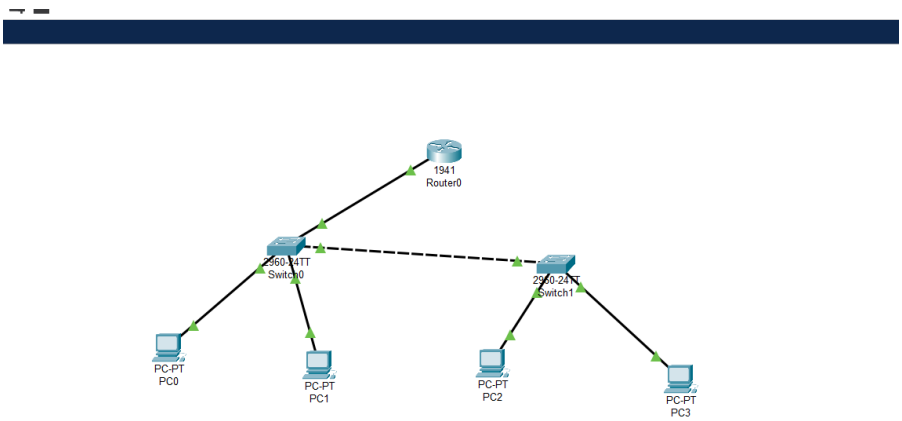
4.Use Cisco packet tracer for the below

5.Set up trunk ports between switches and try ping between different VLANs.

10.Try Inter VLAN routing with Router



Configure VLANs on Switches

Switch0

Physical Config CLI Attributes

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname Switch1
Switch1(config)#vlan 10
Switch1(config-vlan)#name Engineering
Switch1(config-vlan)#exit
Switch1(config)#vlan 20
Switch1(config-vlan)#name Marketing
Switch1(config-vlan)#exit
Switch1(config)#interface fa0/1
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 10
Switch1(config-if)#exit
Switch1(config)#interface fa0/2
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 20
Switch1(config-if)#exit
Switch1(config)#interface fa0/24
Switch1(config-if)#switchport mode trunk

Switch1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/24, changed state to up
exit
Switch1(config)#interface fa0/23
Switch1(config-if)#switchport mode trunk
Switch1(config-if)#exit
Switch1(config)#exit
Switch1#
```

Switch1

Physical Config CLI Attributes

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname Switch2
Switch2(config)#vlan 10
Switch2(config-vlan)#name Engineering
Switch2(config-vlan)#exit
Switch2(config)#vlan 20
Switch2(config-vlan)#name Marketing
Switch2(config-vlan)#exit
Switch2(config)#interface fa0/1
Switch2(config-if)#switchport mode access
Switch2(config-if)#switchport access vlan 10
Switch2(config-if)#exit
Switch2(config)#interface fa0/2
Switch2(config-if)#switchport mode access
Switch2(config-if)#switchport access vlan 20
Switch2(config-if)#exit
Switch2(config)#interface fa0/24
Switch2(config-if)#switchport mode trunk
Switch2(config-if)#exit
Switch2(config)#exit
Switch2#
%SYS-5-CONFIG_I: Configured from console by console
```

Configure Router for Inter-VLAN Routing

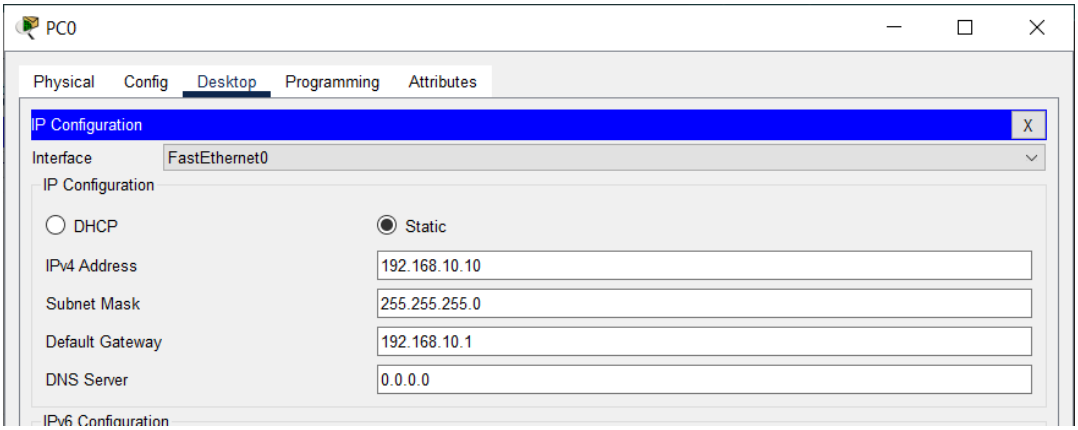
Router0

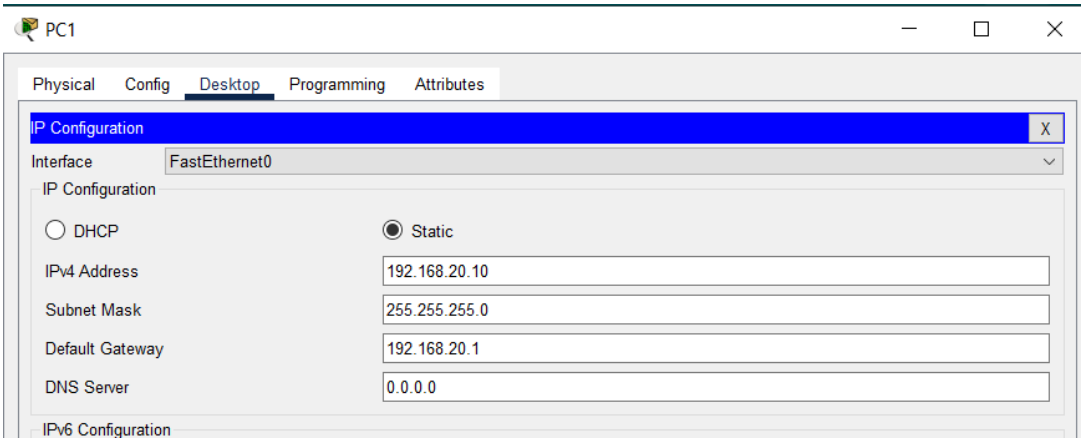
Physical Config CLI Attributes

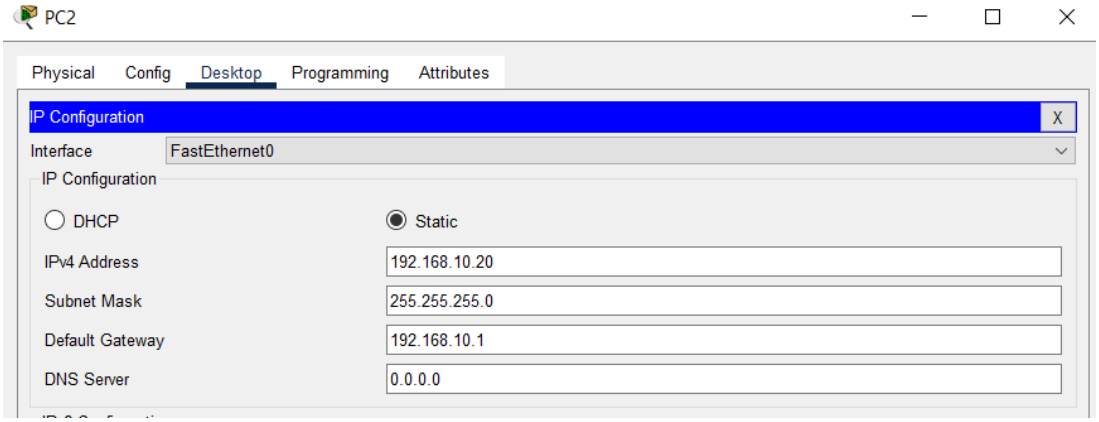
IOS Command Line Interface

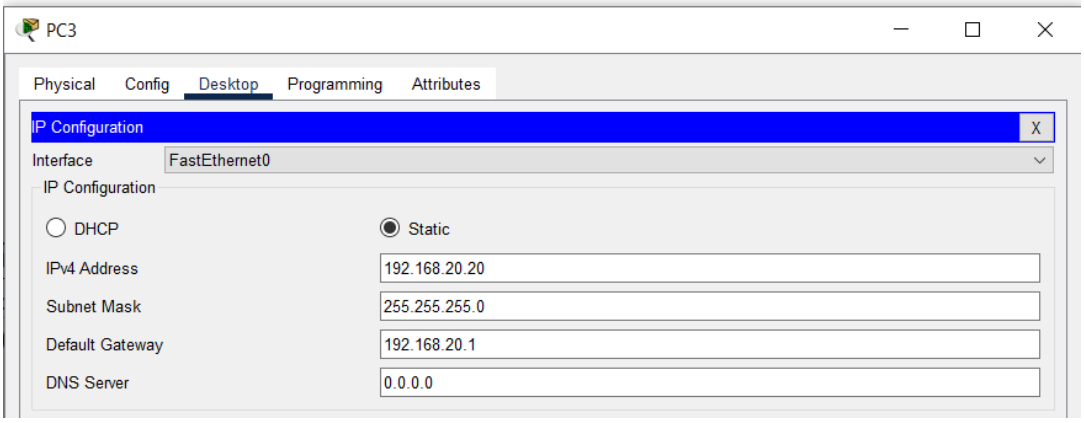
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router1
Router1(config)#interface gigabitEthernet 0/0.10
Router1(config-subif)#encapsulation dot1q 10
Router1(config-subif)#ip address 192.168.10.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#interface gigabitEthernet 0/0.20
Router1(config-subif)#encapsulation dot1q 20
Router1(config-subif)#ip address 192.168.20.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#interface gigabitEthernet 0/0
Router1(config-if)#no shutdown

Router1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up

Router1(config-if)#exit
Router1(config)#exit
```

Configure the PCs


PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.10.10
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.1
DNS Server
0.0.0.0
IPv6 Configuration


PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.20.10
Subnet Mask
255.255.255.0
Default Gateway
192.168.20.1
DNS Server
0.0.0.0
IPv6 Configuration


PC2
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.10.20
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.1
DNS Server
0.0.0.0



Verify Configuration

Verify trunk configuration on switches

```
Switch1#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/23      on           802.1q         trunking      1
Fa0/24      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/23      1-1005
Fa0/24      1-1005

Port        Vlans allowed and active in management domain
Fa0/23      1,10,20
Fa0/24      1,10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/23      1,10,20
Fa0/24      1,10,20
```

```
Switch2#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/24      on           802.1q         trunking      1

Port        Vlans allowed on trunk
Fa0/24      1-1005

Port        Vlans allowed and active in management domain
Fa0/24      1,10,20

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/24      1,10,20
```

Verify VLAN information

```
Switch1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- ---------
--------------------------------
1    default                          active    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
                                                Gig0/1, Gig0/2
10   Engineering                      active    Fa0/1
20   Marketing                        active    Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
Switch1#
```

```
Switch2#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    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, Gig0/1, Gig0/2
10   Engineering                      active    Fa0/1
20   Marketing                        active    Fa0/2
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
Switch2#
```

Test connectivity with ping by pinging in Same and Different VLANs

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 192.168.10.20

Pinging 192.168.10.20 with 32 bytes of data:

Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.10: bytes=32 time=1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.20.20

Pinging 192.168.20.20 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.20:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time=6ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
```

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 192.168.10.20

Pinging 192.168.10.20 with 32 bytes of data:

Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.10: bytes=32 time=1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.20.20

Pinging 192.168.20.20 with 32 bytes of data:

Request timed out.
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127
Reply from 192.168.20.20: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.20:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time=6ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255
Reply from 192.168.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
```

How Inter-VLAN Traffic Flows

When a PC in VLAN 10 wants to communicate with a PC in VLAN 20:

1. PC1 (192.168.10.10) wants to send data to PC2 (192.168.20.10)
2. PC1 realizes the destination is on a different subnet, so it sends the packet to its default gateway (192.168.10.1)
3. The packet arrives at Switch1 with a VLAN 10 tag
4. Switch1 forwards the packet through the trunk link to Router1
5. Router1 receives the packet on subinterface G0/0.10, processes it, and routes it to subinterface G0/0.20
6. Router1 sends the packet back through the trunk link to Switch1, now with a VLAN 20 tag
7. Switch1 forwards the packet to PC2 in VLAN 20

This is precisely how inter-VLAN routing works in this configuration

Q6) Change the native VLAN on a trunk port. Test for VLAN mismatches and troubleshoot.

Change Native VLAN on Trunk Ports

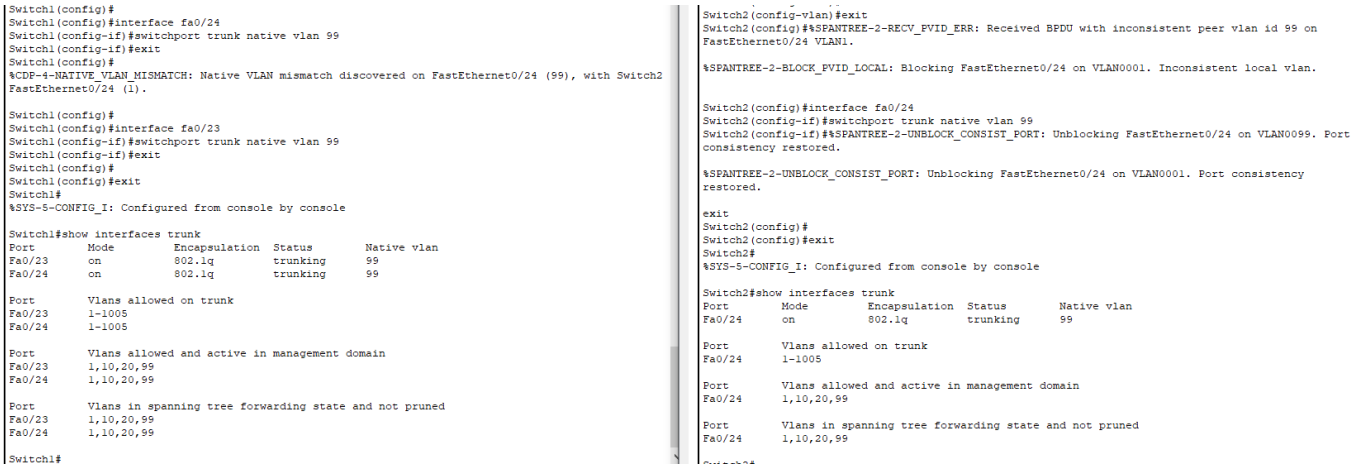
Step 1: Create a new VLAN to use as the native VLAN

Configure a new VLAN on both switches:

```
Switch1>enable
Switch1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch1(config)#vlan 99
Switch1(config-vlan)#name NativeVLAN
Switch1(config-vlan)#exit
Switch1(config)#
```

```
Switch2>enable
Switch2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch2(config)#vlan 99
Switch2(config-vlan)#name NativeVLAN
Switch2(config-vlan)#exit
Switch2(config)#
```

Step 2: Change the native VLAN on Switch1 and Switch2 trunk port and update the trunk port to the router by Changing the native VLAN on the switch port connected to the router and verifying the native VLAN configuration



```
Switch1(config)#
Switch1(config)#interface fa0/24
Switch1(config-if)#switchport trunk native vlan 99
Switch1(config-if)#exit
Switch1(config)#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/24 (99), with Switch2
FastEthernet0/24 (1).

Switch1(config)#
Switch1(config)#interface fa0/23
Switch1(config-if)#switchport trunk native vlan 99
Switch1(config-if)#exit
Switch1(config)#
Switch1(config)#exit
Switch1#
%SYS-5-CONFIG_I: Configured from console by console

Switch1#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/23      on           802.1q         trunking      99
Fa0/24      on           802.1q         trunking      99

Port        Vlans allowed on trunk
Fa0/23      1-1005
Fa0/24      1-1005

Port        Vlans allowed and active in management domain
Fa0/23      1,10,20,99
Fa0/24      1,10,20,99

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/23      1,10,20,99
Fa0/24      1,10,20,99

Switch1#
```

```
Switch2(config-vlan)#exit
Switch2(config)#%SPANTREE-2-RECV_PVID_ERR: Received BPDU with inconsistent peer vlan id 99 on
FastEthernet0/24 VLAN1.

%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/24 on VLAN0001. Inconsistent local vlan.


Switch2(config)#interface fa0/24
Switch2(config-if)#switchport trunk native vlan 99
Switch2(config-if)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/24 on VLAN0099. Port
consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/24 on VLAN0001. Port consistency
restored.

exit
Switch2(config)#
Switch2(config)#exit
Switch2#
%SYS-5-CONFIG_I: Configured from console by console

Switch2#show interfaces trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/24      on           802.1q         trunking      99

Port        Vlans allowed on trunk
Fa0/24      1-1005

Port        Vlans allowed and active in management domain
Fa0/24      1,10,20,99

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/24      1,10,20,99
```

Create a VLAN Mismatch

Create a deliberate native VLAN mismatch

Change the native VLAN on Switch2 to a different value and Create VLAN 88 on Switch2 to avoid errors

```
Switch2#
Switch2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch2(config)#interface fa0/24
Switch2(config-if)#switchport trunk native vlan 88
Switch2(config-if)#exit
Switch2(config)#vlan 88
Switch2(config-vlan)#name M%SPANTREE-2-RECV_PVID_ERR: Received BPDU with inconsistent peer vlan id
99 on FastEthernet0/24 VLAN88.

%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/24 on VLAN0088. Inconsistent local vlan.


Switch2(config-vlan)#name MismatchVLAN
Switch2(config-vlan)#exit
Switch2(config)#
Switch2(config)#exit
Switch2#
%SYS-5-CONFIG_I: Configured from console by console

Switch2#
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/24 (88), with Switch1
FastEthernet0/24 (99).
```

Watch for native VLAN mismatch errors

Check the logs on both switches for native VLAN mismatch errors:

```
Switch1#show log
Syslog logging: enabled (0 messages dropped, 0 messages rate-limited,
          0 flushes, 0 overruns, xml disabled, filtering disabled)

No Active Message Discriminator.


No Inactive Message Discriminator.


    Console logging: level debugging, 20 messages logged, xml disabled,
          filtering disabled
    Monitor logging: level debugging, 20 messages logged, xml disabled,
          filtering disabled
    Buffer logging:  disabled, xml disabled,
          filtering disabled

    Logging Exception size (4096 bytes)
    Count and timestamp logging messages: disabled
    Persistent logging: disabled

No active filter modules.

 --More--
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/24 (99), with Switch2
FastEthernet0/24 (88).
```

%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/24 (99), with Switch2 FastEthernet0/24 (88).

Testing the Impact of Native VLAN Mismatch

```
C:\>
C:\>ping 192.168.10.20

Pinging 192.168.10.20 with 32 bytes of data:

Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128
Reply from 192.168.10.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

- Traffic in VLAN 10 and VLAN 20 still works because they're tagged on the trunk
- Inter-VLAN traffic also works because the tagged VLANs are still correctly configured
- The native VLAN mismatch affects only untagged traffic on the trunk link

Troubleshooting the Native VLAN Mismatch

```
Switch2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch2(config)#interface fa0/24
Switch2(config-if)#switchport trunk native vlan 99
Switch2(config-if)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/24 on VLAN0099
consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/24 on VLAN0088. Port consistency
restored.

exit
Switch2(config)#show log
                ^
% Invalid input detected at '^' marker.

Switch2(config)#exit
Switch2#
%SYS-5-CONFIG_I: Configured from console by console

Switch2#show log
Syslog logging: enabled (0 messages dropped, 0 messages rate-limited,
          0 flushes, 0 overruns, xml disabled, filtering disabled)

No Active Message Discriminator.


No Inactive Message Discriminator.


    Console logging: level debugging, 33 messages logged, xml disabled,
          filtering disabled
    Monitor logging: level debugging, 33 messages logged, xml disabled,
          filtering disabled
    Buffer logging:  disabled, xml disabled,
          filtering disabled

    Logging Exception size (4096 bytes)
    Count and timestamp logging messages: disabled
    Persistent logging: disabled

No active filter modules.
```