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Practical no.1

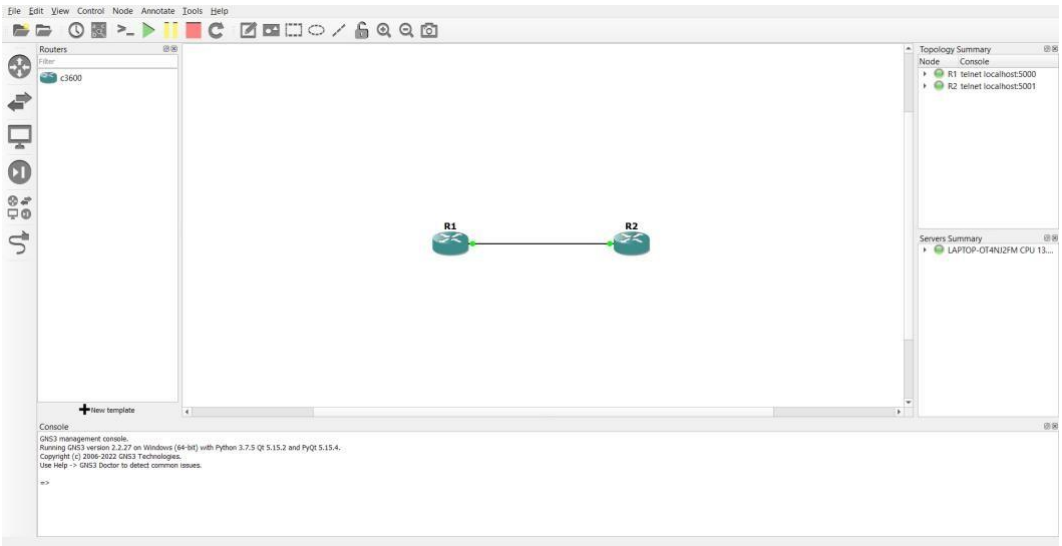
Implement IP SLA (IP Service Level Agreement)

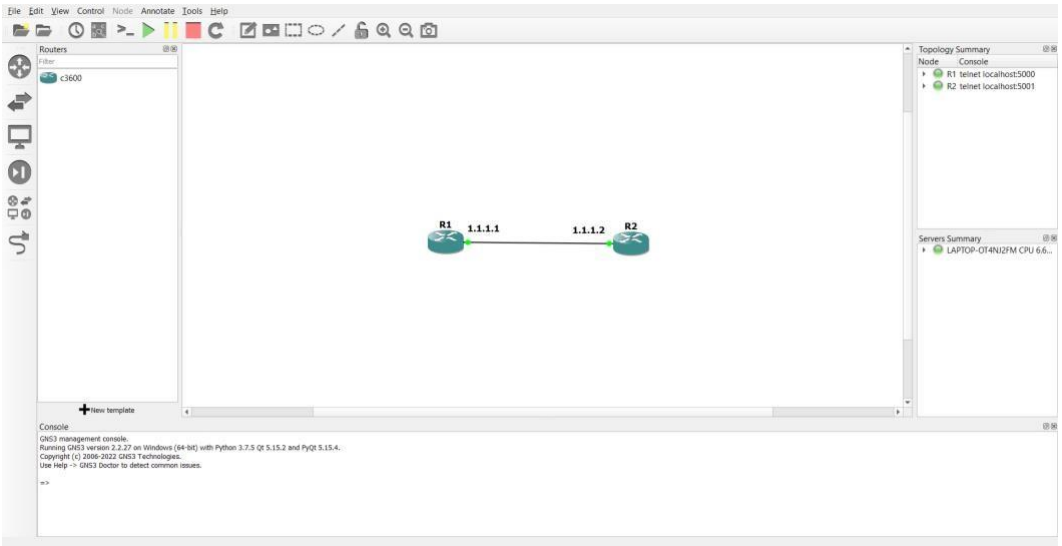
Aim: To implement IP SLA (IP Service Level Agreement) using GNS3 tool.

Requirement: GNS3 tool.

Procedure:

Step1: Build the Network.





Step 2: Configure Routers:

- **<u>Configure Router R2</u>:**

Input:

R2#conf t

R2(config)#int loopback 1

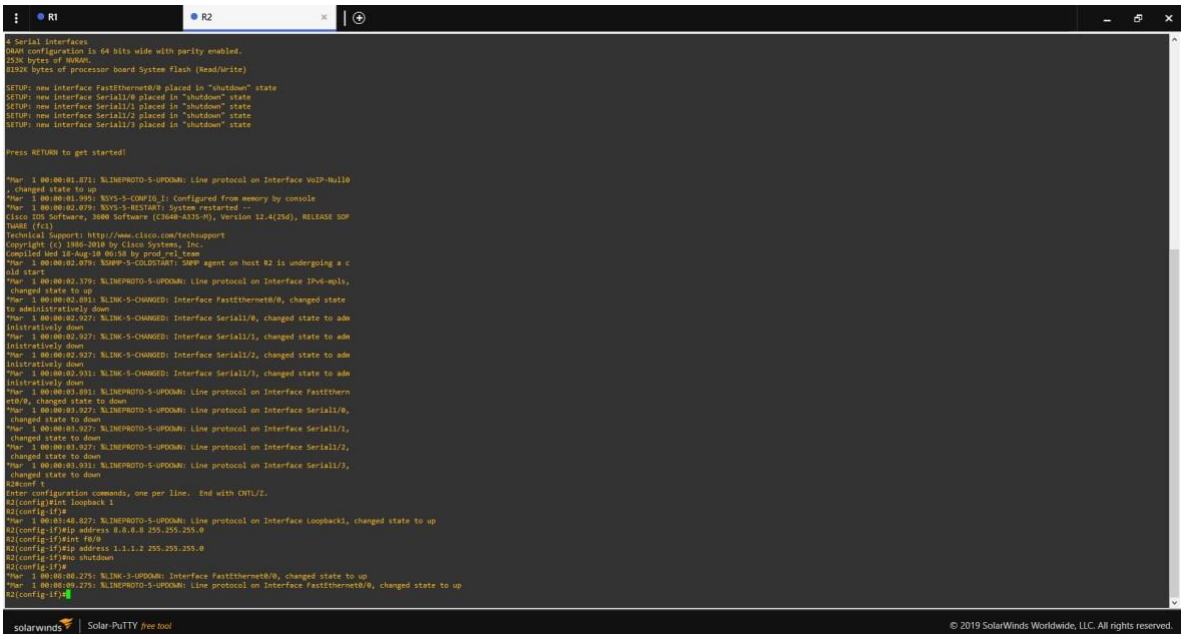
R2(config-if)#ip address 8.8.8.8 255.255.255.0

R2(config-if)#int f0/0

R2(config-if)#ip address 1.1.1.2 255.255.255.0

R2(config-if)#no shutdown

Output:



- **<u>Configure Router R1</u>:**

Input:

R1#conf t

R1(config)#int f0/0

R1(config-if)#ip address 1.1.1.1 255.255.255.0

R1(config-if)#no shutdown

R1(config-if)#end

R1#ping 1.1.1.2

R1#ping 8.8.8.8

Output:

```
 changed state to down
*Mar  1 00:00:04.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/1,
 changed state to down
*Mar  1 00:00:04.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/2,
 changed state to down
*Mar  1 00:00:04.027: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1/3,
 changed state to down
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#f0/0
                ^
% Invalid input detected at '^' marker.

R1(config)#int f0/0
R1(config-if)#ip address 1.1.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#
*Mar  1 00:09:07.423: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:09:08.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#ping 1.1.1.2
                ^
% Invalid input detected at '^' marker.

R1(config-if)#end
R1#
*Mar  1 00:10:07.455: %SYS-5-CONFIG_I: Configured from console by console
R1#ping 1.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 64/70/76 ms
R1#ping 8.8.8.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Input:

R1#conf t

R1(config)#ip route 0.0.0.0 0.0.0.0.0 1.1.1.2

R1(config)#end

R1#ping 8.8.8.8

Output:

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip route 0.0.0.0 0.0.0.0.0 1.1.1.2
                                    ^
% Invalid input detected at '^' marker.

R1(config)#ip route 0.0.0.0 0.0.0.0 1.1.1.2
R1(config)#end
R1#
*Mar  1 00:04:05.943: %SYS-5-CONFIG_I: Configured from console by console
R1#ping 8.8.8.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/66/68 ms
```

Input:

R1(config)#ip sla monitor 1

R1(config-sla-monitor)#$rotocol ipIcmpEcho 8.8.8.8 source-ipaddr 1.1.1.1

R1(config-sla-monitor-echo)#frequency 10

R1(config-sla-monitor-echo)#threshold 300

R1(config-sla-monitor-echo)#exit

R1(config)#ip sla monitor schedule 1 life forever start-time now

R1(config)#end

R1#show ip sla monitor statistics

R1#debug ip icmp

Output:

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip sla monitor 1
R1(config-sla-monitor)#$rotocol ipIcmpEcho 8.8.8.8 source-ipaddr 1.1.1.1
R1(config-sla-monitor-echo)#frequency 10
R1(config-sla-monitor-echo)#threshold 300
R1(config-sla-monitor-echo)#exit
R1(config)#ip sla monitor schedule 1 life forever start-time now
R1(config)#end
R1#
*Mar  1 00:12:49.383: %SYS-5-CONFIG_I: Configured from console by console
R1#show ip sla monitor statistics
Round trip time (RTT)   Index 1
        Latest RTT: 24 ms
Latest operation start time: *00:13:25.863 UTC Fri Mar 1 2002
Latest operation return code: OK
Number of successes: 5
Number of failures: 0
Operation time to live: Forever
```

Note:-

To stop debug use this or at some point memory will get full.

R1#undebug all

Output:

```
R1#debug ip icmp
ICMP packet debugging is on
R1#
*Mar  1 00:13:45.883: ICMP: echo reply rcvd, src 8.8.8.8, dst 1.1.1.1
R1#
*Mar  1 00:13:55.915: ICMP: echo reply rcvd, src 8.8.8.8, dst 1.1.1.1
R1#
```

solarwinds | Solar-PuTTY *free tool*

Practical no.5

Implement Inter-VLAN Routing

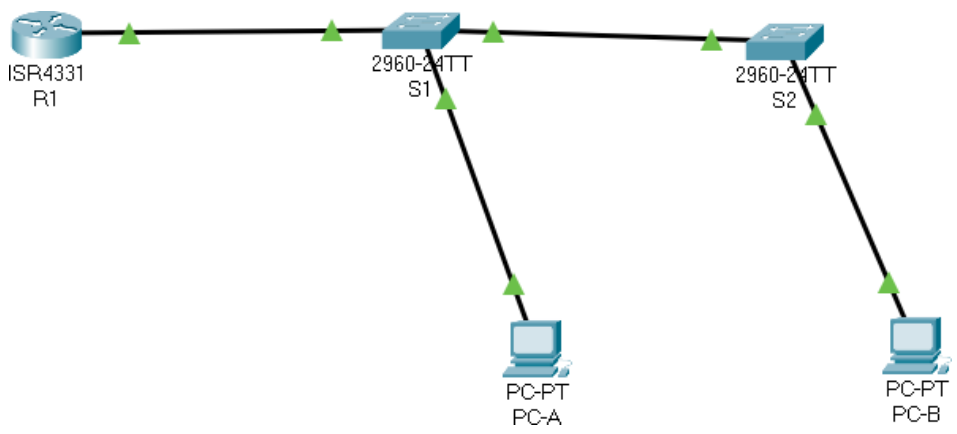
Aim: To implement Inter-VLAN Routing using Cisco Packet Tracer.

Requirement: Cisco Packet Tracer tool.

Procedure:

Part 1:

Step1: Build the Network and Configure Basic Device Settings:



Output:

R1

Physical Config CLI Attributes

```
Press RETURN to get started!


Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#Enable secret class
R1(config)#Line console 0 password
                          ^
% Invalid input detected at '^' marker.

R1(config)#Line console 0
R1(config-line)#password cisco
R1(config-line)#Login
R1(config-line)#exit
R1(config)#line vty 0 15
R1(config-line)#password cisco
R1(config-line)#Login
R1(config-line)#exit
R1(config)#service password-encryption
R1(config)#banner motd $ Uunauthorised access is prohibited $
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
R1#clock set 11:38:50 23 December 2021
```

Step 2: Configure basic settings for the router.

1. Console into the router and enable privileged EXEC mode.
   router> enable
2. Enter configuration mode.
   router# conf t
3. Assign a device name to the router.
   router(config)# hostname R1
4. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.
   R1(config)# no ip domain lookup
5. Assign class as the privileged EXEC encrypted password.
   R1(config)# enable secret class
6. Assign cisco as the console password and enable login.
   R1(config)# line console 0
   R1(config-line)# password cisco
   R1(config-line)# login
7. Assign cisco as the vty password and enable login.
   R1(config)# line vty 0 15
   R1(config-line)# password cisco
   R1(config-line)# login
8. Encrypt the plaintext passwords.
   R1(config)# service password-encryption
9. Create a banner that warns anyone accessing the device that unauthorized access is prohibited.
   R1(config)# banner motd $ Unauthorised access is prohibited $
10. Save the running configuration to the startup configuration file.
    R1(config)# end
    R1# copy running-config startup-config
11. Set the clock on the router.
    R1# clock set 11:38:50 23 December 2021

Step 3: Configure basic settings for switch 1.

1. Assign a device name to the switch.

   switch(config)# hostname S1

2. 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

3. Assign class as the privileged EXEC encrypted password.
   S1(config)# enable secret class

4. Assign cisco as the console password and enable login.
   S1(config)# line console 0
   S1(config-line)# password cisco
   S1(config-line)# login

5. Assign cisco as the vty password and enable login.
   S1(config)# line vty 0 15
   S1(config-line)# password cisco
   S1(config-line)# login

6. Encrypt the plaintext passwords.

   S1(config)# service password-encryption

7. Create a banner that warns anyone accessing the device that unauthorized access is prohibited.

   S1(config)# banner motd “Unauthorised access is prohibited”
   S2(config)# exit

8. Set the clock on the switch.

   S1# clock set 11:48:10 23 December 2021

9. Save the running configuration to the startup configuration.

   S1# copy run st

Output:

S1

Physical Config CLI Attributes

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/6, changed


Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#no ip domain-lookup
S1(config)#enable secret class
S1(config)#line console 0
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exit
S1(config)#line vty 0 15
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#service password-encryption
S1(config)#banner motd "Unauthorised access is prohibited"
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#clock set 11:48:10 23 December 2021
S1#copy run st
Destination filename [startup-config]?
Building configuration...
[OK]
```

Configure basic settings for Switch 2:

2. Assign a device name to the switch.

   switch(config)# hostname S2

3. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.

   S2(config)# no ip domain-lookup

4. Assign class as the privileged EXEC encrypted password.
   S2(config)# enable secret class

5. Assign cisco as the console password and enable login.
   S2(config)# line console 0
   S2(config-line)# password cisco
   S2(config-line)# login

6. Assign cisco as the vty password and enable login.
   S2(config)# line vty 0 15

S2(config-line)# password cisco
S2(config-line)# login

7. Encrypt the plaintext passwords.

   S2(config)# service password-encryption

8. Create a banner that warns anyone accessing the device that unauthorized access is prohibited.

   S2(config)# banner motd “Unauthorised access is prohibited”
   S2(config)# exit

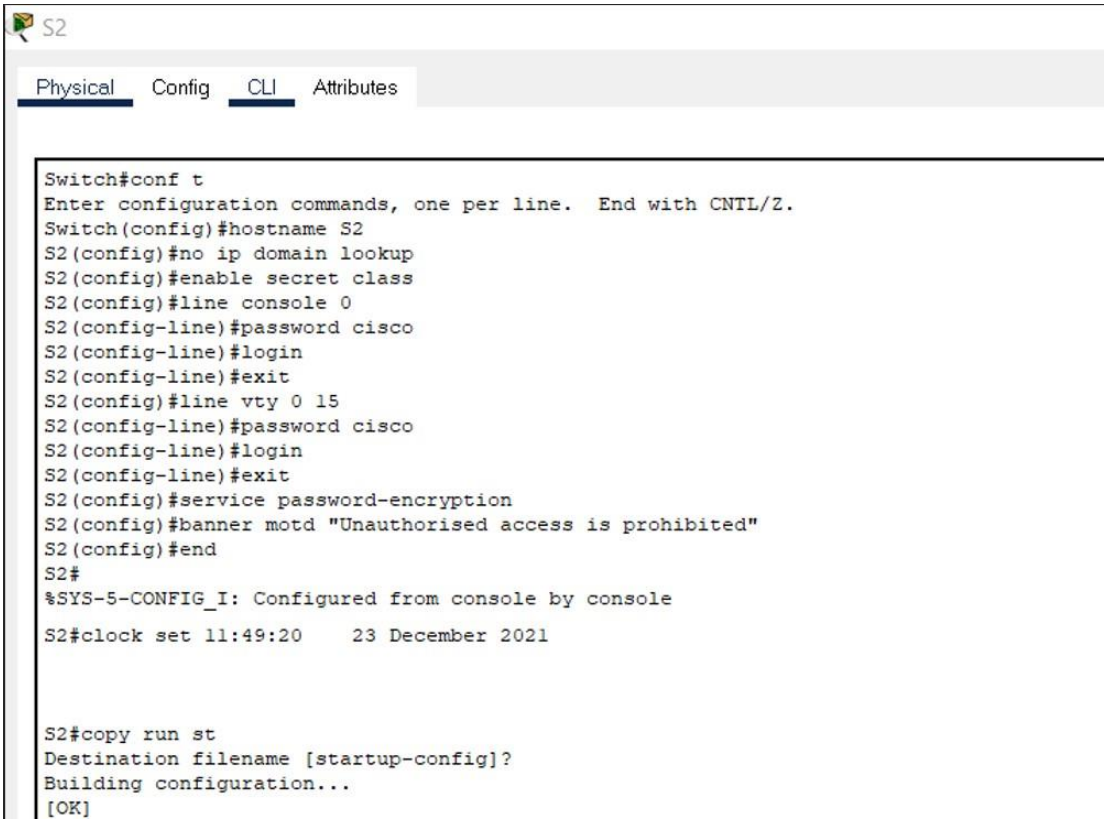
9. Set the clock on the switch.

   S2# clock set 11:49:20 23 December 2021

10. Save the running configuration to the startup configuration.

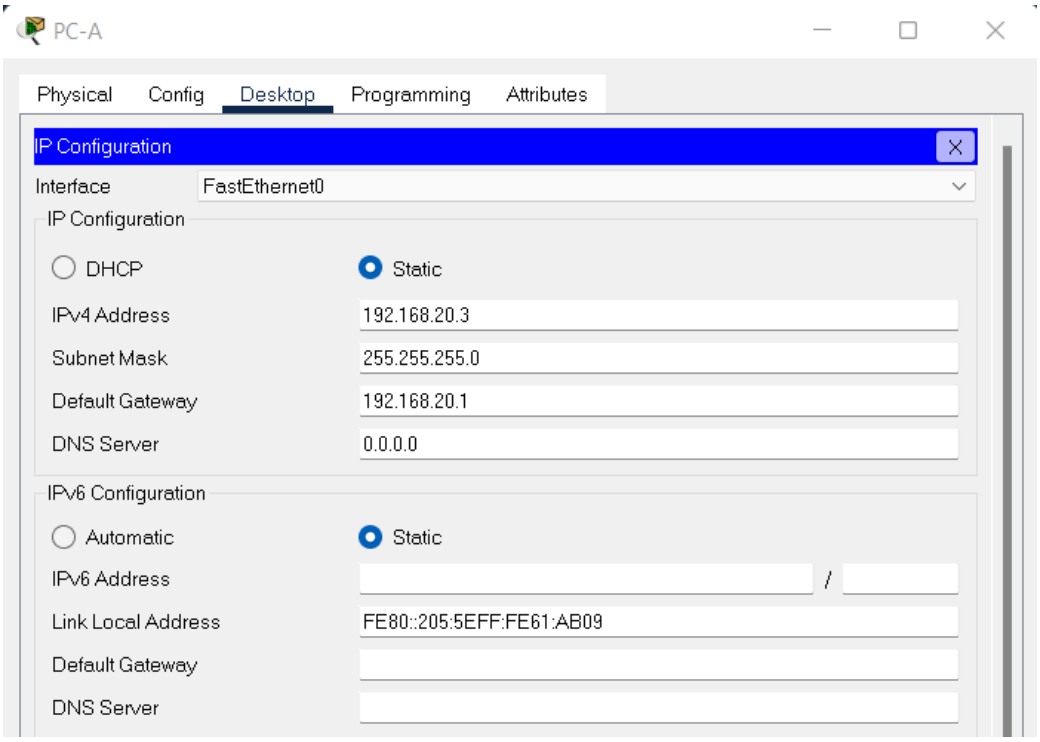
    S2# copy run st

Output:

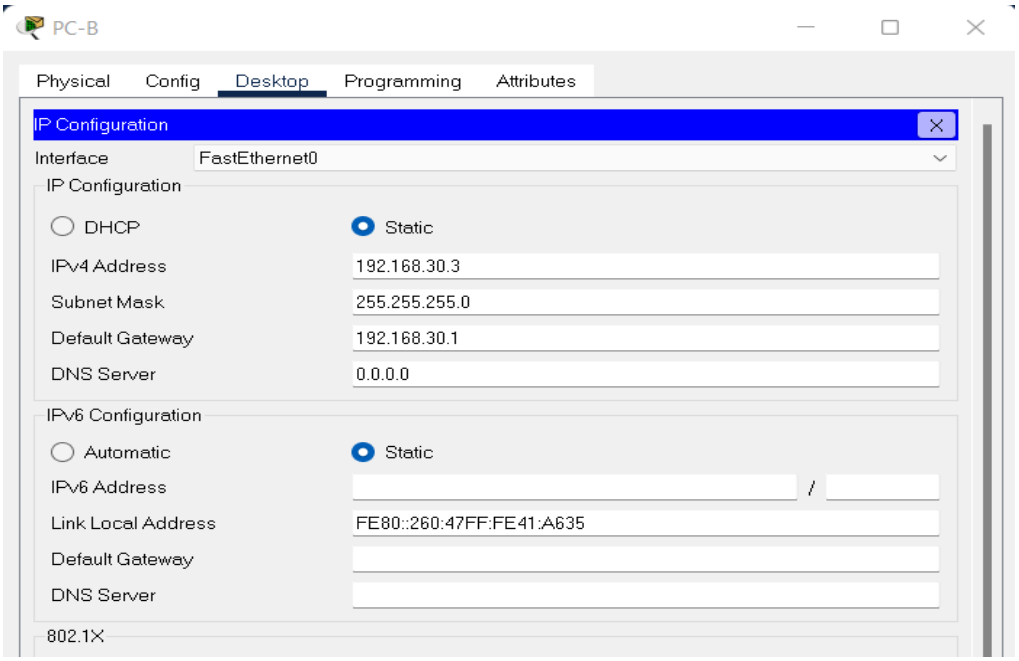


Step 4: Configure PC hosts.

PC-A:



PC-B:



Part 2: Create VLANs and Assign Switch Ports:

Step 1: Create VLANs on both switches.

1. Create and name the required VLANs on each switch from the table above.

S1(config)# vlan 10
S1(config-vlan)# name Management
S1(config-vlan)# vlan 20
S1(config-vlan)# name Sales
S1(config-vlan)# vlan 30
S1(config-vlan)# name Operations
S1(config-vlan)# vlan 999
S1(config-vlan)# name Parking_Lot
S1(config-vlan)# vlan 1000
S1(config-vlan)# name Native
S1(config-vlan)# exit

```
S1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#vlan 10
S1(config-vlan)#name Management
S1(config-vlan)#vlan 20
S1(config-vlan)#name Sales
S1(config-vlan)#vlan 30
S1(config-vlan)#name Operations
S1(config-vlan)#vlan 999
S1(config-vlan)#name Parking_lot
S1(config-vlan)#vlan 1000
S1(config-vlan)#vlan 999
S1(config-vlan)#name Parking_Lot
S1(config-vlan)#vlan 1000
S1(config-vlan)#name Native
S1(config-vlan)#exit
```

S2(config)# vlan 10
S2(config-vlan)# name Management
S2(config-vlan)# vlan 20
S2(config-vlan)# name Sales
S2(config-vlan)# vlan 30
S2(config-vlan)# name Operations
S2(config-vlan)# vlan 999
S2(config-vlan)# name Parking_Lot
S2(config-vlan)# vlan 1000
S2(config-vlan)# name Native
S2(config-vlan)# exit

```
S2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#vlan 10
S2(config-vlan)#name Management
S2(config-vlan)#vlan 20
S2(config-vlan)#name Sales
S2(config-vlan)#vlan 30
S2(config-vlan)#name Operations
S2(config-vlan)#vlan 999
S2(config-vlan)#name Parking_Lot
S2(config-vlan)#vlan 1000
S2(config-vlan)#name Native
S2(config-vlan)#exit
```

2. Configure the management interface and default gateway on each switch using the IP address information in the Addressing Table.

   S1(config)# interface vlan 10
   S1(config-if)# ip address 192.168.10.11 255.255.255.0
   S1(config-if)# no shutdown
   S1(config-if)# exit
   S1(config)# ip default-gateway 192.168.10.1

```
S1(config)#interface vlan 10
S1(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

S1(config-if)#ip address 192.168.10.11 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#exit
S1(config)#ip default-gateway 192.168.10.1
```

   S2(config)# interface vlan 10
   S2(config-if)# ip address 192.168.10.12 255.255.255.0
   S2(config-if)# no shutdown
   S2(config-if)# exit
   S2(config)# ip default-gateway 192.168.10.1

```
S2(config)#interface vlan 10
S2(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

S2(config-if)#ip address 192.168.10.12 255.255.255.0
S2(config-if)#no shutdown
S2(config-if)#exit
S2(config)#ip default-gateway 192.168.10.1
```

3. Assign all unused ports on the switch to the Parking_Lot VLAN, configure them for static access mode, and administratively deactivate them.

   Note: The interface range command is helpful to accomplish this task with as few commands as necessary.

   S1(config)# interface range f0/2 – 4 , f0/7 – 24 , g0/1 – 2

S1(config-if-range)# switchport mode access
S1(config-if-range)# switchport access vlan 999
S1(config-if-range)# shutdown

```
S1(config)#interface range f0/2-4, f0/7-24, g0/1-2
S1(config-if-range)#switchport mode access
S1(config-if-range)#switchport access vlan 999
S1(config-if-range)#shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down
```

S2(config)# **interface range f0/2 – 17 , f0/19 – 24 , g0/1 – 2**
S2(config-if-range)# **switchport mode access**
S2(config-if-range)# **switchport access vlan 999**
S2(config-if-range)# **shutdown**

```
S2(config)#interface range f0/2-17, f0/19-24, g0/1-2
S2(config-if-range)#switchport mode access
S2(config-if-range)#switchport access vlan 999
S2(config-if-range)#shutdown

%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/3, changed state to administratively down

%LINK-5-CHANGED: Interface FastEthernet0/4, changed state to administratively down
```

Step 2: Assign VLANs to the correct switch interfaces.

1. Assign used ports to the appropriate VLAN (specified in the VLAN table above) and configure them for static access mode.

   S1(config)# interface f0/6
   S1(config-if)# switchport mode access
   S1(config-if)# switchport access vlan 20

S1

Physical Config CLI Attributes

```
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to administratively down

%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to administratively down
S1(config-if-range)#exit
S1(config)#interface f0/6
S1(config-if)#switchport mode access
S1(config-if)#switchport access vlan 20
S1(config-if)#end
```

S2(config)# interface f0/18
S2(config-if)# switchport mode access
S2(config-if)# switchport access vlan 30

```
S2(config-if-range)#exit
S2(config)#interface f0/18
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 30
S2(config-if)#end
S2#
```

2. Verify that the VLANs are assigned to the correct interfaces.

S1# show vlan brief

```
S1#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/5
10   Management                       active
20   Sales                            active    Fa0/6
30   Operations                       active
999  Parking_Lot                      active    Fa0/2, Fa0/3, Fa0/4, 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, Gig0/1, Gig0/2
1000 Native                           active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
S1#
```

S2# show vlan brief

```
S2#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1
10   Management                       active
20   Sales                            active
30   Operations                       active    Fa0/18
999  Parking_Lot                      active    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, Gig0/1, Gig0/2
1000 Native                           active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Part 3: Configure an 802.1Q Trunk Between the Switches

Step 1: Manually configure trunk interface F0/1 on switch S1 and S2.

1. Configure static trunking on interface F0/1 for both switches.

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

2. Set the native VLAN to 1000 on both switches.

   S1(config-if)# switchport trunk native vlan 1000

3. Specify that VLANs 10, 20, 30, and 1000 are allowed to cross the trunk.

   S1(config-if)# switchport trunk allowed vlan 10,20,30,1000

4. Verify trunking ports, the Native VLAN and allowed VLANs across the trunk.

   S1# show interfaces trunk

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

   Port      Vlans allowed on trunk
   Fa0/1      10,20,30,1000

   Port      Vlans allowed and active in management domain
   Fa0/1      10,20,30,1000

   Port      Vlans in spanning tree forwarding state and not pruned
   Fa0/1      10,20,30,1000
   ```

```
S1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)# int f0/1
S1(config-if)#switchport mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up

S1(config-if)#switchport mode trunk
S1(config-if)#
S1(config-if)#switchport trunk native vlan 1000
S1(config-if)#switchport trunk allowed vlan 10,20,30,1000
S1(config-if)#end
S1#
%SYS-5-CONFIG_I: Configured from console by console

S1#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1000

Port        Vlans allowed on trunk
Fa0/1       10,20,30,1000

Port        Vlans allowed and active in management domain
Fa0/1       10,20,30,1000

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       10,20,30,1000
```

Switch 2:

2. Configure static trunking on interface F0/1 for both switches.

   S2(config)# interface f0/1
   S2(config-if)# switchport mode trunk

3. Set the native VLAN to 1000 on both switches.

   S2(config-if)# switchport trunk native vlan 1000

4. Specify that VLANs 10, 20, 30, and 1000 are allowed to cross the trunk.

   S2(config-if)# switchport trunk allowed vlan 10,20,30,1000

5. Verify trunking ports, the Native VLAN and allowed VLANs across the trunk.

   S2# show interfaces trunk

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

   Port Vlans allowed on trunk
   Fa0/1 10,20,30,1000

Port	Vlans allowed and active in management domain
Fa0/1	10,20,30,1000

Port	Vlans in spanning tree forwarding state and not pruned
Fa0/1	10,20,30,1000

```
S2#
S2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#int f0/1
S2(config-if)#switchpot
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to uprt
% Incomplete command.
S2(config-if)#switchport mode trunk
S2(config-if)#%SPANTREE-2-RECV_PVID_ERR: Received BPDU with inconsistent peer vlan id 1000 on FastEthernet0/1 VLAN1.

%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/1 on VLAN0001. Inconsistent local vlan.

S2(config-if)#switchport
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/1 (1), with S1 FastEthernet0/1 (1000).

% Incomplete command.
S2(config-if)#switchport trunk native vlan 1000
S2(config-if)#%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/1 on VLAN1000. Port consistency restored.

%SPANTREE-2-UNBLOCK_CONSIST_PORT: Unblocking FastEthernet0/1 on VLAN0001. Port consistency restored.


S2(config-if)#switchport trunk allowed vlan 10,20,30,1000
S2(config-if)#end
S2#
%SYS-5-CONFIG_I: Configured from console by console

S2#show interface trunk
Port        Mode         Encapsulation  Status        Native vlan
Fa0/1       on           802.1q         trunking      1000

Port        Vlans allowed on trunk
Fa0/1       10,20,30,1000

Port        Vlans allowed and active in management domain
Fa0/1       10,20,30,1000

Port        Vlans in spanning tree forwarding state and not pruned
Fa0/1       10,20,30,1000
```

Step 2: Manually configure S1's trunk interface F0/5

1. Configure S1's interface F0/5 with the same trunk parameters as F0/1. This is the trunk to the router.

Switch 1:

```
S1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S1(config)#int f0/5
S1(config-if)#switchport mode trunk
S1(config-if)#switchport trunk native vlan 1000
S1(config-if)#exit
S1(config)#end
S1#
```

Switch 2:

```
S2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#int f0/5
S2(config-if)#switchport mode trunk
S2(config-if)#switchport trunk native vlan 1000
S2(config-if)#exit
S2(config)#end
S2#
```

2. Save the running configuration to the startup configuration file.

   S1# **copy run st**

```
S1#copy run st
Destination filename [startup-config]?
Building configuration...
[OK]
S1#
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up
```

   S2# **copy run st**

```
S2#copy run st
Destination filename [startup-config]?
Building configuration...
[OK]
S2#
```

3. Verify trunking.

   What happens if G0/0/1 on R1 is down?

   S1 F0/5 will not be displayed if the GigabitEthernet 0/0/1 interface status on the router is down.

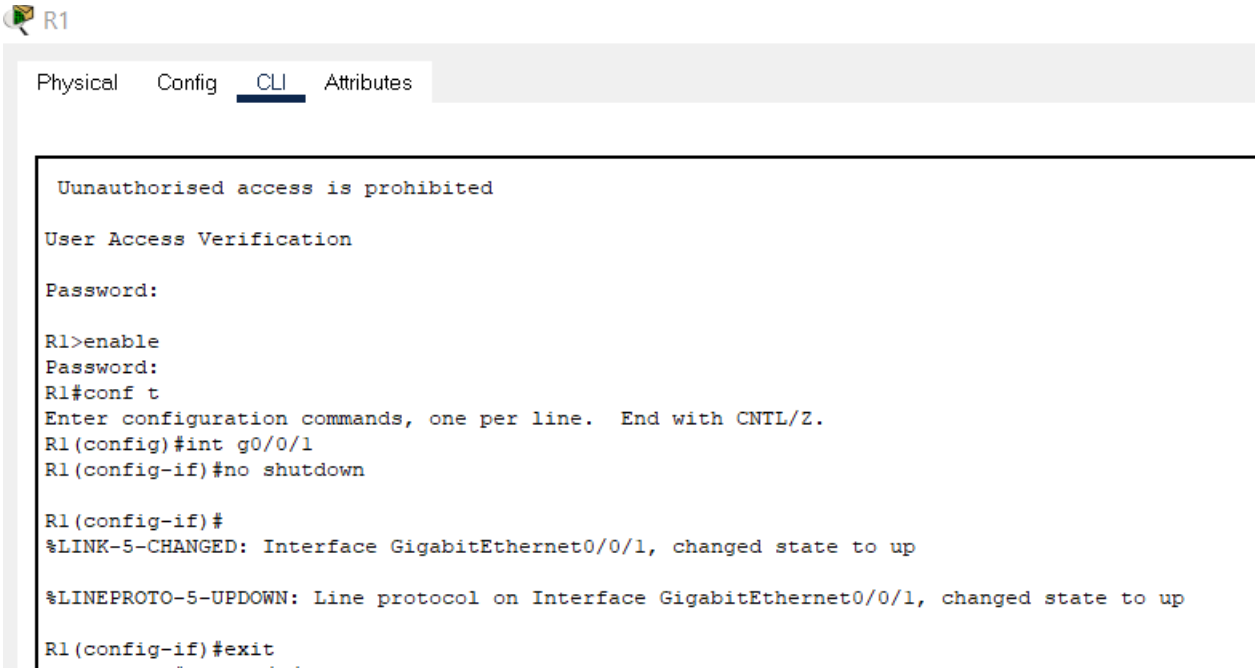
Part 4: Configure Inter-VLAN Routing on the Router

Step 1: Configure the router.

Open configuration window

1. Activate interface G0/0/1 as necessary on the router.

   R1(config)# interface g0/0/1
   R1(config-if)# no shutdown
   R1(config-if)# exit



2. Configure sub-interfaces for each VLAN as specified in the IP addressing table. All sub-interfaces use 802.1Q encapsulation. Ensure the sub-interface for the native VLAN does not have an IP address assigned. Include a description for each sub-interface.

   R1(config)# interface g0/0/1.10
   R1(config-subif)# description Management Network
   R1(config-subif)# encapsulation dot1q 10
   R1(config-subif)# ip address 192.168.10.1 255.255.255.0
   R1(config-subif)# interface g0/0/1.20
   R1(config-subif)# encapsulation dot1q 20
   R1(config-subif)# description Sales Network
   R1(config-subif)# ip address 192.168.20.1 255.255.255.0
   R1(config-subif)# interface g0/0/1.30

R1(config-subif)# encapsulation dot1q 30
R1(config-subif)# description Operations Network
R1(config-subif)# ip address 192.168.30.1 255.255.255.0
R1(config-subif)# interface g0/0/1.1000
R1(config-subif)# encapsulation dot1q 1000 native
R1(config-subif)# description Native VLAN

Output:

```
R1(config)#int g0/0/1.10
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1.10, changed state to up

R1(config-subif)#description Management Network
R1(config-subif)#encapsulation dot1q 10
R1(config-subif)#ip address 192.168.10.1 255.255.255.0
R1(config-subif)#int g0/0/1.20
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1.20, changed state to up
```

```
R1(config-subif)#description Management Network
R1(config-subif)#encapsulation dot1q 10
R1(config-subif)#ip address 192.168.10.1 255.255.255.0
R1(config-subif)#int g0/0/1.20
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1.20, changed state to up

R1(config-subif)#description Sales Network
R1(config-subif)#encapsulation dot1q 20
R1(config-subif)#ip address 192.168.20.1 255.255.255.0
R1(config-subif)#int g0/0/1.30
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1.30, changed state to up

R1(config-subif)#description Operations Network
R1(config-subif)#ip address 192.168.30.1 255.255.255.0

% Configuring IP routing on a LAN subinterface is only allowed if that
subinterface is already configured as part of an IEEE 802.10, IEEE 802.1Q,
or ISL vLAN.

R1(config-subif)#encapsulation dot1q 30
R1(config-subif)#ip address 192.168.30.1 255.255.255.0
R1(config-subif)#int g0/0/1.1000
R1(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/1.1000, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1.1000, changed state to up

R1(config-subif)#description Native VLAN
R1(config-subif)#encapsulation dot1q 1000 native
R1(config-subif)#end
R1#
```

3). Verify the sub-interfaces are operational

R1# show ip interface brief

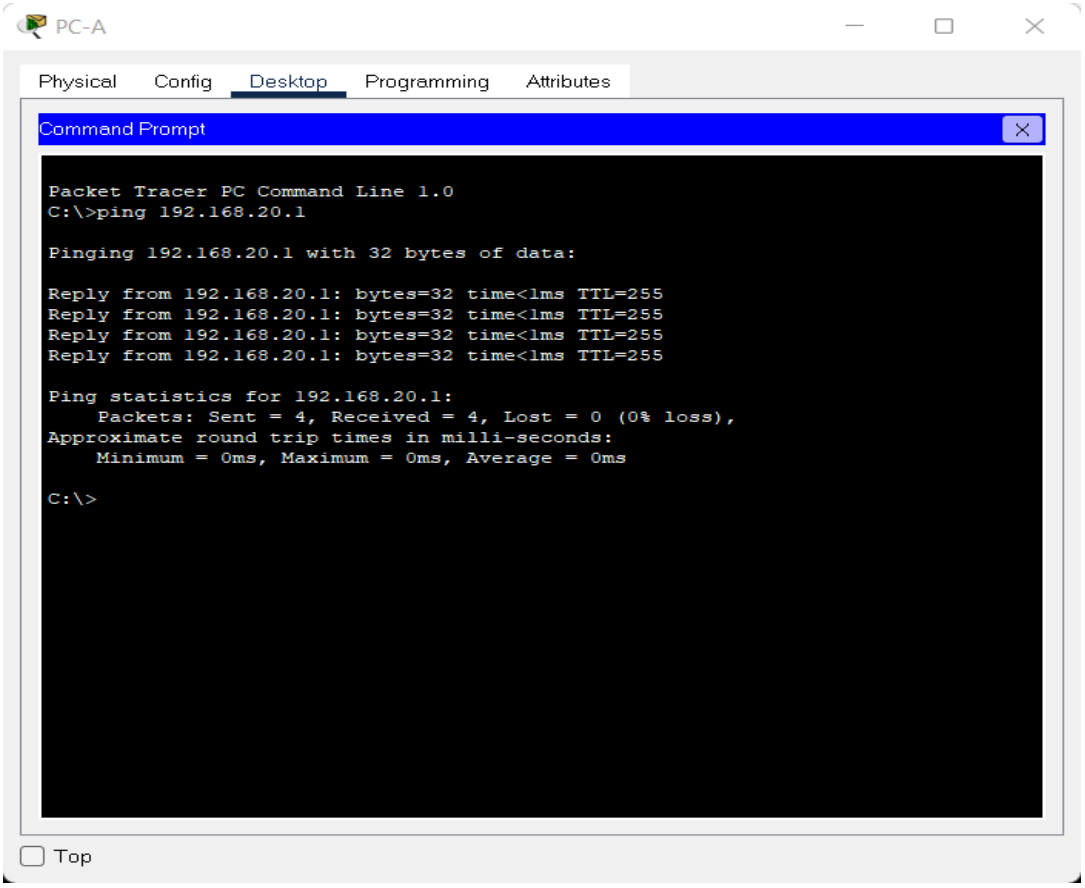
```
R1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   unassigned      YES unset  administratively down down
GigabitEthernet0/0/1   unassigned      YES unset  up                    up
GigabitEthernet0/0/1.10192.168.10.1    YES manual up                    up
GigabitEthernet0/0/1.20192.168.20.1    YES manual up                    up
GigabitEthernet0/0/1.30192.168.30.1    YES manual up                    up
GigabitEthernet0/0/1.1000unassigned      YES unset  up                    up
GigabitEthernet0/0/2   unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
R1#
```

Part 5: Verify Inter-VLAN Routing is Working

Step 1: Complete the following tests from PC-A. All should be successful.
Note: You may have to disable the PC firewall for pings to work

1. **Ping from PC-A to its default gateway. 192.168.20.1**

OUTPUT:-



2. **Ping from PC-A to PC-B**

Output:

```
C:\>ping 192.168.30.3

Pinging 192.168.30.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.30.3: bytes=32 time=1ms TTL=127
Reply from 192.168.30.3: bytes=32 time<1ms TTL=127
Reply from 192.168.30.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.30.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.30.3

Pinging 192.168.30.3 with 32 bytes of data:

Reply from 192.168.30.3: bytes=32 time<1ms TTL=127
Reply from 192.168.30.3: bytes=32 time<1ms TTL=127
Reply from 192.168.30.3: bytes=32 time=13ms TTL=127
Reply from 192.168.30.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.30.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 13ms, Average = 3ms
```

3. **Ping from PC-A to S2**

Step 2: Complete the following test from PC-B.

From the Command Prompt window on PC-B, issue the tracert command to the address of PC-A.:

Output:

PC-B

Physical | Config | Desktop | Programming | Attributes

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>tracert 192.168.20.3

Tracing route to 192.168.20.3 over a maximum of 30 hops:

  1   0 ms      0 ms      0 ms      192.168.30.1
  2   0 ms      0 ms      3 ms      192.168.20.3

Trace complete.

C:\>
```