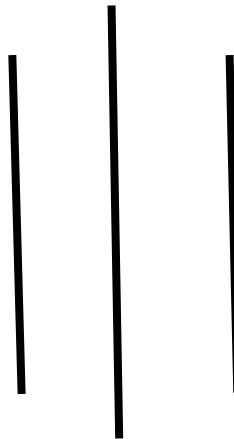


# **INSTITUTE OF ENGINEERING**

**ADVANCED COLLEGE OF ENGINEERING AND MANAGEMENT**

**Kupondole, Lalitpur**

**(AFFILIATED TO TRIBHUVAN UNIVERSITY)**



**Lab no:3**

**Subject: Computer Network**

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## **Lab 3: OSPF routing and VLAN on ipv4.**

### **Objective:**

1. Set up OSPF routing protocol
2. Visualize VLAN setup

### **Introduction**

Open Shortest Path First (OSPF) is a routing protocol for Internet Protocol (IP) networks. It uses a link state routing (LSR) algorithm and falls into the group of interior gateway protocols (IGPs), operating within a single autonomous system (AS). It is defined as OSPF Version 2 in RFC 2328 (1998) for IPv4. The updates for IPv6 are specified as OSPF Version 3 in RFC 5340 (2008). OSPF supports the Classless Inter-Domain Routing (CIDR) addressing model. OSPF is a widely used IGP in large enterprise networks.

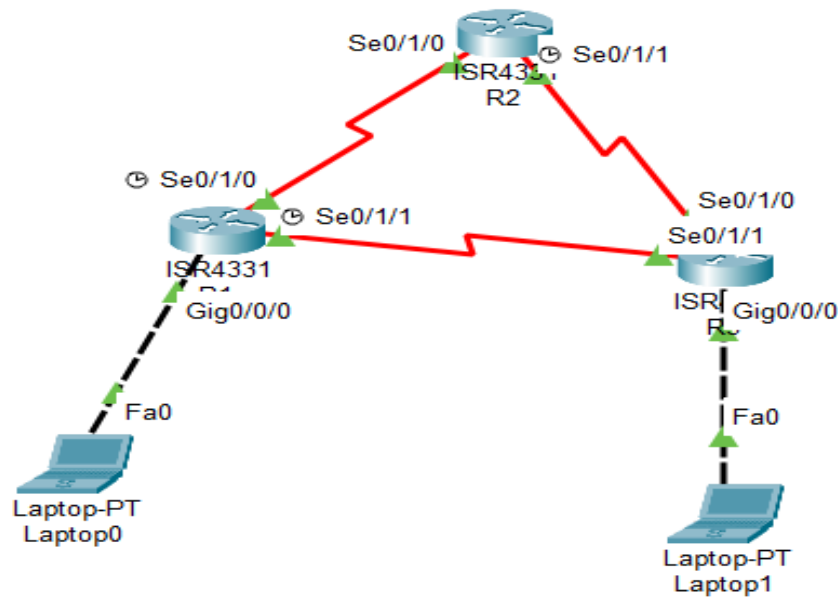
A VLAN (virtual LAN) is a subnetwork which can group together collections of devices on separate physical local area networks (LANs). A LAN is a group of computers and devices that share a communications line or wireless link to a server within the same geographical area.

VLANs make it easy for network administrators to partition a single switched network to match the functional and security requirements of their systems without having to run new cables or make major changes in their current network infrastructure. VLANs are often set up by larger businesses to re-partition devices for better traffic management.

VLANs are also important because they can help improve the overall performance of a network by grouping together devices that communicate most frequently. VLANs also provide security on larger networks by allowing a higher degree of control over which devices have access to each other. VLANs tend to be flexible because they are based on logical connections, rather than physical.

## OSPF

Design:



### Procedure:

1. First the required tools were selected.
2. The required ports of the routers were turned on.
3. Then the IP and subnet mask for each Laptop and router ports was set
  - a. For laptops this was done by going to the desktop and ip configurations
  - b. For routers this was done by going to the configuration and selecting the required port
4. Required connections were made between the routers and laptops
5. The OSPF network was added in the required routers through the routing section of the config tab .

codes:

### Router1

```
Router>enable
```

```
Router# config terminal
```

```
Router(config)#interface FastEthernet0/0
```

```
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 0 //*wild card mask
Router(config-router)#network 40.0.0.0 0.255.255.255 area 0 //*wild card mask
Router(config-router)#network 192.168.1.0 0.0.0.255 area 0
Router(config-router)#end
Router#wr
Router#
```

## **Router2**

```
Router>enable
Router# configure terminal
Router(config)#interface Serial2/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit

Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config-router)#network 10.0.0.0 0.255.255.255 area 0 //*wild card mask
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0 //*wild card mask
Router(config-router)#end
Router#wr
```

Router#

### **Router3**

Router>enable

Router# configure terminal

Router(config)#interface Serial2/0

Router(config-if)#ip address 30.0.0.2 255.0.0.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface Serial3/0

Router(config-if)#ip address 40.0.0.2 255.0.0.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface FastEthernet0/0

Router(config-if)#ip address 192.168.100.1 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#router ospf 1

Router(config-router)#router-id 3.3.3.3

Router(config-router)#network 30.0.0.0 0.255.255.255 area 0//\*wild card mask

Router(config-router)#network 40.0.0.0 0.255.255.255 area 0//\*wild card mask

Router(config-router)#network 192.168.100.0 0.0.0.255 area 0

Router(config-router)#end

Router#wr

Router#

### **Checking OSPF status from any Router**

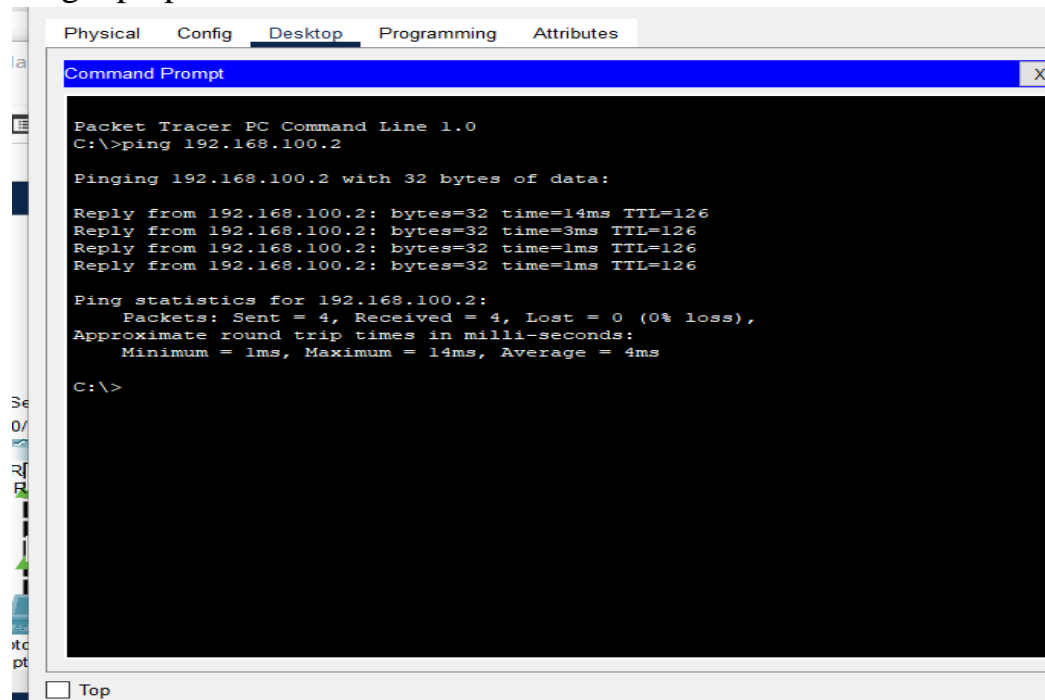
Router#show ip ospf neighbor

Router#show ip ospf database

Router#show ip route ospf

Output:

Ping laptop 1 to 2



The screenshot shows the Packet Tracer Desktop tab with a Command Prompt window open. The window title is "Command Prompt". The text inside the window is as follows:

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.100.2

Pinging 192.168.100.2 with 32 bytes of data:

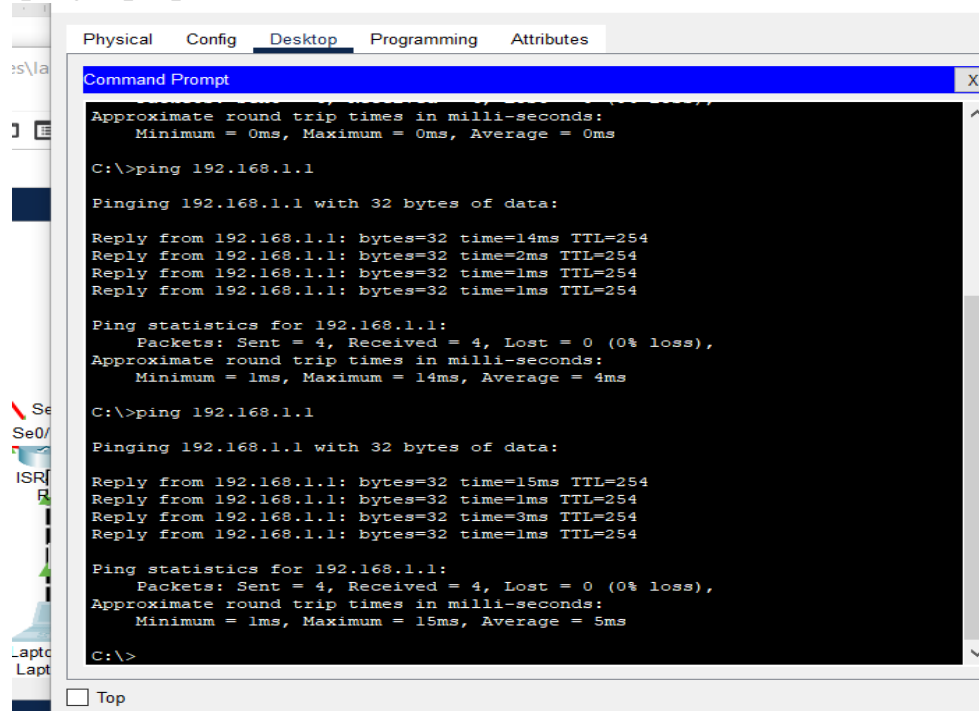
Reply from 192.168.100.2: bytes=32 time=14ms TTL=126
Reply from 192.168.100.2: bytes=32 time=3ms TTL=126
Reply from 192.168.100.2: bytes=32 time=1ms TTL=126
Reply from 192.168.100.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.100.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 4ms

C:\>
```

At the bottom of the window, there is a "Top" button.

ping laptop 2 to 1



The screenshot shows the Packet Tracer Desktop tab with a Command Prompt window open. The window title is "Command Prompt". The text inside the window is as follows:

```
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=14ms TTL=254
Reply from 192.168.1.1: bytes=32 time=2ms TTL=254
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 14ms, Average = 4ms

C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=15ms TTL=254
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254
Reply from 192.168.1.1: bytes=32 time=3ms TTL=254
Reply from 192.168.1.1: bytes=32 time=1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 15ms, Average = 5ms

C:\>
```

At the bottom of the window, there is a "Top" button.

## Ospf show ip

```
Physical  Config  CLI  Attributes

IOS Command Line Interface

00:00:10: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial0/1/1 from LOADING
to FULL, Loading Done

00:00:10: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial0/1/0 from LOADING
to FULL, Loading Done

Router>en
Router#show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address        Interface
1.1.1.1          0     FULL/-          00:00:34    30.0.0.1       Serial0/1/1
2.2.2.2          0     FULL/-          00:00:34    20.0.0.1       Serial0/1/0

Router# show ip ospf database
                OSPF Router with ID (192.168.100.1) (Process ID 1)

                Router Link States (Area 0)

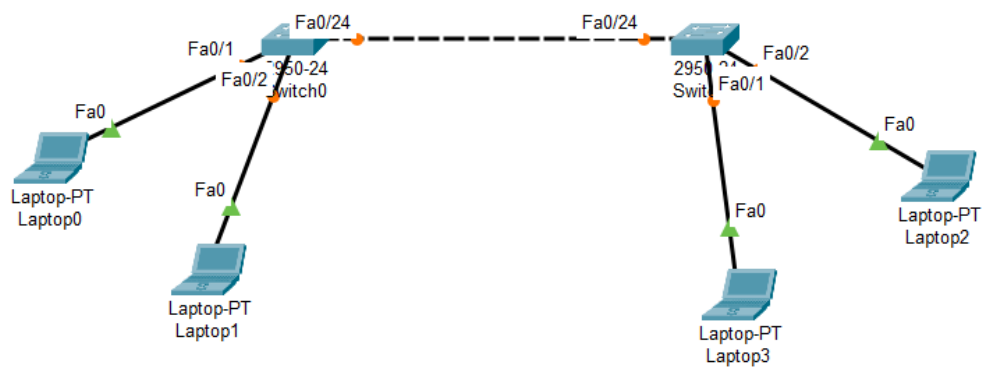
Link ID      ADV Router   Age         Seq#         Checksum Link count
192.168.100.1 192.168.100.1 807         0x80000006  0x00fa37  5
2.2.2.2       2.2.2.2      807         0x80000005  0x001de4  4
1.1.1.1       1.1.1.1      807         0x80000006  0x003c3a  5

Router#show ip route ospf
O    10.0.0.0 [110/128] via 30.0.0.1, 00:13:34, Serial0/1/1
      [110/128] via 20.0.0.1, 00:13:34, Serial0/1/0
O    192.168.1.0 [110/65] via 30.0.0.1, 00:13:34, Serial0/1/1

Router#
```

## VLAN

Design:



## Procedure:

1. First the required tools were selected.
2. The required ports of the switches were turned on.
3. Then the IP and subnet mask for each Laptop ports was set
  - a. For laptops this was done by going to the desktop and ip configurations
  - b. For switches this was done by going to the configuration and selecting the required port
4. Required connections were made between the switches and laptops

The VLAN was configured .

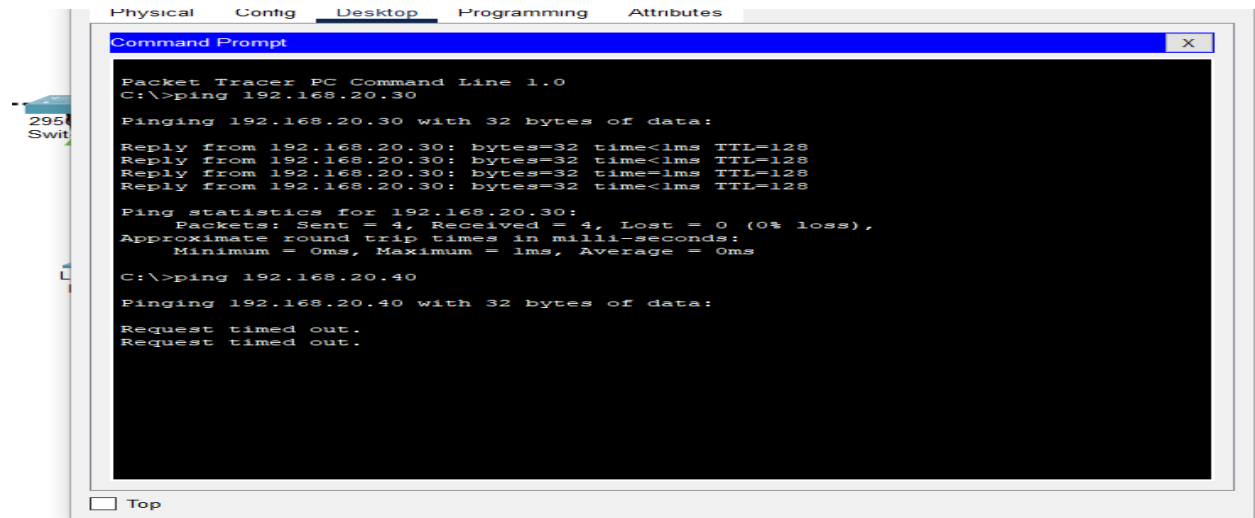
## Codes:

```
Switch>enable
Switch # configure terminal
Switch(config)#vlan 10           //vlan database configuration start from here with number
Switch(config-vlan)#name Account //name assigning on vlan number
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name Exam
Switch(config-vlan)#exit         // vlan end
Switch(config)#interface fa0/24
Switch(config-if)#switchport mode trunk // two-way communication on multiple networks
Switch(config-if)#exit
Switch(config)#interface fa0/1
Switch(config-if)#switchport access vlan 10 // assigning vlan for switch to virtually divide
Switch(config-if)#exit
Switch(config)#interface fa0/11
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface range fa0/15-18 // assigning multiple ports into single vlan
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#exit
Switch#wr
```



Output:

From laptop 1



```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.30

Pinging 192.168.20.30 with 32 bytes of data:

Reply from 192.168.20.30: bytes=32 time<1ms TTL=128
Reply from 192.168.20.30: bytes=32 time<1ms TTL=128
Reply from 192.168.20.30: bytes=32 time<1ms TTL=128
Reply from 192.168.20.30: bytes=32 time<1ms TTL=128

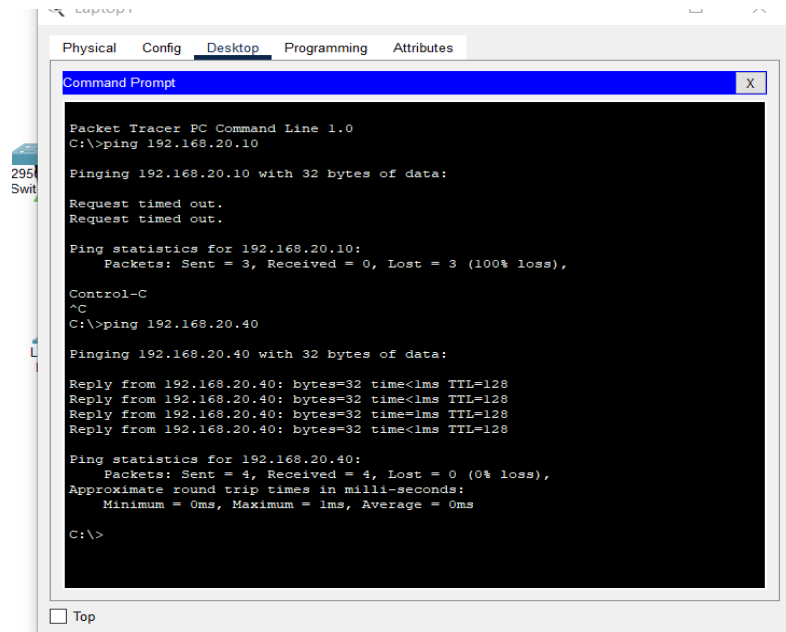
Ping statistics for 192.168.20.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.20.40

Pinging 192.168.20.40 with 32 bytes of data:

Request timed out.
Request timed out.
```

Laptop 2



```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Request timed out.
Request timed out.

Ping statistics for 192.168.20.10:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C
C:\>ping 192.168.20.40

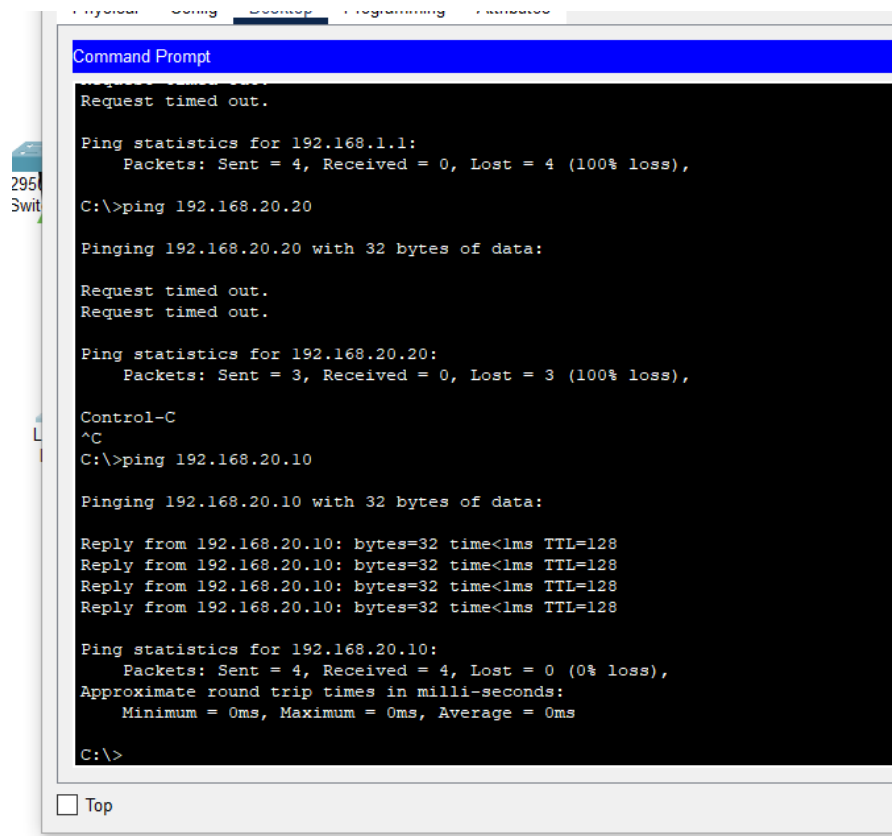
Pinging 192.168.20.40 with 32 bytes of data:

Reply from 192.168.20.40: bytes=32 time<1ms TTL=128
Reply from 192.168.20.40: bytes=32 time<1ms TTL=128
Reply from 192.168.20.40: bytes=32 time<1ms TTL=128
Reply from 192.168.20.40: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.20.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

## Laptop 3



```
Command Prompt

Request timed out.

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.20.20

Pinging 192.168.20.20 with 32 bytes of data:

Request timed out.
Request timed out.

Ping statistics for 192.168.20.20:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C
C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

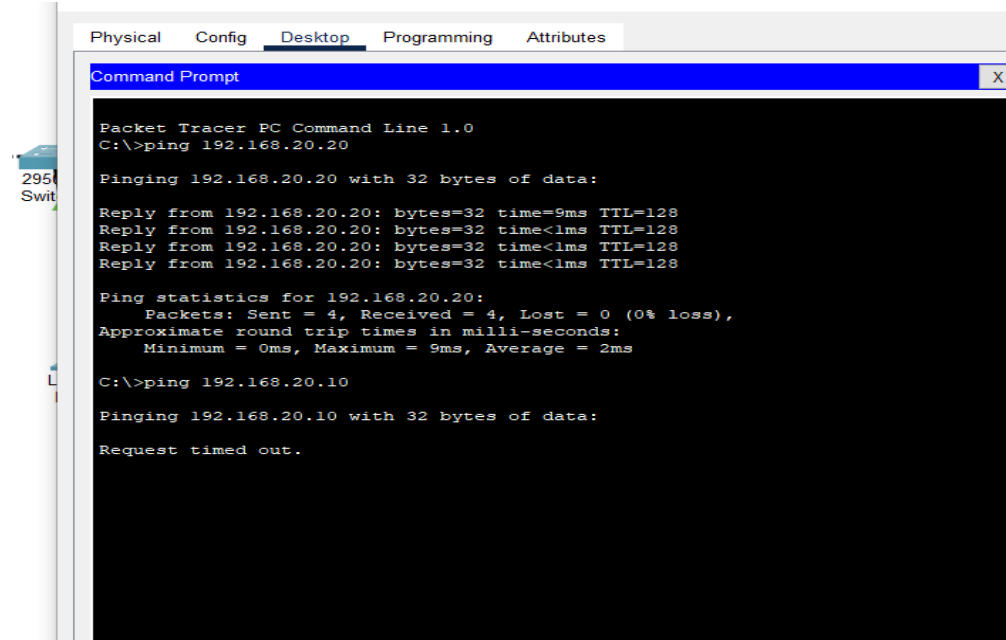
Reply from 192.168.20.10: bytes=32 time<1ms TTL=128
Reply from 192.168.20.10: bytes=32 time<1ms TTL=128
Reply from 192.168.20.10: bytes=32 time<1ms TTL=128
Reply from 192.168.20.10: bytes=32 time<1ms TTL=128

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

C:\>
```

☐ Top

## Laptop 4



```
Physical  Config  Desktop  Programming  Attributes

Command Prompt X

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.20.20

Pinging 192.168.20.20 with 32 bytes of data:

Reply from 192.168.20.20: bytes=32 time=9ms TTL=128
Reply from 192.168.20.20: bytes=32 time<1ms TTL=128
Reply from 192.168.20.20: bytes=32 time<1ms TTL=128
Reply from 192.168.20.20: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.20.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Request timed out.
```

## Discussion And Conclusion

In this lab we visualized the ospf routing protocol and VLAN network. We simulated the message passing and also the ip addresses were analysed.