



**Usman Institute of Technology**

**Department of Computer Science**

**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2023**

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Roll No	21B--141-CS

## Table of Contents

<b>Lab#</b>	<b>Date</b>	<b>Objective</b>	<b>Signature</b>
1	09/09/2023	This practical performance exposes the students to some of the diagnostic commands that are utilised to diagnose/troubleshoot the problems.	
2	16-09-2023	The purpose of this lab is to increase awareness about Packet Tracer and Boson Network Simulator	
3	23-09-2023	This Lab activity focuses on how to create straight and cross cable using RJ-45 connector and Crimping tool	
4	30-10-2023	Implementing FTP server on Packet tracer and exploring the commands.	
5	06-11-2023	Exploring the efficacy of DHCP and DNS server in a wired network using packet tracer	
6	13-11-2023	HUB, BRIDGE, and REPEATER CONFIGURATION	
7	20-11-2023	This lab focuses on the basic configuration of switches and segregation of network using VLANs	
8	27-11-2023	Removing loops using spanning tree protocol and Implementing port security	
9	04-12-2023	Introduction to routers and setting up static routes.	
10	11-12-2023	Routing Information Protocol	
11	18-12-2023	Inter-VLAN Routing (Using Router-on-Stick)	

12	25-12-2023	Routing Protocol IGRP & EIGRP	
13	01-01-2024	OPEN SHORTEST PATH FIRST	
14	08-01-2024	Understand and Implement Standard Access Control List (ACL)	

## **Task 1:**

**ipconfig** is a Windows command-line utility to view and manage network information. It provides you with details about your computer's network interfaces, IP addresses, subnet masks, default gateways, and DNS server configurations. **WinIPCFG** had a graphical interface for the same purpose. WinIPCFG is not used in modern Windows operating systems. It was used in older versions of Windows like Windows 95, 98, and ME, which are no longer in widespread use.

## **Task 2:**

1. size of MAC address: Bytes **(6)** and Bits **(48)**
- 2.

MAC Address	Logical Network Address
Physical Hardware Address	Logical Network Address
Globally unique	Unique within a network
Not routable on the internet	Routable across networks and the internet

3. A gateway is like a door or a bridge in a network that helps data travel between your local network and other networks, such as the internet. It acts as a translator, directing data between devices within your network and devices in external networks. It's a way for your devices to communicate with the outside world and vice versa.
4. It's a way for a computer to establish communication with its own network stack, effectively looping back data without it leaving the local network interface. The loopback address is a valuable tool for network testing, debugging, and ensuring that network-dependent applications and services can function correctly on a device without the need for external network connectivity.
5. PING stands for Packet Internet Groper

6. **ipconfig**: This command provides basic information about your computer's network interfaces, such as the IP address, subnet mask, and default gateway

for each active network interface. It shows essential information to quickly check your network configuration.

**ipconfig /all**: Adding the "/all" switch to the ipconfig command provides a more comprehensive view of your computer's network configuration. It includes additional details like the MAC (Media Access Control) address, DHCP (Dynamic Host Configuration Protocol) lease information, DNS (Domain Name System) server addresses, and more. This command is useful for detailed network troubleshooting and diagnostics.

7. **nbtstat** stands for "NetBIOS over TCP/IP Statistics" and is a command-line tool available in Windows. It is used to diagnose and resolve NetBIOS-related issues on Windows networks.

**finger** is a Unix/Linux command to check user information and login status on a system or remote systems.

**Task 3:**

```
Z:\>tracert www.google.com
Tracing route to www.google.com [142.250.201.132]
over a maximum of 30 hops:

 1      1 ms    <1 ms      1 ms  172.16.32.100
 2      1 ms    1 ms      1 ms  192.168.50.1
 3      3 ms    3 ms      3 ms  202.163.100.245
 4      *        4 ms      5 ms  192.168.200.101
 5      4 ms    3 ms      3 ms  192.168.200.241
 6     24 ms    24 ms    24 ms  58.65.193.234
 7     24 ms    24 ms    24 ms  216.239.41.83
 8     23 ms    24 ms    23 ms  74.125.253.75
 9     25 ms    24 ms    24 ms  mct0ls21-in-f4.1e100.net [142.250.201.132]

Trace complete.

Z:\>tracert 127.0.0.1
Tracing route to CL2-14.uit.edu [127.0.0.1]
over a maximum of 30 hops:

 1    <1 ms    <1 ms    <1 ms  CL2-14.uit.edu [127.0.0.1]

Trace complete.

Z:\>ping www.yahoo.com
Pinging new-fp-shed.wg1.b.yahoo.com [74.6.231.20] with 32 bytes of data:
Reply from 74.6.231.20: bytes=32 time=230ms TTL=47
Reply from 74.6.231.20: bytes=32 time=230ms TTL=47
Reply from 74.6.231.20: bytes=32 time=235ms TTL=47
Reply from 74.6.231.20: bytes=32 time=230ms TTL=47

Ping statistics for 74.6.231.20:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
  Minimum = 230ms, Maximum = 235ms, Average = 231ms

Z:\>ping 127.0.0.1
```

```
Command Prompt X + ▾

Z:\>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

Z:\>ping -a 127.0.0.1

Pinging CL2-14.uit.edu [127.0.0.1] with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

Z:\>arp -a

Interface: 172.16.35.14 --- 0x6
  Internet Address      Physical Address      Type
  172.16.32.7            00-0c-29-d5-26-69  dynamic
  172.16.32.8            00-0c-29-e4-60-13  dynamic
  172.16.32.11           00-0c-29-b4-38-f6  dynamic
  172.16.32.27           00-0c-29-e3-48-83  dynamic
  172.16.32.100          00-09-0f-09-00-03  dynamic
  172.16.32.200          d4-be-d9-97-f5-3c  dynamic
  172.16.33.63           c8-1f-66-13-0e-a8  dynamic
  172.16.33.70           98-90-96-a7-76-b7  dynamic
  172.16.33.222          98-90-96-a7-82-84  dynamic
  172.16.34.8             74-46-a0-a6-9a-f4  dynamic
  172.16.34.17            10-60-4b-87-a6-33  dynamic
```

Active Connections			
Proto	Local Address	Foreign Address	State
TCP	0.0.0.0:135	CL2-14:0	LISTENING
TCP	0.0.0.0:443	CL2-14:0	LISTENING
TCP	0.0.0.0:445	CL2-14:0	LISTENING
TCP	0.0.0.0:902	CL2-14:0	LISTENING
TCP	0.0.0.0:912	CL2-14:0	LISTENING
TCP	0.0.0.0:1521	CL2-14:0	LISTENING
TCP	0.0.0.0:3306	CL2-14:0	LISTENING
TCP	0.0.0.0:3389	CL2-14:0	LISTENING
TCP	0.0.0.0:5040	CL2-14:0	LISTENING
TCP	0.0.0.0:7680	CL2-14:0	LISTENING
TCP	0.0.0.0:8080	CL2-14:0	LISTENING
TCP	0.0.0.0:8787	CL2-14:0	LISTENING
TCP	0.0.0.0:33060	CL2-14:0	LISTENING
TCP	0.0.0.0:49664	CL2-14:0	LISTENING
TCP	0.0.0.0:49665	CL2-14:0	LISTENING
TCP	0.0.0.0:49666	CL2-14:0	LISTENING
TCP	0.0.0.0:49667	CL2-14:0	LISTENING
TCP	0.0.0.0:49668	CL2-14:0	LISTENING
TCP	0.0.0.0:49669	CL2-14:0	LISTENING
TCP	0.0.0.0:49680	CL2-14:0	LISTENING
TCP	0.0.0.0:49683	CL2-14:0	LISTENING
TCP	0.0.0.0:55867	CL2-14:0	LISTENING
TCP	127.0.0.1:8307	CL2-14:0	LISTENING
TCP	127.0.0.1:27017	CL2-14:0	LISTENING
TCP	127.0.0.1:30523	CL2-14:0	LISTENING
TCP	127.0.0.1:49673	CL2-14:0	LISTENING
TCP	127.0.0.1:49675	CL2-14:49676	ESTABLISHED
TCP	127.0.0.1:49676	CL2-14:49675	ESTABLISHED
TCP	127.0.0.1:49677	CL2-14:49678	ESTABLISHED
TCP	127.0.0.1:49678	CL2-14:49677	ESTABLISHED
TCP	127.0.0.1:49715	CL2-14:0	LISTENING
TCP	127.0.0.1:56874	CL2-14:0	LISTENING
TCP	127.0.0.1:59217	CL2-14:0	LISTENING
TCP	172.16.35.14:135	pdc:54646	TIME_WAIT

```
UDP      [fe80::6ffa:50b4:1e05:2ec%20]:59722  *:*
Z:\>netstat -e
Interface Statistics

Received          Sent

Bytes            1261836670    184785202
Unicast packets   1922386     28174510
Non-unicast packets 4991967     478890
Discards          44946       0
Errors            0           0
Unknown protocols 0           0

Z:\>netstat -r
=====
Interface List
6...c0 18 03 ba c3 04 .....Realtek PCIe GbE Family Controller
5...32 03 c8 99 9c e7 .....Microsoft Wi-Fi Direct Virtual Adapter
12...b2 03 c8 99 9c e7 .....Microsoft Wi-Fi Direct Virtual Adapter #2
20...00 50 56 c0 00 01 .....VMware Virtual Ethernet Adapter for VMnet1
17...00 50 56 c0 00 08 .....VMware Virtual Ethernet Adapter for VMnet8
18...30 03 c8 99 9c e7 .....Realtek RTL8821CE 802.11ac PCIe Adapter
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway        Interface Metric
          0.0.0.0      0.0.0.0  172.16.32.100  172.16.35.14    281
         127.0.0.0    255.0.0.0        On-link       127.0.0.1    331
         127.0.0.1  255.255.255.255        On-link       127.0.0.1    331
        127.255.255.255  255.255.255.255        On-link       127.0.0.1    331
        172.16.32.0   255.255.240.0        On-link      172.16.35.14    281
        172.16.35.14  255.255.255.255        On-link      172.16.35.14    281
        172.16.47.255  255.255.255.255        On-link      172.16.35.14    281
       192.168.193.0   255.255.255.0        On-link    192.168.193.1    291
       192.168.193.1  255.255.255.255        On-link    192.168.193.1    291
       192.168.193.255 255.255.255.255        On-link    192.168.193.1    291
      192.168.233.0   255.255.255.0        On-link    192.168.233.1    291
```

```
Unknown protocols          0

Z:\>netstat -r
=====
Interface List
 6...c0 18 03 ba c3 04 .....Realtek PCIe GbE Family Controller
 5...32 03 c8 99 9c e7 .....Microsoft Wi-Fi Direct Virtual Adapter
12...b2 03 c8 99 9c e7 .....Microsoft Wi-Fi Direct Virtual Adapter #2
20...00 50 56 c0 00 01 .....VMware Virtual Ethernet Adapter for VMnet1
17...00 50 56 c0 00 08 .....VMware Virtual Ethernet Adapter for VMnet8
18...30 03 c8 99 9c e7 .....Realtek RTL8821CE 802.11ac PCIe Adapter
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway       Interface Metric
  0.0.0.0          0.0.0.0    172.16.32.100  172.16.35.14    281
 127.0.0.0         255.0.0.0        On-link      127.0.0.1     331
 127.0.0.1         255.255.255.255  On-link      127.0.0.1     331
127.255.255.255   255.255.255.255  On-link      127.0.0.1     331
 172.16.32.0       255.255.240.0    On-link      172.16.35.14    281
 172.16.35.14      255.255.255.255  On-link      172.16.35.14    281
 172.16.47.255     255.255.255.255  On-link      172.16.35.14    281
 192.168.193.0     255.255.255.0    On-link      192.168.193.1   291
 192.168.193.1     255.255.255.255  On-link      192.168.193.1   291
192.168.193.255   255.255.255.255  On-link      192.168.193.1   291
 192.168.233.0     255.255.255.0    On-link      192.168.233.1   291
 192.168.233.1     255.255.255.255  On-link      192.168.233.1   291
192.168.233.255   255.255.255.255  On-link      192.168.233.1   291
 224.0.0.0          240.0.0.0    On-link      127.0.0.1     331
 224.0.0.0          240.0.0.0    On-link      172.16.35.14    281
 224.0.0.0          240.0.0.0    On-link      192.168.233.1   291
 224.0.0.0          240.0.0.0    On-link      192.168.193.1   291
 255.255.255.255   255.255.255.255  On-link      127.0.0.1     331
 255.255.255.255   255.255.255.255  On-link      172.16.35.14    281
 255.255.255.255   255.255.255.255  On-link      192.168.233.1   291
 255.255.255.255   255.255.255.255  On-link      192.168.193.1   291
=====
Persistent Routes:
```

```
Persistent Routes:
  None

Z:\>nslookup
Default Server: pdc.uit.edu
Address: 172.16.32.8

> www.google.com
Server: pdc.uit.edu
Address: 172.16.32.8

Non-authoritative answer:
Name: www.google.com
Addresses: 2a00:1450:4018:807::2004
           142.250.201.132

> 127.0.0.1
Server: pdc.uit.edu
Address: 172.16.32.8

Name: localhost
Address: 127.0.0.1

> exit

Z:\>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

  Connection-specific DNS Suffix  . :
  Link-local IPv6 Address . . . . . : fe80::2ed5:f811:eb50:35da%6
  IPv4 Address. . . . . : 172.16.35.14
  Subnet Mask . . . . . : 255.255.240.0
  Default Gateway . . . . . : 172.16.32.100

Wireless LAN adapter Local Area Connection* 1:
```

```
Z:\>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

  Connection-specific DNS Suffix  . :
  Link-local IPv6 Address . . . . . : fe80::2ed5:f811:eb50:35da%6
  IPv4 Address. . . . . : 172.16.35.14
  Subnet Mask . . . . . : 255.255.240.0
  Default Gateway . . . . . : 172.16.32.100

Wireless LAN adapter Local Area Connection* 1:

  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix  . :

Ethernet adapter VMware Network Adapter VMnet1:

  Connection-specific DNS Suffix  . :
  Link-local IPv6 Address . . . . . : fe80::6ffa:50b4:1e05:2ec7%20
  IPv4 Address. . . . . : 192.168.193.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Ethernet adapter VMware Network Adapter VMnet8:

  Connection-specific DNS Suffix  . :
  Link-local IPv6 Address . . . . . : fe80::5eaf:bf54:4403:6362%17
  IPv4 Address. . . . . : 192.168.233.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :
```

```
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . :

Z:\>ipconfig/all

Windows IP Configuration

Host Name . . . . . : CL2-14
Primary Dns Suffix . . . . . : uit.edu
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : uit.edu

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . . :
Description . . . . . : Realtek PCIe GbE Family Controller
Physical Address. . . . . : C0-18-03-BA-C3-04
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::2ed5:f811:eb50:35da%6(Preferred)
IPv4 Address. . . . . : 172.16.35.14(Preferred)
Subnet Mask . . . . . : 255.255.240.0
Default Gateway . . . . . : 172.16.32.100
DHCPv6 IAID . . . . . : 113252355
DHCPv6 Client DUID. . . . . : 00-01-00-01-2B-A0-BD-DE-C0-18-03-BA-C3-04
DNS Servers . . . . . : 172.16.32.8
                                         172.16.32.7
NetBIOS over Tcpip. . . . . : Enabled

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
Physical Address. . . . . : 32-03-C8-99-9C-E7
```



**Usman Institute of Technology**

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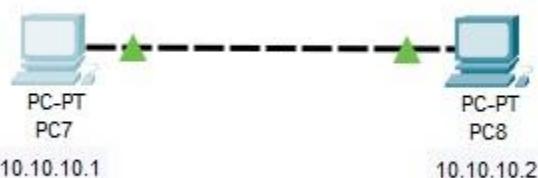
**Fall 2022**

**LAB 2**

## **Task 1:**

1.
  - a. **Cisco Packet Tracer:** Packet Tracer is designed for Cisco networking equipment and focuses on simulating Cisco devices like routers, switches, and access points.
  - b. **Boson Network Simulator:** Boson provides a more vendor-neutral approach. It simulates a variety of networking devices from different manufacturers, allowing users to practice with equipment from multiple vendors.
2.
  - a. **Cisco Packet Tracer:** Supports Cisco devices, including a wide range of routers and switches. It's ideal for learning and practicing Cisco-specific configurations.
  - b. **Boson Network Simulator:** Offers a broader range of supported devices, including equipment from Cisco as well as other major networking vendors.
3.  
:
  - a. **Cisco Packet Tracer:** Packet Tracer is focused on basic to intermediate networking concepts and may not offer the advanced features and protocols supported by real Cisco hardware.
  - b. **Boson Network Simulator:** Provides a more extensive set of features and supports advanced networking protocols and configurations.
4.
  - a. **Cisco Packet Tracer:** Cisco Packet Tracer is often available for free for educational purposes to students enrolled in Cisco Networking Academy courses.
  - b. **Boson Network Simulator:** Boson's products typically come with a cost, and they offer a range of products and packages with different pricing options

## **Task 2:**



IP Configuration

Interface: FastEthernet0

IP Configuration

DHCP       Static

IP Address: 10.10.10.1

Subnet Mask: 255.0.0.0

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

IP Configuration

Interface: FastEthernet0

IP Configuration

DHCP       Static

IP Address: 10.10.10.2

Subnet Mask: 255.0.0.0

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

```
C:\>ipconfig

FastEthernet0 Connection: (default port)

  Link-local IPv6 Address.....: FE80::2D0:BAFF:FEB3:3D33
  IP Address.....: 10.10.10.1
  Subnet Mask.....: 255.0.0.0
  Default Gateway.....: 0.0.0.0

Bluetooth Connection:

  Link-local IPv6 Address.....: ::
  IP Address.....: 0.0.0.0
  Subnet Mask.....: 0.0.0.0
  Default Gateway.....: 0.0.0.0
```

```
C:\>ipconfig

FastEthernet0 Connection: (default port)

Link-local IPv6 Address.....: FE80::260:5CFF:FEC0:875
IP Address.....: 10.10.10.2
Subnet Mask.....: 255.0.0.0
Default Gateway.....: 0.0.0.0

Bluetooth Connection:

Link-local IPv6 Address.....: ::
IP Address.....: 0.0.0.0
Subnet Mask.....: 0.0.0.0
Default Gateway.....: 0.0.0.0
```

```
Command Prompt

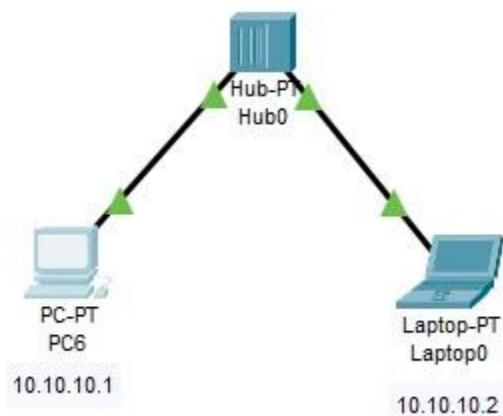
Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time<1ms TTL=128
Reply from 10.10.10.2: bytes=32 time<1ms TTL=128
Reply from 10.10.10.2: bytes=32 time<1ms TTL=128
Reply from 10.10.10.2: bytes=32 time=1ms TTL=128

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

### Task 3:



IP Configuration

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	10.10.10.1
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

IP Configuration

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	10.10.10.2
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
DNS Server	0.0.0.0

```
C:\>ipconfig

FastEthernet0 Connection: (default port)

  Link-local IPv6 Address.....: FE80::2D0:BAFF:FE83:3D33
  IP Address.....: 10.10.10.1
  Subnet Mask.....: 255.0.0.0
  Default Gateway.....: 0.0.0.0

Bluetooth Connection:

  Link-local IPv6 Address.....: ::
  IP Address.....: 0.0.0.0
  Subnet Mask.....: 0.0.0.0
  Default Gateway.....: 0.0.0.0
```

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

Link-local IPv6 Address.....: FE80::20C:FFFF:FE9A:4D27
IP Address.....: 10.10.10.2
Subnet Mask.....: 255.0.0.0
Default Gateway.....: 0.0.0.0

Bluetooth Connection:

Link-local IPv6 Address.....: ::
IP Address.....: 0.0.0.0
Subnet Mask.....: 0.0.0.0
Default Gateway.....: 0.0.0.0
```

Command Prompt

```
Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.2

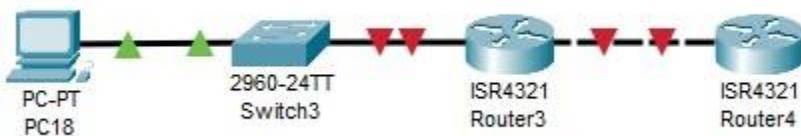
Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time<lms TTL=128

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

A hub connects multiple devices in a network, broadcasting data to all connected devices without intelligence for specific routing.

#### Task 4:





**Usman Institute of Technology**

**Department of Computer Science**

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**Fall 2022**

**LAB 3**

1. Excessive bending of UTP (Unshielded Twisted Pair) cable is not recommended because it might result in signal loss and potentially cable damage. UTP cables are made of precisely twisted pairs of copper wires that are twisted at a specific rate to prevent electromagnetic interference (EMI) and crosstalk. Excessive bending can cause these pairs' balance and twist to be disrupted, resulting in increased crosstalk and signal loss.
2. It is not recommended to run UTP cable outside of a building since UTP cables are not designed to resist exposure to environmental elements. They are primarily intended for indoor use, and their outside insulation is not weatherproof. When exposed to moisture, UV radiation, temperature variations, and other outdoor factors, UTP cables can degrade, leading to signal loss and potential cable damage. .
3. The recommended maximum cable length for UTP (Unshielded Twisted Pair) cable depends on the specific category of UTP cable you are using. Here are the maximum cable lengths for some common UTP cable categories:
  - Cat5e: The maximum recommended cable length for Cat5e UTP cable is 100 meters (about 328 feet). This standard is defined by both TIA/EIA-568 and ISO/IEC 11801.
  - Cat6: Cat6 UTP cable also has a maximum recommended length of 100 meters, following the same industry standards as Cat5e.
  - Cat6a: Cat6a UTP cable can support longer cable runs, with a maximum recommended length of 100 meters as well. It provides better performance and can support higher data rates at this length compared to Cat5e and Cat6.



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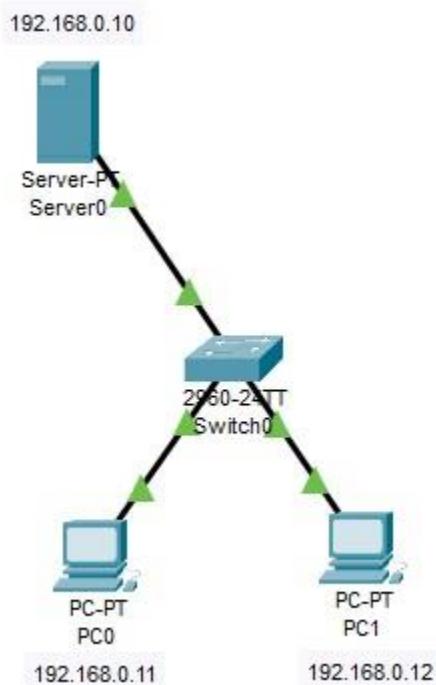
**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2022**

## **LAB 4**

## Network:



IP Configuration

IP Configuration

DHCP       Static

IP Address: 192.168.0.10

Subnet Mask: 255.255.255.0

IP Configuration

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	192.168.0.11
Subnet Mask	255.0.0.0

IP Configuration

Interface	FastEthernet0
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	192.168.0.12
Subnet Mask	255.0.0.0

### Connecting to Server:

```
Command Prompt
C:\>ping 10.10.10.2

Pinging 10.10.10.2 with 32 bytes of data:

Reply from 10.10.10.2: bytes=32 time<1ms TTL=128

Ping statistics for 10.10.10.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ftp 10.10.10.3
Trying to connect...10.10.10.3
Connected to 10.10.10.3
220- Welcome to PT Ftp server
Username:RIJA
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp> put LAB04.txt

Writing file LAB04.txt to 10.10.10.3:
File transfer in progress...

[Transfer complete - 22 bytes]

22 bytes copied in 0.054 secs (407 bytes/sec)
ftp>rename LAB04.txt new.txt

Renaming LAB04.txt
ftp>
[OK Renamed file successfully from LAB04.txt to new.txt]
ftp>

FTP 10.10.10.3
Trying to connect...10.10.10.3
Connected to 10.10.10.3
220- Welcome to PT Ftp server
Username:RIJA
331- Username ok, need password
Password:
230- Logged in
(passive mode On)
ftp>get LAB04.txt

Reading file LAB04.txt from 10.10.10.3:
File transfer in progress...

[Transfer complete - 22 bytes]

22 bytes copied in 0 secs
ftp>
```

**PWD, CD, QUIT:**

```
ftp>put file.txt

Writing file file.txt to 192.168.0.10:
File transfer in progress...

[Transfer complete - 6 bytes]

6 bytes copied in 0.044 secs (136 bytes/sec)
```

**Renaming file:**

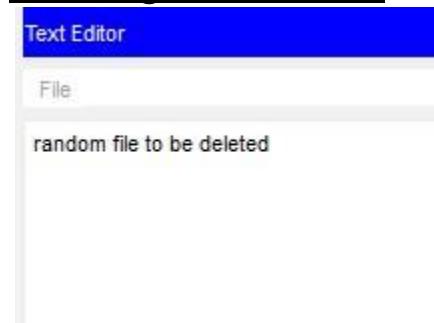
```
ftp>rename file.txt Lab4.txt

Renaming file.txt
ftp>
[OK Renamed file successfully from file.txt to Lab4.txt]
```

**File renamed:**

```
1 Lab4.txt  
2 asa842-k8.bin  
3 asa923-k8.bin  
4 c1841-advinservicesk9-mz.124-15.T1.bin
```

### **Creating random file:**



### **Putting file in server:**

```
ftp>put random.txt  
  
Writing file random.txt to 192.168.0.10:  
File transfer in progress...  
  
[Transfer complete - 10 bytes]  
  
10 bytes copied in 0.047 secs (212 bytes/sec)
```

### **File added to server:**

```
33 pt1000-i-mz.122-28.bin  
  
34 pt3000-i6q4l2-mz.121-22.EA4.bin  
  
35 random.txt
```

### **Deleting random.txt:**

```
ftp>delete random.txt  
  
Deleting file random.txt from 192.168.0.10: ftp>  
[Deleted file random.txt successfully ]
```

### **random.txt deleted:**

```
32 ir800_yocto-1.7.2_python-2.7.3.tar  
  
33 pt1000-i-mz.122-28.bin  
  
34 pt3000-i6q4l2-mz.121-22.EA4.bin
```

**Dir:**

```
Listing /ftp directory from 192.168.0.10:
0  : Lab4.txt                               6
1  : asa842-k8.bin                          5571584
2  : asa923-k8.bin                          30468096
3  : c1841-advipsericesk9-mz.124-15.T1.bin 33591768
4  : c1841-ipbase-mz.123-14.T7.bin        13832032
5  : c1841-ipbasek9-mz.124-12.bin         16599160
6  : c1900-universalk9-mz.SPA.155-3.M4a.bin 33591768
7  : c2600-advipsericesk9-mz.124-15.T1.bin 33591768
8  : c2600-i-mz.122-28.bin                  5571584
9  : c2600-ipbasek9-mz.124-8.bin           13169700
10 : c2800nm-advipsericesk9-mz.124-15.T1.bin 50938004
11 : c2800nm-advipsericesk9-mz.151-4.M4.bin 33591768
12 : c2800nm-ipbase-mz.123-14.T7.bin      5571584
13 : c2800nm-ipbasek9-mz.124-8.bin        15522644
14 : c2900-universalk9-mz.SPA.155-3.M4a.bin 33591768
15 : c2950-i6q412-mz.121-22.EA4.bin       3058048
16 : c2950-i6q412-mz.121-22.EA8.bin       3117390
17 : c2960-lanbase-mz.122-25.FX.bin       4414921
18 : c2960-lanbase-mz.122-25.SEE1.bin     4670455
19 : c2960-lanbasek9-mz.150-2.SE4.bin     4670455
20 : c3560-advipsericesk9-mz.122-37.SEL1.bin 8662192
21 : c3560-advipsericesk9-mz.122-46.SE.bin 10713279
22 : c800-universalk9-mz.SPA.152-4.M4.bin 33591768
23 : c800-universalk9-mz.SPA.154-3.M6a.bin 83029236
24 : cat3k_caa-universalk9.16.03.02.SPA.bin 505532849
25 : cgr1000-universalk9-mz.SPA.154-2.CG   159487552
26 : cgr1000-universalk9-mz.SPA.156-3.CG   184530138
27 : ir800-universalk9-bundle.SPA.156-3.M.bin 160968869
28 : ir800-universalk9-mz.SPA.155-3.M       61750062
29 : ir800-universalk9-mz.SPA.156-3.M       63753767
30 : ir800_yocto-1.7.2.tar                 2877440
31 : ir800_yocto-1.7.2_python-2.7.3.tar    6912000
32 : pt1000-i-mz.122-28.bin                5571584
33 : pt3000-i6q412-mz.121-22.EA4.bin       3117390
```



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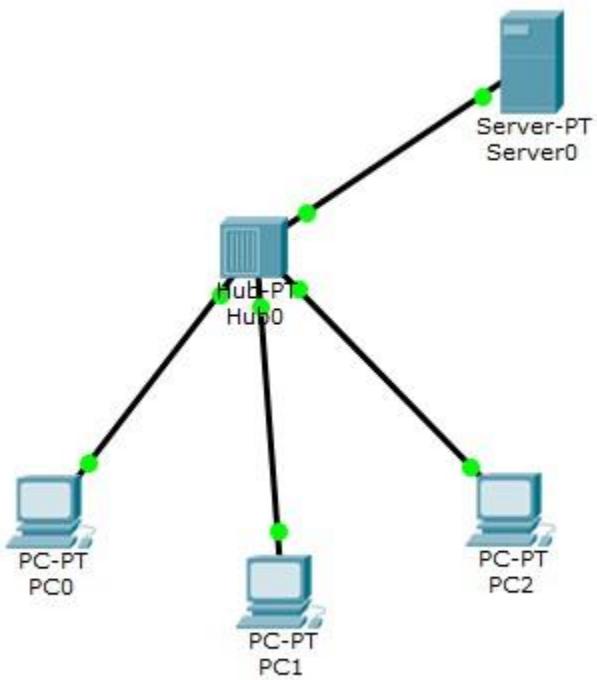
**Department of Computer Science**

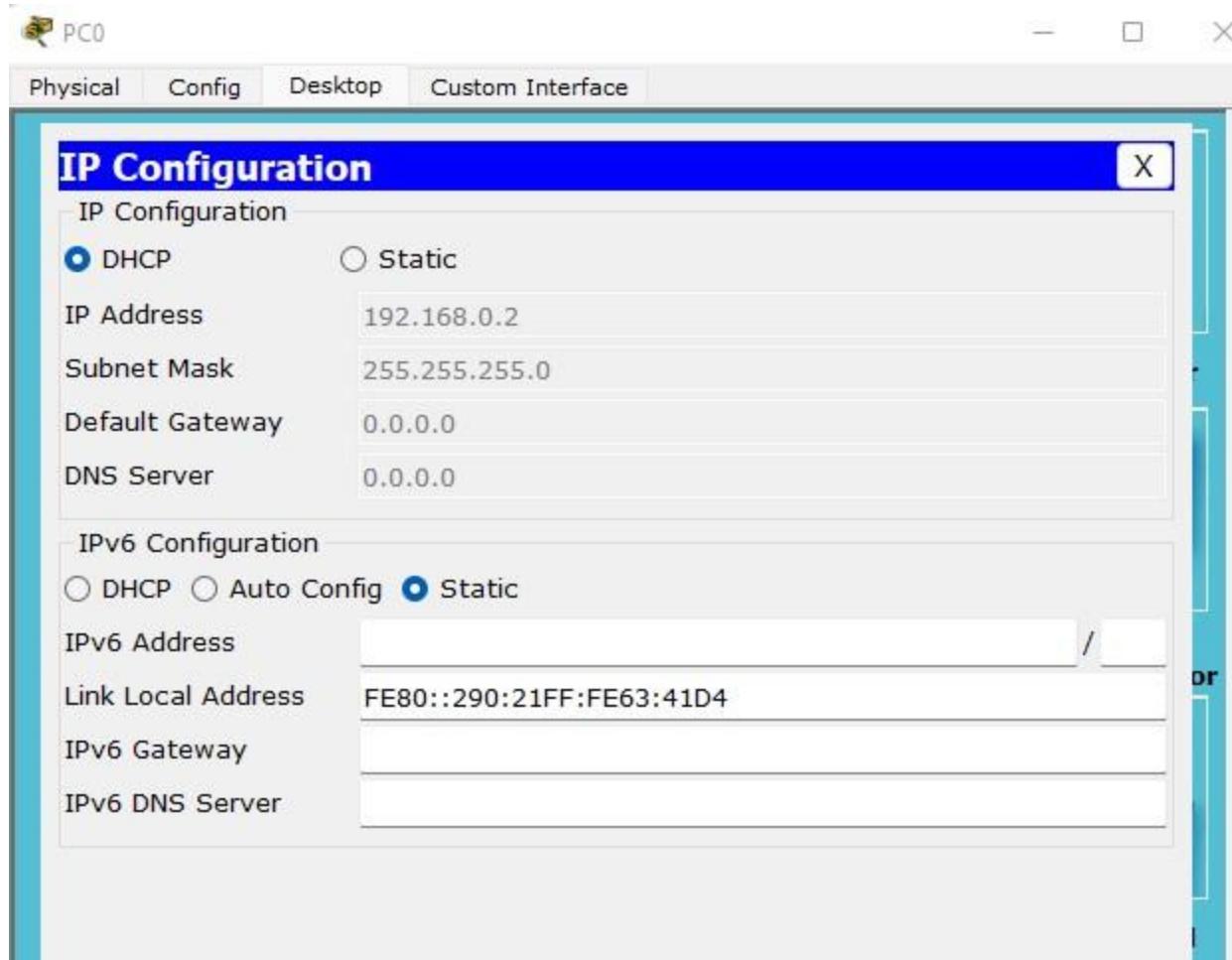
**Course Code: CS222**

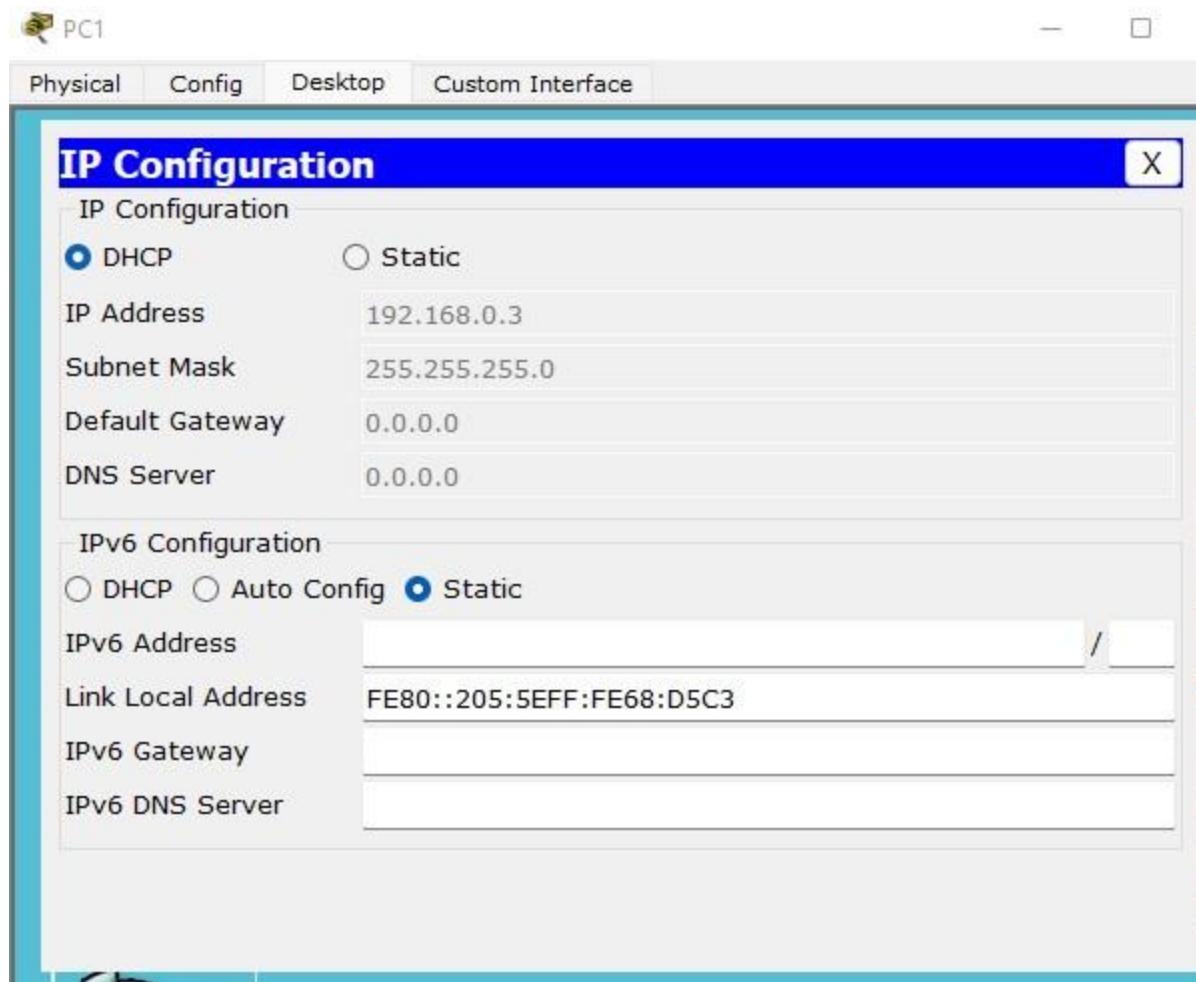
**Course Title: Data Communication & Computer Networks**

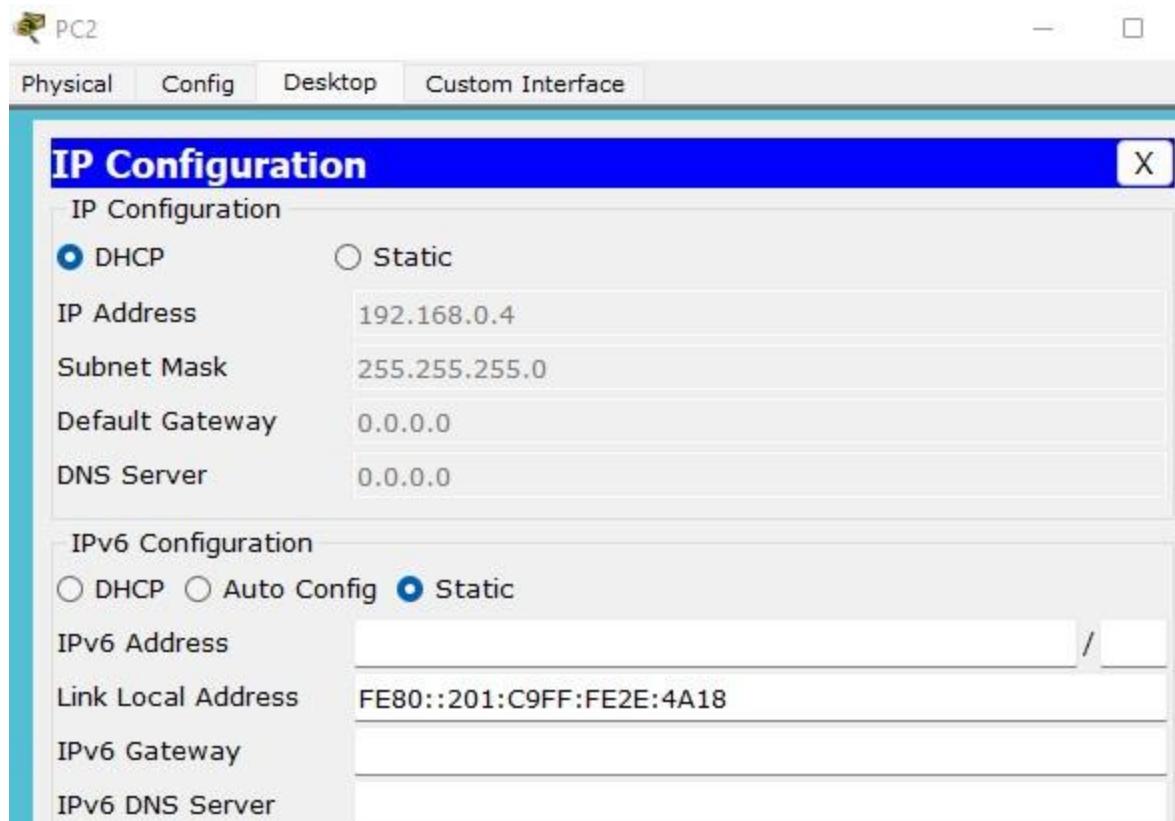
**Fall 2022**

**LAB 5**

**Lab Performance:****DHCP**







Server0

Physical Config Services Desktop Custom Interface

**SERVICES**

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP

**DHCP**

Interface: FastEthernet0 Service:  On  Off

Pool Name: serverPool

Default Gateway: 192.168.1.0

DNS Server: 0.0.0.0

Start IP Address : 192 168 1 0

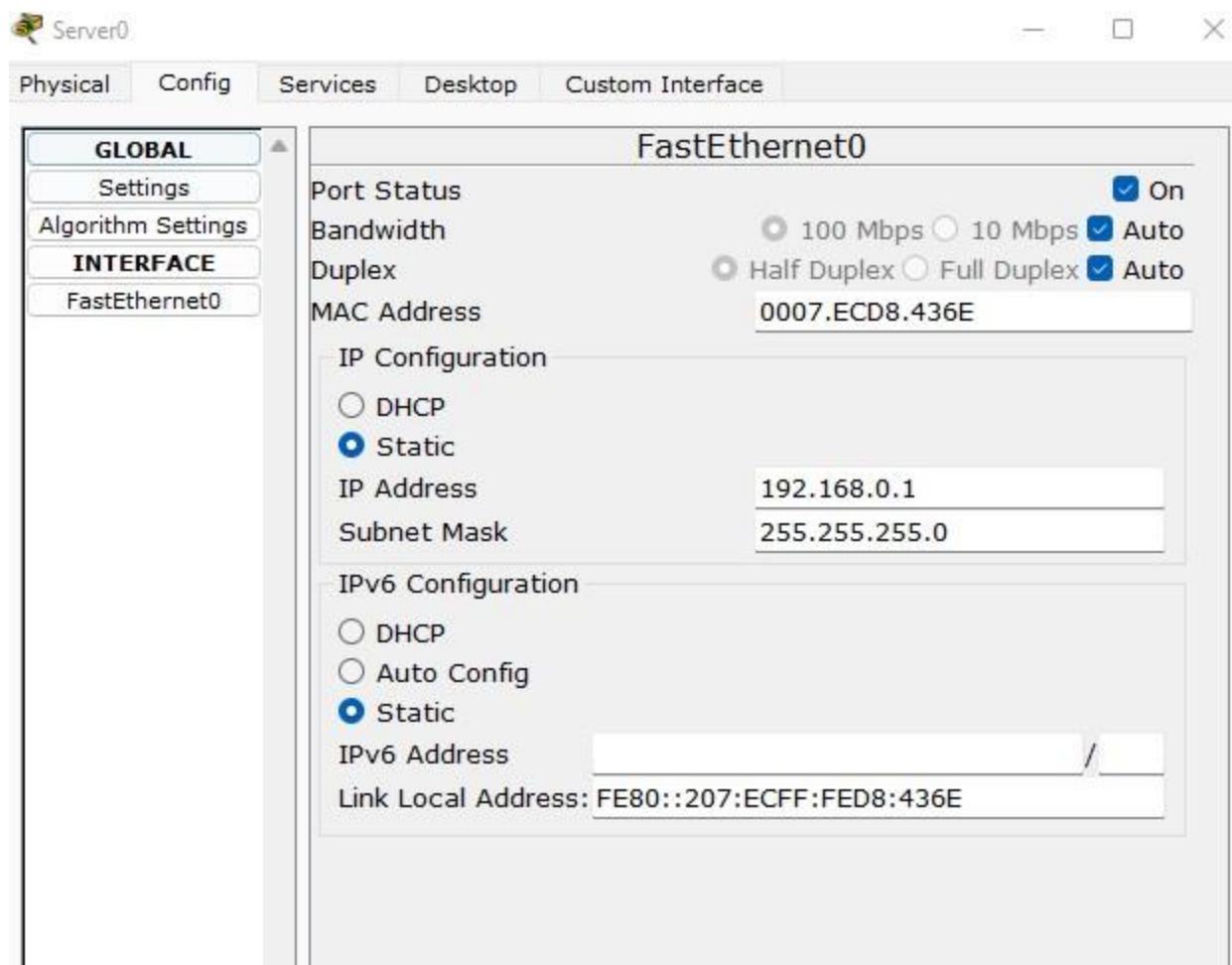
Subnet Mask: 255 255 255 0

Maximum number of Users : 512

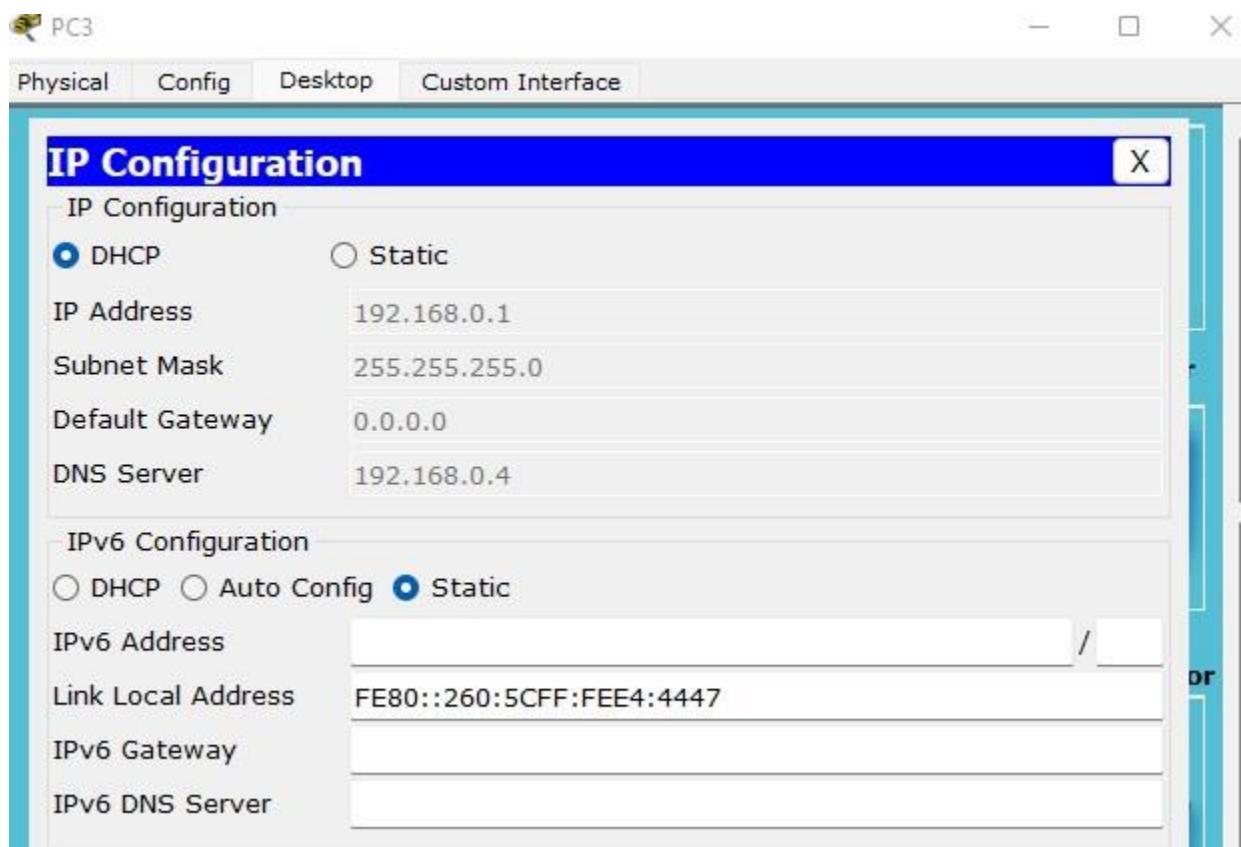
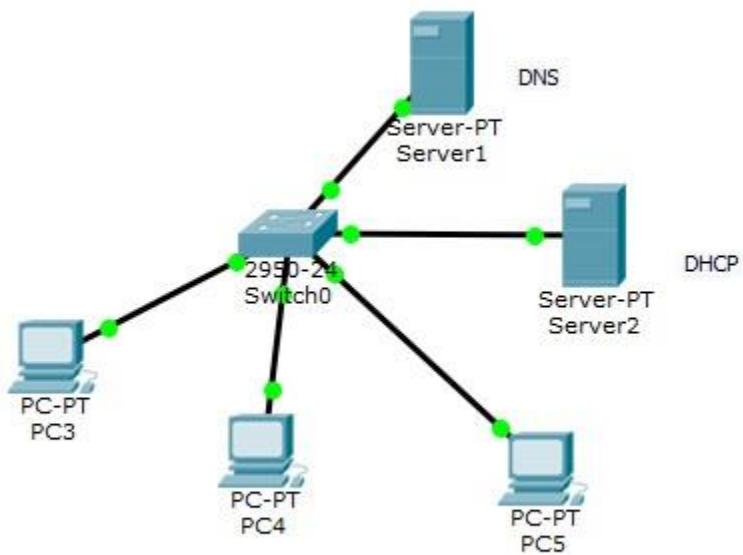
TFTP Server: 0.0.0.0

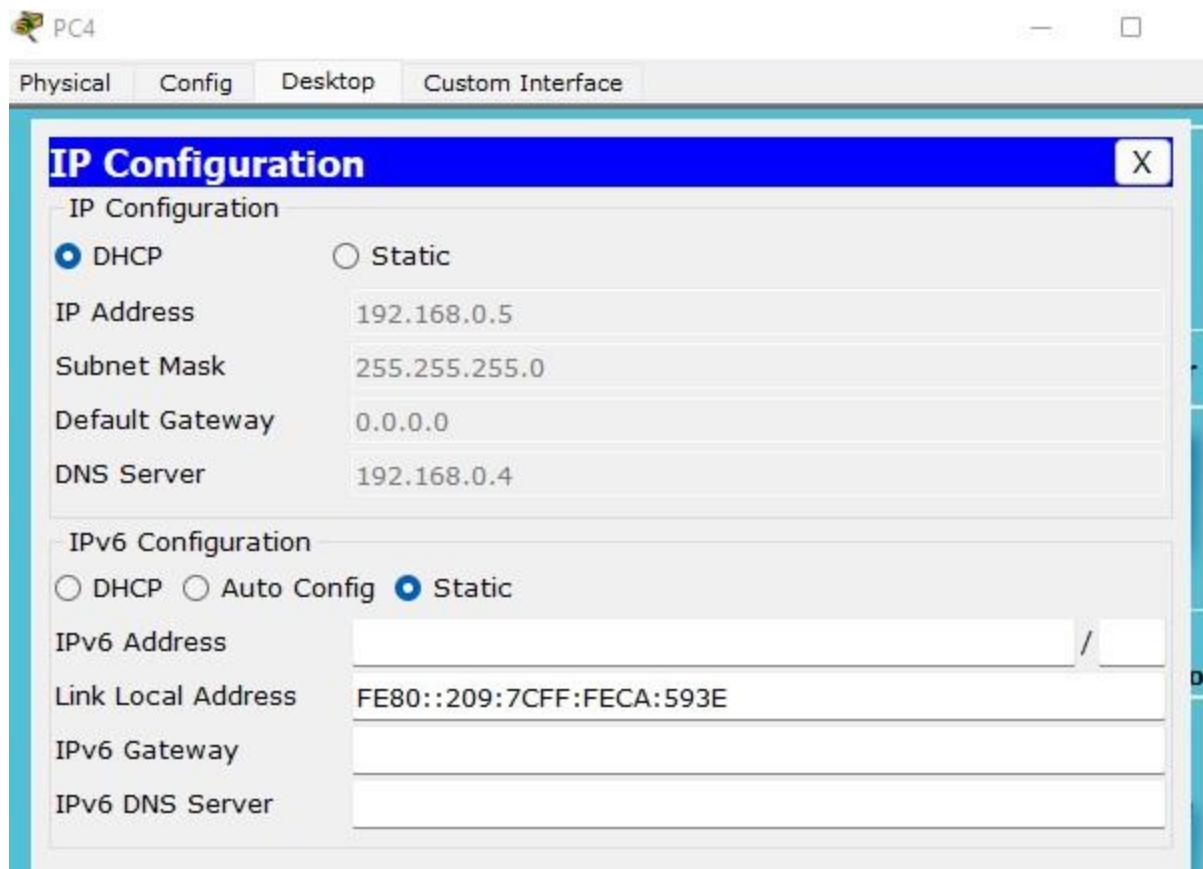
Add Save Remove

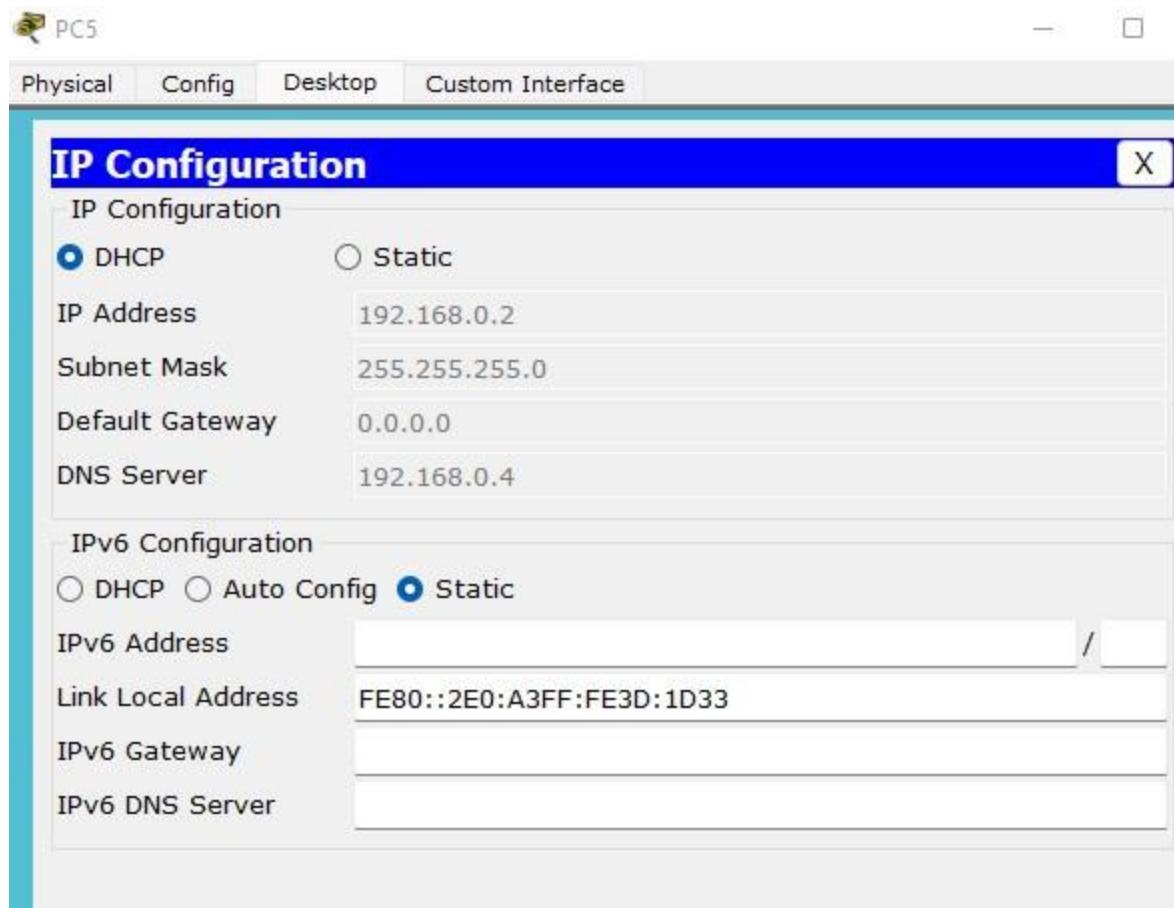
Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP
server...	0.0.0.0	0.0.0.0	192.168.0.0	255.255....	512	0.0.0.0

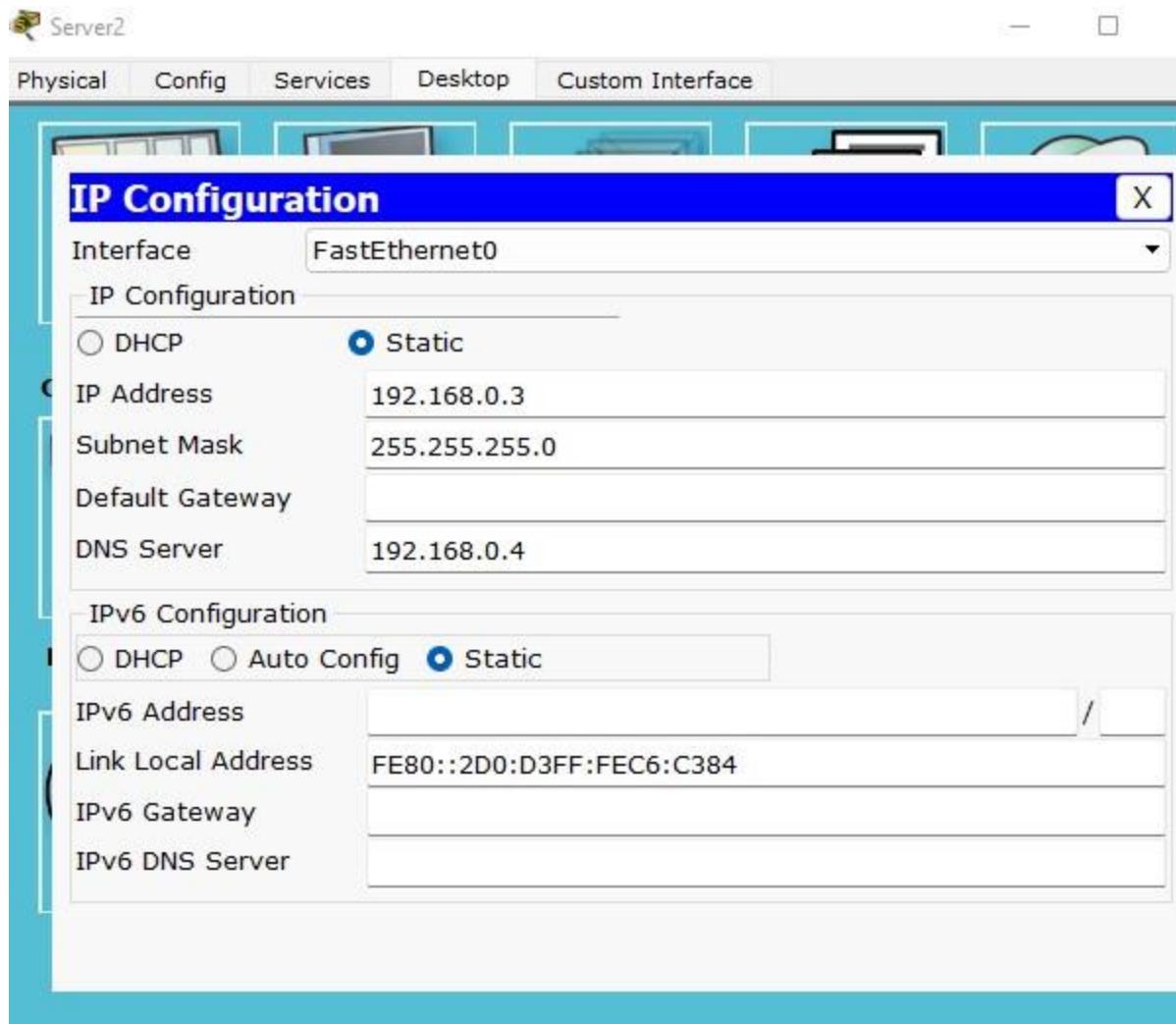


DNS:









Server1

Physical Config Services Desktop Custom Interface

## IP Configuration

Interface: FastEthernet0

DHCP  Static

IP Address: 192.168.0.4

Subnet Mask: 255.255.255.0

Default Gateway:

DNS Server: 192.168.0.4

IPv6 Configuration

DHCP  Auto Config  Static

IPv6 Address: /

Link Local Address: FE80::290:2BFF:FE9E:A287

IPv6 Gateway:

IPv6 DNS Server:

## Command Prompt

```
PC>ping pc4
Pinging 192.168.0.5 with 32 bytes of data:
Reply from 192.168.0.5: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

PC>ping pc5
Pinging 192.168.0.2 with 32 bytes of data:
Reply from 192.168.0.2: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```



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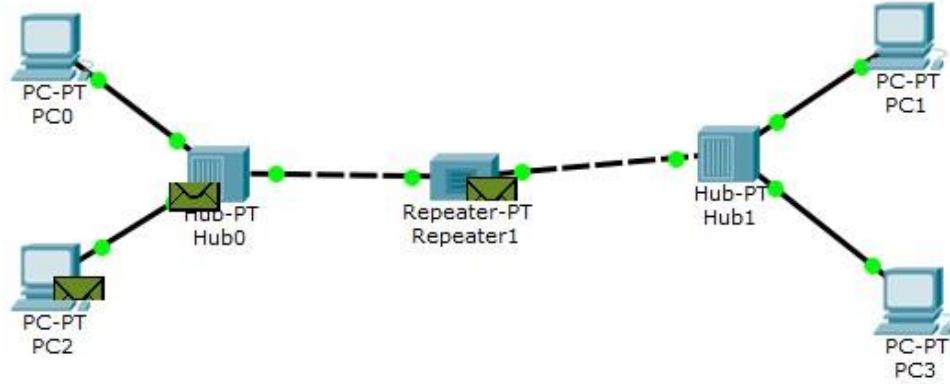
**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2022**

**LAB 6**

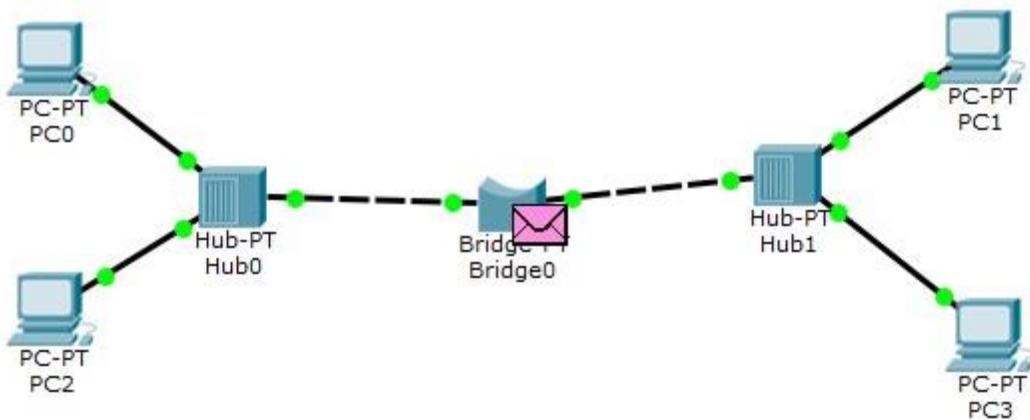
Task1)



Observations:

- Hubs and repeaters are not able to decide what to forward based on the destination address because they function at Layer 1. To every device that is linked, they broadcast the data.
- In this configuration, PC0 sends a data packet to both PC3 and PC4, but only PC4 actually processes it if the destination address matches.
- The network is not using bandwidth effectively because instead of transmitting data directly to the intended receiver, it is broadcasting it to all devices. One disadvantage of network architecture involving hubs and repeaters is this.

2)



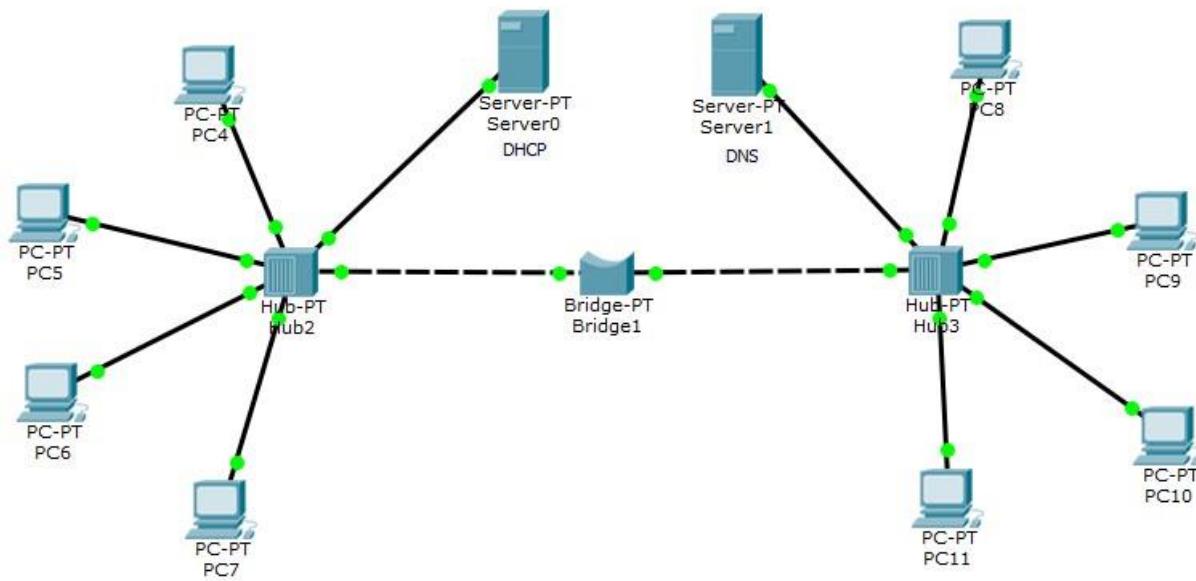
Observations:

- The network can be divided due to the bridge. By intelligently forwarding the data packet only to the other side of the network, it avoids the packet from being unnecessarily broadcast to every device on the first hub.
- In this configuration, PC1 sends a data packet to both PC3 and PC4, but only PC4 actually processes it if the destination address matches.
- When compared to a configuration consisting of hubs, the network uses bandwidth more effectively since the bridge cuts down on unnecessary network traffic.

## **Lab Task**

### **Task 2**

#### **Network Topology:**

**PC4**

### IP Configuration

**IP Configuration**

DHCP       Static

IP Address	10.0.0.1
Subnet Mask	255.0.0.0
Default Gateway	0.0.0.0
DNS Server	10.10.10.1

**IPv6 Configuration**

DHCP     Auto Config     Static

IPv6 Address	/
Link Local Address	FE80::2E0:F7FF:FE6E:B4B6
IPv6 Gateway	
IPv6 DNS Server	

**DHCP**

**IP Configuration** X

Interface	FastEthernet0	▼
<b>IP Configuration</b>		
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static	
IP Address	10.10.10.0	
Subnet Mask	255.0.0.0	
Default Gateway		
DNS Server	10.10.10.1	
<b>IPv6 Configuration</b>		
<input type="radio"/> DHCP	<input type="radio"/> Auto Config	<input checked="" type="radio"/> Static
IPv6 Address	/	
Link Local Address	FE80::290:2BFF:FEBB:9246	
IPv6 Gateway		
IPv6 DNS Server		

**DNS**

**IP Configuration** X

Interface	FastEthernet0	▼
<b>IP Configuration</b>		
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static	
IP Address	10.10.10.1	
Subnet Mask	255.0.0.0	
Default Gateway		
DNS Server	10.10.10.1	
<b>IPv6 Configuration</b>		
<input type="radio"/> DHCP	<input type="radio"/> Auto Config	<input checked="" type="radio"/> Static
IPv6 Address	/	
Link Local Address	FE80::210:11FF:FE07:7A69	
IPv6 Gateway		
IPv6 DNS Server		

```
PC>ping pc7

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC>ping pc11

Pinging 10.0.0.8 with 32 bytes of data:

Reply from 10.0.0.8: bytes=32 time=1ms TTL=128
Reply from 10.0.0.8: bytes=32 time=1ms TTL=128
Reply from 10.0.0.8: bytes=32 time=0ms TTL=128
Reply from 10.0.0.8: bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

## Task 2

1)  
10000001 = 129  
00001011 = 11  
00001011 = 11  
11101111 = 239

**129.11.11.239**

2)  
111 = 01101111  
56 = 00111000  
45 = 00101101  
78 = 01001110

**01101111.00111000.00101101.01001110**



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**LAB 7**

**Switch 0**

```

Switch>en
Switch# show interface fa0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 0009.7cda.78e0 (bia 0009.7cda.78e0)
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/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

Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 2
Switch(config-vlan)#name vlan2
Switch(config-vlan)#exit
Switch(config)#interface vlan2
Switch(config-if)#
*LINK-5-CHANGED: Interface Vlan2, changed state to up

Switch(config-if)#ip address 192.168.1.1 255.255.255.0
Switch(config-if)#no shutdown
Switch(config-if)#interface fa0/1
Switch(config-if)#switchport access vlan 2
Switch(config-if)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan2, changed state to up

Switch(config-if)#ping 192.168.1.2
^
  
```

```
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/0 ms

Switch#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Switch#
```

### **Switch1:**

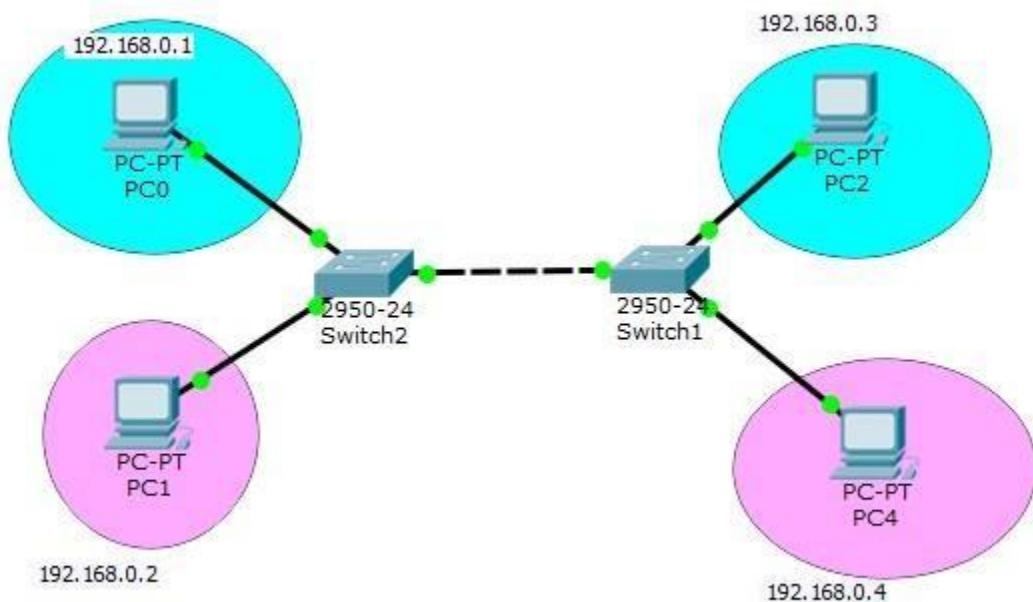
```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 2
Switch(config-vlan)#interface vlan 2
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan2, changed state to up

Switch(config-if)#ip address 192.168.1.2 255.255.255.0
Switch(config-if)#no shutdown
Switch(config-if)#interface fa0/1
Switch(config-if)#switchport access vlan 2
Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan2, changed state to up
```

## **Lab Tasks**

### **Task 1**

The Catalyst 29xx switch series is more basic, while the Catalyst 35xx/36xx switch series offers advanced features. Using a simulation tool like Packet Tracer, the Catalyst 35xx/36xx switch series provides a more realistic environment for practicing advanced networking configurations, making it a better choice for learning and preparing for real-world network scenarios, especially in enterprise and data center environments.

**Task 2**

```

Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name factaha
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name stutaha
Switch(config-vlan)#exit
Switch(config)#exit

Switch#show vlan brief



| VLAN Name               | Status | Ports                               |
|-------------------------|--------|-------------------------------------|
| 1 default               | active | Fa0/1, Fa1/1, Fa3/1, Fa4/1<br>Fa5/1 |
| 10 factaha              | active | Fa2/1                               |
| 20 stutaha              | active |                                     |
| 1002 fddi-default       | active |                                     |
| 1003 token-ring-default | active |                                     |
| 1004 fddinet-default    | active |                                     |
| 1005 trnet-default      | active |                                     |



Switch#en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa2/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#int fal/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(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

```

### IP Configuration

X

IP Configuration	<input type="radio"/> DHCP <input checked="" type="radio"/> Static
IP Address	192.168.0.1
Subnet Mask	255.255.255.0
Default Gateway	
DNS Server	

### IP Configuration

X

IP Configuration

DHCP       Static

IP Address: 192.168.0.2

Subnet Mask: 255.255.255.0

Default Gateway:

DNS Server: 0.0.0.0

### IP Configuration

X

IP Configuration

DHCP       Static

IP Address: 192.168.0.3

Subnet Mask: 255.255.255.0

Default Gateway:

DNS Server:

### IP Configuration

X

IP Configuration

DHCP       Static

IP Address: 192.168.0.4

Subnet Mask: 255.255.255.0

Default Gateway:

DNS Server:

```

PC>ping 192.168.0.4

Pinging 192.168.0.4 with 32 bytes of data:

Reply from 192.168.0.4: bytes=32 time=1ms TTL=128
Reply from 192.168.0.4: bytes=32 time=1ms TTL=128
Reply from 192.168.0.4: bytes=32 time=0ms TTL=128
Reply from 192.168.0.4: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.0.4:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 192.168.0.3

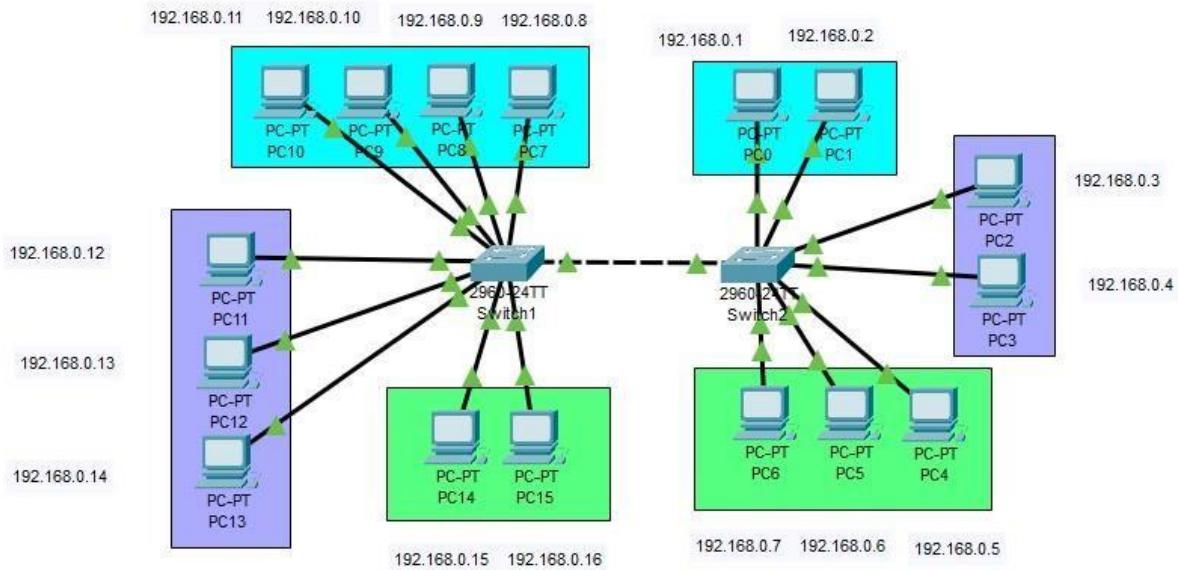
Pinging 192.168.0.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.3:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

```

### Task 3:



### Switch 0:

```
Switch#show vlan brief

VLAN Name          Status    Ports
---- -----
1    default        active    Fa1/1, Fa2/1, Fa3/1, Fa4/1
                           Fa5/1
10   finance         active
1002  fddi-default  active
1003  token-ring-default  active
1004  fddinet-default  active
1005  trnet-default  active
.
```

```
Switch>
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa1/1
Switch(config-if)#exit
Switch(config)#vlan 10
Switch(config-vlan)#name finance
Switch(config-vlan)#exit
Switch(config)#exit
.
```

```
Switch#en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa1/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#
Switch(config)#
.
```

## Switch 1:

```
Switch#show vlan brief

VLAN Name          Status    Ports
---- -----
1    default        active    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
20   marketing      active    Fa0/7, Fa0/8
30   accounting     active    Fa0/5, Fa0/6
40   sales           active    Fa0/2, Fa0/3, Fa0/4
1002  fddi-default  active
1003  token-ring-default  active
1004  fddinet-default  active
1005  trnet-default  active
Switch#
```

```
Switch#en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 20
Switch(config-vlan)#name marketing
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name accounting
Switch(config-vlan)#exit
Switch(config)#vlan 40
Switch(config-vlan)#name sales
Switch(config-vlan)#exit
Switch(config)#exit
c...+~h#
```

```
Switch#en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int fa0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#exit
Switch(config)#int fa0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#exit
Switch(config)#int fa0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#exit
Switch(config)#int fa0/5
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#exit
Switch(config)#int fa0/6
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#exit
Switch(config)#int fa0/7
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#int fa0/8
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20

Switch(config)#int fa0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#exit
c...+~h#
```

## IP Addresses of PCs

 PC0

Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.1			
Subnet Mask	255.255.255.0			

 PC1

Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.2			
Subnet Mask	255.255.255.0			

 PC2

Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.3			
Subnet Mask	255.255.255.0			

 PC3

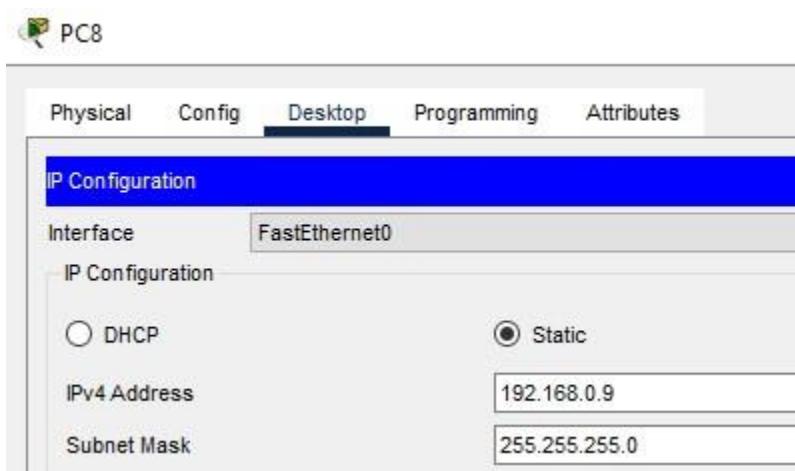
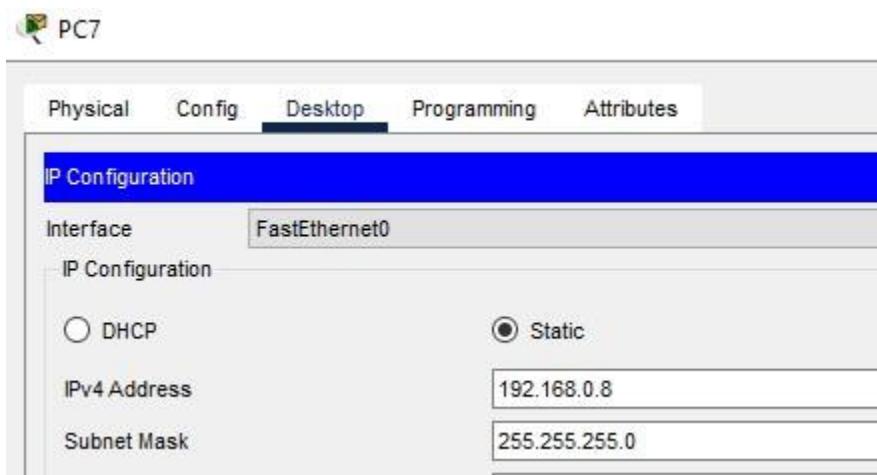
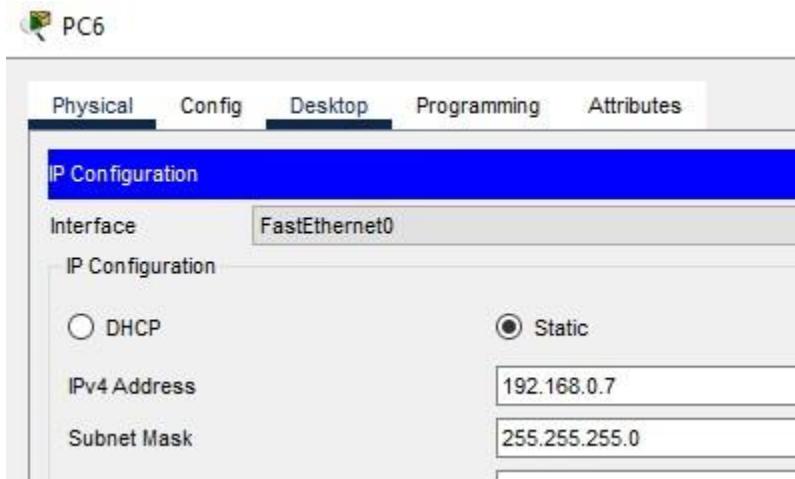
Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.4			
Subnet Mask	255.255.255.0			

 PC4

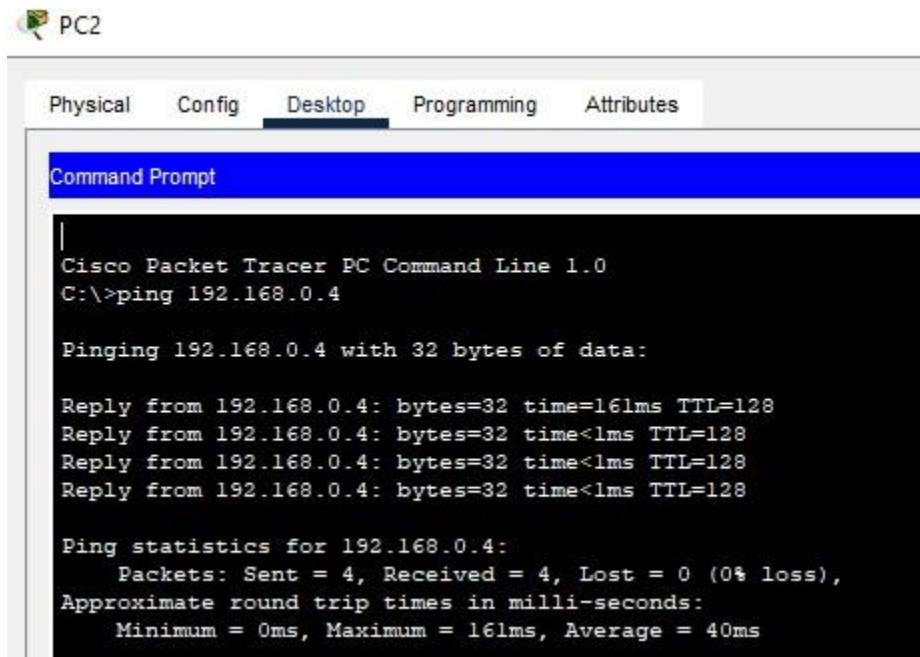
Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.5			
Subnet Mask	255.255.255.0			

 PC5

Physical	Config	Desktop	Programming	Attributes
<b>IP Configuration</b>				
Interface	FastEthernet0			
IP Configuration				
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static			
IPv4 Address	192.168.0.6			
Subnet Mask	255.255.255.0			



## Communication In a VLAN



The screenshot shows the Cisco Packet Tracer interface with a window titled "PC2". The tab bar at the top includes "Physical", "Config", "Desktop", "Programming" (which is selected), and "Attributes". Below the tabs is a blue header bar labeled "Command Prompt". The main area of the window displays the following command-line session:

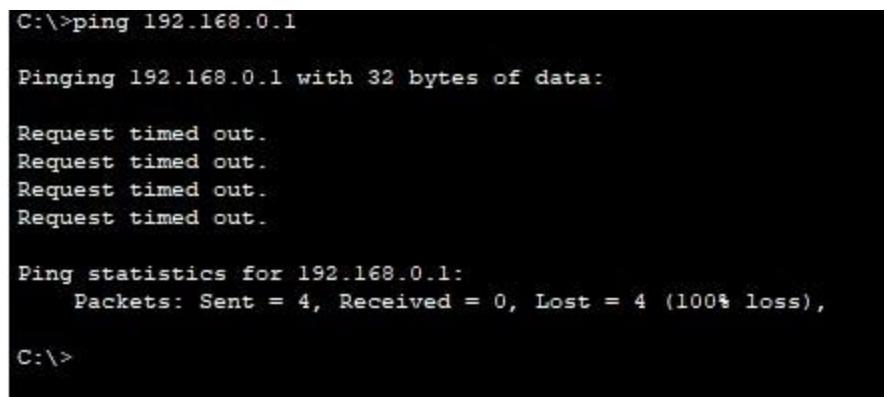
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.4

Pinging 192.168.0.4 with 32 bytes of data:

Reply from 192.168.0.4: bytes=32 time=161ms TTL=128
Reply from 192.168.0.4: bytes=32 time<1ms TTL=128
Reply from 192.168.0.4: bytes=32 time<1ms TTL=128
Reply from 192.168.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 161ms, Average = 40ms
```

### **VLAN to another VLAN**



The screenshot shows the Cisco Packet Tracer interface with a window displaying a command-line session. The session starts with a ping command to an IP address that likely does not exist in the current VLAN, resulting in multiple "Request timed out" messages. It then displays ping statistics showing 100% loss.

```
C:\>ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```



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**LAB 8**

Switch1

Physical Config CLI

### IOS Command Line Interface

```

Switch>en
Switch#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority 32769
              Address 0002.1631.8709
              This bridge is the root
              Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

  Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
              Address 0002.1631.8709
              Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
              Aging Time 20

  Interface      Role Sts Cost      Prio.Nbr Type
  ----- -----
  Fa0/1          Desg FWD 19        128.1    P2p
  Fa0/2          Desg FWD 19        128.2    P2p

```

Switch2

Physical Config CLI

### IOS Command Line Interface

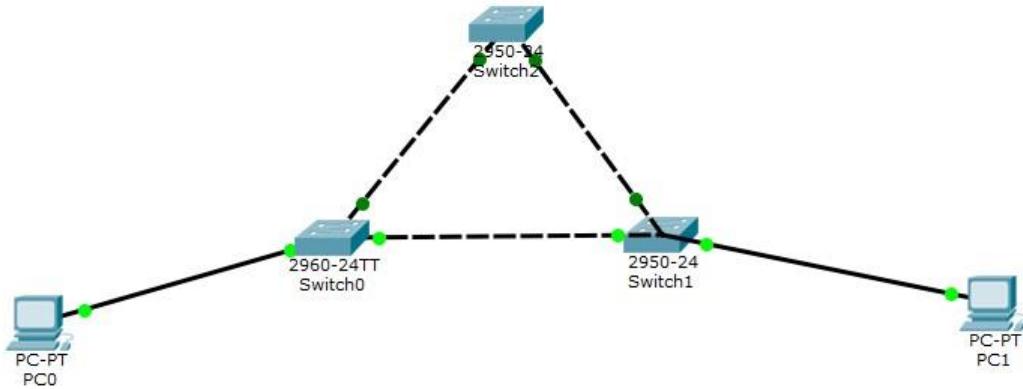
```

Switch>en
Switch#sh spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority 32769
              Address 0002.1631.8709
              Cost 19
              Port 2 (FastEthernet0/2)
              Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

  Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
              Address 000B.BE78.3161
              Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
              Aging Time 20

  Interface      Role Sts Cost      Prio.Nbr Type
  ----- -----
  Fa0/2          Root FWD 19       128.2    P2p
  Fa0/1          Desg FWD 19       128.1    P2p

```



## OBSERVATIONS:

1. It is observed that switch 1 is the root bridge as it contains lowest mac address among three switches interconnected with eachother2. We used command “sh spanning-tree” to look at the details of spanning tree to find out which port is root port and which port is designated port
3. Priority for the bridge is 32768 by default but we observed that the priority changed to 32769 because the default VLAN 1 is added to the priority.
4. It's a layer two protocol that makes a topology loop free and it runs on bridge and switch.
5. Above scenario shows that under such circumstances where there is a loop and if the spanning tree is not activated then the problem of broadcast storms rises.

### Switch 0

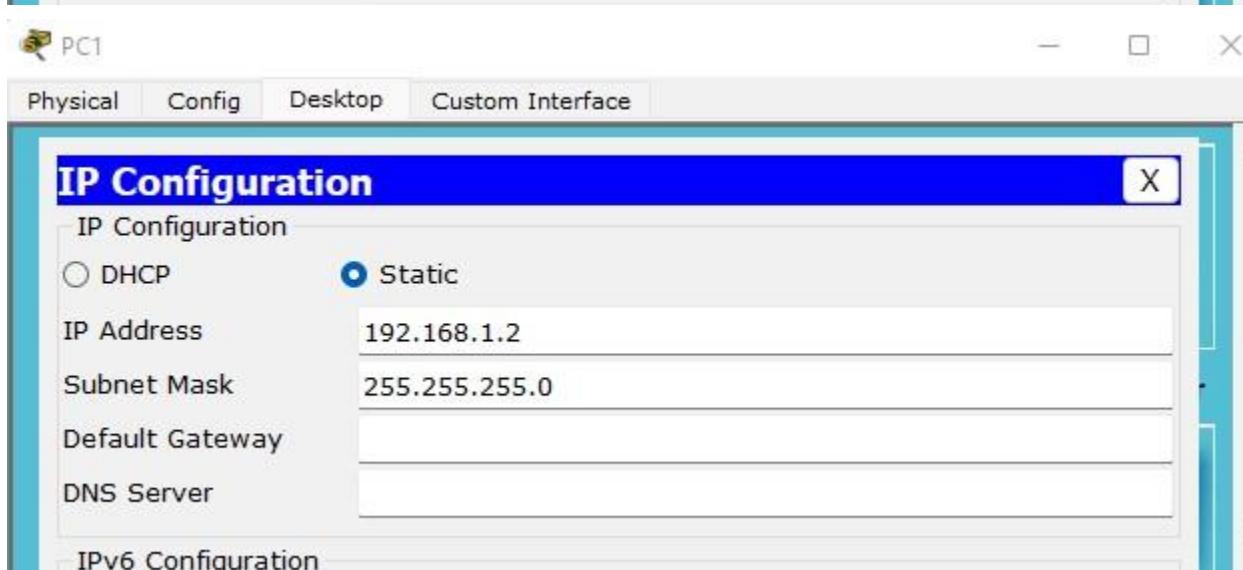
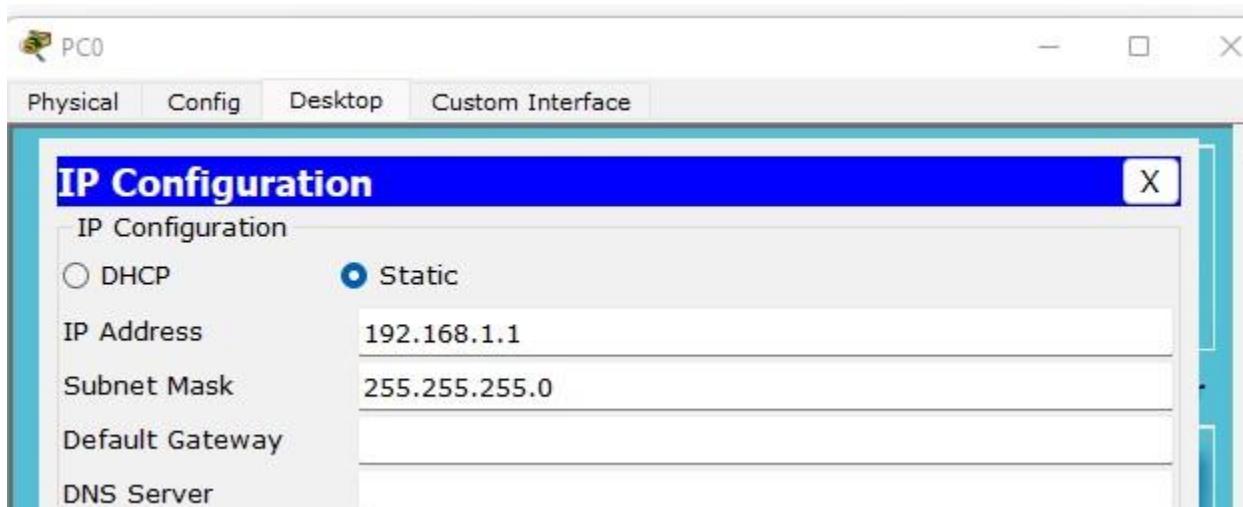
```

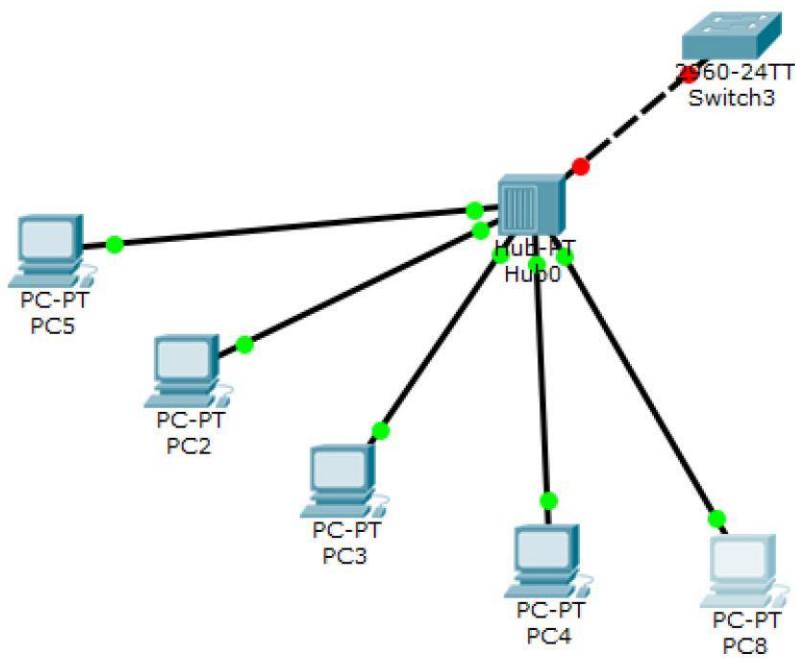
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no spanning-tree vlan 1
  
```

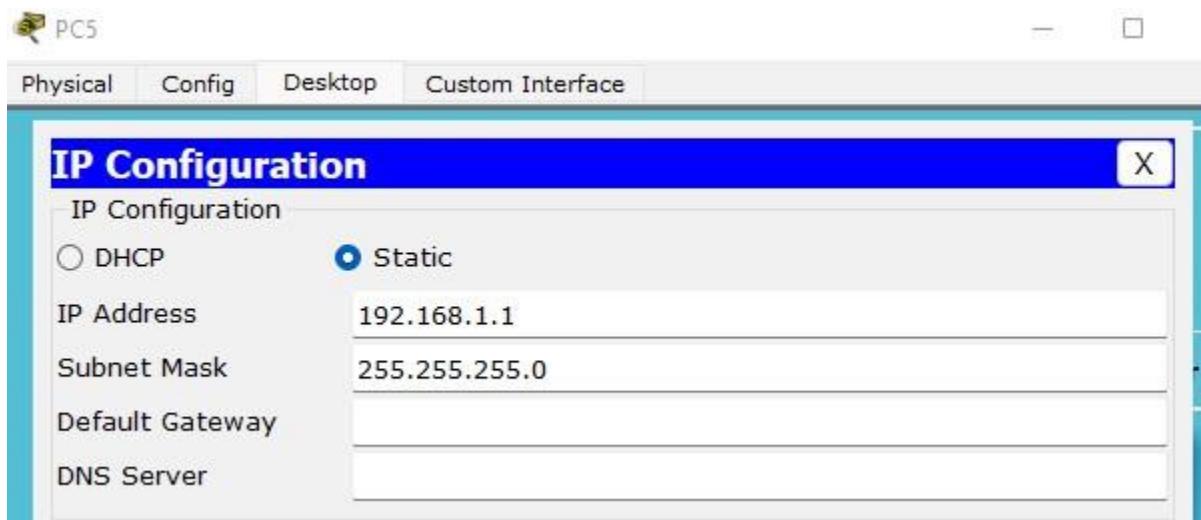
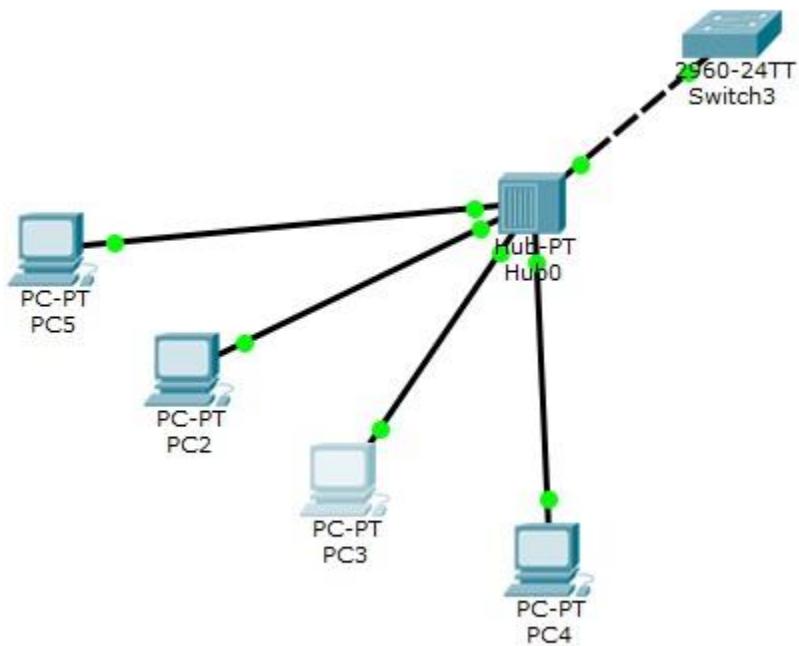
```
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no spanning-tree vlan 1
```

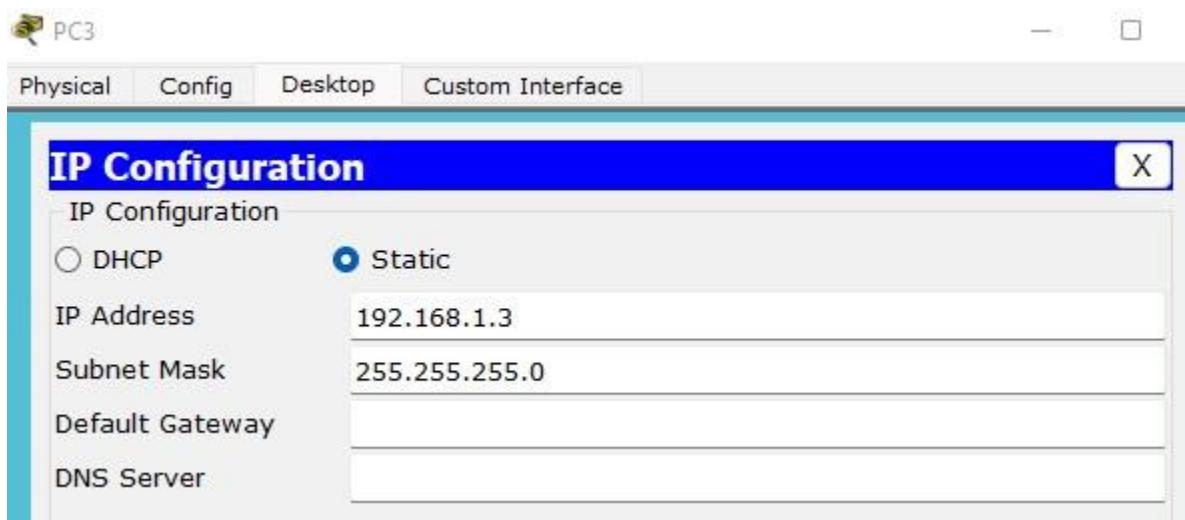
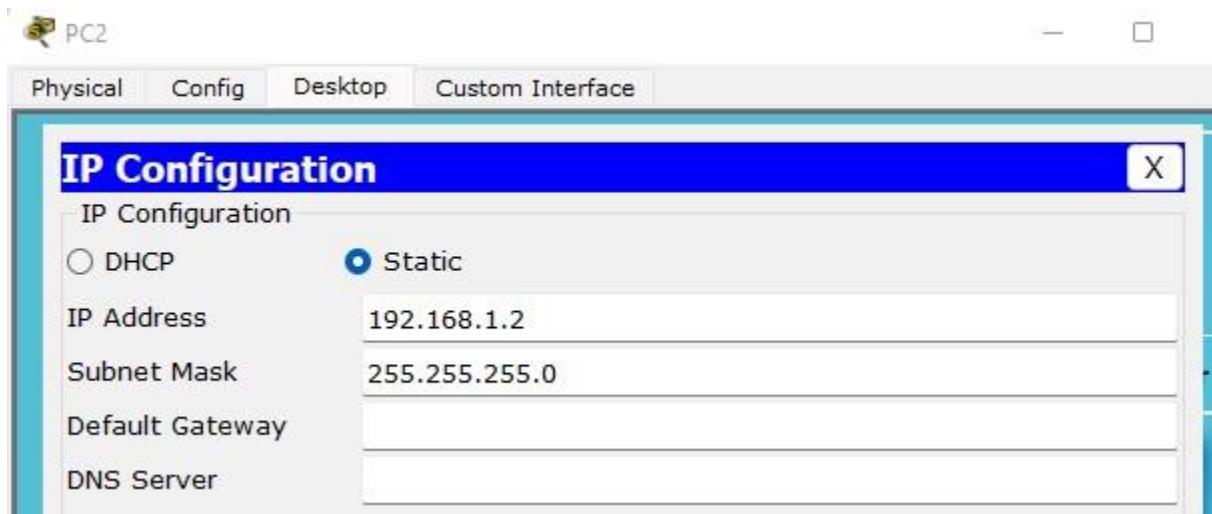
**Switch 1****Switch 2**

```
Switch>en
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no spanning-tree vlan 1
```



**Task 2:**





```
Switch>en
Switch#sh port-security
Switch#sh ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/1    unassigned      YES manual up       up
FastEthernet0/2    unassigned      YES manual down    down
FastEthernet0/3    unassigned      YES manual down    down
FastEthernet0/4    unassigned      YES manual down    down
FastEthernet0/5    unassigned      YES manual down    down
FastEthernet0/6    unassigned      YES manual down    down
FastEthernet0/7    unassigned      YES manual down    down
FastEthernet0/8    unassigned      YES manual down    down
FastEthernet0/9    unassigned      YES manual down    down
FastEthernet0/10   unassigned      YES manual down    down
FastEthernet0/11   unassigned      YES manual down    down
FastEthernet0/12   unassigned      YES manual down    down
FastEthernet0/13   unassigned      YES manual down    down
FastEthernet0/14   unassigned      YES manual down    down
FastEthernet0/15   unassigned      YES manual down    down
FastEthernet0/16   unassigned      YES manual down    down
FastEthernet0/17   unassigned      YES manual down    down
```

```

Switch(config)#int fa0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport port-security
Switch(config-if)#switchport port-security mac-address ?
  H.H.H   48 bit mac address
    sticky  Configure dynamic secure addresses as sticky
Switch(config-if)#switchport port-security mac-address sticky
Switch(config-if)#switchport port-security maximum 4
Switch(config-if)#switchport port-security violation ?
  protect  Security violation protect mode
  restrict  Security violation restrict mode
  shutdown  Security violation shutdown mode
Switch(config-if)#switchport port-security violation shutdown
Switch(config-if)#ex
Switch(config)#ex
Switch#
%SYS-5-CONFIG_I: Configured from console by console

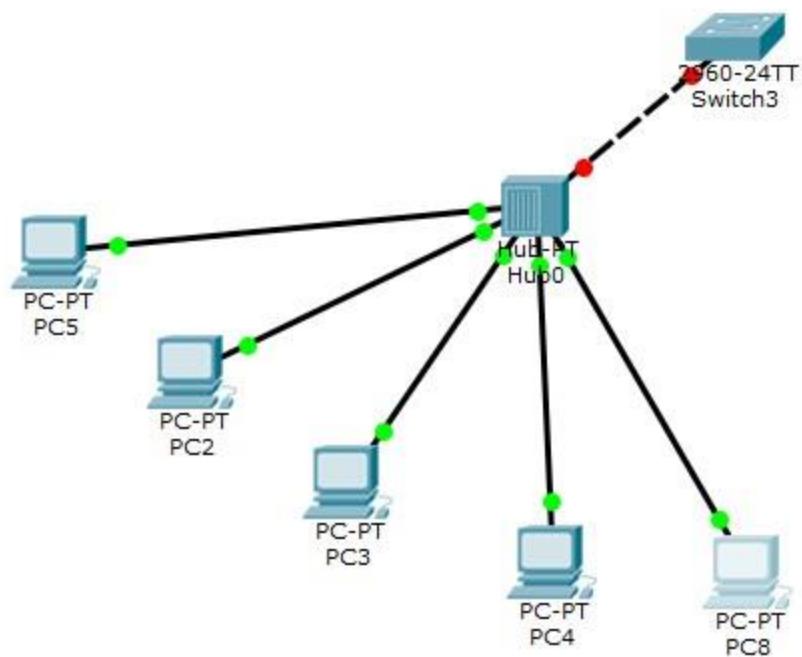
Switch#sh port-security
Secure Port MaxSecureAddr CurrentAddr SecurityViolation Security Action
  (Count)      (Count)      (Count)
-----
Fa0/1        4            0            0       Shutdown
-----

Switch#sh port-security address
          Secure Mac Address Table
-----
Vlan     Mac Address Type           Ports           Remaining Age
  (mins)
-----
-----  -----  -----  -----
Total Addresses in System (excluding one mac per port) : 0
Max Addresses limit in System (excluding one mac per port) : 1024

Switch#sh port-security address
          Secure Mac Address Table
-----
Vlan     Mac Address Type           Ports           Remaining Age
  (mins)
-----
-----  -----  -----  -----
1       0000.0C79.A367   SecureSticky      FastEthernet0/1
1       0001.C7AC.B60C   SecureSticky      FastEthernet0/1
1       000A.4115.7D1C   SecureSticky      FastEthernet0/1
1       0090.2B7D.21AD   SecureSticky      FastEthernet0/1
-----

Total Addresses in System (excluding one mac per port) : 3
Max Addresses limit in System (excluding one mac per port) : 1024

```





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**LAB 9**

**Activities:**

**LAB : 09**

**Activities:**

```

Router(config)#int fa0/0
Router(config-if)#ip add 10.0.0.2
% Incomplete command.
Router(config-if)#ip add 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown

Router(config)#int s2/0
Router(config-if)#ip add 192.168.0.4 255.255.255.0
Router(config-if)#no shut

Router(config)#int fa0/0
Router(config-if)#ip add 192.168.0.2 255.255.255.0
Router(config-if)#no shutdown

Router(config)#int s2/0
Router(config-if)#ip add 192.168.0.7 255.255.255.0
* 192.168.0.0 overlaps with FastEthernet0/0
  
```

**Router 0**

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 10.0.0.2
% Incomplete command.
Router(config-if)#ip add 10.0.0.2 255.0.0.0
Router(config-if)#no shut
  
```

```

Router#en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 192.168.10.4 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#no shu[

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit

Router 1
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 192.168.10.6 255.255.255.0
Router(config-if)#no shut

Router(config)#int fa2/0
%Invalid interface type and number
Router(config)#int se3/0
Router(config-if)#ip add 192.168.10.9 255.255.255.0
% 192.168.10.0 overlaps with Serial12/0
Router(config-if)#ip add 192.168.13.9 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

Router 2
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 192.168.17.1 255.255.255.0
Router(config-if)#no shut

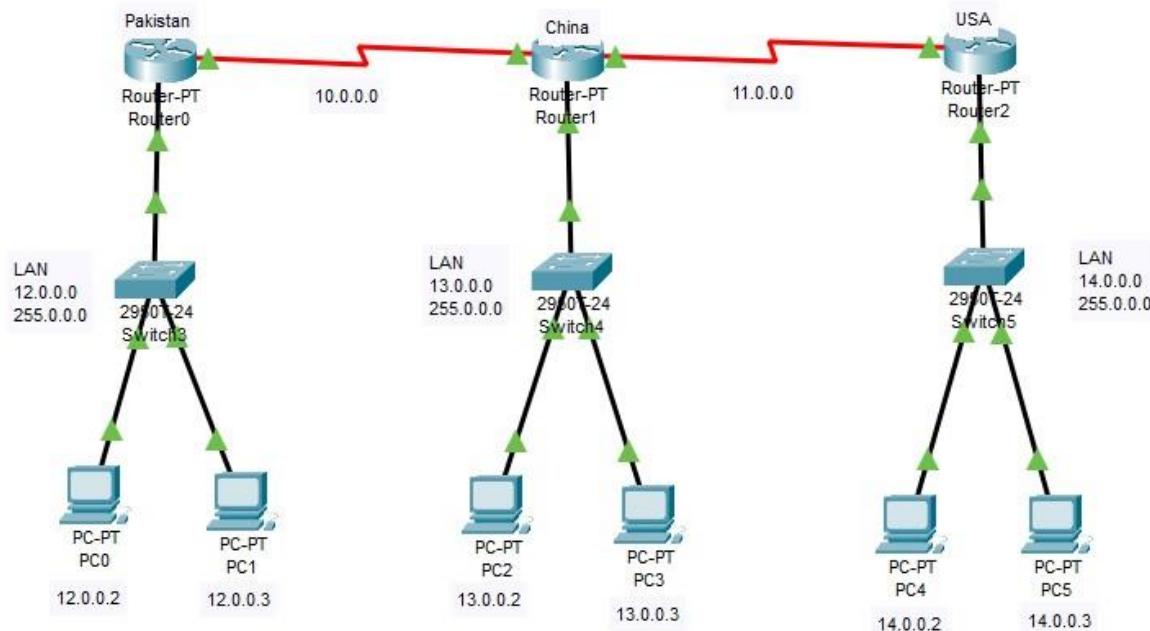
Router(config)#config t
%Invalid hex value
Router(config)#int fa0/0
Router(config-if)#ip add 192.168.12.1 255.255.255.0
Router(config-if)#no shut
  
```

**LAB TASK**

**Task:**

```

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 10.0.0.2
% Incomplete command.
Router(config-if)#ip add 10.0.0.2 255.0.0.0
Router(config-if)#no shut
  
```



## Router 0

```

Router#en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 12.0.0.2 255.0.0.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#exit
Router(config)#int se2/0
Router(config-if)#ip add 10.0.0.9 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

```

## Router 1

```

Router(config)#int fa0/0
Router(config-if)#ip add 13.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 10.0.0.2 255.0.0.0
Router(config-if)#no shut
Router(config-if)#exit

```

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 10.0.0.2 255.0.0.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#int se3/0
Router(config-if)#ip add 11.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#

```

## **Router 2**

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 14.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

Router(config)#int se2/0
Router(config-if)#ip add 11.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

```



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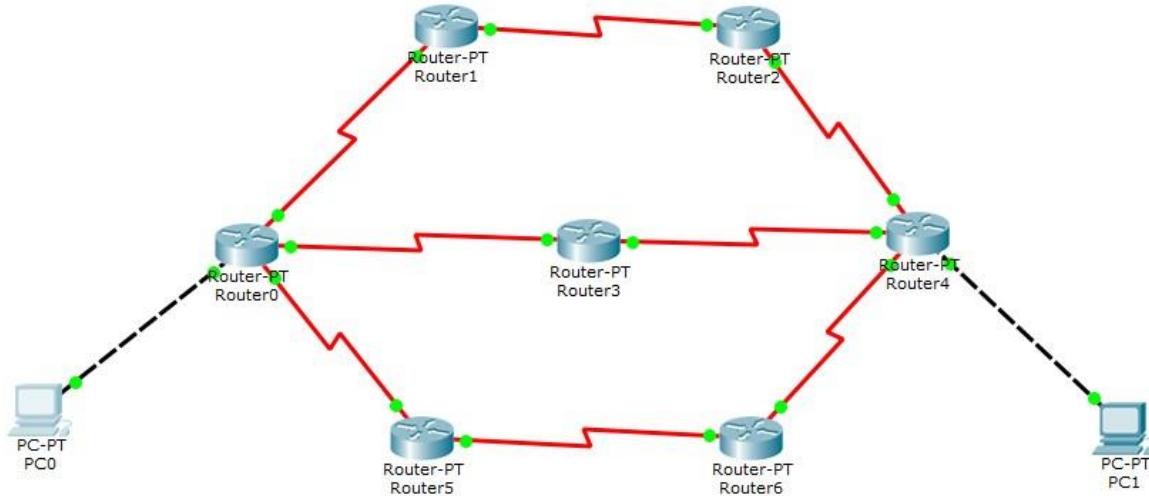
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**LAB 10**

## Activity



```

Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 90.0.0.0 255.0.0.0
Bad mask /8 for address 90.0.0.0
Router(config-if)#ip add 90.1.1.0 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#int se2/0
Router(config-if)#ip add 50.1.1.0 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#int se6/0
Router(config-if)#ip add 40.1.0.0 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial6/0, changed state to down
Router(config-if)#exit
Router(config)#int se3/0
Router(config-if)#ip add 60.1.0.0 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
  
```

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 90.0.0.0
Router(config-router)#network 60.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#exit
Router(config)#

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 50.1.1.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
*LINK-5-CHANGED: Interface Serial2/0, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#int se3/0
Router(config-if)#ip add 10.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

*LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#
*LINK-5-CHANGED: Interface Serial3/0, changed state to up

Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#exit
Router(config)#

```

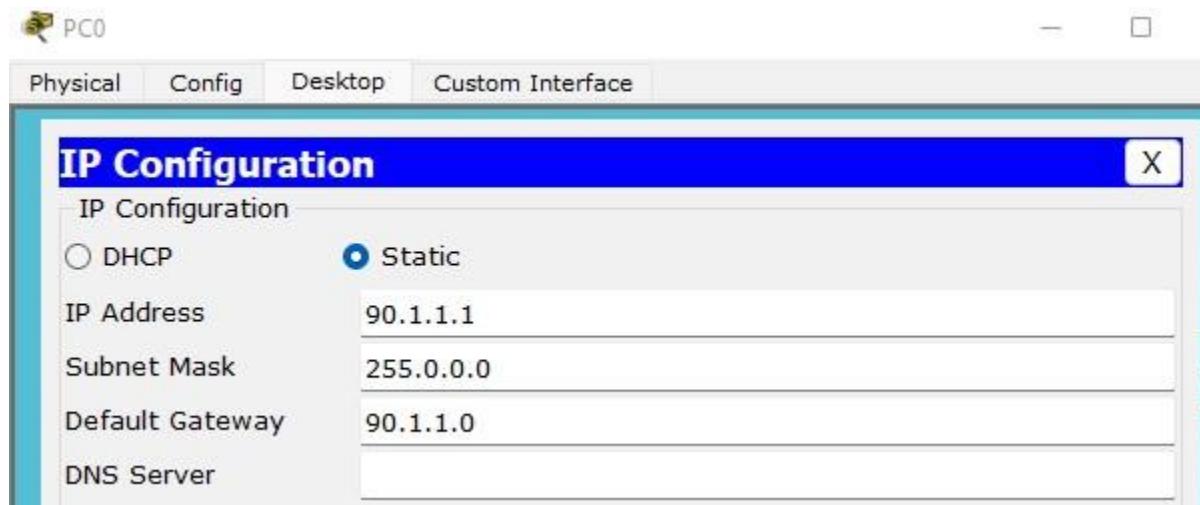
```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 40.1.0.1 255.0.0.0
Router(config-if)#no shut

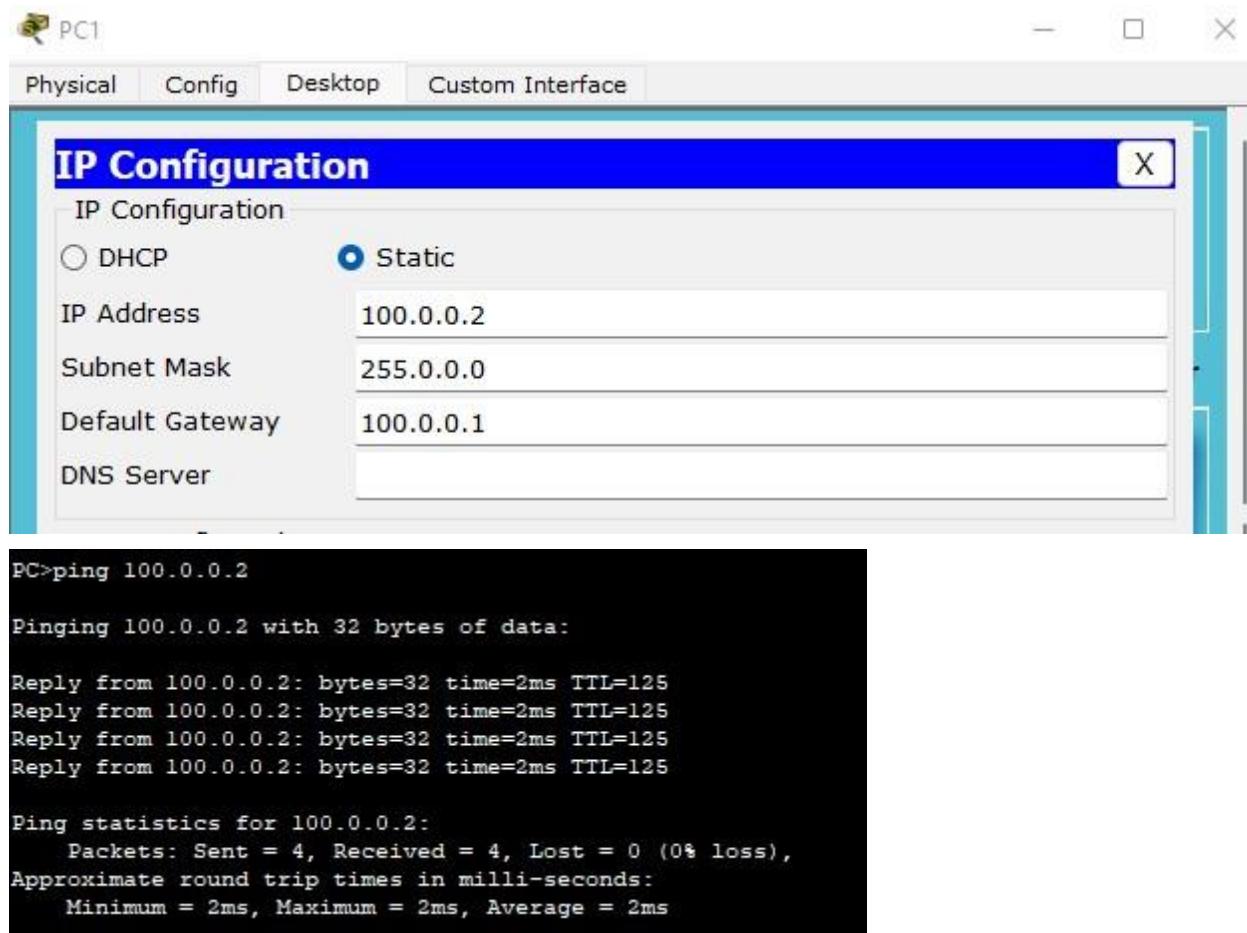
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

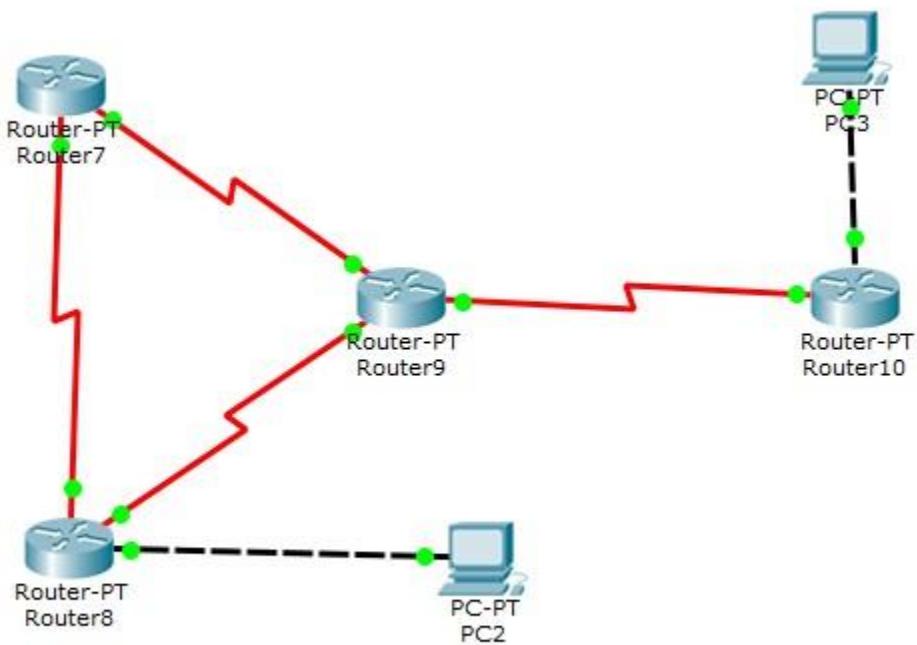
Router(config)#int se3/0
Router(config-if)#ip add 30.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
```





**Lab Task**

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 13.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#int se3/0
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config-if)#ip add 12.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#int fa0/0
Router(config-if)#ip add 192.10.10.1 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 192.10.10.1
Router(config-router)#network 12.0.0.0.1
```

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 13.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#int se3/0
Router(config-if)#ip add 14.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 13.0.0.1
Router(config-router)#network 14.0.0.2
```

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 14.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

Router(config-if)#exit
Router(config)#no shut
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed stateint
% Incomplete command.
Router(config)#int se3/0
Router(config-if)#ip add 12.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

Router(config-if)#exit
Router(config)#i
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

% Ambiguous command: "i"
Router(config)#int se6/0
Router(config-if)#ip add 15.0.0.2 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial6/0, changed state to down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial6/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial6/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 14.0.0.1
Router(config-router)#network 12.0.0.2
Router(config-router)#network 15.0.0.2
```

```
Router>en
Router# config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 15.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
*LINK-S-CHANGED: Interface Serial2/0, changed state to up

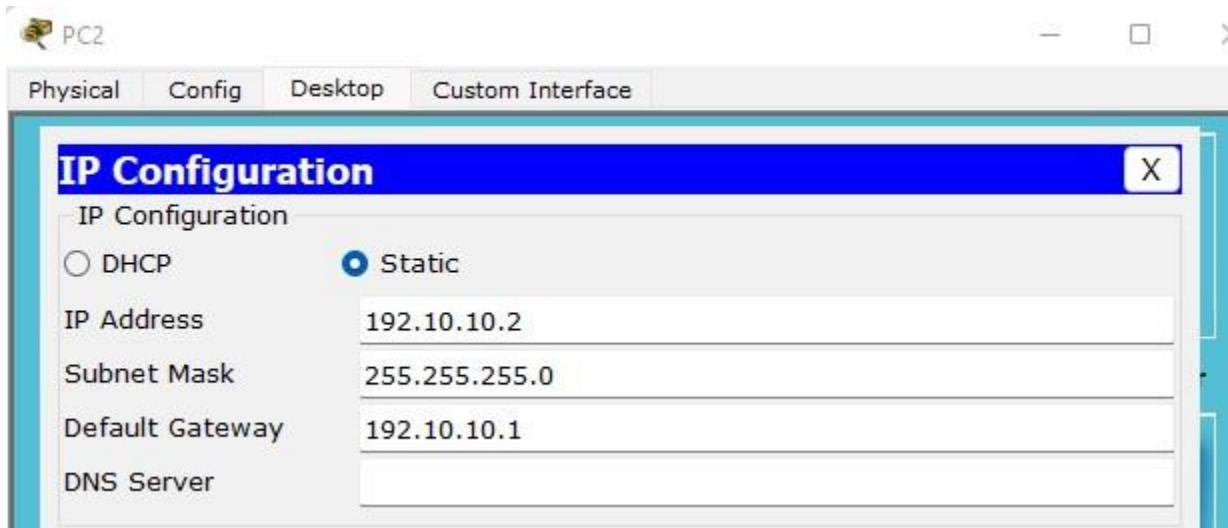
Router(config-if)#exit
Router(config)#int fa
*LINEPROTO-S-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

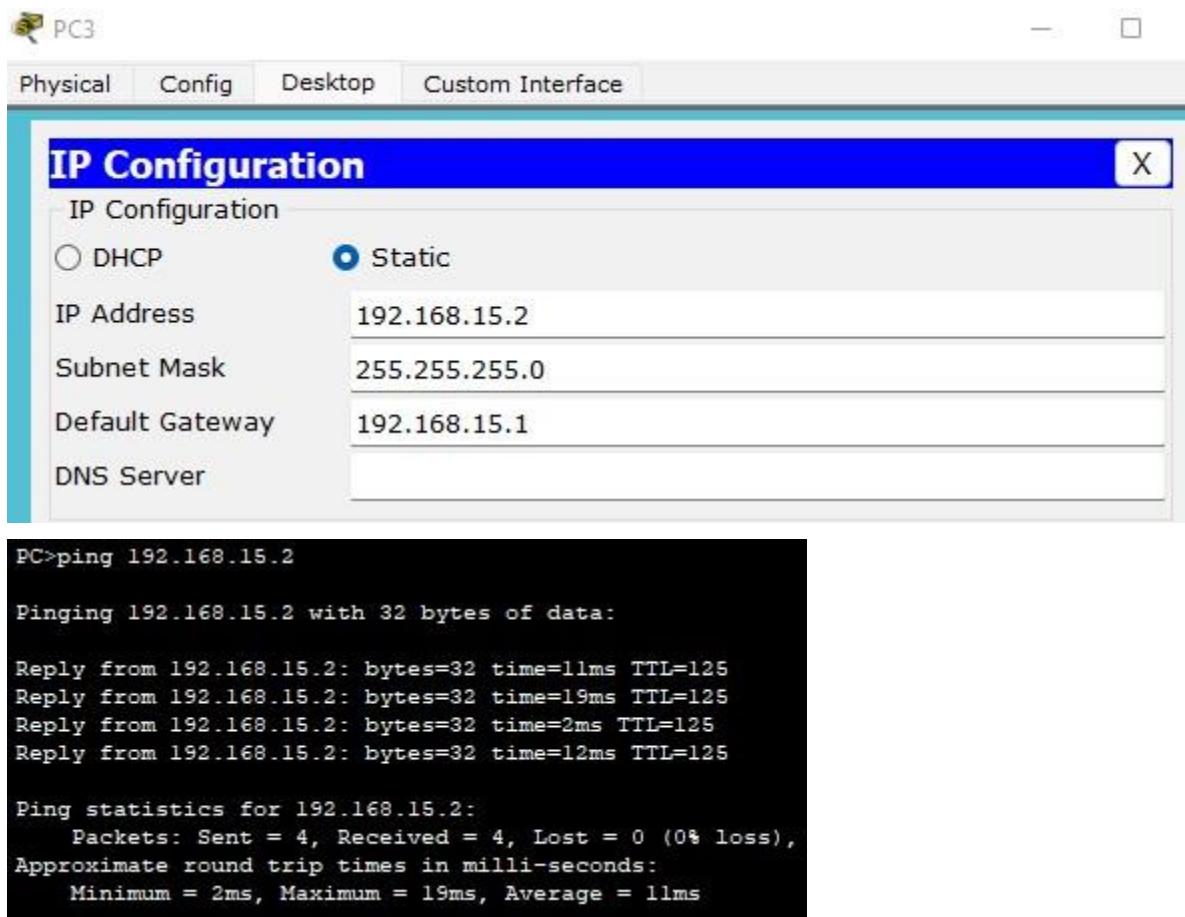
* Incomplete command.
Router(config)#int fa0/0
Router(config-if)#ip add 192.168.15.1 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
*LINK-S-CHANGED: Interface FastEthernet0/0, changed state to up

*LINEPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 15.0.0.1
Router(config-router)#network 192.168.15.1
```



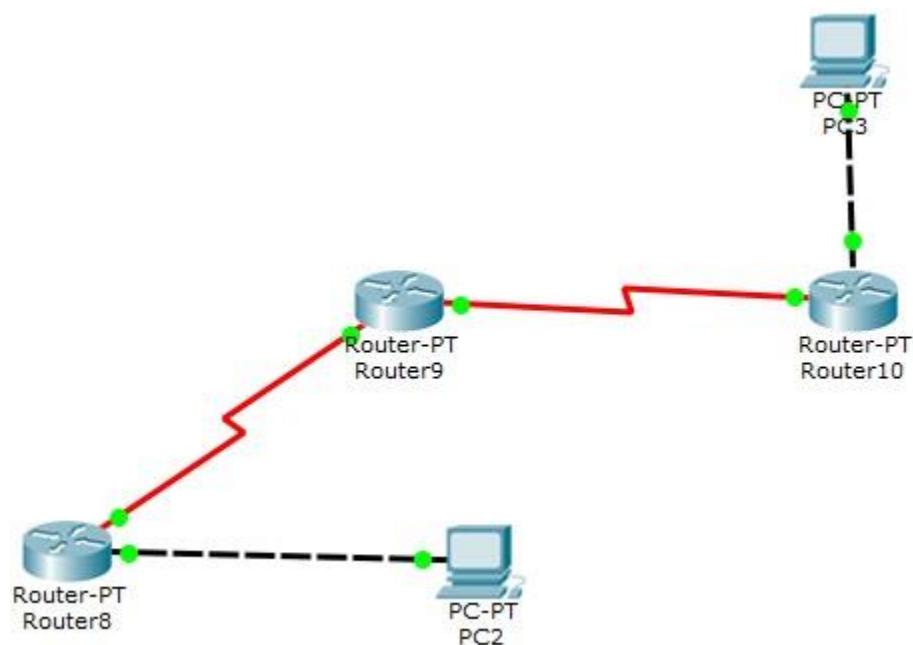


## Removed link

```
Router(config)#router rip  
Router(config-router)#no network 13.0.0.1  
Router(config-router)#{}
```

```
Router(config-router)#no network 14.0.0.1
```

```
PC>ping 192.168.15.2  
  
Pinging 192.168.15.2 with 32 bytes of data:  
  
Reply from 192.168.15.2: bytes=32 time=2ms TTL=125  
  
Ping statistics for 192.168.15.2:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 2ms, Average = 2ms
```





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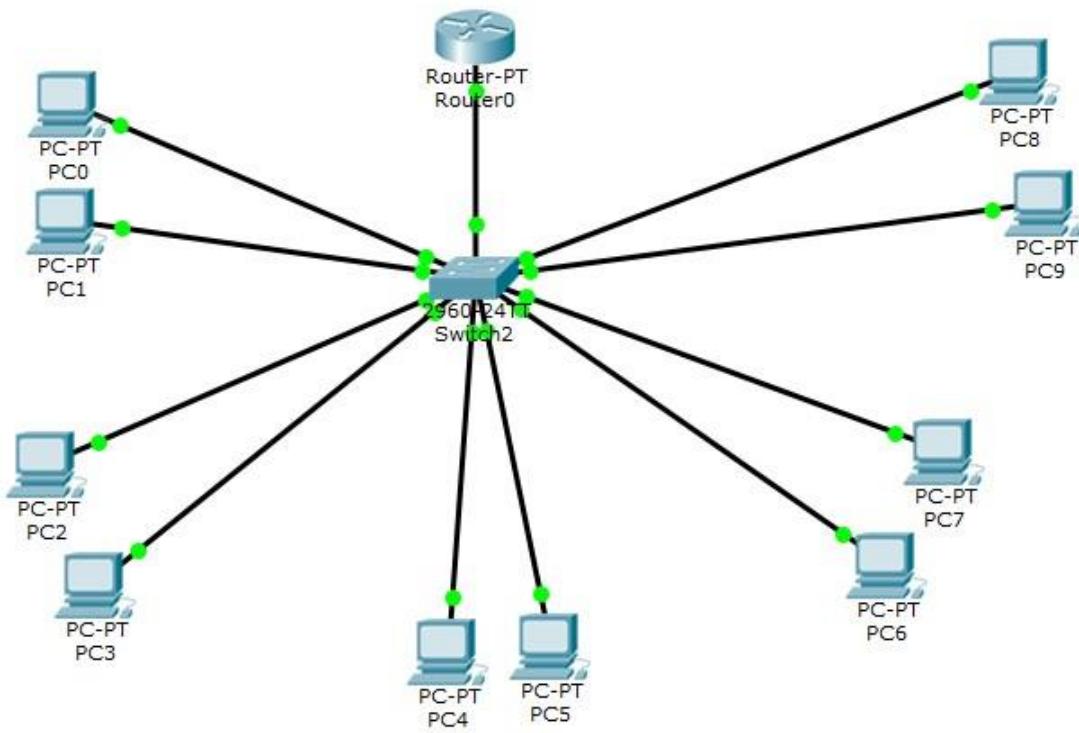
**Department of Computer Science**

**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2022**

**LAB 11**

**Lab Activity**

**Switch**

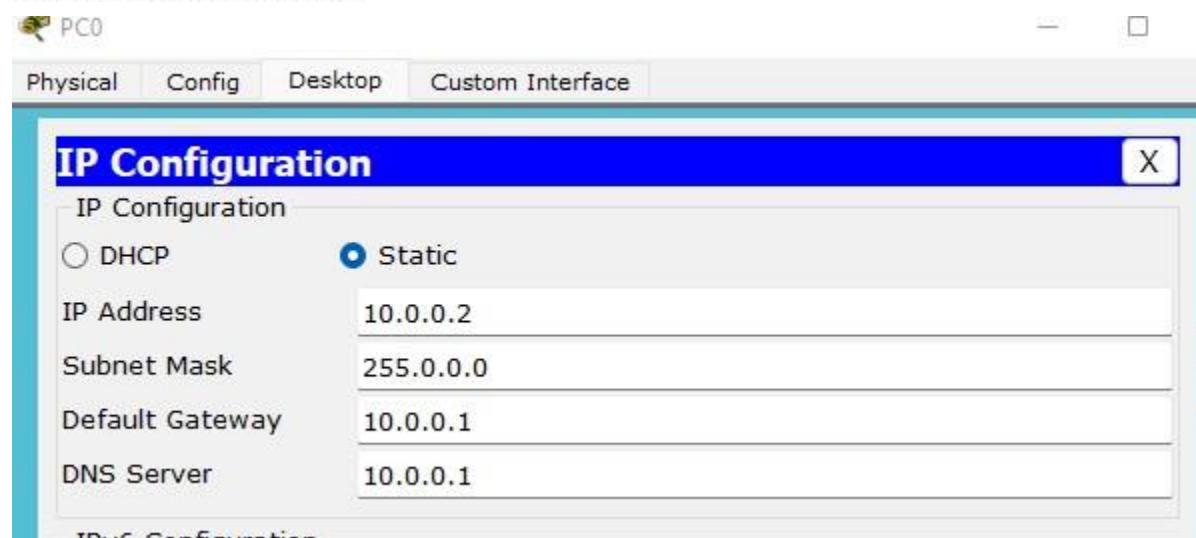
```
Switch(config)#int fa0/2
Switch(config-if)#exit
Switch(config)#int range fa0/2-3
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#exit
Switch(config)#int range fa0/4-5
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#exit
Switch(config)#vlan 20
Switch(config-vlan)#exit
Switch(config)#int range fa0/4-5
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
Switch(config-if-range)#exit
Switch(config)#vlan 30
Switch(config-vlan)#exit
Switch(config)#int range fa0/6-7
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
Switch(config-if-range)#exit
Switch(config)#int range fa0/8-9
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#exit
Switch(config)#vlan 40
Switch(config-vlan)#int range fa0/8-9
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 40
Switch(config-if-range)#exit
Switch(config)#vlan 50
Switch(config-vlan)#int range fa0/10-11
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 50
Switch(config-if-range)#

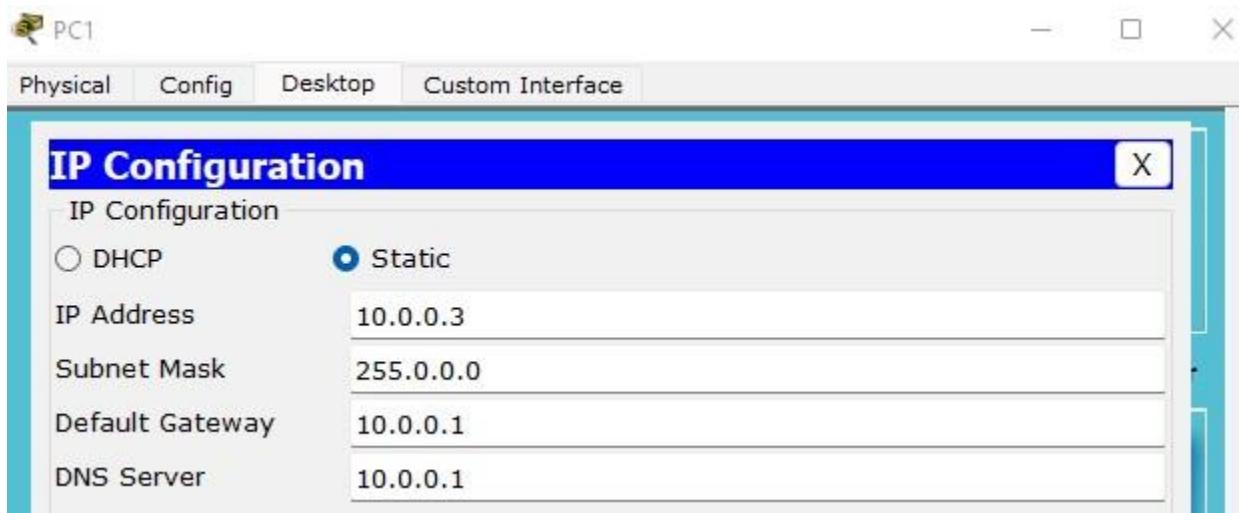
```

**Router**

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0.1
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 10.0.0.1 255.0.0.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#interface fa0/0.2
Router(config-subif)#encapsulation dot1q 30
Router(config-subif)#exit
Router(config)#int fa0/0.1
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 10.0.0.1 255.0.0.0
Router(config-subif)#exit
Router(config)#int fa0/0.2
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 20.0.0.1 255.0.0.0
Router(config-subif)#exit
Router(config)#int fa0/0.3
Router(config-subif)#encapsulation dot1q 30
Router(config-subif)#ip address 30.0.0.1 255.0.0.0
Router(config-subif)#exit
Router(config)#int fa0/0.4
Router(config-subif)#ip address 40.0.0.1 255.0.0.0

Router(config-subif)#
Router(config-subif)#int fa0/0.4
Router(config-subif)#encapsulation dot1q 40
Router(config-subif)#ip address 40.0.0.1 255.0.0.0
Router(config-subif)#exit
Router(config)#int fa0/0.5
Router(config-subif)#encapsulation dot1q 50
Router(config-subif)#ip address 50.0.0.1 255.0.0.0
Router(config-subif)#exit
Router(config)#int fa0/0
Router(config-if)#no shut
```





```
PC>ping 10.0.0.3
Pinging 10.0.0.3 with 32 bytes of data:
Reply from 10.0.0.3: bytes=32 time=2ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

PC>ping 30.0.0.3
Pinging 30.0.0.3 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
```

## Lab Task

<p>21B-141-CS</p> <p>Safiullah khokhar</p> <p><b>Lab Task</b></p> <pre> Router&gt;en Router#config t Enter configuration commands, one per line. End with CNTL/Z. Router(config)#int fa0/0 Router(config-subif)#encapsulation dot1q 10 Router(config-subif)#ip address 10.0.0.1 255.0.0.0 Router(config-subif)#exit Router(config)#int fa0/1 Router(config-subif)#exit Router(config)#int fa0/0 Router(config-subif)#ip address 20.0.0.1 255.0.0.0 % 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.  Router(config-subif)#int fa0/0 Router(config-subif)#encapsulation dot1q 20 Router(config-subif)#ip address 20.0.0.1 255.0.0.0 Router(config-subif)#exit Router(config)#int fa0/0 Router(config-if)#no shut </pre> <p>Switch&gt;en</p> <p>Switch#config t</p> <p>Enter configuration commands, one per line. End with CNTL/Z.</p> <p>Switch(config)#vlan 10</p> <p>Switch(config-vlan)#exit</p> <p>Switch(config)#int fa0/1</p> <p>Switch(config-if)#switchport mode access</p> <p>Switch(config-if)#switchport access vlan 10</p> <p>Switch(config-if)#exit</p> <p>Switch(config)#int fa1/1</p> <p>Switch(config-if)#switchport mode access</p> <p>Switch(config-if)#exit</p> <p>Switch(config)#vlan 20</p> <p>Switch(config-vlan)#exit</p> <p>Switch(config)#int fa1/1</p> <p>Switch(config-if)#switchport mode trunk</p> <p>Switch(config-if)#exit</p>	<p>21B-141-CS</p> <p>Safiullah khokhar</p> <p>Router&gt;en</p> <p>Router#config t</p> <p>Enter configuration commands, one per line. End with CNTL/Z.</p> <p>Router(config)#int fa0/0.1</p> <p>Router(config-subif)#encapsulation dot1q 10</p> <p>Router(config-subif)#ip address 10.0.0.1 255.0.0.0</p> <p>Router(config-subif)#exit</p> <p>Router(config)#int fa0/0.2</p> <p>Router(config-subif)#ip address 20.0.0.1 255.0.0.0</p> <p>% 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.</p> <p>Router(config-subif)#int fa0/0.2</p> <p>Router(config-subif)#encapsulation dot1q 20</p> <p>Router(config-subif)#ip address 20.0.0.1 255.0.0.0</p> <p>Router(config-subif)#exit</p> <p>Router(config)#int fa0/0</p> <p>Router(config-if)#no shut</p>																
<table border="1"> <thead> <tr> <th colspan="2">IP Configuration</th> </tr> <tr> <th>Interface</th> <th>FastEthernet0</th> </tr> </thead> <tbody> <tr> <td>IP Configuration</td> <td></td> </tr> <tr> <td><input type="radio"/> DHCP</td> <td><input checked="" type="radio"/> Static</td> </tr> <tr> <td>IPv4 Address</td> <td>10.0.0.2</td> </tr> <tr> <td>Subnet Mask</td> <td>255.0.0.0</td> </tr> <tr> <td>Default Gateway</td> <td>10.0.0.1</td> </tr> <tr> <td>DNS Server</td> <td>10.0.0.1</td> </tr> </tbody> </table>		IP Configuration		Interface	FastEthernet0	IP Configuration		<input type="radio"/> DHCP	<input checked="" type="radio"/> Static	IPv4 Address	10.0.0.2	Subnet Mask	255.0.0.0	Default Gateway	10.0.0.1	DNS Server	10.0.0.1
IP Configuration																	
Interface	FastEthernet0																
IP Configuration																	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static																
IPv4 Address	10.0.0.2																
Subnet Mask	255.0.0.0																
Default Gateway	10.0.0.1																
DNS Server	10.0.0.1																

```
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time<1ms TTL=127
Reply from 20.0.0.2: bytes=32 time=1ms TTL=127
Reply from 20.0.0.2: bytes=32 time=10ms TTL=127
Reply from 20.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

## 2.

IEEE 802.1Q is a standard for tagging VLAN information in Ethernet networks. The command encapsulation dot1q in Cisco devices configures an interface or subinterface to use this VLAN tagging. It enables proper identification and routing of traffic between VLANs, important for inter-VLAN communication on routers.



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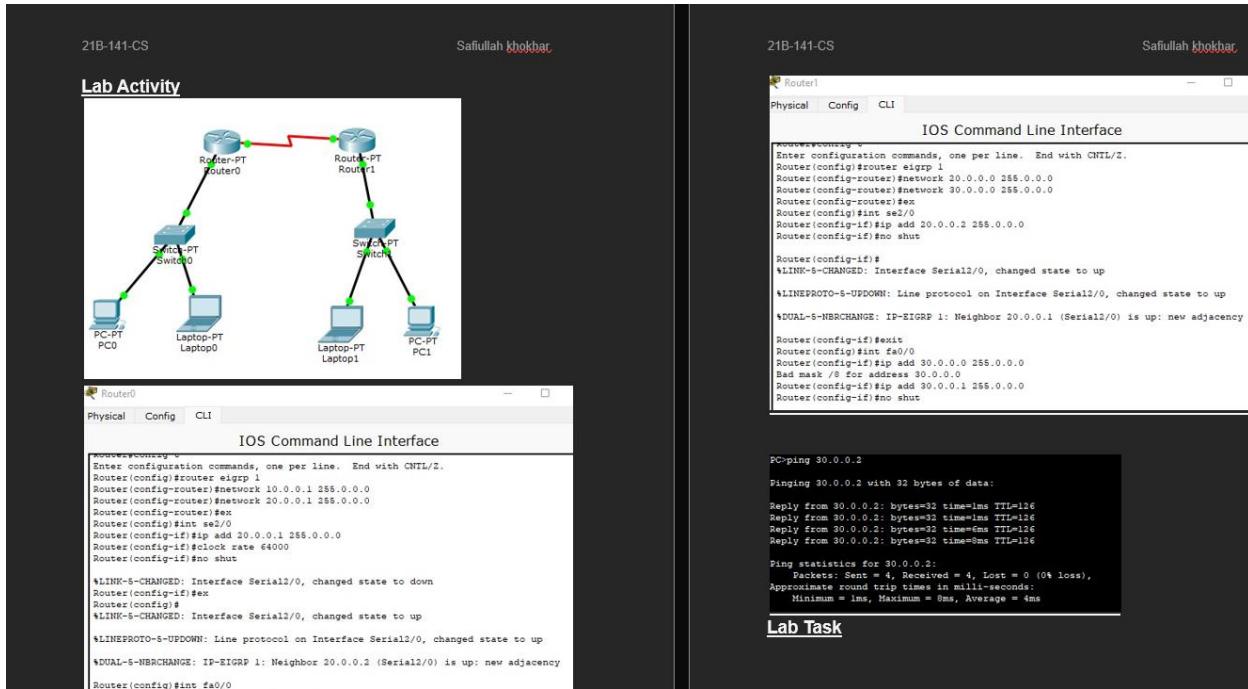
**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

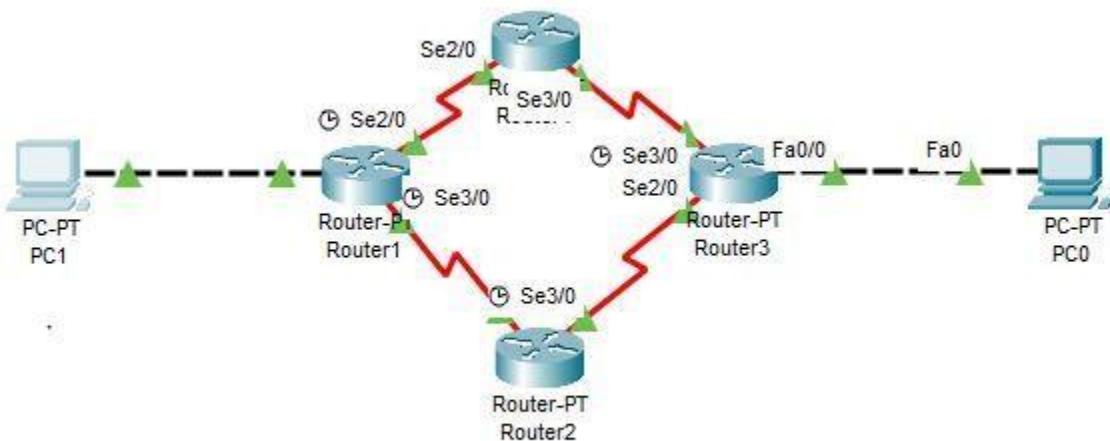
**Fall 2022**

**LAB 12**

## Lab Activity



## Lab Task



The screenshot shows a network simulation interface titled "PC4". At the top, there are tabs for "Physical", "Config", "Desktop", and "Custom Interface". Below the tabs, there are icons representing network components like switches and clouds. A "Command Prompt" window is open in the foreground, displaying the following output:

```
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
PC>ping 10.0.0.1  
Pinging 10.0.0.1 with 32 bytes of data:  
Reply from 50.0.0.1: Destination host unreachable.  
  
Ping statistics for 10.0.0.1:  
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
PC>ping 10.0.0.1  
Pinging 10.0.0.1 with 32 bytes of data:  
Reply from 10.0.0.1: bytes=32 time=15ms TTL=253  
Reply from 10.0.0.1: bytes=32 time=19ms TTL=253  
Reply from 10.0.0.1: bytes=32 time=3ms TTL=253  
Reply from 10.0.0.1: bytes=32 time=2ms TTL=253  
  
Ping statistics for 10.0.0.1:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 19ms, Average = 9ms
```



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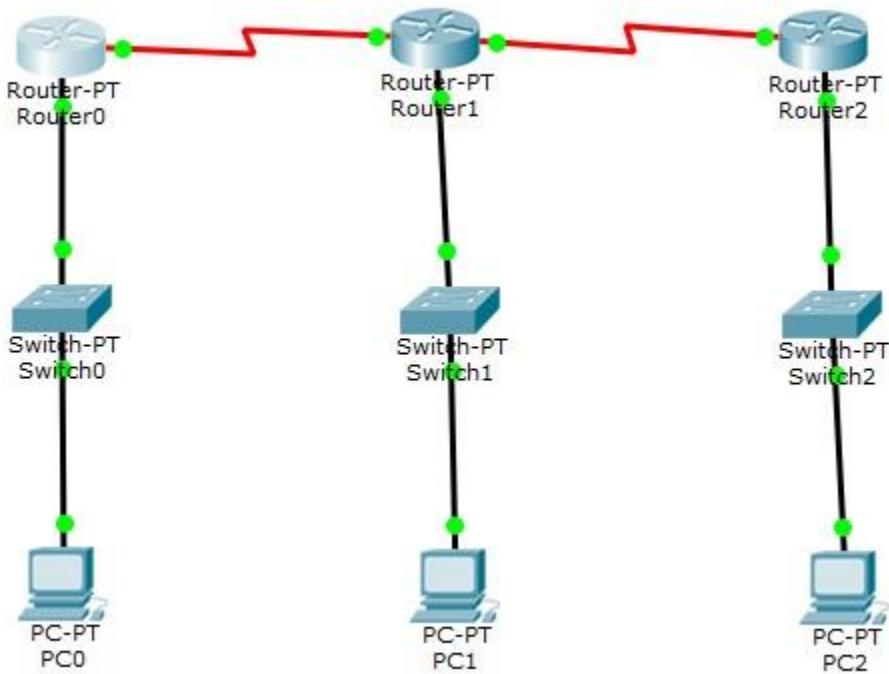
**Department of Computer Science**

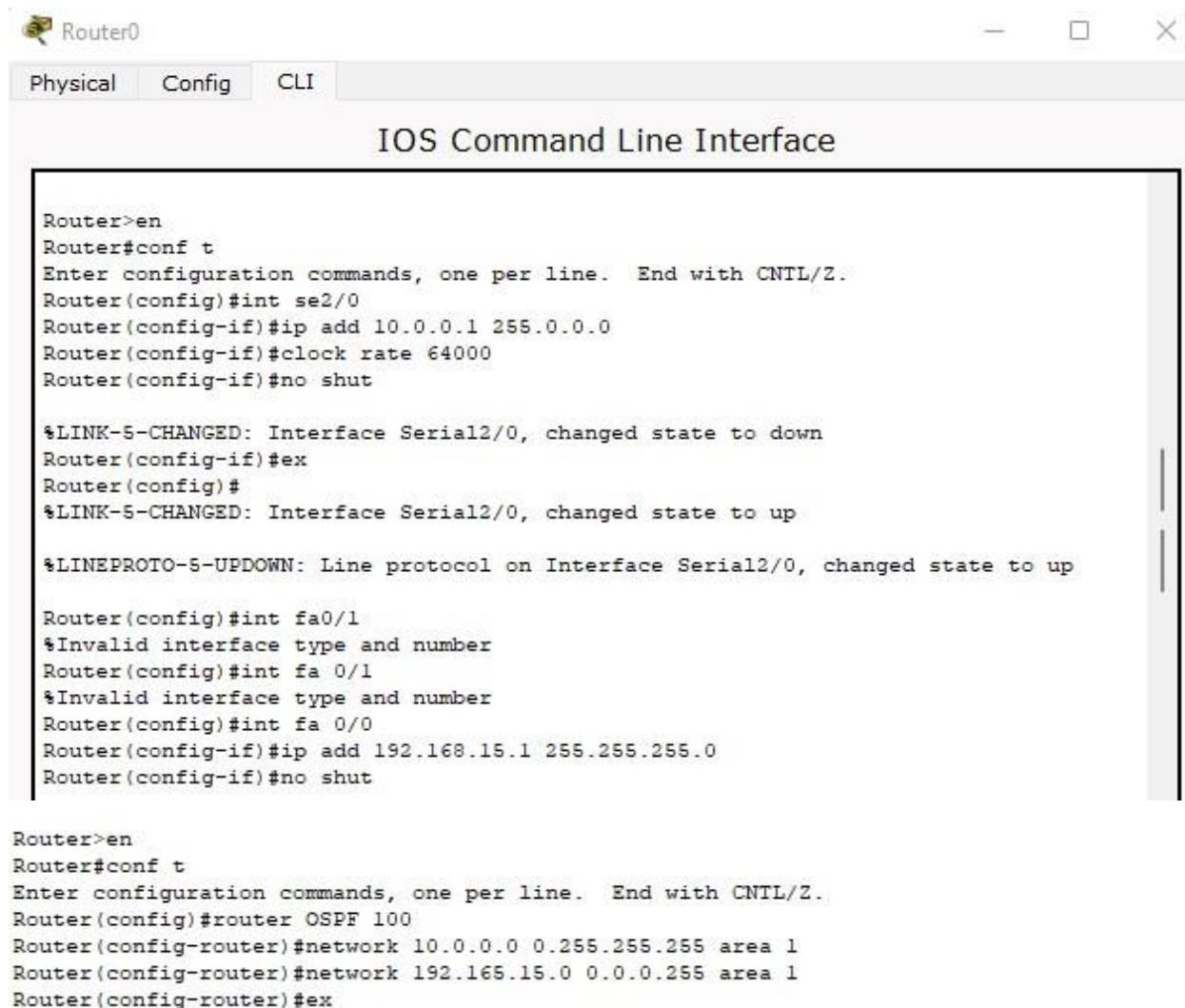
**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2022**

**LAB 13**

**Lab activity:**



The image shows a screenshot of the Cisco IOS Command Line Interface (CLI) running on a virtual machine named "Router". The window title is "Router". The tabs at the top are "Physical", "Config" (which is selected), and "CLI". The main area displays the following configuration commands:

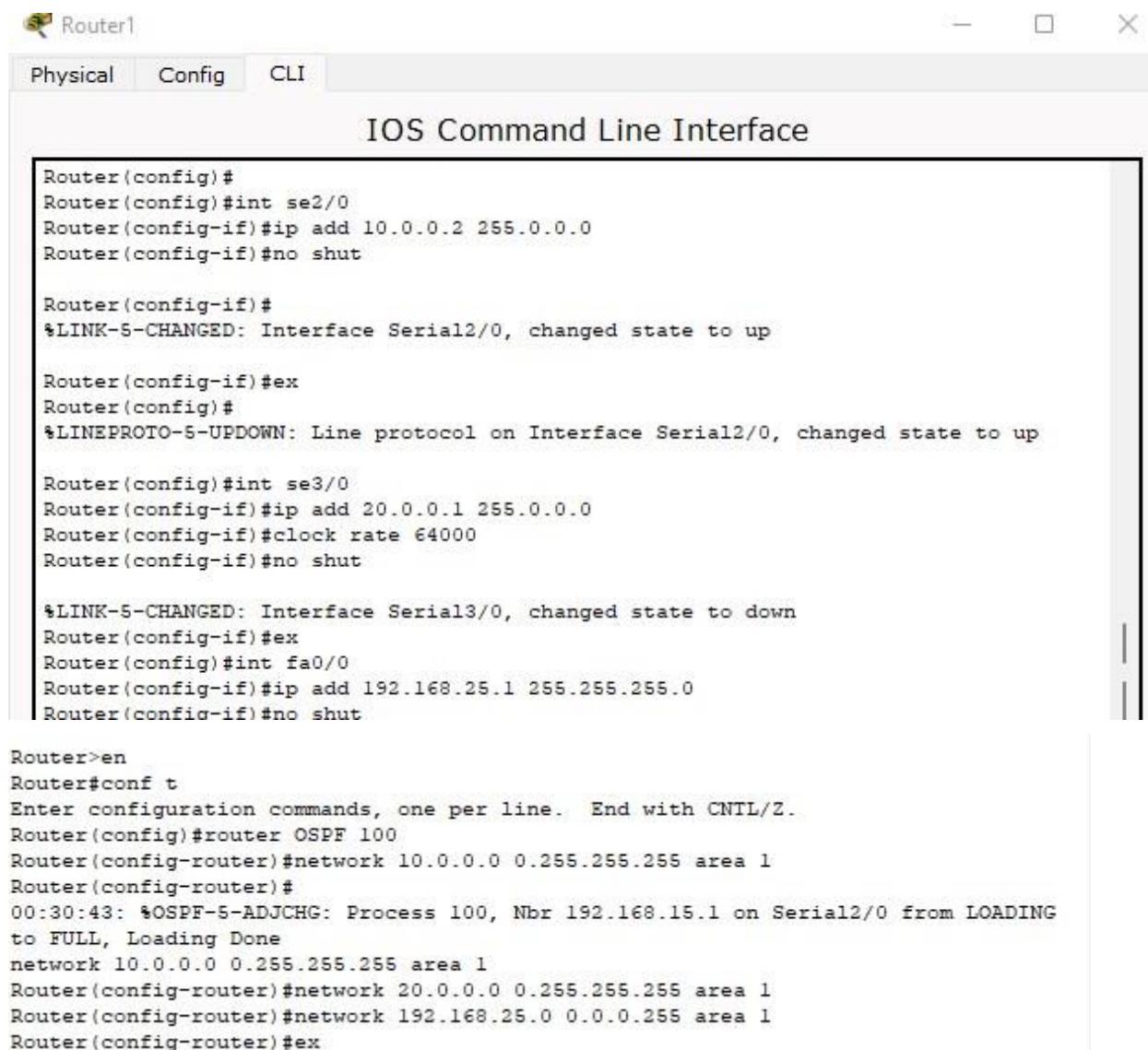
```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 10.0.0.1 255.0.0.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-S-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#ex
Router(config)#
%LINK-S-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-S-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config)#int fa0/1
%Invalid interface type and number
Router(config)#int fa 0/1
%Invalid interface type and number
Router(config)#int fa 0/0
Router(config-if)#ip add 192.168.15.1 255.255.255.0
Router(config-if)#no shut

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router OSPF 100
Router(config-router)#network 10.0.0.0 0.255.255.255 area 1
Router(config-router)#network 192.168.15.0 0.0.0.255 area 1
Router(config-router)#ex
```



The image shows a screenshot of the Cisco IOS Command Line Interface (CLI) running on a device named "Router1". The window title is "Router1". The tabs at the top are "Physical", "Config" (which is selected), and "CLI". The main area displays the following configuration commands:

```
Router(config)#  
Router(config)#int se2/0  
Router(config-if)#ip add 10.0.0.2 255.0.0.0  
Router(config-if)#no shut  
  
Router(config-if)#  
*LINK-5-CHANGED: Interface Serial2/0, changed state to up  
  
Router(config-if)#ex  
Router(config)#  
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up  
  
Router(config)#int se3/0  
Router(config-if)#ip add 20.0.0.1 255.0.0.0  
Router(config-if)#clock rate 64000  
Router(config-if)#no shut  
  
*LINK-5-CHANGED: Interface Serial3/0, changed state to down  
Router(config-if)#ex  
Router(config)#int fa0/0  
Router(config-if)#ip add 192.168.25.1 255.255.255.0  
Router(config-if)#no shut  
  
Router>en  
Router#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#router OSPF 100  
Router(config-router)#network 10.0.0.0 0.255.255.255 area 1  
Router(config-router)#  
00:30:43: %OSPF-5-ADJCHG: Process 100, Nbr 192.168.15.1 on Serial2/0 from LOADING  
to FULL, Loading Done  
network 10.0.0.0 0.255.255.255 area 1  
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1  
Router(config-router)#network 192.168.25.0 0.0.0.255 area 1  
Router(config-router)#ex
```

**Router2**

Physical Config CLI

### IOS Command Line Interface

```

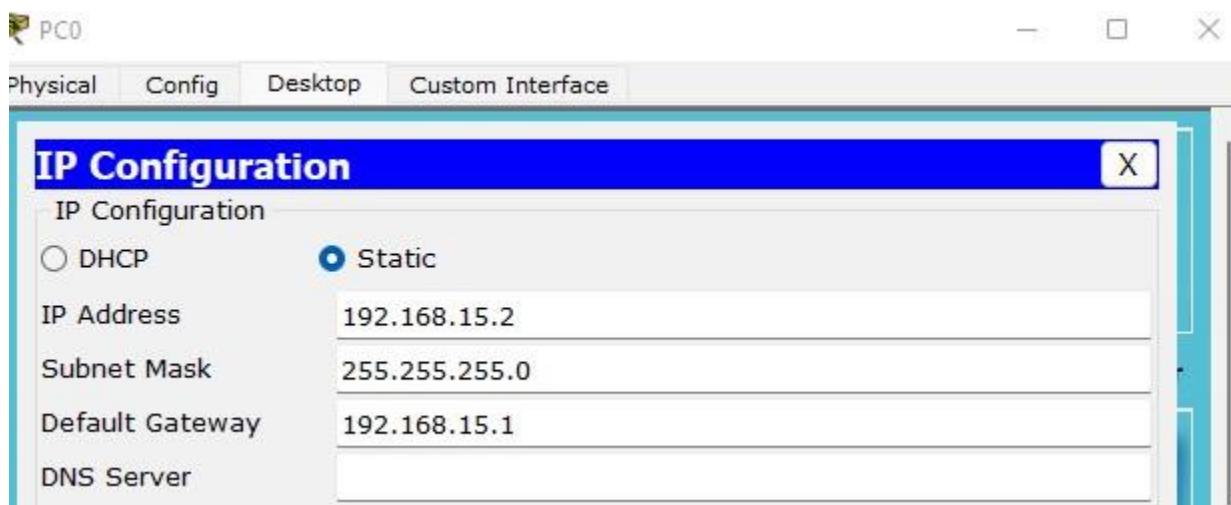
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int se2/0
Router(config-if)#ip add 20.0.0.2 255.0.0.0
Router(config-if)#no shut

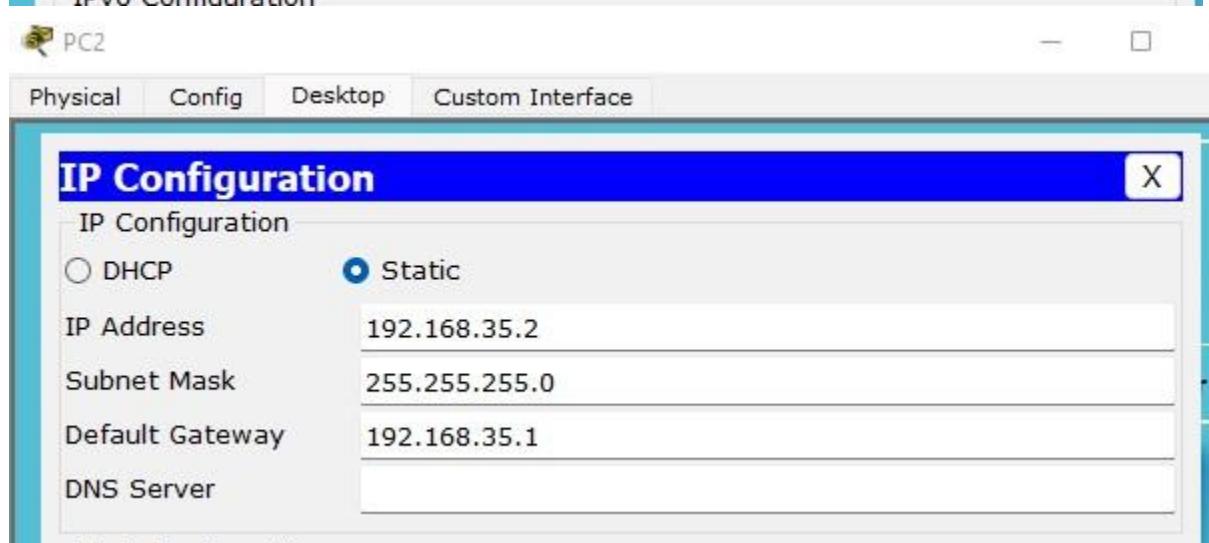
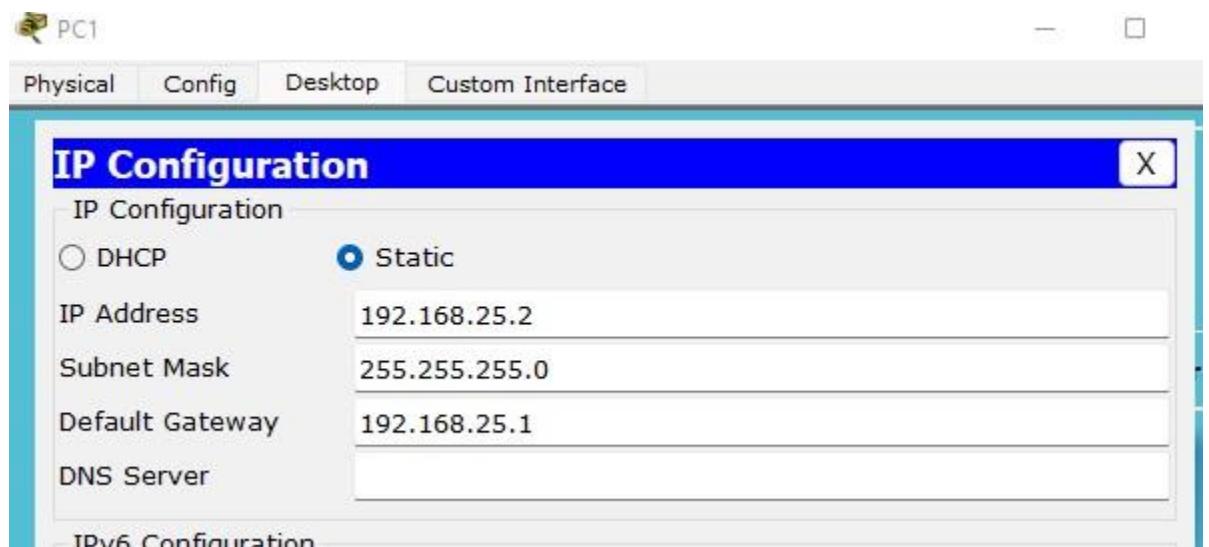
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
ex
Router(config)#int fa 0/
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed stano shut
^
% Invalid input detected at '^' marker.

Router(config)#int fa0/0
Router(config-if)#ip add 192.168.35.1
% Incomplete command.
Router(config-if)#ip add 192.168.35.1 255.255.255.0
Router(config-if)#no shut

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router OSPF 100
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#
00:32:02: %OSPF-5-ADJCHG: Process 100, Nbr 192.168.25.1 on Serial2/0 from LOADING
to FULL, Loading Done
network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#network 192.168.35.0 0.0.0.255 area 1
Router(config-router)#ex
Router(config)#

```





```

PC>ping 192.168.35.2

Pinging 192.168.35.2 with 32 bytes of data:

Reply from 192.168.35.2: bytes=32 time=2ms TTL=125
Reply from 192.168.35.2: bytes=32 time=2ms TTL=125
Reply from 192.168.35.2: bytes=32 time=2ms TTL=125
Reply from 192.168.35.2: bytes=32 time=3ms TTL=125

Ping statistics for 192.168.35.2:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 3ms, Average = 2ms

PC>ping 192.168.25.2

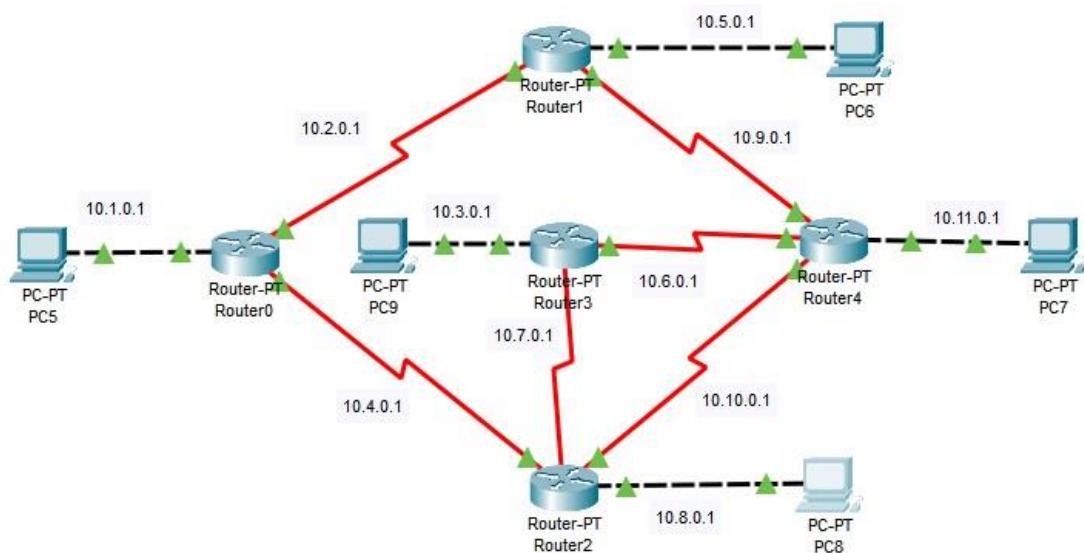
Pinging 192.168.25.2 with 32 bytes of data:

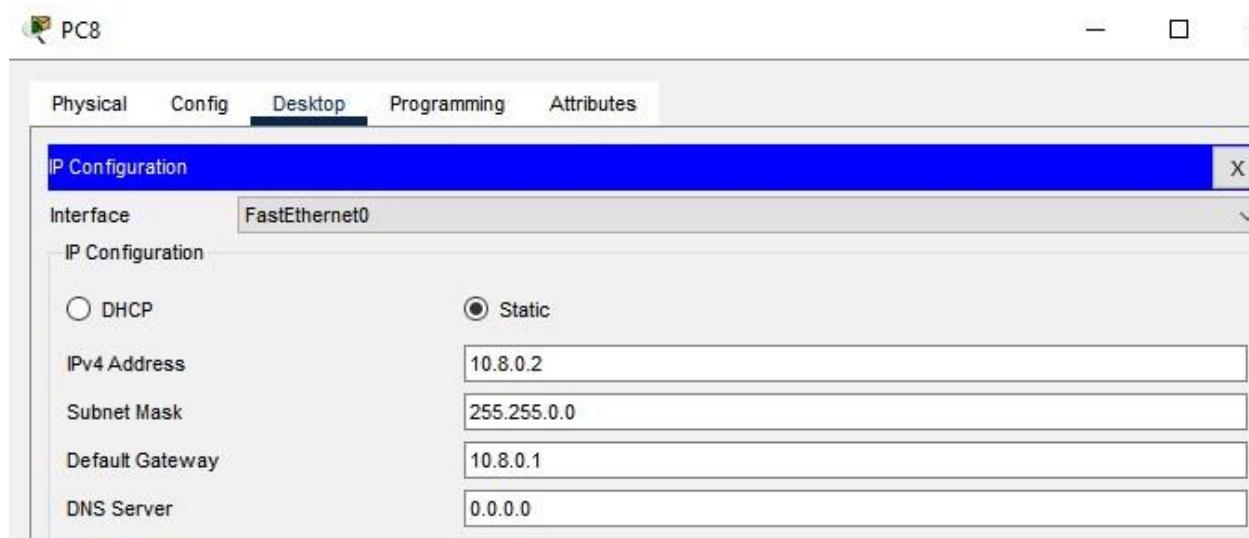
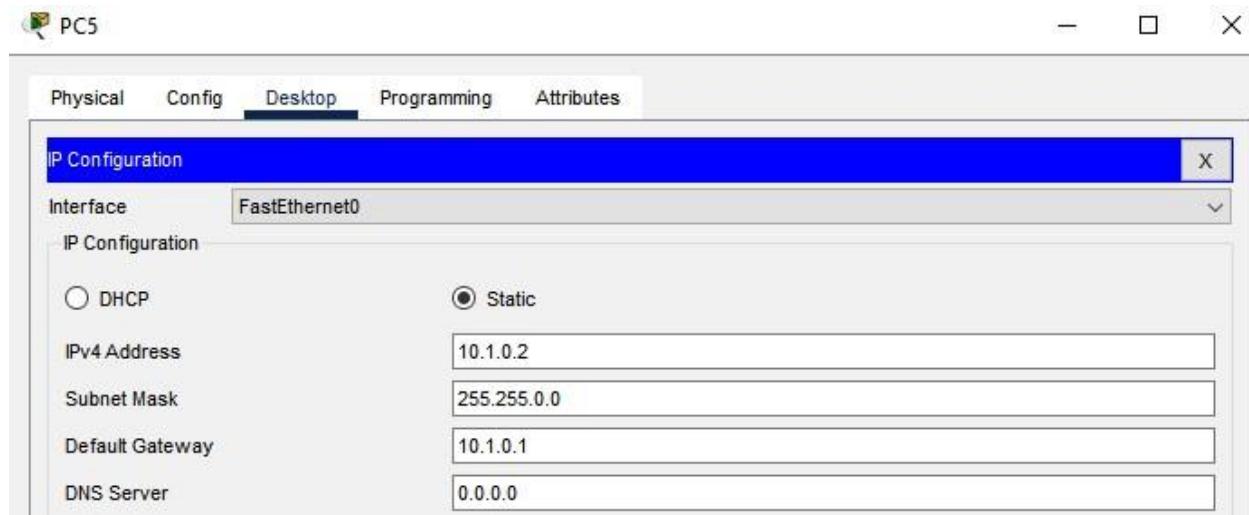
Request timed out.
Reply from 192.168.25.2: bytes=32 time=1ms TTL=126
Reply from 192.168.25.2: bytes=32 time=1ms TTL=126
Reply from 192.168.25.2: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.25.2:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

```

## Task:





Router0

Physical    Config    **CLI**    Attributes

IOS Command Line Interface

```
Router>
Router>en
Router#show ip routes
^
* Invalid input detected at '^' marker.

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

      10.0.0.0/16 is subnetted, 11 subnets
C        10.1.0.0 is directly connected, FastEthernet0/0
C        10.2.0.0 is directly connected, Serial3/0
O        10.3.0.0 [110/129] via 10.4.0.1, 00:06:58, Serial2/0
C        10.4.0.0 is directly connected, Serial2/0
O        10.5.0.0 [110/65] via 10.2.0.2, 00:10:21, Serial3/0
O        10.6.0.0 [110/192] via 10.2.0.2, 00:05:30, Serial3/0
          [110/192] via 10.4.0.1, 00:05:30, Serial2/0
O        10.7.0.0 [110/128] via 10.4.0.1, 00:06:58, Serial2/0
O        10.8.0.0 [110/65] via 10.4.0.1, 00:06:32, Serial2/0
O        10.9.0.0 [110/128] via 10.2.0.2, 00:10:11, Serial3/0
O        10.10.0.0 [110/128] via 10.4.0.1, 00:06:32, Serial2/0
O        10.11.0.0 [110/129] via 10.2.0.2, 00:05:06, Serial3/0
          [110/129] via 10.4.0.1, 00:05:06, Serial2/0
```

Router1

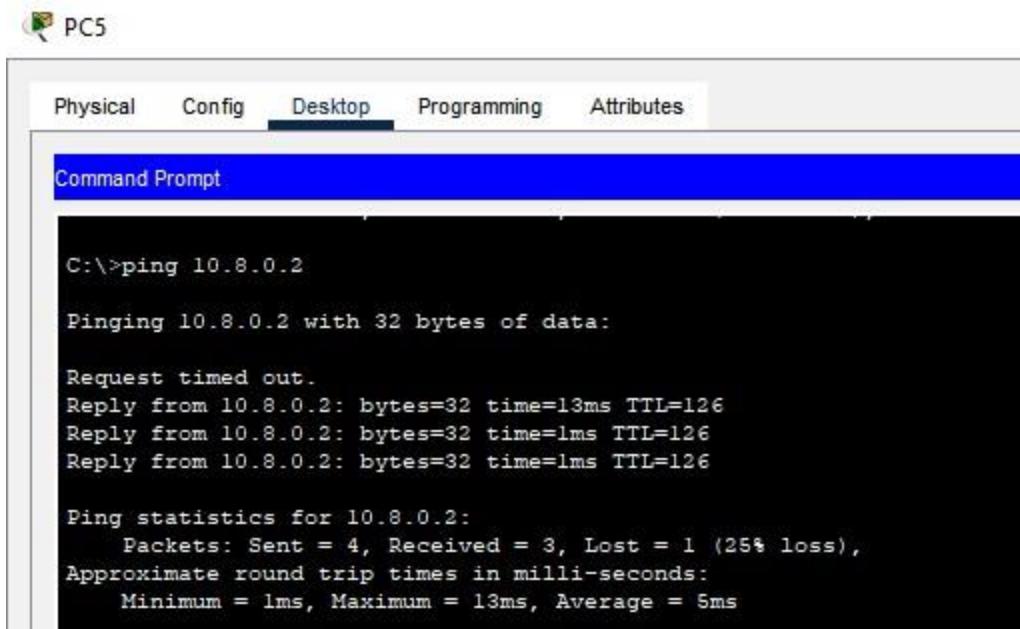
Physical    Config    **CLI**    Attributes

IOS Command Line Interface

```
Router>en
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter ar
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

  10.0.0.0/16 is subnetted, 11 subnets
O    10.1.0.0 [110/65] via 10.2.0.1, 00:11:02, Serial2/0
C    10.2.0.0 is directly connected, Serial2/0
O    10.3.0.0 [110/129] via 10.9.0.1, 00:05:59, Serial3/0
O    10.4.0.0 [110/128] via 10.2.0.1, 00:11:02, Serial2/0
C    10.5.0.0 is directly connected, FastEthernet0/0
O    10.6.0.0 [110/128] via 10.9.0.1, 00:05:59, Serial3/0
O    10.7.0.0 [110/192] via 10.2.0.1, 00:05:59, Serial2/0
          [110/192] via 10.9.0.1, 00:05:59, Serial3/0
O    10.8.0.0 [110/129] via 10.2.0.1, 00:05:45, Serial2/0
          [110/129] via 10.9.0.1, 00:05:45, Serial3/0
C    10.9.0.0 is directly connected, Serial3/0
O    10.10.0.0 [110/128] via 10.9.0.1, 00:05:45, Serial3/0
O    10.11.0.0 [110/65] via 10.9.0.1, 00:05:35, Serial3/0
```



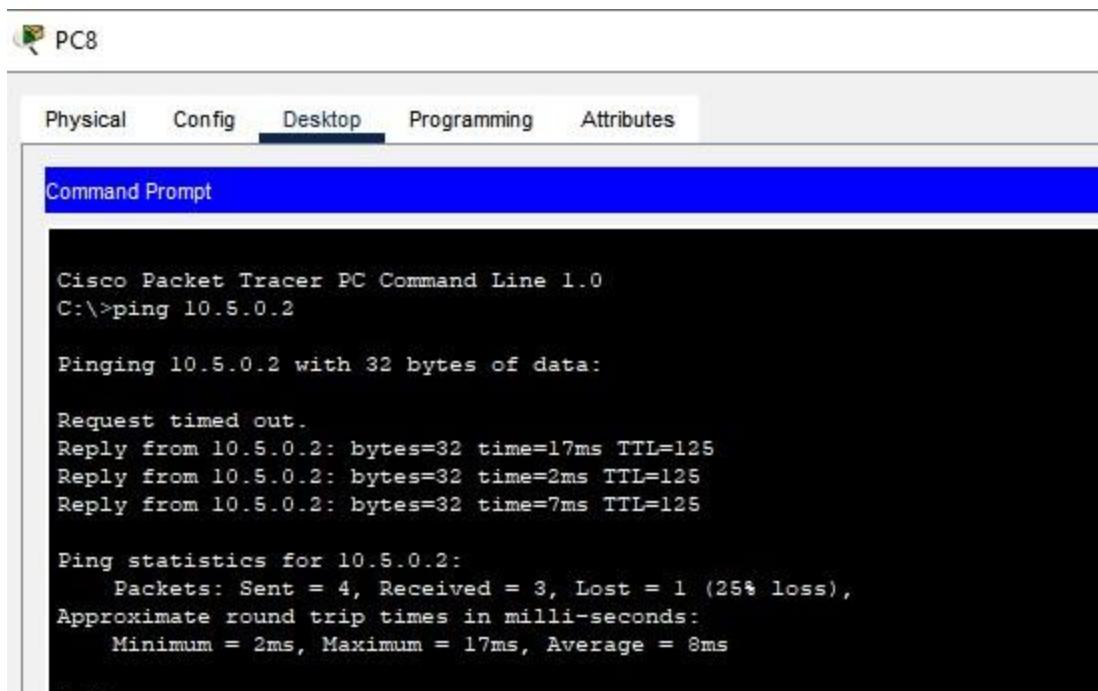
The screenshot shows a software interface for managing network devices. At the top, there's a menu bar with tabs: Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is currently selected, indicated by a dark blue underline. Below the menu is a blue header bar labeled 'Command Prompt'. The main area is a black terminal window displaying the output of a 'ping' command. The text in the terminal is as follows:

```
C:\>ping 10.8.0.2

Pinging 10.8.0.2 with 32 bytes of data:

Request timed out.
Reply from 10.8.0.2: bytes=32 time=13ms TTL=126
Reply from 10.8.0.2: bytes=32 time=1ms TTL=126
Reply from 10.8.0.2: bytes=32 time=1ms TTL=126

Ping statistics for 10.8.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 13ms, Average = 5ms
```



PC8

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.5.0.2

Pinging 10.5.0.2 with 32 bytes of data:

Request timed out.
Reply from 10.5.0.2: bytes=32 time=17ms TTL=125
Reply from 10.5.0.2: bytes=32 time=2ms TTL=125
Reply from 10.5.0.2: bytes=32 time=7ms TTL=125

Ping statistics for 10.5.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 17ms, Average = 8ms
```



**Usman Institute of Technology**

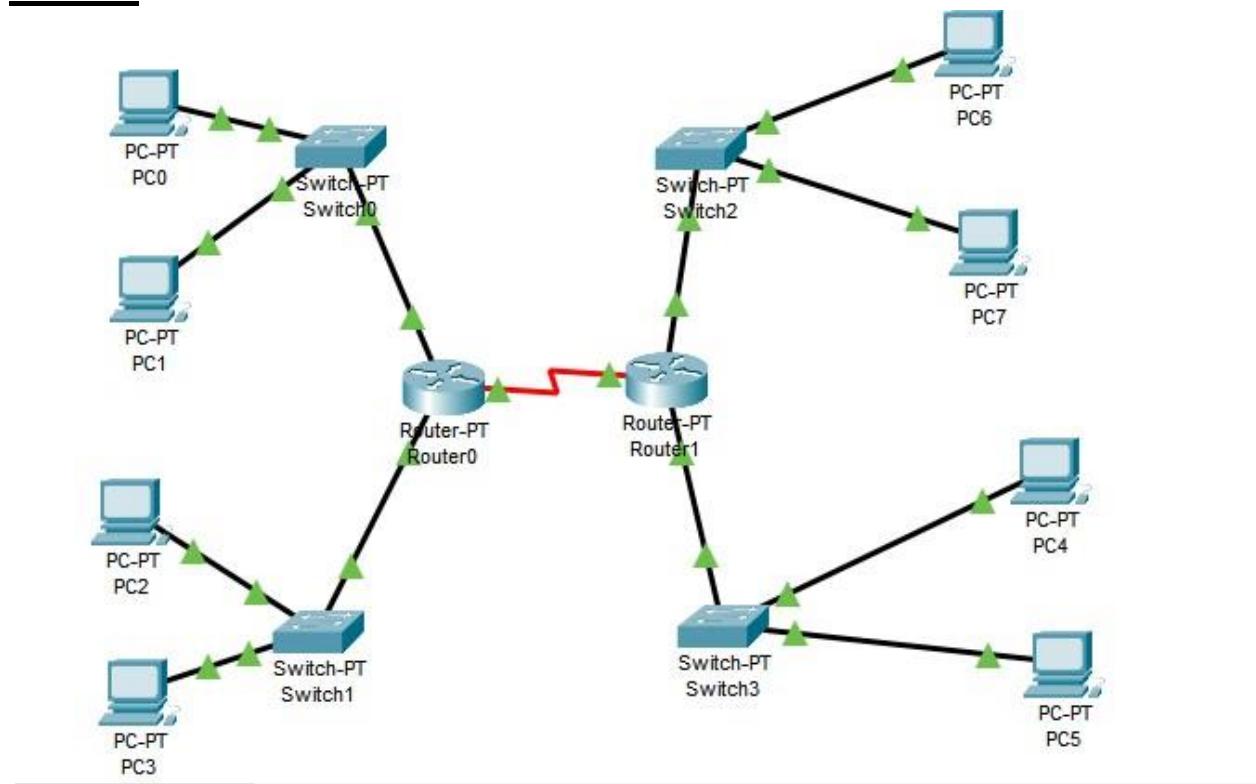
**Department of Computer Science**

**Course Code: CS222**

**Course Title: Data Communication & Computer Networks**

**Fall 2022**

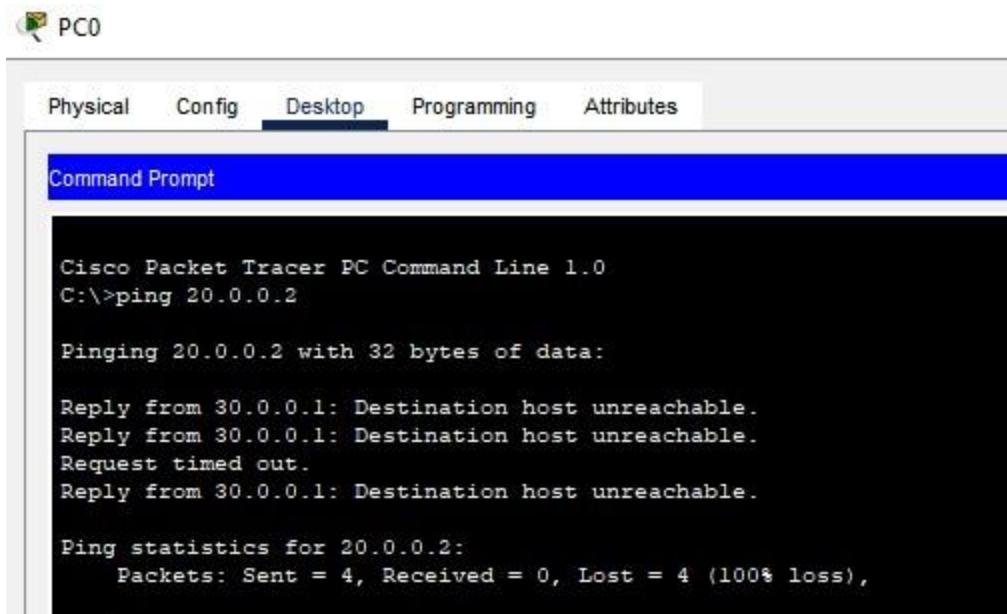
**LAB 14**

**Task 1****1**

```
Router#sh access-lists
Standard IP access list 1
 10 deny host 40.0.0.2
 20 permit any
```

**2**

```
Router>en
Router#sh access-lists
Standard IP access list 1
 10 deny host 40.0.0.2
 20 permit any
 30 permit host 40.0.0.2
```



The image shows a screenshot of the Cisco Packet Tracer software interface. At the top, there is a menu bar with tabs: Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is currently selected, indicated by a blue underline. Below the menu is a title bar labeled 'Command Prompt'. The main area of the window is a black terminal-like interface displaying command-line output. The text in the terminal is as follows:

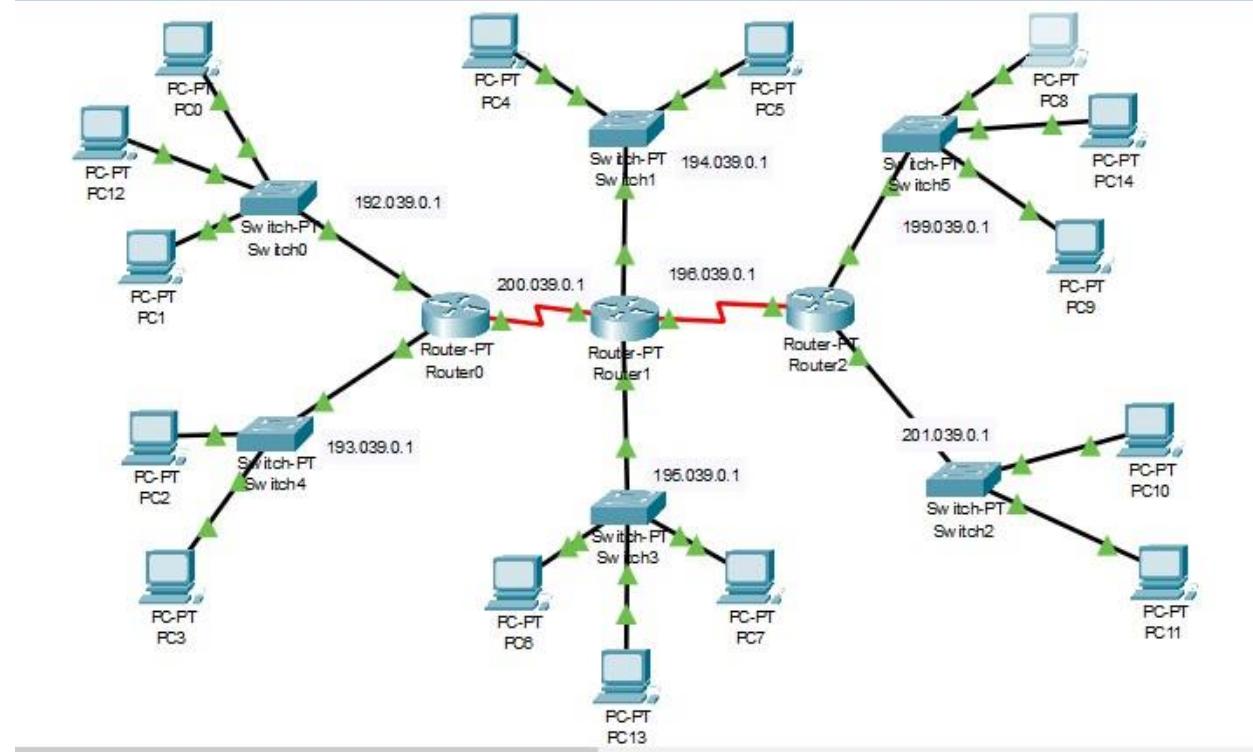
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 30.0.0.1: Destination host unreachable.
Reply from 30.0.0.1: Destination host unreachable.
Request timed out.
Reply from 30.0.0.1: Destination host unreachable.

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

## Task 2



### ACL 1

```

Router>en
Router#sh access-lists
Standard IP access list 1
 10 deny host 192.39.0.2 (12 match(es))
 20 deny host 192.39.0.3 (4 match(es))
 30 permit any (12 match(es))
...

```

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
C:\>ping 201.039.0.3  
Pinging 201.039.0.3 with 32 bytes of data:  
  
Reply from 196.39.0.2: Destination host unreachable.  
  
Ping statistics for 201.39.0.3:  
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

## ACL 2

```
Router#sh access-lists  
Standard IP access list 2  
 10 deny 193.39.0.0 0.0.0.255 (4 match(es))  
 20 permit any
```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0  
C:\>ping 192.039.0.3  
Pinging 192.039.0.3 with 32 bytes of data:  
  
Reply from 193.39.0.1: Destination host unreachable.  
  
Ping statistics for 192.39.0.3:  
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

**ACL 3**

```
Router>en
Router#sh access-lists
Standard IP access list 3
 10 permit 194.39.0.0 0.0.0.255 (4 match(es))
 20 deny any
```

PC4

Physical	Config	Desktop	Programming	Attributes
----------	--------	---------	-------------	------------

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 195.039.0.3

Pinging 195.039.0.3 with 32 bytes of data:

Reply from 195.39.0.3: bytes=32 time<1ms TTL=127
Reply from 195.39.0.3: bytes=32 time=1ms TTL=127
Reply from 195.39.0.3: bytes=32 time<1ms TTL=127
Reply from 195.39.0.3: bytes=32 time=16ms TTL=127

Ping statistics for 195.39.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 16ms, Average = 4ms
```

PC0

Physical	Config	Desktop	Programming	Attributes
----------	--------	---------	-------------	------------

Command Prompt

```
C:\>ping 195.039.0.3

Pinging 195.039.0.3 with 32 bytes of data:

Reply from 200.39.0.2: Destination host unreachable.

Ping statistics for 195.39.0.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

```
Standard IP access list 4
 10 deny host 199.39.0.2 (4 match(es))
 20 deny host 199.39.0.3
 30 permit any (4 match(es))
```

**ACL 4**

PC8

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 201.039.0.3

Pinging 201.039.0.3 with 32 bytes of data:

Reply from 199.39.0.1: Destination host unreachable.

Ping statistics for 201.39.0.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC14

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 201.039.0.3

Pinging 201.039.0.3 with 32 bytes of data:

Reply from 201.39.0.3: bytes=32 time<1ms TTL=127
Reply from 201.39.0.3: bytes=32 time=12ms TTL=127
Reply from 201.39.0.3: bytes=32 time=1ms TTL=127
Reply from 201.39.0.3: bytes=32 time=1ms TTL=127

Ping statistics for 201.39.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 12ms, Average = 3ms
```