

ENCS3320-COMPUTER NETWORKS

PROJECT#2

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TASK 0:IP SUBNETTING & ASSIGNMENT PART

Define the process on how to get the original IP address from your ID. Don't forget to briefly talk about IPv4 and specify the network and the host parts, Show your steps and how to define the subnets' IPs in your topology. Don't forget to complete the table and show the selected IPs on the topology, Provide snapshots showing the results and discuss them.

Answer:

IPv4 addresses are 32-bit numbers typically written in decimal format as four octets separated by periods. Each address has a network part and a host part, determined by the subnet mask. The network part identifies the specific subnet, while the host part identifies devices within that subnet.

Starting with the creation of 4 networks, finding out the IPs of the sub networks first:

(Using Anas's Id 1221020, the IP used for the subnetting become 120.10.8.0/26.

Bits required:

NET2(60 host)

we divide it to subnet Net2-1 and Net2-2 since it has 2-switches

NET2-1(30 host) $2^5 - 2 = 32 \geq 30 \rightarrow \# \text{bits} = 5$

NET2-2(30 host) $2^5 - 2 = 32 \geq 30 \rightarrow \# \text{bits} = 5$

NET1 (20 host) $2^5 - 2 = 30 \geq 20 \rightarrow \# \text{bits} = 5$

NET3 (30 host) $2^5 - 2 = 30 \geq 30 \rightarrow \# \text{bits} = 5$

NET4(10 host)

we divide it to subnet Net4-1 and Net4-2 since it has 2-switches

NET4-1(5 host) $2^3 - 2 = 6 \geq 8 \rightarrow \# \text{bits} = 3$

NET4-2(5 host) $2^3 - 2 = 6 \geq 8 \rightarrow \# \text{bits} = 3$

Then we have 4 links (L0-L3) we need 4 IPS which mean 2 bits for each link

L0 = R0-R1 Link (4 host) $\rightarrow \# \text{bits} = 2$

L1 = R1-R2 Link (4 host) $\rightarrow \# \text{bits} = 2$

L2 = R2-R3 Link (4 host) $\rightarrow \# \text{bits} = 2$

L3 = R3-R0 Link (4 host) $\rightarrow \# \text{bits} = 2$

Subnet	Network IP	First IP	Second IP
NET2	120.10.8.0/26	120.10.8.1	120.10.8.62
NET1	120.10.8.64/27	120.10.8.65	120.10.8.94
NET3	120.10.8.96/27	120.10.8.97	120.10.8.126
NET4	120.10.8.96/28	120.10.8.129	120.10.8.144

Subnet	Subnet Mask/x	Network IP	Broadcast IP	First IP	Last IP	# Hosts
NET2-1	255.255.255.224/27	120.10.8.0	120.10.8.31	120.10.8.1	120.10.8.30	30
NET2-1	255.255.255.224/27	120.10.8.32	120.10.8.63	120.10.8.33	120.10.8.62	30
NET1	255.255.255.224/27	120.10.8.64	120.10.8.95	120.10.8.65	120.10.8.94	20
NET3	255.255.255.224/27	120.10.8.96	120.10.8.127	120.10.8.97	120.10.8.126	30
NET4-1	255.255.255.248/29	120.10.8.128	120.10.8.135	120.10.8.129	120.10.8.134	5
NET4-2	255.255.255.248/29	120.10.8.136	120.10.8.143	120.10.8.137	120.10.8.142	5
R0-R1 Link	255.255.255.252/30	120.10.8.144	120.10.8.147	120.10.8.145	120.10.8.146	2
R1-R2 Link	255.255.255.252/30	120.10.8.148	120.10.8.151	120.10.8.149	120.10.8.150	2
R2-R3 Link	255.255.255.252/30	120.10.8.152	120.10.8.155	120.10.8.153	120.10.8.154	2
R3-R0 Link	255.255.255.252/30	120.10.8.156	120.10.8.159	120.10.8.157	120.10.8.158	2

Figure 1 : Subnetting details.

TASK 1: Building Topology Part

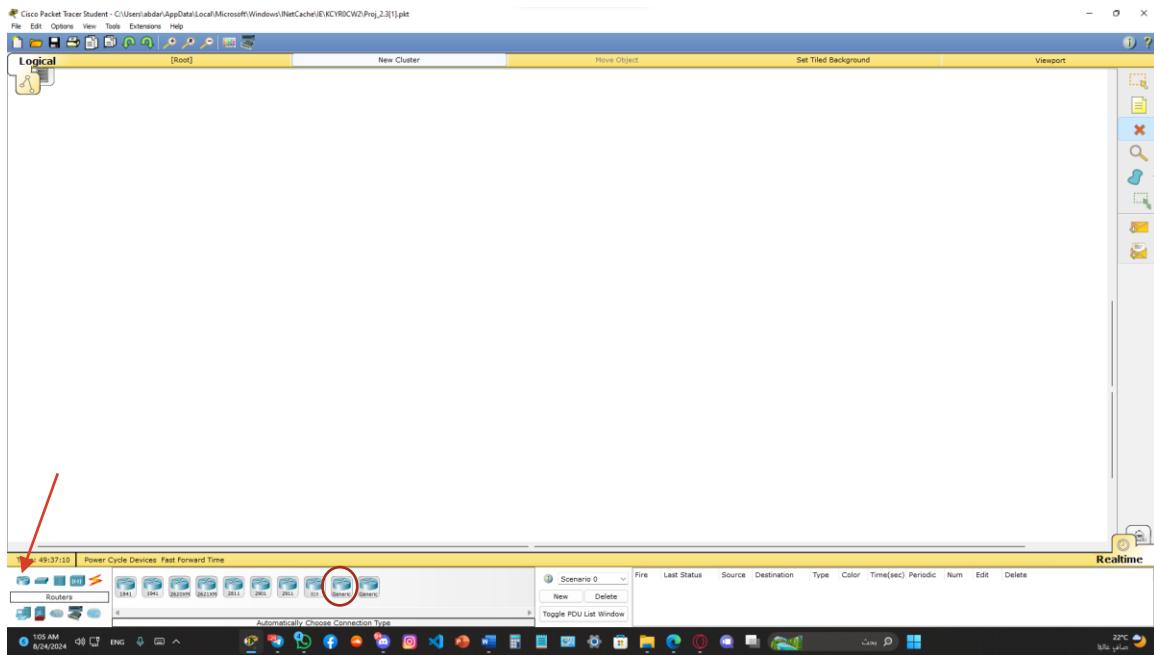


Figure 2: ADDING ROUTER

As shown in figure_ , where the arrow is pointing here we can add an routers.

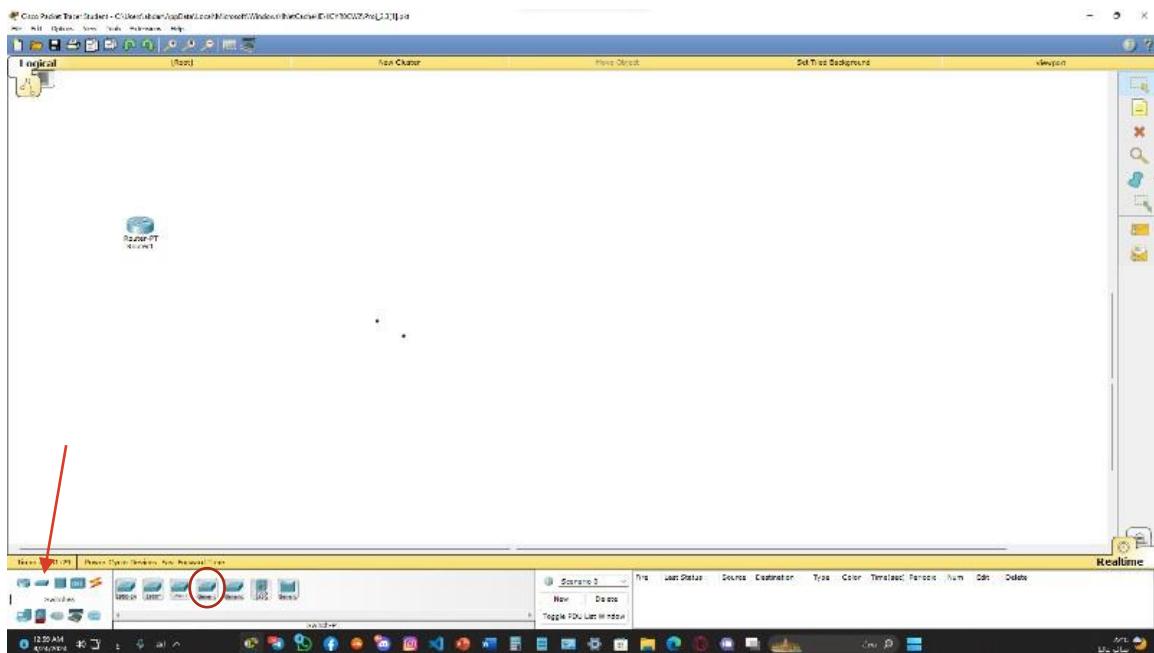


Figure 3:ADDING SERVER

As shown in figure_ , where the arrow is pointing here we can add an switches.

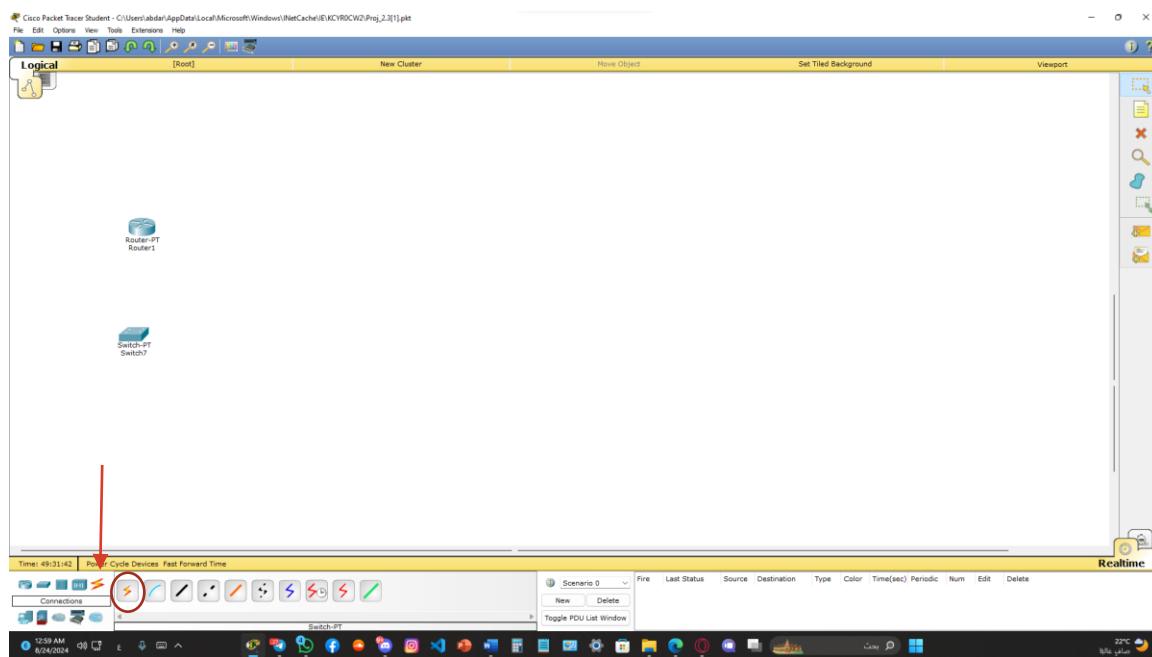


Figure 4:ADDING LINK

As shown in figure_ , where the arrow is pointing here we can add the links.

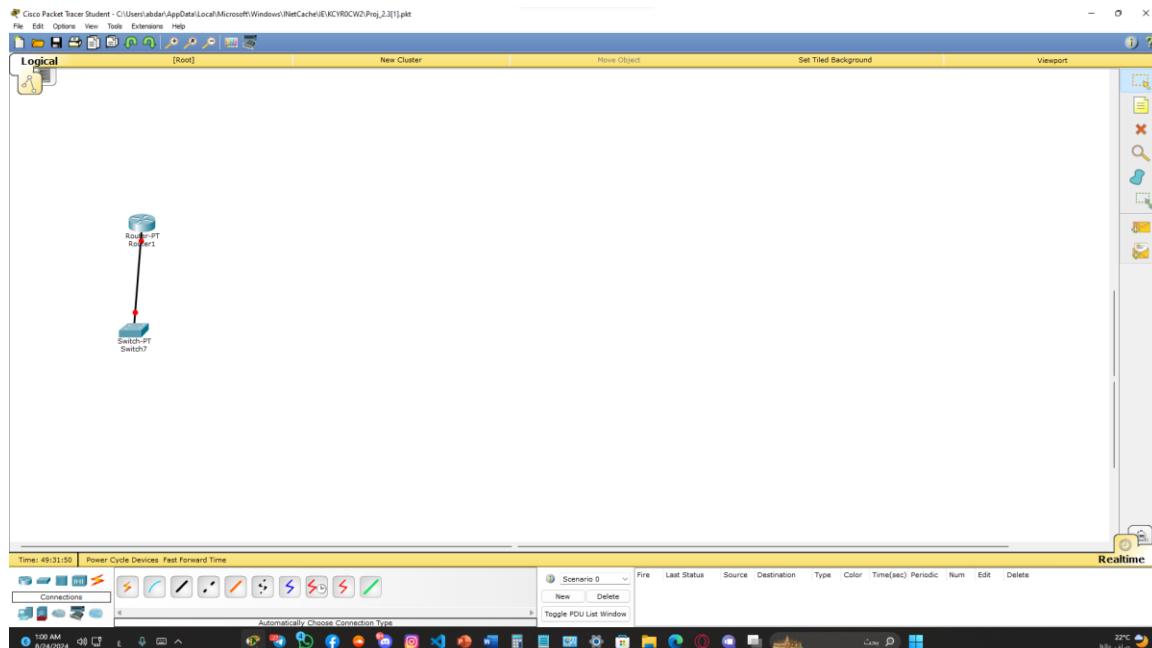


Figure 5:ADDING LINK

As shown in figure_ , the network topology well look like this.

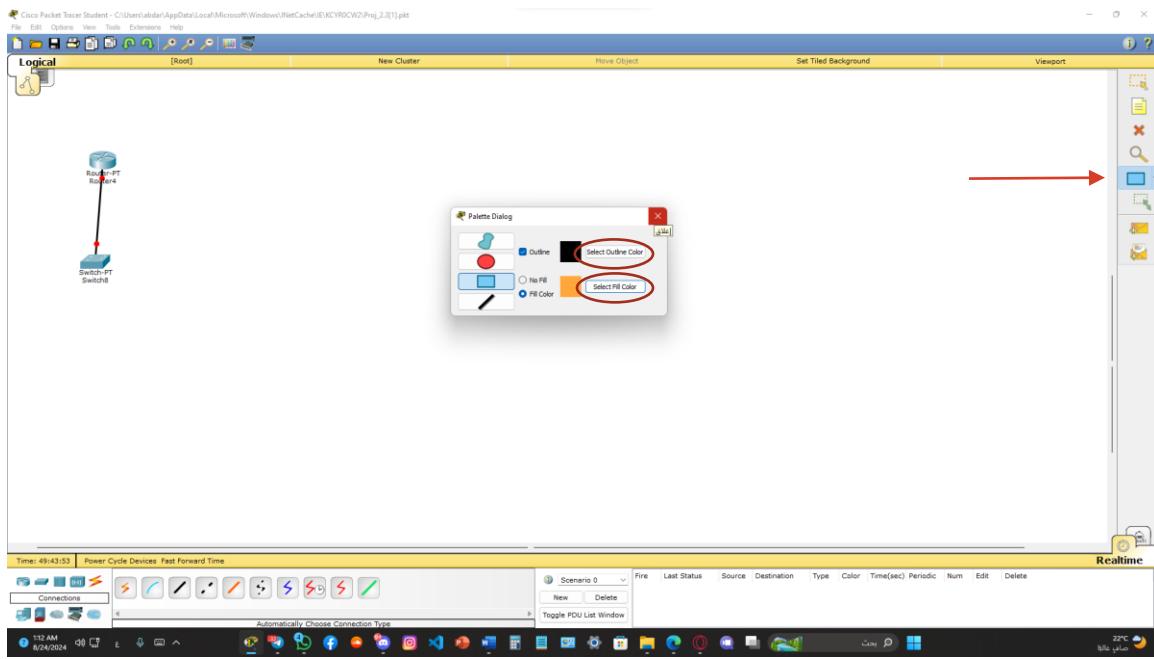


Figure 6:SET COLOAR

As shown in figure_ , where the arrow is pointing here we can add background color.

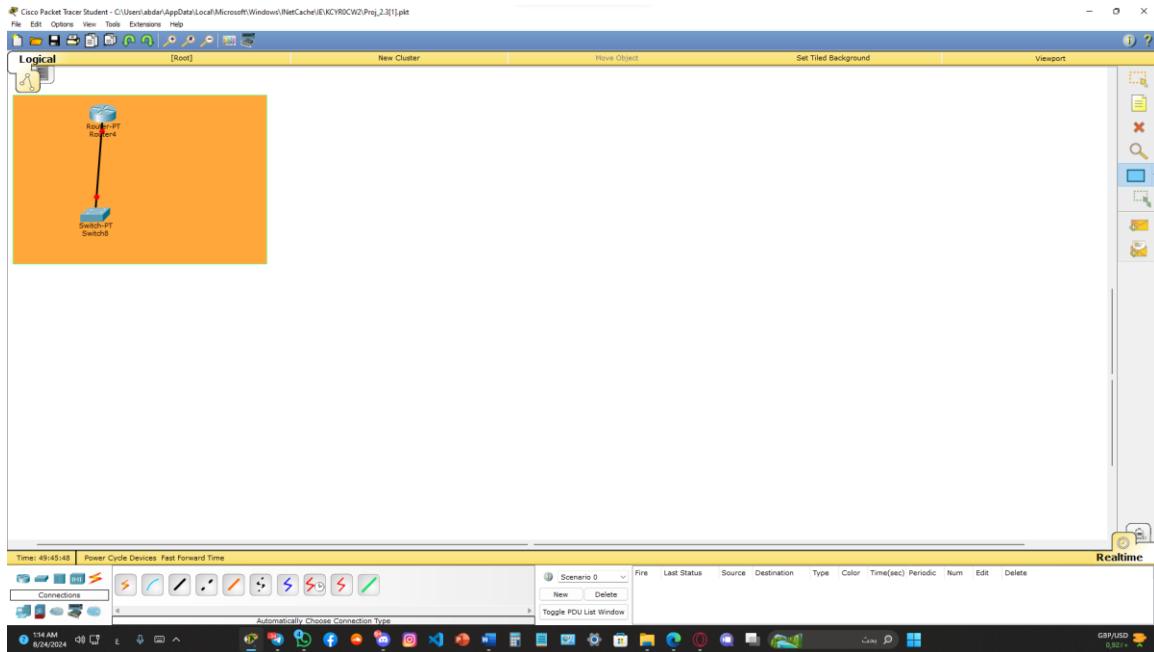


Figure 7:FULL COLOR

And like this we can make the network topology.

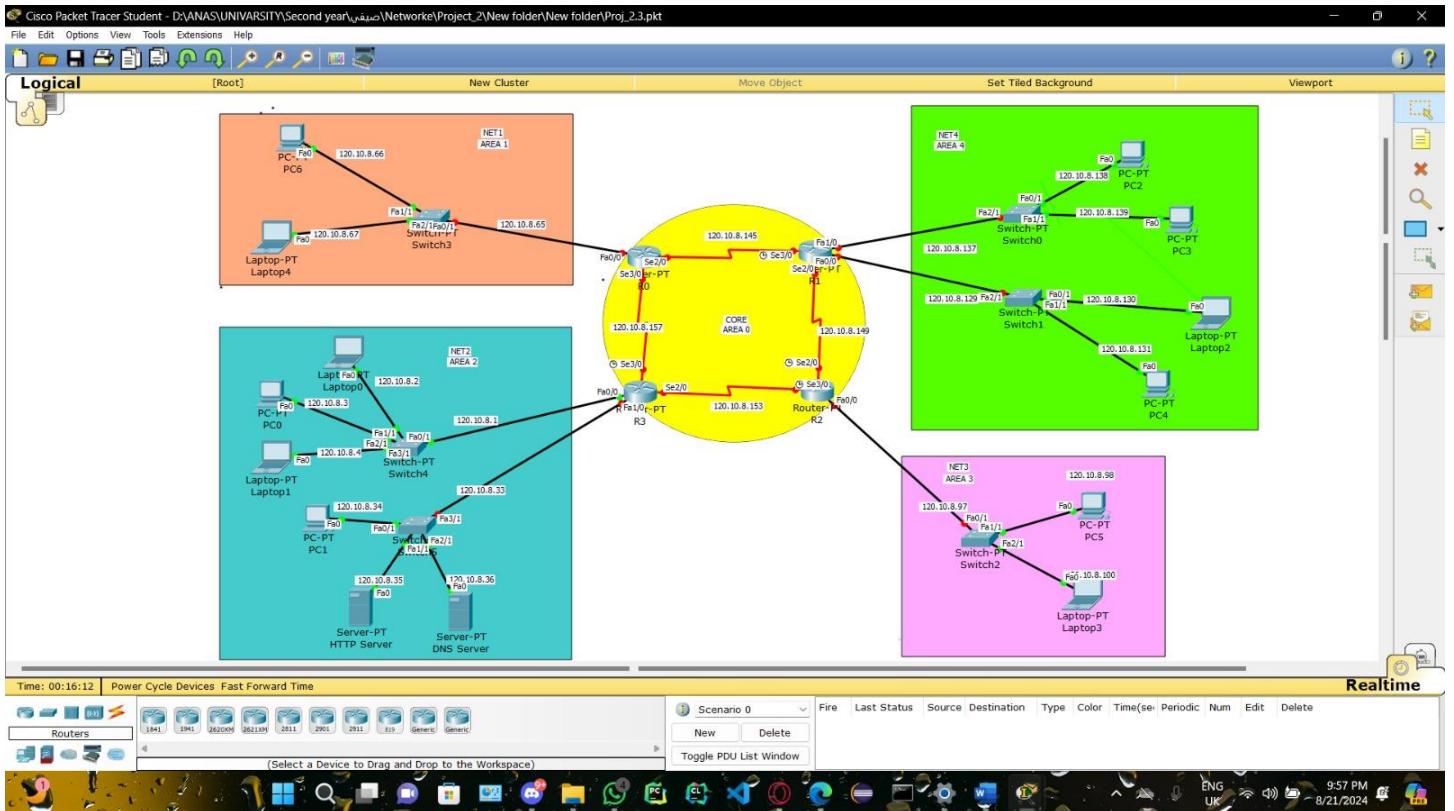


Figure 8 Network topology

In figure 1, The topology was build using packet tracer based on the IPs found in the previous part, and the configuration of interfaces of the 4 routers was done.

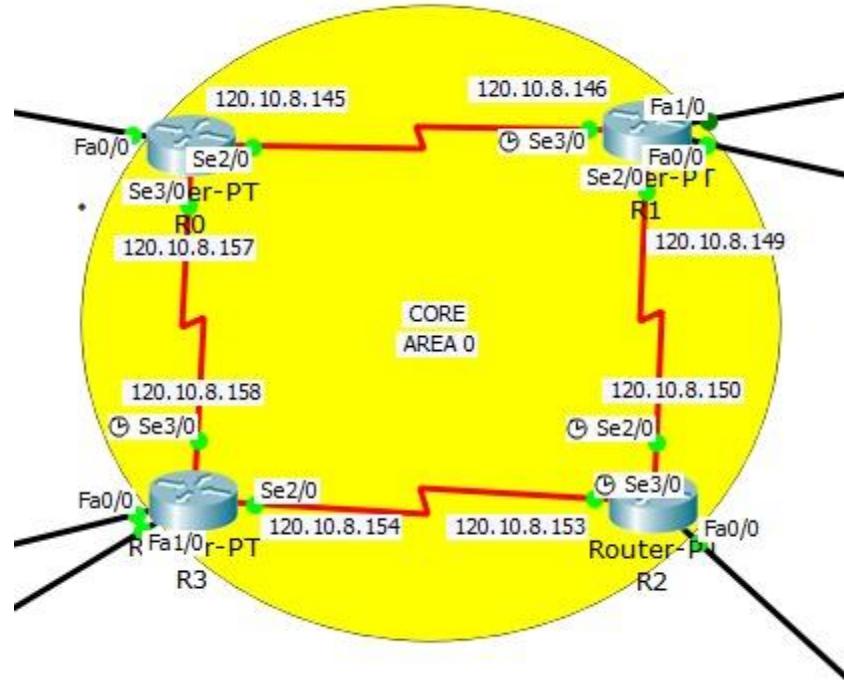


Figure 9 Core Area 0

In figure 2, we created the CORE Area which consist of 4 routers.

These routers have 14 interfaces.

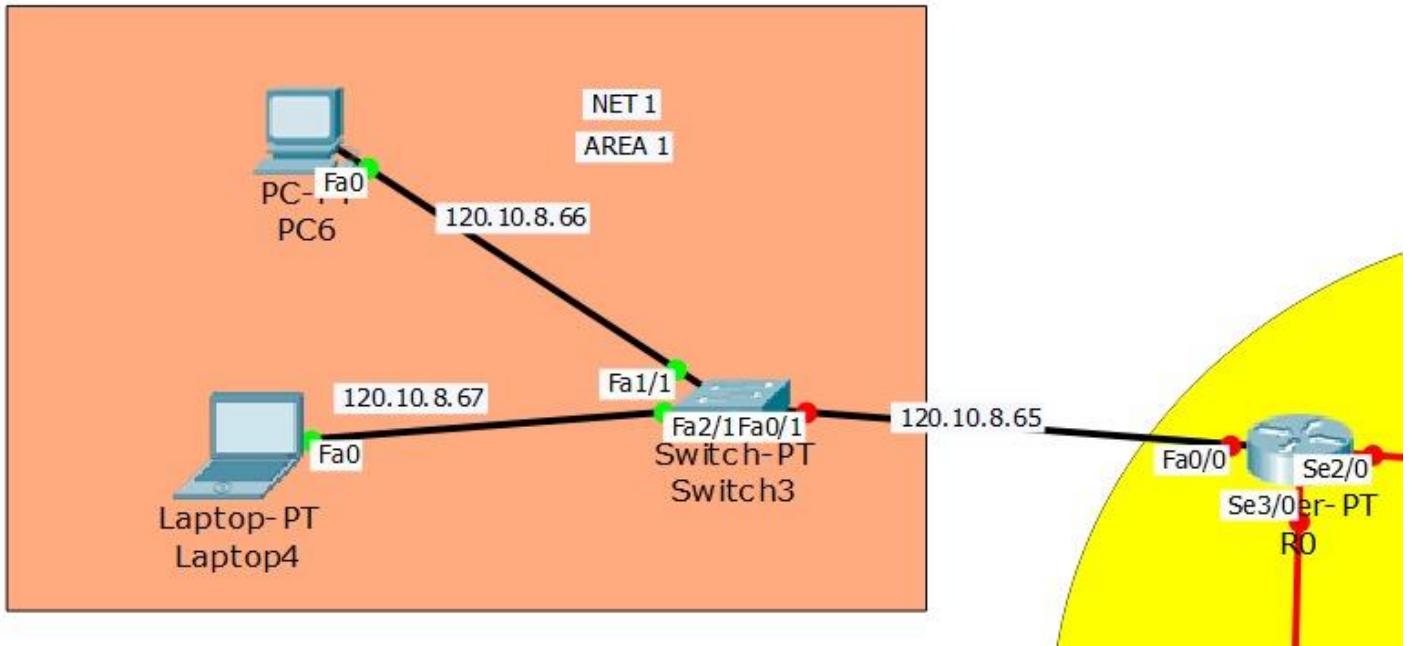


Figure 10 Net 1 Area 1

Figure 3 show Net 1 in Area 1 which have a pc, laptop and switch; After we connected all devices with Switch-PT, we connected the switch directly with Router-PT(R0), We gave each device an IP based on what we got in TASK 0.

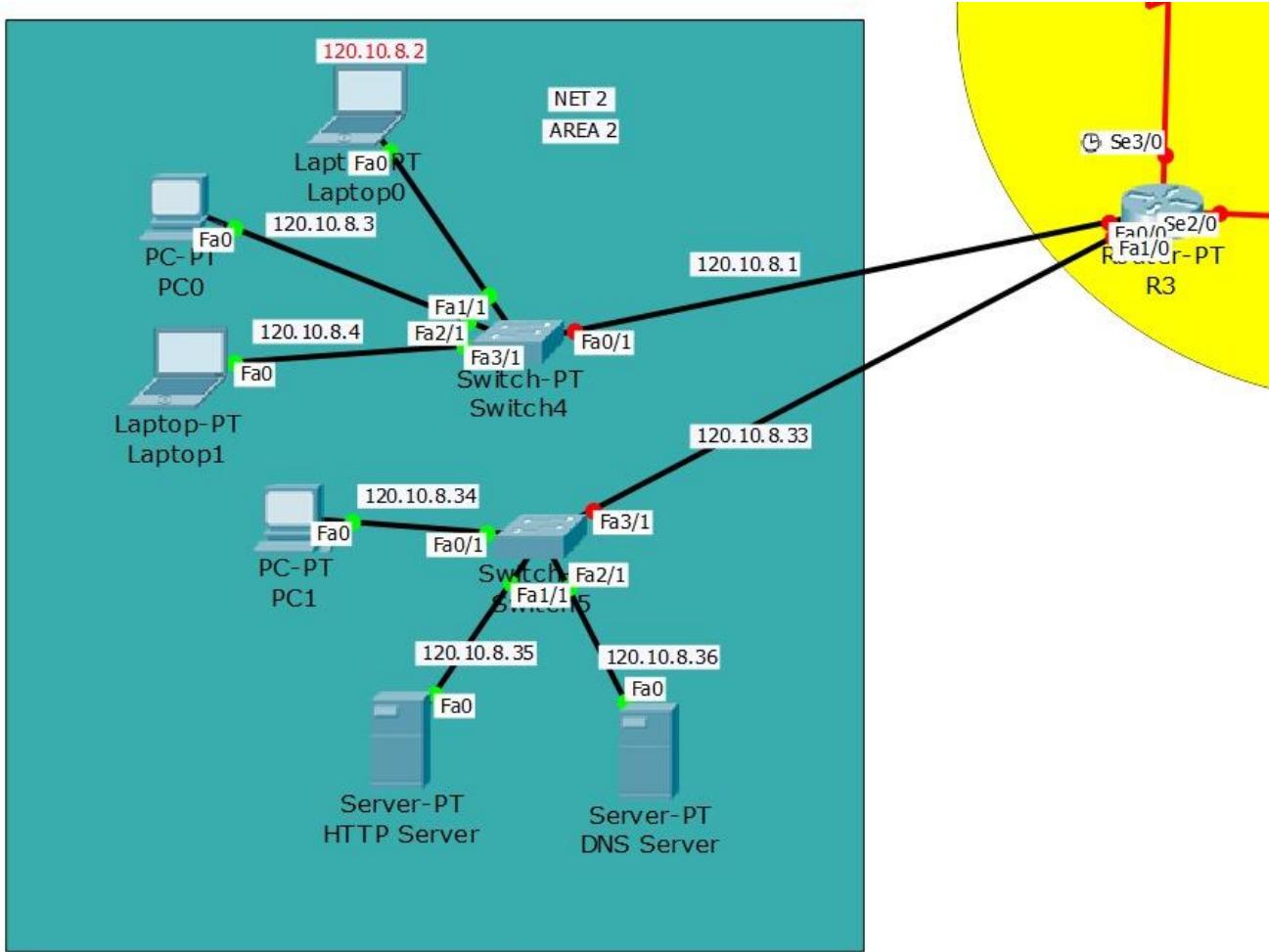


Figure 11 Net 2 Area 2

Figure 4 show Net 2 in Area 2 which have 2 Switches.

For Switch4 it has 2 laptops and one pc all connected to it, As for Switch5 it has A DNS Server and a HTTP Server and a Pc all connected to it, we connected the Switches to the Router-PT(R3), and we gave each device an IP based on TASK 0.

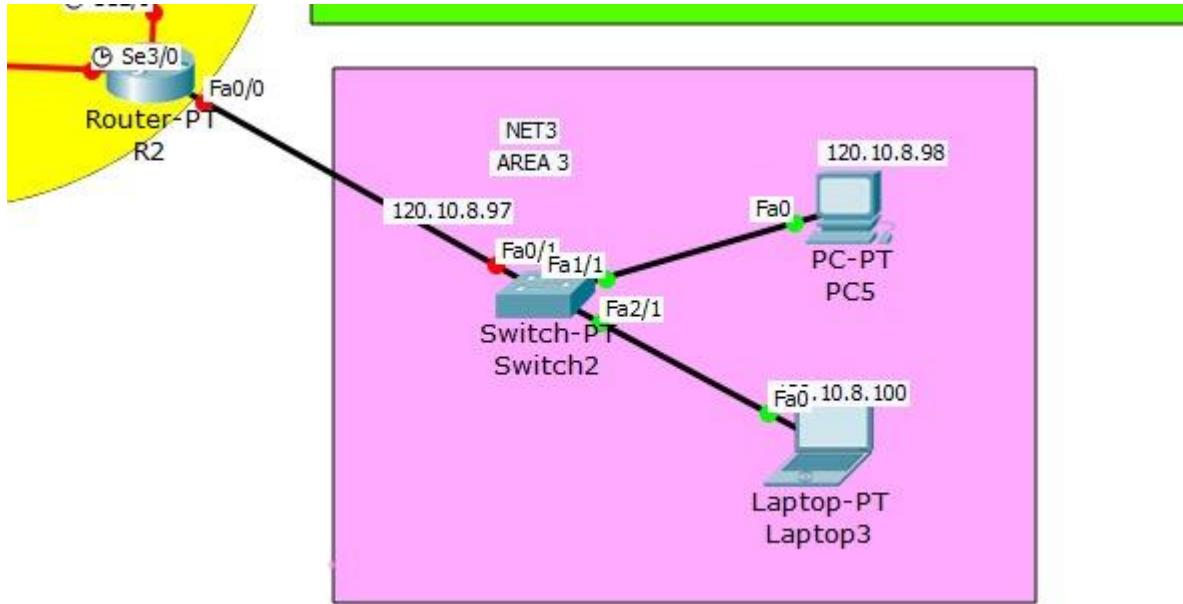


Figure 12 Net 3 Area 3

Figure 5 show Net 3 in Area 3 which have a pc, laptop and switch, after we connected all devices with Switch2, we connected the switch directly with Router-PT(R2), We gave each device an IP based on what we got in TASK 0.

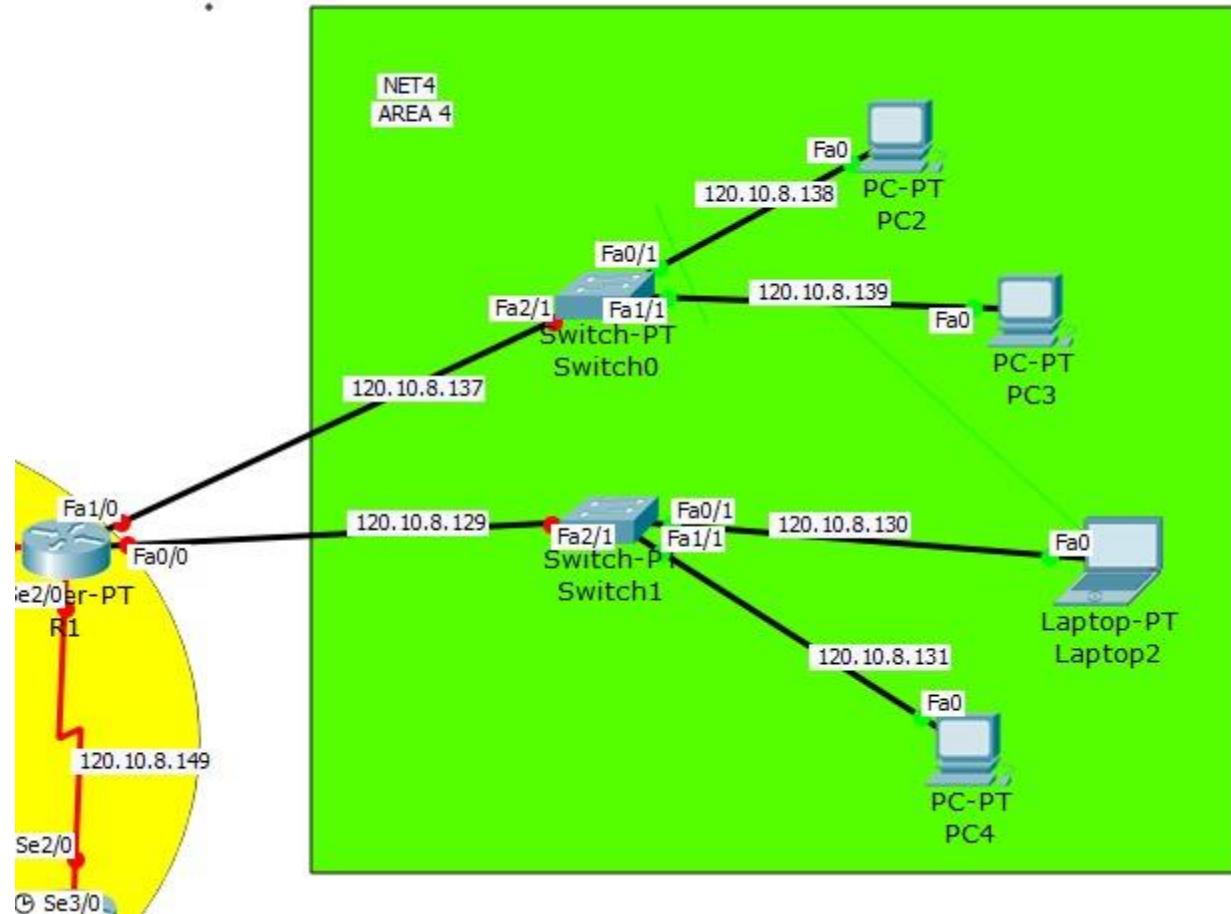


Figure 13: Net 4 Area 4

Figure 6 show Net 4 in Area 4 which have 2 Switches.

For Switch0 it has 2 pc all connected to it , As for Switch1 its Laptop and a Pc all connected to it, we connected the Switches to the Router-PT (R1), and we gave each device and IP based on TASK 0.

END Devices Configuration:

Net1 :

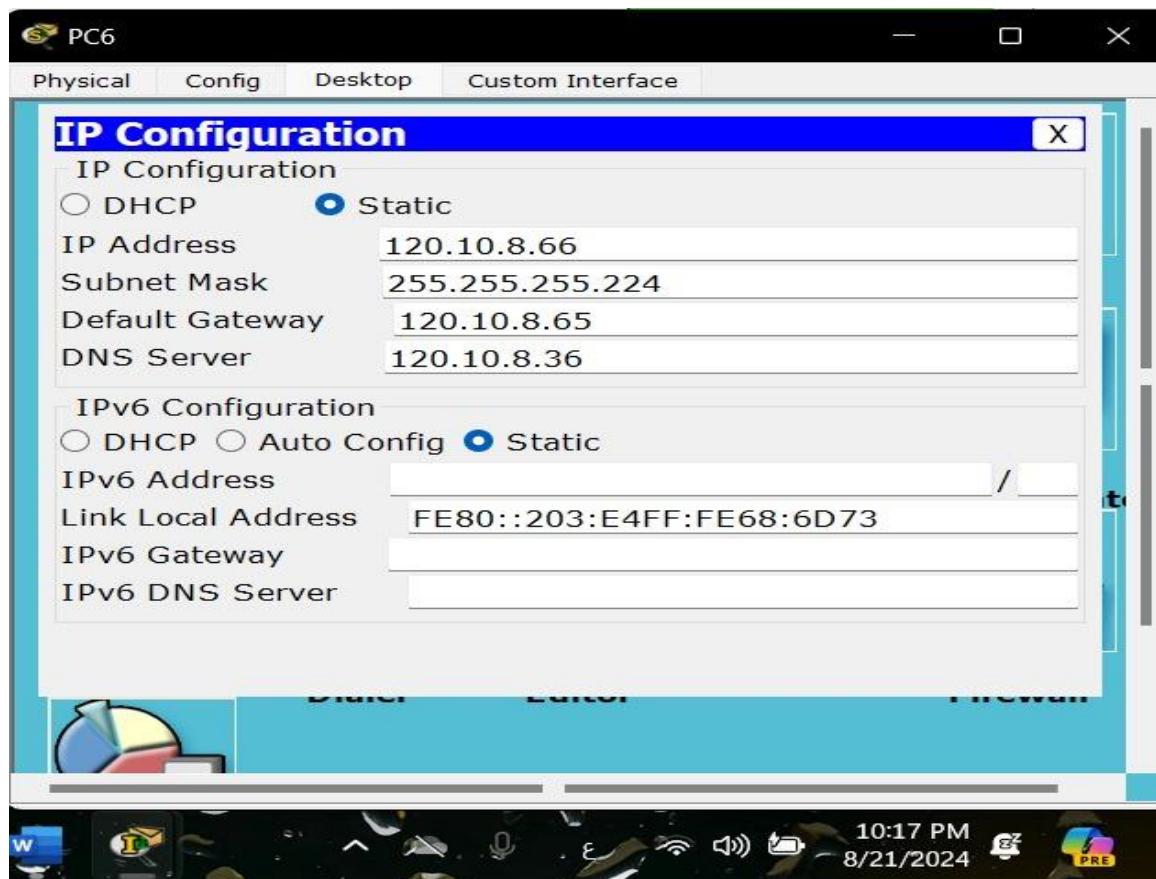


Figure 14 Configuration Of PC6

In figure 7 we add the ip 120.10.8.66 For PC6 and the subnet mask 255.255.255.224 and the default GateWay 120.10.8.65 which is connected with fa0/0 interface for (R0).

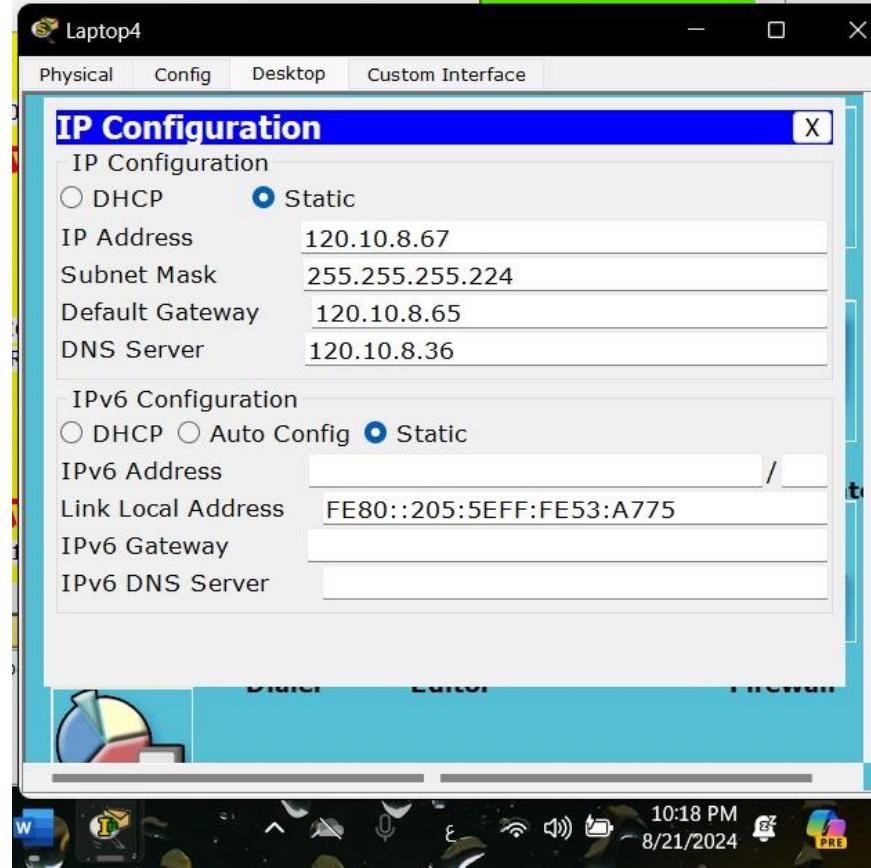


Figure 15 Configuration Of Laptop4

In figure 8 we add the ip 120.10.8.67 For Laptop4 and the subnet mask 255.255.255.224 and the default GateWay 120.10.8.65 which is connected with fa0/0 interface for (R0).

NET 2-1:

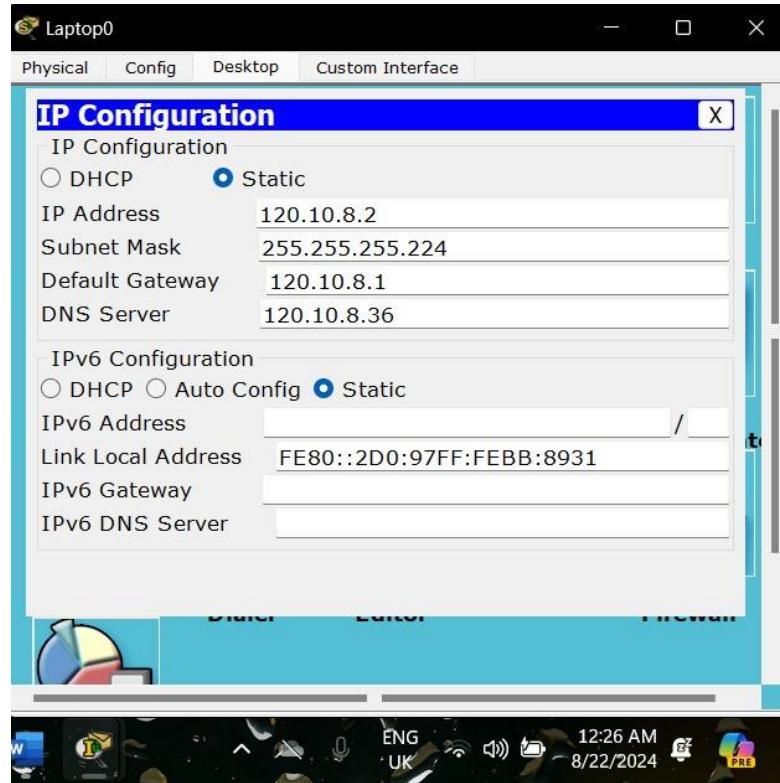


Figure 16 Configuration Of Laptop0

In figure 9 we add the ip 120.10.8.2 For Laptop0 and the subnet mask 255.255.255.224 and the default GateWay 120.10.8.1 which is connected with fa0/0 interface for (R3).

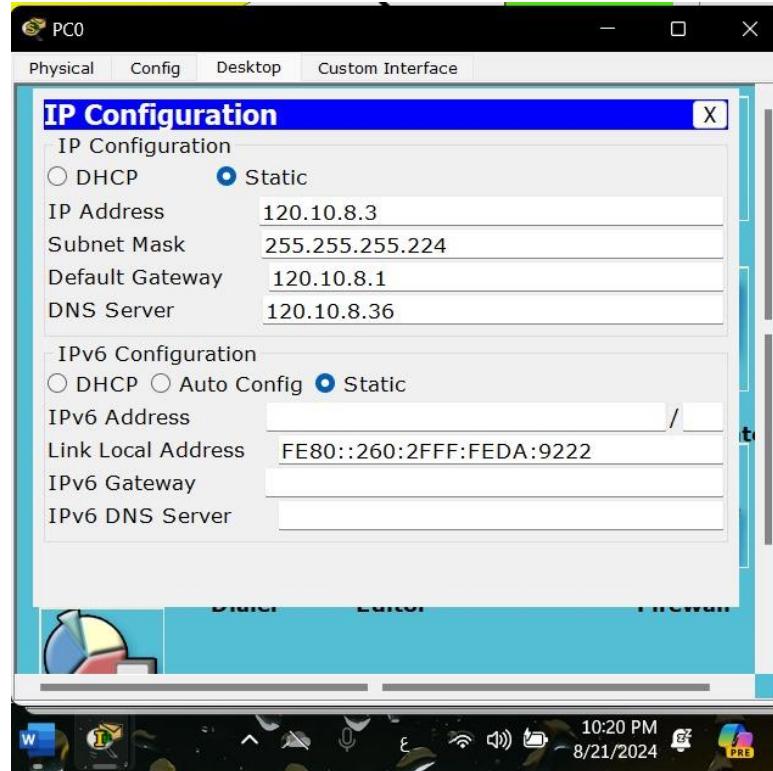


Figure 17 Configuration Of PC0

In figure 10 we add the ip 120.10.8.3 For **PC0** and the subnet mask 255.255.255.224 and the default GateWay 120.10.8.1 which is connected with fa0/0 interface for **(R3)**.

NET2-2:

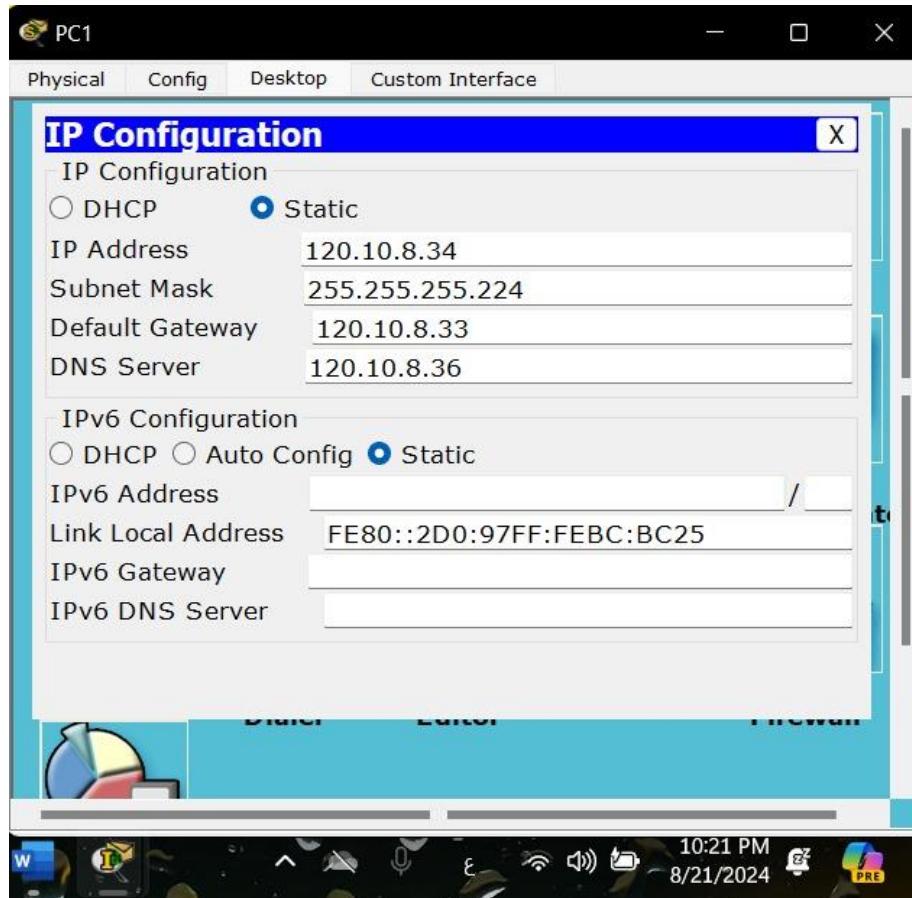


Figure 18 Configuration Of PC1

In figure 11 we add the ip 120.10.8.34 For PC1 and the subnet mask 255.255.255.224 and the default GateWay 120.10.8.33 which is connected with fa0/0 interface for (R3).

NET 3:

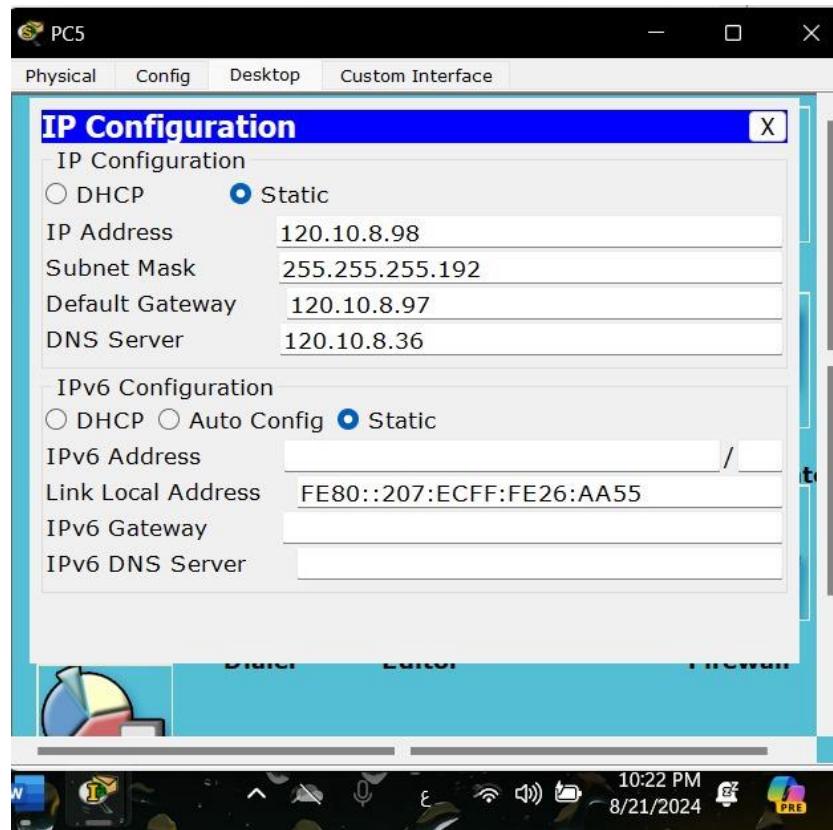


Figure 19 Configuration Of PC5

In figure 12 we add the ip 120.10.8.98 For PC5 and the subnet mask 255.255.255.192 and the default GateWay 120.10.8.97 which is connected with fa0/0 interface for (R2).

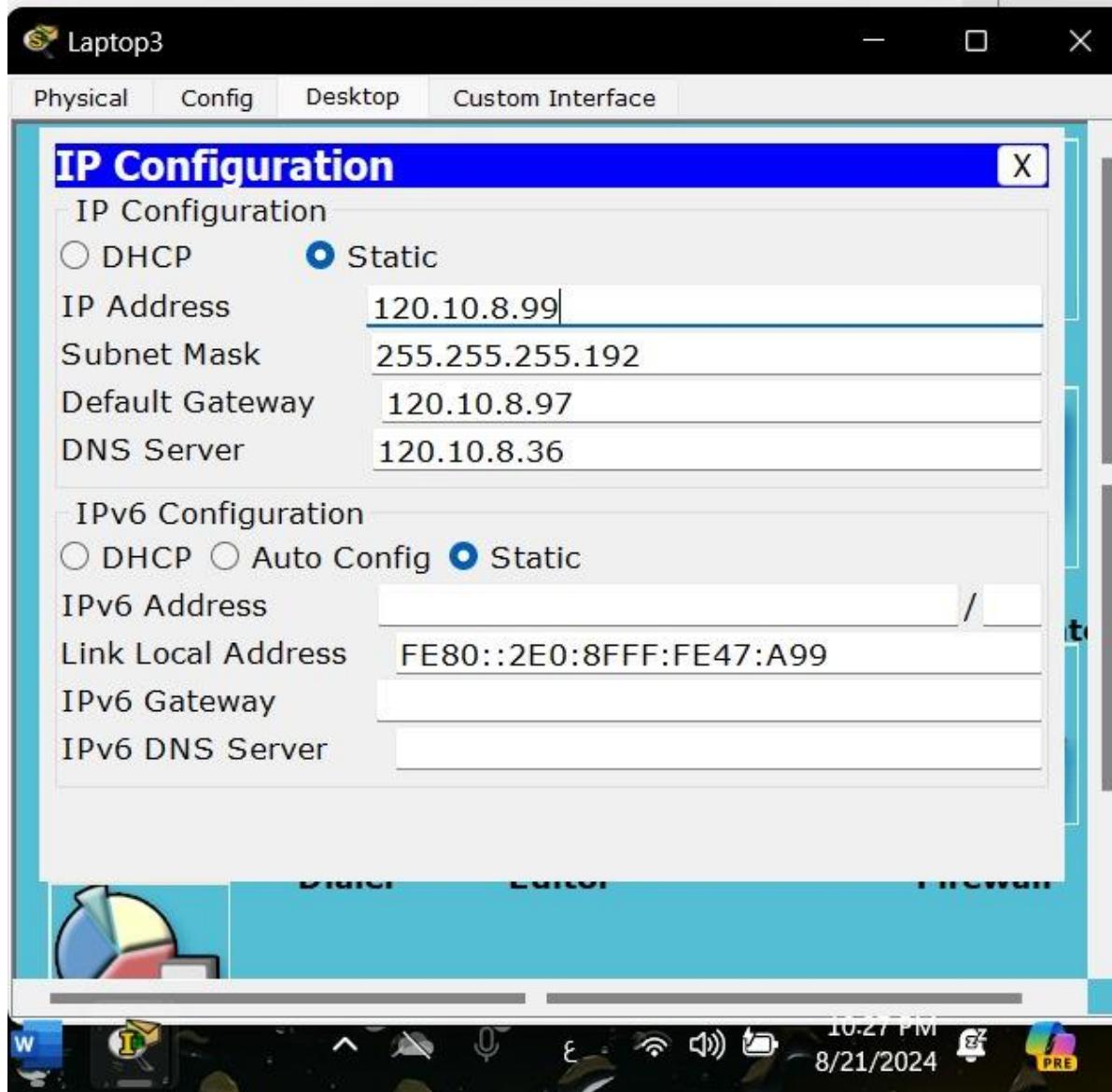


Figure 20 Configuration Of laptop3

In figure 13 we add the ip 120.10.8.99 For **Laptop3** and the subnet mask 255.255.255.192 and the default GateWay 120.10.8.97 which is connected with fa0/0 interface for **(R2)**.

NET 4-1:

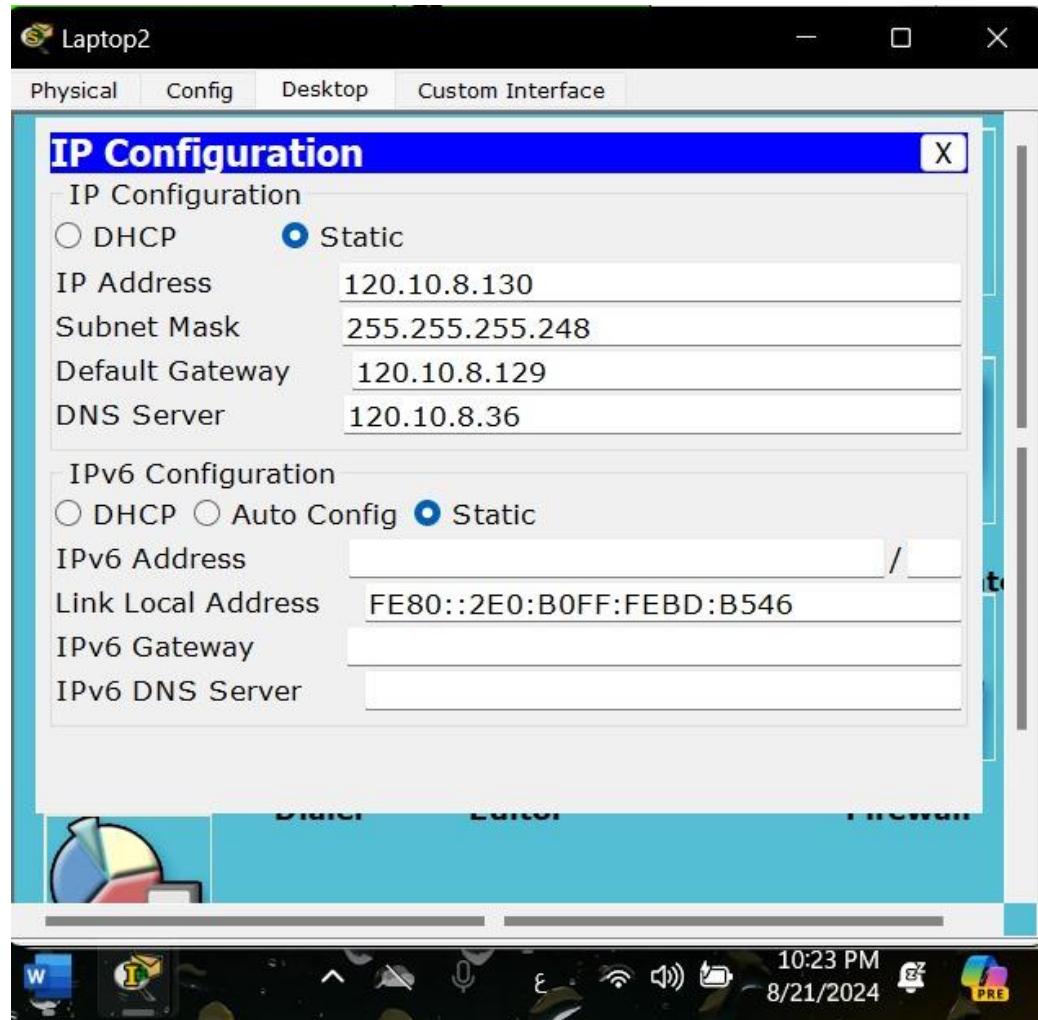


Figure 21 Configuration Of laptop2

In figure 14 we add the ip 120.10.8.130 For **Laptop2** and the subnet mask 255.255.255.248 and the default GateWay 120.10.8.129 which is connected with fa0/0 interface for **(R1)**.

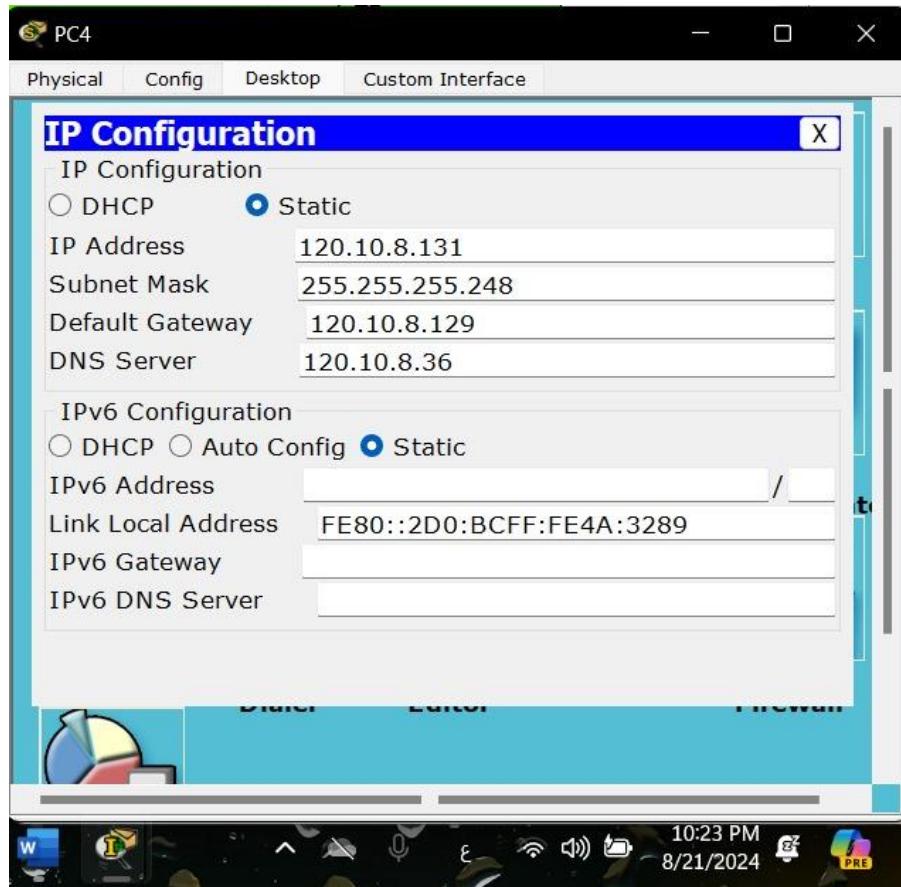


Figure 22 Configuration Of PC4

In figure 15 we add the ip 120.10.8.131 For PC4 and the subnet mask 255.255.255.248 and the default GateWay 120.10.8.129 which is connected with fa0/0 interface for (R1).

NET 4-2:

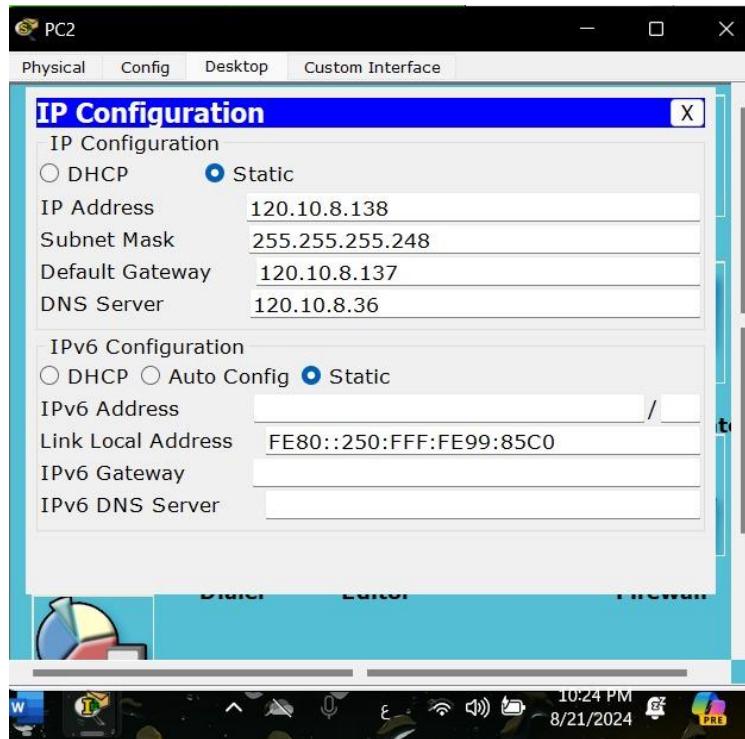


Figure 23 Configuration Of PC2

In figure 16 we add the ip 120.10.8.138 For **PC2** and the subnet mask 255.255.255.248 and the default GateWay 120.10.8.137 which is connected with fa0/0 interface for (R1).

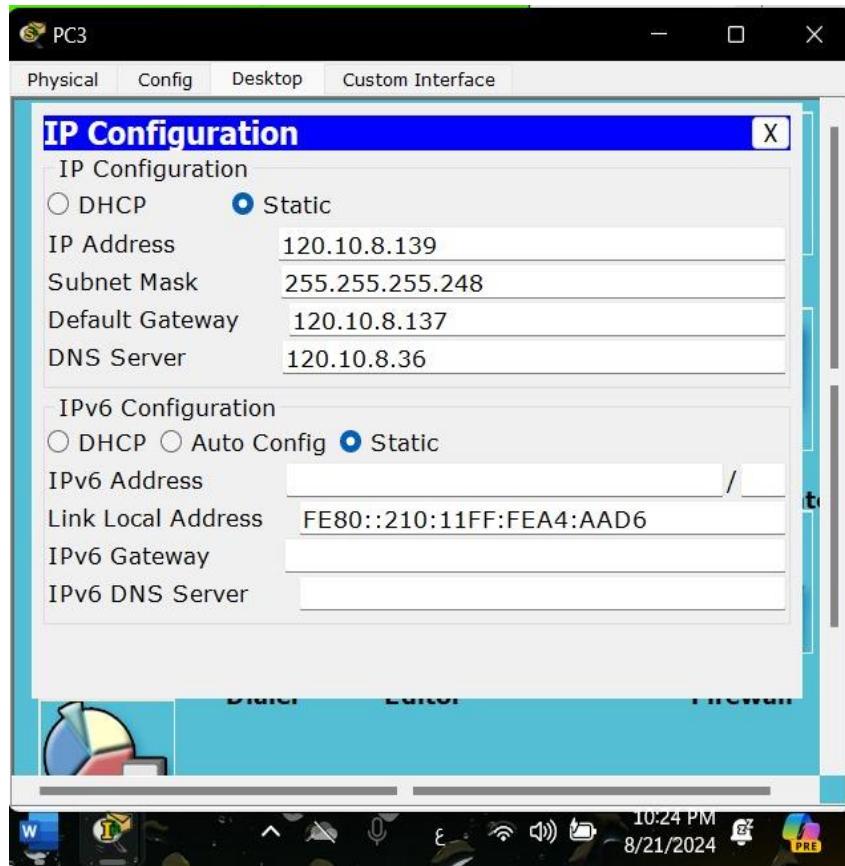
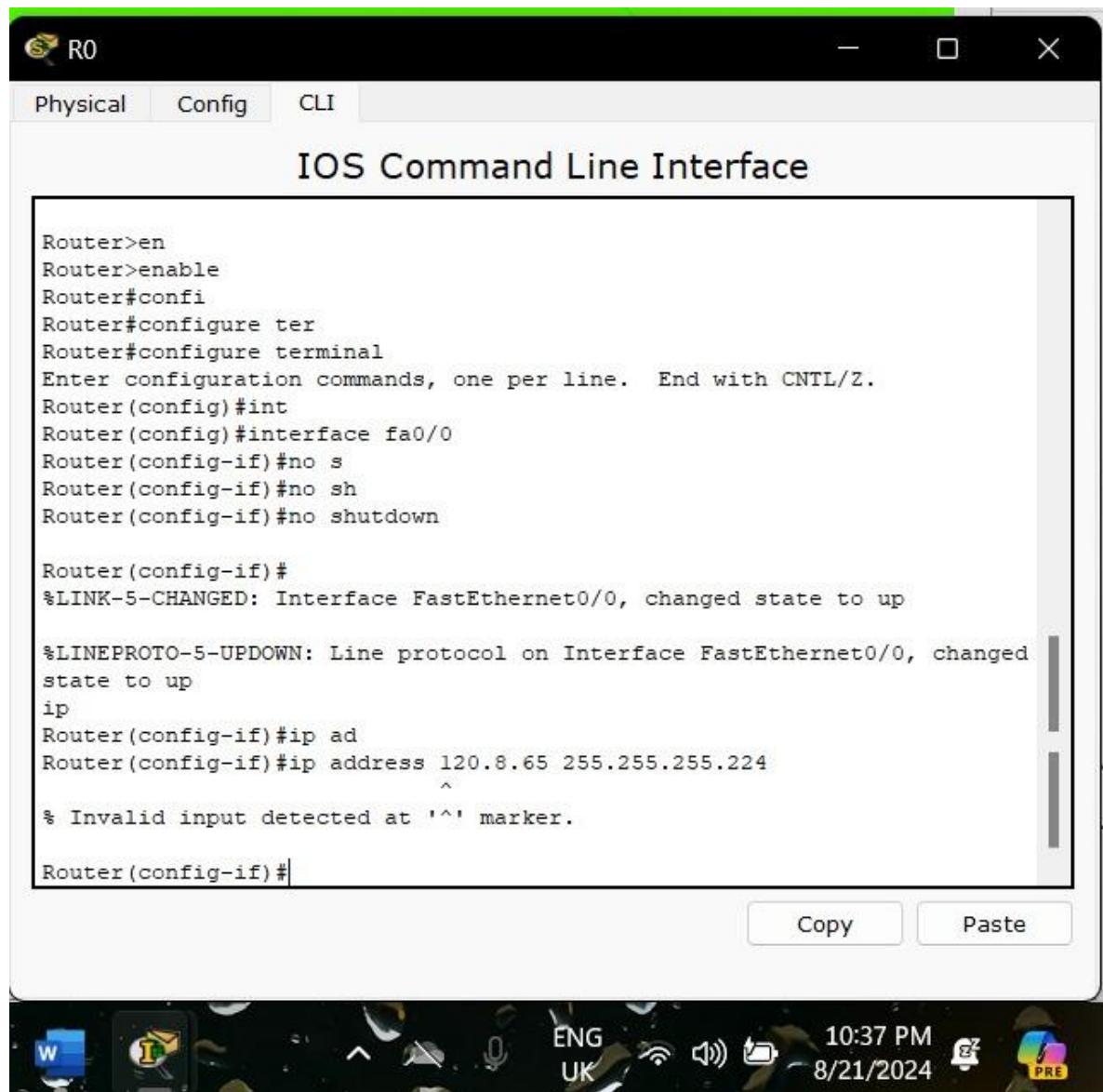


Figure 24 Configuration Of PC3

In figure 17 we add the ip 120.10.8.139 For **PC2** and the subnet mask 255.255.255.248 and the default GateWay 120.10.8.137 which is connected with fa0/0 interface for **(R1)**.

configuring the routers:

R0:



The screenshot shows the Cisco IOS Command Line Interface (CLI) running on Router 0. The window title is "R0". The tabs at the top are "Physical", "Config", and "CLI", with "CLI" being active. The main area displays the following configuration commands:

```
Router>en
Router>enable
Router#confi
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface fa0/0
Router(config-if)#no s
Router(config-if)#no sh
Router(config-if)#no shutdown

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
ip
Router(config-if)#ip ad
Router(config-if)#ip address 120.8.65 255.255.255.224
^
% Invalid input detected at '^' marker.

Router(config-if)#

```

At the bottom of the CLI window, there are "Copy" and "Paste" buttons. Below the CLI window, the Windows taskbar is visible, showing icons for File Explorer, Task View, Start, and others, along with the system tray displaying the date (8/21/2024), time (10:37 PM), battery status, and network connection.

Figure 25 Router 0 (FA0/0 interface) configuration

In figure 18 we configure R0 (FA0/0 interface) with 120.10.8.65 the subnet mask 255.255.255.254 .

```
R0
Physical Config CLI
IOS Command Line Interface
Router(config-if)#ip address 120.8.65 255.255.255.224
^
% Invalid input detected at '^' marker.

Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
int
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int
Router(config)#interface se3/0
Router(config-if)#no sh
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
ip add
Router(config-if)#ip address
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed sip
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.157 255.255.255.252
Router(config-if)#
Copy Paste
```

Figure 26 Router 0 (se3/0 interface) configuration

In figure 19 we configure R0 (se3/0 interface) with 120.10.8.157 the subnet mask 255.255.255.252.

The image shows a screenshot of a terminal window titled "R0". The window has tabs at the top: "Physical", "Config", and "CLI". The "Config" tab is selected. The title bar says "IOS Command Line Interface". The main area contains the following configuration commands:

```
ip add
Router(config-if)#ip address
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed sip
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.157 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
int
Router#int
Router#con
Router#con
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface se2/0
Router(config-if)#no sh
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#ip ad
Router(config-if)#ip address 120.10.8.145 255.255.255.252
Router(config-if)#

```

At the bottom right of the terminal window are "Copy" and "Paste" buttons. Below the terminal window is a system tray with icons for battery, signal, volume, and date/time (10:45 PM, 8/21/2024).

Figure 27 Router 0 (se2/0 interface) configuration

In figure 20 we configure R0 (se2/0 interface) with 120.10.8.145 the subnet mask 255.255.255.252.

R1:

The screenshot shows a window titled "IOS Command Line Interface" with the title bar "R1". The window has tabs "Physical", "Config", and "CLI", with "CLI" selected. The main area displays the following configuration commands:

```
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

Router>en
Router>enable
Router#conf
Router#configure te
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface se3/0
Router(config-if)#no sh
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
ip add
Router(config-if)#ip address
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed sip
address
Router(config-if)#ip address 120.10.8.145 255.255.255.252
Router(config-if)#

```

At the bottom right of the CLI window are "Copy" and "Paste" buttons. Below the window is a taskbar with various icons and system status information:

- Icons: Microsoft Word, Microsoft Excel, File Explorer.
- Language: ENG UK.
- Time: 10:49 PM.
- Date: 8/21/2024.
- Battery: Partially charged.
- Signal strength: Full signal.
- Volume: Muted.
- Power: Sleep mode icon.
- File Explorer: PRE.

Figure 28 Router 1 (se3/0 interface) configuration

In figure 22 we configure **R1 (se3/0 interface)** with **120.10.8.145** the subnet mask **255.255.255.252**.

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed sip address
Router(config-if)#ip address 120.10.8.145 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
CON
Router#CON
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface fa1/0
Router(config-if)#no sh
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
ip add
Router(config-if)#ip address 120.10.8.137 255.255.255.248
Router(config-if)#

```

Copy Paste

Figure 29 Router 1 (FA1/0 interface) configuration

In figure 23 we configure **R1 (FA1/0 interface)** with **120.10.8.137** the subnet mask **255.255.255.248**.

The screenshot shows a window titled "IOS Command Line Interface" for device "R1". The window has tabs "Physical", "Config", and "CLI", with "Config" selected. The main area displays the following configuration commands:

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
ip add
Router(config-if)#ip address 120.10.8.137 255.255.255.248
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface fa0/0
Router(config-if)#no sh
Router(config-if)#no shutdown

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
ip add
Router(config-if)#ip address 120.10.8.129 255.255.255.248
Router(config-if)#[
```

Below the command window are two buttons: "Copy" and "Paste".

The taskbar at the bottom of the screen shows various icons and system status: a blue folder, a yellow folder, a microphone, ENG UK, a signal strength icon, 10:54 PM, 8/21/2024, a battery icon, a lock icon, and a colorful circular icon labeled "PRE".

Figure 30 Router 1 (FA0/0 interface) configuration

In figure 24 we configure R1 (FA0/0 interface) with 120.10.8.129 the subnet mask 255.255.255.248.

R1

Physical Config CLI

IOS Command Line Interface

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface fa0/0
Router(config-if)#no sh
Router(config-if)#no shutdown

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
ip add
Router(config-if)#ip address 120.10.8.129 255.255.255.248
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#ip address 120.10.8.149 255.255.255.252
Router(config-if)#

Copy Paste
```



The image shows a Windows taskbar at the bottom of a computer screen. It includes icons for a blue folder, a yellow envelope, a search bar, a microphone, a battery, signal strength, and volume. The system tray shows the date (8/21/2024), time (10:55 PM), and a battery icon with a 'PRE' label.

Figure 31 Router 1 (se2/0 interface) configuration

In figure 25 we configure R1 (se2/0 interface) with 120.10.8.149 the subnet mask 255.255.255.252.

R2:

The screenshot shows a terminal window titled "IOS Command Line Interface" for device "R2". The window has tabs for "Physical", "Config" (which is selected), and "CLI". The main area displays the following configuration commands:

```
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

Router>en
Router>enable
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface fa0/0
Router(config-if)#no sh
Router(config-if)#no shutdown

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
ip ad
Router(config-if)#ip address 120.10.8.97 255.255.255.192
Router(config-if)#

```

At the bottom right of the terminal window are "Copy" and "Paste" buttons. Below the terminal window is a taskbar with various icons and system status information.

Taskbar details: Icons include a blue folder, a green folder, a white envelope, a speech bubble, a battery, a signal strength icon, and a volume icon. Status indicators show "ENG UK", the date "8/21/2024", the time "10:59 PM", and a small "PRE" logo.

Figure 32 Router 2 (FA0/0 interface) configuration

In figure 26 we configure R2 (FA0/0 interface) with 120.10.8.97 the subnet mask 255.255.255.192.

R2

Physical Config CLI

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
ip ad
Router(config-if)#ip address 120.10.8.97 255.255.255.192
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface se3/0
Router(config-if)#no sh
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
ip
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
ad
Router(config-if)#ip address 120.10.8.153 255.255.255.252
Router(config-if)#

```

Copy

Paste



Figure 33 Router 2 (se3/0 interface) configuration

In figure 27 we configure **R2 (se3/0 interface)** with **120.10.8.153** the subnet mask **255.255.255.252**.

R3:

The screenshot shows the Cisco IOS Command Line Interface (CLI) running on Router R3. The window title is "IOS Command Line Interface". The "Config" tab is selected. The command-line history displays the configuration of two interfaces, se3/0 and se2/0, with IP addresses and subnet masks. The status bar at the bottom shows system icons and the date/time.

```
Router#configure terminal
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#in
Router(config)#interface se3/0
Router(config-if)#no sh
Router(config-if)#no shutdown
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.157 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
CONF
Router#CONFigure ter
Router#CONFigure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface se2/0
Router(config-if)#no sh
Router(config-if)#no shutdown
Router(config-if)#int
Router(config-if)#int
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.153 255.255.255.252
Router(config-if)#

```

Copy Paste

System tray icons include: File, Home, ENG UK, 11:05 PM, 8/21/2024, Battery, and PRE.

Figure 34 Router 3 (se2/0 interface) configuration

In figure 28 we configure **R3 (se2/0 interface)** with **120.10.8.153** the subnet mask **255.255.255.252**.

```
R3
Physical Config CLI
IOS Command Line Interface

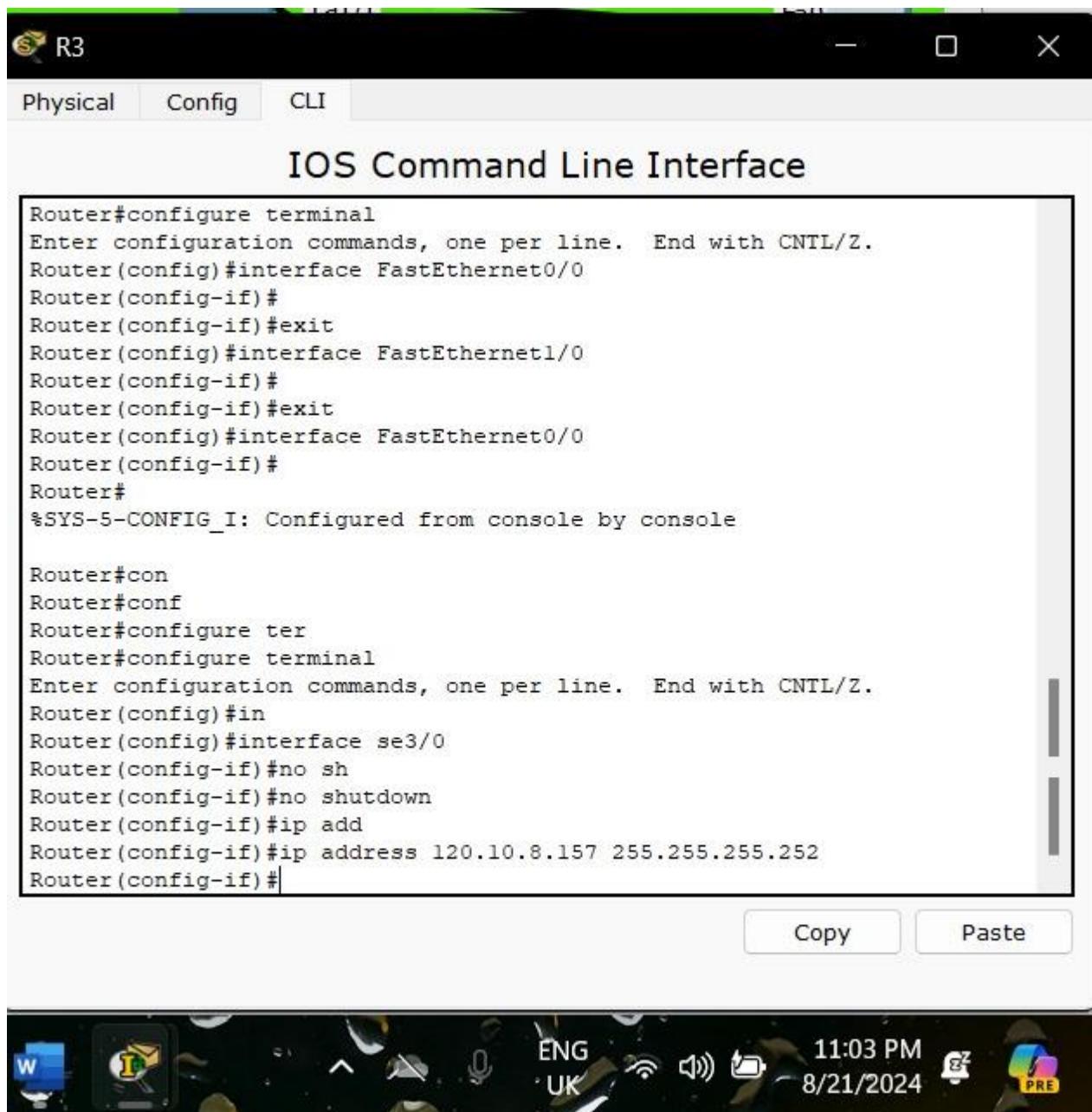
Router(config-if)#ip address 120.10.8.157 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
CONF
Router#CONFigure ter
Router#CONFigure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int
Router(config)#interface se2/0
Router(config-if)#no sh
Router(config-if)#no shutdown
Router(config-if)#int
Router(config-if)#int
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.153 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#no shutdown
Router(config-if)#ip address 120.10.8.1 255.255.255.224
Router(config-if)#

Copy Paste
```

11:07 PM 8/21/2024 ENG UK PRE

Figure 35 Router 3 (FA0/0 interface) configuration

In figure 29 we configure **R3 (FA0/0 interface)** with **120.10.8.1** the subnet mask **255.255.255.224**.



The image shows a software interface for configuring a Cisco router. The title bar says "R3". Below it are three tabs: "Physical", "Config" (which is selected), and "CLI". The main area is titled "IOS Command Line Interface". It contains two blocks of command-line text. The first block shows the configuration of FastEthernet interfaces (FastEthernet0/0, FastEthernet1/0, FastEthernet0/0) via the terminal. The second block shows the configuration of the se3/0 interface via the terminal, including setting its IP address to 120.10.8.157 and subnet mask 255.255.255.252. At the bottom right of the text area are "Copy" and "Paste" buttons. Below the text area is a system tray with icons for Microsoft Word, Microsoft Excel, battery level, signal strength, volume, language (ENG UK), date (8/21/2024), time (11:03 PM), and a power button.

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#con
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#in
Router(config)#interface se3/0
Router(config-if)#no sh
Router(config-if)#no shutdown
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.157 255.255.255.252
Router(config-if)#[
```

Copy Paste



Figure 36 Router 3 (se3/0 interface) configuration

In figure 30 we configure R3 (se3/0 interface) with 120.10.8.157 the subnet mask 255.255.255.252.

The screenshot shows the Cisco IOS Command Line Interface (CLI) running on a device named 'R3'. The window title is 'IOS Command Line Interface'. The tabs at the top are 'Physical', 'Config' (which is selected), and 'CLI'. The main area displays the configuration commands entered:

```
Router(config-if)#ip add
Router(config-if)#ip address 120.10.8.153 255.255.255.252
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#no shutdown
Router(config-if)#ip address 120.10.8.1 255.255.255.224
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no shutdown
^
% Invalid input detected at '^' marker.

Router(config)#interface fal/0
Router(config-if)#no shutdown
% 120.10.8.0 overlaps with FastEthernet0/0
FastEthernet1/0: incorrect IP address assignment
Router(config-if)#ip address 120.10.8.33 255.255.255.224
Router(config-if)#

```

At the bottom right of the CLI window are 'Copy' and 'Paste' buttons. Below the CLI window is a taskbar with various icons and system status information:

- Icons for File, Home, and Search.
- Language: ENG UK.
- Date and Time: 11:08 PM 8/21/2024.
- Volume icon.
- Network icon.
- Battery icon.
- Power icon.
- Color palette icon labeled 'PRE'.

Figure 37 Router 3 (FA1/0 interface) configuration

In figure 31 we configure R3 (FA1/0 interface) with 120.10.8.33 the subnet mask 255.255.255.224.

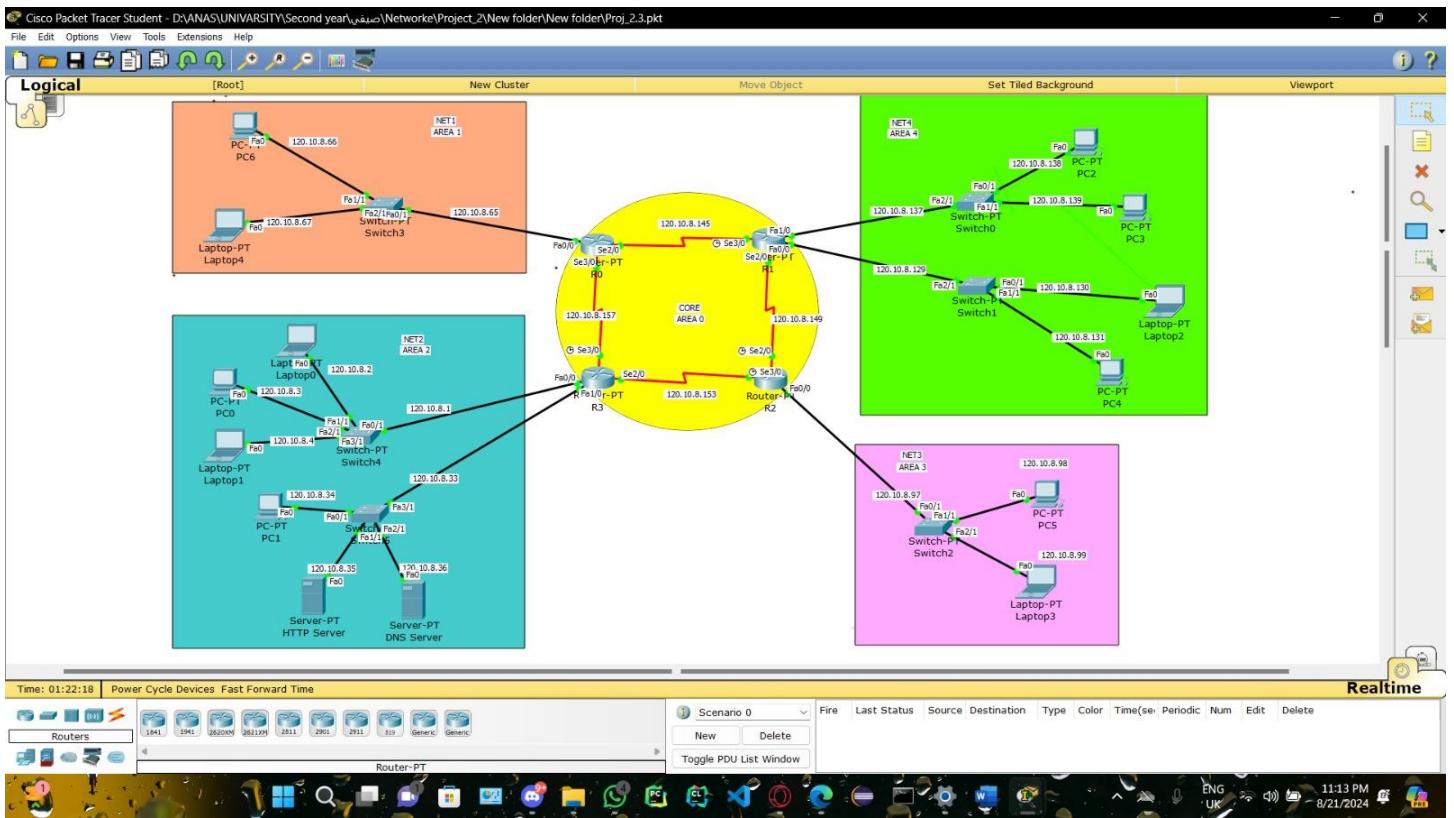


Figure 38 Topology after configuring all end devices and routers

After connecting and configuring all end devices and routers we got this build topology, with green points which means that they are connected successfully to each other's.

Task 2: Setting-up Servers Part

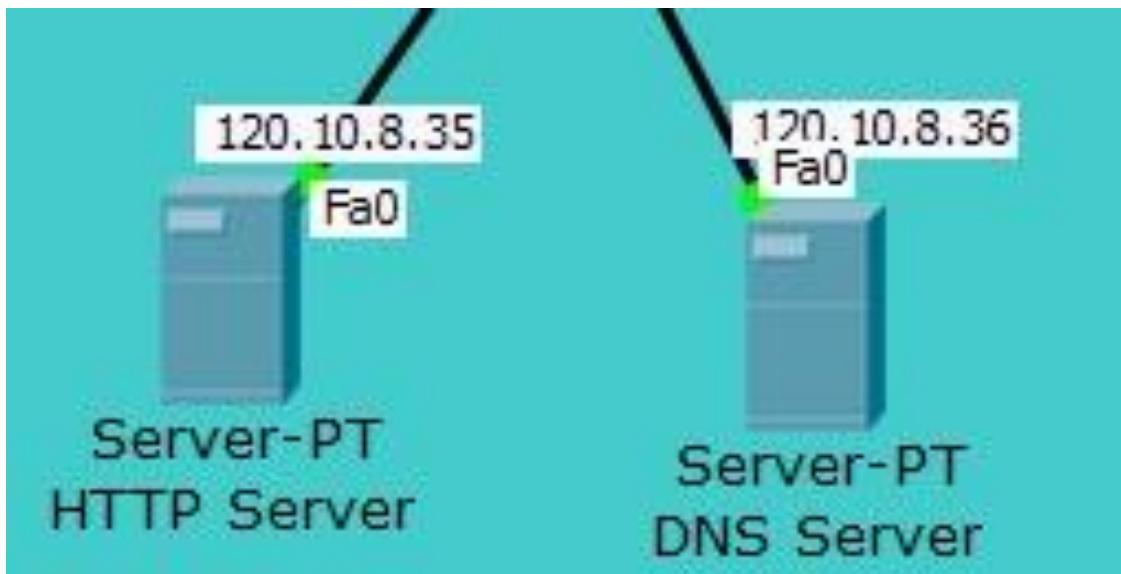


Figure 39 HTTP Server and DNS Server

In figure 32 we add an **HTTP server and DNS server in NAT 2**

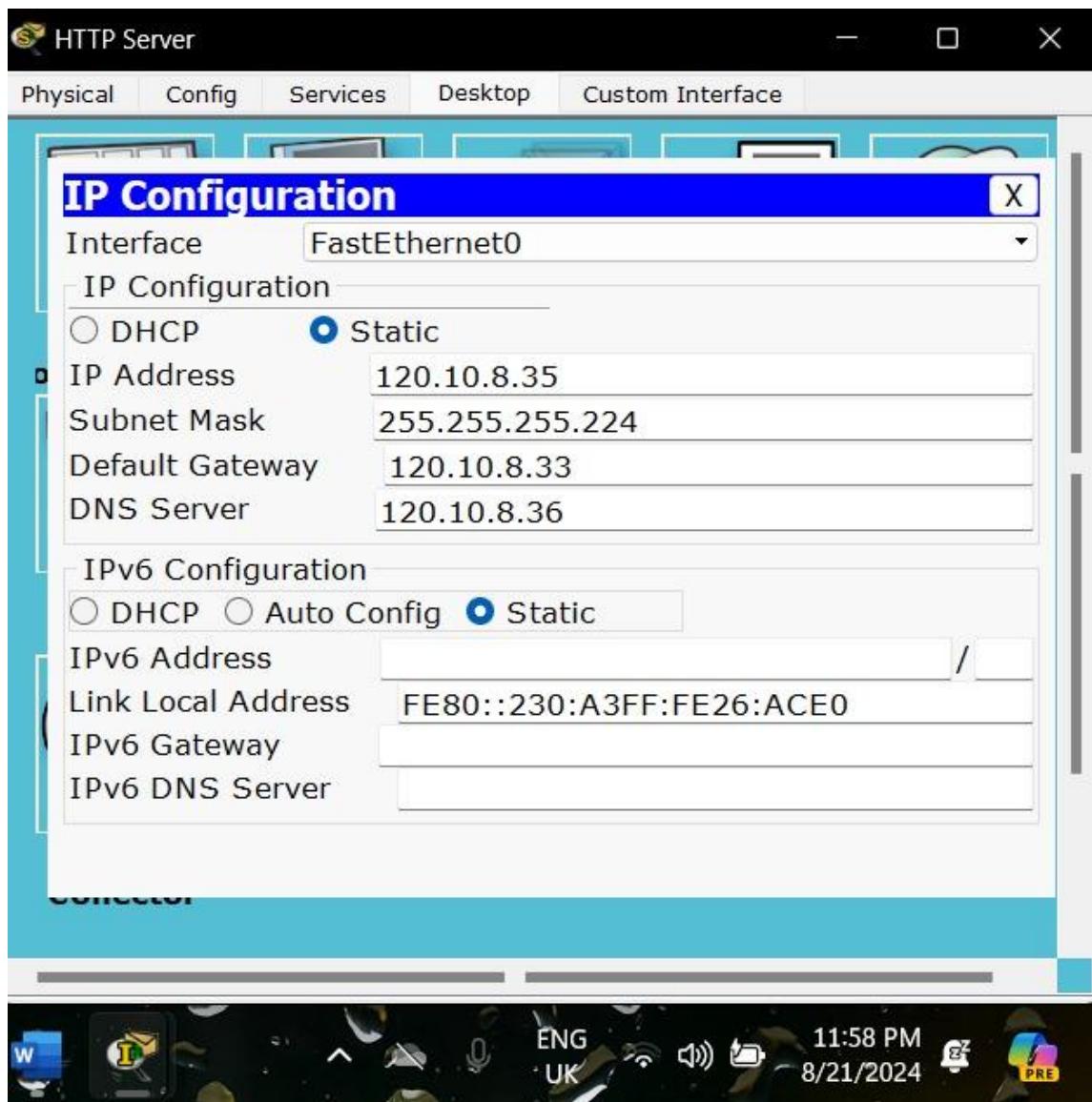


Figure 40 Giving the router IP address and subnet Mask

we give the router an IP address and a subnet mask that we got in task0 and insert default Gateway IP address for Net 2-2, after that we insert the DNS server Ip address.

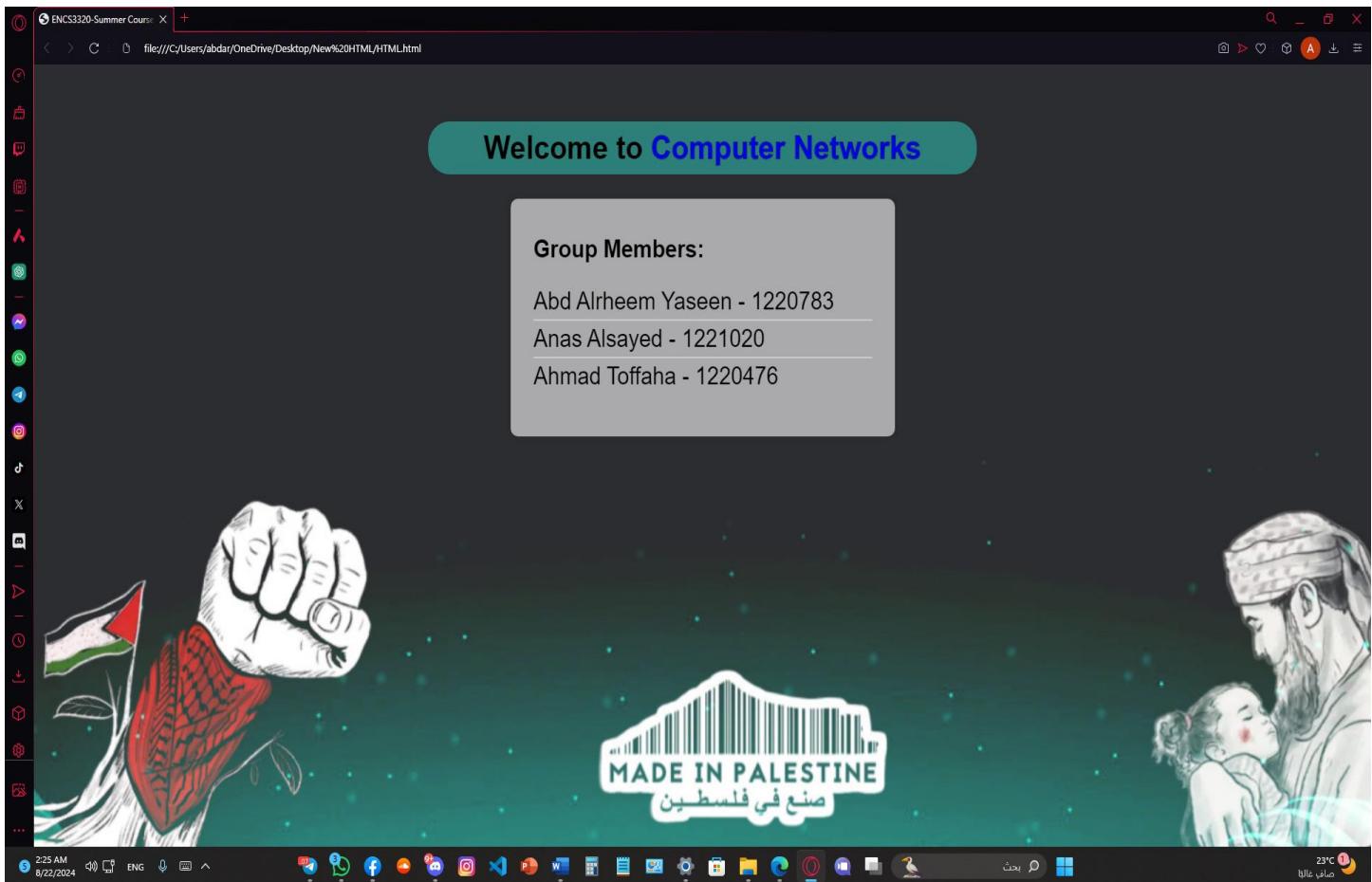


Figure 41 creating an html website

We create our website using HTML and CSS

We put in it some headers and titles, in addition a list of names for Group members and their id's numbers.

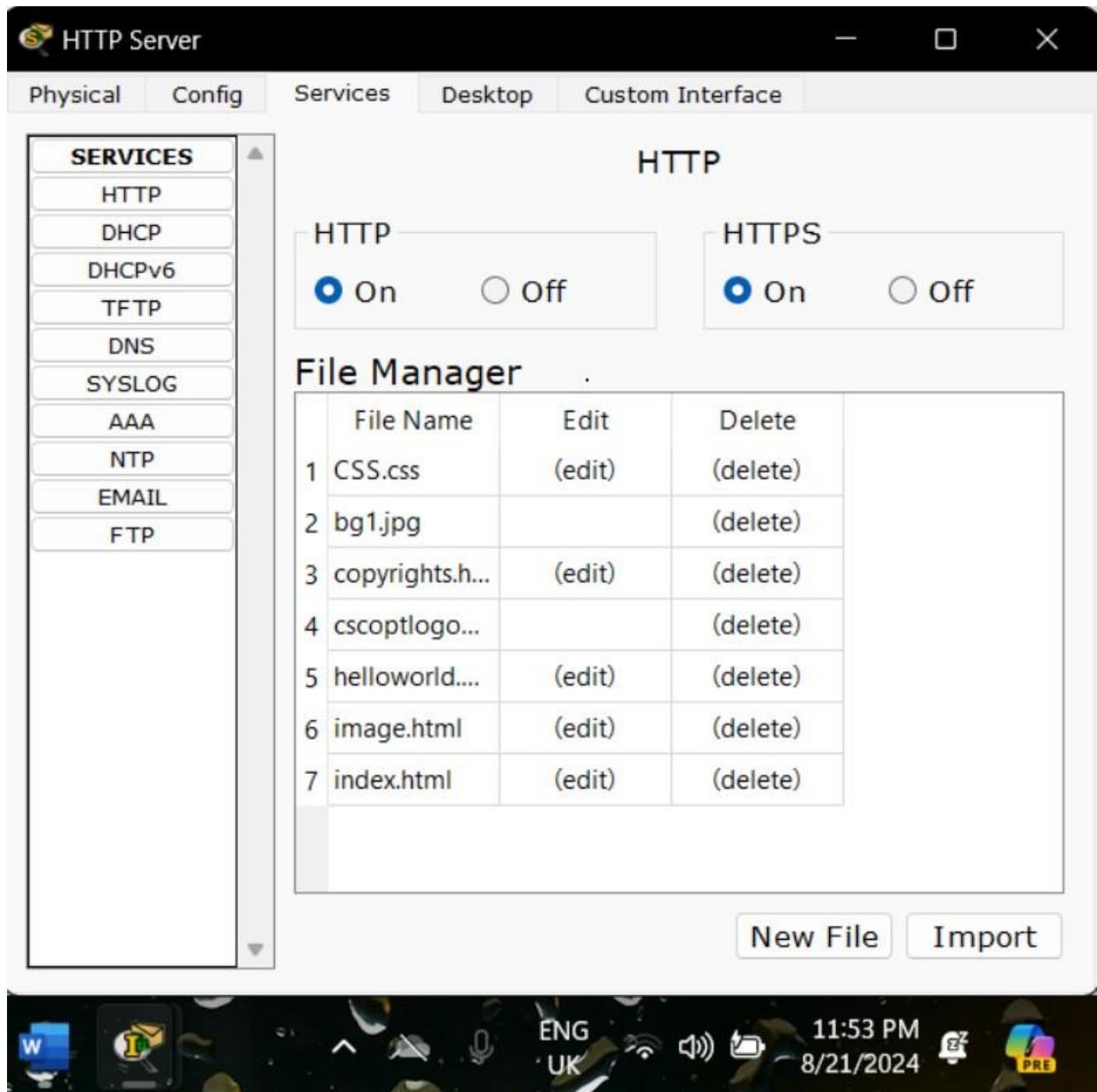


Figure 42 Adding our HTML and CSS file to http server

we add our local web (`index.html`), and (`CSS.css`) to make the site look nice, then we turn the http and https options on.

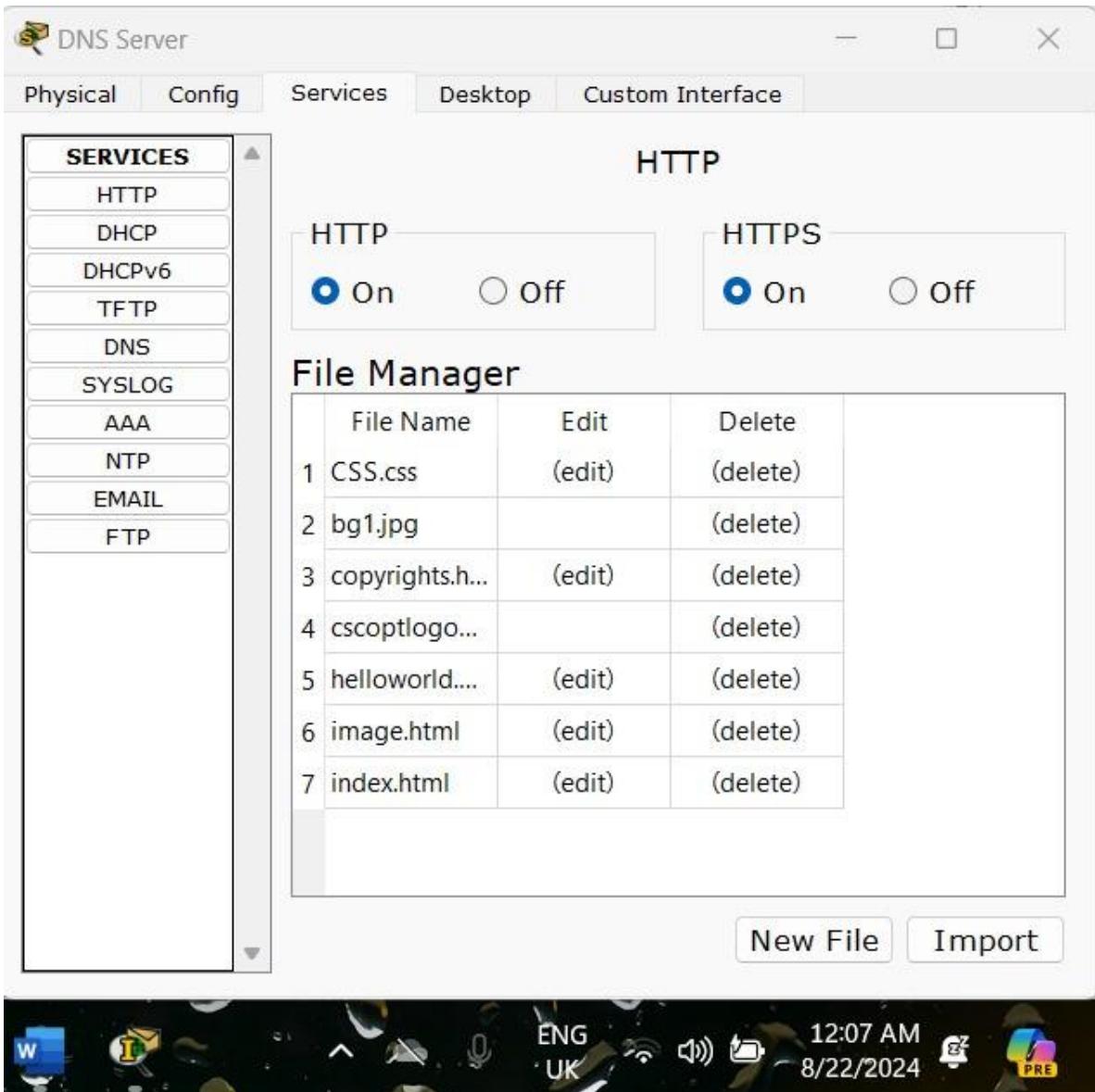


Figure 43 Adding our HTML and CSS file to DNS server

we add the same `index.html` and `CSS.css` in the http server to the DNS server and turn the HTTP and HTTPS options on.

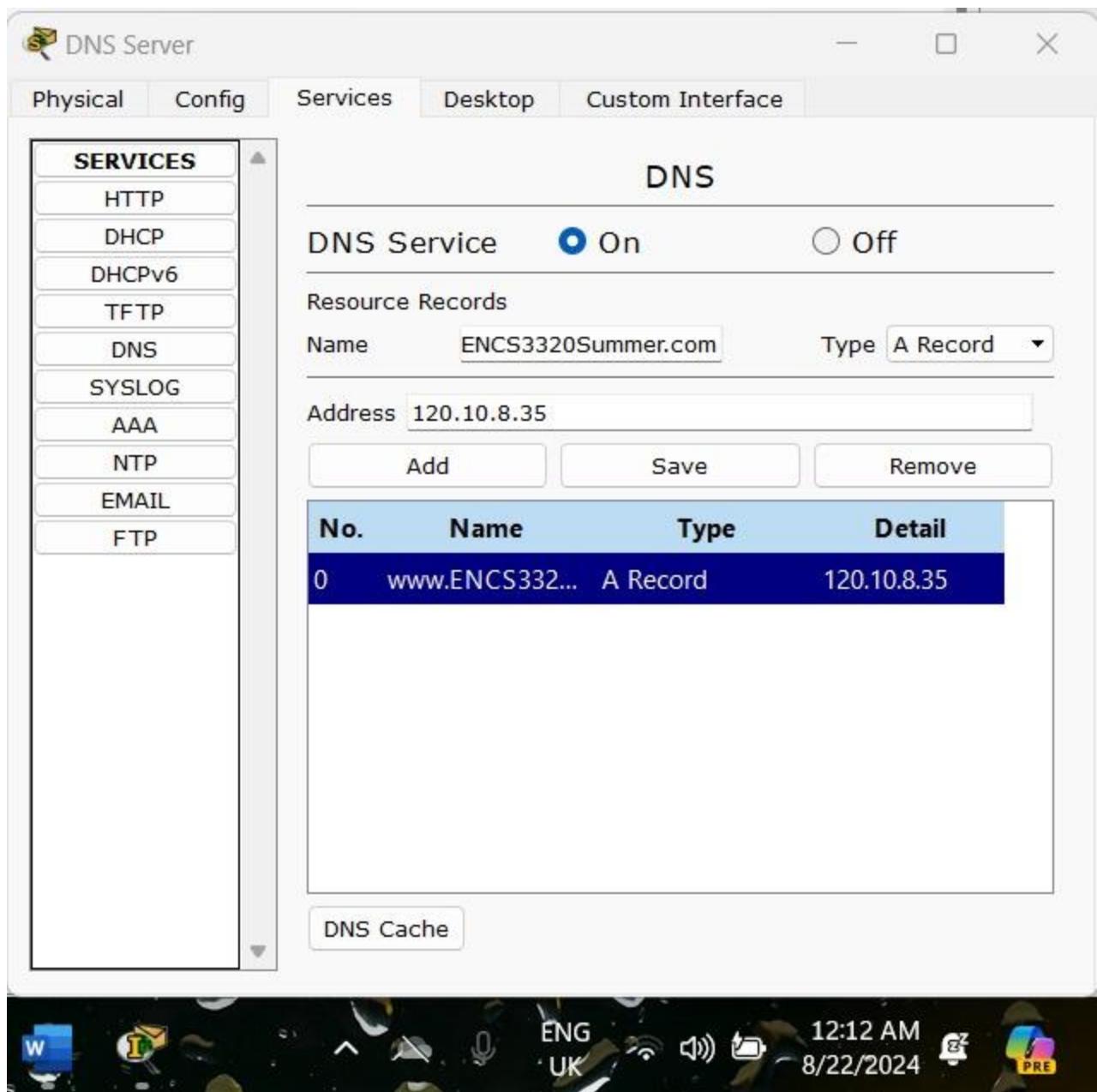


Figure 44 Turning on and configure the DNS server

We turn the DNS server on and then we configure the DNS server and WEB server with domain name "www.ENCS3320Summer.com", and we add the http server IP and then choose the record type A.

TASK 3: ROUTING PART

Describe the OSPF protocol and how to use it in your topology, List the required commands for defining the OSPF.

Answer:

OSPF (Open Shortest Path First) is a link-state routing protocol used in IP networks. It's an interior gateway protocol (IGP) that operates within a single autonomous system (AS). OSPF is designed to dynamically exchange routing information and calculate the shortest path between network nodes based on the Dijkstra algorithm.

How WE Use OSPF in our Network Topology:

First we Determine OSPF Areas:

- We divide your network into areas. The backbone area, Area 0, is mandatory and must connect all other areas. Non-backbone areas (like Area 1, Area 2 and Area3) connect to the backbone area.

Then we Configure OSPF on Routers:

- Enable OSPF on each router in the network and specify the OSPF process ID20.
- We define the router's OSPF area and assign networks to the correct area.

Required commands for defining the OSPF:

R0

Physical Config CLI

IOS Command Line Interface

```
Router>Een
Router>enable
Router#conf
Router#configure ter
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ospf 20
^
% Invalid input detected at '^' marker.

Router(config)#router ospf 20
Router(config-router)#network 120.10.8.65 0.0.0.31 area 1
Router(config-router)#
Router(config-router)#exit
Router(config)#interface Serial2/0
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 20
Router(config-router)#network 120.10.8.65 0.0.0.31 area 1
```

Copy Paste

Figure 45:R0 OSPF

We configure OSPF on the Fa0/0 interface of R0 and assign it to **Area 1**.

```
R0
Physical Config CLI
IOS Command Line Interface

Router(config)#rot
Router(config)#rou
Router(config)#router ospf 20
Router(config-router)#net
Router(config-router)#net
Router(config-router)#network 120.10.8.145 0.0.0.3 area 0
Router(config-router)#network 120.10.8.157 0.0.0.3 area 0
Router(config-router)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
do wr
^
% Invalid input detected at '^' marker.

Router#do we
^
% Invalid input detected at '^' marker.

Router#do wr
^
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#do wr

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```

The screenshot shows the Cisco IOS CLI interface for router R0. The user has entered configuration mode and attempted to define OSPF networks. They have used the 'net' command twice, which is incorrect syntax. The system responds with a configuration message and then prompts for a write operation ('do wr'). The user enters 'we' (write erase), which is also invalid syntax, resulting in another error message. Finally, they attempt to do a regular 'wr' (write) again, leading to a third error message. The system then asks if the user wants to enter configuration mode via 'configure terminal'. The desktop taskbar at the bottom shows the date and time as 8/22/2024 at 1:21 AM.

Figure 46: R0 OSPF

We configure OSPF on the Se2/0 and Se3/0 interfaces of R0 and assign them to Area 0.

R1

Physical Config CLI

IOS Command Line Interface

```
Router>en
Router#con
Router#conf
Router#configure t
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#rou
Router(config)#router ospf 20
Router(config-router)#net
Router(config-router)#network 120.10.8.137 0.0.0.7 area 4
Router(config-router)#network 120.10.8.129 0.0.0.7 area 4
Router(config-router)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
do wr
^
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#do wr
Building configuration...
[OK]
Router(config)#

```

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Windows Taskbar icons: Word, File Explorer, Task View, Start, Volume, Network, ENG UK, 1:25 AM, 8/22/2024, Battery, PRE.

Figure 47:R1 OSPF

We configure OSPF on the Fa1/0 and Fa0/0 interfaces of R1 and assign them to Area 4.

R1

Physical Config CLI

IOS Command Line Interface

```
%SYS-5-CONFIG_I: Configured from console by console
do wr
^
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#do wr
Building configuration...
[OK]
Router(config)#rou
Router(config)#router ospf 20
^
% Invalid input detected at '^' marker.

Router(config)#router ospf 20
Router(config-router)#network 120.10.8.146 0.0.0.3 area 0
Router(config-router)#network 120.10.8.146 0.0.0.3 area 0
03:20:57: %OSPF-5-ADJCHG: Process 20, Nbr 120.10.8.157 on Serial3/0
network 120.10.8.149 0.0.0.3 area 0
Router(config-router)#network 120.10.8.149 0.0.0.3 area 0
Router(config-router)#do wr
Building configuration...
[OK]
Router(config-router) #
```

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Figure 48: R1 OSPF

We configure OSPF on the Se2/0 and Se3/0 interfaces of R1 and assign them to Area 0.

R2

Physical Config CLI

IOS Command Line Interface

```
Router>en
Router#conf
Router#configure t
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#rou
Router(config)#router ospf 20
Router(config-router)#net
Router(config-router)#network 120.10.8.97 0.0.0.63 area 3
Router(config-router)#network 120.10.8.150 0.0.0.3 area 0
Router(config-router)#network 120.10.8.15 0.0.0.3 area 0
03:24:19: %OSPF-5-ADJCHG: Process 20, Nbr 120.10.8.149 on Serial2/0
fnetwork 120.10.8.153 0.0.0.3 area 0
Router(config-router)#do wr
Building configuration...
[OK]
Router(config-router)#

```

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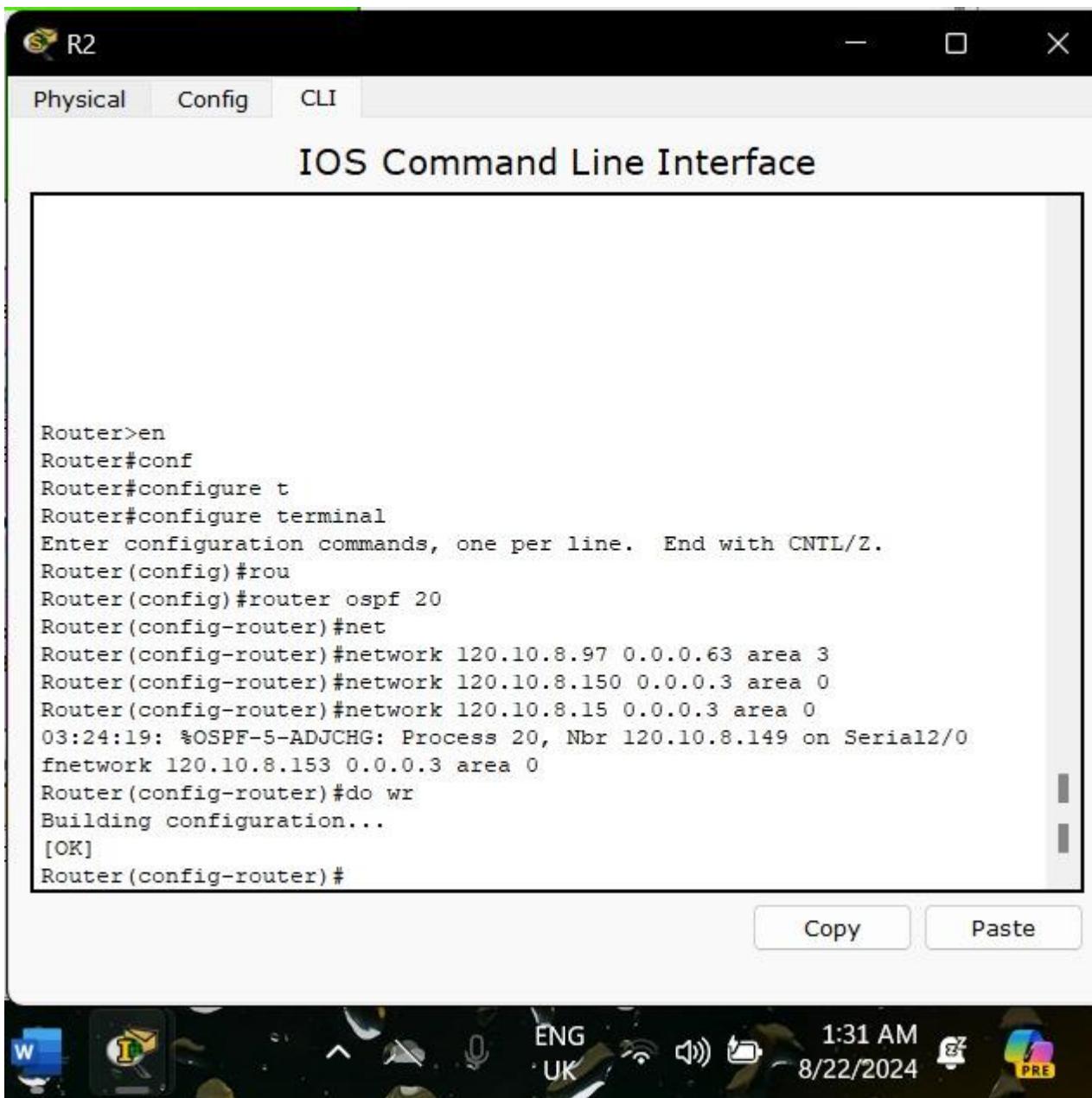


Figure 49: R2 OSPF

We configure OSPF on the Fa0/0 interface of R2 and assign it to **Area 3**, and configure.

OSPF on the Se2/0 and Se3/0 interfaces, assigning them to **Area 0**.

```
Router#cou
Router#co
Router#coun
Router#conf
Router#configure t
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ru
Router(config)#rou
Router(config)#router ospf 20
Router(config-router)#net
Router(config-router)#network 120.10.8.1 0.0.0.31 area 2
Router(config-router)#network 120.10.8.33 0.0.0.31 area 2
Router(config-router)#network 120.10.8.158 0.0.0.3 area 0
Router(config-router)#network 120.10.8.158 0.0.0.3 area 0
03:30:51: %OSPF-5-ADJCHG: Process 20, Nbr 120.10.8.157 on Serial3/0
network 120.10.8.154 0.0.0.3 area 0
Router(config-router)#network 120.10.8.154 0.0.0.3 area 0
Router(config-router)#
03:31:10: %OSPF-5-ADJCHG: Process 20, Nbr 120.10.8.153 on Serial2/0 from
LOADING to FULL, Loading Done
do wr
Building configuration...
[OK]
Router(config-router)#

```

Copy Paste

Figure 50:R3 OSPF

We configure OSPF on the Fa0/0 and Fa1/0 interfaces of R3 and assign them to **Area 2, and configure OSPF on the Se2/0 and Se3/0 interfaces, assigning them to **Area 0**.**

TASK 4: ROUTING PART

Describe the OSPF protocol and how to use it in your topology, List the required commands for defining the OSPF.

Answer:

Laptop 0 in NET 2 TESTING:

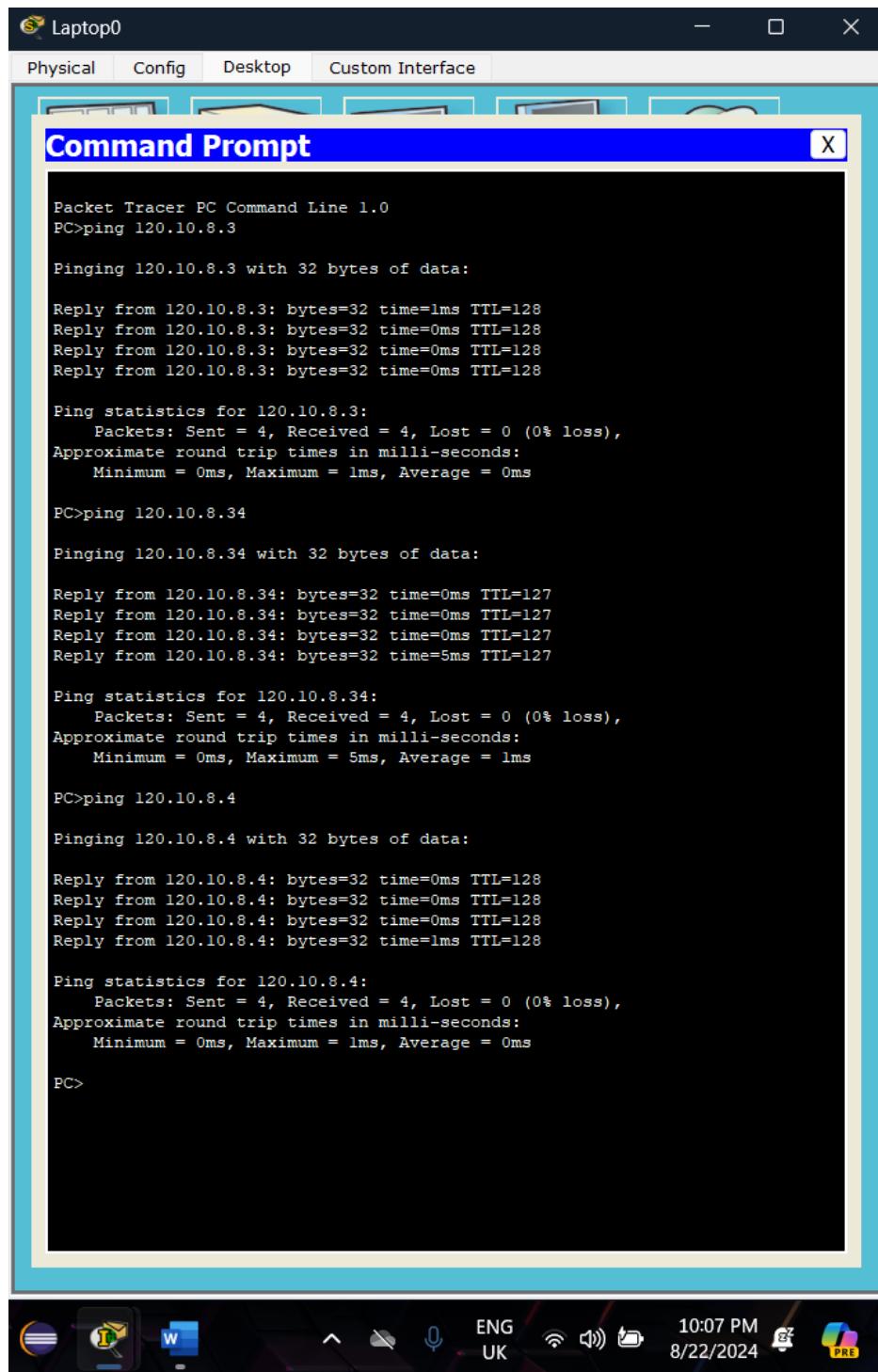


Figure 51:LAP 0 PING IN NET 2.

We use **Laptop 0 in NET 2** to test the connectivity of the topology by using the ping command with different ,device IPs in **NET 2** to ensure communication between all end devices in that network.

```
PC>ping 120.10.8.66

Pinging 120.10.8.66 with 32 bytes of data:

Reply from 120.10.8.66: bytes=32 time=11ms TTL=126
Reply from 120.10.8.66: bytes=32 time=4ms TTL=126
Reply from 120.10.8.66: bytes=32 time=2ms TTL=126
Reply from 120.10.8.66: bytes=32 time=4ms TTL=126

Ping statistics for 120.10.8.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 11ms, Average = 5ms

PC>ping 120.10.8.67

Pinging 120.10.8.67 with 32 bytes of data:

Reply from 120.10.8.67: bytes=32 time=1ms TTL=126
Reply from 120.10.8.67: bytes=32 time=2ms TTL=126
Reply from 120.10.8.67: bytes=32 time=6ms TTL=126
Reply from 120.10.8.67: bytes=32 time=10ms TTL=126

Ping statistics for 120.10.8.67:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 10ms, Average = 4ms

PC>
```



Figure 52:LAP 0 PING IN NET 1.

We use **Laptop 0** in **NET 2** to test the connectivity of the topology by using the ping command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

```

PC>ping 120.10.8.98

Pinging 120.10.8.98 with 32 bytes of data:

Reply from 120.10.8.98: bytes=32 time=16ms TTL=126
Reply from 120.10.8.98: bytes=32 time=11ms TTL=126
Reply from 120.10.8.98: bytes=32 time=18ms TTL=126
Reply from 120.10.8.98: bytes=32 time=3ms TTL=126

Ping statistics for 120.10.8.98:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 18ms, Average = 12ms

PC>ping 120.10.8.99

Pinging 120.10.8.99 with 32 bytes of data:

Reply from 120.10.8.99: bytes=32 time=13ms TTL=126
Reply from 120.10.8.99: bytes=32 time=4ms TTL=126
Reply from 120.10.8.99: bytes=32 time=8ms TTL=126
Reply from 120.10.8.99: bytes=32 time=11ms TTL=126

Ping statistics for 120.10.8.99:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 13ms, Average = 9ms

```



Figure 53:LAP 0 PING IN NET 3.

We use Laptop 0 in NET 2 to test the connectivity of the topology by using the ping command with different device IPs in NET 3 to ensure communication between all end devices in that network.

```
PC>ping 120.10.8.131

Pinging 120.10.8.131 with 32 bytes of data:

Reply from 120.10.8.131: bytes=32 time=15ms TTL=125
Reply from 120.10.8.131: bytes=32 time=15ms TTL=125
Reply from 120.10.8.131: bytes=32 time=3ms TTL=125
Reply from 120.10.8.131: bytes=32 time=4ms TTL=125

Ping statistics for 120.10.8.131:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 15ms, Average = 9ms

PC>ping 120.10.8.139

Pinging 120.10.8.139 with 32 bytes of data:

Request timed out.
Reply from 120.10.8.139: bytes=32 time=13ms TTL=125
Reply from 120.10.8.139: bytes=32 time=3ms TTL=125
Reply from 120.10.8.139: bytes=32 time=9ms TTL=125

Ping statistics for 120.10.8.139:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 13ms, Average = 8ms

PC>
```



Figure 54:LAP 0 PING IN NET 4.

We use **Laptop 0** in **NET 2** to test the connectivity of the topology by using the ping command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

PC 6 in NET 1 TESTING:

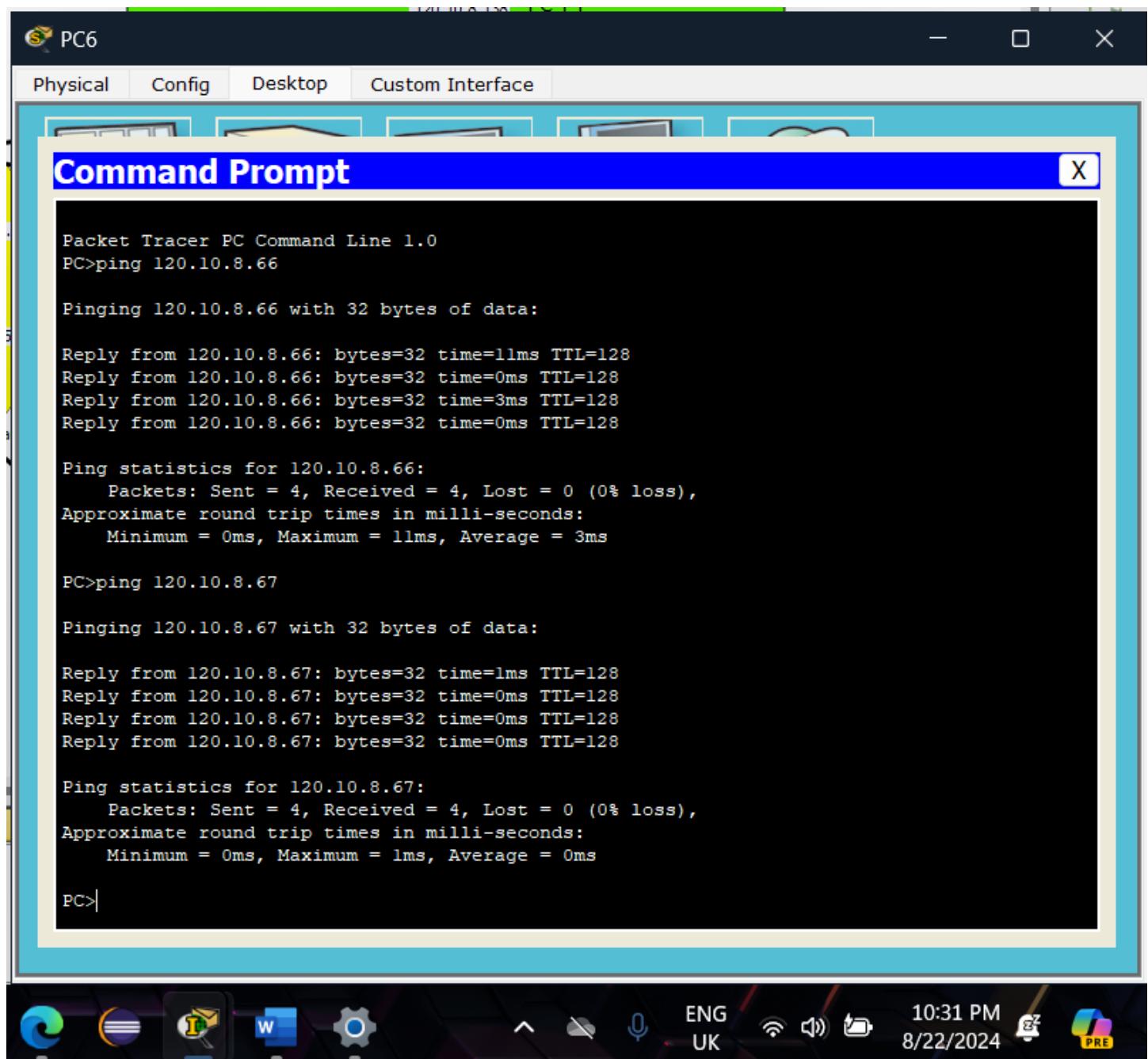


Figure 55:PC 6 PING IN NET 1.

We use **PC 6 in NET 1** to test the connectivity of the topology by using the ping command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

The screenshot shows a Windows desktop environment with a title bar "PC6" and a status bar "120.10.8.138 PC-PT". The taskbar includes icons for File Explorer, Task View, Microsoft Word, and Settings. A Command Prompt window titled "Command Prompt" is open, displaying the following output:

```
Approximate round trip times in milli-seconds:  
    Minimum = 0ms, Maximum = 1ms, Average = 0ms  
  
PC>ping 120.10.8.2  
  
Pinging 120.10.8.2 with 32 bytes of data:  
  
Reply from 120.10.8.2: bytes=32 time=8ms TTL=126  
Reply from 120.10.8.2: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.2: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.2: bytes=32 time=11ms TTL=126  
  
Ping statistics for 120.10.8.2:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 11ms, Average = 5ms  
  
PC>ping 120.10.8.34  
  
Pinging 120.10.8.34 with 32 bytes of data:  
  
Reply from 120.10.8.34: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.34: bytes=32 time=8ms TTL=126  
Reply from 120.10.8.34: bytes=32 time=7ms TTL=126  
Reply from 120.10.8.34: bytes=32 time=13ms TTL=126  
  
Ping statistics for 120.10.8.34:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 13ms, Average = 7ms  
  
PC>
```

Figure 56:PC 6 PING IN NET 2.

We use **PC 6** in **NET 1** to test the connectivity of the topology by using the ping command with different device IPs in **NET 2** to ensure communication between all end devices in that network.

The screenshot shows a network simulation interface titled "PC6". At the top, there are tabs for "Physical", "Config", "Desktop", and "Custom Interface". Below these, a toolbar has icons for "File", "Edit", "View", "Tools", and "Help". A "Command Prompt" window is open, displaying the following output:

```
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 13ms, Average = 7ms  
  
PC>ping 120.10.8.98  
  
Pinging 120.10.8.98 with 32 bytes of data:  
  
Reply from 120.10.8.98: bytes=32 time=15ms TTL=125  
Reply from 120.10.8.98: bytes=32 time=24ms TTL=125  
Reply from 120.10.8.98: bytes=32 time=2ms TTL=125  
Reply from 120.10.8.98: bytes=32 time=8ms TTL=125  
  
Ping statistics for 120.10.8.98:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 24ms, Average = 12ms  
  
PC>ping 120.10.8.99  
  
Pinging 120.10.8.99 with 32 bytes of data:  
  
Reply from 120.10.8.99: bytes=32 time=12ms TTL=125  
Reply from 120.10.8.99: bytes=32 time=2ms TTL=125  
Reply from 120.10.8.99: bytes=32 time=13ms TTL=125  
Reply from 120.10.8.99: bytes=32 time=17ms TTL=125  
  
Ping statistics for 120.10.8.99:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 17ms, Average = 11ms  
  
PC>
```

The taskbar at the bottom includes icons for File, Edit, View, Tools, Help, and a search bar. System status icons show battery level (14%), signal strength, volume, and network connection. The system clock shows 10:36 PM on 8/22/2024.

Figure 57: PC 6 PING IN NET 3.

We use **PC 6 in NET 1** to test the connectivity of the topology by using the ping command with different device IPs in **NET 3** to ensure communication between all end devices in that network.

PC6

Physical Config Desktop Custom Interface

Command Prompt

```
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 17ms, Average = 11ms  
  
PC>ping 120.10.8.131  
  
Pinging 120.10.8.131 with 32 bytes of data:  
  
Reply from 120.10.8.131: bytes=32 time=9ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=2ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=9ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=8ms TTL=126  
  
Ping statistics for 120.10.8.131:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 2ms, Maximum = 9ms, Average = 7ms  
  
PC>ping 120.10.8.138  
  
Pinging 120.10.8.138 with 32 bytes of data:  
  
Request timed out.  
Reply from 120.10.8.138: bytes=32 time=16ms TTL=126  
Reply from 120.10.8.138: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.138: bytes=32 time=14ms TTL=126  
  
Ping statistics for 120.10.8.138:  
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 16ms, Average = 10ms  
  
PC>
```

Figure 58: PC 6 PING IN NET 4.

We use **PC 6 in NET 1** to test the connectivity of the topology by using the ping command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

Laptop 3 in NET 3 TESTING:

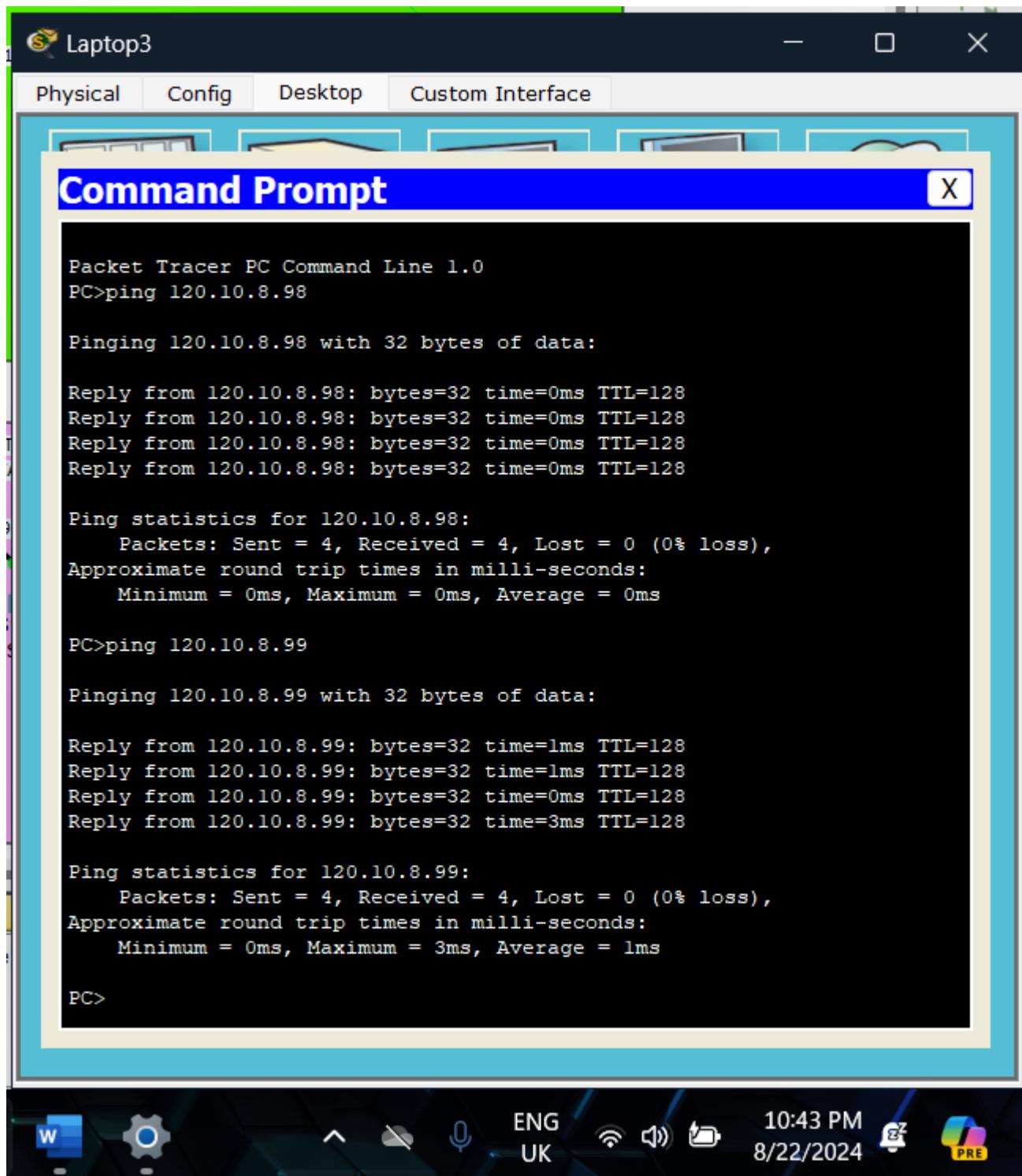


Figure 59:LAP 3 PING IN NET 3.

We use **Laptop 3 in NET 1** to test the connectivity of the topology by using the ping command with different device IPs in **NET 3** to ensure

communication between all end devices in that network.

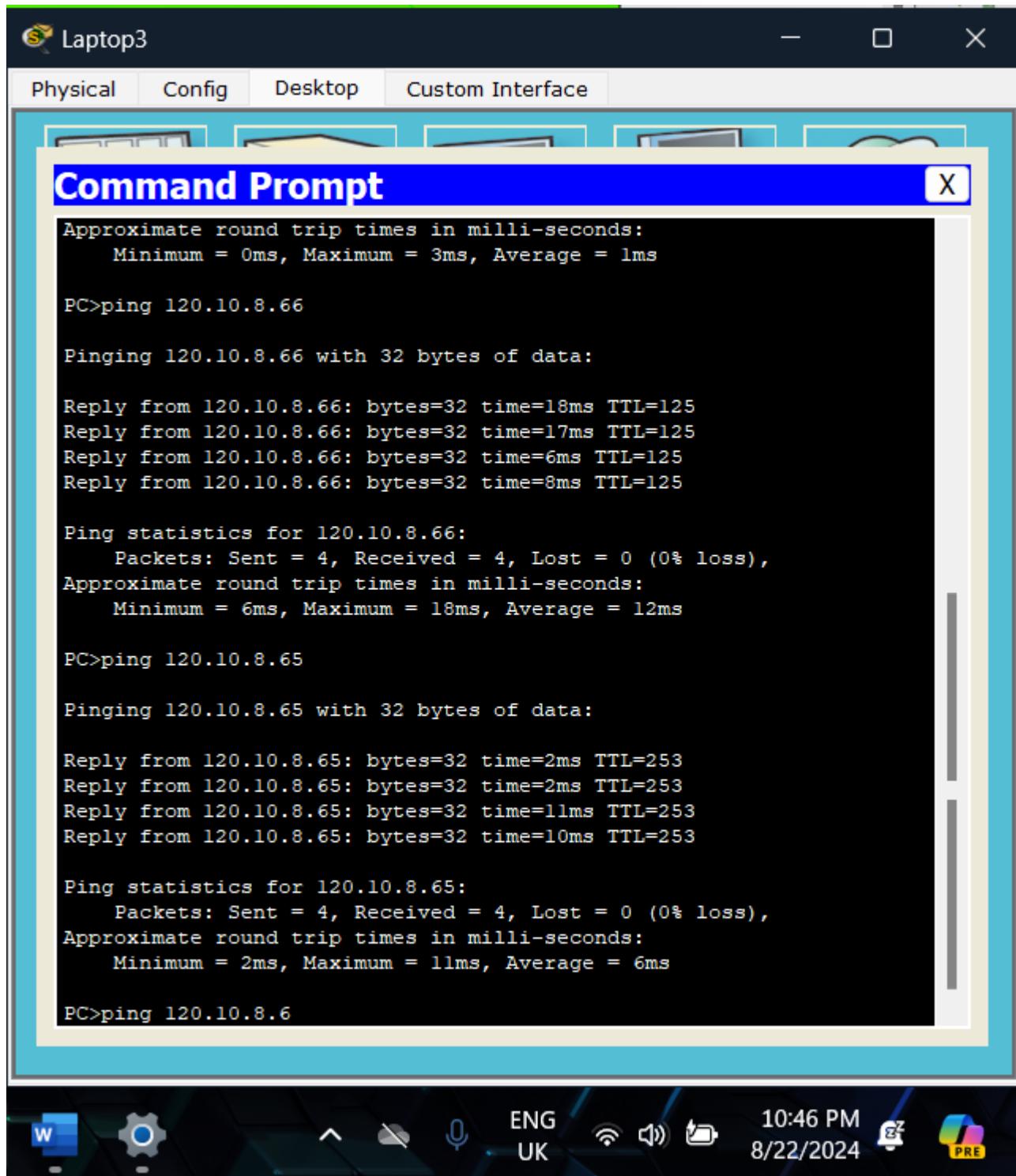


Figure 60:Laptop 3 PING IN NET 1.

We use **Laptop 3 in NET 3** to test the connectivity of the topology by using the ping command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

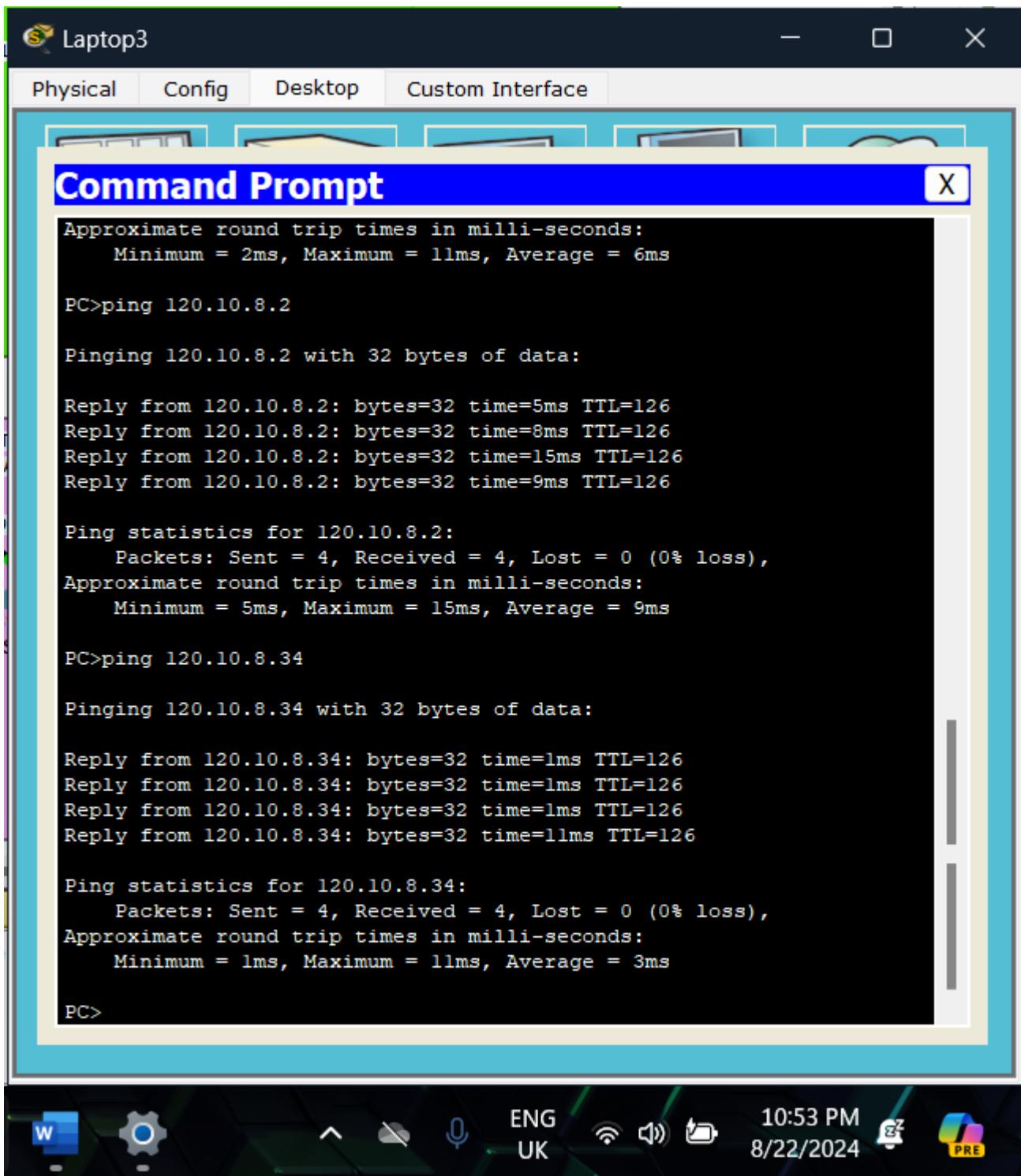


Figure 61:Laptop 3 PING IN NET 2.

We use **Laptop 3** in **NET 3** to test the connectivity of the topology by using the ping command with different device IPs in **NET 2** to ensure communication between all end devices in that network.

Laptop3

Physical Config Desktop Custom Interface

Command Prompt X

```
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 11ms, Average = 3ms  
  
PC>ping 120.10.8.131  
  
Pinging 120.10.8.131 with 32 bytes of data:  
  
Reply from 120.10.8.131: bytes=32 time=7ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.131: bytes=32 time=1ms TTL=126  
  
Ping statistics for 120.10.8.131:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 7ms, Average = 2ms  
  
PC>ping 120.10.8.138  
  
Pinging 120.10.8.138 with 32 bytes of data:  
  
Reply from 120.10.8.138: bytes=32 time=9ms TTL=126  
Reply from 120.10.8.138: bytes=32 time=9ms TTL=126  
Reply from 120.10.8.138: bytes=32 time=1ms TTL=126  
Reply from 120.10.8.138: bytes=32 time=5ms TTL=126  
  
Ping statistics for 120.10.8.138:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 1ms, Maximum = 9ms, Average = 6ms  
  
PC>
```

w ⚙️ ⌛ ENG UK 10:54 PM 8/22/2024 🔔 PRE

Figure 62: Laptop 3 PING IN NET 4.

We use **Laptop 3 in NET 3** to test the connectivity of the topology by using the ping command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

- test the routes of the topology between all end devices using tracert:

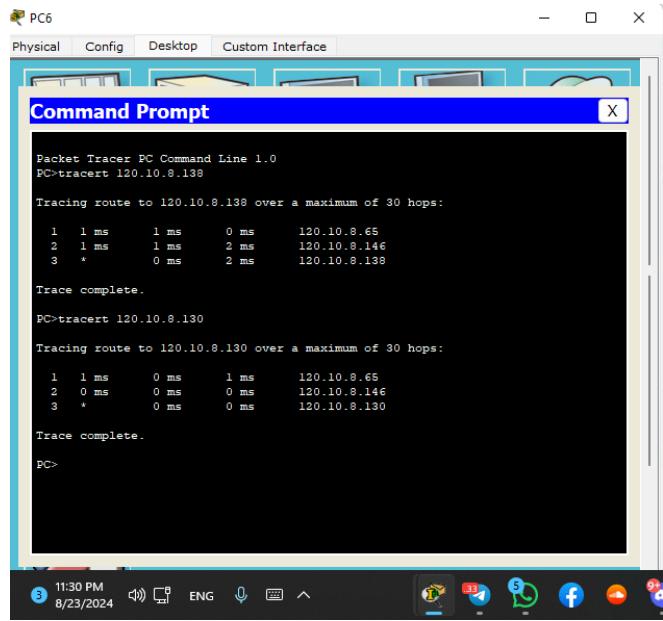


Figure 63: PC6 in NET Area1

We use **PC 6 in NET 1** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

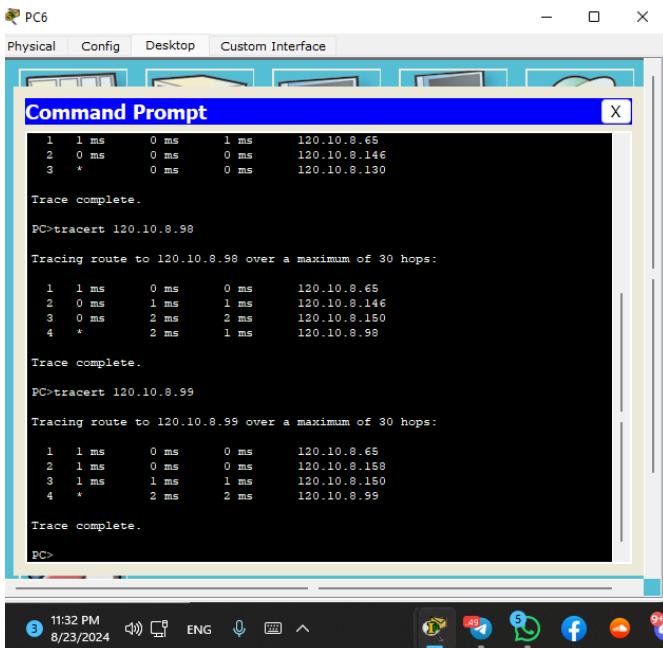


Figure 64: PC6 in NET Area2.

We use PC 6 in NET 1 to test the connectivity of the topology by using the tracert command with different device IPs in NET 3 to ensure communication between all end devices in that network.

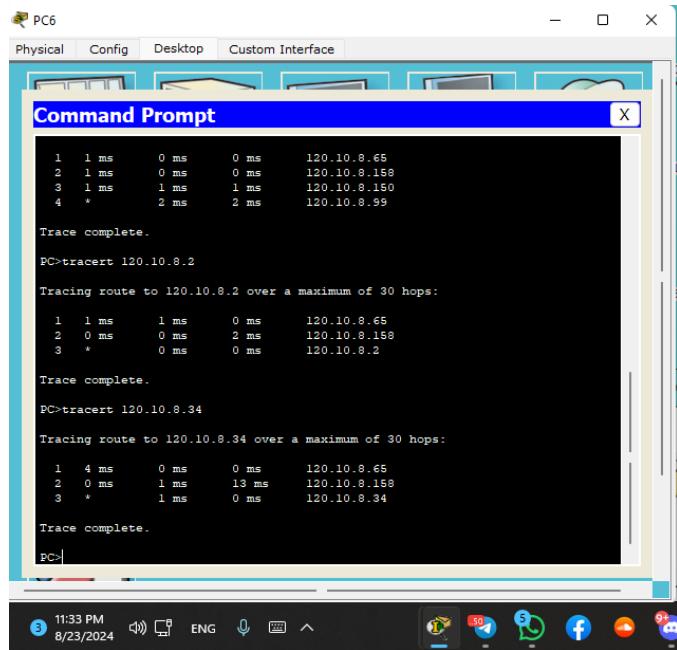


Figure 65: PC6 in NET Area3.

We use PC 6 in NET 1 to test the connectivity of the topology by using the tracert command with different device IPs in NET 2 to ensure communication between all end devices in that network.

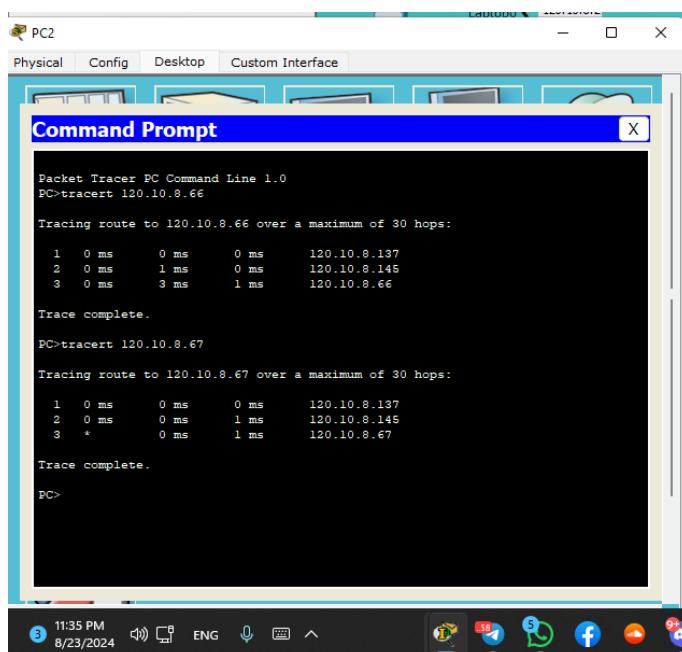


Figure 66: PC2 in NET Area4.

We use **PC 2 in NET 4** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

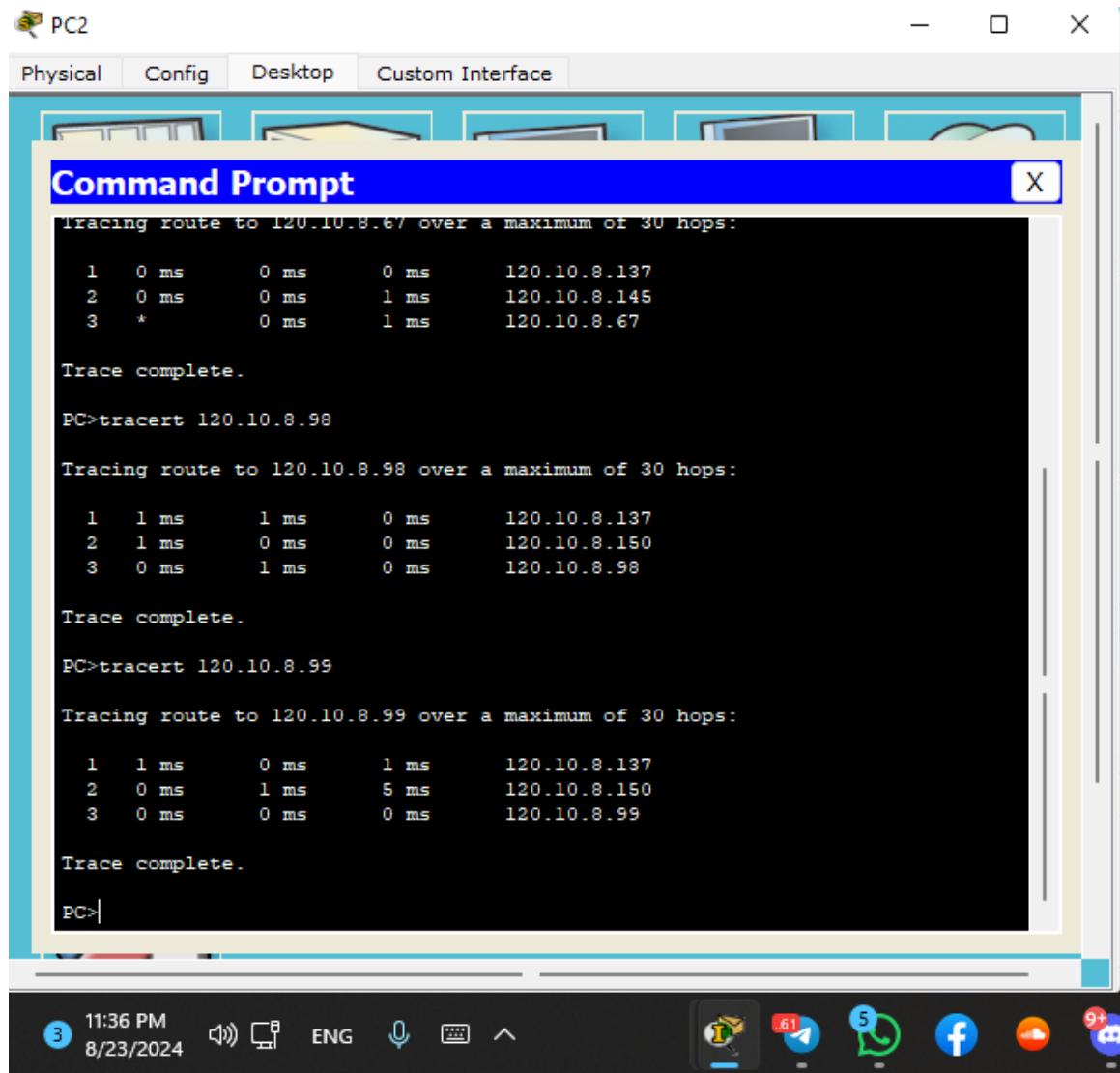


Figure 67: PC2 in NET Area2.

We use **PC 2 in NET 4** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 3** to ensure communication between all end devices in that network.

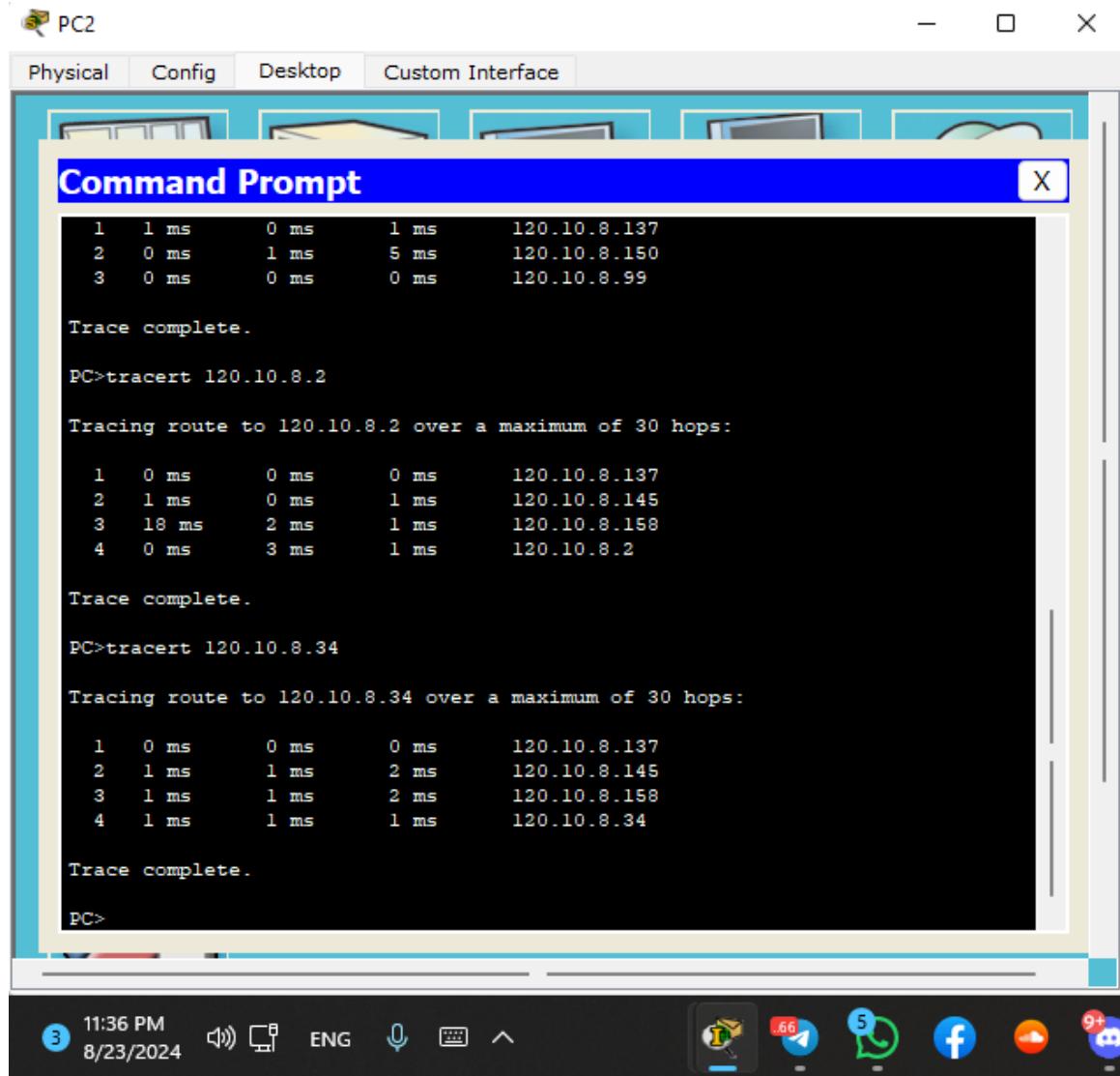


Figure 68: PC2 in NET Area4.

We use **PC 2 in NET 4** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 2** to ensure communication between all end devices in that network.

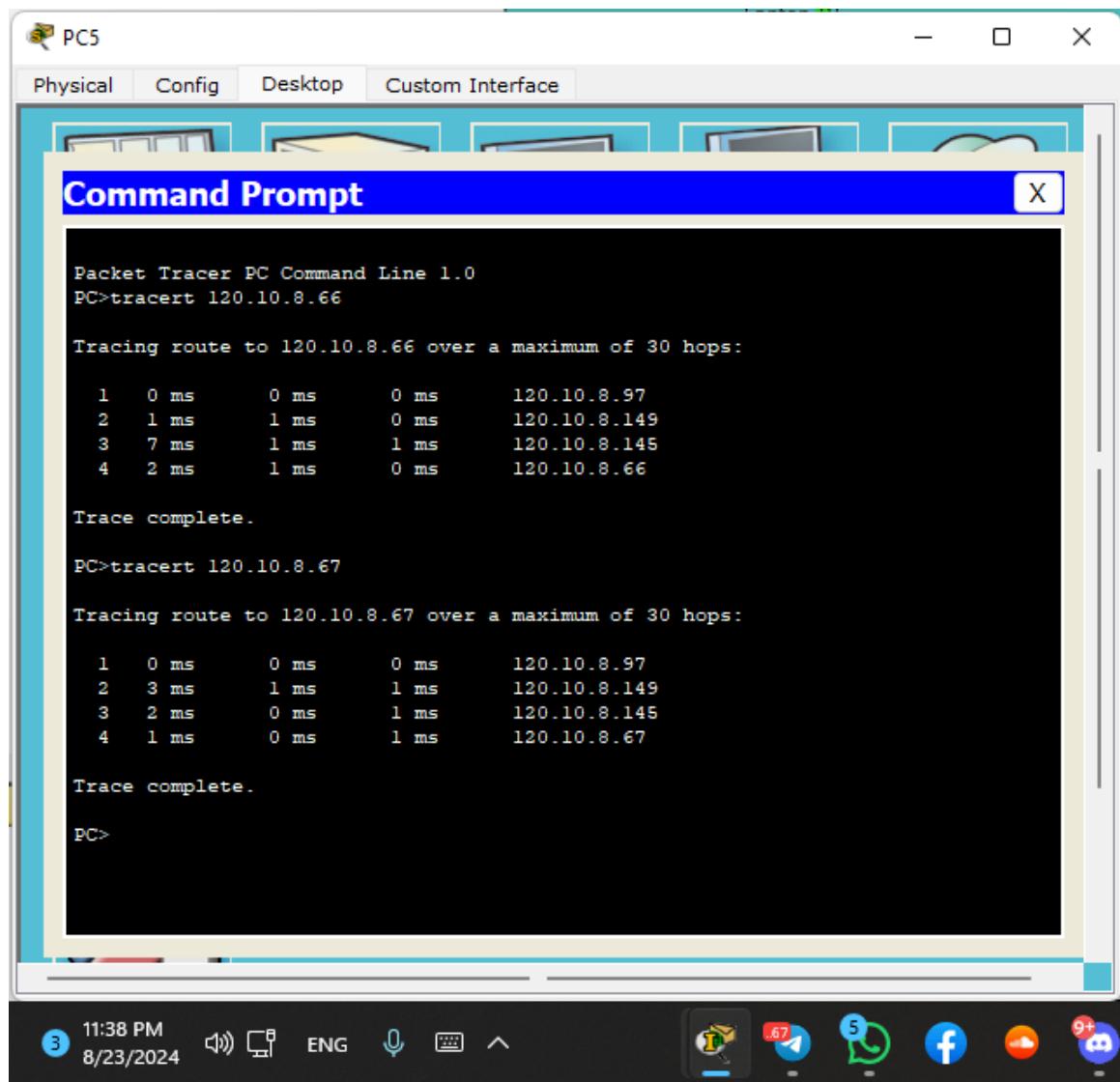


Figure 69: PC5 in NET Area4

We use **PC 5 in NET 3** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

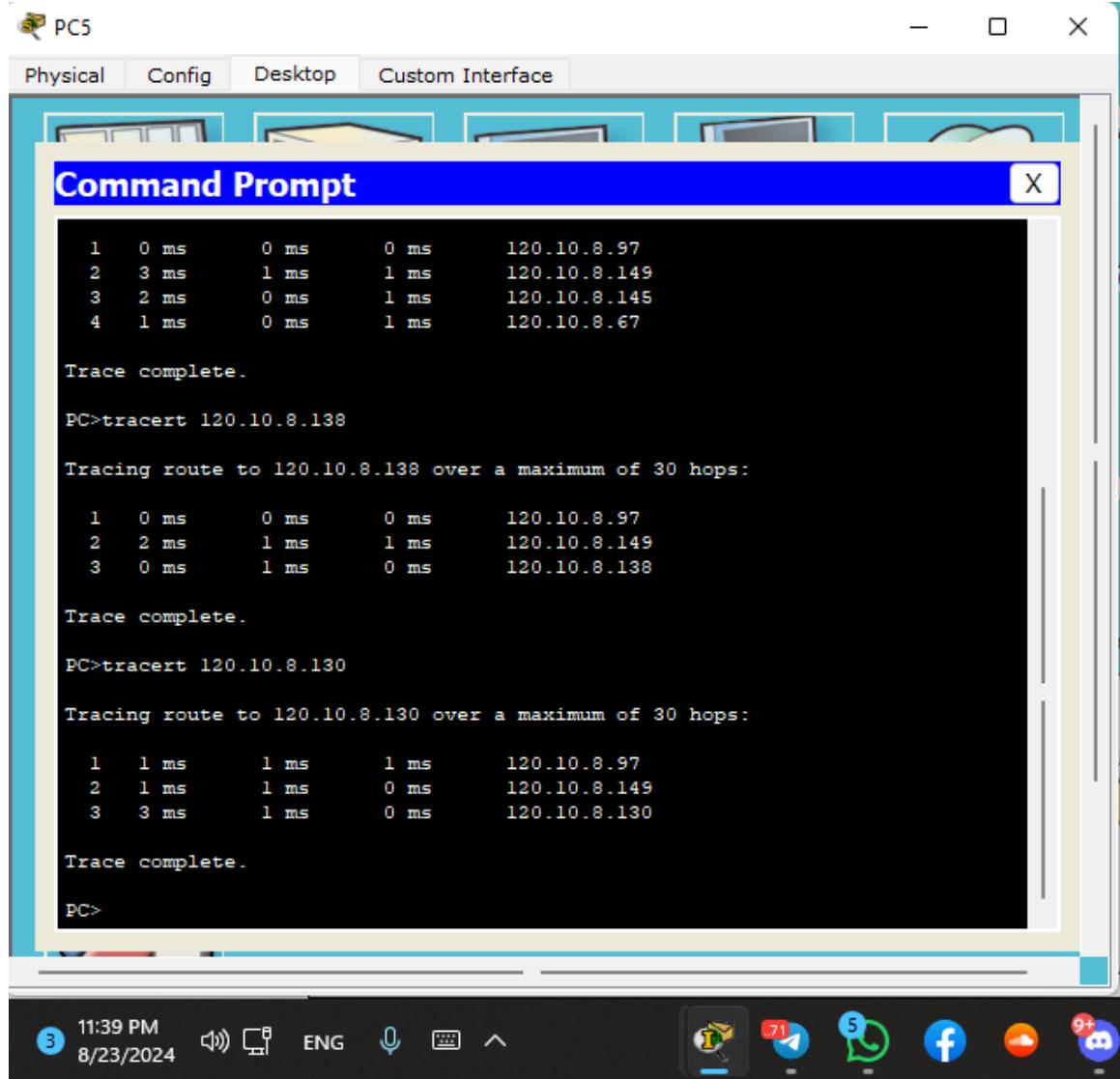


Figure 70: PC5 in NET Area4

We use **PC 5 in NET 3** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

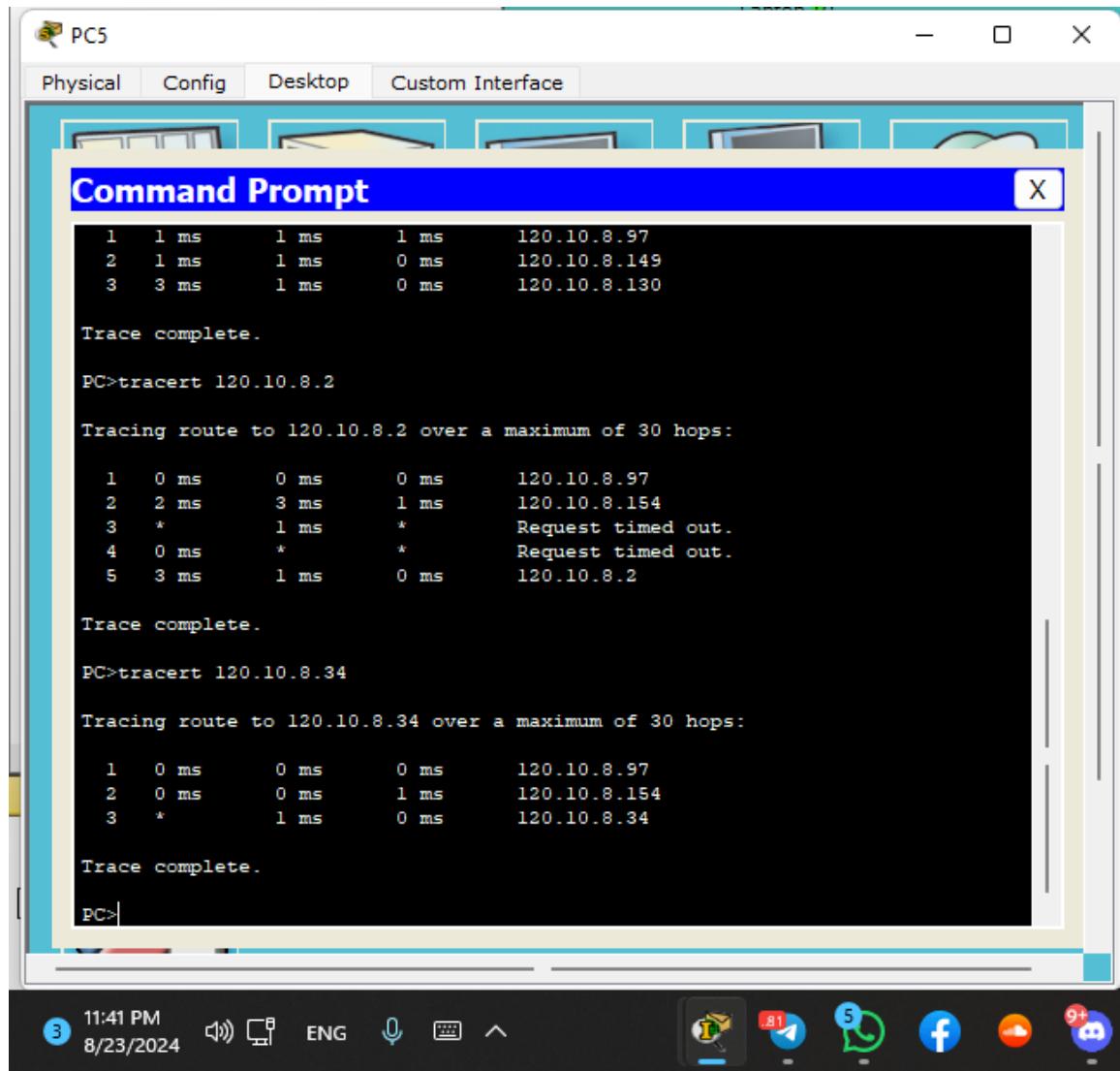


Figure 71: PC5 in NET Area3

We use **PC 5 in NET 3** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 2** to ensure communication between all end devices in that network.

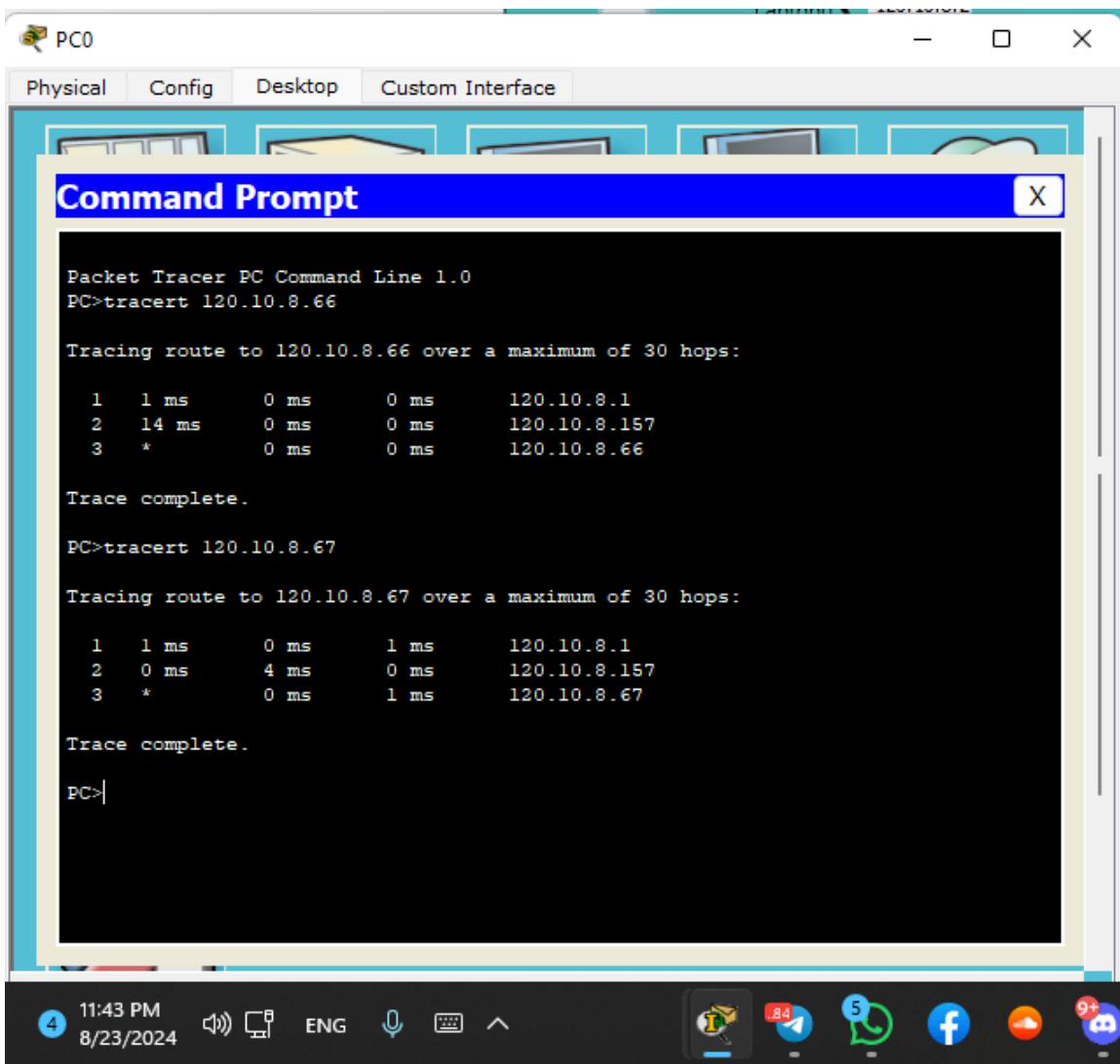


Figure 72:Figure 57: PC0 in NET Area1 .

We use **PC 0 in NET 2** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 1** to ensure communication between all end devices in that network.

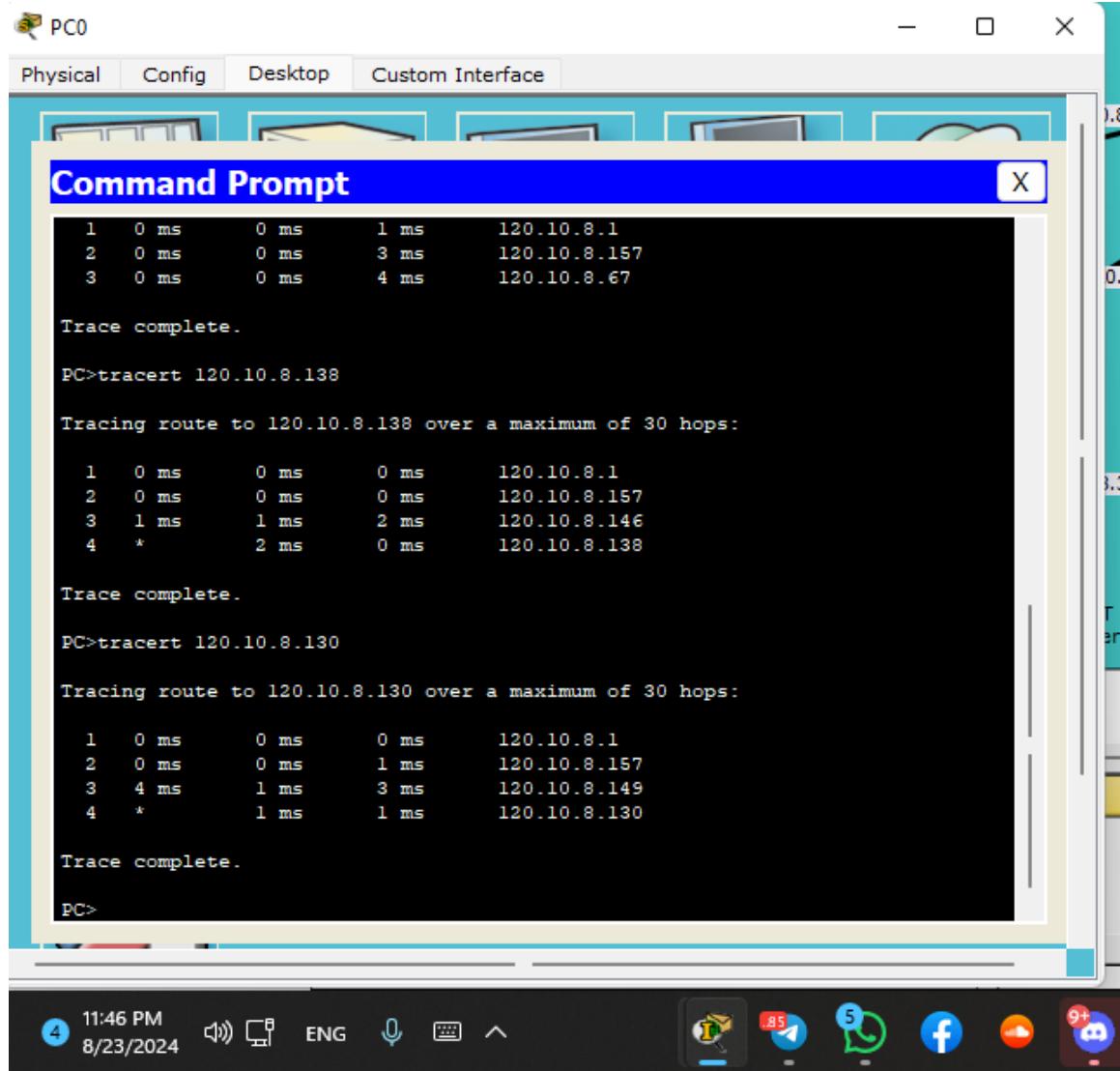


Figure 73: PC0 in NET Area3.

We use **PC 0 in NET 2** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 4** to ensure communication between all end devices in that network.

PC0

Physical Config Desktop Custom Interface

Command Prompt

```
1 0 ms 0 ms 0 ms 120.10.8.1
2 0 ms 0 ms 1 ms 120.10.8.157
3 4 ms 1 ms 3 ms 120.10.8.149
4 * 1 ms 1 ms 120.10.8.130

Trace complete.

PC>tracert 120.10.8.98

Tracing route to 120.10.8.98 over a maximum of 30 hops:

1 1 ms 0 ms 0 ms 120.10.8.1
2 0 ms 0 ms 0 ms 120.10.8.153
3 1 ms 13 ms 0 ms 120.10.8.98

Trace complete.

PC>tracert 120.10.8.99

Tracing route to 120.10.8.99 over a maximum of 30 hops:

1 1 ms 0 ms 0 ms 120.10.8.1
2 5 ms 0 ms 0 ms 120.10.8.153
3 * 0 ms 0 ms 120.10.8.99

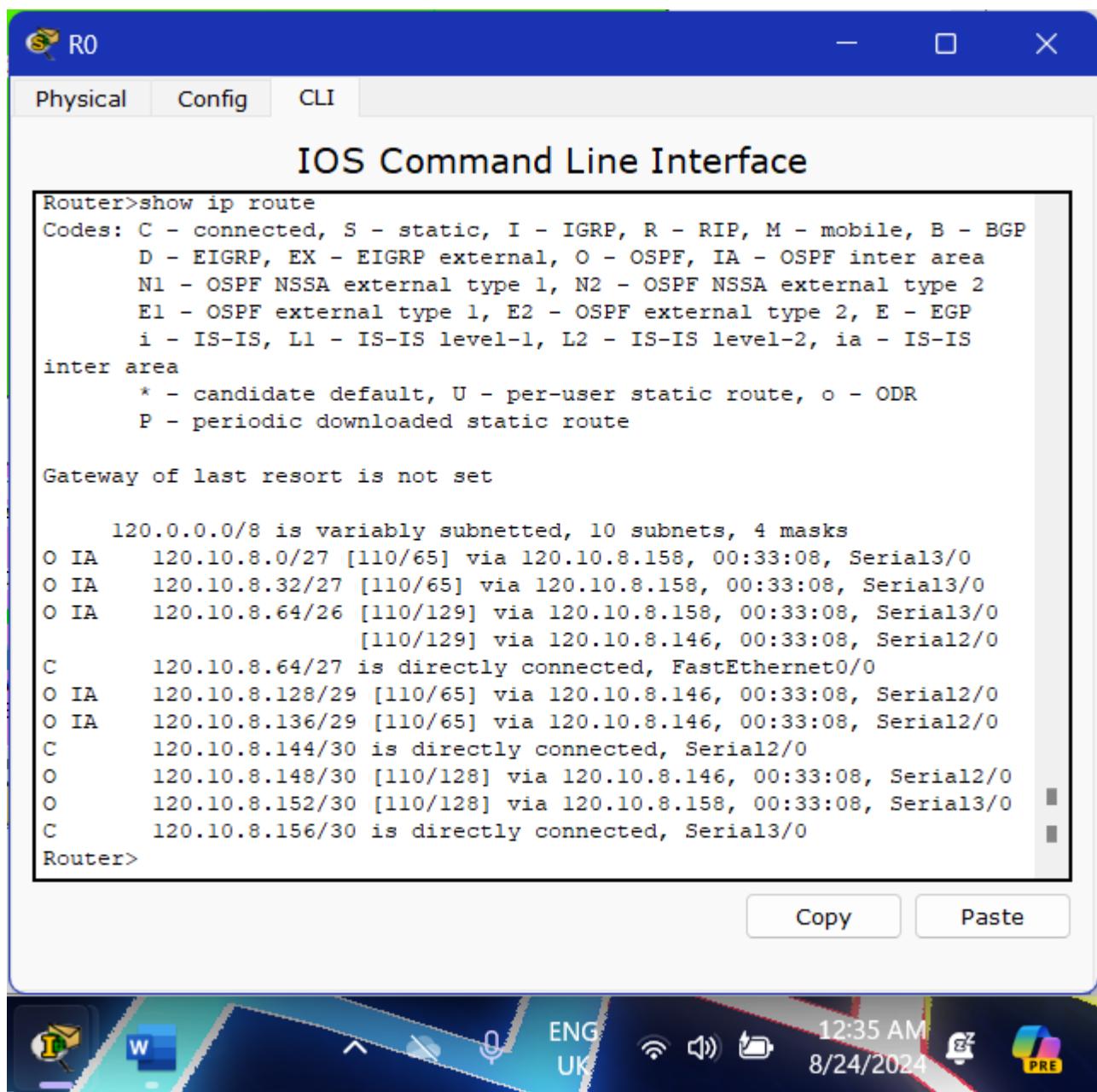
Trace complete.

PC>
```

Figure 74: PC0 in NET Area2

We use **PC 0 in NET 2** to test the connectivity of the topology by using the tracert command with different device IPs in **NET 3** to ensure communication between all end devices in that network.

- Show Routing Tables for All Routers:



The screenshot shows a Windows application window titled "R0" with three tabs: "Physical", "Config", and "CLI". The "CLI" tab is selected, displaying the output of the "show ip route" command. The output includes route codes, gateway information, and a detailed list of routes. At the bottom of the CLI window are "Copy" and "Paste" buttons. Below the window is a taskbar with various icons and system status information.

```
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

  120.0.0.0/8 is variably subnetted, 10 subnets, 4 masks
O IA   120.10.8.0/27 [110/65] via 120.10.8.158, 00:33:08, Serial3/0
O IA   120.10.8.32/27 [110/65] via 120.10.8.158, 00:33:08, Serial3/0
O IA   120.10.8.64/26 [110/129] via 120.10.8.158, 00:33:08, Serial3/0
                  [110/129] via 120.10.8.146, 00:33:08, Serial2/0
C     120.10.8.64/27 is directly connected, FastEthernet0/0
O IA   120.10.8.128/29 [110/65] via 120.10.8.146, 00:33:08, Serial2/0
O IA   120.10.8.136/29 [110/65] via 120.10.8.146, 00:33:08, Serial2/0
C     120.10.8.144/30 is directly connected, Serial2/0
O     120.10.8.148/30 [110/128] via 120.10.8.146, 00:33:08, Serial2/0
O     120.10.8.152/30 [110/128] via 120.10.8.158, 00:33:08, Serial3/0
C     120.10.8.156/30 is directly connected, Serial3/0
Router>
```

Figure 75:The Routing tables for R0 .

This screen show the routing table for R0 using “show ip route” command.

- R1:

The screenshot shows a Windows taskbar at the bottom with icons for File Explorer, Word, Task View, Cloud, Microphone, ENG UK language, battery level, 12:41 AM, 8/24/2024, and a PRE icon. Above the taskbar is a window titled "IOS Command Line Interface" for device "R1". The window has tabs for Physical, Config, and CLI, with CLI selected. The main area displays the output of the "show ip route" command. The output includes a legend of route codes (C, S, I, R, M, B, D, EX, O, IA, N1, N2, E1, E2, E, i, L1, L2, ia) and their meanings. It lists routes for 120.0.0.0/8, including several OSPF (O IA) routes via Serial interfaces and FastEthernet interfaces, and direct connections (C) via Serial and FastEthernet interfaces.

```
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

  120.0.0.0/8 is variably subnetted, 10 subnets, 4 masks
O IA  120.10.8.0/27 [110/129] via 120.10.8.150, 00:37:33, Serial2/0
                                              [110/129] via 120.10.8.145, 00:37:33, Serial3/0
O IA  120.10.8.32/27 [110/129] via 120.10.8.150, 00:37:33, Serial2/0
                                              [110/129] via 120.10.8.145, 00:37:33, Serial3/0
O IA  120.10.8.64/26 [110/65] via 120.10.8.150, 00:37:33, Serial2/0
O IA  120.10.8.64/27 [110/65] via 120.10.8.145, 00:37:33, Serial3/0
C    120.10.8.128/29 is directly connected, FastEthernet0/0
C    120.10.8.136/29 is directly connected, FastEthernet1/0
C    120.10.8.144/30 is directly connected, Serial3/0
C    120.10.8.148/30 is directly connected, Serial2/0
O    120.10.8.152/30 [110/128] via 120.10.8.150, 00:37:33, Serial2/0
--More--
```

Copy Paste

Figure 76:The Routing tables for R1.

This screen show the routing table for R1 using “show Ip route” command.

- R2:

Physical Config CLI

IOS Command Line Interface

```
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

  120.0.0.0/8 is variably subnetted, 10 subnets, 4 masks
O IA   120.10.8.0/27 [110/65] via 120.10.8.154, 00:39:35, Serial3/0
O IA   120.10.8.32/27 [110/65] via 120.10.8.154, 00:39:35, Serial3/0
C     120.10.8.64/26 is directly connected, FastEthernet0/0
O IA   120.10.8.64/27 [110/129] via 120.10.8.154, 00:39:35, Serial3/0
                  [110/129] via 120.10.8.149, 00:39:35, Serial2/0
O IA   120.10.8.128/29 [110/65] via 120.10.8.149, 00:39:35, Serial2/0
O IA   120.10.8.136/29 [110/65] via 120.10.8.149, 00:39:35, Serial2/0
O     120.10.8.144/30 [110/128] via 120.10.8.149, 00:39:35, Serial2/0
C     120.10.8.148/30 is directly connected, Serial2/0
C     120.10.8.152/30 is directly connected, Serial3/0
O     120.10.8.156/30 [110/128] via 120.10.8.154, 00:39:35, Serial3/0
Router>
```

Copy Paste

W 12:44 AM
ENG UK 8/24/2024 PRE

Figure 77:The Routing tables for R2.

This screen show the routing table for R2 using “show ip route” command.

- R3:

The screenshot shows the Cisco IOS Command Line Interface (CLI) window titled "IOS Command Line Interface". The title bar includes tabs for "Physical", "Config", and "CLI", with "CLI" being the active tab. The main area displays the output of the "show ip route" command. The output includes a legend of route codes and a note about the gateway of last resort. The routing table lists several routes, mostly connected (C) routes via FastEthernet and Serial interfaces, along with some OSPF (O IA) routes. At the bottom of the CLI window, there are "Copy" and "Paste" buttons. Below the CLI window, the Windows taskbar is visible, showing icons for File Explorer, Word, and Power, along with system status indicators like battery level, signal strength, and the date/time (12:47 AM, 8/24/2024).

```
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

  120.0.0.0/8 is variably subnetted, 10 subnets, 4 masks
C        120.10.8.0/27 is directly connected, FastEthernet0/0
C        120.10.8.32/27 is directly connected, FastEthernet1/0
O  IA    120.10.8.64/26 [110/65] via 120.10.8.153, 00:42:16, Serial2/0
O  IA    120.10.8.64/27 [110/65] via 120.10.8.157, 00:42:16, Serial3/0
O  IA    120.10.8.128/29 [110/129] via 120.10.8.153, 00:42:06, Serial2/0
                  [110/129] via 120.10.8.157, 00:42:06, Serial3/0
O  IA    120.10.8.136/29 [110/129] via 120.10.8.153, 00:42:06, Serial2/0
                  [110/129] via 120.10.8.157, 00:42:06, Serial3/0
O        120.10.8.144/30 [110/128] via 120.10.8.157, 00:42:16, Serial3/0
O        120.10.8.148/30 [110/128] via 120.10.8.153, 00:42:16, Serial2/0
C        120.10.8.152/30 is directly connected, Serial2/0
--More--
```

Copy Paste

Figure 78:The Routing tables for R3.

This screen show the routing table for R3 using “show ip route” command.

- Accessing our web server from all devices using the browser option in the device:



Figure 79: PC 1 Desktop

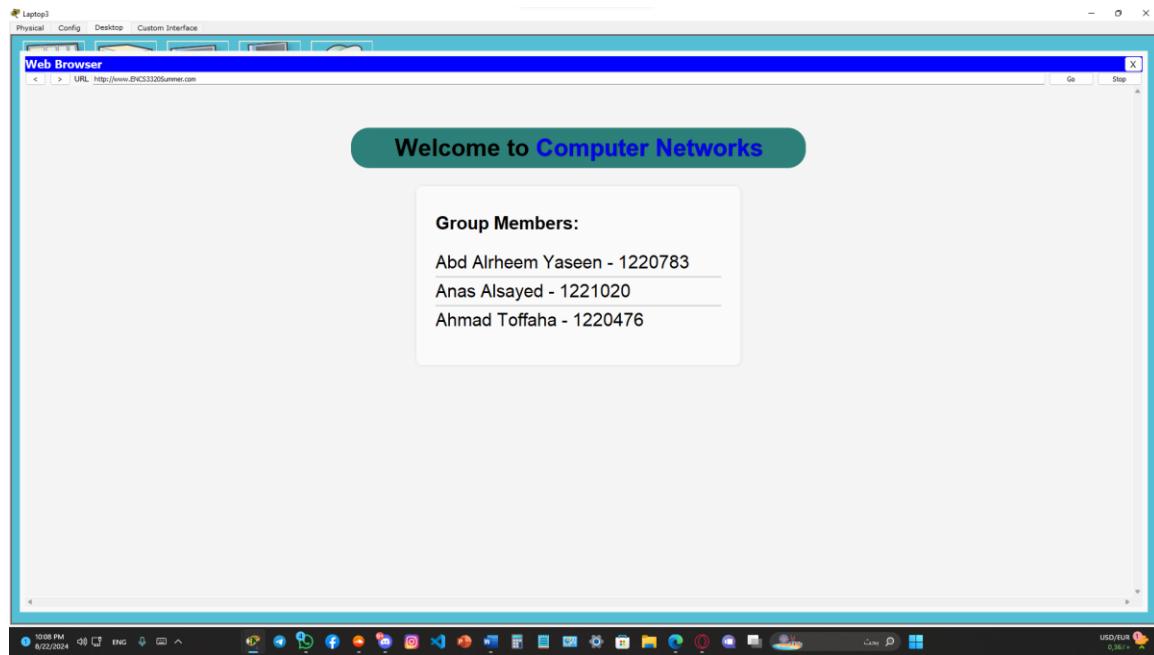


Figure 80 our web html from pc 1

As shown figure __, __ we access our website from PC 1 which is in NET 2-2.



Figure 81 Laptop 1 Desktop

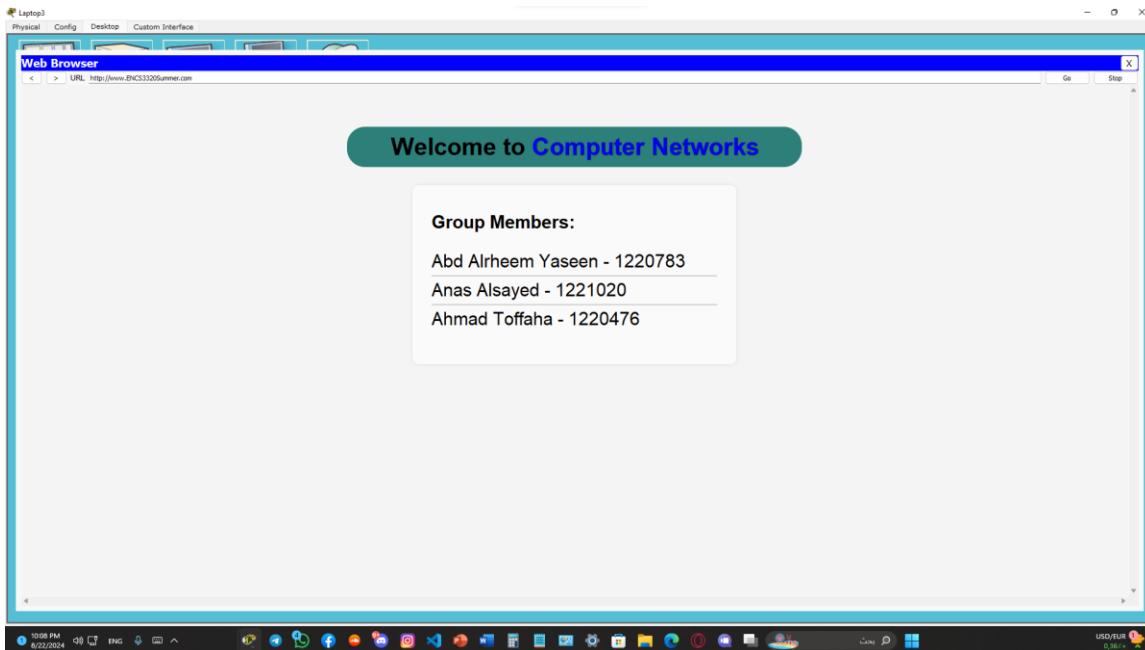


Figure 82 our web html from Laptop 1

As shown figure ___, we access our website from Laptop 1 which is in NET 2.1.

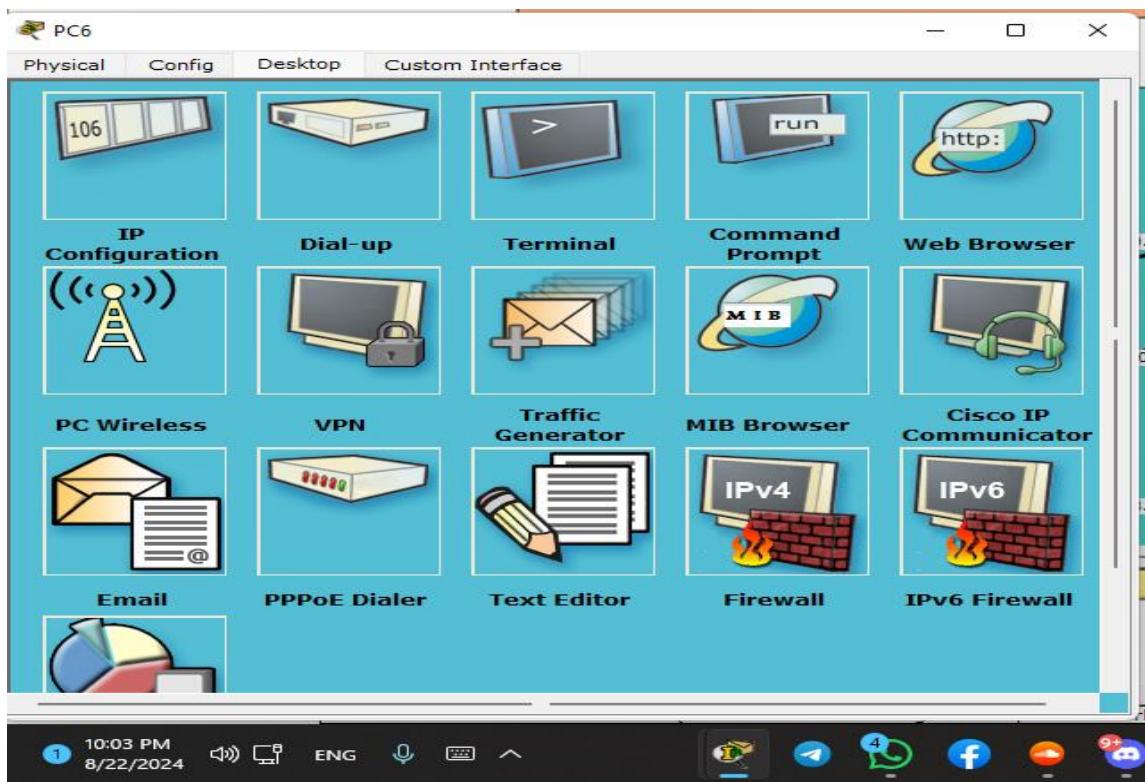


Figure 83 PC 6 Desktop

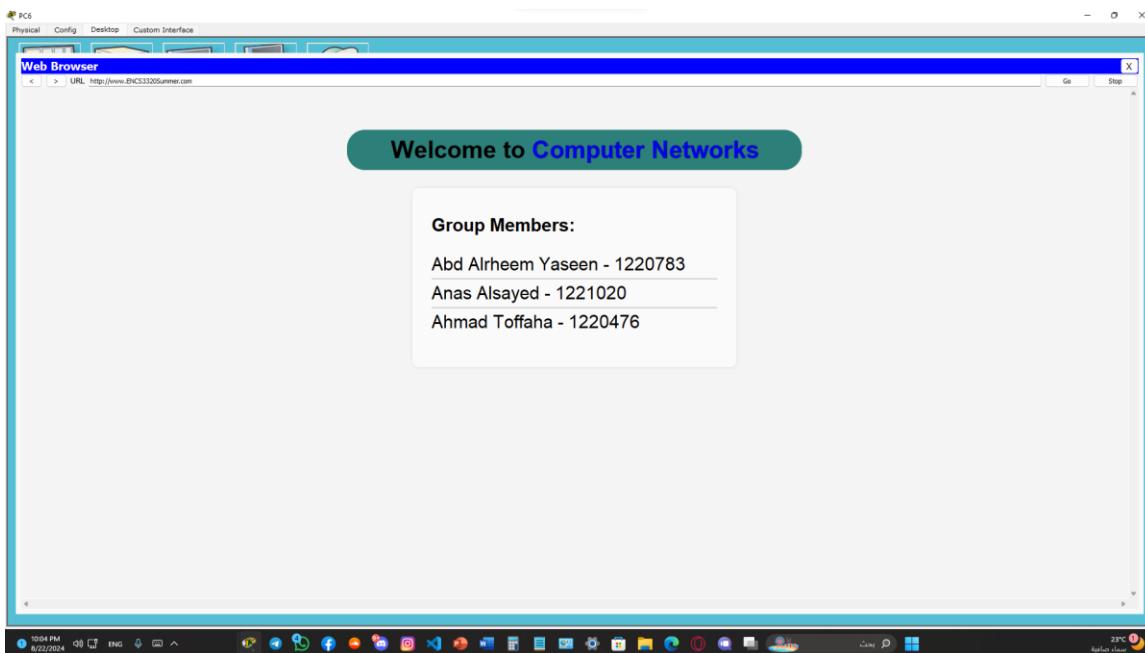


Figure 84 our web html from pc 6

As shown figure __, __ we access our website from PC6 which is in NET 1.



Figure 85 Laptop 2 Desktop

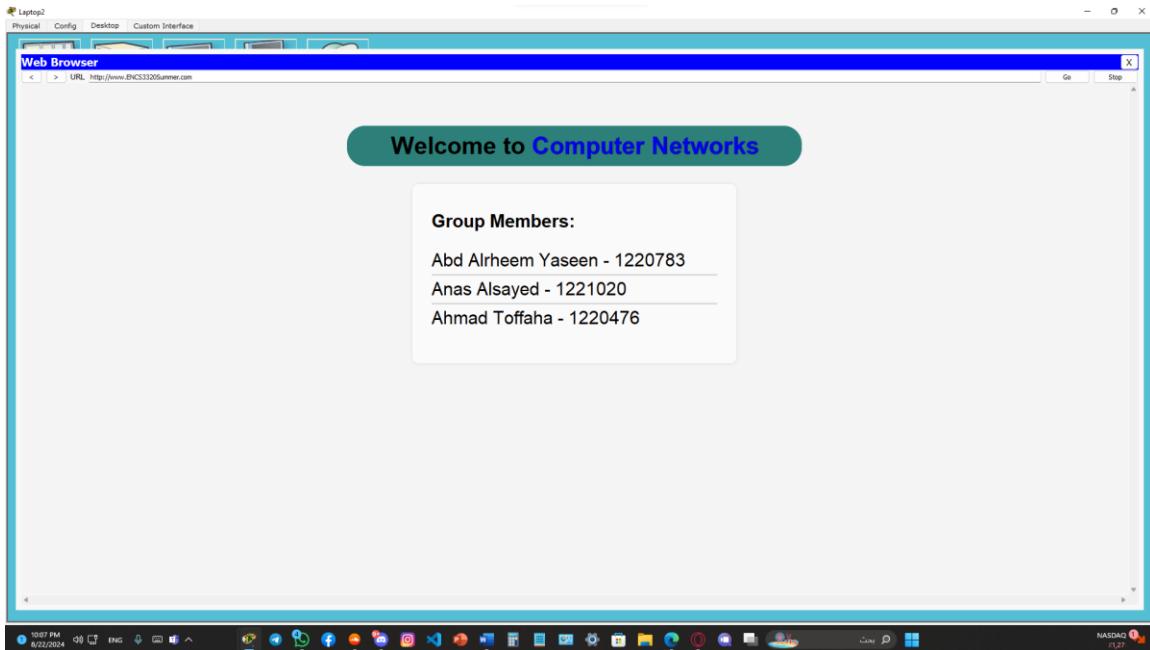


Figure 86 our web html from Laptop 2

As shown figure ___, we access our website from Laptop 2 which is in NET 4.2

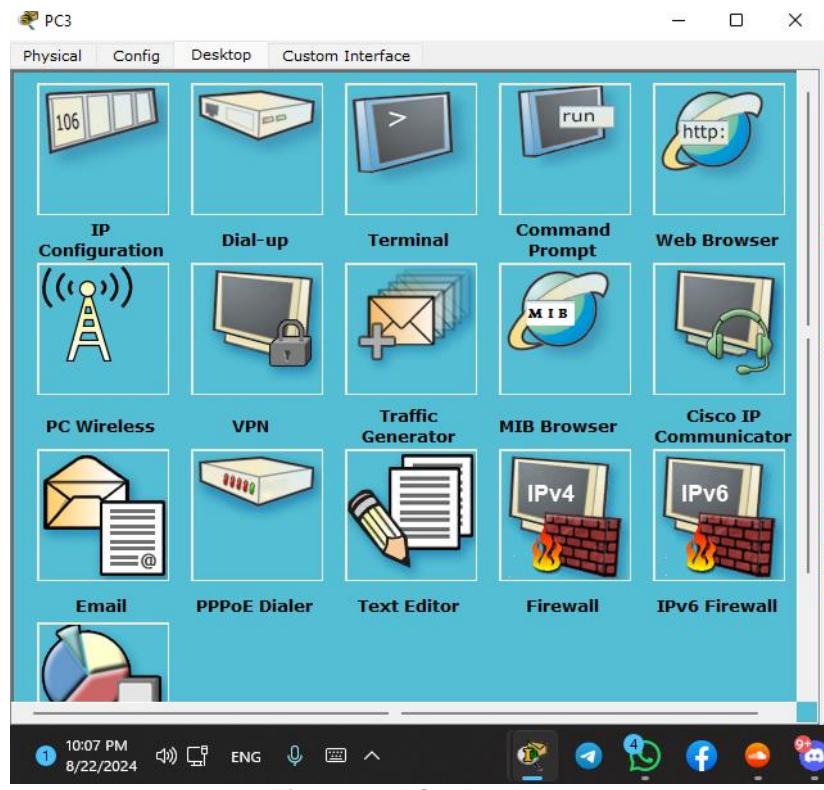


Figure 87 PC 3 Desktop

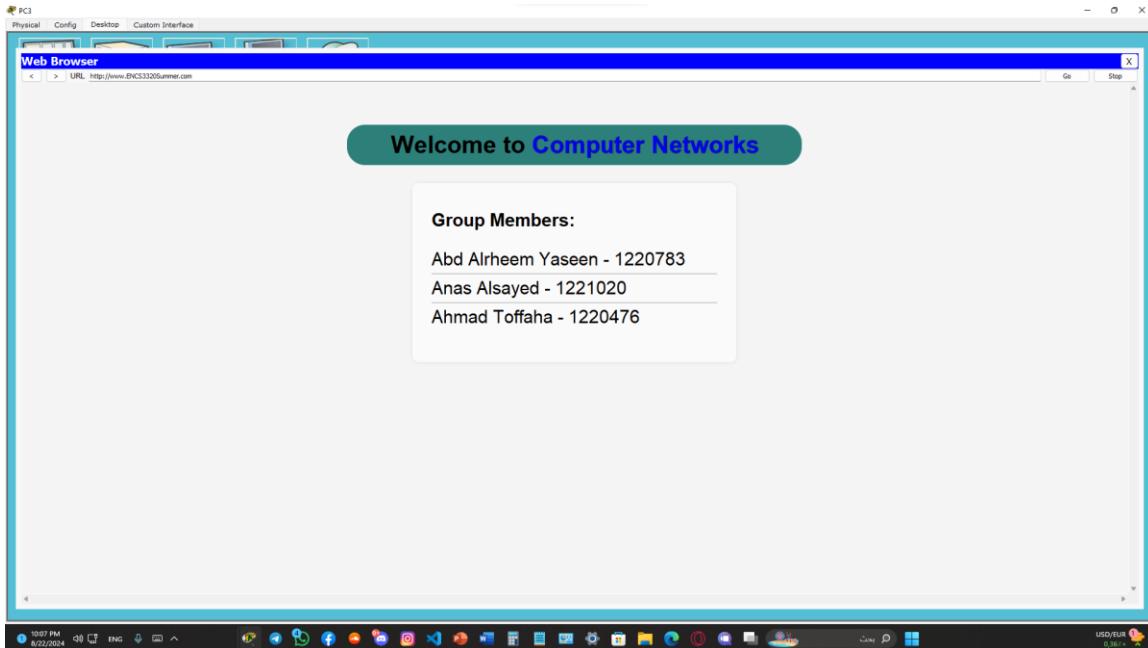


Figure 88 our web html from pc 3

As shown figure ___, we access our website from PC 3 which is in NET 2.1

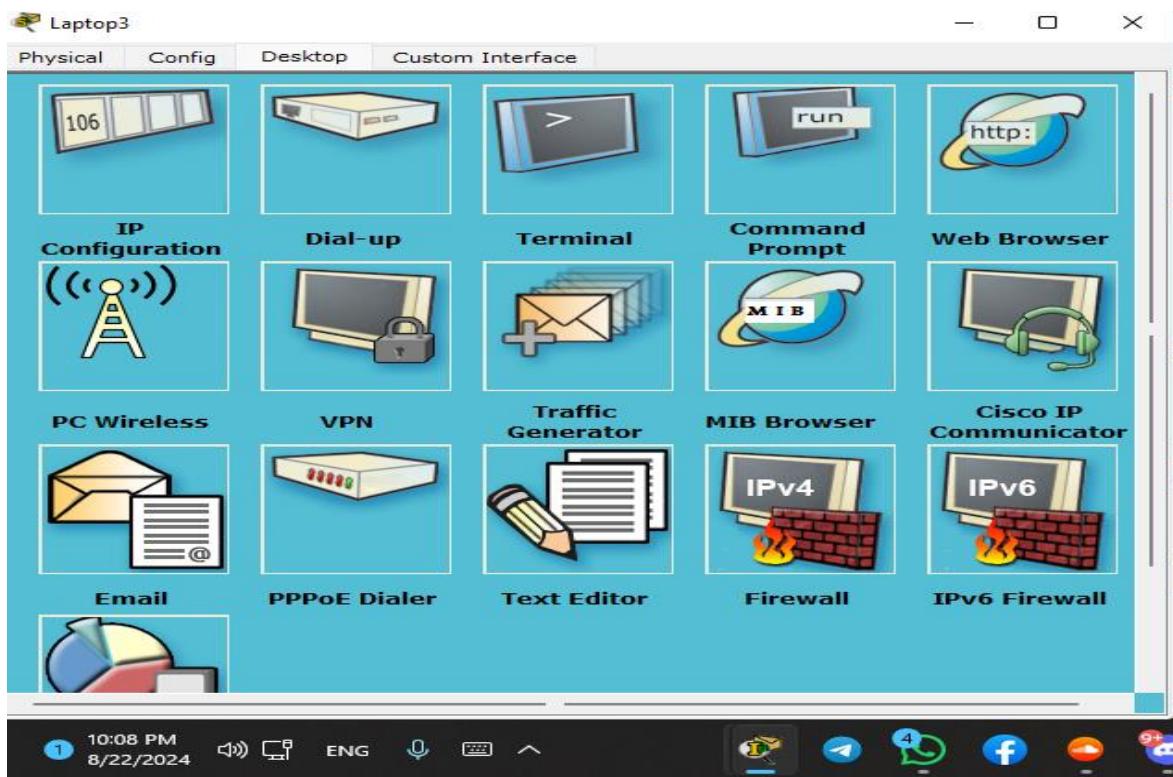


Figure 89 Laptop 3 Desktop

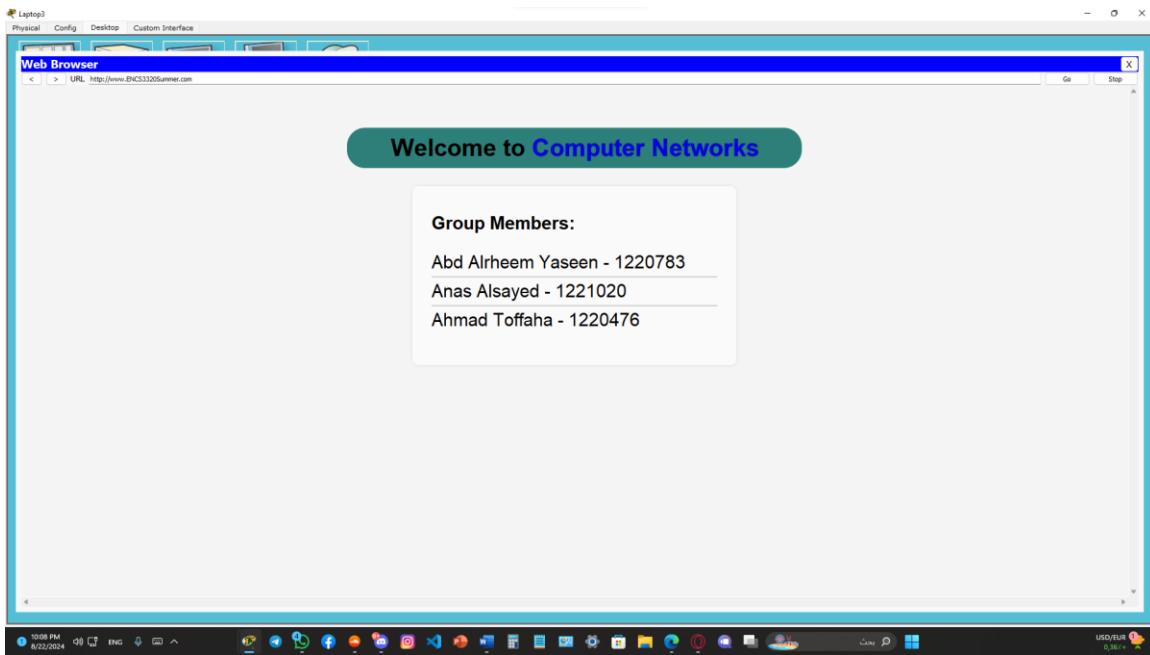


Figure 90 our web html from Laptop 3

As shown figure __, __ we access our website from Laptop 3 which is in NET 3.

TEAM WORK:

