ENCS3320-COMPUTER NETWORKS

PROJECT#2

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BIRZEIT UNIVERSITY
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OUR WILL IS UNBREAKABLE... WE ARE ALL GAZA

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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 >=30 ->#bits=5
NET2-2(30 host) -> 2^5-2 =32 >=30 ->#bits=5
NET1 (20 host) -> 2^5-2=30 >=20 ->#bits=5
NET3 (30 host) -> 2^5-2=30 >=30 ->#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 >=8 ->#bits=3
NET4-2(5 host) -> 2^3-2=6 >=8 ->#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) ->#bits=2
L1 = R1-R2 Link (4 host) ->#bits=2
L2 = R2-R3 Link (4 host) ->#bits=2
L3 = R3-R0 Link (4 host) ->#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

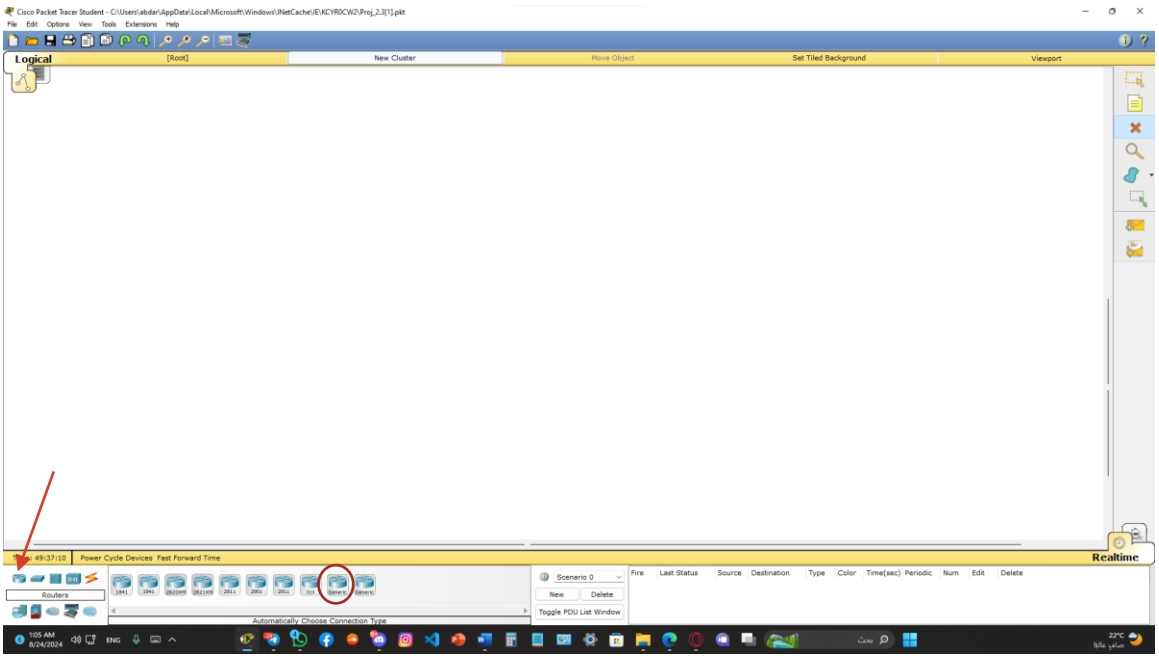


Figure 2: ADDING ROUTER

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

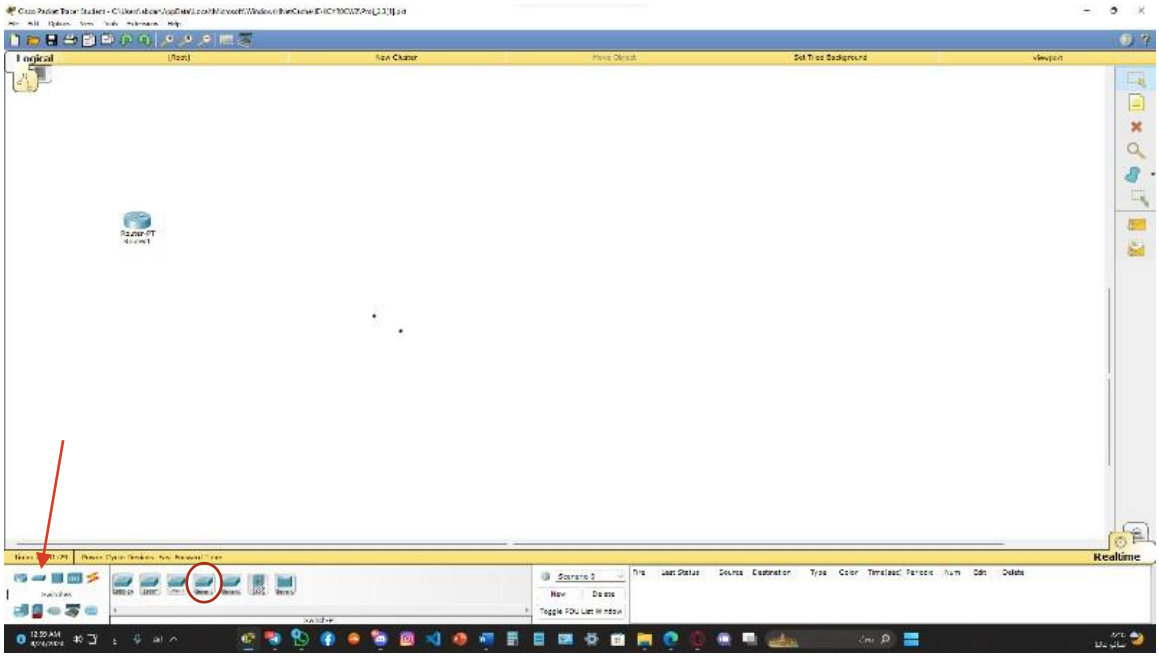


Figure 3:ADDING SERVER

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

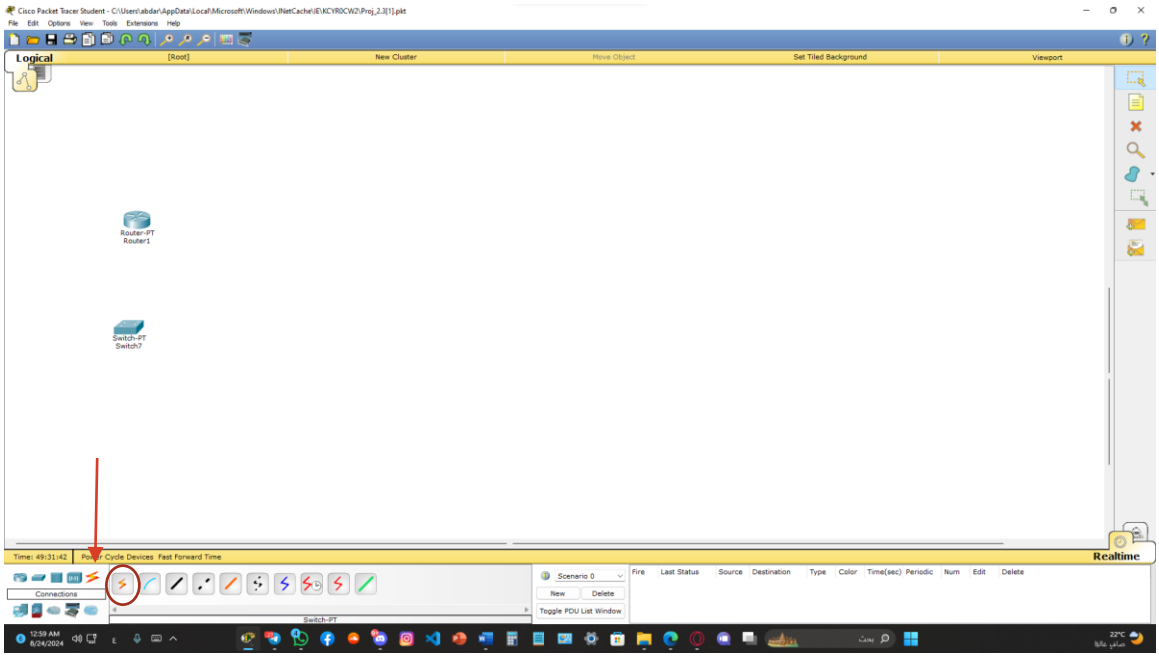


Figure 4:ADDING LINK

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

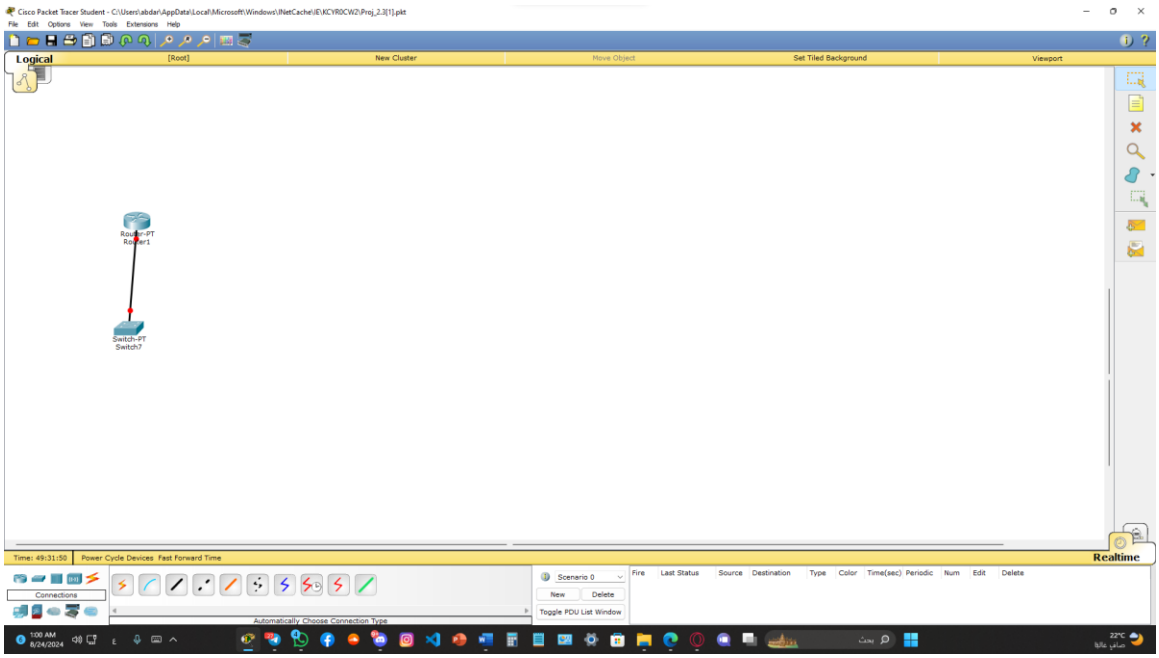


Figure 5:ADDING LINK

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

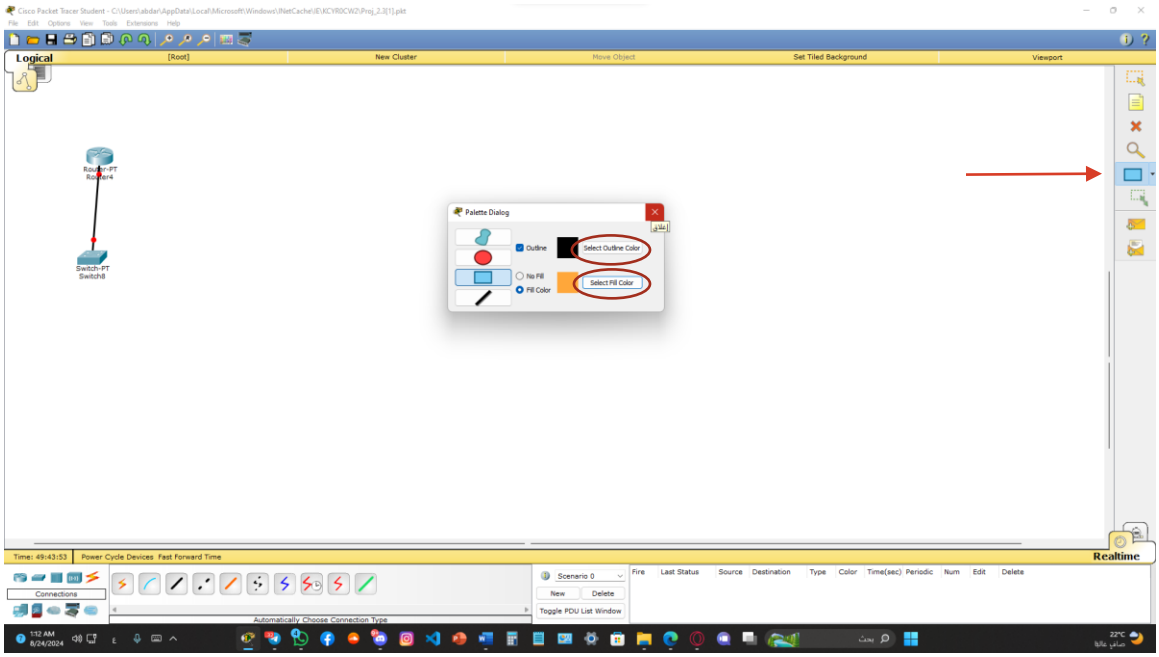


Figure 6:SET COLOAR

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

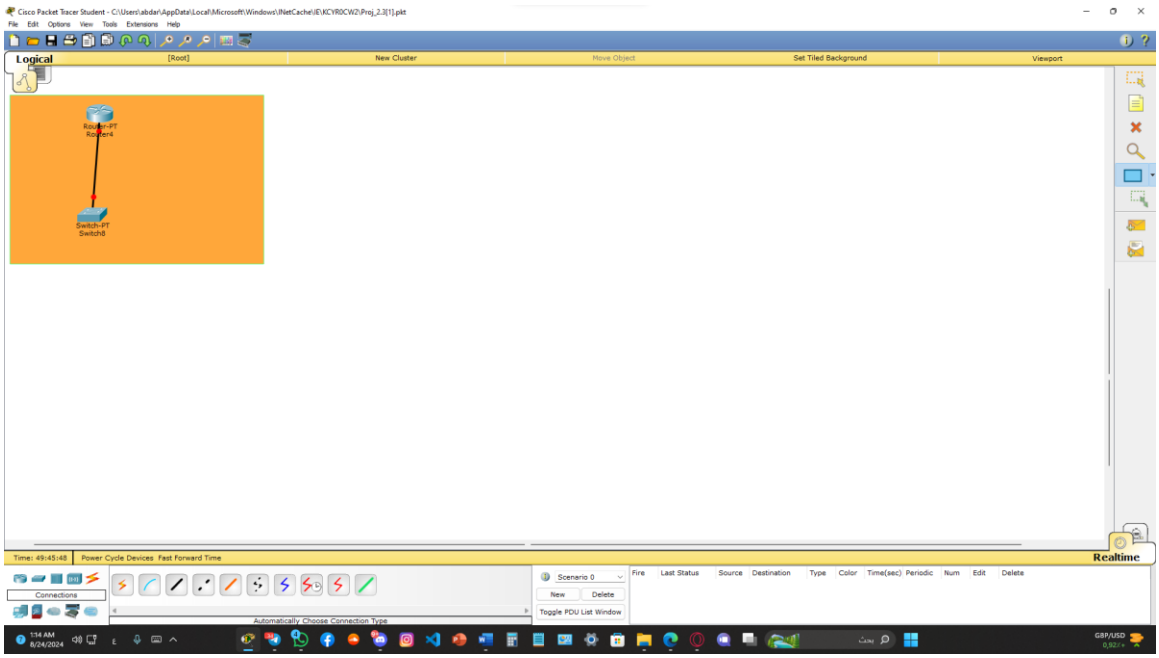


Figure 7:FULL COLOR

And like this we can make the network topology.

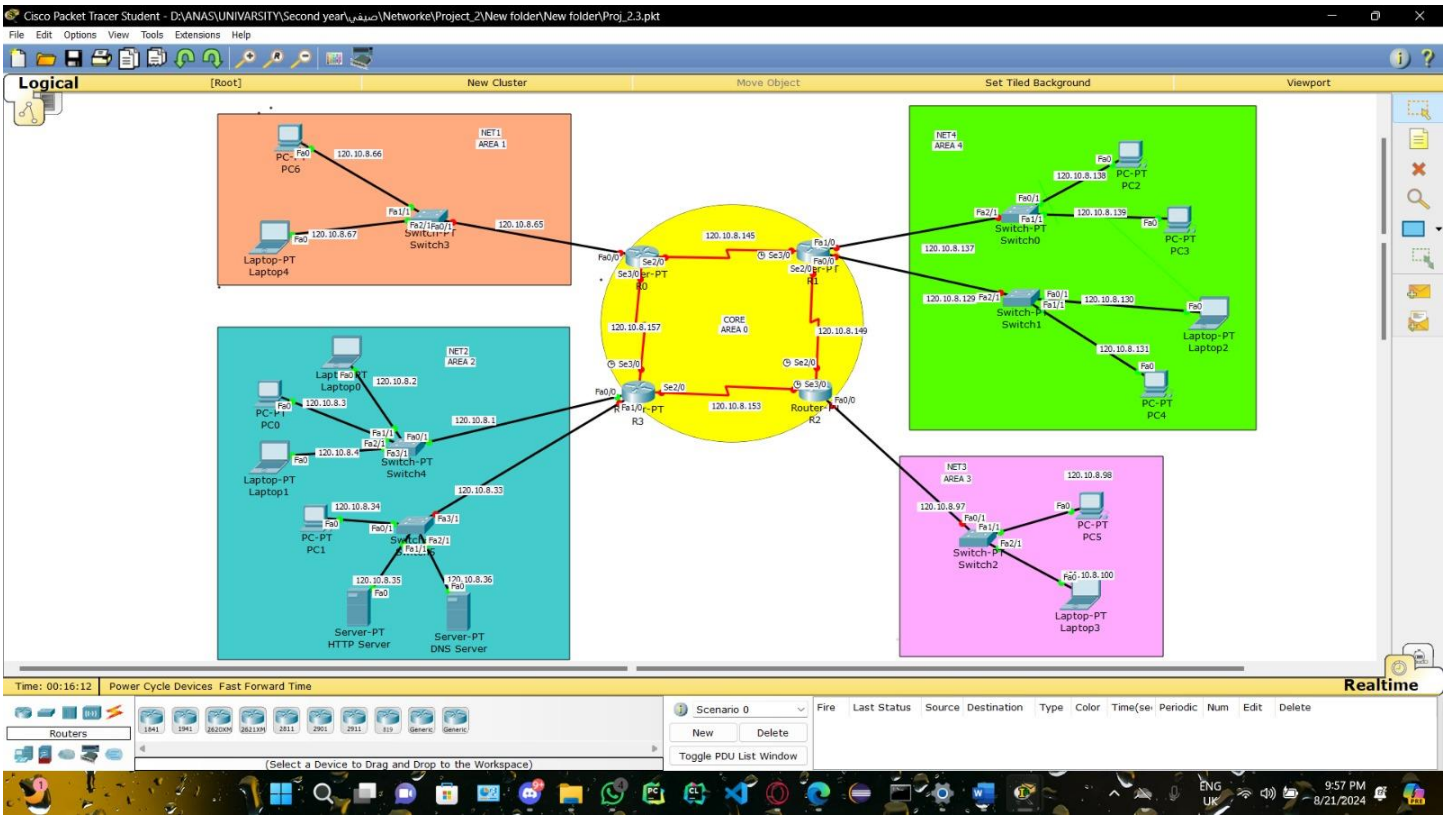


Figure 8 Network topology

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.

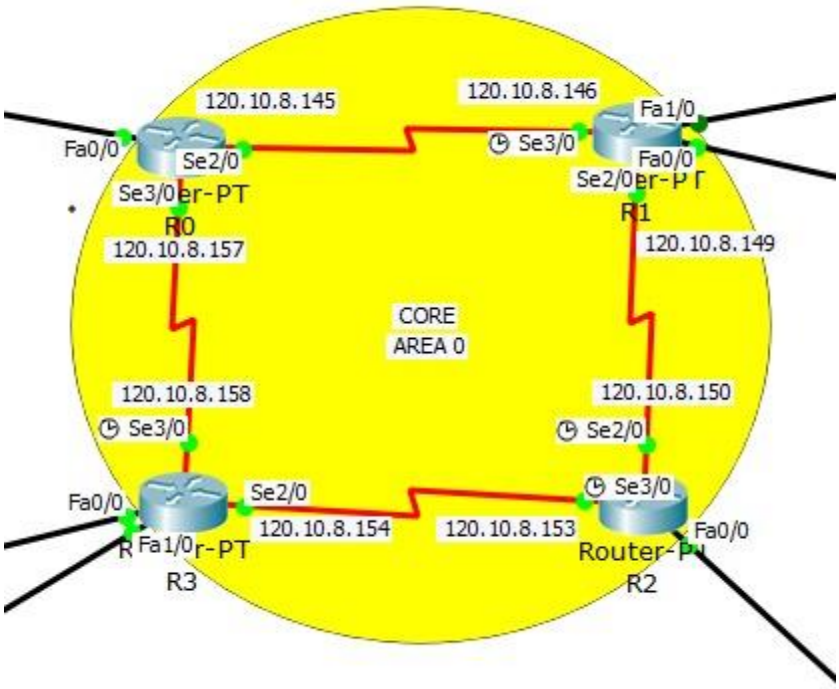


Figure 9 Core Area 0

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

These routers have 14 interfaces.

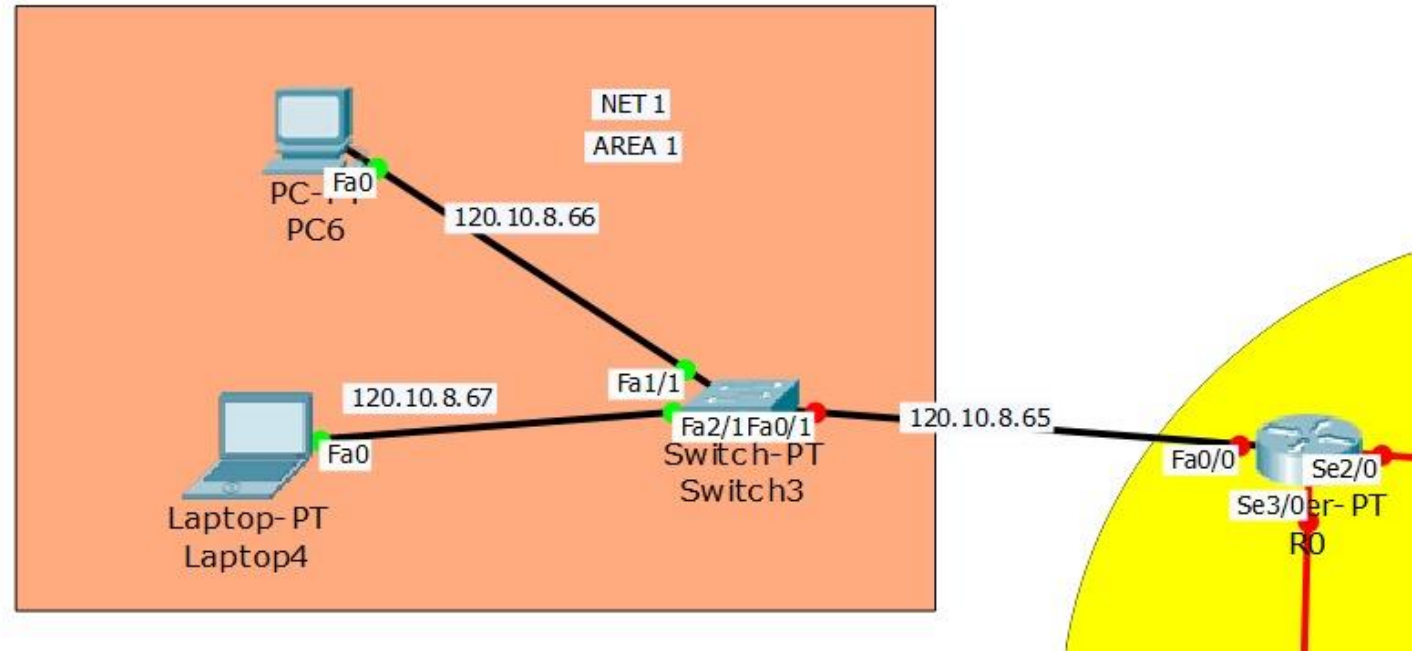


Figure 10 Net 1 Area 1

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.

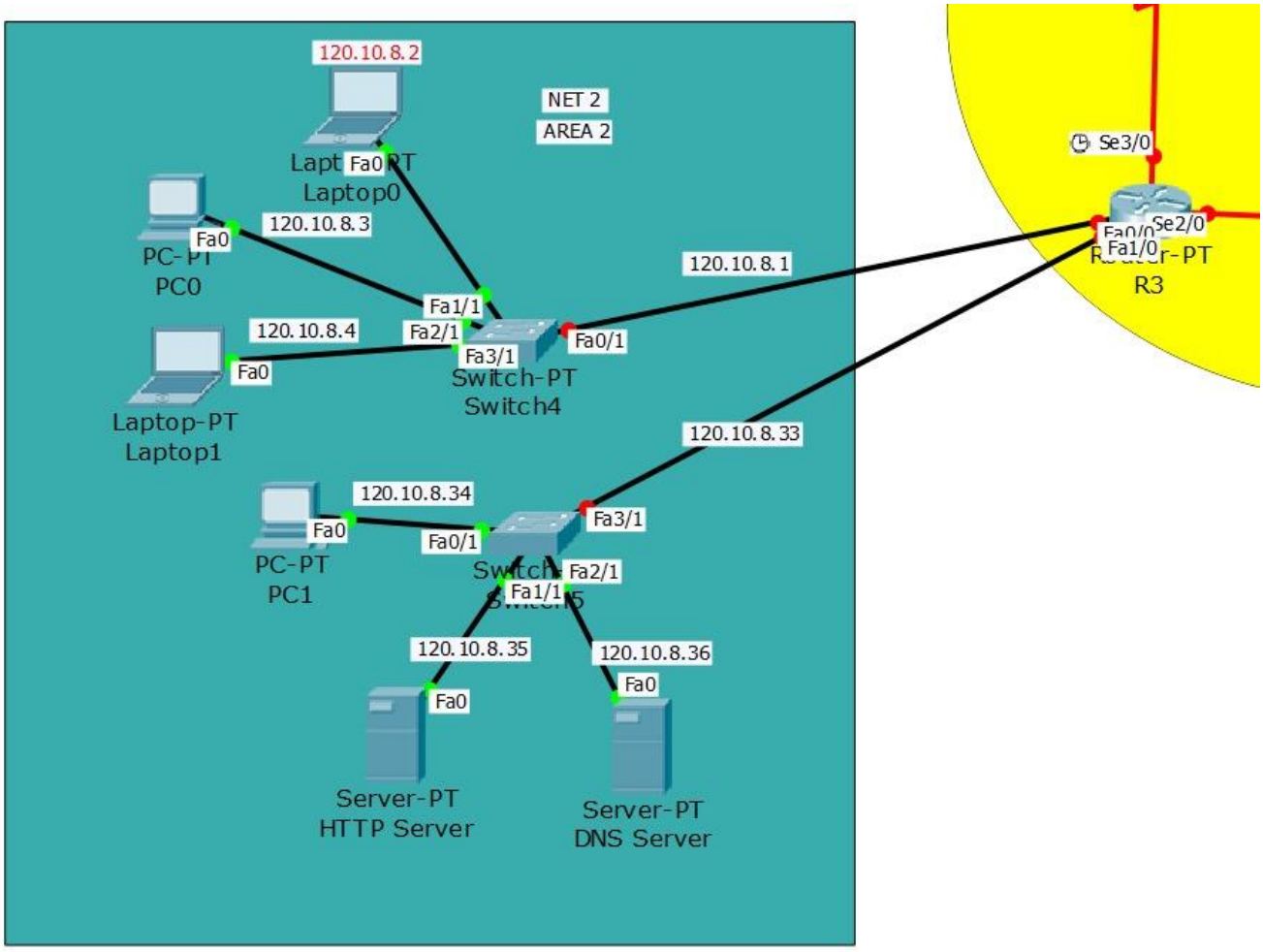


Figure 11 Net 2 Area 2

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.

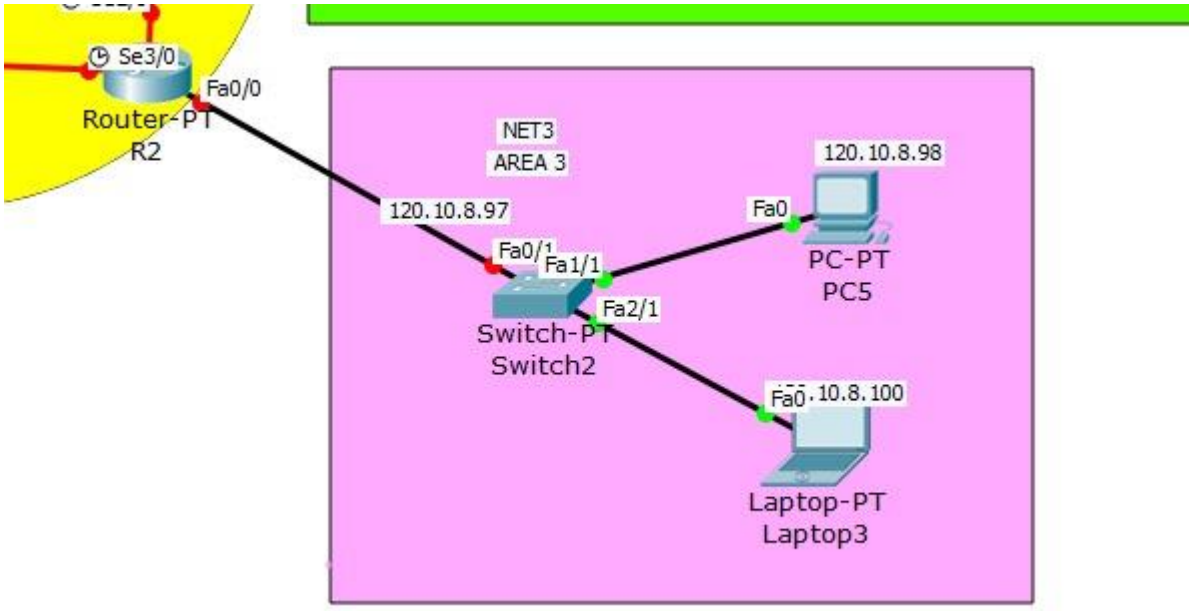


Figure 12 Net 3 Area 3

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.

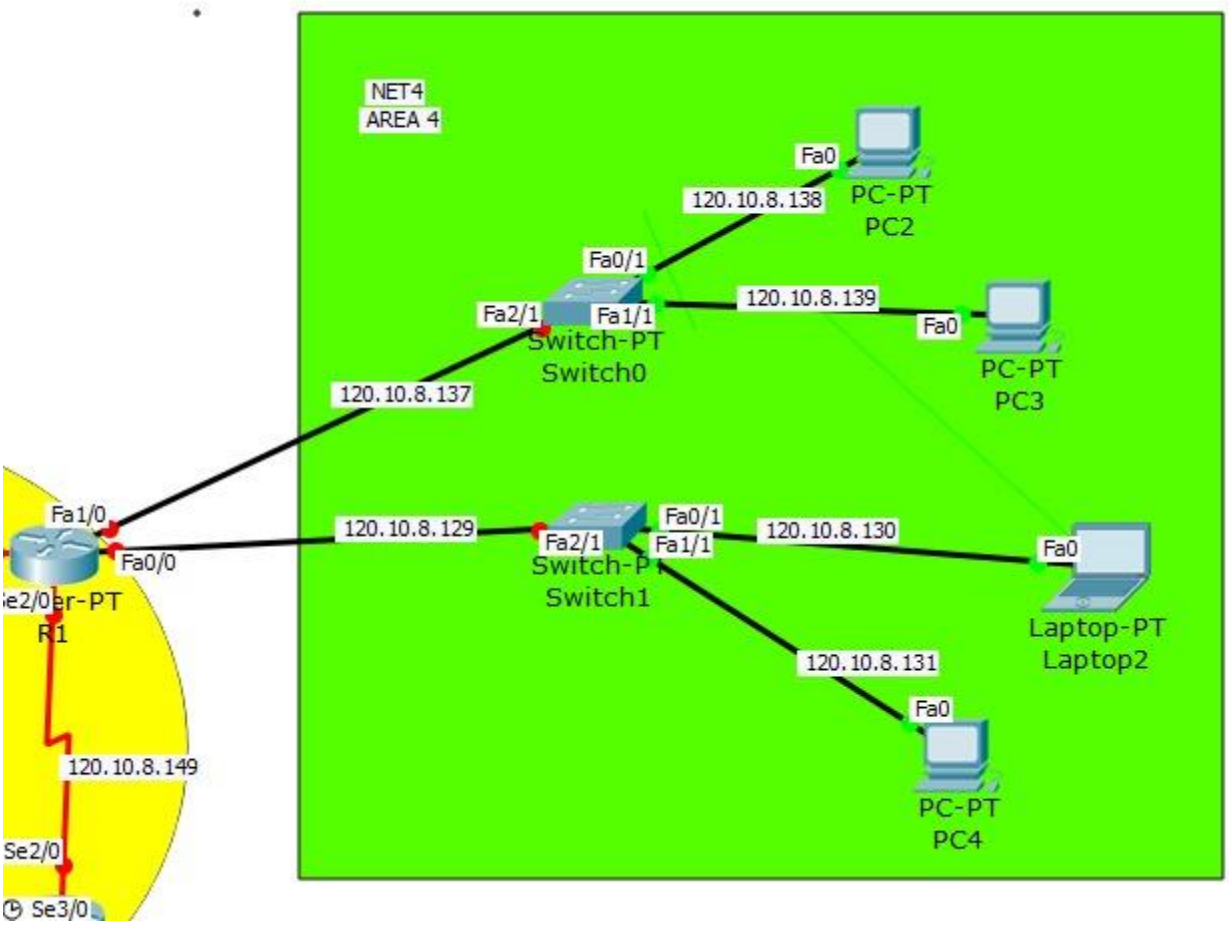


Figure 13: Net 4 Area 4

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 :

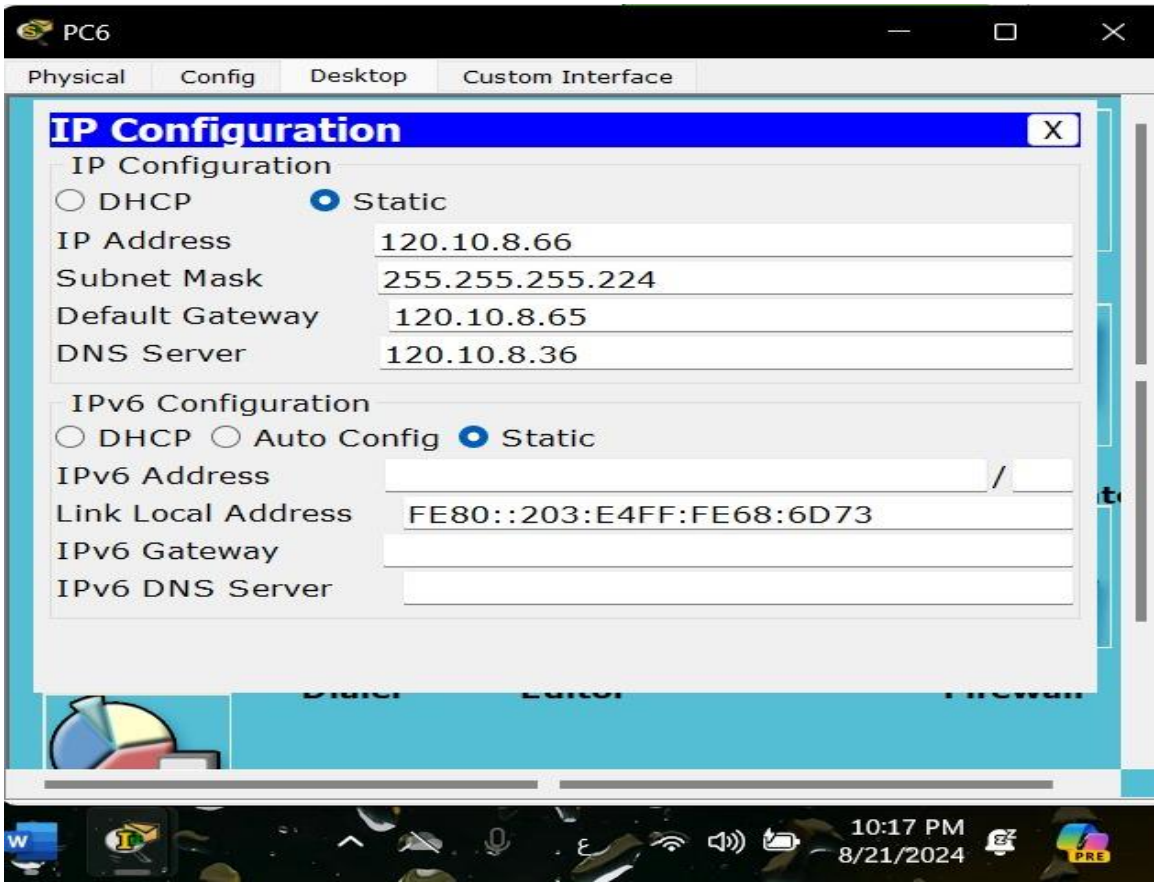


Figure 14 Configuration Of PC6

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).

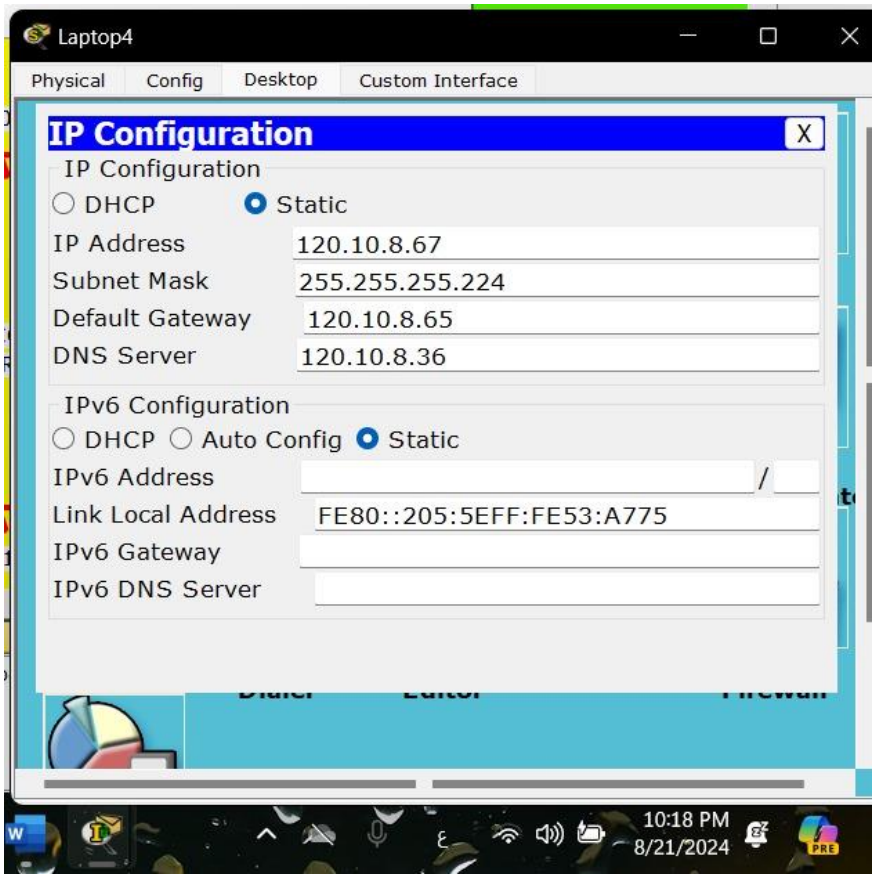


Figure 15 Configuration Of Laptop4

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:

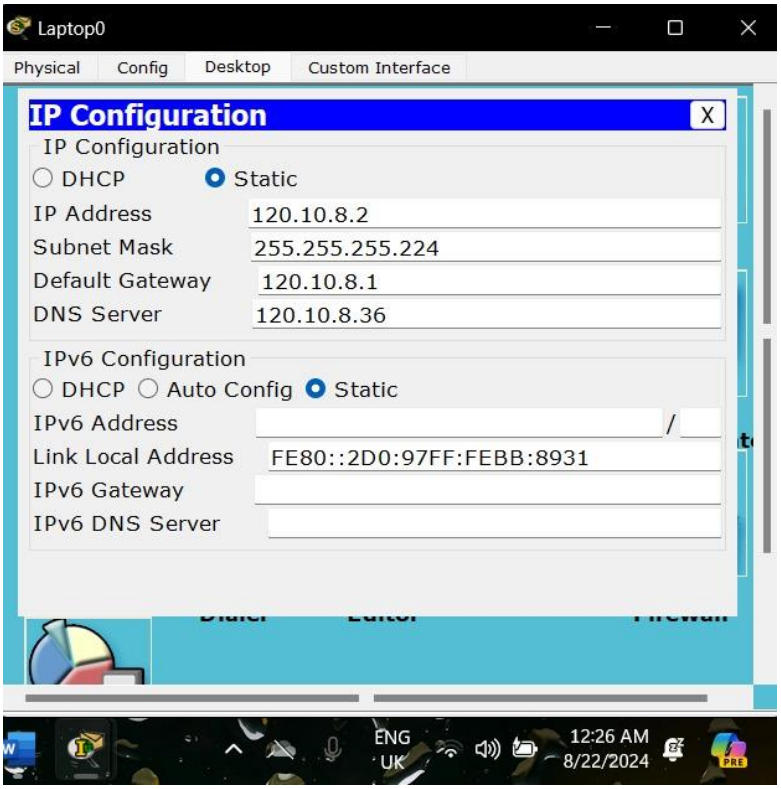


Figure 16 Configuration Of Laptop0

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).

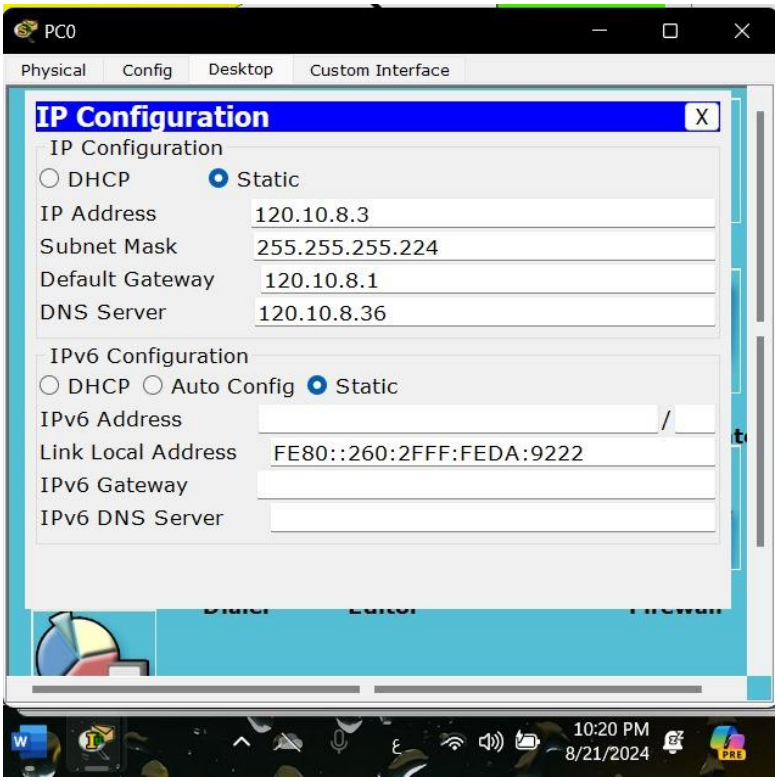


Figure 17 Configuration Of PC0

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:

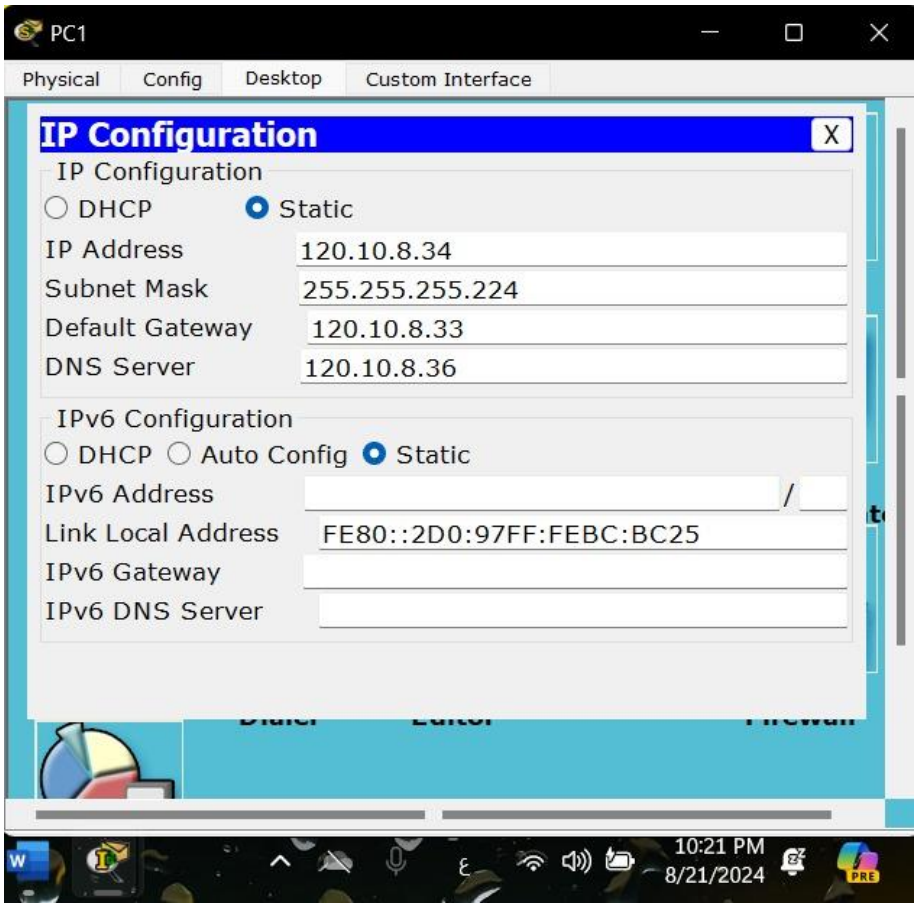


Figure 18 Configuration Of PC1

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:

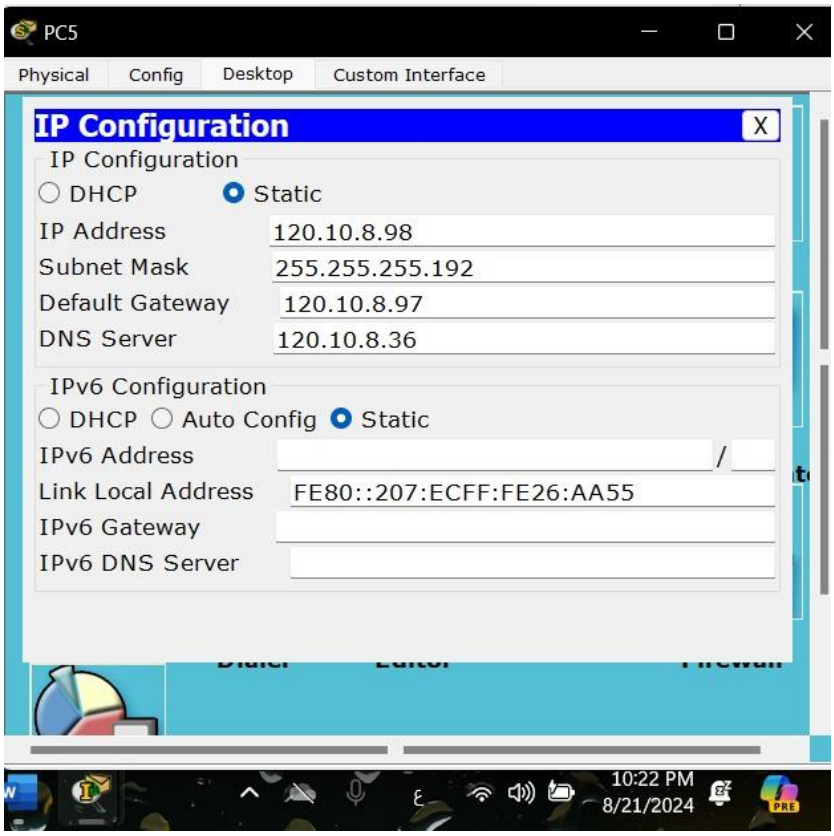


Figure 19 Configuration Of PC5

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).

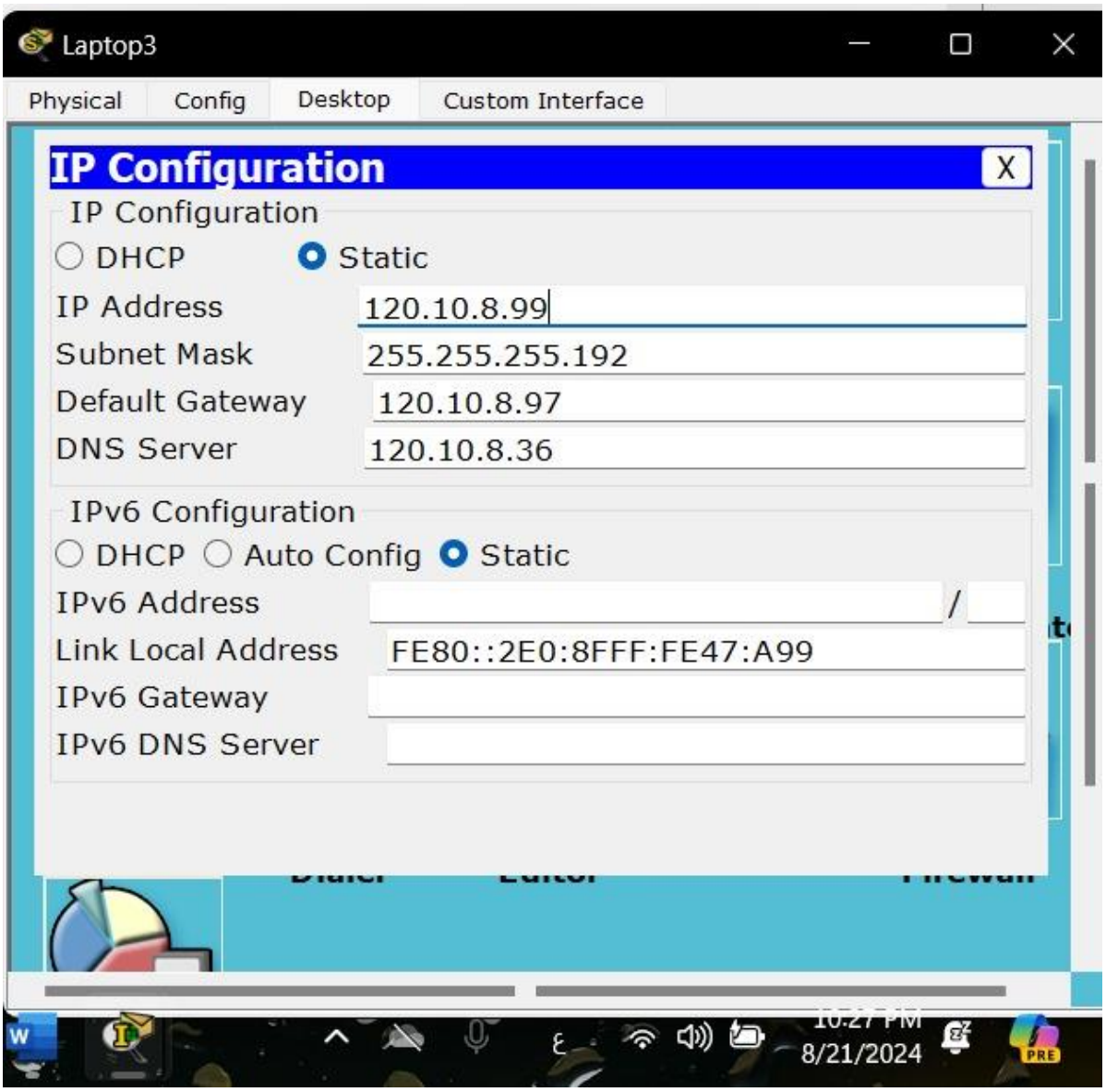


Figure 20 Configuration Of laptop3

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:

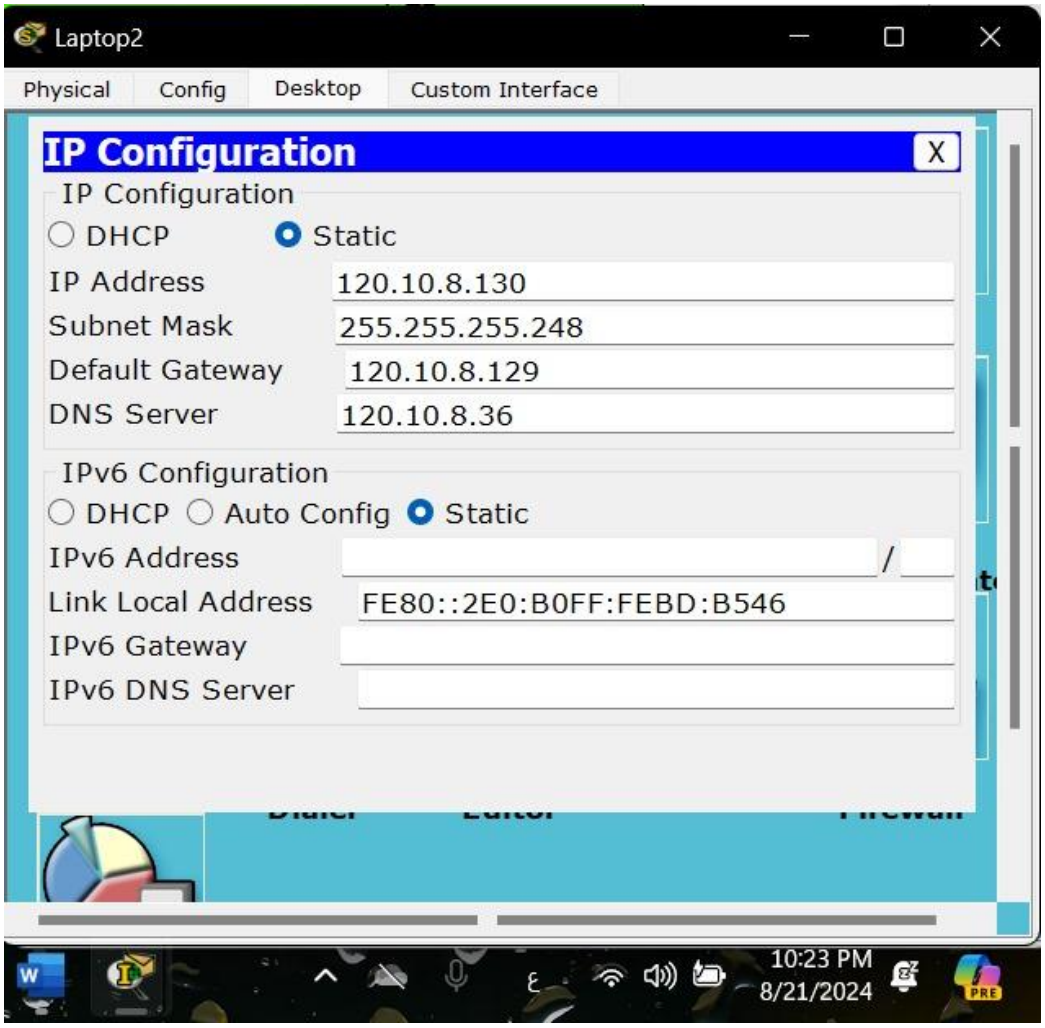


Figure 21 Configuration Of laptop2

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).

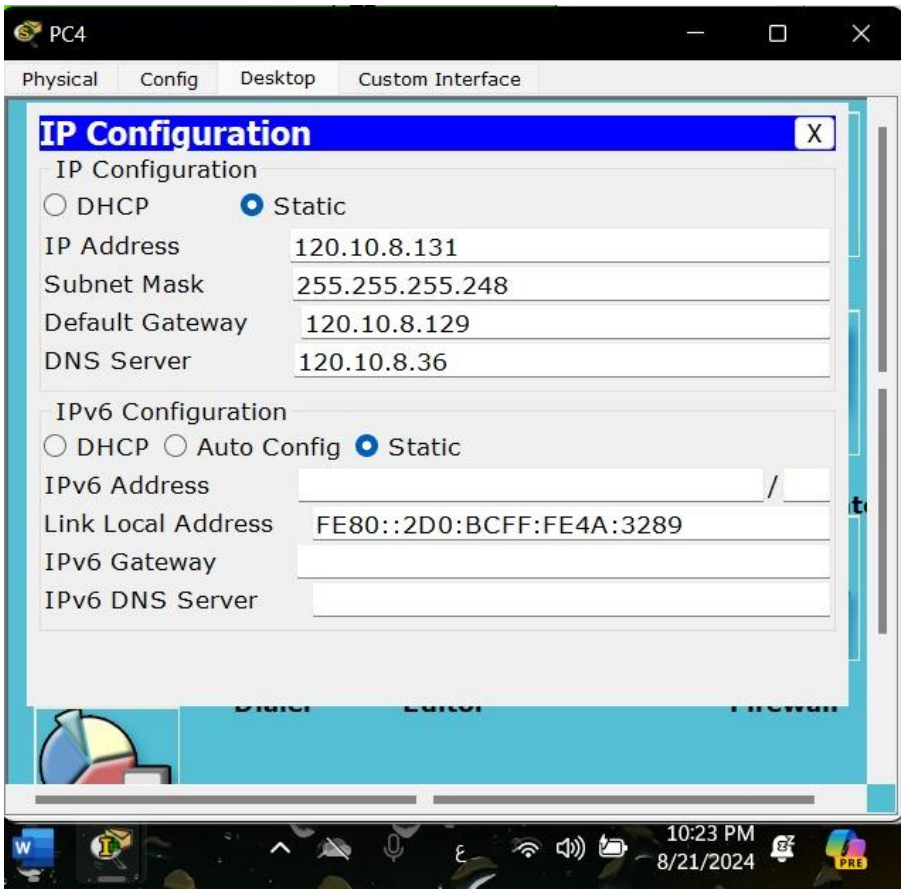


Figure 22 Configuration Of PC4

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:

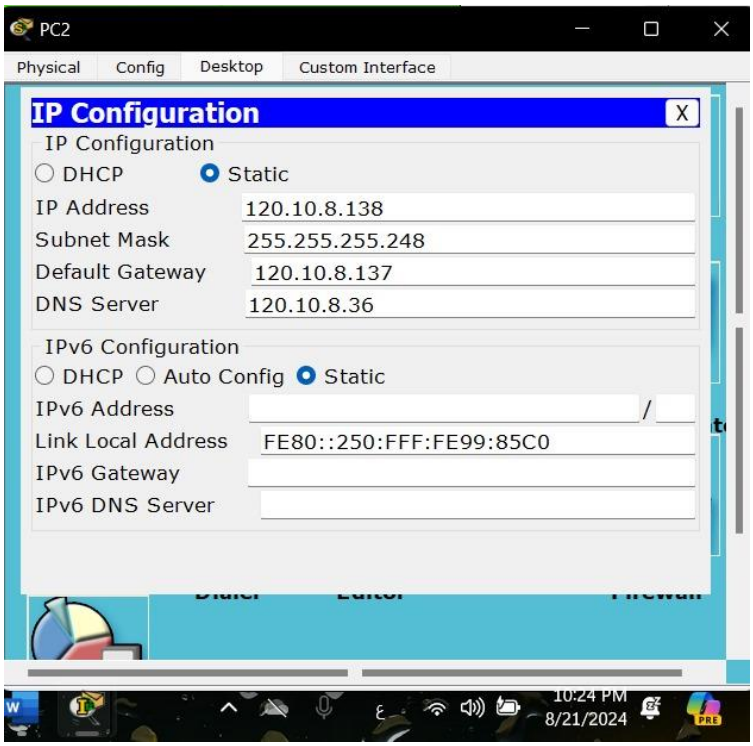


Figure 23 Configuration Of PC2

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).

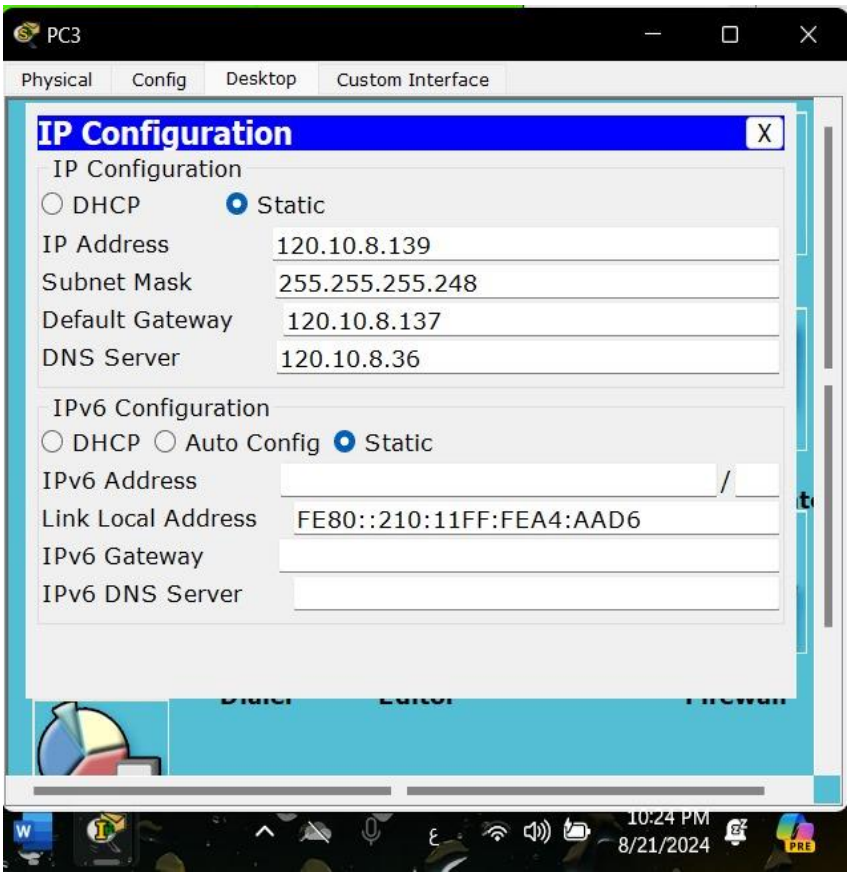


Figure 24 Configuration Of PC3

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:

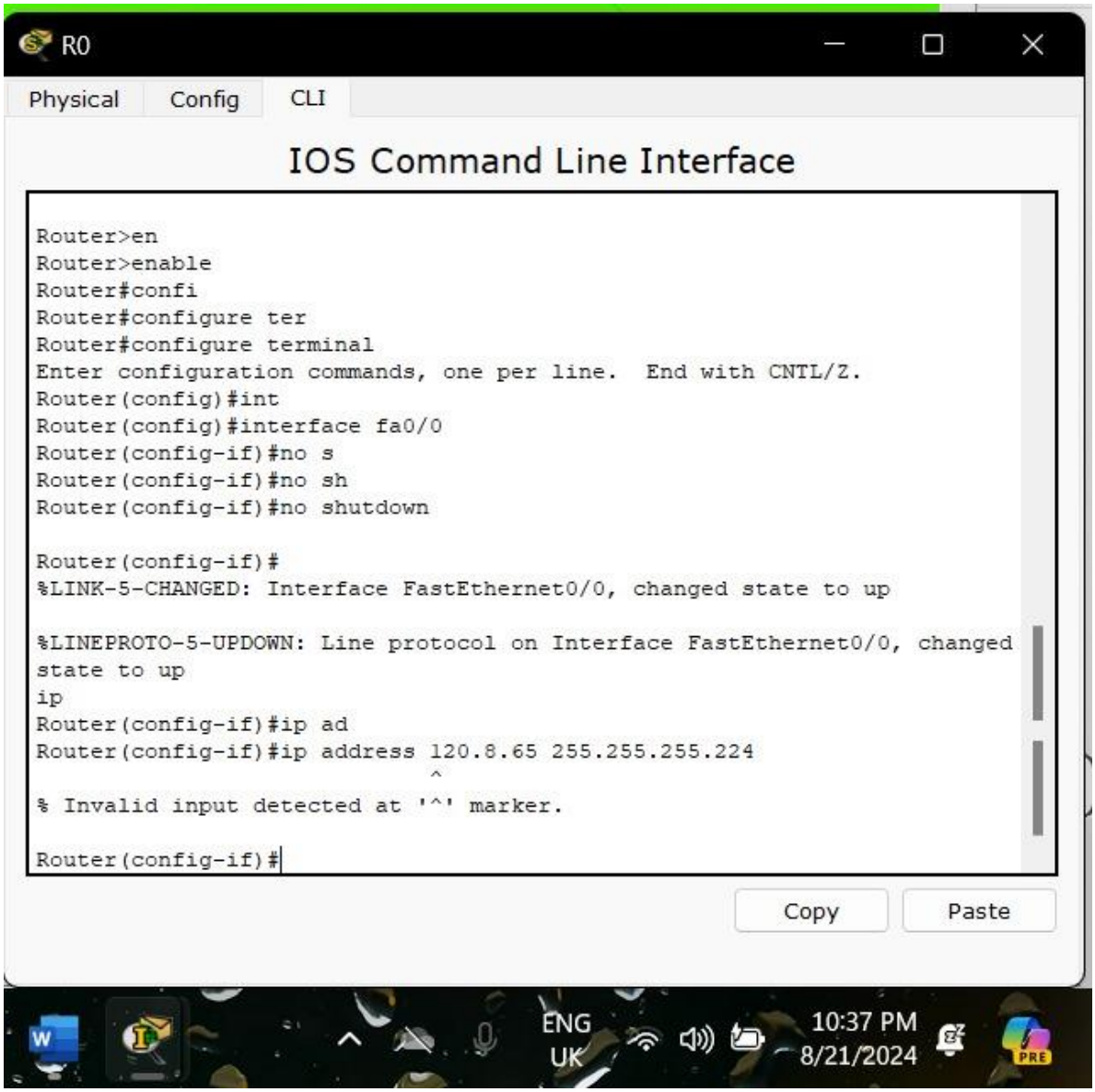


Figure 25 Router 0 (FA0/0 interface) configuration

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

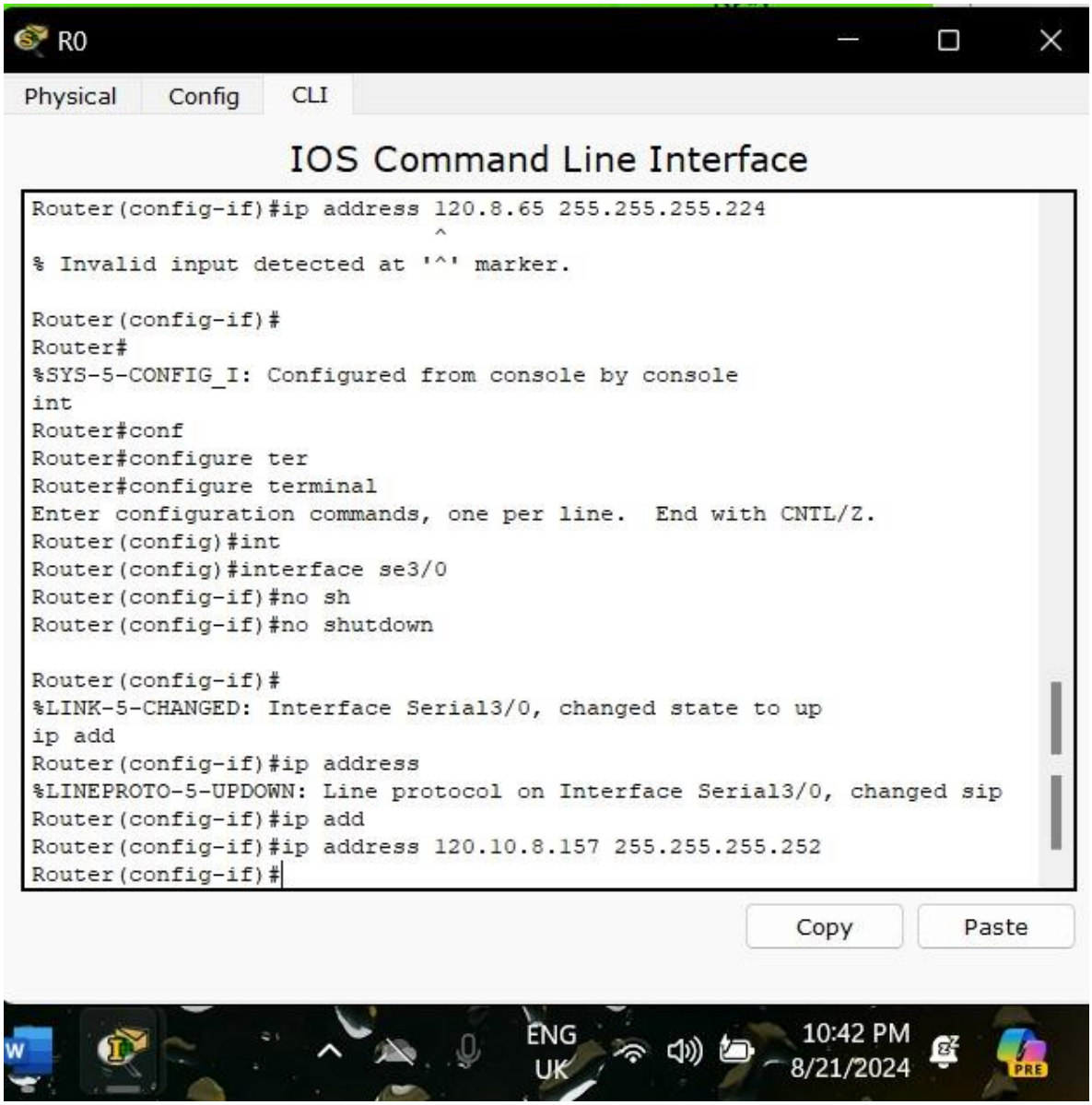


Figure 26 Router 0 (se3/0 interface) configuration

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

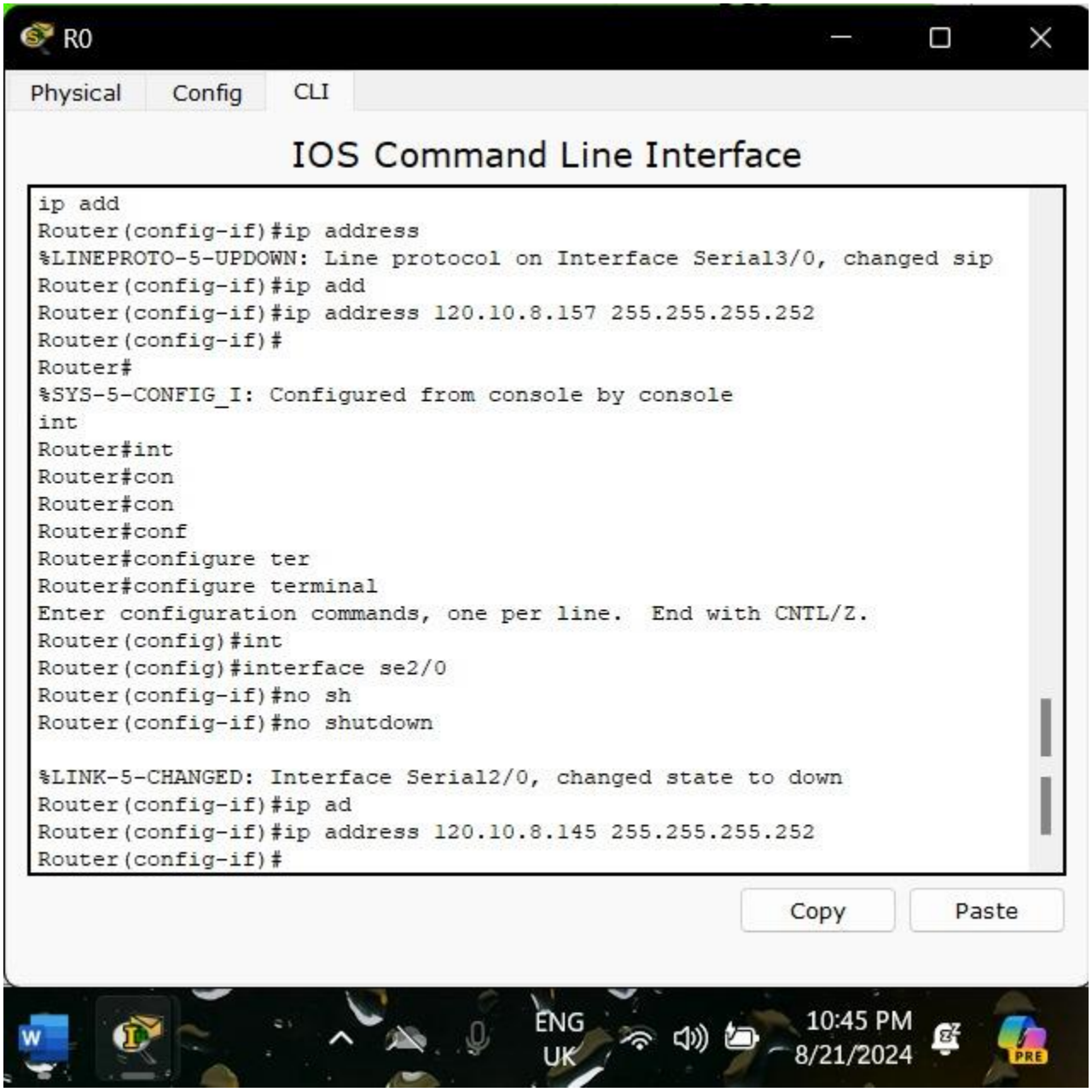


Figure 27 Router 0 (se2/0 interface) configuration

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

R1:

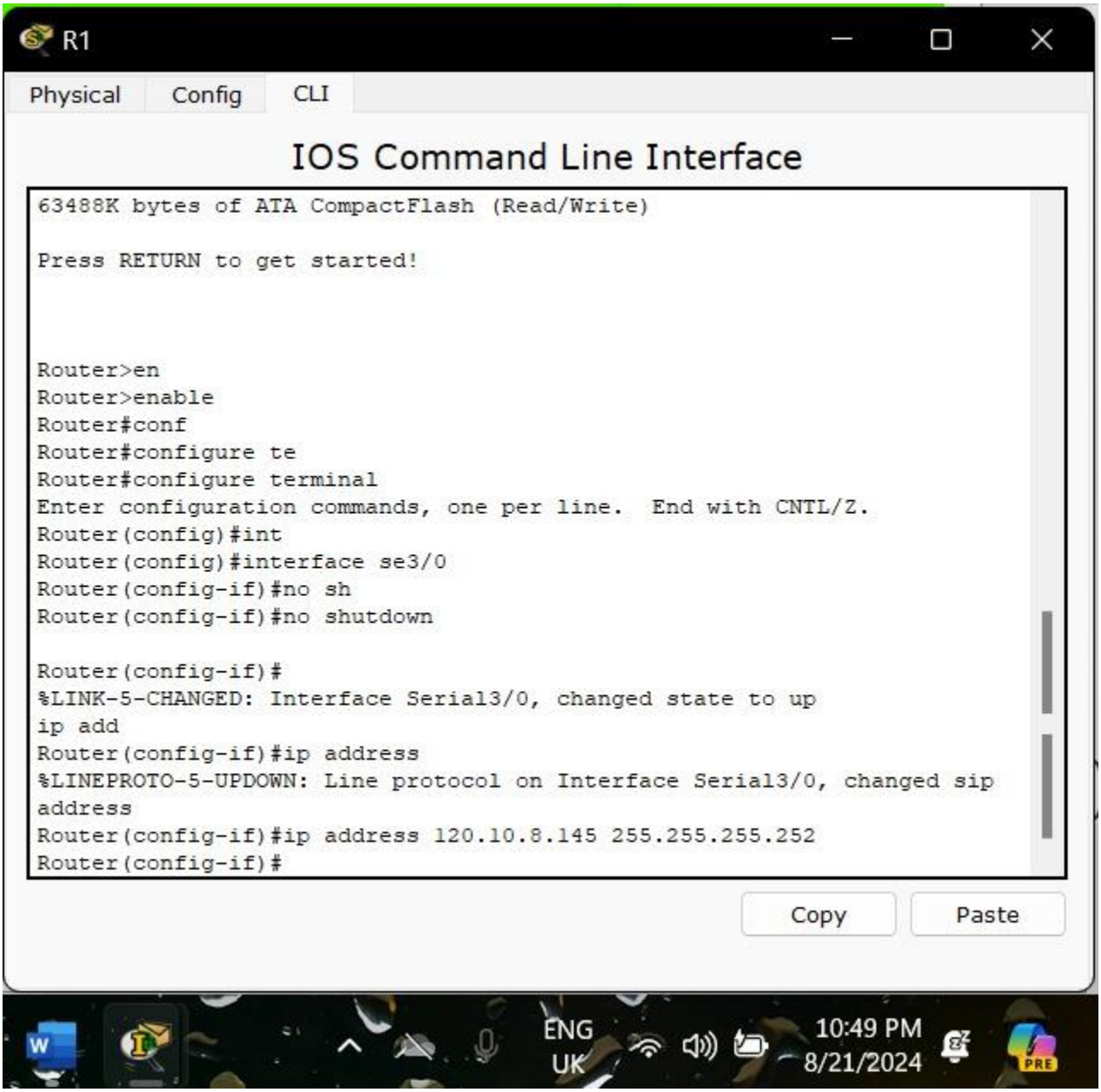


Figure 28 Router 1 (se3/0 interface) configuration

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

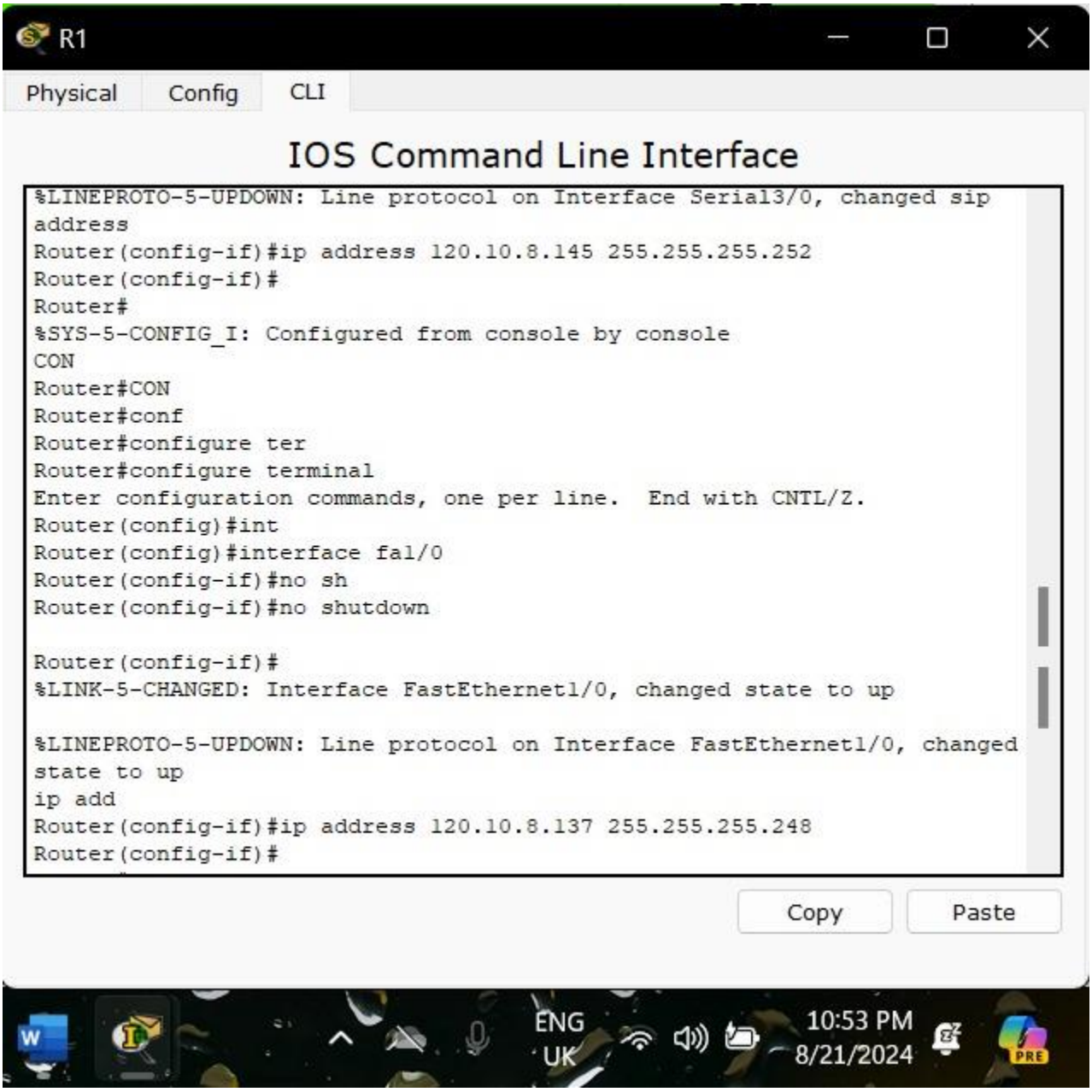


Figure 29 Router 1 (FA1/0 interface) configuration

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

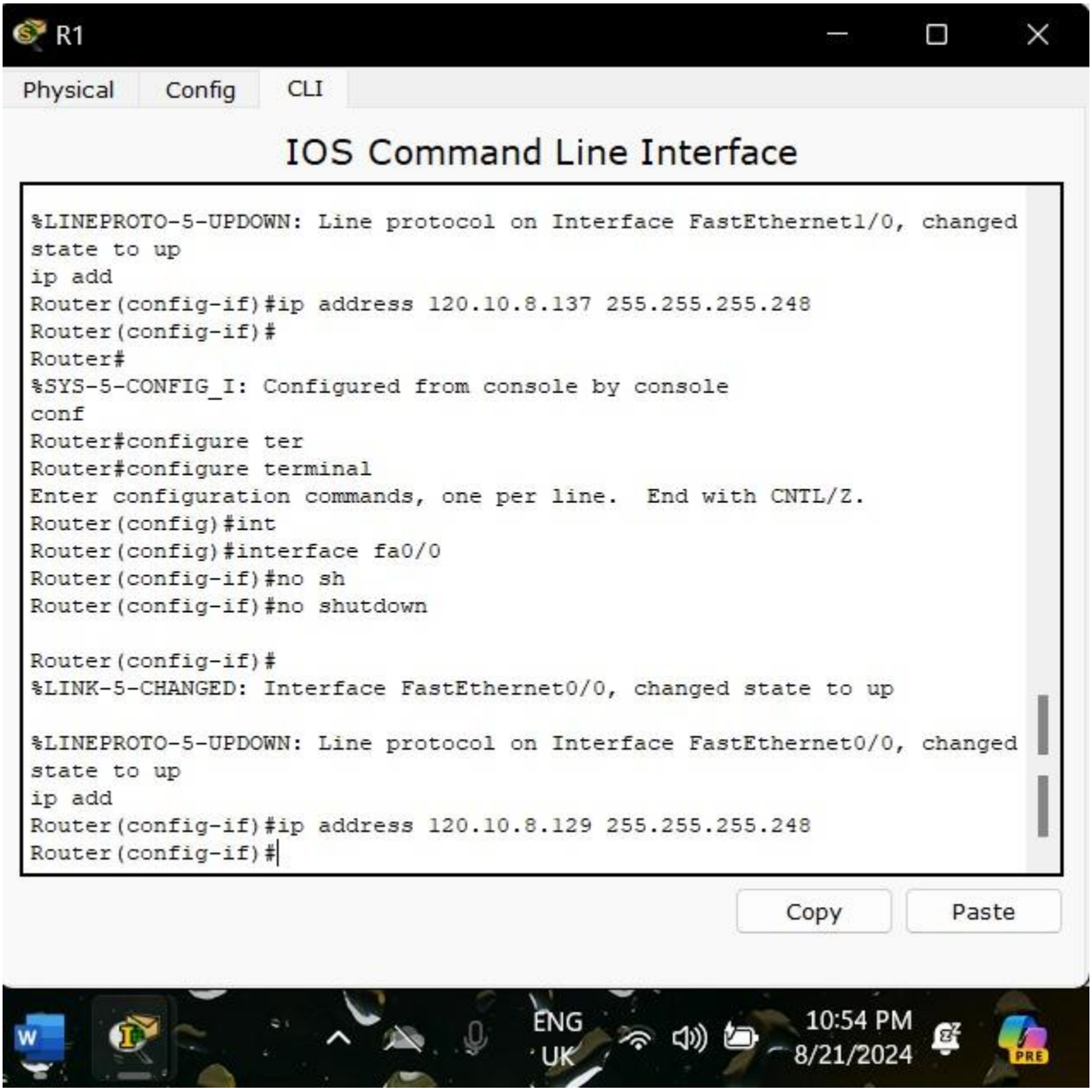


Figure 30 Router 1 (FA0/0 interface) configuration

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

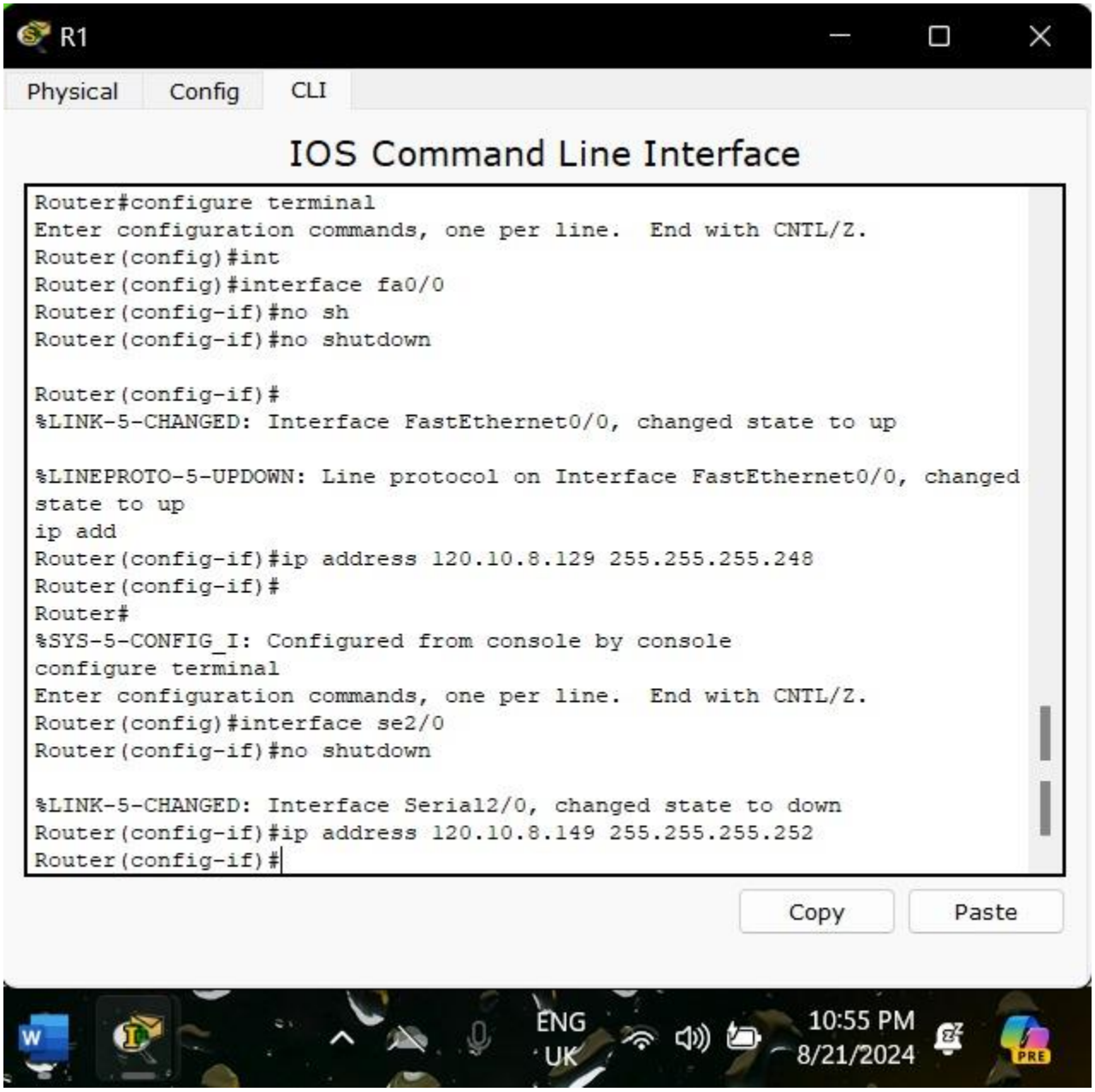


Figure 31 Router 1 (se2/0 interface) configuration

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

R2:

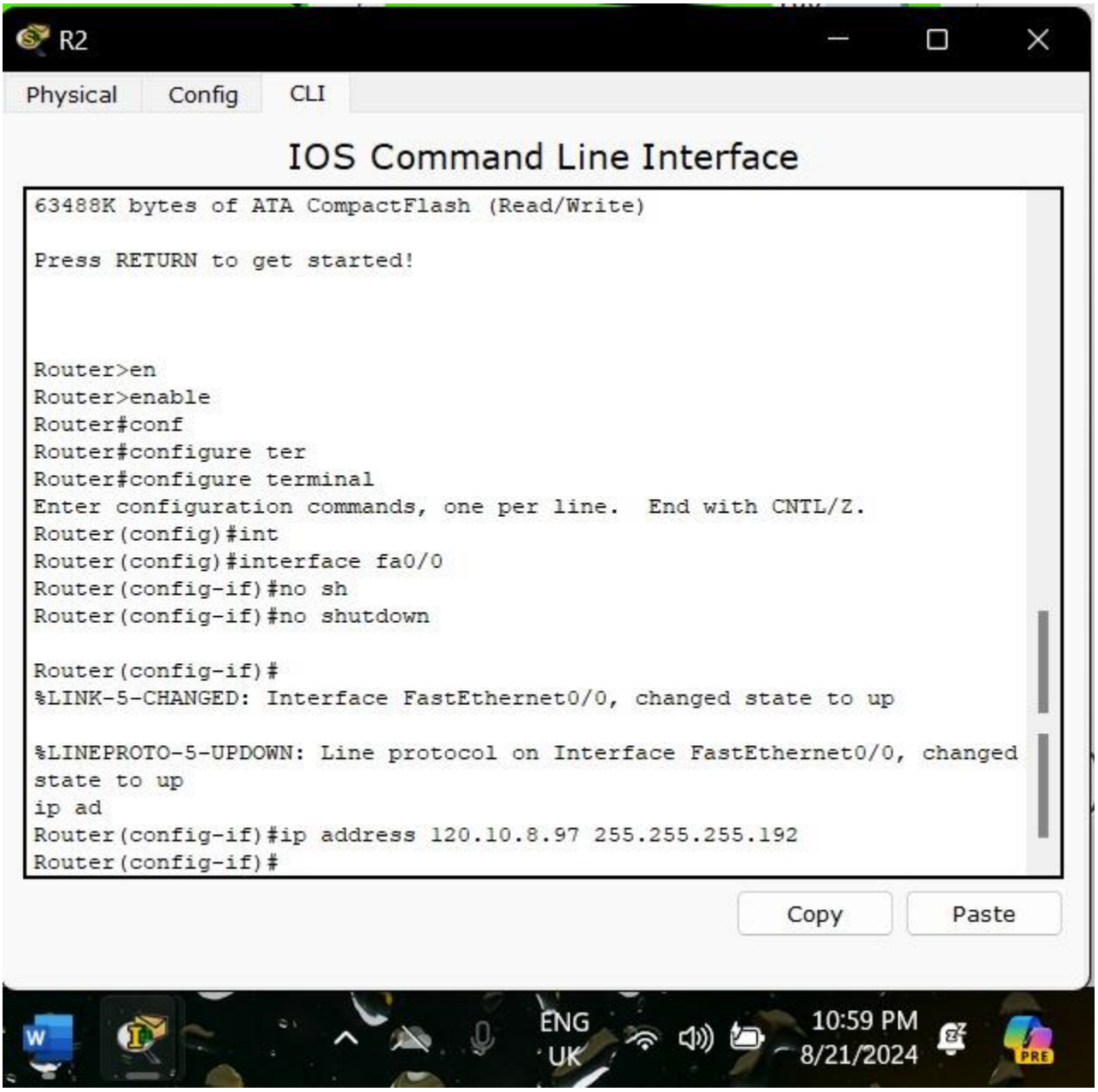


Figure 32 Router 2 (FA0/0 interface) configuration

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

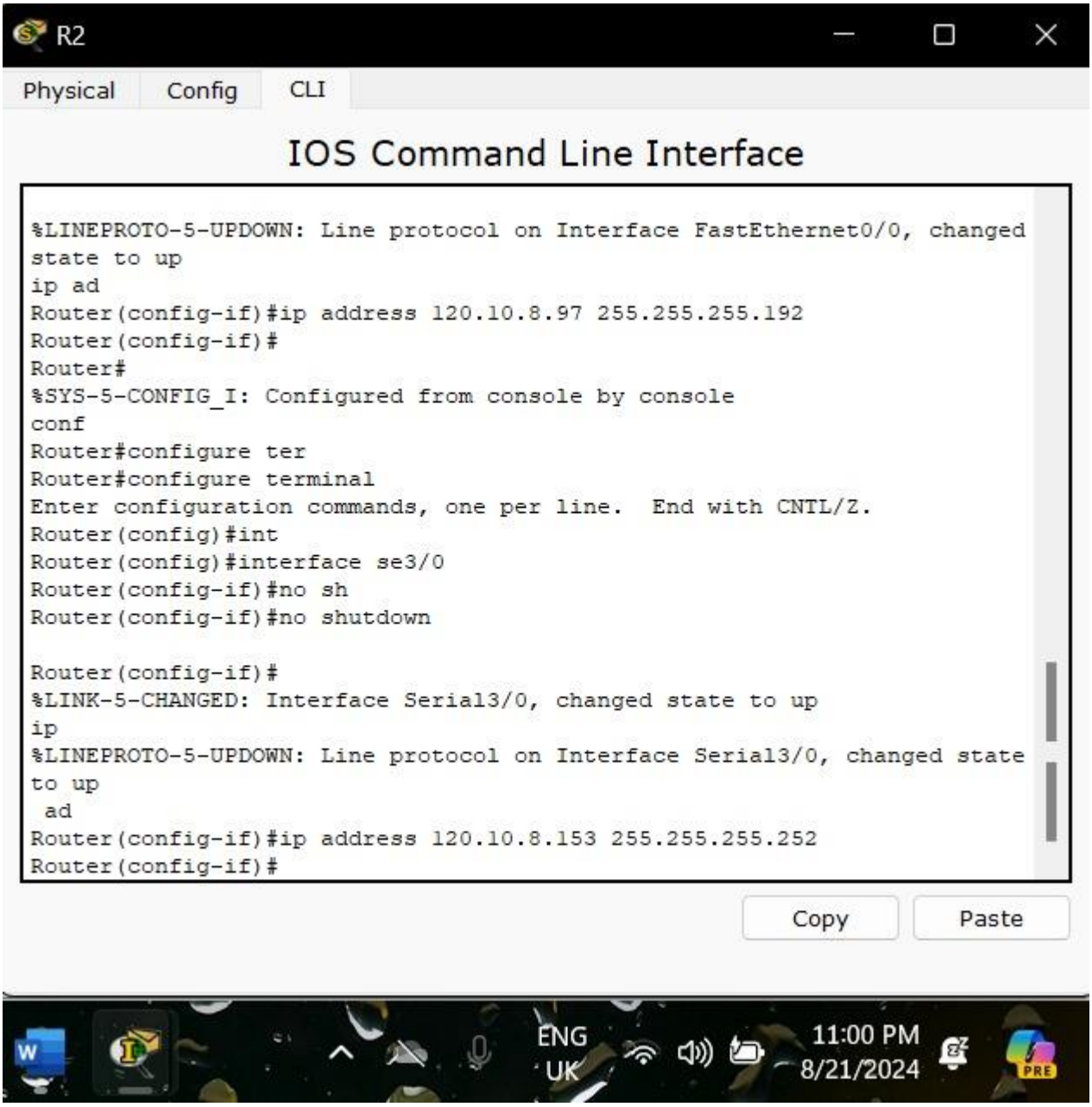


Figure 33 Router 2 (se3/0 interface) configuration

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

R3:

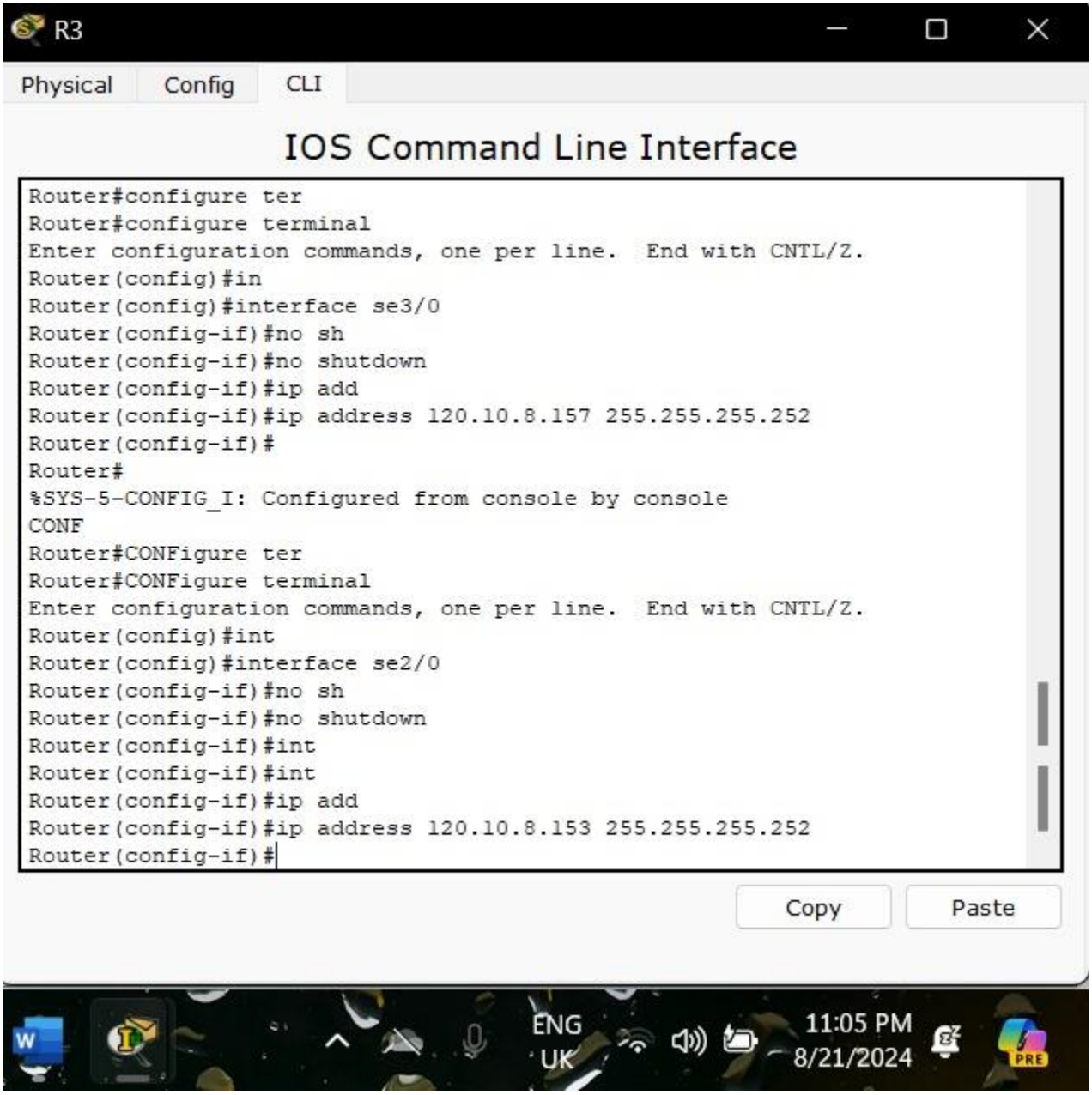


Figure 34 Router 3 (se2/0 interface) configuration

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

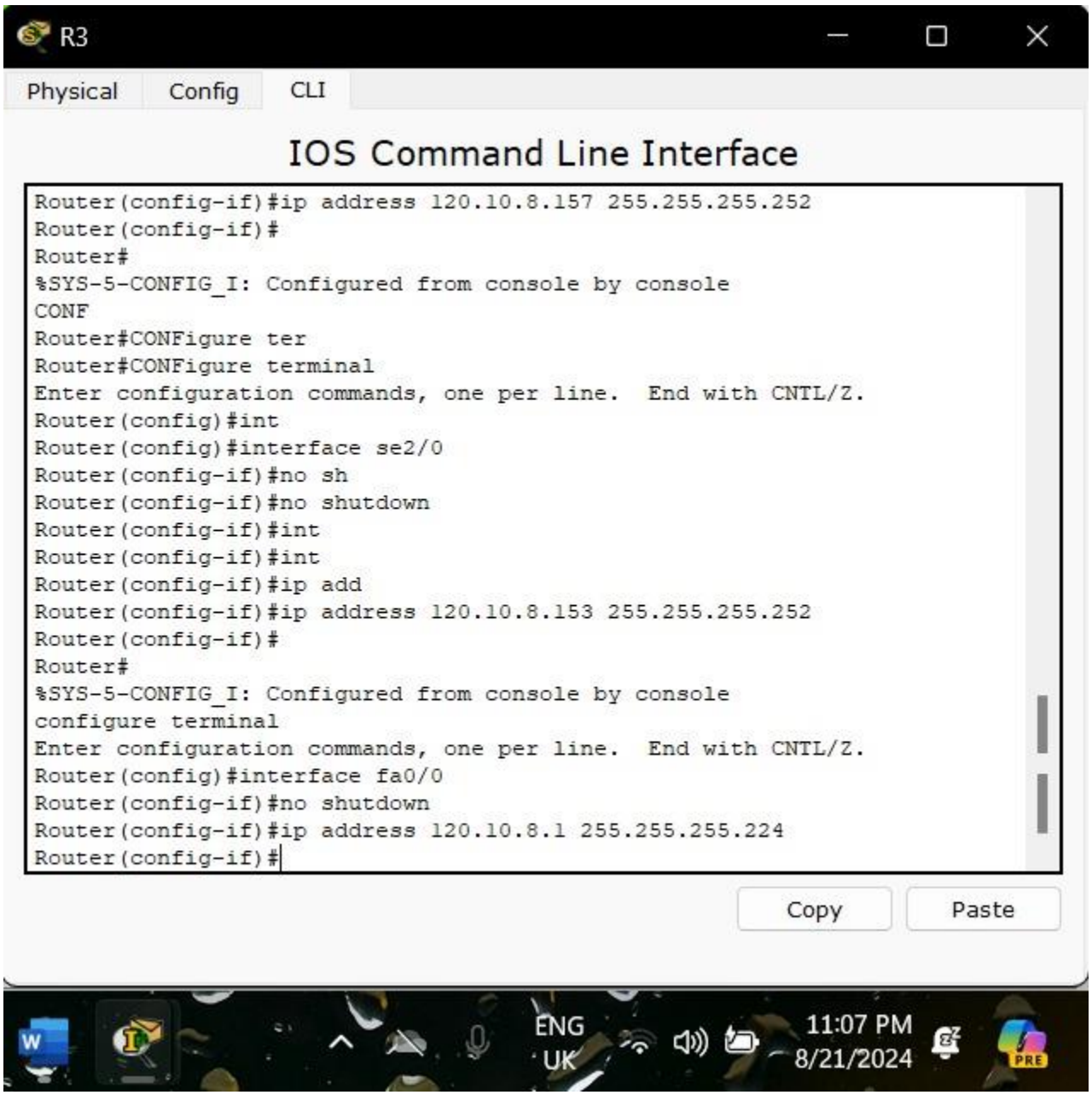


Figure 35 Router 3 (FA0/0 interface) configuration

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

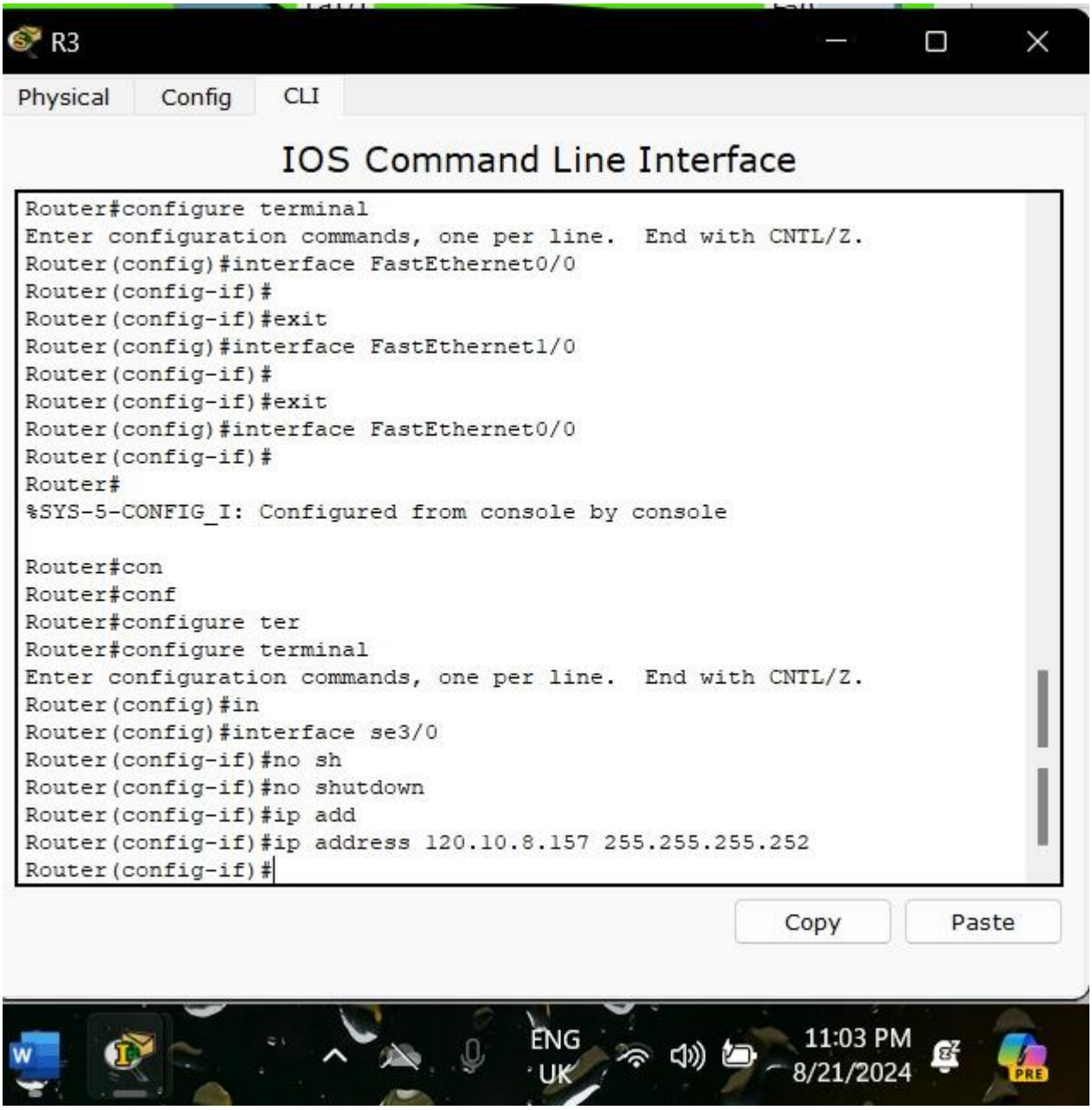


Figure 36 Router 3 (se3/0 interface) configuration

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

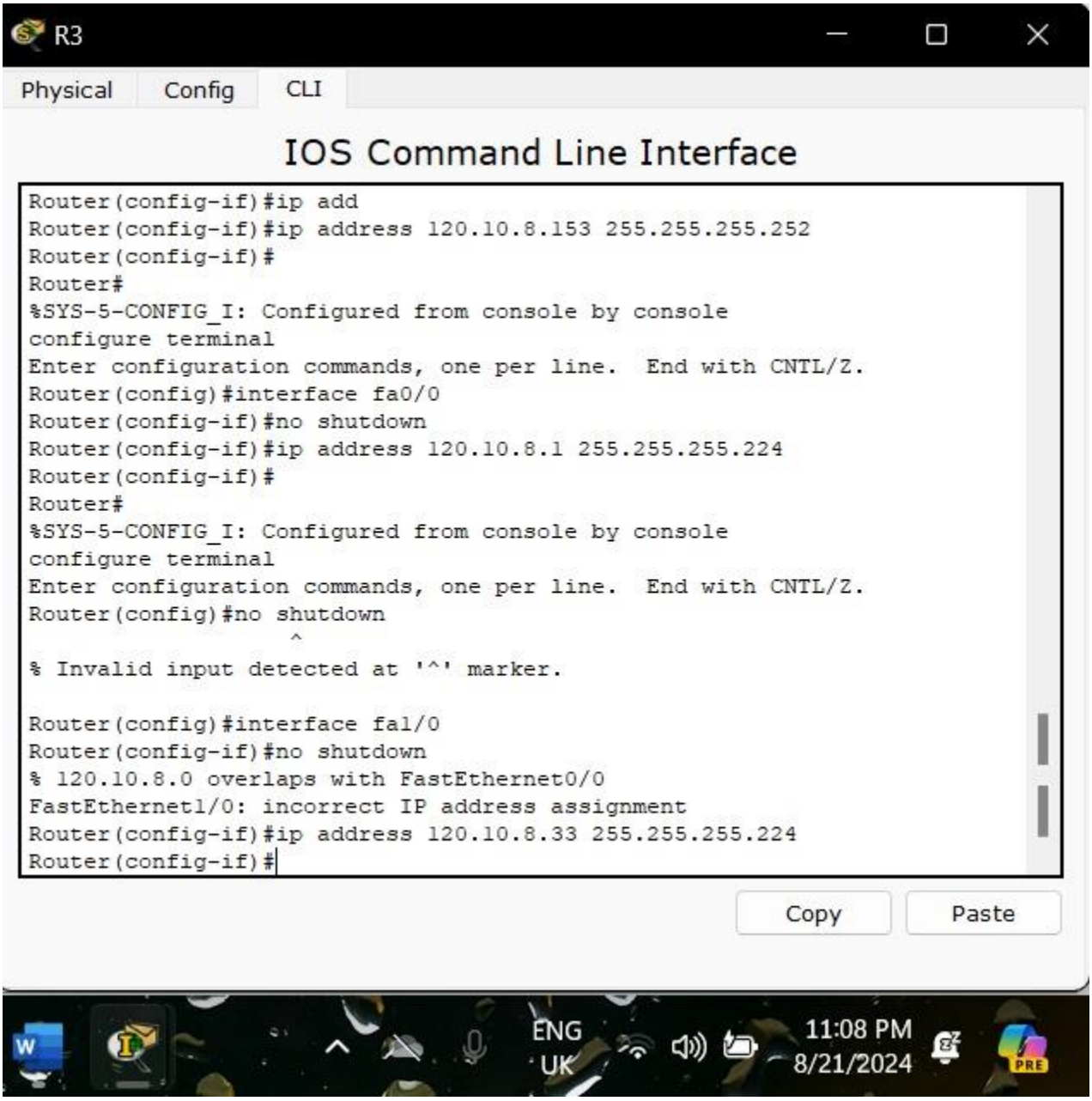


Figure 37 Router 3 (FA1/0 interface) configuration

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

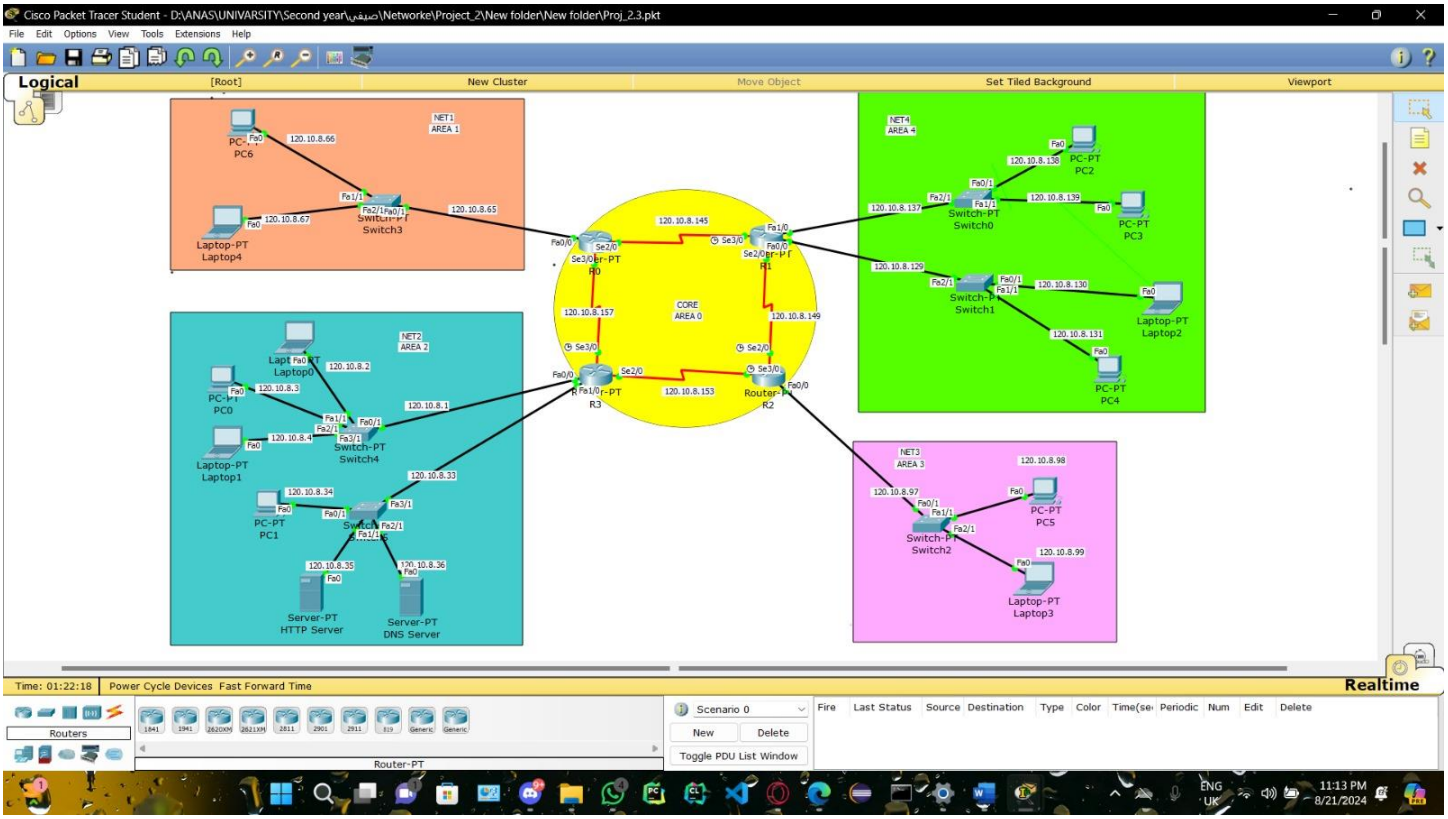


Figure 38 Topology after configuring all end devices and routers

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

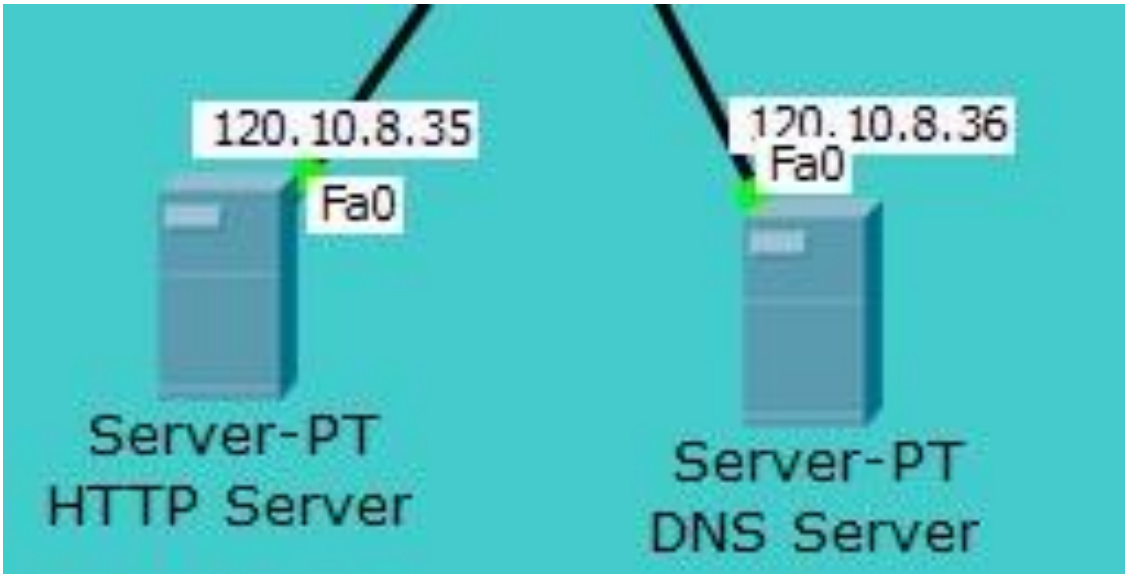


Figure 39 HTTP Server and DNS Server

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

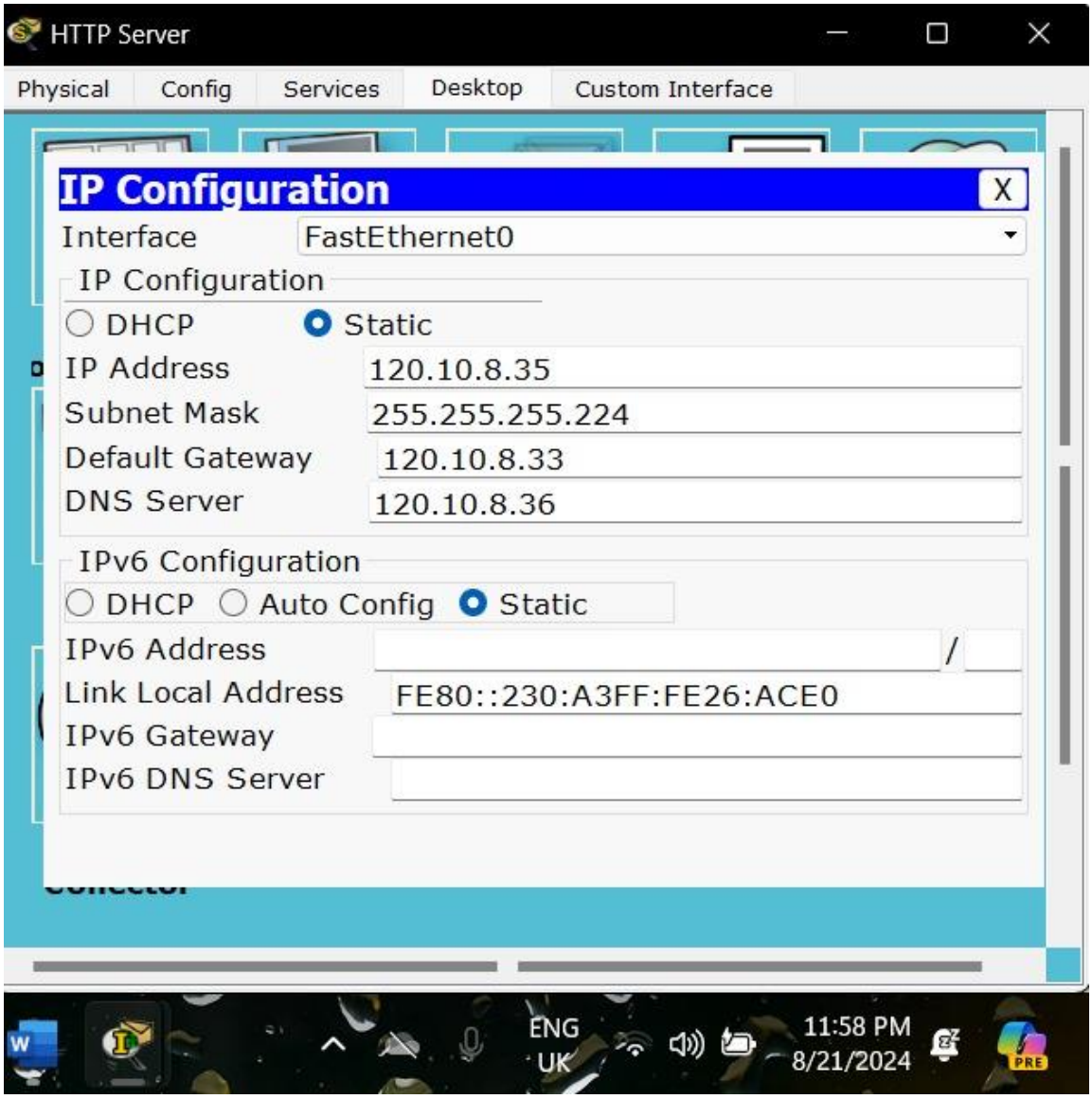


Figure 40 Giving the router IP address and subnet Mask

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.

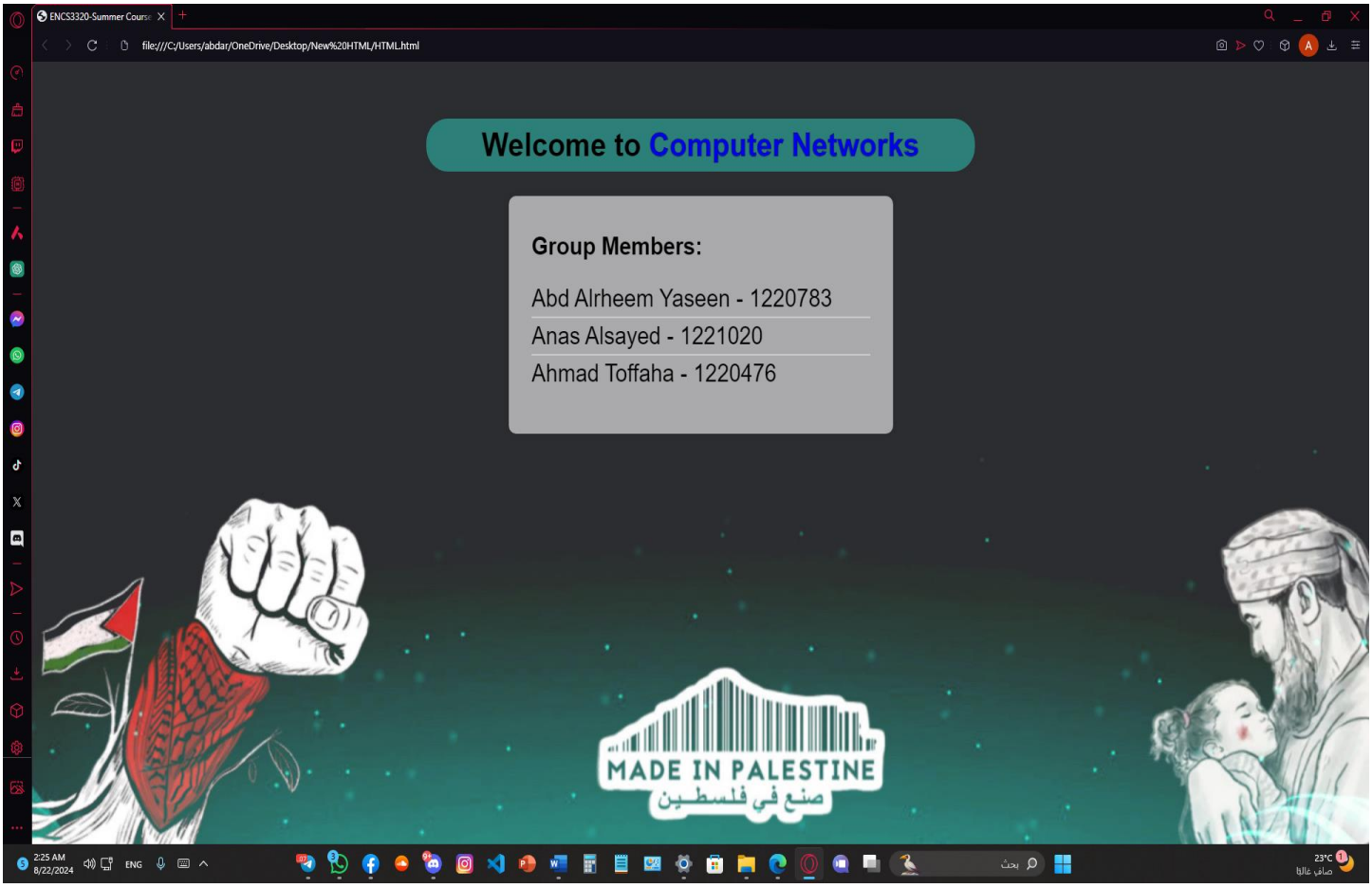


Figure 41 creating an html website

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.

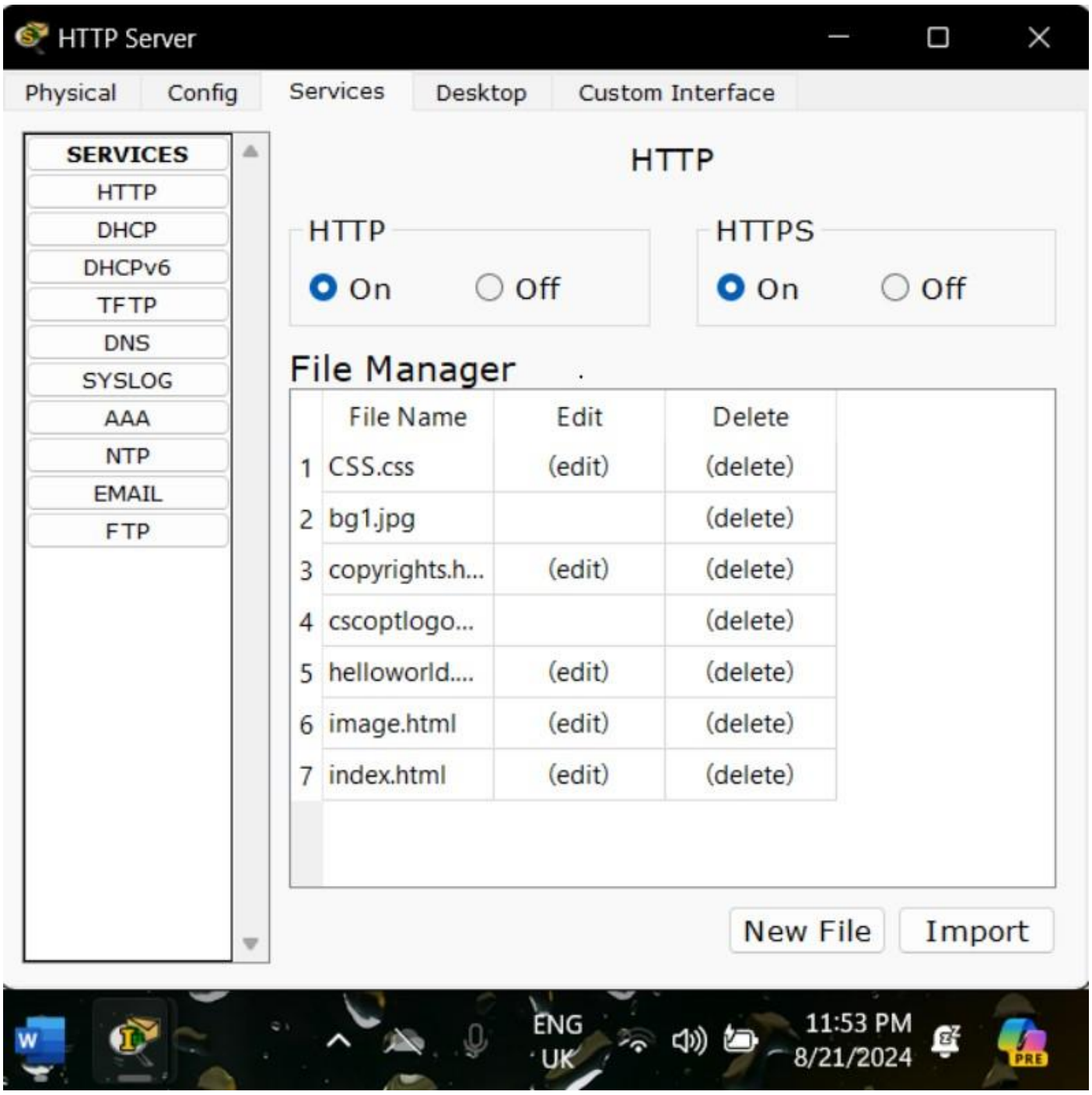


Figure 42 Adding our HTML and CSS file to http server

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.

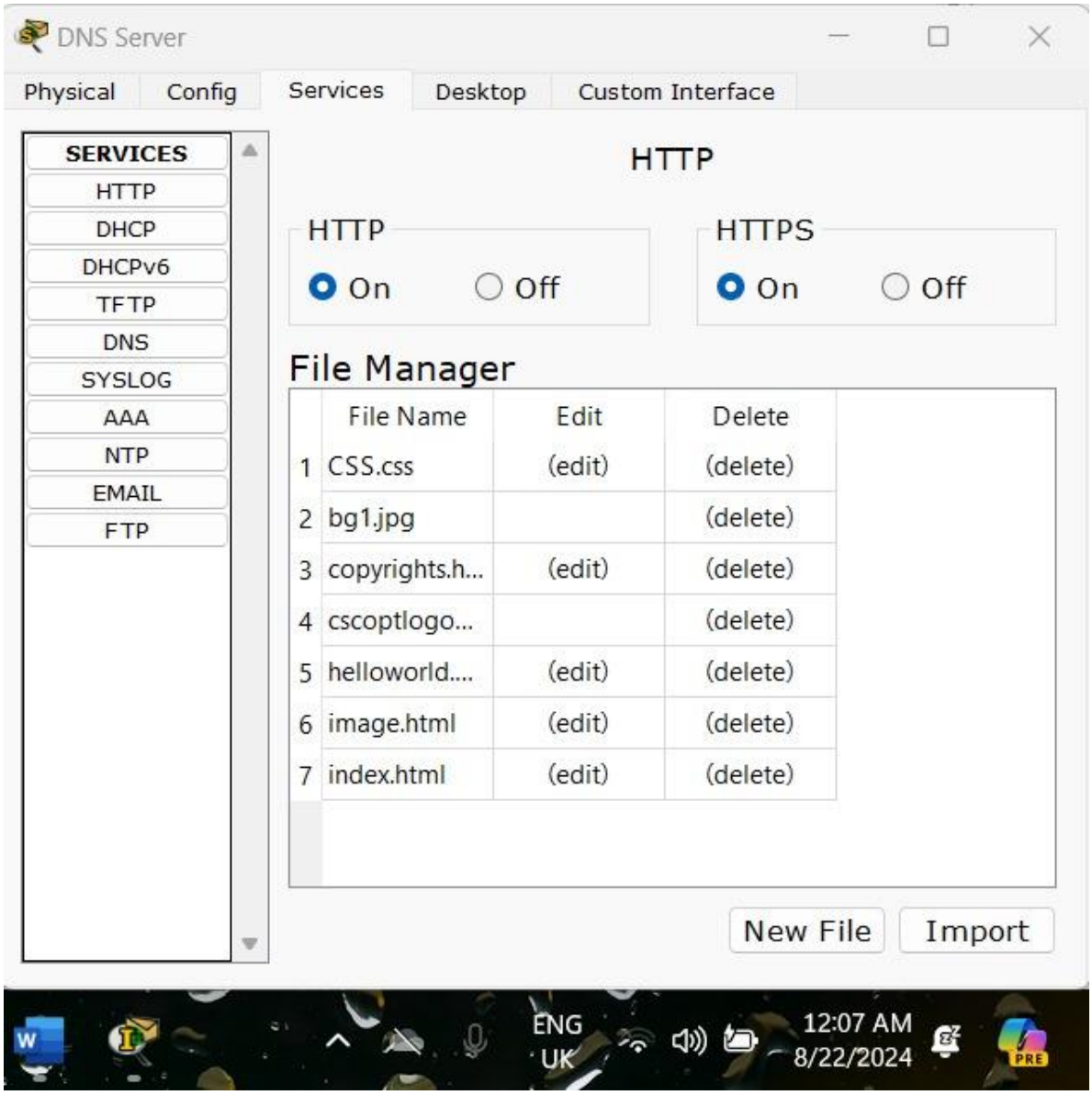


Figure 43 Adding our HTML and CSS file to DNS server

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.

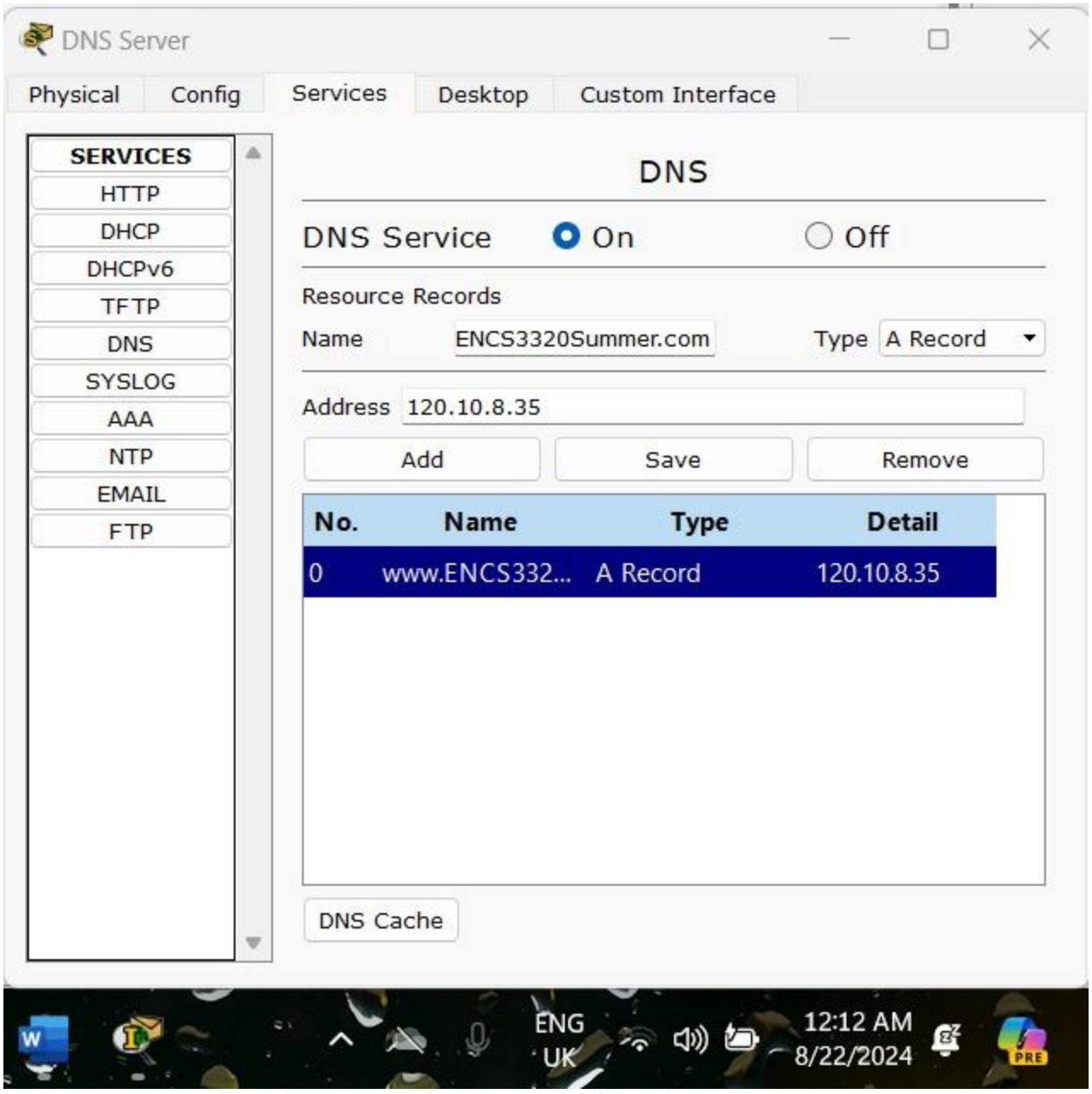


Figure 44 Turning on and configure the DNS server

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:

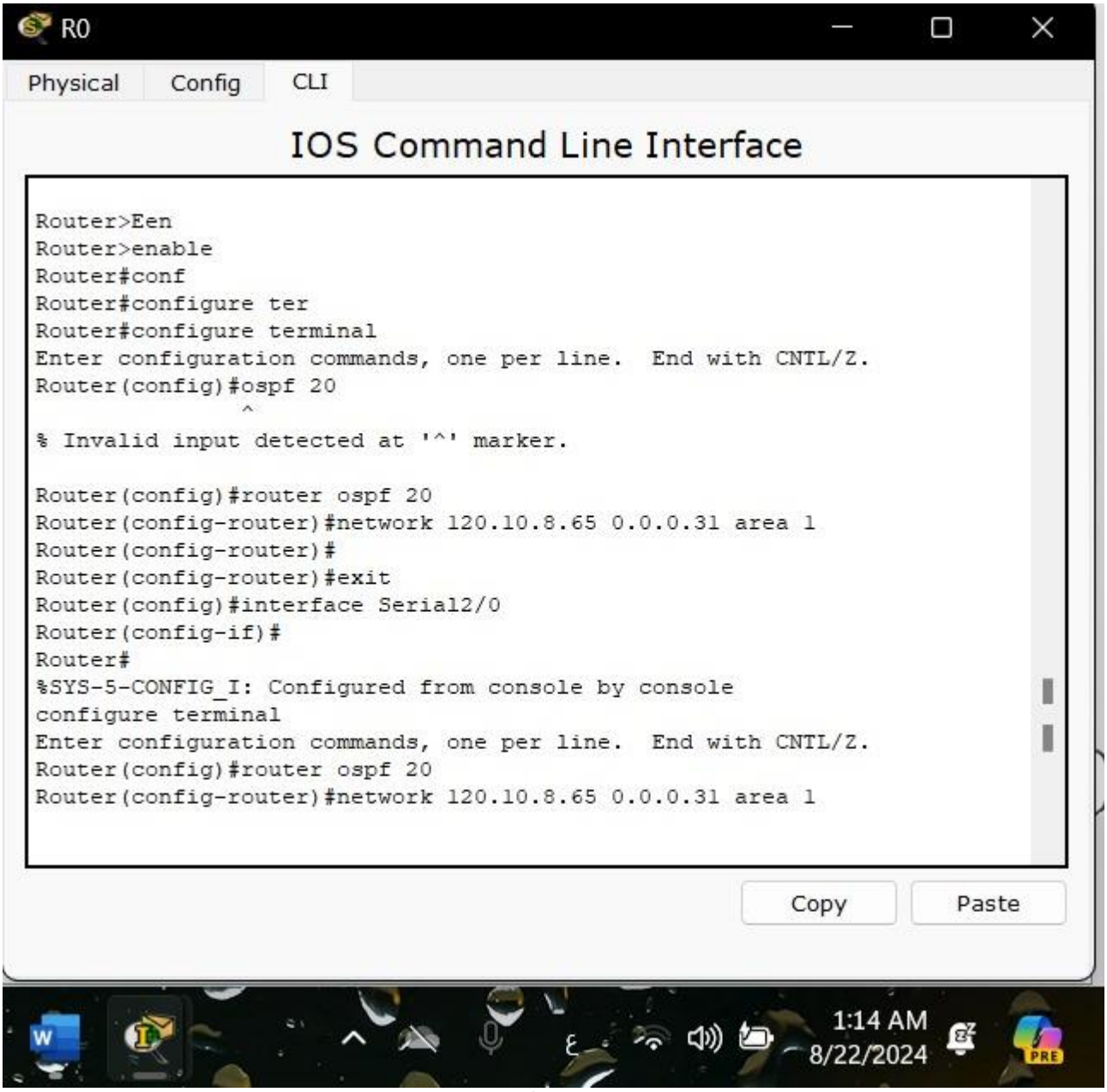


Figure 45:R0 OSPF

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

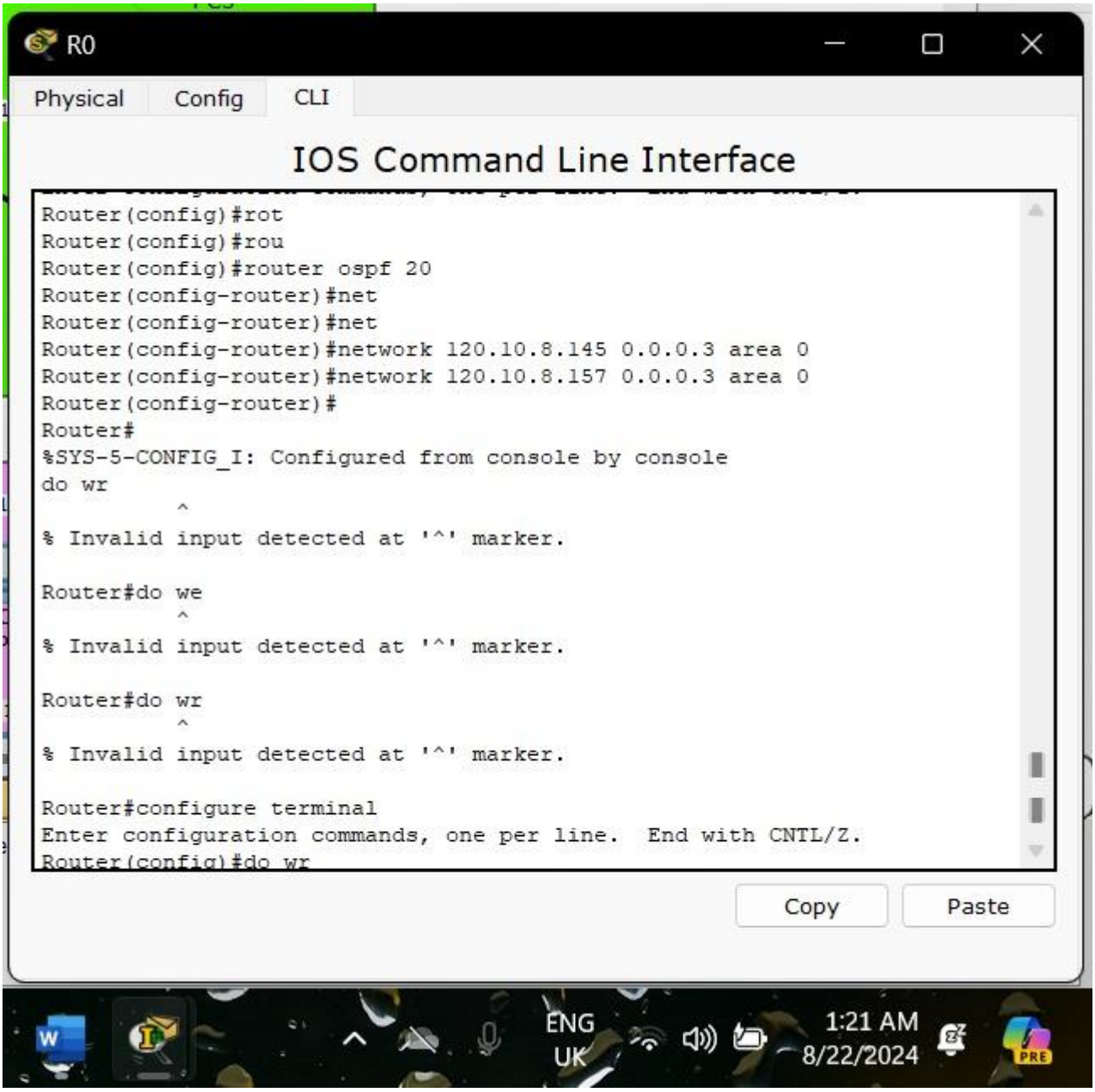


Figure 46: R0 OSPF

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

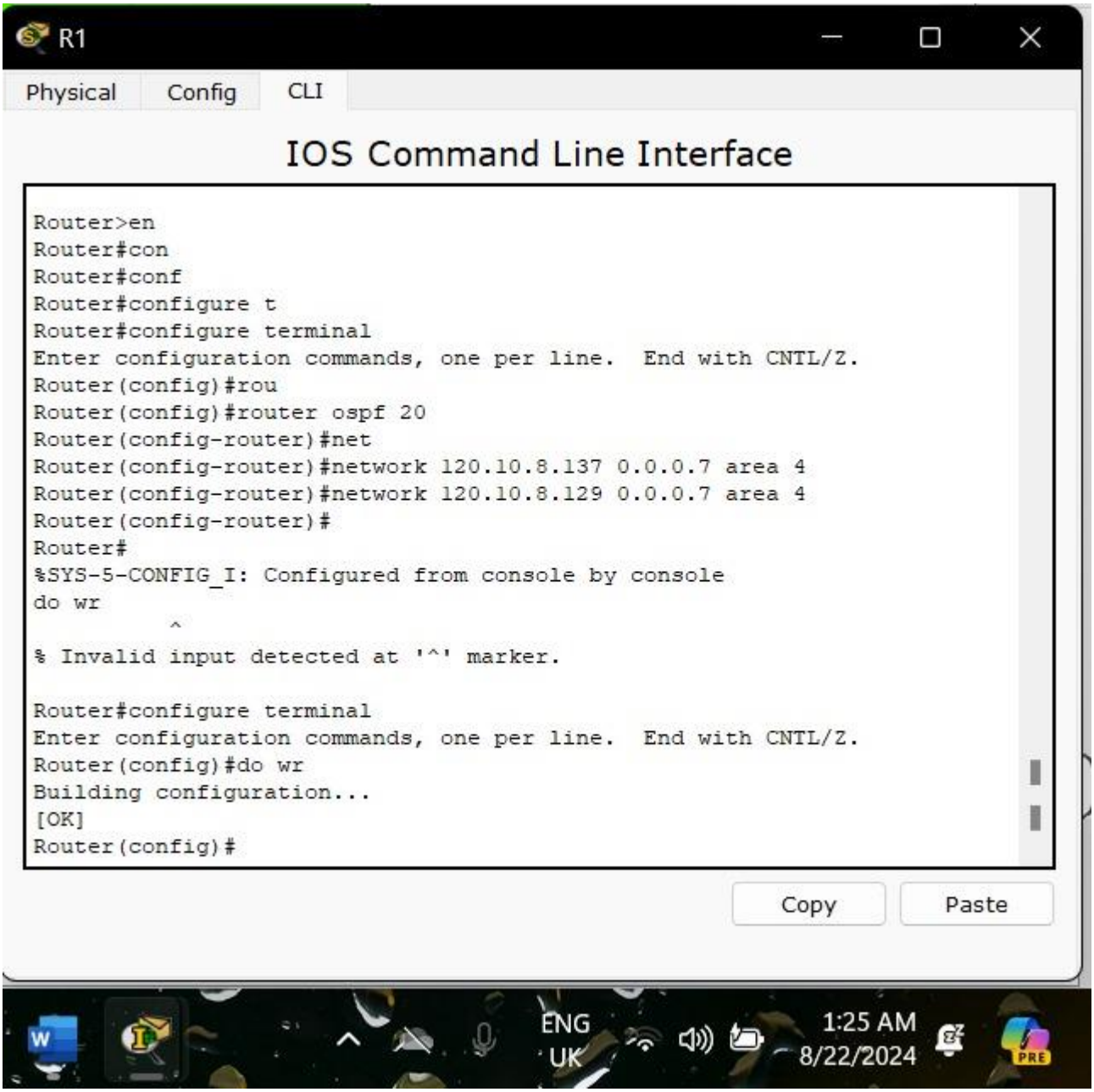


Figure 47:R1 OSPF

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

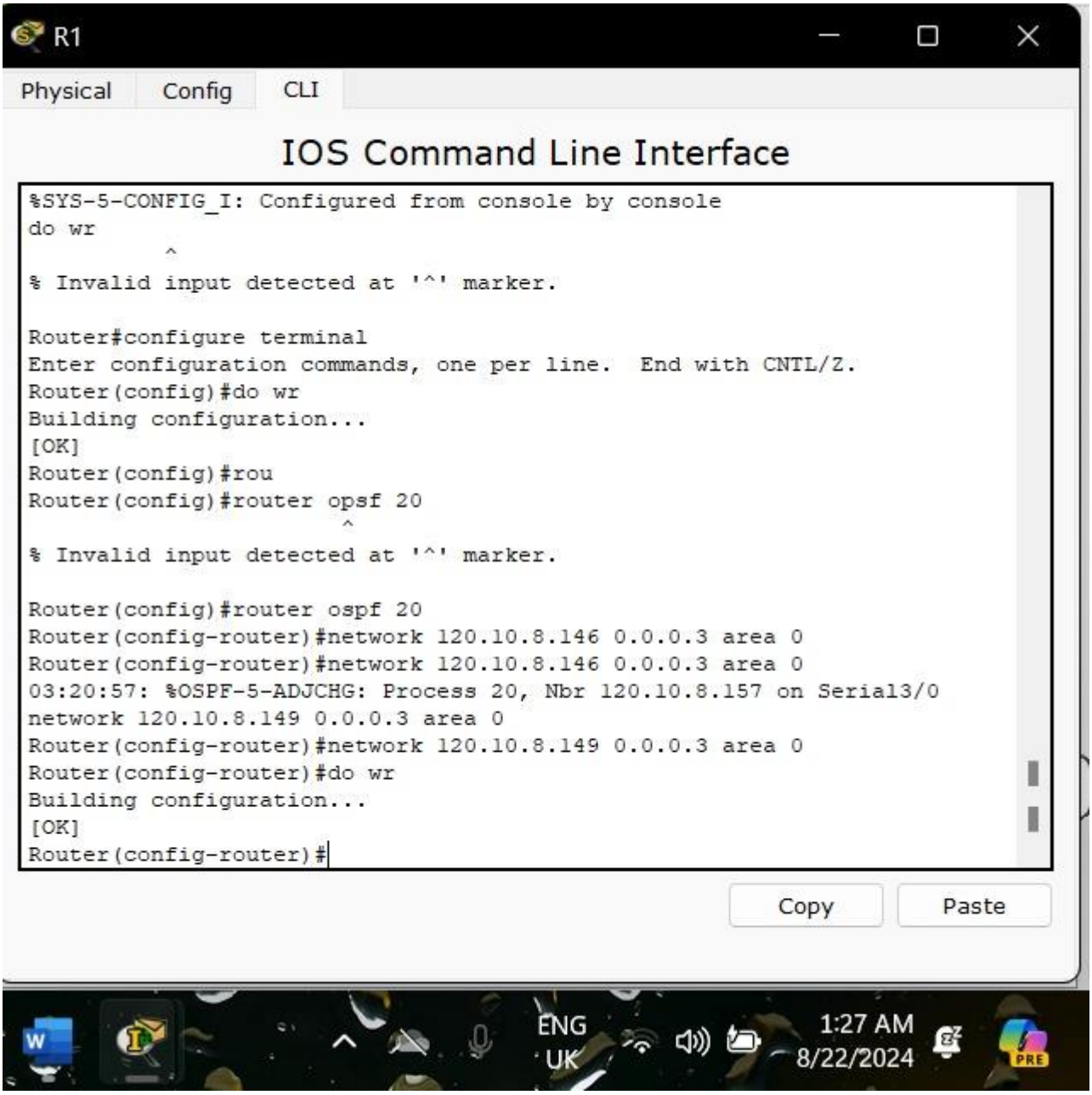


Figure 48: R1 OSPF

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

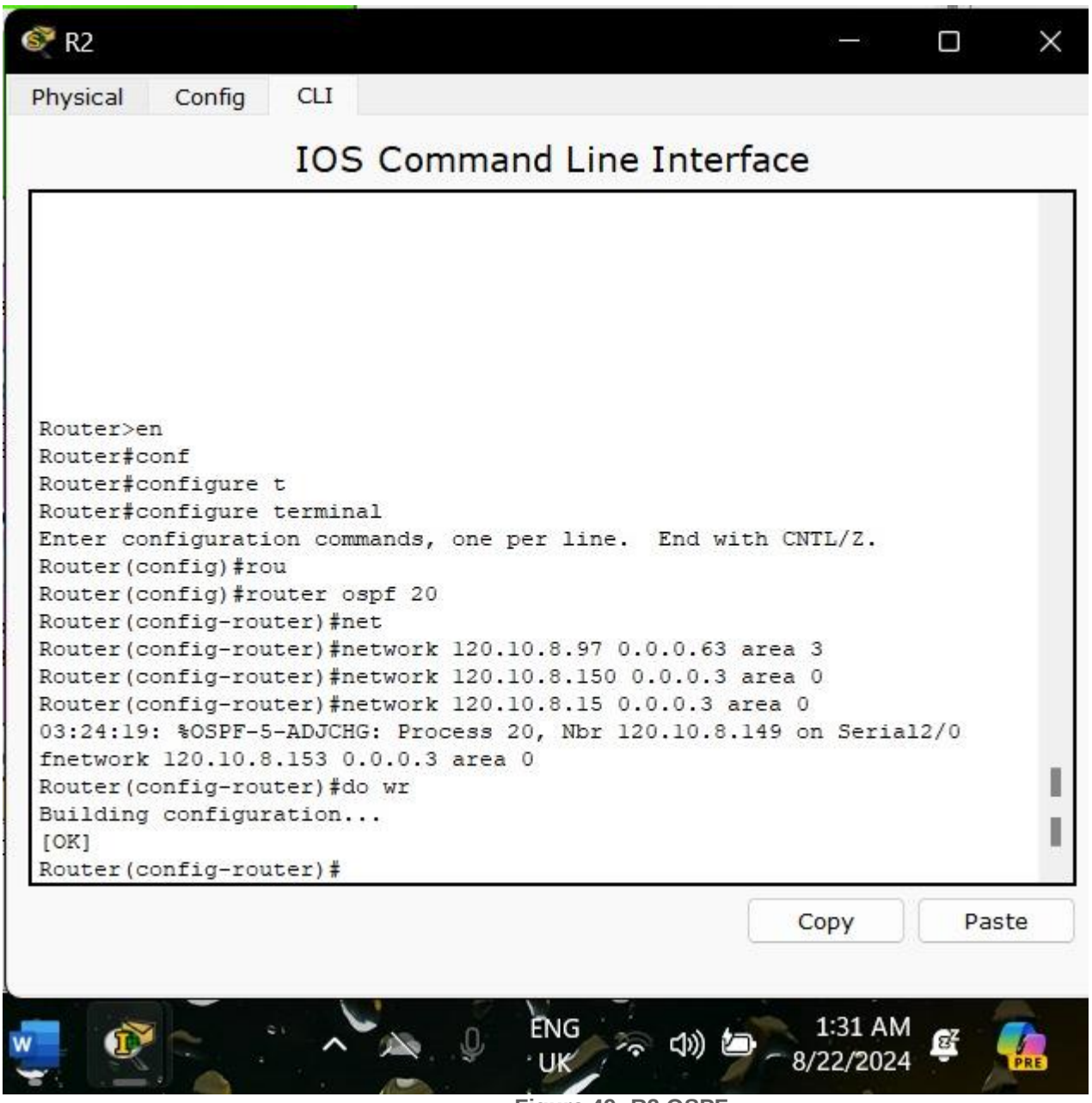


Figure 49: R2 OSPF

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.

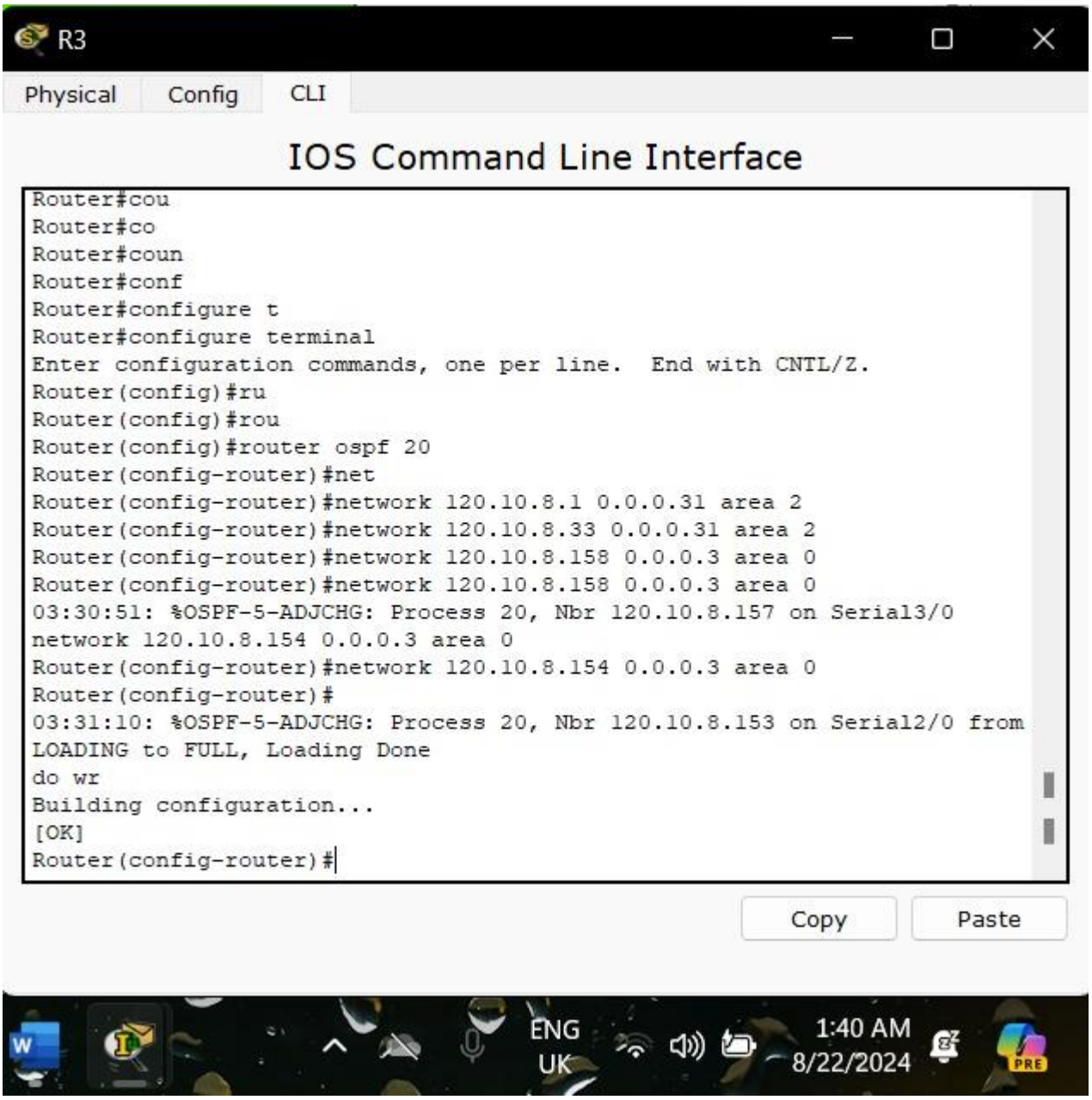


Figure 50:R3 OSPF

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:

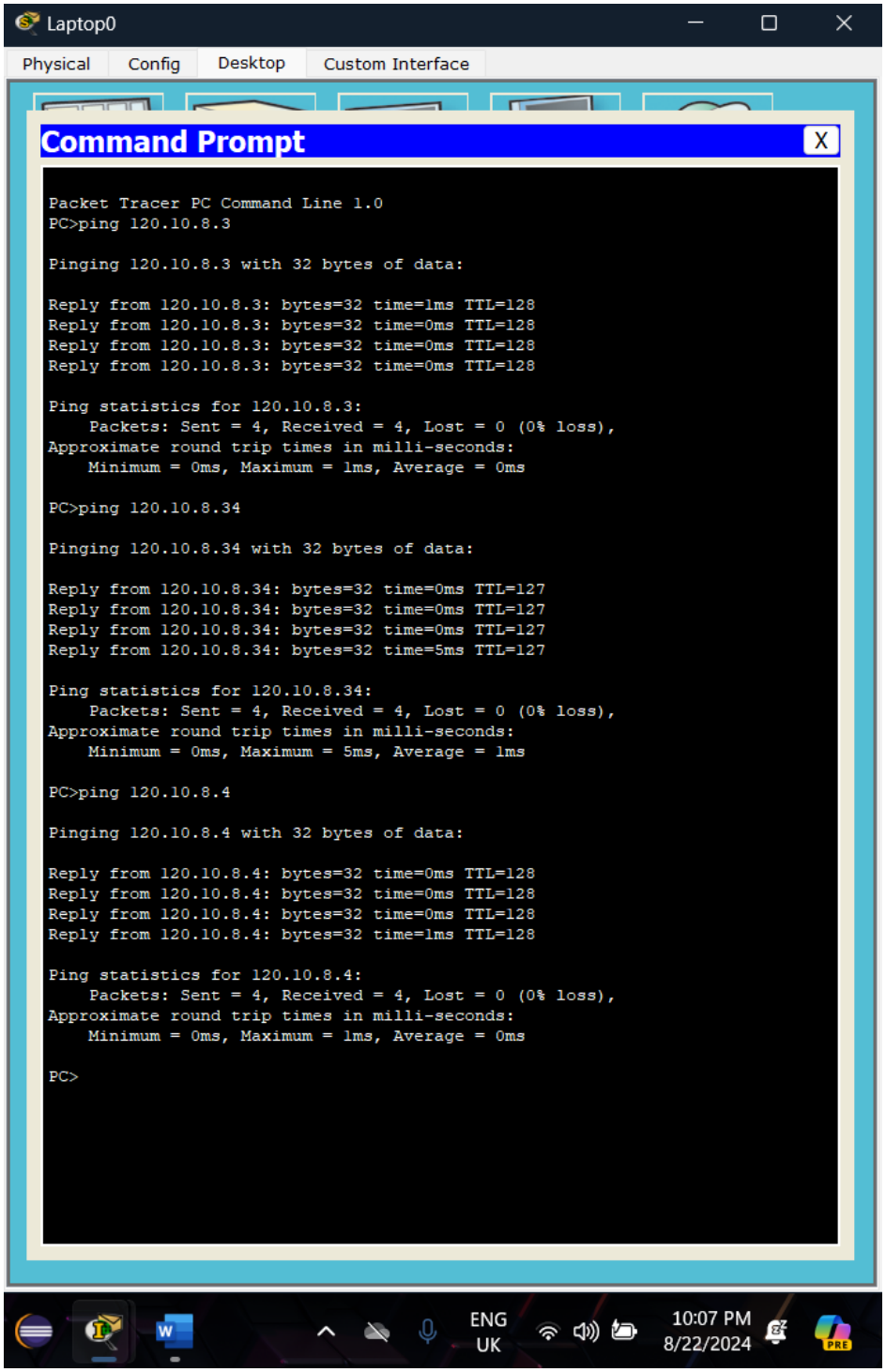


Figure 51:LAP 0 PING IN NET 2.

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.

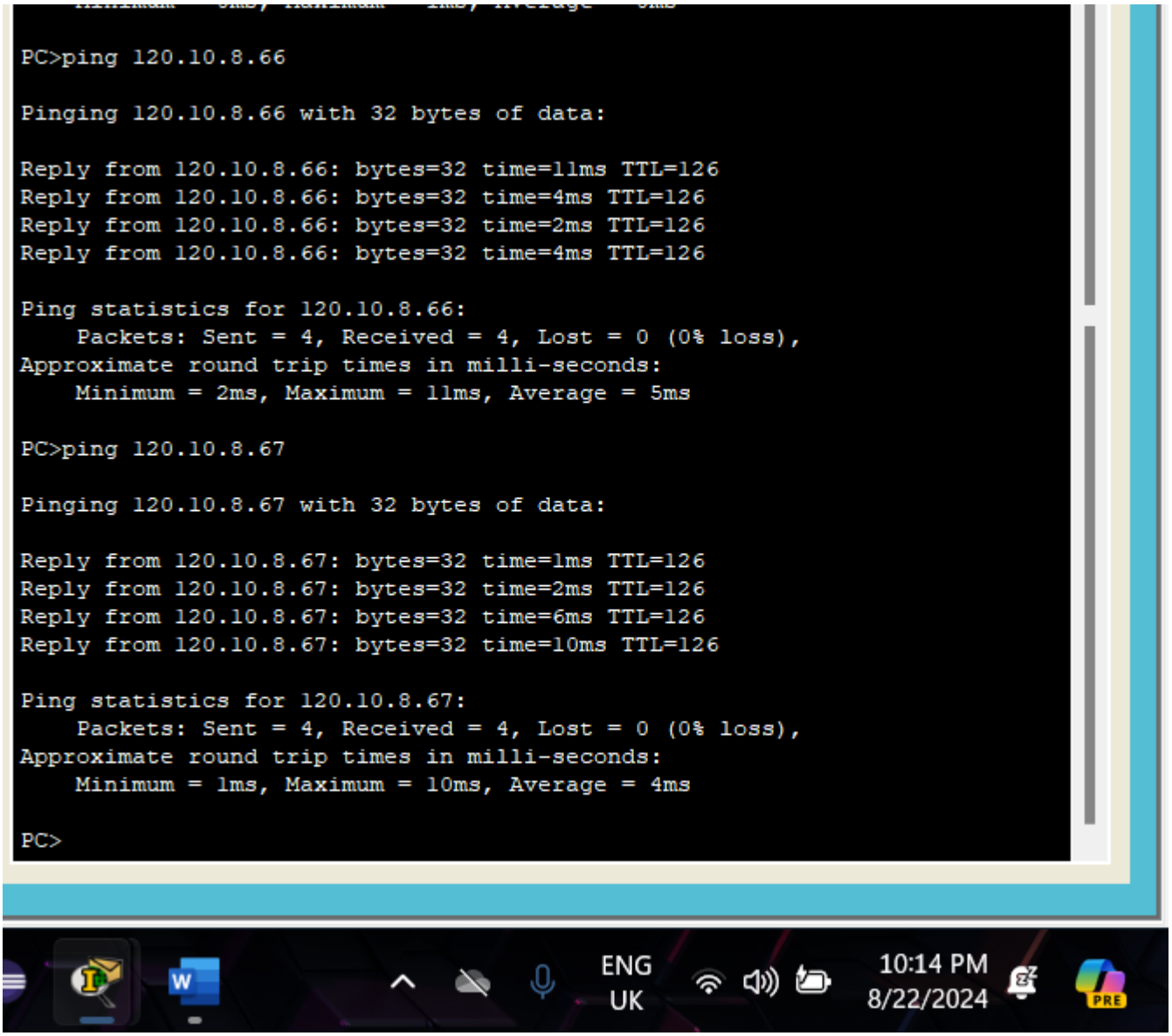


Figure 52:LAP 0 PING IN NET 1.

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.

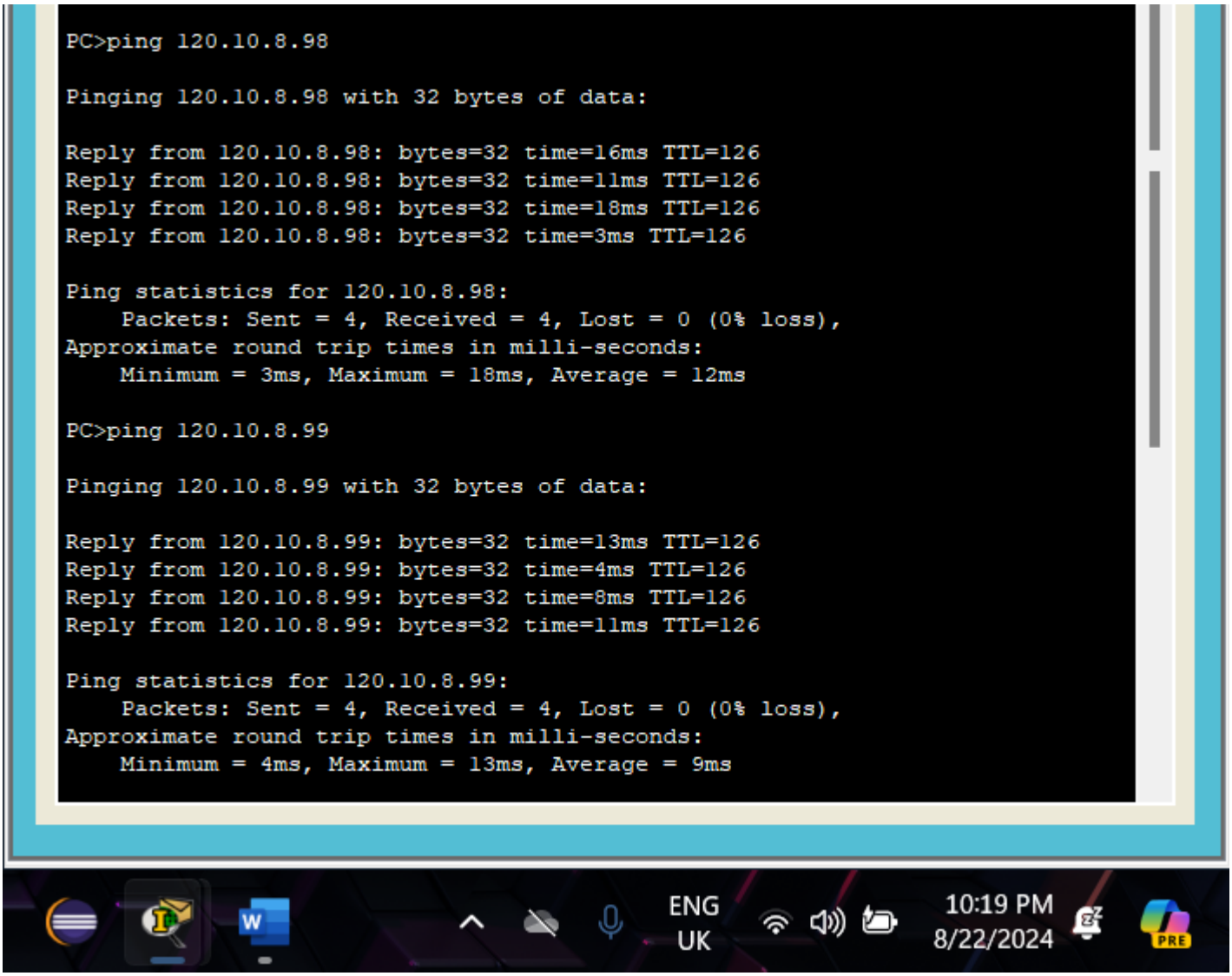


Figure 53:LAP 0 PING IN NET 3.

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.

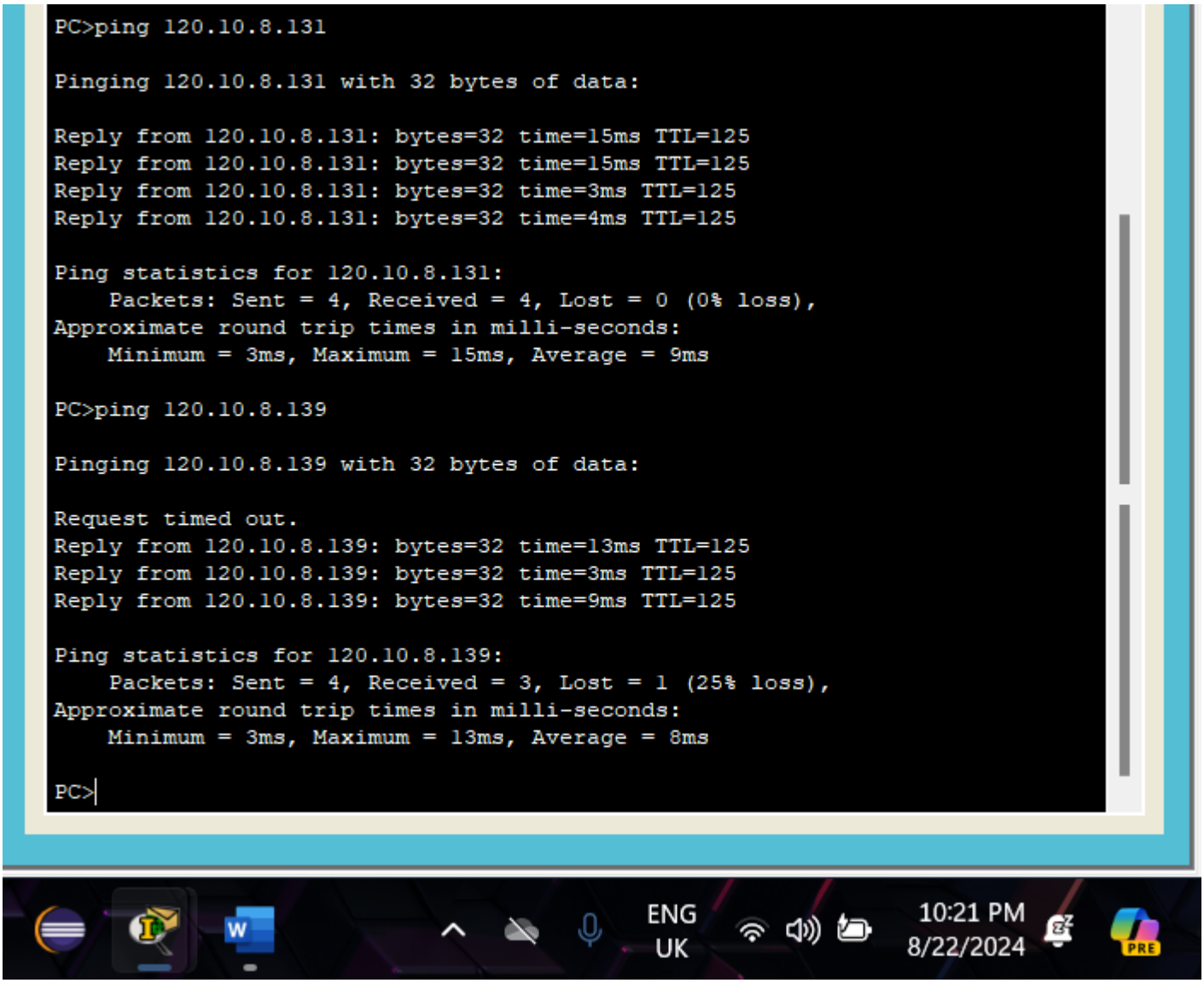


Figure 54:LAP 0 PING IN NET 4.

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:

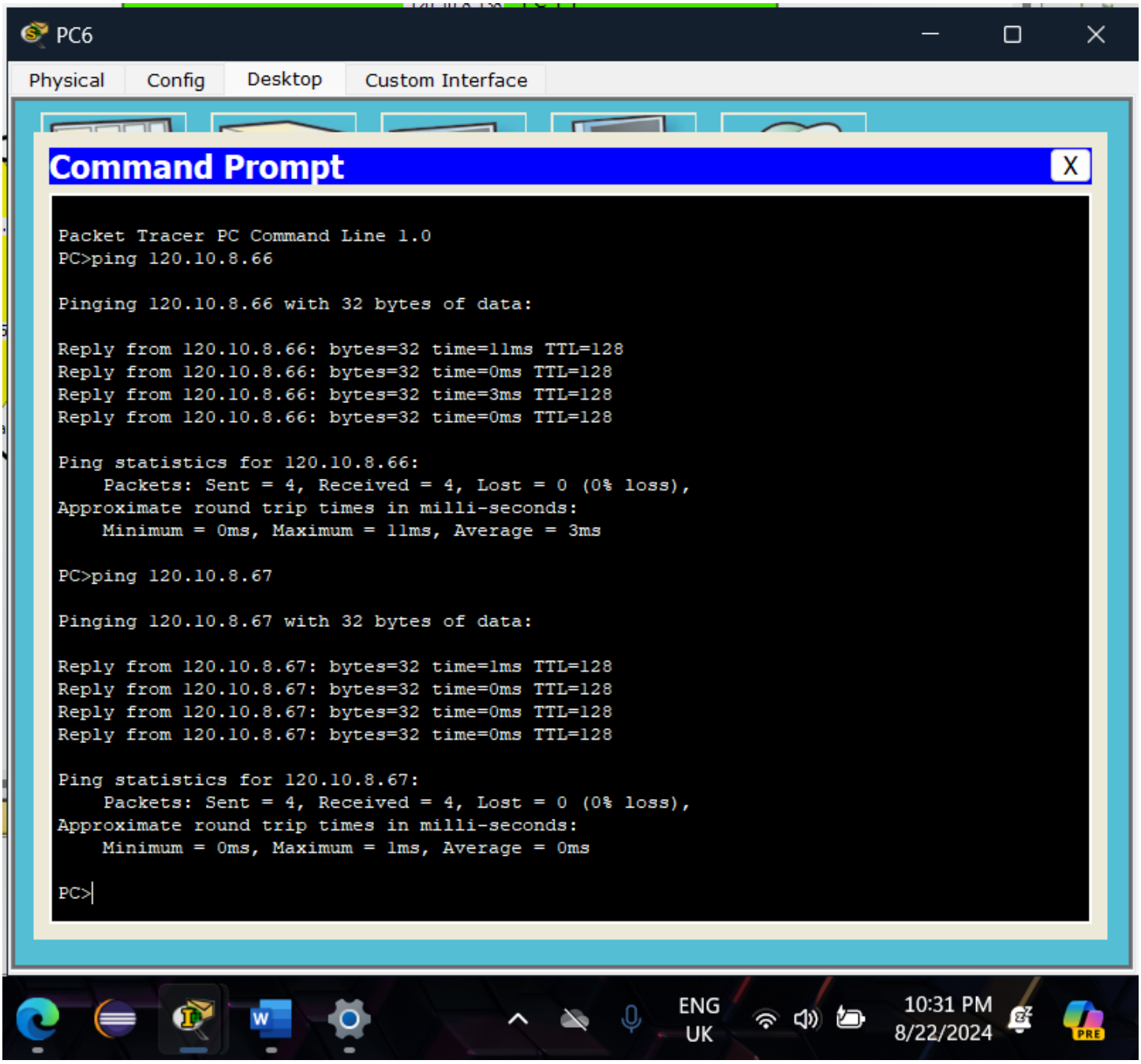


Figure 55:PC 6 PING IN NET 1.

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.

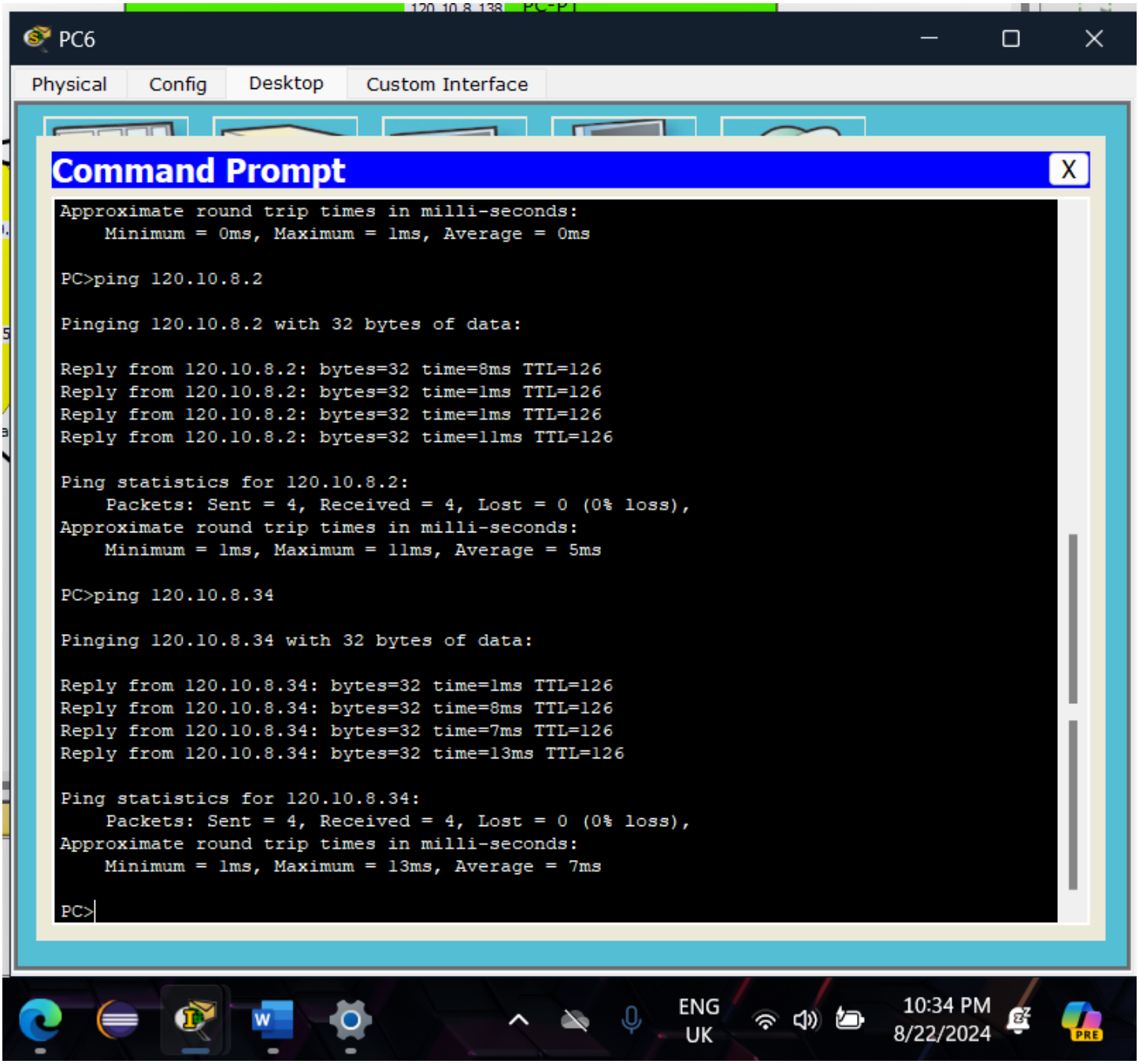


Figure 56:PC 6 PING IN NET 2.

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.

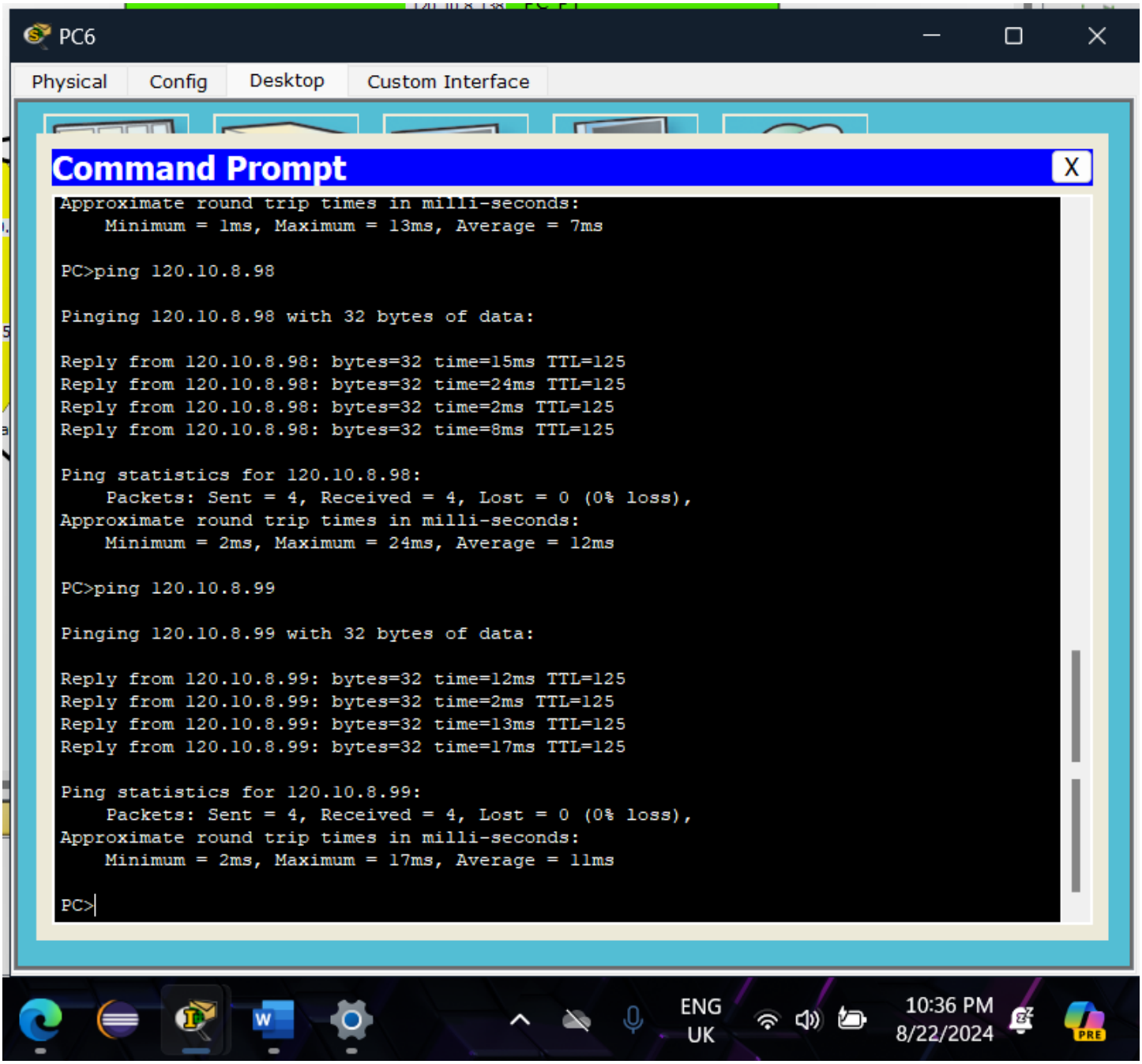


Figure 57:PC 6 PING IN NET 3.

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.

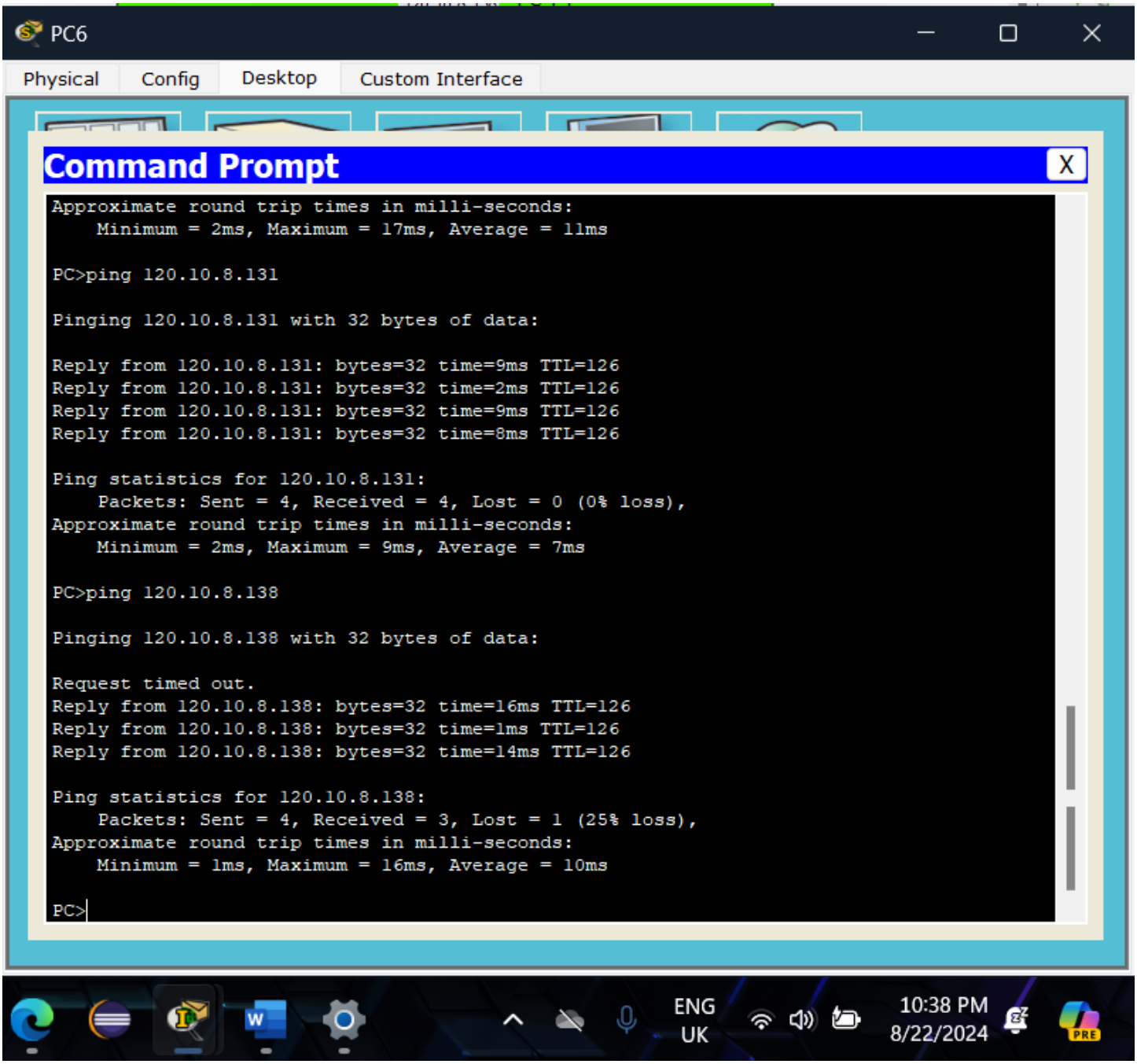


Figure 58: PC 6 PING IN NET 4.

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:

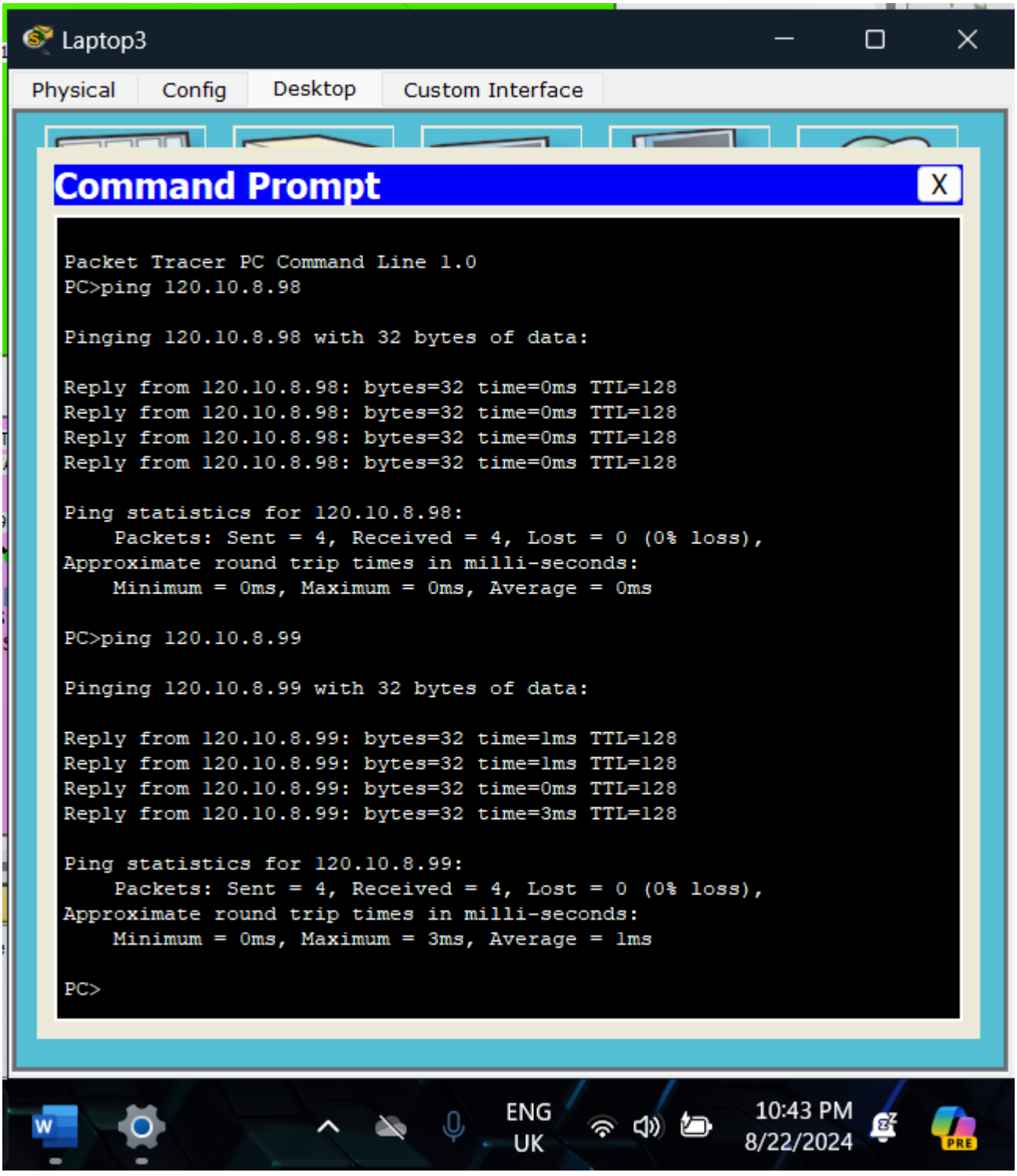


Figure 59:LAP 3 PING IN NET 3.

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.

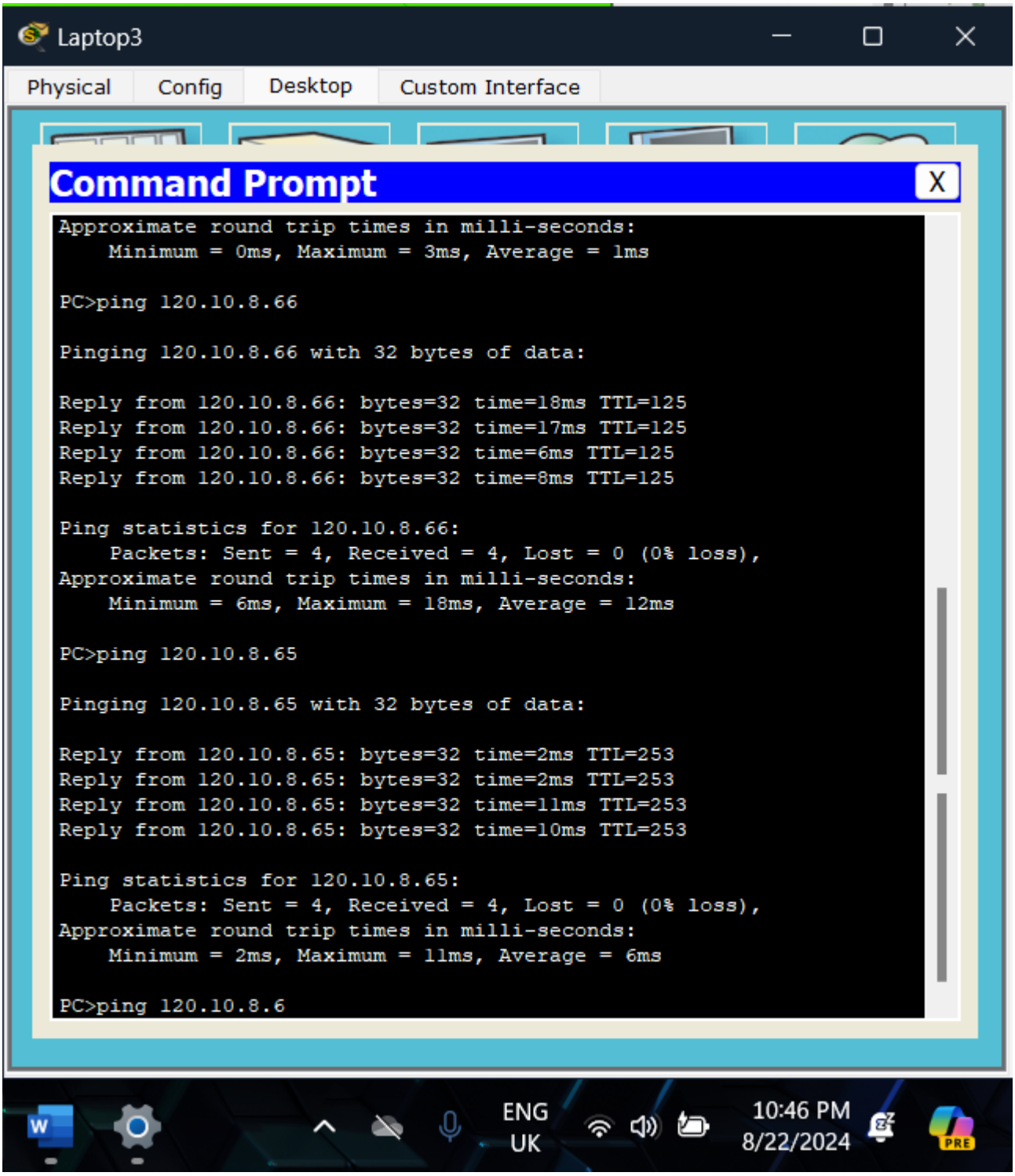


Figure 60:Laptop 3 PING IN NET 1.

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.

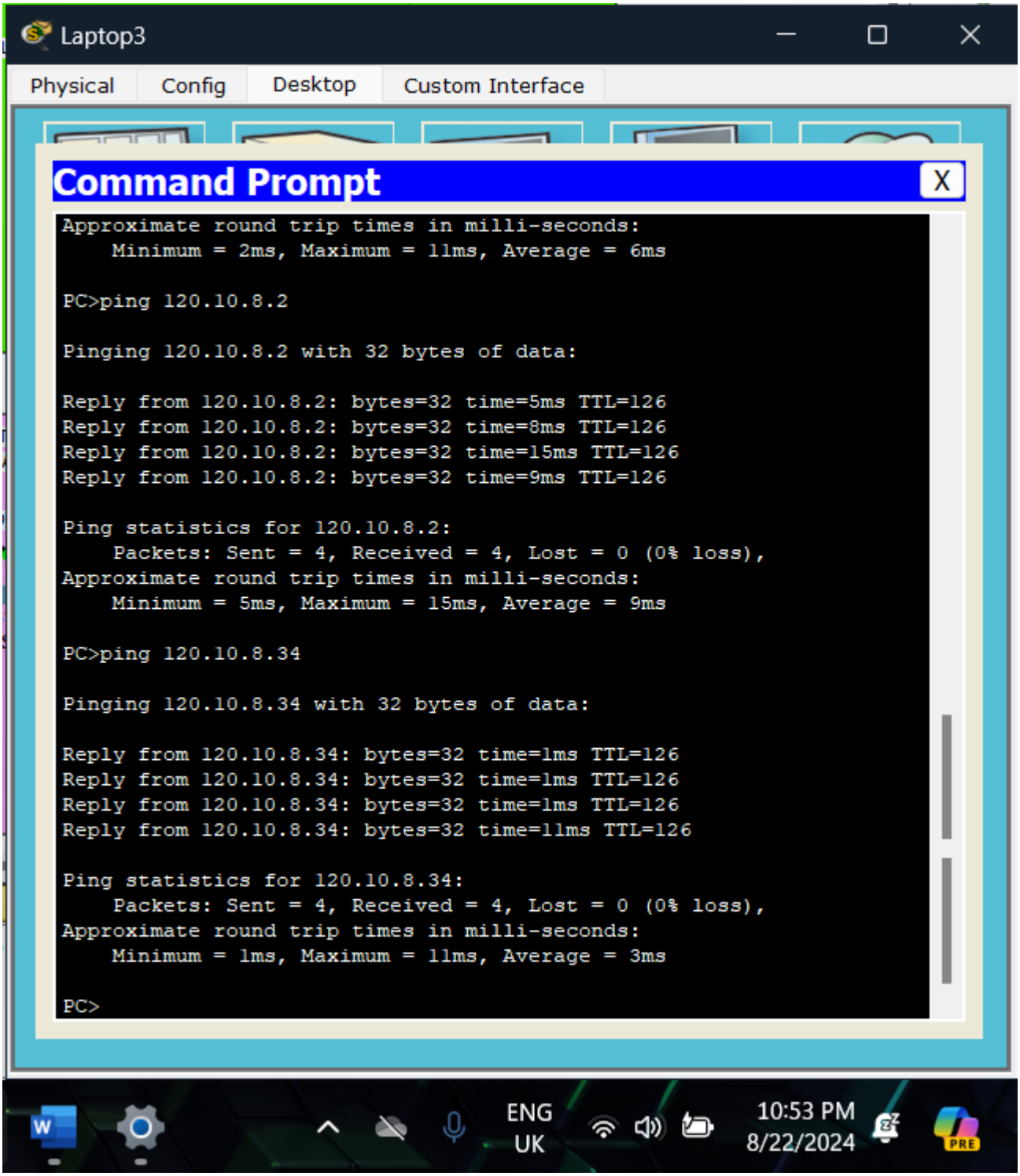


Figure 61:Laptop 3 PING IN NET 2.

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.

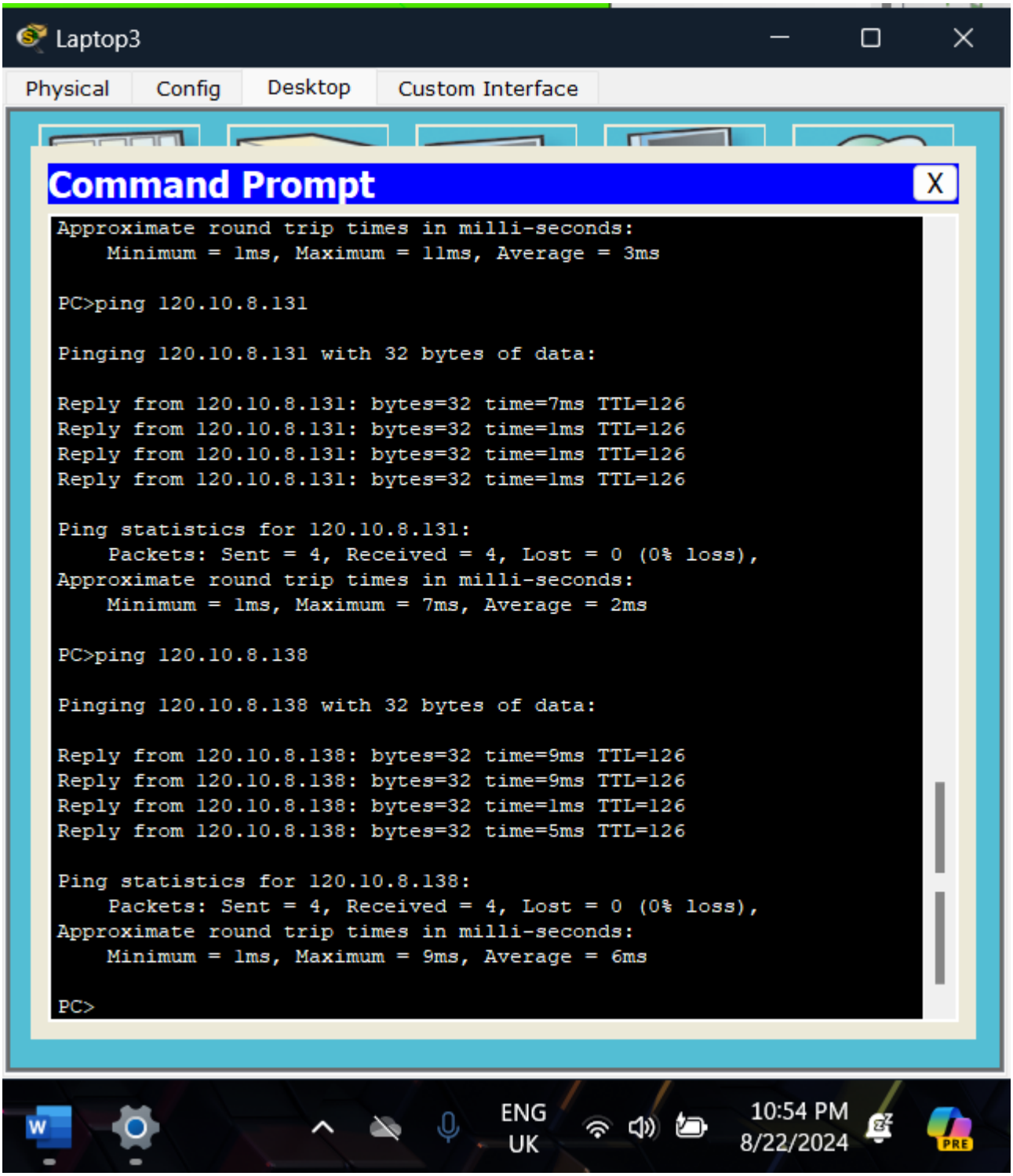


Figure 62: Laptop 3 PING IN NET 4.

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:

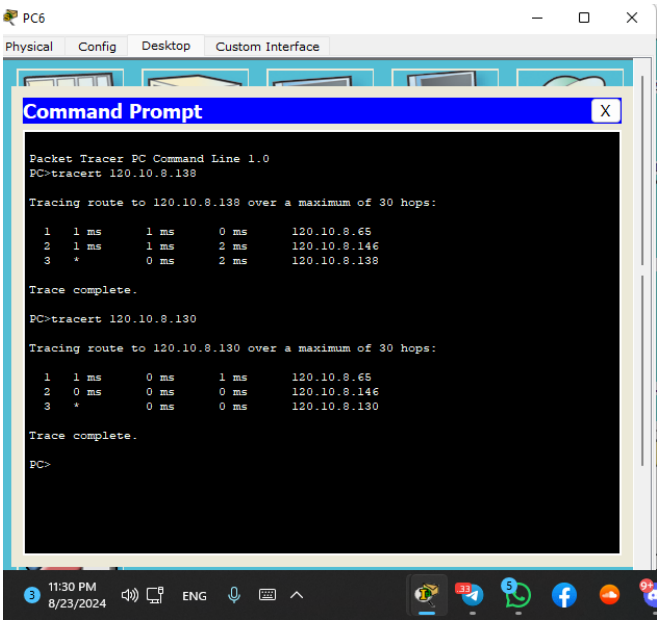


Figure 63: PC6 in NET Area1

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.

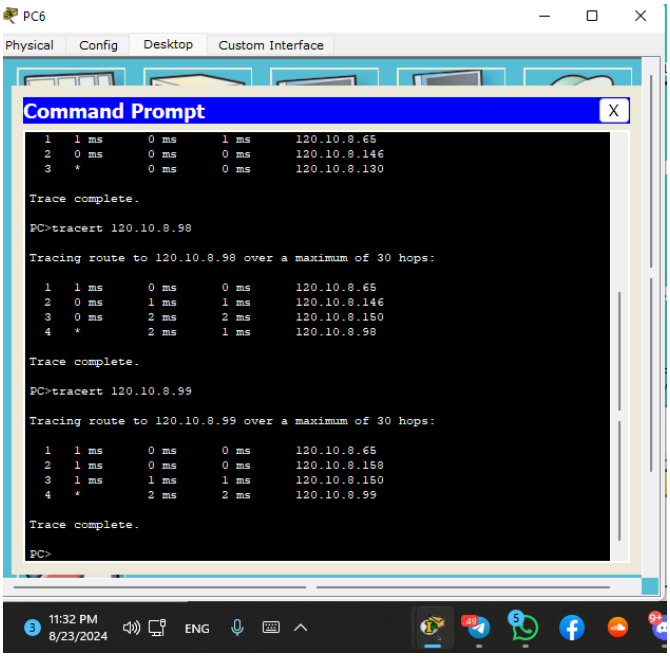


Figure 64: PC6 in NET Area2.

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.

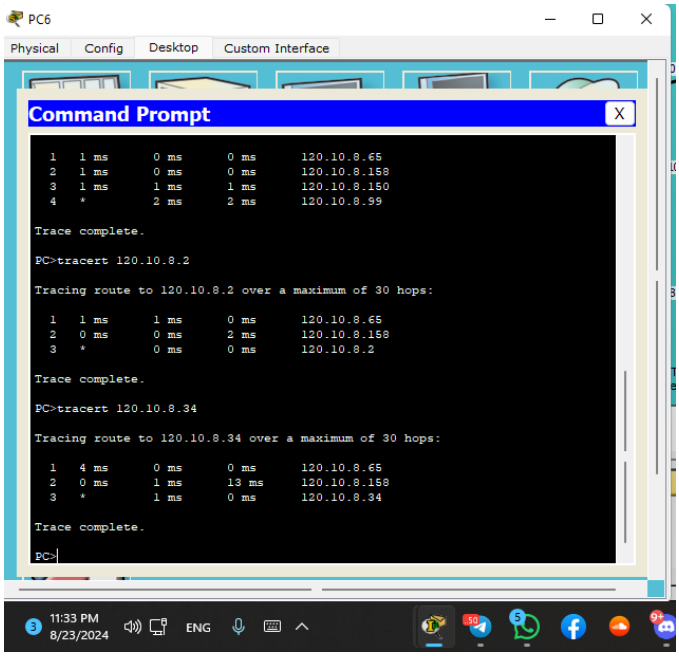


Figure 65: PC6 in NET Area3.

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.

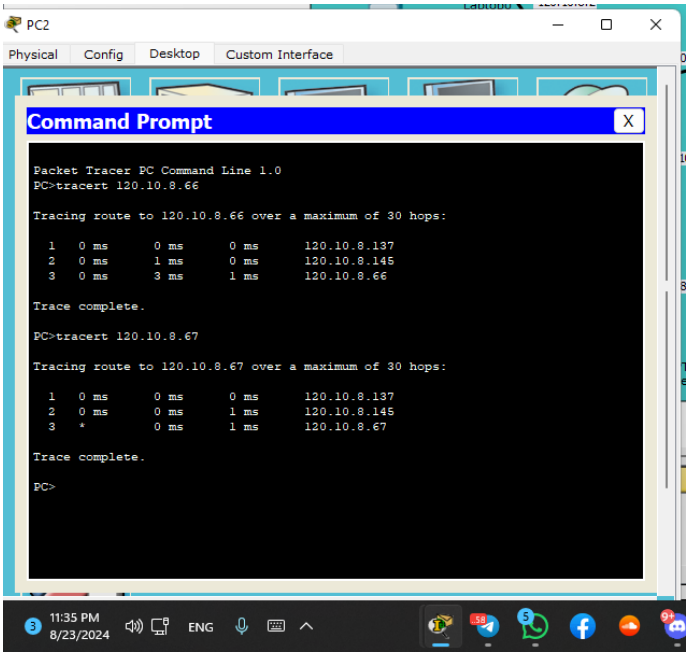


Figure 66: PC2 in NET Area4.

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.

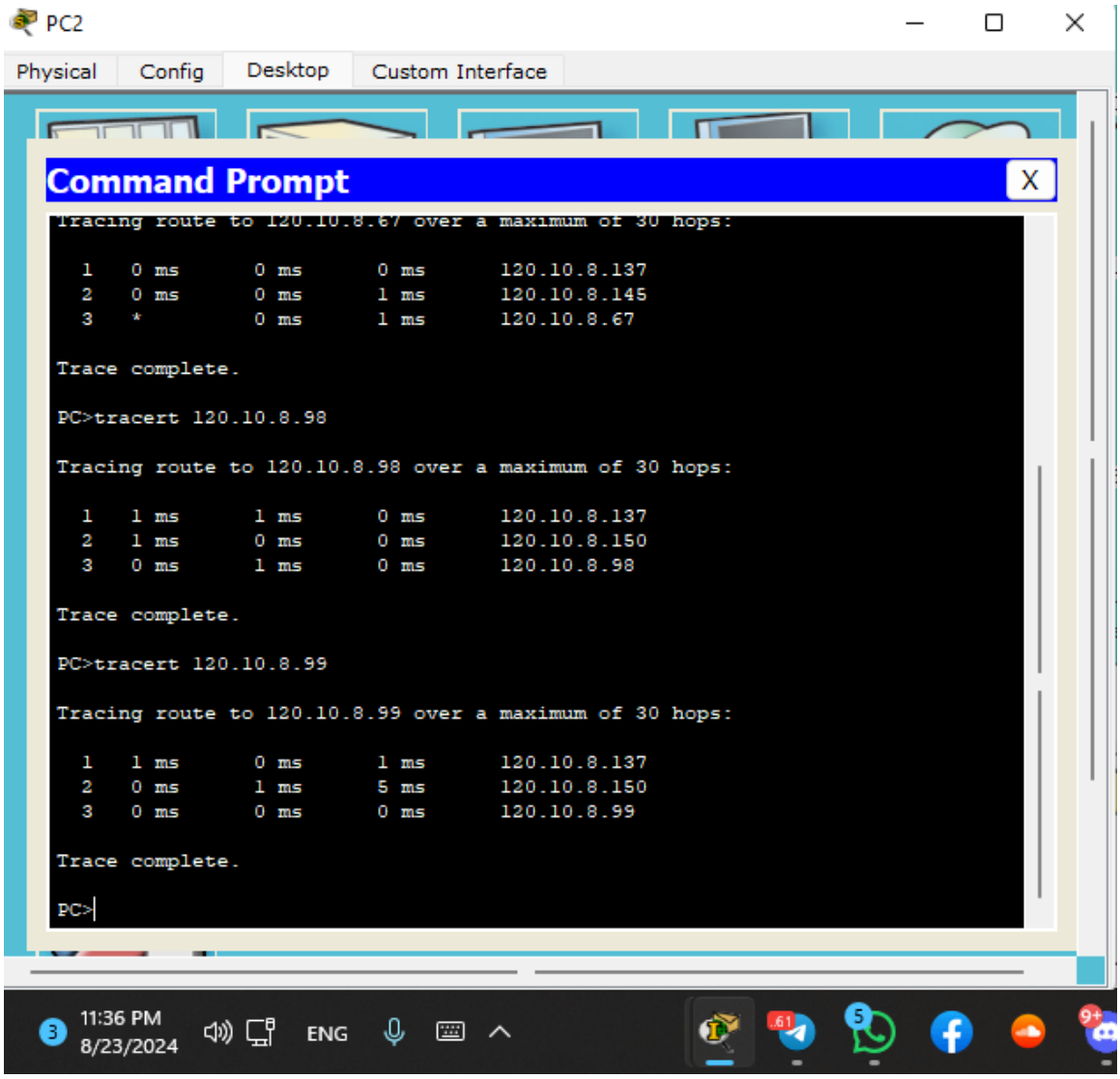


Figure 67: PC2 in NET Area2.

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.

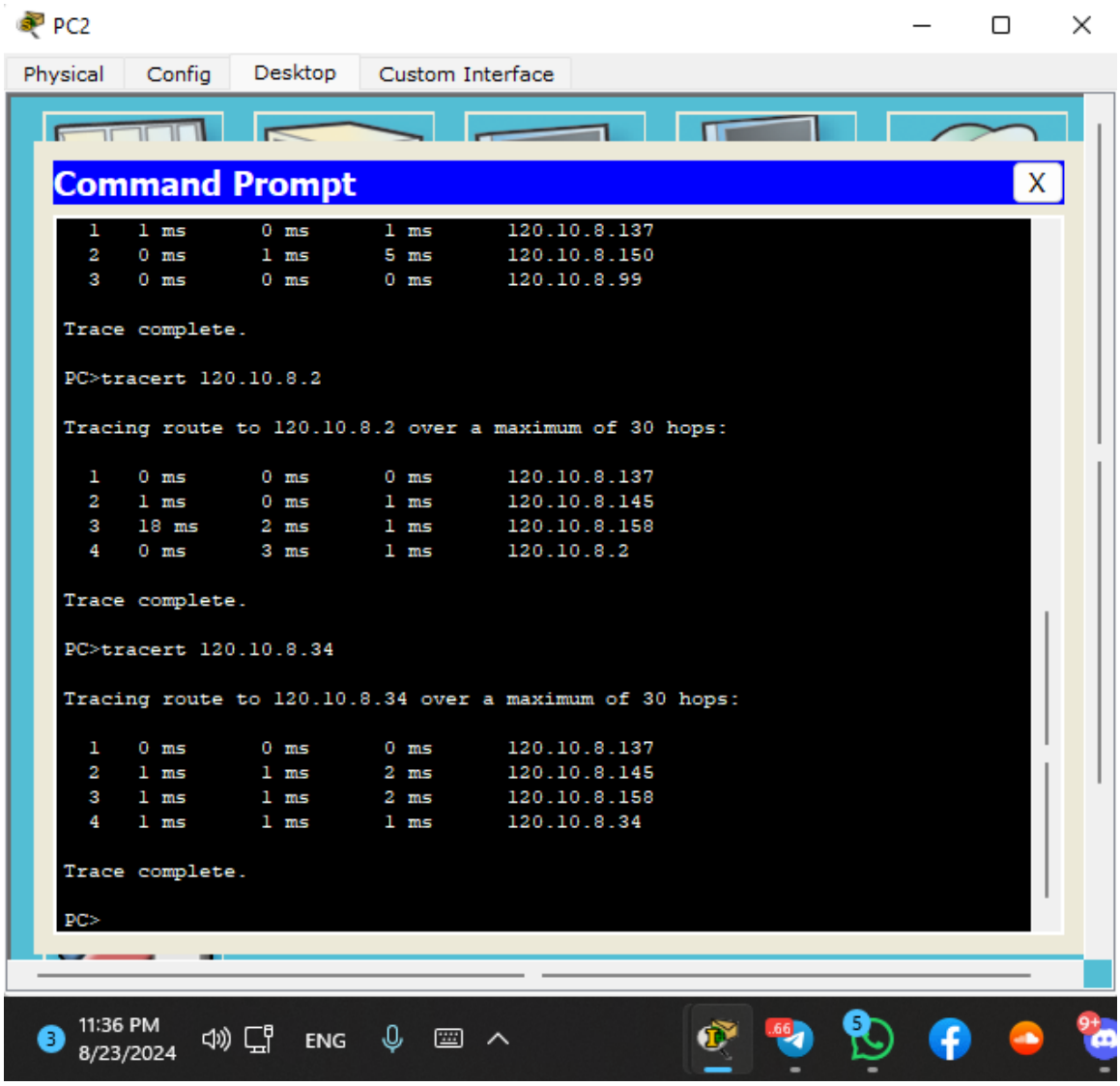


Figure 68: PC2 in NET Area4.

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.

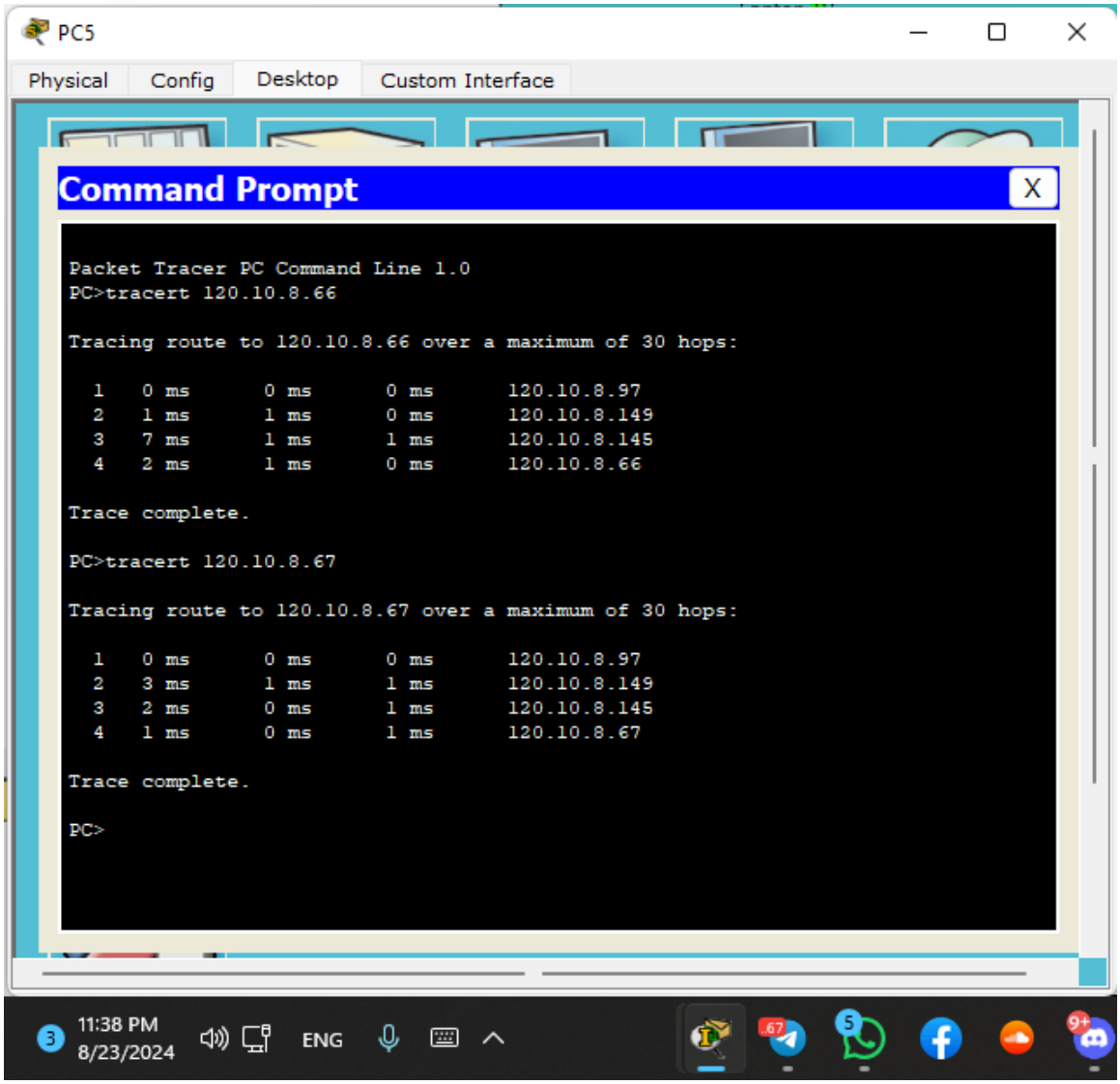


Figure 69: PC5 in NET Area4

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.

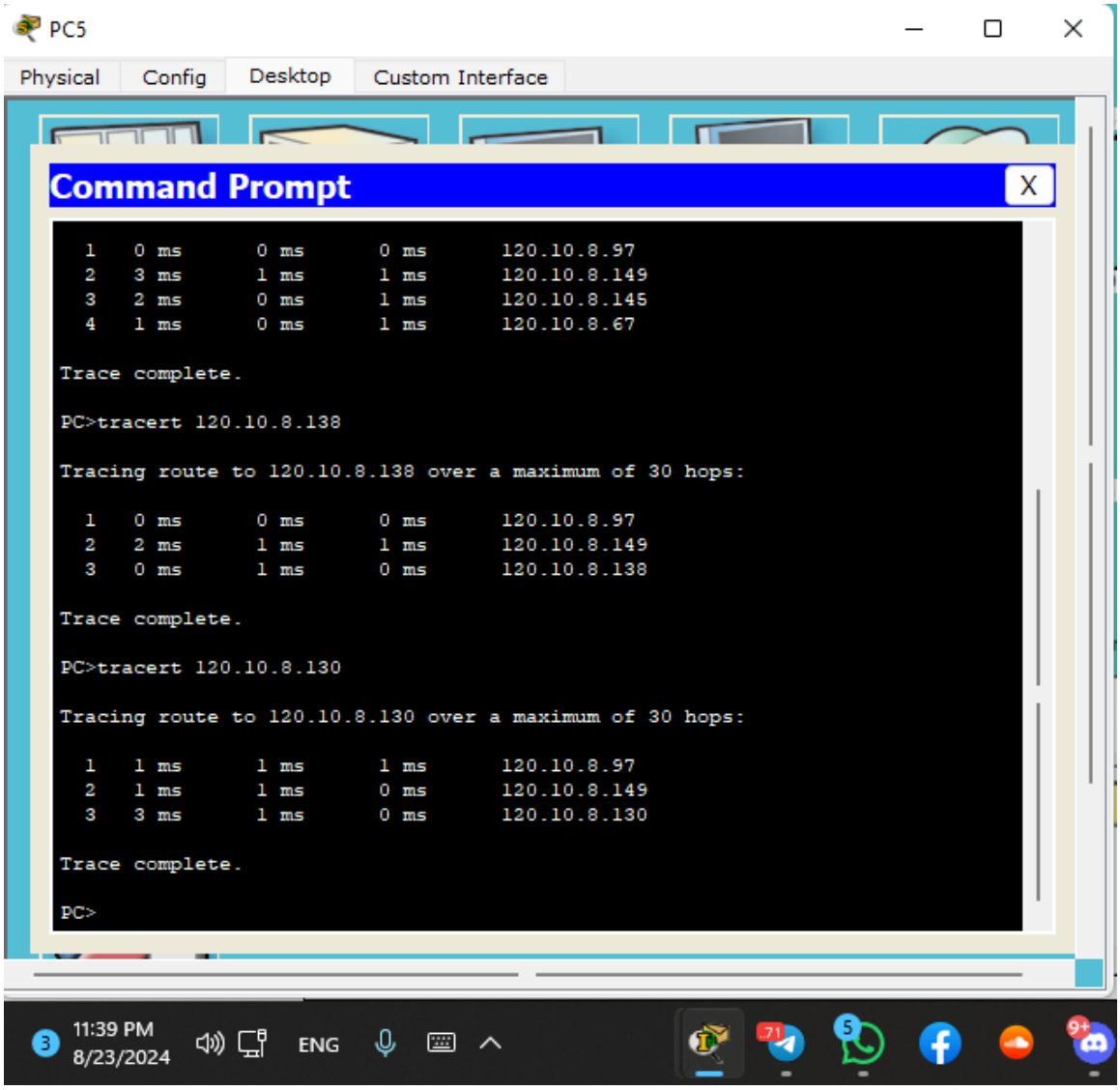


Figure 70: PC5 in NET Area4

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.

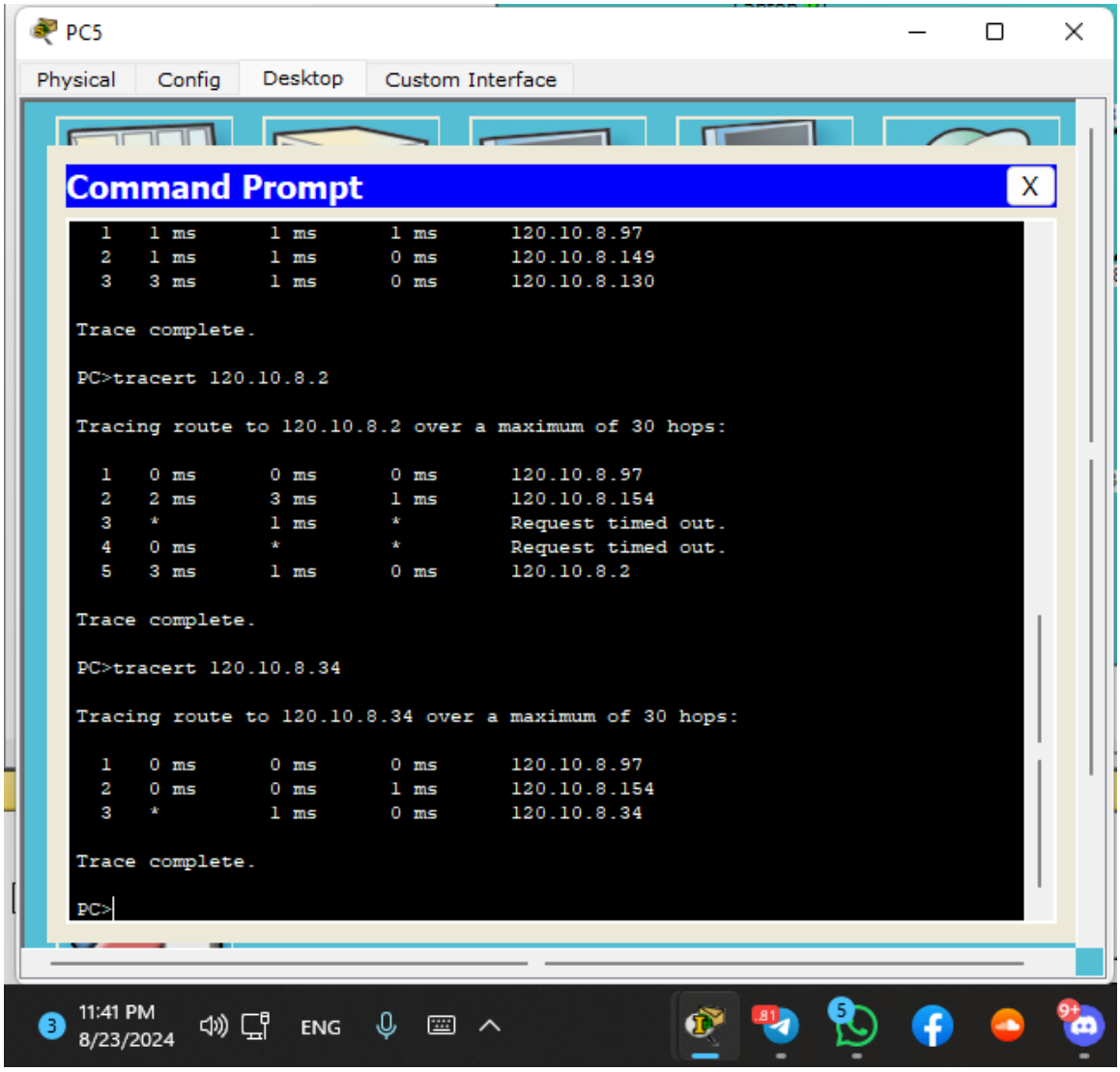


Figure 71: PC5 in NET Area3

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.

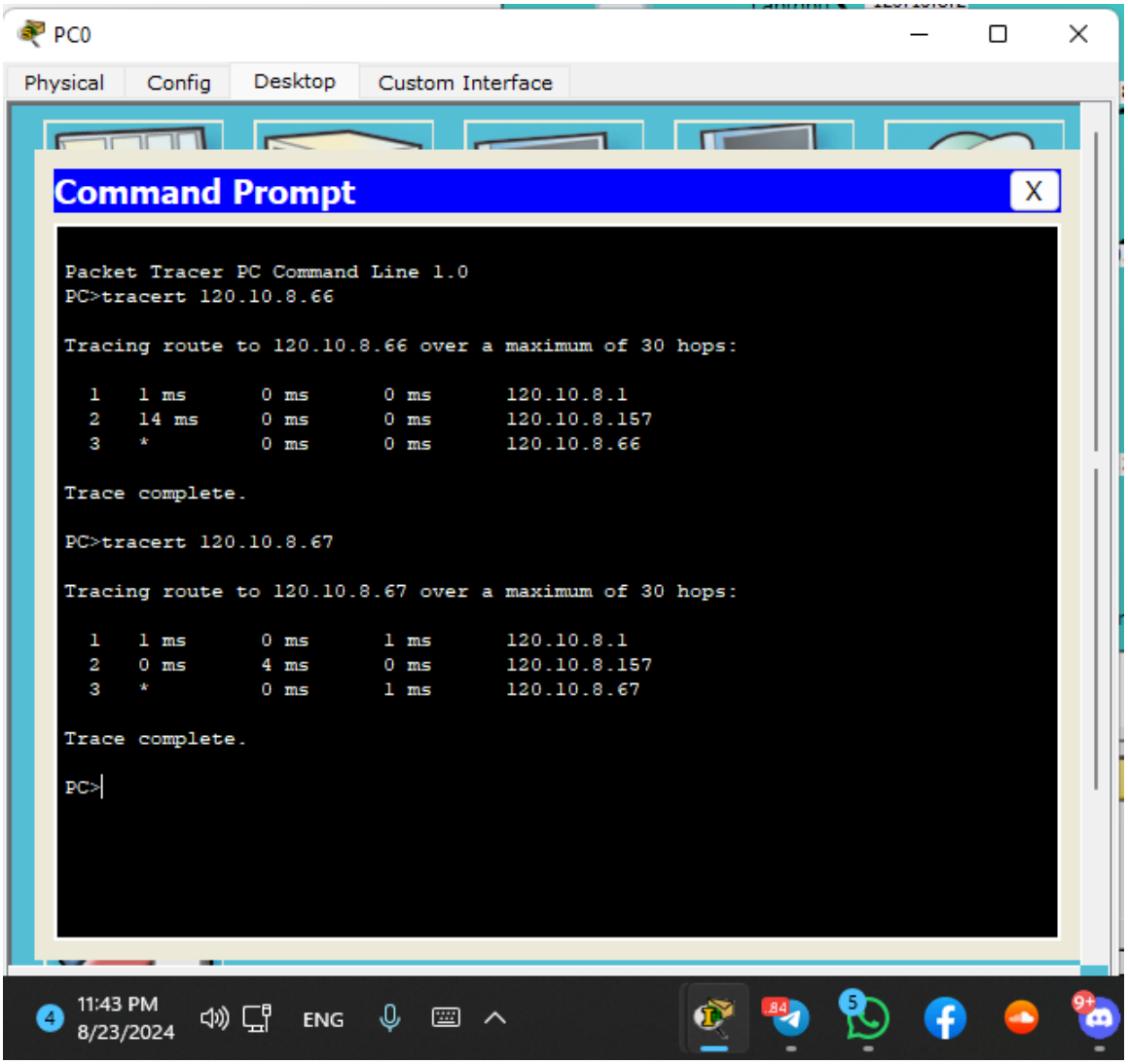


Figure 72:Figure 57: PC0 in NET Area1 .

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.

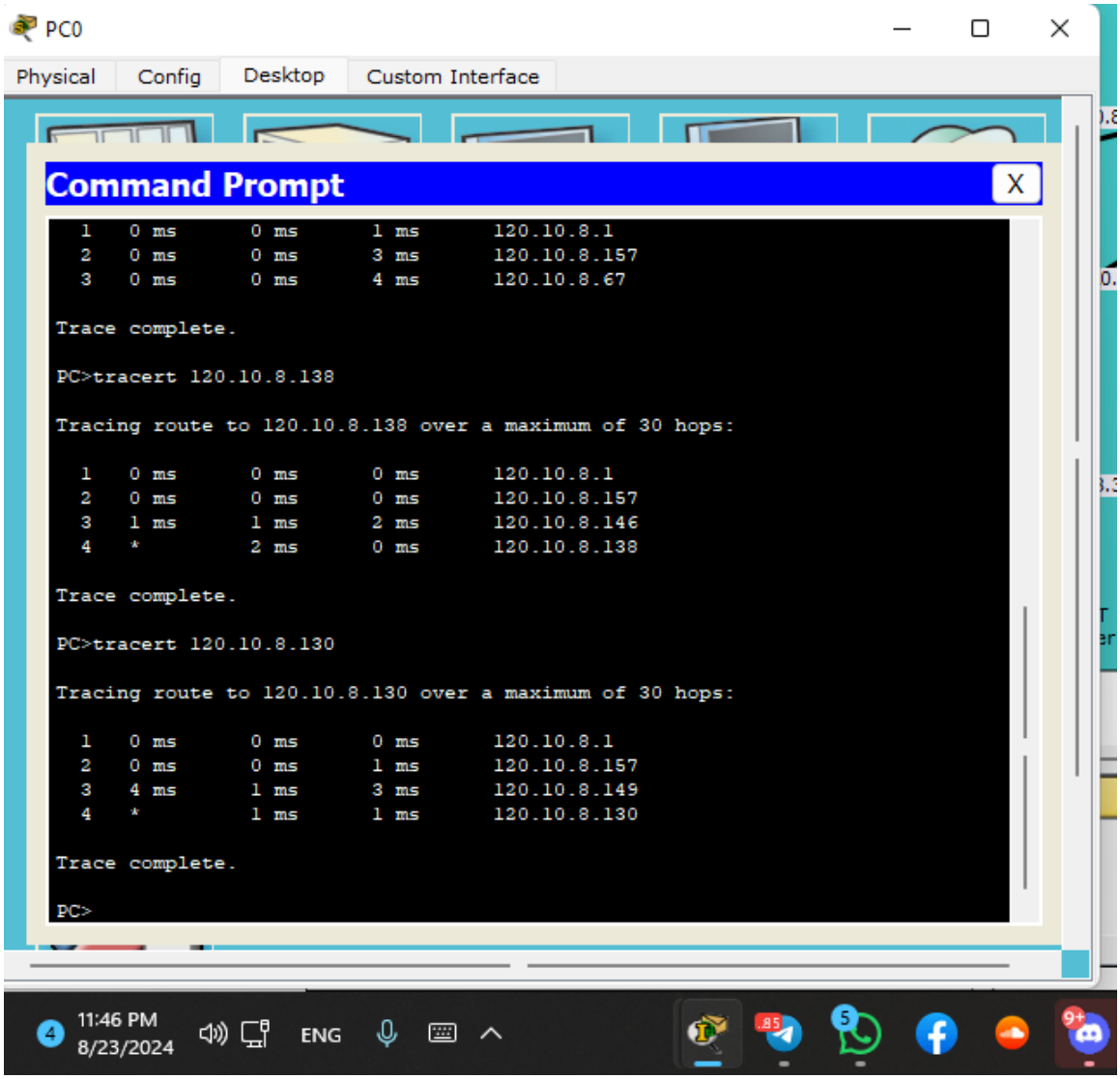


Figure 73: PC0 in NET Area3.

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.

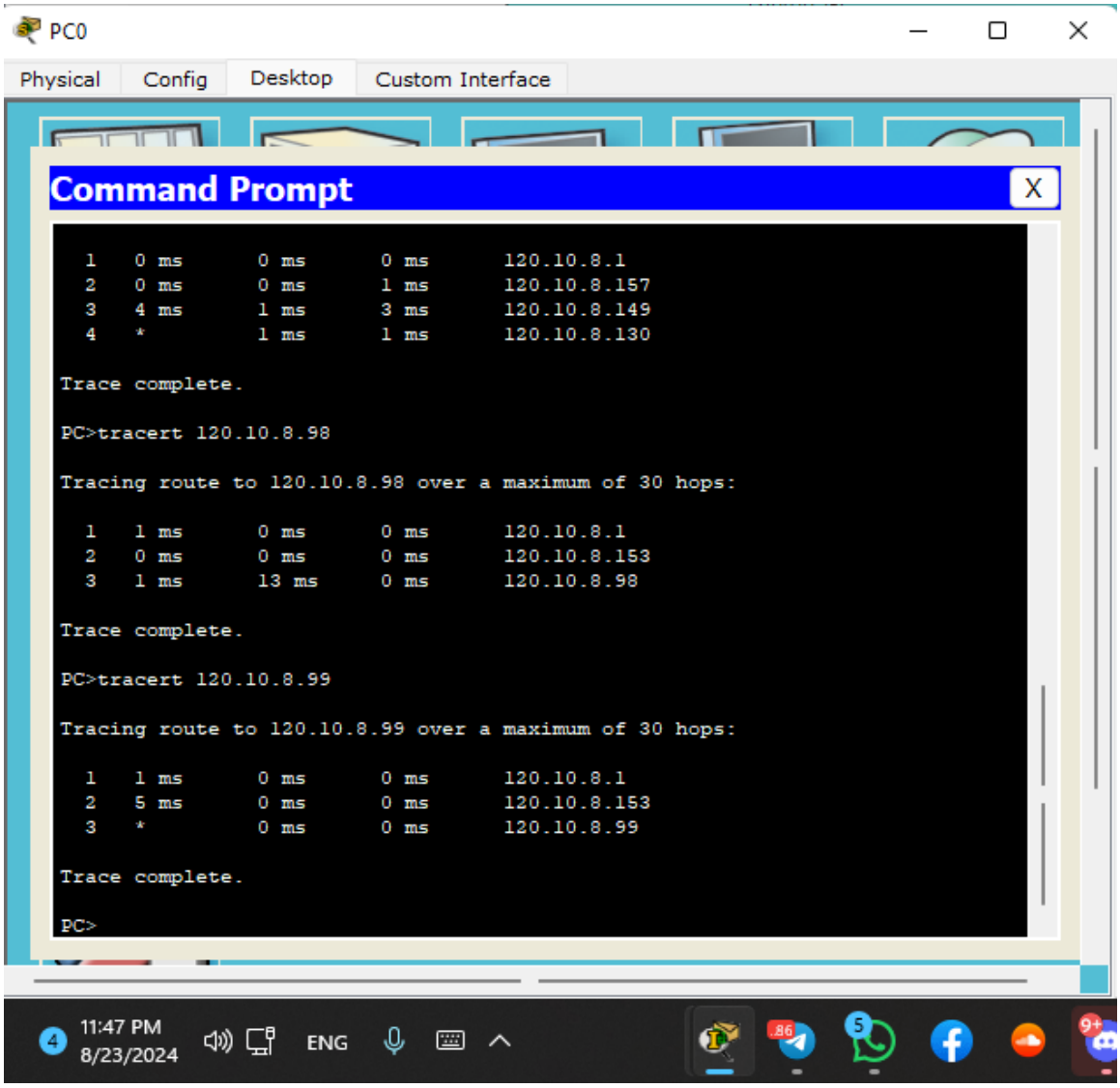


Figure 74: PC0 in NET Area2

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:

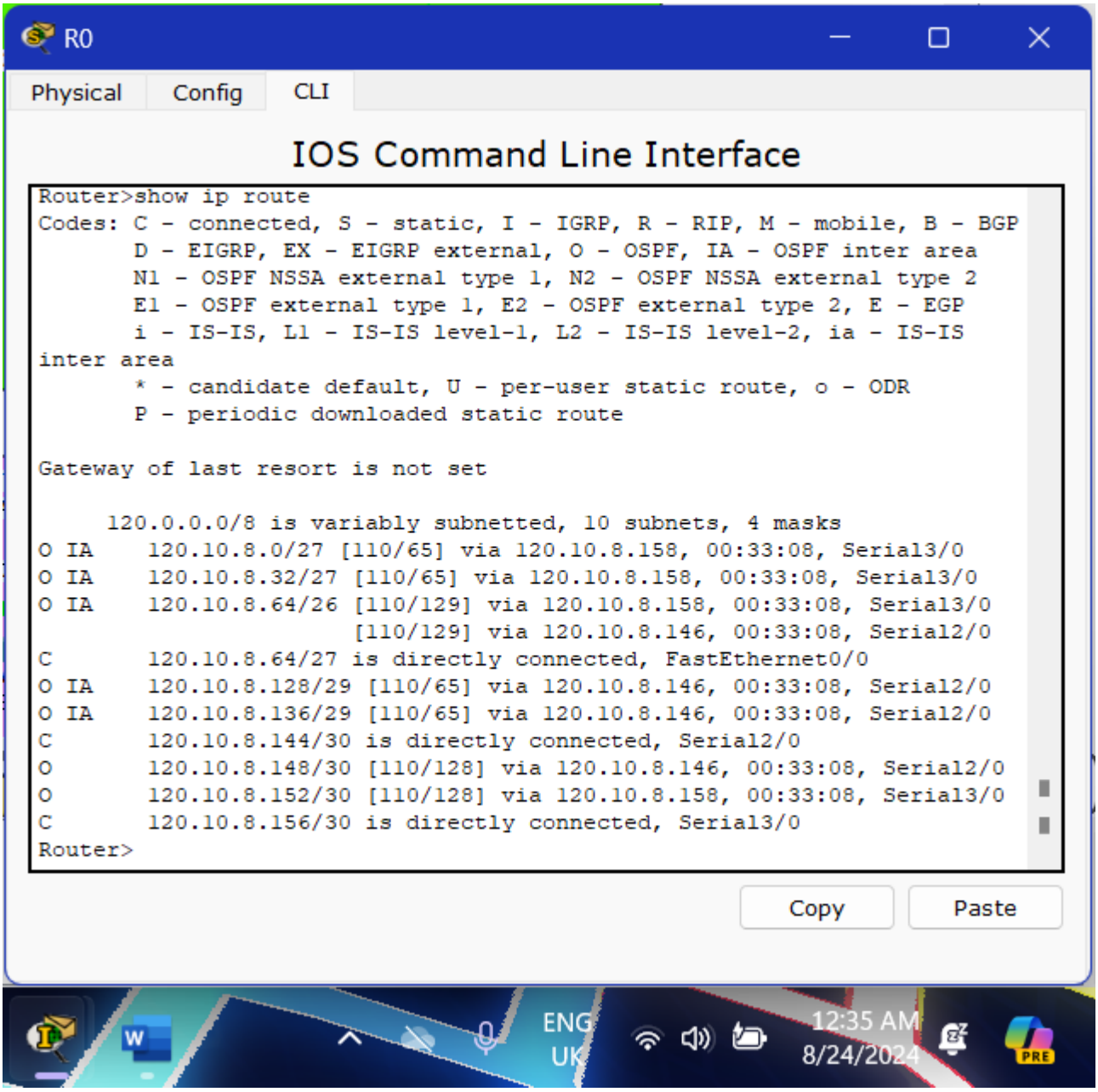


Figure 75:The Routing tables for R0 .

This screen show the routing table for R0 using "show Ip route" command.

- R1:

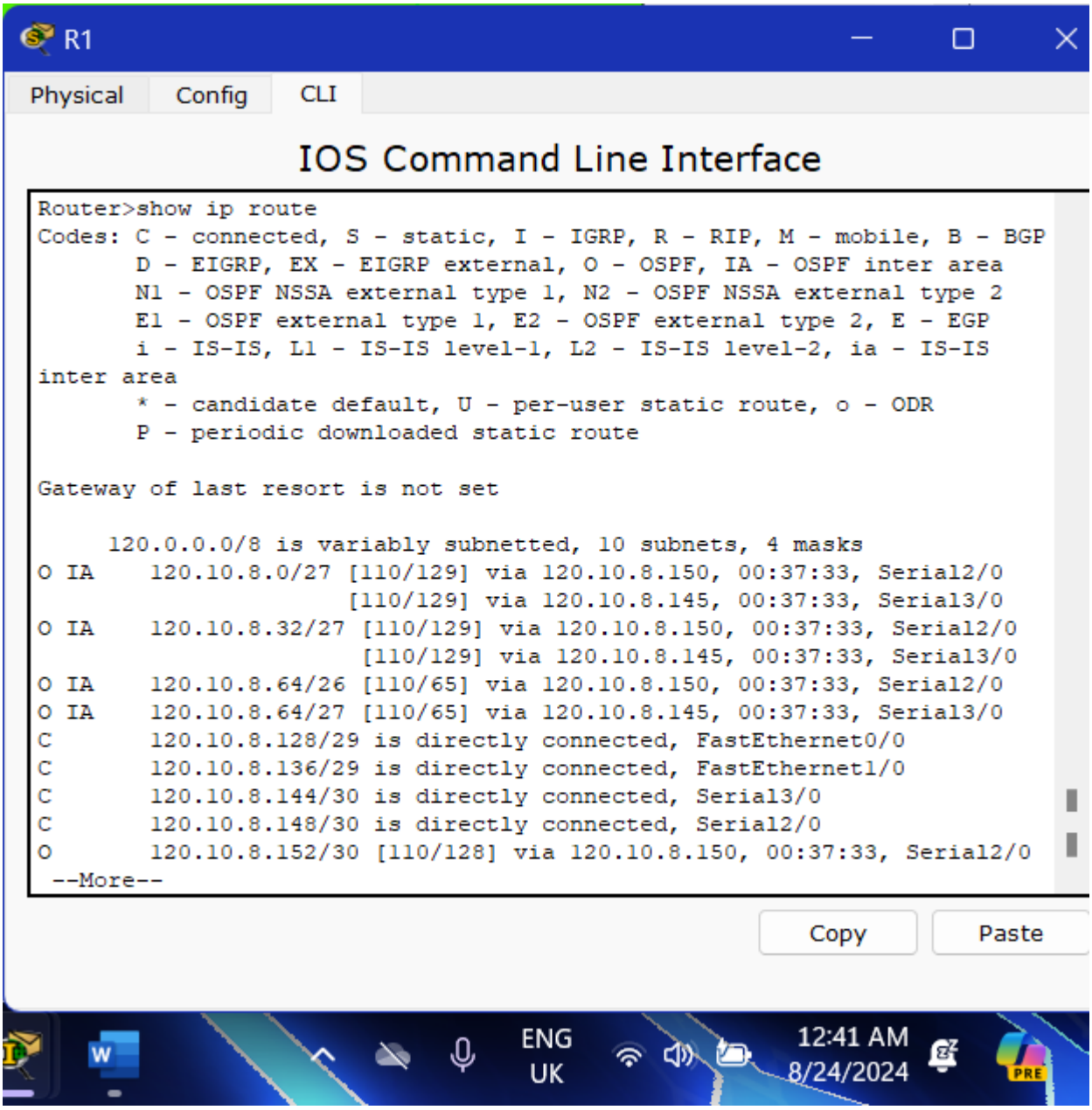


Figure 76:The Routing tables for R1.

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

- R2:

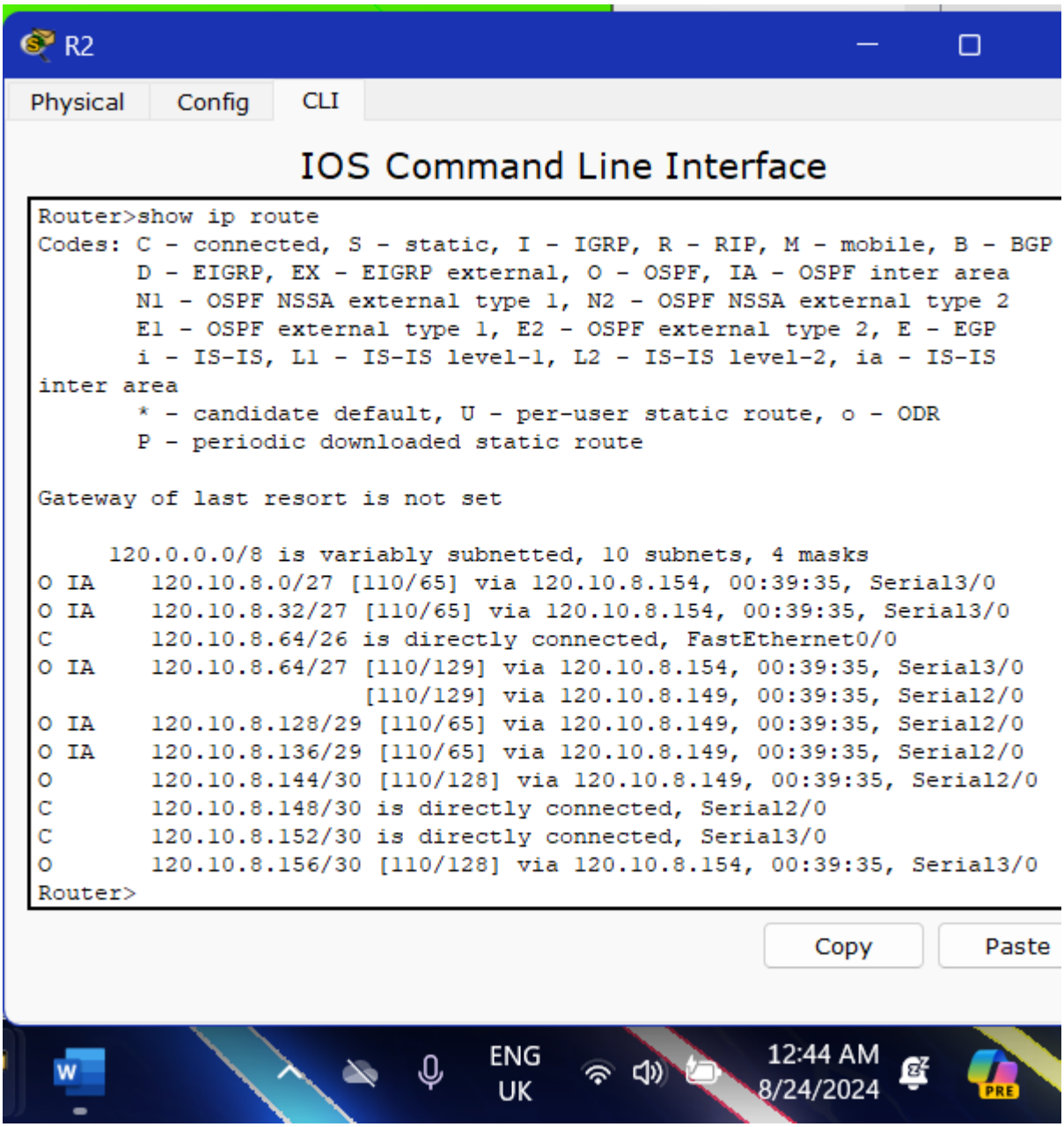


Figure 77:The Routing tables for R2.

This screen show the routing table for R2 using "show Ip route" command.

- R3:

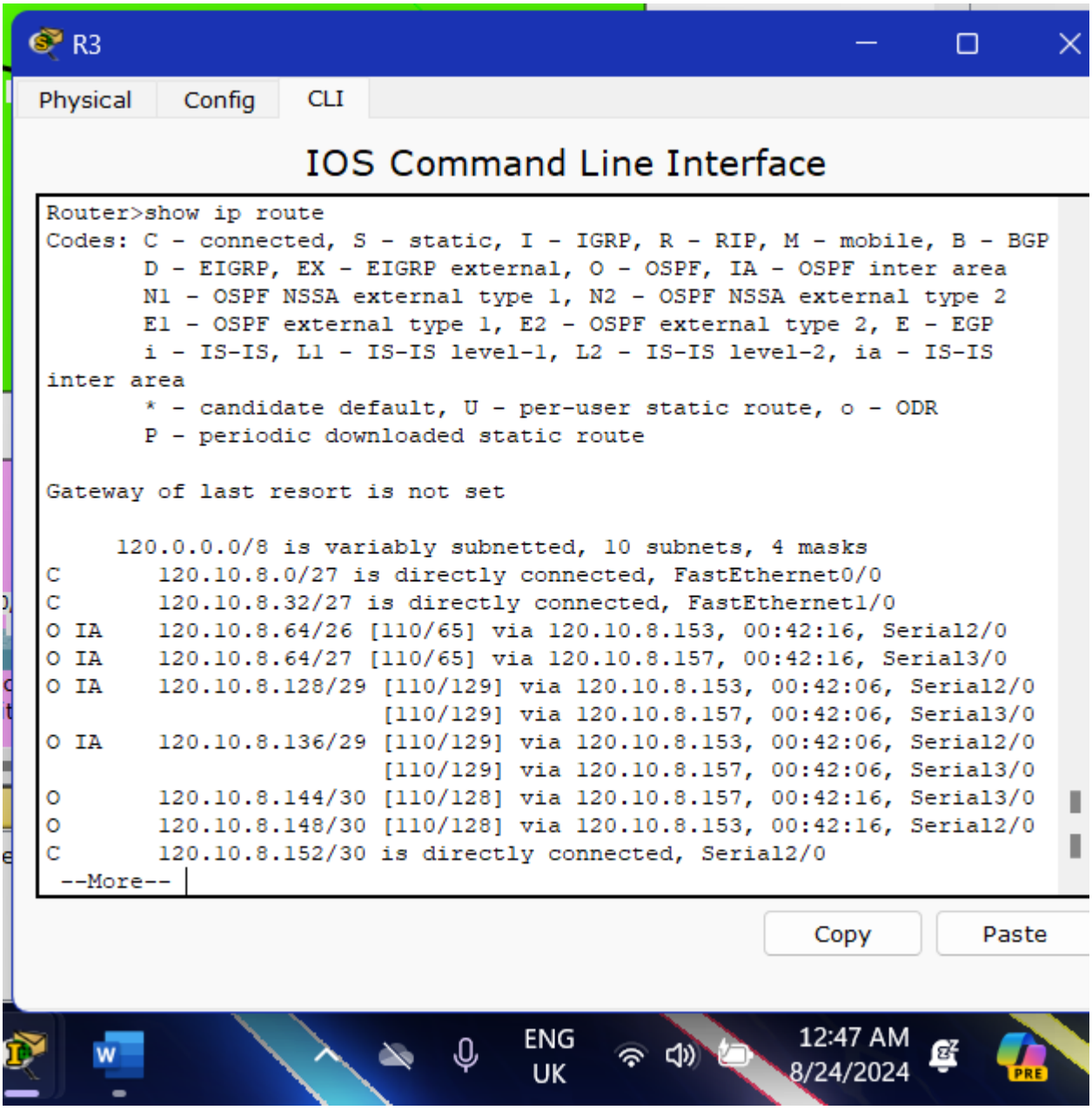


Figure 78:The Routing tables for R3.

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

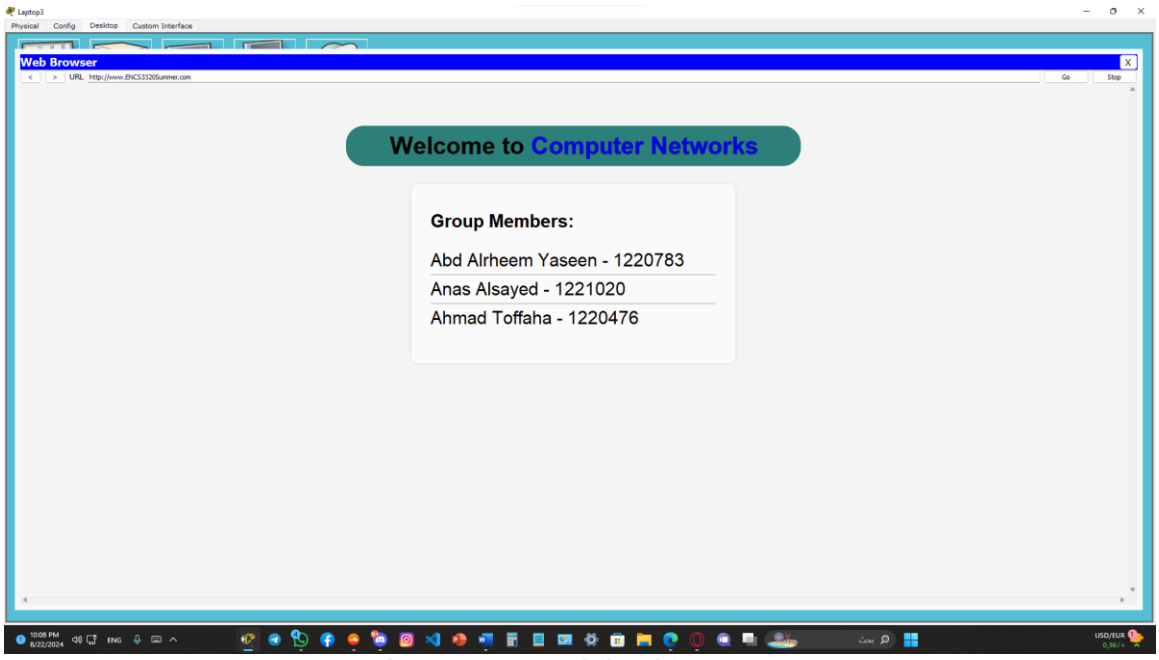


Figure 80 our web html from pc 1

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

Figure 81 Laptop 1 Desktop

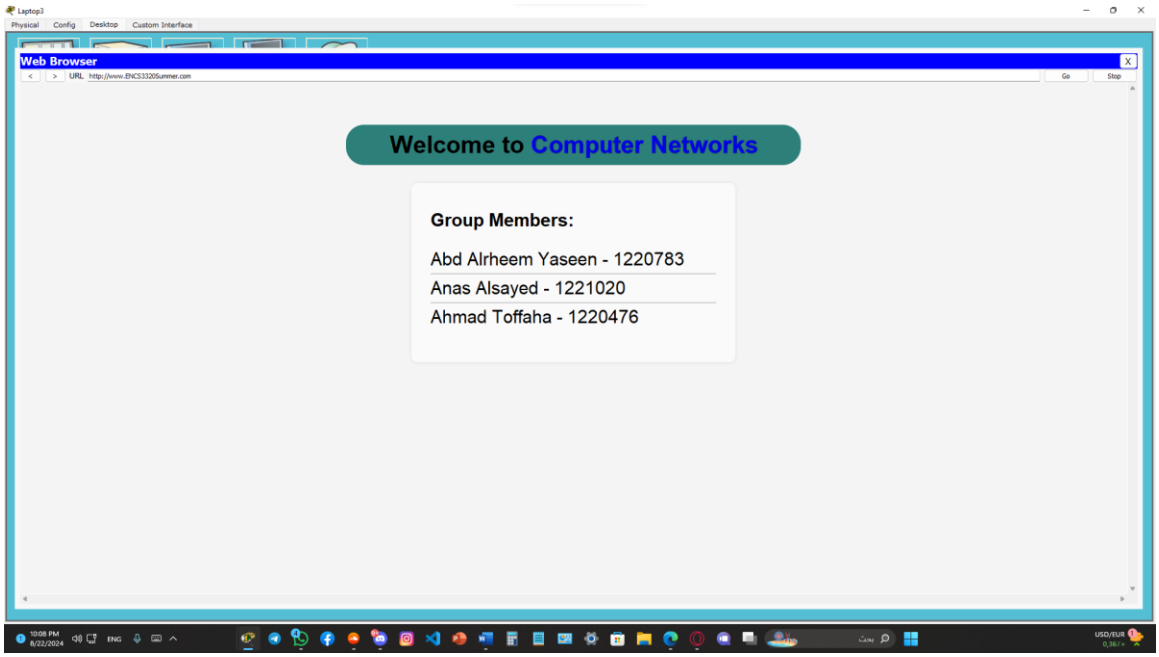


Figure 82 our web html from Laptop 1

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

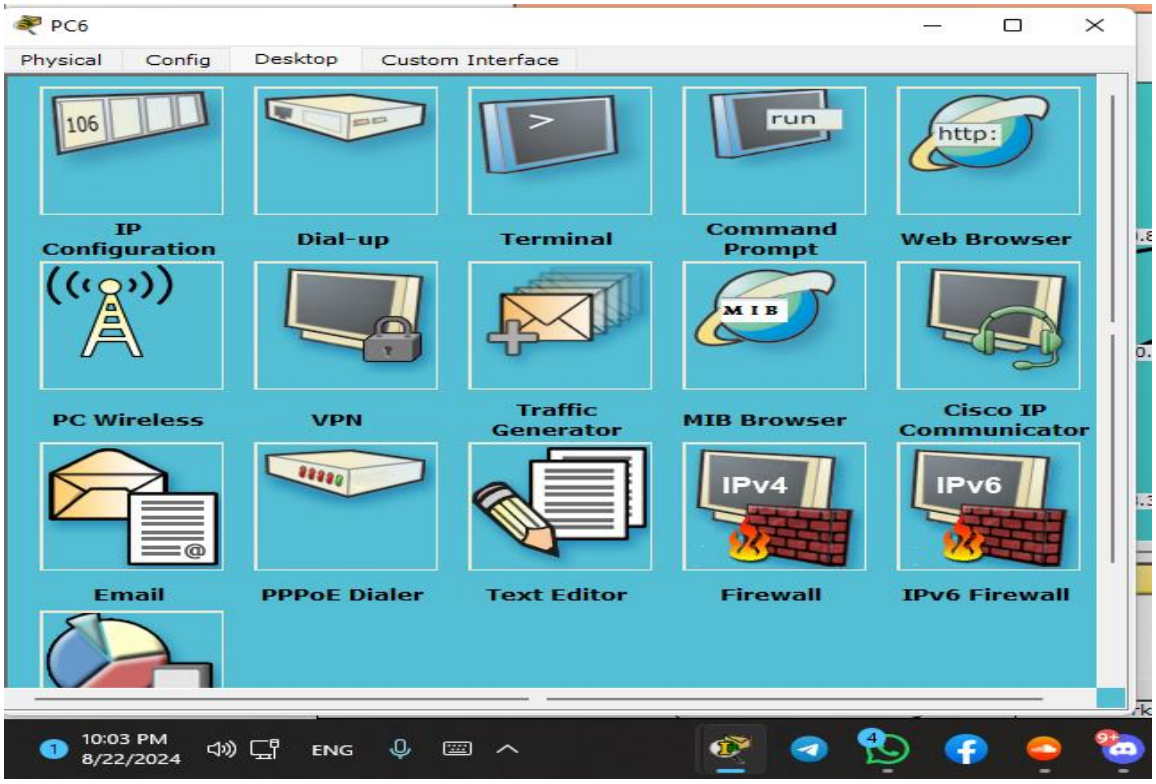


Figure 83 PC 6 Desktop

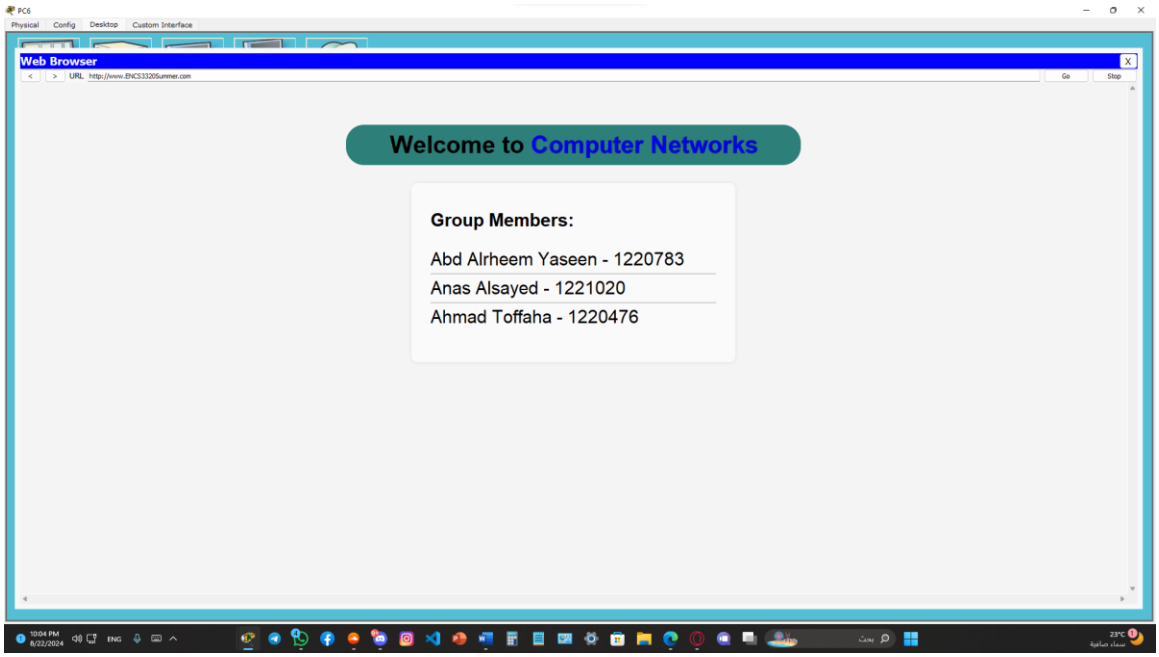


Figure 84 our web html from pc 6

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

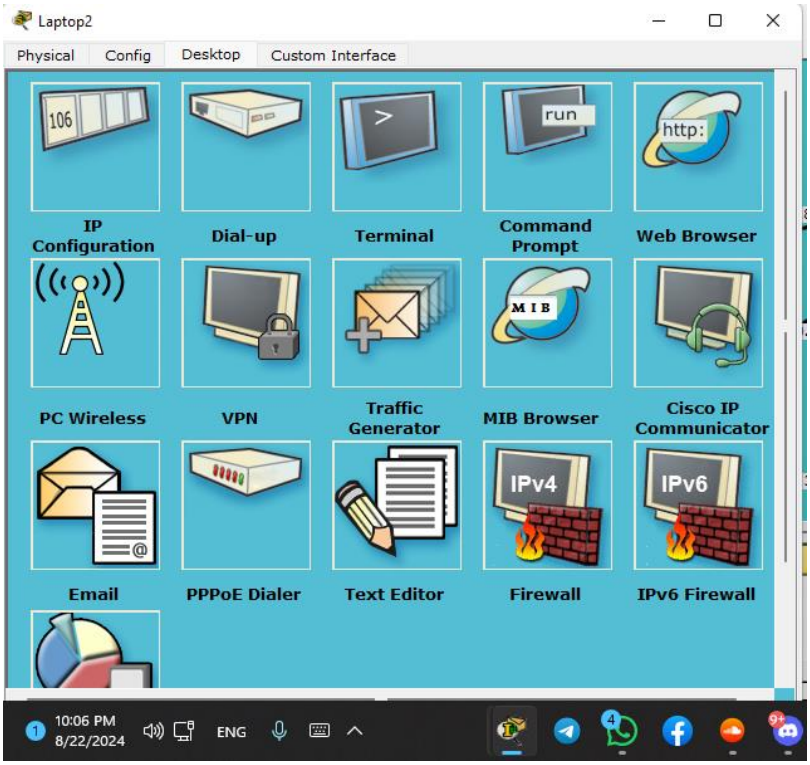


Figure 85 Laptop 2 Desktop

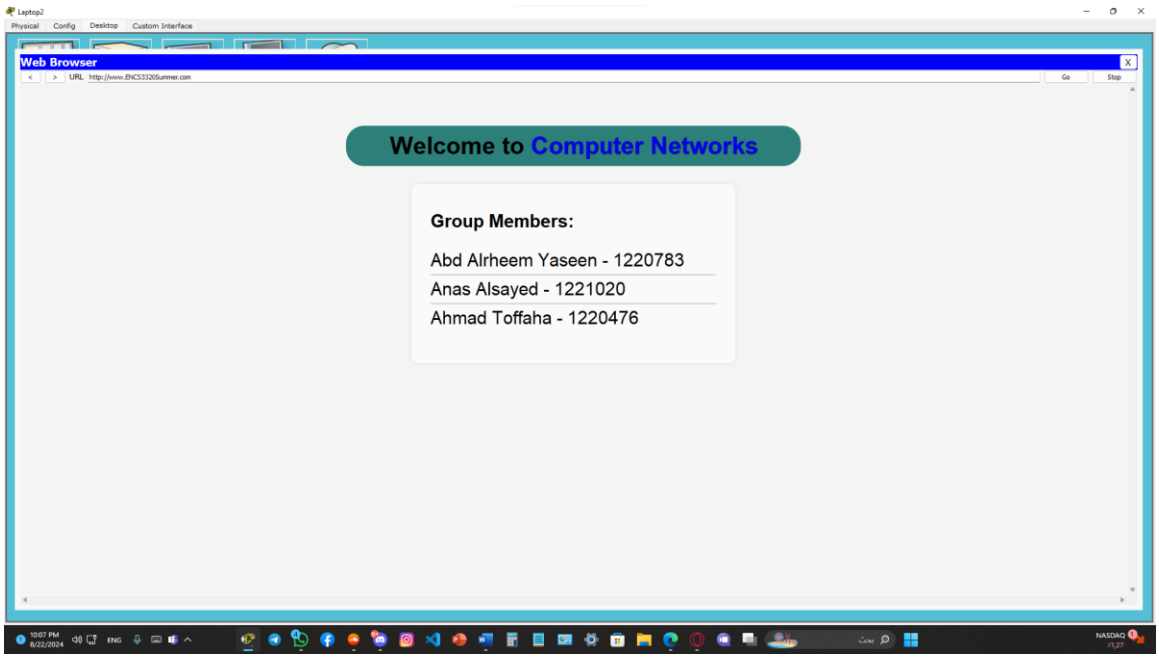


Figure 86 our web html from Laptop 2

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

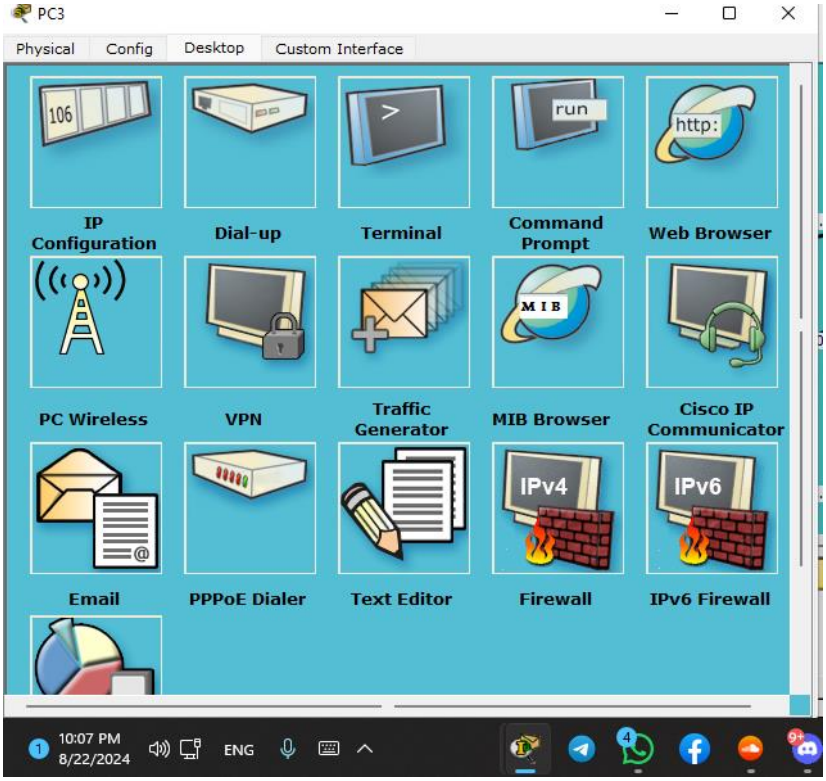


Figure 87 PC 3 Desktop

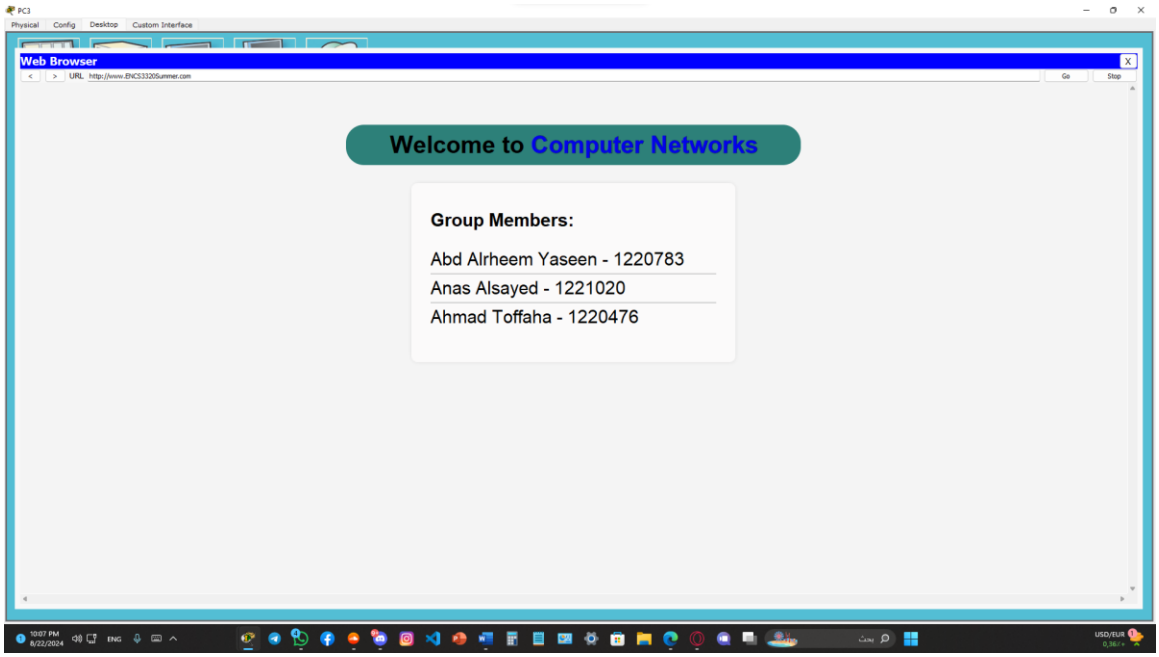


Figure 88 our web html from pc 3

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

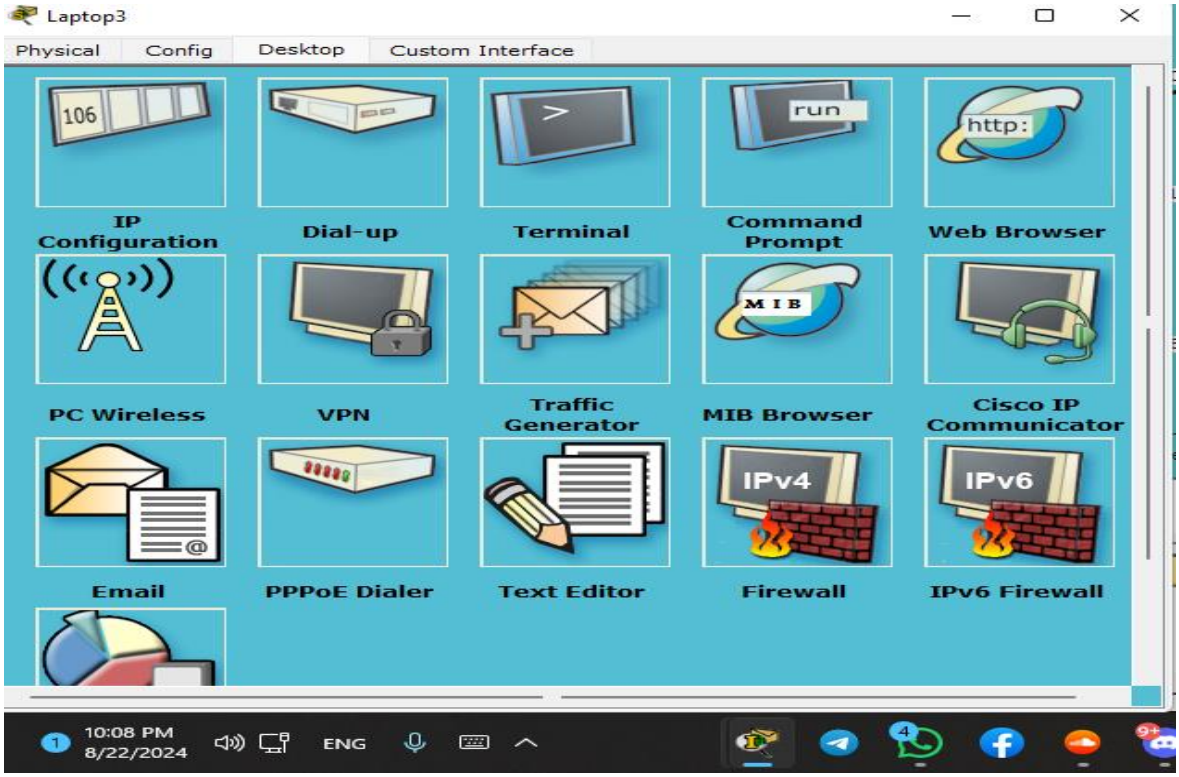


Figure 89 Laptop 3 Desktop

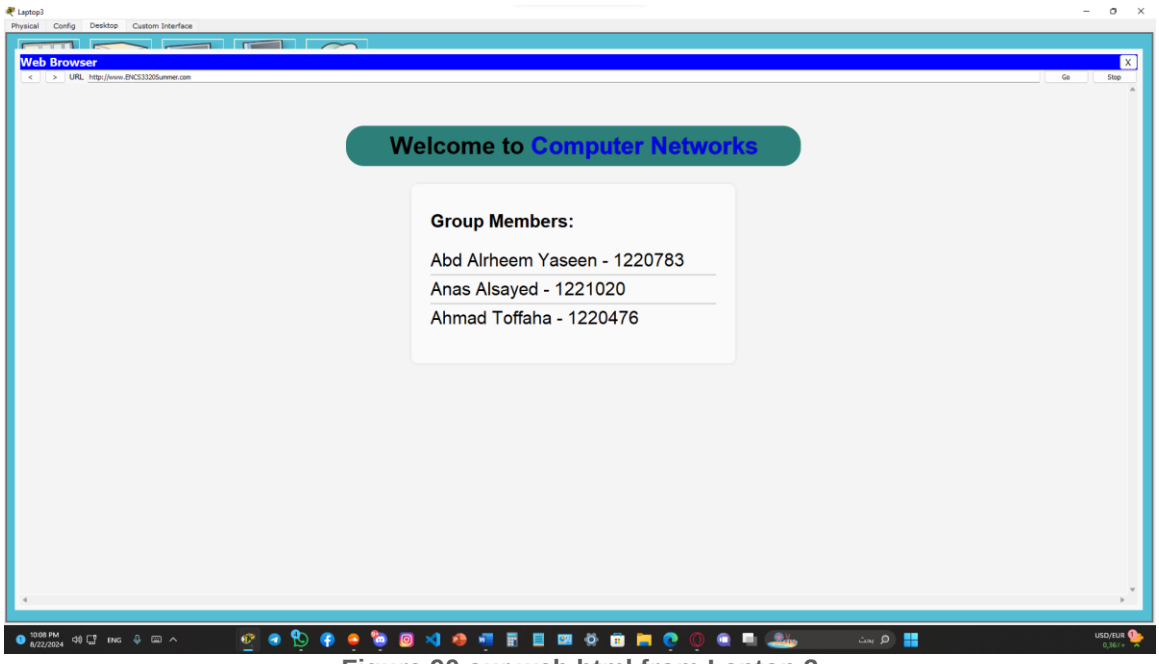
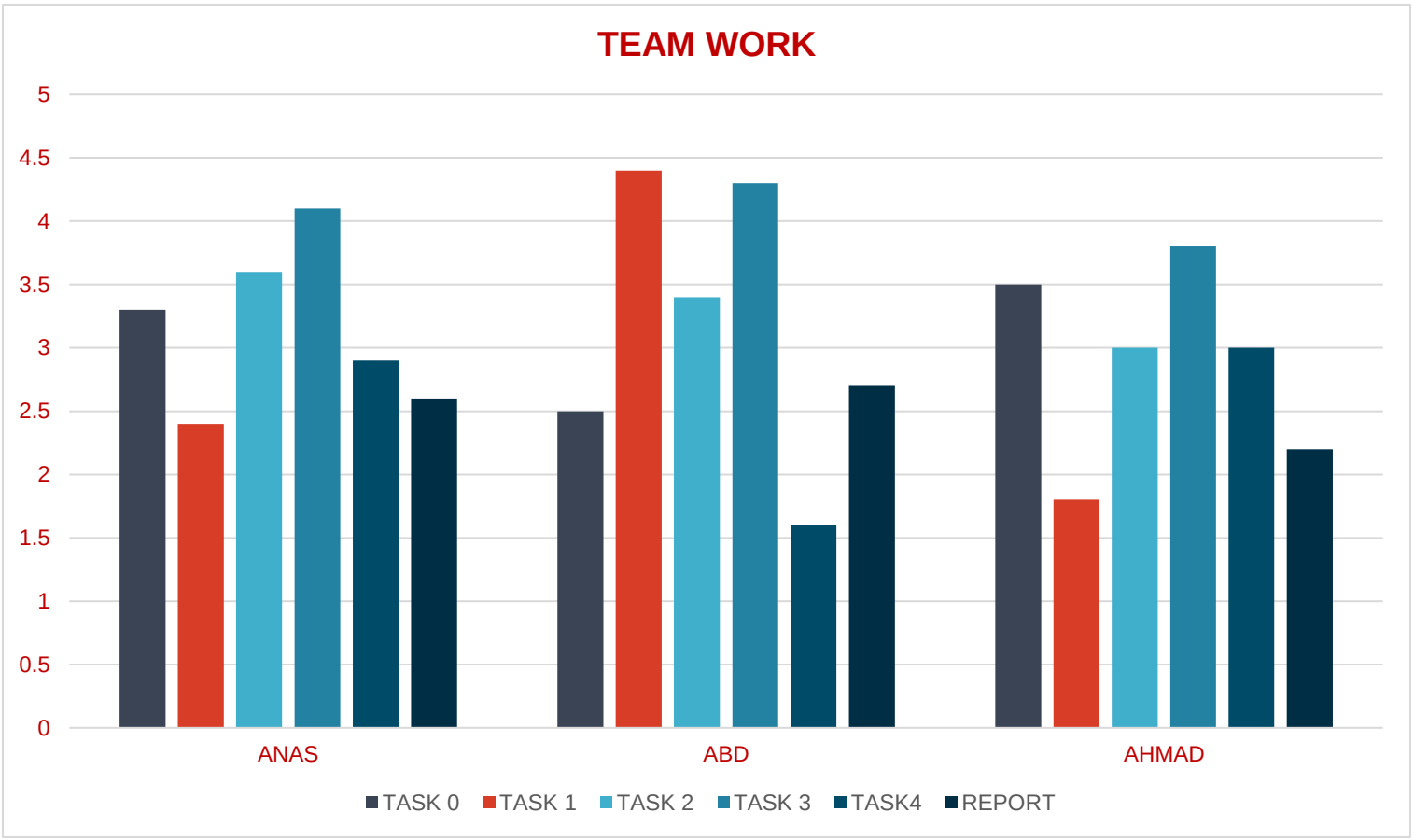


Figure 90 our web html from Laptop 3

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

TEAM WORK:


TEAM WORK
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
ANAS
ABD
AHMAD
TASK 0
TASK 1
TASK 2
TASK 3
TASK4
REPORT