



**Faculty of Engineering & Technology**

**Electrical & Computer Engineering Department**

**ENCS3320-Computer Networks**

**Project#2**

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## Part 0: IP subnetting and assignment

My ID =1201139

So, the network will be 197.11.0.0/24

Since there are 6 networks in total, we need to use 3 bits for subnetting so they will be as follows:

1. Subnet 1: 197.11.0.0/27 (Subnet Mask: 255.255.255.224)
2. Subnet 2: 197.11.0.32/27 (Subnet Mask: 255.255.255.224)
3. Subnet 3: 197.11.0.64/27 (Subnet Mask: 255.255.255.224)
4. Subnet 4: 197.11.0.96/27 (Subnet Mask: 255.255.255.224)
5. Subnet 5: 197.11.0.128/27 (Subnet Mask: 255.255.255.224)
6. Subnet 6: 197.11.0.160/27 (Subnet Mask: 255.255.255.224)
7. Subnet 7: 197.11.0.192/27 (Subnet Mask: 255.255.255.224)
8. Subnet 8: 197.11.0.224/27 (Subnet Mask: 255.255.255.224)

## Part 1: Building the topology

Topology:

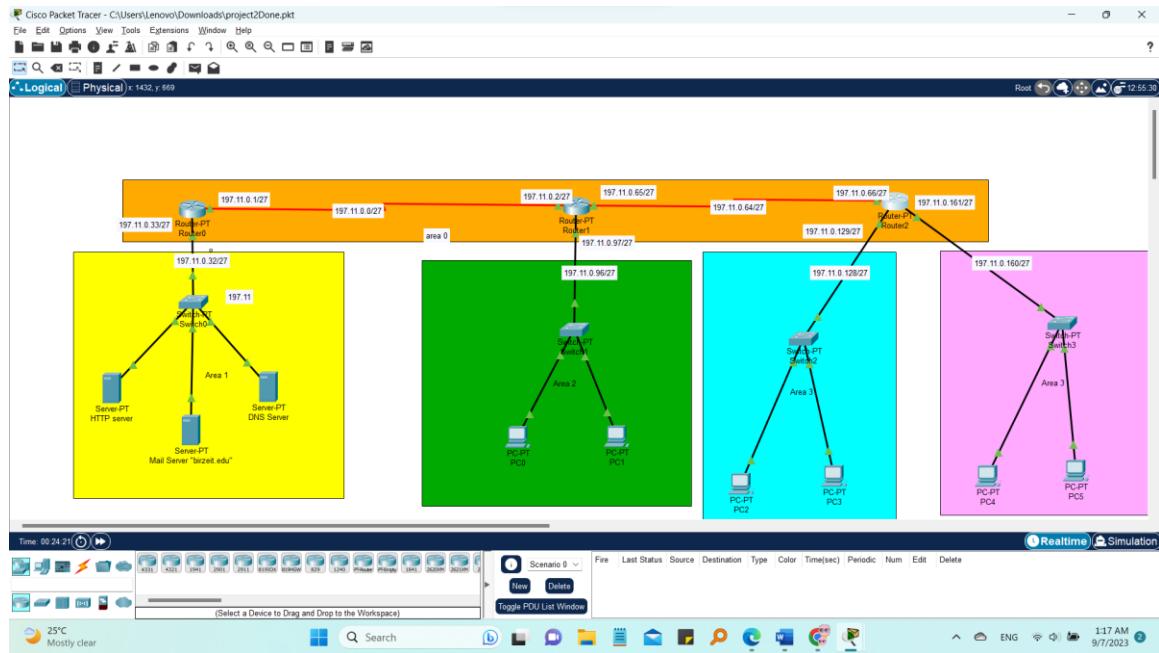


Figure 1 : topology built

## Configuring the interfaces of the routers:

Each port of the routers has been given an ip address according to the subnet it was connecting to

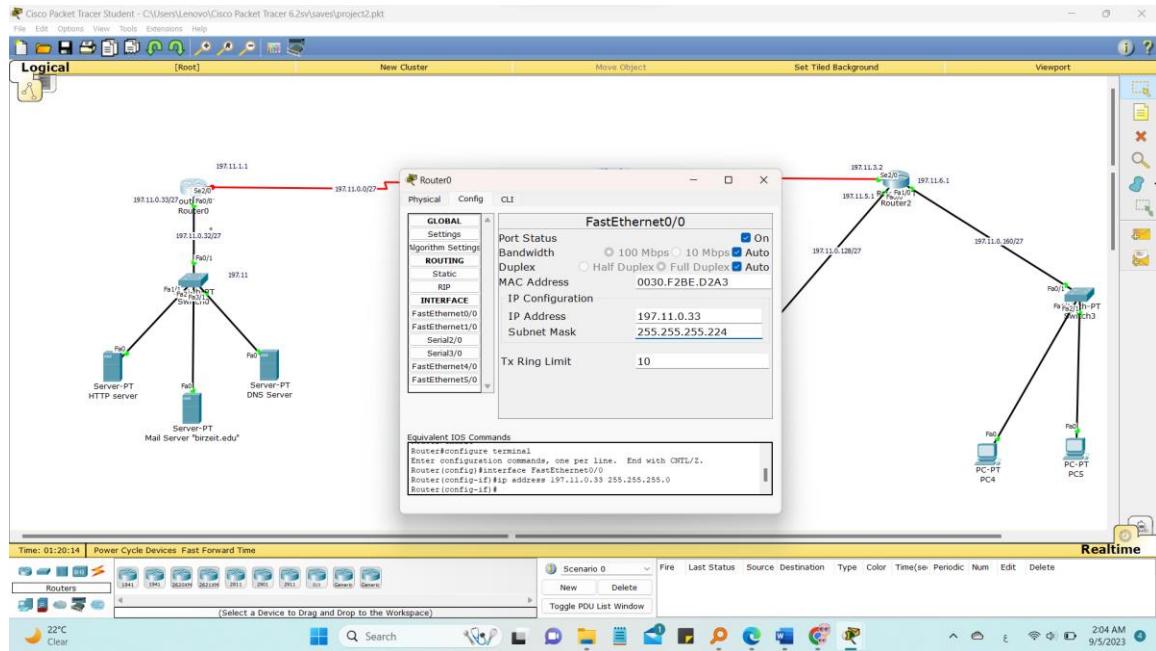


Figure 2:router 0 fa

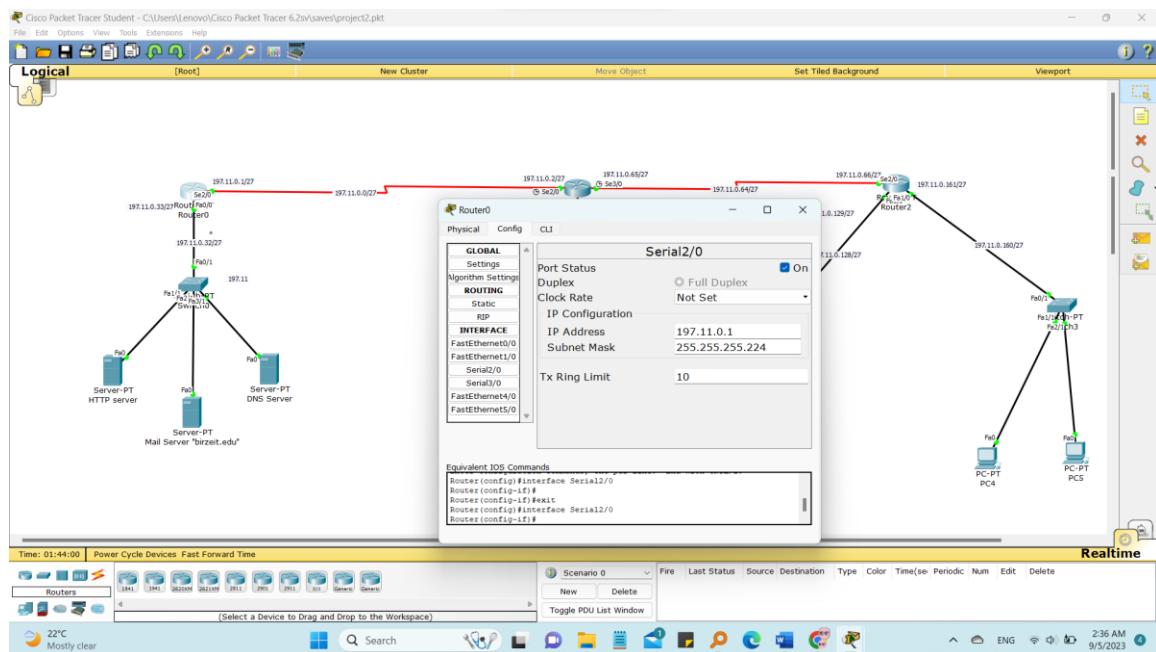


Figure 3 : router 0 serial 2

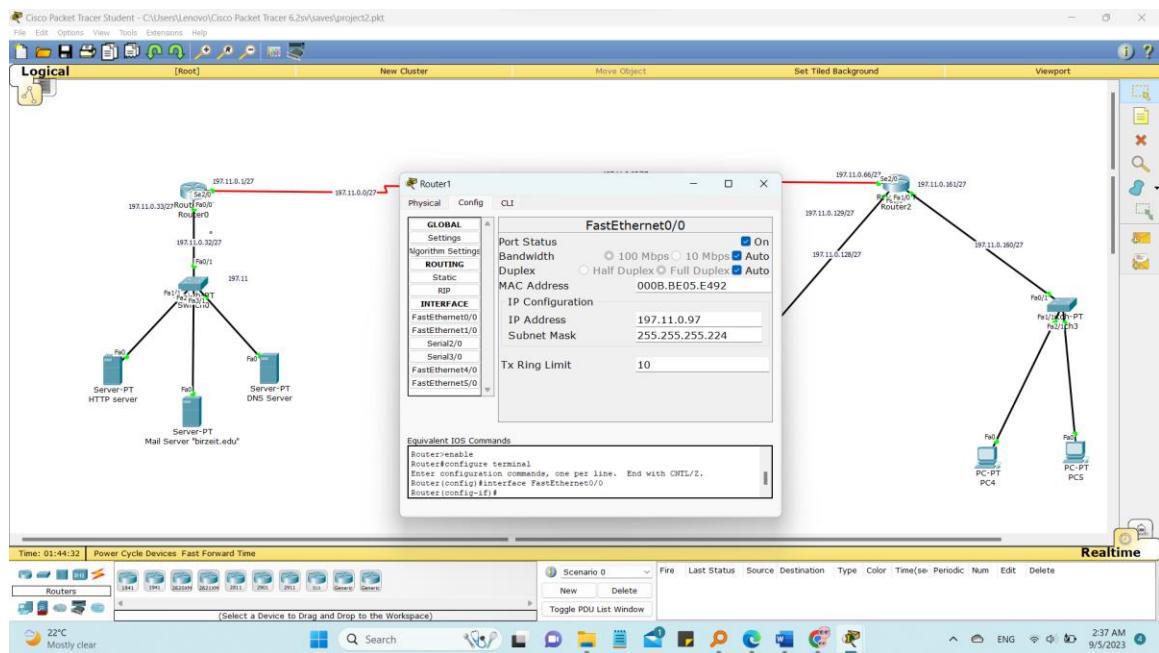


Figure 4 : router 1fa

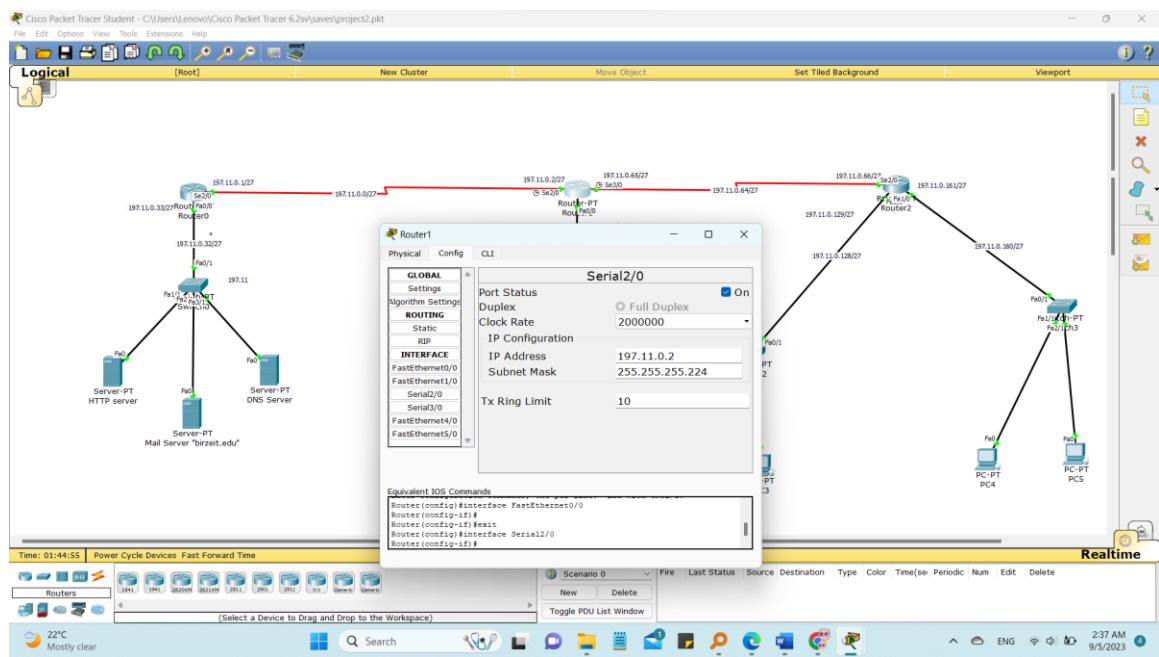


Figure 5:router 1 serial2

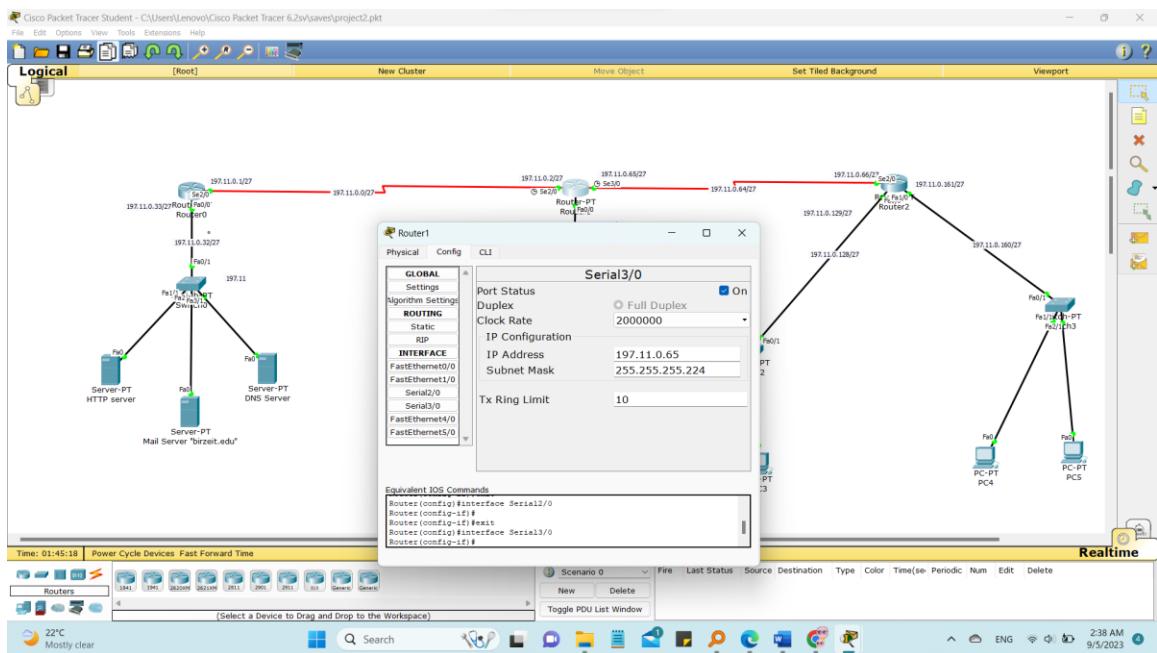


Figure 6 : router 1 serial 3

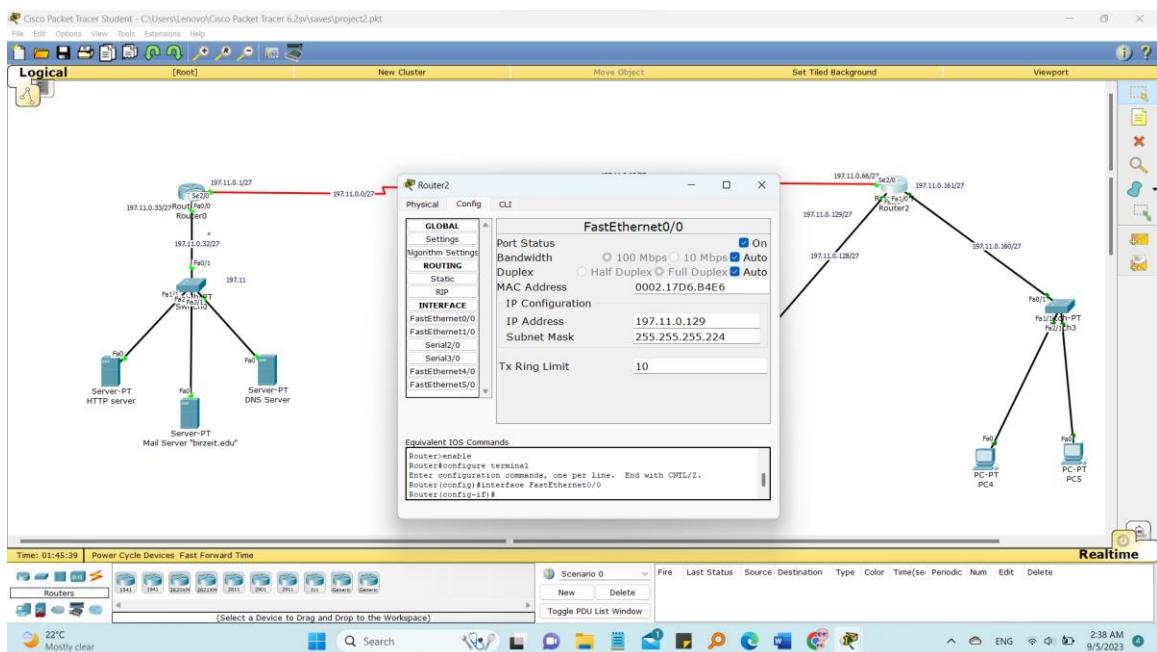


Figure 7 : router 2 fa0/0

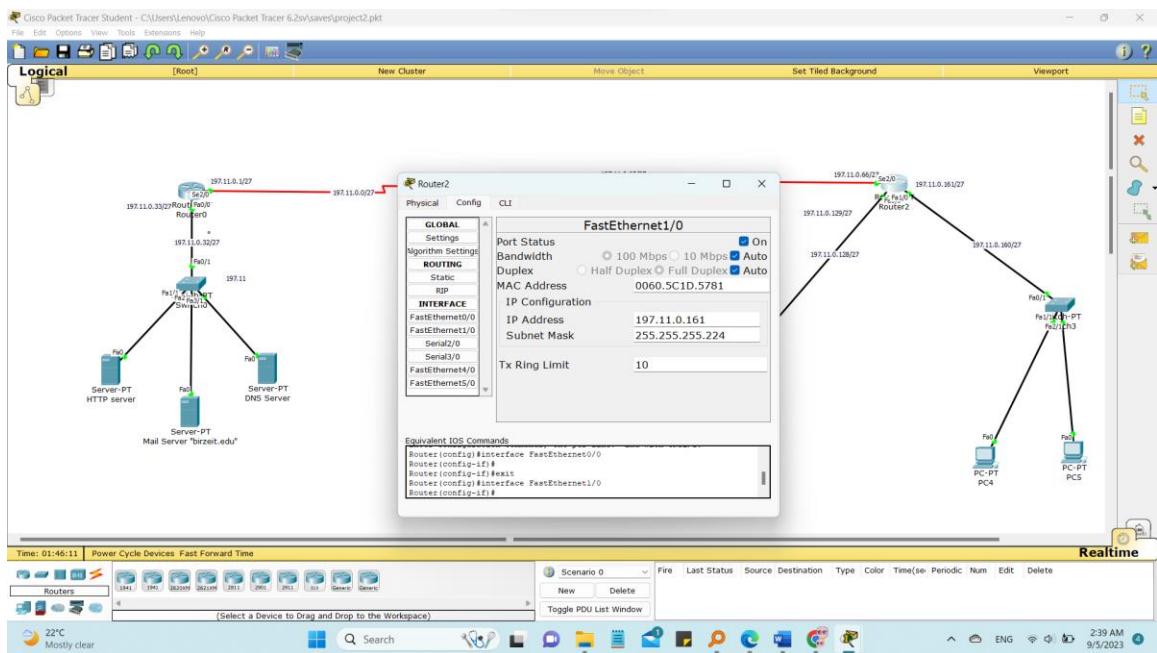


Figure 8 : router 2 : fa1/0

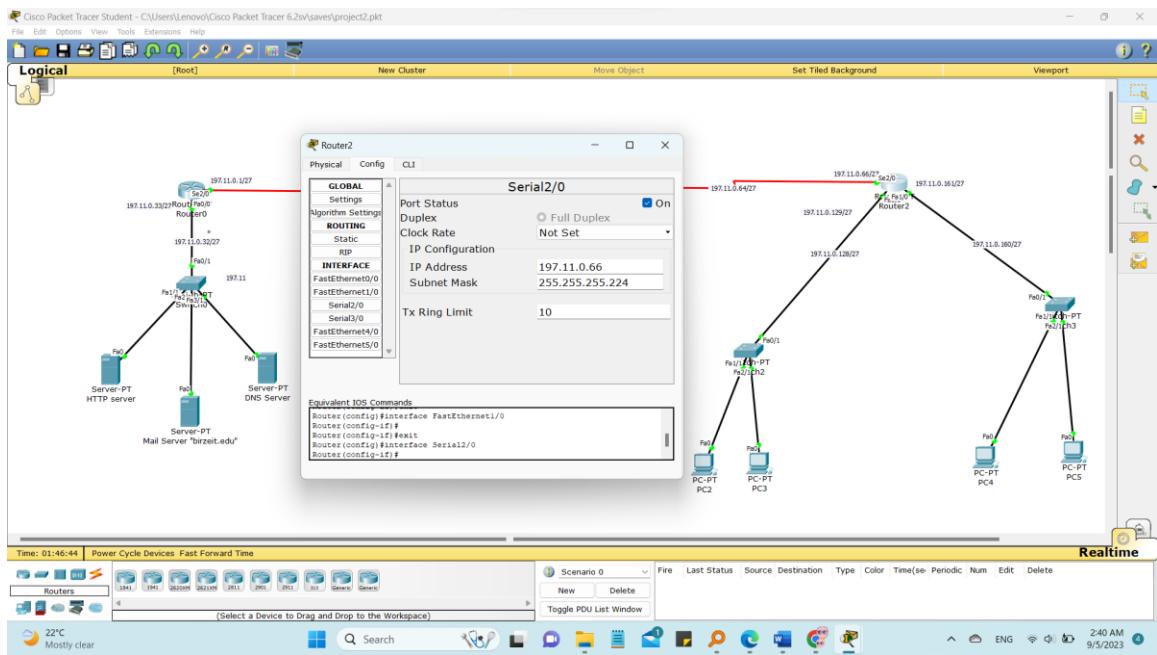


Figure 9: router 2 serial 2

## Configuring the end devices ips as static ips:

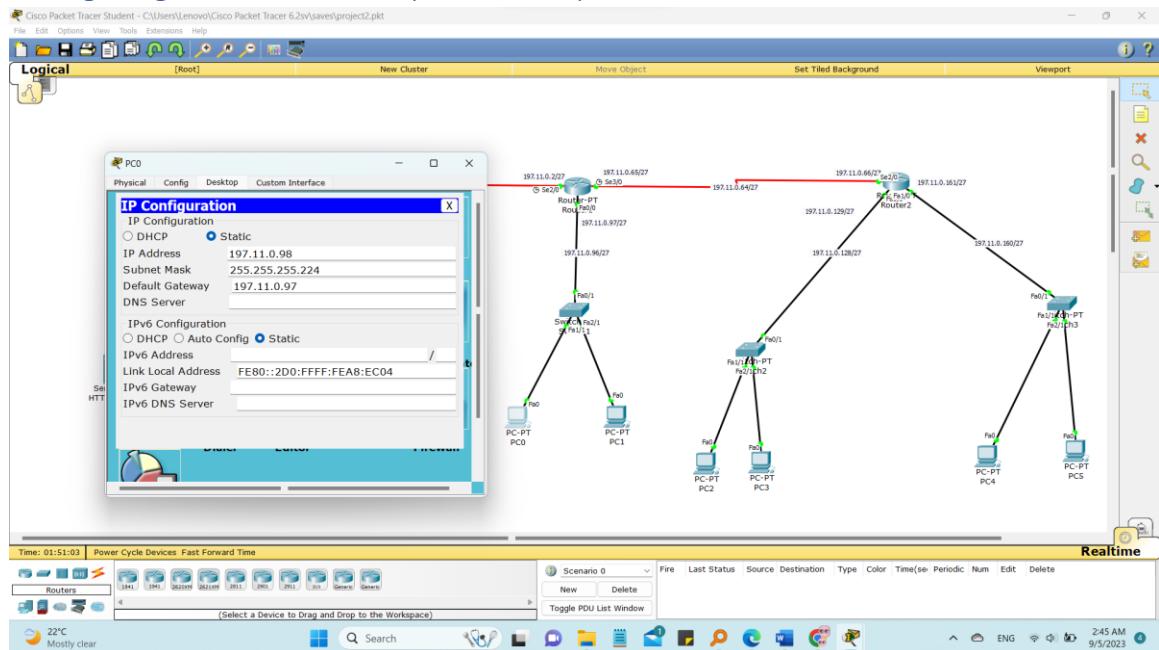


Figure 10 :pc0 configuration

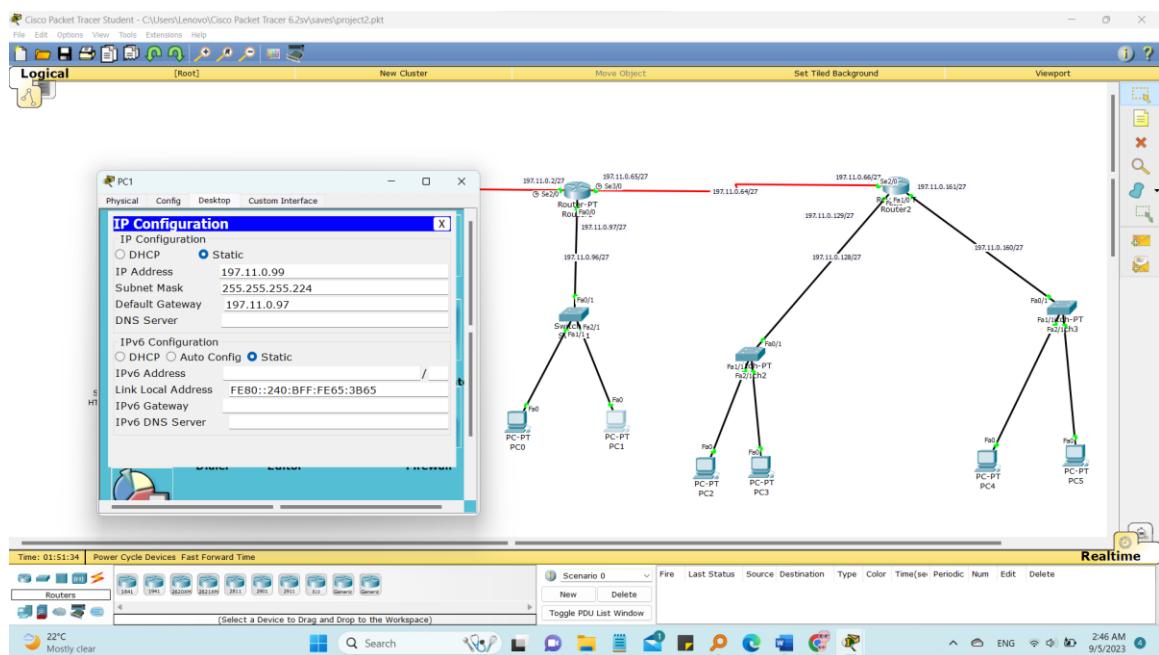


Figure 11:pc1 configuration

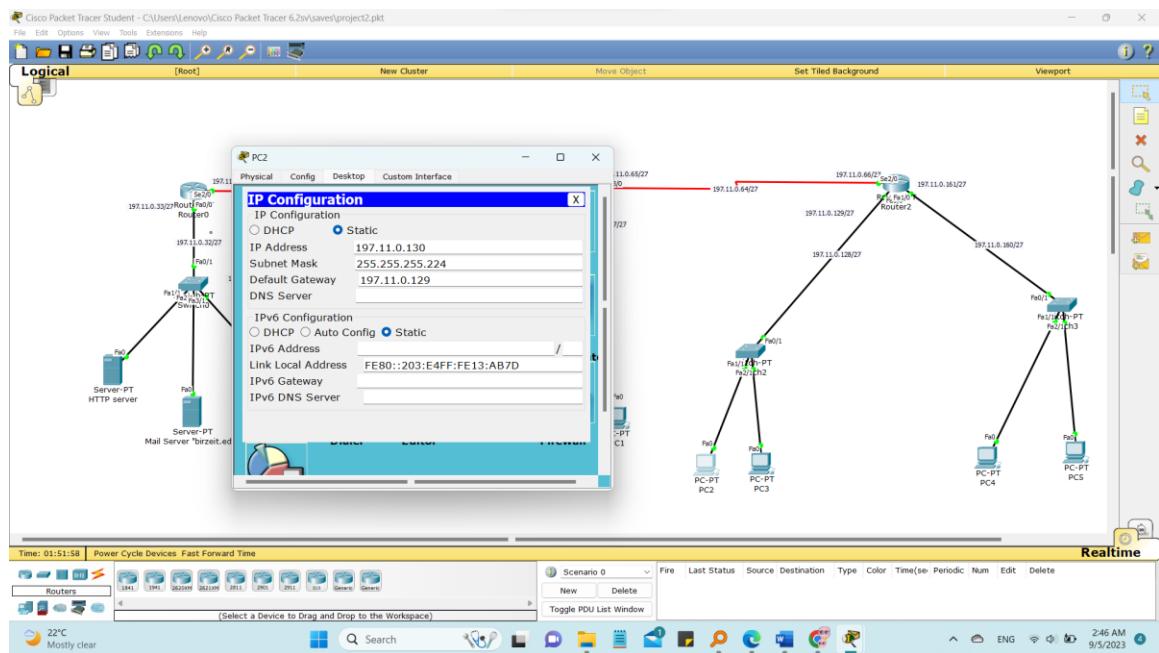


Figure 12 :pc2 configuration

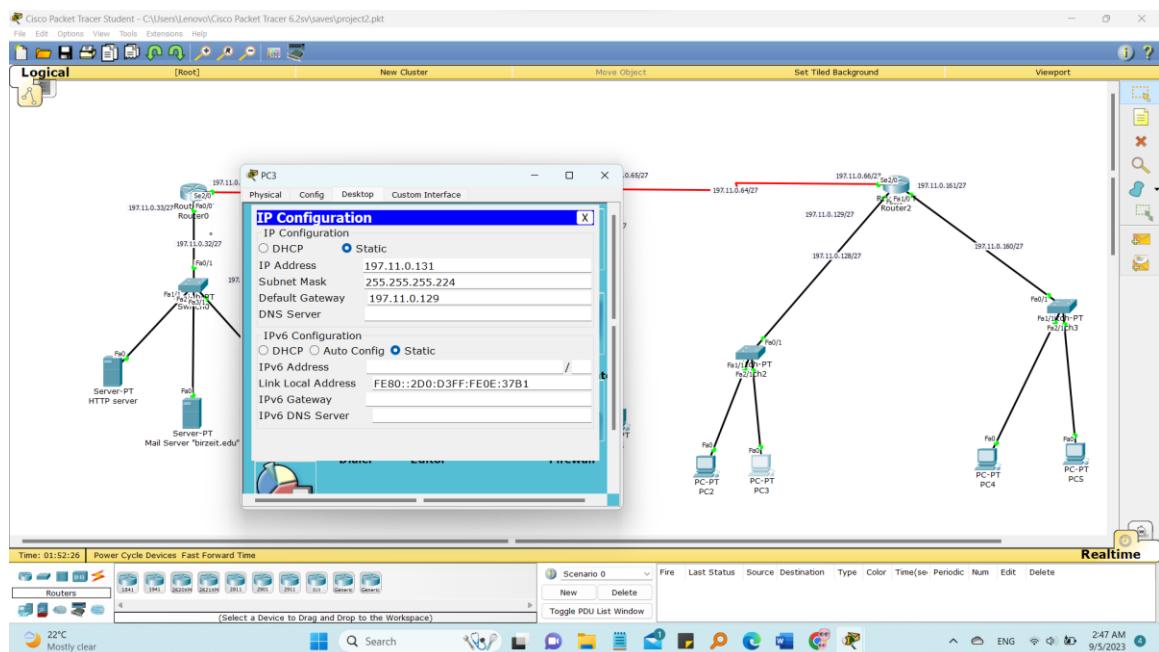


Figure 13 :pc3 configuration

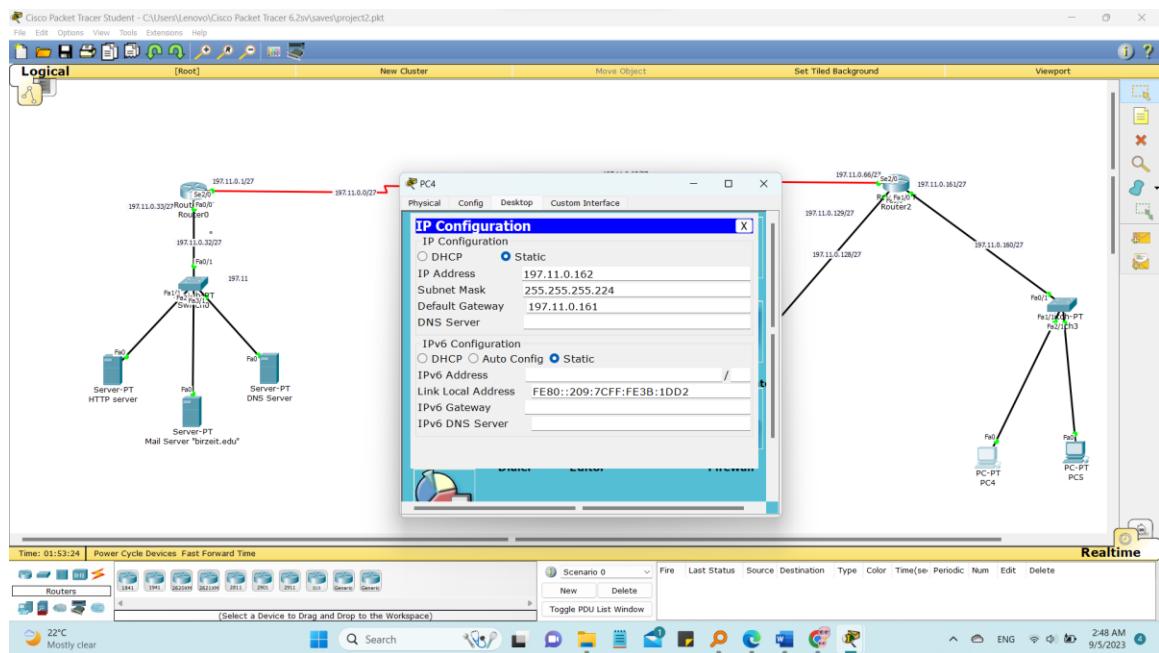


Figure 14 : pc4 configuration

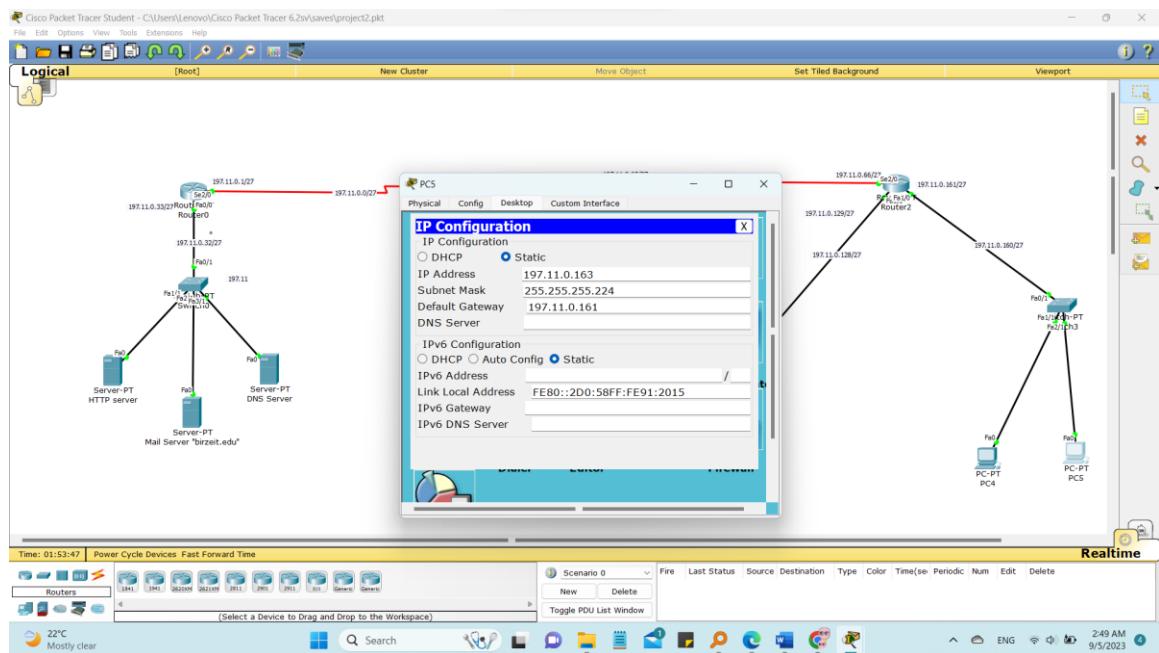


Figure 15 : pc5 configuration

## Part2: Configuring servers

Index.html code:

```
<!DOCTYPE html>
<html>
<head>
<title>ENCS3320-My First Webserver</title>
<link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
<h1>Welcome to our course <samp class="redcolor" > Computer Networks
</samp> </h1>
<p class="intro">Here are the group members and some information about them:</p>
<div class="student-box">
<h2>Student 1</h2>
<p>Name: Dana Ismail</p>
<p>ID: 1200006</p>
<p>Projects: Programming, Shill</p>
<p>Skills: C, Html,css, Problem Solving, SQL </p>
<p>Hobbies: cooking, reading</p>
</div>
<div class="student-box">
<h2>Student 2</h2>
<p>Name: Jana Herzallah</p>
<p>ID: 1201139</p>
<p>Projects: Programming, Data Base</p>
<p>Skills: HTML, CSS, Java-FX,Python</p>
<p>Hobbies:Drawing, Cooking </p>
</div>
<div class="student-box">
<h2>Student 3</h2>
<p>Name: Lana Badwan</p>
<p>ID: 1200937</p>
<p>Projects: Project managment, Machine learning</p>
<p>Skills: Java, C,python , shill</p>
<p>Hobbies: Playing bowling, drwaing</p>
</div>
</body>
</html>
```

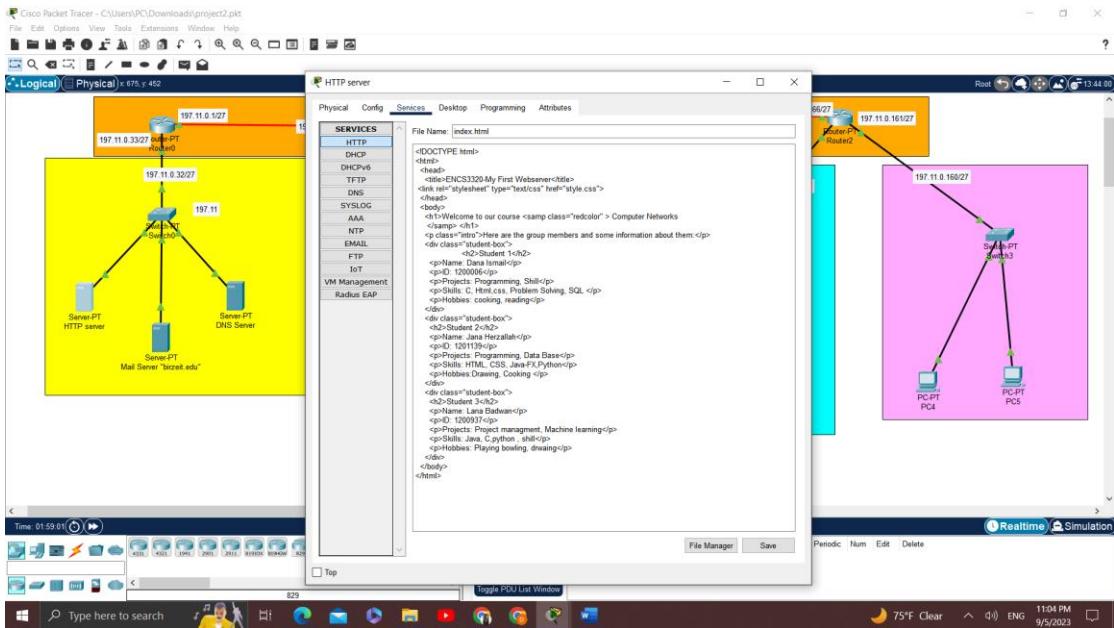


Figure 16 HTML code for HTTP server

### Style.Css code:

```
/* Set the background gradient */
body {
background: linear-gradient(to bottom, #FCA5F1, #B5FFFF);
margin: 0;
padding: 0;
font-family: Arial, sans-serif;
}
/* Style the student boxes */
.student-box {
background-color: #fff;
border-radius: 10px;
padding: 20px;
margin: 20px;
box-shadow: 0px 0px 10px rgba(0, 0, 0, 0.2);
transition: transform 0.2s ease-in-out;
}
.student-box:hover {
transform: scale(1.05);
}
/* Style the text inside the boxes */
.student-box h2 {
color: #FCA5F1;
}
.student-box p {
margin: 5px 0;
color: #333;
```

```

}

/* Style the "Welcome to our course" heading */
h1 {
background-color: #fff;
padding: 10px;
border-radius: 10px;
text-align: center;
}

/* Style the "Computer Networks" text */
.redcolor {
color: #FCA5F1;
}

/* Style the introductory paragraph */
.intro {
font-style: italic;
text-align: center;
color: #333;
}

```

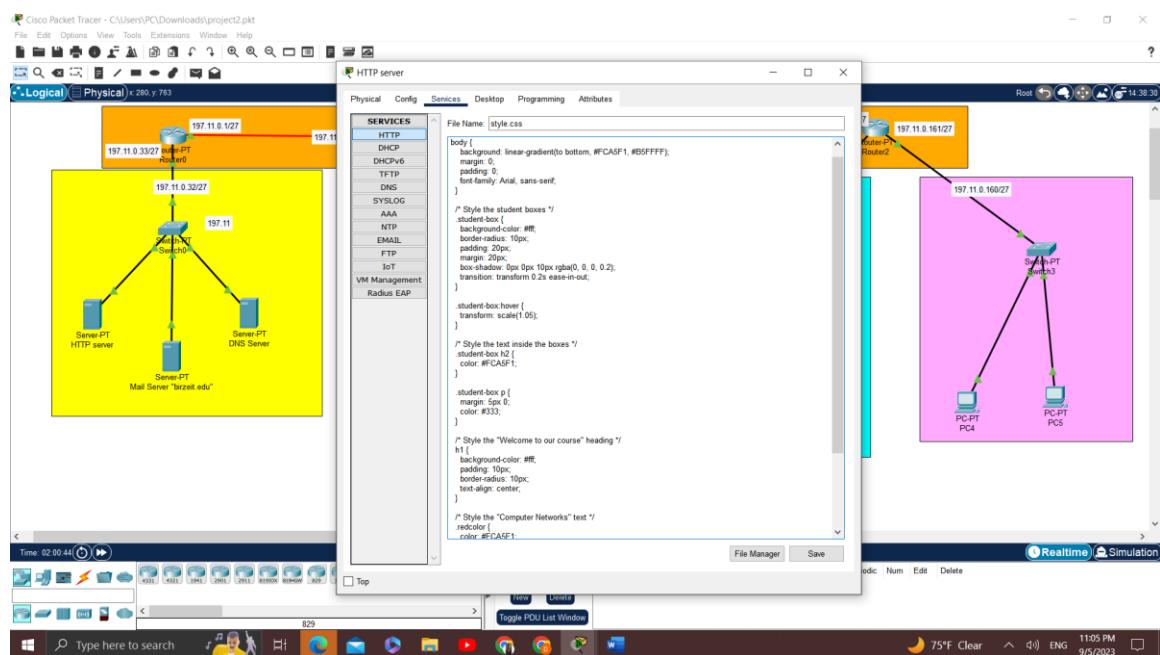


Figure 17 CSS file for HTTP server

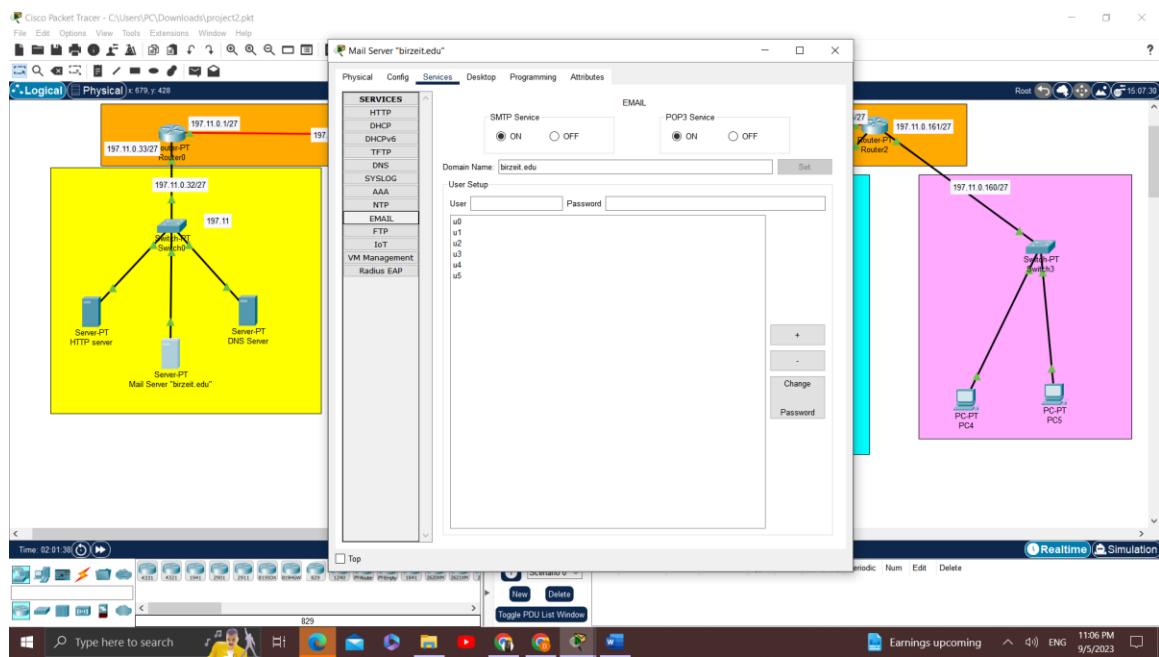


Figure 18 Add users with u321 password

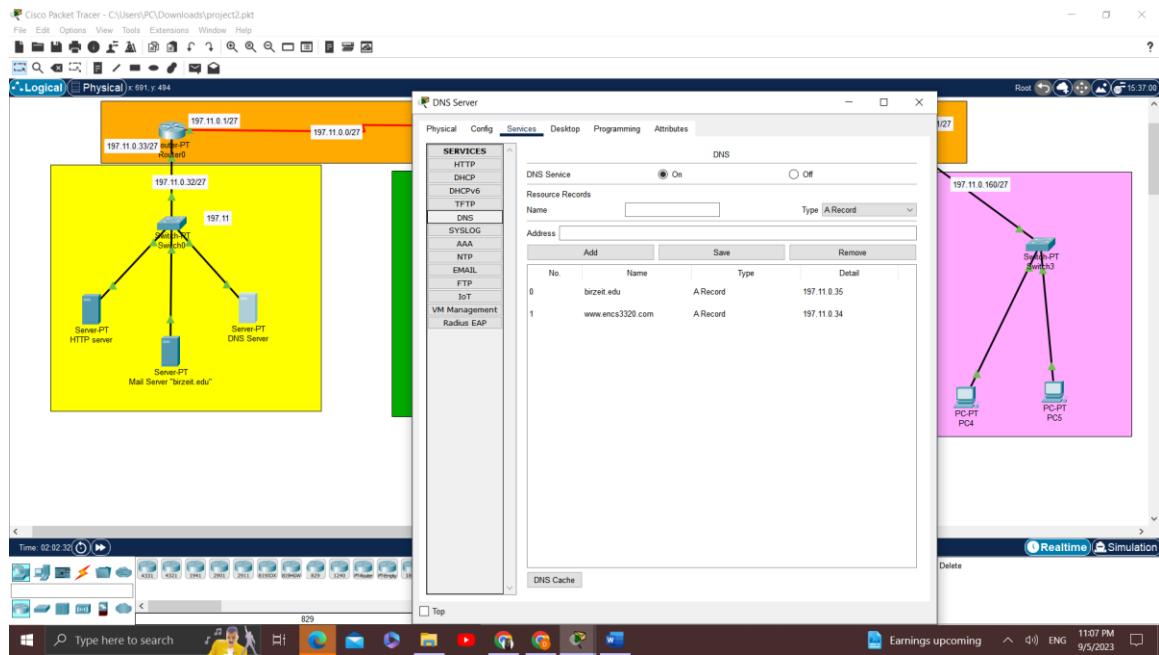


Figure 19 DNS server connection with (HTTP & Mail) server

## Part 3: Applying routing protocol

### Wild mask

Since our subnet mask is 255.255.255.224 0.0.0.31 the wild mask to the subnet mask

For the ospf configuration we followed these steps:

### Configuration Steps for OSPF:

#### 1.1. OSPF Router Configuration:

- Access the router's command-line interface.
- Enable OSPF routing using the command **router ospf <process\_id>**.
- Assign a router ID using **router-id <router\_id>**.
- Define OSPF areas with the **area <area\_id> range <network> <wildcard\_mask>** command.

#### 1.2. Interface Configuration:

- Access interface configuration mode (**interface <interface\_type> <interface\_number>**).
- Enable OSPF on the interface with **ip ospf <process\_id> area <area\_id>**.

As shown below for each router:

### Router0

Ospf 10 because the process id =10

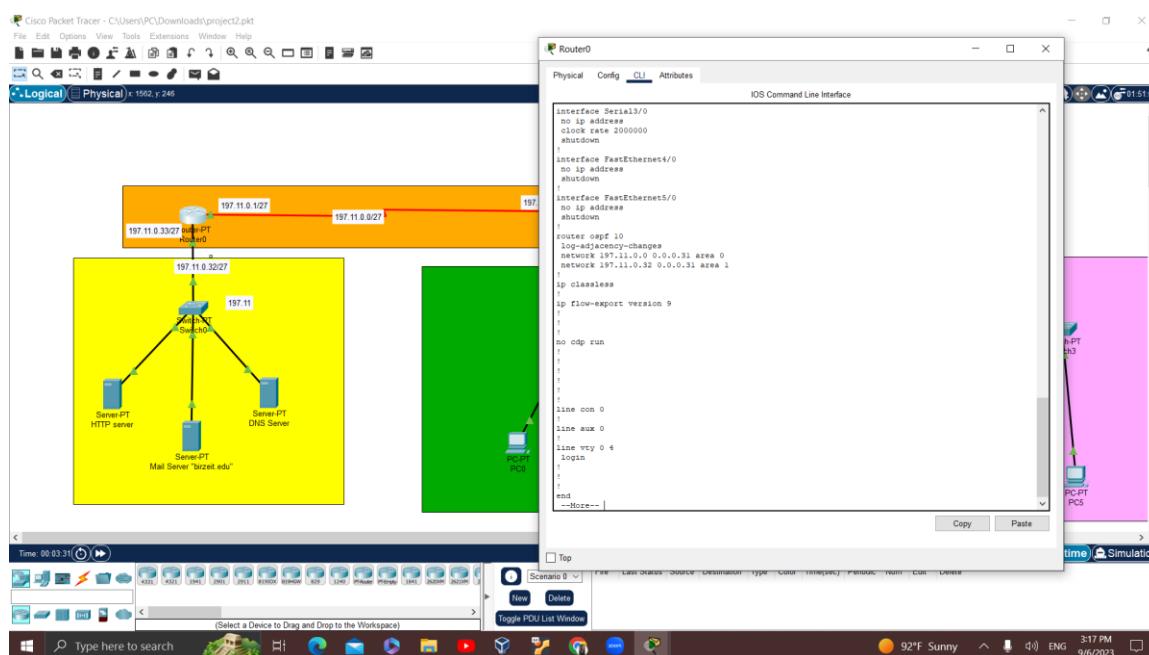


Figure 20: ospf for router0

## Router1

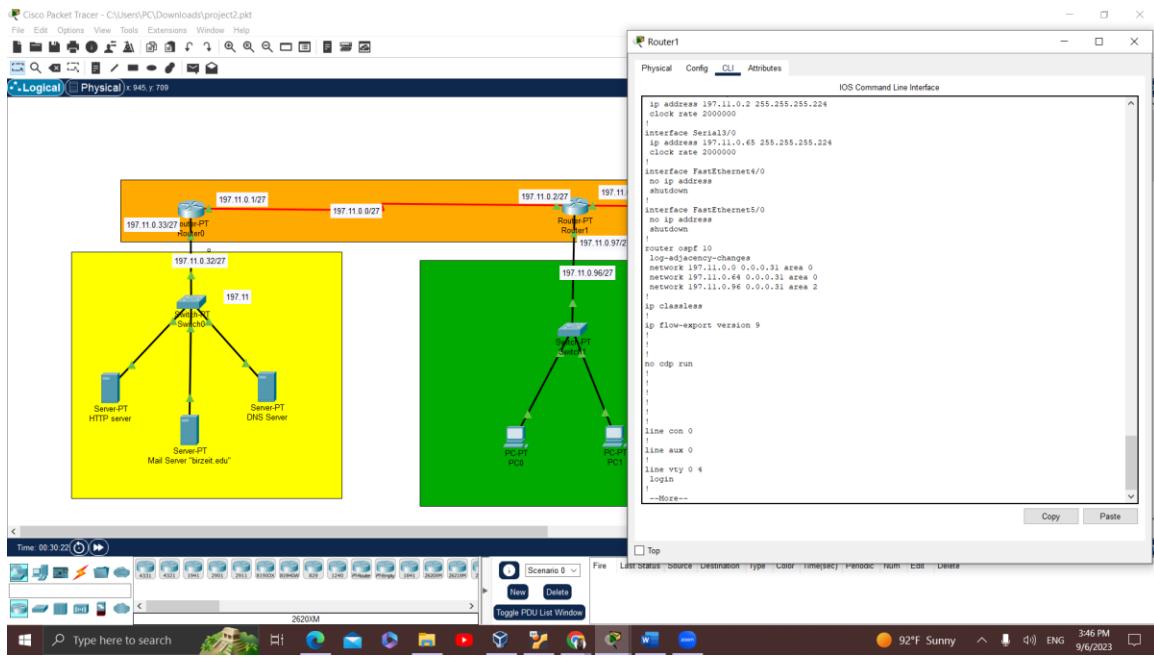


Figure 21 OSPF for router 1

## Router2

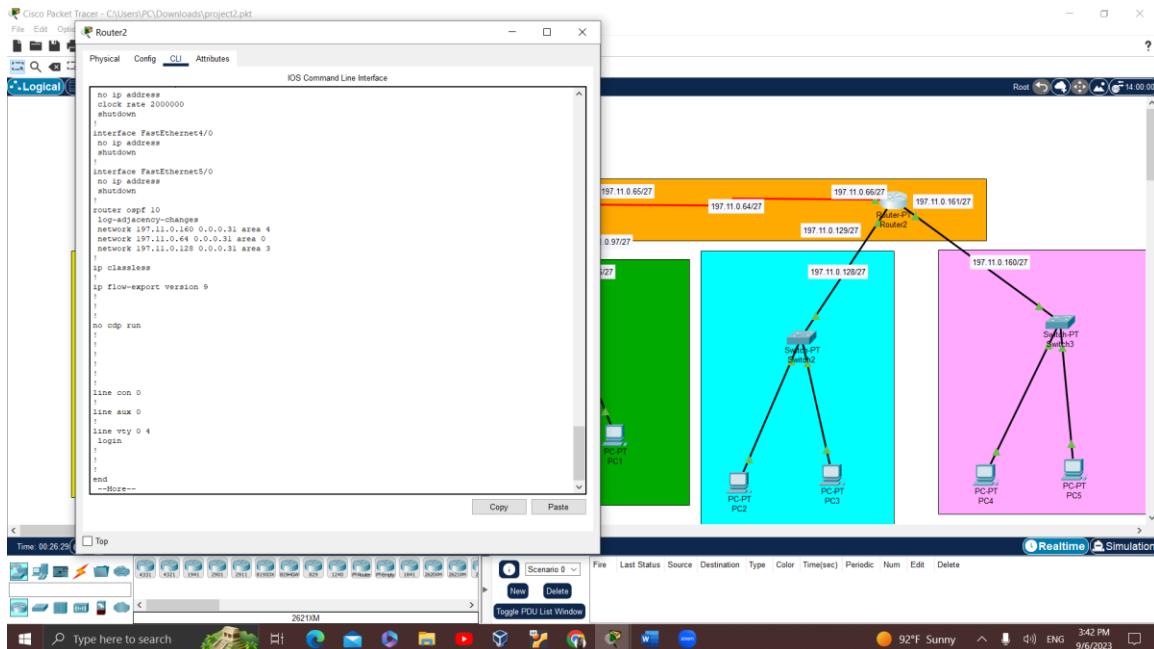


Figure 22 show on for router2

## Part 4: Testing connectivity, routes, website, and emails:

### 1. Pcs pinging each other and tracert in the same subnet:

All pcs could ping and tracert other pcs in their subnets and through different subnets in the next section

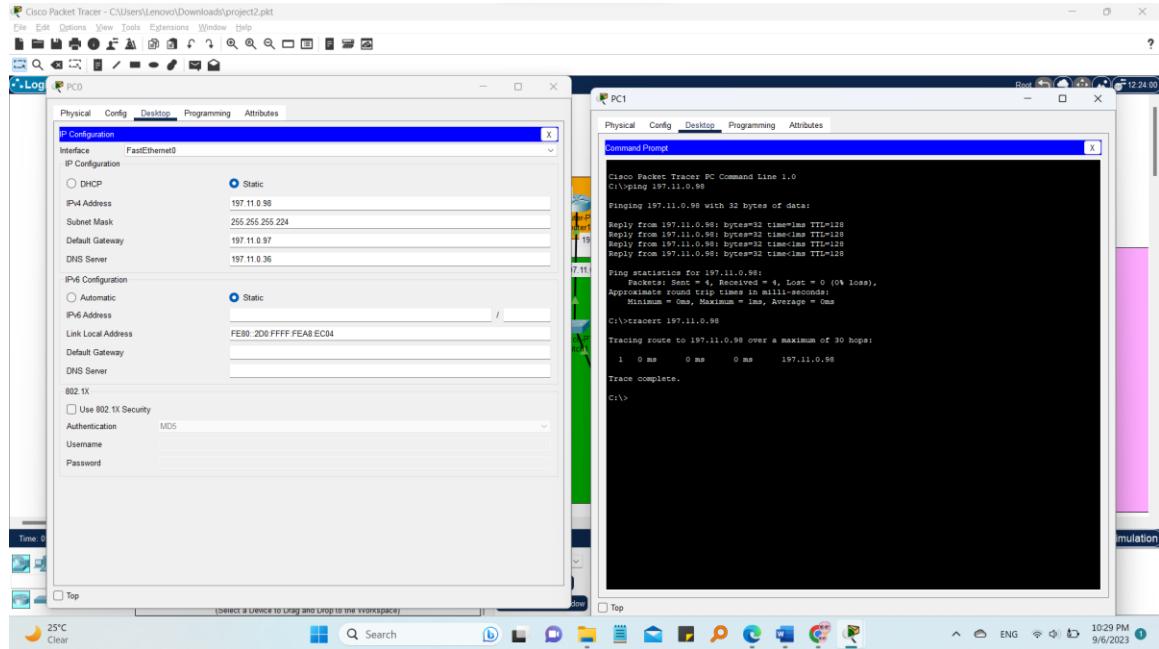


Figure 23 : pc1 pinging and tracert to pc0

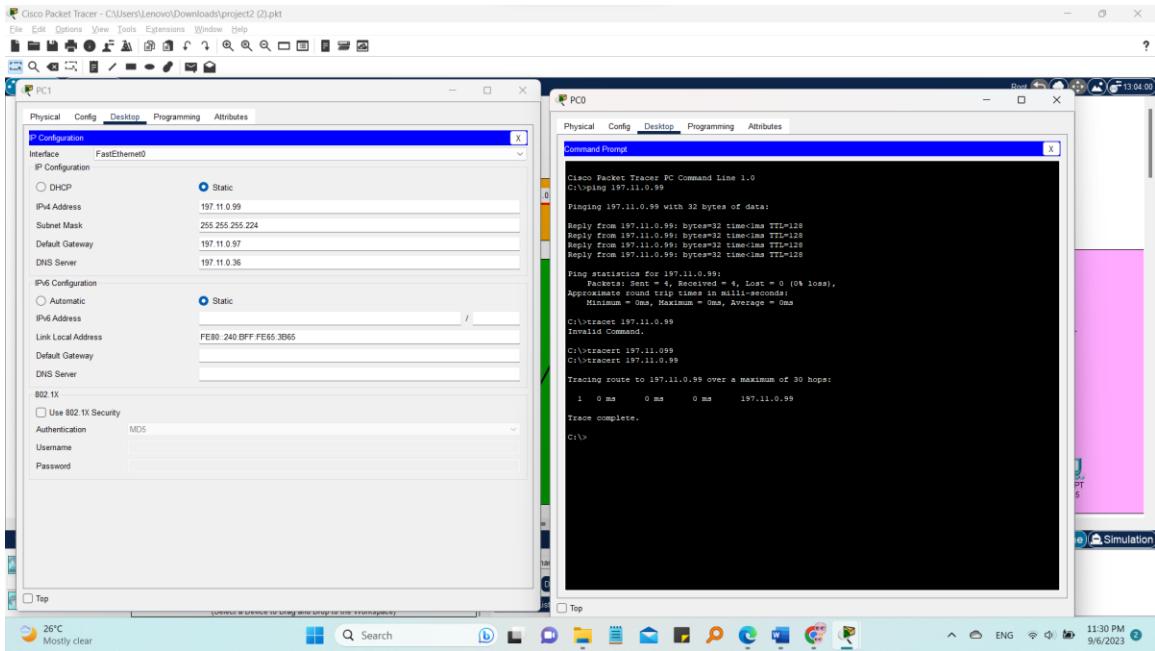


Figure 24 : pc0 pinging and tracert to pc1

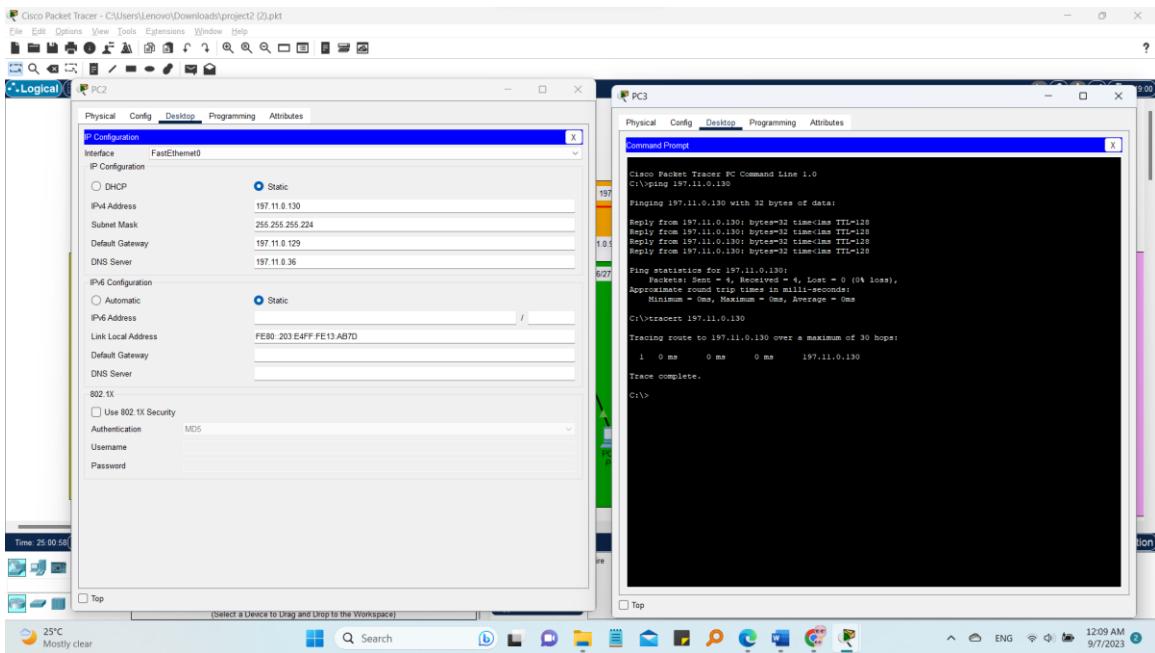


Figure 25 : pc3 pinging and tracert to pc2

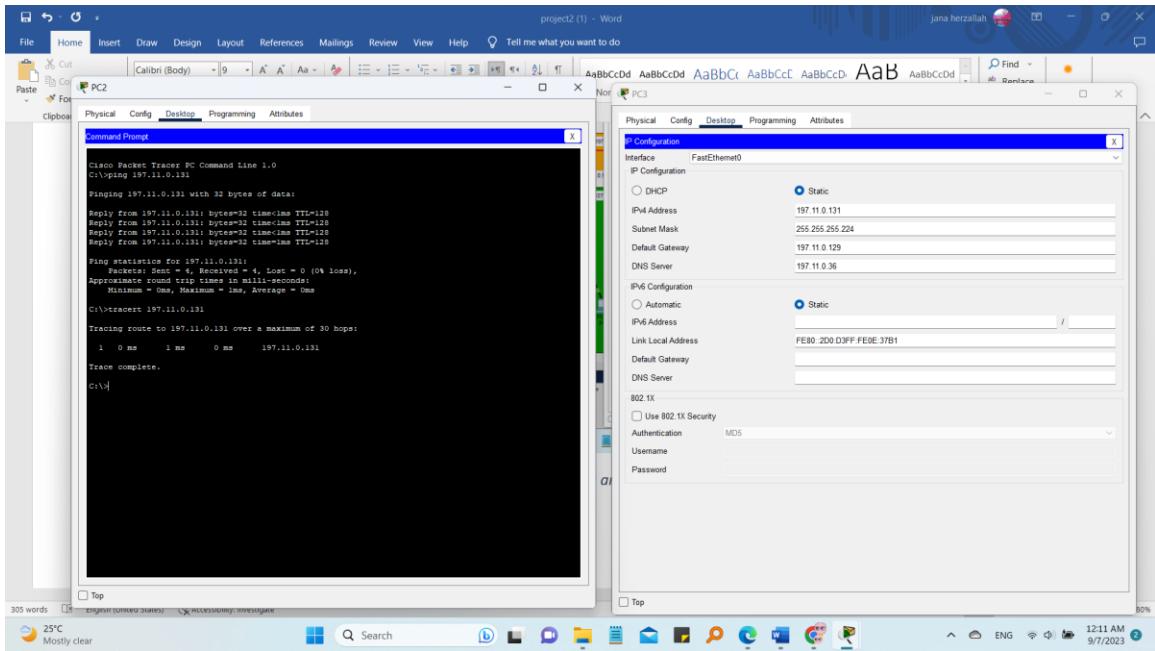


Figure 26 : pc2 pinging and tracert to pc3

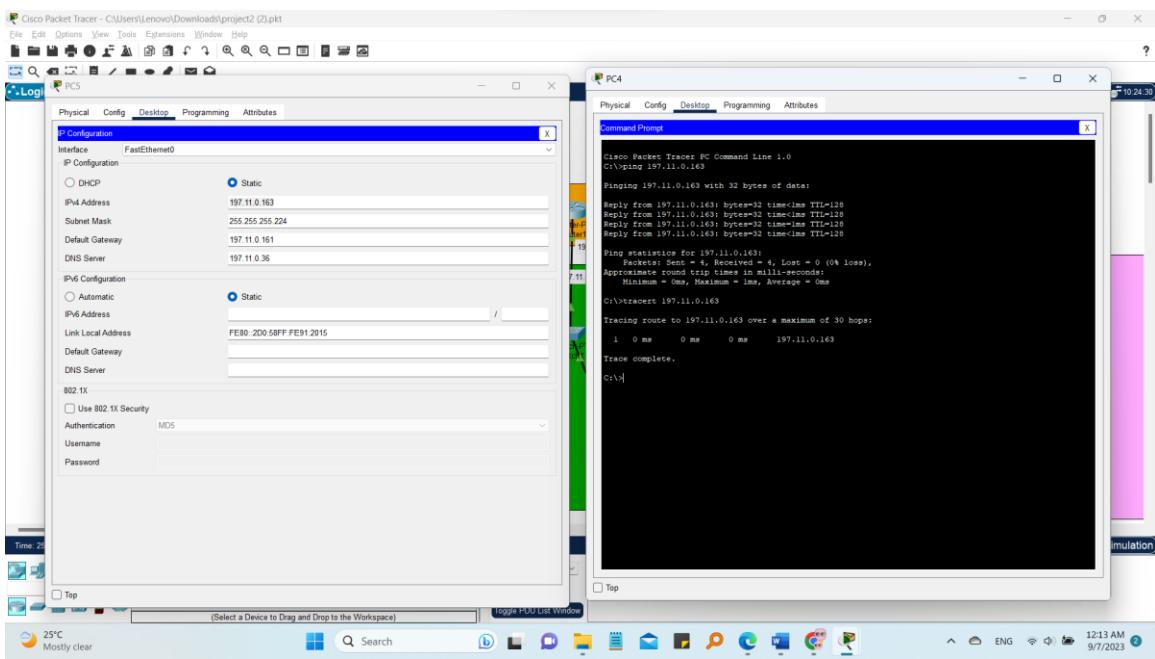


Figure 27 : pc4 pinging and tracert to pc5

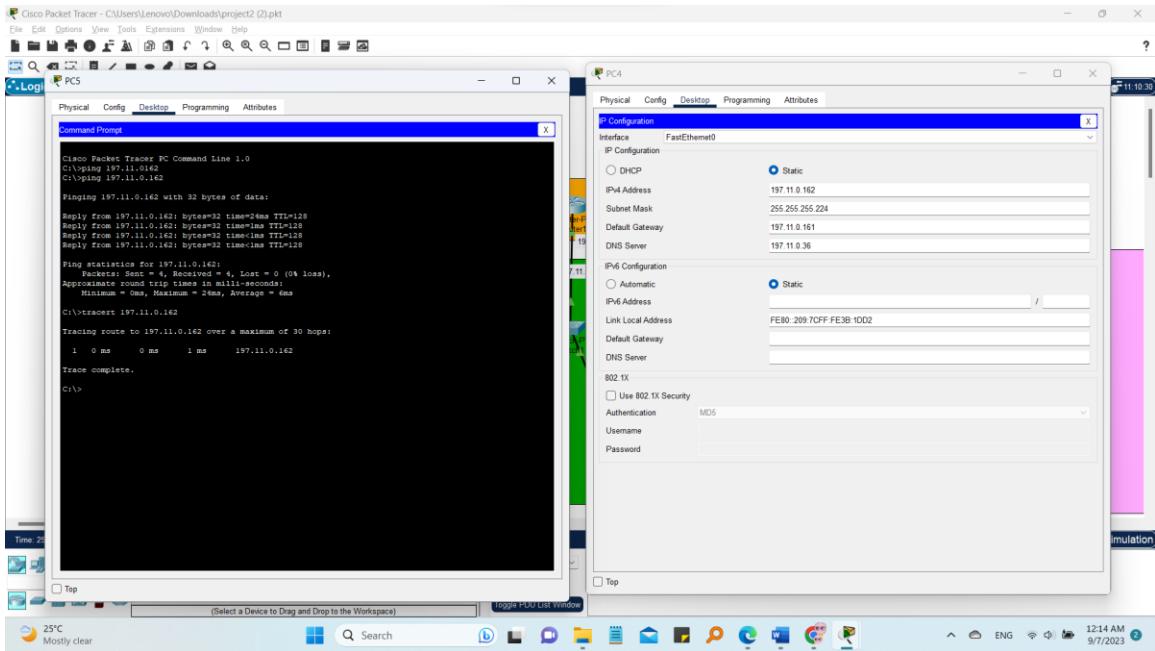


Figure 28 :pc5 pinging and tracert to pc4

## 2. Pcs pinging each other and tracert in different subnets:

We have tried different pcs pinging and tracert to other pcs from different subnets around and they all have worked successfully

We took one pc from each subnet and pinged another pc from another subnet: so our first test was for pc0 we pinged pc3 from another subnet and pc5 from another subnet

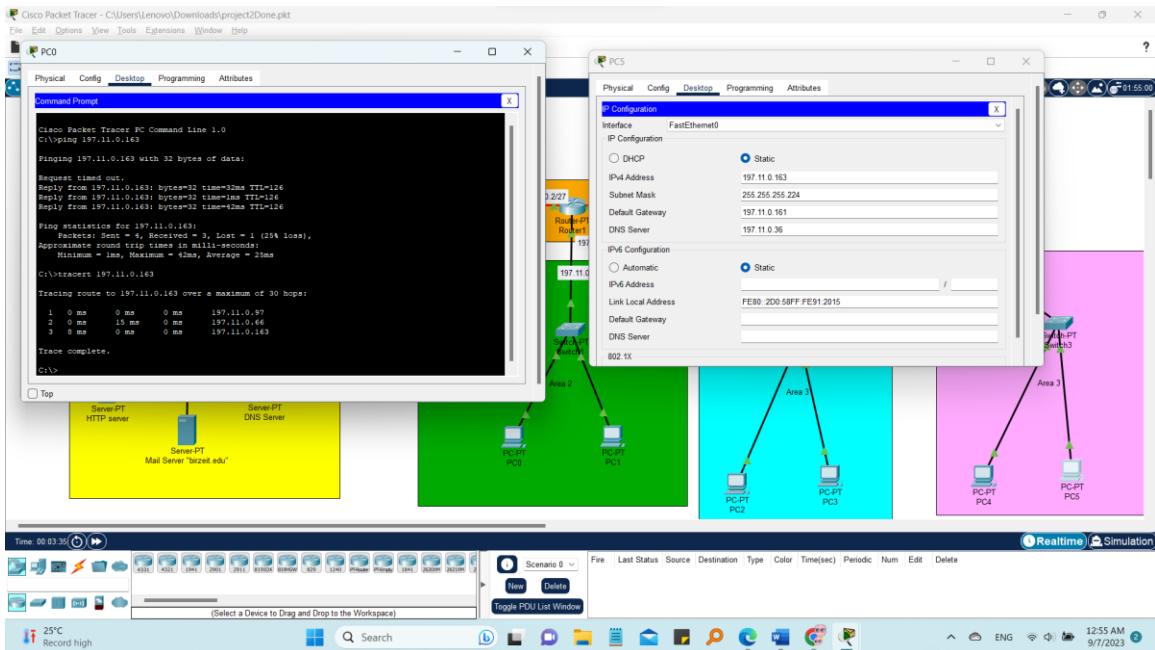


Figure 29 : pc0 pinging and tracert to pc5 (different subnets)

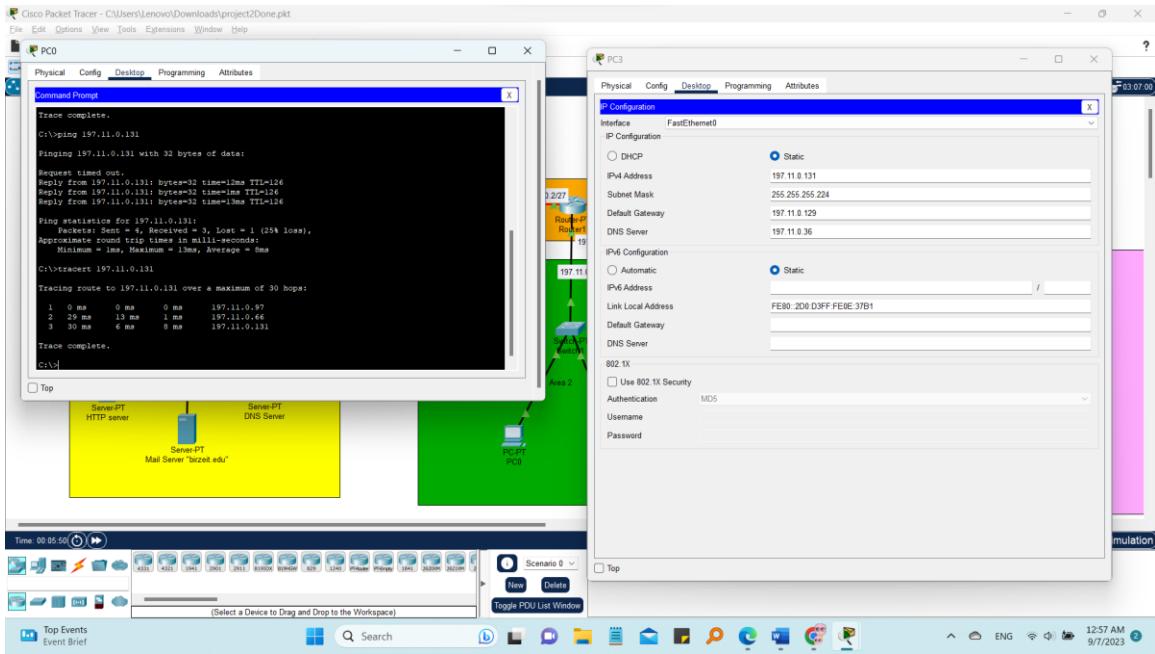


Figure 30 : pc0 pinging and tracert to pc3 (different subnets)

Second test was for pc2 so we took pc1 from another subnet and pc4 from another subnet too

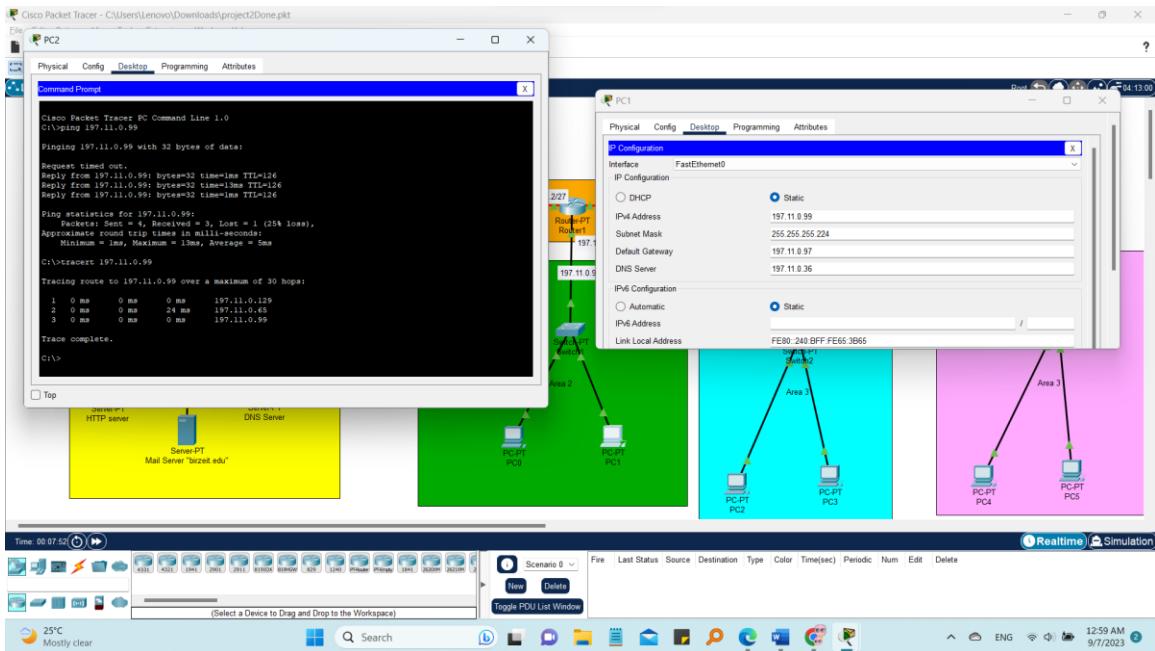


Figure 31 : pc2 pinging pc1 (different subnets)

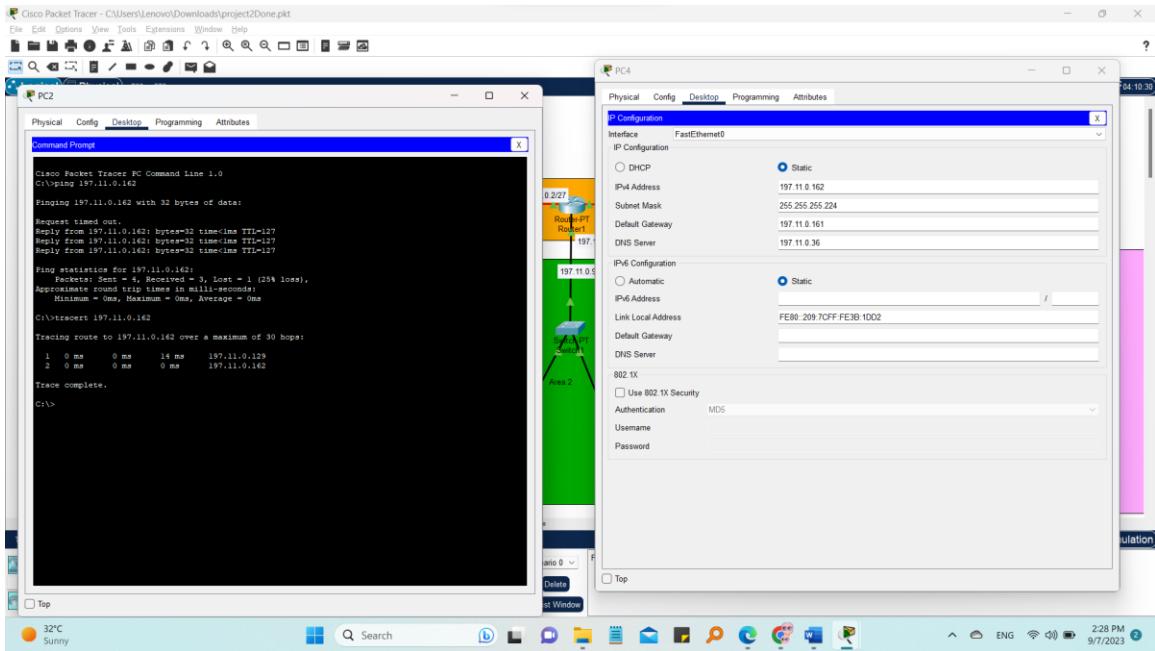


Figure 32 : pc2 pinging pc4 (different subnets)

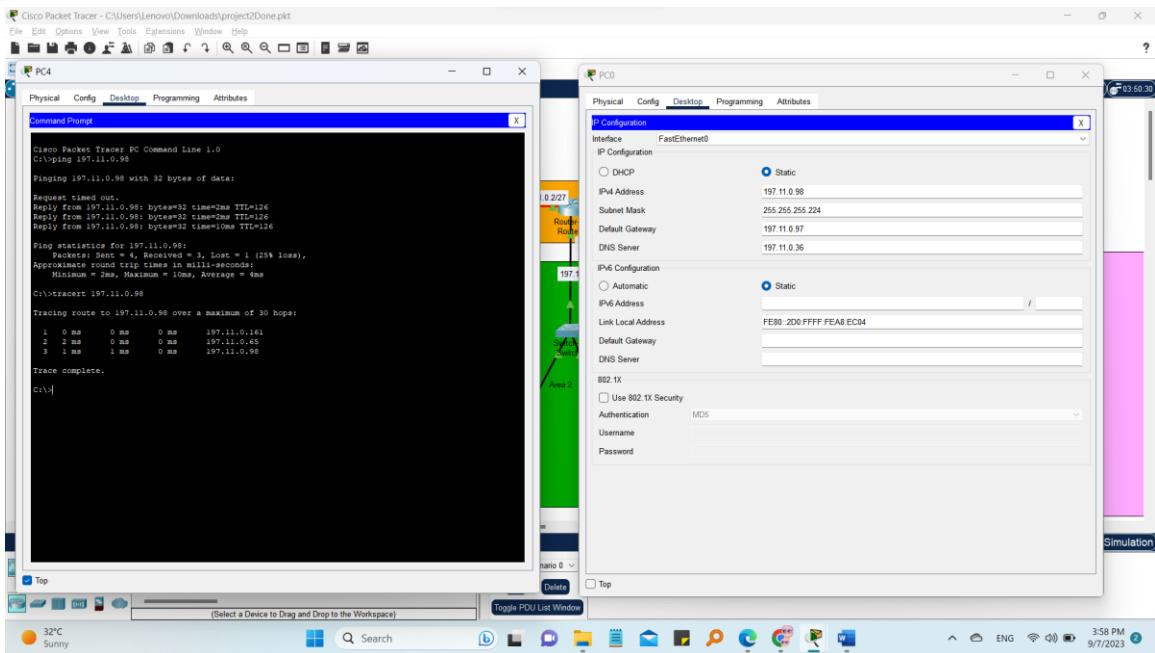


Figure 33 :Pc4 pinging and tracert Pc0 (different subnets)

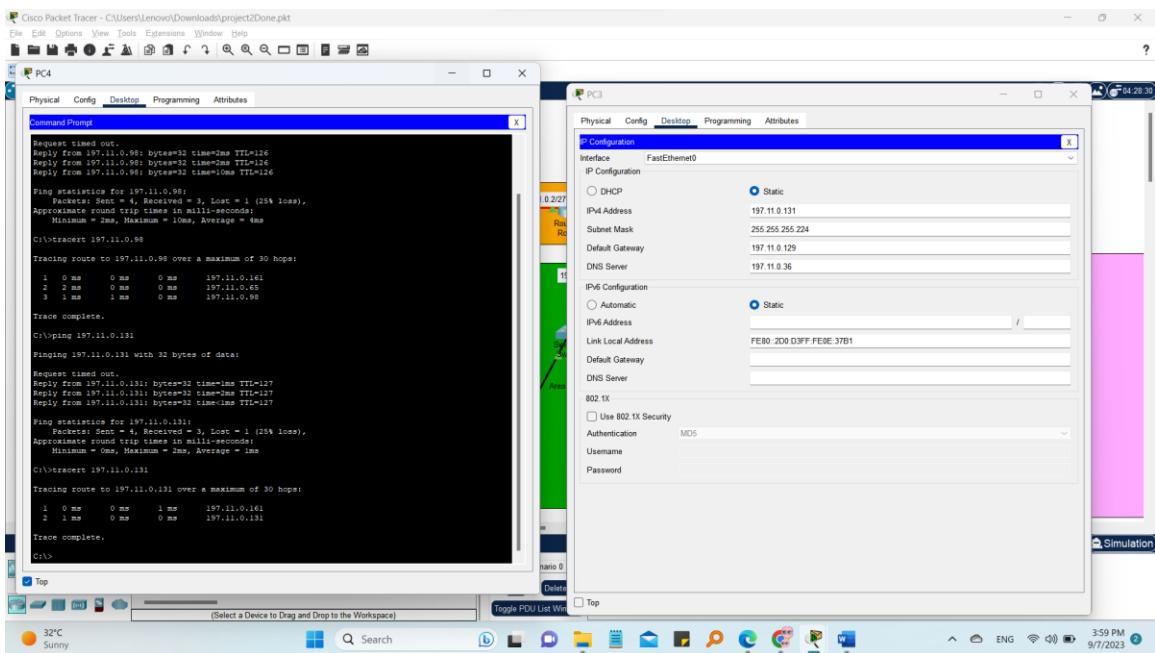


Figure 34: Pc4 pinging and tracert Pc3 (different subnets)

### 3. Pcs accessing [www.ENCS.com](http://www.ENCS.com)

We went to each pc and typed the URL of the [www.ENCS.com](http://www.ENCS.com) and this the html we got in all pcs:

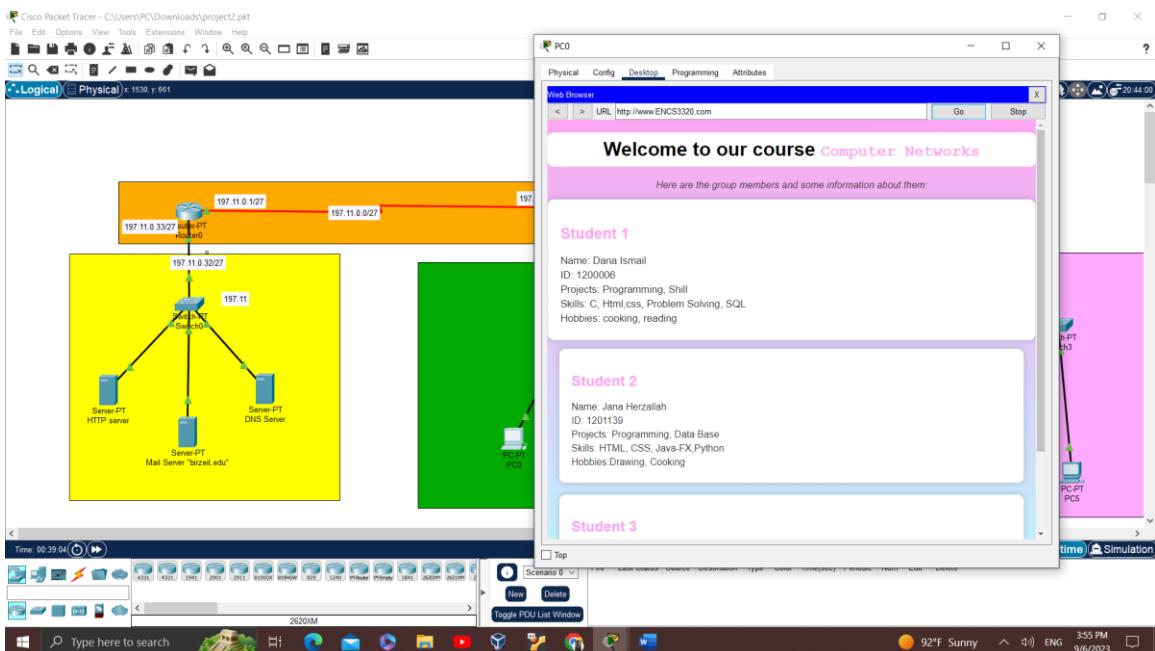


Figure 35 try to run a website PC0

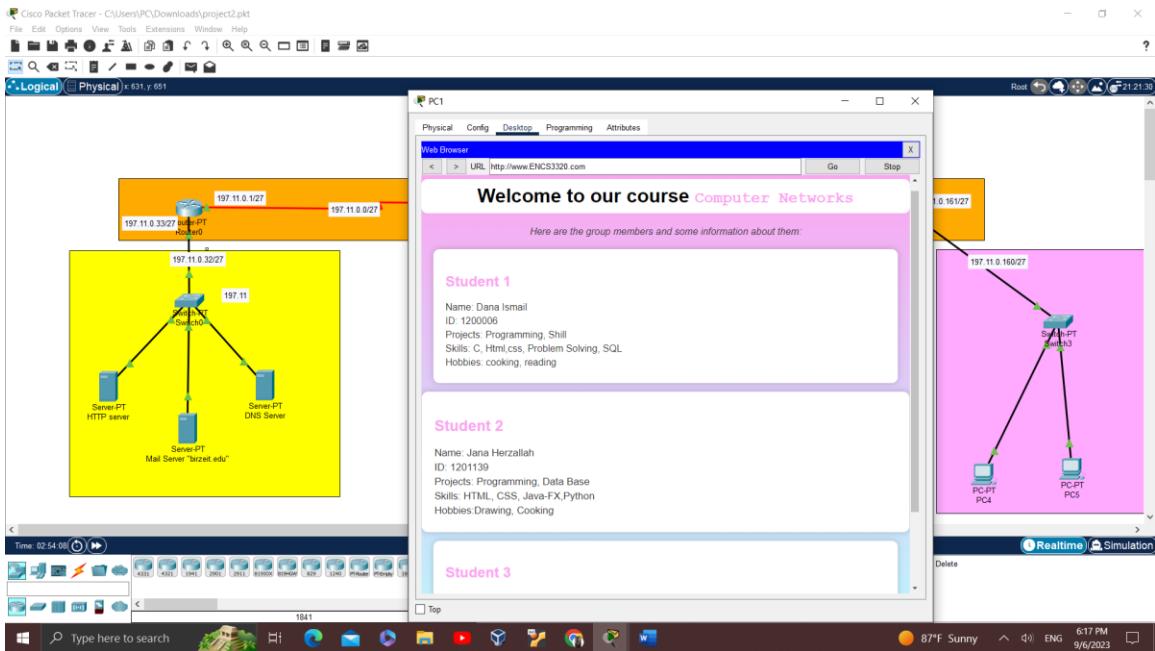


Figure 36 PC1

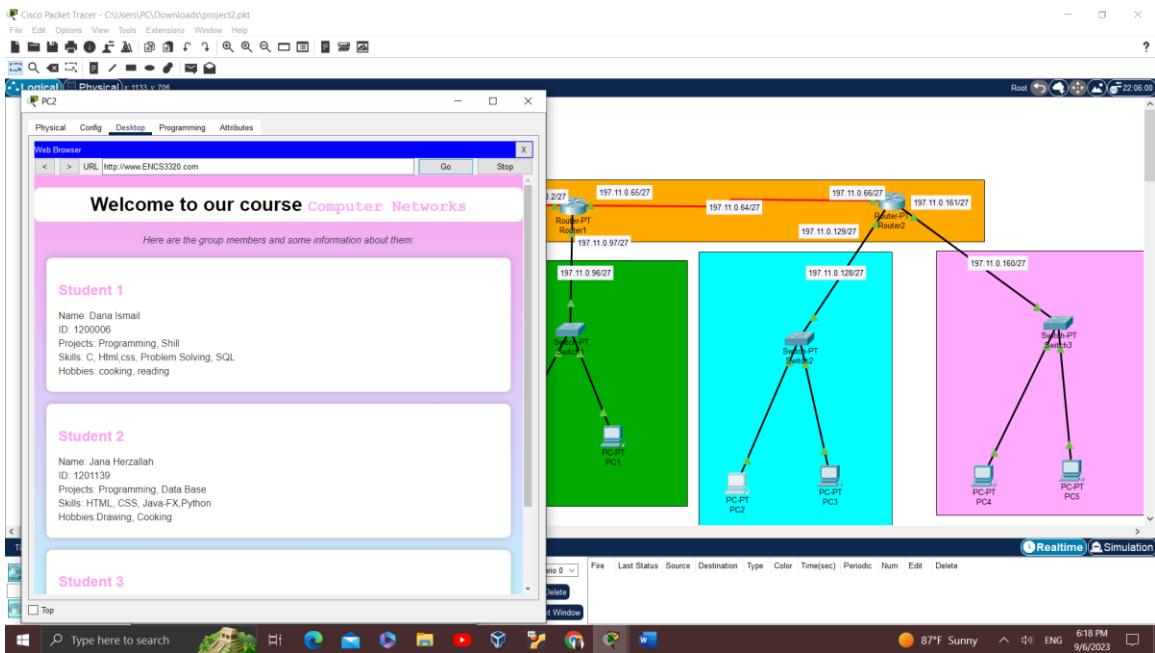


Figure 37 PC2

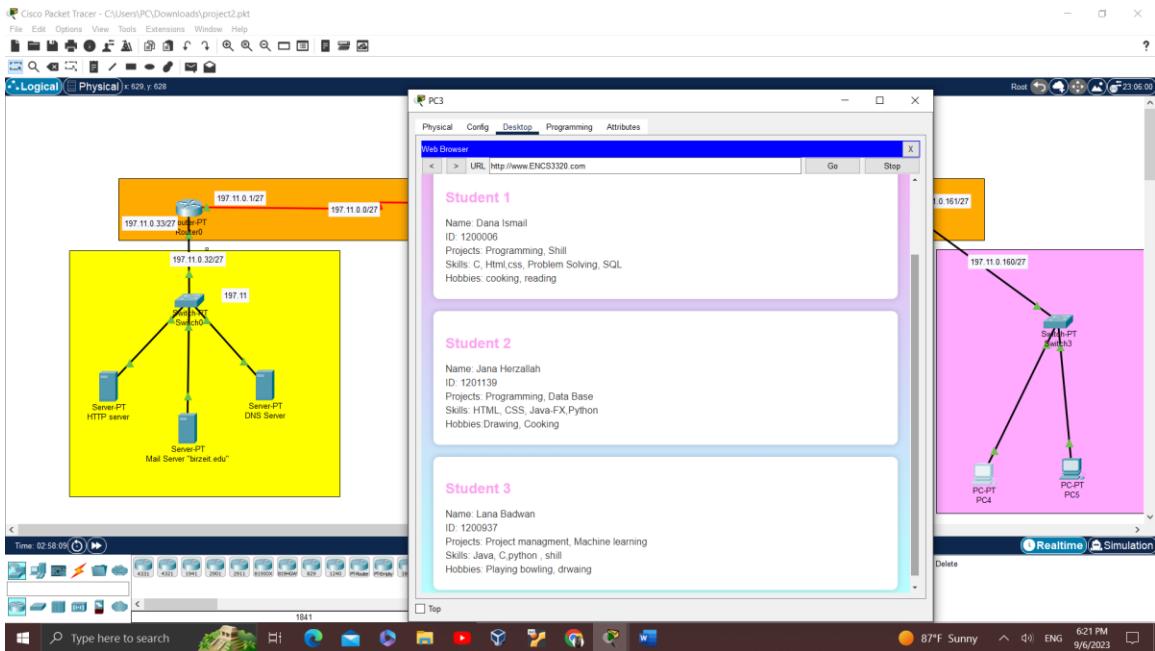


Figure 38 PC3

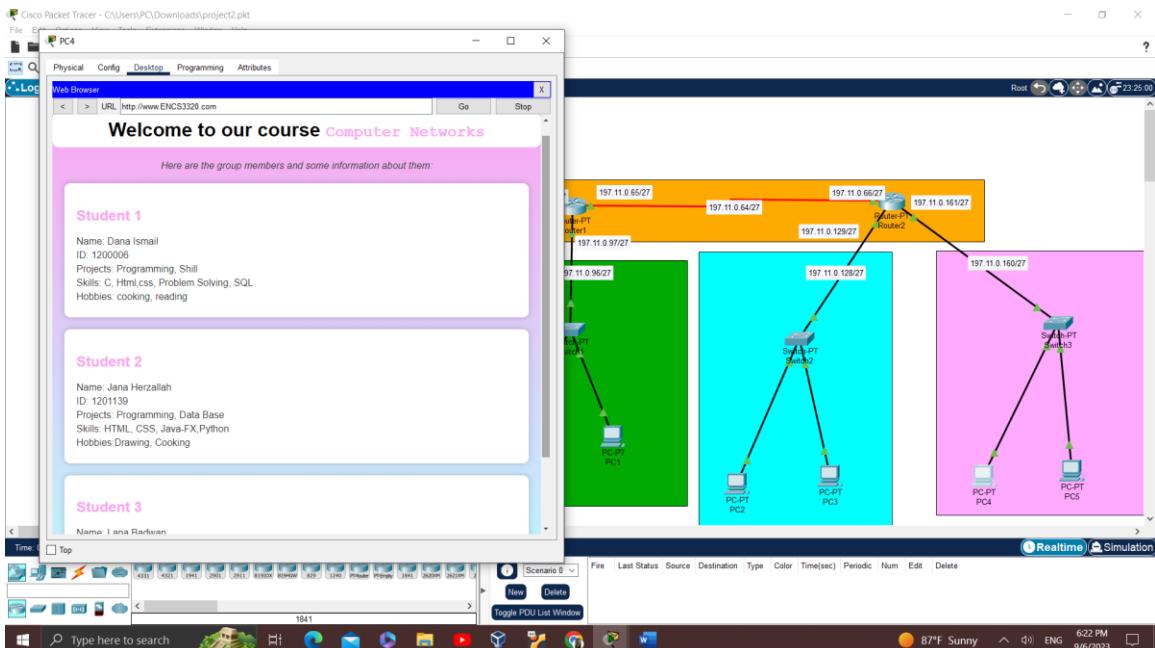


Figure 39 PC4

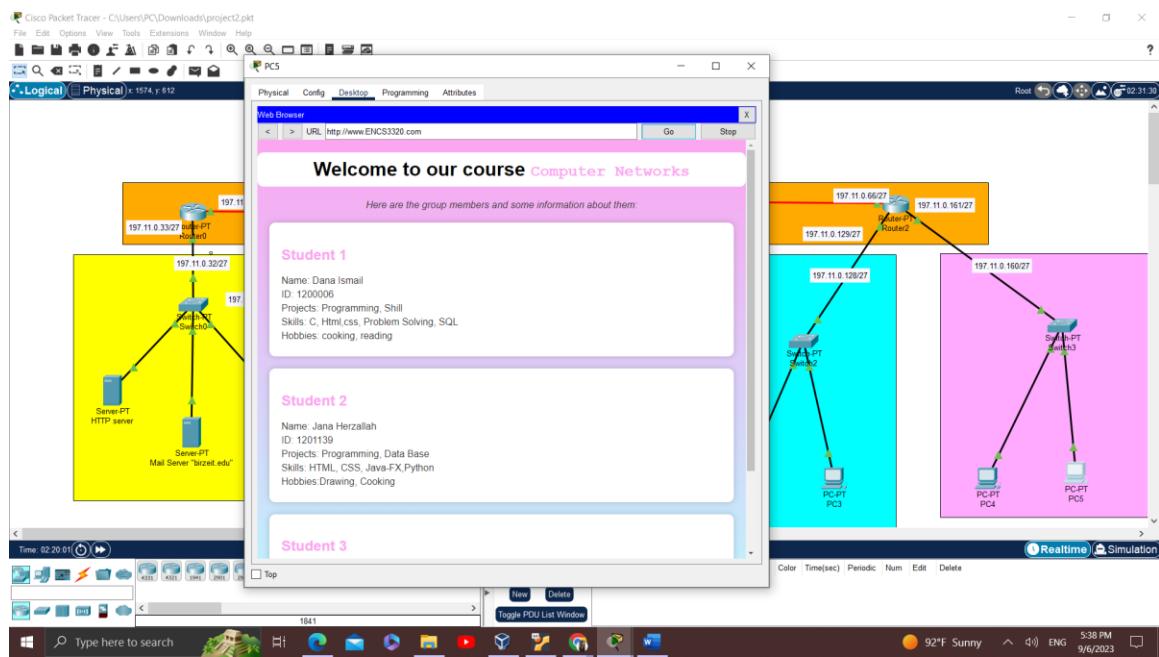


Figure 40 PCS

#### 4. Sending emails from one pc to all pcs:

##### Explanation of the stages behind:

The process of establishing email communication within our network infrastructure. We initiated this process by setting up usernames in the mail server, subsequently connecting the mail server to the DNS for proper domain resolution, and finally configuring five PCs with their respective usernames to enable seamless email communication.

##### 1. Usernames Setup in the Mail Server:

The first step in establishing email communication was to configure usernames within the mail server. Usernames are essential for identifying users and routing emails to their respective accounts. This step involved the following sub-tasks:

- **Accessing the Mail Server:** We accessed the mail server administration console using appropriate credentials.
- **Creating User Accounts:** Within the mail server interface, user accounts were created for each of the individuals who would be using email services. Each user was assigned a unique username and password for authentication.
- **Verification:** After creating user accounts, we verified the functionality by sending test emails within the server to ensure that each username was correctly configured.

##### 2. Connecting the Mail Server to DNS:

To enable email communication across the network, we established a connection between the mail server and the Domain Name System (DNS). This connection allows for the translation of domain names to IP addresses, ensuring email routing accuracy.

- **DNS Configuration:** We accessed the DNS server settings and configured the mail server's domain name (e.g., mail.example.com) to point to the corresponding IP address.

This ensured that email requests sent to domain names would be resolved to the correct mail server.

- **Testing Connectivity:** To validate the DNS configuration, we tested connectivity by pinging the mail server's domain name from various network devices, ensuring successful resolution.

Which these 2 main ideas were done in part 2 (configuring the servers) and the last thing was done here

### **3. Configuring PCs with Usernames:**

With the mail server and DNS connection established, the next step was to configure the five PCs within the network with their respective usernames. This process enabled users to send and receive emails using their assigned accounts.

- **PC Configuration:** On each PC, we accessed the email client application (e.g., Microsoft Outlook) and input the following details:
  - Username: [Insert Username]
  - Password: [Insert Password]
  - Incoming Mail Server (POP3 or IMAP) settings: [Insert Settings]
  - Outgoing Mail Server (SMTP) settings: [Insert Settings]
- **Testing Email Communication:** To confirm successful configuration, we conducted tests by sending and receiving emails between PCs within the network. We ensured that emails were routed correctly based on the recipient's username.

All the figures below show testing the connectivity between pc0 and all other pcs as required:

## Testing emails between pcs:

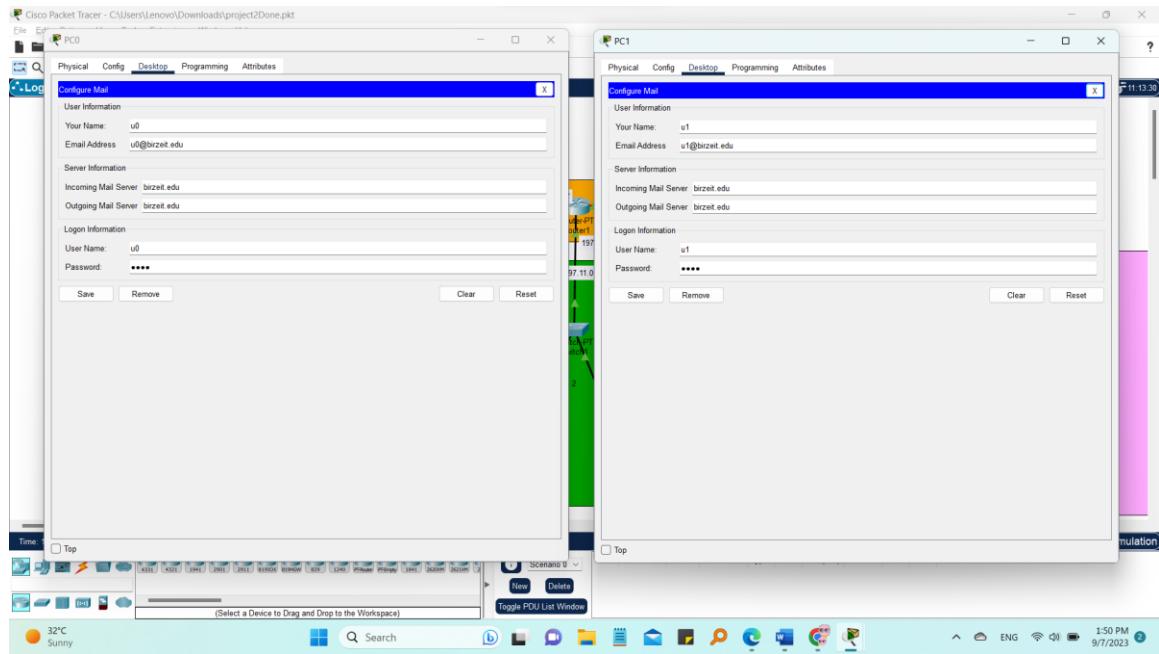


Figure 41 : configuring mail of pc0 and pc1

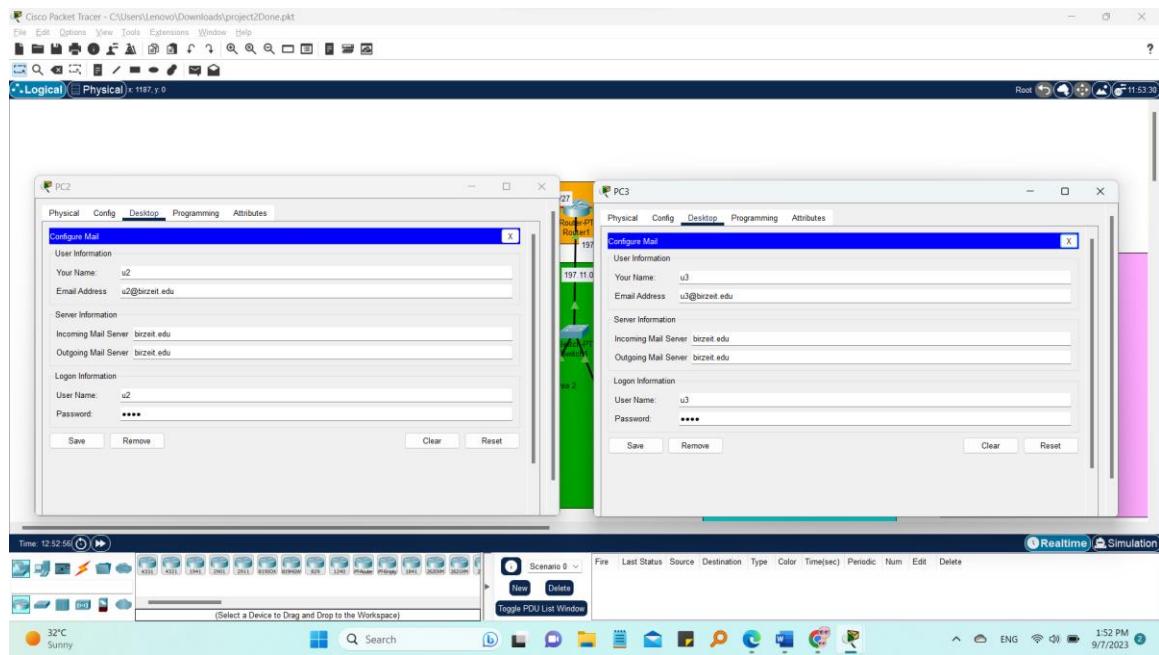


Figure 42 : configuring mail of pc2 and pc3

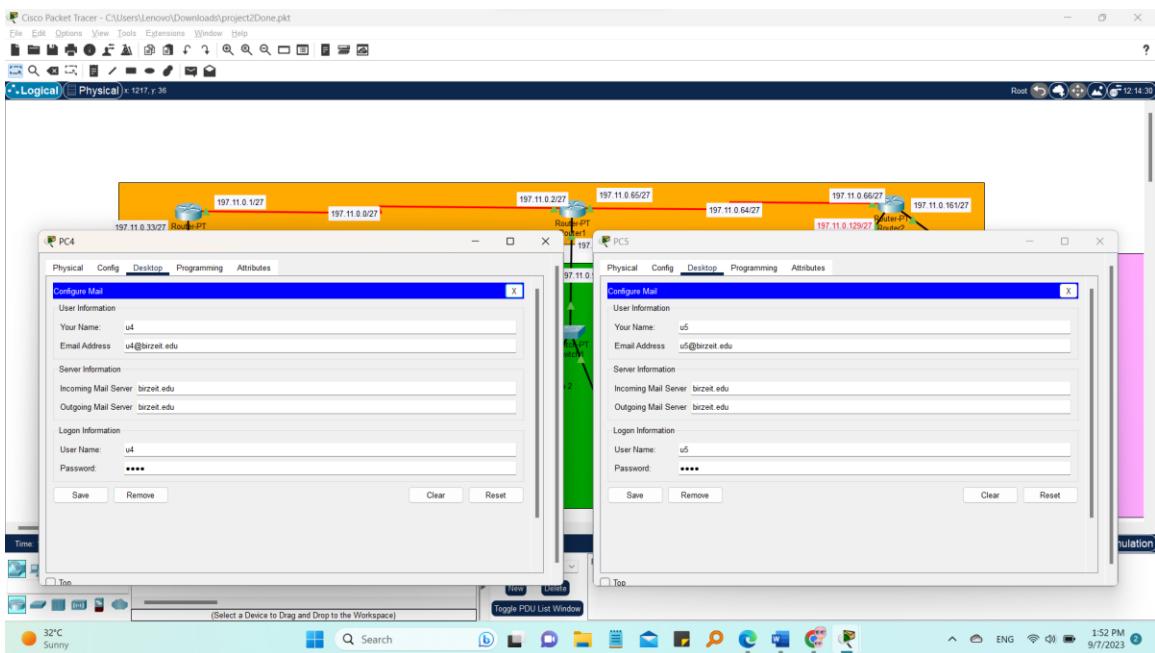


Figure 43 : configuring mail of pc4 and pc5

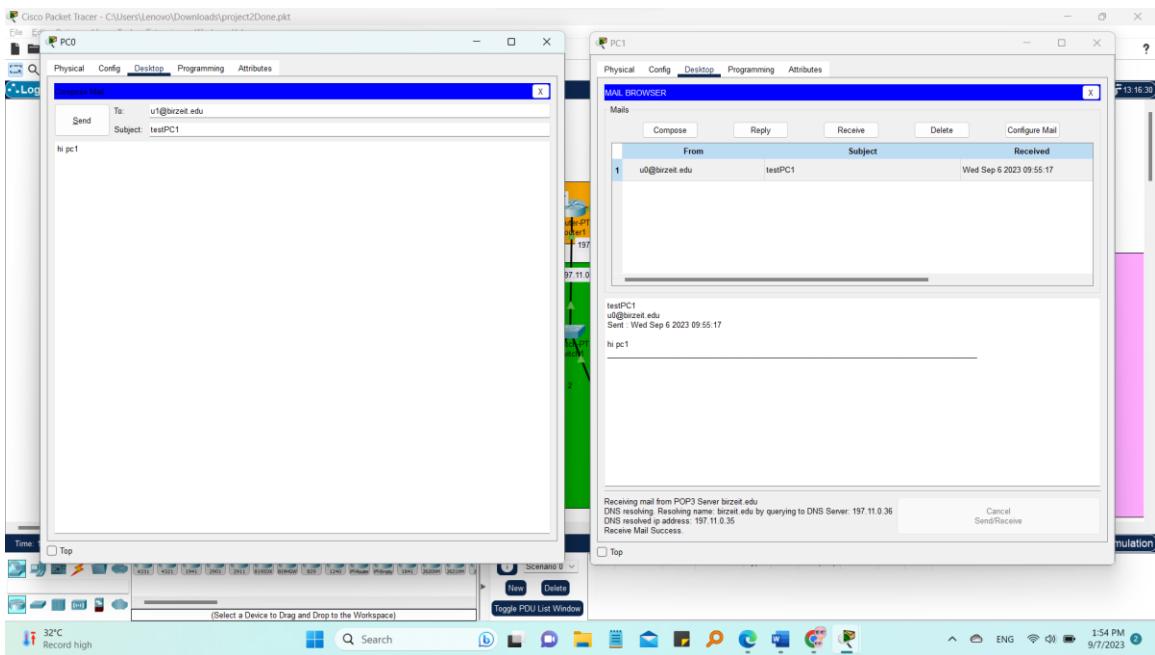


Figure 44 : sending an email from pc0 to pc1

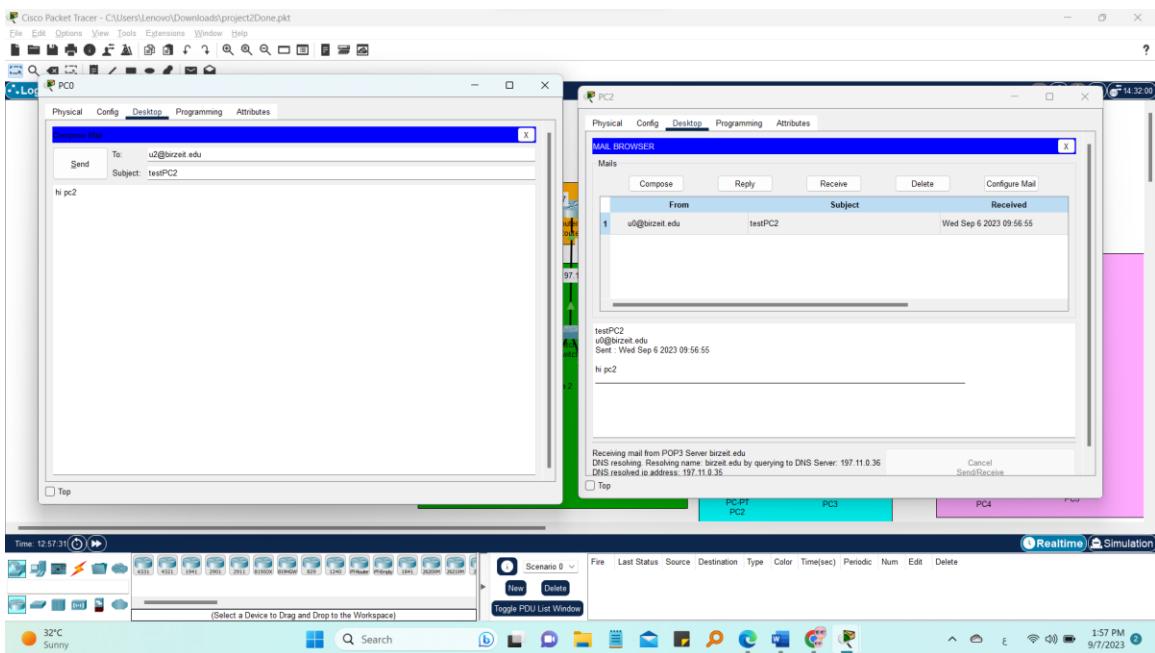


Figure 45 : sending email from pc0 to pc2

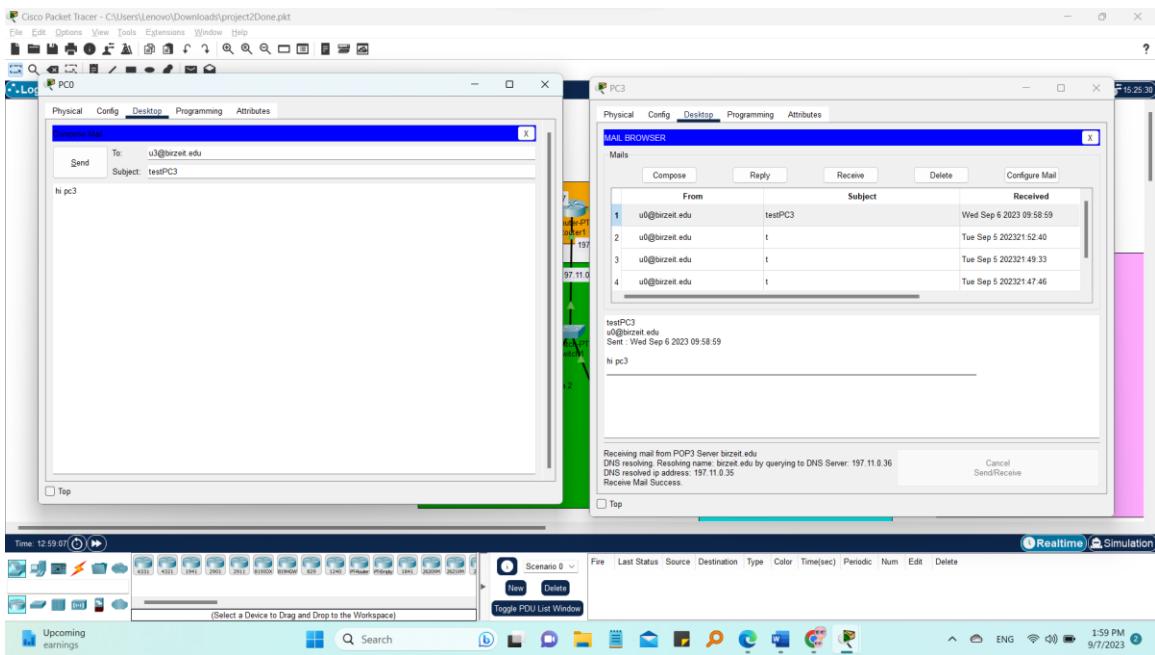


Figure 46: sending email from pc0 to pc3

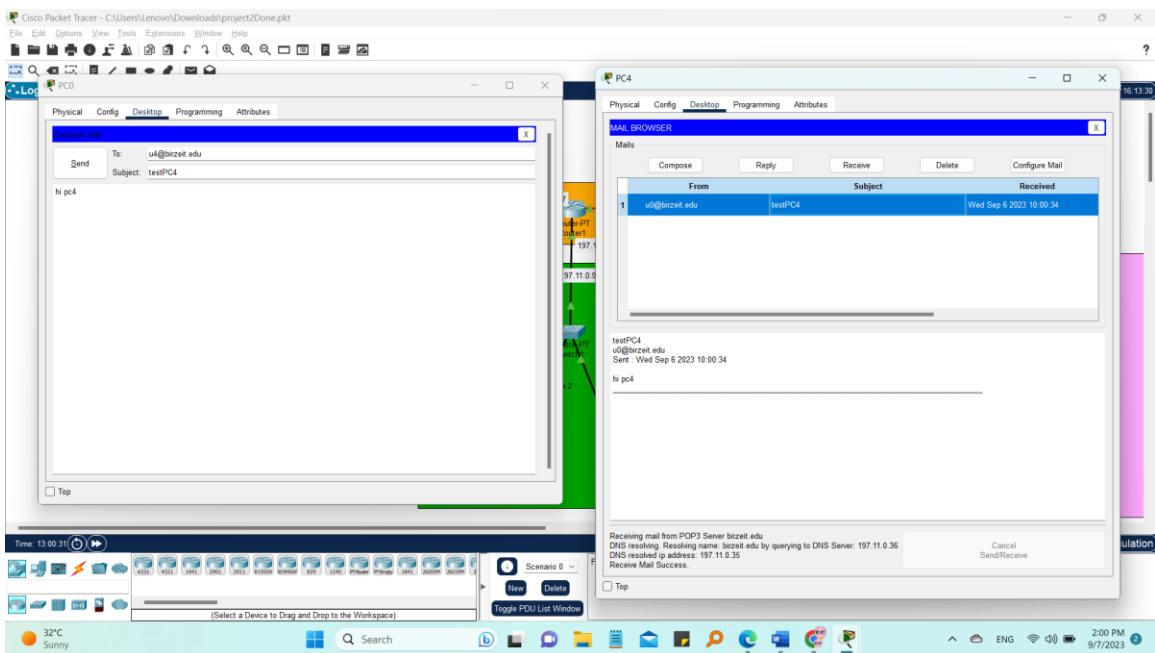


Figure 47 : sending email from pc0 to pc4

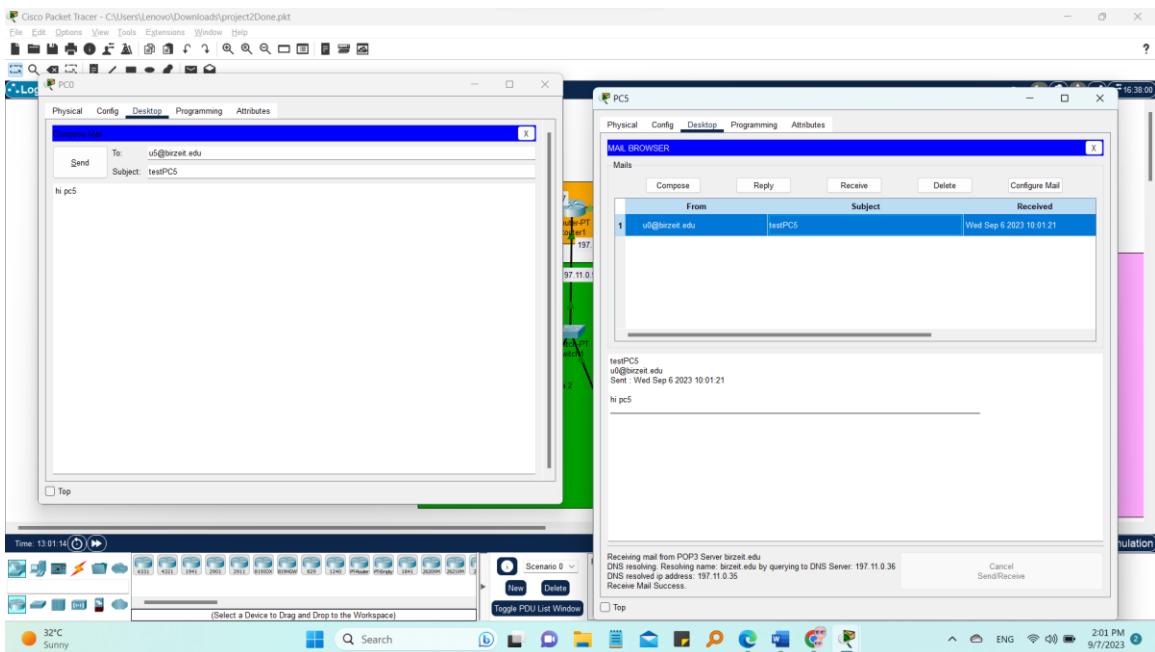


Figure 48 : sending email from pc0 to pc5