Faculty of Engineering and Technology
Electrical and Computer Engineering Department

ENCS3320-Computer Networks

Project#2

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Part 0:

Subnet	Subnet Mask "using the slash notation"	Network IP	Broadcast IP	First IP	Last IP	Maximum number of IPs in this subnet
R1-R2 link	255.255.255.252/30	200.17.10.104	200.17.10.107	200.17.10.105	200.17.10.106	2^2-2 = 2
R2-R3 link	255.255.255.252/30	200.17.10.108	200.17.10.111	200.17.10.109	200.17.10.110	2^2-2 = 2
R3-R4 link	255.255.255.252/30	200.17.10.112	200.17.10.115	200.17.10.113	200.17.10.114	2^2-2 = 2
R4-R1 link	255.255.255.252/30	200.17.10.116	200.17.10.119	200.17.10.117	200.17.10.118	2^2-2 = 2
Data Center	255.255.255.248/29	200.17.10.96	200.17.10.103	200.17.10.97	200.17.10.102	2^3-2=6
Company A	255.255.255.224/27	200.17.10.0	200.17.10.31	200.17.10.1	200.17.10.30	2^5-2=30
Company B	255.255.255.224/27	200.17.10.32	200.17.10.63	200.17.10.33	200.17.10.62	2^5-2=30
Company C Office 1	255.255.255.240/28	200.17.10.64	200.17.10.79	200.17.10.65	200.17.10.78	2^4-2=14
Company C Office 2	255.255.255.240/28	200.17.10.80	200.17.10.95	200.17.10.81	200.17.10.94	2^4-2=14

Table 1: Subnetting details

Part 1:

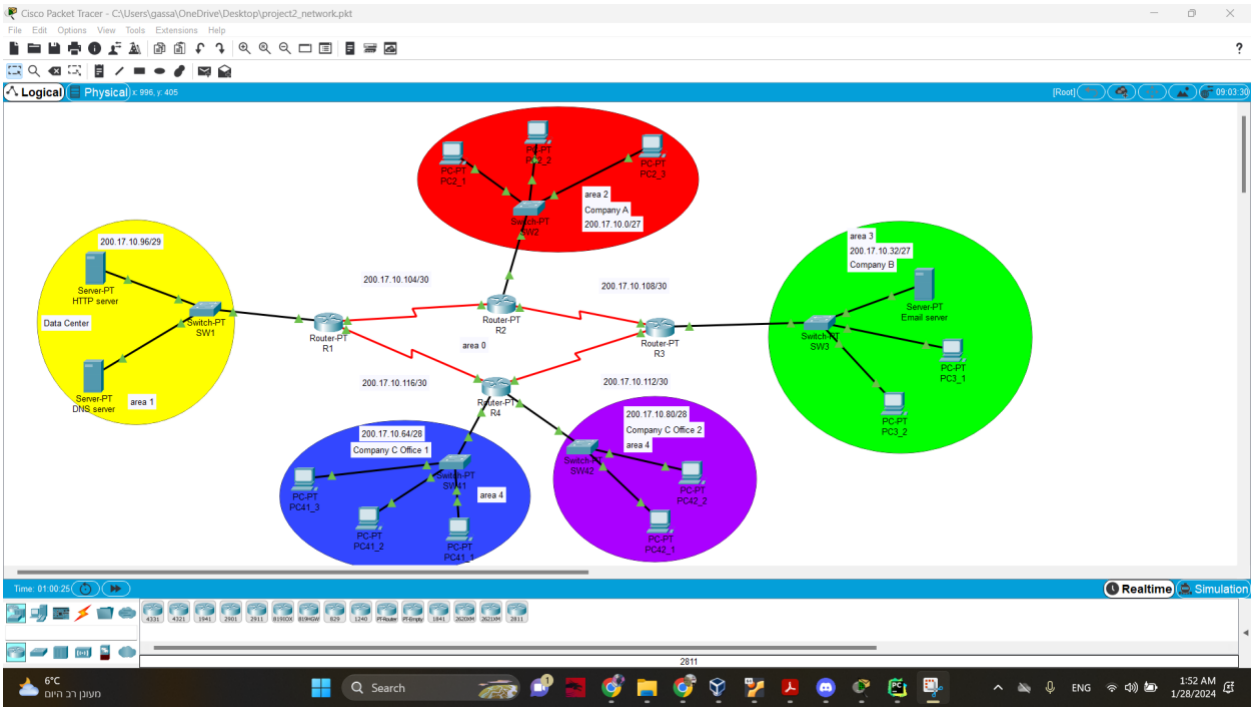

figure 1:Network Topology

HTTP server:

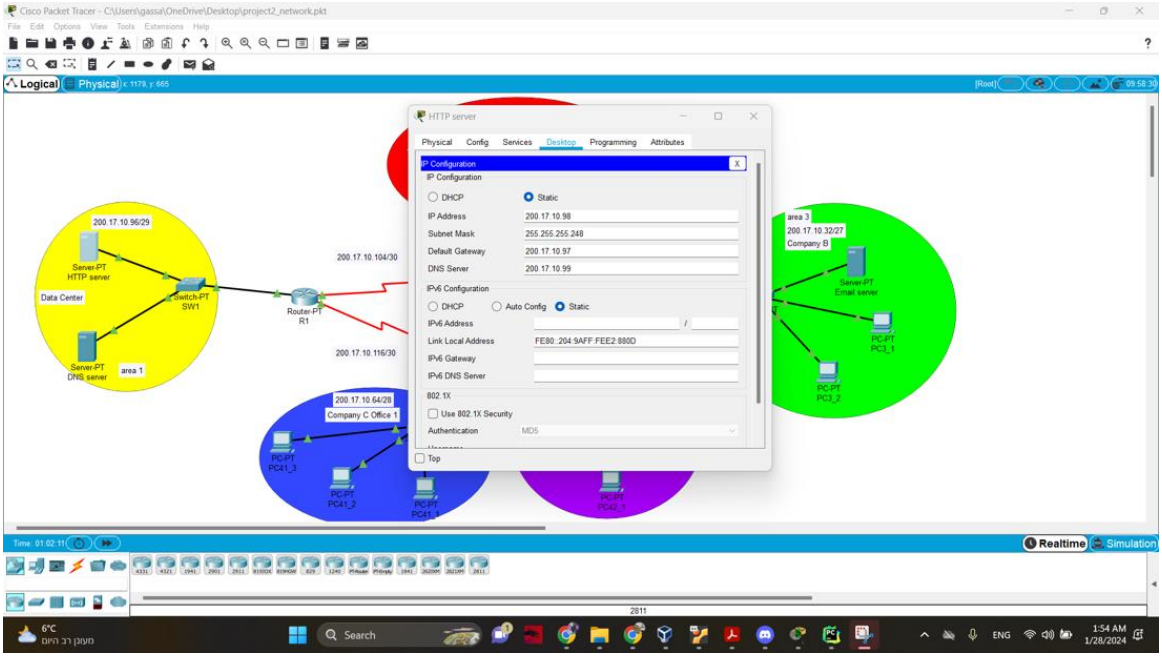

figure 2: HTTP server getting ip using static manner

For the web server (http) we give it IP 200.17.10.98 and subnet mask 255.255.255.11111000->255.255.255.248 and put the gateway router1 200.17.10.97 and the DNS 200.17.10.99 .

DNS server

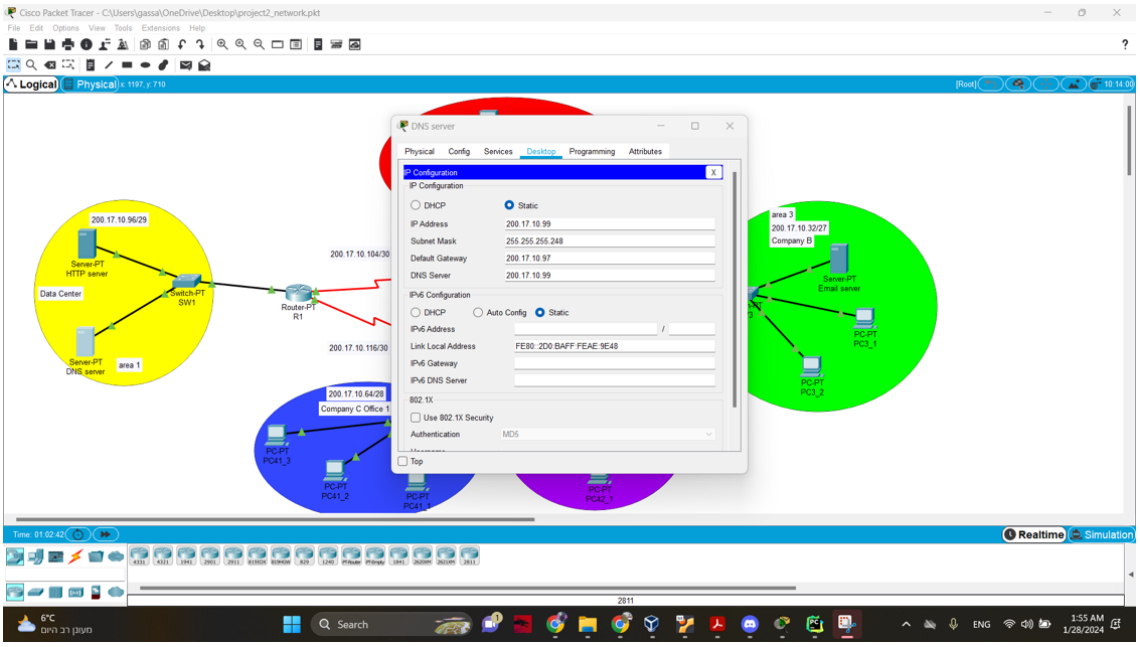

figure 3:DNS server getting ip using static manner

For the DNS server we give it IP 200.17.10.99 and subnet mask 255.255.255.11111000->255.255.255.248 and put the gateway router1 200.17.10.97 and the DNS 200.17.10.99 .

Mail server

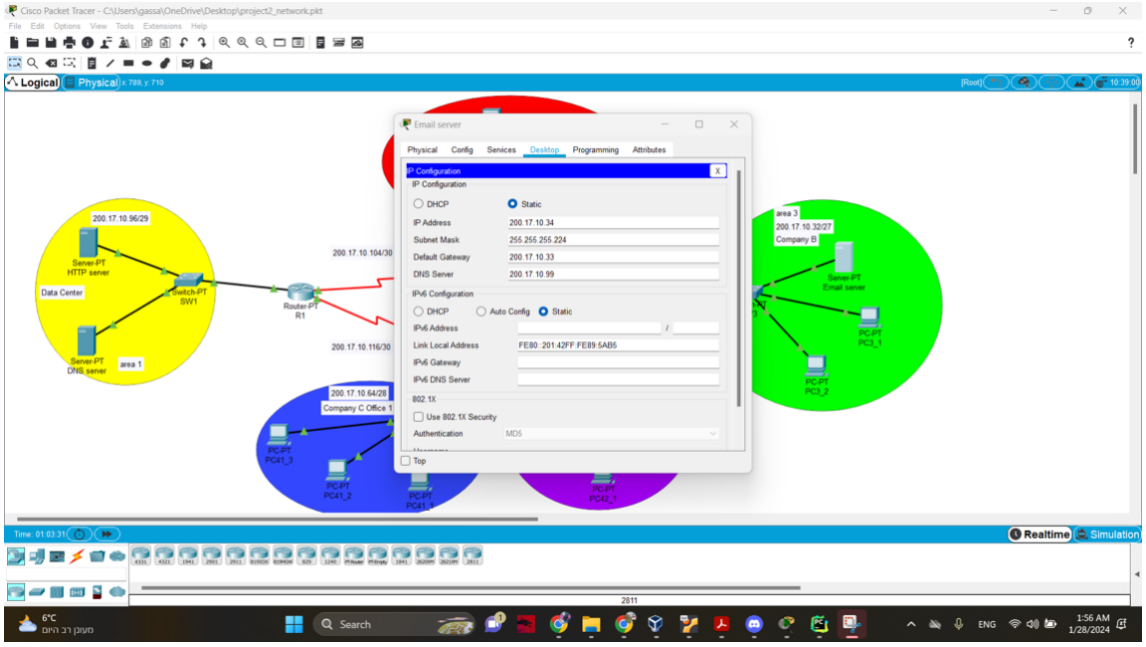

figure 4:Mail server getting ip using static manner

For the mail server we give it IP 200.17.10.34 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router3 200.17.10.33 and the DNS 200.17.10.99 .

Router 1:

Fast eathernet 0

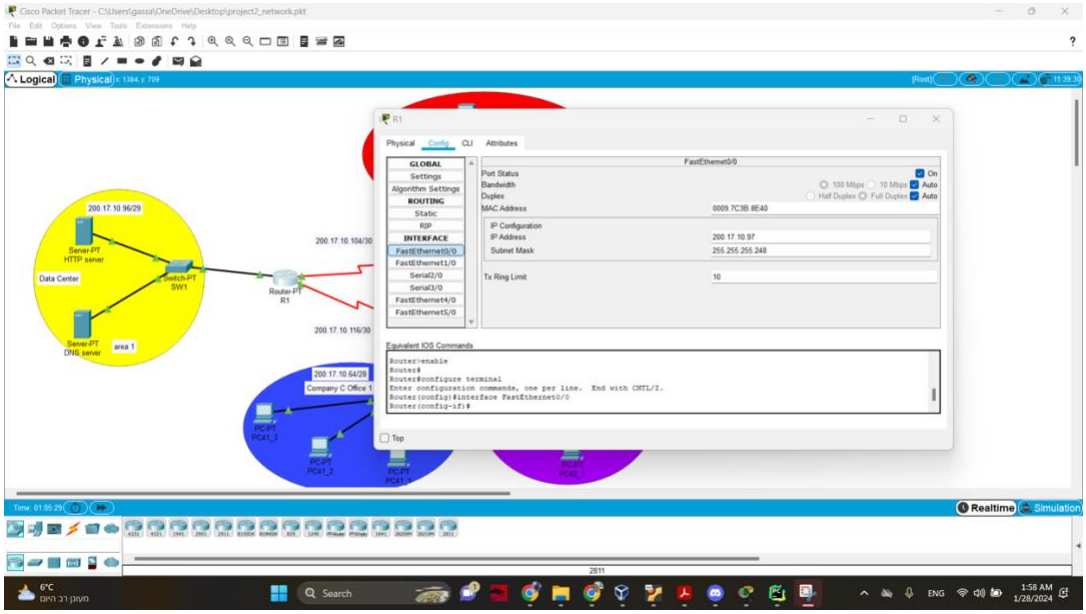

figure 5:Router 1 ethar 0/0 getting ip using static manner

For router 1 we give it IP 200.17.10.97 and subnet mask 255.255.255.11111000->255.255.255.248

ethar0/0

Serial 2

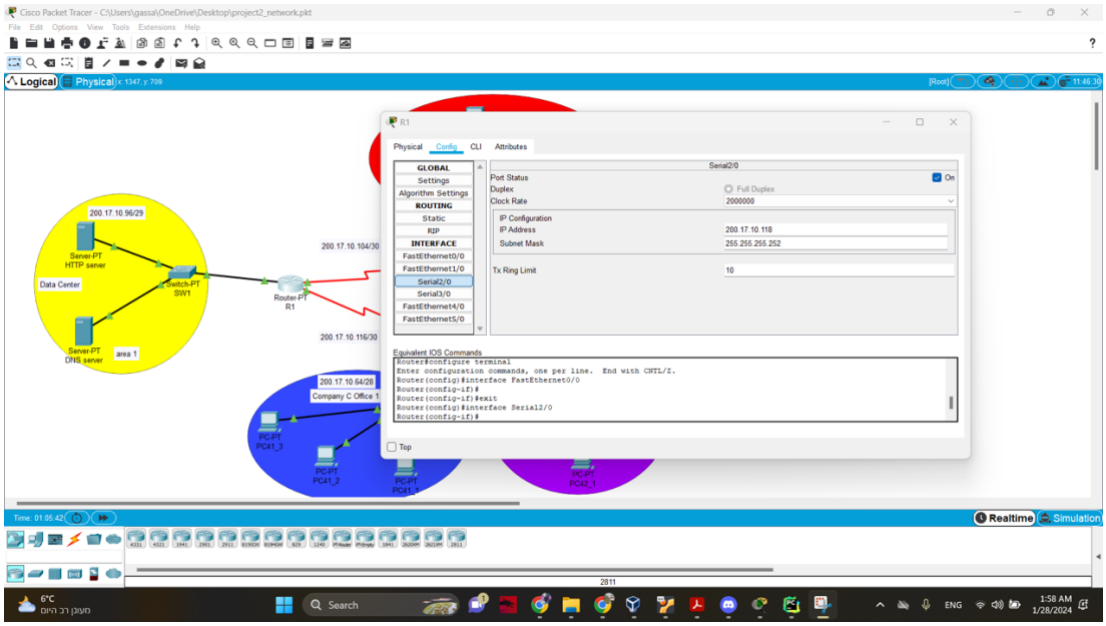

figure 6:Router 1 serial 2 getting ip using static manner

For the interface that is used to connect with router 4 se2 we give it IP 200.17.10.118 and a subnet mask 255.255.255.11111100->255.255.255.252.

Serial 3

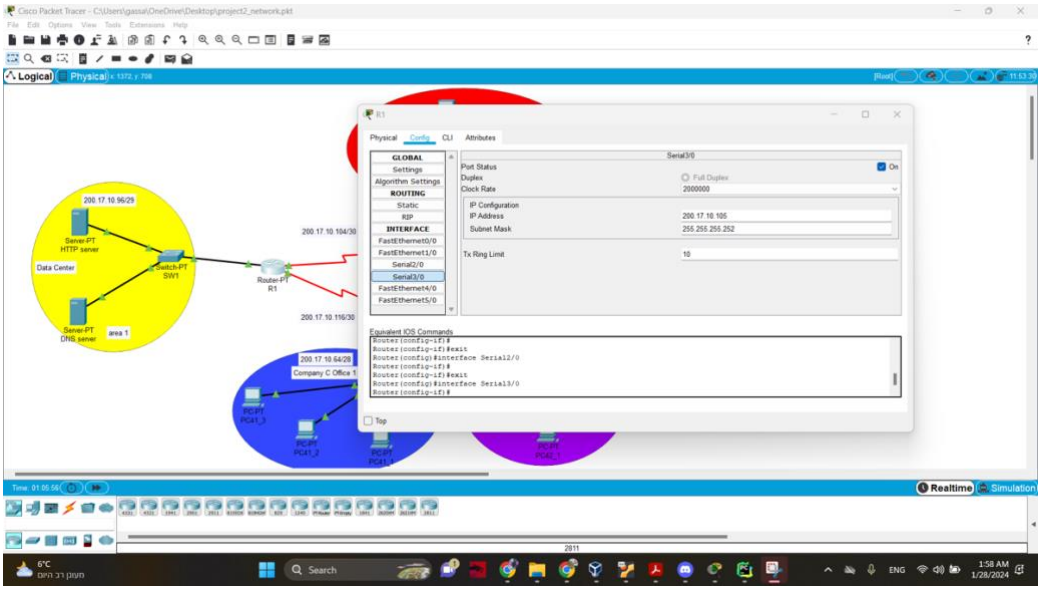

figure 7:Router 1 serial 3 getting ip using static manner

For the interface that is used to connect with router 2 se3 we give it IP 200.17.10.105 and a subnet mask 255.255.255.11111100->255.255.255.252.

Router 2:

Fast eathernet 0

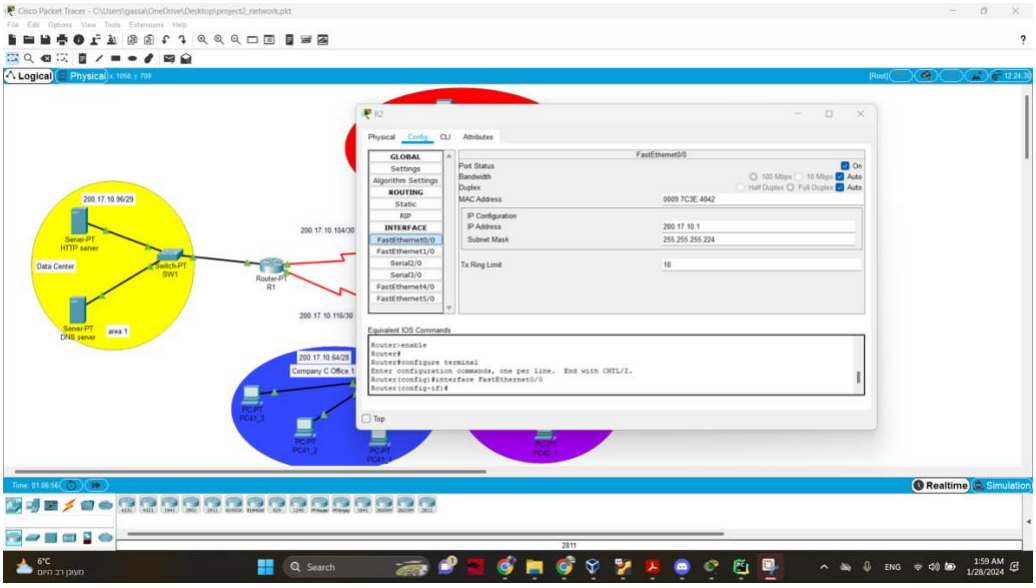

figure 8:Router 2 ethar0/0 getting ip using static manner

For router 2 we give it IP 200.17.10.1 and subnet mask 255.255.255.11100000->255.255.255.224

Serial 2

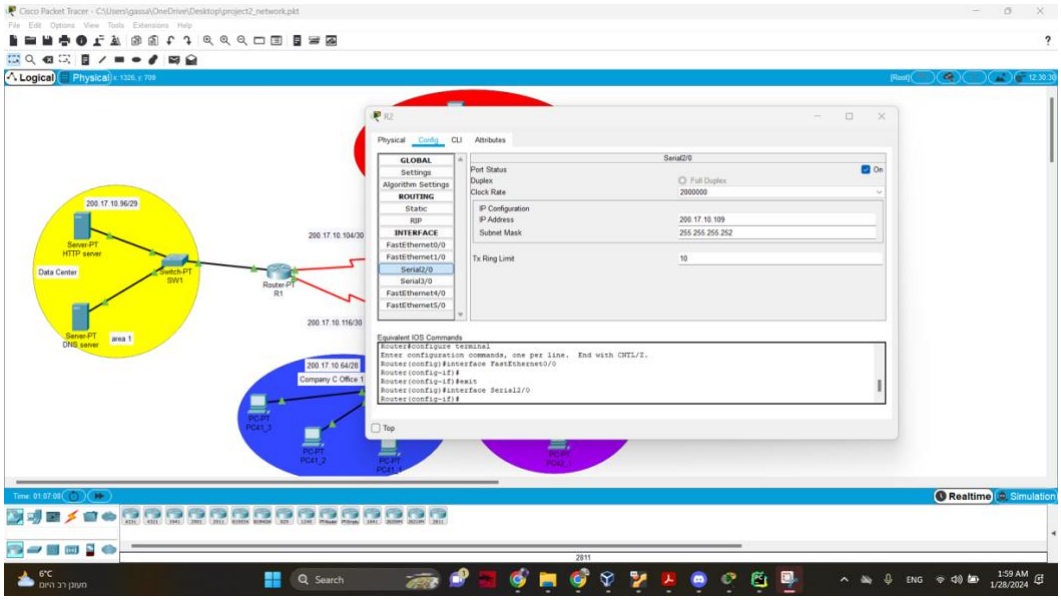

figure 9:Router 1 serial 2 getting ip using static manner

For the interface that is used to connect with router 3 se2 we give it IP 200.17.10.109 and a subnet mask 255.255.255.11111100->255.255.255.252.

Serial 3

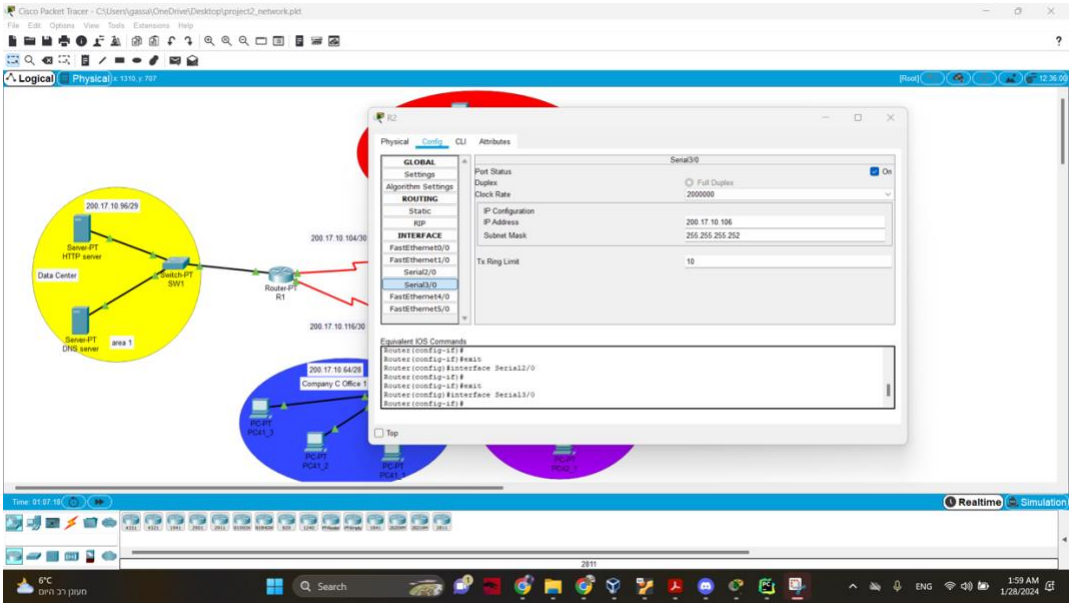

figure 10:Router 2 serial 3 getting ip using static manner

For the interface that is used to connect with router 1 se3 we give it IP 200.17.10.106 and a subnet mask 255.255.255.11111100->255.255.255.252.

Router 3:

Fast eathernet 0

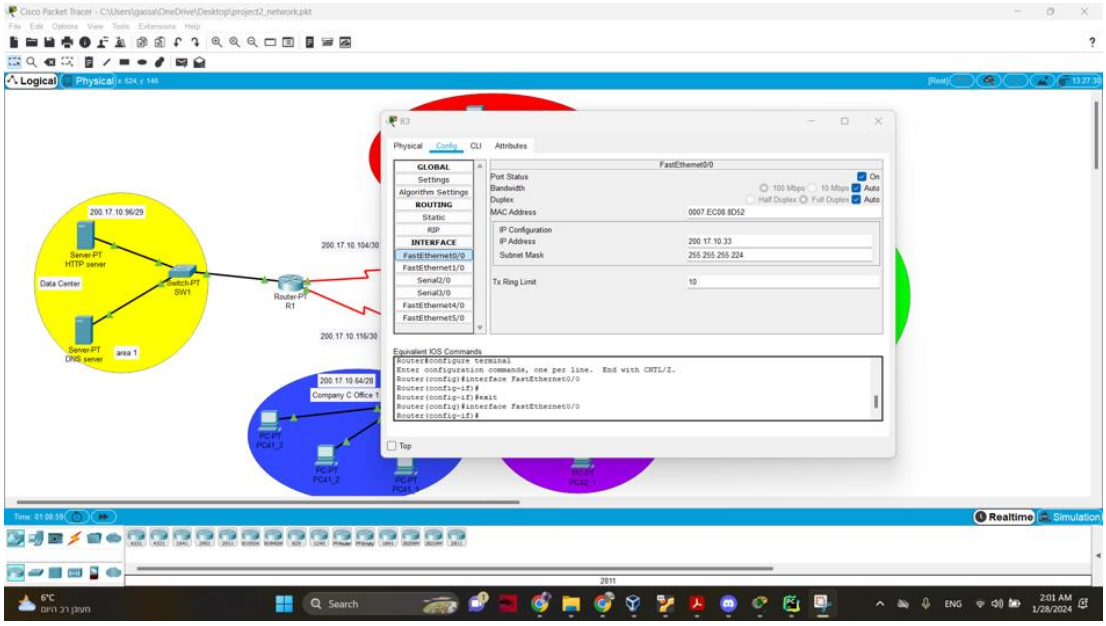

figure 11:Router 3 ethar0/0 getting ip using static manner

For router 3 we give it IP 200.17.10.33 and subnet mask 255.255.255.11100000->255.255.255.224

Serial 2

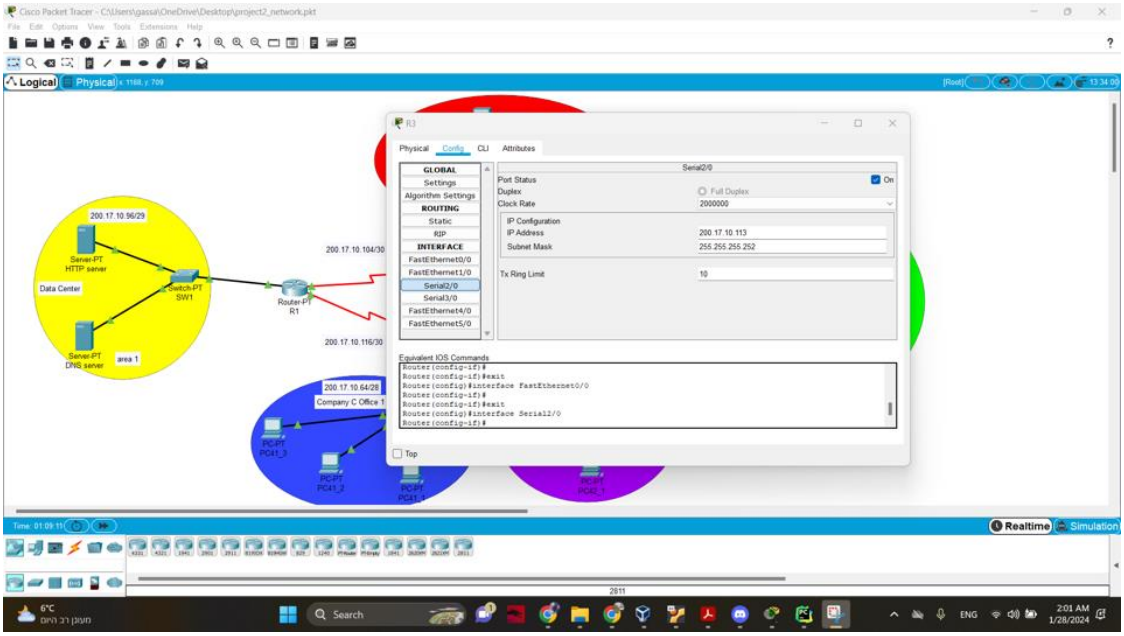

figure 12:Router 3 serial 2 getting ip using static manner

For the interface that is used to connect with router 4 se2 we give it IP 200.17.10.113 and a subnet mask 255.255.255.11111100->255.255.255.252.

Serial 3

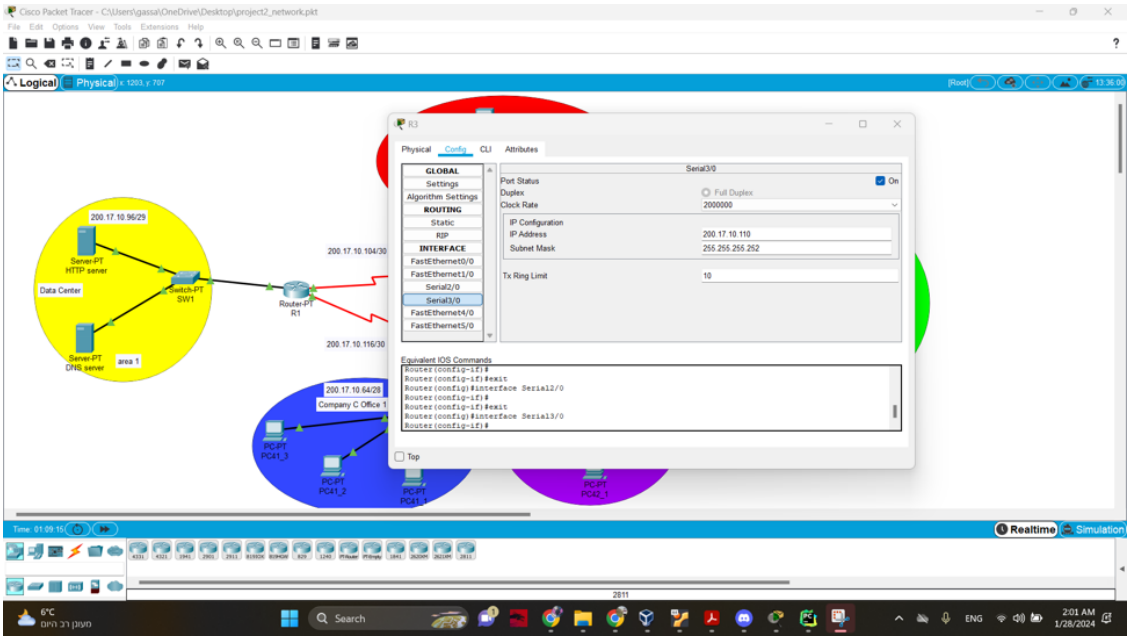

figure 13:Router 3 serial 3 getting ip using static manner

For the interface that is used to connect with router 2 se3 we give it IP 200.17.10.110 and a subnet mask 255.255.255.11111100->255.255.255.252.

Router 4:

Fast eathernet 0

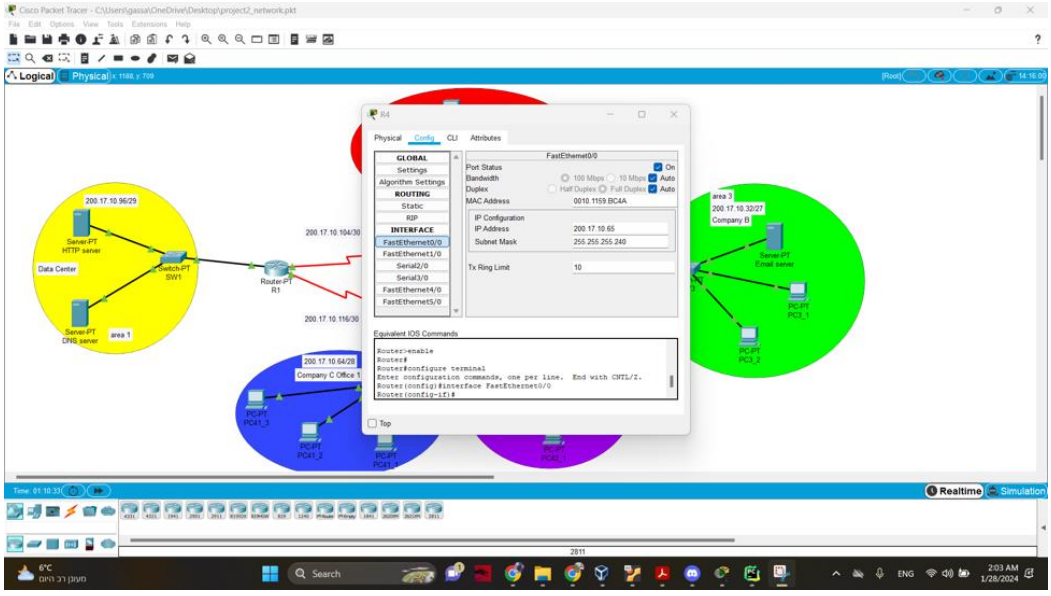

figure 14:Router 4 ethar0/0 getting ip using static manner

For router 4 we give it IP 200.17.10.65 and subnet mask 255.255.255.11110000->255.255.255.240

Fast eathernet 1

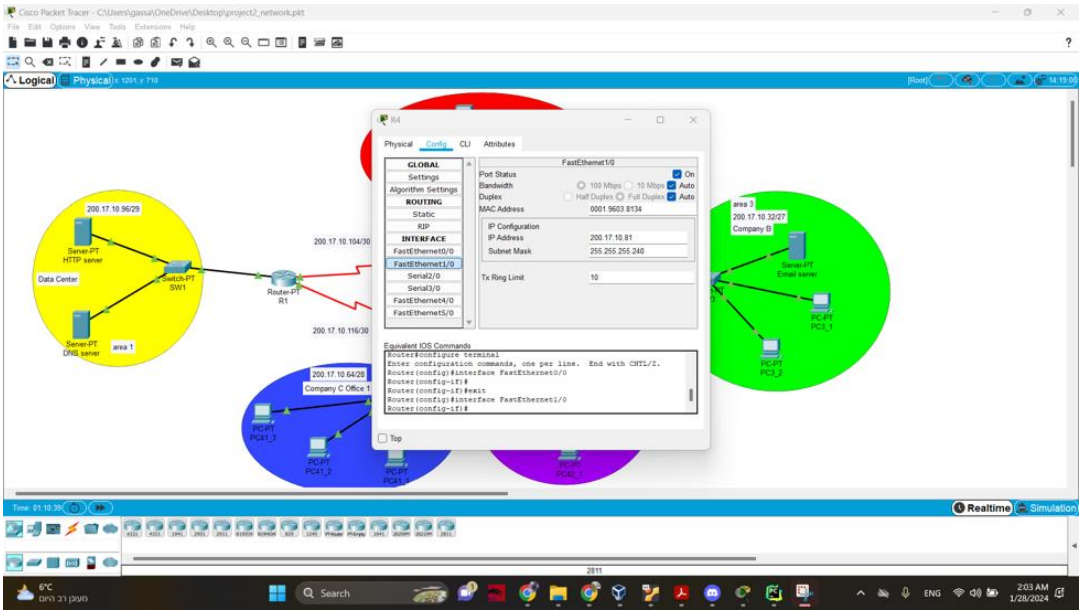

figure 15:Router 4 ethar0/1 getting ip using static manner

For router 4 we give it IP 200.17.10.81 and subnet mask 255.255.255.11110000->255.255.255.240

Serial 2

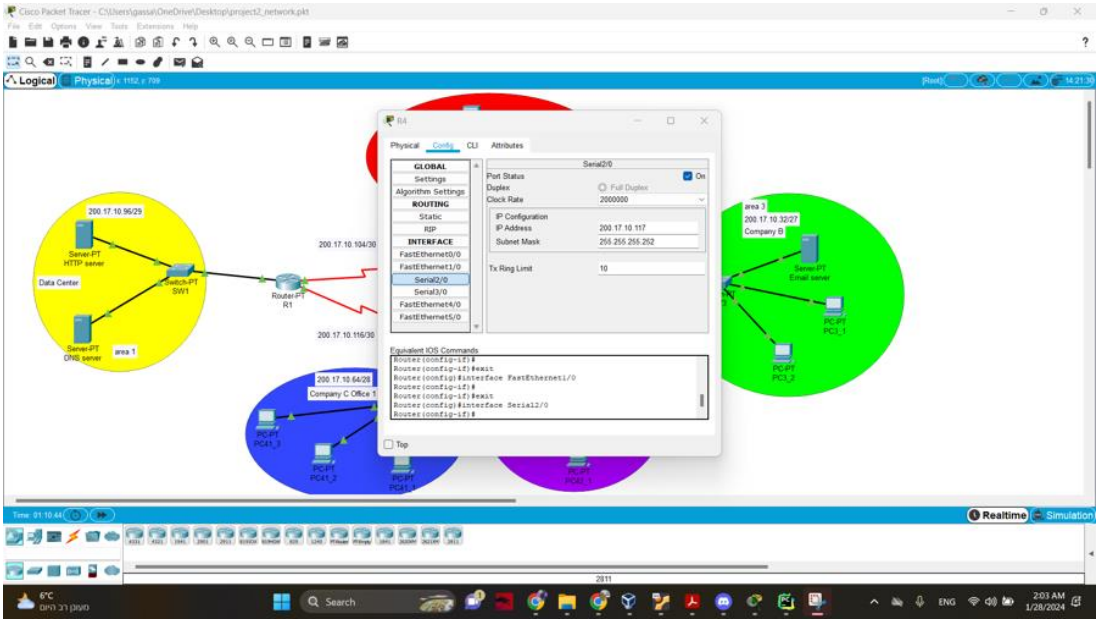

figure 16:Router 4 serial 2 getting ip using static manner

For the interface that is used to connect with router 1 se2 we give it IP 200.17.10.117 and a subnet mask 255.255.255.11111100->255.255.255.252.

Serial 3

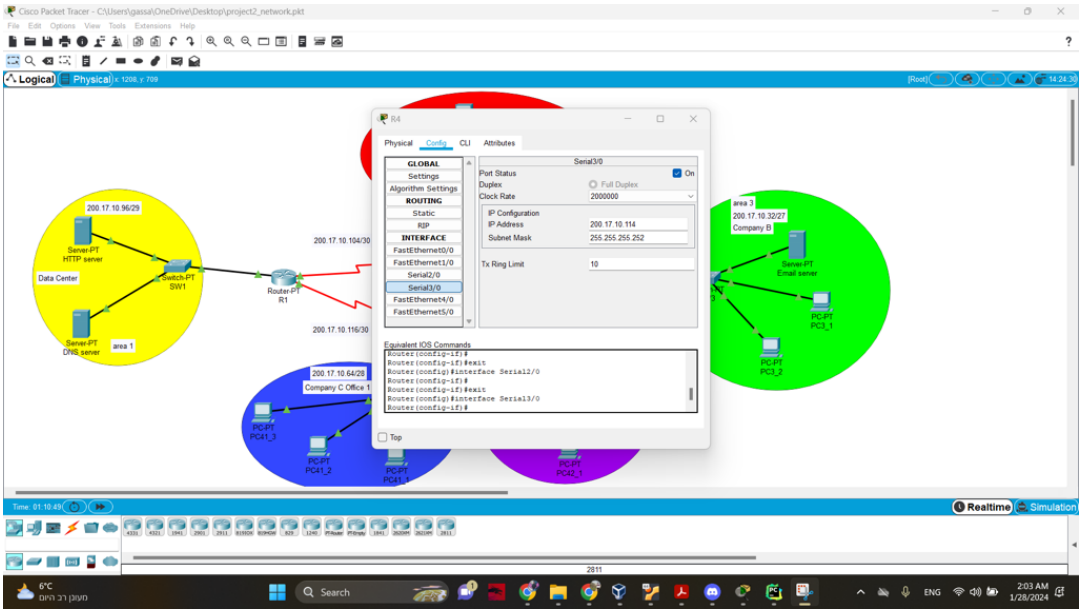

figure 17:Router 4 serial 3 getting ip using static manner

For the interface that is used to connect with router 3 se3 we give it IP 200.17.10.114 and a subnet mask 255.255.255.11111100->255.255.255.252.

Pc's:

Pc2_1

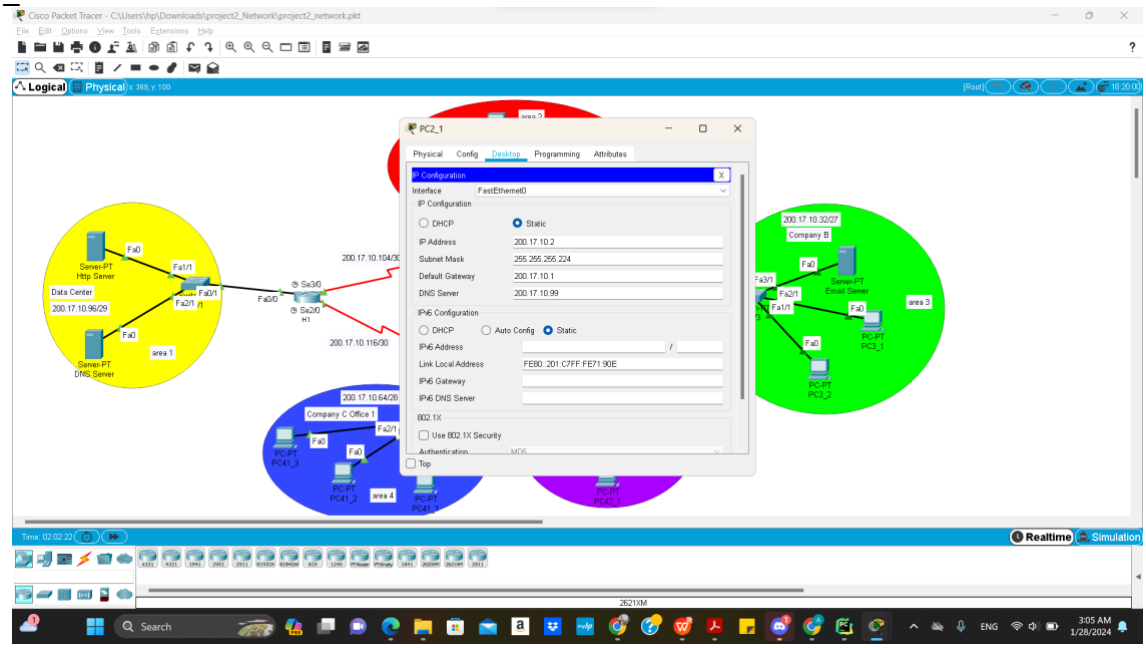

figure 18:Pc2_1 getting ip using static manner

For the PC2_1 we give it IP 200.17.10.2 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router2 200.17.10.1 and the DNS 200.17.10.99 .

Pc2_2

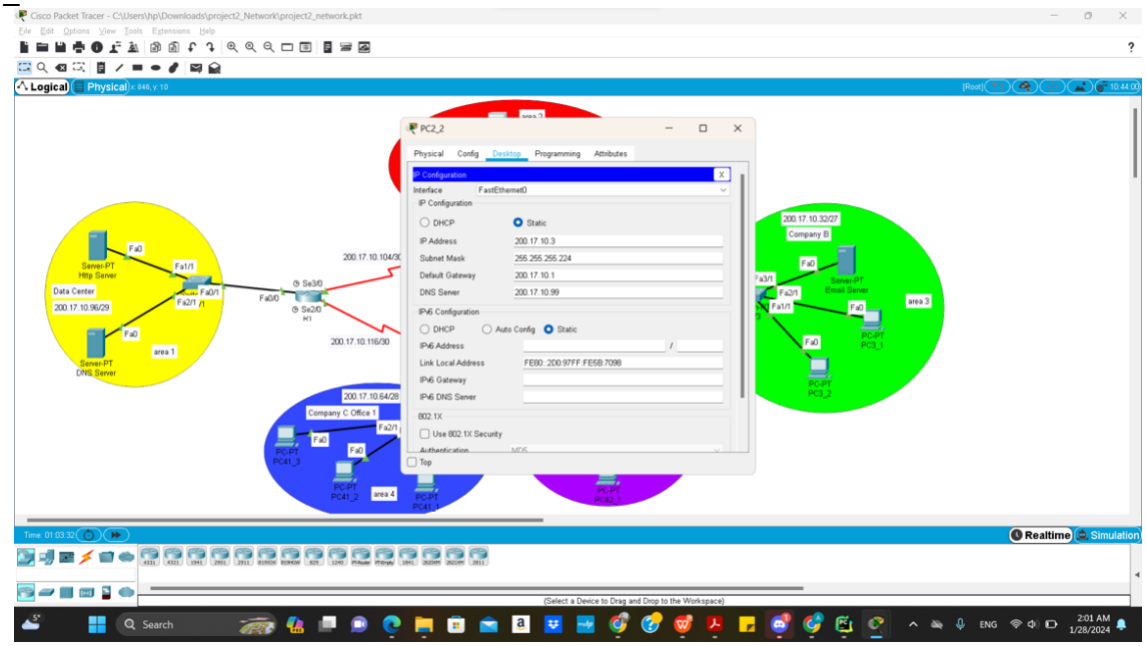

figure 19:Pc2_2 getting ip using static manner

For the PC2_2 we give it IP 200.17.10.3 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router2 200.17.10.1 and the DNS 200.17.10.99 .

Pc2_3

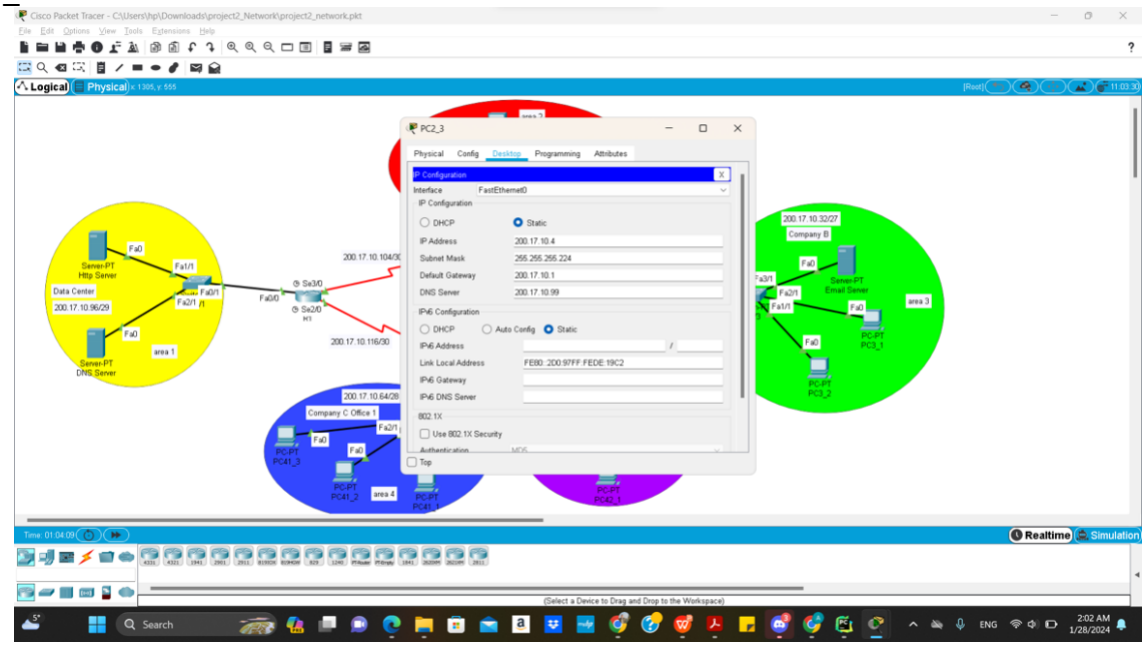

figure 20:Pc2_3 getting ip using static manner

For the PC2_3 we give it IP 200.17.10.4 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router2 200.17.10.1 and the DNS 200.17.10.99 .

Pc 3_1

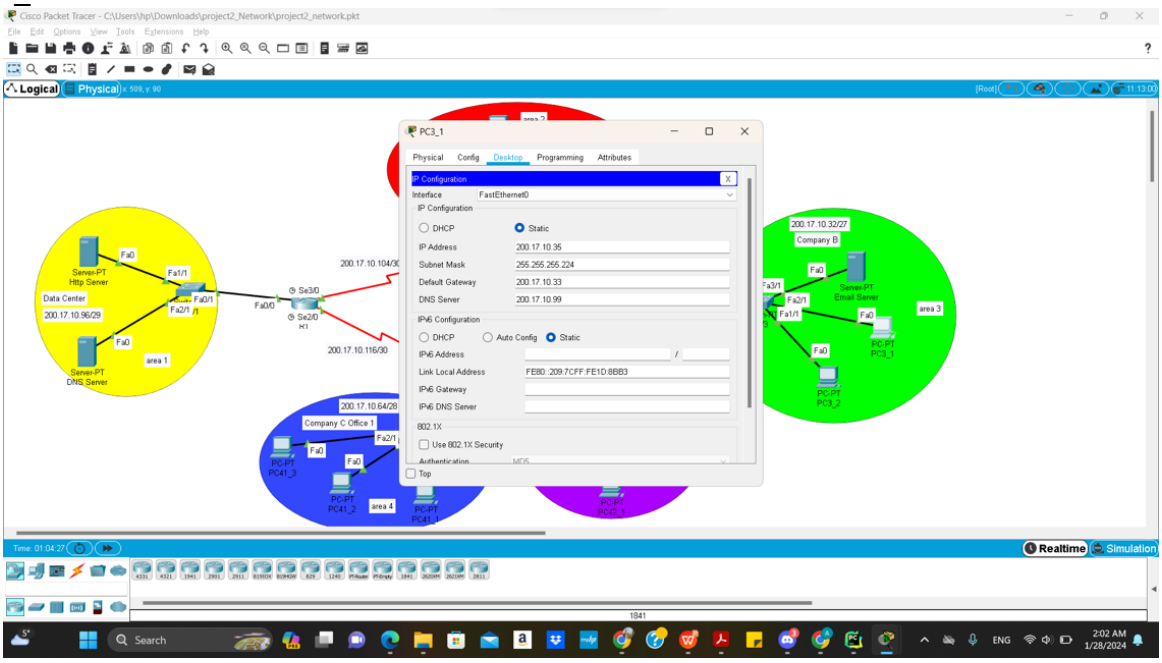

figure 21:Pc3_1 getting ip using static manner

For the PC3_1 we give it IP 200.17.10.35 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router3 200.17.10.33 and the DNS 200.17.10.99 .

Pc 3_2

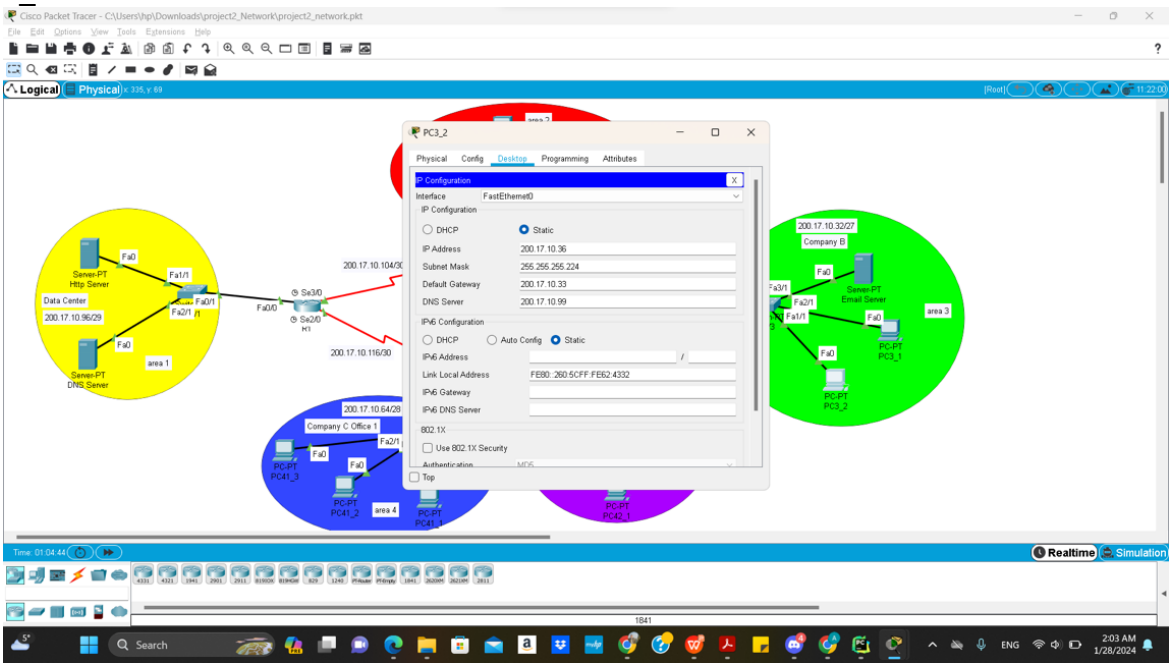

figure 22:Pc3_2 getting ip using static manner

For the PC3_2 we give it IP 200.17.10.36 and subnet mask 255.255.255.11100000->255.255.255.224 and put the gateway router3 200.17.10.33 and the DNS 200.17.10.99 .

Pc 41_1

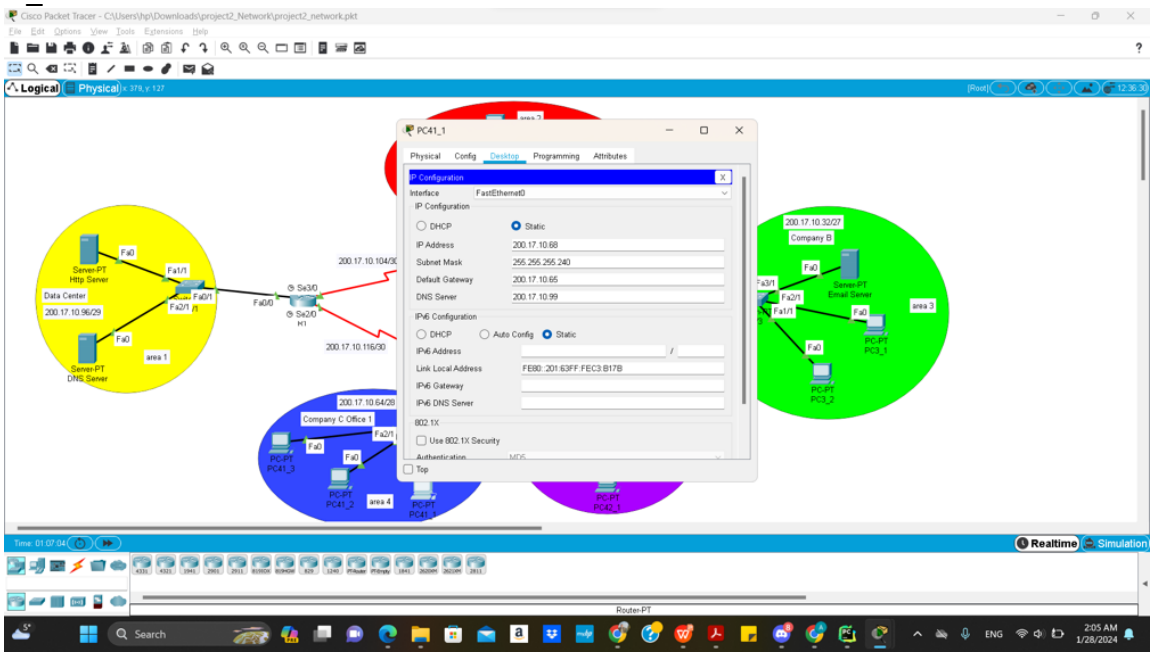

figure 23:Pc41_1 getting ip using static manner

For the PC41_1 we give it IP 200.17.10.68 and subnet mask 255.255.255.11110000->255.255.255.240 and put the gateway router4 200.17.10.65 and the DNS 200.17.10.99 .

Pc 41_2

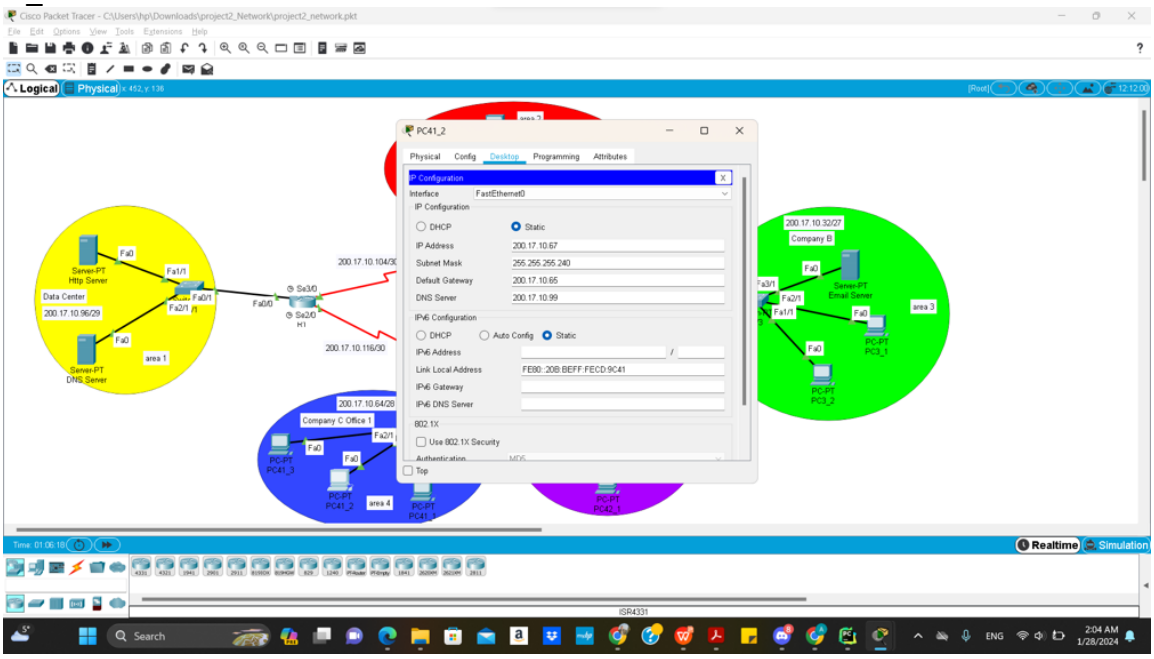

figure 24:Pc41_2 getting ip using static manner

For the PC41_2 we give it IP 200.17.10.67 and subnet mask 255.255.255.11110000->255.255.255.240 and put the gateway router4 200.17.10.65 and the DNS 200.17.10.99 .

Pc 41_3

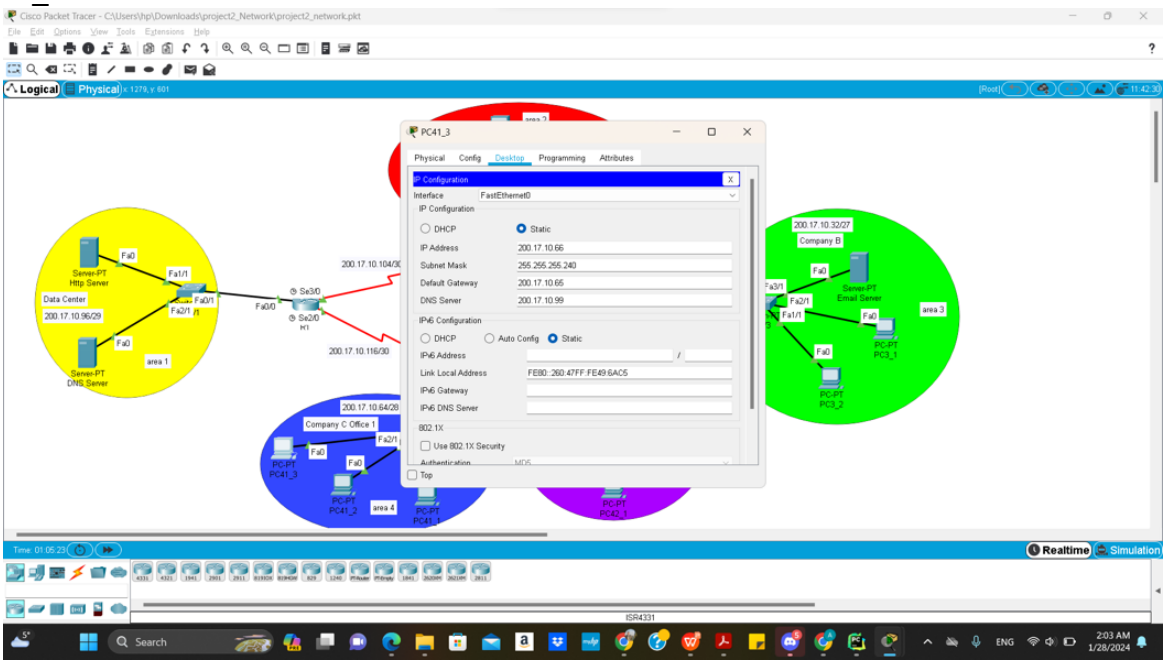

figure 25:Pc41_3 getting ip using static manner

For the PC41_3 we give it IP 200.17.10.66 and subnet mask 255.255.255.11110000->255.255.255.240 and put the gateway router4 200.17.10.65 and the DNS 200.17.10.99 .

Pc 42_1

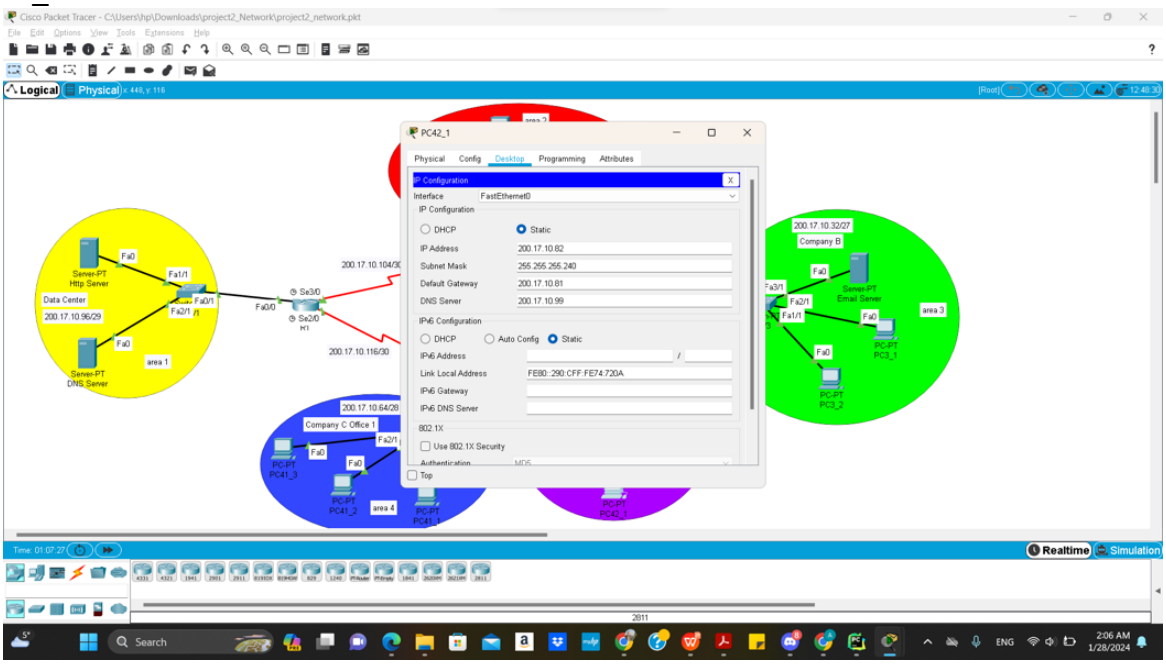

figure 26:Pc42_1 getting ip using static manner

For the PC42_1 we give it IP 200.17.10.82 and subnet mask 255.255.255.11110000->255.255.255.240 and put the gateway router4 200.17.10.81 and the DNS 200.17.10.99 .

Pc 42_2

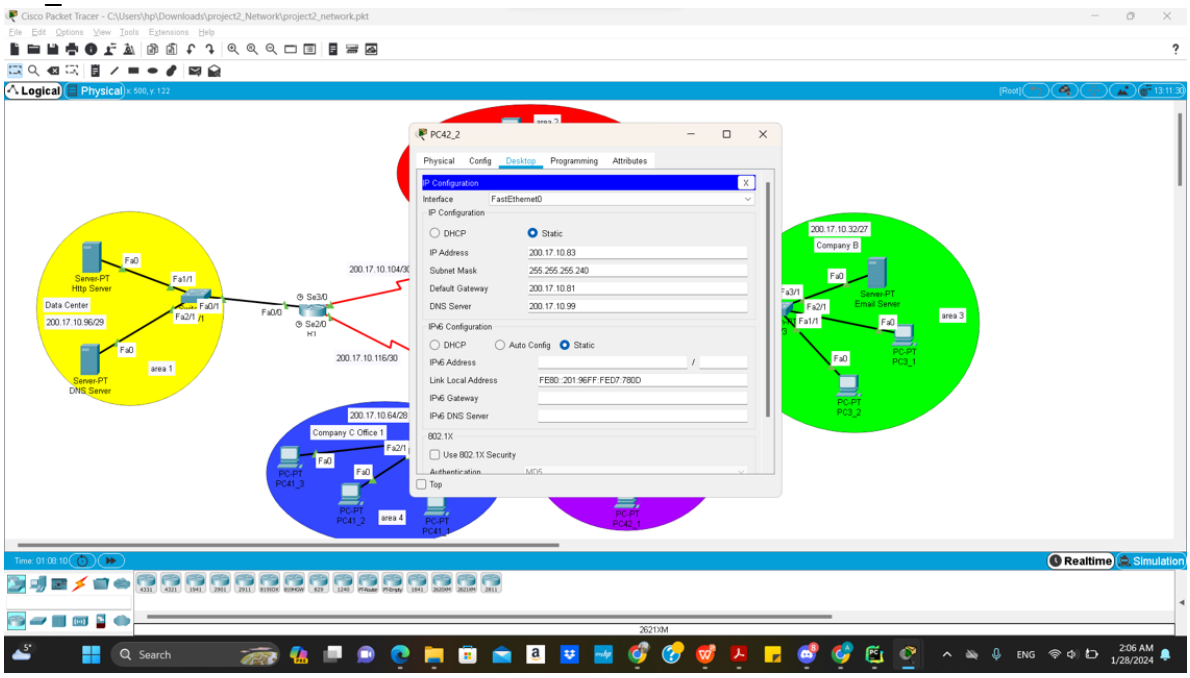

figure 27:Pc42_2 getting ip using static manner

For the PC42_2 we give it IP 200.17.10.83 and subnet mask 255.255.255.11110000->255.255.255.240 and put the gateway router4 200.17.10.81 and the DNS 200.17.10.99 .

Part 2:

in this part we Configure the DNS server and WEB server with domain name www.FirstSem2024.com and we Create usernames/passwords for all PCs (PC2_1, PC3_1, PC41_1, PC42_1) in the email server (ENCS3320.edu).

Servers configuration:

HTTP server

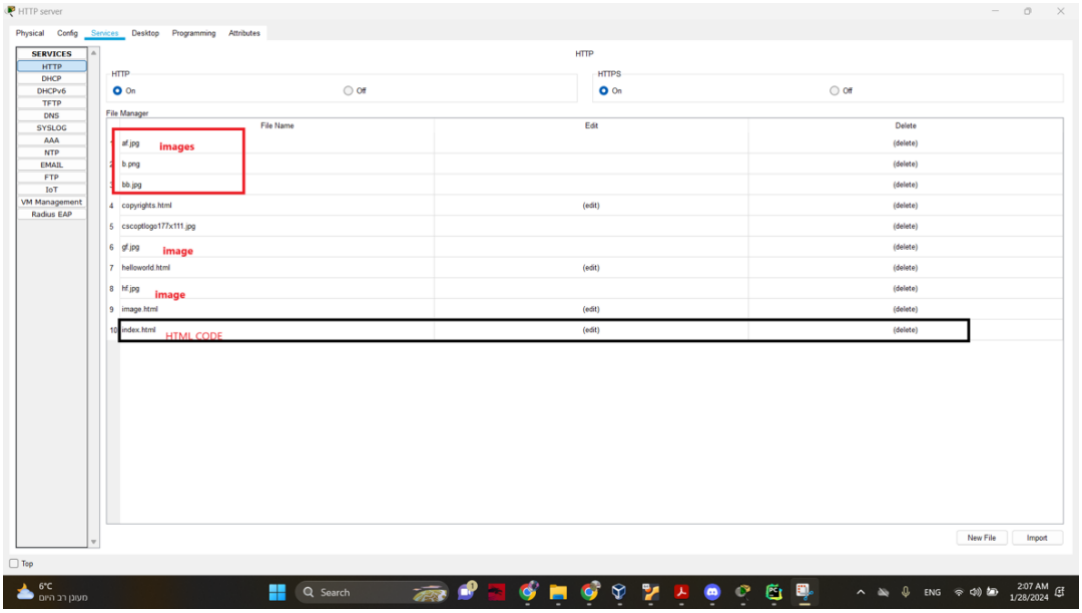

figure 28:HTTP server configuration "1"

For this server we turn on the HTTP and HTTPS protocol since it is a web protocol then we create website by modifying the index.html file and photos in the HTTP server.

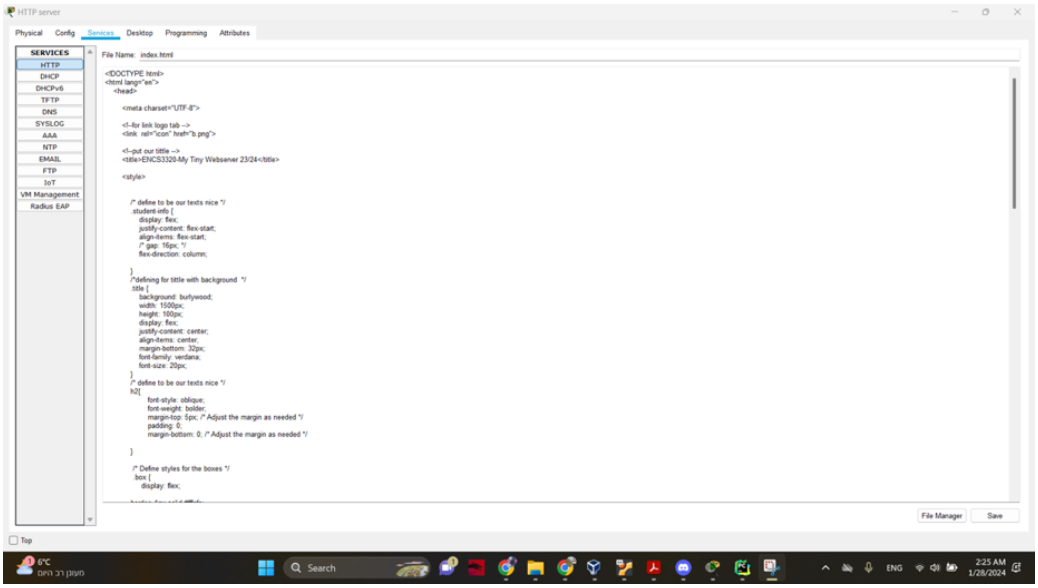

figure 29:HTTP server configuration "2"

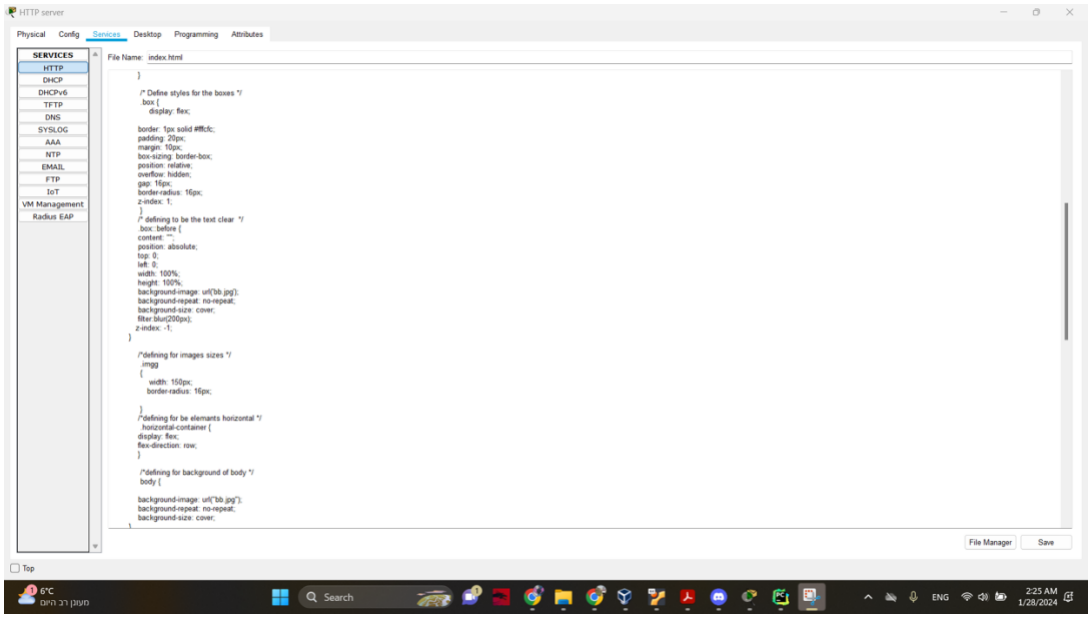

figure 30:HTTP server configuration "3"

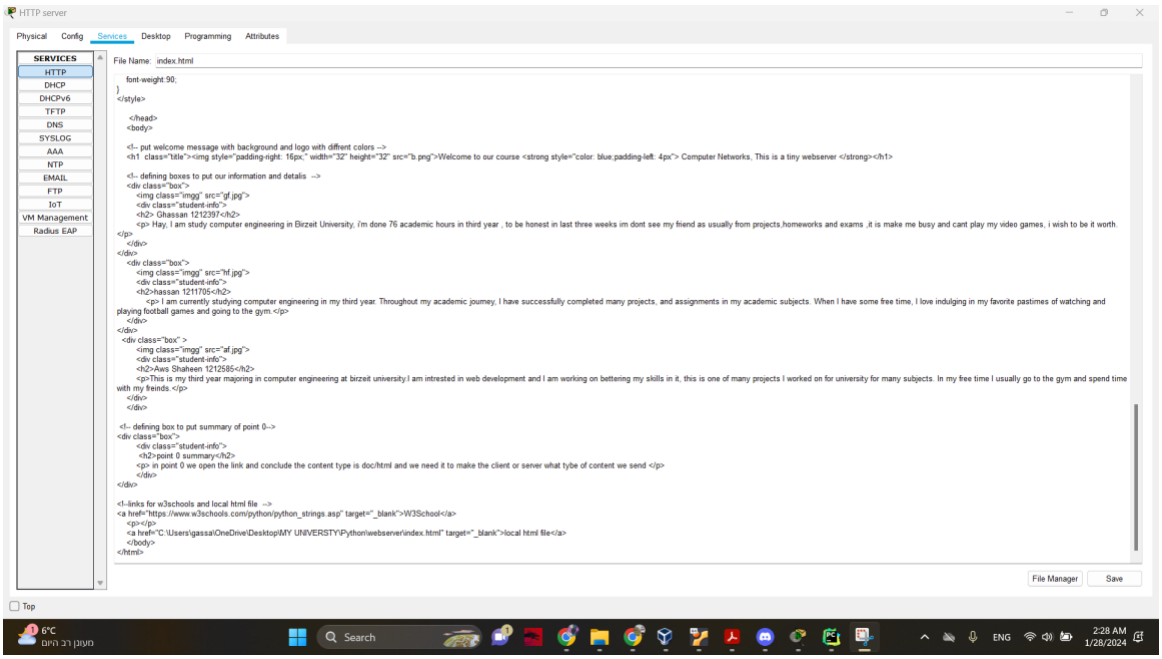

figure 31:HTTP server configuration "4"

These images show the html code that we used to create our website.

DNS server

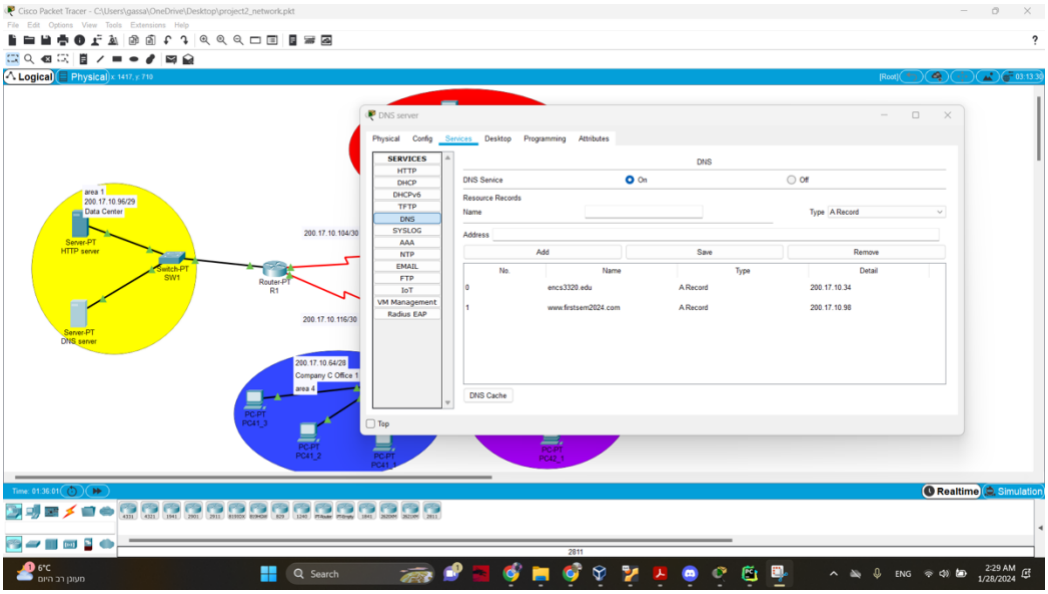

figure 32:DNS server configuration

For this server we turn on the DNS protocol since it is a DNS server then we configure the DNS server with domain name www.FirstSem2024.com with the IP op the http server 200.17.10.98.

Mail server

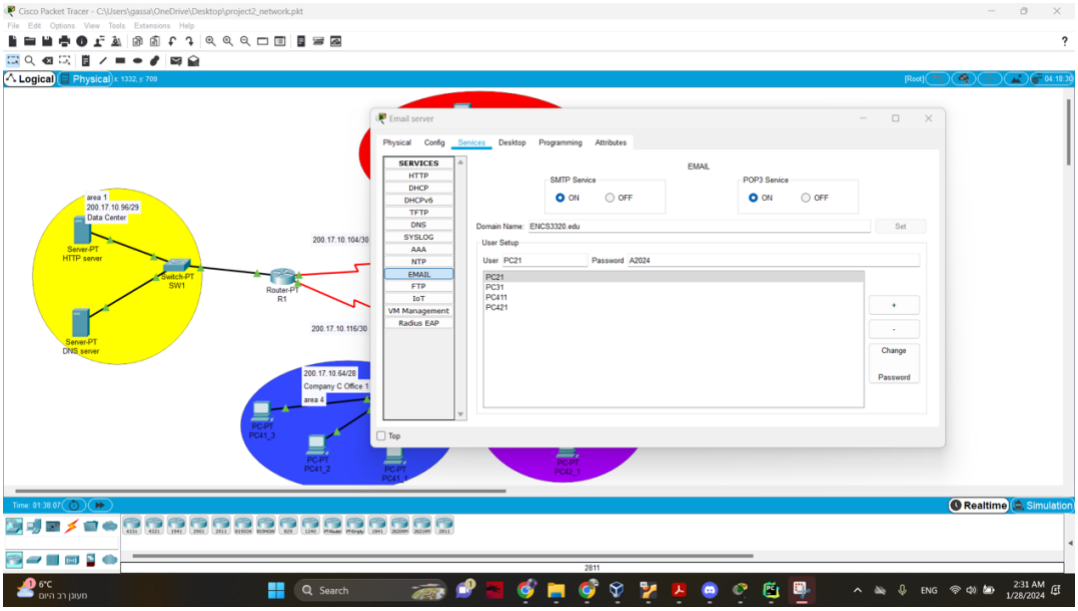

figure 33:Mail server configuration

For this server we turn on the SMTP and POP3 protocols (send and receive protocols) since it is a mail then we create usernames/passwords for all PCs (PC21, PC31,PC411, PC421) and their passwords are same for all “A2024”.

Part 3:

In this part we use open shortest path protocol (OSPF) on all routers with process ID 10 so we can connect all the routers together with areas (area0, area1, area2, area3, area4).

OSPF:

Router 1:

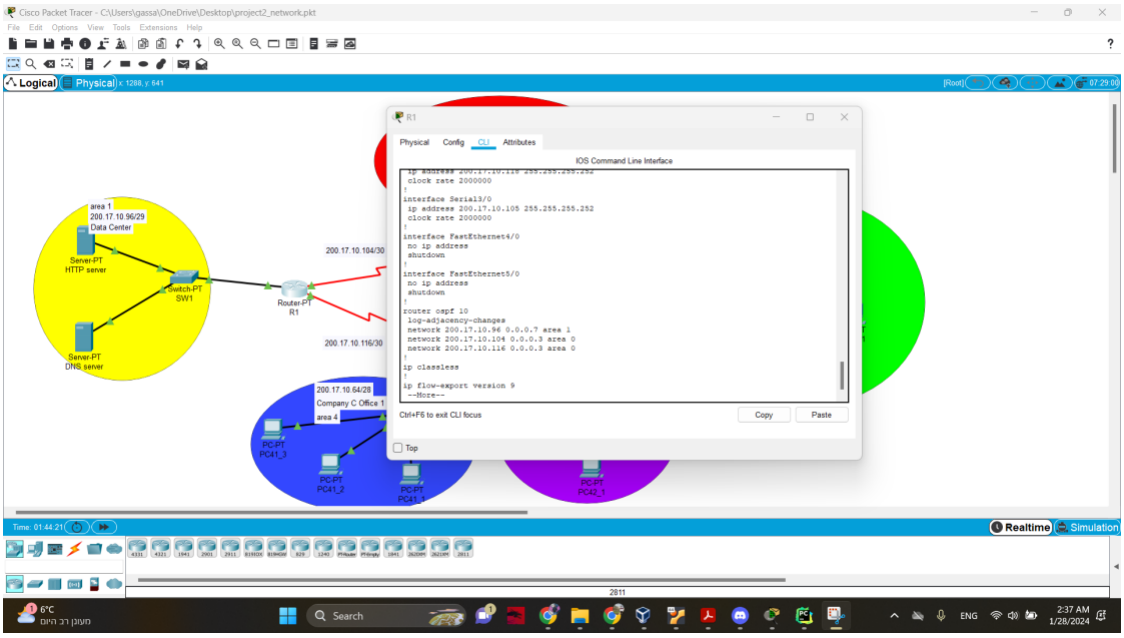

figure 34:Applying routing protocol for Router 1

We have connected 200.17.10.96 with area 1, 200.17.10.104 with area 0, 200.17.10.116 with area 0

Router 2:

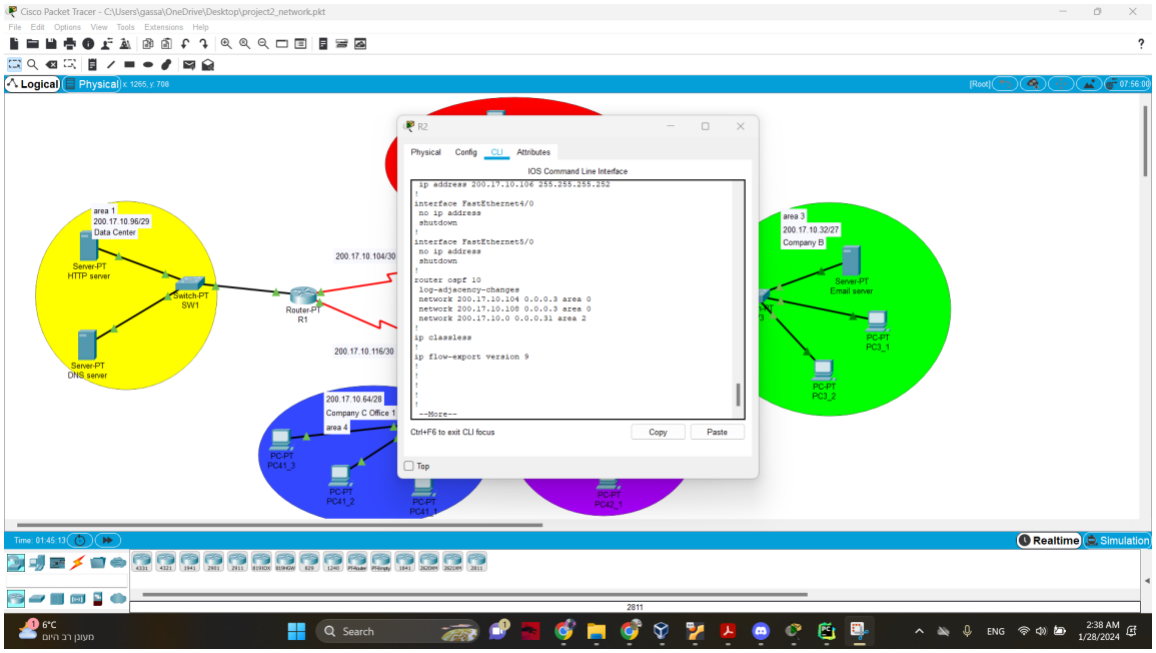

figure 35:Applying routing protocol for Router 2

We have connected 200.17.10.0 with area 2 ,200.17.10.104 with area 0, and 200.17.10.108 with area 0

Router 3:

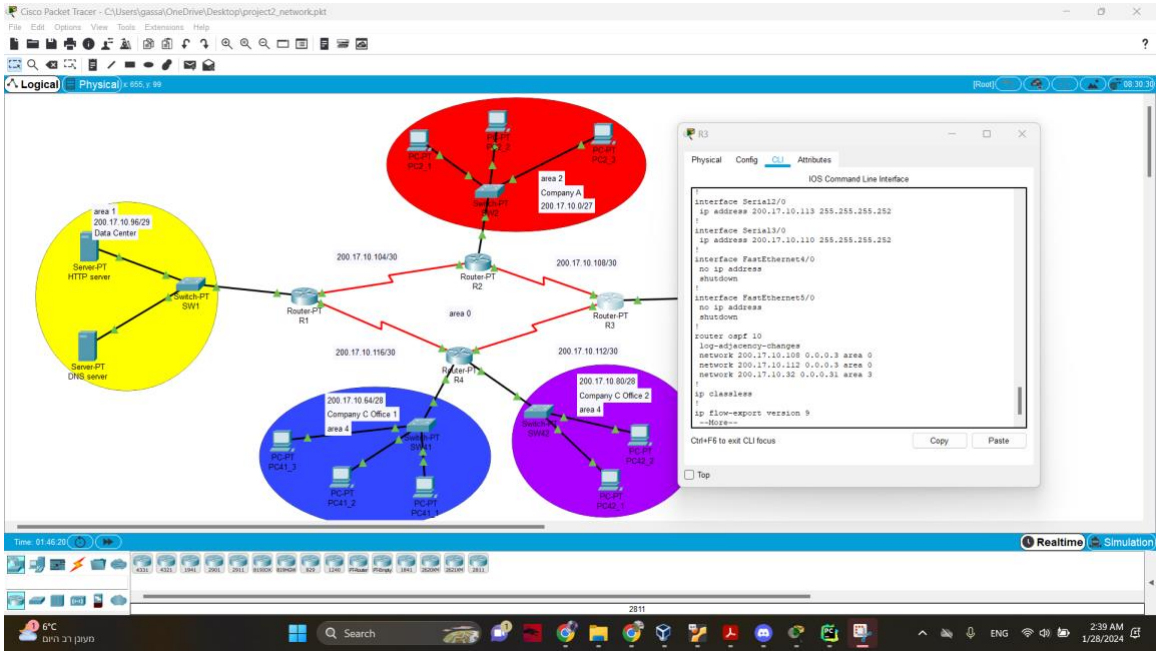

figure 36:Applying routing protocol for Router 3

We have connected 200.17.10.32 with area 3 ,200.17.10.108 with area 0, and 200.17.10.112 with area 0

Router 4:

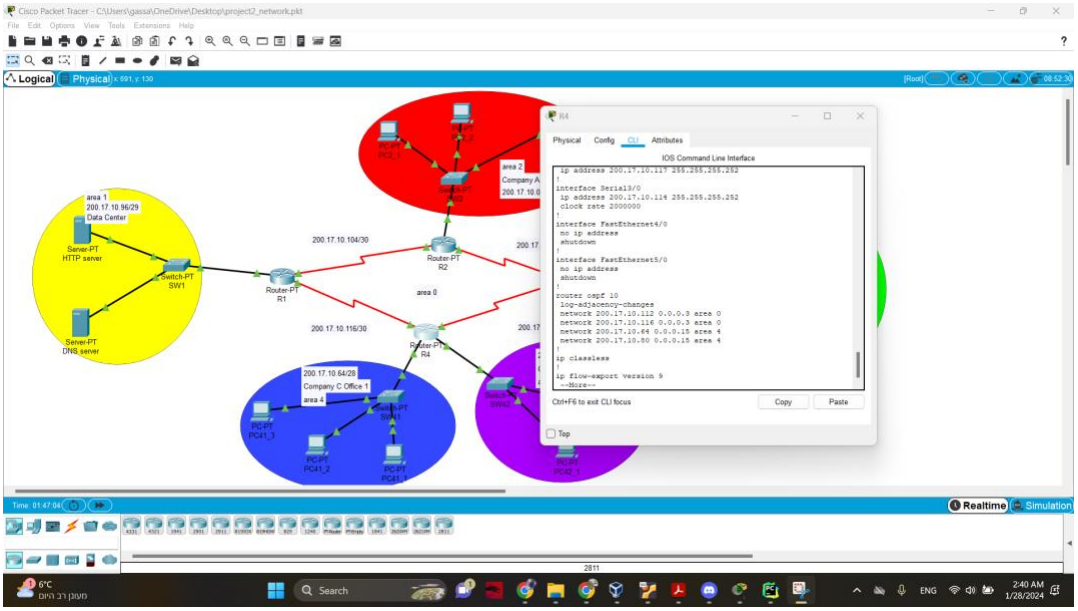

figure 37:Applying routing protocol for Router 4

We have connected 200.17.10.64 with area 4, 200.17.10.80 with area 4 ,200.17.10.112 with area 0, and200.17.10.116 with area 0

Part 4:

Testing connectivity, routes, website, and emails

In this part we aim to test the connection between the pcs and between the pcs and the servers.

Pc's Ping and tracert commands To Test the connectivity between all PCs :

In this part we use cmd commands ping and tracert to test the connections between pcs (test the reachability of a device on the network,traceroute is a command you use to 'trace' the route that a packet takes when traveling to its destination)

Pc2_1

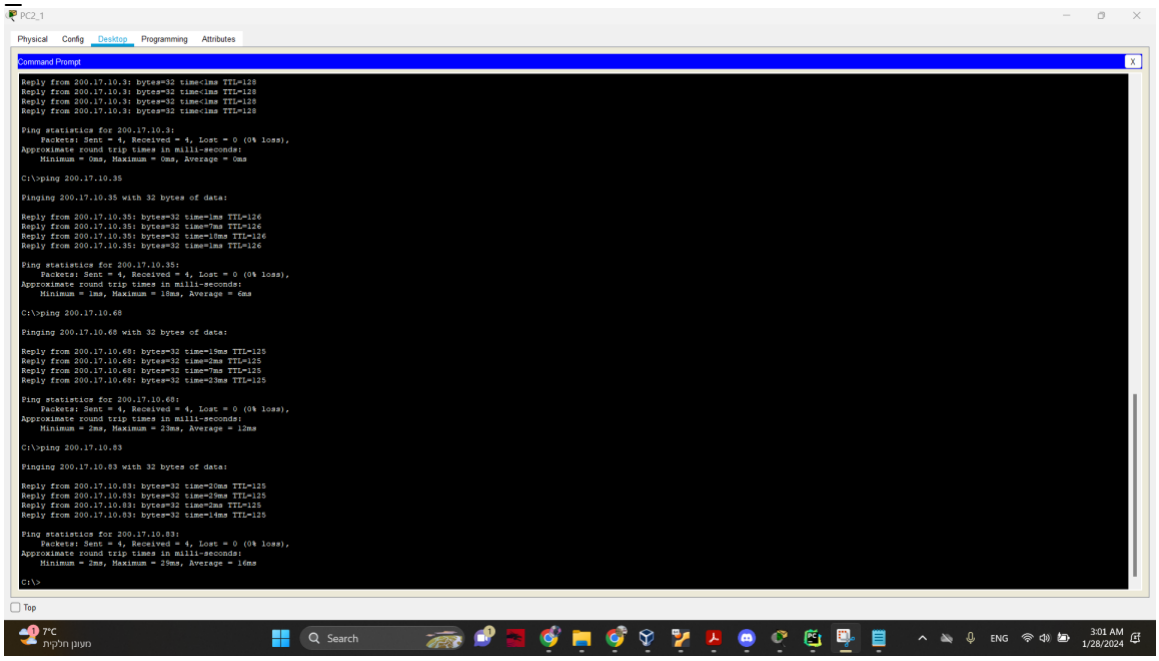

figure 38:Ping from Pc2_1

From the above picture we try to ping to all pcs from PC2_1 by sending 4 packets and we can see that all packets arrive without and lost packet or requested out.

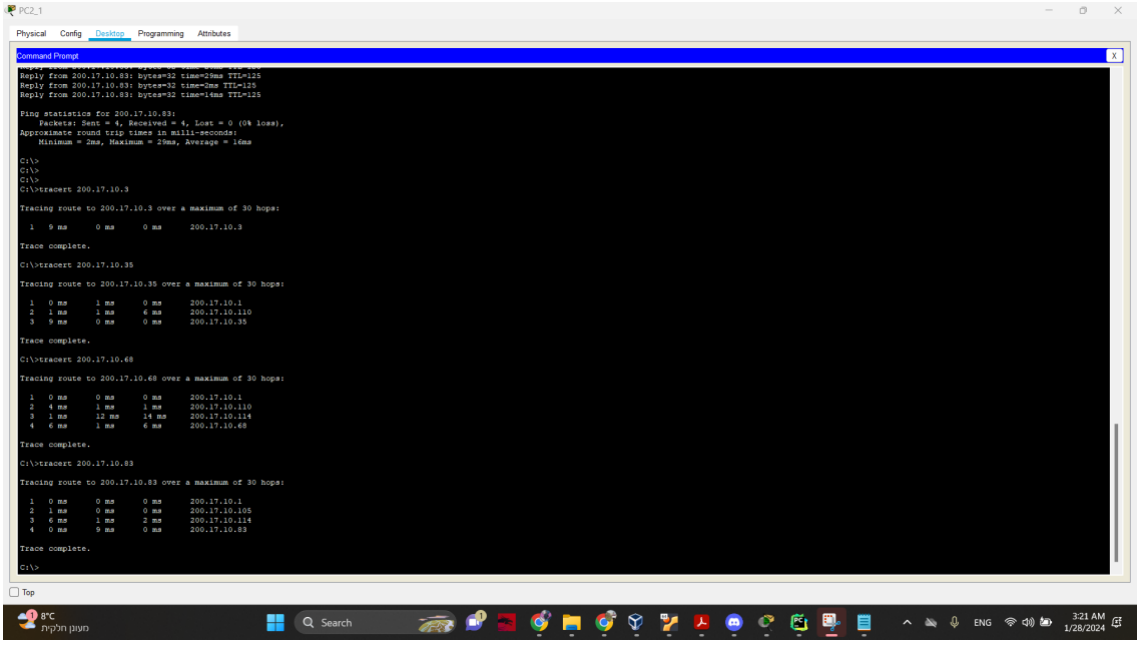

figure 39:tracert from Pc2_1

When we use tracert between PC2_1 and other pcs it gives us the path between PC2_1 and the other PCs.

To PC2_2 the packet arrives directly since they are in the same network area.
To PC3_1 first we get through the gateway of the area 200.17.10.1 then through the interface 200.17.10.108 in the core network.
To PC41_1 (same PC3_1 path)
To PC42_2 (same PC3_1 path)

Pc3_2

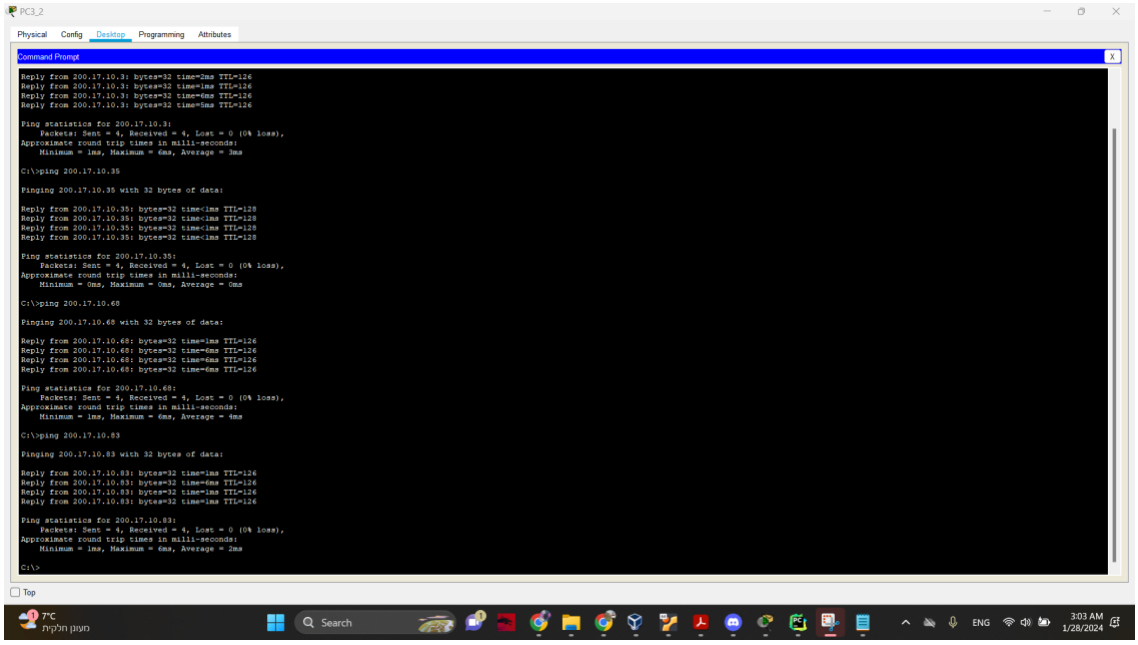

figure 40:Ping from Pc3_2

From the above picture we try to ping to all pcs from PC3_2 by sending 4 packets and we can see that all packets arrive without and lost packet or requested out.

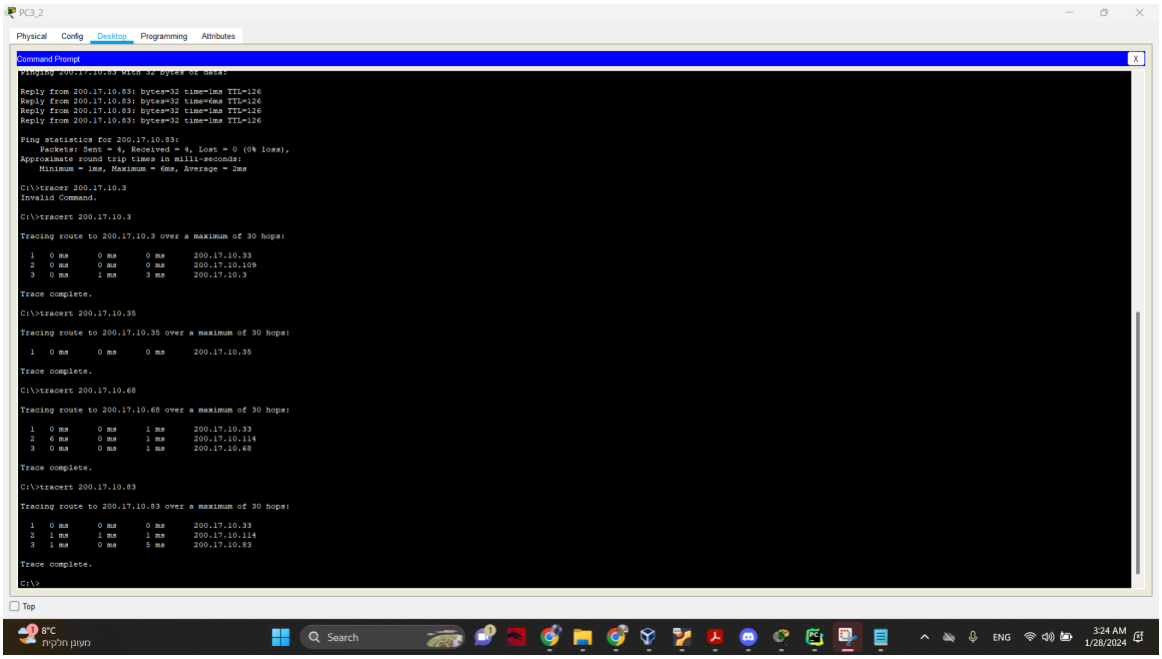

figure 41:tracert from Pc3_2

When we use tracert between PC3_2 and other pcs it gives us the path between PC3_2 and the other PCs.

To PC2_2 first we get through the gateway of the area 200.17.10.33 then through the interface 200.17.10.108 in the core network.
To PC3_1 the packet arrives directly since they are in the same network area.
To PC41_1 first we get through the gateway of the area 200.17.10.33 then through the interface 200.17.10.112 in the core network.
To PC42_2 (same PC41_1 path)

Pc41_1

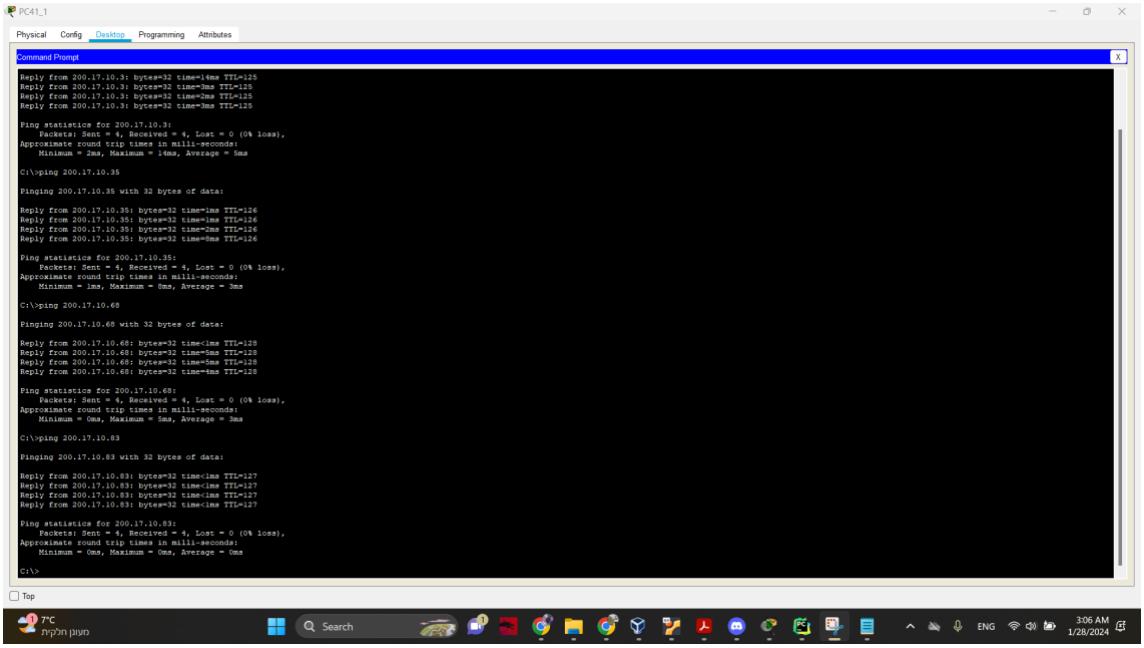

figure 42:Ping from Pc41_1

From the above picture we try to ping to all pcs from PC41_1 by sending 4 packets and we can see that all packets arrive without and lost packet or requested out.

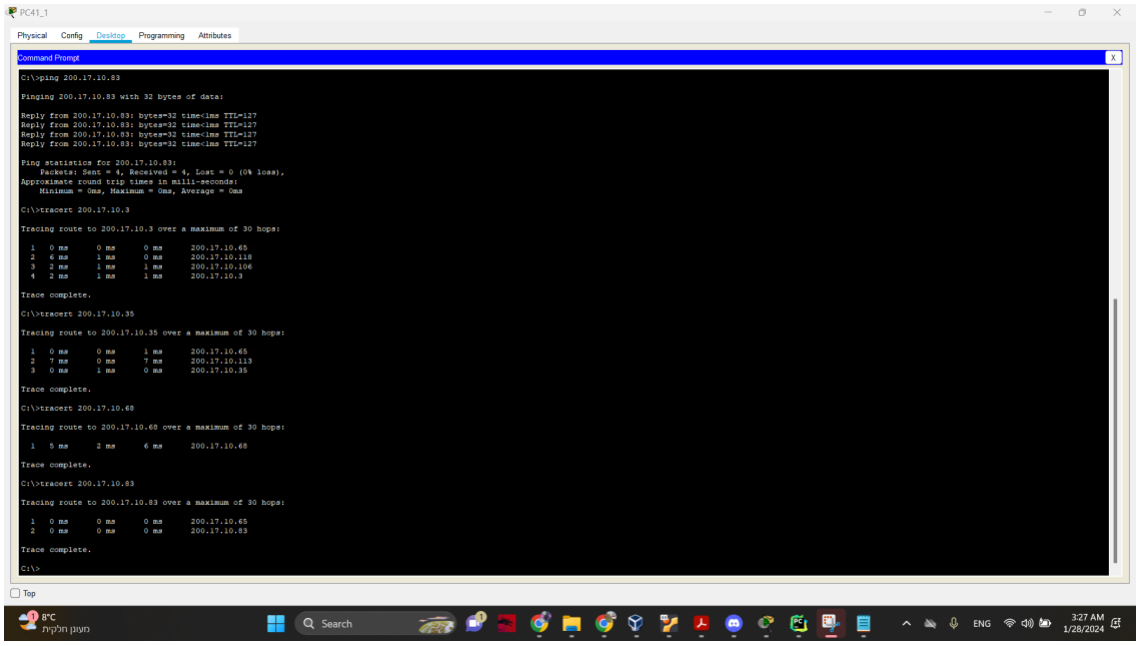

figure 43:tracert from Pc41_1

When we use tracert between PC41_1 and other pcs it gives us the path between PC41_1 and the other PCs.

To PC2_2 first we get through the gateway of the area 200.17.10.65 then through the interface 200.17.10.116 in the core network.
To PC3_1 first we get through the gateway of the area 200.17.10.65 then through the interface 200.17.10.112 in the core network.
To PC41_1 the packet arrives directly since they are in the same network area.
To PC42_2 (same PC41_1 path), but here from Ethernet0/0 200.17.10.65 with Ethernet1/0 200.17.10.81 for C Office 2

Pc42_1

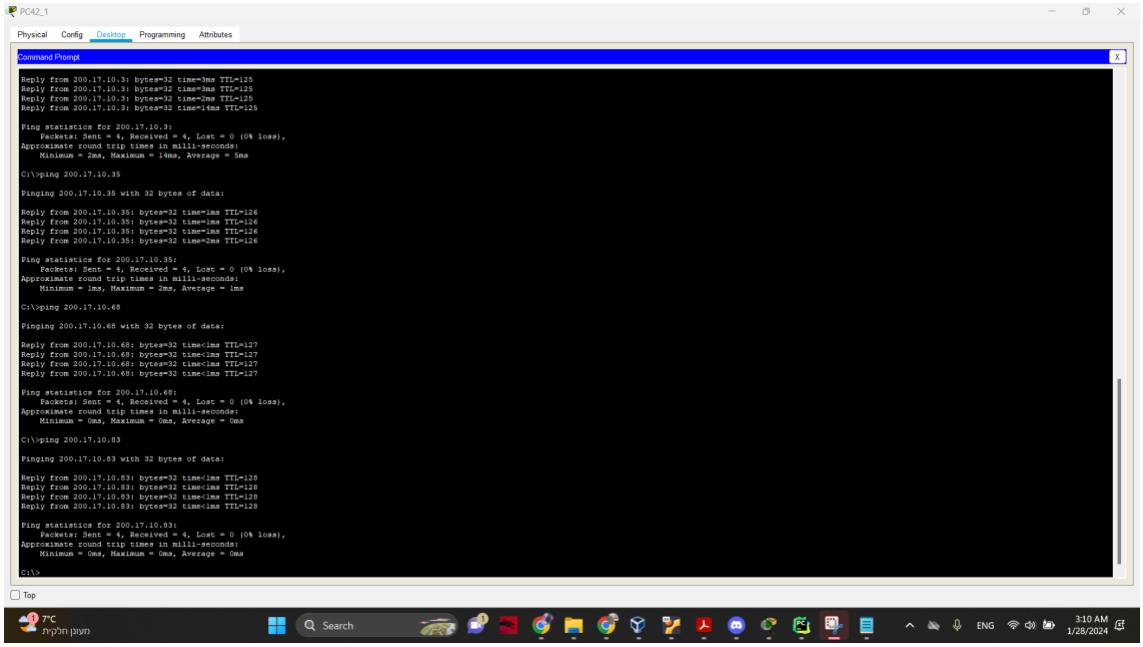

figure 44:Ping from Pc42_1

From the above picture we try to ping to all pcs from PC42_1 by sending 4 packets and we can see that all packets arrive without and lost packet or requested out.

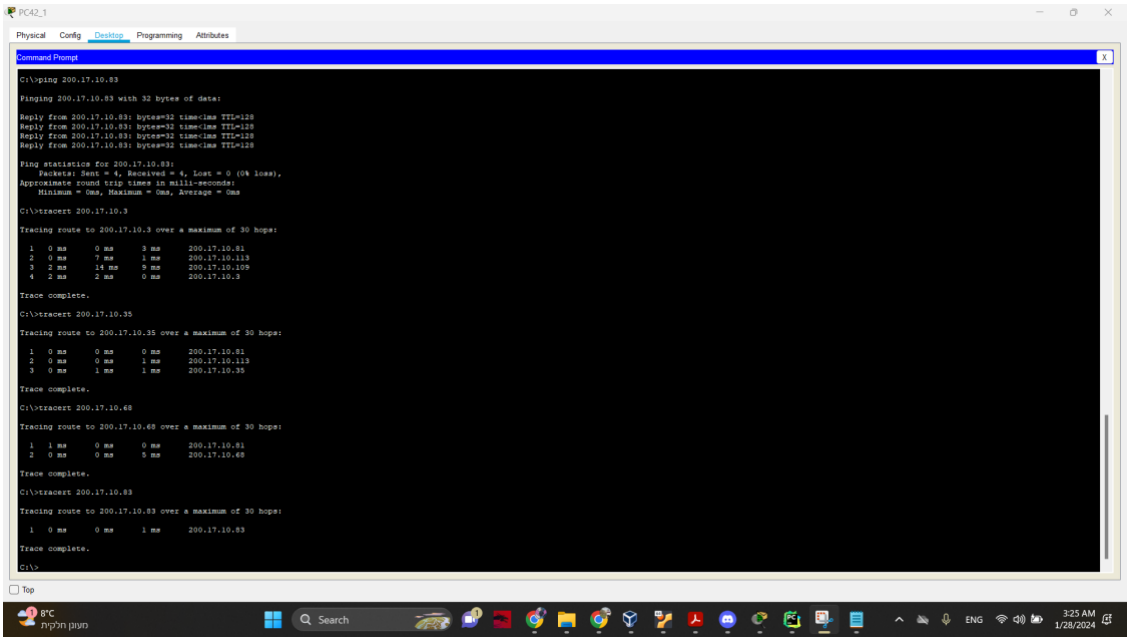

figure 45:tracert from Pc42_1

When we use tracert between PC42_1 and other pcs it gives us the path between PC42_1 and the other PCs.

To PC2_2 first we get through the gateway of the area 200.17.10.81 then through the interface 200.17.10.112 in the core network.
To PC3_1 first we get through the gateway of the area 200.17.10.81 then through the interface 200.17.10.112 in the core network.
To PC41_1 the packet arrives from Ethernet1/0 200.17.10.81 with Ethernet0/0 200.17.10.81 for C Office 1
To PC42_2 the packet arrives directly since they are in the same network area.

Access www. FirstSem2024.com from all PCs:

In this part we try to access the web site we create to make sure that we can connect with HTTP server and DNS server.

Pc2_1

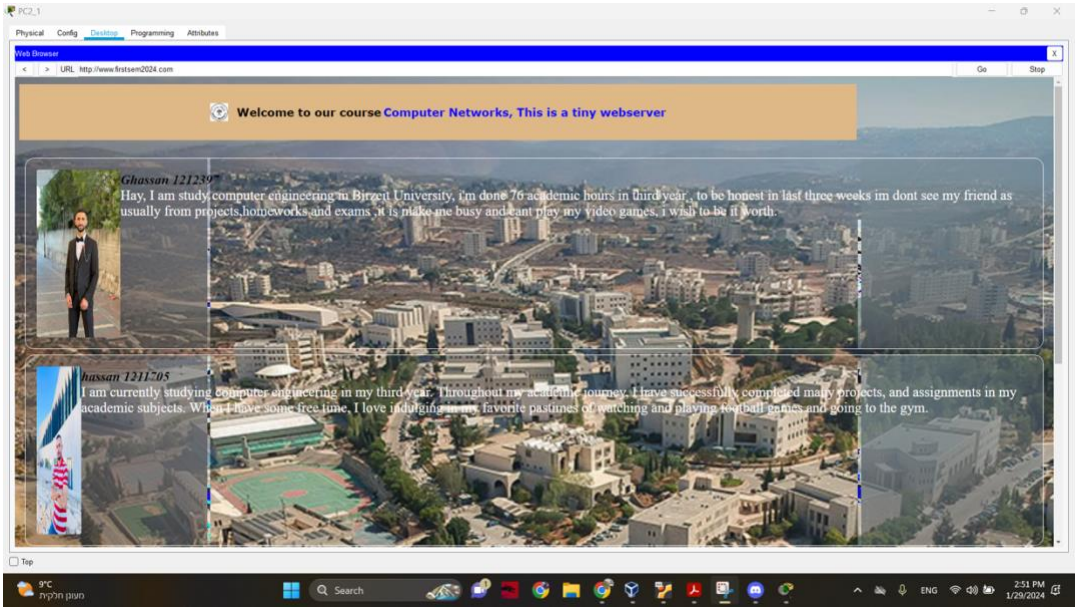

figure 46:Accessing www. FirstSem2024.com from Pc2_1 '1'

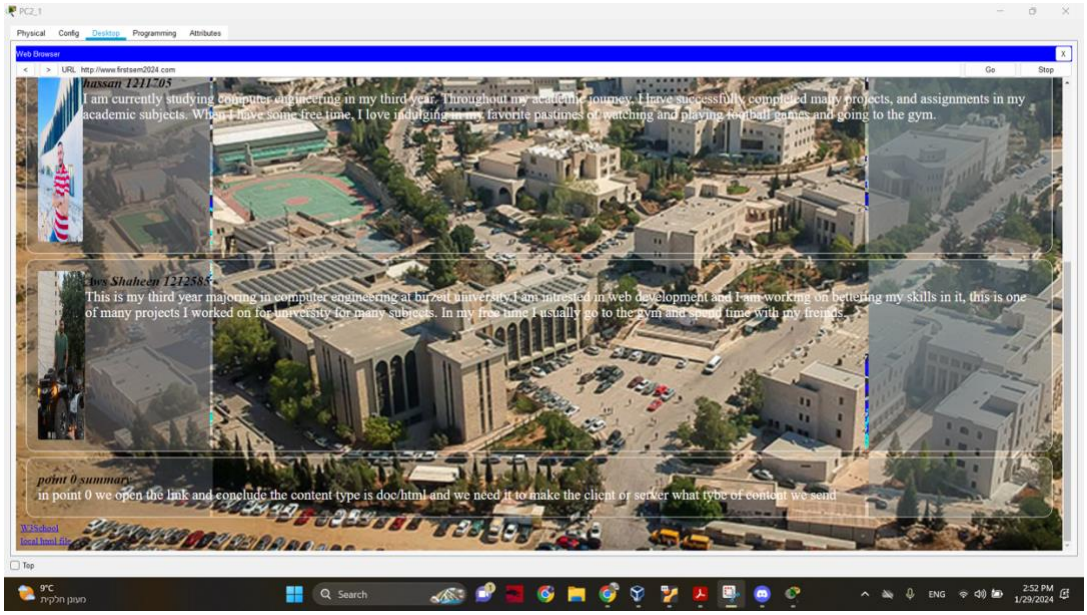

figure 47:Accessing www. FirstSem2024.com from Pc2_1 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc2_2

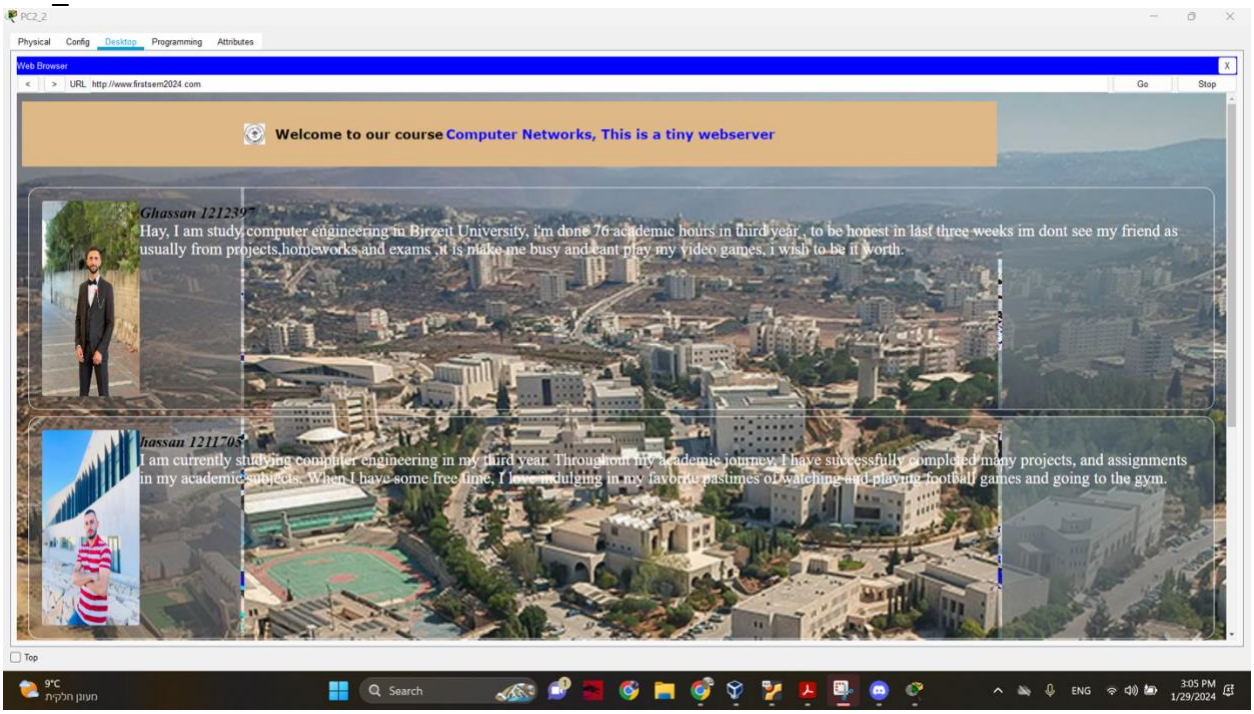

figure 48:Accessing www. FirstSem2024.com from Pc2_2 '1'

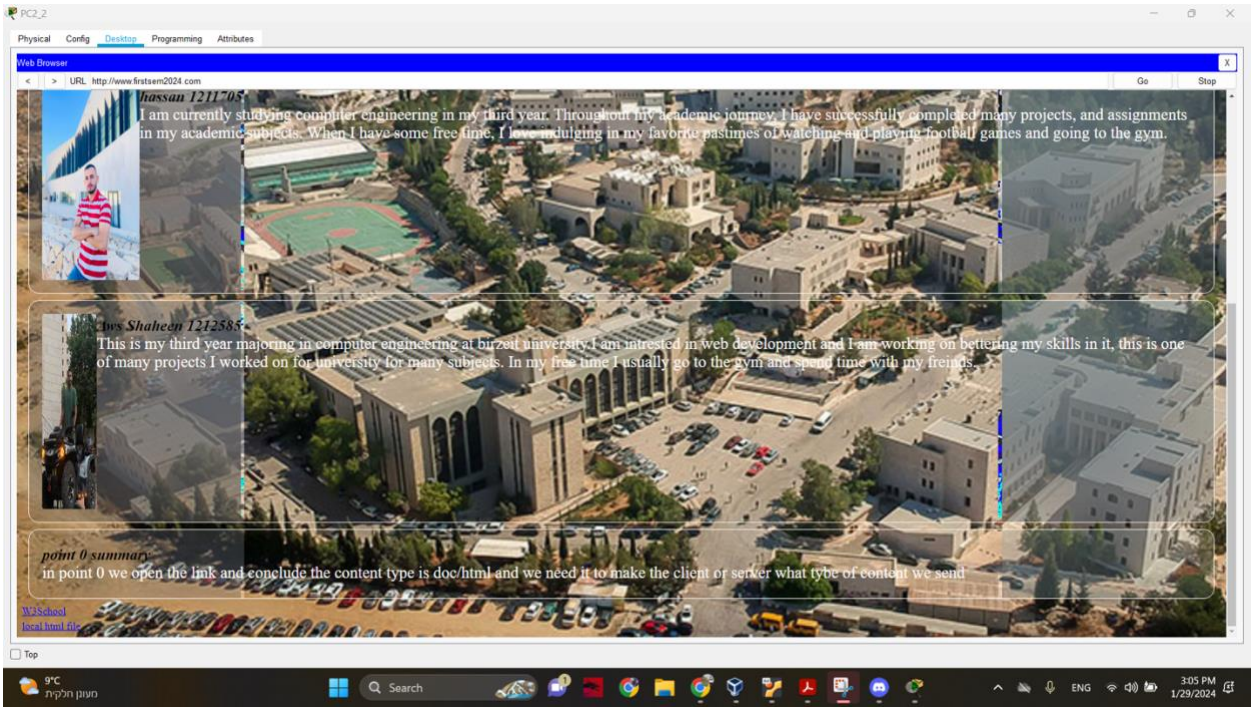

figure 49:Accessing www. FirstSem2024.com from Pc2_2 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc2_3

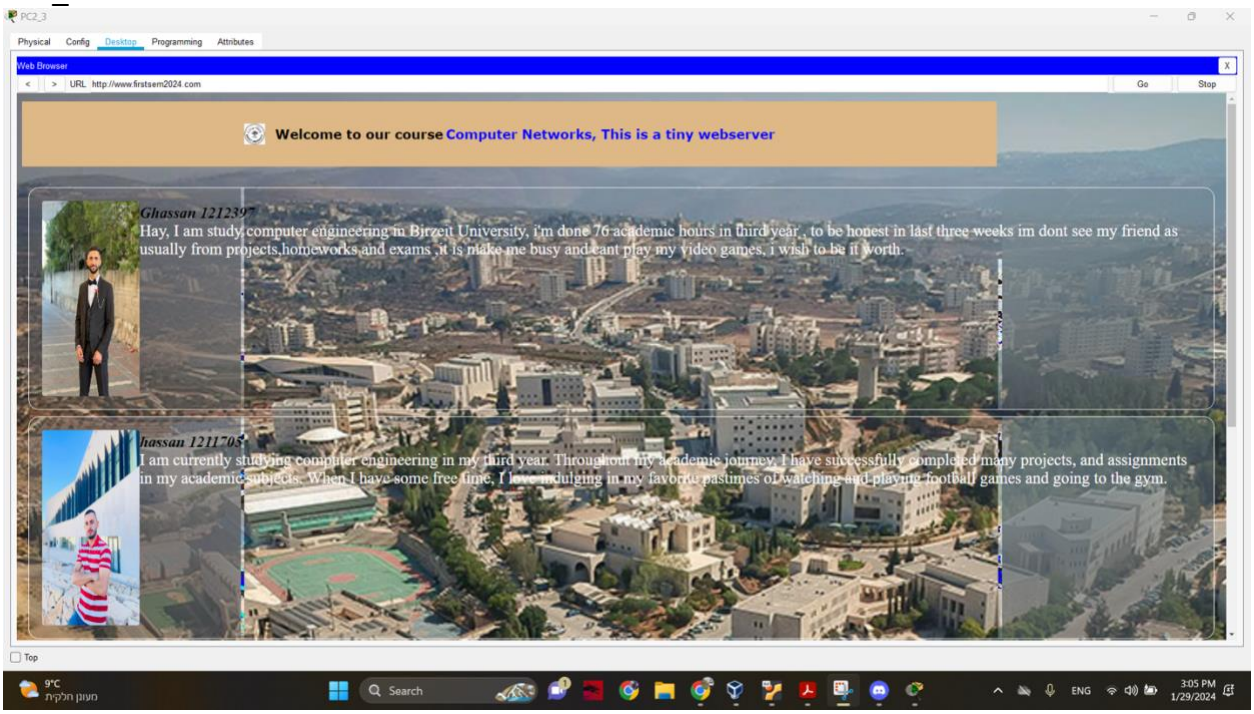

figure 50:Accessing www. FirstSem2024.com from Pc2_3 '1'

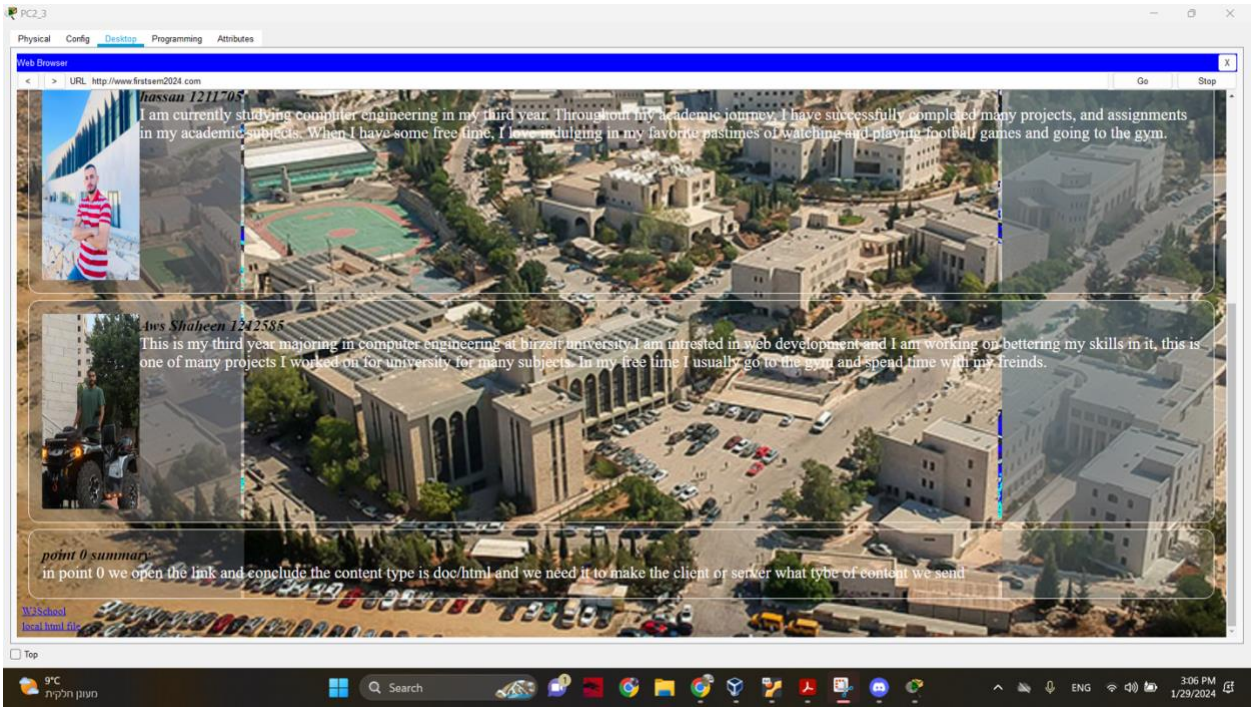

figure 51:Accessing www. FirstSem2024.com from Pc2_3 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc3_1

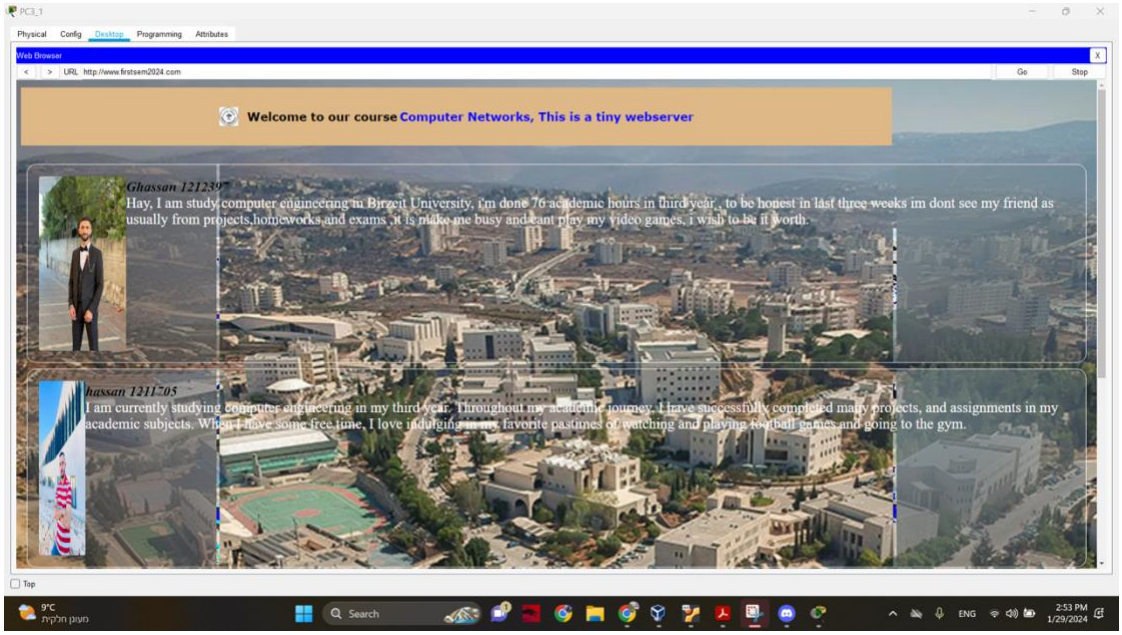

figure 52:Accessing www. FirstSem2024.com from Pc3_1 '1'

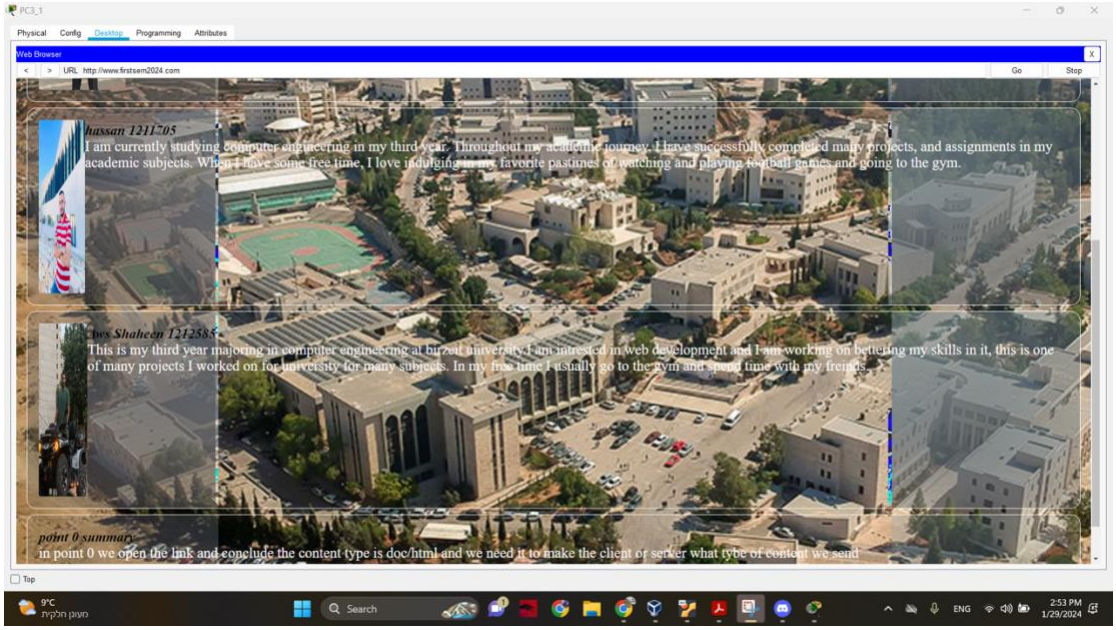

figure 53:Accessing www. FirstSem2024.com from Pc3_1 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc3_2

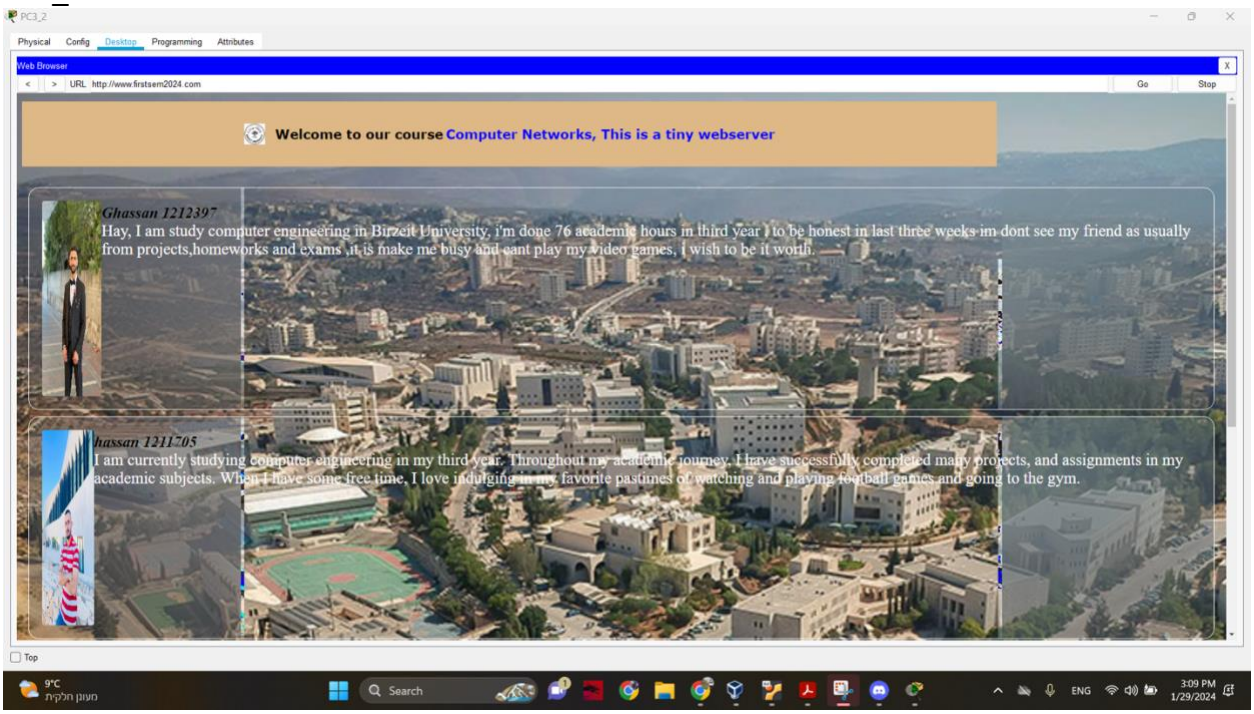

figure 54:Accessing www. FirstSem2024.com from Pc3_2 '1'

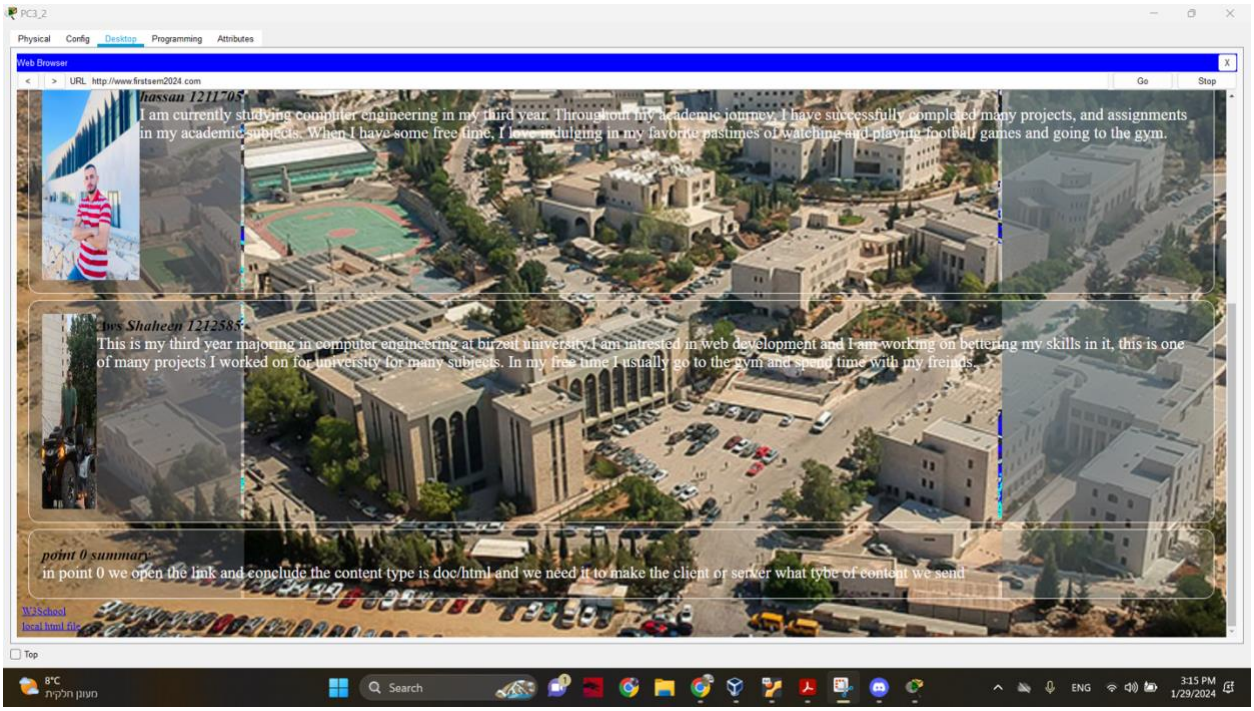

figure 55:Accessing www. FirstSem2024.com from Pc3_2 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc42_1

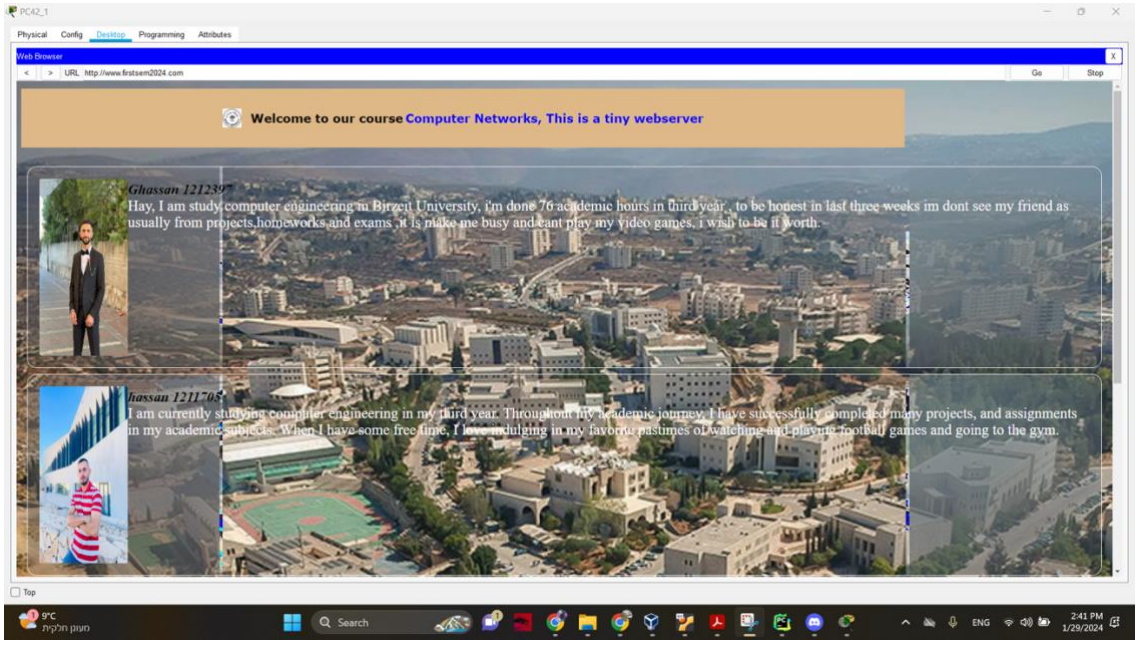

figure 56:Accessing www. FirstSem2024.com from Pc42_1 '1'

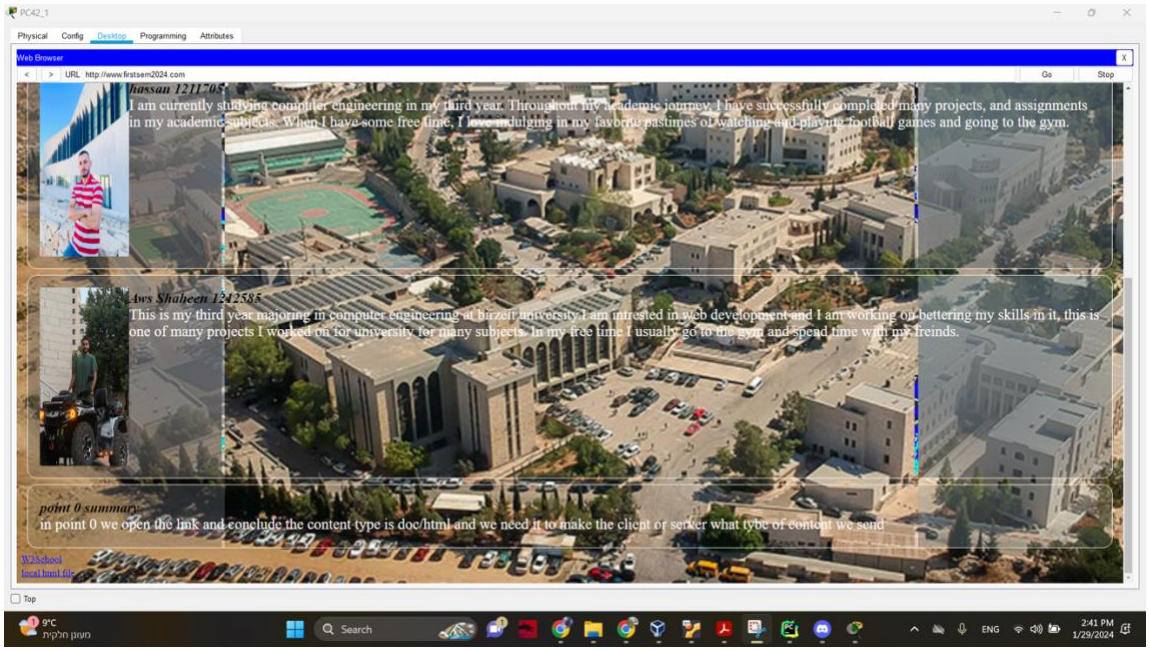

figure 57:Accessing www. FirstSem2024.com from Pc42_1 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Pc41_3

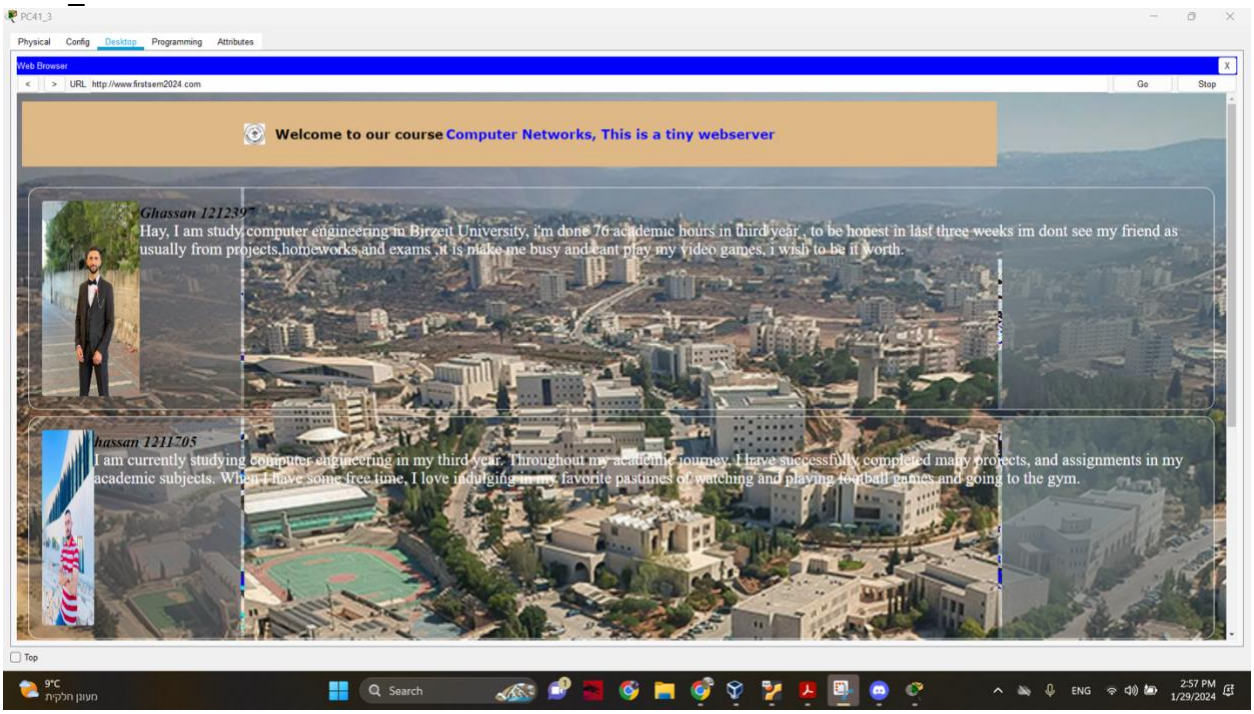

figure 58:Accessing www. FirstSem2024.com from Pc41_3 '1'

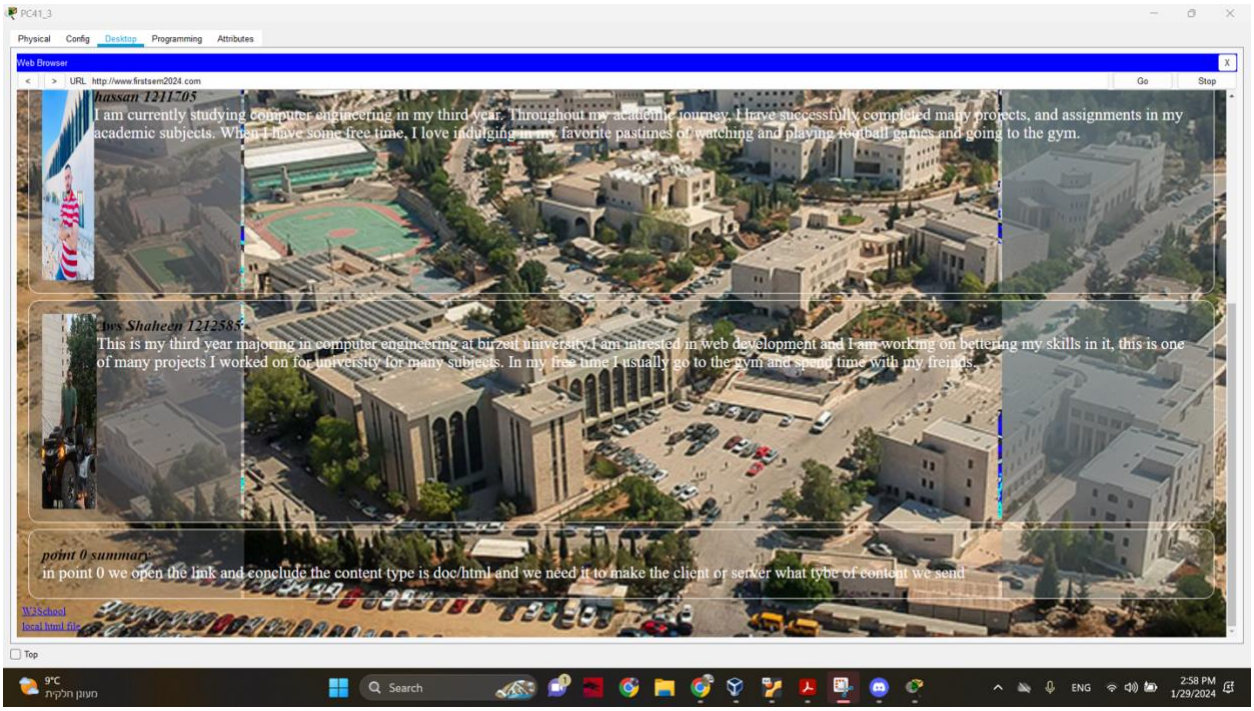

figure 59:Accessing www. FirstSem2024.com from Pc41_3 '2'

As we see we reach the web page that we have create in the http server in the network 200.17.10.96 by getting its IP from the DNS server (the domain name firstsem2024 to 200.17.10.97).

Testing Mail server:

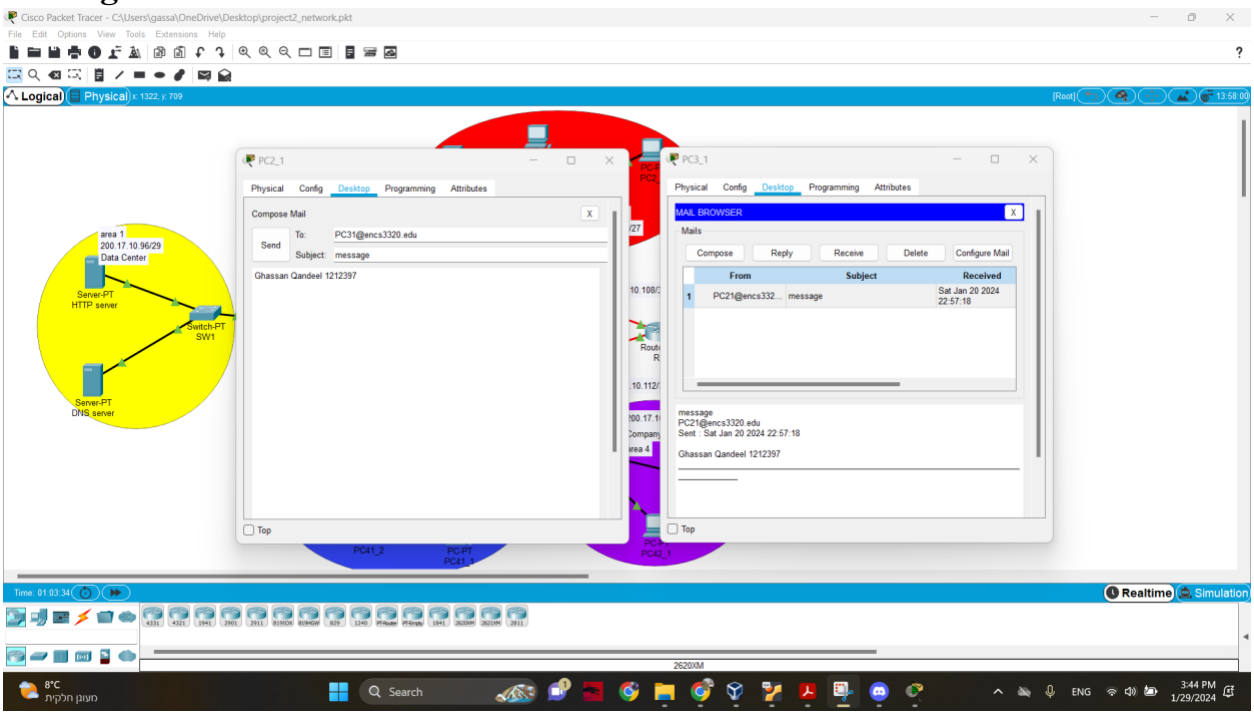

figure 60:Sending email from Pc2_1 to Pc3_1

As we see the email transfer from PC2_1 to PC3_1 using SMTP protocol.

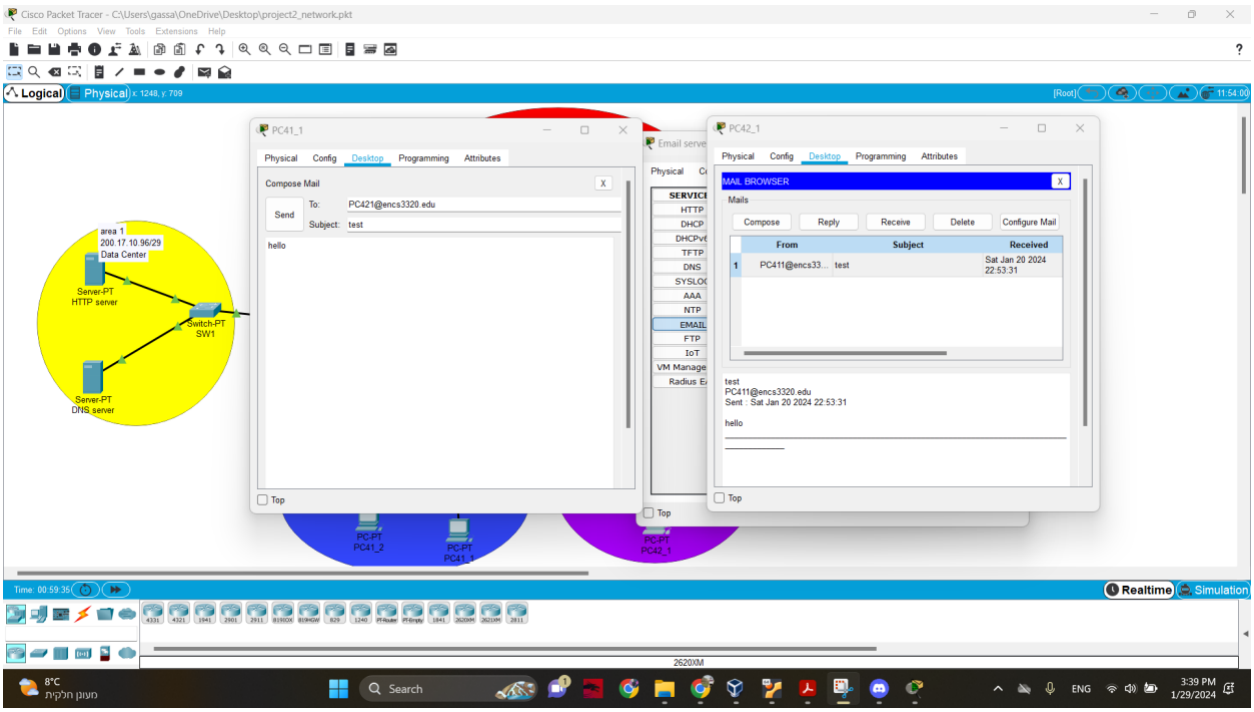

figure 61:Sending email from Pc41_1 to Pc42_1

As we see the email transfer from PC41_1 to PC42_1 using SMTP protocol.

Conclusion

In this project, we have successfully applied our classroom knowledge of subnetting to construct a fully operational network using Cisco Packet Tracer. This network includes various servers, switches, and end devices. Our hands-on experience in building and configuring this network deepened our understanding of subnetting concepts. To verify the functionality of our network, we executed commands like 'ping', and also tested practical network operations such as sending emails and accessing web pages from various end devices. This practical application not only reinforced our theoretical knowledge but also ensured the effective operation of our network setup.