



Computer Science & Engineering Department

Computer Networks Lab CSEUGPC23

Project Report

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Date: 16-05-2025

Abstract:

The aim of this project is to provide a comprehensive tutorial on how to effectively use Packet Tracer, a network simulation tool, and to teach the reader a range of essential networking skills. Specifically, the project focuses on teaching the reader how to perform IP subnetting and assignment, configure HTTP, DNS, and Email servers, set up routing algorithms on routers, configure VLANs on switches and routers, and set up ACLs. By following the step-by-step instructions provided in the tutorial, the reader will gain a comprehensive understanding of how to use Packet Tracer to build and manage networks, and will be well-equipped to apply these skills in a range of real-world scenarios.

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Theory

Introduction to Networks: The Foundation of Modern Communication

In the contemporary world, networks serve as the backbone of communication, enabling the seamless exchange of information across vast distances. The concept of networking encompasses a wide array of technologies and protocols that facilitate the connection of devices, allowing them to communicate and share resources. This interconnectedness has transformed how individuals, businesses, and governments interact, making networking a fundamental aspect of modern life.

The Importance of Networking

Networking is crucial for various reasons:

1. **Global Connectivity:** Networks enable people from different parts of the world to connect and communicate in real-time. This global connectivity has fostered international collaboration, cultural exchange, and the sharing of knowledge.
2. **Information Access:** The Internet, a product of networking, provides access to an immense repository of information. Users can retrieve data, conduct research, and engage with educational resources from anywhere, democratizing knowledge.
3. **Business Operations:** In the business realm, networking is essential for operations, communication, and data management. Organizations rely on networks to facilitate internal communication, manage supply chains, and engage with customers.
4. **Innovation and Development:** Networking has spurred innovation across various sectors, including healthcare, education, and entertainment. The ability to share ideas and collaborate remotely has accelerated technological advancements and the development of new solutions.

The Evolution of Networking

Networking has undergone a remarkable transformation since its inception, evolving from rudimentary communication methods to complex systems that underpin modern society. The journey began in the early 1960s with the development of ARPANET, a project funded by the U.S. Department of Defense. ARPANET was the first network to implement packet switching, a method that breaks data into smaller packets for efficient transmission. This innovation laid the groundwork for the development of the Internet. In the 1970s, the introduction of the Transmission Control Protocol (TCP) and Internet Protocol (IP) by Vint Cerf and Bob Kahn marked a significant milestone. These protocols established a standardized method for data transmission across diverse networks, enabling the interconnection of multiple networks into what we now know as

the Internet. The 1980s saw the commercialization of the Internet, leading to the establishment of the Domain Name System (DNS) and the introduction of the World Wide Web by Tim Berners-Lee in 1991. This period marked the beginning of the Internet as a public resource, revolutionizing how information is shared and accessed. The 1990s and early 2000s witnessed rapid advancements in networking technologies, including the proliferation of broadband connections, wireless networking, and the emergence of mobile communication. The introduction of Wi-Fi technology in the late 1990s allowed users to connect to the Internet without physical cables, further enhancing accessibility. The rise of social media platforms, e-commerce, and cloud computing transformed the way individuals and businesses interact, creating a more interconnected world.

Today, networking continues to evolve with the advent of technologies such as 5G, the Internet of Things (IoT), and artificial intelligence (AI). These innovations are reshaping industries, enabling smart cities, and enhancing communication in ways previously unimaginable. The future of networking promises even greater advancements, with ongoing research into quantum networking and the potential for global connectivity.

The Genesis of Networking

The genesis of networking can be traced back to the need for efficient communication. Early forms of communication, such as postal services and telegraphs, laid the foundation for more sophisticated methods. The invention of the telephone in the late 19th century revolutionized communication, allowing real-time voice transmission over long distances. However, these methods were limited in scope and speed.

The concept of networking began to take shape with the development of computer technology in the mid-20th century. As computers became more prevalent, the need for them to communicate with one another grew. The first significant step towards networking was the establishment of point-to-point connections between computers, enabling data exchange. This was followed by the creation of local area networks (LANs), which allowed multiple computers within a limited geographical area to connect and share resources.

The introduction of protocols, such as Ethernet in the 1970s, facilitated the development of LANs, enabling devices to communicate over a shared medium. This innovation was crucial in the growth of networking, as it provided a standardized method for data transmission. The subsequent development of wide area networks (WANs) allowed for the interconnection of LANs over larger distances, further expanding the reach of networking.

The 1980s marked a turning point in networking with the establishment of the Internet. The combination of TCP/IP protocols and the growing number of connected networks

created a global communication system. The Internet's open architecture allowed for the seamless integration of various technologies, fostering innovation and collaboration across different sectors.

In conclusion, the evolution of networking has been driven by the need for efficient communication and the desire to connect people and devices. From its humble beginnings to the complex systems we rely on today, networking has become the backbone of modern communication, enabling a level of connectivity that has transformed society. As we look to the future, the continued advancement of networking technologies promises to further enhance our ability to communicate and share information on a global scale.

IP assignment and subnetting

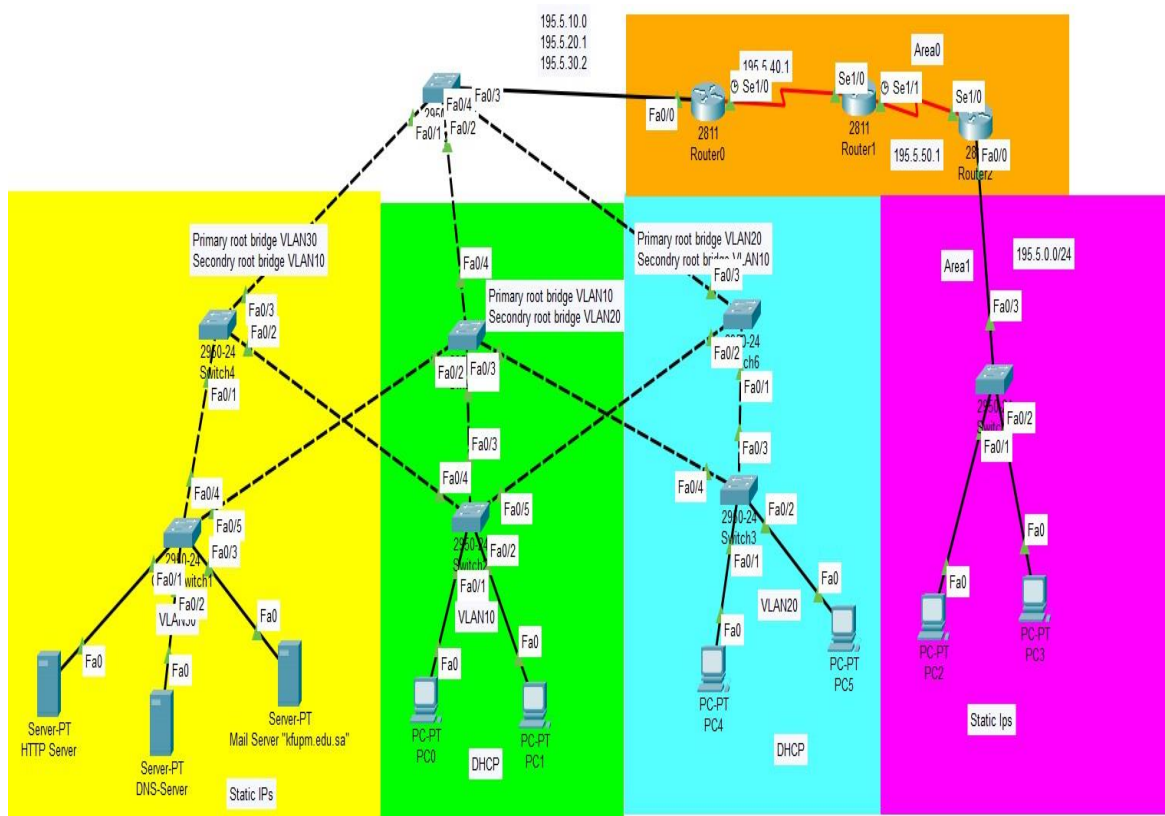
One of the student ID is 1200549,

So the IP is 195.5.0.0/24

Building the topology

This part is describing the steps for building a network topology using the Cisco Packet Tracer software. The topology includes three routers, switches, PCs, and servers, which are organized into four VLANs (virtual local area networks): a home network (Purple), two user VLANs (Green and Blue), and a server VLAN (Yellow).

We Use the IP addresses assigned in Part 0 to perform subnetting and create the network topology. We configure the interfaces of the three routers according to the instructions in the figure. We configure the switches based on the instructions in the figure. We Assign static IP addresses to PCs in the home network (Purple) using the assigned network IP. We Configure DHCP on "Router0" to assign dynamic IP addresses to PCs in VLANs 10 and 20 (Green and Blue). Assign static IP addresses to servers in VLAN 30 in the data center network (Yellow) using the assigned network IP.



Configuring servers and VLANs

the project involves configuring servers and VLANs. In this topology, three servers are used: HTTP/WEB server, DNS server, and Email server. The DNS and WEB servers are configured with the domain name `www.ENCS3320.com`. The HTTP server is then modified to create a website that contains information about the group members, their projects, skills, and hobbies. A link to <https://www.netacad.com/courses/packet-tracer> is also added. Usernames and passwords are created for all PCs in the email server. VLANs 10, 20, and 30 are created in the switches, and sub-interfaces are configured in the router. VLAN10, VLAN20, and VLAN30 are assigned to the 1st, 2nd, and 3rd sub-networks respectively, with Router0 as the gateway. The mode (access/trunk) of the switches links is then configured based on the connected devices. Understanding how to configure servers and VLANs is crucial in network design and management, as it enables network administrators to segment their network into smaller, more manageable parts and configure the various servers required for network communication and resource sharing.

Applying the routing protocols

In this section of the project, we will apply routing protocols to the network using Packet Tracer. Specifically, we will configure the following protocols on the designated routers:

- On "Router0", we will use Routing Information Protocol version 2 (RIPv2) to enable dynamic routing. RIPv2 is a simple protocol that uses hop count as the metric to determine the best path to a destination network.
- On "Router2", we will use Open Shortest Path First (OSPF), which is a more advanced routing protocol that uses a hierarchical structure and a more sophisticated algorithm to determine the best path to a destination network.
- On "Router1", we will apply the redistribution of the RIPv2 and OSPF protocols. Redistributing the routing information between RIPv2 and OSPF will enable the routers to share routing information between the two protocols and provide connectivity between the networks.

By configuring these routing protocols on the designated routers, we will be able to provide a reliable and efficient routing solution for the network.

Testing the connectivity

To ensure the network is properly configured and connected, various tests were conducted on the topology. First, the connectivity between all PCs was tested using the ping and tracert commands. Snapshots of the results were taken for all PC pairs to verify successful communication.

Next, the website www.ENCS3320.com was accessed from all PCs to test connectivity to the HTTP/WEB server. Snapshots were taken for all cases to confirm successful access.

Email functionality was also tested by sending emails from one PC to other PCs using the Email server configured earlier. Snapshots were taken at the receiving PCs to verify the successful receipt of emails.

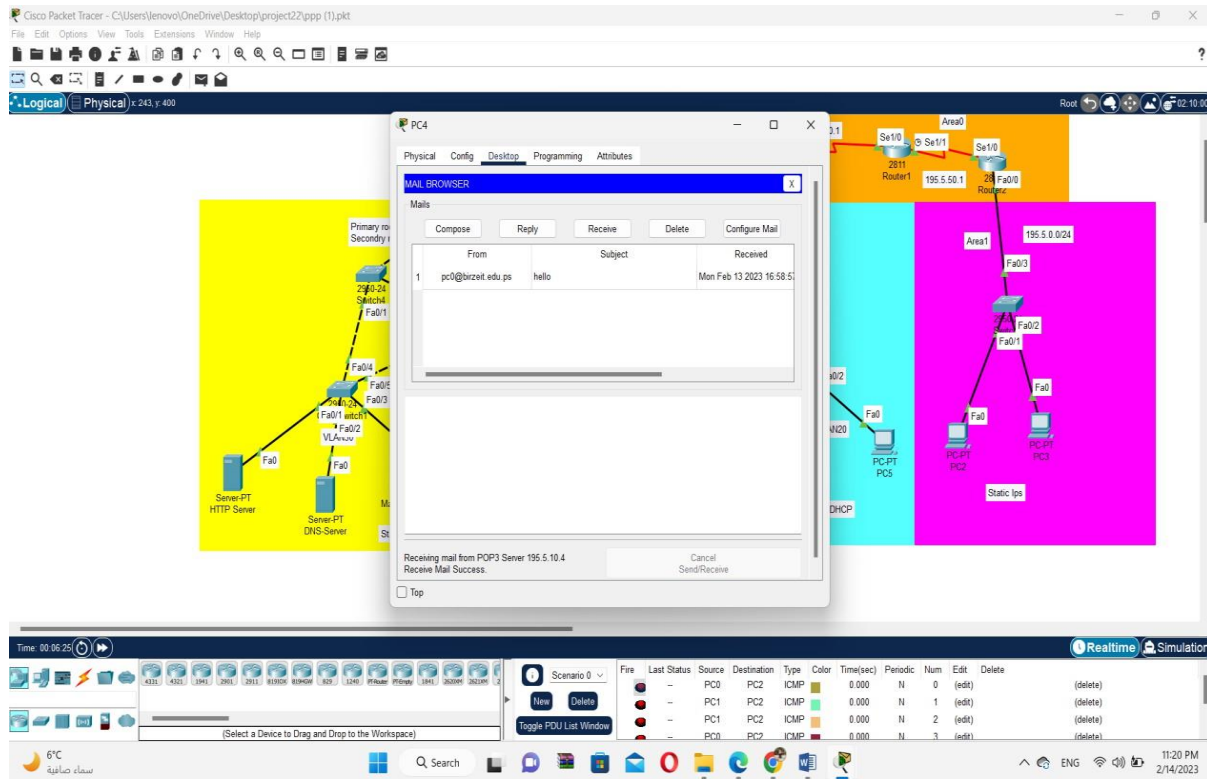
All the results of the tests were recorded in the report with detailed explanations, accompanied by the corresponding snapshots. This ensured that the objectives of the project were met and that the network topology was fully functional

Procedure:

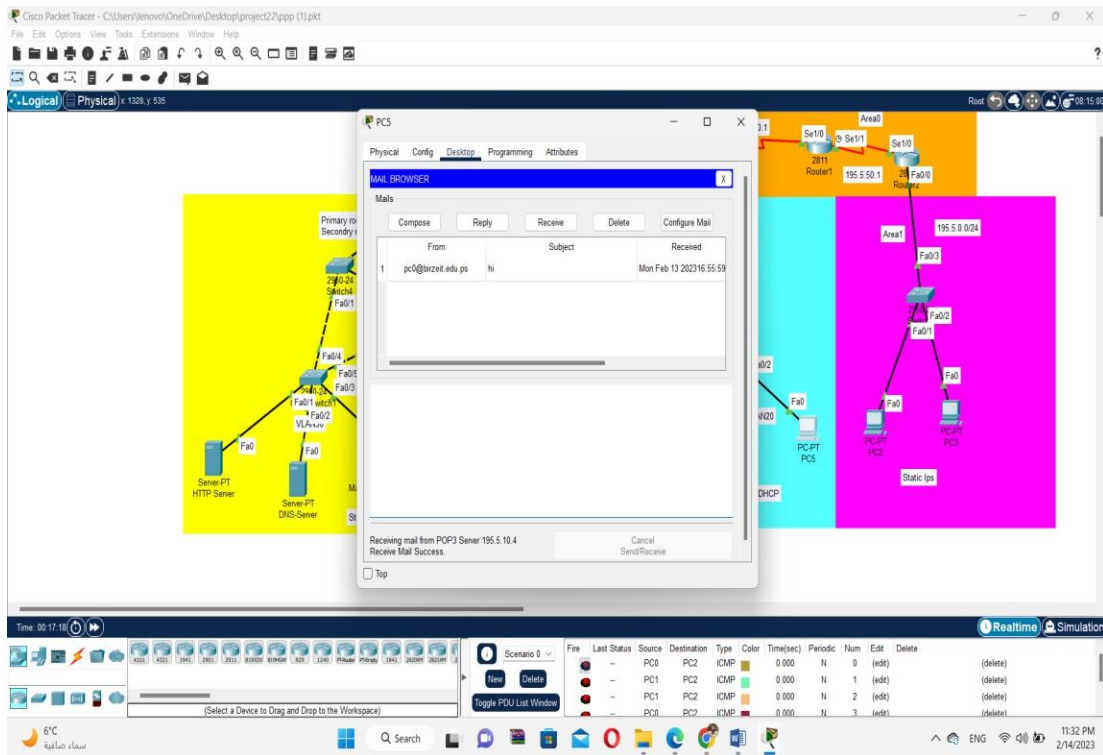
Testing the connectivity:

Sending Emails to PCs:

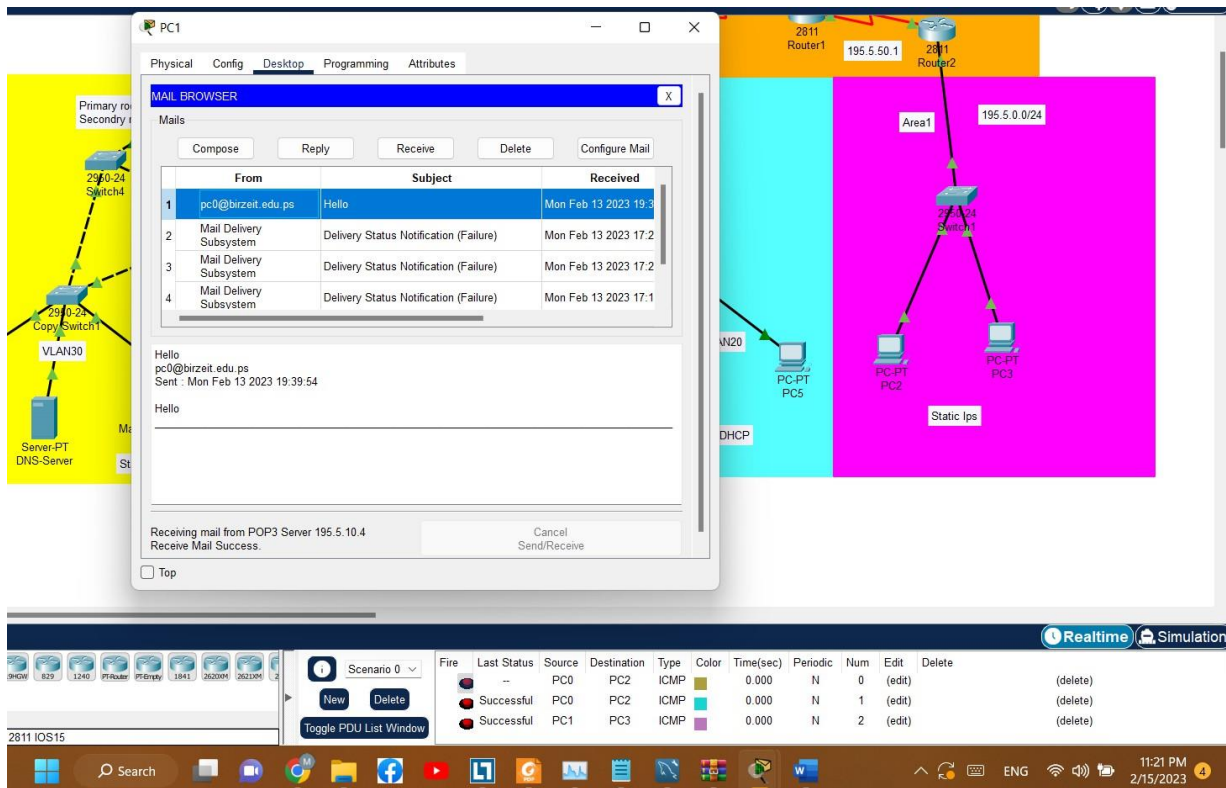
Send email from PC0 to PC4



Send email PC0 to PC5:



Send Email from PC0 to PC1:



Send Email from PC0 to PC3:

The screenshot shows a network simulation interface. In the foreground, a window titled "PC3" is open, displaying an email client interface. The "Mails" tab is active, showing a list of received emails. The email list has the following columns: From, Subject, and Received. The emails are as follows:

	From	Subject	Received
1	pc0@birzeit.edu.ps	Hello	Mon Feb 13 2023 19:5
2	pc0@birzeit.edu.ps	HLO	Mon Feb 13 2023 19:4
3	pc0@birzeit.edu.ps	hello	Mon Feb 13 2023 19:4
4	pc0@birzeit.edu.ps	hello	Mon Feb 13 2023 19:4

Below the list, the email content is displayed: "Hello", "pc0@birzeit.edu.ps", "Sent : Mon Feb 13 2023 19:50:38", and "Hello". At the bottom, a status bar indicates: "Receiving mail from POP3 Server birzeit.edu.ps", "DNS resolving. Resolving name: birzeit.edu.ps by querying to DNS Server: 195.5.10.2. DNS resolved ip address: 195.5.10.4", and "Receive Mail Success.".

The background shows a network diagram. On the left, a yellow area labeled "VLAN30" contains a "Primary root bridge VLAN30", a "Secondary root bridge VLAN10", and a "Server-PT Mail Server 'Mupm.edu.sa'". On the right, a pink area labeled "Area1" contains a "Switch1" and "PC PT PC3". The simulation is running in "Realtime" mode.

Send Email from PC0 to PC2:

The screenshot shows a network simulation interface. In the foreground, a window titled "PC2" is open, displaying an email client interface. The "MAIL BROWSER" tab is active, showing a list of received emails. The email list has the following columns: From, Subject, and Received. The emails are as follows:

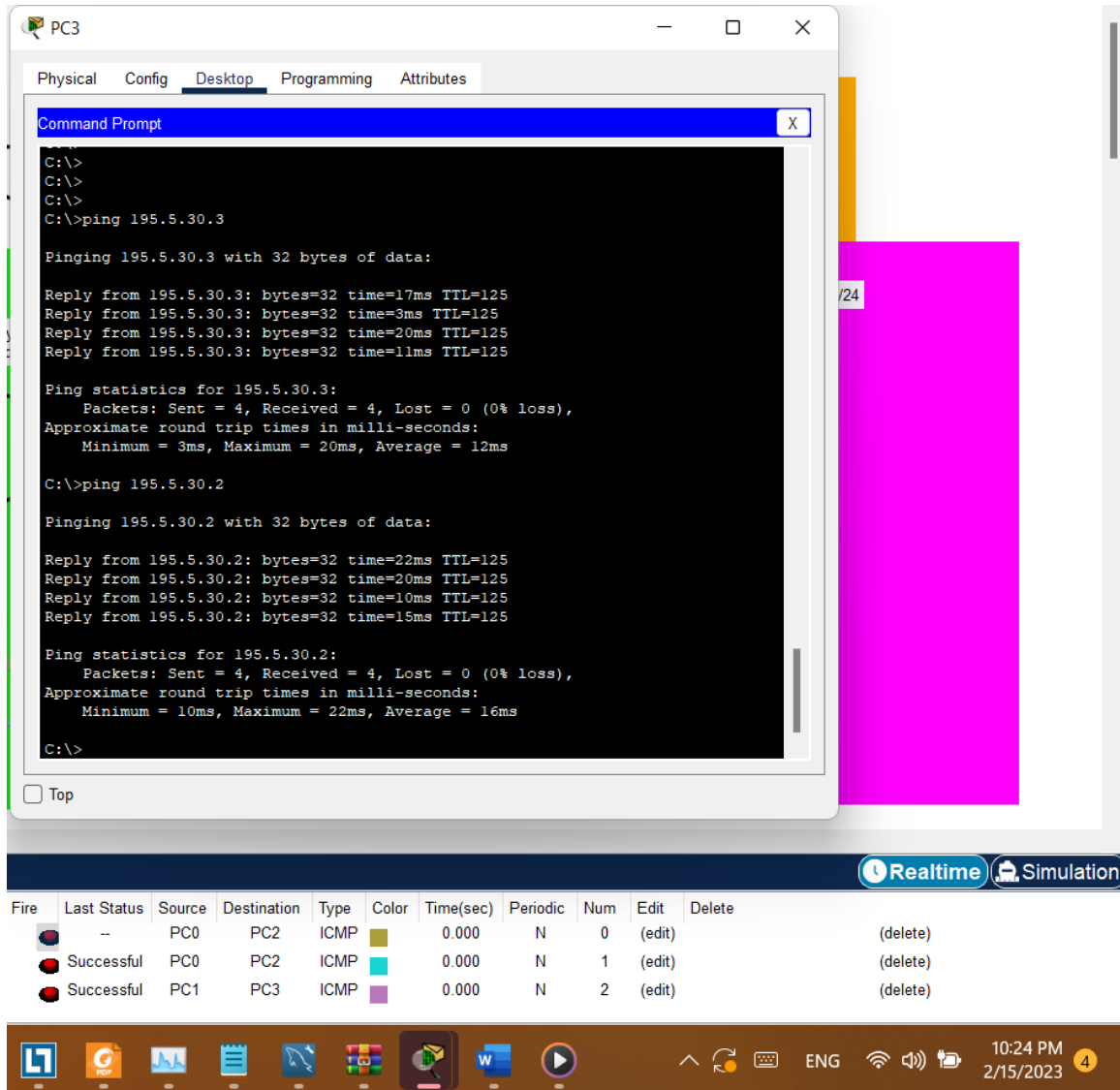
	From	Subject	Received
1	pc0@birzeit.edu.ps	Hello PC2	Mon Feb 13 2023 19:5
2	pc0@birzeit.edu.ps	Hello	Mon Feb 13 2023 19:4
3	pc0@birzeit.edu.ps	Hello	Mon Feb 13 2023 19:4
4	Mail Delivery Subsystem	Delivery Status Notification (Failure)	Mon Feb 13 2023 17:2

Below the list, the email content is displayed: "Hello PC2", "pc0@birzeit.edu.ps", "Sent : Mon Feb 13 2023 19:51:43", and "Hello PC2". At the bottom, a status bar indicates: "Receiving mail from POP3 Server birzeit.edu.ps", "DNS resolving. Resolving name: birzeit.edu.ps by querying to DNS Server: 195.5.10.2. DNS resolved ip address: 195.5.10.4", and "Cancel Send/Receive".

The background shows a network diagram. On the left, a yellow area labeled "VLAN30" contains a "Primary root bridge VLAN30", a "Secondary root bridge VLAN10", and a "Server-PT Mail Server 'Mupm.edu.sa'". On the right, a pink area labeled "Area1" contains a "Switch1" and "PC PT PC3". The simulation is running in "Realtime" mode.

Ping Between PCs:

Ping from PC3 to PC1 and PC0:



The screenshot shows a PC3 window with a Command Prompt open. The Command Prompt displays the results of ping commands executed from PC3 to PC1 and PC0. The ping to PC1 (195.5.30.3) shows four successful replies with times ranging from 11ms to 20ms. The ping to PC0 (195.5.30.2) shows four successful replies with times ranging from 10ms to 22ms. Below the Command Prompt, there is a table showing the results of the ping commands.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

At the bottom of the window, there is a taskbar with various icons, including a clock showing 10:24 PM on 2/15/2023.

Ping from PC3 to PC4 and PC5:

The screenshot displays a network simulation environment. On the left, a window titled 'PC3' is open, showing a 'Command Prompt' with the following output:

```
C:\>
C:\>
C:\>
C:\>ping 195.5.20.3

Pinging 195.5.20.3 with 32 bytes of data:

Reply from 195.5.20.3: bytes=32 time=18ms TTL=125
Reply from 195.5.20.3: bytes=32 time=10ms TTL=125
Reply from 195.5.20.3: bytes=32 time=10ms TTL=125
Reply from 195.5.20.3: bytes=32 time=44ms TTL=125

Ping statistics for 195.5.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 44ms, Average = 20ms

C:\>ping 195.5.20.2

Pinging 195.5.20.2 with 32 bytes of data:

Reply from 195.5.20.2: bytes=32 time=27ms TTL=125
Reply from 195.5.20.2: bytes=32 time=21ms TTL=125
Reply from 195.5.20.2: bytes=32 time=22ms TTL=125
Reply from 195.5.20.2: bytes=32 time=27ms TTL=125

Ping statistics for 195.5.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 21ms, Maximum = 27ms, Average = 24ms

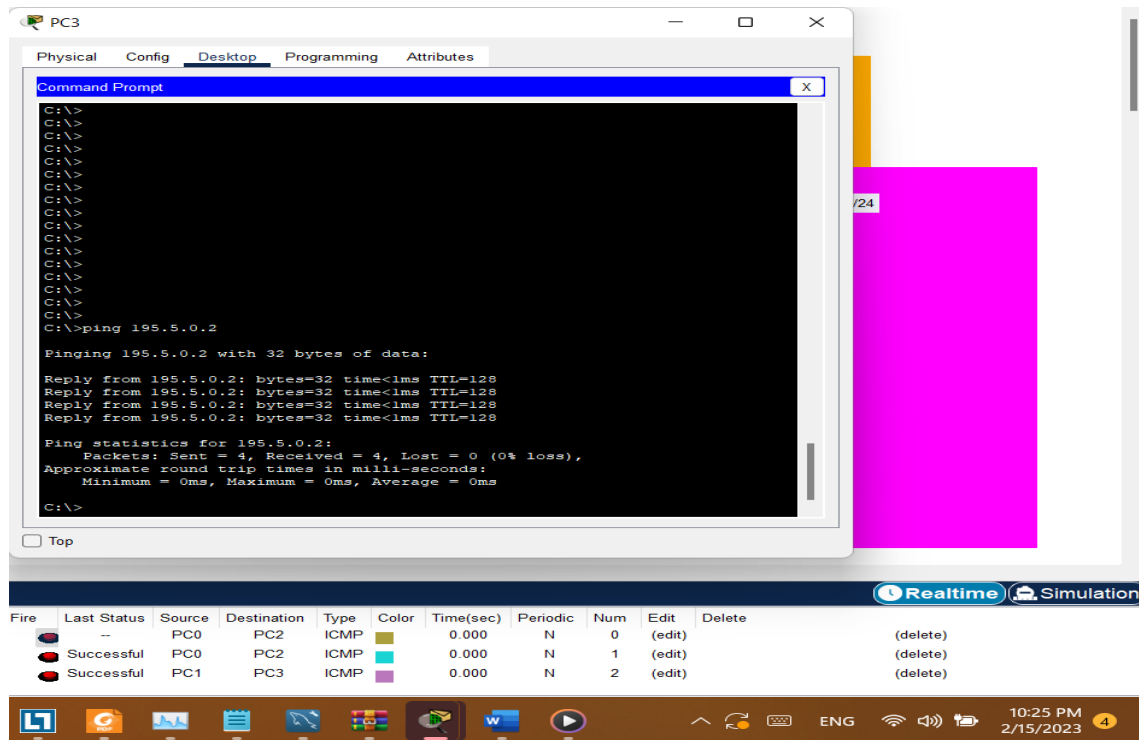
C:\>
```

On the right, a network diagram is visible. It shows 'Area0' (orange) containing 'Router2' with IP '195.5.50.1'. 'Area1' (pink) contains 'Switch1' with IP '195.5.0.0/24'. 'Switch1' is connected to two PCs: 'PC-PT PC2' and 'PC-PT PC3'. A label 'Static Ips' is at the bottom of Area1. The interface includes a 'Top' button, 'Realtime' and 'Simulation' tabs, and a table of network events.

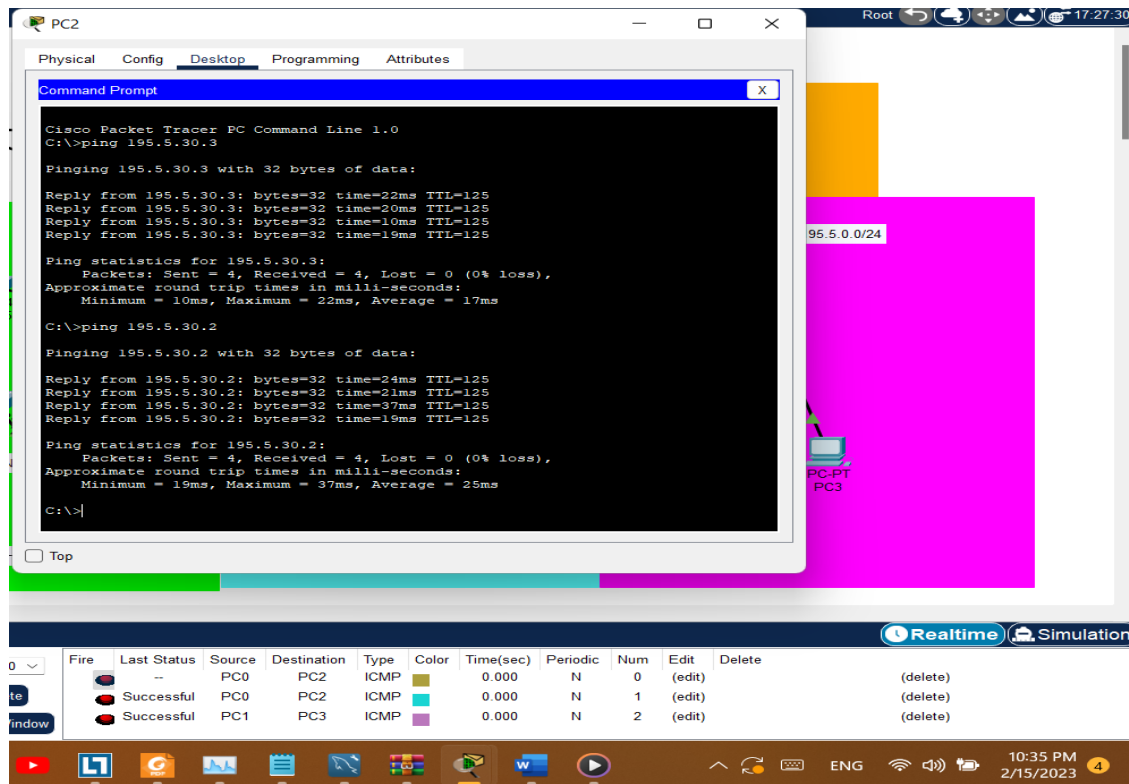
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP	Yellow	0.000	N	0	(edit)	(delete)
	Successful	PC0	PC2	ICMP	Cyan	0.000	N	1	(edit)	(delete)
	Successful	PC1	PC3	ICMP	Purple	0.000	N	2	(edit)	(delete)

The bottom of the interface shows a Windows taskbar with various application icons and a system clock indicating 10:53 PM on 2/15/2023.

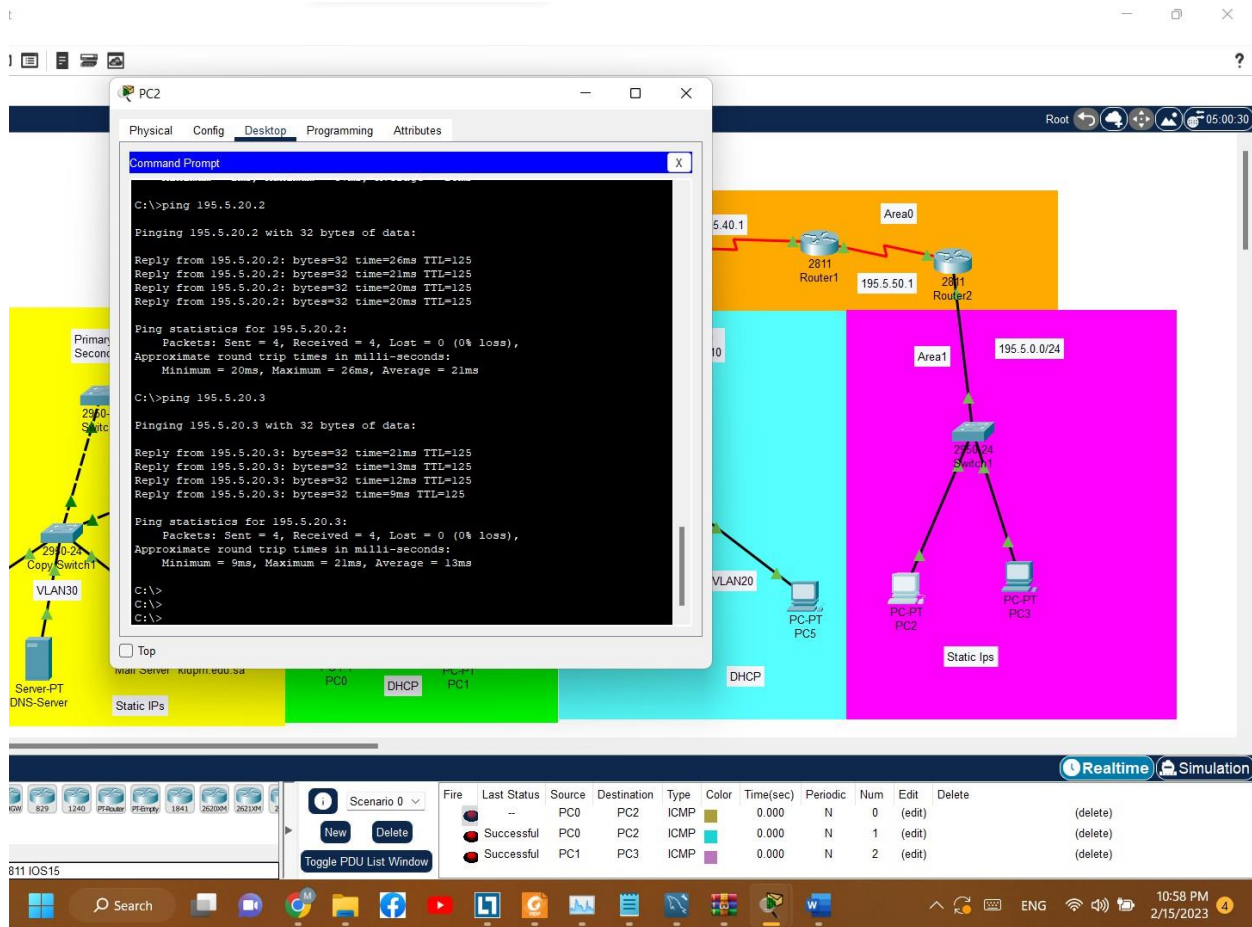
Ping from PC3 to PC2:



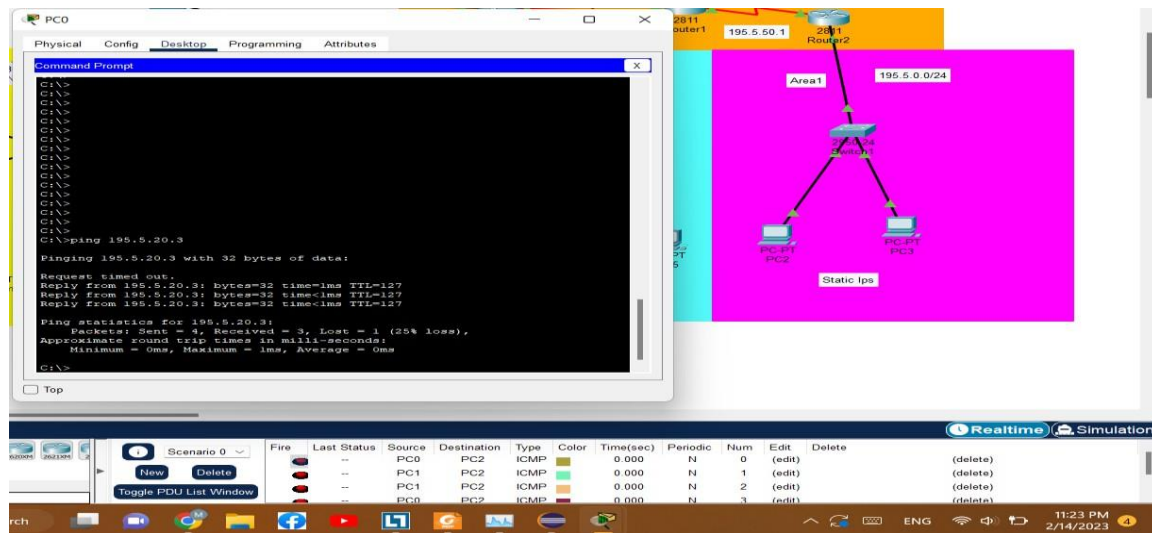
Ping from PC2 to PC0 and PC1:

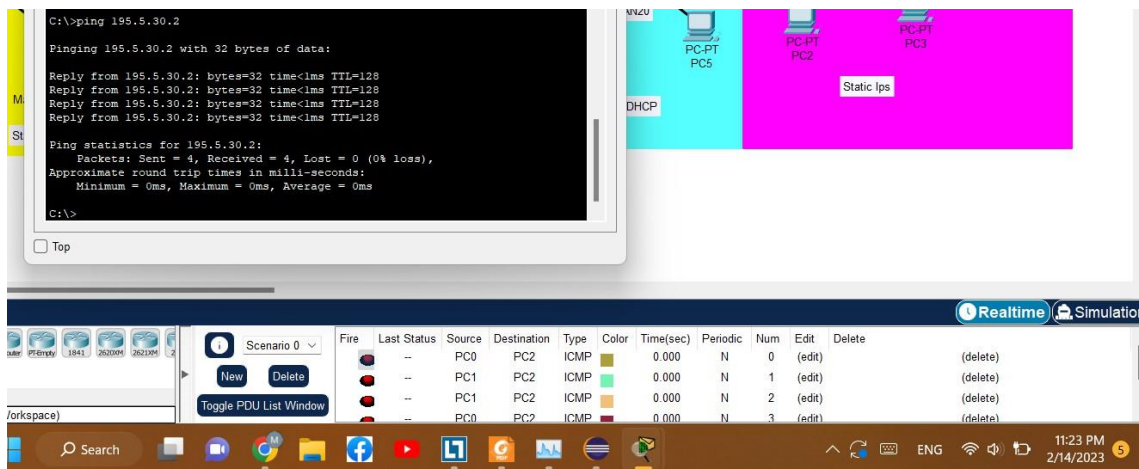


Ping from PC2 to PC4 and PC5:

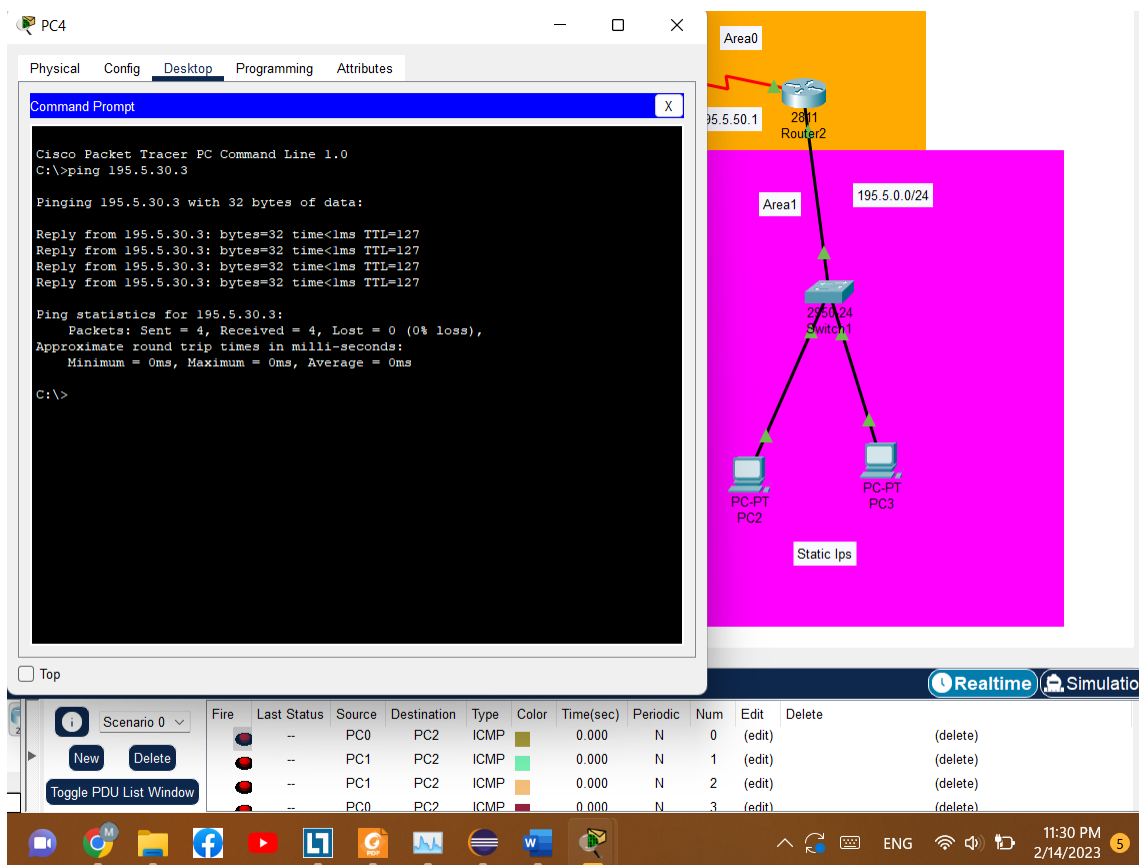


Ping from PC0 to PC4 and PC5





Ping From PC4 to PC1 and PC0



PC4

Physical Config Desktop Programming Attributes

Command Prompt

```

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 195.5.30.3

Pinging 195.5.30.3 with 32 bytes of data:

Reply from 195.5.30.3: bytes=32 time<1ms TTL=127
Reply from 195.5.30.3: bytes=32 time<1ms TTL=127
Reply from 195.5.30.3: bytes=32 time<1ms TTL=127
Reply from 195.5.30.3: bytes=32 time<1ms TTL=127

Ping statistics for 195.5.30.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 195.5.30.2

Pinging 195.5.30.2 with 32 bytes of data:

Request timed out.
Reply from 195.5.30.2: bytes=32 time=3ms TTL=127
Reply from 195.5.30.2: bytes=32 time<1ms TTL=127
Reply from 195.5.30.2: bytes=32 time<1ms TTL=127

Ping statistics for 195.5.30.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms
C:\>

```

Area0

2811 Router1

195.5.50.1

Area1

2950.24 Switch1

195.5.0.0/24

PC-PT PC2

PC-PT PC3

Static Ips

Realtime Simulation

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	--	PC0	PC2	ICMP		0.000	N	3	(edit)	(delete)

Scenario 0

New Delete

Toggle PDU List Window

11:31 PM 2/14/2023

Ping From PC1 to PC0:

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 195.5.30.3

Pinging 195.5.30.3 with 32 bytes of data:

Reply from 195.5.30.3: bytes=32 time<1ms TTL=128
Reply from 195.5.30.3: bytes=32 time<1ms TTL=128
Reply from 195.5.30.3: bytes=32 time<1ms TTL=128
Reply from 195.5.30.3: bytes=32 time<1ms TTL=128

Ping statistics for 195.5.30.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>

```

Area0

2811 Router1

40.1

2811 Router2

195.5.50.1

Area1

2950.24 Switch1

195.5.0.0/24

PC-PT PC2

PC-PT PC3

Static Ips

DHCP

Realtime Simulation

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

Scenario 0

New Delete

Toggle PDU List Window

11:02 PM 2/15/2023

Ping from PC0 to PC2 and PC3:

bridge VLAN30
t bridge VLAN10

Server-PT
Server "ktupn.edu sa"

c IPs

```

C:\>ping 195.5.0.3

Pinging 195.5.0.3 with 32 bytes of data:

Reply from 195.5.0.3: bytes=32 time=22ms TTL=125
Reply from 195.5.0.3: bytes=32 time=2ms TTL=125
Reply from 195.5.0.3: bytes=32 time=2ms TTL=125
Reply from 195.5.0.3: bytes=32 time=2ms TTL=125

Ping statistics for 195.5.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 22ms, Average = 7ms

C:\>ping 195.5.0.2

Pinging 195.5.0.2 with 32 bytes of data:

Reply from 195.5.0.2: bytes=32 time=25ms TTL=125
Reply from 195.5.0.2: bytes=32 time=20ms TTL=125
Reply from 195.5.0.2: bytes=32 time=21ms TTL=125
Reply from 195.5.0.2: bytes=32 time=2ms TTL=125

Ping statistics for 195.5.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 25ms, Average = 17ms

C:\>
C:\>
C:\>
C:\>
  
```

Area0
5.50.1
201
Router2

Area1
195.5.0.0/24
255.255.255.0
Switch1

PC-PT
PC2

PC-PT
PC3

Static Ips

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
Successful		PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
Successful		PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

Realtime Simulation

11:12 PM
2/15/2023

Ping from PC4 to PC2 and PC3:

not bridge VLAN30
root bridge VLAN10

Server-PT
Mail Server "ktupn.edu sa"

Static IPs

```

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 195.5.0.3

Pinging 195.5.0.3 with 32 bytes of data:

Reply from 195.5.0.3: bytes=32 time=2ms TTL=125
Reply from 195.5.0.3: bytes=32 time=3ms TTL=125
Reply from 195.5.0.3: bytes=32 time=2ms TTL=125
Reply from 195.5.0.3: bytes=32 time=2ms TTL=125

Ping statistics for 195.5.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 20ms, Average = 6ms

C:\>ping 195.5.0.2

Pinging 195.5.0.2 with 32 bytes of data:

Reply from 195.5.0.2: bytes=32 time=2ms TTL=125
Reply from 195.5.0.2: bytes=32 time=2ms TTL=125
Reply from 195.5.0.2: bytes=32 time=14ms TTL=125
Reply from 195.5.0.2: bytes=32 time=2ms TTL=125

Ping statistics for 195.5.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 22ms, Average = 10ms

C:\>
  
```

Area0
195.5.0.0/24
201
Router2

Area1
255.255.255.0
Switch1

PC-PT
PC2

PC-PT
PC3

Static Ips

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
Successful		PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
Successful		PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

Realtime Simulation

11:13 PM
2/15/2023

TraceRt between PCs:

From PC0 to PC4:

The screenshot displays a Cisco Packet Tracer simulation. On the left, a PC0 window is open, showing a Command Prompt with the following text:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>195.5.0.3
Invalid Command.

C:\>ping 195.5.0.3

Pinging 195.5.0.3 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 195.5.30.1: Destination host unreachable.
Reply from 195.5.30.1: Destination host unreachable.

Ping statistics for 195.5.0.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>tracert 195.5.20.3

Tracing route to 195.5.20.3 over a maximum of 30 hops:

  0  0 ms    0 ms    0 ms    195.5.30.1
  1  0 ms    0 ms    0 ms    195.5.20.3

Trace complete.

C:\>
```

On the right, a network diagram is visible. It shows a central switch labeled 'Switch1' with a '255.0.24' label. To the left of the switch is a router labeled 'Router2' with a '2811' label. To the right of the switch is a PC labeled 'PC-PT PC3'. A label '195.5.0.0/24' is placed near the switch. A label 'Static Ips' is at the bottom. The background is a solid magenta color.

At the bottom of the screen, a taskbar shows various application icons. A table is visible in the background, showing network traffic details:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
PC0	--	PC0	PC2	ICMP	0.000	N	0	(edit)	(delete)	
PC1	--	PC1	PC2	ICMP	0.000	N	1	(edit)	(delete)	
PC1	--	PC1	PC2	ICMP	0.000	N	2	(edit)	(delete)	
PC0	--	PC0	PC2	ICMP	0.000	N	3	(edit)	(delete)	

The bottom right corner of the screen shows the system clock: 11:37 PM, 2/14/2023, and a battery icon.

From PC0 to PC5

Command Prompt Window:

```
C:\>tracert 195.5.20.2

Tracing route to 195.5.20.2 over a maximum of 30 hops:

 1  0 ms    0 ms    0 ms    195.5.30.1
 2  *        0 ms    1 ms    195.5.20.2

Trace complete.

C:\>
```

Network Diagram:

- PC-PT PC3
- Static Ips

Simulation Controls: Realtime, Simulation

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	--	PC0	PC2	ICMP		0.000	N	3	(edit)	(delete)

Taskbar: 11:39 PM 2/14/2023

From PC4 to PC1

Command Prompt Window:

```
C:\>tracert 195.5.30.2

Tracing route to 195.5.30.2 over a maximum of 30 hops:

 1  0 ms    0 ms    0 ms    195.5.20.1
 2  0 ms    0 ms    0 ms    195.5.30.2

Trace complete.

C:\>
```

Network Diagram:

- PC1
- DHCP

Simulation Controls: Realtime, Simulation

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	--	PC0	PC2	ICMP		0.000	N	3	(edit)	(delete)

Taskbar: 11:40 PM 2/14/2023

From PC4 to PC0:

The screenshot shows a network simulation interface. At the top, a command prompt window displays the output of a traceroute command:

```
C:\>tracert 195.5.30.3

Tracing route to 195.5.30.3 over a maximum of 30 hops:

  1  0 ms    21 ms   0 ms    195.5.20.1
  2  0 ms    0 ms    0 ms    195.5.30.3

Trace complete.

C:\>
```

Below the command prompt, there is a table with columns: Fire, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, Num, Edit, and Delete. The table contains four rows of data:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	--	PC1	PC2	ICMP		0.000	N	2	(edit)	(delete)
	--	PC0	PC2	ICMP		0.000	N	3	(edit)	(delete)

The interface also includes a taskbar at the bottom with various application icons and a system clock showing 11:41 PM on 2/14/2023.

From PC3 to PC0 and PC1:

The screenshot shows a network simulation interface. On the left, a command prompt window displays the output of two traceroute commands:

```
C:\>tracert 195.5.30.3

Tracing route to 195.5.30.3 over a maximum of 30 hops:

  1  0 ms    0 ms    0 ms    195.5.0.1
  2  5 ms    0 ms    1 ms    195.5.50.1
  3  19 ms   1 ms    1 ms    195.5.40.1
  4  5 ms    2 ms    6 ms    195.5.30.3

Trace complete.

C:\>tracert 195.5.30.2

Tracing route to 195.5.30.2 over a maximum of 30 hops:

  1  0 ms    0 ms    0 ms    195.5.0.1
  2  0 ms    0 ms    0 ms    195.5.50.1
  3  30 ms   7 ms   13 ms   195.5.40.1
  4  0 ms    1 ms    1 ms    195.5.30.2

Trace complete.

C:\>
```

On the right, a network diagram is shown. It features two areas: Area0 (orange) and Area1 (pink). Area0 contains Router1 and Router2, both with IP 2811. Area1 contains a Switch and two PCs (PC-PT PC2 and PC-PT PC3). The Switch is connected to Router2. The PCs are connected to the Switch. The diagram is labeled "Static Ips".

Below the command prompt and diagram, there is a table with columns: Fire, Last Status, Source, Destination, Type, Color, Time(sec), Periodic, Num, Edit, and Delete. The table contains three rows of data:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

The interface also includes a taskbar at the bottom with various application icons and a system clock showing 11:06 PM on 2/15/2023.

From PC3 to PC4 and PC5:

The screenshot shows a Cisco Packet Tracer simulation. A Command Prompt window on PC3 displays the following traceroute results:

```
C:\>tracert 195.5.20.2

Tracing route to 195.5.20.2 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  195.5.0.1
  1  0 ms  1 ms  6 ms  195.5.50.1
  2  8 ms  1 ms  1 ms  195.5.40.1
  3  6 ms  0 ms  11 ms  195.5.20.2
Trace complete.

C:\>tracert 195.5.20.3

Tracing route to 195.5.20.3 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  195.5.0.1
  1  0 ms  1 ms  6 ms  195.5.50.1
  2  1 ms  5 ms  12 ms  195.5.40.1
  3  0 ms  6 ms  1 ms  195.5.20.3
Trace complete.
```

The network diagram shows a topology with a central switch (Switch1) connected to two routers (Router1 and Router2) and two PCs (PC1 and PC2). The switch is labeled 'Static Ips'. The routers are labeled 'Area1' and '195.5.0.0/24'. The PCs are labeled 'PC-PT' and 'PC3'. The background is a yellow and green grid.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	-	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
Successful		PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
Successful		PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

From PC0 to PC2 and PC3:

The screenshot shows a Cisco Packet Tracer simulation. A Command Prompt window on PC0 displays the following traceroute results:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>tracert 195.5.0.3

Tracing route to 195.5.0.3 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  195.5.30.1
  1  0 ms  0 ms  0 ms  195.5.40.2
  2  8 ms  1 ms  12 ms  195.5.50.2
  3  12 ms  6 ms  11 ms  195.5.0.3
Trace complete.

C:\>tracert 195.5.0.2

Tracing route to 195.5.0.2 over a maximum of 30 hops:
  0  0 ms  0 ms  0 ms  195.5.30.1
  1  15 ms  2 ms  1 ms  195.5.40.2
  2  1 ms  2 ms  1 ms  195.5.50.2
  3  1 ms  0 ms  6 ms  195.5.0.2
Trace complete.
```

The network diagram shows a topology with a central switch (Switch1) connected to two routers (Router1 and Router2) and two PCs (PC1 and PC2). The switch is labeled 'Static Ips'. The routers are labeled 'Area1' and '195.5.0.0/24'. The PCs are labeled 'PC-PT' and 'PC3'. The background is a yellow and green grid.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	-	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
Successful		PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
Successful		PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

From PC5 to PC2 and PC3:

PC5

Physical Config Desktop Programming Attributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0

C:\>tracert 195.5.0.2

Tracing route to 195.5.0.2 over a maximum of 30 hops:

	0 ms	0 ms	0 ms	195.5.20.1
1	0 ms	0 ms	0 ms	195.5.20.1
2	1 ms	13 ms	13 ms	195.5.40.2
3	6 ms	1 ms	0 ms	195.5.50.2
4	3 ms	14 ms	1 ms	195.5.0.2

Trace complete.

C:\>tracert 195.5.0.3

Tracing route to 195.5.0.3 over a maximum of 30 hops:

	0 ms	0 ms	0 ms	195.5.20.1
1	0 ms	0 ms	0 ms	195.5.20.1
2	7 ms	0 ms	14 ms	195.5.40.2
3	2 ms	0 ms	14 ms	195.5.50.2
4	1 ms	0 ms	8 ms	195.5.0.3

Trace complete.

C:\>

Top

Area1 195.5.0.0/24

Router2

Switch

PC-PT PC2

PC-PT PC3

Static IPs

Server-PT Mail Server "ktupm.edu.sa"

Static IPs

Scenario 0

New Delete

Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC2	ICMP		0.000	N	0	(edit)	(delete)
Successful		PC0	PC2	ICMP		0.000	N	1	(edit)	(delete)
Successful		PC1	PC3	ICMP		0.000	N	2	(edit)	(delete)

Realtime Simulation

11:10 PM 2/15/2023

Conclusion:

Through this project, we learned a great deal about computer networking and gained practical skills that can be applied to real-world scenarios. I started by learning how to use Packet Tracer, a powerful network simulation tool used for creating, configuring, and troubleshooting virtual networks. I then delved into the fundamental concepts of IP subnetting and assignment, which enabled me to assign IP addresses to network devices. Next, I learned how to configure HTTP, DNS, and email servers, essential services used for communication and information sharing in a network. Moving on, I explored the basics of routing algorithms and learned how to configure them on routers to enable dynamic routing. I then set up VLANs on switches and routers to segment a network into smaller, more manageable parts, and set up Access Control Lists (ACLs) to control network traffic and restrict access to network resources. By achieving these objectives, I gained a deeper understanding of computer networking and acquired practical skills that will undoubtedly be useful in my future endeavors in this exciting and rapidly-evolving field.