COMPUTER NETWORKS LAB

Campus Networking Project

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ABSTRACT

Computer networks have a significant impact on the working of an organization. Universities depend on the proper functioning and analysis of their networks for education, administration, communication, e-library, automation, etc. An efficient network is essential to facilitate the systematic and cost-efficient transfer of information in an organization in the form of messages, files, and resources. The project provides insights into various concepts such as topology design, IP address configuration, and how to send information in the form of packets to the wireless networks of different areas of a University.

The aim of this project is to design the topology of the university network using the software Cisco Packet Tracer with the implementation of wireless networking systems. This university network consists of the following devices:

1) Router (1941)
2) Switches (2960-24TT)
3) Email server
4) DNS server
5) WEB server (HTTP)
6) Wireless Device (Access Point)
7) PCs
8) Laptops
9) Smartphones

The design includes the following parts of the University:
Hostel Blocks: Girls Block and Boys Block
Academic Blocks: AB1 and AB2
Dome Building and Library
IT Consulting

PROJECT STATEMENT

In this mini-project, we defined a simulation of campus networks based on wireless networking. The network is divided into two sets: one for the campus area and the other for the hostel area.

The major aim of this project is to show the wireless connectivity that is used in universities to make the network efficient and mobile at the same time. Mobility is the major concentration of this project. In order to provide equal functionality to all the users (college staff and students), we have added DNS, Email, and HTTP servers for the maximum utilization of resources.

Hence the campus network provides different services such as connecting the user to the internet, data sharing among users (students, teachers, and different university members), accessing different web services for different functionalities, so it needs wireless networking for smooth processing

DEVICES USED

Devices	Quantity
1) Router (1941)	3
2) Switches (2960-24TT)	3
3) EMAIL server	1
4) DNS server	1
5) WEB server (HTTP)	1
6) Wireless Device (Access Point)	7
7) PCs	12
8) Laptops	10
9) Smartphones	2
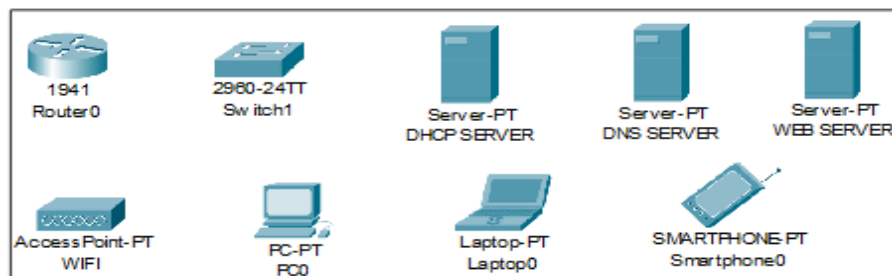
IP ADDRESS CONFIGURATION

- MAIN ROUTER CONFIGURATION

Global Settings

Display Name	main_router
Hostname	main_router
NVRAM	Erase Save
Startup Config	Load... Export...
Running Config	Export... Merge...

GigabitEthernet0/1

IP Configuration

IP Address	192.168.2.1
Subnet Mask	255.255.255.0

Serial0/1/0

IP Configuration

IP Address	10.0.0.1
Subnet Mask	255.0.0.0

Serial0/1/1

IP Configuration

IP Address	11.0.0.1
Subnet Mask	255.0.0.0

RIP

Network Address
10.0.0.0
11.0.0.0
192.168.1.0
192.168.2.0

- DNS SERVER

IP Configuration

○ DHCP   ● Static

IP Address   192.168.2.3

Subnet Mask   255.255.255.0

Default Gateway   192.168.2.1

DNS Server   192.168.2.3

Global Settings

Display Name DNS

Gateway/DNS IPv4
○ DHCP
● Static
Gateway   192.168.2.1
DNS Server 192.168.2.3

- **WEB SERVER**

IP Configuration

○ DHCP   ● Static

IP Address   192.168.2.4

Subnet Mask   255.255.255.0

Default Gateway   192.168.2.1

DNS Server   192.168.2.3

Global Settings

Display Name WEB

Gateway/DNS IPv4
○ DHCP
● Static
Gateway   192.168.2.1
DNS Server 192.168.2.3

- **EMAIL SERVER**

IP Configuration

○ DHCP   ◉ Static

IP Address	192.168.2.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.2.1
DNS Server	192.168.2.3

Global Settings

Display Name EMAIL

Gateway/DNS IPv4
○ DHCP
◉ Static
Gateway 192.168.2.1
DNS Server 192.168.2.3

- **COLLEGE ROUTER**

Global Settings

Display Name	College Router
Hostname	Router1

Network Address

11.0.0.0

192.168.1.0

GigabitEthernet0/0

IP Configuration

IP Address	192.168.1.1
Subnet Mask	255.255.255.0

Serial0/1/0

IP Configuration

IP Address	11.0.0.2
Subnet Mask	255.0.0.0
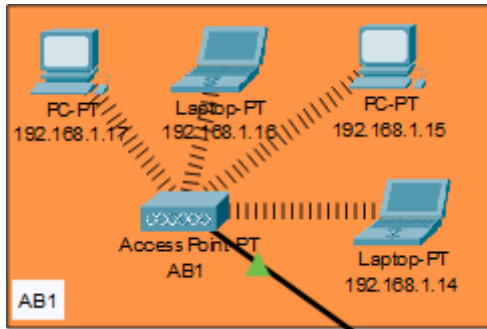
- **ACADEMIC BLOCK 1**

IP Address are as follows
192.168.1.14- Laptop
192.168.1.15- PC
192.168.1.16- Laptop
192.168.1.17- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- ACADEMIC BLOCK 2
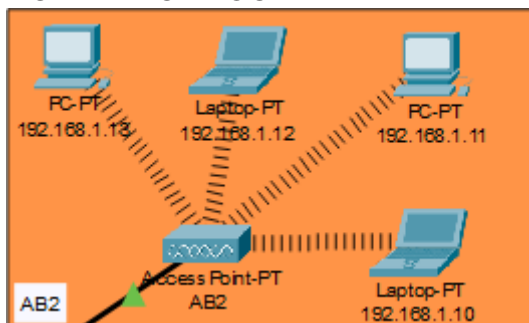
IP Address are as follows
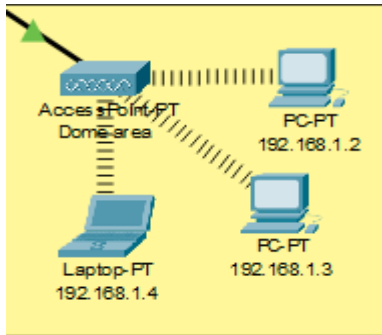192.168.1.10- Laptop
192.168.1.11- PC
192.168.1.12- Laptop
192.168.1.13- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- DOME BUILDING

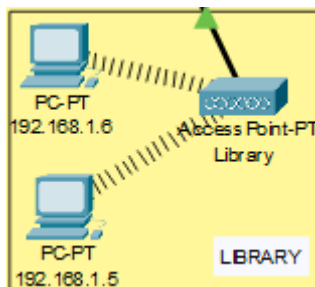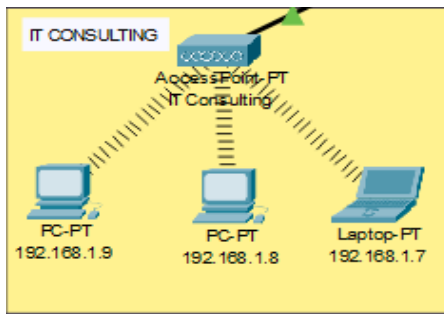IP Addresses are as follows
192.168.1.2- PC
192.168.1.3- PC
192.168.1.4- Laptop
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- LIBRARY

IP Addresses are as follows
192.168.1.5- PC
192.168.1.6- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- IT Consulting

IP Addresses are as follows
192.168.1.7- Laptop
192.168.1.8- PC
192.168.1.9- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- HOSTEL ROUTER
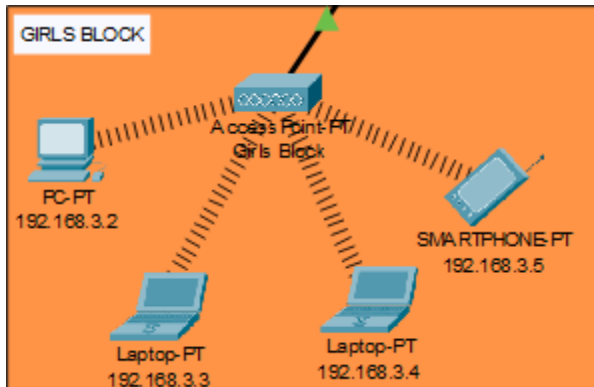

GigabitEthernet0/0

Serial0/1/0

- Boys Block

IP Addresses are as follows

192.168.3.6- PC
192.168.3.7-Laptop
192.168.3.8- PC
192.168.3.9- Smartphone
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.3.1
DNS Server- 192.168.2.3

- Girls Block

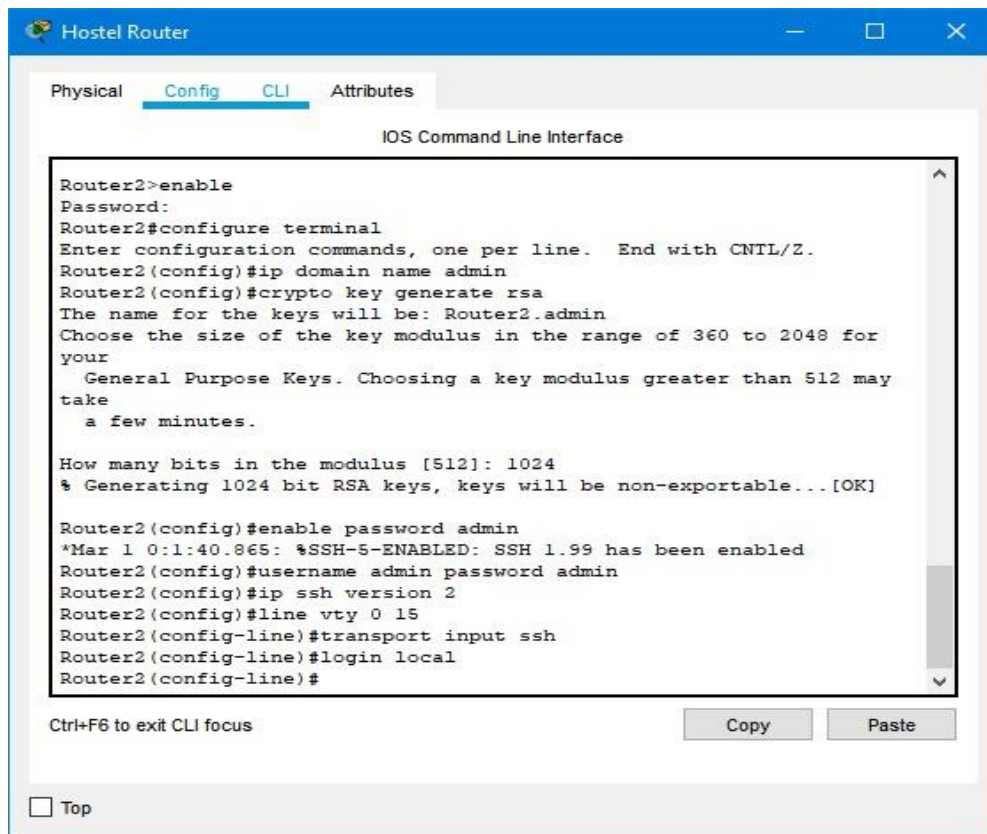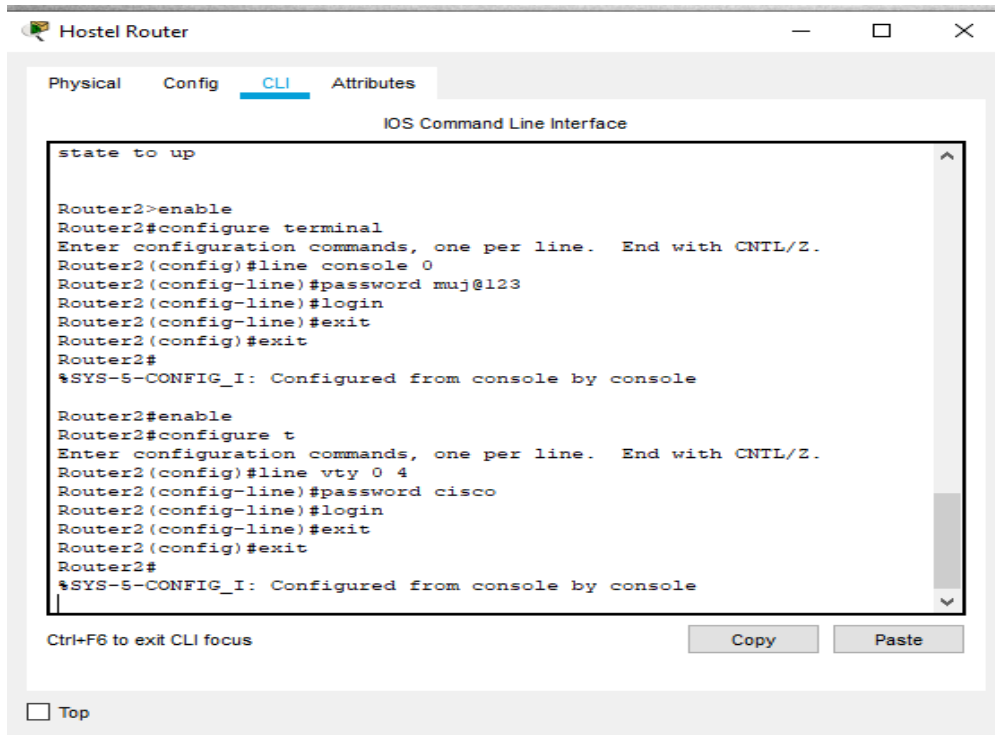

IP Addresses are as follows
192.168.3.2- PC
192.168.3.3-Laptop
192.168.3.4- PC
192.168.3.5- Smartphone
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.3.1
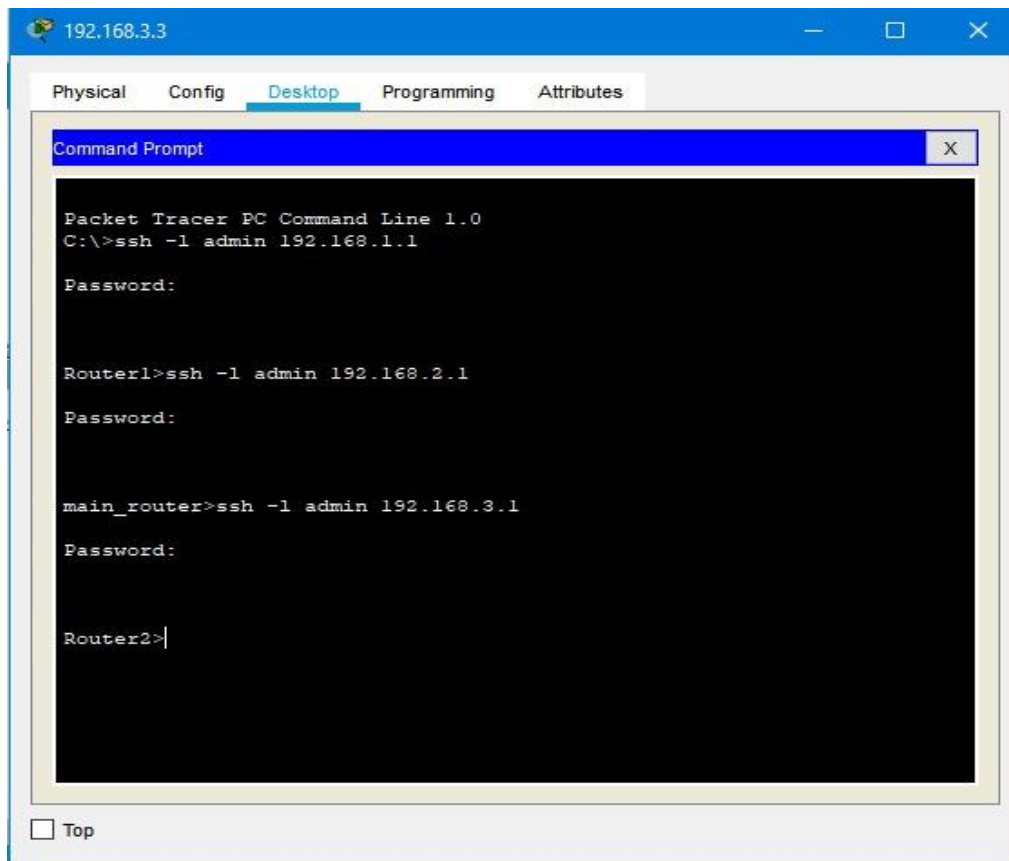DNS Server- 192.168.2.3
- WIRELESS ACCESS POINT

SSID	Password
1)muj_dome	1234567890
2)muj_library	1234567890
3)muj_ITC	1234567890
4)muj_AB1	1234567890
5)muj_AB2	1234567890
6)muj_boys	1234567890
7)muj_girls	1234567890

Port 1	
Port Status	☑ O
SSID	muj_dome
2.4 GHz Channel	6
Coverage Range (meters)	140.00

Authentication

○ Disabled ◉ WEP WEP Key 1234567890

○ WPA-PSK ○ WPA2-PSK PSK Pass Phrase

1. **Securing the network**

Hostel Router

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
state to up


Router2>enable
Router2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router2(config)#line console 0
Router2(config-line)#password muj@123
Router2(config-line)#login
Router2(config-line)#exit
Router2(config)#exit
Router2#
%SYS-5-CONFIG_I: Configured from console by console

Router2#enable
Router2#configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Router2(config)#line vty 0 4
Router2(config-line)#password cisco
Router2(config-line)#login
Router2(config-line)#exit
Router2(config)#exit
Router2#
%SYS-5-CONFIG_I: Configured from console by console
```

Ctrl+F6 to exit CLI focus   Copy   Paste

☐ Top

Hostel Router

Physical | Config | CLI | Attributes

IOS Command Line Interface

```
Router2>enable
Password:
Router2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router2(config)#ip domain name admin
Router2(config)#crypto key generate rsa
The name for the keys will be: Router2.admin
Choose the size of the key modulus in the range of 360 to 2048 for
your
  General Purpose Keys. Choosing a key modulus greater than 512 may
take
  a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

Router2(config)#enable password admin
*Mar 1 0:1:40.865: %SSH-5-ENABLED: SSH 1.99 has been enabled
Router2(config)#username admin password admin
Router2(config)#ip ssh version 2
Router2(config)#line vty 0 15
Router2(config-line)#transport input ssh
Router2(config-line)#login local
Router2(config-line)#
```

Ctrl+F6 to exit CLI focus   Copy   Paste
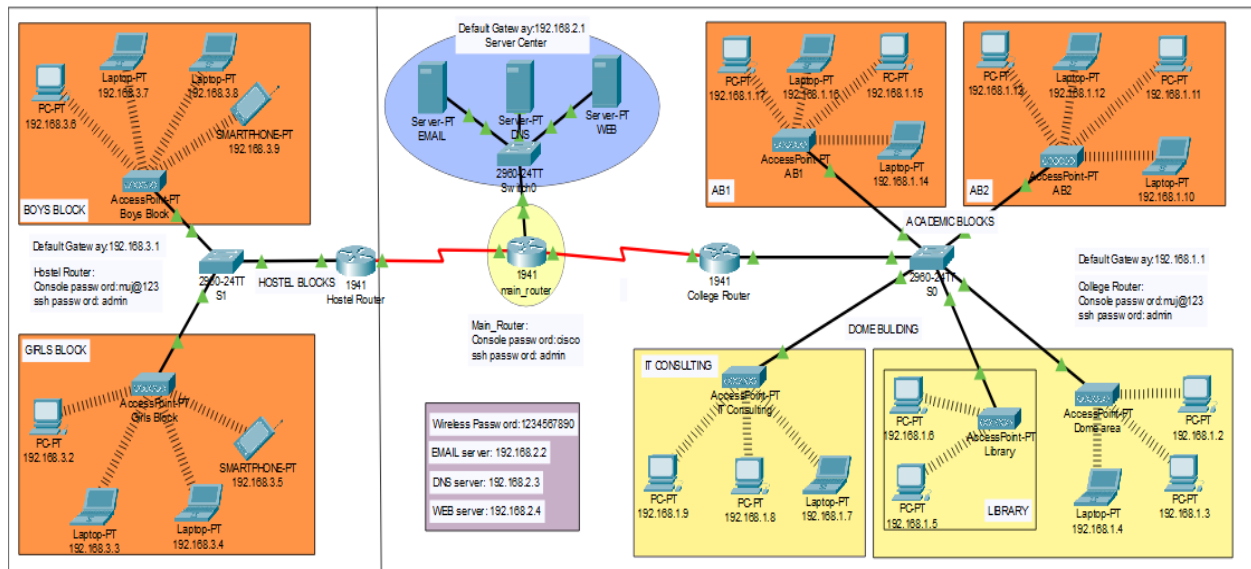
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RESULT

Finally, we have combined all the steps as mentioned in chapter 3 (work done) and implemented the desired wireless network for University. We have the complete network providing various facilities to the teaching staff, non-teaching staff, and students.

The complete diagram of the University Area Network Scenario created in Packet Tracer environment

- Final Simulation

In Simulation Mode, you can watch your network run at a slower pace, observing the paths that packets take and inspecting them in detail. The proposed architecture, when simulated on Cisco Packet Tracer, produced results which are demonstrated as follows:
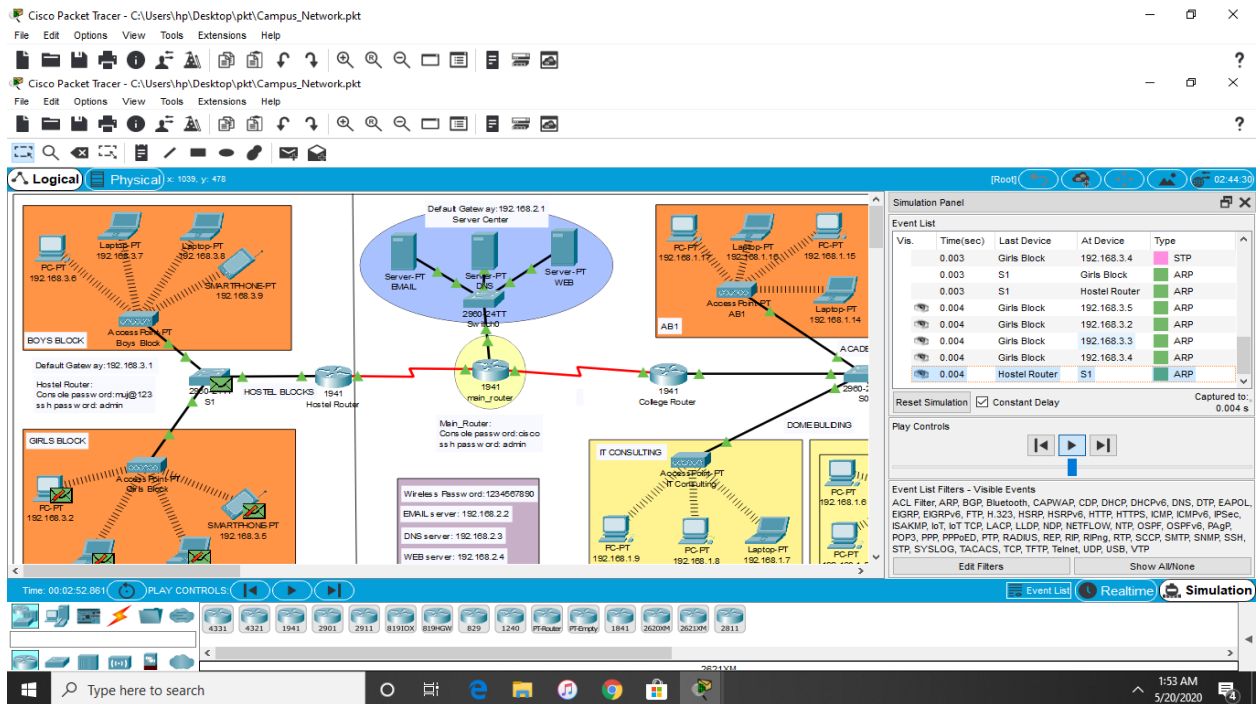
Final simulation for the network system to check all the connections

- Ping Test: Network connectivity and communication can be tested using the ping command, followed by the domain name or the IP address of the device (equipment) whose connectivity one wishes to verify.

Ping Test for EMAIL server

Ping Test for DNS server

Ping Test for WEB server

CONCLUSION REFERENCES

We started our discussion with the word "digitalization" and in order to achieve it, we aimed to start with an educational institute, and finally, we designed a network for a University, which is wireless. As we mentioned, mobility and efficiency are the key aspects of wireless networks, which were our main goal, and hence, we decided to shift to a wireless network instead of a wired one, making our network clean and less chaotic.

In this project, we designed a University Network using Cisco Packet Tracer that uses a networking topology implemented using servers, routers, switches, and end devices in a multiple area networks. We have covered all the necessary features that are required for a network to function properly. We have included a DNS server and a web server for establishing a smooth communication system between different areas of our network and specifically for the communication between students and teachers. We have included an email server to facilitate intra university communication through emails within the domain. We have used console passwords and ssh protocol to ensure a safe and secure transfer of data.

REFERENCES

https://en.wikipedia.org/wiki/Packet_Tracer

https://computernetworking747640215.wordpress.com/2018/07/05/secure-shell-ssh-configuration-on-a-switch-and-router-in-packet-tracer/