NETWORK DESIGN OF A UNIVERSITY

A COURSE PROJECT REPORT

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Under the guidance of

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FACULTY OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Kattankulathur, Chenpalpattu District

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SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

(Under Section 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this mini project report " **Network Design of a University** " is the bonafide work of **Tanmay Shukla (RA2011003010119)** and **Khushi Suri (RA2011003010129)** who carried out the project work under my supervision.

SIGNATURE

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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 SRM 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: Tech Park and University building comprising ITKM and Central Library

ACKNOWLEDGEMENT

We express our heartfelt thanks to our honorable **Vice Chancellor Dr. C. MUTHAMIZHCHELVAN**, for being the beacon in all our endeavors.

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We extend my gratitude to our **HoD Dr. M Pushpalta, Head and Professor, Computing Technologies** and my Departmental colleagues for their Support.

Finally, we thank our parents and friends near and dear ones who directly and indirectly contributed to the successful completion of our project. Above all, I thank the almighty for showering his blessings on me to complete my Course project.

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1. INTRODUCTION

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.

Topology used in the developed network design is Tree topology. Tree Topology is a topology which is having a tree structure in which all the computer are connected like the branches which are connected with the tree. In Computer Network, tree topology is called as a combination of a Bus and Start network topology. **The main advantages of this topology are these are very flexible and also have better scalability.**
Tree network topology is considered to be the simplest topology in all the topologies which is having only one route between any two nodes on the network. The pattern of connection resembles a tree in which all branches spring from one root hence (Tree Topology). Tree topology is one of the most popular among five network topology.

Advantages of Tree Topology :

- This topology is the combination of bus and star topology.
- This topology provides a hierarchical as well as central data arrangement of the nodes.
- As the leaf nodes can add one or more nodes in the hierarchical chain, this topology provides high scalability.
- The other nodes in a network are not affected, if one of their nodes get damaged or not working.
- Tree topology provides easy maintenance and easy fault identification can be done.
- A callable topology. Leaf nodes can hold more nodes.
- Supported by several hardware and software vendors.
- Point-to-point wiring for individual segments.

2. REQUIREMENT SPECIFCATION

2.1. Software and hardware requirements

Before heading towards the implementation, we need to make sure of the following requirements.

- A proper workstation (any mid-high range laptop will suffice).
- Packet Tracer by Cisco
- 8 GB RAM.
- Any 10,000+ Average CPU Mark scored processor.
- 16 GB of dedicated hard disk space.
- USB 3.0+ port.

2.2 Network Requirements

SRM Institute of Science and Technology brank KTR outline is considered for this wireless university network.
The network is divided into 2 areas:

1. Campus Area
   The Campus area is further divided into various accessing points like Tech Park and University building comprising of ITKM and central Library.
2. Hostel Area
   The Hostel area is further divided into Boys blocks and Girls blocks respectively.

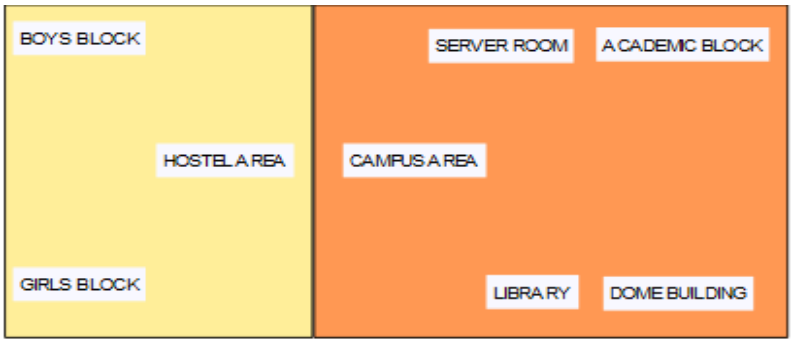
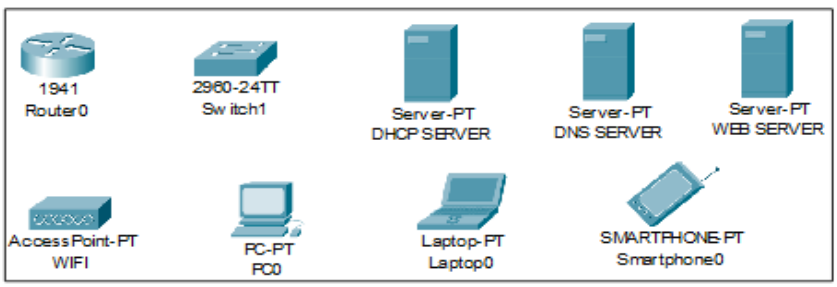


Figure 2:Basic layout of our wireless access points in University

Devices Used in the Network

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)	6
7) PCs	10
8) Laptops	8
9) Smartphones	2

Figure 3: Devices used in the network



4. ARCHITECTURE AND DESIGN

- To design the wireless network of the university we initially started by placing the core devices into the frame as mentioned in the layout.

- Firstly, we placed the **main router** at the center of the university outline, which was further connected to the **server switch** using the gigabit ethernet port with copper straight-through cable and sub routers (**campus router and hostel router**) using the serial port with serial DCE cable at the hostel area and campus area respectively.

- The server switch was further connected to the **EMAIL, DNS, and WEB** servers respectively.

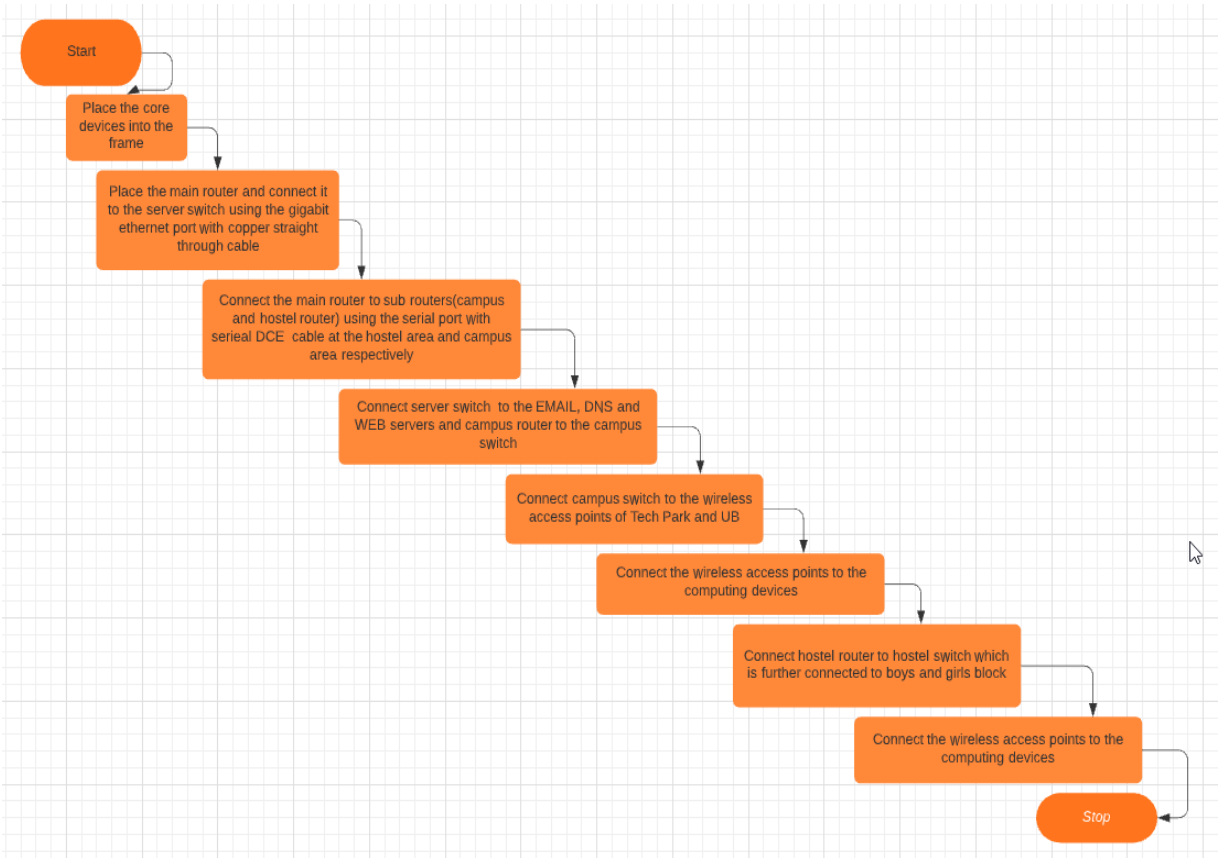
- Campus router was connected to the campus switch which was further connected with wireless access points of the **Tech park** , **University building**, central **library,** and **ITKM.**

- The wireless access points were then connected to computing devices (PCs, laptops, and smartphones).

- Similarly, the hostel router was connected to the hostel switch which was further connected with the wireless access point of boys block and girls block.

- The wireless access points were then connected to the computing devices (PCs, laptops, and smartphones), every area has a dedicated access point which can only be connected with the help of a password.

- All these connections are made through ethernet ports (gigabit ethernet and fast ethernet) using copper straight-through cables.

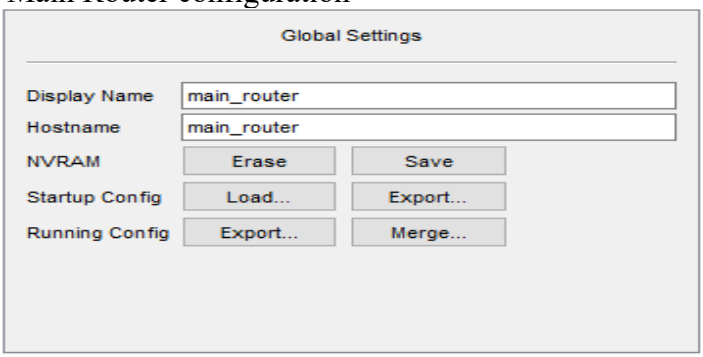


This is the flow diagram for a better understanding of the steps mentioned above.

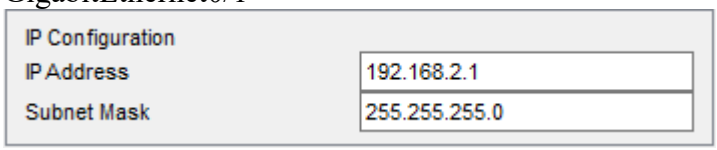
1. Configuring IP Addresses

We have attached the screenshots of all the IP configuration below:

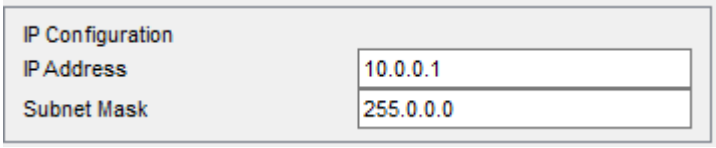
- Main Router configuration



GigabitEthernet0/1



Serial0/1/0



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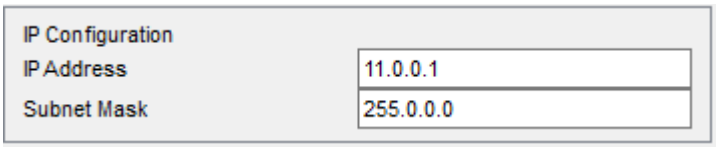
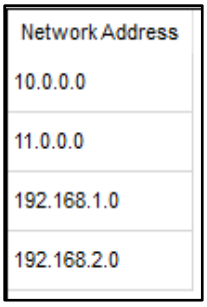
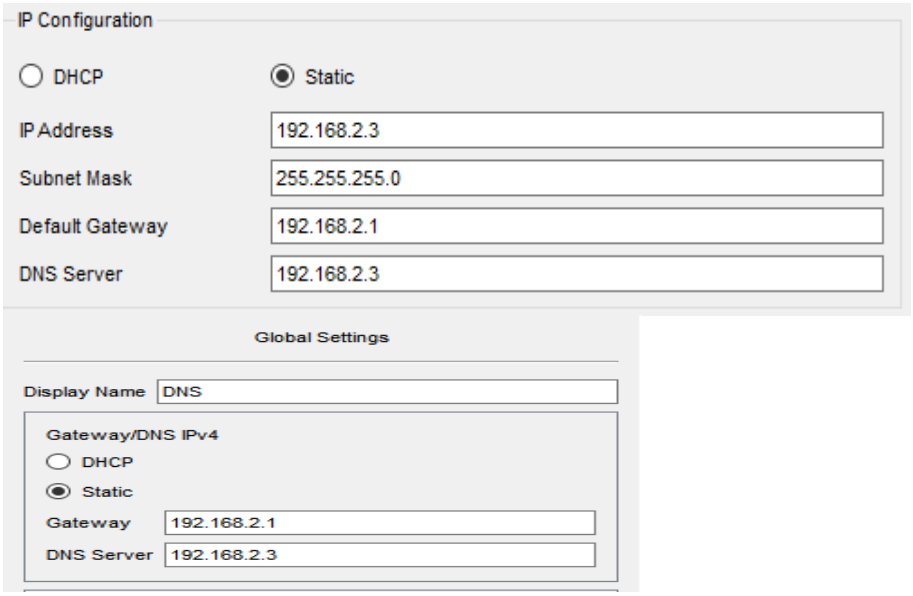


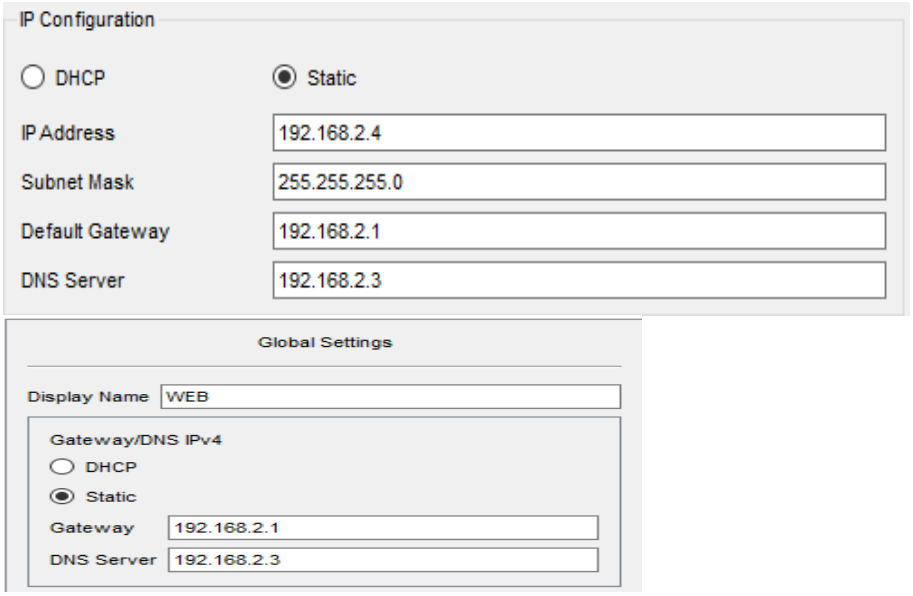
RIP



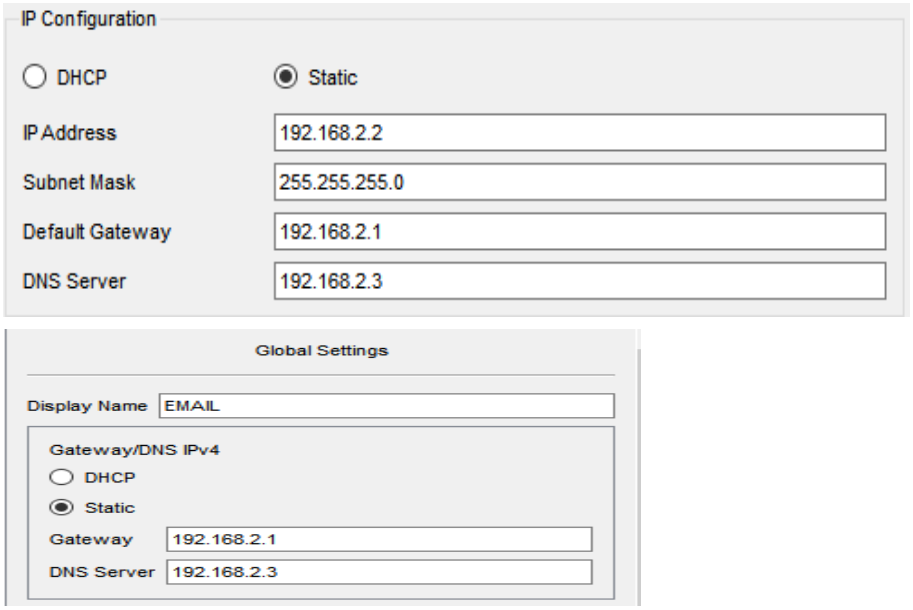
- DNS SERVER



- WEB SERVER

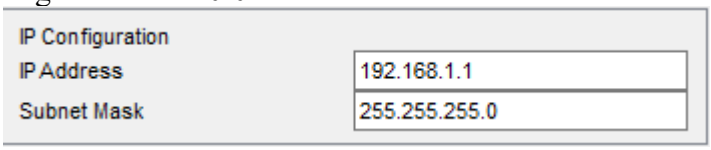


- EMAIL SERVER

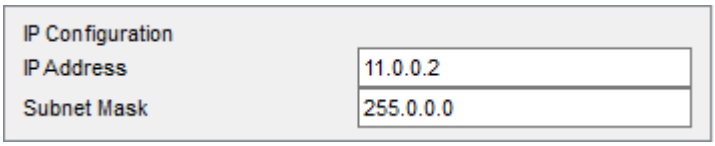


- COLLEGE ROUTER

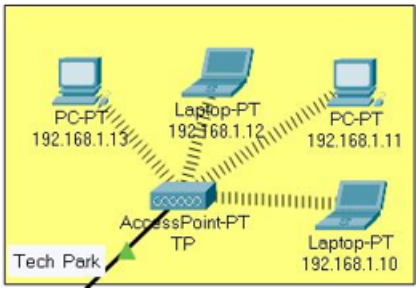
GigabitEthernet0/0



Serial0/1/0

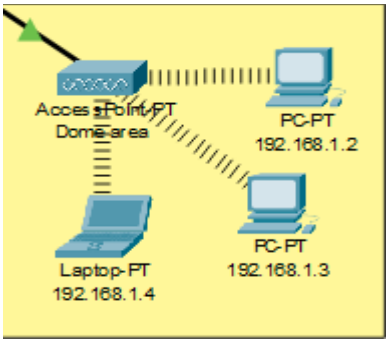


- TECH PARK



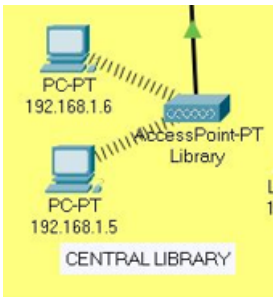
IP Address are as follows
192.168.1.10- Laptop
192.168.1.11- PC
192.168.1.12- Laptop
192.168.1.13- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- UNIVERSITY BUILDING



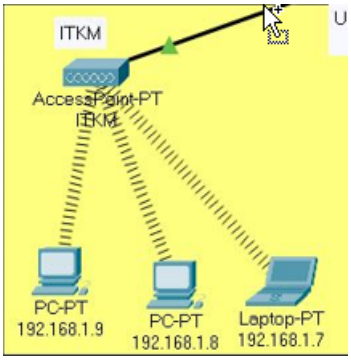
IP Addresses are as follows
192.168.1.2- PC
192.168.1.3- PC
192.168.1.4- Laptop
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- CENTRAL LIBRARY



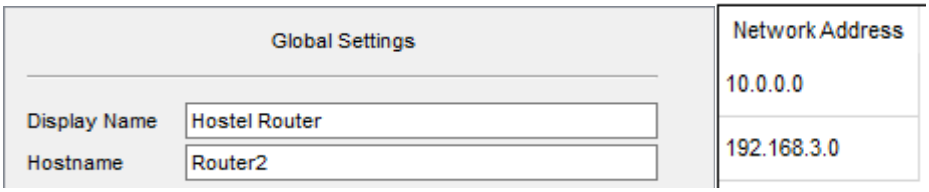
IP Addresses are as follows
192.168.1.5- PC
192.168.1.6- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

- ITKM

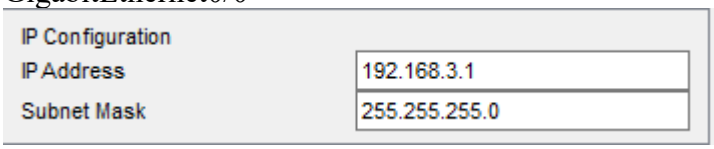


IP Addresses are as follows
192.168.1.7- Laptop
192.168.1.8- PC
192.168.1.9- PC
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 192.168.2.3

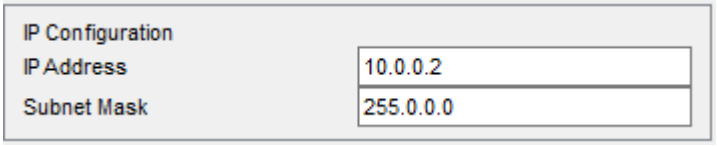
- HOSTEL ROUTER



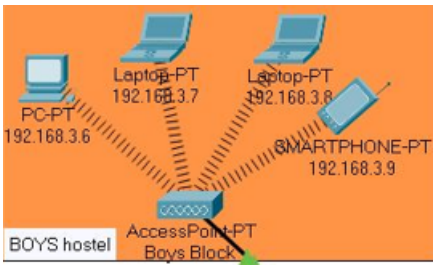
GigabitEthernet0/0



Serial0/1/0

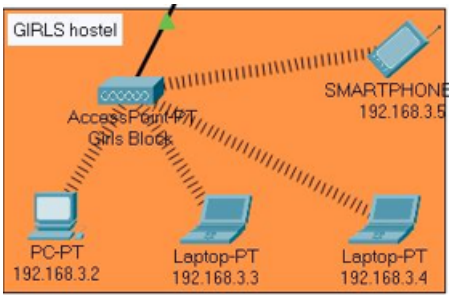


- BOYS HOSTEL



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 HOSTEL



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

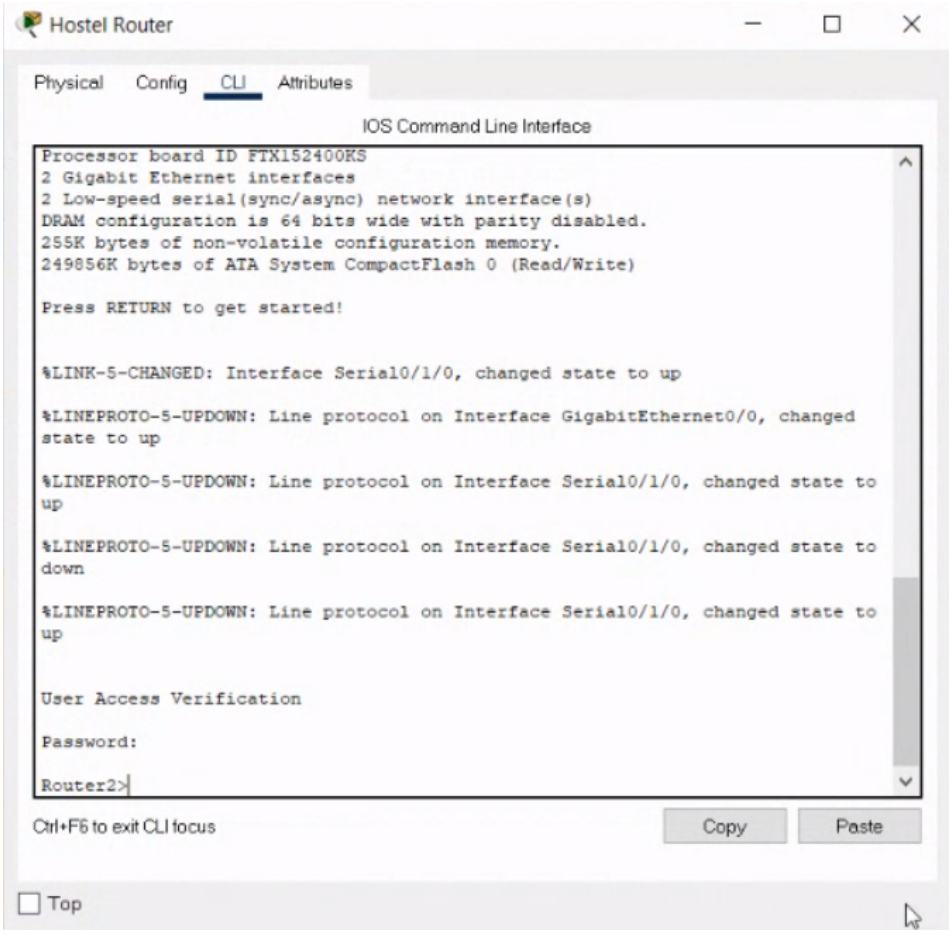
- WIRELESS ACCESS POINT

SSID	Password
1)techpark	1234567890
2)library	1234567890
3)ITKM	1234567890
4)ub	1234567890
5) srm boys	1234567890
6)srm girls	1234567890

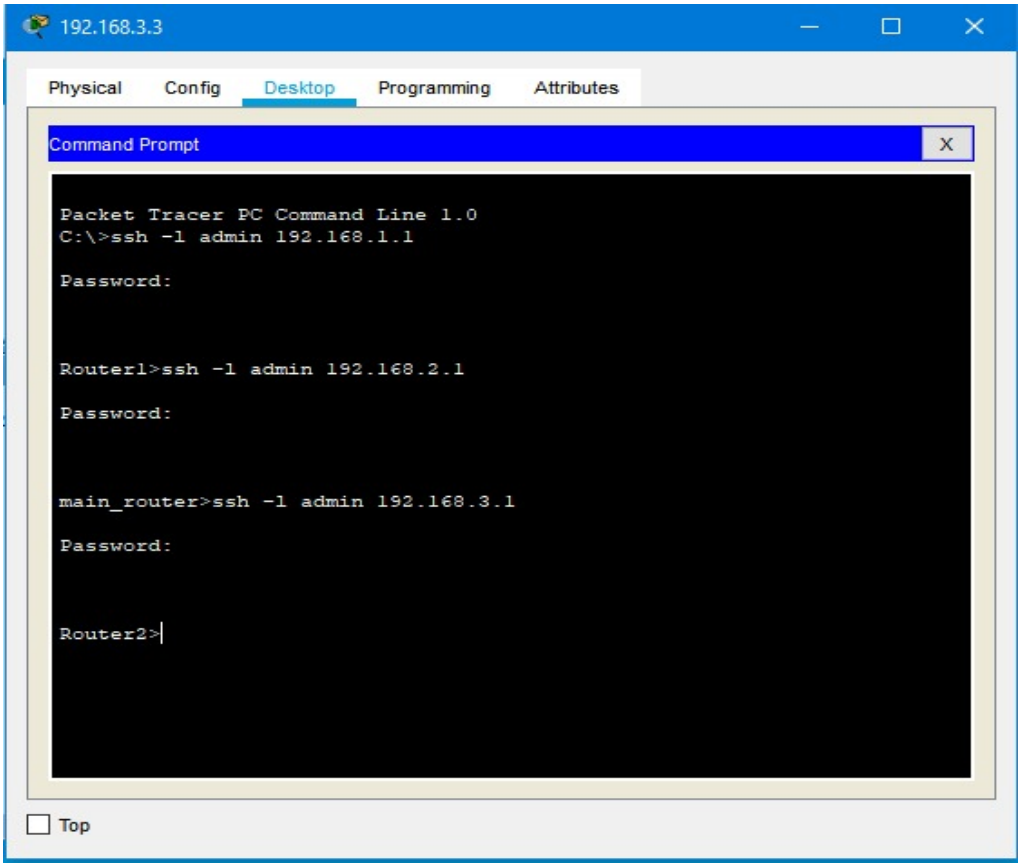
2. Securing the network

Passwords are used in accessing the router and all the wireless networks (mentioned in step 5 wireless access point) to make the access limited to University authorized users only.
Routers are also secured with ssh (Secure Shell). Routers and their assigned passwords are mentioned below:

Router Name	Passwords
1)main_router	Console password: cisco ssh password: admin
2)Router1(College Router)	Console password:srm ssh password: admin
3)Router2(Hostel Router)	Console password:srm ssh password: admin

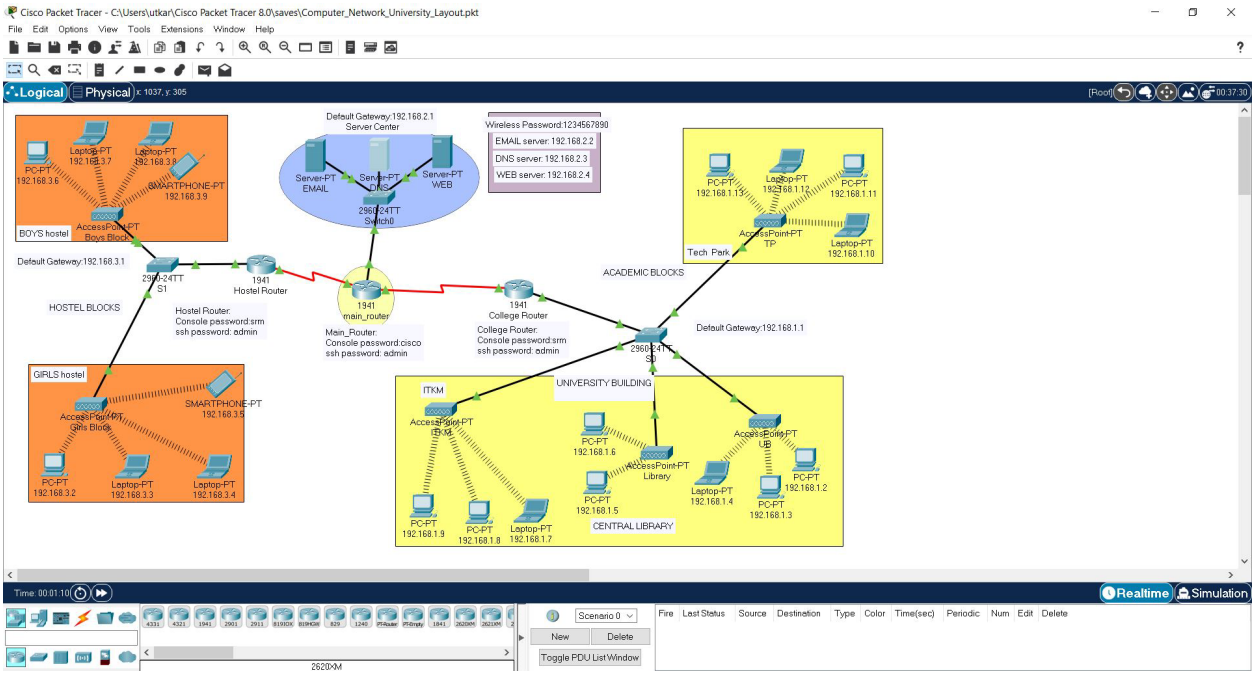


Connectivity of wireless network on computing devices



5. IMPLEMENTATION

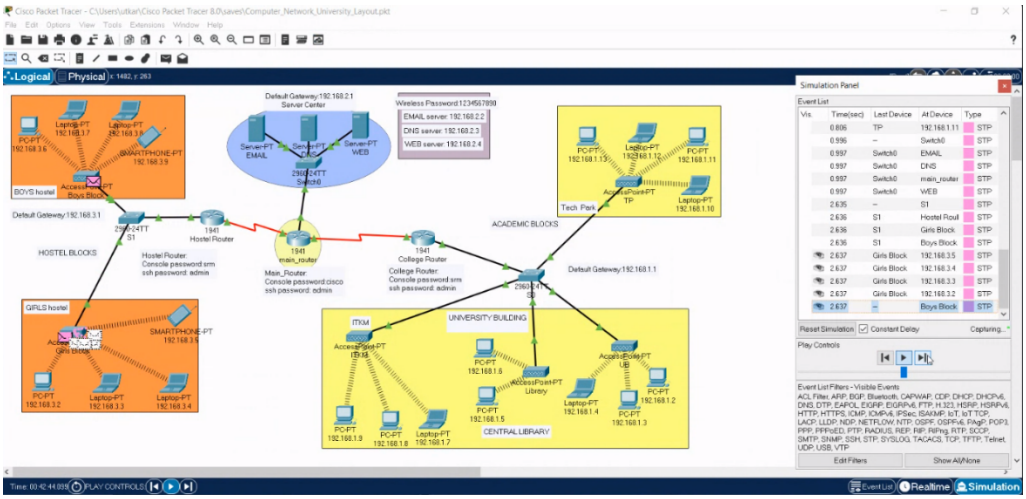
Finally, we have combined all the steps as before and implemented the desired wireless network for University. We have the complete network providing various facilities to the teaching staff, non-teaching staff, and students.



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

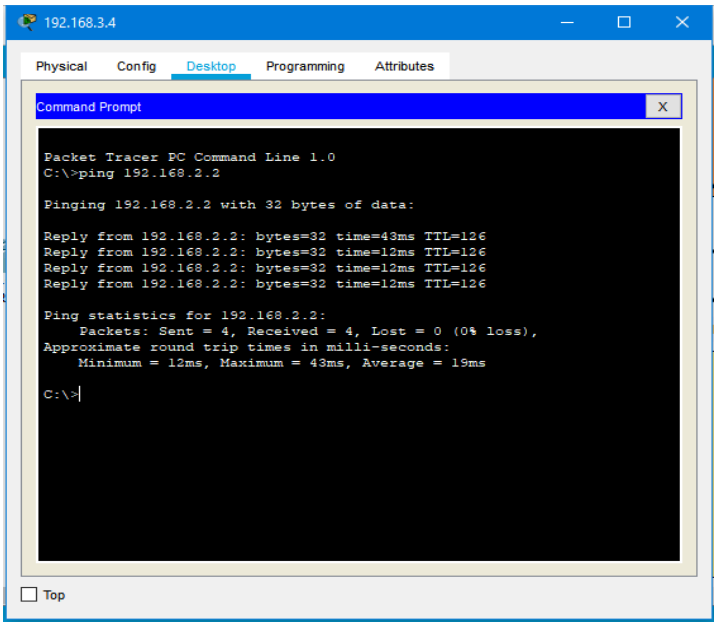
- Final Simulation

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:

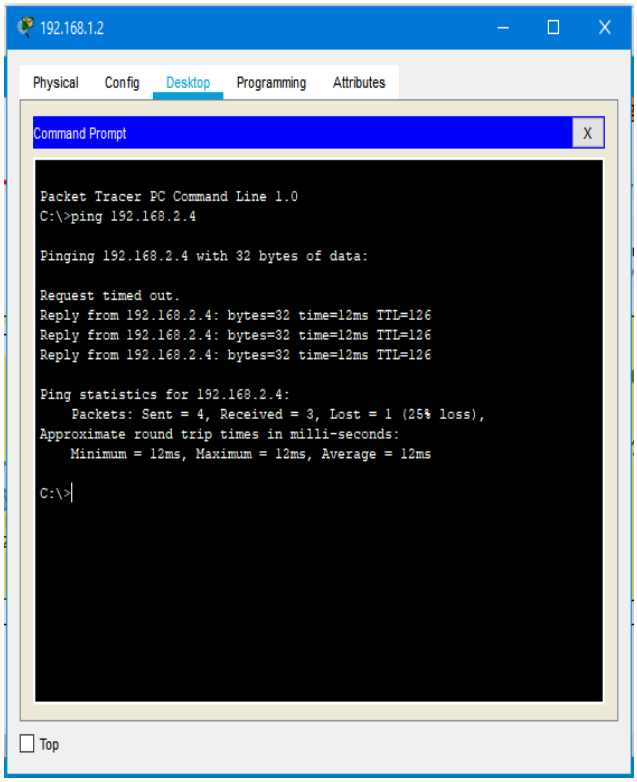


Final simulation for the network system to check all the connection

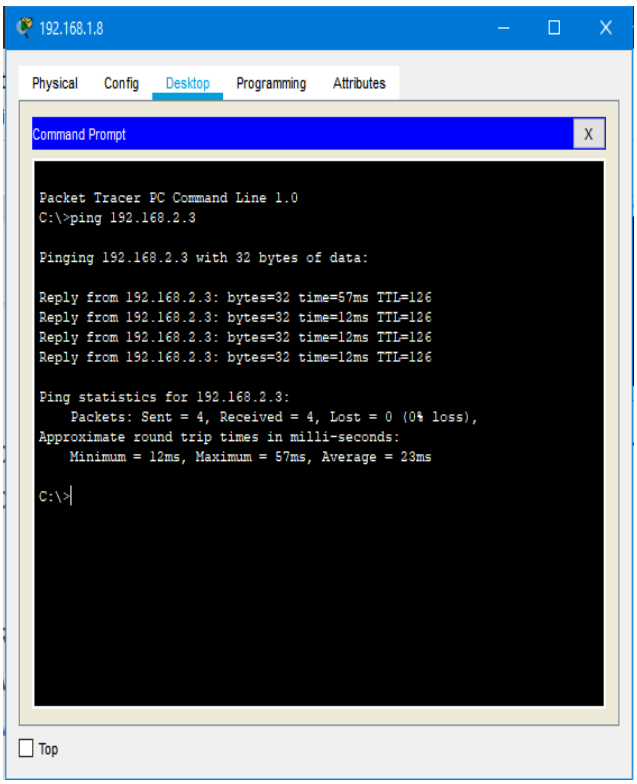
- Ping Test: Network connectivity and communication can be tested using the ping command, followed by the domain name or the IP address of the device (equipment) whose connectivity one wishes to verify.



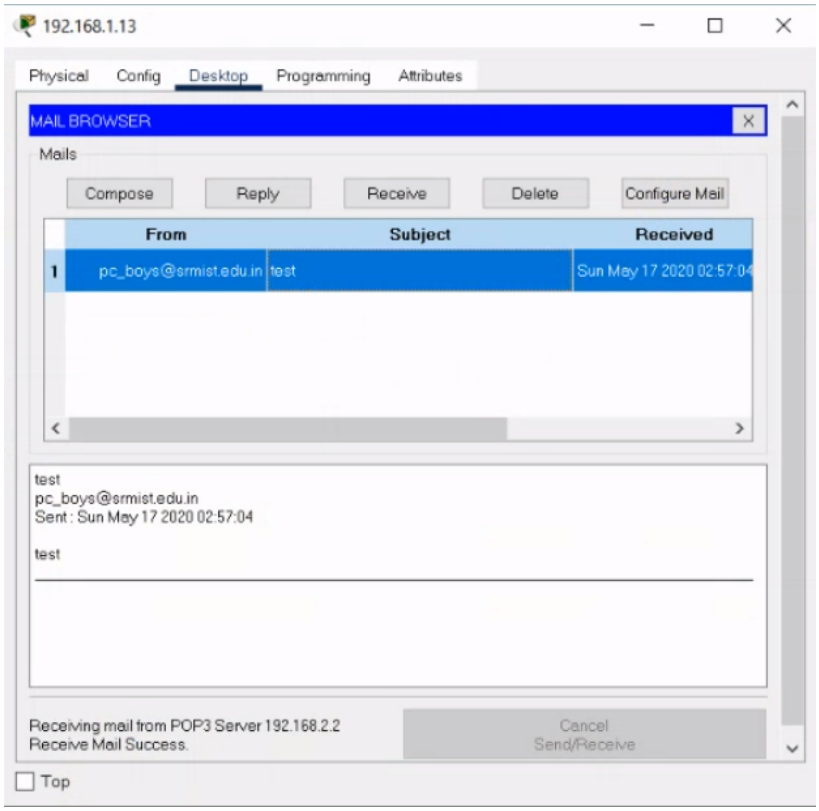
Ping Test for EMAIL server



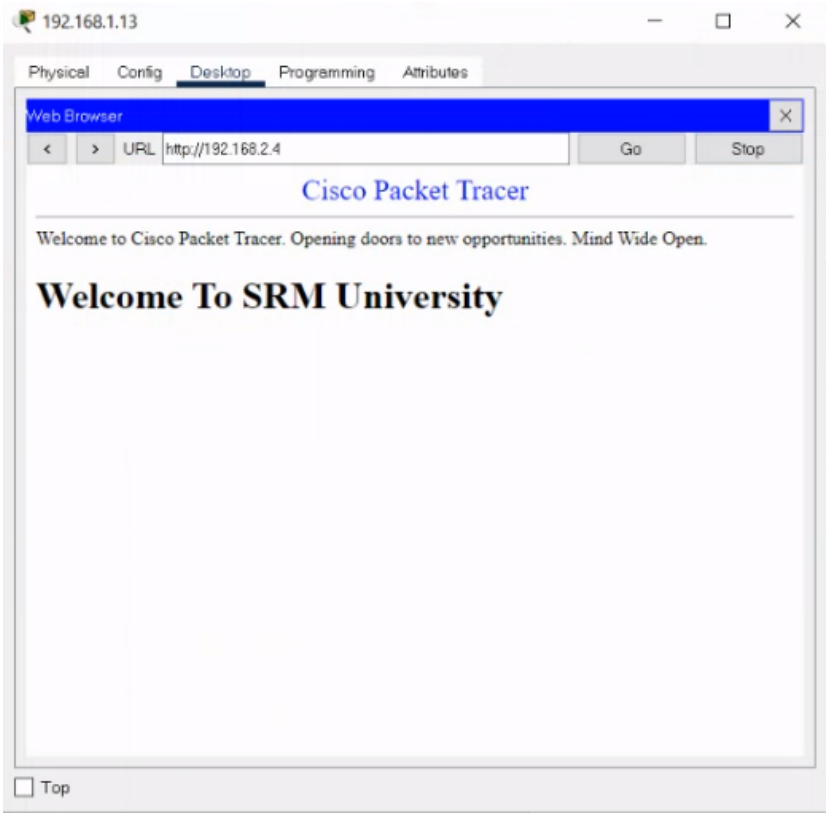
Ping Test for WEB server



Ping Test for DNS server



Email Received on device sent through EMAIL Server



Website accessed through Web Browser in Packet Tracer

6. EXPERIMENT RESULTS AND ANALYSIS

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 network. 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.

7. REFERENCES

[1]https://en.wikipedia.org/wiki/Packet_Tracer

[2]https://www.paessler.com/it-explained/server

[3]http://router.over-blog.com/article-how-to-configure-cisco-router-password-106850439.html

THANK YOU