A Mini Project Report on

ENGINEERING CAMPUS NETWORK SCENERIO

(INFORMATION TECHNOLOGY)

Submitted in partial fulfilment of the requirements of
the Semester VII Subject of

Network Design Lab

SUBMITTED BY

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Pillai HOC College of Engineering & Technology, Rasayani

Year 2021-22

INFORMATION TECHNOLOGY

Certificate

This is to certify that the project entitled " **ENGINEERING CAMPUS NETWORK SCENERIO**" in successfully completed by following students:

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As per the syllabus & in partial fulfilment for the completion of NETWORK DESIGN LAB Mini Project in Information Technology from University of Mumbai, it is also to certify that this is the original work of the candidate done during the academic year 2021-2022.

Project Guide

Head of Department

Principal

Internal Examiner

External Examiner

ACKNOWLEDGEMENT

A project is never complete without the guidance of experts who already gone through this in past before and hence become master of it and as a result, our guides. So, we would like to take this opportunity to thank all those individuals who helped us in visualizing our project.

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We extend our sincerity appreciation to all our Professor and Principal **Dr. J. W. Bakal** Principal of Pillai HOC College of Engineering and Technology, Rasayani for providing the infrastructure and resource required for project.

Thanking You,

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I. INTRODUCTION

This Engineering Campus Network Scenario is about designing a topology of a network that is a LAN (Local Area Network) and Wireless for a Campus in which various computers of different departments are set up so that they can interact and communicate with each other by interchanging data. To design a networking scenario for a campus which connect various departments to each other's, it puts forward communication among different departments. CNS is used to design a systematic and well-planned topology, satisfying all the necessities of the campus (i.e., client). CNS come up with a network with good performance. With the development of network and communication technology, cable networks and wireless networks on a campus bring much convenience for teaching and research work. The campus wired LAN enables communications between devices in a building or group of buildings, as well as interconnection to the WAN and Internet edge at the network core.

The word "digital" is very significant in today's world, with an increase in the development of technology the entire world is moving towards the digital era. The educational institution plays an important role in this digitalization; hence the campus should adapt to digital means of networking as well. Going wireless plays an important role in this digitalization. Campus networking via wireless connection becomes an important part of campus life and provides the main way for teachers and students to access educational resources, which gives an important platform to exchange information. As laptops and intelligent terminals are widely used, demand for access to information anytime and anywhere has become more and more urgent, but traditional cable networks cannot meet this requirement.

II. OBJECTIVES

The main objective of the proposed network is to update the existing network and also enhance its capabilities and increase the flexibility and security of the network which will eventually provide good security. A simulation of campus networks based on wired and wireless networking. This project is to show the wired and 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, DHCP, SMPT 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 wired and wireless networking for smooth processing.

III. NETWORK REQUIREMENTS

The following summarizes Engineering Campus Network's Requirement:

Sr. No.	Devices	Functions
1	**Router (PT Router)**	A router is a switching device for networks, which is able to route network packets, based on their addresses, to other networks or devices.
2	**Switches (PT Switch)**	A switch is defined as a device that is used for making and breaking of electric current in a circuit.
3	**PC**	Taking data and instructions from a user, processing the data as per instructions, and displaying or storing the processed data, are the four major functions of a computer.
4	**Access Point**	In an all-wireless network, an access point acts as a standalone root unit. It is not attached to a wired LAN.
5	**Copper Straight Wires**	Straight-through cable is a type of twisted pair copper wire cable for local area network (LAN) use for which the RJ-45 connectors at each end have the same pinout (i.e., arrangement of conductors).
6	**Serial DCE wires**	A DCE provides a physical connection to a network and forwards traffic
7	**Printers**	A printer is a device that accepts text and graphic output from a computer and transfers the information to paper
8	**Laptops**	Laptops combine all of the input and output capabilities and components of a desktop computer, including its display screen, keyboard, speakers, data storage, disc drives, and pointing devices (a touchpad or a trackpad), with a processor and operating system into a smaller device
9	**Server (Server PT)**	The role of a server is to share data as well as to share resources and distribute work

1: The new system should be able to reduce internet downtime. Download and upload links should be maintained above 5 Mbps speed requirement.
2: Network will be scalable.
3: The system should support remote access.
4: Should comprise of data center's with necessary security features and support.

IV. MAJOR DESIGN AREAS AND FUNCTIONAL AREAS

The following are some considerations for each of the functional areas and modules.

In this framework, we are proposing to deploy a wireless network in 2 floors so faculty or student can access the electronics easily. Even more security is provided to the systems. The new system planned comprises of IP based switches that remain as the access point to LAN-based (ethernet) as well as Wi-Fi-based connectivity. These switches provide SNMP support as well so that traffic monitoring becomes easy. The systems are enhanced and reliability.

Ip based switches are used mainly because:

- The inter VLAN routing feature is supported on both IP base or SMI and IP services or EMI image Layer 3 switches. For Layer 2-only switches, you require a Layer 3 routing device with any of the previous images.

- The IP Base feature set includes advanced quality of service (QoS), rate limiting, access control lists (ACLs), and basic static and Routing Information Protocol (RIP) functions. Dynamic IP routing protocols (Open Shortest Path First (OSPF), BGPv4, Enhanced Interior Gateway Routing Protocol (EIGRP)) are available only on the IP services image.

- The IP Services image provides a richer set of enterprise-class features, which includes advanced hardware-based IP unicast and IP Multicast routing. Support for IPv6 Layer 3 switching in hardware is also available with the addition of the Advanced IP Services license to either the IP Base or the IP Services images. Both the IP base Image and the IP services image allow for Layer 3 and Layer 4 lookups for QoS and security.

- Some PCs are allotted DHCP which will give a network management protocol to automatically assigning IP addresses and other communication parameters to devices connected to the network using a client–server architecture.

Problem 1: The Campus followed the traditional design.

Proposed solution: In this framework, we are proposing a deployment of a new network design for the Engineering Campus making it faster and more reliable with less maintenance and cost effective.

Problem 2: Campus need to make the network efficient and mobility at the same time.

Proposed solution: In this framework, we are proposing a Access point in IT Labs and Research labs which will give access to the students or faculty to use there laptops for work purpose getting wireless connection.

V. Existing Infrastructure

The existing system is a very basic system. College mainly comprises of three main sections as

1. TPO & Other

2. Exam Center

3. Office

All the hosts are assigned with static IPs and are assigned in the order in which it where set up. No support for dynamic IP allocations. Even though the working is divided into three major sectors all the host, multimedia devices are connected in a single network. Thus, network security and maintenance are difficult. One more problem observed was the existing switches were outdated and hence could not prove to be beneficial for the network administrator to observe monitor and handle the network traffic the system has no remote access to the network. Absence of basic small-scale businesses firewall was also observed. Thus, security is also compromised. Three server rooms were used for the purpose of independent networking which further caused wastage of power and money.

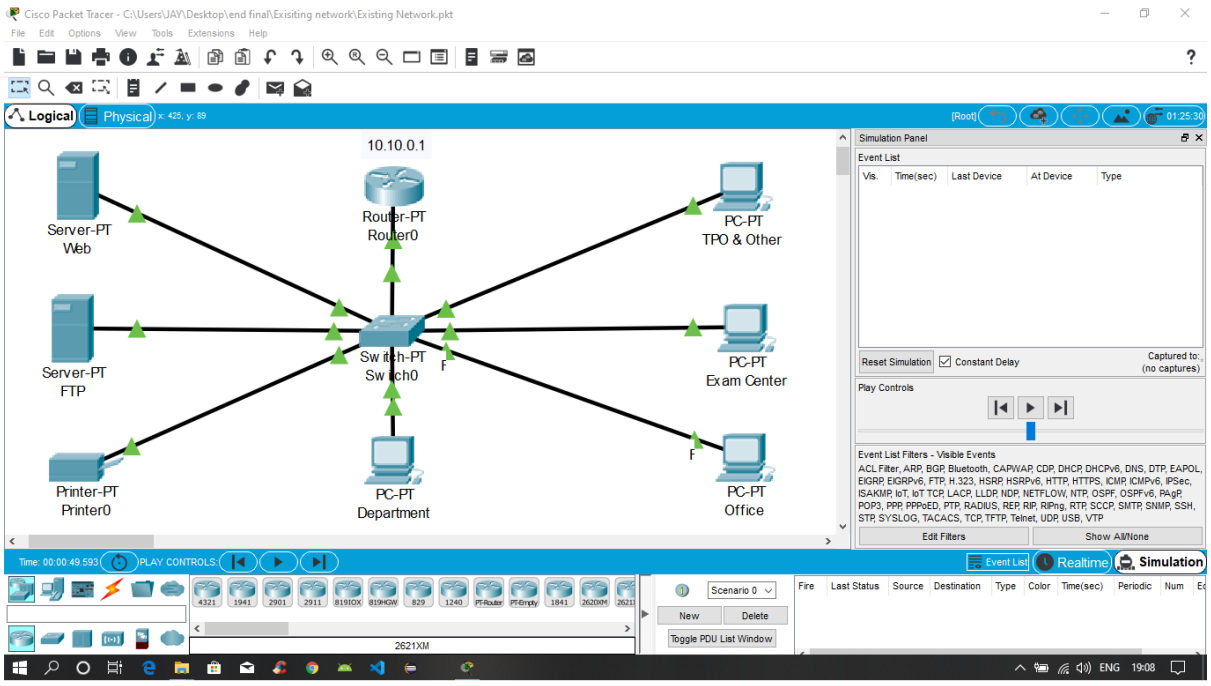

Fig 1: The above design is the existing network traced on cisco packet tracer

VI. NETWORK DEVICES

Identify the network devices required design the chosen Engineering Campus Network

Server:

A server is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network. In theory, whenever computers share resources with client machines they are considered servers. This means that a device could be both a server and a client at the same time.

How does a Server work?

The web server finds and assembles all the information needed to display the site – including things like ads, dynamic elements, content and more. The server then sends this complete package of information back to the web browser as a response. The web browser receives this complete page and displays it for the user.

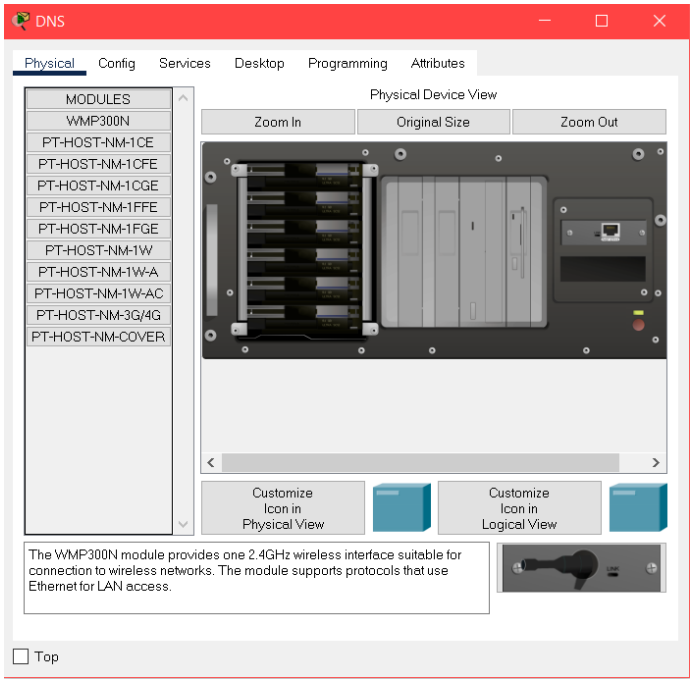

Fig 2: Server

Router:

A router is a box that lets all of your wired and wireless devices use that Internet connection at once and also allows them to talk to one another without having to do so over the Internet.

How does a router work?

Routers pass through internet brought from the Modem and use it to connect various devices across a specific network. Data that enters a router and is either sent through ethernet ports or

WiFi to devices demanding data. Today, you will often find modems and routers in one physical device.

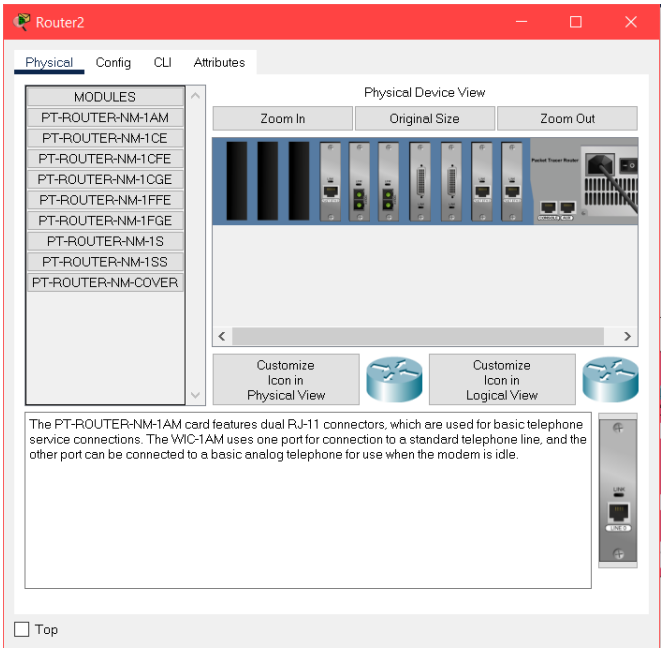

Fig 3: Router

Switch:

Switches are key building blocks for any network. They connect multiple devices, such as computers, wireless access points, printers, and servers; on the same network within a building or campus. A switch enables connected devices to share information and talk to each other.

How does a switch work?

The switch uses the MAC address to identify which attached device outgoing packets are being sent from and where to deliver incoming packets. ... When a device sends a packet to another device, it enters the switch and the switch reads its header to determine what to do with it.

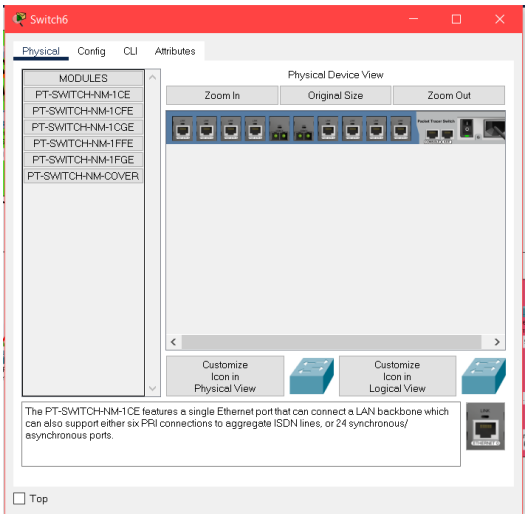

Fig 4: Switch

Access point:

Access point in a wireless network is any device that will allow the wireless devices to a wired network. It is a multiple access protocol used by IEEE 802.11 standard for wireless LAN.

How does access point works?

Access points work by connecting direct to your broadband router or network switch with a Ethernet or data cable. This provides the AP with the internet connection and bandwidth required. It then transmits and receives a wireless signal in either the 2.4Ghz or 5Ghz frequency range (WIFI).

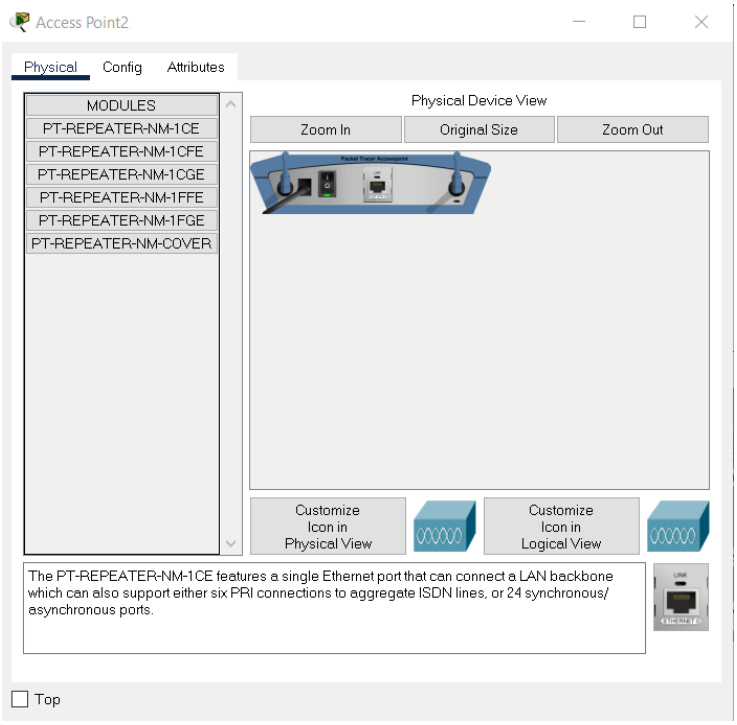

Fig 5: Access point

VII. REQUEST FOR PROPOSAL (RFP)

A request for proposal (RFP) is a business document that announces a project, describes it, and solicits bids from qualified contractors to complete it. Most organizations prefer to launch their projects using RFPs, and many governments always use them.

Serial No	Network Devices	Price per unit	Quantity	Total Cost (INR)
1	The Cisco System Business switches	17999	9	1,61,991
2	Routers	8000	3	24,000
3	Copper straight Cable	1490	55	81,950
4	Serial DCE cable	7414	5	37,070
5	PC	30000	40	12,00,000
6	Printers	6000	13	78,000
7	Server	50000	4	2,00,000
8	Access Point	7641	2	15,282
9	Laptop	30000	4	1,20,000
10	Smartphone	13000	2	26,000
			Total	19,44,293/-

VIII. IP ADDRESSING PLAN

IP address plan

An IP addressing plan is a document usually developed by network/design engineers to show how the IP addresses will be distributed among the network devices based on the network architecture or topology in a way that support the required services.

The IP addressing plan:

- Will determine the number of IP addresses required immediately and in the long term to deliver the specified services to your customers.
- Will also be used by your network engineers to maintain reachability between the different network segments.
- Will ease future network expansion and modification.

Internet Lab (128.168.0.0)	
PC-PT PC0	128.168.0.1
PC-PT PC1	128.168.0.2
PC-PT PC2	128.168.0.3
PC-PT PC3	128.168.0.4
Printer-PT Printer0	128.168.0.5

SERVER ROOM (1.0.0.0)	
Server-PT FTP	1.0.0.2
Server-PT WEB	1.0.0.3
Server-PT DNS	1.0.0.4
Server-PT DHCP	1.0.0.6
PC-PT PC9	1.0.0.1

Research Lab (1.0.0.0)	
Laptop 1	1.0.0.15
Laptop 2	1.0.0.16
PC4	1.0.0.7
PC5	1.0.0.18
Printer	1.0.0.7
Smartphone	1.0.0.11

PRINCIPAL ROOM (192.168.2.0)	
LAPTOP-PT LAPTOP 0	192.168.2.1
PC-PT PC26	192.168.2.2
PRINTER-PT PRINTER 10	192.168.2.3

LIBRARY (192.168.6.0)	
PC-PT PC 14	192.168.6.1
PC-PT PC 15	192.168.6.2
PC-PT PC 16	192.168.6.3
PC-PT PC 17	192.168.6.4
PC-PT PC 18	192.168.6.5
PRINTER-PT PRINTER 5	192.168.6.6

FEES COUNTER (192.168.4.0)	
PC-PT PC 21	192.168.4.1
PRINTER-PT PRINTER 8	192.168.4.2
PC-PT PC 19	192.168.4.3
PRINTER-PT PRINTER 7	192.168.4.4

Other (192.168.3.0)	
OFFICE	192.168.3.1
PRINTER 4	192.168.3.2
EXAM CELL	192.168.3.3
PRINTER 2	192.168.3.4
ENQUIRY	192.168.3.5
TPO	192.168.3.7
PRINTER 3	192.168.3.6

IT Dept (192.168.1.0)	
IT HOD Cabin	192.168.1.1
IT LAB 1	192.168.1.2
IT LAB 2	192.168.1.3
IT LAB 3	192.168.1.5
IT LAB 4	192.168.1.4
IT LAB PRINTER 1	192.168.1.6

COMPUTER DEPT (192.168.7.0)	
CS HOD CABIN	192.168.7.1
CS LAB 1	192.168.7.2
CS LAB 2	192.168.7.3
CS LAB 3	192.168.7.4
CS LAB 4	192.168.7.5
CS LAB PRINTER 2	192.168.7.6

EXTC DEPT (192.168.5.0)	
EXTC PC 1	192.168.5.1
EXTC PC 2	192.168.5.2
EXTC PC 3	192.168.5.3
EXTC PC 4	192.168.5.4
EXTC HOD CABIN	192.168.5.7
EXTC PRINTER	192.168.5.5

Civil DEPT (192.168.8.0)	
Civil PC 1	192.168.8.2
Civil PC 2	192.168.8.3
Civil PC 3	192.168.8.4
Civil PC 4	192.168.8.5
Civil HOD CABIN	192.168.8.1
Civil Lab PRINTER	192.168.8.6

IX. ROUTING PROTOCOL PLAN

Routing Information Protocol (RIP) is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the source and the destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model.

The OSPF (Open Shortest Path First) protocol is one of a family of IP Routing protocols, and is an Interior Gateway Protocol (IGP) for the Internet, used to distribute IP routing information throughout a single Autonomous System (AS) in an IP network.

The OSPF protocol is a link-state routing protocol, which means that the routers exchange topology information with their nearest neighbours. The topology information is flooded throughout the AS, so that every router within the AS has a complete picture of the topology of the AS. This picture is then used to calculate end-to-end paths through the AS, normally using a variant of the Dijkstra algorithm. Therefore, in a link-state routing protocol, the next hop address to which data is forwarded is determined by choosing the best end-to-end path to the eventual destination.

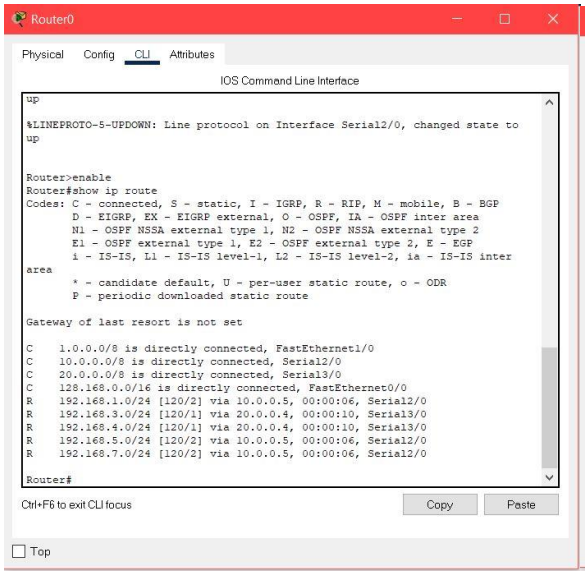

Fig 6: Routing Protocol Plan for Router 0

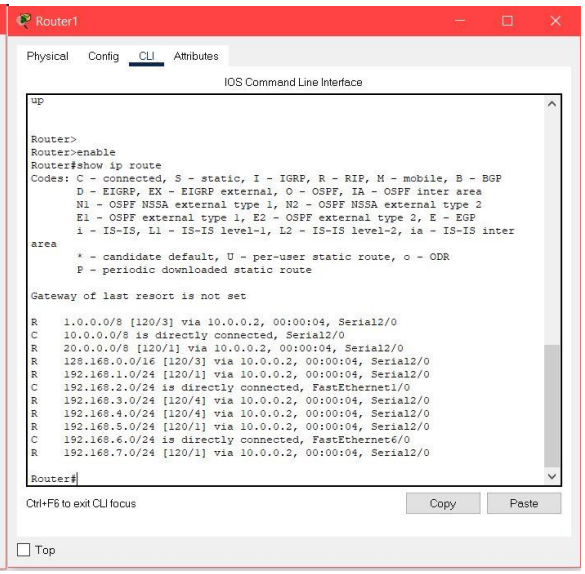

Fig 7: Routing Protocol Plan for Router 1

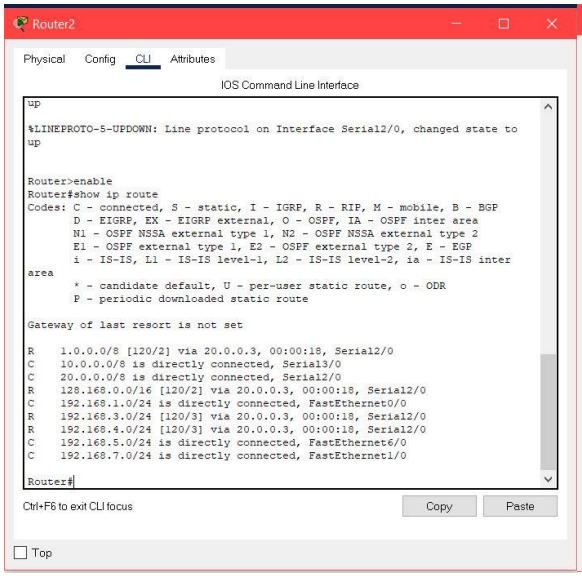

Fig 8: Routing Protocol Plan for Router 2

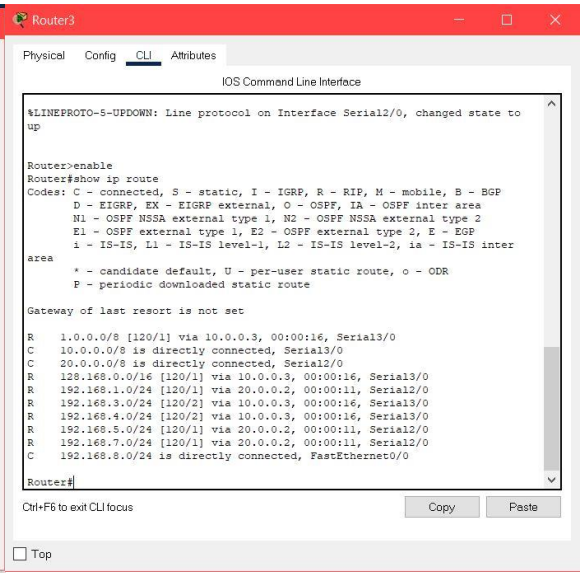

Fig 9: Routing Protocol Plan for Router 3

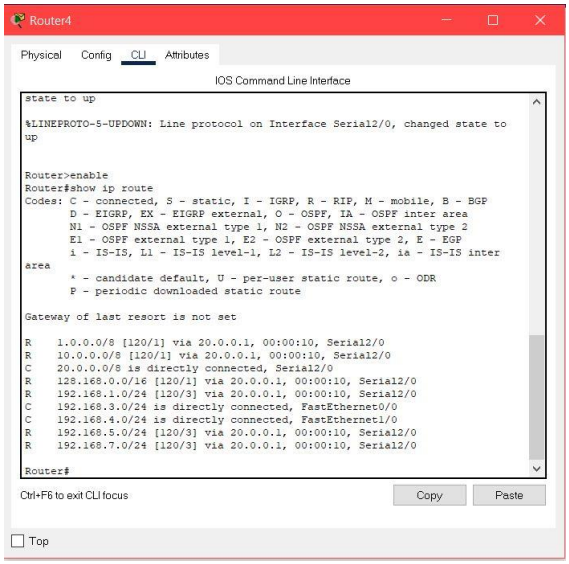

Fig 10: Routing Protocol Plan for Router 4

X. NETWORK DESIGN

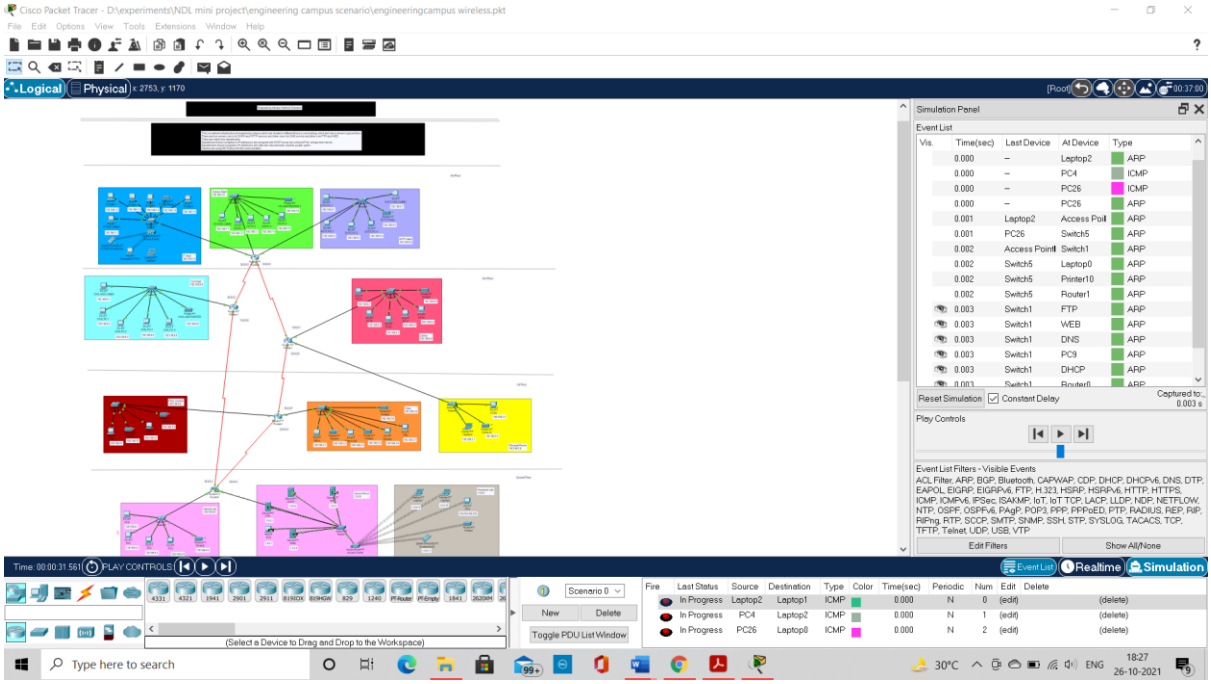

Fig11: The prototype of the proposed network is implemented on cisco packet tracer

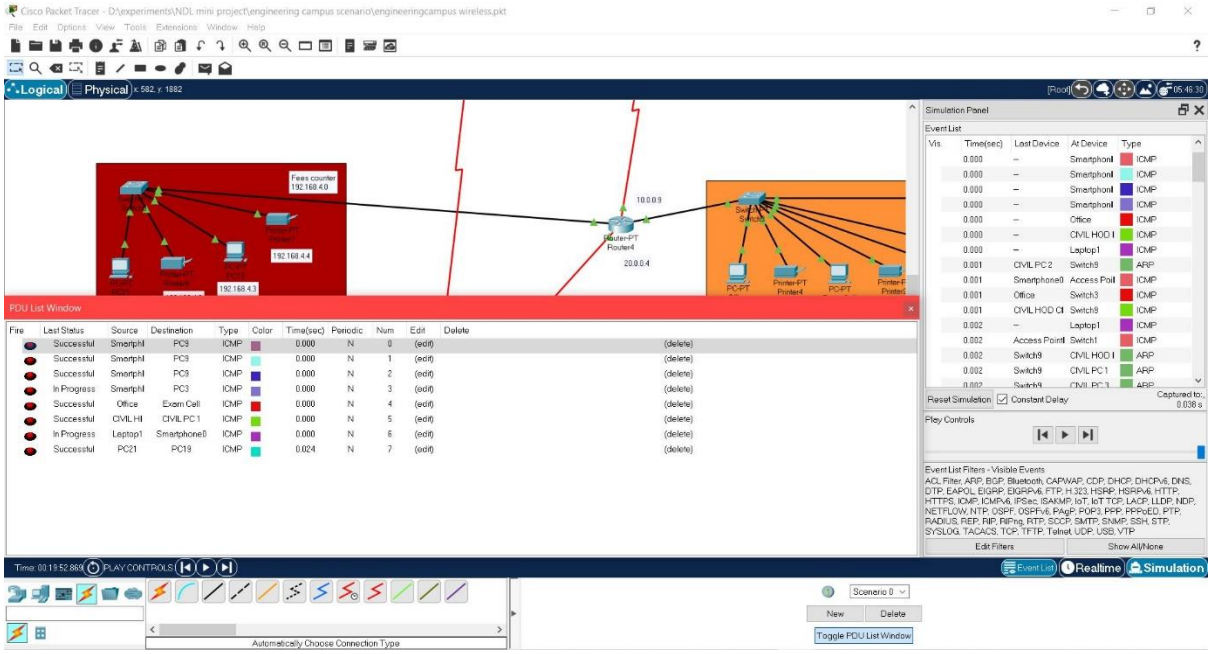

Fig 12: Packet tracing successful

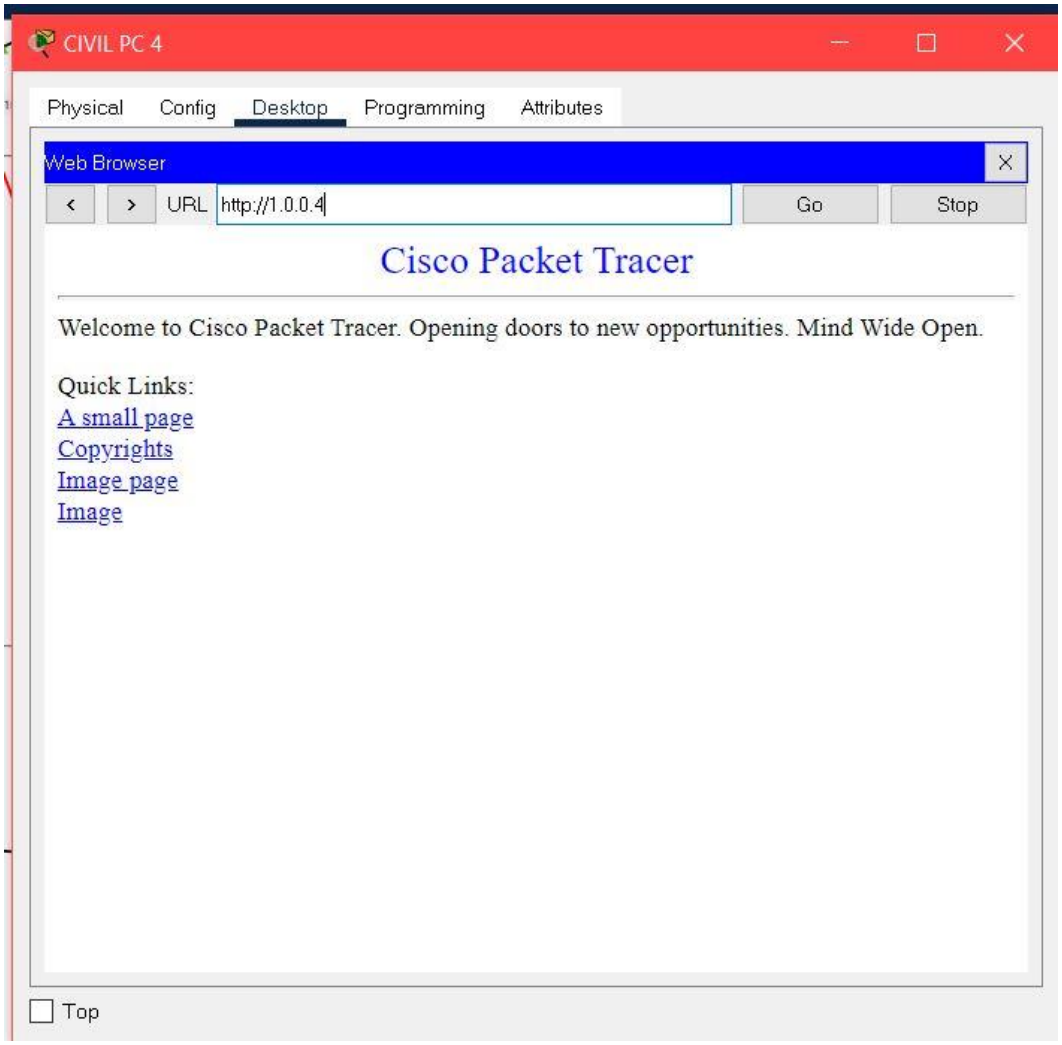

Fig 13: Testing Web Hosting and DNS

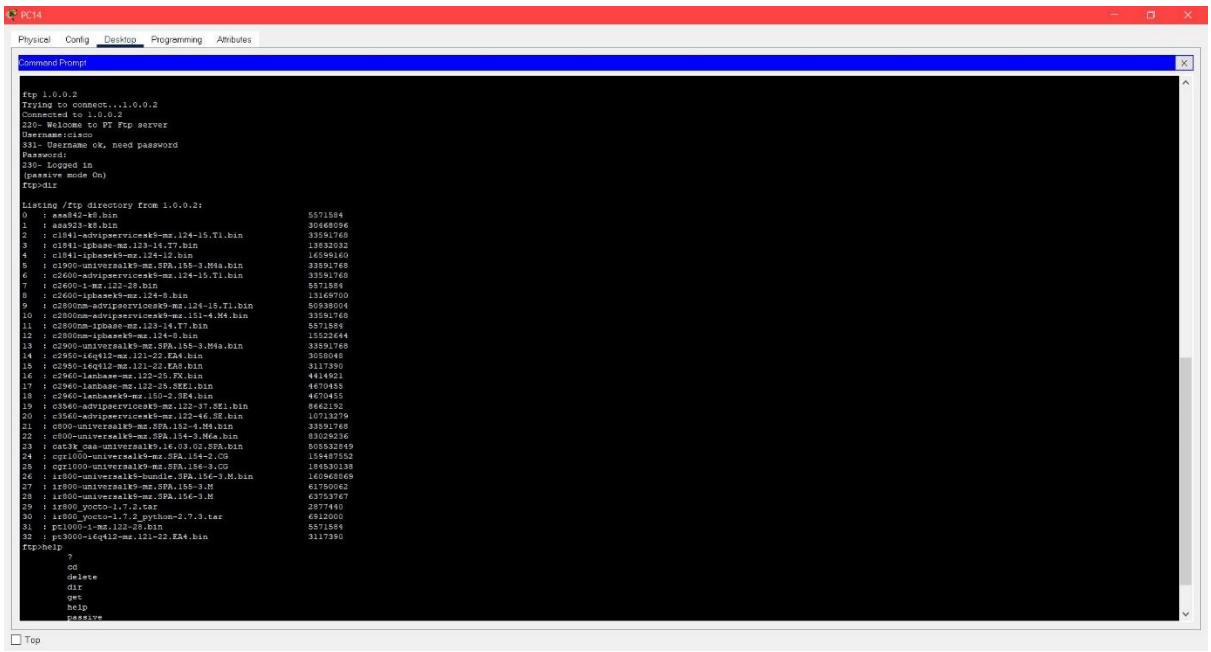

Fig 14: Testing FTP Protocol

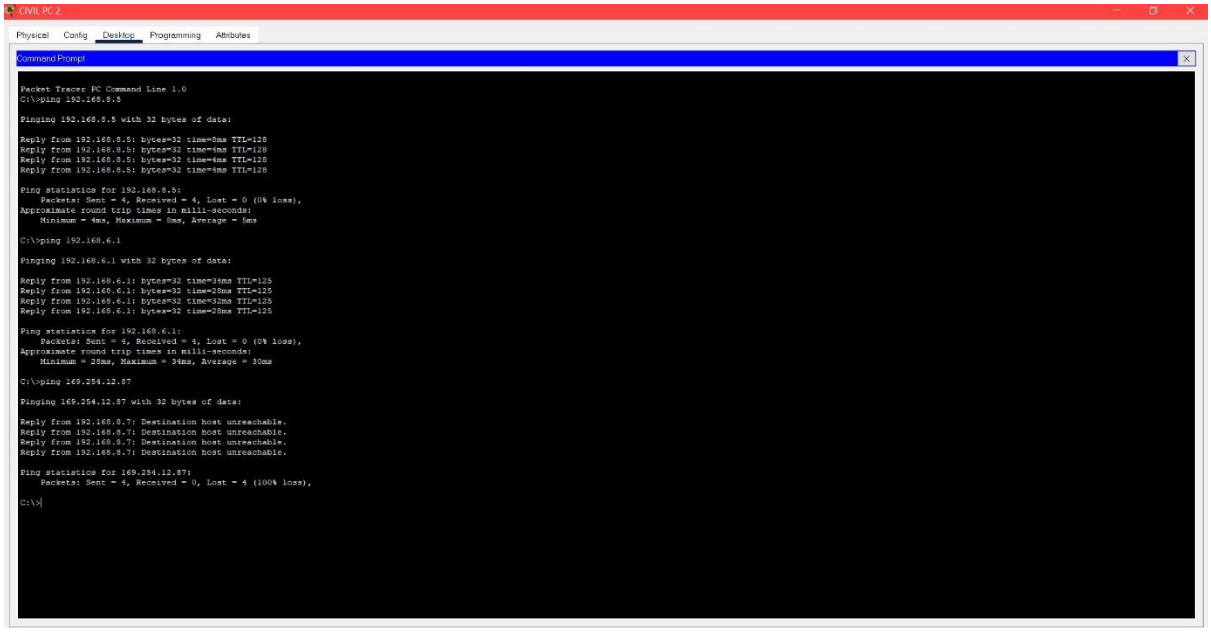

Fig 14: Testing VLAN communications

XI. SUMMARY

The outcome of the proposed system will be a fail-safe backbone network infrastructure which meets the requirements for readily available access to information and security of the private network, and also ensures optimized productivity when telecommunication services are accessed. The installed equipment allowed to organize high-speed wired and wireless Internet access throughout the whole complex of Campus buildings as well as providing transfer of all types of data throughout the single optimized network.The existing system including TPO, Office, Exam cell is extended in the propose system which includes a whole campus scenario. Our implemented system consist of IT dept, comps dept, other, server room, principal room, library, fee counter. We have designed a fail safe system i.e. if a particular system faces failure the remaining system will keep working. It has more security protocols.

XII. REFERENCE

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