CAMPUS NETWORK SIMULATION

Project Report

For

7th Sem Project -1

Submitted By:

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In partial fulfillment of the requirement for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

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at

KATIHAR ENGINEERING COLLEGE, KATIHAR -854109
AFFILIATED TO BIHAR ENGINEERING CAMPUS, PATNA, BIHAR (INDIA)

APRIL - 2024

DECLARATION

We hereby declare that the project entitled "**CAMPUS NETWORK SIMULATION**" submitted for the B. Tech. (CSE) degree is our original work and the project has not formed the basis for the award of any other degree, diploma, fellowship or any other similar titles.

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Place: Katihar

Date :

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This is to certify that the project entitled "**CAMPUS NETWORK SIMULATION**" is a record of work carried out by **Harshit Shubham,** Reg. No. **(20105129019)**, **Ritika Kumari,** Reg. No. **(20105129011), Vishal Kumar,** Reg. No. **(20105129024),** students of B.Tech. (CSE) of Katihar Engineering College, Katihar (Bihar) affiliated to Bihar Engineering College, Patna, Bihar (INDIA) during the academic year 2020-2024, in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (Computer Science and Engineering) and that the project has not formed the basis for the award previously of any other degree, diploma, fellowship or any other similar title.

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Place: Katihar

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CERTIFICATE BY THE EXAMINERS

This is to certify that the project entitled "**CAMPUS NETWORK SIMULATION**" is a record of work carried out by **Harshit Shubham,** Reg. No. **(20105129019)**, **Ritika Kumari,** Reg. No. **(20105129011), Vishal Kumar,** Reg. No. **(20105129024),** has been completed under the guidance of **Dr. Dharmveer Kumar Yadav**, **Assistant Professor,** Department of Computer Science & Engineering, **Katihar Engineering College Katihar,** has been examined by the undersigned as a part of the examination for the award of Bachelor of Technology degree in **Computer Science & Engineering** branch in Bihar Engineering Campus, Patna.

"Project Examined and Approved"

Internal Examiner Signature	**External Examiner Signature**
Date: _____	**Date: _____**

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ABSTRACT

Campus Network (CN) is a set of Virtual Local Area network (VLAN), which covers the entire Campus. It provides difference service such as connect user to internet, data sharing among user, accessing different web service for different functionalities. As Campus Network (CN) provides students, teachers, and different Campus member for different application, to sustain different activities in the Campus, so it needs to design in advance. To sophisticate the campus network service, this paper proposed Smart Campus Network Design (SCND) by integrating internet of thing device with classically network device in campus network and each smart device for different application must be registered to IOE server and controlled by legitimate user. To design the proposed campus network design, I used cisco packet tracer simulator software. The aim of this project is to design the topology of the Campus network using the software Cisco Packet Tracer with the implementation of wired networking systems.

List of Acronyms and abbreviations

(CN)	**C**ampus **N**etwork
(VLAN)	**V**irtual **L**ocal **A**rea **N**etwork
(SCND)	**S**mart **C**ampus **N**etwork **D**esign
(IP)	**I**nternet **P**rotocol
(NGN)	**N**etwork connectivity for **N**ext **G**eneration **N**etwork
(MAC)	**M**edium **A**ccess **C**ontrol **A**ddress
(VLAN)	**V**irtual **L**ocal **A**rea **N**etwork

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CHAPTER 1: INTRODUCTION

1.1 CISCO Packet Tracer Introduction

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 and become a “digital campus”. Going wired plays an important role in this digitalization. The wired network makes the connection easy with a reduction in the use of wires or cables. A wired connection makes it difficult to keep track of all the devices and to manage the cable connection, which is not only chaotic but also challenging to handle.

Campus networking via wired 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. Then wired network construction becomes necessary and essential. The wired network is one of the important components of a digital campus and wisdom campus. It provides an efficient way to explore the internet with a mobile terminal for teachers and students regardless of cables and places. This is an important mark of the modern campus as a supplement of a cable network. With the development of network and communication technology, cable networks on a Campus bring much convenience for teaching and research work. But for mobility and flexibility, it has obvious shortcomings. A wired network can overcome these drawbacks and has been applied to the Campus.

1.1 Project Statement

Developing a hierarchical network Topology using devices (routers, switches & Pcs) to create a multi-layered network structure creating different departments & users’ groups within campus.

1.2 Scope of Work

The project gives an expected outcome with a functional & secure campus network model replicating real-world network scenario.

CHAPTER 2: LITERATURE REVIEW

2.1 Previous Study (Packet Tracer)

a. Packet Tracer is a network simulation tool & virtual lab environment that allows to practice networking, and Internet of Things.

b. Packet Tracer is an incredibly powerful learning tool with multiple modes that enable us to explore the vast world of networking.

c. In simulation mode, we dive into how a network really works. We create a logical view of our network, configure our devices, and follow how data packets travel across our network.

d. After that, physical mode puts us in the virtual lab to see how our logical view translates into physical devices and cables. We'll practice setting up our own device rack and selecting the right cables and ports.

e. Packet Tracer has a built-in intelligent tutor as well to give us hints along the way, but only if we want them. Once we have the hang of it, it takes our abilities even further by creating advanced networks with IoT devices, integrating Python code, or practicing your network automation skills.

2.2 Tools and Technology

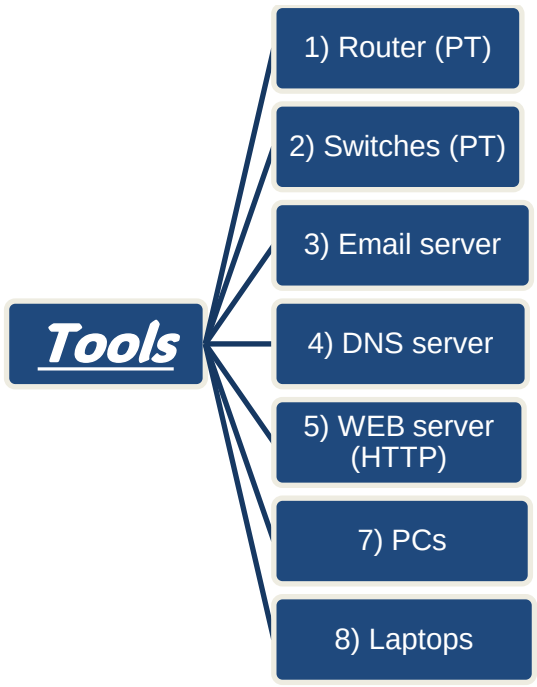


Figure 2. 1 List of all Tools and technology used in Campus Network

CHAPTER 3: METHODOLOGY OF WORK

3.1 Experimental Work Done

In order to make our project understandable, we have divided the content into steps. They are as follows:

a. Software and hardware requirements

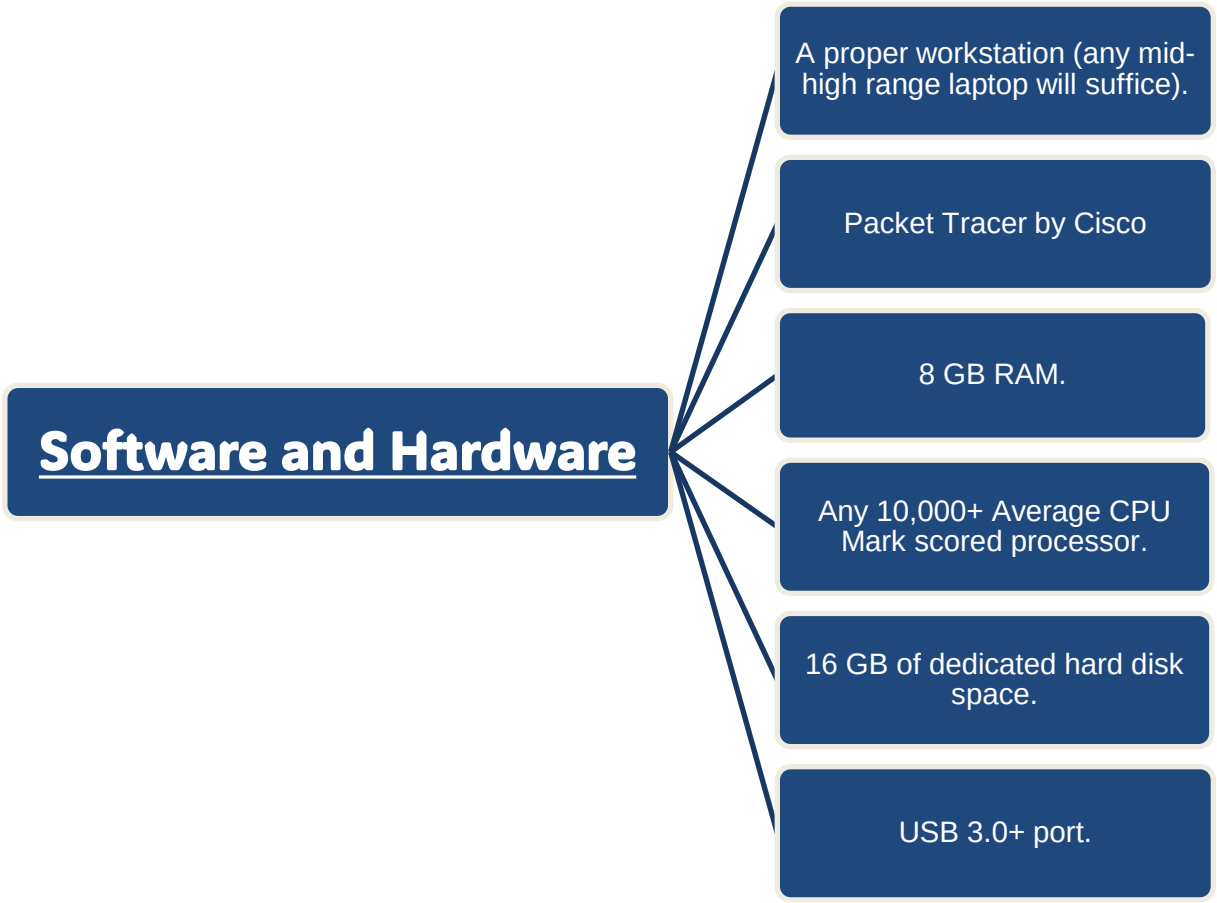


Figure 3.1 Software and Hardware requirements

b. Our approach

The proposed wired network is implemented for a Campus. We have made a virtual visualization of the network using the Cisco Packet tracer which provides a huge platform for users to test their projects using simulation tools. A Wired network in an educational campus makes it easier for teachers and students to access educational resources, by enabling an important platform to exchange information.

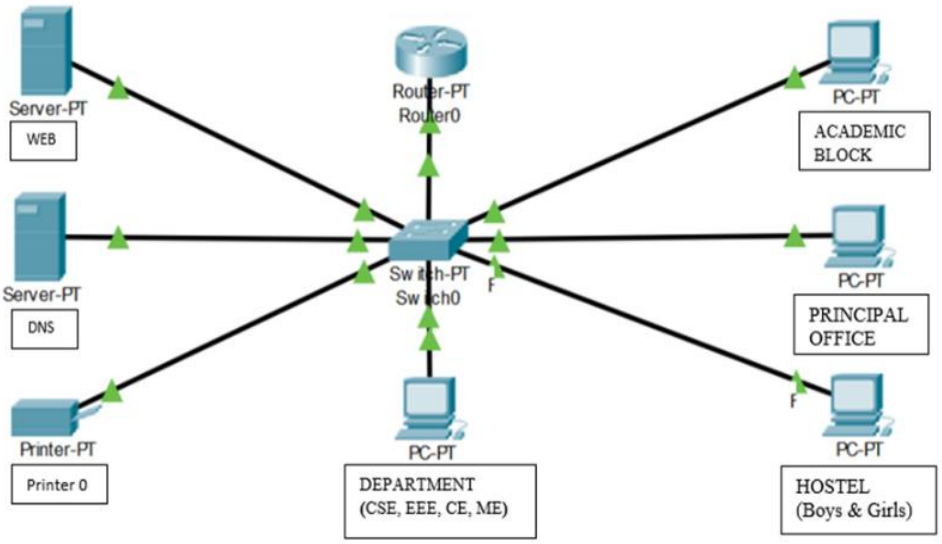


Figure 3.2 Shows the wired connection access by various tool

c. Network Requirements

Katihar Engineering College, Katihar outline is considered for this wired Campus network.

The network is divided into 2 areas:

1. Campus Area

   The Campus area is further divided into various accessing points like Department, Academic Blocks (TPO, Exam Cell & Others), Server Room, and Principal Office.

2. Hostel Area

-

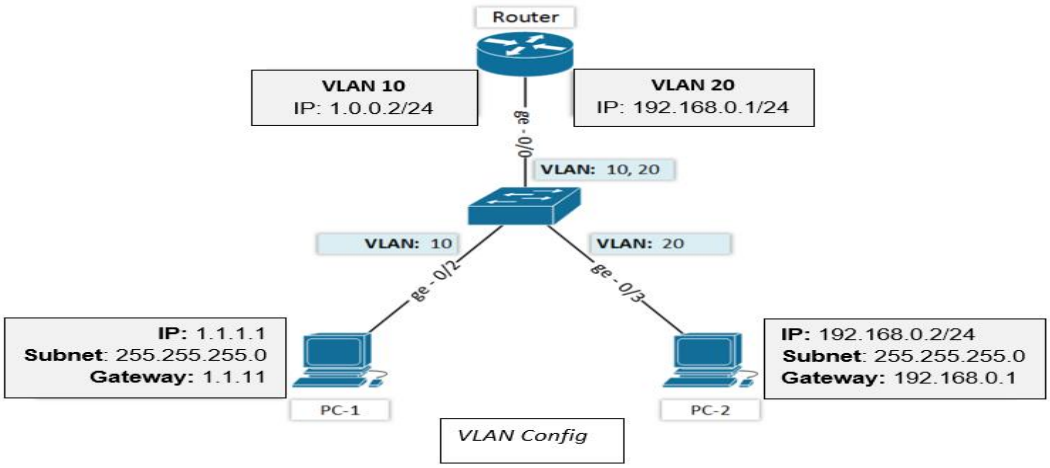


Figure 3.3 Basic layout of our wired access points in Campus

3.2 Test Apparatus (Devices)

Devices	Quantity
1) Router (PT)	3
2) Switches (PT)	3
3) EMAIL server	1
4) DNS server	1
5) WEB server (HTTP)	1
6) Wired Device (Access Point)	7
7) PCs	12
8) Laptops	10

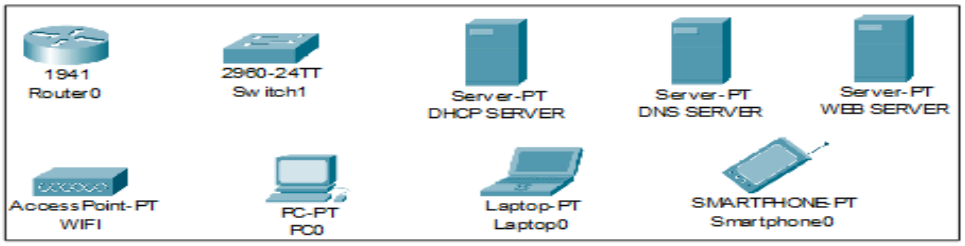


Figure 3.4 Devices used in the network

3.3 Test Procedure

d. Implementation and Flow Diagram

a. To design the wired network of the Campus we initially started by placing the core devices into the frame as mentioned in the layout.

b. Firstly, we placed the **main router** at the center of the Campus 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.

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

d. Campus router was connected to the campus switch which was further connected with wired access points of the **academic block** (TPO, Exam Cell & Others), **Department (**CSE, EEE, CIVIL & Mech.), **Principal Office** and **Server Room.**

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

f. Similarly, the hostel router was connected to the hostel switch

g. The wired 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.

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

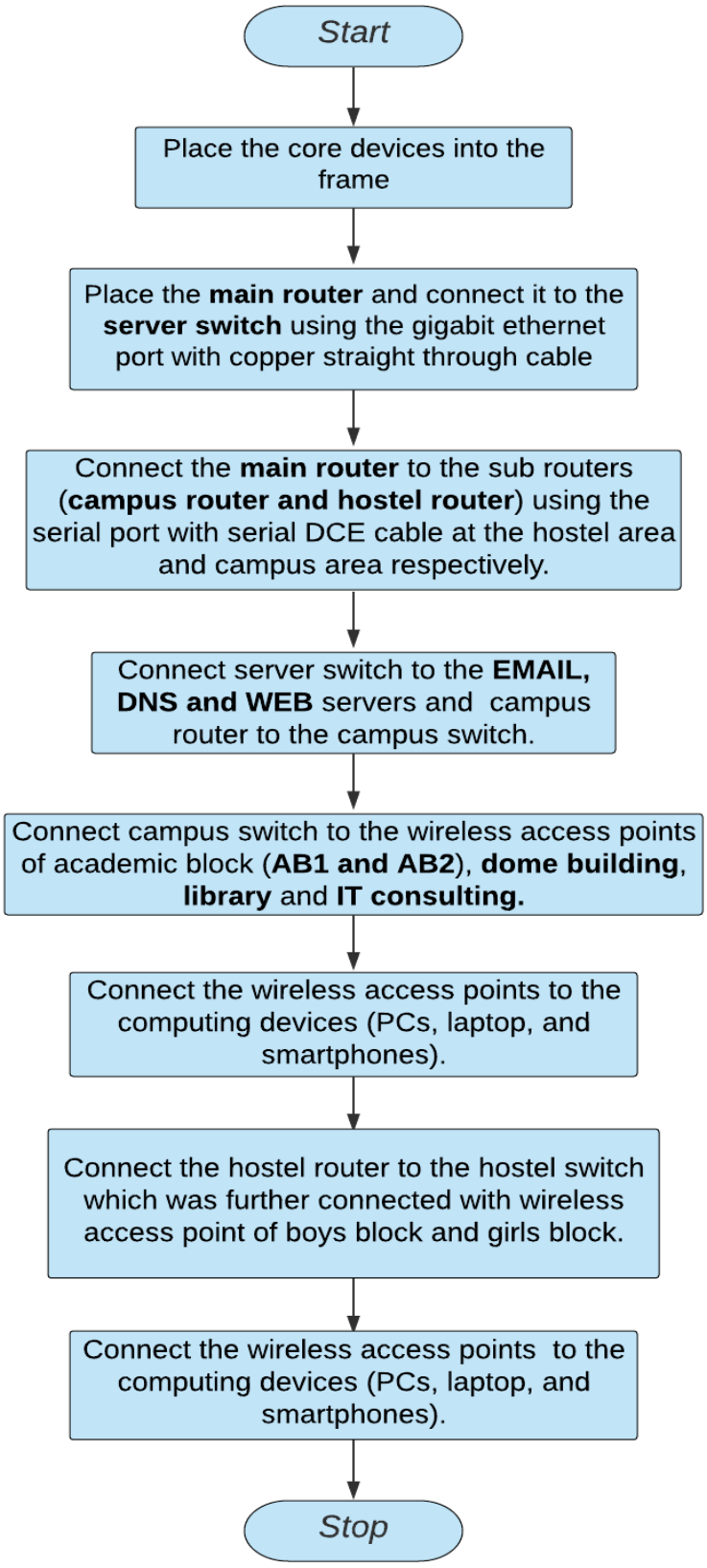


Figure 3.5 This is the flow diagram for a better understanding of the steps mentioned above.

e. Configuring IP Addresses

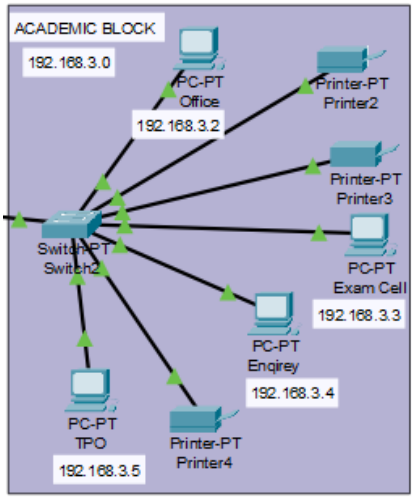
Table 3.1 College Router IP configuration

S.NO	Device	Interface	IPv4 Address	Subnet mask
1.	router0	FastEthernet0/0	192.168.1.1	255.255.255.0
		FastEthernet1/0	192.168.2.1	255.255.255.0
		Serial2/0	10.10.0.1	255.0.0.0
2.	router1	FastEthernet0/0	192.168.3.1	255.255.255.0
		FastEthernet1/0	192.168.4.1	255.255.255.0
		Serial 2/0	10.10.0.2	255.0.0.0
		Serial 3/0	20.20.0.1	255.0.0.0
		FastEthernet4/0	192.168.5.1	255.255.255.0
		FastEthernet5/0	192.168.6.1	255.255.255.0
3.	router 2	FastEthernet0/0	1.0.0.1	255.0.0.0
		FastEthernet1/0	128.168.0.1	255.255.0.0
		Serial2/0	20.20.0.2	255.0.0.0

Table 3.2 Server Room IP configuration

S.NO	Device	Default Gateway	IPv4 Address	Subnet mask
1.	DNS Server	1.0.0.1	1.0.0.2	255.0.0.0
2.	WEB Server	1.0.0.1	1.0.0.3	255.0.0.0
3.	EMAIL Server	1.0.0.1	1.0.0.4	255.0.0.0

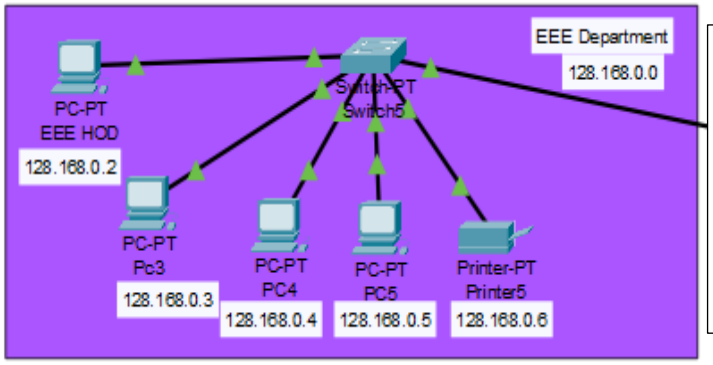
- ACADEMIC BLOCK (TPO, Exam Cell & Others)



IP Address are as follows

OFFICE: - (192.168.3.2)
Exam Cell: - (192.168.3.3)
TPO: - (192.168.3.4)
Printer 2: - (192.168.3.5)
Printer 3: - (192.168.3.6)
Printer 4: - (192.168.3.7)
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 1.0.0.2

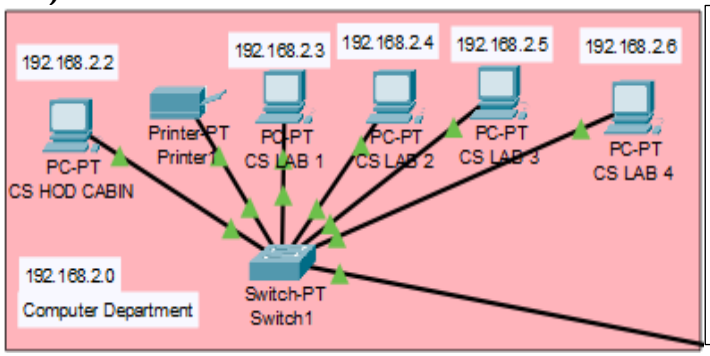
- DEPARTMENT
(EEE)



IP Address are as follows

EEE HOD Cabin :- (128.168.0.2)
PC 3 :- (128.168.0.3)
PC 4 :- (128.168.0.4)
PC 5 :- (128.168.0.5)
Printer 5 :- (128.168.0.6)
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 1.0.0.2

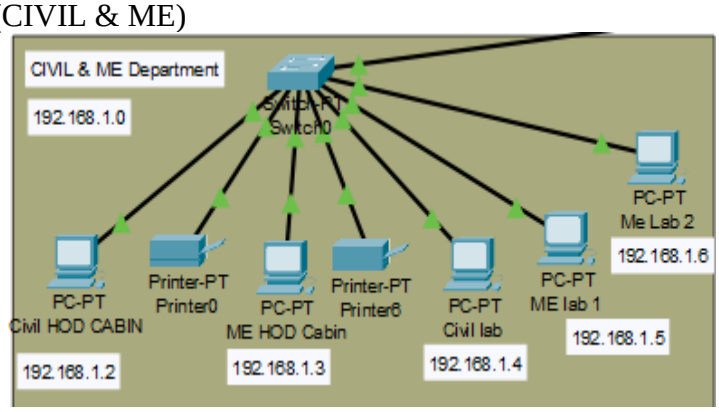
(CSE**)**



IP Address are as follows

CS HOD Cabin :- (192.168.2.2)
CS LAB 1 :- (192.168.2.3)
CS LAB 2 :- (192.168.2.4)
CS LAB 3 :- (192.168.2.5)
CS LAB 4 :- (192.168.2.6)
Printer 7 :- (192.168.2.7)
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 1.0.0.2

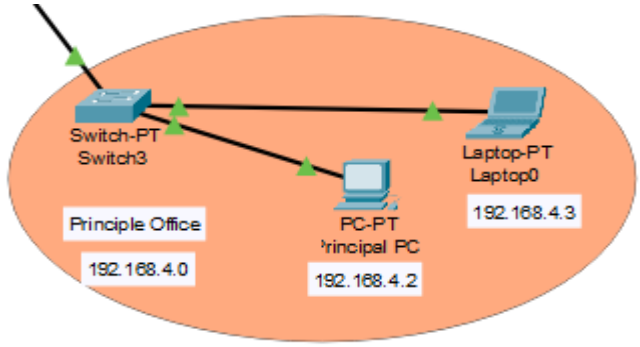
(CIVIL & ME)



IP Address are as follows

Civil HOD Cabin :- (192.168.1.2)
ME HOD Cabin :- (192.168.1.3)
CIVIL Lab 1 :- (192.168.1.4)
ME Lab 1 :- (192.168.1.5)
ME Lab 2 :- (192.168.1.6)
Printer :- (192.168.1.7)
Printer :- (192.168.1.8)
Subnet Mask- 255.255.255.0
Default Gateway- 192.168.1.1
DNS Server- 1.0.0.2

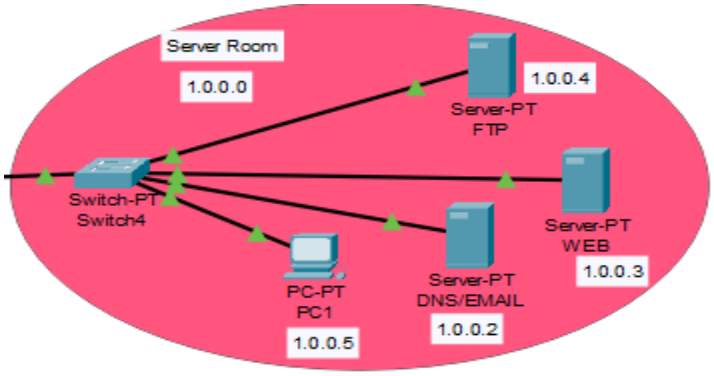
- PRINCIPAL OFFICE



IP Address are as follows

PRINCIPAL PC :-	**(192.168.4.2)**
LAPTOP 0 :-	**(192.168.4.3)**
Subnet Mask-	**255.255.255.0**
Default Gateway-	**192.168.1.1**
DNS Server-	**1.0.0.2**

- SERVER ROOM

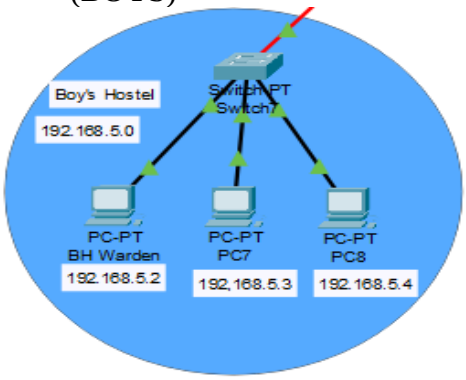


IP Address are as follows

DNS/EMAIL: -	**(1.0.0.2)**
WEB Server: -	**(1.0.0.3)**
FTP Server: -	**(1.0.0.4)**
PC 1:-	**(1.0.0.5)**
Subnet Mask-	**255.0.0.0**
Default Gateway-	**192.168.1.1**
DNS Server-	**1.0.0.2**

- HOSTEL

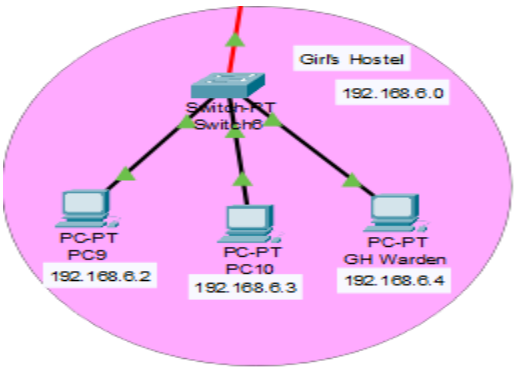
(BOYS)



IP Address are as follows

Boy's Hostel Warden :-	**(192.168.5.2)**
PC 7 :-	**(192.168.5.3)**
PC 8:-	**(192.168.5.4)**
Subnet Mask-	**255.255.255.0**
Default Gateway-	**192.168.1.1**
DNS Server-	**1.0.0.1**

(GIRLS)



IP Address are as follows

Girl's Hostel Warden :-	**(192.168.6.2)**
PC 10 :-	**(192.168.6.3)**
PC 09 :-	**(192.168.6.4)**
Subnet Mask-	**255.255.255.0**
Default Gateway-	**192.168.1.1**
DNS Server-	**1.0.0.1**

CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 Final Result

Finally, we have combined all the steps as mentioned in chapter 3 (Methodology of work done) and implemented the desired Wired network for Campus using CISCO Packet Tracer. We have the complete network providing various facilities to the teaching staff, non-teaching staff, and students.

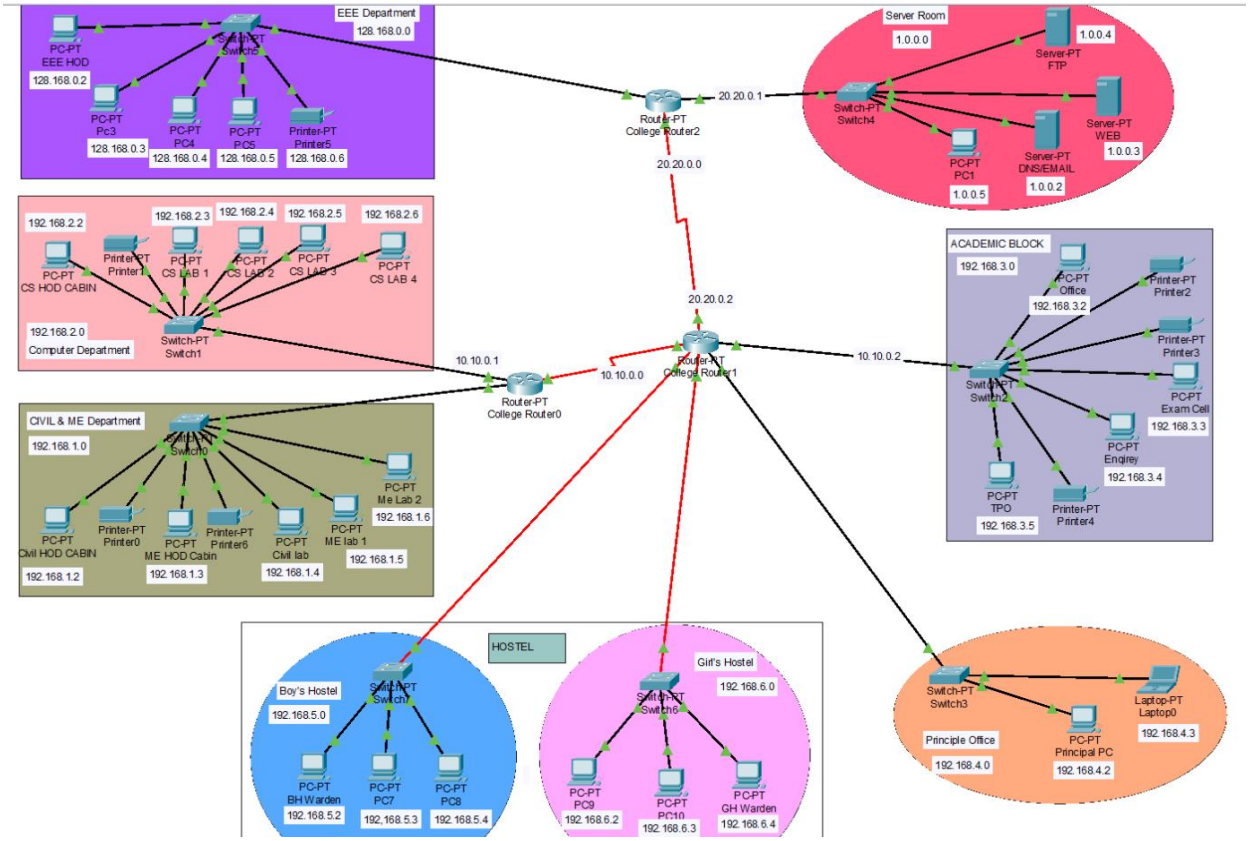


Figure 4.1: Campus Network Simulation

- ## 4.2 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.

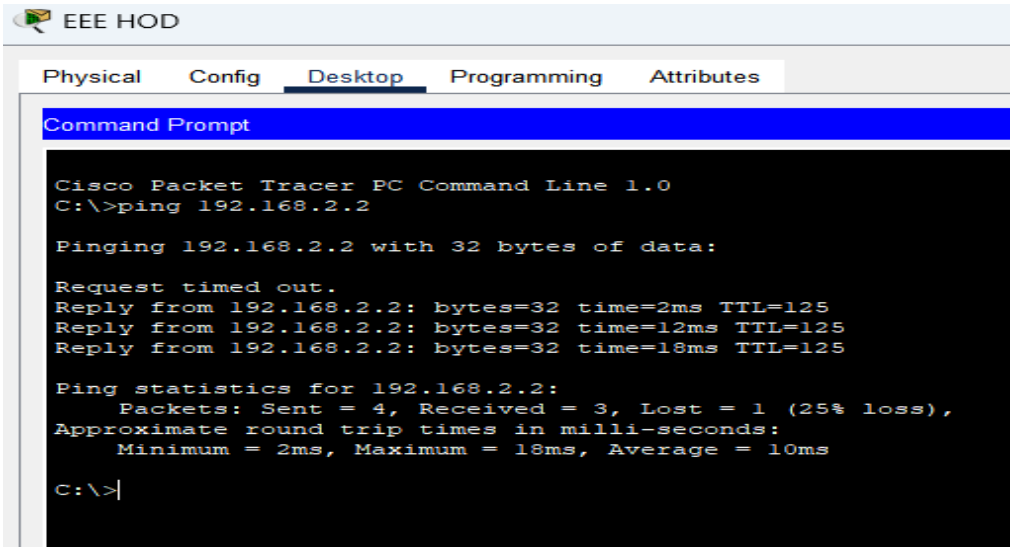


Figure 4.2 Testing VLAN communications from EEE HOD Cabin to CS HOD

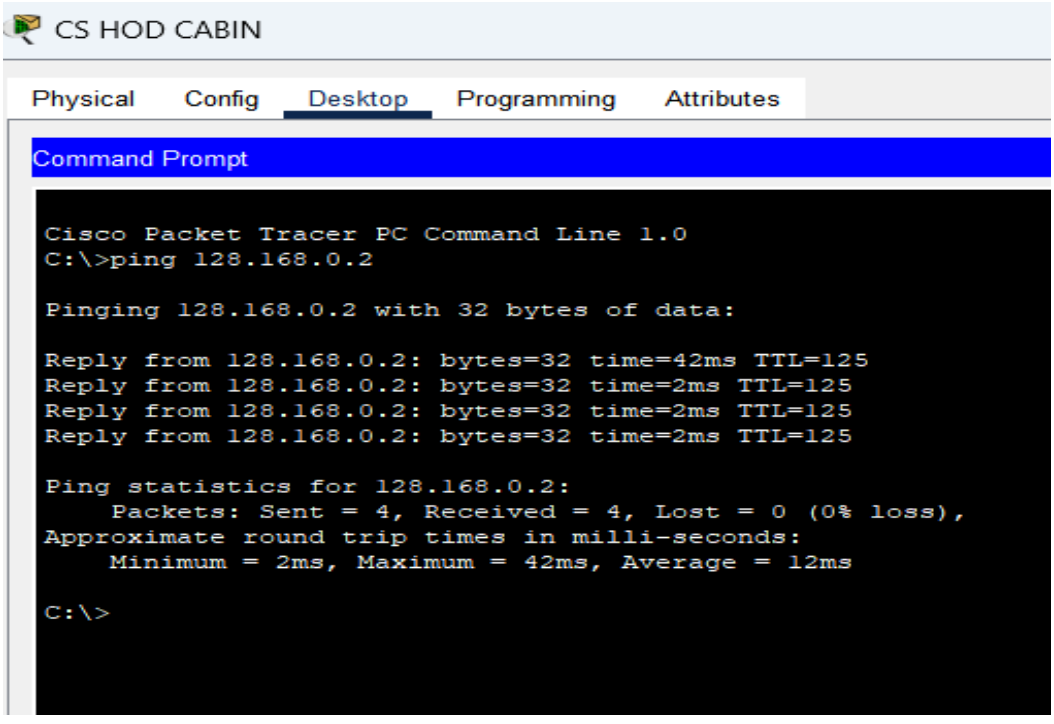


Figure 4.3 Testing VLAN communications from CS HOD Cabin to EEE HOD

4.3 WEB Hosting

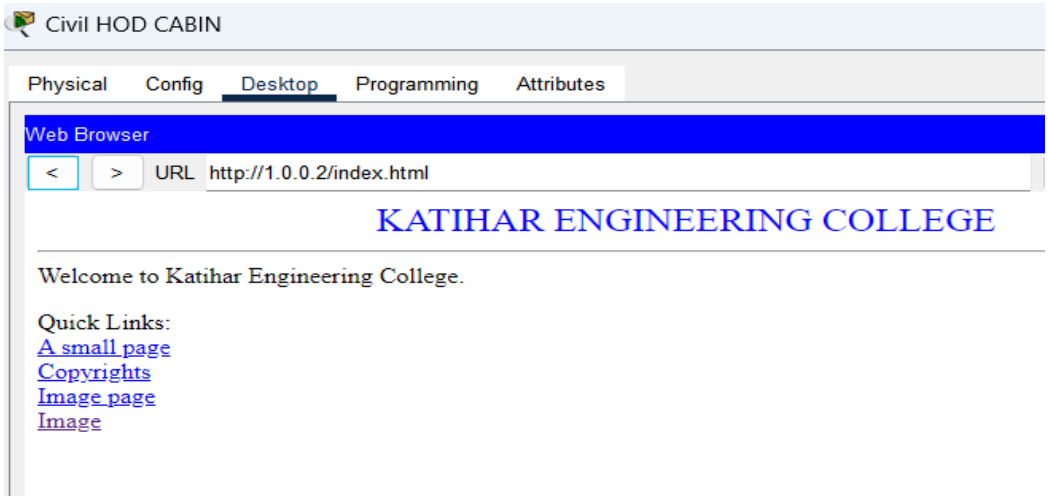


Figure 4.4 Testing Web Hosting

4.4 EMAIL Server Hosting

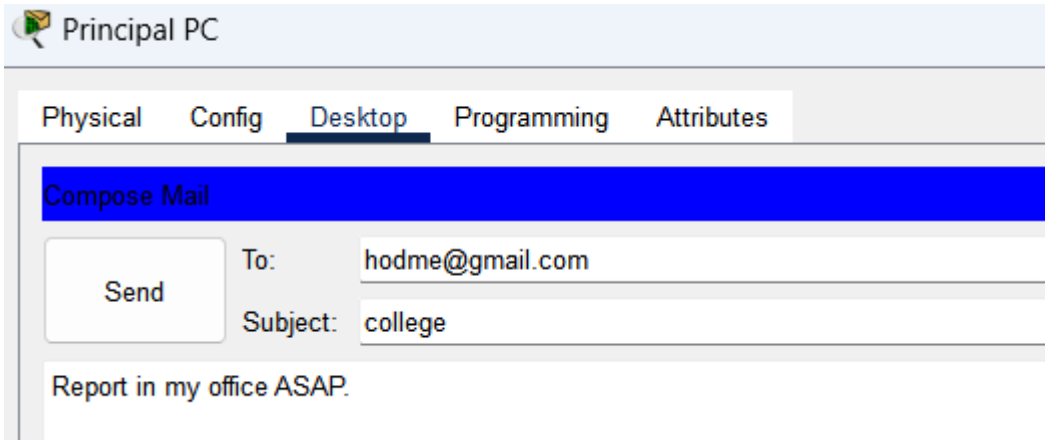


Figure 4.6 Testing EMAIL server Hosting

4.5 FTP Server Hosting

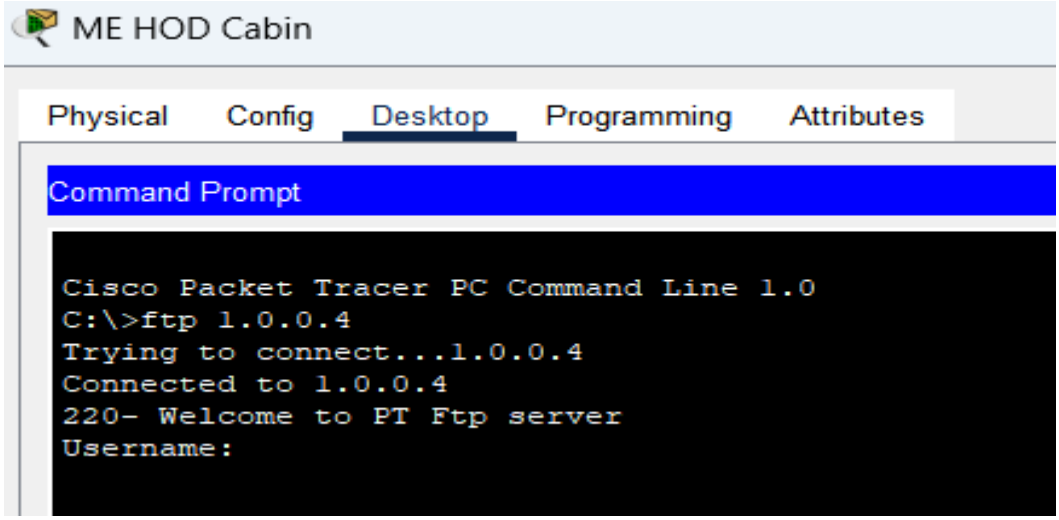


Figure 4.7 Testing FTP server Hosting

4.6 EMAIL service configuration

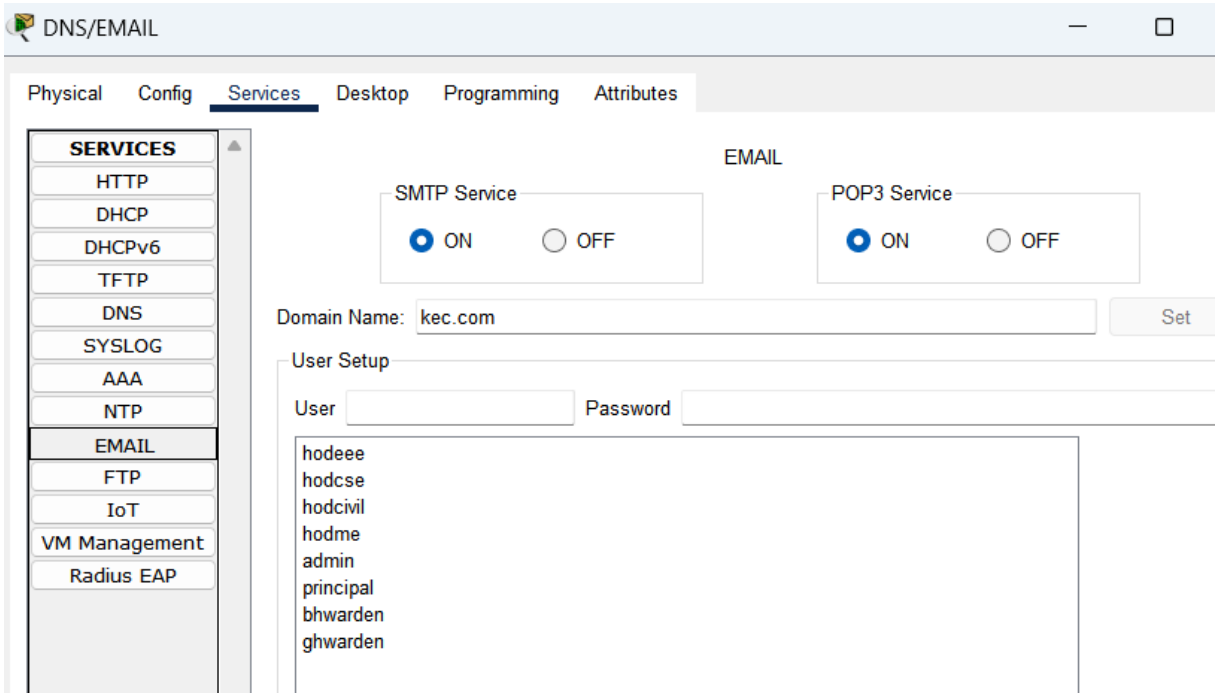


Figure 4.8 EMAIL service configuration in DNS/EMAIL server

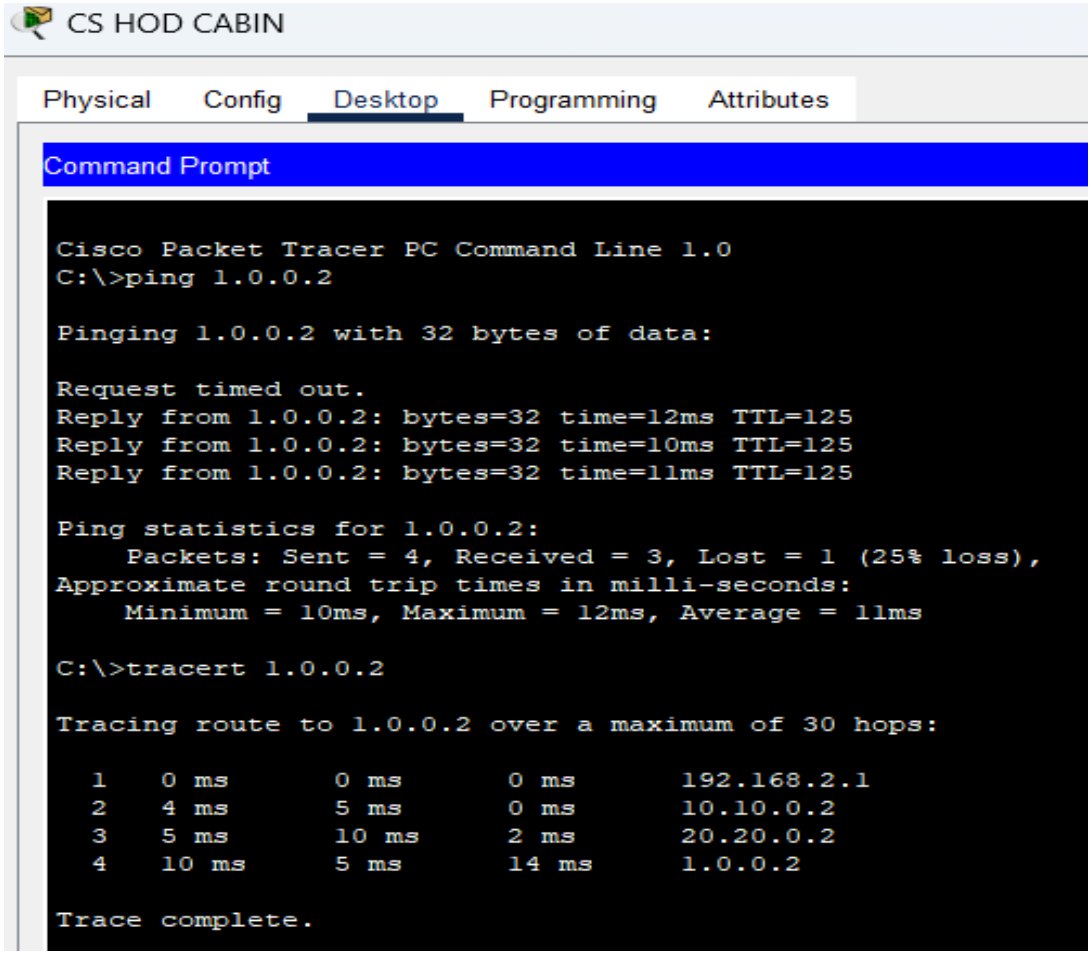


Figure 4.9 Testing connectivity with TRACEROUTE

CHAPTER 5: CONCLUSIONS AND FUTURE WORKS

5.1 Summary

In this report, we present design and deployment of a college computer network. The proposed system network is to update the existing network and also enhance its capabilities and increase the flexibility of the network which will eventually provide good security. Thus, we have studied all the components like routers, switches, etc. and services like DNS, DHCP, IoT, Email, FTP, etc. and successfully designed a College Computer Network using Cisco Packet Tracer.

Thus, in this way we developed the "College Network Simulation" using cisco packet tracer for designing the network topology. In this experiment we learnt to how to design and implement the networking Simulation using cisco packet tracer. We successfully implemented the college networking Simulation for the main building, library, and hostel along with the main internet service provider and college server. It is noteworthy that, the configuration and specifications are for the initial prototype and can further be developed and additional functionality can be added to increase support and coverage as well as security. The procedures provide a veritable approach for the design of LANs for end-to-end IP network connectivity for next generation network (NGN) architecture implementations moreover the security for accessing the network can be increased by making registering the Medium Access Control Address (MAC) addresses of the devices in the system and then accessing the network by giving the pass keys if the MAC is not registered then that user is unable to connect to the network.

5.2 Future Works

The configuration and specifications are for the initial prototype and can further be developed and additional functionality can be added to increase support and coverage of our existing network.

- **Additional Functionalities**
    a. More Departments can be added
    b. Library Network setup
    c. Setup for IOT Devices (fans, smartphones, laptops
    d. College Wi-Fi network setup

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