UNIVERSITY NETWORKING DESIGN

A COURSE PROJECT REPORT

By

SANSKAR SINHA (RA2011003010195)
KRISH ANKOLA (RA2011003010166)
SARANSH SINGH (RA2011003010163)
DIVY SINGHAL (RA2011003010143)

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Dr. D Vinod

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1. ABSTRACT

A Campus network is an important part of campus life and network security is essential for a campus. Campus network faces challenges to address core issues of security which are governed by network architecture. Secured network protects an institution from security attacks associated with network. A college network has a number of uses, such as teaching, learning, research, management, e-library, result publishing and connection with the external users. Network security will prevent the college network from different types of threats and attacks. A hierarchical architecture of the campus network is configured with different types of security issues for ensuring the quality of service. In this project, a tested and secure network design is proposed based on the practical requirements and this proposed network infrastructure is realizable with adaptable infrastructure.

2. INTRODUCTION

2.1 Scenario Description

This College Network Architecture is about designing a topology of a network that is a LAN (Local Area Network) for a College 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 architecture for a college which connect various departments to each other's, it puts forward communication among different departments. CNA is used to design a systematic and wellplanned topology, satisfying all the necessities of the college (i.e. client). CNA come up with a network with good performance. CNA is also providing security and authentication to forbid unauthorized logins. Cisco Packet Tracer (CPT) is a multi-tasking network simulation software that can be used to perform and analyze various network activities such as implementation of different topologies, selection of optimum path based on various routing algorithms, creation of appropriate servers, subnetting, and analysis of various network configuration and troubleshooting commands. In order to start communication between end user devices and to design a network, we need to select appropriate networking devices like routers, switches, make physical connection by connecting cables to serial and fast Ethernet ports from the component list of packet tracer. Networking devices are costly so it is better to perform first on packet tracer to understand the concept and behavior of the network.

1.2 Major Design Areas and Functional Areas:

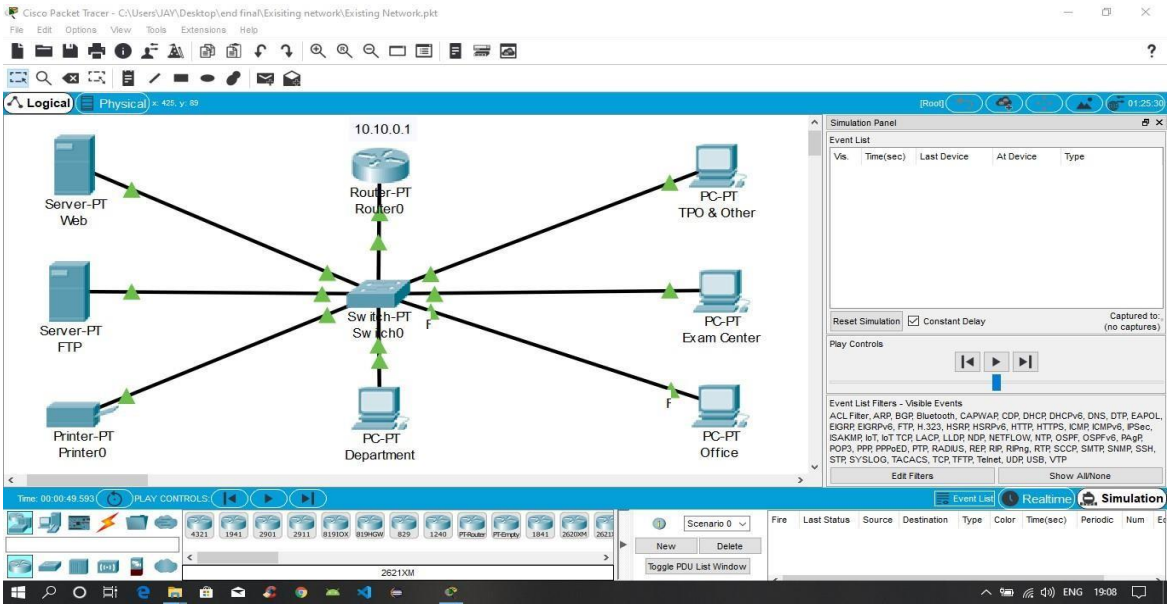
The new system planned comprises of IP based switches that remain as the access point to lan-based (ethernet) as well as Wi-Fi-based connectivity.

These switches provide SNMP support as well so that traffic monitoring becomes easy. 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. 3 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. The above design is the existing network traced on cisco packet tracer



3. LITERATURE SURVEY

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1. TPO & Other

2. Exam Center 3. Office

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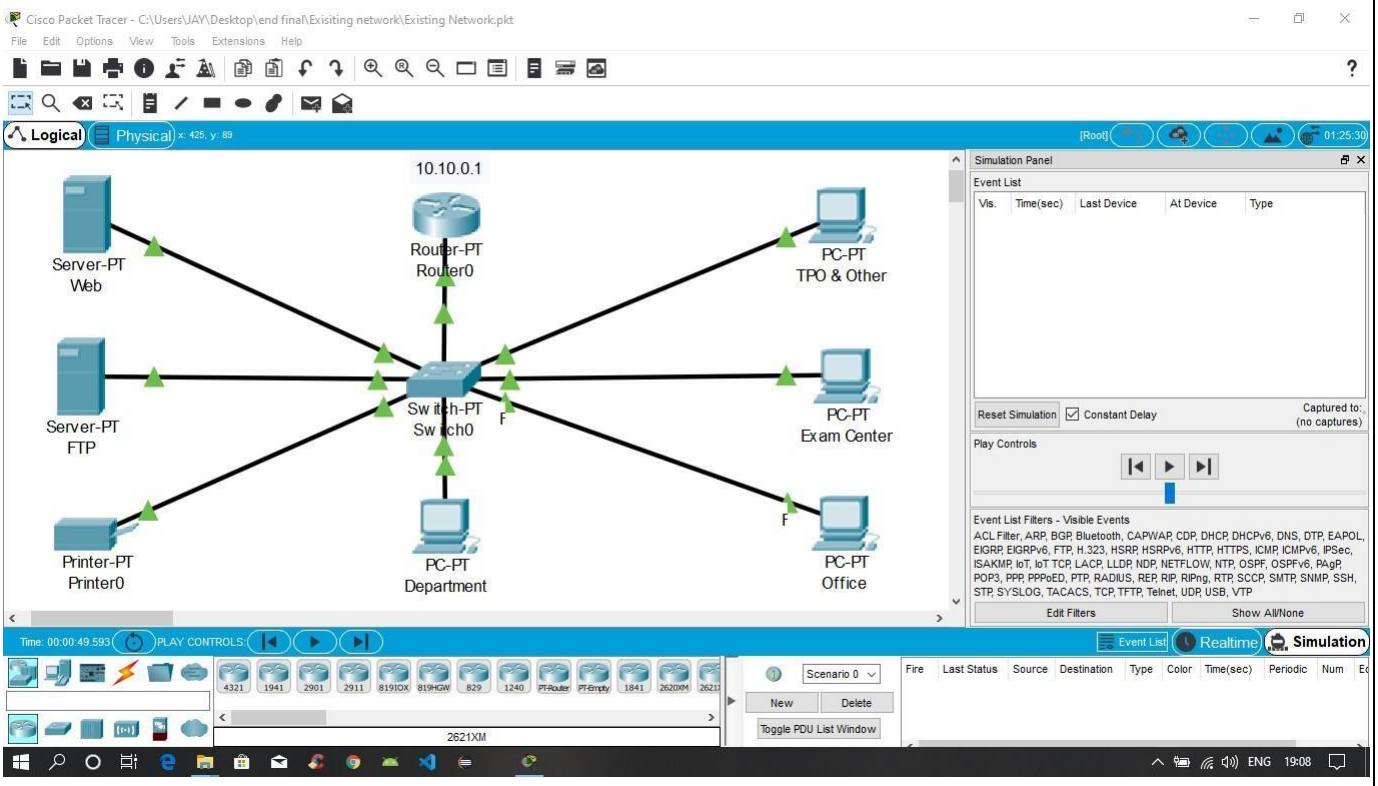


The above design is the existing network traced on cisco packet tracer.

Network Devices

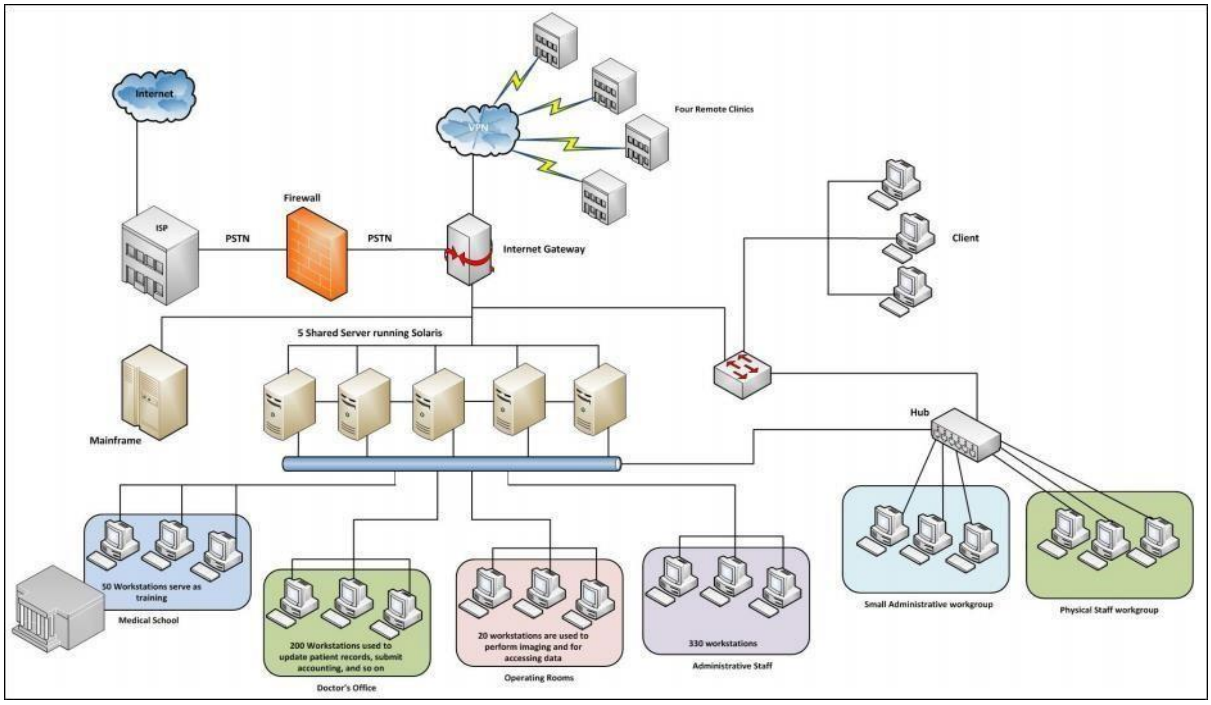
Developing the existing Lan system:

- The basis of the LAN core is Cisco Catalyst 6509 switches equipped with Cisco 720 supervisors and Virtual Switching System (VSS), as well as Cisco 4500 switches, combined in a stack with the data transmission ports at 10 Gb/s bandwidth capacity. Switches create a platform for additional services, such as content processing, firewall (the project uses the Cisco firewall), intrusion prevention system, application of IPsec security tools, the arrangement of protected VPN channels, network analysis and acceleration of Secure Sockets Layer (SSL) connections.

Mobility Services Engine (MSE) solution and 300 Cisco Aironet 1140 access points were used.

- The Cisco Aironet 1140 Series is a component of the Cisco Unified Wireless Network, which can scale up to 18,000 access points with full Layer 3 mobility across central or remote locations on the enterprise campus, in branch offices, and at remote sites.

- The Cisco Unified Wireless Network is the industry's most flexible, resilient, and scalable architecture, delivering secure access to mobility services and applications and offering the lowest total cost of ownership and investment protection by integrating seamlessly with the existing wired network.



Above is the pictorial representation of the proposed network

Cisco Unified Computing System (UCS) solution allowed the integration of computer and network resources as well as storage and virtualization systems as part of an energy efficiency system. Cisco Unified Computing System platform notably simplifies traditional architecture and significantly reduces the number of devices to be purchased, to connect by wires, to supply with electricity and cooling, to protect and maintain. This solution is the foundation of complex optimization of the virtualized medium while maintaining the ability to support traditional operating systems and applications stacks in physical medium. This overall infrastructure developed allowed integration of several functionally different physical networks into one, such as guest network, hotel management network, telephone network and IP-Television network. The convergence within single network reduced hotel expenses for constructing and managing several dedicated networks which traditionally remain separate in hotels.

The term unified computing system is often associated with Cisco. Cisco UCS products have the ability to support traditional operating system (OS) and application stacks in physical environments, but are optimized for virtualized environments. Everything is managed through Cisco UCS Manager, a software application that allows administrators to provision the server, storage and

network resources all at once from a single pane of glass. Similar offerings to Cisco UCS include HP BladeSystem Matrix, Liquid Computing's LiquidIQ, Sun Modular Datacenter and InteliCloud 360.

4. REQUIREMENT ANALYSIS

1.1 Requirement Analysis

From the given scenario, we draw the following requirements:

1. Identifying the appropriate hardware which would be used (Cisco Packet Tracer)
2. Users on the internet should be able to access only https on the e-commerce server.
3. Users on the internet should have access only to the public IP address of the server and not the private IP address.
4. The users in the organization should have full access to the server.
5. TCP/IP Network design with IP addressing
6. Features and configuration required on the hardware with explanation

We need to configure a network design keeping the following requirements in mind.

1.2 Hardware Requirement

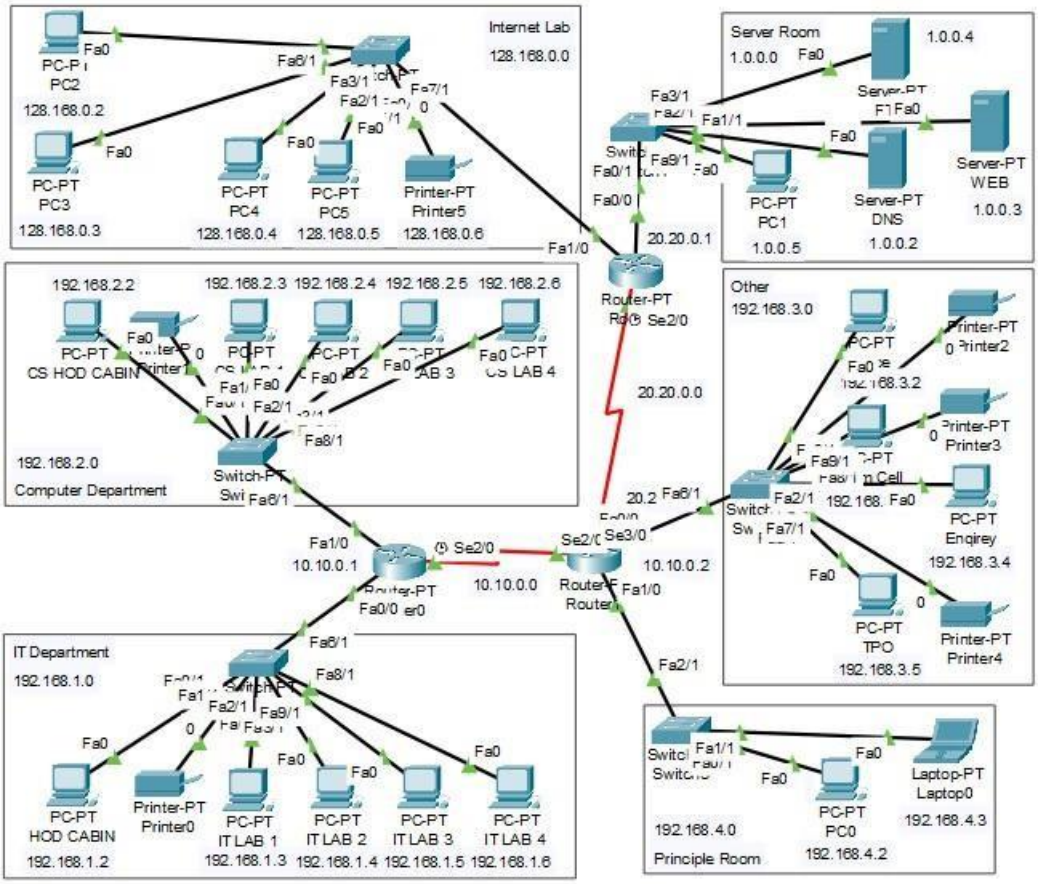
From the given scenario, we draw the following requirements:

NO	DEVICE	FUNCTION
1	Cisco 2911 router	Core connection
2	Cisco 2811 router	Outdoor & ISP
3	Cisco 2960 switch	Department connection
4	DHCP server	DHCP Access
5	DNS server	College website access
6	Cisco Access Point	Wi-Fi Access
7	Computers	User Access
8	Laptops	User Access
9	Wireless Printers	User Access
10	CAT5 SERIAL,CROSS, STRIGHT CABLE	LAN Connectivity

5. ARCHITECTURE AND DESIGN

a. Network Architecture

The network architecture is as follows:



The architecture consists of three major networks:

- Company Network(s)
- Public Internet
- Network maintained by the Internet Service Provider

These networks are interconnected with each other with varying degrees (discussed in the implementation chapter).

6. IMPLEMENTATION

a. Address Table

IT DEPARTMENT (192.168.1.0)	
HOD CABIN	192.168.1.2
IT LAB 1	192.168.1.3
IT LAB 2	192.168.1.4
IT LAB 3	192.168.1.5
IT LAB 4	192.168.1.6
Printer 0	192.168.1.7

COMPUTER DEPARTMENT (192.168.2.0)	
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

OTHERS (192.168.3.0)	
OFFICE	192.168.3.2
Printer 2	192.168.3.6
EXAM CELL	192.168.3.3
Printer 3	192.168.3.7
ENQUIRY	192.168.3.4
TPO	192.168.3.5
Printer 4	192.168.3.8

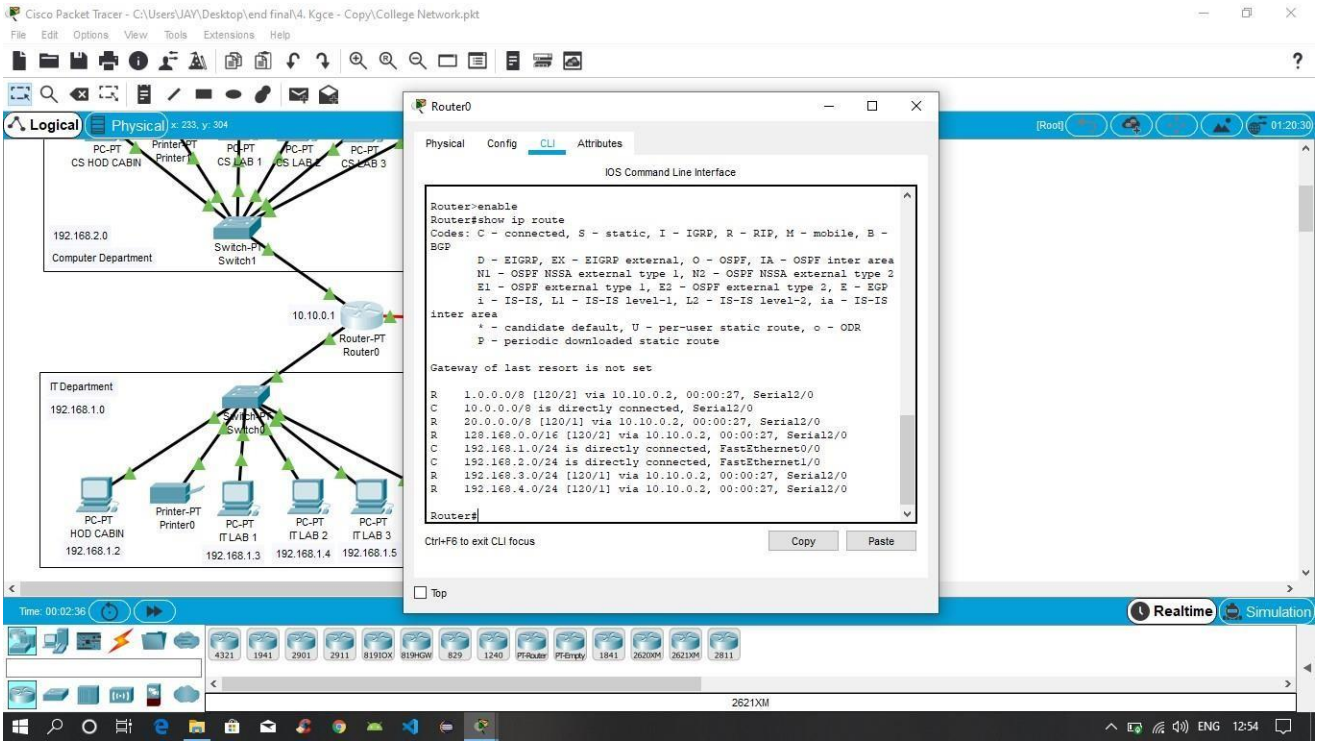
SERVER ROOM (1.0.0.0)	
FTP SERVER	1.0.0.4
PC1	1.0.0.5
DNS SERVER	1.0.0.2
WEB SERVER	1.0.0.3

INTERNET LAB (128.168.0.0)	
PC2	128.168.0.2
PC3	128.168.0.3
PC4	128.168.0.4
PC5	128.168.0.5
Printer 5	128.168.0.6

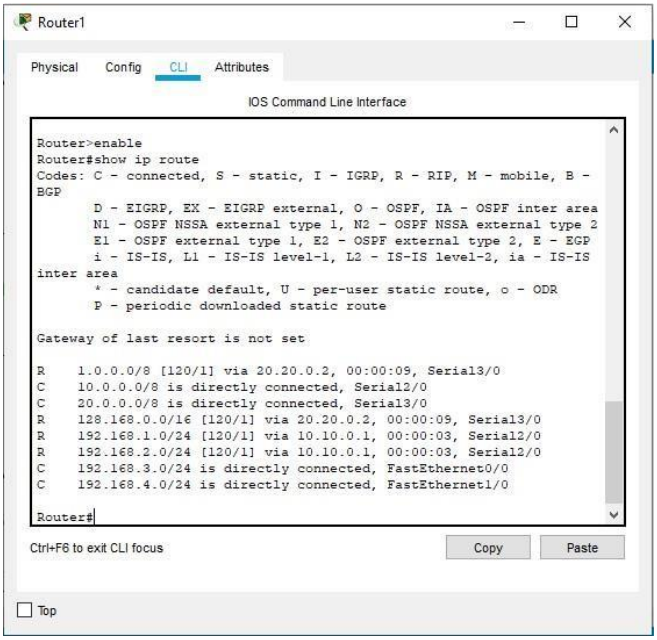
PRINCIPLE ROOM (192.168.4.0)	
PC 0	192.168.4.2
LAPTOP 0	192.168.4.3

Routing Protocol Plan

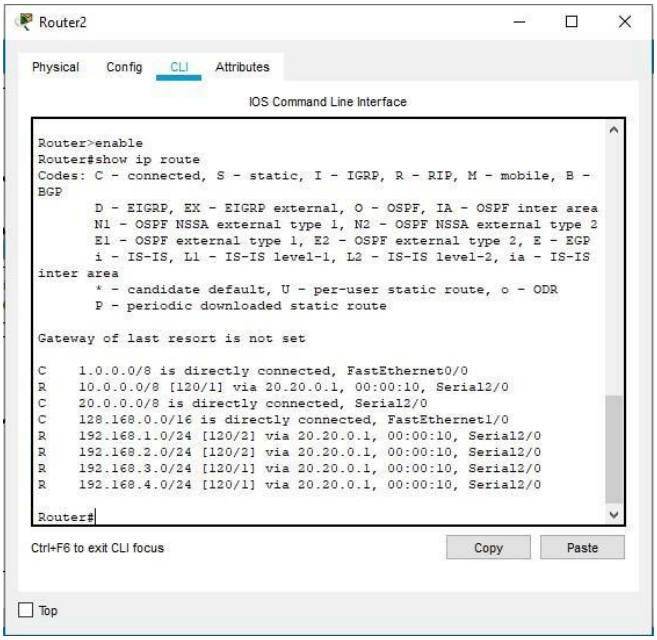
Routing Information Protocol (RIP) is a dynamic routing protocol which uses hop count as a routing metric to find the best path between the source and the destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model.



Routing Protocol Plan for Router0

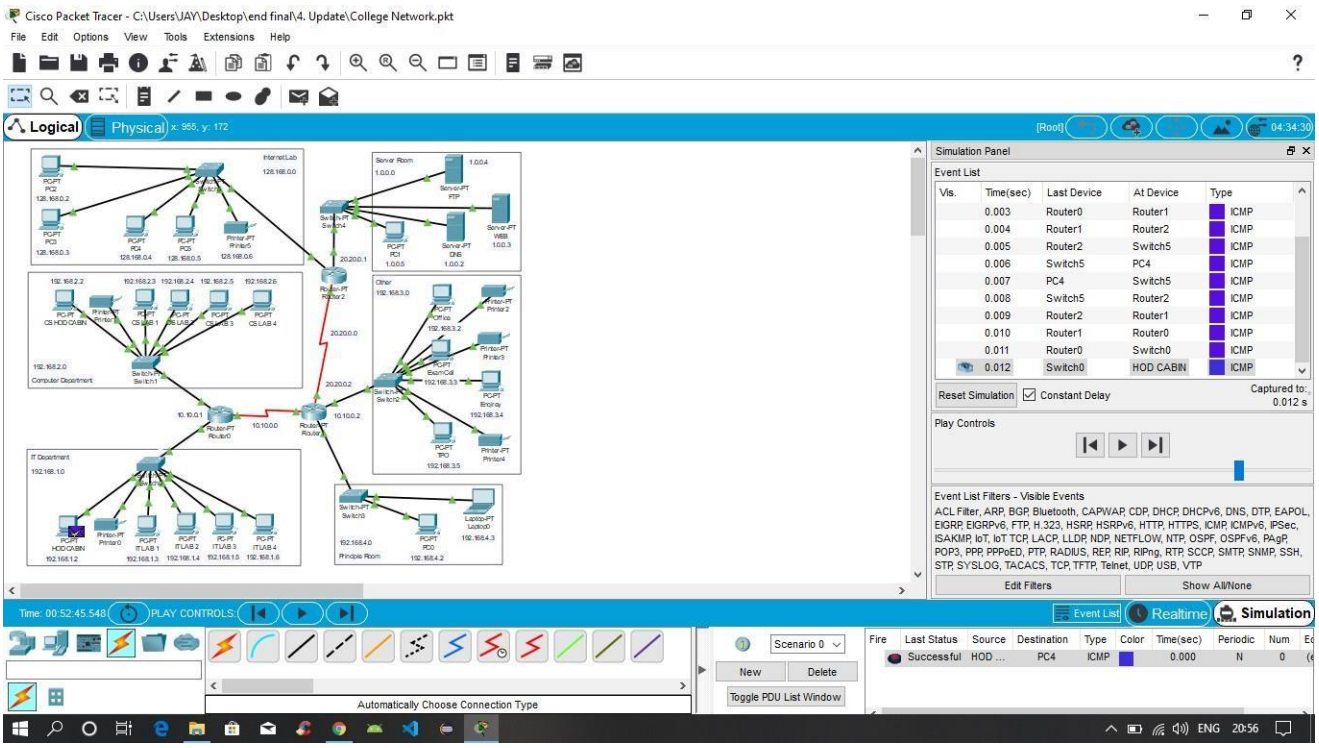


Routing Protocol Plan for Router1

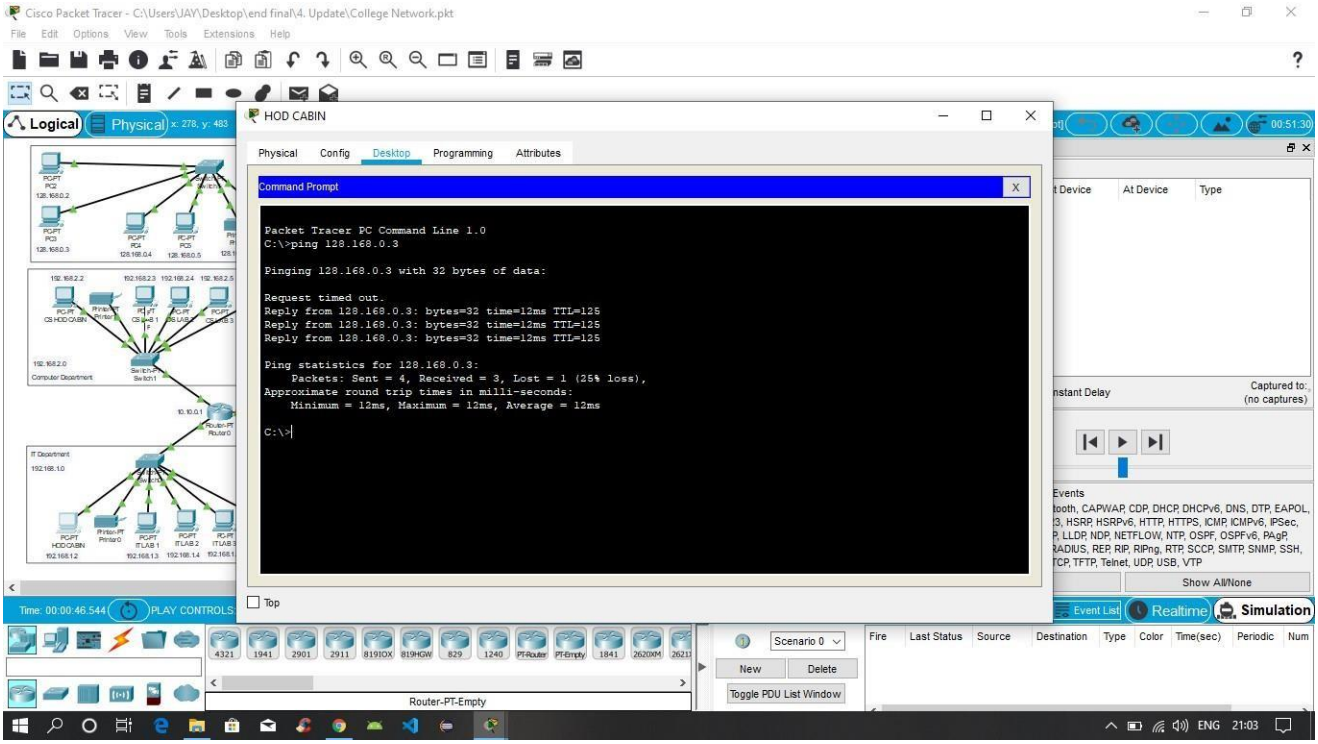


Routing Protocol Plan for Router2

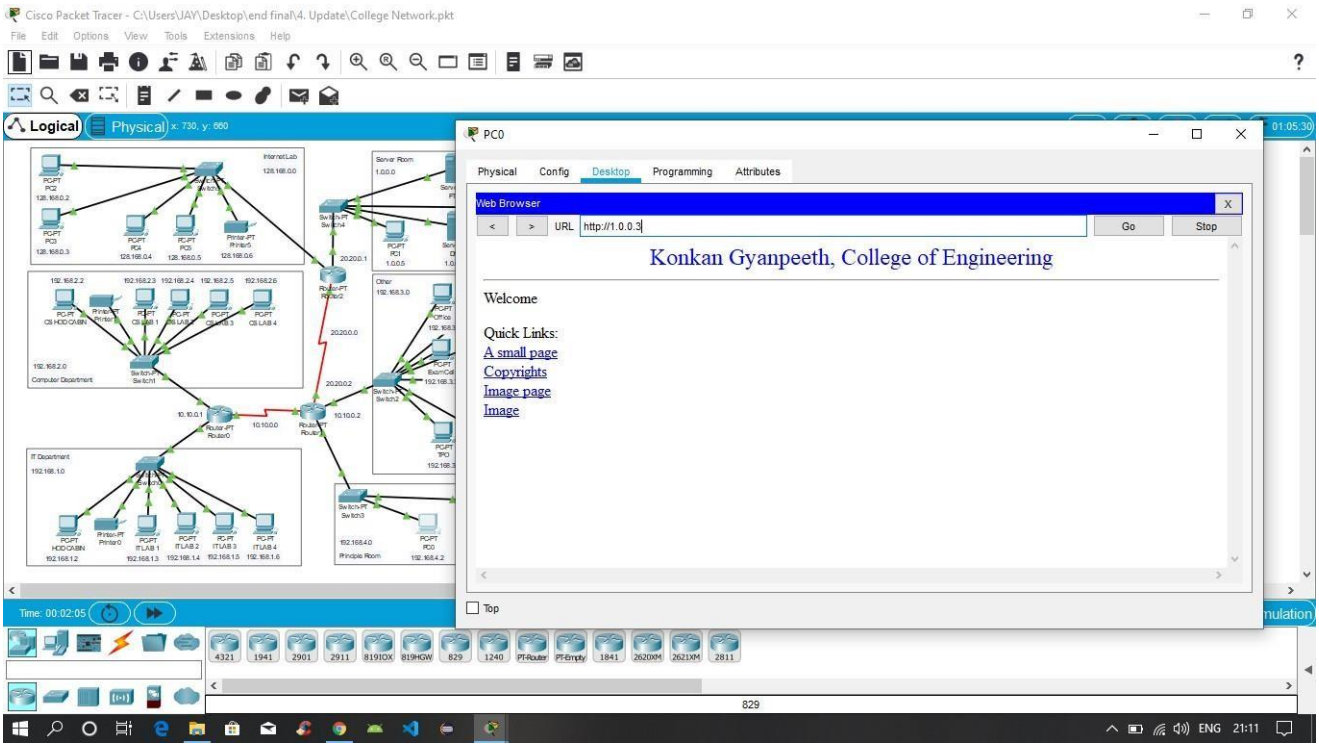
Network Design



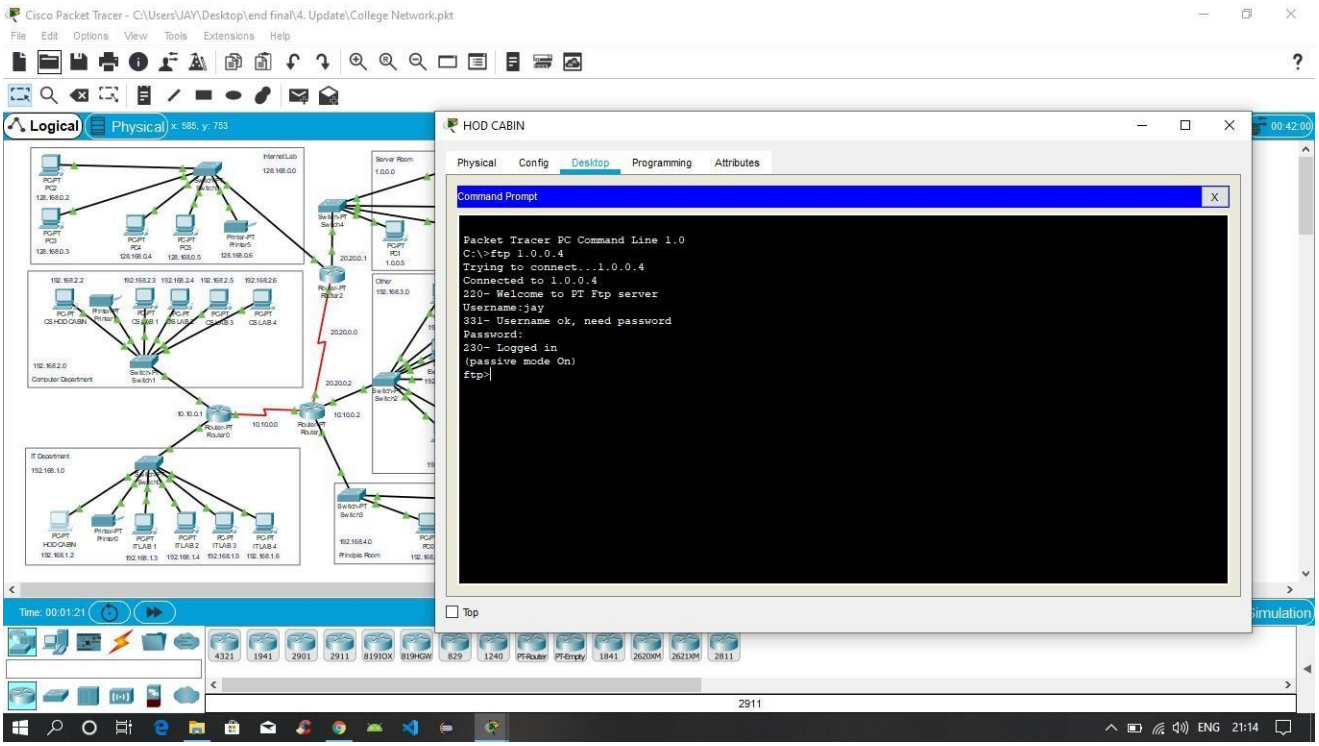
The prototype of the proposed network is implemented on cisco packet tracer



Testing VLAN communications from HOD Cabin to Internet Lab



Testing Web Hosting

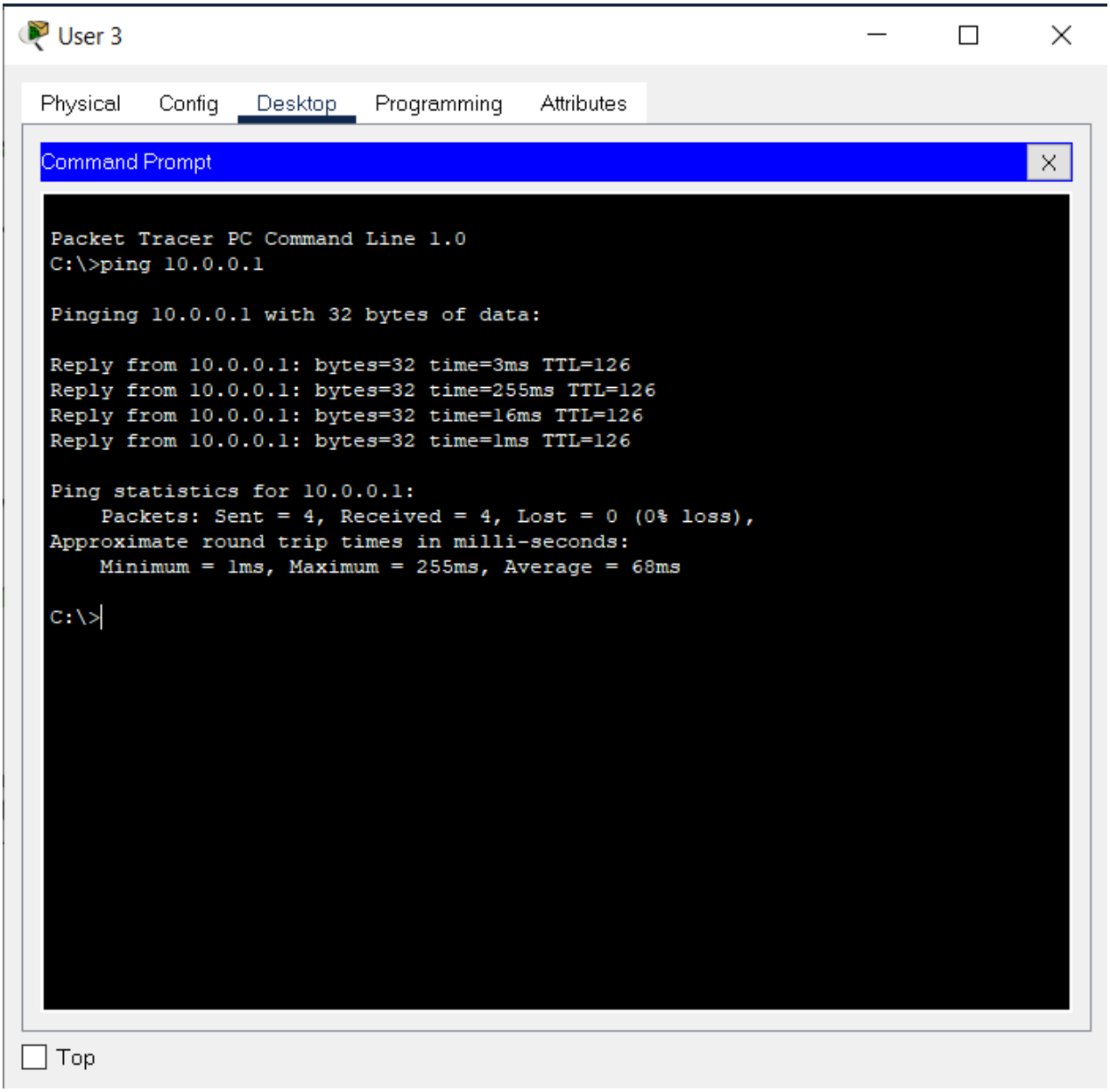


Testing FTP Server

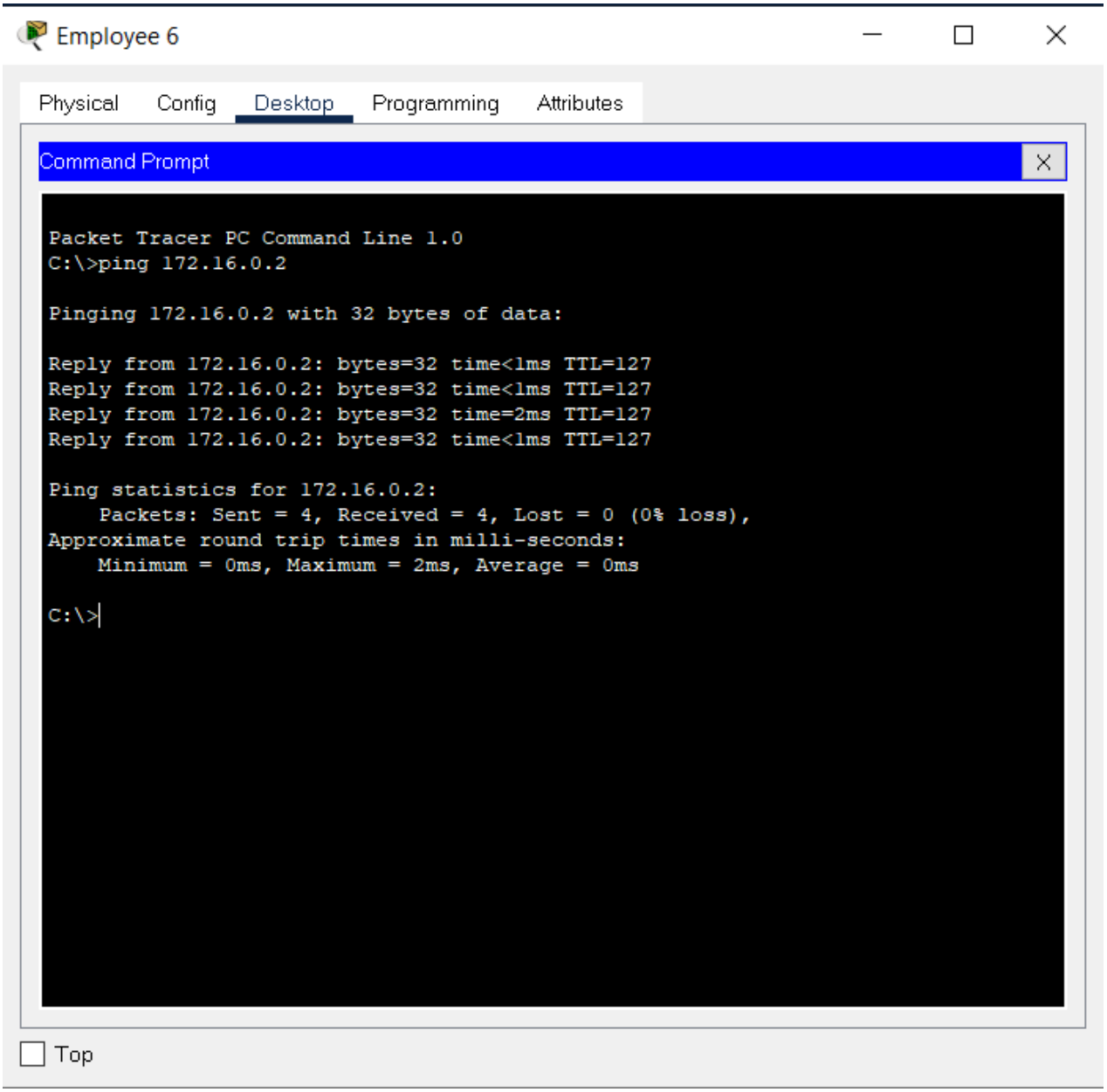
7. RESULTS AND DISCUSSION

6.1 Connection Check

The network connections were checked by ping requests:



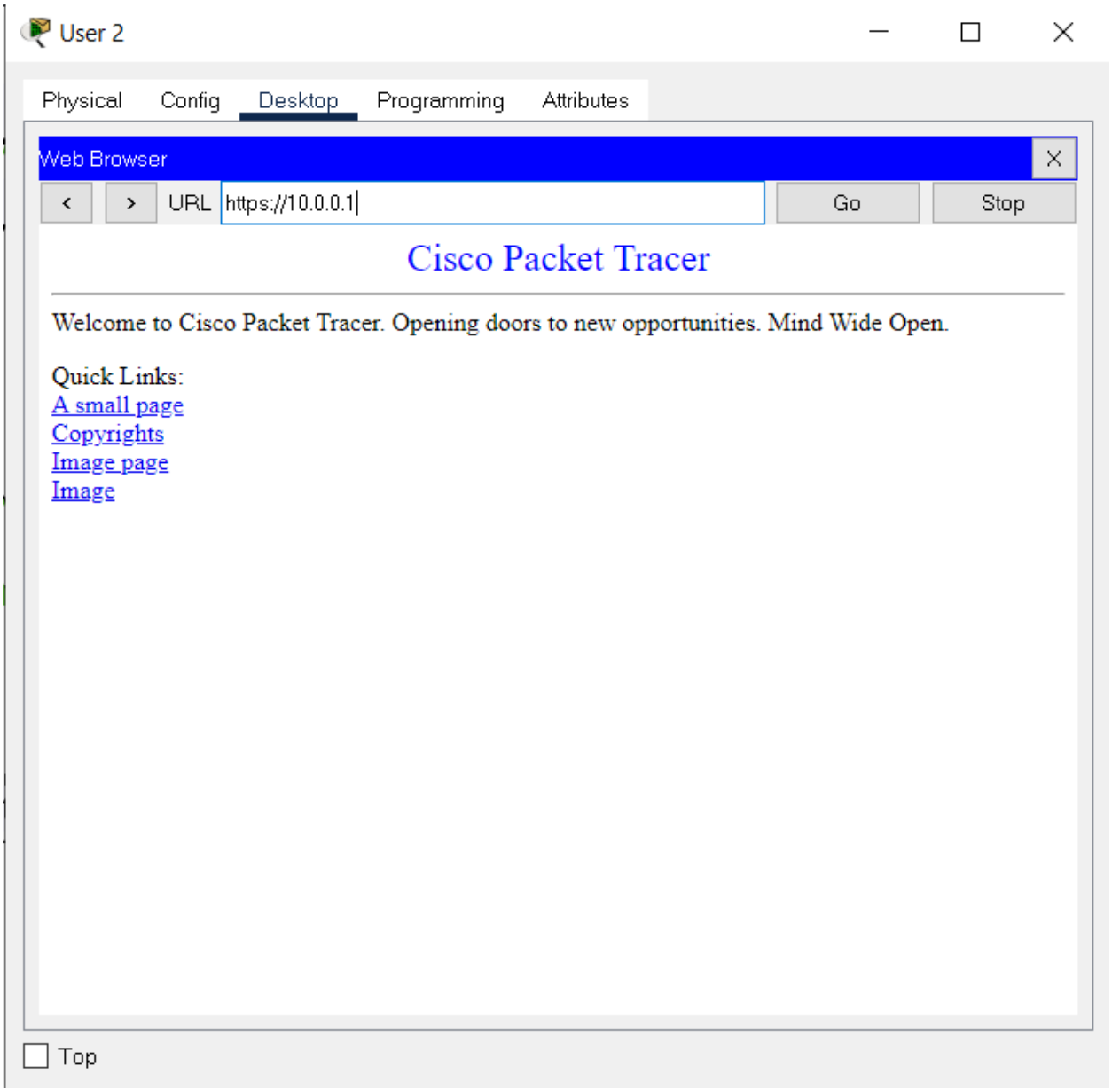
A public PC pinging the server via public IP



An employee PC pinging the server via private IP

6.2 HTTPS Check

The server access was checked with HTTPS by using a browser:



8. CONCLUSION AND FUTURE ENHANCEMENT

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 hospital buildings as well as providing transfer of all types of data throughout the single optimized network.

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