

To Design and Configure University Area Network using EIGRP and DHCP

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ABSTRACT

In today's world, networking has become essential for providing e-mail, telnet, chat, and other services. In these services, computer networks play a vital role in communicating, administering, automating, and processing information from one point to another. So, computer networks are considered the key factors in proper functioning in most educational institutions. In this paper, Cisco Packet Tracer is used as a network simulator tool to simulate and design a network for the university. This paper discusses the interconnection between routers, switches, and other components in data communication networks and how they are programmed and configured. We have included a DNS server, DHCP server, FTP server, and a web server to establish an appropriate communication system for communication between different areas of our network, especially among students and teachers. We've included an email server within the domain to facilitate inter-departmental communication via email. We use console passwords to identify those who are not authorized and cannot access the router. The FTP protocol is used to securely transfer files / data.

Keywords

Network, EIGRP, DHCP, configuration, communication

1. INTRODUCTION

The word "digital" in today's world is very important, increasing the development of technology and moving towards the entire world's digital era. Educational institutions play an important role in this digitalization, so campus networking should be adapted to digital media and "digital campus" will become Wireless is going to play an important role in this digitalization. The wireless network makes the connection easier and reduces the use of wires. A wired connection makes it difficult to keep track of all devices and only manage the connection, which is not just challenging but not challenging to handle.

As computers and network systems prosper in today's world, the need for growing and powerful computer and network security becomes increasingly necessary and important. Campus Area Network Design is the design of a network topology that is a LAN (local area network) for a campus where different departments and different computers in the building are placed so that they can communicate with each other by exchanging information. Cisco Packet Tracer (CPT) is a multitasking network simulation software that performs and analyzes various network activities such as implementing different topologies, selecting optimal paths based on different routing algorithms, creating DNS and DHCP servers, sub netting, and various network configuration solutions. To initiate communication between end-user devices and design a network, we need to select suitable networking devices such as routers, switches, and hubs and make physical connections by connecting wires to serial and fast Ethernet ports from the packet's component list. This paper is featured on the VLAN (Virtual Local Area

Network) switch just like EIGRP (Enhanced Interior Gateway Routing Protocol). A VLAN is just a subset of switch ports that are framed to be in a similar transmission space. EIGRP is a Cisco-owned classless routing protocol that is essentially an extended distance vector protocol.

2. RELATED WORKS

Few research works [1, 5] are related to this work is described below.

Paper [1] proposed design of the university network has been established in a simulated environment. The router and computer system were configured accordingly. Packets were sent from one computer to another and the transmission of such data to their destination was successfully accomplished. Through the network, emails and files can be sent and received by staff and students of the organization. Different methods are used to provide network security. Password protection is also applied to switches for limited use. Authentication is done within the network. Paper [2] specifically highlights the security level of network systems on campus, and recommends designing and mimicking a secure Campus Network (SCN) view using the Cisco Packet Tracer program. This paper represents a topology consisting of four buildings, with different networks and different types of devices. Paper [3] has demonstrated that a standard network system can be planned for minimal price. Albeit the least expensive devices have been utilized in network plan, the security of these networks has been found to be very strong. This study shows that various costs have been reduced to maximize the quality of the designed network. Paper [4] has designed a network using packet tracer. They mentioned how a simulation model of Pabna University of Science and Technology, Pabna, Bangladesh could be created using the tool. The study gives different ideas such as topology design, IP address configuration and how to send information in packet form to a single network and differentiates the traffic generated by different departments using Virtual Local Area Network (VLAN). In paper [5] the packet tracer is used to implement the network and clarify the concept of VLAN, DHCP, phone, website server and router configuration. Networking devices are expensive so it is easy and optimal to implement the network structure before applying the packet tracer to real ground. Also on paper, VLANs provide security, broadcast control, and physical level transparency while reducing VTP configuration and integrating VLAN management for any changes to the VTP server then it will be distributed to other switches in the same VTP domain so the same VLAN is reduced during configuration.

3. BASIC ARCHITECTURE

Fig. 1 shows the basic architecture of campus area network. this project is based on computer network, IP address, wireless connection access through various tools, DHCP server, HTTP server, FTP server, ping test, Cisco packet tracer simulation tool, VLANS, switch, router and university.

4. DESIGN AND CONFIGURATION

In this work, the proposed network is implemented for a university campus. A virtual visualization of the network is done using Cisco Packet Tracer which provides a huge platform for users to test their projects using simulation tools. The network on an educational campus makes it easy for teachers and students to access educational resources by activating an important platform

for information exchange. Fig. 2 is the diagram of the university network and includes routers, switches, servers and end devices. The network is divided into different sections like Center, Sheikh Hasina Girls' Hall, Bangabandhu Boys' Hall, ICT Cell, Library, VC Office, Administration Office, Faculty of Science and Faculty of Engineering. Networks are connected to each other by EIGRP Configuration.

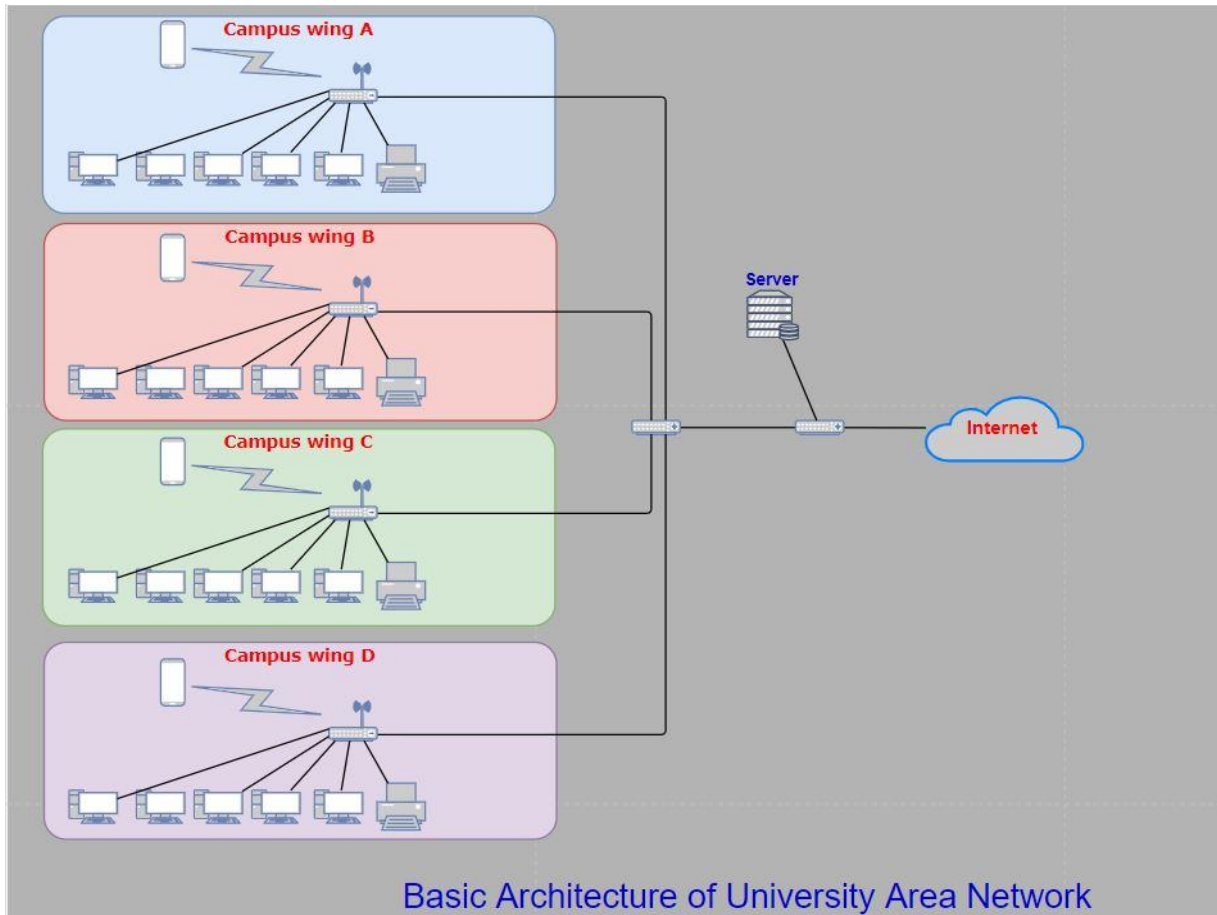


Fig 1: Basic Architecture of University Network Design

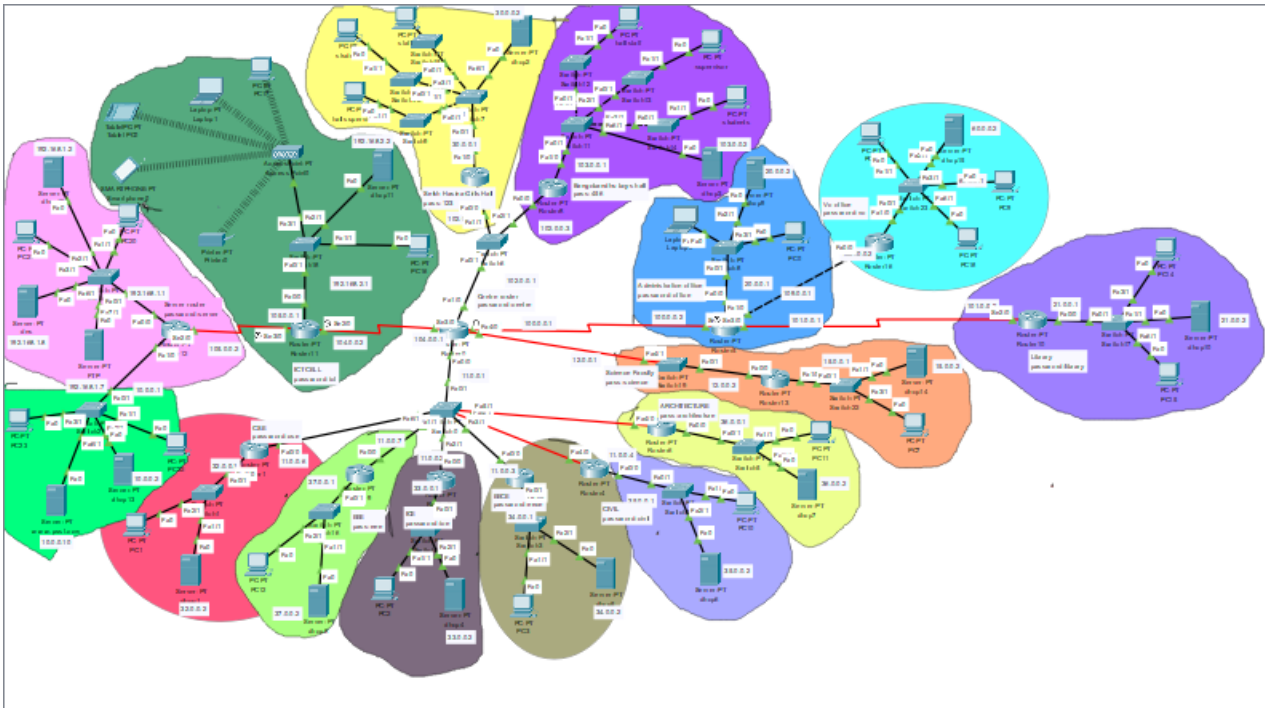


Fig 2: Network Diagram.

4.1 Administration Office Area

Fig. 3 shows the administration office router that is connected to the center router and we use the DHCP server here because we know that DHCP automatically assigns IP addresses to default gateways, DNS and other network parameters on network devices. Security features have also been added to this network so that one person in one sector cannot access data in another sector. We have used EIGRP protocol which enables routers to connect to other routers.

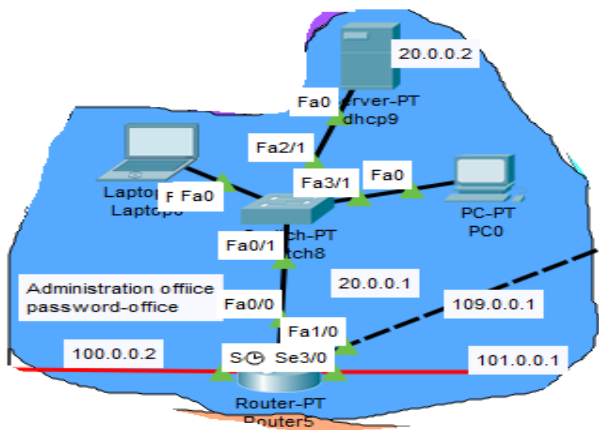


Fig 3: Physical diagram of Administration Office.

4.2 Vice Chancellor’s Office Area

The VC office area is located on the right side of the center router and is connected to other routers via the EIGRP protocol. The IP address of the router is 109.0.0.2 and its default gateway is 60.0.0.1. It has been shown that it has two PCs with IP addresses 60.0.0.3 and 60.0.0.5 and dhcp server IP addresses 60.0.0.2. It is connected to DNS server which is IP 192.168.1.8 and it is protected with password.

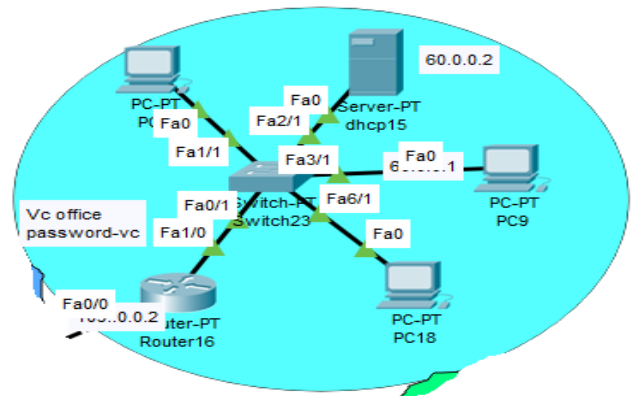


Fig 4: Physical diagram of VC Office.

4.3 Library Area

The library area is situated on the right side of the router and is connected to other routers via the EIGRP protocol. The ip address of the router is 101.0.0.2 and its default gateway is 21.0.0.1. It has been displayed that it has two PCs whose IP addresses are 21.0.0.3 and 21.0.0.1 and dhcp IP addresses are 21.0.0.2, attached to it is dns which ip 192.168.1.8 and password is used to secure the network.

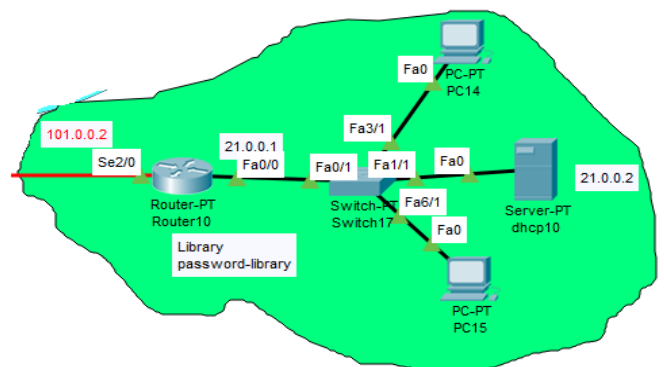


Fig 5: Physical diagram of Library.

4.4 ICT Cell

The ICT cell controls the entire network of the university campus. Fig. 6 shows that two routers and 3 switches are used, one switch for the wireless device, one for DNS and FTP, and another for the HTTP server.

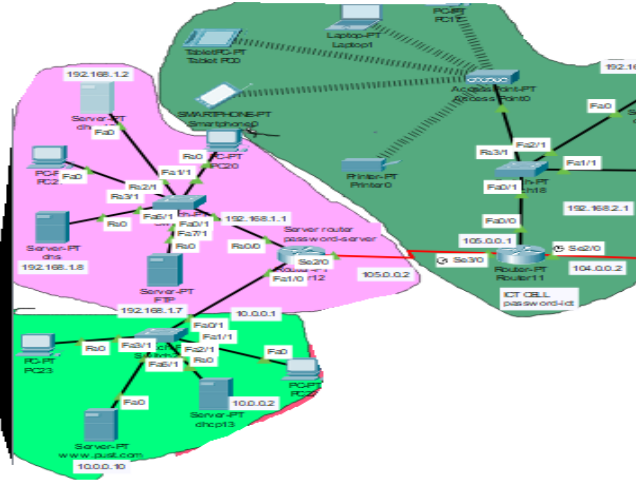


Fig 6: Physical diagram of ICT cell.

4.4.1 Wireless Access Point

The following Fig. 7 shows that laptop, PC, smartphone, tablet and printer are connected to wireless access points. The wireless access point is connected to a wired router via an Ethernet cable. Devices are able to connect to the Internet via a wireless network.

The IP address of the laptop is 192.168.2.7, connected to two PCs whose IP addresses are 192.168.2.3 and 192.168.2.4 and the tablet IP is 192.168.2.6, the IP of the smartphone is 192.168.2.8 and the printer IP is 192.168.2.5.

4.4.2 DNS and FTP Server

DNS acts as a translator where domain names are translated to IP addresses so that browsers can cover Internet resources. Each device linked to the Internet has an identical IP address that other machines use to search for the device. DNS servers eliminate the need for

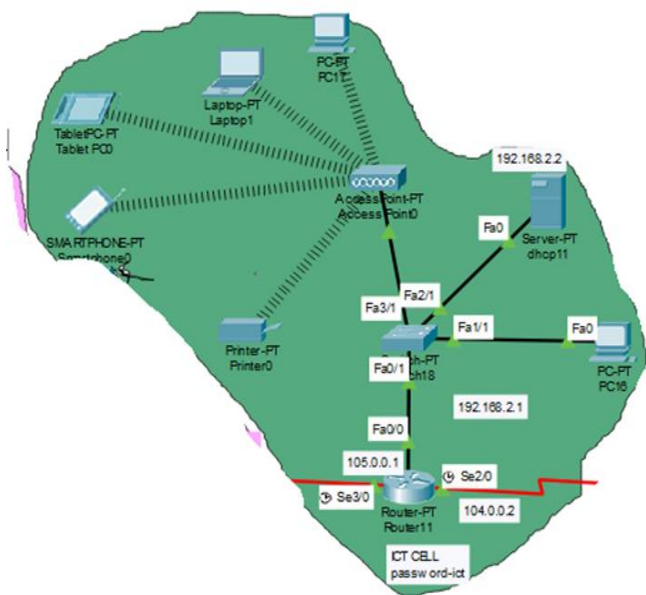


Fig 7: Physical diagram of Wireless Access Point.

people to remember IP addresses such as 192.168. Here we use www.pust.ac.bd, users can easily remember it instead of 192.168.1.8.

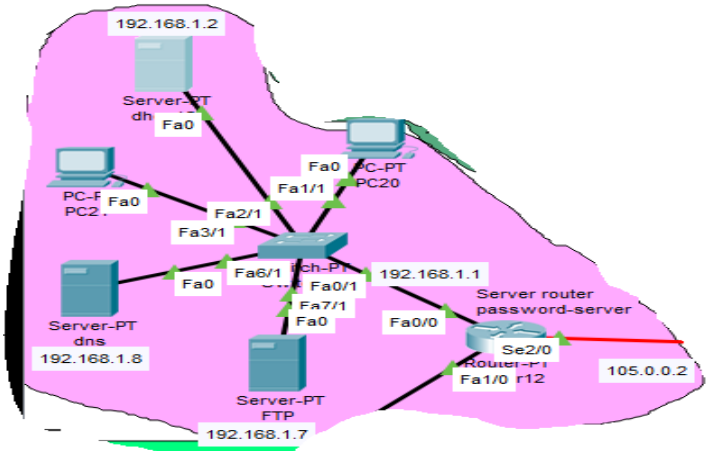


Fig8: Physical Diagram of DNS and FTP server.

File transfer protocol is a set of protocols that network computers use to communicate over the Internet. Using an FTP client we can upload, download, delete, move, rename and copy the file to a server. If someone sends files via FTP, the files are basically uploaded or downloaded from the FTP server. This project shows that two users, user1 and user2 whose passwords 123 and 123 can use the server according to their needs.

4.4.3 HTTP Server

HTTP requests act as intermediary transport between a client / application and a server. The client submits an HTTP request to the server and after internalizing the message, the server returns a response. Contains status information about response requests. Fig.9 shows that the www.pust.ac.bd web server is used to communicate with http.

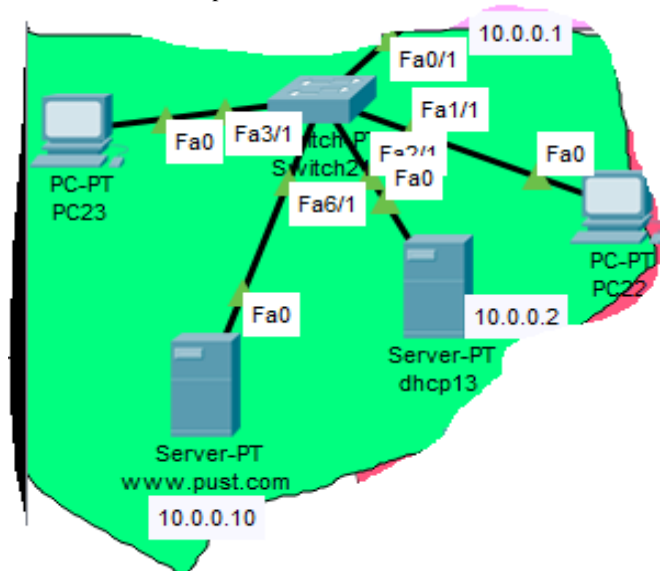


Fig 9: Physical Diagram of HTTP server.

4.5 Sheikh Hasina Girls' Hall

Fig 10 shows the Sheikh Hasina Girls' Hall area located above the center router where a router and a dhcp server are used for network coverage. The IP address of the router is 102.0.0.2 and the dhcp ip is 102.0.0.1

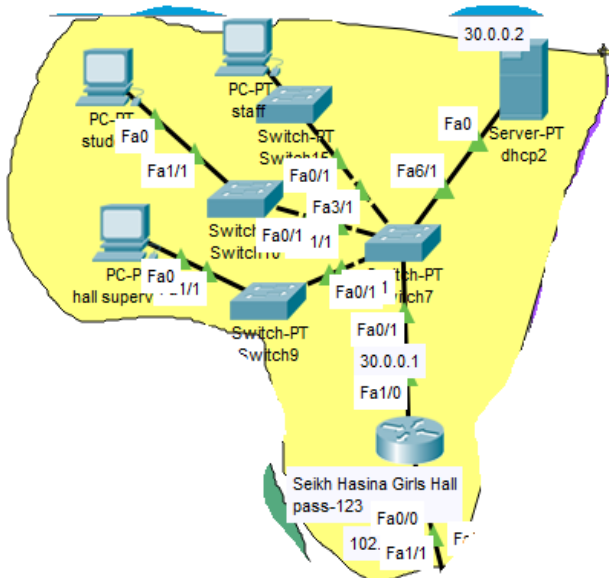


Fig 10: Physical Diagram of Sheikh Hasina Girls Hall

4.6 Bangabandhu Boys' Hall

Fig 11 shows the Bangabandhu Boys' Hall area next to Sheikh Hasina Girls Hall where a router and a DHCP server are used for network coverage. The IP address of the router is 103.0.0.2 and the dhcpip is 103.0.0.2.

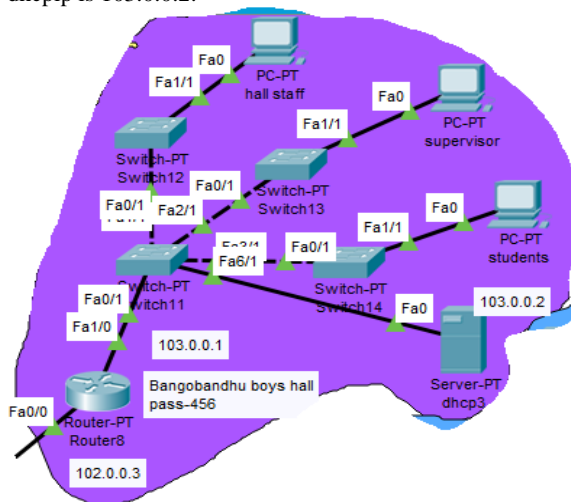


Fig 11: Physical Diagram of Bangabandhu Boys' Hall.

4.7 Departments

Fig 12 shows the views of six departments and the Faculty of Science. Each section has a router and a dhcp server and is securely configured.

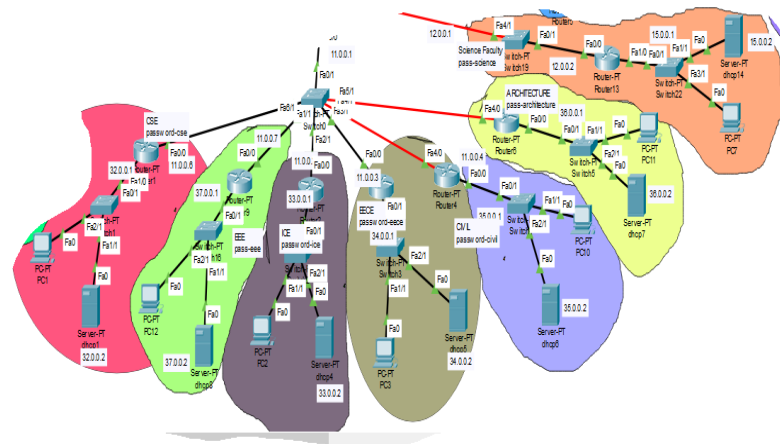


Fig 12: Physical Diagram of Departments.

5. SIMULATED RESULT

In a network, data must be successfully transmitted and received. There are two methods for checking whether the data packets are sent successfully to the destination. The first method is simulation based, and the second one is command based which is called ping. Here ping test is used for checking the data transferring process.

5.1 Ping Test

Fig 13 shows the successful simulation for the Administration office to Library. This means that the data / packet has been sent successfully.

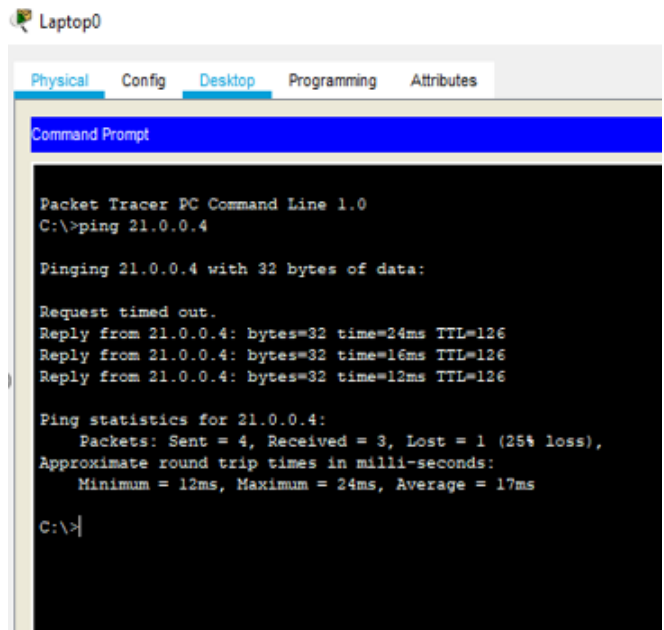


Fig 13:pinging Administration office to Library.

Checking the result using ping command between two offices in fig 14.

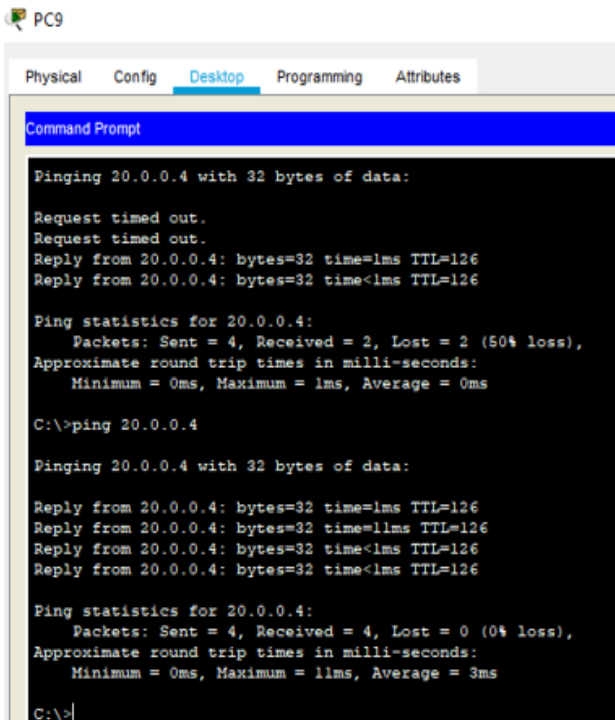


Fig 14:pinging VC’s office to administration office.

Fig 15 shows the results are being tested using the ping command between the two departments.

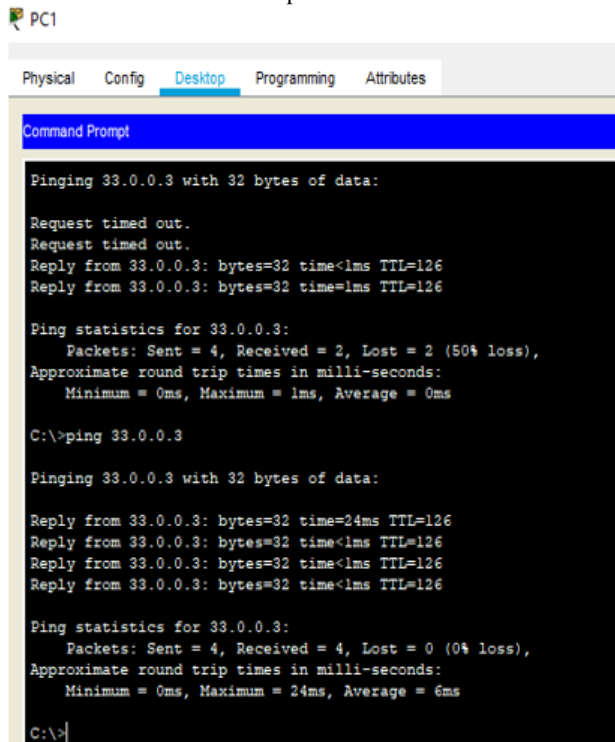


Fig 15: pinging CSE department to ICE department.

Two devices are able to successfully transfer packets to a wireless network using wireless access points.



Fig 16: Successful connected wireless devices.

Fig 18 shows that the DNS server will convert <http://www.pust.com> to an IP address then reply to the host with the IP address and the http server has worked successfully.

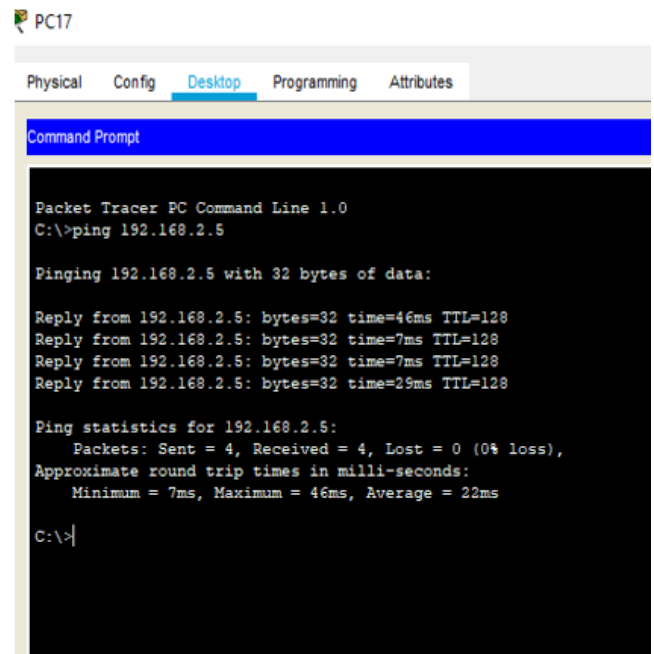


Fig 17: Pinging between two wireless devices.

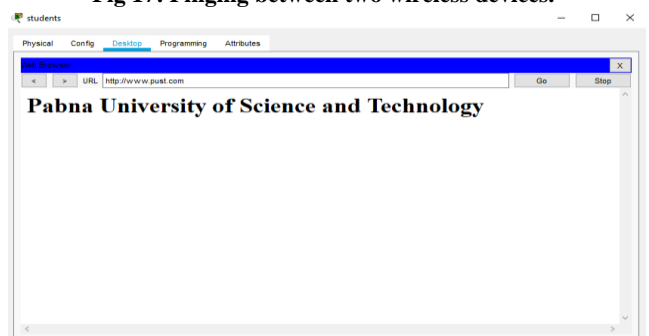


Fig 18: DNS and HTTP testing

Fig 19 shows that FTP connection established successfully.

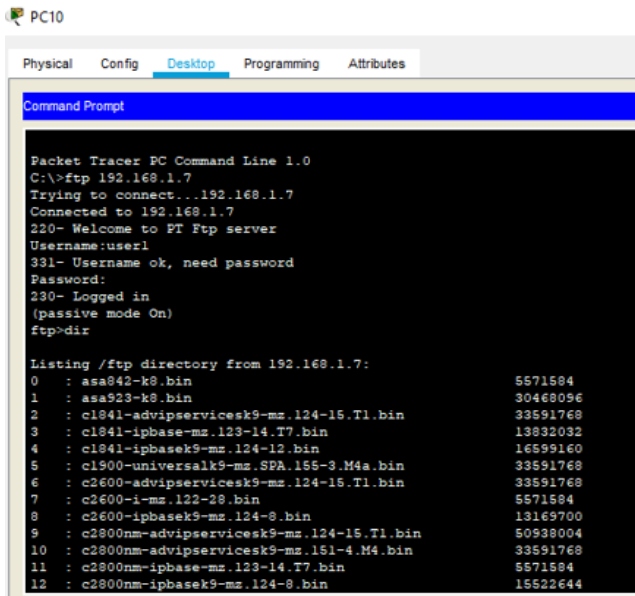


Fig 19: FTP testing

Fig 20 shows successful pinging from Bangobandhu boys hall to administration office.

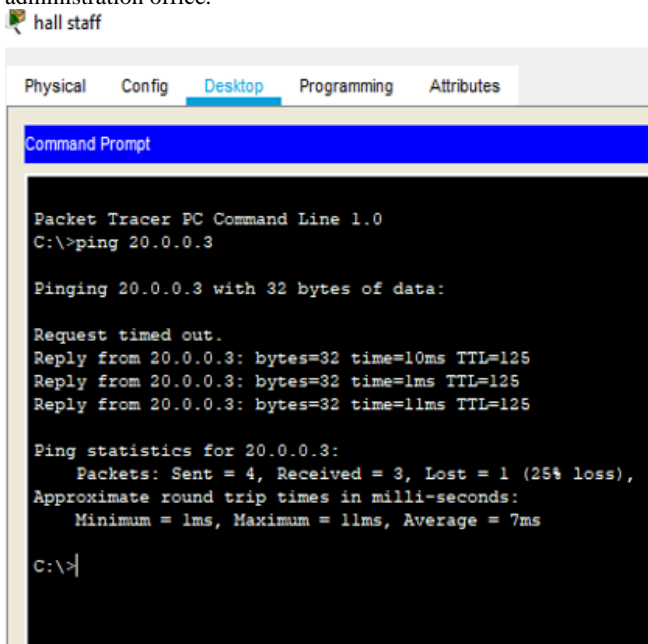


Fig 20: Pinging Bangabandhu boys' Hall to administration office

6. CONCLUSION

In this paper, a university network is designed and implemented using servers, routers, switches and end devices on multiple area networks. All the features needed to make the network work properly are covered. A DNS server, DHCP server and a web server is included to establish a smooth communication system for communication between different areas of the network and especially between students and teachers. An email server is also included within the domain to facilitate interdisciplinary communication via email. Console passwords and FTP protocols are used to ensure safe and secure data transfer.

7. REFERENCES

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