IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANALYSIS AND DESIGNING SMART COLLEGE NETWORK USING CISCO PACKET TRACER

[1] Sreedhanya.S.Pillai

[1]College Lecturer

[1]V.P.M. Polytechnic college

[1] Thane, India

Abstract: An intelligent and safe computer network facilitates appropriate user communication within an organization. The primary goal of a computer network is to allow users to share information in different formats. There are more benefits to using a computer network to connect multiple departments at a college than to share data offline. It will shorten the time it takes for faculty and students to share information and communicate with one another. For this project, a smart college network was designed using the Cisco Packet Tracer software. This college network includes the exam hall, AV room, office, library, and several departments. With the use of a real-time simulation that verifies actual data movement across devices, the Cisco Packet Tracer is a visual simulation tool that assists in configuring every device in each department.

Index Terms **- College network, VLAN, security, hierarchical design.**

I. INTRODUCTION

The key to communication is becoming digitalized every day; to keep up with technology, everyone must update their skill set with it. We are more integrated with a campus network because we are frequently a part of it. Depending on their needs, everyone utilizes it most of the time for both academic and everyday activities on campus. It is essential to make changes to data to guarantee that it cannot be corrupted.

The two most important factors in any information switch problem are integrity and reliability, which guarantee easy and secure customer transfers. Because of this research, a stable campus community and a safe campus network have been created for end users to exchange high-security data.

This project suggested the most important security configurations for the networking employed in this design, along with the architecture for a college of several networks and virtual local area networks (VLANs), using a Cisco packet tracer.

In addition to adding switches, routers, printers, PCs, laptops, and other network devices to improve communication, a vast array of protocols was employed to protect and serve the users of the secure campus network design.

The college network is made more secure and technologically focused by the digital campus, which is the destination for the next generation's education and world knowledge. Everyone can benefit from the knowledge and familiarity that students and other staff can gain from them.

College networks have difficulties in addressing fundamental security concerns that are controlled by network architecture. A secure network protects an institution from network-related security threats. A college network can be used for many purposes, including instruction, learning, research, administration, e-library access, posting of results, and communication with other users. To ensure service quality, the college network's hierarchical architecture is set up with various security concerns.

In this research, many computers from distinct departments are configured to exchange data and engage in interaction and communication. To create a networking architecture for a college that links its departments to one another, it facilitates departmental communication. Using a CAN Converged network adapter, a methodical and well-planned topology is designed to meet all the college's requirements. CNA offers authentication and security to prevent unwanted logins. Cisco Packet Tracer (CPT), a multitasking network simulation program, you can carry out and examine a range of network tasks, including implementing different topologies, choosing the best route based on various routing algorithms, setting up suitable servers, subnetting, and examining different network configuration and troubleshooting commands. Networking devices are expensive; thus, it is recommended to perform first on a packet tracer to grasp the concept and behavior of the network.

Selecting the proper networking equipment, such as switches and routers, and physically connecting cables to serial and fast Ethernet ports from the packet tracer component list are necessary to establish communication between end-user devices and construct a network.

II. REVIEW OF PREVIOUS STUDIES

The research entitled "Architecture of college campus network using Cisco packet tracer" was released in 2023 by Prof. P. Jaipurkar, Aman Banothe, Roshni Thakur, and Yunisha Banothe. This article describes the implementation of a college campus network design using a combination of wired and wireless topologies, along with key elements like DHCP, DNS, email, and VLANs all inside a single network using Cisco design. Logically grouping clients on the network, VLANs have been used to transport data packets from one device to another with the help of router and switch configurations.

The study "Enhancing the College Network," published by Jagdish K.P. and Pavan Kumar [3], discusses using CISCO-PACKET Tracer to build an advanced network. To develop an advanced college network design (ACND) that will optimize the campus's use of college network components. Thus, network devices such as routers, switches, access points, servers, and end devices such as desktops and laptops are utilized to improve communication. In this project, many IOE devices are connected and coded to be controlled using a Microcontroller unit (MCU).

Alaa H. Ahmed, Mokhaled N. Hamadani, et al. [4] separated the entire network into discrete portions known as VLANs, which are also known as virtual LANs, in their research article "Designing a secure campus network and simulating it using Cisco packet tracer." These VLANs are collections of smaller networks that are set up similarly to routers. They tried to use VLANs but were unsuccessful.

III. PROBLEM STATEMENT

When a network device communicates with many other devices, complexity, and workload will increase. As a result, the modular structure of the hierarchical design approach allows for correct capacity planning at each stage of the hierarchy, decreasing wasted bandwidth. To control administration expenses, network management responsibilities, and systems should be divided throughout the layers of a modular network design.

IV. REQUIREMENTS & DESIGNING OF COLLEGE NETWORK

To reduce the complexity of designing the entire college network project, we can use CISCO packet tracer to design a secure, less complex, and real-time simulation using the Cisco packet tracer. It allows users to perform network experiments, configuration, implementation, and troubleshooting with several topologies without damaging the existing network.

With the Cisco packet Tracer,

- Capability to design, create, configure, and debug sophisticated networks.
- Real-time simulation and visualization are provided.
- The freedom to try new things and investigate concepts.
- Python is one of the programming languages that this simulator software supports dynamically.

The college network architecture can be seen in Figure 1. The topology proposed for the secure college network is made up of several elements, including the IF department, CO department, EPS department, IS department, main office, AV room, and library. Each component incorporates a variety of network equipment, including switches, hubs, and routers. Additional resources and gadgets can be connected, including computers, laptops, phones, access points, and cell phones. All those devices are linked via a switch that connects them directly to a router. The campus's routers are dynamically connected and have a hierarchical design. IP addresses are provided for each device linked in the network. To enable easy data sending and receiving without any dropped packets, every device in the network assigns a unique IP address to make it identifiable and visible to other devices in the network. The DHCP protocol for certain devices and the manual method for others to assign IP addresses.

Depending on the configuration made on certain devices, such as a server or router, the DHCP protocol, which stands for dynamic host configuration, provides an IP address to end devices. After the configuration of each device, we can ensure a secure college network.

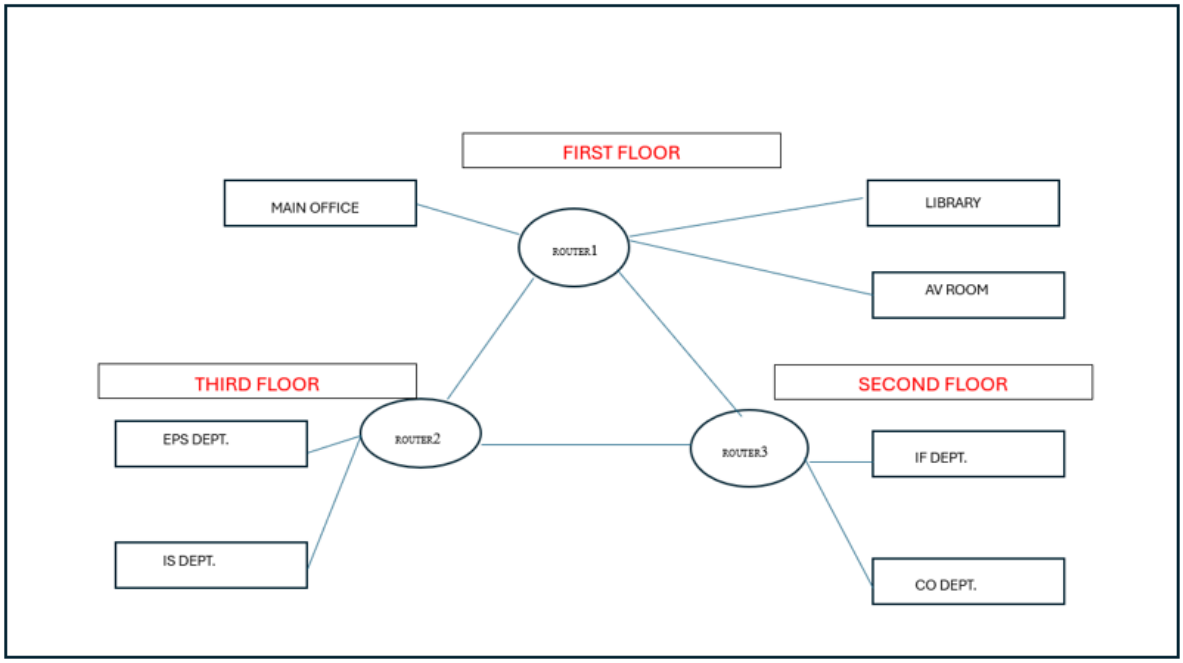

Fig.1. college network architecture

V. IMPLEMENTATION OF NETWORK

To implement the College Network Design, different networking devices used are Cisco router (2811), switch (2960), PCs, access points, and printers. The college design consists of three floors. The first floor provided the main office room, library, and AV room. Each device occupied in each room is connected to the first router through two switches. On the second floor for the IF and CO departments, all the PCs and printers are connected through two switches for the second router. On the third floor, provided for the EPS and IS department, each PC and printer are connected through two switches for the third router. All the devices are connected and configured. The fig.2. shows the entire design of the college network using Cisco packet Tracer.

5.1 Required resources

Here different types of devices in this work show different connectivity cases. Most of the devices are connected using cables like PCs.
The descriptions of the devices are:

-3 Routers (2811)
-6 Switches (2960-24TT)
-Access point
-11 PCs (Pc-PT)
-7 printers (Printer-PT)

- Copper straight through cables to connect most of the end devices with switches, and switches with routers.
- Serial DTE cables connect routers dynamically.
- Copper cross-over cables to connect the three switches.

5.2 IP Address Assigned

An IP address is a numeric identifier assigned to each machine on an IP network. It designates the specific location of a device on the network. An IPv4 address is a 32-bit address. However, rather than writing out each bit value, the address is typically written in dotted-decimal notation, for example, 10.0.0.0. There are five classes of IP addresses class A, B, C, D, and class E. Each class is divided into a certain range of values.
Below table.1, table2, table.3, table.4, table.5, Table 6, and Table .7 show the IP address of each device with gateways. Each IPv4 address is assigned and configured statically or dynamically configured using DHCP.

1) Main Office

Devices	IP Address	Gateway
PC1	10.0.0.1	10.0.0.0
Printer 1	10.0.0.2	

Table.1

2) Library

Devices	IP Address	Gateway
PC2	10.10.10.1	10.10.10.0
Printer 2	10.10.10.2	

Table.2

3) AV Room

Devices	IP Address	Gateway
PC3	10.0.0.3	10.10.10.0
Printer 3	10.0.0.4	

Table.3

4) IF Department

Devices	IP Address	Gateway
PC4	192.168.1.1	192.168.1.0
PC5	192.168.1.2	
Printer4	192.168.1.3	

Table.4

5) CO Department

Devices	IP Address	Gateway
PC6	192.168.1.4	192.168.1.0
PC7	192.168.1.5	
Printer5	192.168.1.6	

Table.5

6) EPS Department

Devices	IP Address	Gateway
PC8	128.168.0.1	128.168.1.0
PC9	128.168.0.2	
Printer6	128.168.0.3	

Table.6

7) IS Department

Devices	IP Address	Gateway
PC10	128.168.0.4	128.168.1.0
PC11	128.168.0.5	
Printer7	128.168.0.6	

Table.7

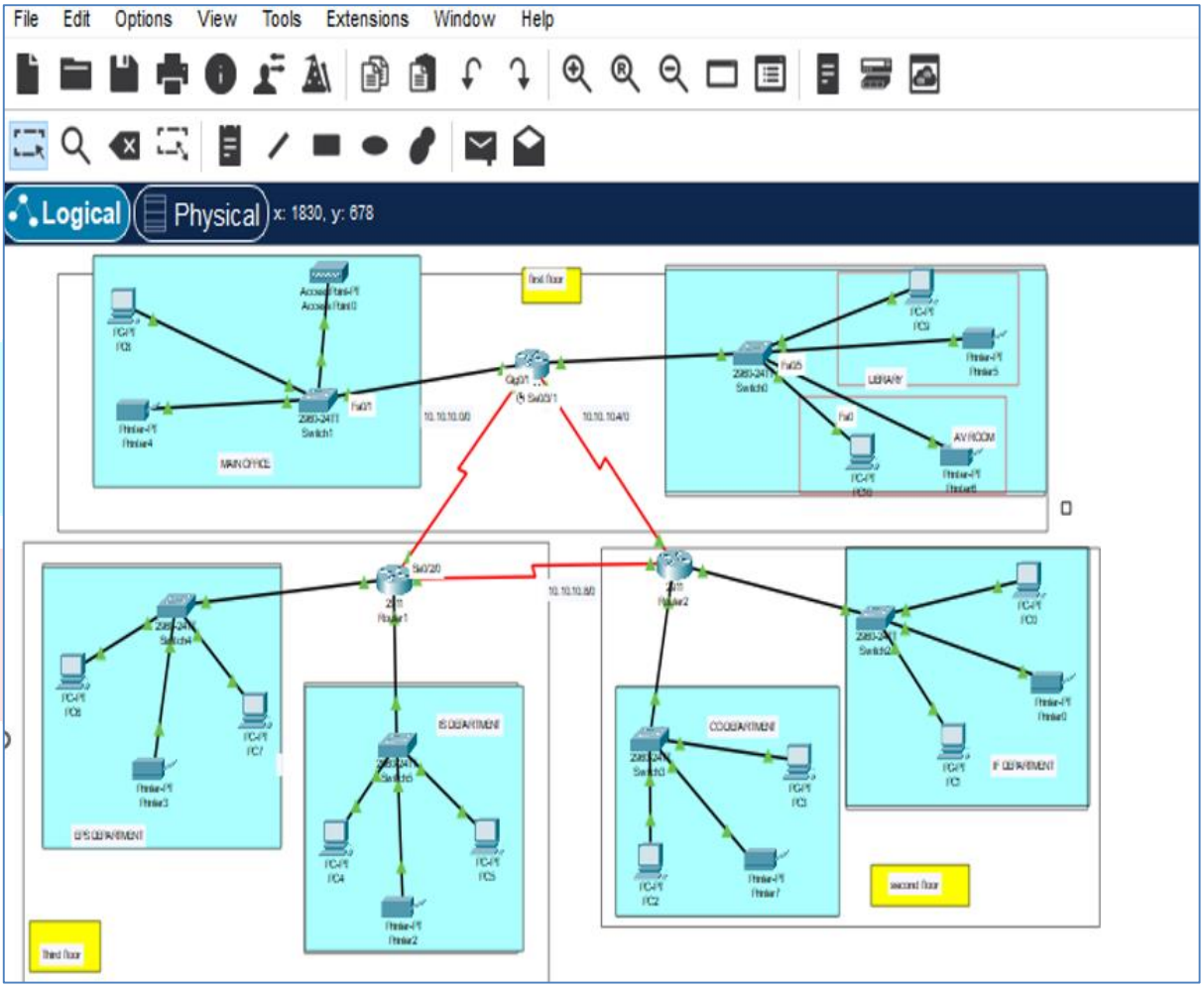

Fig.2. Design of college network using Cisco packet Tracer

Fig. 3 shows the real-time simulations of network architecture, where the packets are sent from one device to another device. Network connectivity and communication can be tested using a ping command in the command prompt followed by the domain name or the IP address of the device. Two VLANs have been added to the existing network and the ping test was performed to test if the devices connected to those VLANs are communicating with the rest of the devices on the network. After Simulating the network with hardware and devices, the project is successfully establishing a good communication network among all the devices on each floor.

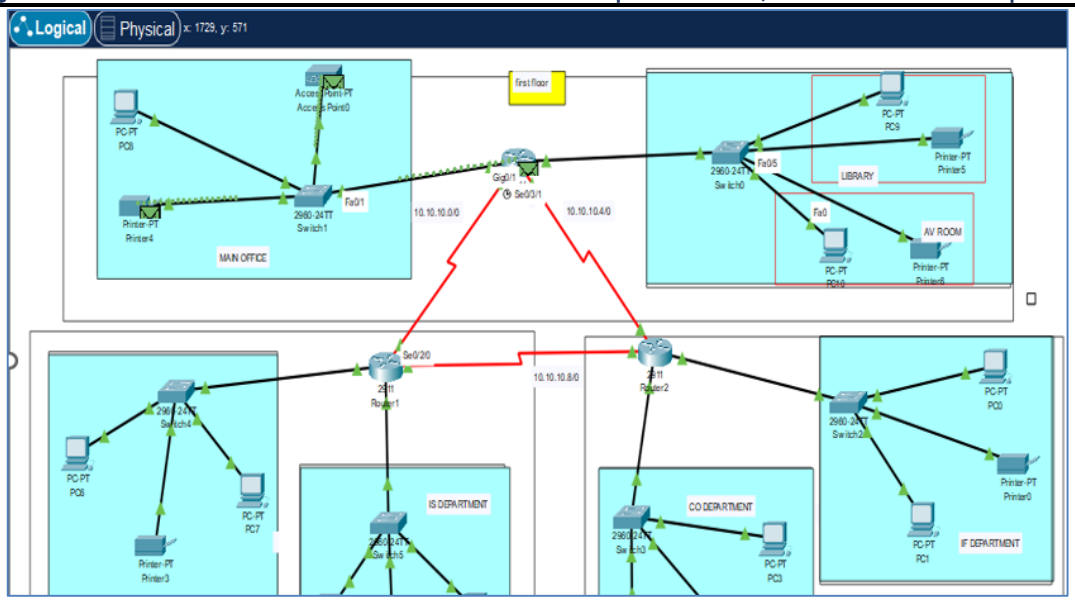

Fig.3. simulation on network architecture

VI. CONCLUSION

To improve the security of the network system, especially on campuses, we can demonstrate a secure area network scenario that was designed and simulated using the Cisco packet tracer tool. This paper presents an analysis of network topology presenting a range of networks and device types throughout all buildings. To ensure security, we can separate end devices onto different VLANs within buildings. It additionally, implemented security measures on the switches and routers that connect the end devices and the networks to prevent outside. This study proposes integrating Internet of Things devices with traditional network devices to enhance campus network services.

REFERENCES

[1] Yunisha Banothe, Roshni Thakur, Aman Banothe, Prof. P. Jaipurkar(2023).” ARCHITECTURE OF COLLEGE CAMPUS NETWORK USING CISCO PACKET TRACER” International Research Journal of Modernization in Engineering Technology and Science (Peer-Reviewed, Open Access, Fully Refereed International Journal), Volume:05/Issue:04/April-2023 Impact Factor-7.868.

[2] Dr. Banta Singh Jangra, anish Kumar Naga. (2014). “Cisco packet tracer: a securing technique for wired or wireless network” International Journal of Research in Engineering, IT & Social Sciences (ISSN 2250-0588) IMPACT FACTOR: 5.07 (Volume 4, Issue 9.

[3] Jagdish K.P & Pavan Kumar, ‘Enhancing the College Network’, Department of Computer Science & Information Science Engineering, Sri Krishna Institute of Technology, Banglore IJIRSET- International Journal of Innovative Research in Science, Engineering & Technology, ISSN (online):2319-8753, Vol.7, May 2018.

[4] Ahmed, Alaa & Al-Hamadani, Mokhaled. (2021). Designing a secure campus network and simulating it using Cisco packet tracer. Indonesian Journal of Electrical Engineering and Computer Science. 23. 479 489. 10.11591/ijeecs. v23.i1. pp479-489.

[5] Midhun Krishna Yadav, Akhilendranath Mummadi, Vishnu Vardhan Ciripuram, Dr. R Uma Mageswari (2023). SECURE CAMPUS AREA NETWORK IN CISCO PACKET TRACER. © 2023 IJCRT | Volume 11, Issue 3 March 2023 | ISSN: 2320-2882.