International Journal of
Computational Learning & Intelligence
Vol. 03, Issue 02 (April) 2024

RESEARCH ARTICLE OPEN ACCESS

Campus Area Network Design Using Cisco Packet Tracer

Meghana S . Suriya Hanchinal . Preethi H A . Naveen Chandra Gowda

School of Computer Science and Engineering
REVA University, Bengaluru, India

DOI: **10.5281/zenodo.11065719**
Received: 18 January 2024 / Revised: 16 March 2024 / Accepted: 12 April 2024

Abstract – The operation of an organization is significantly impacted by computer networks. Universities rely on their networks to operate and analyze properly for a variety of purposes, including automation, e-learning, communication, administration, and libraries. An effective network is necessary to enable the methodical and economical information flow throughout an organization in the in the form of documents, files, and assets. The initiative sheds light on a number of ideas such as IP address configuration, topology design, and the way to transfer data in the format of packets to the various university locations' wireless networks. The project's goal is to use the software to design the university network's topology. Wireless networking systems are implemented utilizing Cisco Packet Tracer. The main focus of this initiative is mobility. In order to give every user (college) equal functionality employees and pupils), we have expanded DNS, Email, and HTTP servers to accommodate the most use of available resources.

Index Terms – HTTP Server, Cisco Packet Tracer, DNS

I. INTRODUCTION

Wireless campus networking has grown in importance as a means of facilitating communication between instructors and students as well as providing a primary means of accessing educational resources. Since computers and smart terminals are widely utilized, the need for information access at all times and locations has increased and increasingly pressing, but conventional cable networks are unable to fulfill this need. Next, wireless Building a network becomes vital and crucial. One of the is the wireless network essential elements of a wisdom campus and digital campus. It offers a productive method for educators and students to use a mobile device to access the internet without the need for cables and locations.

The design includes the following parts of university:

- Hostel blocks: Girls block and Boys block
- Academic Blocks: AB1 AND AB2
- Dome building and Library
- IT Consulting

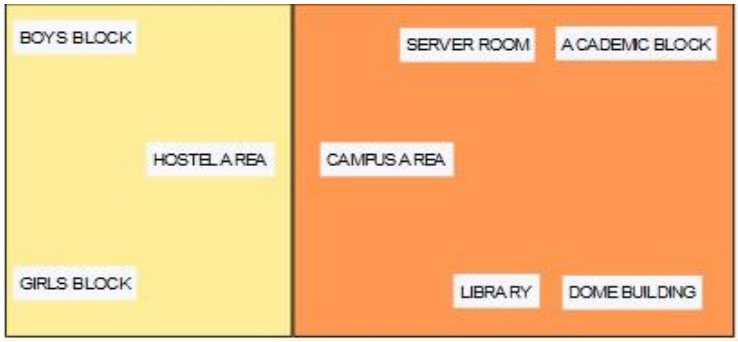

Fig. 1. Layout of Campus area network

II. LITERATURE SURVEY AND COMPONENTS USED

Cisco packet Tracer

Cisco Systems created Packet Tracer, a cross-platform visual simulation tool that lets users design network topologies and mimic contemporary computer networks. With the software, users can mimic how Cisco switches and routers are configured through a simulated CLI. With Packet Tracer's drag-and-drop user interface, users can add and remove fictitious network devices as needed. Students in the Certified Cisco Network Associate Academy are the primary target audience for the software, which serves as an instructional tool to help them understand basic CCNA concepts. The tool was previously available for free download and use by students enrolled in CCNA Academy programs for educational purposes.

Routers

Similar to a switch, a router is a device that routes data packets according to their IP addresses. The router is primarily a device at the Network Layer. Typically, routers join LANs and WANs together. They decide how to route data packets based on a routing table that is updated dynamically. A router separates the broadcast domains of hosts that are connected to it.

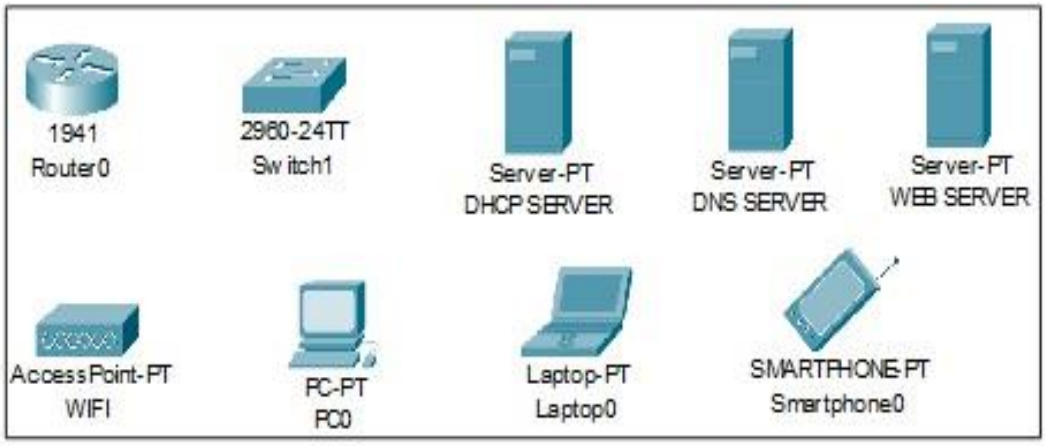

Fig. 2. Types devices used in campus area network

Switch

A network switch is networking hardware that links devices on a computer network by using packet switching to receive and forward data to the destination device. It is also referred to as a switching hub, bridging hub, or officially MAC bridge. A network switch is a multiport network bridge that forwards data at the OSI model's data link layer, or layer 2, using MAC addresses. By adding routing functionality, some switches can also forward data at the network layer (layer 3). These switches are also referred to as multilayer switches or layer-3 switches.

NETWORK PACKET

A packet-switched network uses packets, which are organized data units. The payload, also referred to as user data, and control information make up a packet.

WIRELESS NETWORK

The workstations or PCs receive an access signal from a wireless network. This allows computers, tablets, and laptops to move around a room while always keeping a stable network connection. Additional security requirements are also associated with wireless networks.

ETHERNET

The core of our network is Ethernet. It is made up of the cabling and can normally transfer data at a speed of 100 MB per second. It is a system for joining several computers together to create a local area network, with protocols in place to manage data flow and prevent multiple systems from transmitting data at once. We have utilized gigabit Ethernet, one of the various varieties of Ethernet that can transfer data quickly and at a rate of 1000 Mbps. Ethernet is a kind of Ethernet network that has a 100 Mbps data transfer speed.

COMPUTING DEVICES

Electronic devices known as computing devices are those that process and output data after receiving input from the user. Smartphones, PC desktops, laptops, printers, and many other gadgets could be among them.

SERVER

A server is a computer or system that uses a network to supply resources, information, services, or programs to other computers, also referred to as clients. Theoretically, computers are regarded as servers whenever they share resources with client computers. Web servers, mail servers, and virtual servers are just a few of the various kinds of servers. One or more of the common servers can be found in many networks. The following servers are employed in our project:

DNS SERVER

DNS, or domain name system, servers are application servers that give user computers a human-friendly naming convention so that users can understand IP addresses. Any DNS server can be used to request a computer name that is otherwise unknown. The DNS system is a widely dispersed database of names. A user sends a DNS request to a DNS server with the name of the desired resource when they need to know the address of a system. The required IP address is returned by the DNS server from its table of names.

WEB SERVER

A web server is one of the most popular types of servers available today. One particular type of application server that hosts files and applications that users request over the Internet or intranet is called a web server. When client computer browsers ask for web pages or other web-based services, web servers reply.

EMAIL SERVER

An email server is a server that uses common email protocols to handle and deliver emails across a network. The SMTP protocol, for instance, manages outgoing mail requests and message delivery. The POP3 protocol is used to process incoming mail and receive messages. These protocols manage all the connections behind the scenes when you use an email client or webmail interface to log on to a mail server.

SIMULATION ENVIRONMENT

With Cisco Packet Tracer, simulating our network topology is simple and straightforward. In the simulation mode, packets can be seen moving between nodes, and by clicking on a packet, you can view comprehensive details about the networking's OSI layers. A vast platform for combining realistic simulation and simultaneous visualization is provided by Packet Tracer. Cisco Packet Tracer facilitates multi-user collaboration and offers a realistic simulation environment for project experimentation, which greatly eases learning and teaching.

III. PROPOSED WORK

A campus area network (CAN) is a collection of linked local area networks (LANs) in a constrained geographic area, such as a corporate building, school, university, or military installation. While a campus area network is smaller than a wide area network and a metropolitan area network (MAN), it is larger than a local area network (WAN). The Corporate Area Network is another name for this campus area network. Because it is exclusively used by residents of a particular campus, this network is also sometimes referred to as the Residential Network, or ResNet. Campus Area Networks are a collection of Local Area Networks (LANs) that are connected to one another via switches and routers to form a single network similar to CAN. The Campus Area Network covers a distance of approximately 1 to 5 km as shown in Fig. 2.

IV. IMPLEMENTATION AND RESULTS

As indicated in the layout, we first began designing the university's wireless network by arranging the core devices inside the frame.

1. Firstly, we positioned the main router in the middle of the university perimeter. It was then connected to the server switch via a gigabit ethernet port and a copper straight-through cable. The campus and hostel sub-routes were connected to the serial port and serial DCE cable at the respective locations of the routers.

2. The WEB, DNS, and EMAIL servers were connected to the server switch in turn. The campus router was linked to the campus switch, which in turn was connected to the academic block's (AB1 and AB2) wireless access points, the dome building, the library, and IT consulting. The access points that

are wireless. With your network operating at a slower speed in simulation mode, you can examine and track the paths that packets take. When the suggested architecture was simulated on Cisco Packet Tracer, the following outcomes were obtained as shown in Fig. 4.

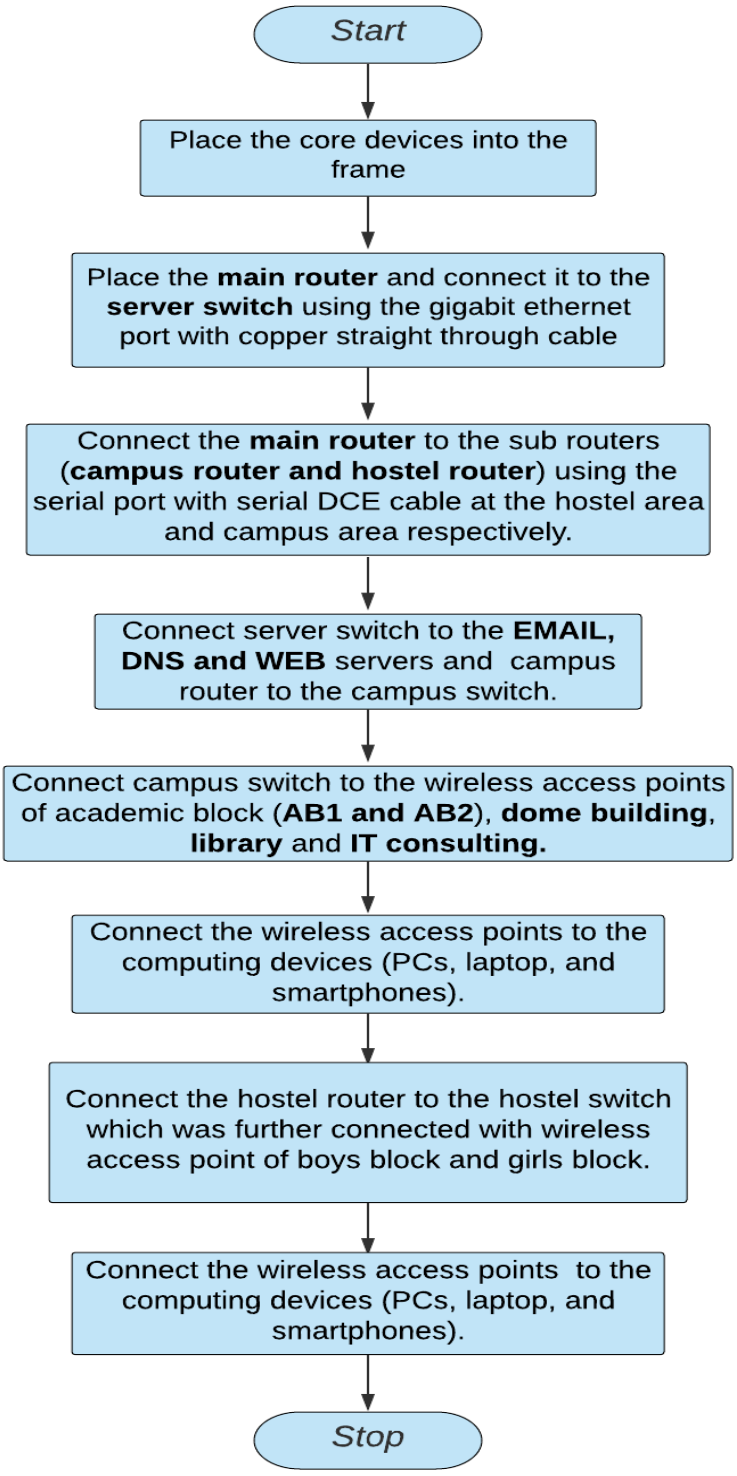

Fig. 3. Flow diagram

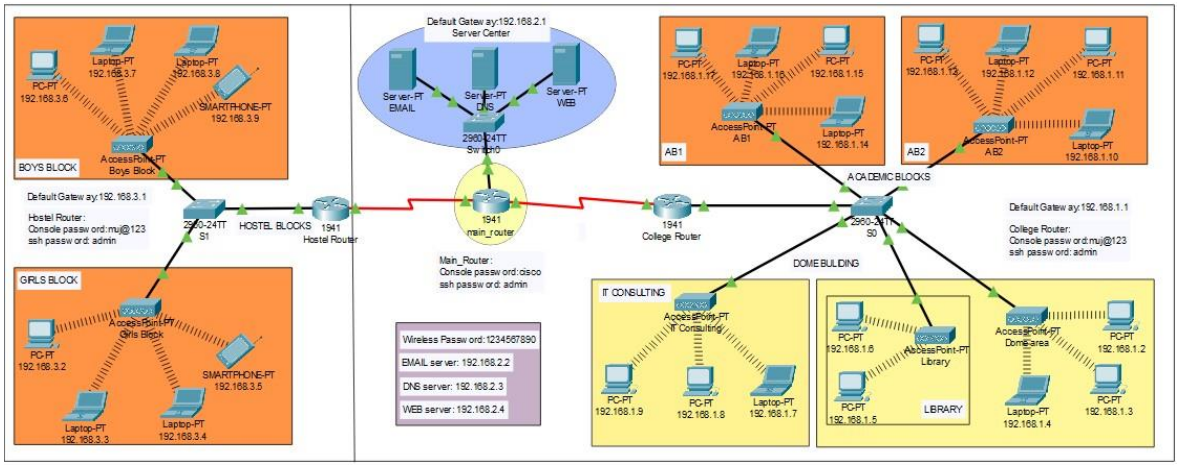

Fig. 4. Outcome of the campus area network

V. CONCLUSION

We began our conversation with the term "digitalization," and to realize it, we set out to work with educational institutions first. Ultimately, we created a wireless network for a university. We chose to switch from a wired network to a wireless one because, as we previously stated, mobility and efficiency are the two main benefits of wireless networks. This has made our network more orderly and less chaotic. In this paper, we used Cisco Packet Tracer to design a university network with a multiple area network topology implemented using servers, routers, switches, and end devices. We have now covered every feature needed for a network to operate as intended. For the purpose of creating a seamless communication system throughout our network, particularly for student-teacher communication, we have added a web server and a DNS server. In order to promote email communication within the university, we have integrated an email server. To guarantee a secure and safe transfer of data, we have employed the SSH protocol and console passwords.

VI. REFERENCES

1. Huang, M., Luo, W., & Wan, X. (2019, April). Research on network security of campus network. In *Journal of Physics: Conference Series* (Vol. 1187, No. 4, p. 042113). IOP Publishing.
2. Perera, C., Qin, Y., Estrella, J. C., Reiff-Marganiec, S., & Vasilakos, A. V. (2017). Fog computing for sustainable smart cities: A survey. *ACM Computing Surveys (CSUR)*, *50*(3), 1-43.
3. Galaviz-Mosqueda, A., Morales-Sandoval, M., Villarreal-Reyes, S., Galeana-Zapién, H., Rivera-Rodriguez, R., & Alonso-Arevalo, M. A. (2017). Multi-hop broadcast message dissemination in vehicular ad hoc networks: A security perspective review. *International Journal of Distributed Sensor Networks*, *13*(11), 1550147717741263.
4. Ahmed, S. T., Kumar, V. V., Singh, K. K., Singh, A., Muthukumaran, V., & Gupta, D. (2022). 6G enabled federated learning for secure IoMT resource recommendation and propagation analysis. *Computers and Electrical Engineering*, *102*, 108210.
5. Kumar, S. S., Ahmed, S. T., Vigneshwaran, P., Sandeep, H., & Singh, H. M. (2021). Two phase cluster validation approach towards measuring cluster quality in unstructured and structured numerical datasets. *Journal of Ambient Intelligence and Humanized Computing*, *12*, 7581-7594.
6. Chen, S., Ma, R., Chen, H. H., Zhang, H., Meng, W., & Liu, J. (2017). Machine-to-machine communications in ultra-dense networks—A survey. *IEEE Communications Surveys & Tutorials*, *19*(3), 1478-1503.
7. Ahmed, S. T., Basha, S. M., Ramachandran, M., Daneshmand, M., & Gandomi, A. H. (2023). An edge-AI enabled autonomous connected ambulance route resource recommendation protocol (ACA-R3) for eHealth in smart cities. *IEEE Internet of Things Journal*.

8. Guo, H., Li, J., Liu, J., Tian, N., & Kato, N. (2021). A survey on space-air-ground-sea integrated network security in 6G. *IEEE Communications Surveys & Tutorials*, *24*(1), 53-87.
9. Liu, H., Wang, Y., Fan, W., Liu, X., Li, Y., Jain, S., ... & Tang, J. (2022). Trustworthy ai: A computational perspective. *ACM Transactions on Intelligent Systems and Technology*, *14*(1), 1-59.