HOSPITAL NETWORKING DESIGN

A COURSE PROJECT REPORT

By
ADITYA KOTASTHANE (RA2111003011683)
SHRUTI PAWAR (RA2111003011696)
VEDASHREE CHAKRABORTY (RA2111003011698)
KHUSHI TIWARI (RA2111003011709)
VIBHU KAUSHIK (RA2111003011711)

Under the guidance of

Dr. BIBIN CHRISTOPHER V

In partial fulfilment for the Course

of

18CSS202J - COMPUTER COMMUNICATIONS in C-

TECH

FACULTY OF ENGINEERING AND TECHNOLOGY SRM

INSTITUTE OF SCIENCE AND TECHNOLOGY

Kattankulathur, Chengalpattu District

APRIL 2023

SRM INSTITUTION OF SCIENCE AND TECHNOLOGY
KATTANKULATHUR-603203

BONAFIDE CERTIFICATE

Certified that this Course Project Report titled **"HOSPITAL NETWORKING DESIGN"** is the bonafide work done by **ADITYA KOTASTHANE(RA2111003011683), SHRUTI PAWAR (RA2111003011696), VEDASHREE CHAKRABORTY (RA2111003011698), KHUSHI TIWARI (RA2111003011709), VIBHU KAUSHIK (RA2111003011711)** who carried out under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other work.

SIGNATURE

Faculty In-Charge
Dr. Bibin Christopher
Assistant Professor
Department of Computing Technologies
SRM Institute of Science and Technology

SIGNATURE

HEAD OF THE DEPARTMENT
Dr. M. Pushpalatha
Professor and Head,
Department of Computing Technologies
SRM Institute of Science and Technology

TABLE OF CONTENTS

1) AIM

This report describes the network design of Health care management or Hospital. In this network topology the nodes (i.e., computers, switches, routers or other devices) are connected to a local area network (LAN) and network via links (twisted pair copper wire cable or optical fiber cable). We have used Cisco Packet Tracer for designing the network topology It's a general design which can be implemented at any higher level to manage network system.

2) ALGORITHM

Designing a hospital network in Cisco Packet Tracer can be a challenging task. Here's an algorithm that can help you design a hospital network in CiscoPacket Tracer:

- Identify the requirements: Start by identifying the hospital's network requirements, such as the number of devices that will be connected to the network, the types of applications that will be used, and the amount of bandwidth that will be needed. This information will help you determine the size and capacity of the network.
- Plan the network topology: Based on the network requirements, plan the network topology. This involves determining the physical layout of the network, including the location of switches, routers, and other network devices. You may want to consider a hierarchical network design, where the network is divided into multiple layers, such as access, distribution, and core layers

Choose the network equipment: Based on the network requirements and topology, choose the appropriate network equipment, such as switches, routers, and firewalls. In Cisco Packet Tracer, you can select the devices from the device list on the left-hand side of the interface.

- Configure the network devices: Once you have chosen the network equipment, you can start configuring the network devices. This involves setting up the network devices, such as switches and routers, and configuringthe network protocols, such as TCP/IP, OSPF, and BGP. You can use the command line interface (CLI) or the graphical user interface (GUI) to configure the devices.

Connect the network devices: Once the devices are configured, connect themto each other using appropriate cables. In Cisco Packet Tracer, you can drag and drop cables from the device connectors to connect the devices.

- Test the network: After configuring the network and connecting the devices, test the network to ensure it's working properly. This involves testing the connectivity of the network devices, as well as the performance of the network, such as the speed of data transfer and the quality of service.
- Monitor and maintain the network: Once the network is up and running, it's important to monitor and maintain it to ensure it's working properly. This involves regularly checking the network devices and applications for any issues, such as hardware failures or security breaches, and taking appropriate action to resolve them.

By following this algorithm, you can design a hospital network in Cisco Packet Tracer that meets the hospital's requirements and supports the efficientand effective delivery of healthcare services.

3) PROTOCOLS USED

- **DHCP**

  The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on UDP/IP networks.

- **DNS**

  The Domain Name System is a hierarchical and decentralized naming system for computers, services, or other resources connected to the Internet or a private network.

- **SUBNETTING**

  A subnetwork or subnet is a logical subdivision of an IP network. The practice of dividing a network into two or more networks is called subnetting.

- **HTTPS**

  Hypertext Transfer Protocol Secure is an extension of the Hypertext Transfer Protocol. It is used for secure communication over a computer network and is widely used on the Internet. It is used for secure communication over a computer network and is widely used on the Intern

- **SSH**

  Secure Shell is a cryptographic network protocol for operating network services securely over an unsecured network.

- **SMTP**

  The Simple Mail Transfer Protocol is a communication protocol for electronic mail transmission.

- **FTP**

  The File Transfer Protocol is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

- **WIFI**

  Wi-Fi is the name of a wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections.

- **NTP:**

  Used for the IoT devices used as well as the local storage of data. This shows the current time and data on the IP-Phones used

- **AAA(tacacs+):**

  Crucial admin data are stored here which only one person knowing the password can access.

- **RIP:**

  Used for communicating between 2 networks.

- **NAT:**

  Used with the ASA firewall because people will access the hospital via the outside public network which the NAT translates and the firewall scans the packet before allowing the packet to enter.

4) EXPLANATION PROCEDURE

- From the given scenario, we draw the following requirements:

- In Health care Network topology, we have desktop Computer, laptops, smart phone. There is a data flow between the devices within the system. We have divided our network into segments like for Hospital wards, clinical area etc. We have also used SSH for security. Our network requirements include network devices like routers, switches, server.
- We need to configure a network design keeping the following requirements in mind.

5) ARCHITECTURE DESIGN AND EXPLANATION

The core layer is where the admin has access to his private network along with the information of the entire member's, doctors and employees who work in the hospital.

The distribution layer is placed on the 1st floor is because many people will access, from an outside network to an inside network. Intrusion can also take place here, this can also be considered as the core layer part of the network.

The Access layer contains all the normal floors which includes emergency/mortuary on -1 floor and the patients floor with the doctor's office.

1. Connectivity.

I have used the 5 connectivity types in my network.

- Copper Straight- through,
- Serial DCE (for connecting 2 or more router's),
- Copper Cross Over (Switch to Switch),
- IoT Custom Cable (for the IoT device connectivity) and
- Console

2. Security.

SSH, tacacs+, asa firewall, local login, vlans.

My core layer is highly secure which is located at the 3rd floor of the hospital building which has 2 sections:

i. The Admin Area and

ii. The Sales Area.

The Distribution layer is placed at the 1st Floor which has 2 sections:

i. The ASA (Adaptive Security Appliance),

ii. The Diet Office aka Cafeteria.

The 2nd and -1st Floor of the hospital are normal floors, which are the access layers. 2nd floor has the patient's rooms, and -1 is the mortuary or the emergency floor.

1. The 2nd Floor:

This floor has 2 parts:

i. The Doctors office and

ii. Operation Theatre rooms, normal wards.

3. Case Study:

Explanation of core layer (3rd floor):

The admin area is where the Tacacs+ configuration has been implemented because; the admin would have access to his crucial information which only he/she can access with a username and password.

The sales dept. is the area which has all the information about the employees and doctors who work in the hospital, which is ultimately connected to the admin area. This network is internally divided into Vlans (Vlan10, Vlan20, Vlan 30 and Vlan 40). Vlan 30 is connected to a printer. Vlan 40 is an Access Point through which 2 laptops are connected further. So the admin can get all the information about each staff member, nurses and the doctors.

Explanation of distribution layer (1st floor):

The area where the ASA firewall is configured is implemented there because, that is the part of the hospital where people come and fill the forms and do the payment of money (if any operation/surgery is carried out). ASA is configured with NAT, DNS. It basically is the ISP.

Waiting place for everyone will also be there, that is why the cafeteria is placed there, where people who are waiting can also take advantage of the delicious food and meals.

Diet Office is an area where food is supplied to the patients on the 2nd floor of the hospital via IP-Phone calls where each phone is assigned a number (1000, 2000, and 3000). These phones can also be accessed by the patients at the 2nd floor.

Since this is where the Kitchen will be, so in case the kitchen catches fire, 4 IoT devices are connected:

a) Camera's:

These cameras will work when the Motion detector detects someone coming inside.

b) Motion detector:

On when anyone enters or it might be an intruder who tries to enter.

c) Smoke detector's

When smoke more than 1 level is detected the siren automatically starts to beep and the fire sprinkler is automatically on.

d) Siren:

Starts when the smoke detector detects more smoke that's specified in the NTP Server.

e) Fire sprinklers:

Starts to water the area when smoke is detected.

Explanation of access layer's:

Since this floor is for the OT and normal wards patients, there should be a doctor's office situated nearby. I have configured a "local login" one for each doctor, this is because every doctor will have a list of patients he/she are treating and the patient's information in their PC (with their own login and password).

This office is then connected to the 1st floor ASA router, which has all the information of which patient is being treated and have paid and the 1st floor is further connected to the -1 floor /emergency floor.

Patient's room has a wireless router connected to Laptops in each room for the doctors to give them internet access while they are treating the patients. And each patient's room has phones connected to the cafeteria on the 1st floor.

Each phone is assigned a number (100, 200, and 300).

The mortuary/Emergency floor is where 2 cars are acting as ambulance's, an emergency door(which is always open).

An Access point which gives internet to many devices which is turn connected to a server(FTP AND SMTP) . This floor devices give all the details to the first floor trough the FTP or SMTP servers used devices making them aware who entered the emergency room and various kind of information's.

6) IMPLEMENTATION

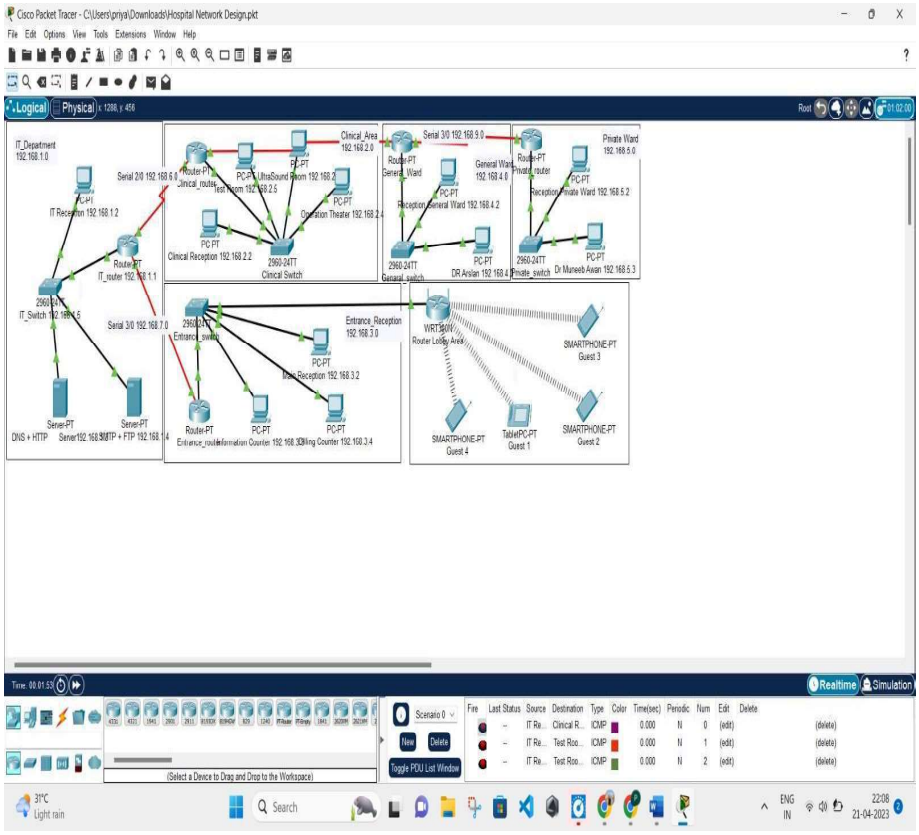
The implementation of the hospital network design project will involve several steps.

- The first step is to assess the existing network infrastructure and security measures. This assessment should include an examination of the hardware, software, and security systems currently in place. This assessment will provide an understanding of the current network and help to identify any potential weak points.

- The next step is to design and implement the new network. This will involve selecting appropriate hardware and software, as well as configuring the network to meet the hospital's needs. This will also involve establishing secure protocols and policies to ensure that the network is secure.

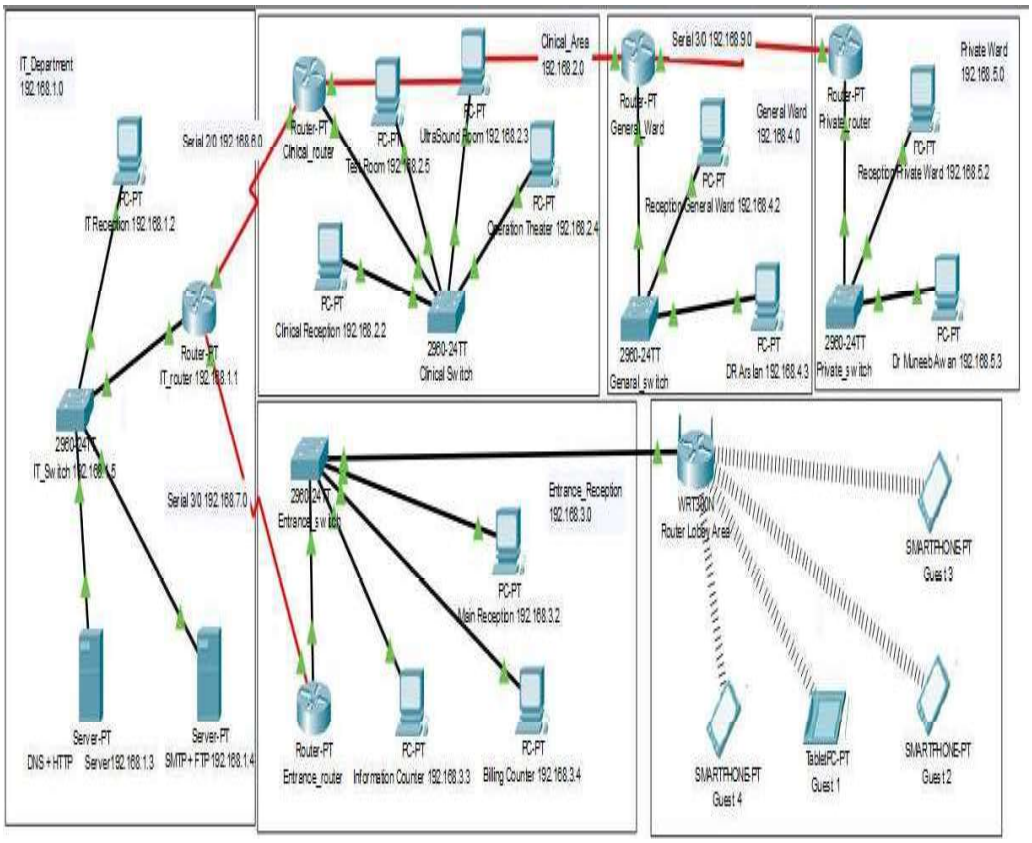
The final step is to provide training and support to ensure that all users are properly aware of the new network and security measures. This will help ensure that the hospital is able to effectively use the new network and keep its data secure.

7) EXPERIMENT OUTPUT



8) RESULT AND FUTURE ENHANCEMENT

This report describes how we have designed network topology of hospital (Health care Management System). With VLSM for Subnetting, segmented the diagram into 5 segments. This topology can also be implemented on higher level of hospitals.



9) REFERENCES

- https://www.netacad.com/
- CISCO PACKET TRACER
- Packet Tracer Network Design: https://www.cisco.com/c/en/us/td/docs/net_mgmt/packet_tracer/7_3/pt_73_network_design/pt_73_network_design_chapter_0101.html