Hospital Network Design

18CSS202J- Computer Communication Project Report

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BONAFIDE CERTIFICATE

Certified that this Course Project Report titled **"HOSPITAL NETWORK DESIGN"** is a bonafide work done by **Anushka Siddhu-RA2111026010214, Jephrin Esther-RA2111026010215, Jaswanth Sunkara-RA2111026010216, Shanmukh-RA2111026010217** 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.

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1. Abstract

In order to enable the delivery of healthcare services, it is essential to develop a secure, dependable, and scalable network infrastructure for hospitals. An overview of the hospital network architecture is given in this abstract, along with a discussion of its main concerns and difficulties.

Technology is a crucial component of healthcare delivery in the modern healthcare environment. Healthcare providers heavily rely on technology to connect with other healthcare professionals, store, manage, and distribute patient information, and offer care to patients. As a result, hospital network design has developed into a crucial activity requiring careful planning, technological know-how, and a thorough comprehension of the needs of the healthcare sector.

The hospital network design often entails a thorough examination of the hospital's requirements, including the quantity and categories of users.

The hospital network design typically involves a comprehensive analysis of the hospital's needs, including the number of users, types of applications, and data storage requirements. Based on these requirements, the network designer develops a network architecture that includes switches, routers, firewalls, servers, and storage devices.

In order to enable the delivery of healthcare services, it is essential to develop a secure, dependable, and scalable network infrastructure for hospitals. An overview of the hospital network architecture is given in this abstract, along with a discussion of its main concerns and difficulties.

Technology is a crucial component of healthcare delivery in the modern healthcare environment. Healthcare providers heavily rely on technology to connect with other healthcare professionals, store, manage, and distribute patient information, and offer care to patients. As a result, hospital network design has developed into a crucial activity requiring careful planning, technological know-how, and a thorough comprehension of the needs of the healthcare sector.

The hospital network design often entails a thorough examination of the hospital's requirements, including the quantity and categories of users.Another critical consideration in hospital network design is reliability. The network designer must ensure that the hospital network is designed to be highly available and can recover quickly from outages or other disruptions. This may involve implementing redundant components such as power supplies, network interfaces, and storage devices, as well as designing the network with fault-tolerance and failover capabilities.

2. Project Scope

A network proposal has to be designed for a hospital that has the following. There is a main block and three wards on the campus. The main block is the administrative block, where registration of new patients takes place. The main block has 3 floors. The hospital has identified hospital management software, which should be accessible to the employees. The software is installed on a server at the administrative block. On the ground floor, there are 10 computers in the billing section. On other floors, there is one computer user each. The farthest distance between the computer on the topmost floor and the ground floor is less than 70 meters. The wards have 3 floors each, with 5 computers on the ground floor of each ward. The distance between the wards and the blocks is less than 80 Meters. The computers in the wards may be increased based on future expansion plans.

3.Network Requirements

1. Hardware requirement analysis in main block with quantity.
2. Hardware requirements analysis in wards.
3. The employees should receive dynamic IP addressing from a central server.
4. Network should be loop free at Layer 2
5. Every computer should be able to access the hotel management software from each of the location using a fixed IP address.
6. IP Network design table.
7. Identify configurations on the hardware wherever appropriate.
8. Network topology diagram with necessary equipment's

4. Network Requirement Analysis

Hardware Requirement Analysis in Main Block with Quantity:

a) Server: One server is required to host the hospital management software. The server should have enough power, memory, and storage to run the software and support the large number of users accessing it at any given time. The server will have backup power sources and redundancy to store the data.

b) Switches: 3 switches are required to connect all the computers in the main block. The switches will have gigabit speeds and have enough ports to connect all the computers in the main block. The switches should also support VLANs to segregate traffic and increase security.

c) Computers: There are 10 computers in the billing section on the ground floor, and one computer user each on the other floors i.e. 30 computers will be required.

Hardware Requirements Analysis in Wards:

a) Switches: 3 switches are required for each ward to connect all the computers in each ward. The switches will have gigabit speeds and have enough ports to connect all the computers in each ward. The switches should also support VLANs to segregate traffic and increase security.

b) Computers: Each ward has 5 computers on the ground floor i.e 15 computers in each ward. The number of computers in each ward may be increased based on future expansion plans.

Dynamic IP Addressing:

All computers in the network receive dynamic IP addressing from a central server. This ensures that the hospital network will manage the IP addresses more efficiently. The DHCP server is configured to lease IP addresses for a specified amount of time and have a pool of IP addresses available to handle the expected number of users.

Loop-Free Network:

The network should be loop-free at Layer 2 to prevent any network loops and broadcast storms. By using Spanning Tree Protocol (STP) we can implement a loop-free network.

Fixed IP Address Access to Hospital Management Software:

All computers will be able to access the hospital network by using a fixed IP address. This ensures that all employees can access the hospital records easily without any setbacks. The fixed IP addresses is assigned to each computer based on its location and subnet.

IP Network Design Table:

The IP network design table should include the following information:

a) IP Address range for the hospital network: The IP address range is based on the number of computers in the network and the subnets in the hospital.

b) Subnet Mask for each subnet: Subnets and consequently choosing suitable subnet masks which can accommodate necessary hosts are crucial aspects that need attention.

c) Gateway IP Address for each subnet: The gateway IP addresses serve as connections across different subnets via connecting every single existing subnet device through its assigned router.

d) DHCP Server IP Address: The key role of assigning unique IP addresses to different networking devices lies with the DHCP server, without which network communication would become virtually impossible. It is incumbent upon us to assign a specific IP address than can assist all connected devices in locating this server effortlessly.

Hardware Configurations:

Hardware configurations should be identified wherever appropriate. For example, the switches should be configured with VLANs to segregate traffic and increase security. The switches are configured with Quality of Service (QoS) to prioritize certain types of traffic such as voice.

Network Topology Diagram:

The network topology diagram should include all the devices in the hospital network and their connections. The diagram depicts the main block, wards, switches, computers, and the server. The diagram shows the VLANs and subnets that are implemented in the hospital network in order to allow for connectivity of the devices.

Hardware analysis

a) Server: One server is required to host the hospital management software. The server should have enough processing power, memory, and storage capacity to handle the software and support the number of concurrent users. The server should also have redundancy and backup systems in place to ensure high availability and data protection.

b) Switches: 3 switches are required to connect all the computers in the main block. The switches should support at least gigabit speeds and have enough ports to connect all the computers in the main block. The switches should also support VLANs to segregate traffic and increase security.

c) Computers: There are 10 computers in the billing section on the ground floor, and one computer user each on the other floors. So, a total of 30 computers are required in the main block. The computers should have enough processing power, memory, and storage capacity to handle the hospital management software and support the users' needs. The computers should also have antivirus and firewall software installed to ensure security and protection against malware and cyber-attacks.

Hardware Requirements Analysis in Wards:

a) Switches: 3 switches are required for each ward to connect all the computers in each ward. The switches should support at least gigabit speeds and have enough ports to connect all the computers in each ward. The switches should also support VLANs to segregate traffic and increase security.

b) Computers: Each ward has 5 computers on the ground floor. So, a total of 15 computers are required in each ward. The computers should have enough processing power, memory, and storage capacity to handle the ward-specific software and support the users' needs. The computers should also have antivirus and firewall software installed to ensure security and protection against malware and cyber-attacks. The number of computers in each ward may be increased based on future expansion plans.

5. Network Configuration Guidelines

DHCP server: The medical institution should have a DHCP server hooked up to the administrative block's server that hosts the hospital management software program. The DHCP server is configured to lease IP addresses for a specific time period and feature a pool of IP addresses to be had to address the anticipated wide variety of customers.

IP cope with variety: The hospital's community ought to be assigned a completely unique IP to cope with variety. This variety is determined based on the range of subnets required, the whole range of computer systems, and destiny enlargement plans.

Subnet masks: The subnet mask should be configured primarily based on the variety of hosts required in every subnet. For example, the subnet mask for the primary block and every ward ought to be configured to accommodate the whole number of computer systems and future enlargement plans.

VLANs: VLANs must be configured to segregate site visitors and boom security. All switches within the community need to be configured with VLANs.

Link aggregation: The switches have to be configured to support link aggregation to offer redundancy and boom community bandwidth.

Gateway IP copes with The gateway IP cope with must be assigned to the router interface that connects every subnet. The gateway IP cope with should be the same for all gadgets at the same subnet.

DNS server: The clinic ought to have a DNS server mounted at the administrative block's server. The DNS server ought to be configured to deal with all DNS requests for the sanatorium's community.

Antivirus and firewall software: All computers ought to have antivirus and firewall software programs installed to make certain protection and protection against malware and cyber-assaults.

Future growth: The network needs to be designed to deal with destiny expansion plans. This consists of increasing the wide variety of computers inside the wards and doubtlessly adding new wards or buildings to the community.

6. IP Network Design Table

Subnet	IP Address Range	Subnet Mask	Gateway IP Address	DHCP Server IP Address
Main Block	192.168.10.0 - 192.168.10.255	255.255.255.0	192.168.10.1	192.168.10.10
Ward 1	192.168.20.0 - 192.168.20.255	255.255.255.0	192.168.20.1	192.168.20.10
Ward 2	192.168.30.0 - 192.168.30.255	255.255.255.0	192.168.30.1	192.168.30.10
Ward 3	192.168.40.0 - 192.168.40.255	255.255.255.0	192.168.40.1	192.168.40.10

7.Network Topology Diagrams

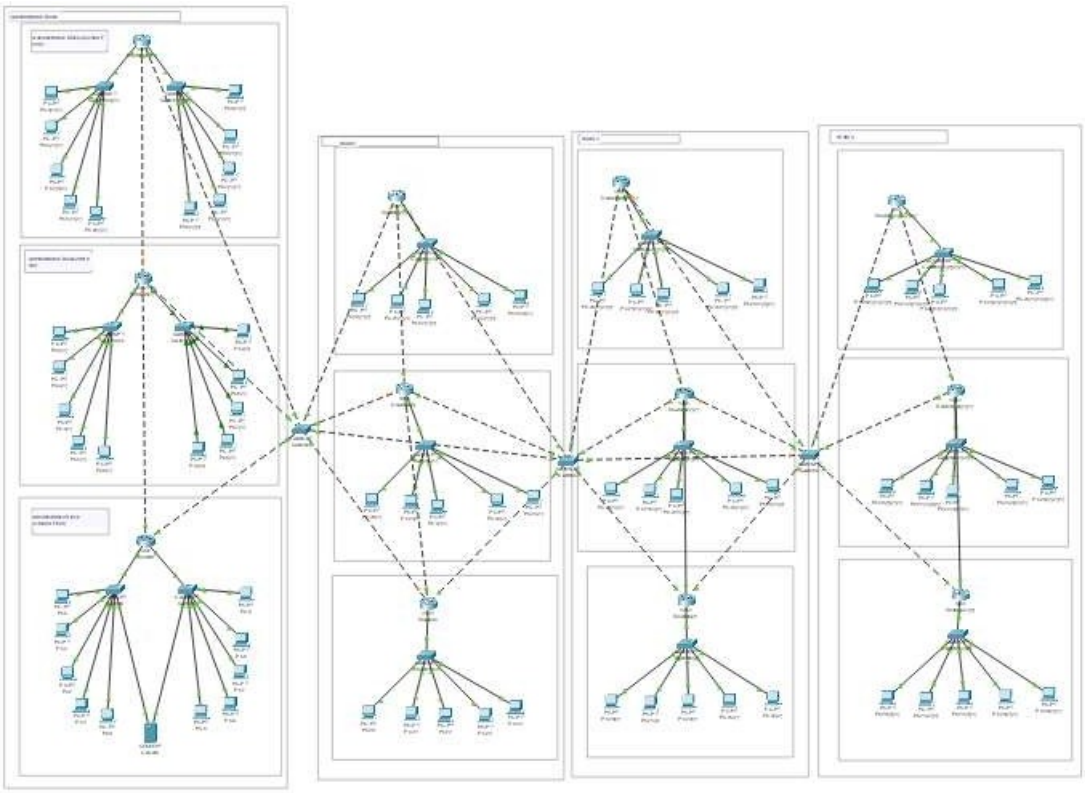

Fig-7.1 Network Topology

Wards

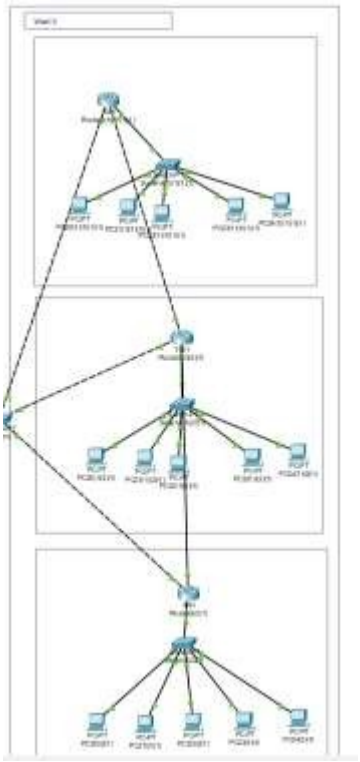

Fig- 7.2 Wards

Main Block

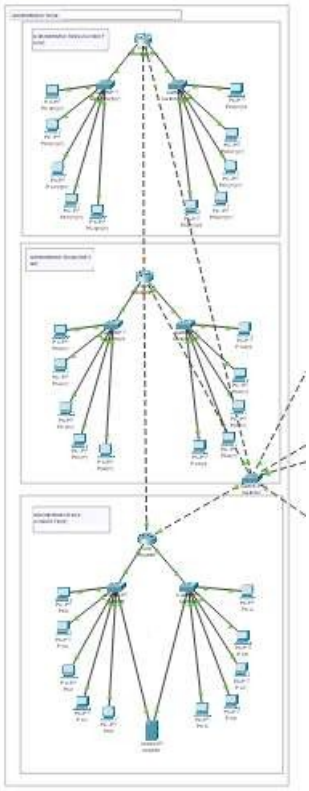

Fig- 7.3 Main Block

8. Network Testing and Verification

he following network design shows the implementation of a hospital network system. In the network, a person can access the central server present at a different location. The network can be further expanded due to the implementation of DHCP, this protocol allows new users to be added with ease.

9.Hardware Inventory

Main Block

1.Server-1

2.Switches-3

3.Router-3

4.Computers-30

5.Copper straight through cables

6.Copper crossover

Wards

For 3 wards:

1.Router-3

2.Switches-3

3.Computers-15

10. RESULTS

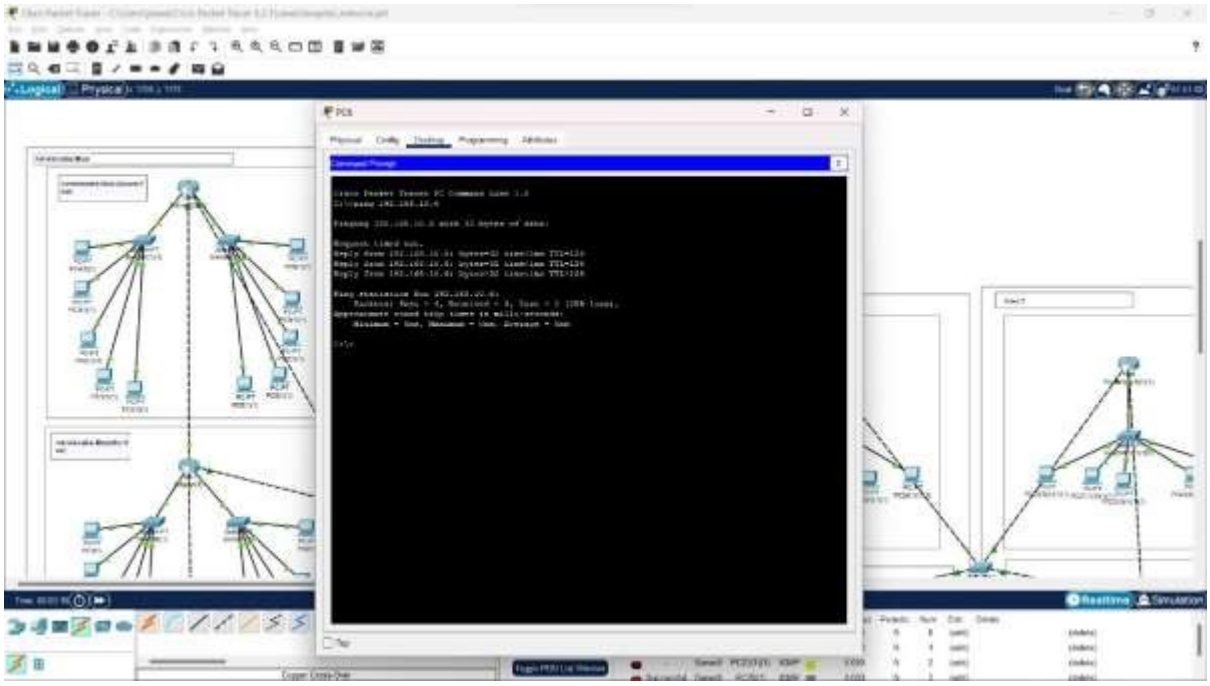

Fig – 10.1 Pinging from one pc to another

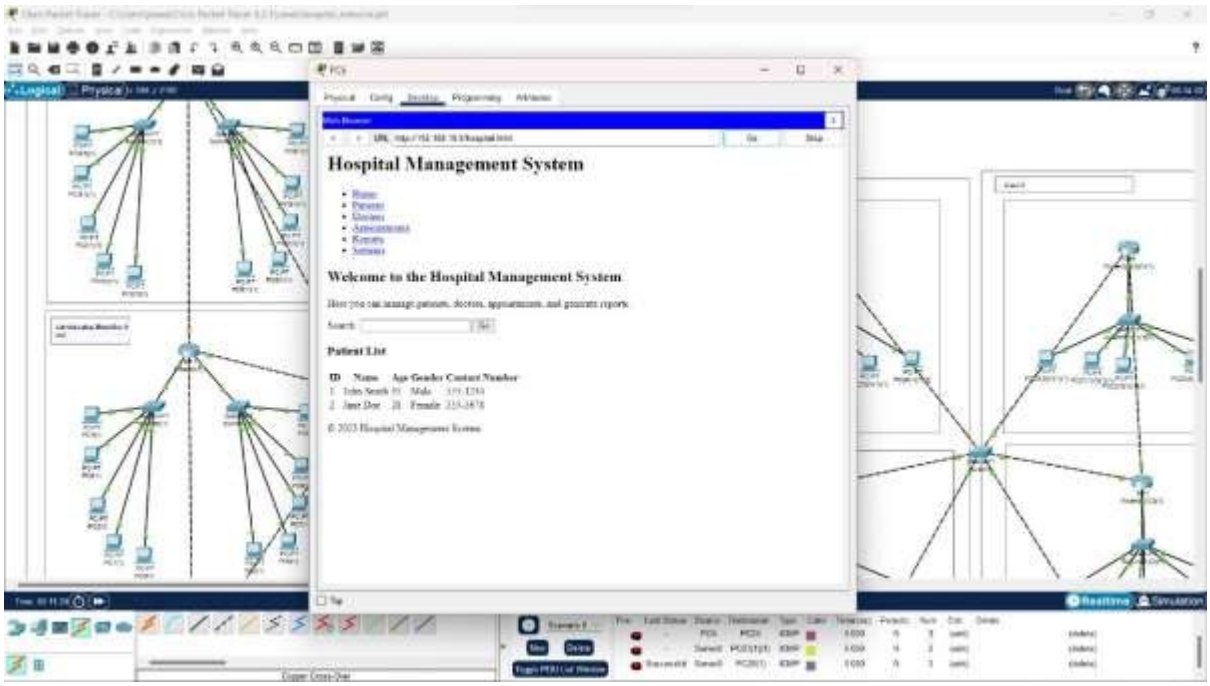

Fig – 10.2 Application server

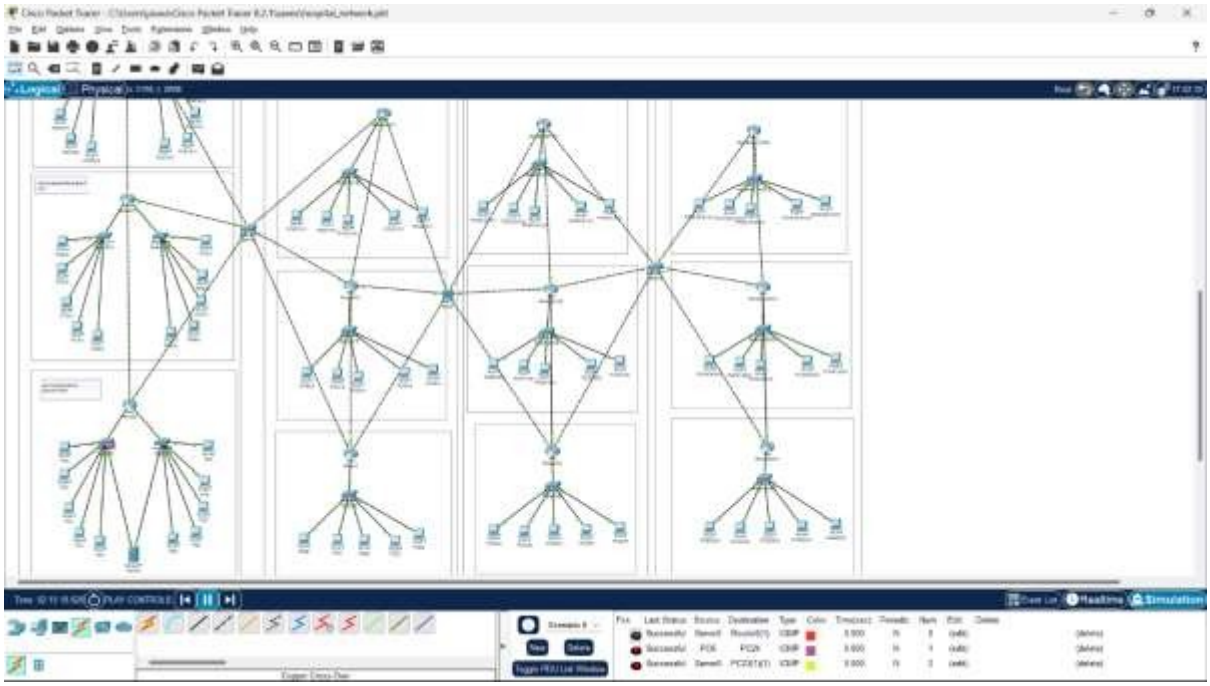

Fig – 10.3 Topology

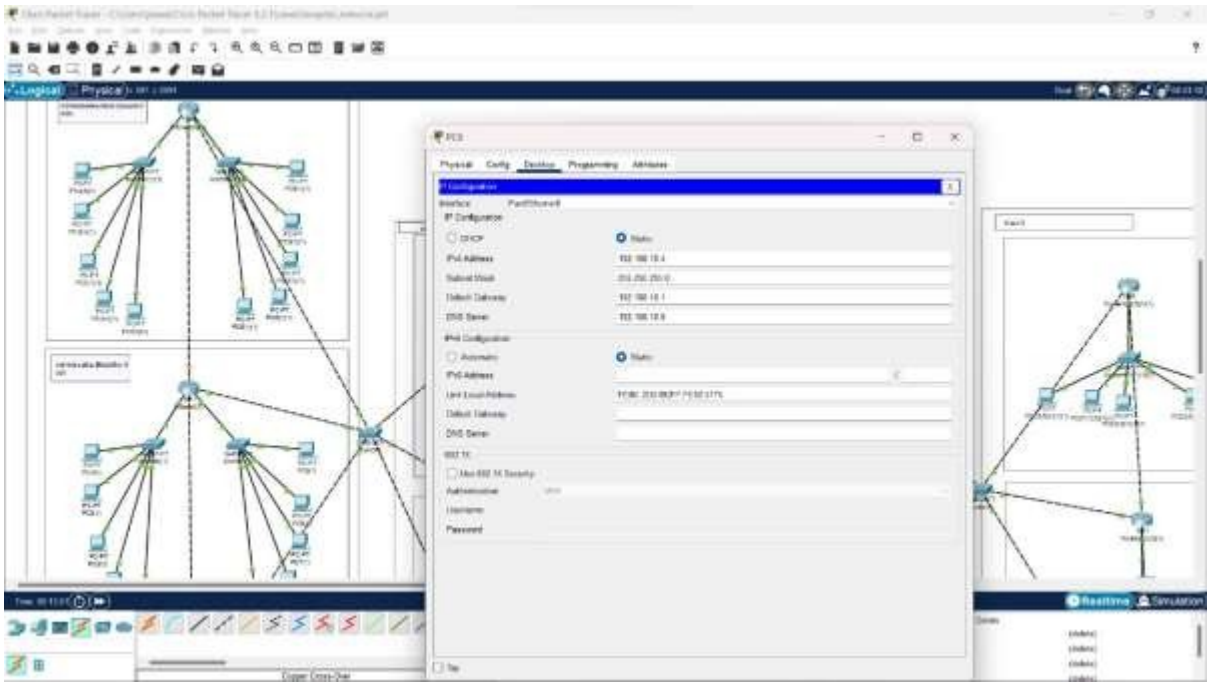

Fig – 10.4 Use of DNS

11.CONCLUSION

In conclusion, our suggested hospital network design provides a thorough and reliable response to satisfy the intricate demands of contemporary healthcare systems. We have created a design that puts efficiency, security, scalability, and patient care as top priorities after carefully examining the hospital's requirements and challenges.

Our design integrates cutting-edge networking infrastructure and technologies, such as high-speed connectivity, dependable data storage and backup systems, and seamless medical device and system integration. Through effective communication, quicker processes, and safe access to patient information, various hospital departments and locations will be made possible.

The hospital will gain some important advantages by implementing our suggested network configuration. These include increased operational effectiveness, stronger interprofessional communication, quicker access to patient data, and ultimately, better patient outcomes.

The hospital's financial restrictions have been carefully studied, and we have offered a cost-effective solution that maximises value without sacrificing quality or functionality. Furthermore, our design is future-proof, allowing the hospital's network to adapt and grow to accommodate expansion and technological advancements.

12. REFERENCE LINKS

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