2024

COMPUTER NETWORK

PROJECT : HOTEL CHAIN NETWORK

Presented By :

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Dept : CSE
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Year : 3RD

A Progress Report

on

Hotel Chain Network

carried out as a part of the course Computer Network Lab CSE20222

Submitted by

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In

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Certificate

This is to certify that the project entitled 'Hotel Chain Network' is a bonafide work carried out as part of the course Computer Networks Lab, is developrd by students Md Faizan Ahmer and Md Ekramuddin of B.Tech in Computer Science and Engineering, 6th Semester at the Department of Computer Science & Engineering, Aliah University, during the academic semester 6, in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology in Computer Science & Communication Engineering, at Aliah University, Kolkata.

The project demonstrates a comprehensive understanding and practical application of key concepts in computer networks, reflecting our dedication and hard work throughout the semester. The team has shown commendable teamwork and technical skills in designing and implementing the 'Hotel Chain Network' project, which aligns with the academic standards and objectives set by the department.

Further, we declare that we will not share, re-submit, or publish the code, idea, framework, and/or any publication that may arise out of this work for academic or profit purposes without obtaining the prior written consent of the Course Faculty Mentor and Course Instructor. This ensures the integrity and originality of the work, maintaining the academic ethics and standards of Aliah University.

Place: Aliah University, Kolkata

Abstract

The Hotel Chain Network project is an initiative to explore and enhance the networking infrastructure within multiple branches of the Crimson Hotels chain, which has locations in Delhi, Mumbai, and Jaipur. This project seeks to understand how the various departments within these branches—Reception, Reservation, Accounts, Food and Beverage, and Guest Rooms—communicate and coordinate to ensure smooth operations and exceptional guest services. By examining the existing network setups and identifying areas for improvement, the project aims to develop a more robust and efficient network architecture. This includes implementing high-speed internet connectivity, secure communication channels, and advanced collaboration tools. Additionally, the project will focus on enhancing data security to protect sensitive information and comply with industry regulations. Ultimately, the goal is to improve operational efficiency, streamline departmental interactions, and enhance the overall guest experience across all branches of Crimson Hotels.

Table of Content

Network Components

What is packet tracer?

Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command-line interface. Packet Tracer makes use of a drag-and-drop user interface, allowing users to add and remove simulated network devices as they see fit. The software is mainly focused on Certified Cisco Network Associate Academy students as an educational tool for helping them learn fundamental CCNA concepts. Previously students enrolled in a CCNA Academy program could
freely download and use the tool free of charge for educational use.

●Router

A router is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network Layer device. Routers normally connect LANs and WANs together and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divides broadcast domains of hosts connected through it.

● Switch

A network switch (also called switching hub, bridging hub, officially MAC bridge is networking hardware that connects devices on a computer network by using packet switching to receive and forward data to the destination device. A network switch is a multiport network bridge that uses MAC addresses to forward data at the data link layer (layer 2) of the OSI model. Some switches can also forward data at the network layer (layer 3) by additionally incorporating routing functionality. Such switches are commonly known as layer-3 switches or multilayer switches.

● Network Packet

A network packet is a formatted unit of data carried by a packet-switched network. A packet consists of control information and user data, which is also known as the payload.

● Server

A server is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network. In theory, whenever computers share resources with client machines they are considered servers. There are many types of servers, including web servers, mail servers, and virtual servers.

Many networks contain one or more of the common servers. The servers used in our project are

as
follows:

➢ DNS Server

DNS stands for Domain Name System servers which are application servers that provide a human-friendly naming method to the user computers in order to make IP addresses readable by users. The DNS system is a widely distributed database of names and other DNS servers, each of which can be used to request an otherwise unknown computer name. When a user needs the address of a system, it sends a DNS request with the name of the desired resource to a DNS server. The DNS server responds with the necessary IP address
from its table of names.

➢ WEB Server

One of the widely used servers in today's market is a web server. A web server is a special kind of application server that hosts programs and data requested by users across the Internet or an intranet. Web servers respond to requests from browsers running on client computers for web pages, or other web-based services.

➢ EMAIL Server

An e-mail server is a server that handles and delivers e-mail over a network, using standard email protocols. For example, the SMTP protocol sends messages and handles outgoing mail requests. The POP3 protocol receives messages and is used to process incoming mail. When you log on to a mail server using a webmail interface or email client, these protocols handle all the connections behind the scenes.

● Wireless Network

A wireless network broadcasts an access signal to the workstations or PCs. This enables mobility among laptops, tablets, and PCs from room to room while maintaining a firm network connection continuously. A wireless network also presents additional security requirements.

● Ethernet

This is the backbone of our network. It consists of the cabling and is typically able to transfer data at a rate of 100mb/s. It is a system for connecting a number of computer systems to form a local area network, with protocols to control the passing of information and to avoid simultaneous transmission by two or more systems. Among the different types of ethernet, we have used Gigabit Ethernet, which is a type of Ethernet network capable of transferring data at a rate of 1000 Mbps and fast Ethernet is a type of Ethernet network that can transfer data at a rate of 100 Mbps.

● Computing Device

Computing devices are the electronic devices that take user inputs, process the inputs, and then provide us with the end results. These devices may be Smartphones, PC Desktops, Laptops, printer, and many more.

- Internet Protocol

Internet Protocol (IP) is one of the fundamental protocols that allow the internet to work. IP addresses are a unique set of numbers on each network and they allow machines to address each other across a network. It is implemented on the internet layer in the IP/TCP model.

- SSH Protocol

Secure Shell enables a user to access a remote device and manage it remotely. However, with SSH, all data transmitted over a network (including usernames and passwords) is encrypted and secure from eavesdropping.
SSH is a client-server protocol, with an SSH client and an SSH server. The client machine (such as a PC) establishes a connection to an SSH server running on a remote device (such as a router). Once the connection has been established, a network admin can execute commands on the remote device.

- Benefits of wireless networking over wired networking

To better understand the wide usage of wireless networking in today's world, is to start with the benefits it has over traditional wired networking is crucial for our project implementation. Some major aspects have been stated below that show the various advantages of a wireless network over wired ones.

1. Mobility

   One of the major advantages of wireless is mobility. Users have the freedom to move within the area of the network with their computing devices staying connected to a network without being concerned about the cable connection.

2. Less Hassle

   The wireless network helps in the reduction of large amounts of cables or wire
   s which
   becomes chaotic and difficult to maintain, it makes the connection hassle-free.

3. Accessibility

   Provide network access across your organization, even in areas that have been challenging
   to reach with the wired network, so your entire team can stay in touch.

4. Expandability
   The wireless network helps in the expansion of the network to a wide range by adding multiple new users and locations without additional need to run cables and wires.

5. Guest Access
   Offer secure network access to guest users, including customers and business partners, while keeping your network resources protected.

With lots of advantages, there come disadvantages as well, like security issues which can be resolved using strict protection passwords. Also, the Speed of wireless networks is considered to be slow and having low bandwidth when compared to the direct cable connection networks.

- Simulation Environment

The simulations of our network topology can be easily achieved using cisco packet tracer. Using a simulation mode, you can see packets flowing from one node to another and can also click on a packet to see detailed information about the OSI layers of the networking. Packet Tracer offers a huge platform to combine realistic simulation and visualize them simultaneously. Cisco Packet Tracer makes learning and teaching significantly easier by supporting multi-user collaboration and by providing a realistic simulation environment for experimenting with projects.

In order to make our project understandable, we have divided the content into steps. They are as follows:

1. Software and hardware requirements

Before heading towards the implementation we need to make sure of the following requirements.

- A proper workstation (any mid-high range laptop will suffice).
- Packet Tracer by Cisco
- 2 GB RAM.

● Any 10,000+ Average CPU Mark scored processor.
● 500 MB of dedicated hard disk space. ● USB 3.0+ port.

2. Brief knowledge about our approach

The proposed wireless network is implemented for a university campus. We have made a virtual visualization of the network using the Cisco Packet tracer which provides a huge platform for users to test their projects using simulation tools. A Wireless network in an educational campus makes it easier for teachers and students to access educational resources, by enabling an important platform to exchange information.

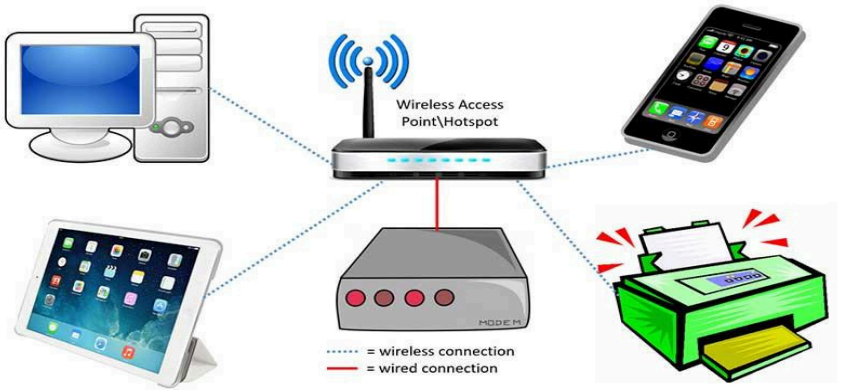


Figure 1: Shows the wireless connection access by various tool

3. Network Requirements

Crimson Hotel outline is considered for this wireless university network. The network is divided into 2 areas :

Hotel Area

The Hotel area is further divided into Boys blocks and Girls blocks respectively.

System Used

CPU: Intel Pentium 4, 2.53 GHz or equivalent
OS: Microsoft Windows 7, 8.1, 10, Linux Ubuntu 18.04.3 LTS (Ubuntu 16.04 and 14.04 LTS are no longer supported)
RAM: 2 GB
Storage: 500 MB of free disk space
Display resolution: 1024 x 768
Language fonts supporting Unicode encoding (if viewing in languages other than English)
Latest video card drivers and operating system updates
Cisco Packet Tracer 7.3

Devices Used In The Network

Devices

1) Router (1941)

2) Switches (2960-24TT)

3) EMAIL server

4) DNS server

5) WEB server (HTTP)

6) Wireless Device (Access Point)

7) PCs

8) Laptops

9) Smartphones

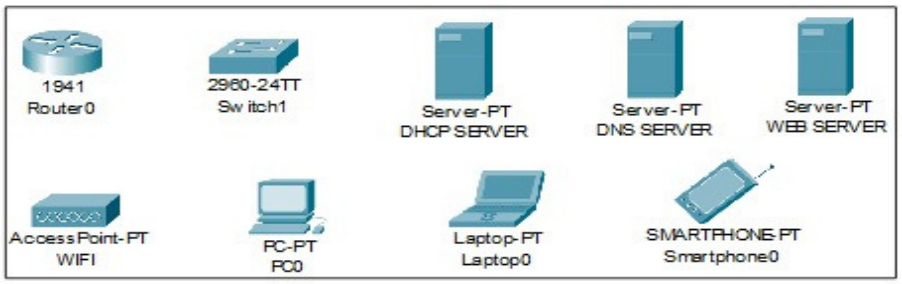


Figure 3: Devices used in the network

Project
Hotel Chain Design

Introduction to Project

Scope of Work

There are three main routers for each city, and they are connected to one central router, which is further connected to the dns and http servers. The main routers are then connected to the switches/wireless access points designated for the departments via a main switch. The department switches are connected to the end devices. There is also a wireless network facility for the rooms and food court for the guests to use. The data related to the hotels and its website is stored on the central web server. The website www.crimsonhotels.in is the website for our hotel chain.

Network Scenarios

- optimal path for data transfer

  Open Shortest Path First (OSPF) is a link-state routing protocol that is used to find the best path between the source and the destination router using its own Shortest Path First). OSPF is developed by Internet Engineering Task Force (IETF) as one of the Interior Gateway Protocol (IGP), i.e, the protocol which aims at moving the packet within a large autonomous system or routing domain. It is a network layer protocol which works on the protocol number 89 and uses AD value 110. OSPF uses multicast address 224.0.0.5 for normal communication and 224.0.0.6 for update to designated router(DR)/Backup Designated Router (BDR). example: A packet is to be transferred from pc3(delhi area) to pc23(jaipur area), using its ospf protocol it is transferred via router4, then router8, then router6, and finally pc23, but if the connection between router8 and router6 is removed, it opts another path. that is now the same packet is transferred via router 4 , then router 6 and then to then destination pc23.

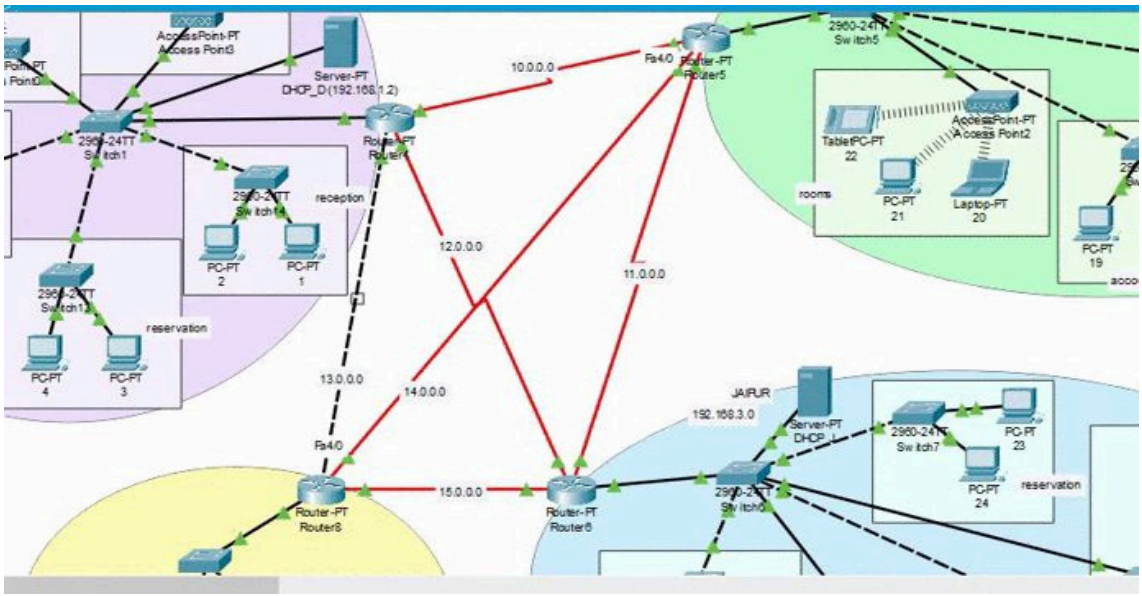


fig1. packet transfer between pc4(delhi network) to pc23(jaipur network)

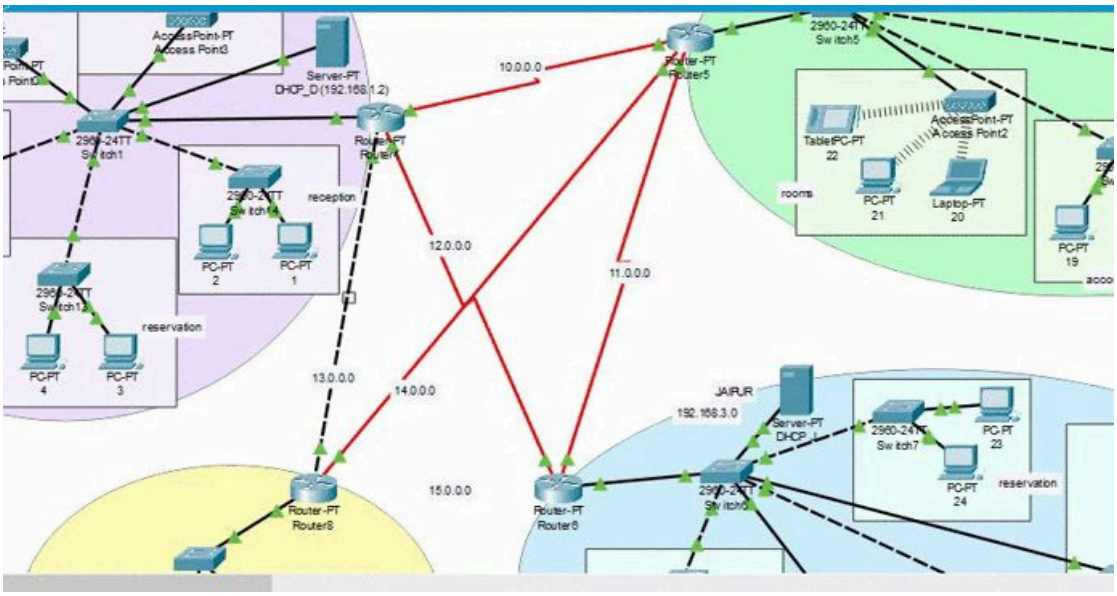


fig2. packet transfer between pc4(delhi network) to pc23(jaipur network), if a network disconnects

- **wireless access**

  Wireless networks are computer networks that are not connected by cables of any kind. The use of a wireless network enables enterprises to avoid the costly process of introducing cables into buildings or as a connection between different equipment locations. To configure wireless connections in rooms and food court areas, we have used wireless access points, ssid and password and the ports are switched on.To configure end devices, WMP300N module is integrated to the device(PCs, laptops), which provides wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN access.now end devices connects to the nearest wireless access point by typing in ssid and password.

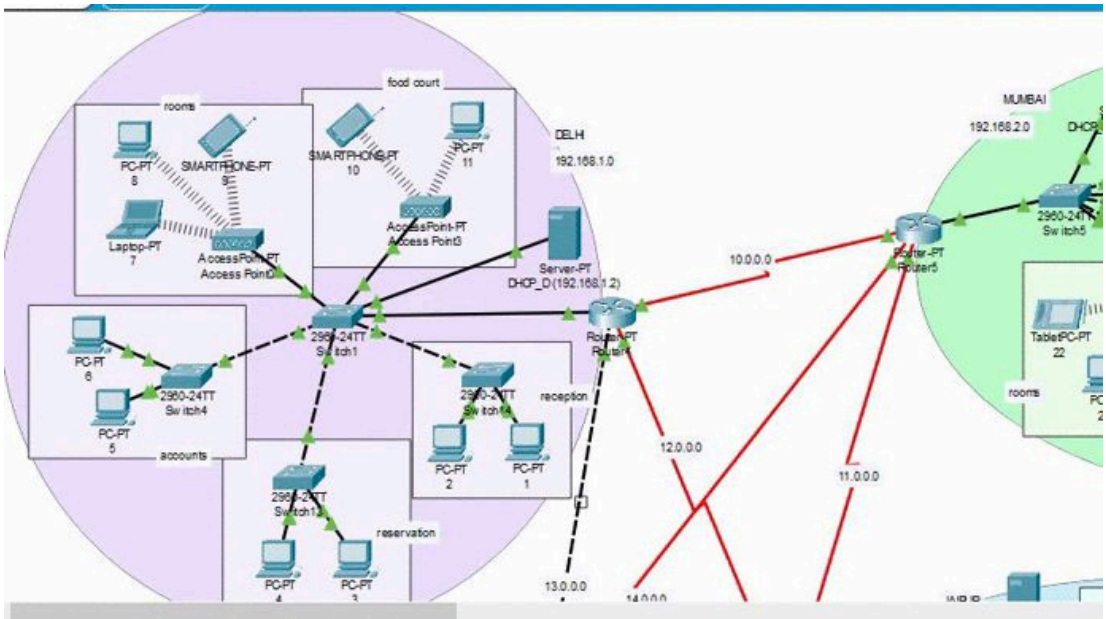


fig3. packet transfer between pc9 to pc11

- **accessing website**

  A DNS server is a computer server that contains a database of public IP addresses and their associated hostnames, and in most cases serves to resolve, or translate, those names to IP addresses as requested. A web server is server software, or hardware dedicated to running this software, that can satisfy client requests on the World Wide Web. A web server can, in general, contain one or more websites. A web server processes incoming network requests over HTTP and several other related protocols.

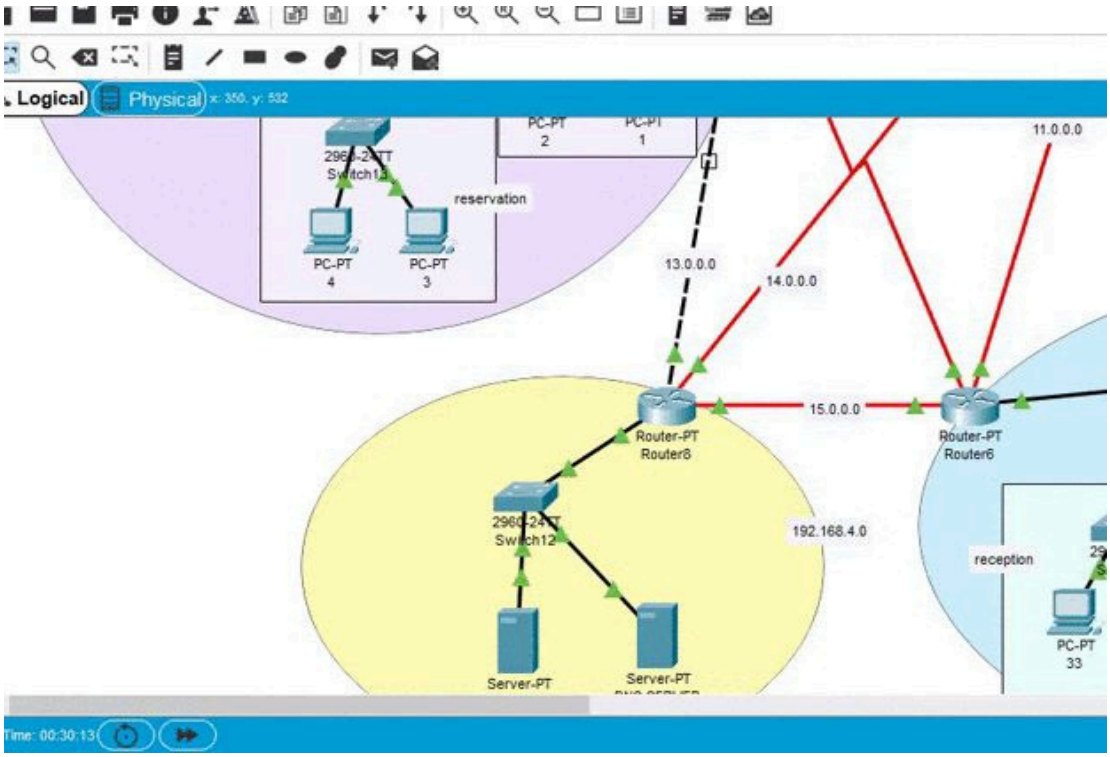


fig3. user can browse to hotel's website using url

Requirement Analysis

Functional Analysis

- Correct delivery of data packets from source to destination
- data packets takes optimal path, and packets reaches the destination even if any router aur connecting devices stops functioning
- ip address are assigned dynamically by dhcp server
- wireless connections are provided in rooms and food court area for guests
- The users can browse the hotel website at www.crimsonhotels.in using their web browsers.
- hotel staff can access server and view/store/update/delete data

Non-Functional Analysis

- Usability Requirement : The network allows the users to tranfer/access data from any device to another. It allows to access the company website and data from a central HTTP server.
- Availability Requirement : The network should be available 100% for the user and is used 24 hrs a day and 365 days a year.
- Efficiency Requirement : Ospf Routing protocol is used to ensure fast and efficient delivery of packets.
- Accuracy : The system accurately delivers packet to the destination ip adresses. The system shall provide 100% access reliability.
- Performance Requirement : The topology needs some time to load the address and information on opening the simulation device, Packet tracer or when updation of the routing table occurs. But in real application its performance will be good.
- Reliability Requirement : The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete delivery of data packets.

Use case scenarios

- **transfer of packets**

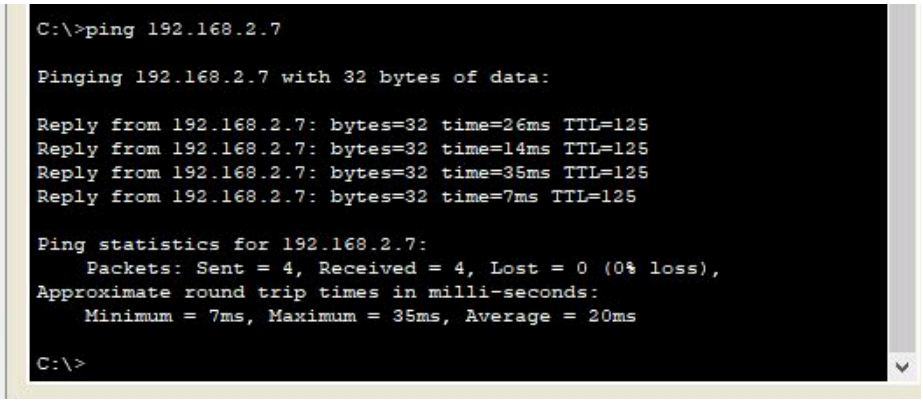


fig4. Pinging a wirelessly connect PC (in Delhi) to a wired PC in Mumbai

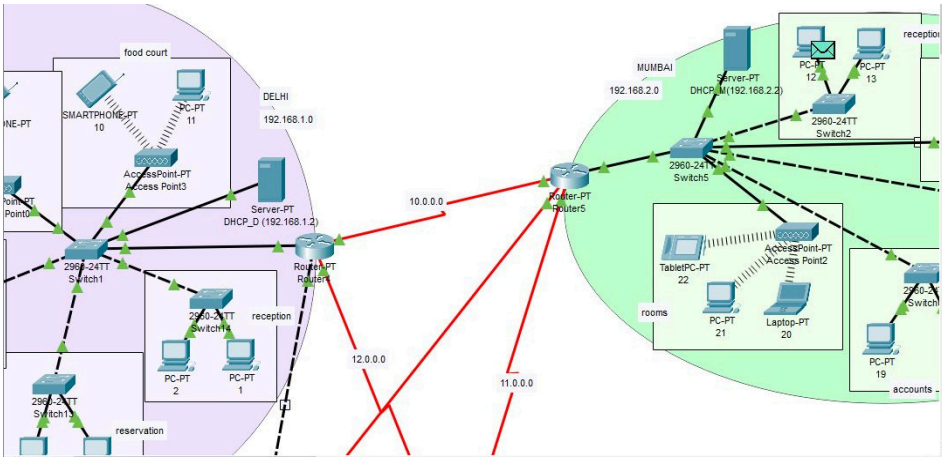


fig5 Sending a PDU from Smartphone PT10 in Delhi to PC-PT12 in Mumbai. PDU received

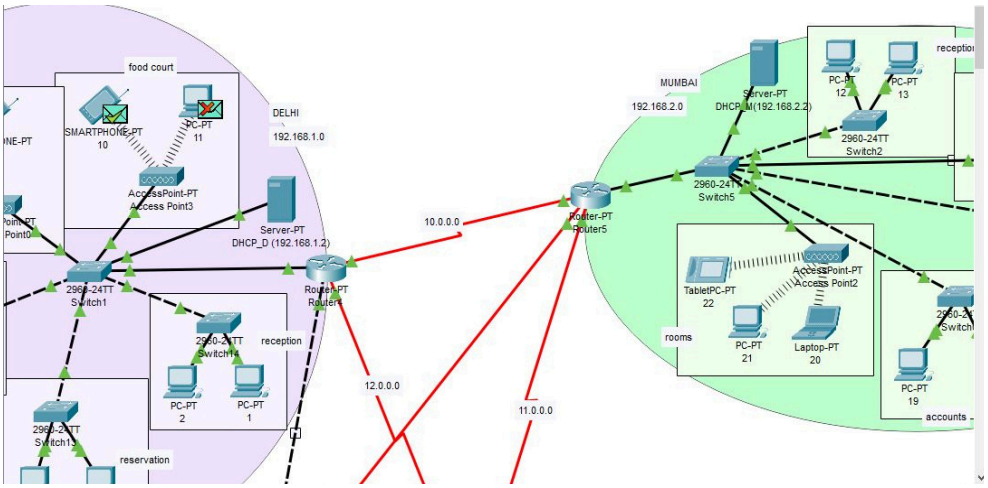


fig6. Acknowledgement of PDU received. Transmission complete.

- **accessing hotel website**

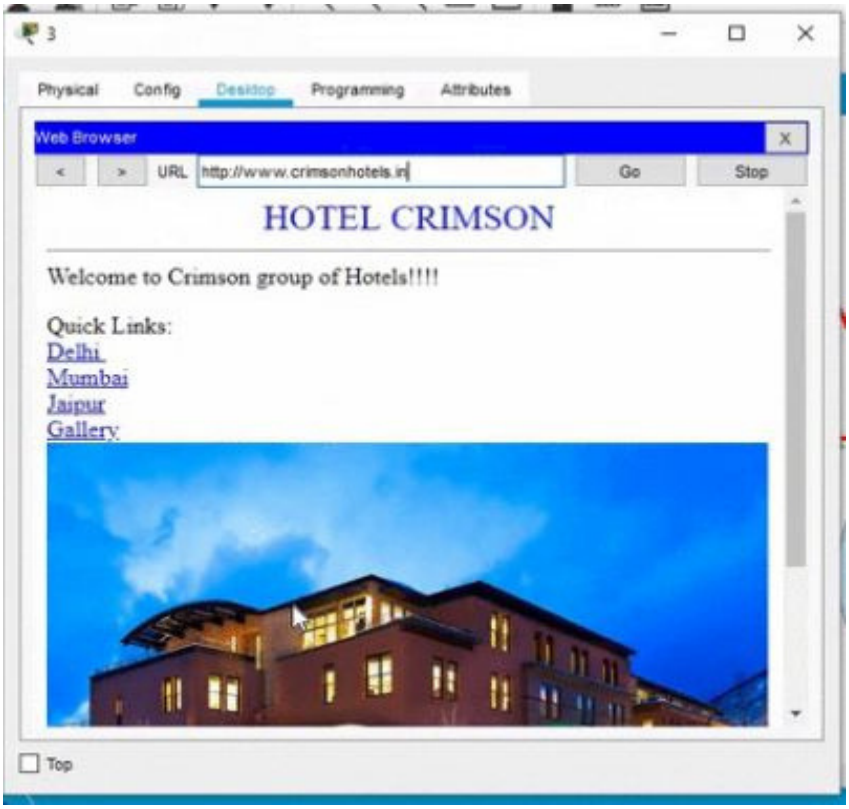


fig9. Web browser window on end device(pc,laptop,tablets,smartphones)

System Design

Design Goals

Our aim is to design a network in an efficient way, so we can communicate with the least cost, and least complexity. We plan to design the system in such a way that manual handling is least, and dynamism is maximum.

System Requirements

- CPU: Intel Pentium 4, 2.53 GHz or equivalent
- OS: Microsoft Windows 7, 8.1, 10, Linux Ubuntu 18.04.3 LTS (Ubuntu 16.04 and
- 14.04 LTS are no longer supported)
- RAM: 2 GB
- Storage: 500 MB of free disk space
- Display resolution: 1024 x 768
- Language fonts supporting Unicode encoding (if viewing in languages other than
- English)

  Latest video card drivers and operating system updates

  Cisco Packet Tracer 7.3

Detailed Design Methodologies

step1: The topology is designed in the following manner:

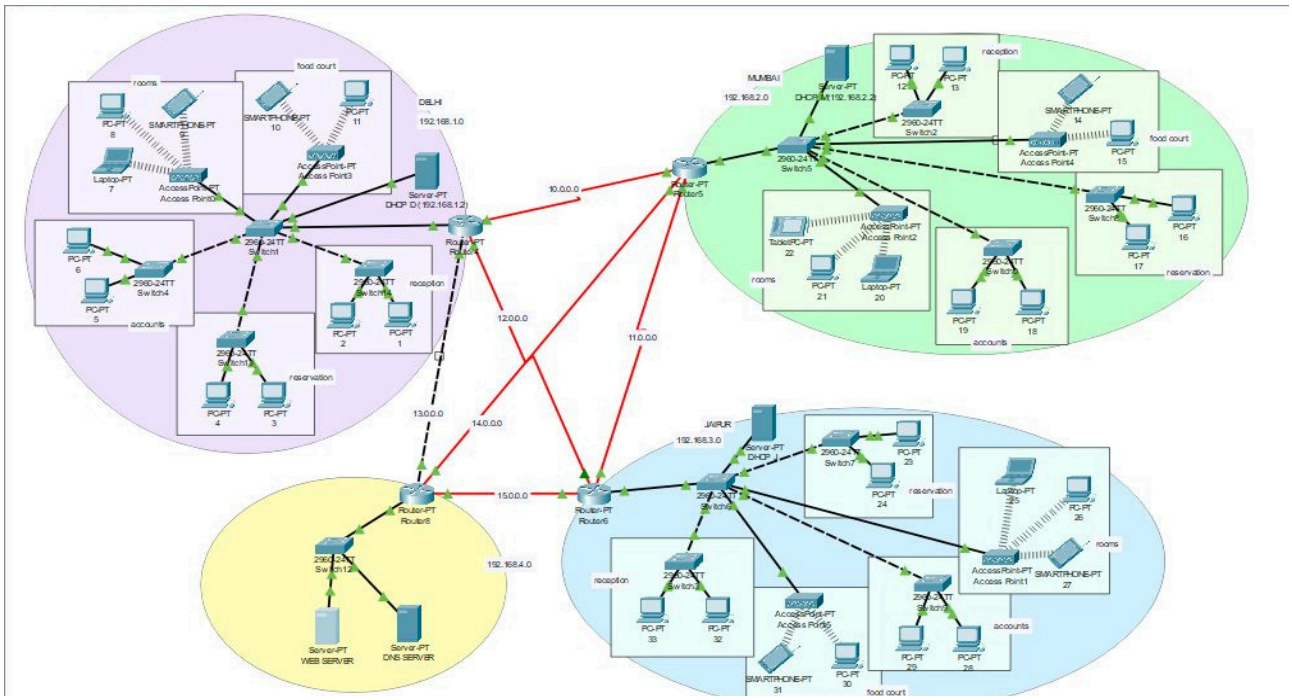
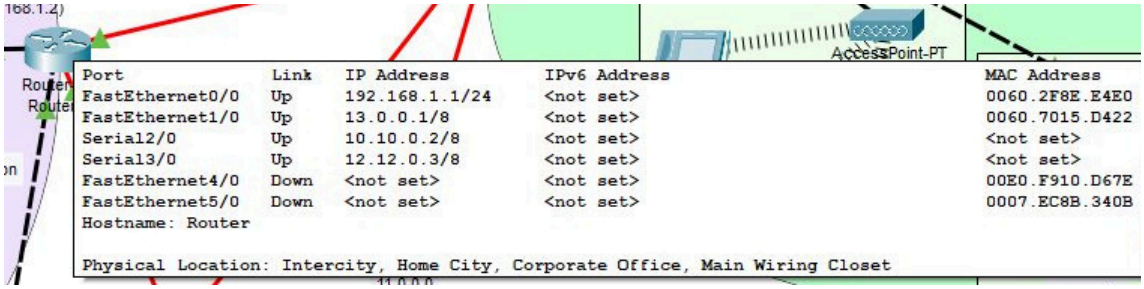


fig10. The Crimson Hotel Chain Topology

step2 The routers are configured on the fastethernet and serial interfaces.



Port	Link	IP Address	IPv6 Address	MAC Address
FastEthernet0/0	Up	192.168.1.1/24	<not set>	0060.2F8E.E4E0
FastEthernet1/0	Up	13.0.0.1/8	<not set>	0060.7015.D422
Serial2/0	Up	10.10.0.2/8	<not set>	<not set>
Serial3/0	Up	12.12.0.3/8	<not set>	<not set>
FastEthernet4/0	Down	<not set>	<not set>	00E0.F910.D67E
FastEthernet5/0	Down	<not set>	<not set>	0007.EC8B.340B

Hostname: Router

Physical Location: Intercity, Home City, Corporate Office, Main Wiring Closet

fig11. Delhi Router Configurations

City	Network Address
Delhi	192.168.1.0
Mumbai	192.168.2.0
Jaipur	192.168.3.0
Central Network (DNS and web servers)	192.168.4.0

Table1: Network addresses for the cities

step3: The IP addresses to the end devices are assigned dynamically using the DHCP (Dynamic Host Configuration Protocol) via a server. For example, in Delhi, a server pool is created with the Starting address as 192.168.1.3 and default gateway as 192.168.1.1.

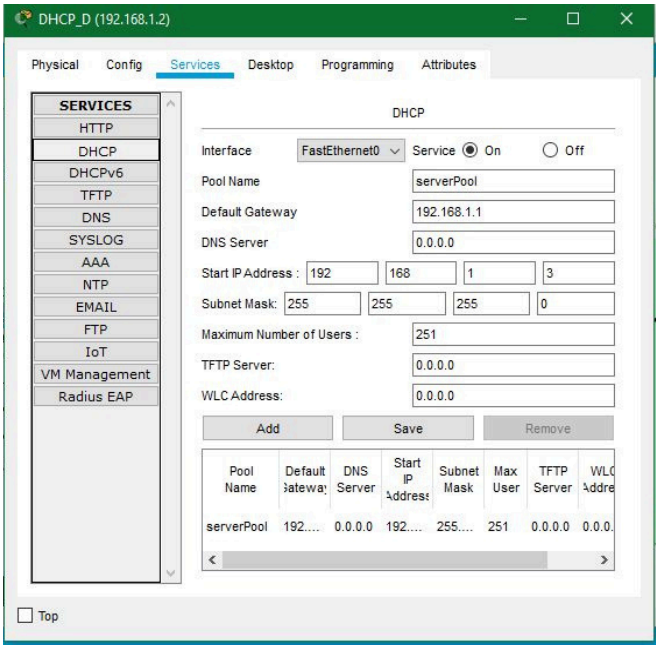


fig12. DHCP configuration at Delhi Server

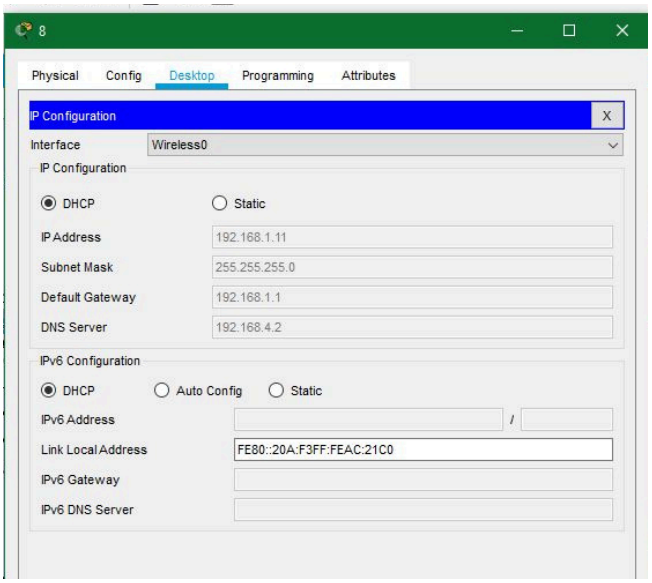


fig13. IP configuration at end device i.e. PC using DHCP

step4: The routers are routed using a dynamic protocol, OSPF (Open Shortest Path First), which minimises the costs.

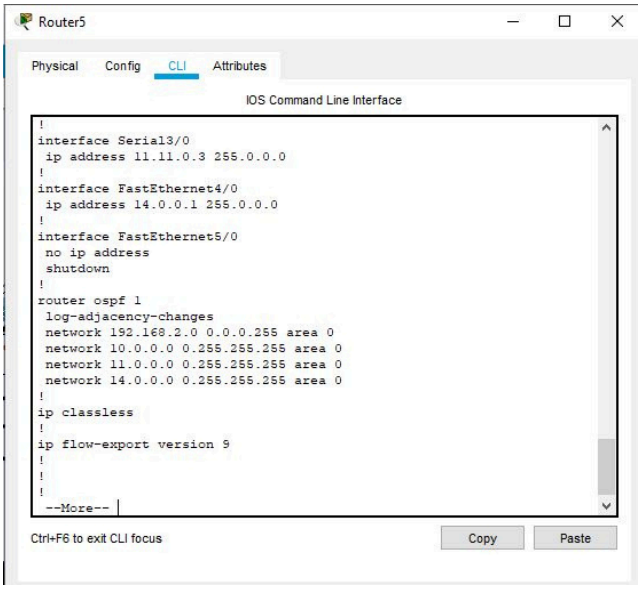


fig14. OSPF routing protocol network at jaipur network

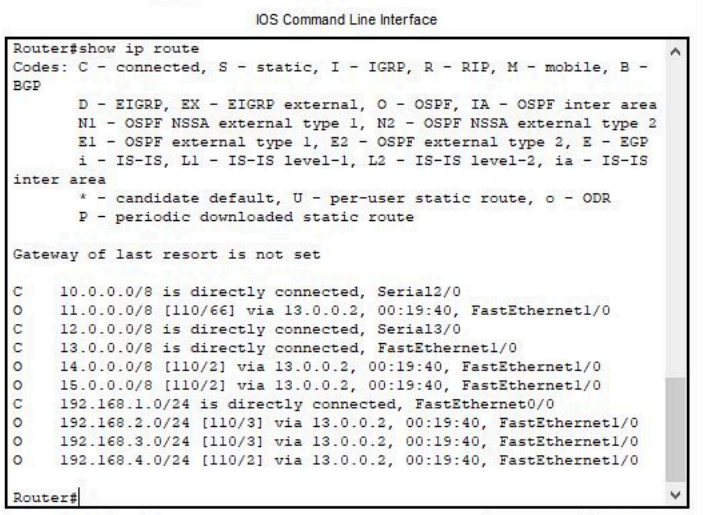


fig15. OSPF routes at Delhi router

step5: The wireless Access Points are assigned a SSID and password to keep the wireless network secure.

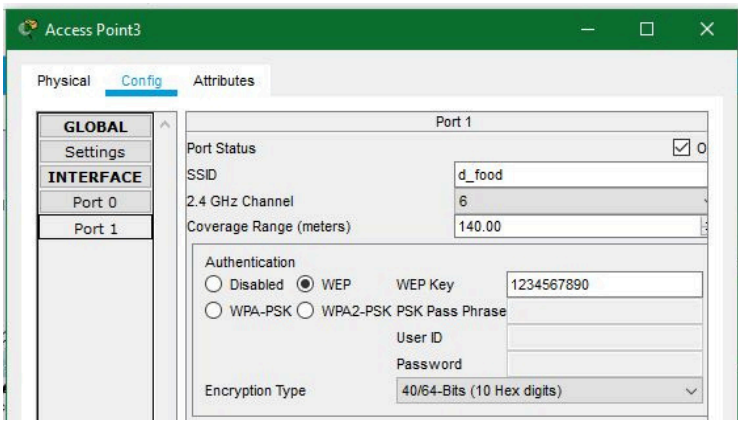


fig16. Access Point SSID for food and beverages

step6: DNS SERVER is configured to create www.crimsonhotels.in url having ip address 198.168.4.3. So that when a user types in the website name in its web browser, a Dns Query is generated and dns server returns the IP address of the the web page that is stored on HTTP SERVER.

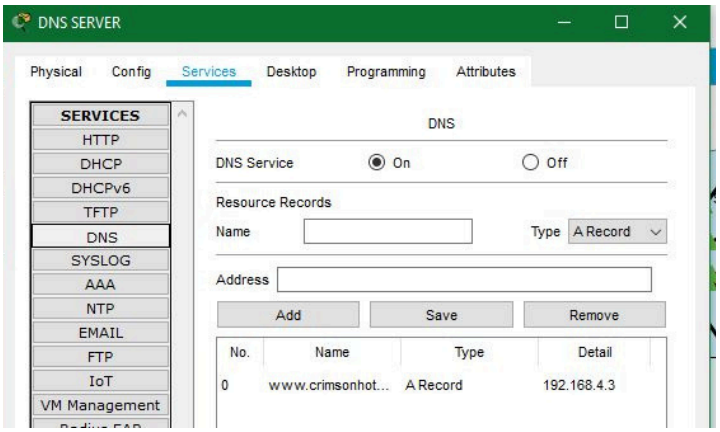


fig17. DNS service at the DNS Server

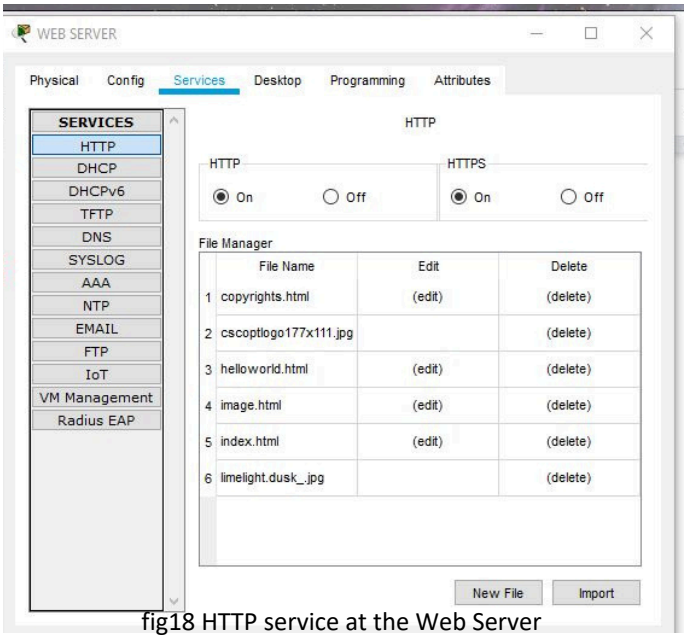


fig18 HTTP service at the Web Server

Work done

Development Environment

The project is developed using Cisco Packet Tracer (version 7.3).

Contributation

Faizan Ahmer & Md Ekramuddin

- Designed the entire topology
- Configuring all the routers

- Assigned IP addresses to end devices using DHCP via Servers
- Allotting SSIDs and passwords to wireless access points for guest rooms and food court

- Applying OSPF routing protocol
- DNS and HTTP

Result and Discussions

The entire hotel chain is represented as the entire network. Each city represents a sub-network which is further divided into departments. The OSPF protocol applied allows a smooth functioning for the entire network. The wireless access point (WAP) allows guests to have wireless internet access in their guest rooms and food court.

Conclusion and Future Scope

The project revolves around a network of a hotel chain operating in three cities with each city having five departments- reception, reservations, accounts, food and beverages and guest rooms. Among these five departments, the guest rooms have a wireless access point(WAP) to allow wireless internet access to the guests. And the entire network uses the OSPF routing protocol.

In the future , we would like to expand the size of the hotel chain to more cities, thereby expanding the entire network. More departments can be added to each city. We can provide wireless connections in more departments, and not just in guest rooms. Also, depending on the size of the network, a better routing protocol can be used.