Advanced Network Design for

Pak Modern Hotel



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DATE OF SUBMISSION:

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# Summary

This project presents the design and simulation of a structured and efficient network infrastructure for **Pak Modern Hotel** using **Cisco Packet Tracer**. The network spans multiple floors and departments, with dedicated routers and switches providing connectivity to various end-user devices such as PCs and printers. The network ensures secure communication, efficient routing, and centralized access to services.

Key components include four routers (**R0 to R3**), where **R1, R2, and R3** connect end-user devices across different subnets, and **R0** hosting essential services. Core services like **FTP**, **DNS**, **Web**, **Email (SMTP)**, and **DHCP** are configured on dedicated servers, connected to R0.

Each router is assigned a unique set of IP addresses, and devices are logically distributed across subnets such as 192.168.0.0, 192.168.1.0, 192.168.2.0, and 192.168.3.0. Routers are interconnected through serial DCE links, with **static routing** implemented to control traffic flow between networks.

Security features include **Telnet** access with password protection. The network is scalable, well-segmented, and capable of supporting real-world hotel operations such as internal communications, data sharing, and service access.

Overall, the project demonstrates the application of theoretical networking concepts in a simulated enterprise environment, ensuring performance, reliability, and ease of management.

# Introduction

In today’s digital landscape, the hospitality industry increasingly relies on robust, secure, and highly available network infrastructures to maintain operational efficiency, enhance guest experience, and streamline internal communications. Hotels, especially large and multi-department establishments like **Pak Modern Hotel**, must ensure continuous access to various services including the internet, file sharing, centralized management systems, and real-time communication tools. A dependable network is no longer a luxury.

This project is centered on the design, configuration, and simulation of a **comprehensive enterprise-grade network** that meets the technical and functional needs of Pak Modern Hotel. The goal is to create a secure, scalable, and efficient system that not only enables reliable connectivity between departments but also incorporates centralized services such as **FTP, DNS, Web, Email (SMTP)**, and **DHCP** servers. To achieve this, the network uses multiple routers and switches to manage segmented subnets for each department, with inter-router connections built over simulated wide area links (serial DCE) to reflect real-world routing scenarios.

The infrastructure spans across **three floors** of the hotel, connecting essential departments such as **Reception, Store, Logistics, HR, Finance, Sales, IT, and Administration**. Each department has its own dedicated subnet and is linked through routers to a **centralized server room**, which hosts all core services and interconnects with other networks via static routing. Devices such as **PCs, printers, and servers** are integrated into the system using structured IP addressing for ease of management and to reduce conflicts.

By utilizing **Cisco Packet Tracer**, the entire network is virtually simulated and tested. This allows for the visualization of end-to-end connectivity, verification of static route configurations, testing of dynamic IP allocation via DHCP, and secure management through Telnet. The simulation also demonstrates file sharing via FTP, domain resolution using DNS, website hosting on an internal web server, and email communication using SMTP.

Ultimately, this project illustrates the application of theoretical networking concepts in a practical, real-world scenario. It provides a scalable blueprint for a high-performance, service-oriented network capable of supporting the present and future digital requirements of a modern hotel environment like Pak Modern Hotel.

# Objectives

The project aims to build an efficient enterprise-level network with the following objectives:

* To establish **connectivity between devices** for efficient communication.
* To perform **basic router configuration** for secure network operations.
* To assign **IP addresses and enable Telnet** for remote access.
* To configure **Dynamic Host Configuration Protocol (DHCP) on the router** for automatic IP allocation.
* To enable **File Transfer Protocol (FTP)** for secure data exchange.
* To configure **Domain Name System (DNS).**
* To configure **Web Server** for hotel management.
* To set up **DNS and Email Server** for internal and external communications.
* To configure **Static Routes** for efficient traffic management.
* To implement **DHCP on a server** for scalable IP address management.

# Features

The project includes the following key features:

* **Logical Departmental Segmentation:** Each department is logically separated into different subnets, improving network management and security.
* **Full Device Interconnectivity:** PCs and printers in every department are connected to departmental switches and routed through a central backbone.
* **Centralized Server Room:** Hosts core services like FTP, DNS, Web, Email, and DHCP to serve all departments efficiently.
* **Remote Management via Telnet:** Secure access to routers from the IT department allows for centralized administration.
* **Automatic IP Management:** DHCP provides automated IP configuration of devices, reducing human error.
* **Efficient File Management:** The FTP server centralizes document sharing and data backup operations.
* **Integrated Communication:** DNS and SMTP streamline user experience and improve operational communication.
* **Network Scalability:** Designed to support future expansion with minimal reconfiguration.

# Full Network

# 1

# 2

# Networks Topology

The network topology implemented in this project is primarily a **ring topology**, which ensures organized data flow and reliable communication across the network. In a ring topology, each router is connected to exactly two other routers, forming a closed loop for data transmission. This configuration is particularly suitable for environments like the multi-department structure of Pak Modern Hotel, where systematic and predictable data paths are needed. In the simulated network, routers R0, R1, R2, and R3 are connected in a circular manner via serial DCE links, forming a complete ring. This setup enables reliable communication between departments, maintains consistent performance, and helps in isolating faults quickly. The topology is further enhanced with static routing, allowing precise control over data flow between the hotel’s floors and the centralized server room. Overall, the ring topology provides a structured and dependable backbone for the network, supporting continuous service availability and streamlined performance.

# 3

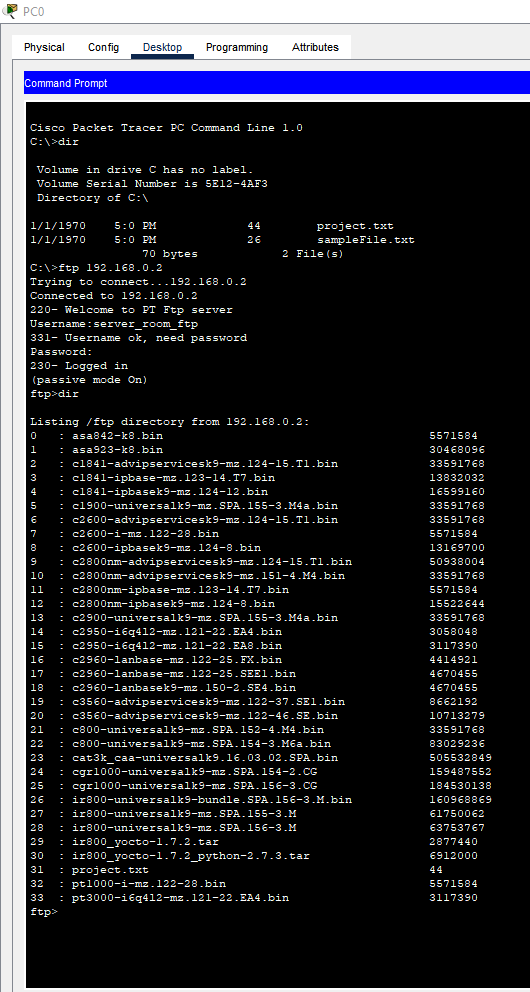
# Network Segmentation

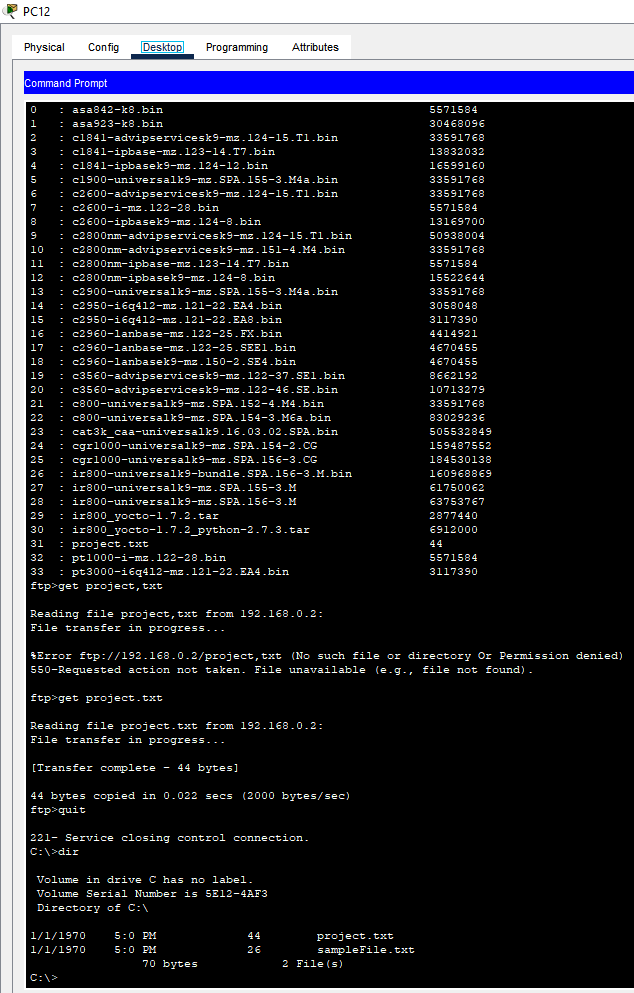
# The network of Pak Modern Hotel is logically segmented based on floor levels and departmental functions to ensure organized traffic management, improved security, and easier troubleshooting. The **first floor**, which includes departments such as **Reception, Store, and Logistics**, is assigned to the network **192.168.1.0**. The **second floor**, comprising **Finance, HR, and Sales**, operates within the network **192.168.2.0**. The **third floor**, home to the **IT and Administration** departments, uses the network **192.168.3.0**. All essential services such as **FTP, DNS, Web, Email**, and **DHCP servers** are housed in the **centralized server room**, which uses the network **192.168.0.0.** Each department connects to its own switch, and these switches are linked through a core switch to the router mesh, ensuring efficient communication across the entire network.

# Core Services Configuration

# File Transfer Protocol (FTP)

* **Purpose**: Enables secure and centralized file transfer between departments.
* **Implementation**: Hosted on a dedicated FTP server in the Server Room (IP: 192.168.0.2).
* **Usage**: All departments use it for daily report uploads and data sharing.
* **FTP Access Credentials**: Username: server\_room\_ftp, Password: 123

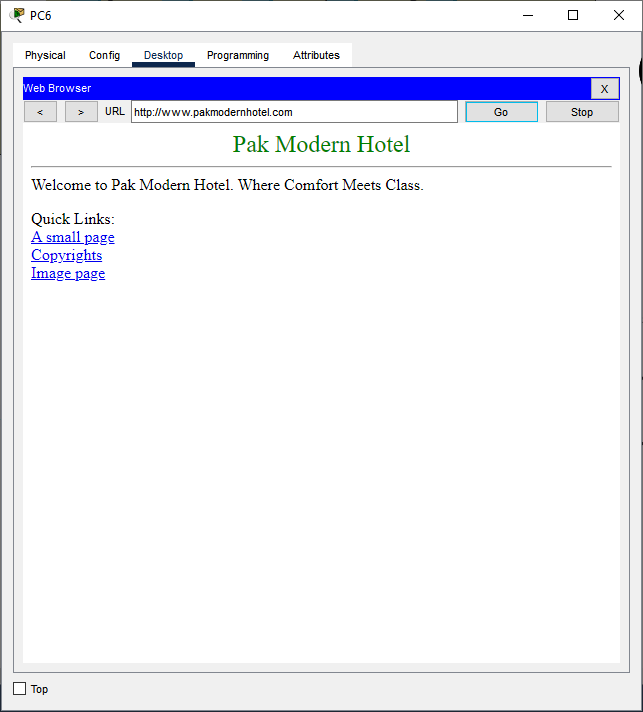




Create File on PC0(Reception), Uploading on FTP Server then Downloading on PC12(HR) using FTP Server

# Domain Name Server (DNS)

* **Purpose**: Resolves internal hostnames into IP addresses.
* **Implementation**: A DNS server configured in the Server Room (IP: 192.168.0.3).
* **Usage**: Simplifies access to the internal website and other services using names like [www.pakmodernhotel.com,](http://www.pakmodernhotel.com,) gmail.com.



Accessing website on PC6(Logistics)

# Web Server

* **Purpose**: Hosts the internal hotel portal used for operations, schedules, and guest management.
* **Implementation**: Hosted in the Server Room on IP 192.168.0.4.
* **Usage**: Accessed by all departments via browser using domain name resolved through DNS.

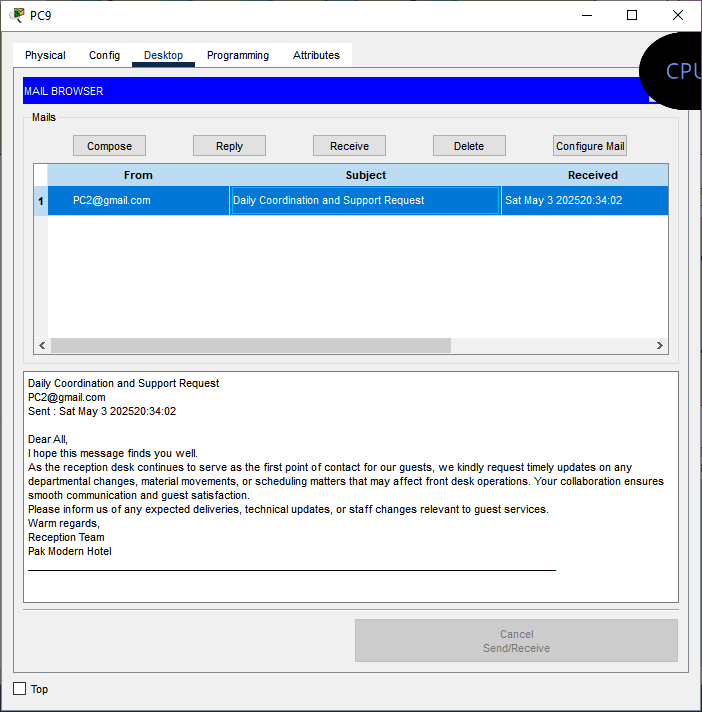
Accessing website on PC6



Accessing web server on PC15(Finance)

# Simple Mail Transfer Protocol (SMTP)

* **Purpose**: Provides email services for internal and external communication.
* **Implementation**: Email Server setup in the Server Room (IP: 192.168.0.5).
* **Usage**: Employees use email for announcements, HR communications, and management coordination.

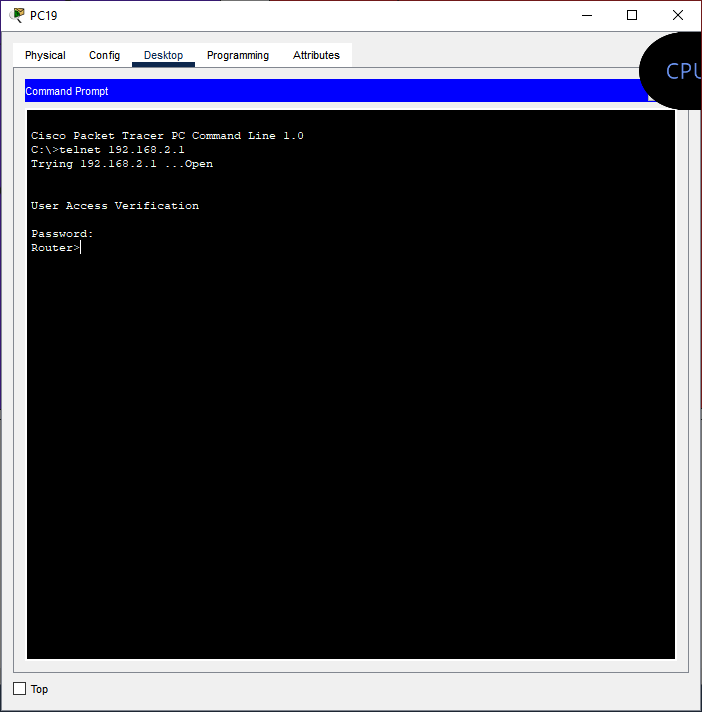


Receiving email from PC2(Reception) on PC9(Sales)

# Telnet

* **Purpose**: Enables remote command-line access to routers.
* **Implementation**: Telnet access is configured on all routers.
* **Usage**: IT and Administration departments use Telnet for managing devices without physical access.
* **Telnet Password Configuration:** The Telnet password is set to **cisco**.

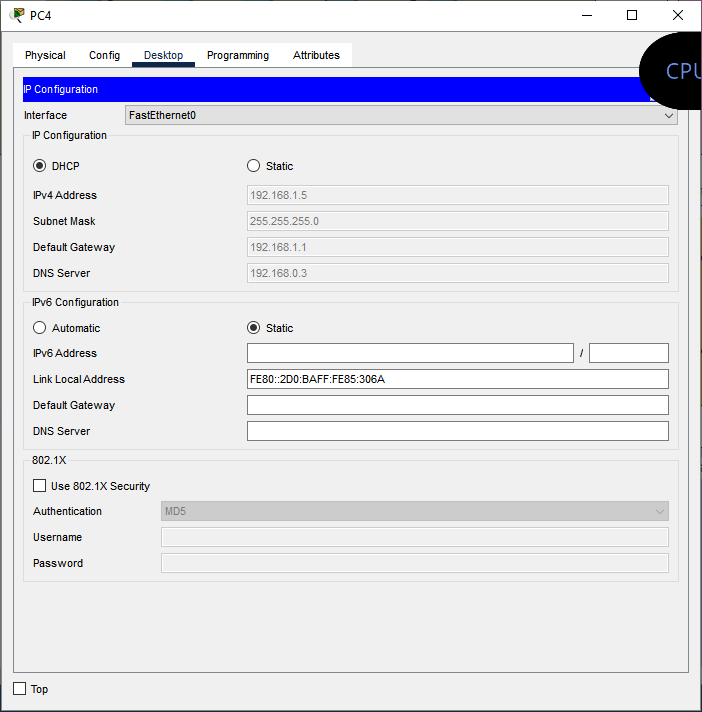
Accessing Router3 on PC16 using Telnet



Accessing Router2 on PC19(Adminstrator) using Telnet

# Dynamic Host Configuration Protocol on a Server (DHCP)

* **Purpose**: Automatically assigns IP addresses to all end-user devices.
* **Implementation**: **DHCP setup** on router1 and a central DHCP server (**192.168.0.6**).
* ****Usage****: Departments of router1 benefit from automated IP allocation, reducing manual configuration time.



PC4(Store) getting ip dynamically using DHCP server

# Dynamic Host Configuration Protocol on the Router (DHCP)

* **Purpose**: Automatically assigns IP addresses to all end-user devices.
* **Implementation**: **Use DHCP manually on the router 2.**
* ****Usage****: Departments of router 2 benefit from automated IP allocation, reducing manual configuration time.

# 

PC18(I.T) getting ip dynamically using DHCP

# Static Routes

# ****Purpose:**** Manages traffic flow between networks using fixed paths.

# ****Implementation:**** Manually configured routes on each router.

# ****Usage:**** Ensures reliable, secure, and predictable inter-network communication.

# 0

Static routes on Router 0

# 1

Static routes on Router 1

# 2

Static routes on Router 2

# 3

Static routes on Router 3

# Device-to-Router Connectivity

Each department in the Pak Modern Hotel network is connected to a specific router that manages local communication, IP address assignment, and routing. The routers R0, R1, R2, R3 are strategically placed across different network segments to maintain structured and efficient traffic flow.

* **R1 (192.168.1.1)** connects a high-density department with **PC0 to PC8** and **Printers 0 to 2**, covering IPs from 192.168.1.2 to 192.168.1.14 (The ip’s are allocated dynamically). This segment likely represents **Reception, Store, and Logistics** on the first floor.
* **R2 (192.168.2.1)** serves a smaller set of devices including **PC17 to PC19** and **Printers 6 and 7**, ranging from 192.168.2.2 to 192.168.2.20 (The ip’s are allocated dynamically). This router could be assigned to a specialized department like **Finance or HR**.
* **R3 (192.168.3.1)** manages a mid-size group of clients, including **PC9 to PC16** and **Printers 3 to 5**, assigned IPs from 192.168.3.2 to 192.168.3.12. This router likely supports departments such as **Sales, Administration, or IT**.
* **R0 (192.168.0.1)** functions as the **central routing node** in the network. It does not serve client PCs or printers but is connected to critical infrastructure servers such as the **FTP Server (192.168.0.2)**, **DNS Server (192.168.0.3)**, **Web Server (192.168.0.4)**, **Email Server (192.168.0.5) and DHCP Server(192.168.0.6)**. Additionally, R0 handles inter-router communication, linking with R1, R2, and R3 via serial interfaces and managing static routing between subnets.

.

# Tools and Devices Used

* · **Simulation Tool:**·

1. Cisco Packet Tracer

* · **Network Devices:**

1. Cisco Routers (1841)
2. Cisco Switches (2950-24)
3. Serial DCE Cables
4. Ethernet Cables

* · **End Devices:**·

1. PCs
2. Printers

* · **Servers:**

1. FTP Server
2. DNS Server
3. Web Server
4. Email (SMTP) Server
5. DHCP Server

# Conclusion

# The proposed network design for Pak Modern Hotel ensures that all operational needs are met through secure, reliable, and efficient infrastructure. By using Cisco Packet Tracer to simulate the design, the team validated the implementation of critical services such as **FTP, DNS, Web, Email (SMTP), DHCP**, and **Telnet**, ensuring that the network is future-proof and scalable. This architecture lays the foundation for a digital-first hospitality experience at Pak Modern Hotel.

# **Appendices**

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R0: 192.168.0.1

# FTP: 192.168.0.2

# DNS: 192.168.0.3

# Web: 192.168.0.4

# Email: 192.168.0.5

# DHCP: 192.168.0.6

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R1: 192.168.1.1

# DHCP SERVER RANGE(192.168.1.2-192.168.1.14) (Total 13 devices can connect)

# PC0: DHCP SERVER

# PC1: DHCP SERVER

# PC2: DHCP SERVER

# PC3: DHCP SERVER

# PC4: DHCP SERVER

# PC5: DHCP SERVER

# PC6: DHCP SERVER

# PC7: DHCP SERVER

# PC8: DHCP SERVER

# Printer0: DHCP SERVER

# Printer1: DHCP SERVER

# Printer2: DHCP SERVER

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R2: 192.168.2.1

# ip dhcp excluded-address 192.168.2.21 192.168.2.254 (Total 19 device can connect from 192.168.2.2 to 192.168.2.20)

# PC17: DHCP ROUTER

# PC18: DHCP ROUTER

# PC19: DHCP ROUTER

# Printer6: DHCP ROUTER

# Printer7: DHCP ROUTER

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R3: 192.168.3.1

# PC9: 192.168.3.2

# PC10: 192.168.3.3

# PC11: 192.168.3.4

# PC12: 192.168.3.5

# PC13: 192.168.3.6

# PC14: 192.168.3.7

# PC15: 192.168.3.8

# PC16: 192.168.3.9

# Printer3: 192.168.3.10

# Printer4: 192.168.3.11

# Printer5: 192.168.3.12

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R0 (0/0/0): 192.168.4.1

# R1 (0/0/0): 192.168.4.2

# -----------------------

# R1 (0/0/1): 192.168.5.1

# R2 (0/0/0): 192.168.5.2

# -----------------------

# R2 (0/0/1): 192.168.6.1

# R3 (0/0/0): 192.168.6.2

# -----------------------

# R3 (0/0/1): 192.168.7.1

# R0 (0/0/1): 192.168.7.2

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# www.pakmodernhotel.com

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R0 (192.168.0.1)

# Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.4.2

# Router(config)#ip route 192.168.5.0 255.255.255.0 192.168.4.2

# Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.4.2

# Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.7.1

# Router(config)#ip route 192.168.6.0 255.255.255.0 192.168.7.1

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R1 (192.168.1.1)

# Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.5.2

# Router(config)#ip route 192.168.6.0 255.255.255.0 192.168.5.2

# Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.5.2

# Router(config)#ip route 192.168.7.0 255.255.255.0 192.168.4.1

# Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.4.1

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# R2 (192.168.2.1)

# Router(config)#ip route 192.168.3.0 255.255.255.0 192.168.6.2

# Router(config)#ip route 192.168.7.0 255.255.255.0 192.168.6.2

# Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.6.2

# Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.5.1

# Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.5.1

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*R3 (192.168.3.1)

# Router(config)#ip route 192.168.0.0 255.255.255.0 192.168.7.2

# Router(config)#ip route 192.168.4.0 255.255.255.0 192.168.7.2

# Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.7.2

# Router(config)#ip route 192.168.5.0 255.255.255.0 192.168.6.1

# Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.6.1

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# telnet password : cisco

# ftp user & password : server\_name\_ftp & 123

# email user & password : PC\_ @gmail.com & 123 (in dash "\_" the number of the pc will come)

# router password : cisco

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*