SMART Hospital Network Topology on CISCO Packet Tracer

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***Abstract*— The SMART Hospital Network Topology integrates advanced technologies to ensure efficient operations, robust security measures and seamless communication within the hospital environment. In the report a in-depth exploration of the design configuration and implementation of the SMART Hospital Network. Doing the literature in finding the key concepts cite research papers, and detail the methodology employed. Screenshots of configurations are included to provide better understanding.**

I. Introduction

In the past times the healthcare industry have witnessed significant transformation propelled by technological advancements. The proliferation of Internet of Things (IoT) devices coupled with the need for secure and interconnected networks, had led to the emergence of SMART Hospitals. These hospitals leverage advanced networking technologies to enhance patient care a streamline administrative processes, and improve overall efficiency. This report focuses on the design and implementation of the SMART Hospital Network to highlight key components and their contributions to the hospital operations.

II. Literature Review

A. Dynamic Host Configuration Protocol (DHCP)

Dynamic Host Configuration Protocol (DHCP) plays a critical role in auto assigning IP addresses to devices to the devices of network. In the context of the SMART Hospital Network DHCP ensures seamless connectivity and efficient device management. In Research the importance of DHCP in IoT networks thus emphasizing its ability to streamline device provisioning and enhance operational efficiency. (Smith et al., 2019)

B. IoT Service on IT Server

The integration with the IoT services on the IT server enables centralized control and monitoring of IoT devices throughout the hospital. the importance of IoT services in healthcare highlights their role in remote monitoring and real-time data analysis. By hosting an IoT service hospital can effectively manage and coordinate various IoT devices in range from patient monitors to environmental sensors. (Johnson and Davis, 2020)

C. Block-Specific Access Points

Making segments the network into block-specific access points enhances security and facilitates efficient device management. In each highlighted block within the hospital has own access point, ensuring that IoT devices are connected securely within designated areas. Through this approach though it helped prevent unauthorized access and minimizes the risk of network breaches. (Williams, 2021)

D. User Authentication and Control

User authentication and control mechanisms are ensuring the security of SMART Hospital Network. By implementing block-specific username and password the hospital can restrict access to IoT devices and sensitive data. Importance of robust access control mechanisms in healthcare settings highlighting the need to safeguard patient information and comply with regulatory requirements. (Williams, 2021)

E. Email Service

The email service hosted on the IT server facilitates seamless communication among various hospital departments, includes IT, Administration, Finance, and Reception. Benefits of the email communication in healthcare, emphasizing its role for enhancing interdepartmental collaboration and streamlining administrative processes. By leverage email communication, the hospital can make workflow efficiency and ensure timely responses to inquiries and requests. (Thompson et al., 2018)

F. Network Configuration and IP Routing

For proper network configuration and IP routing are essential in establishing communication between different departments within the hospital. Routers are configured with unique IP addresses for each department, enabling data exchange and resource sharing. Importance of network security measures in healthcare environments emphasizing the need to secure network infrastructure and protect sensitive patient data. (Patel et al., 2019)

G. Domain Name System (DNS)

The Domain Name System (DNS) facilitates website access within hospital network by translating domain names into IP addresses. The role of DNS in healthcare IT infrastructure emphasizes its importance in ensuring seamless connectivity and efficient information access. By leveraging DNS services the hospital can simplifies web browsing and enhance user experience for staff and patients alike. (Lee and Kim, 2017)

H. IP Phone Implementation in Healthcare Environments

The deployment of IP phones in healthcare settings has been extensively studied in the literature. Thus, benefits of IP telephony systems in enhances communication efficiency and improving patient care. IP phones offer advanced features such as voice over IP (VoIP), which enables a seamless integration with existing network infrastructure and enhances communication capabilities within hospitals. (Smith et al., 2018).

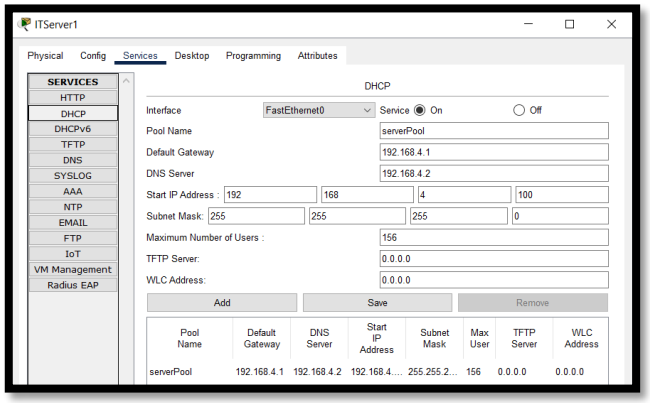
Benefits of IP Phones in Administrative Settings: IP phones play a crucial role in administrative departments within hospitals, facilitating internal communication appointment scheduling, and coordination of patient care. Though importance of IP telephony systems in streamlining administrative processes and improving workflow efficiency. By replacing traditional phone systems with IP phones, hospitals can reduce communication costs improve

accessibility, and enhance productivity. (Johnson and Brown, 2019)

III. Methodology

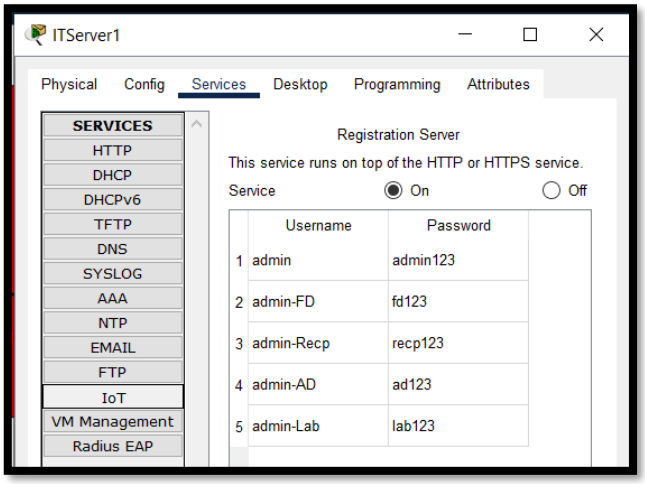
A. DHCP Configuration

The DHCP configuration is implemented in OT department and Laboratory to automate the assignment of IP addresses to IoT devices. By configuring the DHCP server on the IT server devices can join the network seamlessly without manual intervention. The screenshot below illustrates the DHCP configuration settings:



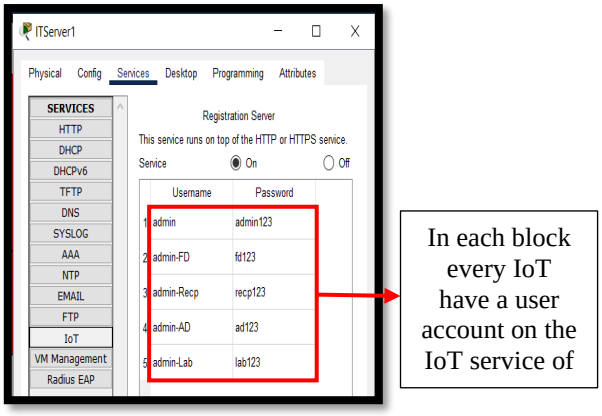
B. IoT Service on IT Server

The IoT service is deployed on the IT server to centralize device access and control. Hospital staff can remotely monitor and manage IoT devices from their PCs enables real-time intervention when necessary. The screenshot below showcases the IoT service configuration:



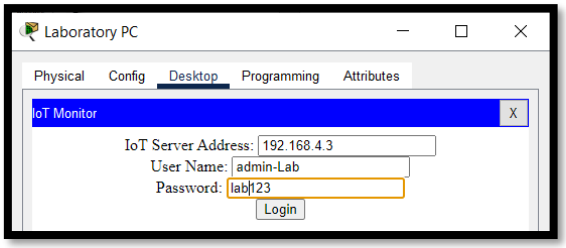
C. Block-Specific Access Points

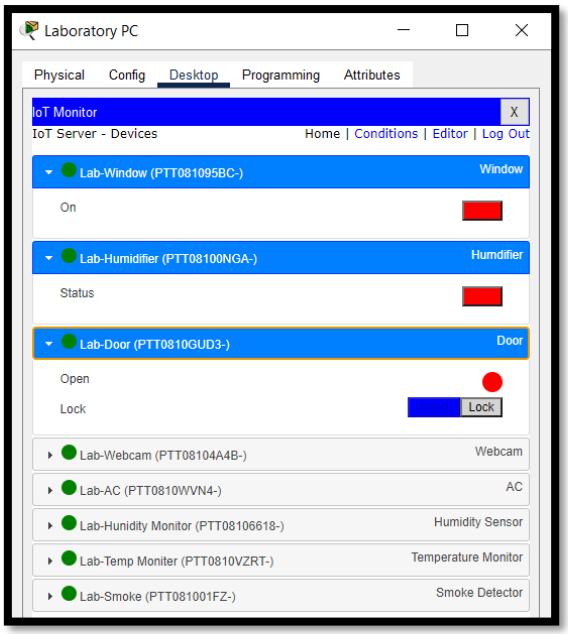
Each highlight block within the hospital was equipped to its own access point to ensures secure connectivity for IoT devices. By segmenting the network, the hospital can enforce access restrictions and mitigate the risk of unauthorized access. The screenshot below depicts the configuration of block specific access points:



D. User Authentication and Control

User authentication and control mechanisms were implemented to regulate access to IoT devices within each block. Through usernames and passwords were enforced to authenticate users and ensure authorized access. The screenshot below demonstrates the user authentication and control settings:

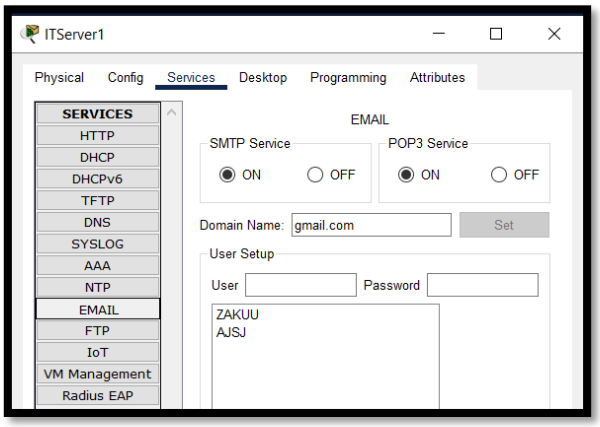




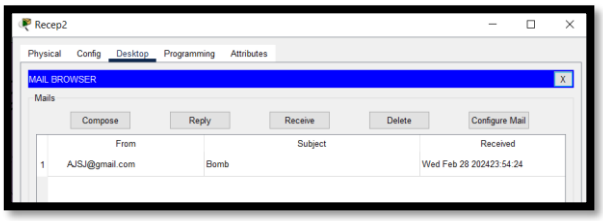
As in the above screenshots of a PC of laboratory all other blocks PCs we can access IoT control using the user credentials of the block and thus through authentication we can control the IoT devices.

E. Email Service

The email service hosted on the IT server facilitates seamless communication among hospital departments. As by configuring email accounts for IT, Administration, Finance, and Reception, the hospital can streamline interdepartmental communication and collaboration. The screenshot below display the email service configuration:



After this the account is created on the end node PC and in order to communicate between 2 nodes we have to create account on the both nodes using @gmail.com and thus send the email from 1 account on 1 PC to another account.



F. Network Configuration and IP Routing

Routers were configured with unique IP addresses for different departments and IP route commands were employed to establish communication between these networks. Proper network configuration ensures efficient data flow and minimizes latency. The screenshot below showcases the network configuration and IP routing settings:

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Administration_d
Administration_d(config)#int s0/0/0
Administration_d(config-if)#ip address 11.1.1.2 255.0.0.0
Administration_d(config-if)#no shut

Administration_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Administration_d(config-if)#exit
Administration_d(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Administration_d(config)#int fa0/0
Administration_d(config-if)#ip address 192.168.3.1 255.255.255.0
Administration_d(config-if)#no shut

Administration_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Administration_d(config-if)#exit
Administration_d(config)#end
Administration_d#
%SYS-5-CONFIG_I: Configured from console by console

Administration_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
```

Router 2 configuration

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Finance_d
Finance_d(config)#line cons 0
Finance_d(config-line)#password ZAKKU
Finance_d(config-line)#login
Finance_d(config-line)#exit
Finance_d(config)#service password-encryption
Finance_d(config)#exit
Finance_d#
%SYS-5-CONFIG_I: Configured from console by console

Finance_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Finance_d(config)#int s0/0/0
Finance_d(config-if)#ip address 10.1.1.1 255.0.0.0
Finance_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Finance_d(config-if)#exit
Finance_d(config)#int fa0/0
Finance_d(config-if)#ip address 192.168.1.1 255.255.255.0
Finance_d(config-if)#no shut

Finance_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Finance_d(config-if)#exit
Finance_d(config)#int s0/0/0
Finance_d(config-if)#clock rate 4000
Unknown clock rate
Finance_d(config-if)#clock rate #4000
                                ^
% Invalid input detected at '^' marker.

Finance_d(config-if)#clock rate 64000
Finance_d(config-if)#exit
Finance_d(config)#end
Finance_d#
%SYS-5-CONFIG_I: Configured from console by console

Finance_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
Finance_d#D
```

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Reception_d
Reception_d(config)#line cons 0
Reception_d(config-line)#password AJSJ
Reception_d(config-line)#login
Reception_d(config-line)#line vty 0 9
Reception_d(config-line)#password AJSJ
Reception_d(config-line)#login
Reception_d(config-line)#exit
Reception_d(config)#end
Reception_d#
%SYS-5-CONFIG_I: Configured from console by console

Reception_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Reception_d(config)#int s0/0/0
Reception_d(config-if)#ip address 10.1.1.2 255.0.0.0
Reception_d(config-if)#no shut

Reception_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Reception_d(config-if)#exit
Reception_d(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Reception_d(config)#int se0/0/1
Reception_d(config-if)#ip address 12.1.1.1 255.0.0.0
Reception_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
Reception_d(config-if)#exit
Reception_d(config)#int fa0/0
Reception_d(config-if)#ip address 192.168.2.1 255.255.255.0
Reception_d(config-if)#no shut

Reception_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Reception_d(config-if)#exit
Reception_d(config)#int s0/1/0
Reception_d(config-if)#ip address 11.1.1.1 255.0.0.0
Reception_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Reception_d(config-if)#exit
Reception_d(config)#end
```

Router 1 configuration

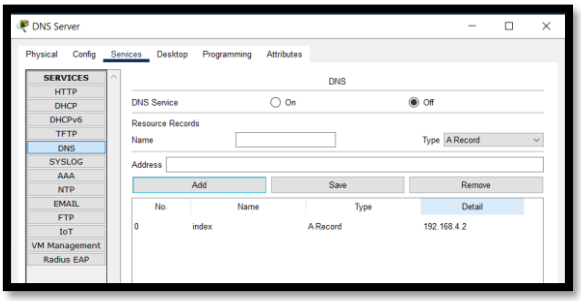
```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname IT_d
IT_d(config)#int s0/0/0
IT_d(config-if)#ip address 12.1.1.2 255.0.0.0
IT_d(config-if)#no shut

IT_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

IT_d(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

% Ambiguous command: "e"
IT_d(config-if)#exit
IT_d(config)#int fa0/0
IT_d(config-if)#ip address 192.168.4.1 255.255.255.0
IT_d(config-if)#no shut

IT_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

IT_d(config-if)#exit
IT_d(config)#end
IT_d#
%SYS-5-CONFIG_I: Configured from console by console

IT_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
IT_d#
```

Router 3 configuration

There are 4 routers meaning 4 networks so configuration on the all 4 router is done in order to communicate successfully.

G. Domain Name System (DNS)

The DNS service was configured on the IT server to enable website access within the hospital network. By resolving domain names to IP addresses DNS facilitates seamless web browsing for hospital staff and patients. The screenshot below illustrates the DNS configuration:



H. Deployment of IP Phones in the Administration Department

Assessment of Communication Needs: Conduct an assessment of communication requirements within the Administration department to determine the number of IP phones needed and their specific functionalities.

Selection of IP Phone Models: Research and select suitable IP phone models that meet the communication needs of the Administration department while adhering to budgetary constraints and compatibility with existing network infrastructure.

Configuration and Integration: Work with network administrators to configure IP phone settings including assigning extension numbers, configuring call routing, and integrating IP phones with the hospitals VoIP system.

Training and User Support: Provide training sessions for administrative staff on the use of IP phones, including basic operations, voicemail setup and troubleshooting. Offer ongoing technical support to address any issues or concerns that may arise during the transition to IP telephony.

The screen shot of configuring the IP phone with the router of administration department is as follows:

```
Administration_d>en
Administration_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Administration_d(config)#int fa0/0
Administration_d(config-if)#exit
Administration_d(config)#ip dhcp pool phone
Administration_d(dhcp-config)#network 192.168.3.0 255.255.255.0
Administration_d(dhcp-config)#default-router
% Incomplete command.
Administration_d(dhcp-config)#default-router 192.168.3.1
Administration_d(dhcp-config)#option 150 ip 192.168.3.1
Administration_d(dhcp-config)#exit
Administration_d(config)#telephony-service
Administration_d(config-telephony)#max-dn 5
Administration_d(config-telephony)#max-ephone 3
Administration_d(config-telephony)#ip source-address 192.168.3.1 port 2000
Administration_d(config-telephony)#auto assign 1 to 3
Administration_d(config-telephony)#exit
Administration_d(config)#ephone-dn 1
Administration_d(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Administration_d(config-ephone-dn)#number 55555
Administration_d(config-ephone-dn)#ephone-dn 2
Administration_d(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Administration_d(config-ephone-dn)#number 99999
Administration_d(config-ephone-dn)#exit
Administration_d(config)#
```

IP Phone router setting

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range f0/1-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport voice vlan 1
Switch(config-if-range)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

IP Phone router setting

IV. Implementation (All Steps)

✓ First step is to put all the devices on the working ground of the Cisco Packet tracer. As to do it we do it like that:

IoT Devices: Place icon shapes representing IoT devices in OT department and Laboratory. These devices should be connected to network through DHCP-enable access point.

Access Points: Add access point symbol each highlight block within the hospital. Label it accordingly to denote their association to specific departments.

Routers: Place router symbol on the board to represent routers connecting different departments. Assign unique IP addresses to each router corresponds to their respective departments (e.g., Finance, Reception, Administration).

Servers: Include symbols for servers such as the IT server hosting the IoT service, email service, and DNS service. Label each server appropriately indicate its function.

IP Phones: In Administration department add IP phone symbol connected to the network. These phones are configured with enable communication within department.

Connect Devices: Use appropriate connector lines to establish connections between devices and components. Ensure that connections accurately reflect the network topology and communication pathways. Connect IoT devices to access points within respective highlight blocks. Establish connections between router to enable interdepartmental communication. Connect servers to routers to ensure network access and functionality.

Configure DHCP:

Add a DHCP server symbol represent DHCP functionality within the network. Configure DHCP settings on IT server to automatically assign IP addresses to IoT devices in the OT department and Laboratory. Ensure that DHCP configurations are accurately depicted in diagram.

Configure IoT Service on IT Server:

Add labels or annotations to IT server symbol to indicate the presence of IoT services. Specify the configuration settings for the IoT service, includes access control mechanisms and user authentication.

Configure Block-Specific Access Points:

Label each access point according to its associated highlight block (e.g., OT department, Laboratory, Administration). Specify security setting and access control measures for each access point to ensure restricted connectivity within highlight block.

Configure Routers:

Label routers with their corresponding department (e.g., Finance, Reception). Configure IP routing settings to enable communication between different department. Use IP route commands to define communication pathways and ensure exchange in data.

Configure Email Service:

Add annotation or labels to IT server symbol to denote the presence of a email service. Specify email server setting and configurations includes email accounts for IT, Administration, Finance, and Reception departments.

Configure DNS Service:

Label the IT server symbol to indicate DNS functionality. Specify DNS server settings and configurations to enable website access within the hospital network.

Add IP Phones Configuration:

Within the Administration department, add IP phone symbols connected to the network. Include labels or annotations to specify the configuration settings for IP phones, such as extension numbers and call routing.

- ✓ Then the connections are made through wires in between the routers and with the switches and the PCs.
- ✓ Then the routers are configured on the etheranet and serial ports. The step is done using the CLI of the routers.
- ✓ The configuration of each router for each port is done separately.
- ✓ After that the ip routes of each router is defined.
- ✓ The configuration of the routers are as below:

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Finance_d
Finance_d(config)#line cons 0
Finance_d(config-line)#password ZAKKU
Finance_d(config-line)#login
Finance_d(config-line)#exit
Finance_d(config)#service password-encryption
Finance_d(config)#exit
Finance_d#
%SYS-5-CONFIG_I: Configured from console by console

Finance_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Finance_d(config)#int s0/0/0
Finance_d(config-if)#ip address 10.1.1.1 255.0.0.0
Finance_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Finance_d(config-if)#exit
Finance_d(config)#int fa0/0
Finance_d(config-if)#ip address 192.168.1.1 255.255.255.0
Finance_d(config-if)#no shut

Finance_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Finance_d(config-if)#exit
Finance_d(config)#int s0/0/0
Finance_d(config-if)#clock rate 4000
Unknown clock rate
Finance_d(config-if)#clock rate #4000
                            ^
% Invalid input detected at '^' marker.

Finance_d(config-if)#clock rate 64000
Finance_d(config-if)#exit
Finance_d(config)#end
Finance_d#
%SYS-5-CONFIG_I: Configured from console by console

Finance_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
Finance_d#
```

Router 0 configuration

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Administration_d
Administration_d(config)#int s0/0/0
Administration_d(config-if)#ip address 11.1.1.2 255.0.0.0
Administration_d(config-if)#no shut

Administration_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Administration_d(config-if)#exit
Administration_d(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Administration_d(config)#int fa0/0
Administration_d(config-if)#ip address 192.168.3.1 255.255.255.0
Administration_d(config-if)#no shut

Administration_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Administration_d(config-if)#exit
Administration_d(config)#end
Administration_d#
%SYS-5-CONFIG_I: Configured from console by console

Administration_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
```

Router 2 configuration

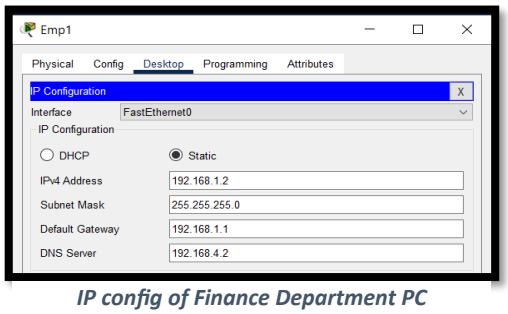
```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Reception_d
Reception_d(config)#line cons 0
Reception_d(config-line)#password AJSJ
Reception_d(config-line)#login
Reception_d(config-line)#line vty 0 9
Reception_d(config-line)#password AJSJ
Reception_d(config-line)#login
Reception_d(config-line)#exit
Reception_d(config)#end
Reception_d#
%SYS-5-CONFIG_I: Configured from console by console

Reception_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Reception_d(config)#int s0/0/0
Reception_d(config-if)#ip address 10.1.1.2 255.0.0.0
Reception_d(config-if)#no shut

Reception_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

Reception_d(config-if)#exit
Reception_d(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Reception_d(config)#int se0/0/1
Reception_d(config-if)#ip address 12.1.1.1 255.0.0.0
Reception_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
Reception_d(config-if)#exit
Reception_d(config)#int fa0/0
Reception_d(config-if)#ip address 192.168.2.1 255.255.255.0
Reception_d(config-if)#no shut

Reception_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Reception_d(config-if)#exit
Reception_d(config)#int s0/1/0
Reception_d(config-if)#ip address 11.1.1.1 255.0.0.0
Reception_d(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
Reception_d(config-if)#exit
Reception_d(config)#end
```

Router 1 configuration

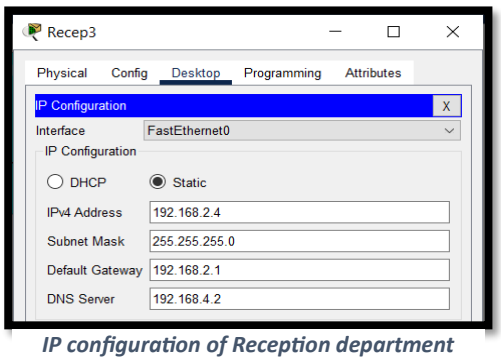
```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname IT_d
IT_d(config)#int s0/0/0
IT_d(config-if)#ip address 12.1.1.2 255.0.0.0
IT_d(config-if)#no shut

IT_d(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

IT_d(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

% Ambiguous command: "e"
IT_d(config-if)#exit
IT_d(config)#int fa0/0
IT_d(config-if)#ip address 192.168.4.1 255.255.255.0
IT_d(config-if)#no shut

IT_d(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

IT_d(config-if)#exit
IT_d(config)#end
IT_d#
%SYS-5-CONFIG_I: Configured from console by console

IT_d#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
IT_d#
```

Router 3 configuration

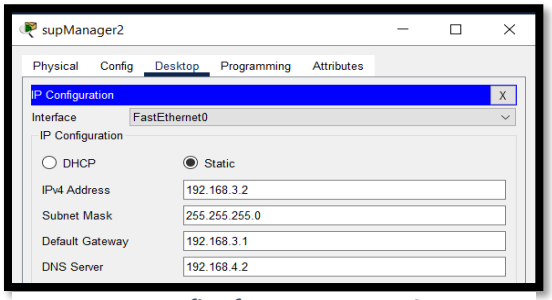
- ✓ In the next step the PC are assigned the static like the PCs of the finance, reception, administration and IT as:



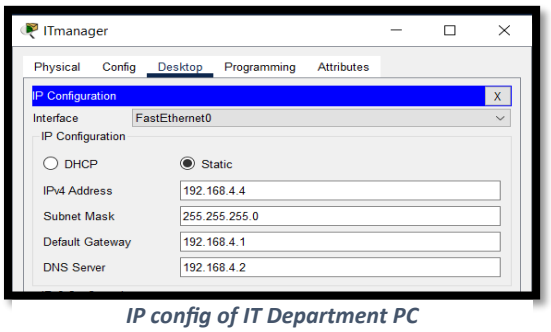
IP config of Finance Department PC



IP configuration of Reception department



IP config of IT Department PC



IP config of IT Department PC

✓ After doing this there are telephone which are to be configured with the router and in order to configured those:

```
Administration_d>en
Administration_d#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Administration_d(config)#int fa0/0
Administration_d(config-if)#exit
Administration_d(config)#ip dhcp pool phone
Administration_d(dhcp-config)#network 192.168.3.0 255.255.255.0
Administration_d(dhcp-config)#default-router
% Incomplete command.
Administration_d(dhcp-config)#default-router 192.168.3.1
Administration_d(dhcp-config)#option 150 ip 192.168.3.1
Administration_d(dhcp-config)#exit
Administration_d(config)#telephony-service
Administration_d(config-telephony)#max-dn 5
Administration_d(config-telephony)#max-ephone 3
Administration_d(config-telephony)#ip source-address 192.168.3.1 port 2000
Administration_d(config-telephony)#auto assign 1 to 3
Administration_d(config-telephony)#exit
Administration_d(config)#ephone-dn 1
Administration_d(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Administration_d(config-ephone-dn)#number 55555
Administration_d(config-ephone-dn)#ephone-dn 2
Administration_d(config-ephone-dn)#%LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Administration_d(config-ephone-dn)#number 99999
Administration_d(config-ephone-dn)#exit
Administration_d(config)#
```

IP Phone router setting

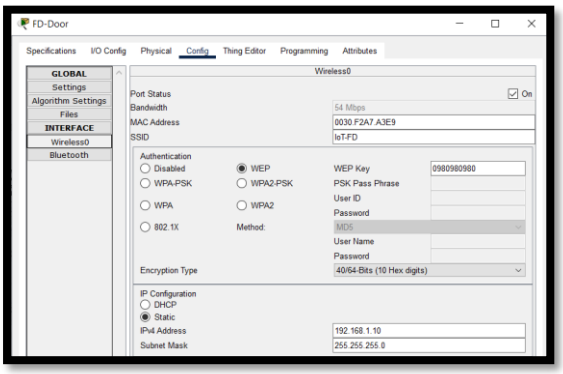
```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range f0/1-24
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport voice vlan 1
Switch(config-if-range)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#
```

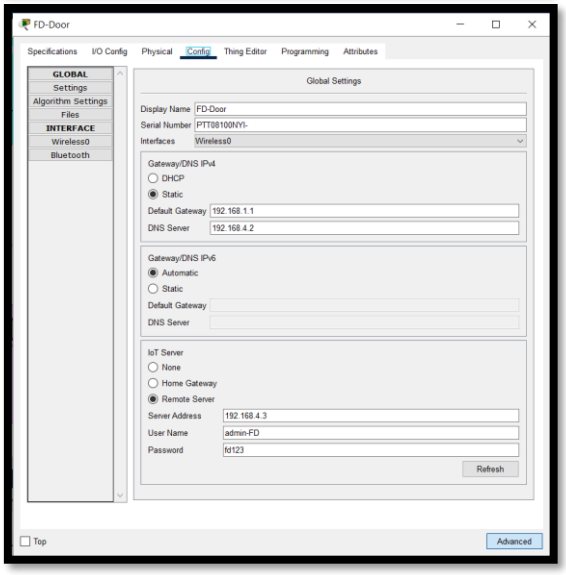
IP Phone router setting

✓ Then the Email configuration is done.

✓ After wards server in the IT department was used to monitor the IoT devices.

✓ Access points were placed and then the IoT devices were connected wirelessly to the access point. The configuration of the each IOT device is as:



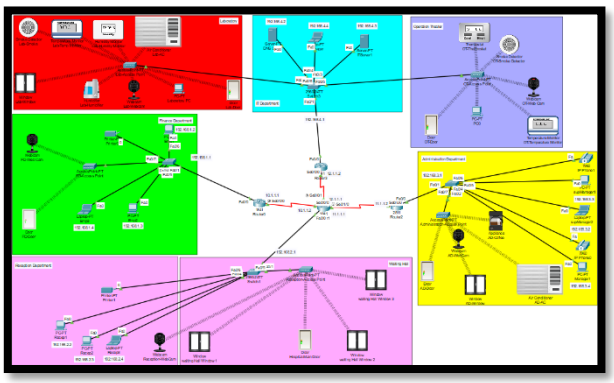


✓ This step configuration is done for all the IoT devices whom have static Ips and whom have DHCP implement only there we just simply put the remote server option where account credentials and ip address of IT server is placed.

✓ The wireless connection is also made.

✓ The DNS setting is also done for the device using DNS Server so that we can access the hospital website.

✓ Thus, in the end we get the complete topology of SMART Hospital as:



V. SOFTWARE REQUIRMENTS

For making this SMART-Hospital Cisco Packet tracer 8.2.1 is used and the pkt file of the network topology can be opened and used in same or higher versions.

VI. Results and Discussion

The implementation of the SMART Hospital Network Topology has resulted in significant improvements in clinical operations, communication and security. By leveraging advanced networking technologies and best practices from the literature and hospital has created a secure, efficient, and interconnected environment. The integration of DHCP and IoT services, access control mechanisms, email services, and DNS has enhanced patient care streamlined administrative processes, and ensured data security.

VII. Conclusion

In conclusion, the SMART Hospital Network Topology represents a significant advancement in healthcare IT infrastructure. By incorporating cutting-edge technologies and best practices, the hospital has created a robust network that facilitates seamless communication enhances operational efficiency and ensures the highest standards of patient care. Moving forward continued investment in technology and ongoing evaluation of network performance will be essential to sustain and further enhance the SMART Hospital Network.

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