Hospital Network Design

18CSS202J- Computer Communication Project Report

Submitted by

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

NETWORK REQUIREMENTS
In Health care Network topology, we have desktop Computer, laptops, smart phone. There is a data flow between the devices within the system. We have divided our network into segments like for Hospital wards, clinical area etc. We have also used SSH for security. Our network requirements include network devices like routers, switches, and server.

HOSPITAL SEGMENTS
1 General ward
2 Private ward
3 Clinical Area
4 IT Department
5 Entrance Reception
6 Lobby and Parking

FEATURES AND SERVICES
- DHCP
- DNS
- Subnetting
- HTTPS
- SSH
- SMTP
- FTP
- WIFI

COST OF NETWORK
- **Cisco Switch**
  19,690.63RS Each
  98,453RS Cost of 5 Switch

- **Cisco Router**
  27,566.88RS Each
  165,401.25RS Cost of 6 Router

- **Cisco Server**
  31,505RS Each
  63,010RS Cost of 2 Server

- **Computer Cost**
  9845.31RS Each
  9845.31 Cost of 12 Computers

Total Cost = 445,008.13 RS

CONFIGURATION

The diagram is properly commented. We have divided the diagram into 6 segments as named above. Hospital Segments representing different departments of hospital. Following are the running configuration of routers and switches related to different segments of hospital respectively:

General Ward Switch	General Ward Router

Private Ward Switch	Private Ward Router

Clinical Area Switch	Clinical Area Router

IT Department Switch	IT Department Router

Entrance Switch	Entrance Router

DEFINITIONS

- **DHCP**
  The Dynamic Host Configuration Protocol (DHCP) is a network management protocol used on UDP/IP networks whereby a DHCP server dynamically assigns an IP address and other network configuration parameters to each device on a network so they can communicate with other IP networks.

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

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

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

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

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

- **FTP**

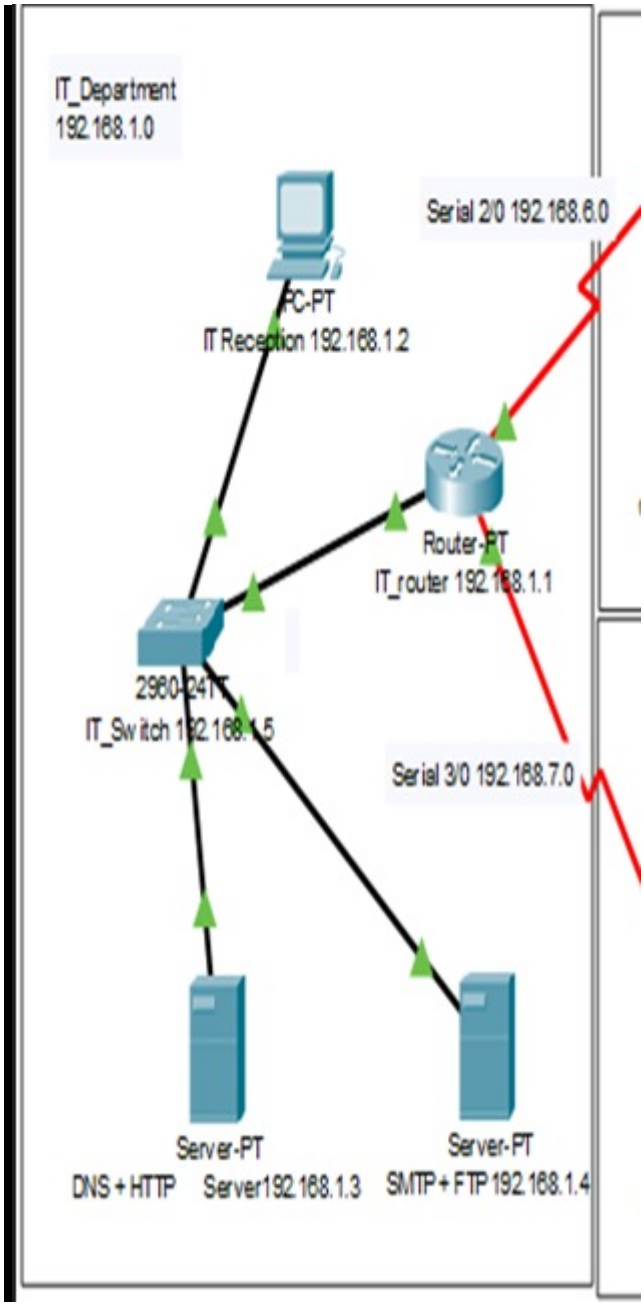
The File Transfer Protocol is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

- **WIFI**

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

NETWORK DIAGRAM:

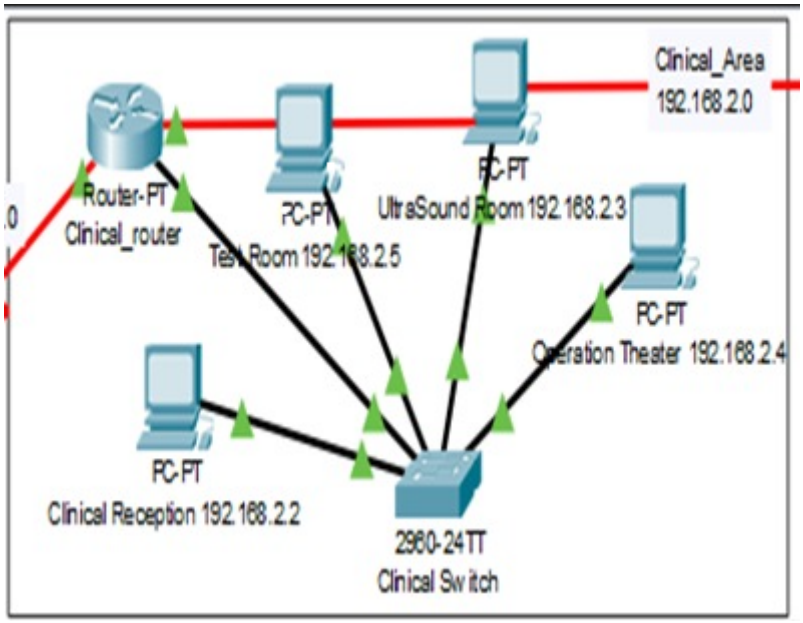
IT DEPARTMENT:



The IT department is the core of all networking in the hospital setup. It consists of 2 servers: Server-1(IP address 192.168.1.3) runs on DNS+HTTP configuration while Server-2(IP address 192.168.1.4) runs on SMTP+FTP configuration. Server-1 handles naming and communication of hosts over the hospital network. Server-2 handles transfer of files and mail between computers. IT reception area has one PC that can send and receive packets over the network. Router-PT works on RIP protocol and has defined its neighbour networks.

```
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, FastEthernet0/0
R    192.168.2.0/24 [120/1] via 192.168.6.1, 00:00:11, Serial2/0
C    192.168.6.0/24 is directly connected, Serial2/0
C    192.168.7.0/24 is directly connected, Serial3/0
R    192.168.8.0/24 [120/1] via 192.168.6.1, 00:00:11, Serial2/0
```

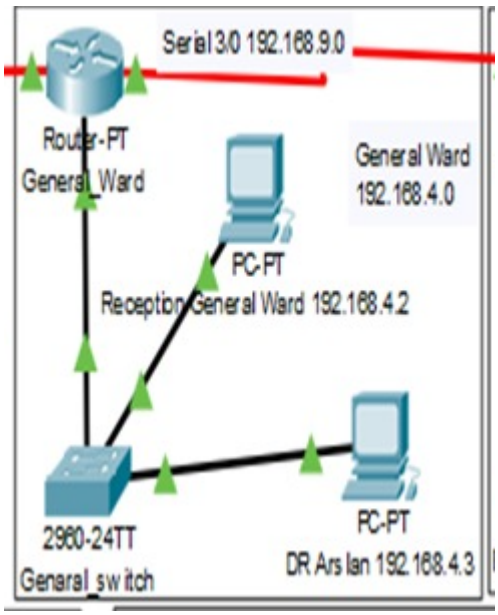
CLINICAL AREA:



The clinical area has 4 hosts: Ultrasound Room, Operation Theatre, Test Room, Clinical Reception.
All PCs are connected to Switch which uses VLAN configuration. This is the most critical area of the hospital in terms of its real world function. The hosts are connected using Serial ports as it is a small area.

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

R    192.168.1.0/24 [120/1] via 192.168.6.2, 00:00:12, Serial2/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
C    192.168.6.0/24 is directly connected, Serial2/0
R    192.168.7.0/24 [120/1] via 192.168.6.2, 00:00:12, Serial2/0
C    192.168.8.0/24 is directly connected, Serial3/0
```

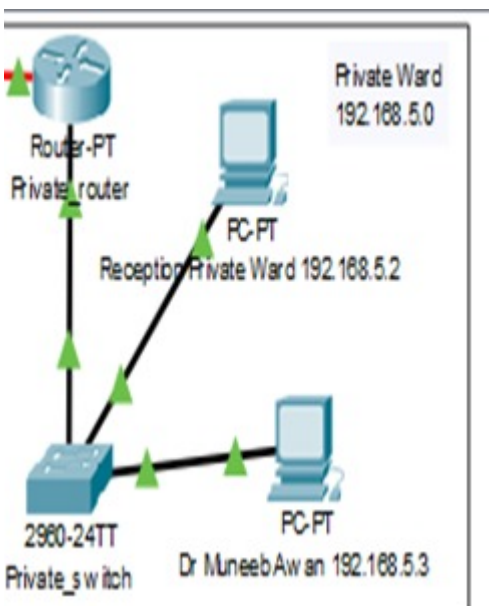
GENERAL WARD:



General Ward has 2 hosts, one of whom is Dr. Arslan. Anyone in the network can directly message his computer as it is not configured using SSH. The general ward reception computer is also public.

```
Router>enable
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.4.0/24 is directly connected, FastEthernet0/0
C    192.168.8.0/24 is directly connected, Serial2/0
C    192.168.9.0/24 is directly connected, Serial3/0

Router#
```

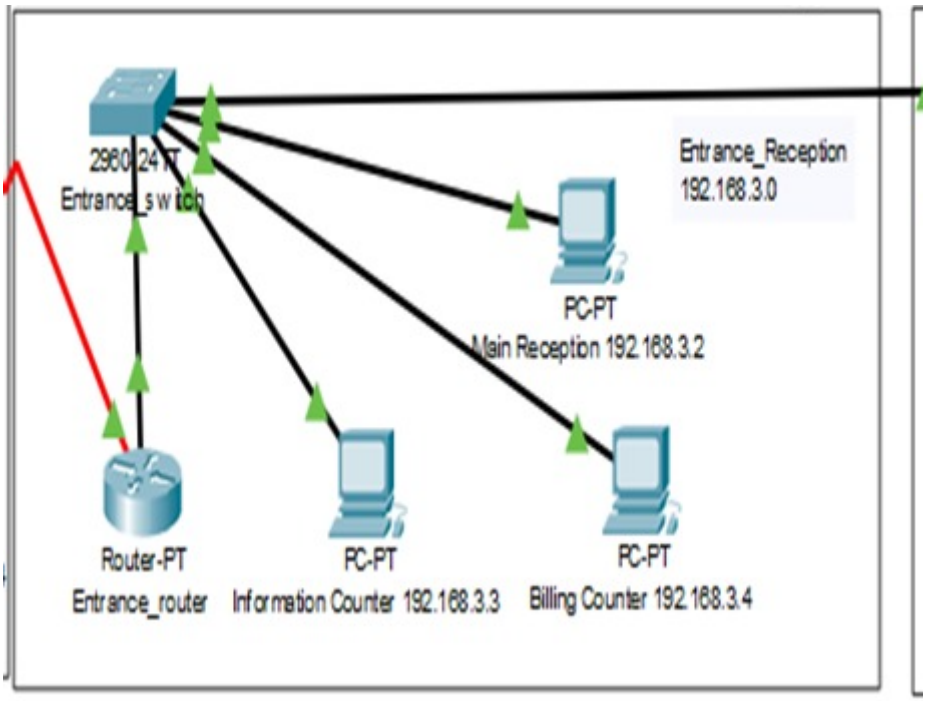
PRIVATE WARD:



The Private ward has 2 hosts, Reception Private Ward and the computer of Dr. MuneebAwan, who cannot be messaged or mailed by anyone in the network as it is secured by SSH.

```
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.5.0/24 is directly connected, FastEthernet0/0
C    192.168.9.0/24 is directly connected, Serial2/0
```

MAIN RECEPTION:

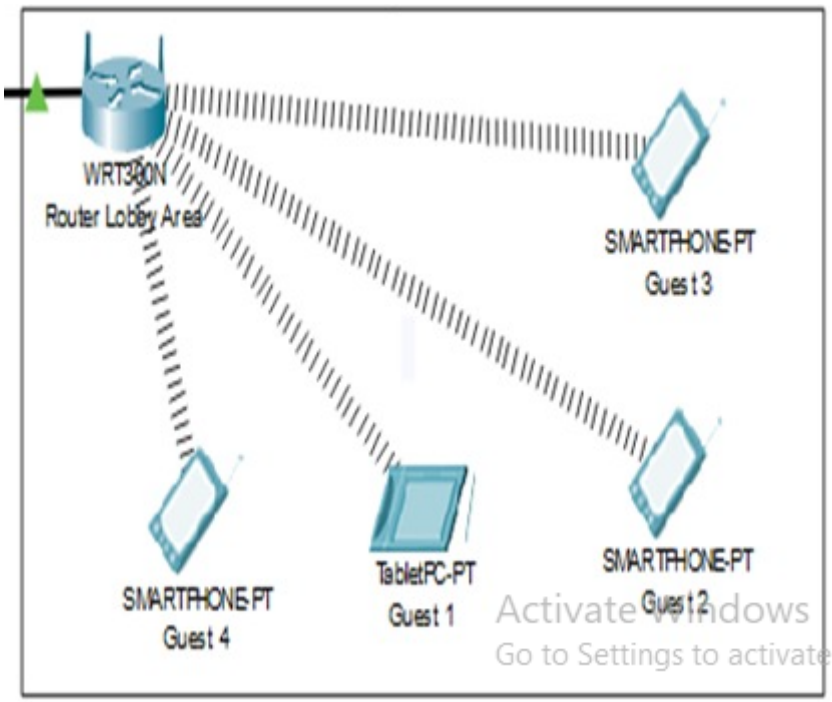


The main reception area has one Switch connected to the Router in the Lobby Area(see under “LOBBY AREA(WIRELESS ROUTER)) and 3 hosts with a local router.
The reception area handles:

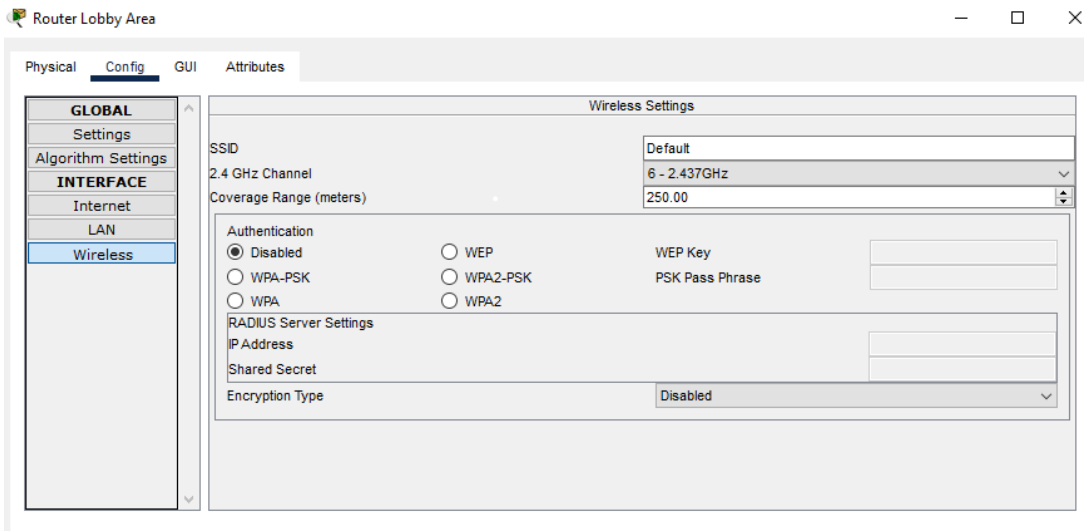
- Billing and payment related queries
- Information about general know-how of the hospital
- Main Reception computer which has database of all existing patients.

```
Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

R    192.168.1.0/24 [120/1] via 192.168.7.1, 00:00:06, Serial3/0
R    192.168.2.0/24 [120/2] via 192.168.7.1, 00:00:06, Serial3/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
R    192.168.6.0/24 [120/1] via 192.168.7.1, 00:00:06, Serial3/0
C    192.168.7.0/24 is directly connected, Serial3/0
R    192.168.8.0/24 [120/2] via 192.168.7.1, 00:00:06, Serial3/0
```

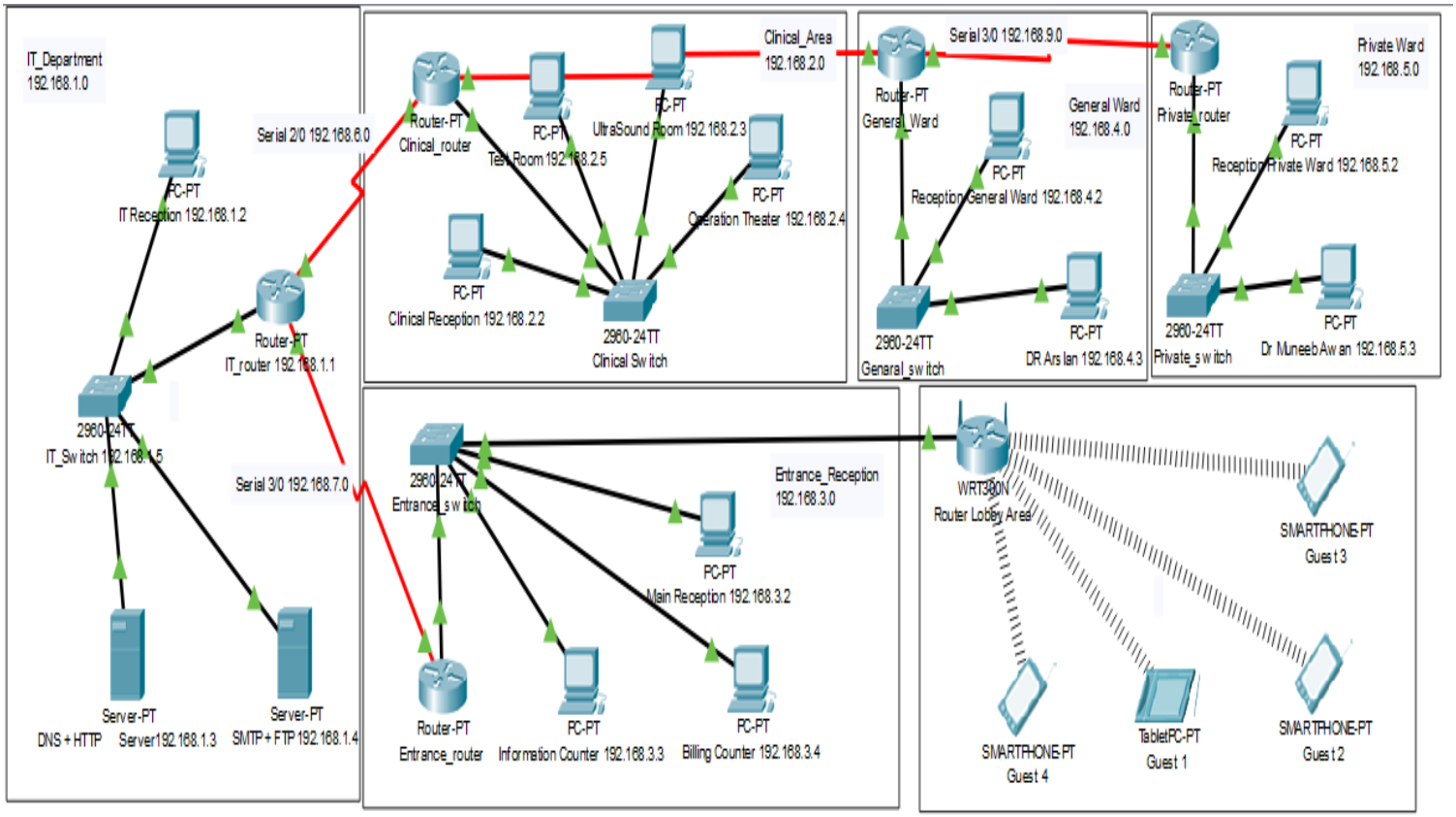
LOBBY AREA(WIRELESS ROUTER):



The Lobby area has a router capable of sending WiFi signals to any kind of electronic device such as Smartphones, tablets etc. This is the general waiting area for relatives of patients. They all have access to the WiFi.



OVERALL PROJECT PLAN:



CONCLUSION

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