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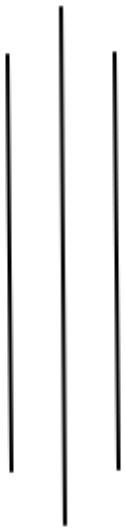

Project Report on

Hospital Network Architecture

(Computer Networks)

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Abbreviations

ISA	Internal Service Area
PSA	Patient Service Area
MSA	Medical Service Area
VLSM	Variable Length Subnet Masking
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
VLAN	Virtual Local Area Network
OSPF	Open Shortest Path First
ISP	Internet Service Provider

INTRODUCTION

The network topology in this project is about a hospital network architecture. The topology was built using different hospital's departments and corresponding architecture.

I supposed the network ID to be: 220.24.0.0/21.

NETWORK TOPOLOGY

The detailed topology of the hospital network architecture is shown below. **Since all the PCs in the network are provided IP address through respective DHCP servers, I have not marked IP Address to them since IP address will change for each PC.**

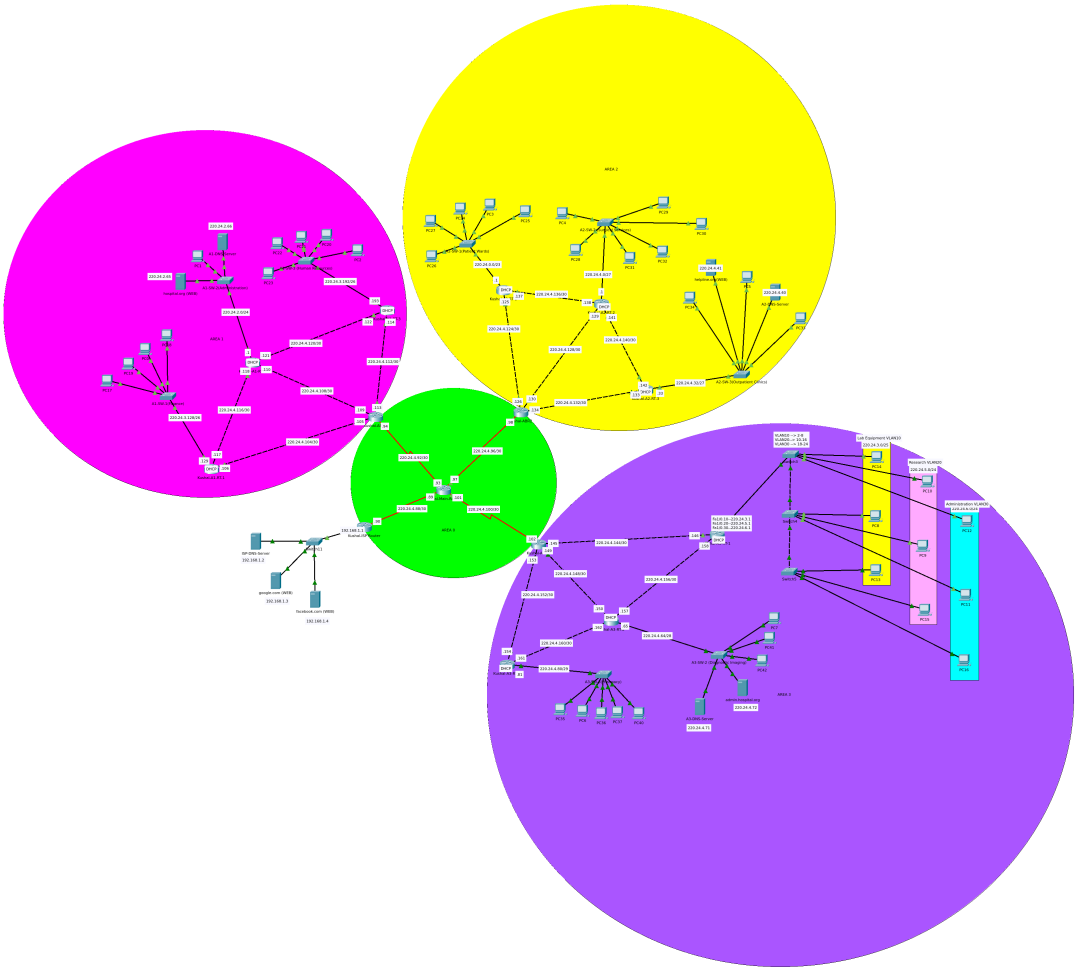

Figure 1: Hospital Network Topology

IP Pools using VLSM

Name	Network Address	Usable Range
Patient Wards	220.24.0.0/23	220.24.0.1 - 220.24.1.254
Administration	220.24.2.0/24	220.24.2.1 - 220.24.2.254
Lab Equipment(VLAN 10)	220.24.3.0/25	220.24.3.1 - 220.24.3.126
Finance	220.24.3.128/26	220.24.3.129 - 220.24.3.190
Human Resources	220.24.3.192/26	220.24.3.193 - 220.24.3.254
Surgical Services	220.24.4.0/27	220.24.4.1 - 220.24.4.30
Outpatient Clinic	220.24.4.32	220.24.4.33 - 220.24.4.62
Diagnostic Imaging	220.24.4.64	220.24.4.65 - 220.24.4.78
Pharmacy	220.24.4.80/29	220.24.4.81 - 220.24.4.86
ISP-Main Router	220.24.4.88/30	220.24.4.89 - 220.24.4.90
Main Router- ISA	220.24.4.92/30	220.24.4.93 - 220.24.4.94
Main Router-PSA	220.24.4.96/30	220.24.4.97 - 220.24.4.98
Main Router- MSA	220.24.4.100/30	220.24.4.101 - 220.24.4.102
ISA-Finance	220.24.4.104/30	220.24.4.105 - 220.24.4.106
ISA-Administration	220.24.4.108/30	220.24.4.109 - 220.24.4.110
ISA-Human Resources	220.24.4.112/30	220.24.4.113 - 220.24.4.114
Finance-Administration	220.24.4.116/30	220.24.4.117 - 220.24.4.118
Administration-Human Resources	220.24.4.120/30	220.24.4.121 - 220.24.4.122
PSA-Patient Wards	220.24.4.124/30	220.24.4.125 - 220.24.4.126
PSA-Surgical Services	220.24.4.128/30	220.24.4.129 - 220.24.4.130
PSA-Outpatient Clinics	220.24.4.132/30	220.24.4.133 - 220.24.4.134
Patient Wards-Surgical Services	220.24.4.136/30	220.24.4.137 - 220.24.4.138
Surgical Services-Outpatient Clinics	220.24.4.140/30	220.24.4.141 - 220.24.4.142
MSA-Laboratory	220.24.4.144/30	220.24.4.145 - 220.24.4.146
MSA-Diagnostic Imaging	220.24.4.148/30	220.24.4.149 - 220.24.4.150
MSA-Pharmacy	220.24.4.152/30	220.24.4.153 - 220.24.4.154
Laboratory-Diagnostic Imaging	220.24.4.156/30	220.24.4.157 - 220.24.4.158
Diagnostic-Pharmacy	220.24.4.160/30	220.24.4.161 - 220.24.4.162
Research(VLAN 20)	220.24.5.0/24	220.24.5.1 - 220.24.5.254
Administration(VLAN 30)	220.24.6.0/24	220.24.6.1 - 220.24.6.254

Table 1: Network Address and Usable Range for Departments and P2P links

OSPF Areas

OSPF routing is used for the routing in the network with following area division in the network:

Area 0: Backbone Area

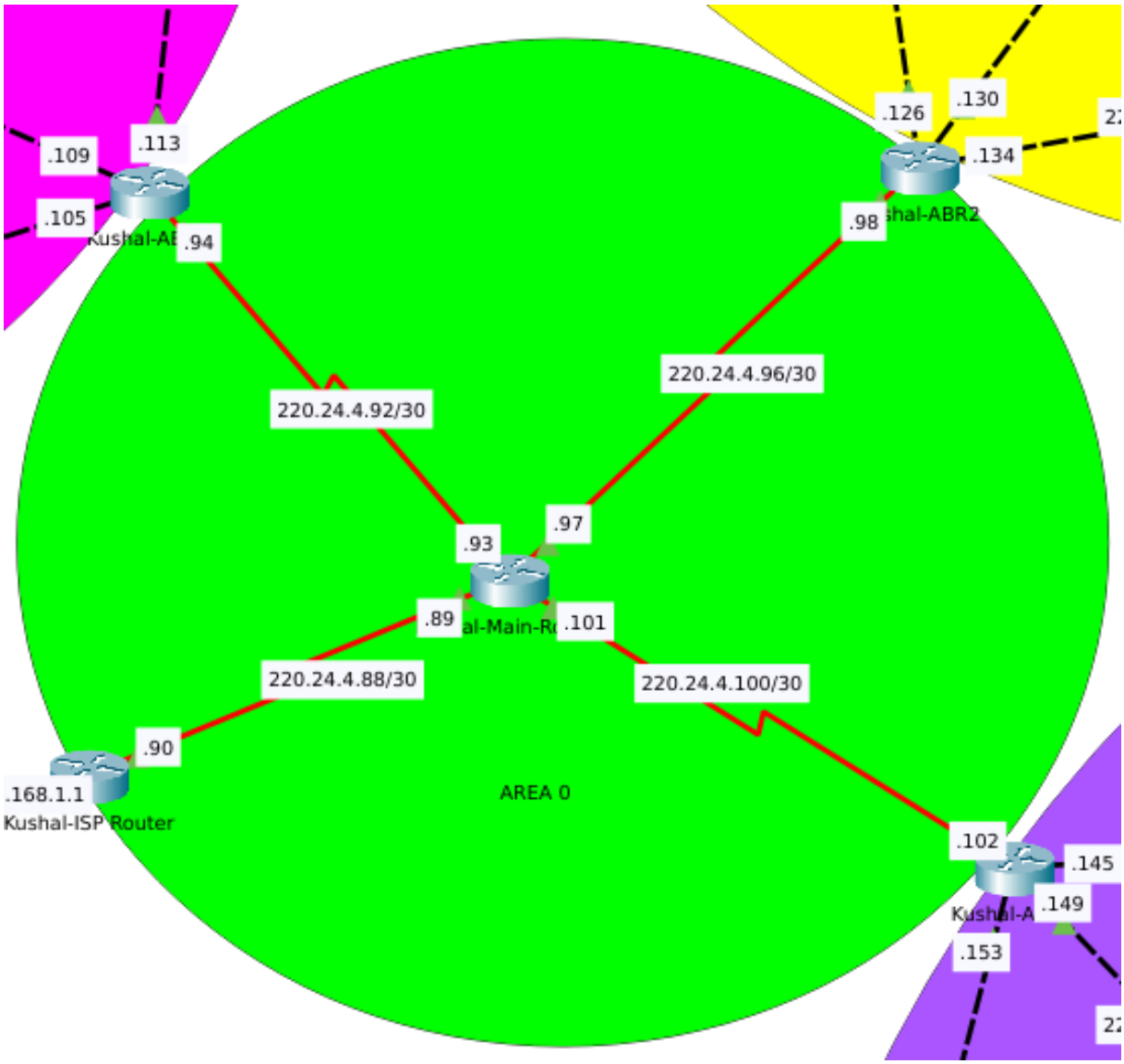

Figure 2: Area 0 Network Architecture

Area 1: Internal Department Area

Departments

- Finance
- Administration
- Human Resources

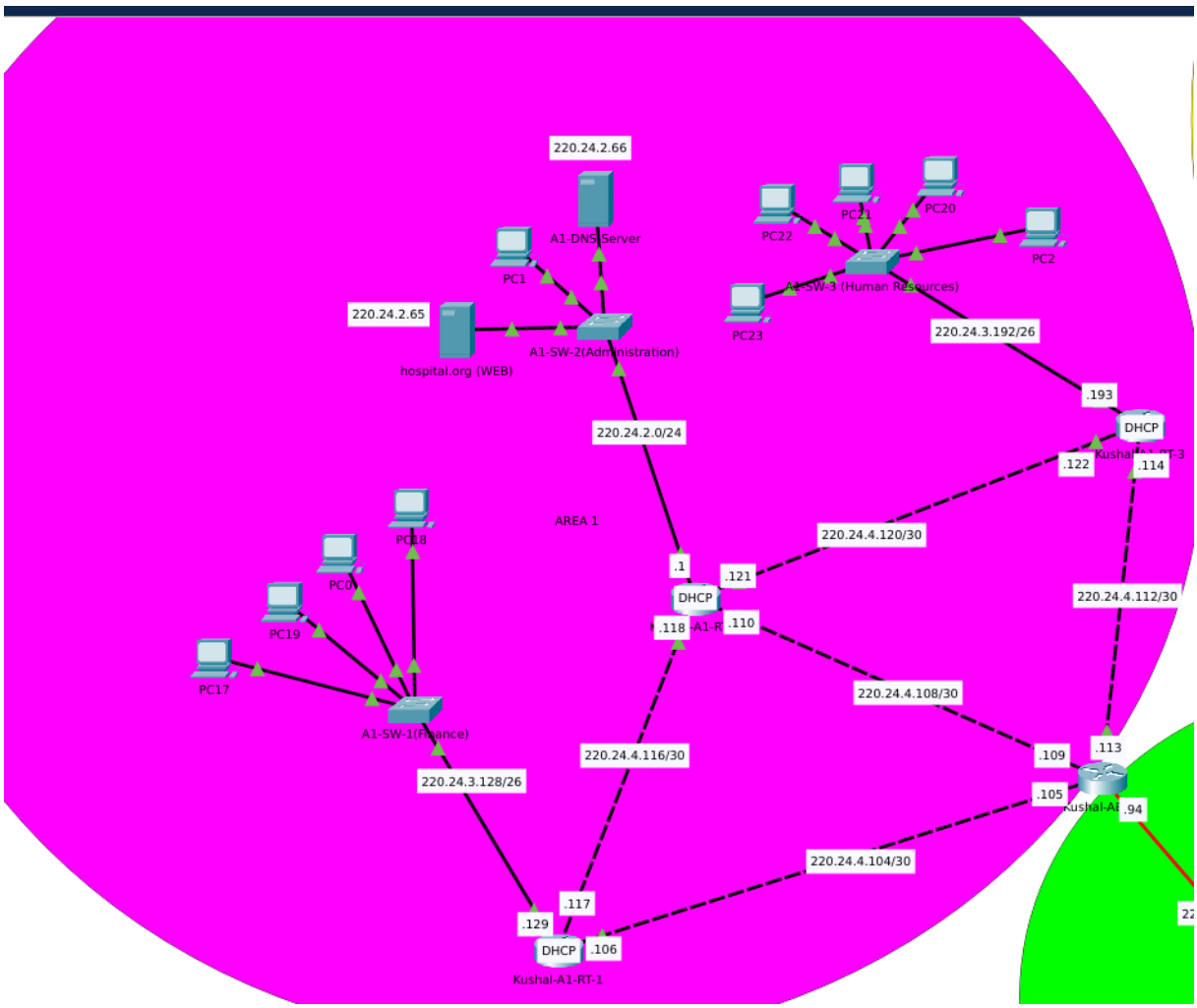

Figure 3: Area 0 Network Architecture

Area 2: Patient Services Area

Departments

- Patient Wards
- Surgical Services
- Outpatient Clinics

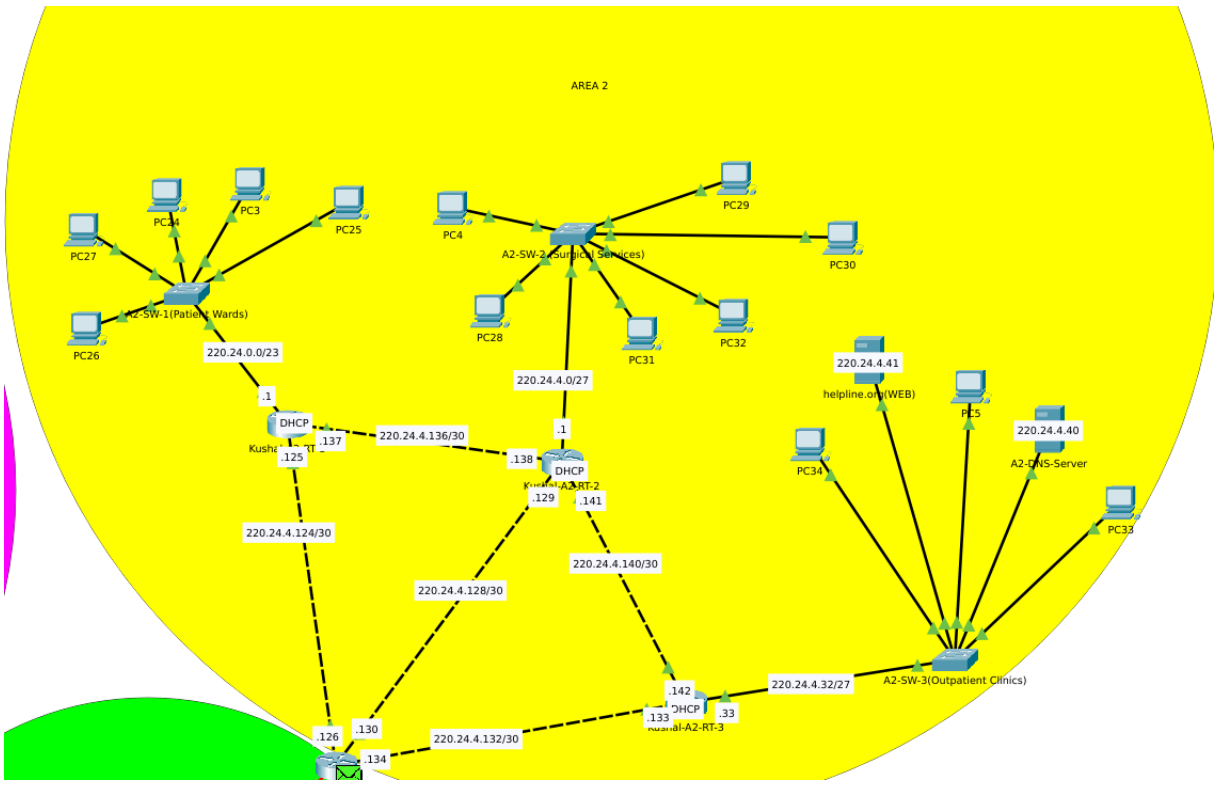

Figure 4: Area 0 Network Architecture

Area 3: Medical Services Area

Departments

- Laboratory
- Diagnostic Imaging
- Pharmacy

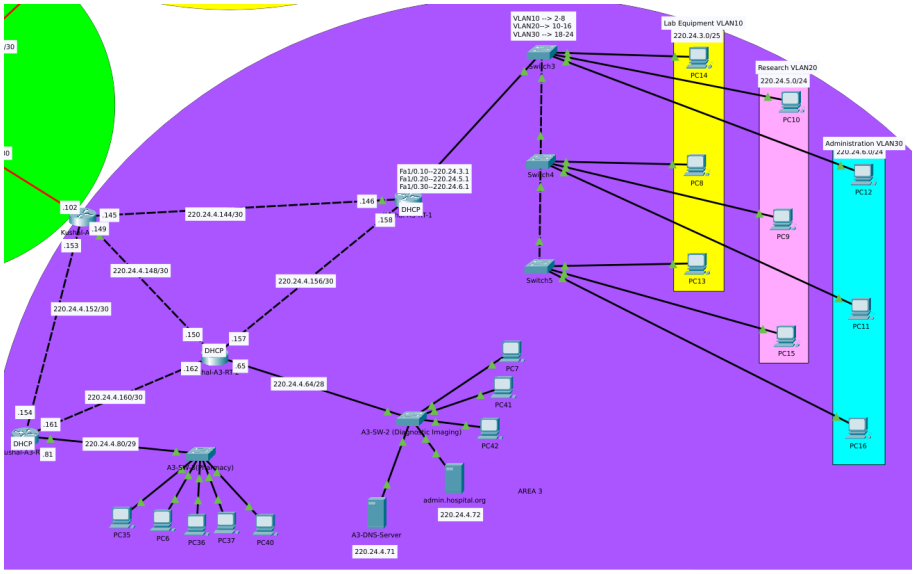

Figure 5: Area 0 Network Architecture

VLAN Configuration

General Overview of VLANs in the network:

- Lab Equipment VLAN (VLAN 10):
  - VLAN ID: 10
  - Purpose: This VLAN is dedicated to lab equipment such as diagnostic devices, testing instruments, and research tools.
- Research VLAN (VLAN 20):
  - VLAN ID: 20
  - Purpose: This VLAN is for researchers and scientists who need to collaborate and share data within the laboratory.
- Administration VLAN (VLAN 30):
  - VLAN ID: 30
  - Purpose: This VLAN is for administrative devices within the Laboratory department, such as office computers, printers, and management tools.

Switch3, Switch4 and Switch5 in Area 3 are configured for VLAN with following ports mapping:

- VLAN 10: Port Fa0/2-8
- VLAN 20: Port Fa0/10-16
- VLAN 30: Port Fa0/18-24

Trunk Ports:

- Switch3: Fa0/1, Fa0/9
- Switch4: Fa0/17, Fa0/9
- Switch5: Fa0/17

Kushal-A3-RT-1 is configured for Router-on-stick for inter-vlan routing with following sub-interfaces at interface Fa1/0:

- Fa1/0.10–220.24.3.1/25
- Fa1/0.20–220.24.5.1/24
- Fa1/0.30–220.24.6.1/24

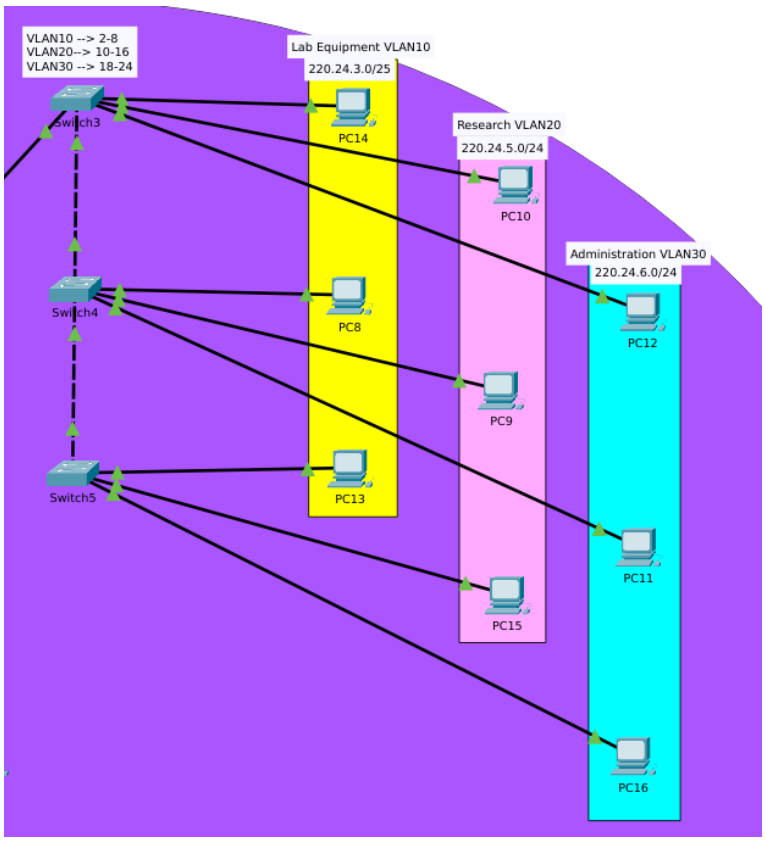

Figure 6: VLAN Configuration

DHCP Configuration

Routers at each departments are used as DHCP servers. The following routers are used for DHCP:

- Area 1: Kushal-A1-RT-1, Kushal-A1-RT-2, Kushal-A1-RT-3
- Area 2: Kushal-A2-RT-1, Kushal-A2-RT-2, Kushal-A2-RT-3
- Area 3: Kushal-A3-RT-1, Kushal-A3-RT-2 Kushal-A3-RT-3

ISP & Servers

ISP

Only on ISP is used for the network connected through Kushal-ISP-Router at 192.168.1.1.

Servers

Following table provides all the DNS and Web servers in the network architecture:

Servers	IP Address
A1-DNS-Server	220.24.2.66
A2-DNS-Server	220.24.4.40
A3-DNS-Server	220.24.4.71
ISP-DNS-Server	192.168.1.2
hospital.org(Web Server)	220.24.2.65
helpline.org(Web Server)	220.24.4.41
admin.hospital.org(Web Server)	220.24.4.72
google.com(Web Server)	192.168.1.3
facebook.com(Web Server)	192.168.1.4

Table 2: Servers and their corresponding ip address in the architecture

Network Devices Details

- **Routers**:
  - Total 14 routers are used.
  - 1 ISP router,1 Main router in Backbone Area, 3 Area Border Routers and 3*3 Routers for each department.
- **Switch**
  - Total 12 switch are used.
  - For every department, one switch is provided.
  - In case of laboratory department, VLAN configuration is used. The details are:

Conclusion

The successful culmination of this extensive network project exemplifies the successful attainment of the objectives stipulated by the Computer Network course. Through the adept incorporation of a myriad of intricate networking principles and cutting-edge technologies, encompassing aspects such as VLSM, OSPF routing, static routing, ISP connectivity, web servers, DNS, DHCP, and VLANs, this project has effectively bridged the gap between theoretical underpinnings and tangible real-world outcomes. The resultant network infrastructure stands as a testament to meticulous planning, deliberate design, and skillful execution, embodying both a carefully crafted architectural approach and a robust implementation strategy.