TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

Project Report On
Design of Pulchowk Campus
Autonomous System in Cisco Packet Tracer

Submitted By:
Name: Sudip Tiwari
Rollno: 077BCT085
Group: D

Submitted To:
Department of Electronics and
Computer Engineering

Introduction

Project Overview: This proposal consists of a network design effort that attempts to envisage the Network Topology and functioning of Pulchowk Campus, IoE. This proposal ventures on realizing the Campus Network as an Autonomous System with an effort to model the campus network architecture as accurately as possible. This project aims to implement the concept gathered during Computer Networks and Security theory and practical classes into real world applications.

Objectives: The primary objective of this project is to design and implement a functional network topology for Pulchowk Campus, IoE, using Cisco Packet Tracer. The design divides the campus network into four OSPF areas, each representing different segments of the campus network. The network aims to achieve efficient data communication and connectivity across various departments and facilities within the campus.

Network Design

Topology Overview: The network design for Pulchowk Campus, IoE, is divided into four OSPF areas to represent different segments of the campus network. Each area is color-coded in the network diagram for easy identification and management.

- **Area 0 (Blue):** Contains the CIT ASBR and CIT Library Subnet, including a web server for "pulchowk.com". This area also includes two VLANs, namely ICTC & DoECE Students and ICTC & DoECE Faculty, along with a DNS Server.
- **Area 1 (Brown):** Encompasses the Whitehouse and Architecture Subnets, along with the Web Server for "ioe.com".
- **Area 2 (Pink):** Comprises the Mechanical Department Router, which is further divided into two VLANs for Mechanical and Aerospace Department LANs. This area also includes the Civil Department Router and the Applied Science Router, where the second DNS Server is connected.
- **Area 3 (Green):** Includes the Hostel zone, consisting of a Boys Hostel Router with three VLANs dividing the network into Block A, Block B, and Block C VLANs. This area also includes a Girls Hostel Router.

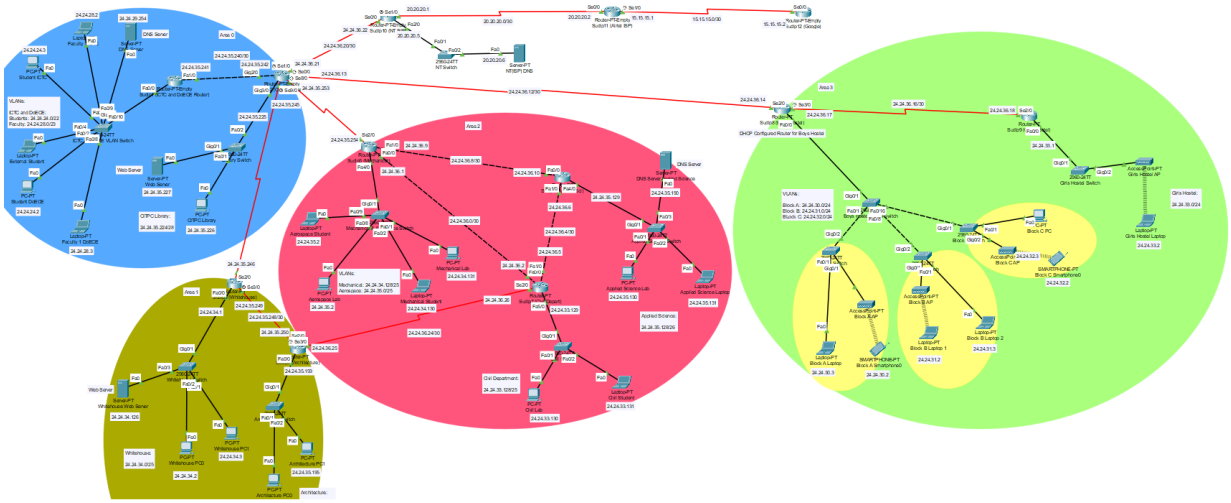

Fig: Network Topology

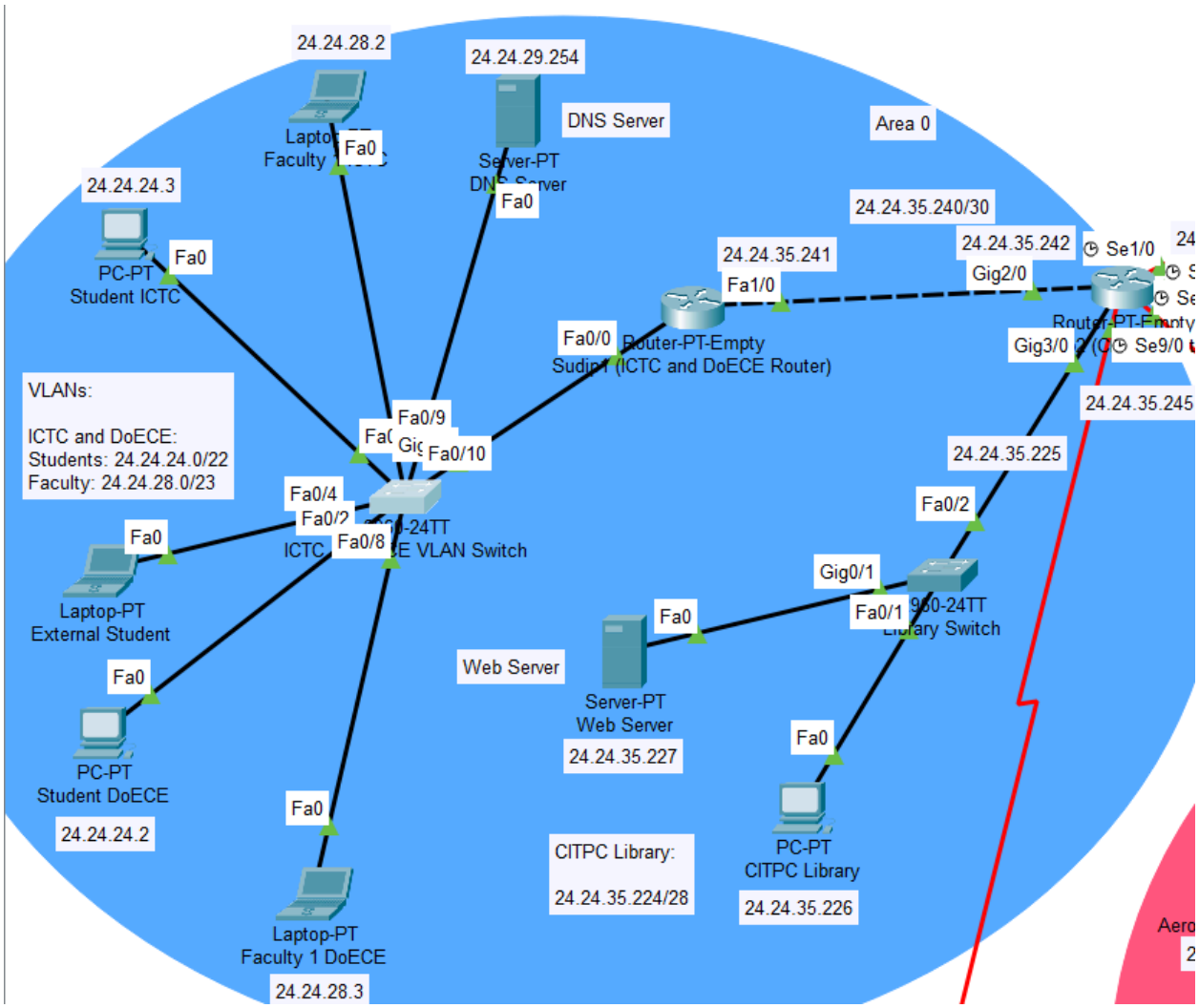

Fig: Network Topology of Area 0

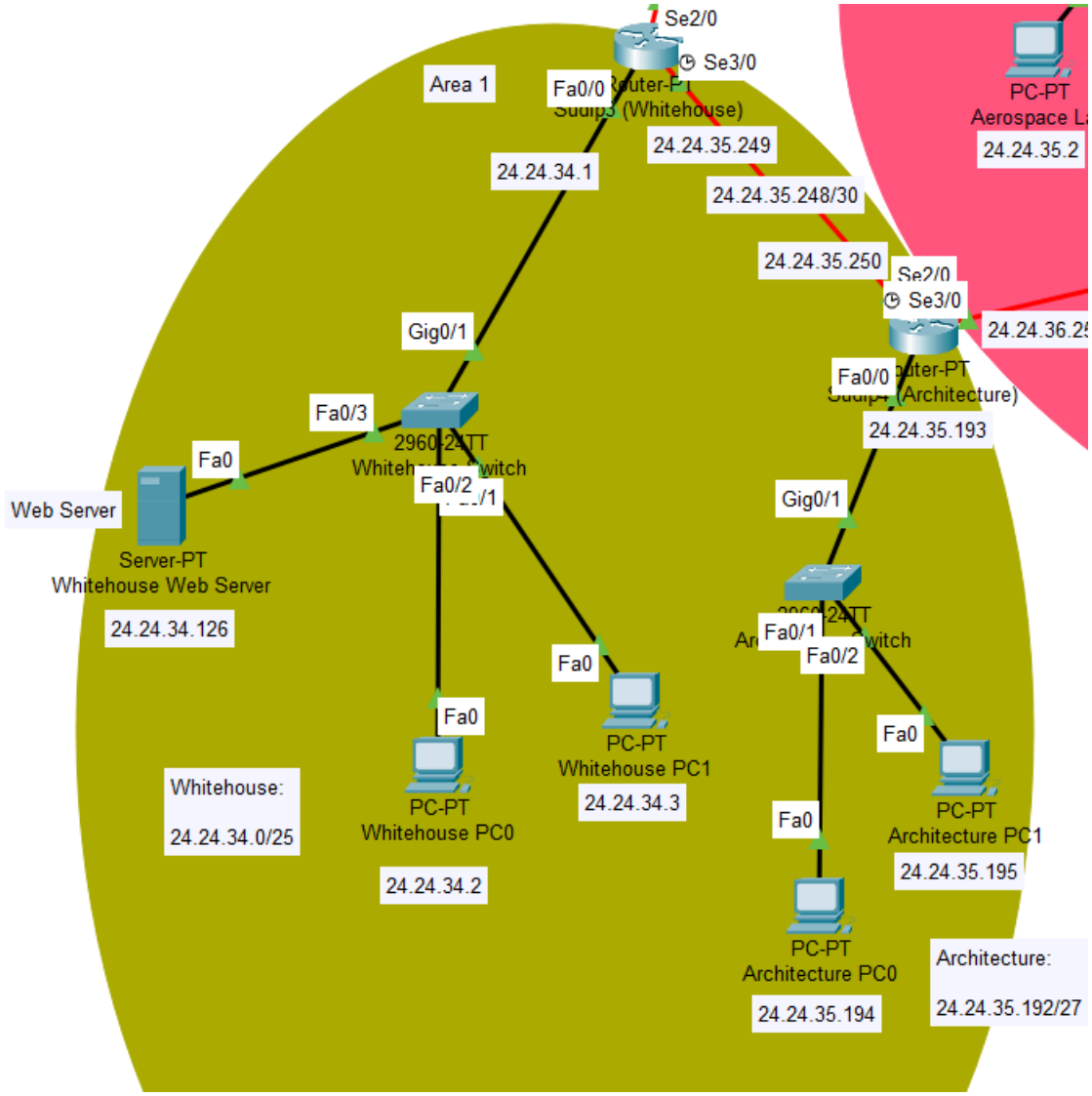

Fig: Network Topology of Area 1

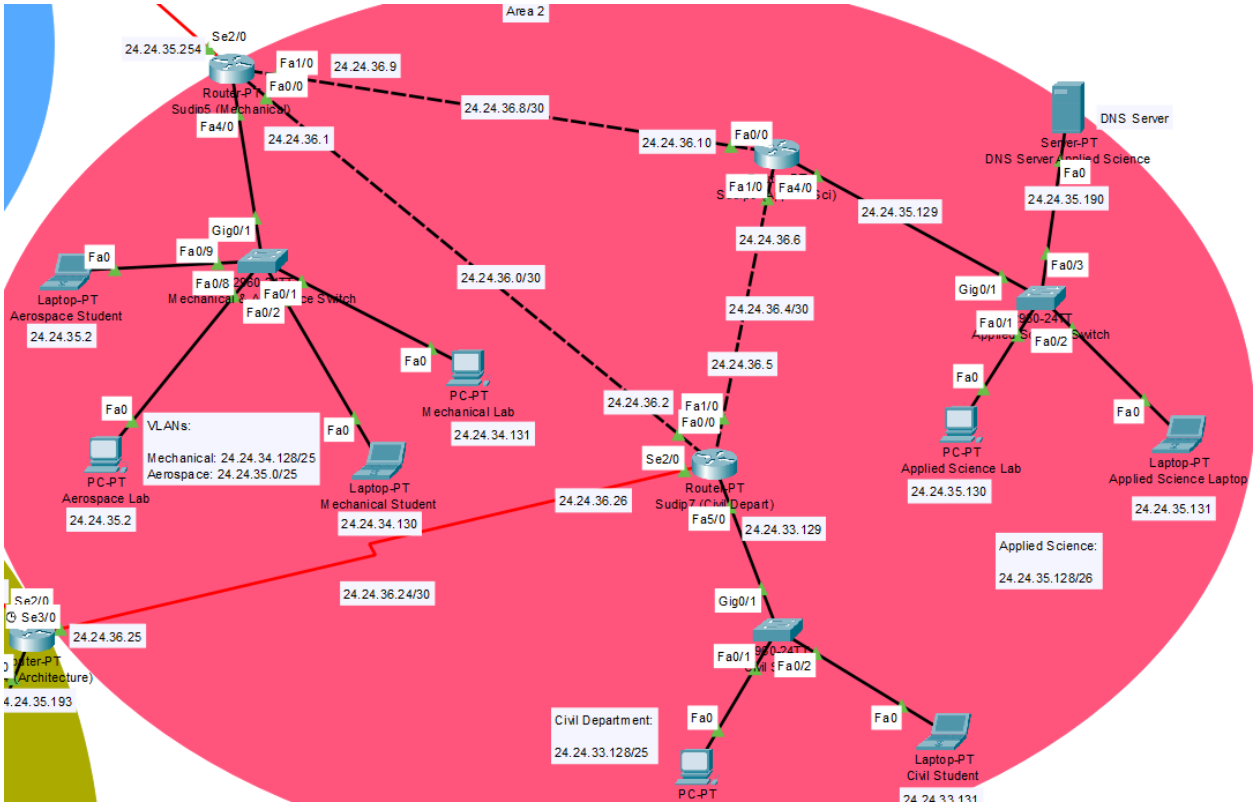

Fig: Network Topology of Area 2

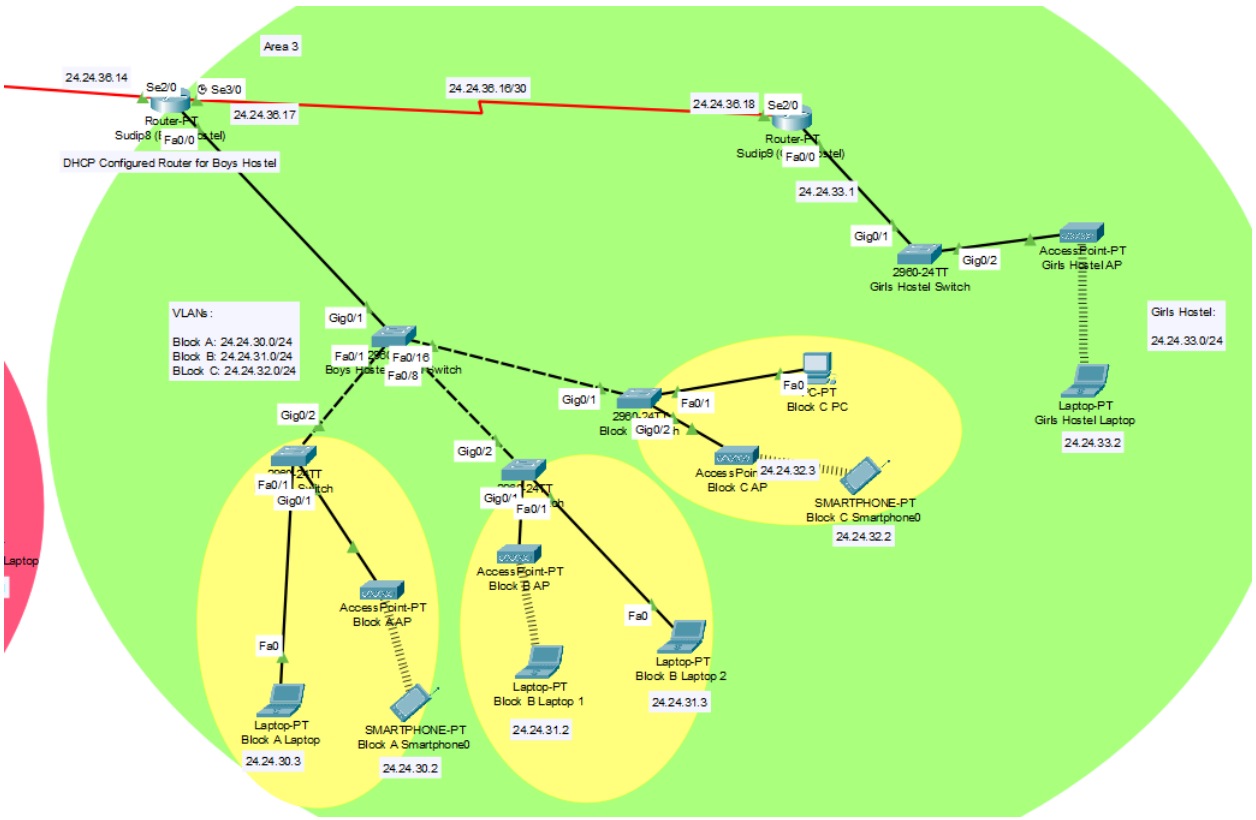

Fig: Network Topology of Area 3

IP Addresses: The following pool of IP Addresses of two networks were acquired:

- **24.24.24.0/21,** and
- **24.24.32.0/21**

The division of IP Addresses for each subnet using VLSM resulted into:

S.N	Department	No. of IPs Required	Subnet Mask	Net-ID	Usable IP Range	Broadcast Address
1	ICTC	550	255.255.252.0	24.24.24.0	24.24.24.1 - 24.24.26.254	24.24.27.255
2	DoECE	300	255.255.254.0	24.24.28.0	24.24.28.1 - 24.24.29.254	24.24.29.255
3	Boys Hostel Block A	200	255.255.255.0	24.24.30.0	24.24.30.1 - 24.24.30.254	24.24.30.255
4	Boys Hostel Block B	200	255.255.255.0	24.24.31.0	24.24.31.1 - 24.24.31.254	24.24.31.255
5	Boys Hostel Block C	200	255.255.255.0	24.24.32.0	24.24.32.1 - 24.24.32.254	24.24.32.255
6	Girls Hostel	120	255.255.255.128	24.24.33.0	24.24.33.1 - 24.24.33.126	24.24.33.127
7	Civil Department	100	255.255.255.128	24.24.33.128	24.24.33.129 - 24.24.33.254	24.24.33.255
8	Whitehouse	80	255.255.255.128	24.24.34.0	24.24.34.1 - 24.24.34.126	24.24.34.127
9	Mechanical Department	70	255.255.255.128	24.24.34.128	24.24.34.129 - 24.24.34.254	24.24.34.255
10	Aerospace Department	70	255.255.255.128	24.24.35.0	24.24.35.1 - 24.24.35.126	24.24.35.127
11	Applied Science	60	255.255.255.192	24.24.35.128	24.24.35.129 - 24.24.35.190	24.24.35.191
12	Architecture Department	25	255.255.255.224	24.24.35.192	24.24.35.193 - 24.24.35.222	24.24.35.223
13	CITPC Library	10	255.255.255.240	24.24.35.224	24.24.35.225 - 24.24.35.238	24.24.35.239
14	CIT to ICTC & DoECE	2	255.255.255.252	24.24.35.240	24.24.35.241 - 24.24.35.242	24.24.35.243
15	CIT to	2	255.255.255.2	24.24.35.2	24.24.35.245 -	24.24.35.247

	Whitehouse		52	44	24.24.35.246	
16	Whitehouse to Architecture	2	255.255.255.252	24.24.35.248	24.24.35.249 - 24.24.35.250	24.24.35.251
17	CIT to Mechanical	2	255.255.255.252	24.24.35.252	24.24.35.253 - 24.24.35.254	24.24.35.255
18	Mechanical to Civil	2	255.255.255.252	24.24.36.0	24.24.36.1 - 24.24.36.2	24.24.36.3
19	Civil to Applied Science	2	255.255.255.252	24.24.36.4	24.24.36.5 - 24.24.36.6	24.24.36.7
20	Mechanical to Applied Science	2	255.255.255.252	24.24.36.8	24.24.36.9 - 24.24.36.10	24.24.36.11
21	Applied Science to Boys Hostel	2	255.255.255.252	24.24.36.12	24.24.36.13 - 24.24.36.14	24.24.36.15
22	Boys Hostel to Girls Hostel	2	255.255.255.252	24.24.36.16	24.24.36.17 - 24.24.36.18	24.24.36.19
23	CIT to NT	2	255.255.255.252	24.24.36.20	24.24.36.21 - 24.24.36.22	24.24.36.23
24	Civil to Architecture	2	255.255.255.252	24.24.36.24	24.24.36.25 - 24.24.36.26	24.24.36.27

IP Address of each Server:

Web Server for “pulchowk.com”	24.24.35.227
Web Server for “ioe.com”	24.24.34.126
DNS 1	24.24.29.254
DNS 2	24.24.35.190
Root DNS at ISP	20.20.20.6

Implementation

Devices and Connections: The network implementation for Pulchowk Campus, IoE, utilizes the following devices:

- **Routers:** Router-PT (each router was configured to have console password as “cisco”, password for privileged access as “class” and password for telnet as “network”.)
- **Switches:** Switch 2960-24 TT
- **Servers:** DNS servers and Web servers for specific subnets

The network design includes VLAN configurations on three different switches to segregate traffic and improve network management. The VLANs are set up as follows:

1. **Area 0:** Includes VLANs for ICTC & DoECE Students and ICTC & DoECE Faculty.
2. **Area 2:** Includes VLANs for Mechanical and Aerospace Department LANs.
3. **Area 3:** Includes VLANs for Boys Hostel (Blocks A, B, and C).

The devices are interconnected to form a cohesive network topology and the routers are configured to handle OSPF routing, while the switches manage VLAN traffic within their respective areas.

Configuration Details: While the specific configuration commands are not included in this report to maintain brevity, the overall configuration process involved:

- Setting up OSPF areas and assigning routers to their respective areas.
- Configuring IP addresses and subnet masks as per the VLSM scheme.
- Creating and managing VLANs on the switches to segregate network traffic.
- Configuring DNS and Web servers to provide necessary services within the network.

Testing and Results

The Ping Test and Web server access test were carried out to confirm connectivity and access of Web Servers from different devices inside the network and following are the results of the tests conducted:

1. **Ping Test:** All PCs successfully pinged any other PC in the network, indicating that the network connectivity is robust and there are no communication issues within the network.
2. **Web Server Access Test:** All PCs were able to browse the web servers "pulchowk.com" and "ioe.com" without any issues, confirming that the web servers are accessible and functioning as expected.

These results validate that the network design meets the required objectives and functions as intended.

Conclusion

The network design for Pulchowk Campus, IoE, was successfully implemented using Cisco Packet Tracer. The network was divided into four OSPF areas to efficiently manage different segments of the campus. The IP addressing scheme was carried out using VLSM to ensure optimal use of IP addresses. The devices were correctly configured and interconnected, and VLANs were established to segregate network traffic effectively. Each of the internal networks were reachable from any computer and all the Internet Traffic was forwarded to the Upstream Service Provider. Similarly, the network packets were forwarded to our network from ISP without Dynamic routing using minimum possible route entries. Finally, each of the servers were made operable so that they can be accessed from any computers and in this way, our objective for this project was fulfilled.