TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS

A

PROJECT REPORT ON

"COMPUTER NETWORK MINI PROJECT"

SUBMITTED BY

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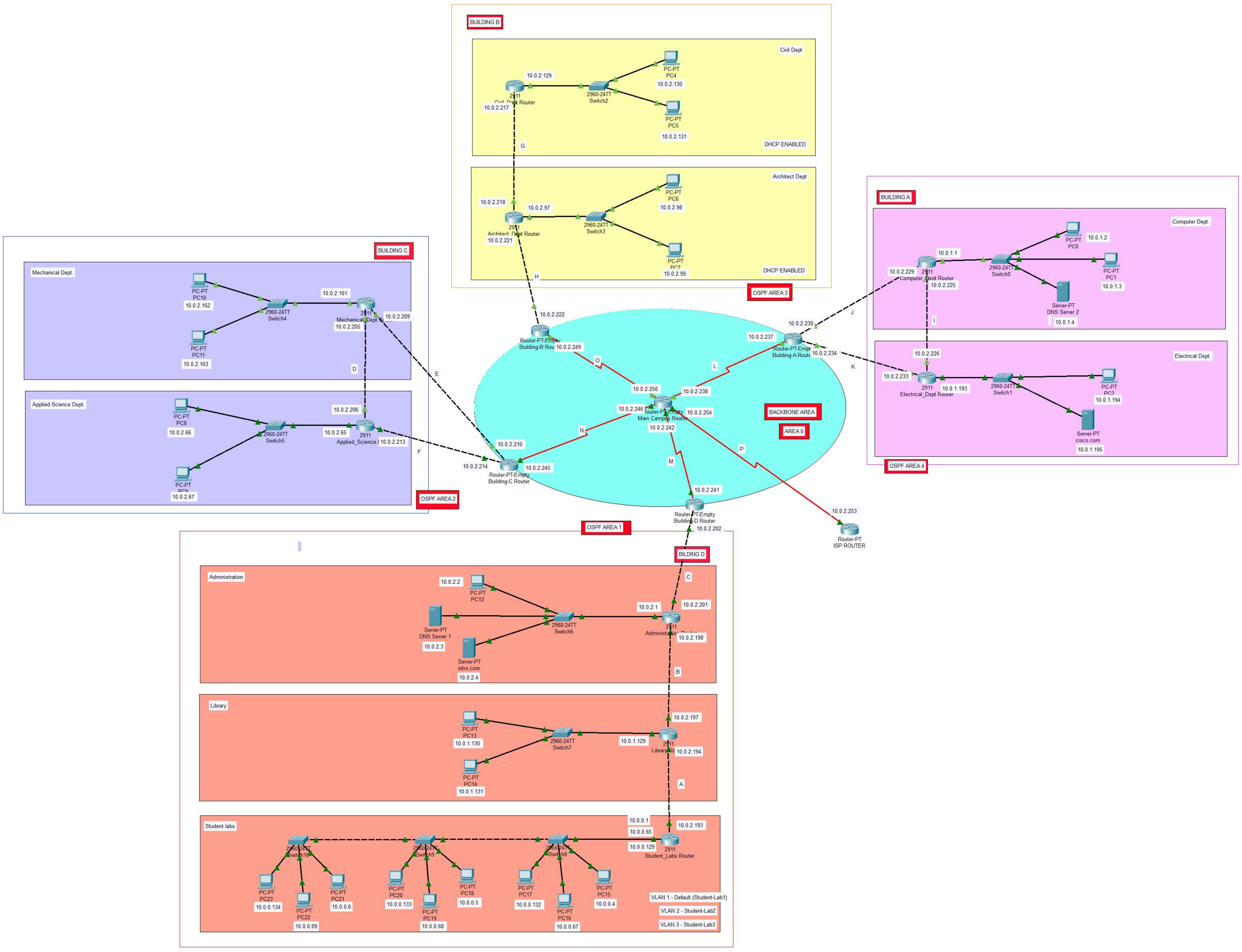
SUBMITTED TO

DEPARTMENT OF ELECTRONICS & COMPUTER ENGINEERING

AUGUST 30, 2023

NETWORK DESIGN

The network topology for **XYZ-Engineering College** after the final configuration is as below;



Major Network IP Address: **10.0.0.0/22**
Available IP addresses in major network: 1022
Number of IP addresses needed: 540

VARIABLE LENGTH SUBNETTING (VLSM)

Subnet Name	No. Of Hosts	Network ID	Subnet Mask	Assignable Range	Broadcast
Students Labs	180	10.0.0.0/24	255.255.255.0	10.0.0.1 - 10.0.0.254	10.0.0.255
Computer	96	10.0.1.0/25	255.255.255.128	10.0.1.1 - 10.0.1.126	10.0.1.127
Library	50	10.0.1.128/26	255.255.255.192	10.0.1.129 - 10.0.1.190	10.0.1.191
Electrical	48	10.0.1.192/26	255.255.255.192	10.0.1.193 - 10.0.1.254	10.0.1.255
Administration	40	10.0.2.0/26	255.255.255.192	10.0.2.1 - 10.0.2.62	10.0.2.63

Applied Science	24	10.0.2.64/27	255.255.255.224	10.0.2.65 - 10.0.2.94	10.0.2.95
Architect	24	10.0.2.96/27	255.255.255.224	10.0.2.97 - 10.0.2.126	10.0.2.127
Civil	24	10.0.2.128/27	255.255.255.224	10.0.2.129 - 10.0.2.158	10.0.2.159
Mechanical	24	10.0.2.160/27	255.255.255.224	10.0.2.161 - 10.0.2.190	10.0.2.191
Interface A	2	10.0.2.192/30	255.255.255.252	10.0.2.193 - 10.0.2.194	10.0.2.195
Interface B	2	10.0.2.196/30	255.255.255.252	10.0.2.197 - 10.0.2.198	10.0.2.199
Interface C	2	10.0.2.200/30	255.255.255.252	10.0.2.201 - 10.0.2.202	10.0.2.203
Interface D	2	10.0.2.204/30	255.255.255.252	10.0.2.205 - 10.0.2.206	10.0.2.207
Interface E	2	10.0.2.208/30	255.255.255.252	10.0.2.209 - 10.0.2.210	10.0.2.211
Interface F	2	10.0.2.212/30	255.255.255.252	10.0.2.213 - 10.0.2.214	10.0.2.215
Interface G	2	10.0.2.216/30	255.255.255.252	10.0.2.217 - 10.0.2.218	10.0.2.219
Interface H	2	10.0.2.220/30	255.255.255.252	10.0.2.221 - 10.0.2.222	10.0.2.223
Interface I	2	10.0.2.224/30	255.255.255.252	10.0.2.225 - 10.0.2.226	10.0.2.227
Interface J	2	10.0.2.228/30	255.255.255.252	10.0.2.229 - 10.0.2.230	10.0.2.231
Interface K	2	10.0.2.232/30	255.255.255.252	10.0.2.233 - 10.0.2.234	10.0.2.235
Interface L	2	10.0.2.236/30	255.255.255.252	10.0.2.237 - 10.0.2.238	10.0.2.239
Interface M	2	10.0.2.240/30	255.255.255.252	10.0.2.241 - 10.0.2.242	10.0.2.243
Interface N	2	10.0.2.244/30	255.255.255.252	10.0.2.245 - 10.0.2.246	10.0.2.247
Interface O	2	10.0.2.248/30	255.255.255.252	10.0.2.249 - 10.0.2.250	10.0.2.251
Interface P	2	10.0.2.252/30	255.255.255.252	10.0.2.253 - 10.0.2.254	10.0.2.255

VLAN CONFIGURATION

Here, the network "Student Labs" is subdivided to create three VLANs, resulting in the subnetting of the network ID **10.0.0.0/24** into three separate subnetted VLANs.

Vlan Name	No. Of Hosts	Network Id	Subnet Mask	Assignable Range	Broadcast
Vlan 1 [Students-Lab1]	60	10.0.0.0/26	255.255.255.192	10.0.0.1 - 10.0.0.62	10.0.0.63

Vlan 2 [Students-Lab2]	60	10.0.0.64/26	255.255.255.192	10.0.0.65 - 10.0.0.126	10.0.0.127
Vlan 3 [Students-Lab3]	60	10.0.0.128/26	255.255.255.192	10.0.0.129 - 10.0.0.190	10.0.0.191

OSPF CONFIGURATION

Here, each building is treated as one area of OSPF, i.e area-1 to area-4. The backbone area(or area 0) helps to route the packets among different areas.

AREA ID	BUILDING	DEPARTMENTS	ROUTERS
AREA 1	BUILDING - D	Students Labs Library Administration	Student_Labs Router [Router 1], Library Router [Router 2], Administration Router [Router 3]
AREA 2	BUILDING - C	Mechanical Department Applied Science Department	Mechanical_Dept Router[Router 5], Applied_Science Router [Router 6]
AREA 3	BUILDING - B	Civil Department Architect Department	Civil_Dept Router[Router 8], Architect_Dept Router [Router 9]
AREA 4	BUILDING - A	Computer Department Electrical Department	Computer_Dept Router[Router 11], Electrical_Dept Router [Router 12]
AREA 0	-	-	Main Campus Router [Router 14]
AREA BORDER ROUTERS	-	-	Building-D Router [Router 4], Building-C Router [Router 7], Building-B Router [Router 10], Building-A Router [Router 13]

WEB AND DNS SERVER CONFIGURATION

Here, I have configured two web servers and two dns server located at different network area.

WEB/DNS	URL/NAME	IP ADDRESS	NETWORK
WEB	cisco.com	10.0.1.195	Electrical Department
	intro.com	10.0.2.4	Administration
DNS	DNS Server 1	10.0.2.3	Administration
	DNS Server 2	10.0.1.4	Computer Departement

DHCP SERVER CONFIGURATION

The DHCP Servers have been configured inside two different networks.

DHCP Name	Router	IP Pool	Gateway	DNS Server
civil_dept	Civil_Dept Router	10.0.2.128/27	10.0.2.129	10.0.2.3
architect_dept	Architect_Dept Router	10.0.2.96/27	10.0.2.97	10.0.1.4

ADDITIONAL CONFIGURATION

The paragraph describes the additional configurations implemented in the network design project as follows:

- OSPF routing protocol is employed for internal routing. Any ping request to the devices outside the network is directed to the ISP Router. This is achieved by configuring a default route within the main-campus router, which is subsequently distributed within the OSPF network.
- The ISP router is configured with a Static Route to facilitate the forwarding of all network packets to the XYZ-Engineering network.
- Building-C and Building-A have been equipped with multiple paths, aligning with the specifications outlined in the proposal requirements.

ROUTER PASSWORD CONFIGURATION

The router password configuration is as below:

- Password for privileged access mode: **class**
- Password for console line : **cisco**
- Password for virtual terminal (telnet): **cisco**

CONCLUSION

To sum things up, the network project for XYZ-Engineering College reflects a comprehensive solution tailored to the institution's networking needs. I employed Variable Length Subnetting (VLSM) to effectively manage IP addresses, facilitating the coexistence of various departments and segments within the major network. The segmentation of the "Student Labs" network into VLANs enhances both network security and management. Utilizing the OSPF routing protocol with distinct areas optimizes packet routing and communication.

Furthermore, strategically situating web and DNS servers across diverse network zones improves service availability and load distribution. The implementation of DHCP servers in different network sections streamlines the management of IP addresses, simplifying the provisioning of network devices. Lastly, additional configurations such as OSPF routing, setting up static routes for the ISP underscore my commitment to enhancing resilience, fault tolerance, and efficient data flow within the project. To conclude, the network design project showcases meticulous planning, effective application of networking principles, and my dedication to meeting the connectivity and resource requirements of XYZ-Engineering College.