Computer Networksand Data Communications

(CSCL 3205)

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CNDC PROJECT

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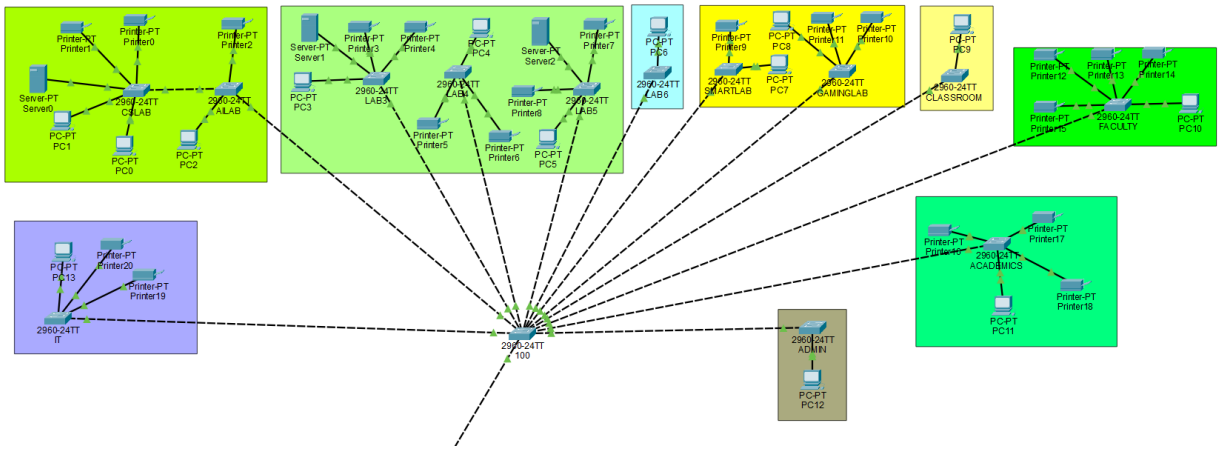
SCENERIO:
You have to design and implement networking infrastructure for SZABIST Karachi campus. In Karachi there are multiple departments functioning in seven different buildings. Based on the following description, draw up a detailed diagram to illustrate the SZABIST's networking infrastructure. In the diagram, include the internal network with the connecting devices. Requirement for each building have been mentioned and should be implemented accordingly. Clearly label all the elements of the diagram.

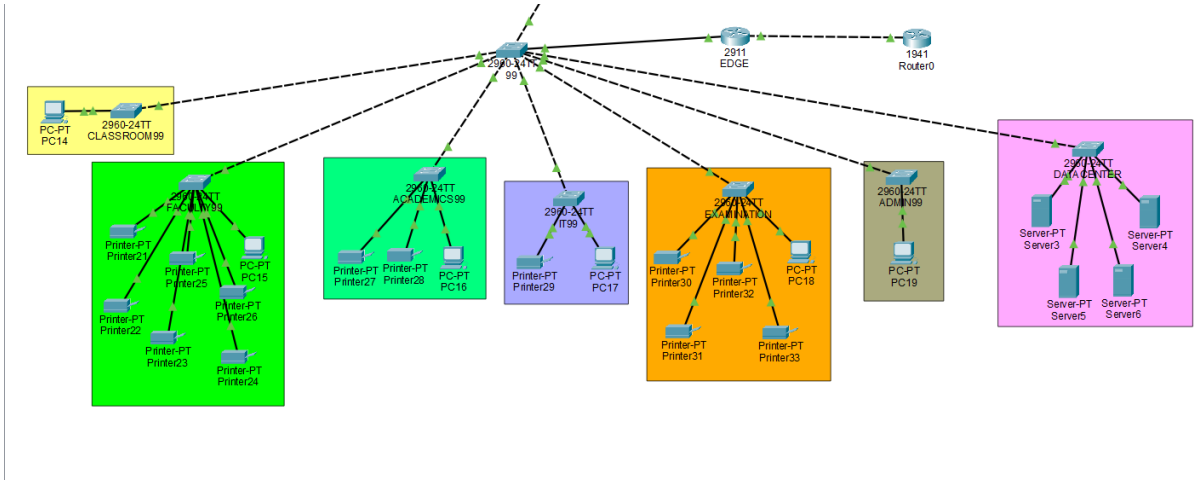
INTRODUCTION:
This report presents the design and implementation of the networking infrastructure for SZABIST Karachi campus. The objective is to provide a robust and scalable network that supports the various departments and buildings within the campus. The report outlines the requirements for each building and provides details on the network design, IP pooling, subnetting, VLAN implementation, inter-VLAN routing, DHCP configuration, port security, NAT, ACLs, dynamic routing, connectivity, remote management, and security measures.

Network Design and Implementation
This section describes the networking infrastructure for each building within the SZABIST Karachi campus.
100 Campus Building The 100 Campus Building consists of seven labs, classrooms, and departments. The
following devices are present in each lab:
CS Lab: 58 PCs, 2 Printers, 1 FTP server
Lab-3: 38 PCs, 2 Printers, 1 FTP server
Lab-4: 35 PCs, 2 Printers
Lab-5: 35 PCs, 2 Printers, 1 FTP server
Lab-6: 35 PCs
Smart Lab: 40 PCs, 1 Printer
Gaming Lab: 9 PCs, 2 Printers
Additionally, there are classrooms, faculty PCs, printers, and department-specific devices. The networking infrastructure for the 100 Campus Building will be designed and implemented to accommodate these requirements.

100 Campus Building:



99 Campus Building:



VLANS implementation:

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                                 Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                                 Fa0/9, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/16, Gig0/1
                                                 Gig0/2
2    CSAILAB                           active
3    LAB345                            active
4    FACULTY                           active
5    SGLAB                             active
6    CLASSROOM                         active
7    LAB6                              active
8    EXAMINATION                       active
9    ACADEMICS                         active
10   IT                                active
11   ADMIN                             active
12   DC                                active
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
2    enet  100002     1500  -      -      -        -    -        0      0
3    enet  100003     1500  -      -      -        -    -        0      0
4    enet  100004     1500  -      -      -        -    -        0      0
5    enet  100005     1500  -      -      -        -    -        0      0
6    enet  100006     1500  -      -      -        -    -        0      0
7    enet  100007     1500  -      -      -        -    -        0      0
8    enet  100008     1500  -      -      -        -    -        0      0
9    enet  100009     1500  -      -      -        -    -        0      0
10   enet  100010     1500  -      -      -        -    -        0      0
11   enet  100011     1500  -      -      -        -    -        0      0
12   enet  100012     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0
```

IP Pools:

Name	Interface	IP Address	Subnet Mask	Default Gateway
CSLAB	___	___	___	211.21.10.1
AILAB	___	___	___	211.21.10.1
LAB3	___	___	___	211.21.10.129
LAB4	___	___	___	211.21.10.129
LAB5	___	___	___	211.21.10.129
LAB6	___	___	___	211.21.26.1
SMARTLAB	___	___	___	211.21.20.129
GAMINGLAB	___	___	___	211.21.20.129
FACULTY	___	___	___	211.21.20.1
FACULTY99	___	___	___	211.21.20.1
CLASSROOM	___	___	___	211.21.20.193
CLASSROOM99	___	___	___	211.21.20.193

IT	___	___	___	211.21.27.1
IT99	___	___	___	211.21.27.1
ACADEMICS	___	___	___	211.21.26.97
ACADEMICS99	___	___	___	211.21.26.97
EXAMINATION	___	___	___	211.21.26.65
ADMIN	___	___	___	211.21.27.33
ADMIN99	___	___	___	211.21.27.33
DATACENTER	___	___	___	211.21.27.49

Sub-Interfaces:

G0/0.2	211.21.10.1	255.255.255.128	___	VLAN 2
G0/0.3	211.21.10.129	255.255.255.128	___	VLAN 3
G0/0.4	211.21.20.1	255.255.255.128	___	VLAN 4
G0/0.5	211.21.20.129	255.255.255.192	___	VLAN 5
G0/0.6	211.21.20.193	255.255.255.192	___	VLAN 6
G0/0.7	211.21.26.1	255.255.255.192	___	VLAN 7
G0/0.8	211.21.26.65	255.255.255.224	___	VLAN 8
G0/0.9	211.21.26.97	255.255.255.224	___	VLAN 9
G0/0.10	211.21.27.1	255.255.255.224	___	VLAN 10
G0/0.11	211.21.27.33	255.255.255.240	___	VLAN 11
G0/0.12	211.21.27.49	255.255.255.248	___	VLAN 12

Static IPs:

CS-Printer-1	___	211.21.10.10	255.255.255.128	211.21.10.1
CS-Printer-2	___	211.21.10.11	255.255.255.128	211.21.10.1
CS-Server-1	___	211.21.10.12	255.255.255.128	211.21.10.1
AI-Printer-1	___	211.21.10.13	255.255.255.128	211.21.10.1
Lab3-Printer-1	___	211.21.10.140	255.255.255.128	211.21.10.129
Lab3-Printer-2	___	211.21.10.141	255.255.255.128	211.21.10.129
Lab3-Server-1	___	211.21.10.142	255.255.255.128	211.21.10.129
Lab4-Printer-1	___	211.21.10.143	255.255.255.128	211.21.10.129
Lab4-Printer-2	___	211.21.10.144	255.255.255.128	211.21.10.129
Lab5-Printer-1	___	211.21.10.145	255.255.255.128	211.21.10.129
Lab5-Printer-2	___	211.21.10.146	255.255.255.128	211.21.10.129
Lab5-Server-1	___	211.21.10.147	255.255.255.128	211.21.10.129
SmartLab-Printer-1	___	211.21.20.140	255.255.255.192	211.21.20.129
GamingLab-Printer-1	___	211.21.20.141	255.255.255.192	211.21.20.129

GamingLab-Printer-2	___	211.21.20.142	255.255.255.192	211.21.20.129
Faculty100-Printer-1	___	211.21.20.10	255.255.255.128	211.21.20.1
Faculty100-Printer-2	___	211.21.20.11	255.255.255.128	211.21.20.1
Faculty100-Printer-3	___	211.21.20.12	255.255.255.128	211.21.20.1
Faculty100-Printer-4	___	211.21.20.13	255.255.255.128	211.21.20.1
Academic100-Printer-1	___	211.21.26.110	255.255.255.224	211.21.26.97
Academic100-Printer-2	___	211.21.26.111	255.255.255.224	211.21.26.97
Academic100-Printer-3	___	211.21.26.112	255.255.255.224	211.21.26.97
IT100-Printer-1	___	211.21.27.10	255.255.255.224	211.21.27.1
IT100-Printer-2	___	211.21.27.11	255.255.255.224	211.21.27.1
Faculty99-Printer-1	___	211.21.20.14	255.255.255.128	211.21.20.1
Faculty99-Printer-2	___	211.21.20.15	255.255.255.128	211.21.20.1
Faculty99-Printer-3	___	211.21.20.16	255.255.255.128	211.21.20.1
Faculty99-Printer-4	___	211.21.20.17	255.255.255.128	211.21.20.1
Faculty99-Printer-5	___	211.21.20.18	255.255.255.128	211.21.20.1
Faculty99-Printer-6	___	211.21.20.19	255.255.255.128	211.21.20.1
Academic99-Printer-1	___	211.21.26.113	255.255.255.224	211.21.26.97
Academic99-Printer-2	___	211.21.26.114	255.255.255.224	211.21.26.97
IT99-Printer-1	___	211.21.27.12	255.255.255.224	211.21.27.1
Examination99-Printer-1	___	211.21.26.80	255.255.255.224	211.21.26.65
Examination99-Printer-2	___	211.21.26.81	255.255.255.224	211.21.26.65
Examination99-Printer-3	___	211.21.26.82	255.255.255.224	211.21.26.65
Examination99-Printer-4	___	211.21.26.83	255.255.255.224	211.21.26.65
DataCenter99-Web-Server	___	211.21.27.52	255.255.255.248	211.21.27.49
DataCenter99-ZABDESK-Server	___	211.21.27.51	255.255.255.248	211.21.27.49
DataCenter99-Email-Server	___	211.21.27.53	255.255.255.248	211.21.27.49
DataCenter99-CMS-Server	___	211.21.27.54	255.255.255.248	211.21.27.49

Access and Trunk Ports:

VLANs	***NAME***	***SWITCH PORT NUMBER***			
		DEVICE	***ACCESS PORTS***	***DEVICE***	***TRUNK PORT***
VLAN 2	CSAILAB	CSLAB	fa 0/1 - fa 0/23	CSLAB	fa 0/24
		AILAB	fa 0/1 - fa 0/24	AILAB	g 0/1
VLAN 3	LAB345	LAB3	fa 0/1 - fa 0/24	LAB3	g 0/1
		LAB4	fa 0/1 - fa 0/24	LAB4	g 0/1
		LAB5	fa 0/1 - fa 0/24	LAB5	g 0/1
VLAN 4	FACULTY	FACULTY	fa 0/1 - fa 0/24	FACULTY	g 0/1
		FACULTY99	fa 0/1 - fa 0/24	FACULTY99	g 0/1
VLAN 5	SGLAB	SMARTLAB	fa 0/1 - fa 0/24	SMARTLAB	g 0/1
		GAMINGLAB	fa 0/1 - fa 0/24	GAMINGLAB	g 0/1
VLAN 6	CLASSROOM	CLASSROOM	fa 0/1 - fa 0/24	CLASSROOM	g 0/1

		CLASSROOM99	fa 0/1 - fa 0/24	CLASSROOM99	g 0/1
VLAN 7	LAB6	LAB6	fa 0/1 - fa 0/24	LAB6	g 0/1
VLAN 8	EXAMINATION	EXAMINATION	fa 0/1 - fa 0/24	EXAMINATION	g 0/1
VLAN 9	ACADEMICS	ACADEMICS	fa 0/1 - fa 0/24	ACADEMICS	g 0/1
		ACADEMICS99	fa 0/1 - fa 0/24	ACADEMICS99	g 0/1
VLAN 10	IT	IT	fa 0/1 - fa 0/24	IT	g 0/1
		IT99	fa 0/1 - fa 0/24	IT99	g 0/1
VLAN 11	ADMIN	ADMIN	fa 0/1 - fa 0/24	ADMIN	g 0/1
		ADMIN99	fa 0/1 - fa 0/24	ADMIN99	g 0/1
VLAN 12	DATACENTER	DC	fa 0/1 - fa 0/24	DC	g 0/1
				100Campus	fa 0/10 & fa 0/12 - fa 0/
				99Campus	fa 0/10 & fa 0/18 - fa 0/

Network Functionality and Security

Enhancements To optimize the network infrastructure at SZABIST Karachi campus, various measures will
be implemented. Inter-VLAN routing will facilitate seamless communication between VLANs, promoting efficient data transfer and network connectivity. DHCP configuration will dynamically assign IP addresses
to PCs, streamlining network management and device configuration. Static IP addresses will be allocated to servers and printers, ensuring consistent and reliable connectivity. Port security measures will enhance network security by implementing appropriate techniques to restrict unauthorized access to servers and lab devices. Network Address Translation (NAT) will establish a connection between SZABIST's network and the internet using a public IP pool, enabling secure and efficient internet access. Access Control Lists (ACLs) will be implemented to control network traffic, allowing only authorized users and devices to access critical network resources. These measures collectively enhance network functionality, efficiency, and security at SZABIST Karachi campus.

CONCLUSION:

In conclusion, the design and implementation of the networking infrastructure for SZABIST Karachi campus will deliver a resilient and adaptable network solution tailored to the diverse needs of different departments and buildings. By incorporating advanced techniques such as IP pooling, subnetting, VLANs, inter-VLAN routing, DHCP configuration, port security, NAT, ACLs, dynamic routing, connectivity, remote management, and robust security measures, the network will offer seamless and secure operations throughout the campus. These comprehensive approaches guarantee efficient utilization of IP addresses, efficient traffic routing, centralized management, and protection against unauthorized access, resulting in a reliable and high-performing network infrastructure for SZABIST Karachi.