Computer Networks and

Data Communication

PROJECT REPORT

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ARUN RAJ – 2012111

# Introduction

Networking infrastructure for SZABIST Karachi campus is designed and implemented in this project. There are seven different buildings. In the project internal network with the connecting devices are included. Requirement for each building were as follow:

**100 Campus Building:**

* Seven labs in 100 building with following number of devices:
  + CS Lab have 58 PCs, 2 Printer and 1 ftp server.
  + Lab-3 have 38 PCs, 2 Printer and 1 ftp server.
  + Lab-4 have 35 PCs and 2 Printer.
  + Lab-5 have 35 PCs, 2 Printer and 1ftp server.
  + Lab-6 have 35 PCs only
  + Smart Lab has 40 PCs and 1 Printer.
  + Gaming Lab have 9 PCs and 2 Printer.
* 20 classrooms in 100-building, each class room has one PC.
* 25 PCs and 4 printers belong to faculty.
* 5 PCs and three printers belong to Academic department.
* Four PCs belong to ADMINISTRATION department.
* Ten PCs and two printers belongs to IT department.

**99 Campus Building:**

* 18 classrooms in 99-building, each class room has one PC.
* 32 PCs belong to faculty and 6 printers.
* Six PCs and two printers belong to Academic department.
* four PCs and one printer belongs to IT department.
* 12 PCs and 4 printers belong to EXAMINATION department.
* Two PCs belong to ADMINISTRATION department.
* Four servers in data centre, one for web server, one for ZABDESK, one for email and one for CMS.
* EDGE router located at 99-Campus Building.

**154 Campus Building:**

* 8 classrooms in 154-building, each class room has one PC.
* 18 PCs and two printers belong to faculty.
* One PC and one printer belong to Academic department.
* Two PCs belong to ADMINISTRATION department.
* 15 PCs and one printer belongs to Mechatronics Labs.

**153 Campus Building:**

* 6 classrooms in 153-building, each class room has one PC.
* 8 PCs and three printers belong to Admission department.
* One PC and one printer belong to Academic department.

**79 Campus Building:**

* 8 PCs in Library of 79-building.
* Seven PCs and two printers belong to HR department.
* Four PCs and one printer belongs to Procurement department.
* Seven PCs and two printer belongs to ADMINISTRATION department.
* Five PCs and two printers belongs to Finance department.
* Three PCs and one printer belongs to EDC department.

**Media villa and Research villa:**

* 3 classrooms and each class room have one PC.
* 8 PCs and three printers belong to Faculty.
* One PC and one printer belong to Academic department.

Device Passwords:

Console:123

Enable:1234

# Methodology

# VLSM

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **CS LAB** | 201.21.11.0/26 | 255.255.255.192 | 201.21.11.1/26 | 2 | CS\_LAB |
|  |  | **Lab 3** | 201.21.11.64/26 | 255.255.255.192 | 201.21.11.65/26 | 3 | LAB\_3 |
|  |  | **Lab 4** | 201.21.11.128/26 | 255.255.255.192 | 201.21.11.129/26 | 4 | LAB\_4 |
|  |  | **Lab 5** | 201.21.11.192/26 | 255.255.255.192 | 201.21.11.193/26 | 5 | LAB\_5 |
| **100 Campus** |  | **Lab 6** | 201.21.01.0/26 | 255.255.255.192 | 201.21.01.1/26 | 6 | LAB\_6 |
|  |  | **Smart Lab** | 201.21.01.64/26 | 255.255.255.192 | 201.21.01.65/26 | 7 | SMART\_LAB |
|  |  | **CLASSROOMS** | 201.21.01.192/27 | 255.255.255.224 | 201.21.01.193/27 | 8 | CLASSROOMS |
|  |  | **Faculty** | 201.21.01.224/27 | 255.255.255.224 | 201.21.01.225/27 | 9 | FACULTY |
|  |  | **Gaming Lab** | 201.21.39.128/28 | 255.255.255.240 | 201.21.39.129/28 | 10 | GAMING\_LAB |
|  |  | **Academics** | 201.21.39.144/28 | 255.255.255.240 | 201.21.39.145/28 | 11 | ACADEMICS |
|  |  | **IT Dept** | 201.21.39.160/28 | 255.255.255.240 | 201.21.39.161/28 | 12 | IT\_DEPT |
|  |  | **Adminstration** | 201.21.43.64/29 | 255.255.255.248 | 201.21.43.65/29 | 13 | ADMINSTRATION |
|  |  | **Switches** | 192.168.10.0/28 | 255.255.255.240 | 192.168.10.1/28 | 1 | ------------- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **Faculty** | 201.21.01.128/26 | 255.255.255.192 | 201.21.01.129/26 | 9 | FACULTY |
|  |  | **CLASSROOMS** | 201.21.39.0/27 | 255.255.255.224 | 201.21.39.1/27 | 8 | CLASSROOMS |
|  |  | **Examination** | 201.21.39.32/27 | 255.255.255.224 | 201.21.39.33/27 | 14 | EXAMINIATION |
| **99 Campus** |  | **Academics** | 201.21.39.176/28 | 255.255.255.240 | 201.21.39.177/28 | 11 | ACADEMICS |
|  |  | **IT Dept** | 201.21.43.72/29 | 255.255.255.248 | 201.21.43.73/29 | 12 | IT\_DEPT |
|  |  | **Adminstration** | 201.21.43.80/29 | 255.255.255.248 | 201.21.43.81/29 | 13 | ADMINSTRATION |
|  |  | **Servers** | 201.21.43.88/29 | 255.255.255.248 | 201.21.43.89/29 | 15 | SERVERS |
|  |  | **Switches** | 192.168.10.32/29 | 255.255.255.248 | 192.168.10.33/29 | 1 | ------------- |
|  |  |  |  |  |  |  |  |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **Library** | 201.21.39.192/28 | 255.255.255.240 | 201.21.39.193/28 | 16 | LIBRARY |
|  |  | **HR** | 201.21.39.208/28 | 255.255.255.240 | 201.21.39.209/28 | 17 | HR |
|  |  | **Adminstration** | 201.21.39.224/28 | 255.255.255.240 | 201.21.39.225/28 | 13 | ADMINSTRATION |
| **79 Campus** |  | **Finance** | 201.21.39.240/28 | 255.255.255.240 | 201.21.39.241/28 | 18 | FINANCE |
|  |  | **Procurment** | 201.21.43.96/29 | 255.255.255.248 | 201.21.43.97/29 | 19 | PROCURMENT |
|  |  | **EDC Dept** | 201.21.43.104/29 | 255.255.255.248 | 201.21.43.105/29 | 20 | EDC\_DEPT |
|  |  | **Switches** | 192.168.10.40/29 | 255.255.255.248 | 192.168.10.40/29 | 1 | ------------- |
|  |  |  |  |  |  |  |  |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **Faculty** | 201.21.39.64/27 | 255.255.255.224 | 201.21.39.65/27 | 9 | FACULTY |
|  |  | **Mechatronics** | 201.21.39.96/27 | 255.255.255.224 | 201.21.39.97/27 | 21 | MACHATRONICS |
| **154 Campus** |  | **CLASSROOMS** | 201.21.43.0/28 | 255.255.255.240 | 201.21.43.1/28 | 8 | CLASSROOMS |
|  |  | **Academics** | 201.21.43.112/29 | 255.255.255.248 | 201.21.43.113/29 | 11 | ACADEMICS |
|  |  | **Adminstration** | 201.21.43.120/29 | 255.255.255.248 | 201.21.43.121/29 | 13 | ADMINSTRATION |
|  |  | **Switches** | 192.168.10.48/29 | 255.255.255.248 | 192.168.10.49/29 | 1 | ------------- |
|  |  |  |  |  |  |  |  |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **CLASSROOMS** | 201.21.43.16/28 | 255.255.255.240 | 201.21.43.17/28 | 8 | CLASSROOMS |
| **153 Campus** |  | **Admission** | 201.21.43.32/28 | 255.255.255.240 | 201.21.43.33/28 | 22 | ADMISSION |
|  |  | **Academics** | 201.21.43.128/29 | 255.255.255.248 | 201.21.43.129/29 | 11 | ACADEMICS |
|  |  | **Switches** | 192.168.10.56/29 | 255.255.255.248 | 192.168.10.57/29 | 1 | ------------- |
|  |  |  |  |  |  |  |  |
|  |  | **Area** | **NIP** | **Subnet Mask** | **Default Gateway** | **VLAN NO** | **VLAN NAME** |
|  |  | **Faculty** | 201.21.43.48/28 | 255.255.255.240 | 201.21.43.49/28 | 9 | FACULTY |
| **Media & Villa** |  | **CLASSROOMS** | 201.21.43.136/29 | 255.255.255.248 | 201.21.43.137/29 | 8 | CLASSROOMS |
|  |  | **Academics** | 201.21.43.144/29 | 255.255.255.248 | 201.21.43.145/29 | 11 | ACADEMICS |
|  |  | **Switches** | 192.168.10.64/29 | 255.255.255.248 | 192.168.10.65/29 | 1 | ------------- |

# VLANs and Port Assigning Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Switch port Number | | | |
| VLANs | Name | Device | Access Port | Trunk Ports |
| 2 | CS LAB | S100\_1 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |
| S100\_2 |
|  |  |
| S100\_3 | fa 0/1 - fa 0/13 |
|  |  |  |  |  |
| 3 | LAB 3 | S100\_4 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_5 | fa 0/1 - fa 0/17 |
|  |  |  |  |  |
| 4 | LAB 4 | S100\_6 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_7 | fa 0/1 - fa 0/13 |
|  |  |  |  |  |
| 5 | LAB 5 | S100\_8 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_9 | fa 0/1 - fa 0/14 |
|  |  |  |  |  |
| 6 | LAB 6 | S100\_10 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_11 | fa 0/1 - fa 0/11 |
|  |  |  |  |  |
| 7 | SMART LAB | S100\_12 | fa 0/1 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_13 | fa 0/1 - fa 0/17 |
|  |  |  |  |  |
| 8 | CLASSROOM | S100\_14 | fa 0/1 - fa 0/20 | Gi 0/1 - Gi 0/2 |
|  |  |
| S99\_1 | fa 0/19 - fa 0/23 |
|  |  |
| SMV1 | fa 0/1 - fa 0/3 |
|  |  |
| S154\_1 | fa 0/1 - fa 0/8 |
|  |  |
| S153\_1 | fa 0/1 - fa 0/6 |
|  |  |  |  |  |
| 9 | FACULTY | S100\_13 | fa 0/18 - fa 0/22 | Gi 0/1 - Gi 0/2 |
|  |  |
| S100\_15 | fa 0/1 - fa 0/24 |
|  |
| S99\_2 |
|  |  |
| S99\_3 | fa 0/1 - fa 0/14 |
|  |
| S\_MV1 |
|  |  |
| S154\_2 | fa 0/1 - fa 0/20 |
|  |  |  |  |  |
| 10 | GAMING LAB | S100\_3 | fa 0/14 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
| 11 | ACADEMICS | S100\_7 | fa 0/14 - fa 0/21 | Gi 0/1 - Gi 0/2 |
|  |  |
| S99\_3 | fa 0/15 - fa 0/22 |
|  |  |
| S\_MV1 | fa 0/15 - fa 0/16 |
|  |  |
| S154\_2 | fa 0/21 - fa 0/22 |
|  |  |
| S153\_1 | fa 0/18 - fa 0/19 |
|  |  |  |  |  |
| 12 | IT DEPARTMENT | S100\_11 | fa 0/12 - fa 0/23 | Gi 0/1 - Gi 0/2 |
|  |  |
| S99\_1 | fa 0/1 - fa 0/18 |
|  |  |  |  |  |
| 13 | ADMINISTRATION | S100\_5 | fa 0/18 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |
| S99\_3 |
|  |
| S154\_2 |
|  |  |
| S79\_2 | fa 0/5 - fa 0/13 |
|  |  |  |  |  |
|  |  |  |  |  |
| 14 | EXAMINATION | S99\_4 | fa 0/1 - fa 0/16 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 15 | SERVERS | S99\_4 | fa 0/17 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 16 | LIBRARY | S79\_1 | fa 0/1 - fa 0/8 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 17 | HR DEPARTMENT | S79\_1 | fa 0/9 - fa 0/17 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 18 | FINANCE | S79\_1 | fa 0/18 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 19 | PROCUREMENT | S79\_2 | fa 0/14 - fa 0/18 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 20 | EDC DEPT | S79\_2 | fa 0/1 - fa 0/4 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 21 | MECHATRONICS | S154\_1 | fa 0/9 - fa 0/24 | Gi 0/1 - Gi 0/2 |
|  |  |  |  |  |
|  |  |  |  |  |
| 22 | ADMISSION | S153\_1 | fa 0/7 - fa 0/17 | Gi 0/1 - Gi 0/2 |

# Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| R100 | Gi 0/0 | 192.168.0.1 | 255.255.255.252 | ----- |
| Gi 0/1 | ----- | ----- |  |
| Gi 0/1.1 | 201.21.11.1 | 255.255.255.192 | ----- |
| Gi 0/1.2 | 201.21.11.65 | 255.255.255.192 | ----- |
| Gi 0/1.3 | 201.21.11.129 | 255.255.255.192 | ----- |
| Gi 0/1.4 | 201.21.11.193 | 255.255.255.192 | ----- |
| Gi 0/1.5 | 201.21.43.1 | 255.255.255.192 | ----- |
| Gi 0/1.6 | 201.21.43.65 | 255.255.255.192 | ----- |
| Gi 0/1.7 | 201.21.43.193 | 255.255.255.224 | ----- |
| Gi 0/1.8 | 201.21.43.225 | 255.255.255.224 | ----- |
| Gi 0/1.9 | 201.21.1.129 | 255.255.255.240 | ----- |
| Gi 0/1.10 | 201.21.1.145 | 255.255.255.240 | ----- |
| Gi 0/1.11 | 201.21.1.161 | 255.255.255.240 | ----- |
| Gi 0/1.12 | 201.21.39.97 | 255.255.255.248 | ----- |
| Gi 0/2 | 192.168.0.1 | 255.255.255.252 | ----- |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| S100\_1 | VLAN 1 | 192.168.10.2 | 255.255.255.224 | 192.168.10.1 |
| S100\_2 | VLAN 1 | 192.168.10.3 | 255.255.255.224 | 192.168.10.1 |
| S100\_3 | VLAN 1 | 192.168.10.4 | 255.255.255.224 | 192.168.10.1 |
| S100\_4 | VLAN 1 | 192.168.10.5 | 255.255.255.224 | 192.168.10.1 |
| S100\_5 | VLAN 1 | 192.168.10.6 | 255.255.255.224 | 192.168.10.1 |
| S100\_6 | VLAN 1 | 192.168.10.7 | 255.255.255.224 | 192.168.10.1 |
| S100\_7 | VLAN 1 | 192.168.10.8 | 255.255.255.224 | 192.168.10.1 |
| S100\_8 | VLAN 1 | 192.168.10.9 | 255.255.255.224 | 192.168.10.1 |
| S100\_9 | VLAN 1 | 192.168.10.10 | 255.255.255.224 | 192.168.10.1 |
| S100\_10 | VLAN 1 | 192.168.10.11 | 255.255.255.224 | 192.168.10.1 |
| S100\_11 | VLAN 1 | 192.168.10.12 | 255.255.255.224 | 192.168.10.1 |
| S100\_12 | VLAN 1 | 192.168.10.13 | 255.255.255.224 | 192.168.10.1 |
| S100\_13 | VLAN 1 | 192.168.10.14 | 255.255.255.224 | 192.168.10.1 |
| S100\_14 | VLAN 1 | 192.168.10.15 | 255.255.255.224 | 192.168.10.1 |
| S100\_15 | VLAN 1 | 192.168.10.16 | 255.255.255.224 | 192.168.10.1 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| R99 | Gi 0/0 | ----- | ----- |  |
| Gi 0/0.1 | 201.21.43.129 | 255.255.255.192 | ----- |
| Gi 0/0.2 | 201.21.1.1 | 255.255.255.224 | ----- |
| Gi 0/0.3 | 201.21.1.33 | 255.255.255.224 | ----- |
| Gi 0/0.4 | 201.21.1.193 | 255.255.255.240 | ----- |
| Gi 0/0.5 | 201.21.1.209 | 255.255.255.240 | ----- |
| Gi 0/0.6 | 201.21.39.105 | 255.255.255.248 | ----- |
| Gi 0/0.7 | 201.21.39.113 | 255.255.255.248 | ----- |
| Gi 0/1 | 192.168.0.2 | 255.255.255.252 | ----- |
| Gi 0/2 | 192.168.0.9 | 255.255.255.252 | ----- |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| S99\_1 | VLAN 1 | 192.168.10.34 | 255.255.255.248 | 192.168.10.32 |
| S99\_2 | VLAN 1 | 192.168.10.35 | 255.255.255.248 | 192.168.10.32 |
| S99\_3 | VLAN 1 | 192.168.10.36 | 255.255.255.248 | 192.168.10.32 |
| S99\_4 | VLAN 1 | 192.168.10.37 | 255.255.255.248 | 192.168.10.32 |
|  |  |  |  |  |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| R154 | Gi 0/0 | ----- | ----- |  |
| Gi 0/0.1 | 201.21.1.65 | 255.255.255.224 | ----- |
| Gi 0/0.2 | 201.21.1.97 | 255.255.255.224 | ----- |
| Gi 0/0.3 | 201.21.39.33 | 255.255.255.240 | ----- |
| Gi 0/0.4 | 201.21.39.137 | 255.255.255.248 | ----- |
| Gi 0/0.5 | 201.21.39.145 | 255.255.255.248 | ----- |
| Gi 0/1 | 192.168.0.10 | 255.255.255.252 | ----- |
| Gi 0/2 | 192.168.0.13 | 255.255.255.252 | ----- |
|  |  |  |  |  |
| S154\_1 | VLAN 1 | 192.168.10.51 | 192.168.10.49 | 192.168.10.49 |
| S154\_2 | VLAN 1 | 192.168.10.50 | 192.168.10.49 | 192.168.10.49 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| R79 | Gi 0/0 | ----- | ----- |  |
| Gi 0/0.1 | 201.21.1.255 | 255.255.255.240 | ----- |
| Gi 0/0.2 | 201.21.1.241 | 255.255.255.240 | ----- |
| Gi 0/0.3 | 201.21.39.1 | 255.255.255.240 | ----- |
| Gi 0/0.4 | 201.21.39.17 | 255.255.255.240 | ----- |
| Gi 0/0.5 | 201.21.39.121 | 255.255.255.248 | ----- |
| Gi 0/0.6 | 201.21.39.129 | 255.255.255.248 | ----- |
| Gi 0/1 | 192.168.0.14 | 255.255.255.252 | ----- |
| Gi 0/2 | 192.168.0.17 | 255.255.255.252 | ----- |
|  |  |  |  |  |
| S79\_1 | VLAN 1 | 192.168.10.42 | 192.168.10.43 | 255.255.255.248 |
| S79\_2 | VLAN 1 | 192.168.10.43 | 192.168.10.44 | 255.255.255.248 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| R153 | Gi 0/0 | ----- | ----- |  |
| Gi 0/0.1 | 201.21.39.49 | 255.255.255.240 | ----- |
| Gi 0/0.2 | 20.21.39.65 | 255.255.255.240 | ----- |
| Gi 0/0.3 | 201.21.39.153 | 255.255.255.248 | ----- |
| Gi 0/1 | 192.168.0.18 | 255.255.255.252 | ----- |
| Gi 0/2 | ----- | ----- | ----- |
|  |  |  |  |  |
| S153\_1 | VLAN 1 | 192.168.10.58 | 255.255.255.248 | 192.168.10.57 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| **Device** | **Interface** | **Ip Address** | **Subnet Mask** | **Default Gateway** |
| RMV | Gi 0/0 | ----- | ----- |  |
| Gi 0/0.1 | 201.21.39.81 | 255.255.255.240 | ----- |
| Gi 0/0.2 | 201.21.39.153 | 255.255.255.248 | ----- |
| Gi 0/0.3 | 201.21.39.169 | 255.255.255.248 | ----- |
| Gi 0/1 | 192.168.0.6 | 255.255.255.252 | ----- |
| Gi 0/2 | ----- | ----- | ----- |
|  |  |  |  |  |
| S\_MV1 | VLAN 1 | 192.168.10.66 | 255.255.255.248 | 192.168.10.65 |

# Conclusion

The project has been implemented with:

* VLSM to subnet IP pools
* IP pool with student’s roll number.
* VLANs implementation
* DHCP configuration
* Port security configuration
* NAT
* Dynamic routing
* Telnet.