CS361: Computer Networks
Campus Network Implementation
Project Report

IIITV-ICD

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Abstract

Computer networks have a significant impact on the working of an organization. Universities depend on the proper functioning and analysis of their networks for education, administration, communication, e-library, automation, etc. An efficient network is essential to facilitate the systematic and cost-efficient transfer of information in an organization in the form of messages, files, and resources. The project provides insights into various concepts such as topology design, IP address configuration, and how to send information in the form of packets to the wireless networks of different areas of a campus. How to configure and use the IoT devices in a campus setting.

The aim of this project is to design the topology of the campus network using the software Cisco Packet Tracer with the implementation of wireless networking systems.

This campus network consists of the following devices:
1) Router (2811)
2) Switches (2960-24TT)
3) Email server
4) DNS server
5) Radius and IoT server
6) Wireless Devices
      i. Wireless Router (WRT300N)
      ii. Access Points
7) IoT Devices
      i. Home Speaker
      ii. Air Conditioner
      iii. Appliance
      iv. Smart Street Lamp
8) Other End Devices
      i. PCs
      ii. Smartphones
      iii. Laptops
      iv. Tabs
      v. Printer
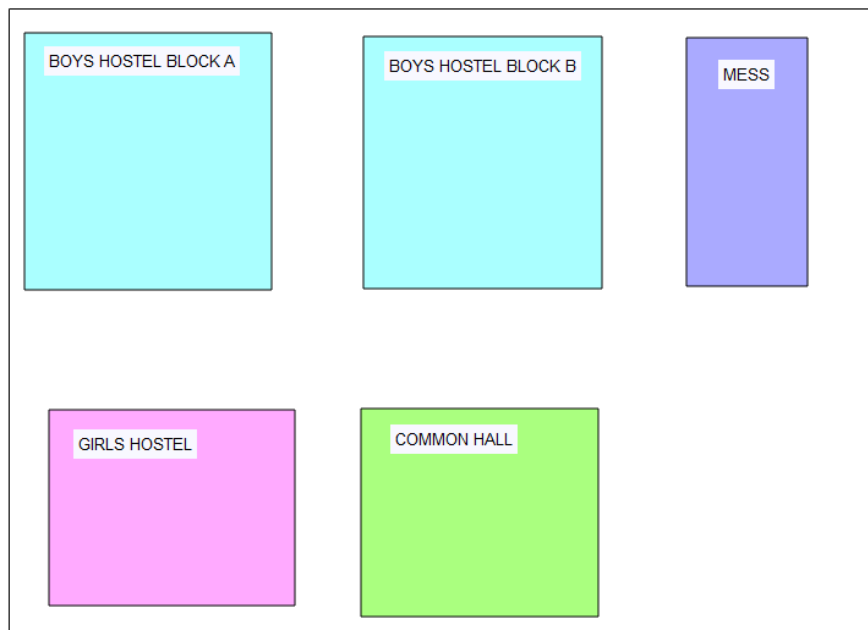
Table of Contents

1. Network Requirements

Indian Institute of Information Technology, Vadodara - International Campus Diu is broadly divided into the following blocks:
1. Student Section
    a. Boys Hostel Block A
    b. Boys Hostel Block B
    c. Girls Hostel
    d. Mess
    e. Common Hall
2. Staff Quarters
3. Academic Section
    a. Academic Block
    b. Library
    c. Office
    d. Laboratories

I.   Student Section

II.   Staff Quarters

STAFF QUARTERS

III.   Academic Section

LABORATORIES

LIBRARY

ACADEMIC BLOCK

OFFICE

Overall Structure

BOYS HOSTEL BLOCK A

BOYS HOSTEL BLOCK B

MESS

GIRLS HOSTEL

COMMON HALL

LABORATORIES

LIBRARY

ACADEMIC BLOCK

OFFICE

FACULTY QUARTERS
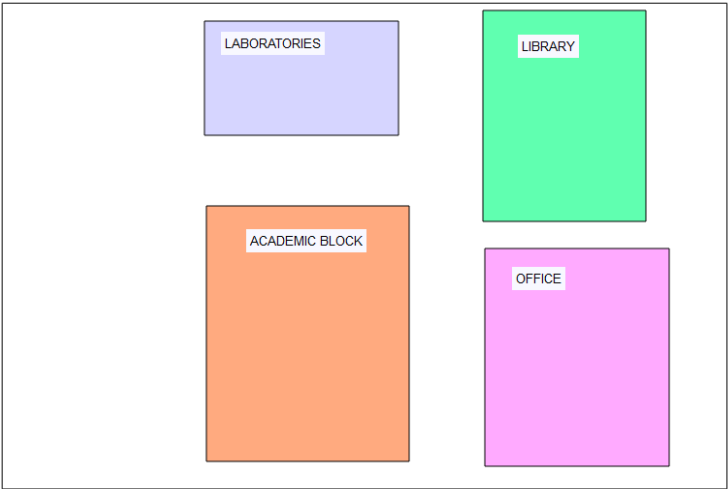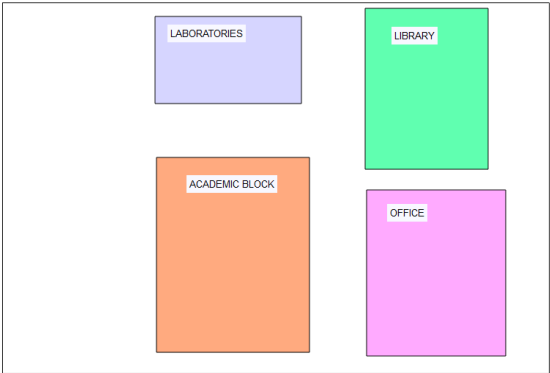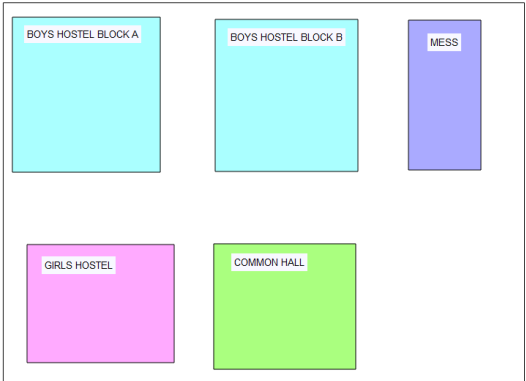
2. Assigning Subnets to Blocks

a. Student Section

BOYS HOSTEL BLOCK A

BOYS HOSTEL BLOCK B

MESS

2960-24TT
Student Switch

2811
Student Router

10.0.0.1

GIRLS HOSTEL

COMMON HALL

Default Gateway:
192.168.0.1
Hostel Router.
Password:
diu@kevdi

b. Staff Quarters

STAFF QUARTERS

2960-24TT
Staff Switch

2811
Staff Router

12.0.0.1

Default Gateway:
192.168.2.1
Staff Router.
Password:
diu@kevdi
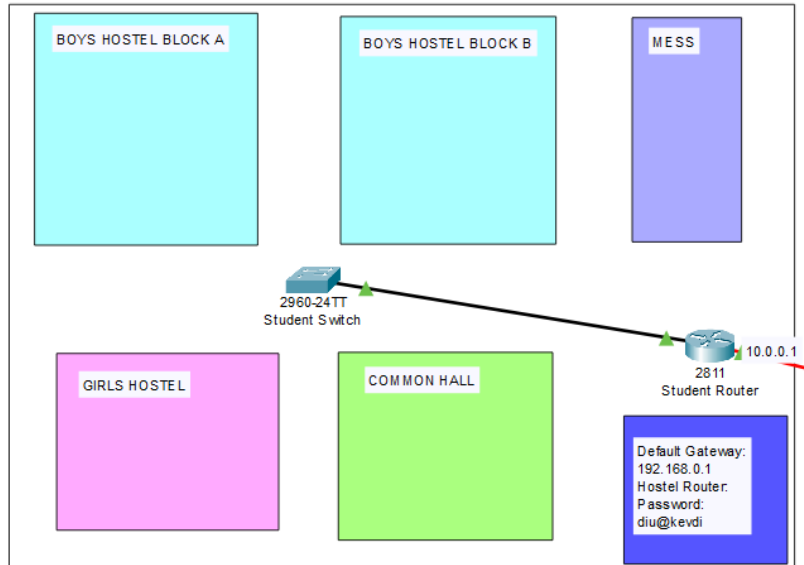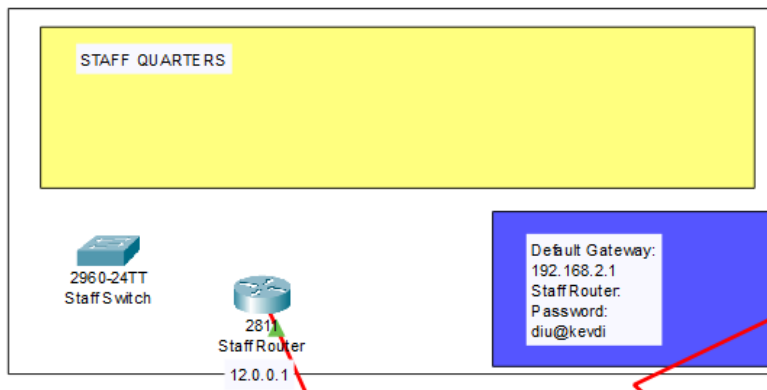
c. Academic Section

d. Main Router

12.0.0.2

10.0.0.2   11.0.0.2

2811
Main Router

e. Server Subnet

Default Gateway
192.168.3.1

2960-24TT
Server Switch

Server-PT
Email

Server-PT
DNS

Server-PT
Radius_Server

Server-PT
HTTP

Overall View:

BOYS HOSTEL BLOCK A

BOYS HOSTEL BLOCK B

MESS

STAFF QUARTERS

LABORATORIES

LIBRARY

2960-24TT
StaffSwitch

2811
StaffRouter

12.0.0.1

Default Gateway:
192.168.2.1
StaffRouter:
Password:
diu@kevdi

2811
Academic Router

11.0.0.1

2960-24TT
Academic Switch

2960-24TT
Student Switch

2811
Student Router

10.0.0.1

GIRLS HOSTEL

COMMON HALL

Default Gateway:
192.168.0.1
Hostel Router:
Password:
diu@kevdi

12.0.0.2

10.0.0.2

11.0.0.2

2811
Main Router

Default Gateway
192.168.3.1

2960-24TT
Server Switch

Server-PT
Email

Server-PT
DNS

Server-PT
Radius_Server

Server-PT
HTTP

LECTURE BUILDING

OFFICE

Default Gateway:
192.168.1.1
Hostel Router:
Password:
Diu@kevdi@111TV

3. Implementation of the Student Section

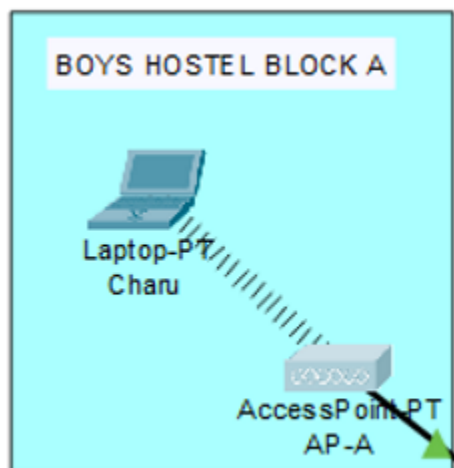## Network Details for Student Section

Default Gateway: 192.168.0.2
Password for Access Points (common for all): diu@kevdi
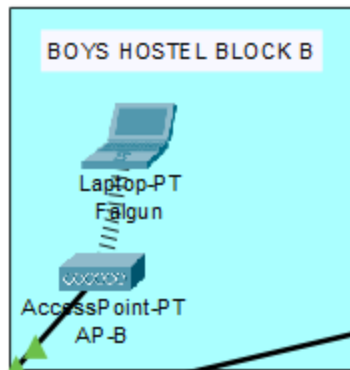**Wireless Router IP:** 192.168.0.1
Total Access Points: 5

a. Boys Hostel Block A

This block consists of an access point with ssid "dlinkA" and password "diu@kevdi". Users in this block connect to this access point.

b. Boys Hostel Block B

BOYS HOSTEL BLOCK B	dlinkB
Laptop-PT Falgun	6
AccessPoint-PT AP-B	140.00
	WEP Key	
	PSK Pass Phrase	diu@kevdi

This block consists of an access point with ssid "dlinkB" and password "diu@kevdi". Users in this block connect to this access point.

c. Girls Hostel

GIRLS HOSTEL	dlinkGH
Laptop-PT Sahil	6
AccessPoint-PT AP-GH	140.00
	WEP Key	
	PSK Pass Phrase	diu@kevdi

This block consists of an access point with ssid "dlinkGH" and password "diu@kevdi". Users in this block connect to this access point.

d. Mess

MESS	dlinkMess
PC-PT Abhay	6
AccessPoint-PT AP-Mess	140.00
	WEP Key	
	PSK Pass Phrase	diu@kevdi

This block consists of an access point with ssid "dlinkMess" and password "diu@kevdi". Users in this block connect to this access point.
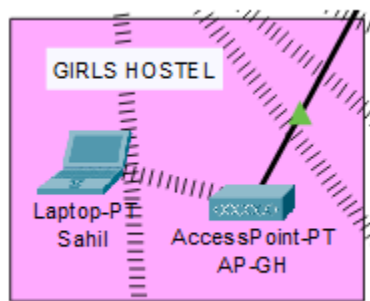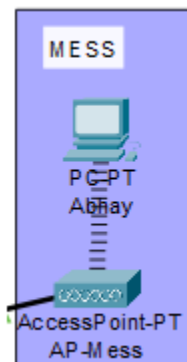
e. Common Hall

This block consists of an access point with ssid "dlinkCH" and password "diu@kevdi". Users in this block connect to this access point.

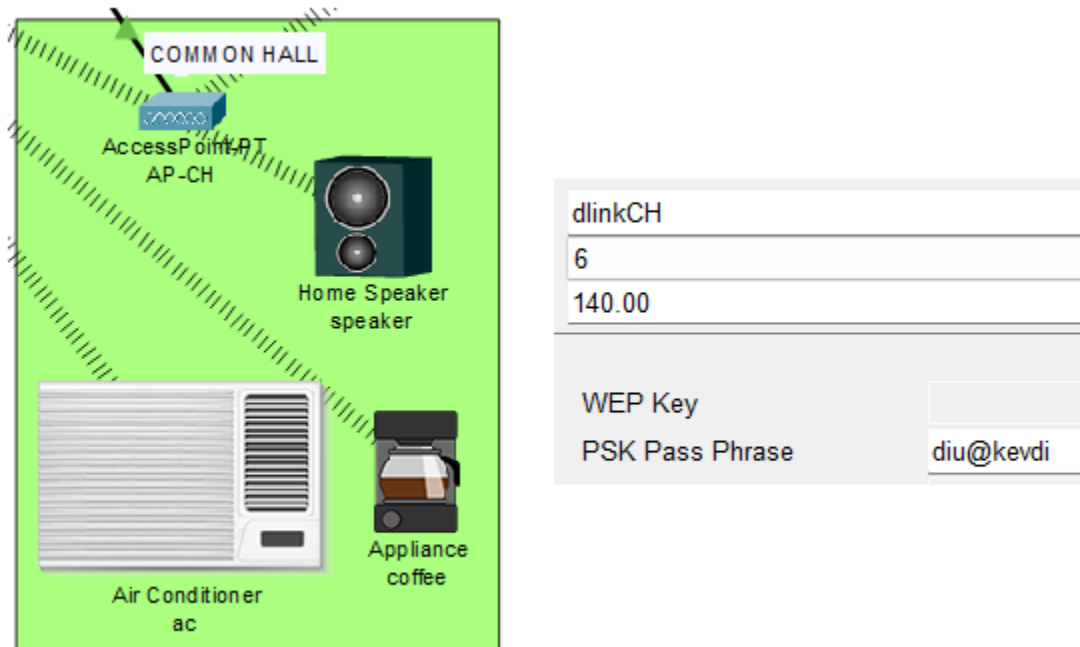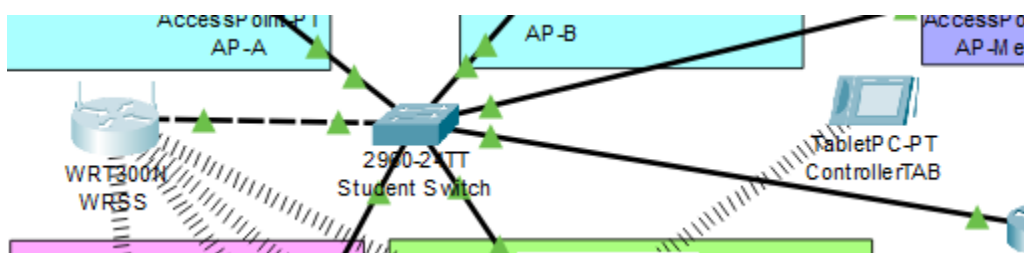The Common Hall also has a few IoT devices such as an air conditioner, a speaker and a coffee machine. These are controlled by the admin using the "controllerTab".

Overall View of Student Section
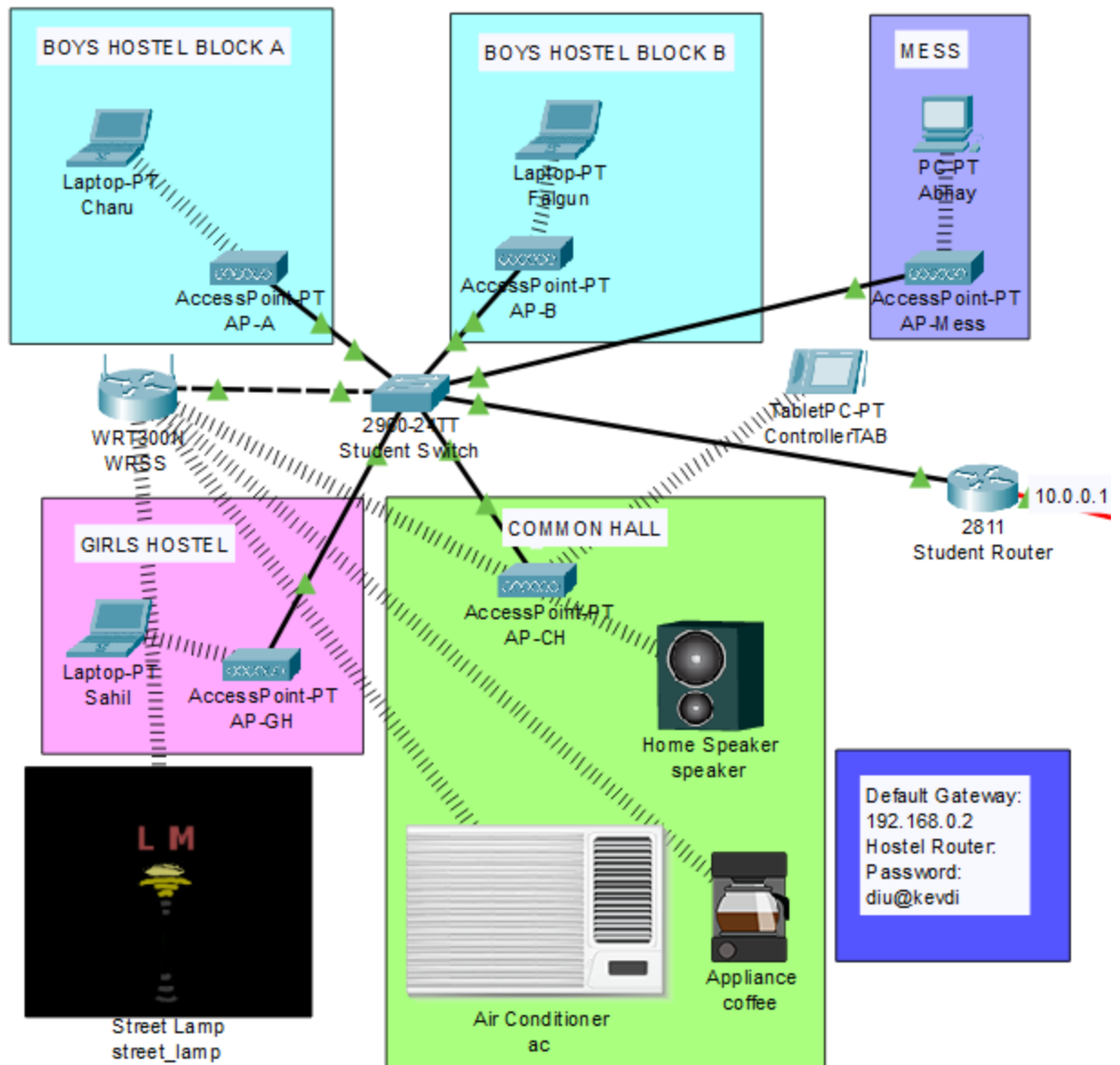
There is also a common wireless router for controlling the IoT devices in the common hall along with the smart street lamp. The radius server is in the server section that is discussed later in this report. The controllerTAB is used to control all these devices.

ControllerTAB

Physical | Config | **Desktop** | Programming | Attributes

Web Browser   X

< | > | URL http://192.168.3.4/home.html | Go | Stop

IoT Server - Devices

Home | Conditions | Editor | Log Out

ac (PTT0810X621-)   AC

On   ▮

speaker (PTT0810IZG1-)   Home Speaker

Signal   -1

street_lamp (PTT0810K5TH-)   Street Lamp

Light   72.9167
Light gradient   No Change | Increasing | Decreasing
Motion   0
Moton gradient   No Change | Increasing | Decreasing

coffee (PTT081046KM-)   Appliance

On   ▮

4. Implementation of Academic Section

Network Details for Academic Section

Default Gateway: 192.168.1.1
Password for Access Points (common for all): Diu@kevdi@111TV
Total Access Points: 4

a. Lecture Building

This block consists of an access point with ssid "IIITV-AB" and password "Diu@kevdi@111TV". Users in this block connect to this access point.

b. Library
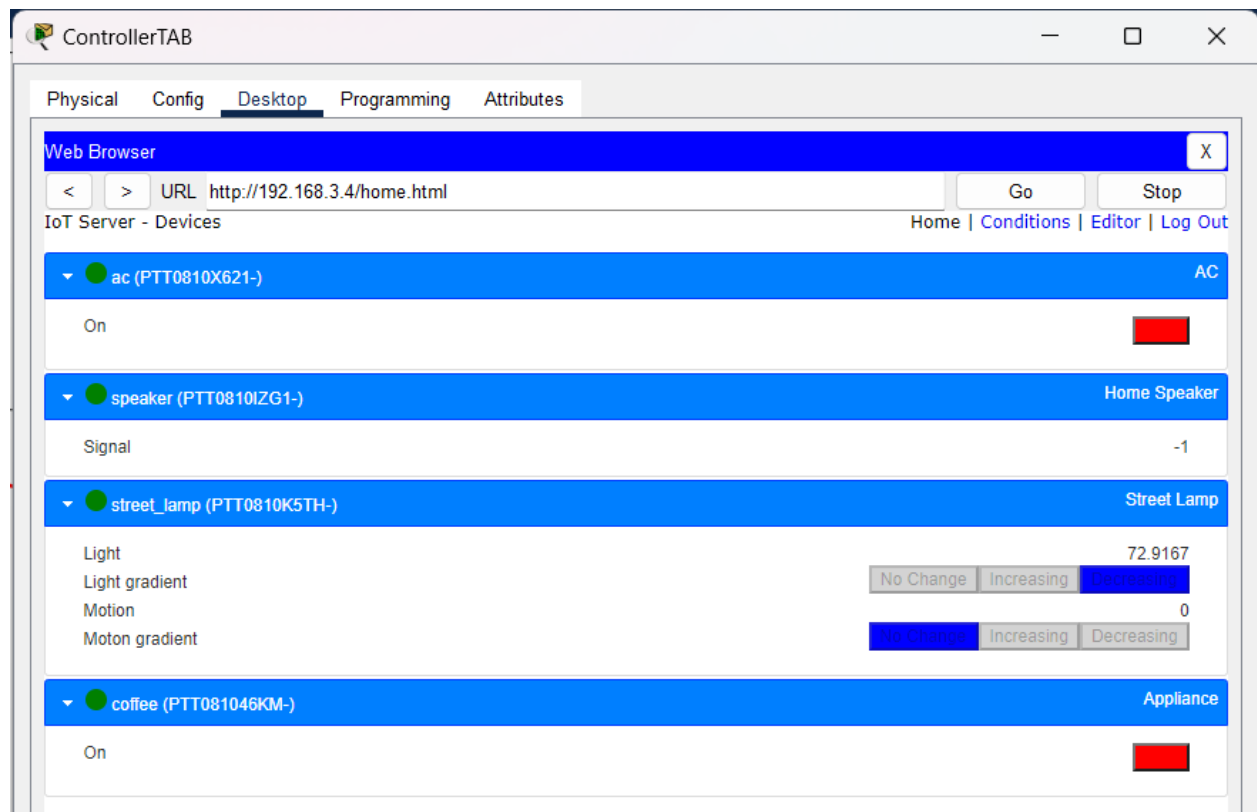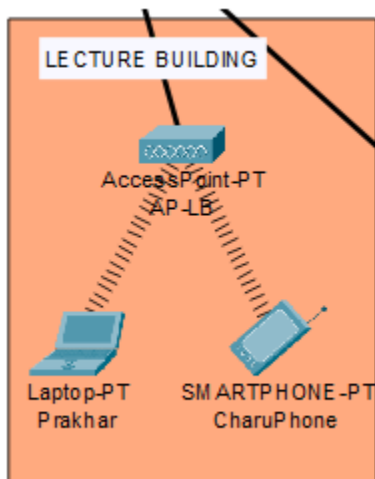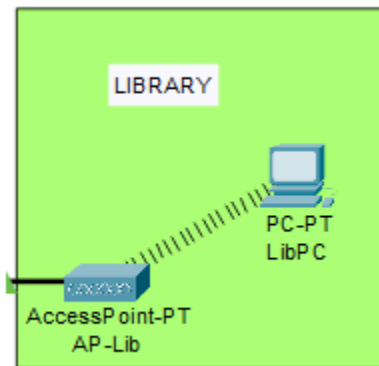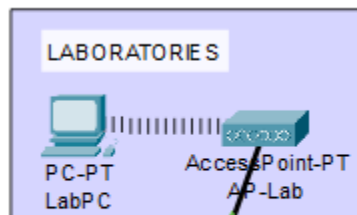

IIITV-LIB

6

140.00

WEP Key

PSK Pass Phrase   Diu@kevdi@111TV

This block consists of an access point with ssid "IIITV-LIB" and password "Diu@kevdi@111TV". Users in this block connect to this access point.
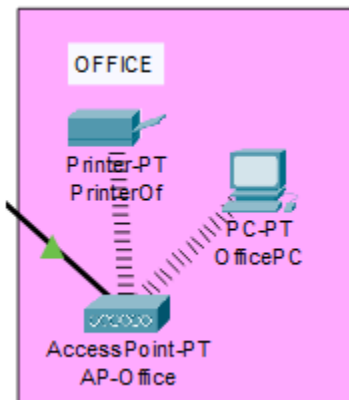
c. Laboratories

IIITV-Lab

6

140.00

WEP Key

PSK Pass Phrase   Diu@kevdi@111TV

This block consists of an access point with ssid "IIITV-Lab" and password "Diu@kevdi@111TV". Users in this block connect to this access point.

d. Office

IIITV-Office

6

140.00

WEP Key

PSK Pass Phrase   Diu@kevdi@111TV

This block consists of an access point with ssid "IIITV-Office" and password "Diu@kevdi@111TV". Users in this block connect to this access point.

Overall View

LABORATORIES

PC-PT
LabPC

AccessPoint-PT
AP-Lab

LIBRARY

PC-PT
LibPC

AccessPoint-PT
AP-Lib

2811
Academic Router
11.0.0.1

2960-24TT
Academic Switch

LECTURE BUILDING

AccessPoint-PT
AP-LB

Default Gateway:
192.168.1.1
Hostel Router:
Password:
Diu@kevdi@111TV

Laptop-PT
Prakhar

SMARTPHONE-PT
CharuPhone

OFFICE

Printer-PT
PrinterOf

PC-PT
OfficePC

AccessPoint-PT
AP-Office
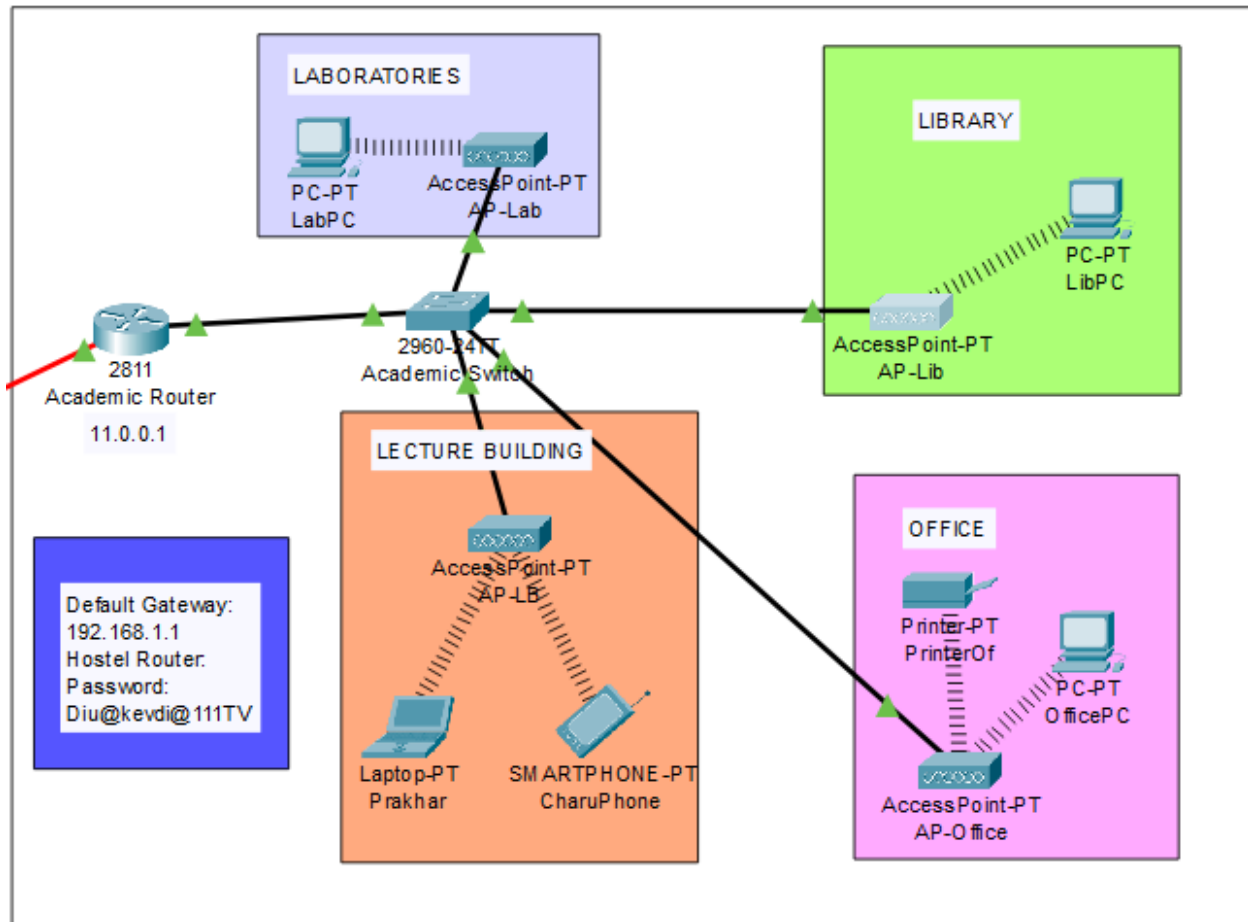
5. Implementation of Staff Quarters

Network Details for Staff Quarters

Default Gateway: 192.168.2.1
Password for Access Points (common for all): diu@kevdi
Total Access Points: 1

The staff quarters has an access point with ssid "IIITV-Staff" and password "diu@kevdi". Users can connect to this access point.

6. Servers

Network Details for Servers Subnetwork
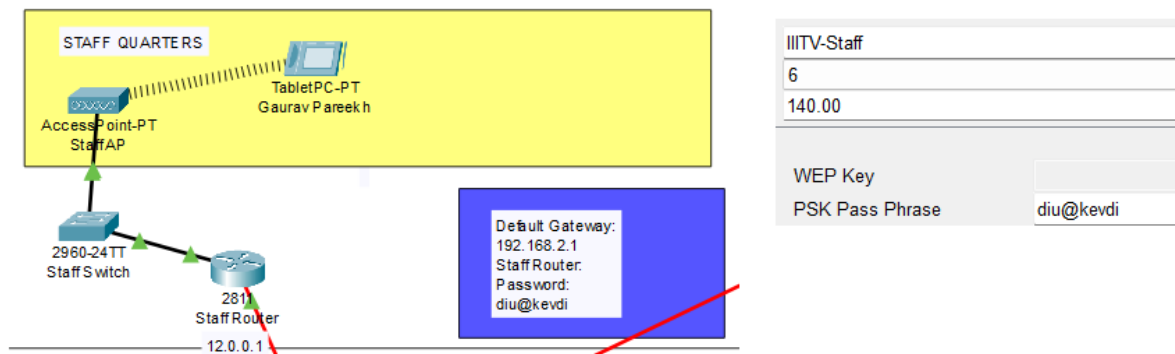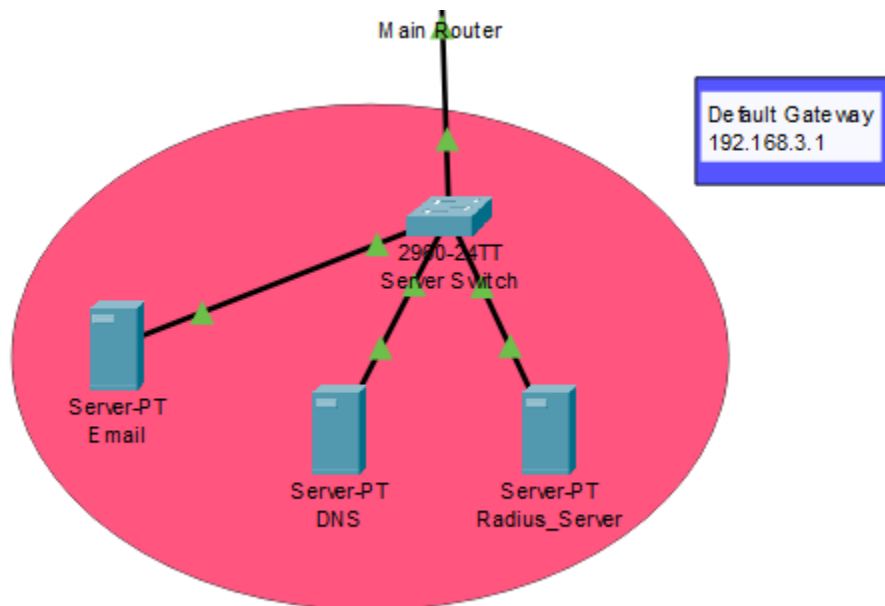
Default Gateway: 192.168.3.1

The three servers we use are:
DNS: For domain name. **(192.168.3.2)**
Email: For institute email service. **(192.168.3.3)**
Radiu_Server: For IoT devices. **(192.168.3.4)**

a. DNS Server
We are using our institute domain name i.e "diu.iiitvadodara.ac.in".

DNS

DNS Service	● On	○ Off

Resource Records

Name			Type	A Record	⌄

Address	

Add	Save	Remove

No.	Name	Type	Detail	
0	diu.iiitvadodara.ac.in	A Record	192.168.3.3	

Demonstration:

Falgun — □

Physical	Config	Desktop	Programming	Attributes

Web Browser

<	>	URL	http://diu.iiitvadodara.ac.in		Go	Sto

Welcome to IIIT Vadodara - International Campus Diu
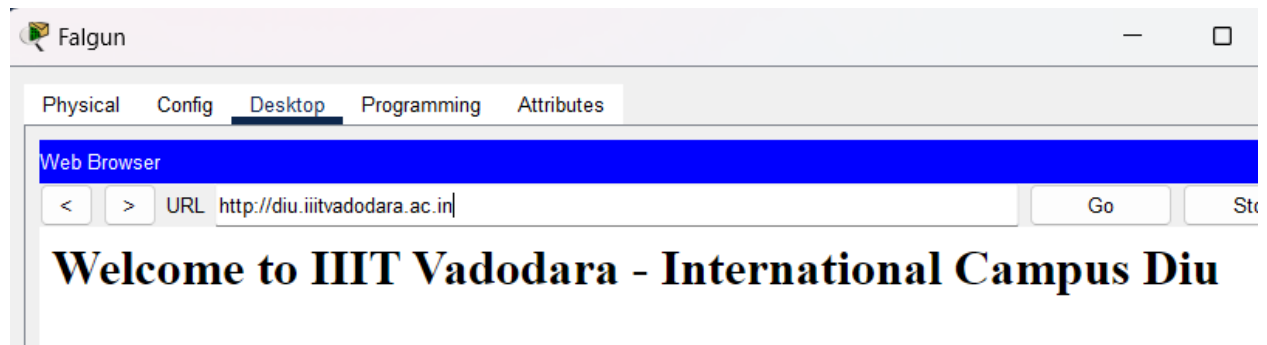
b. Email Server:

EMAIL

SMTP Service
◉ ON   ○ OFF

POP3 Service
◉ ON   ○ OFF

Domain Name: diu.iiitvadodara.ac.in   [Set]

User Setup

User [   ]   Password [   ]

202111001
202111019
202111067
202111075
gauravpareekh

A total of 6 emails are set up and tested. All work successfully. These email ids are in accordance with the real institute email ids.

Emails

202111001@diu.iiitvadodara.ac.in
202111019@diu.iiitvadodara.ac.in
202111028@diu.iiitvadodara.ac.in
202111067@diu.iiitvadodara.ac.in
202111075@diu.iiitvadodara.ac.in
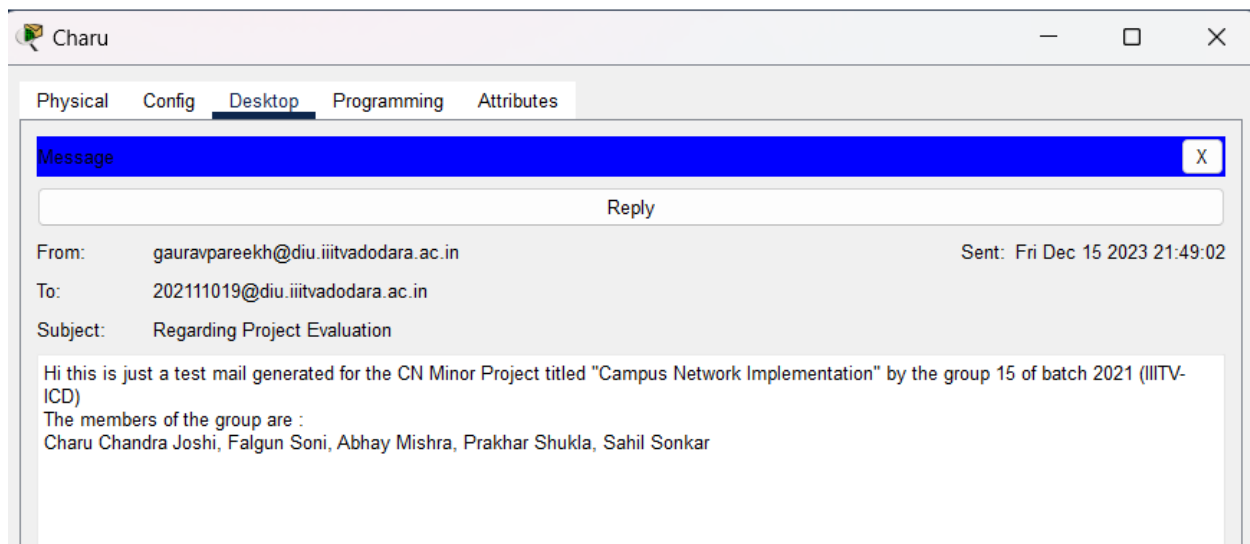gauravpareekh@diu.iiitvadodara.ac.in

Demonstration:
Sending mail from device "Gaurav Pareekh" in staff quarters to "Charu" in boys hostel block A

Sending:
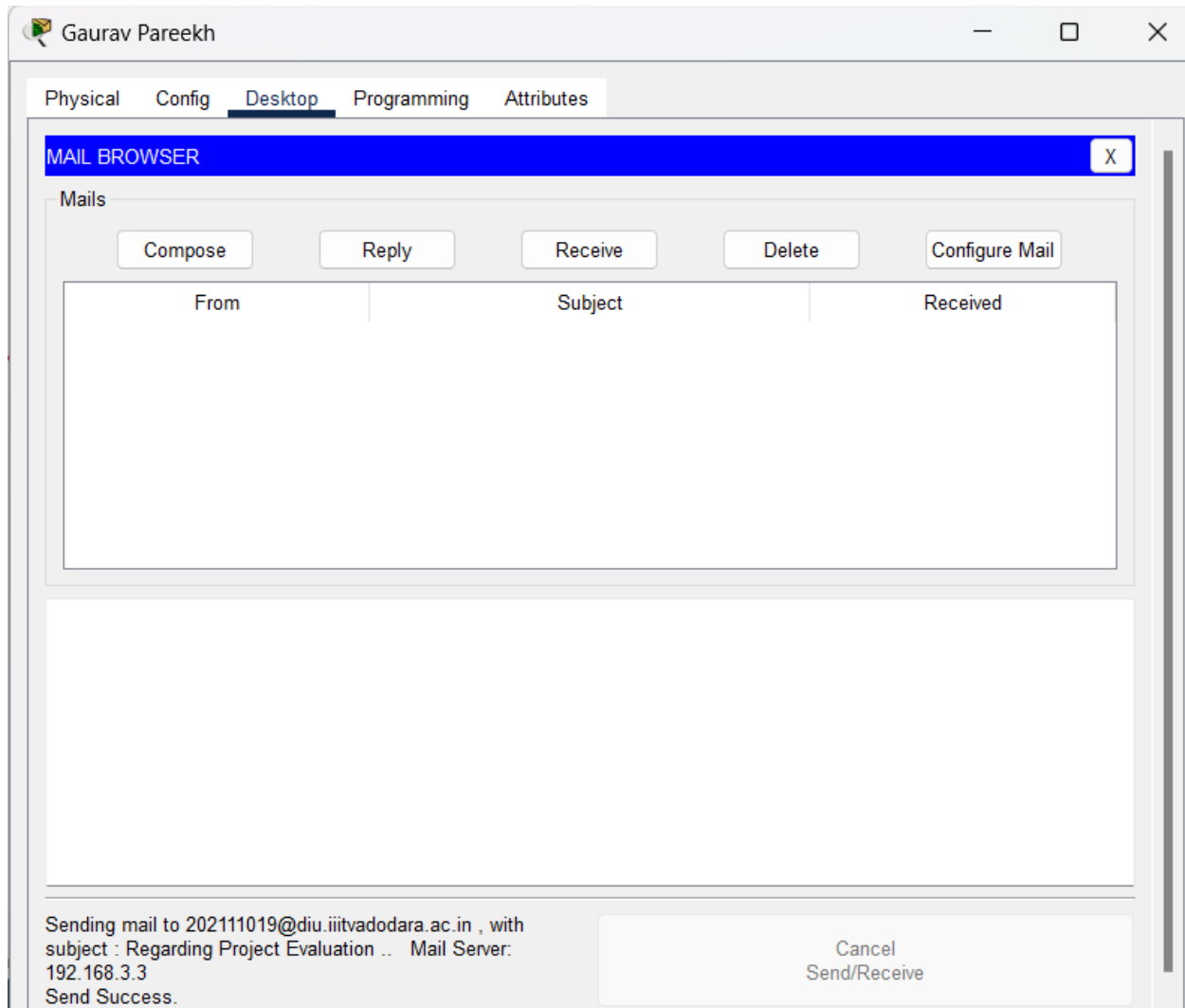
Receiving:

c. Radius and IoT Server

The radius_server is used for the IoT devices that are being used in the student section.

AAA

| Service | ● On ○ Off | Radius Port | 1645 |

Network Configuration

| Client Name | | Client IP | |
| Secret | | ServerType | Radius ⌄ |

	Client Name	Client IP	Server Type	Key	
1	WRSS	192.168.0.1	Radius	123456789	Add
					Save
					Remove

User Setup

| Username | | Password | |

	Username	Password	
1	ac	ac	Add
2	coffee	coffee	
3	speaker	speaker	Save
4	street_lamp	street_lamp	

Registration Server

This service runs on top of the HTTP or HTTPS service.

Service   ● On   ○ Off

	Username	Password
1	adminSS	admin

The username and password for the IoT server are "adminSS" and "admin" respectively.

It can be logged in from either an IoT Monitor or a web browser. The IoT devices can then be controlled remotely.

Below is the demonstration of the same.

Step I: Sign In

ControllerTAB   —   □   ✕

Physical   Config   Desktop   Programming   Attributes

Web Browser   X

<   >   URL http://192.168.3.4   Go   Stop

Registration Server Login

Username: adminSS
Password: •••••

Sign In

Don't have an IoT account? Sign up now

Step II: Control the IoT devices

ControllerTAB

Physical   Config   **Desktop**   Programming   Attributes

<   >   URL   http://192.168.3.4/home.html   Go   Stop

IoT Server - Devices   Home | Conditions | Editor | Log Out

▼ ● ac (PTT0810X621-)	AC
On	🟩

▼ ● speaker (PTT0810IZG1-)	Home Speaker
Signal	-1

| ▼ ● street_lamp (PTT0810K5TH-)	Street Lamp
Light	0
Light gradient	No Change Increasing Decreasing
Motion	0
Moton gradient	No Change Increasing Decreasing

▼ ● coffee (PTT081046KM-)	Appliance
On	🟩

7. Router Setup

We have used 4 "2811" routers in the manner shown below. The main router is in the middle which is in turn connected to 3 routers for the 3 main blocks that we have in our institute. They are connected by a serial DCE wire using the WIC-2T module.
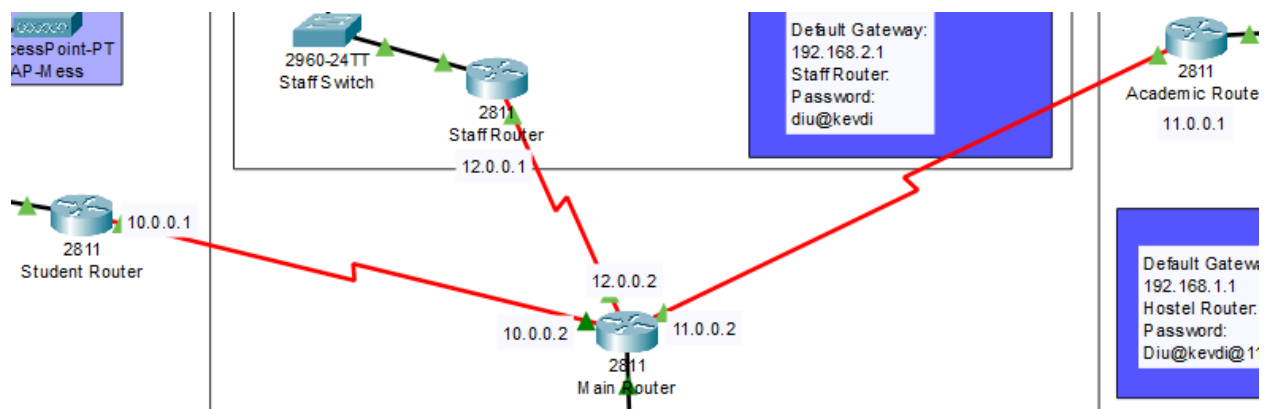
Below are the static routes for all the routers:

a. Main Router

Network Address
192.168.0.0/24 via 10.0.0.1
192.168.1.0/24 via 11.0.0.1
192.168.2.0/24 via 12.0.0.1

b. Student Router

| Network Address |
| --- |
| 192.168.3.0/24 via 10.0.0.2 |
| 192.168.1.0/24 via 10.0.0.2 |
| 192.168.2.0/24 via 10.0.0.2 |
| 11.0.0.0/8 via 10.0.0.2 |
| 12.0.0.0/8 via 10.0.0.2 |

c. Academic Router

Network Address
192.168.3.0/24 via 11.0.0.2
192.168.0.0/24 via 11.0.0.2
192.168.2.0/24 via 11.0.0.2
10.0.0.0/8 via 11.0.0.2
12.0.0.0/8 via 11.0.0.2

d. Staff Router

Network Address
192.168.0.0/24 via 12.0.0.2
192.168.1.0/24 via 12.0.0.2
192.168.3.0/24 via 12.0.0.2
11.0.0.0/8 via 12.0.0.2
10.0.0.0/8 via 12.0.0.2

8. Overall View of the Campus Network
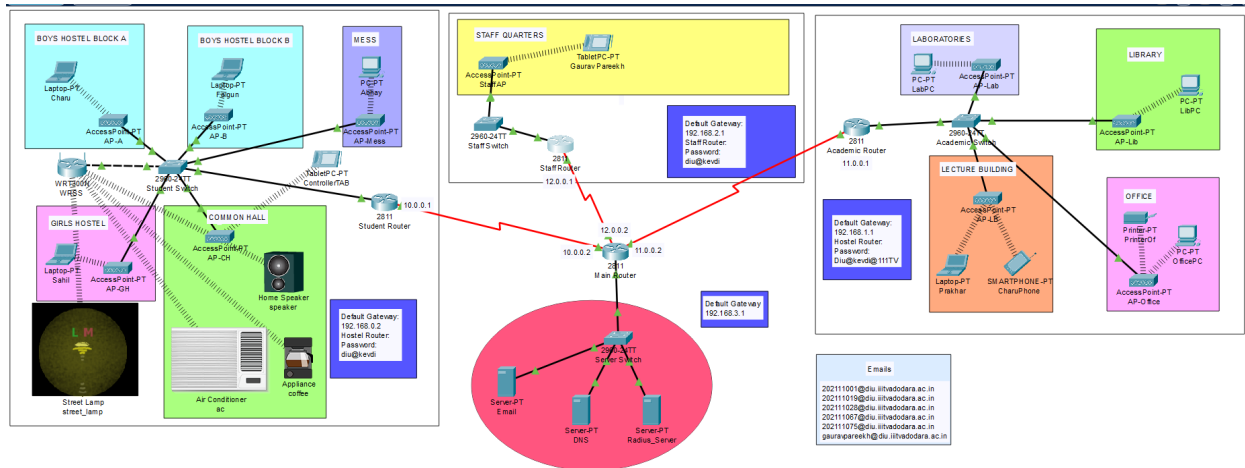
9. Simulation

The simulations of our network topology can be easily achieved using cisco packet tracer. Using a simulation mode, you can see packets flowing from one node to another and can also click on a packet to see detailed information about the OSI layers of the networking. Packet Tracer offers a huge platform to combine realistic simulation and visualize them simultaneously. Cisco Packet Tracer makes learning and teaching significantly easier by supporting multi-user collaboration and by providing a realistic simulation environment for experimenting with projects.

10. Contributions

a. **202111001, Abhay Mishra**
   Network Requirements - Created a detailed requirement list for our institute and created a skeleton structure.
   Staff Quarters - Implemented the staff quarters.
b. **202111019, Charu Chandra Joshi**
   Student Section - Implemented the student section

Radius and IoT Server - Implemented the IoT functionality of the project.

Router Configuration - Contributed in router configuration.

c. 202111028, Falgun Soni

Academic Section - Implemented the academic section

Email Server - Setup and configured the emails for the project and tested them.

Router Configuration - Contributed in the router configuration.

d. 202111067, Prakhar Shukla

Access Points - Setting up the ids and passwords for the access points

Subnetwork Decision - Decided the IP addresses for the different subnets.

e. 202111075, Sahil Sonkar

IP configuration - configured all the end devices like PCs, Laptops, Smartphones etc by providing the IP addresses, default gateways and dns servers.