



User and Technical Documentation

Assignment 2: Milestone 2

CS 346: Software Engineering Laboratory

Task:

Telephone (ISP) Management System

Authors:

Aasneh Prasad	210101001
Abhi Agarwal	210101002
Abhinav Kumar	210101003
Abinash Sonowal	210101004
Achintya Gupta	210101005
Achyut Dhiman	210101006

Instructor:

Prof. Pradip K. Das, Dept. of CSE, IITG

March 4, 2024

1 Problem Statement

The Problem Statement given is to develop a *VisualBasic* Application of Telephone Management System (TMS) for Indian Institute of Technology, Guwahati (IITG). This report presents the development of a Visual Basic Application tailored to address the institution's telecommunications needs.

The Telephone Management System (TMS) must be designed to streamline various tasks associated with telephony services, including new user registration, profile management, plan management, and administrative functionalities.

Leveraging *VisualBasic* as the primary programming language and utilizing either *MySQL* for database management, the TMS must offer a robust platform to manage telephone-related operations seamlessly.

The subsequent sections of this report will delve into the design, development, and implementation details of the Telephone Management System, elucidating its features, architecture, and functionalities in depth. Additionally, it will address the methodologies employed, challenges encountered, and future recommendations for further enhancements.

2 Design Requirements

The following are the specifications of the software that have to be developed according to the design requirements:

- **User Registration:**

- The system should provide a user-friendly interface for new users to register their telephone accounts.
- Mandatory fields such as *name*, *IITG email id*, *usertype* and *password* should be included in the registration process.
- Validation mechanisms should ensure the integrity of user-provided information.

- **Profile Management:**

- Registered users should be able to access and update their profile information.
- Profile management functionalities should include options to view personal details, update contact information, and modify active plans.

- **Plan Management:**

- The application must support the management of various telephone plans offered at IITG.
- Users should have the ability to select and/or modify their telephone plans as per their needs.
- Plan details such as *subscription fees*, *validity*, *talktime* and *data limits* should be clearly presented to users.

- **Admin Panel:**

- An administrative dashboard should be provided for authorized personnel to manage system settings and user accounts.
- Admin functionalities should include user account management (creation, modification, deletion), plan configuration, access control, and monitoring.
- Comprehensive reporting tools and analytics features should be available to administrators for tracking system usage and performance.

- **Database Management:**

- The application should integrate with MySQL for database requirements.
- Database design should support efficient storage and retrieval of user profiles, plan details and administrative data.

- **User Interface Design:**

- The application's interface should be intuitive, user-friendly, and responsive on user's device.
- Navigation should be simple and logically organized to facilitate smooth user interactions.
- Clear and informative content should be provided to users and admin during registration, profile management, and other system operations.

- **Scalability and Performance:**

- Extensive testing and performance monitoring tools should be utilized to identify and address bottlenecks in system performance.
- The system architecture should be designed to accommodate large data.

3 Design Components and Visual Interface

3.1 Landing and Login



Figure 1: Login Interface

Components of Landing page:

- **New User Button:** Click to register if you are new user and have not registered yet.
- **Login Button:** Click to login if you are an existing user.
- **Admin Button:** Click to manage various activity if you are an admin

Components of Landing page:

- **IITG Email ID:** Enter your IIT Guwahati official mail ID.
- **Password:** Enter your secure password that you set during registration.
- **Login Button:** Click to Login with your username and password.

Technical details and Functionality:

- **Picture Box:** Picture Box is used to display images, icons, or other graphical content on a form.
 - PictureBox1: Display an image of *IITG* Logo.



Figure 2: Login Interface

- PictureBox2: Display an avatar of student or admin in their respective page.
- **Button:** Button control is a fundamental graphical user interface (GUI) element used to trigger actions or events when clicked by the user.
 - Button1: Select *Login* option to log in to your profile.
- **Label:** The Label control is used to display static text or descriptive information on a form.
- **TextBox:** TextBox control is used to display and edit formatted text, allowing users to create, view, and manipulate text.
 - TextBox1: Take username of user as input.
 - TextBox2: Take Password of user as input. ***UseSystemPasswordChar*** property of Textbox control is set to True so the dots are shown instead of real password to secure users privacy.
- **Check Box:** The Check Box control is used to toggle entered Password.

Error Handling and Edge Cases:

- **Check domain of Email ID:** In case of mail Does not ends with @iitg.ac.in, an error message will be displayed "Email id should ends with@ iitg.ac.in", prompting the user to re-enter a Email.
- **Email not registered:** In case of mail ID not found on database, an error message will be displayed "Email not registered", prompting the user to re-enter a username and password.

- **Incorrect Password:** An error message will be displayed stating "Incorrect Password" and prompting the user to enter the password.
- **Empty Input:** An error message will be displayed stating "Email and Password required" and prompting the user to re-enter.

3.2 New User Registration

IITG Telephone System

New User Registration

Name:

IITG Email:

UserType:

Department:

Password: Show Password

Confirm Password:

User Visibility:

Back **Register**

Figure 3: New User Registration Form

Technical Details and Know How:

- **Information Privacy:** Users have the option to select "Private," which will conceal their information from others and can only be configured by the administrator.
- **Unmasking Button:** 'Show Password' button displays the typed password which was masked by '*' character.
- **Strength of Password:** Entered password will be checked for its strength in real time and status would be shown on action.
NOTE: Password with 'STRONG' status is recommended.
- **Hashed Password:** For enhanced security, the password has been hashed and then stored in the database.

Communication Messages:

- **Confirmation Message:** On Successful registration, a message will be displayed "Your Account has been successfully created".
- **Phone Number Allocation:** A 10-digit phone number will be provided upon successful completion of registration, and the same should be noted for communication purposes.

Error Handling and Edge Cases:

- **Unique Username:** In case of a non-unique username, an error message will be displayed "Username Already Exists", prompting the user to enter a unique username.
- **Password Mismatch:** An error message will be displayed stating "Password Mismatch" and prompting the user to enter the matching password.
- **Empty Field prompt:** If any of the 'name', 'username', 'password' and 'confirm password' field is left empty, it will display an error message prompting to enter the required information.

3.3 User Profile Page

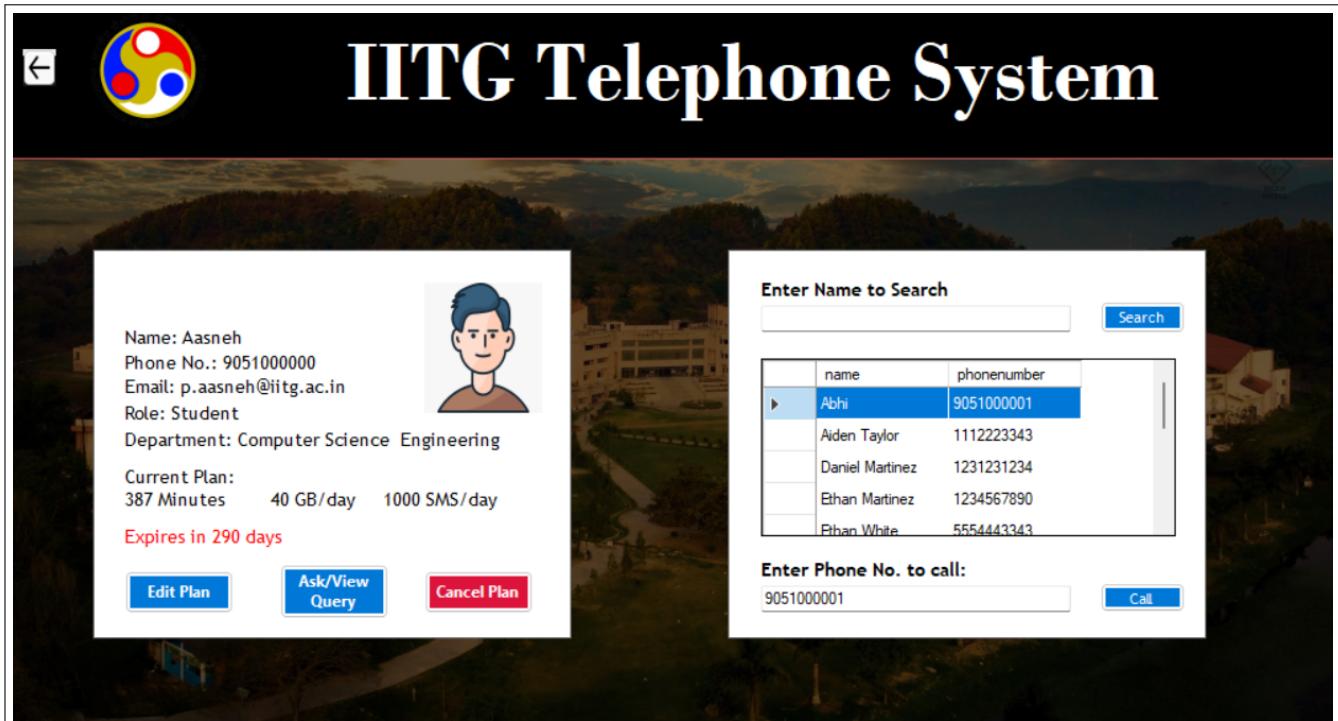


Figure 4: Profile Page graphical layout

Profile Display Module:

- **Details:** This provides the entire information of the user. Consists of the following functionalities:
 - **Display Data:** All the data of the user including phone, name, current plan etc.

- **Latest Updates:** All the data including the expiry date is up to date, fetched from the database on each reload.
- **Edit/Buy Plan:** Based on whether the user has a plan or not, the button changes and redirects to the New Plan page.
- **Cancel Plan:** If a user currently has a plan, they can cancel their plan. This also updates the database.
- **Ask query:** If the user faces any problems, they can ask the admin. This redirects to another page for asking queries.

Call Management Module:

- **Finding User Details:** A user can search the database for phone numbers of other users. Only public phone numbers are displayed.
- **Starting a call:** With proper error checks like a wrong phone number or calling oneself, the user can call other users. The call is initiated in a new form.
- **During the call:** A timer updates the time talked between user. There is also a check to ensure that the talk time is not exceeded. When the call is ended, the talk time of the user is updated in the database.

Error Handling and Edge Cases:

- Only public phone numbers are displayed. No more details are sent to the user
- Existence and correctness of phone numbers are checked. You cannot call yourself, the user can only call other users.
- **During the call:** A timer updates the time talked between user. There is also a check to ensure that the talk time is not exceeded. When the call is ended, the talk time of the user is updated in the database.

3.4 Plan Management



Figure 5: Plan Management Interface

3.4.1 Data Plans:

Different buttons correspond to different plans. They are used to display the various offers given by each plan. By clicking on any one you can select it and then proceed to payment. There are 5 data plans as follows

- **Basic Plan**
- **Standard Plan**
- **Premium Plan**
- **Ultra Plan**
- **Ultimate Plan**

3.4.2 Confirm and Pay Button

Clicking on which redirects to payment page. It also forwards the following data to the Payment Page :

- **User Id**
- **Selected Plan**
- **Talktime Left**
- **Data Left**

3.4.3 Error Handling and Edge Cases:

- **Multiple Plans Selected:** It has been ensured that multiple plans cannot be selected at the same time.
- **No Plan Selected:** In case where no plan is selected the User will be prompted to select a plan before redirecting to the Payment Page.
- **Default Plan:** By default the Basic Plan will be selected at the start.

3.5 Payment Gateway



Figure 6: Payment Gateway interface

Technical details and Functionality:

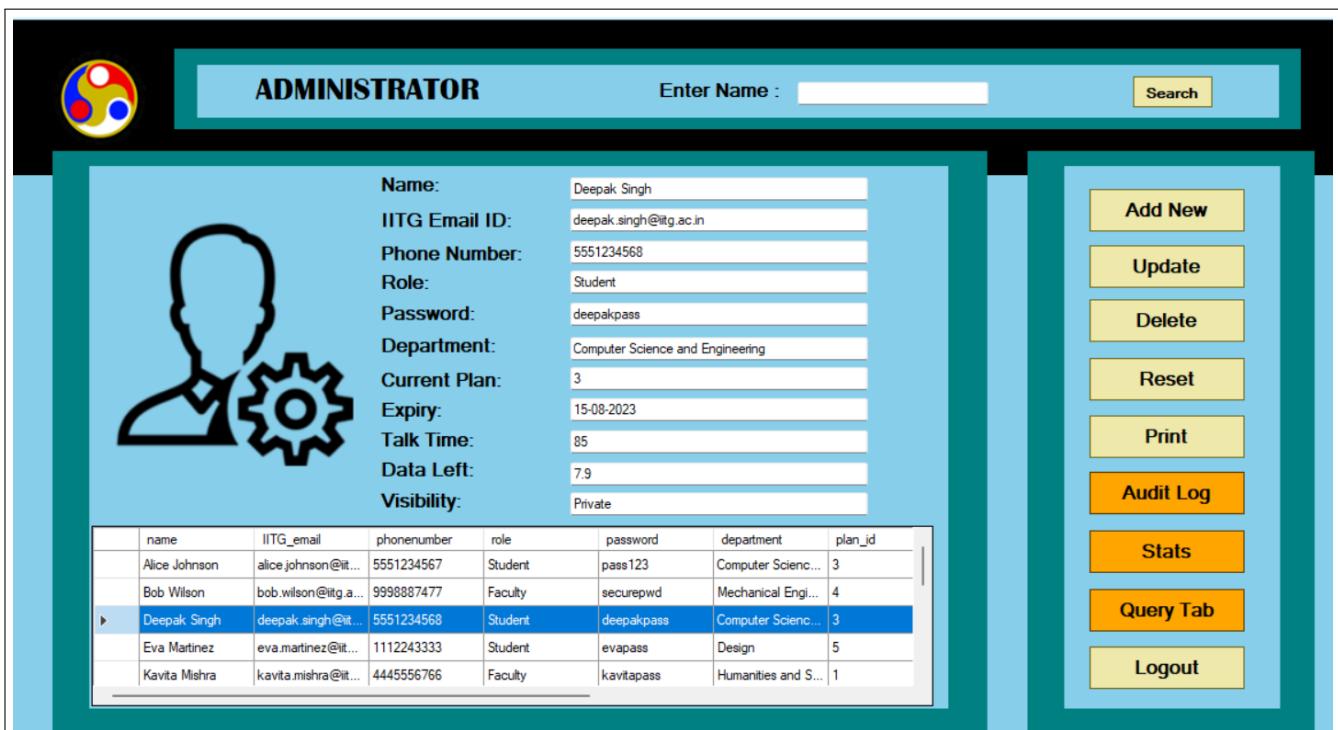
- **Picture Box:** Picture Box is used to display images, icons, or other graphical content on a form. It is used to display various modes of payments' symbols including *UPI*, *Credit Card*, *Debit Card* and *Netbanking*.
- **RadioButton:** The RadioButton control is used to present a set of options to the user, where only one option can be selected at a time. It is used to select a single kind of payment method including *UPI*, *Credit Card*, *Debit Card* and *Netbanking*.
- **Button:** Button control is a fundamental graphical user interface (GUI) element used to trigger actions or events when clicked by the user. Select *Pay Now* option to make successful payment in required payment method.
- **Label:** The Label control is used to display static text or descriptive information on a form.

- **Progress bar:** ProgressBar control is used to visually represent the progress of transaction that takes a certain amount of time/delay to complete..
- **RichTextBox:** RichTextBox control is used to display and edit formatted text, allowing users to create, view, and manipulate text. The payable amount is displayed using this.

Error handling and edge cases:

- We must make sure that the user can select a single form of payment correctly.
- The *Payable Amount* must be appropriate according to the plan selected and displayed correctly.
- The *Transaction* must be initiated when the user clicks *Pay Now* button and must be executed appropriately.

3.6 Administrator



The screenshot shows the Administrator interface with the following components:

- Header:** A logo on the left, followed by the title "ADMINISTRATOR" in bold. To the right is a search bar labeled "Enter Name : " with a "Search" button.
- User Profile:** On the left, there is a placeholder icon of a person with a gear, representing user management.
- User Details:** A group of text input fields for a user named "Deepak Singh". The fields include:
 - Name: Deepak Singh
 - IITG Email ID: deepak.singh@itg.ac.in
 - Phone Number: 5551234568
 - Role: Student
 - Password: deepakpass
 - Department: Computer Science and Engineering
 - Current Plan: 3
 - Expiry: 15-08-2023
 - Talk Time: 85
 - Data Left: 7.9
 - Visibility: Private
- Data Grid:** A table showing a list of users with columns: name, IITG_email, phonenumer, role, password, department, and plan_id. The row for "Deepak Singh" is highlighted in blue.
- Action Buttons:** A vertical column of buttons on the right side:
 - Add New
 - Update
 - Delete
 - Reset
 - Print
 - Audit Log
 - Stats
 - Query Tab
 - Logout

Figure 7: Administrator Interface

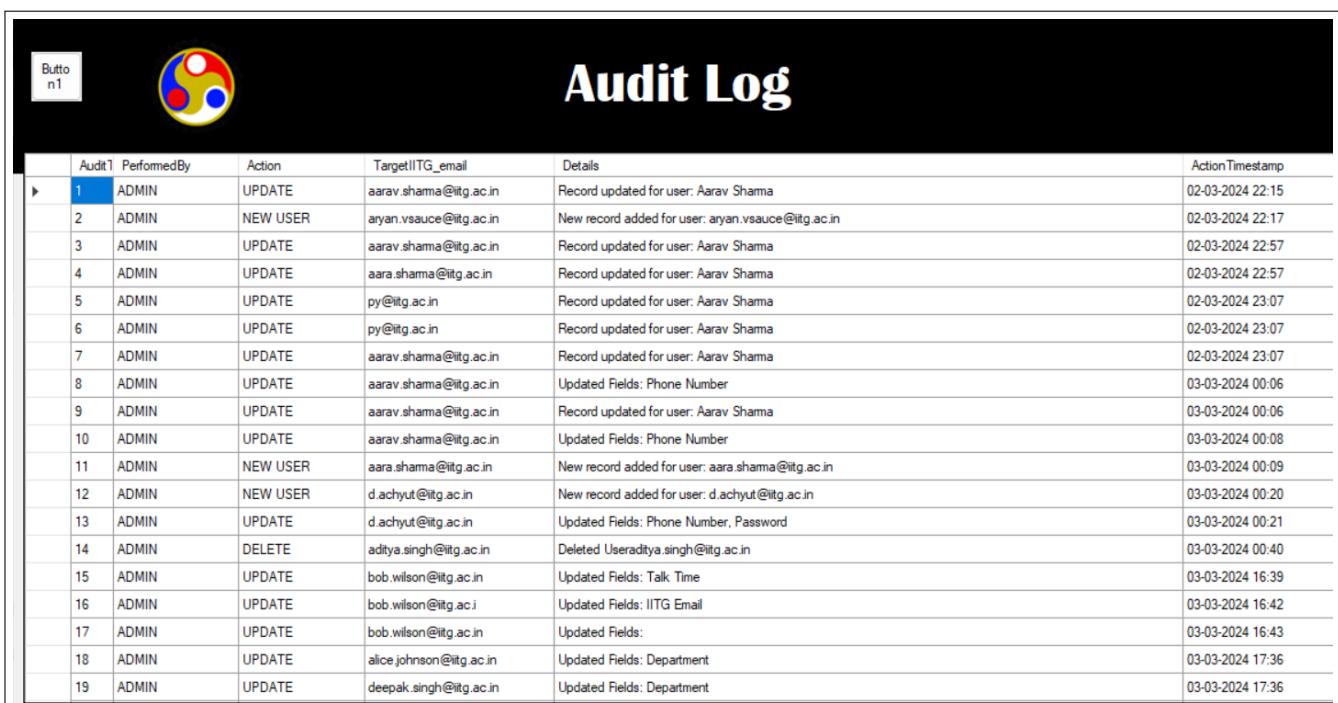
Technical Details and Functionality:

- **Add New:** Add a new user to the system with the specs given in the text boxes
- **Update:** Update the changed fields for the user, entered in the relevant textboxes.
- **Delete:** Delete data of the selected user.
- **Reset:** Reset all the textboxes.

- **Print:** Prints the data in dataGridView.
- **Audit Log:** Goes to the Audit Log page and hence fetches from and modifies the AuditTrail Table.
- **Stats:** Goes to the stats page and displays all relevant information such as number of users per plan and/or per department.
- **Reset:** Goes to the Query tab.
- **Reset:** Goes to the previous page after logging out.

Error Handling and Edge Cases:

- **Empty Fields:** There should be validation to ensure that required fields are not left empty when adding or updating data.
- **Duplicate Entries:** Prevent adding duplicate entries to maintain data integrity. The Email ID as well as the Phone Numbers should be unique.
- **Boundary Cases:** Test edge cases like adding maximum allowed data entries, entering special characters, etc., to ensure robustness.



The screenshot shows a Windows application window titled "Audit Log". In the top-left corner, there is a small icon labeled "Button n1". The main area contains a table with 19 rows of audit log data. The columns are labeled: "AuditID", "PerformedBy", "Action", "TargetIITG_email", "Details", and "ActionTimestamp". The data in the table is as follows:

AuditID	PerformedBy	Action	TargetIITG_email	Details	ActionTimestamp
1	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 22:15
2	ADMIN	NEW USER	aryan.vsaunce@iitg.ac.in	New record added for user: aryan.vsaunce@iitg.ac.in	02-03-2024 22:17
3	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 22:57
4	ADMIN	UPDATE	aara.sharma@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 22:57
5	ADMIN	UPDATE	py@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 23:07
6	ADMIN	UPDATE	py@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 23:07
7	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Record updated for user: Aarav Sharma	02-03-2024 23:07
8	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Updated Fields: Phone Number	03-03-2024 00:06
9	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Record updated for user: Aarav Sharma	03-03-2024 00:06
10	ADMIN	UPDATE	aarav.sharma@iitg.ac.in	Updated Fields: Phone Number	03-03-2024 00:08
11	ADMIN	NEW USER	aara.sharma@iitg.ac.in	New record added for user: aara.sharma@iitg.ac.in	03-03-2024 00:09
12	ADMIN	NEW USER	d.achyut@iitg.ac.in	New record added for user: d.achyut@iitg.ac.in	03-03-2024 00:20
13	ADMIN	UPDATE	d.achyut@iitg.ac.in	Updated Fields: Phone Number, Password	03-03-2024 00:21
14	ADMIN	DELETE	aditya.singh@iitg.ac.in	Deleted User aditya.singh@iitg.ac.in	03-03-2024 00:40
15	ADMIN	UPDATE	bob.wilson@iitg.ac.in	Updated Fields: Talk Time	03-03-2024 16:39
16	ADMIN	UPDATE	bob.wilson@iitg.ac.in	Updated Fields: IITG Email	03-03-2024 16:42
17	ADMIN	UPDATE	bob.wilson@iitg.ac.in	Updated Fields:	03-03-2024 16:43
18	ADMIN	UPDATE	alice.johnson@iitg.ac.in	Updated Fields: Department	03-03-2024 17:36
19	ADMIN	UPDATE	deepak.singh@iitg.ac.in	Updated Fields: Department	03-03-2024 17:36

Figure 8: Administrator Interface for Audit log

3.7 Statistics Page

Technical Details:

- **Stat Options:** The buttons are used to select the data which one wants to display. It can be of the form :

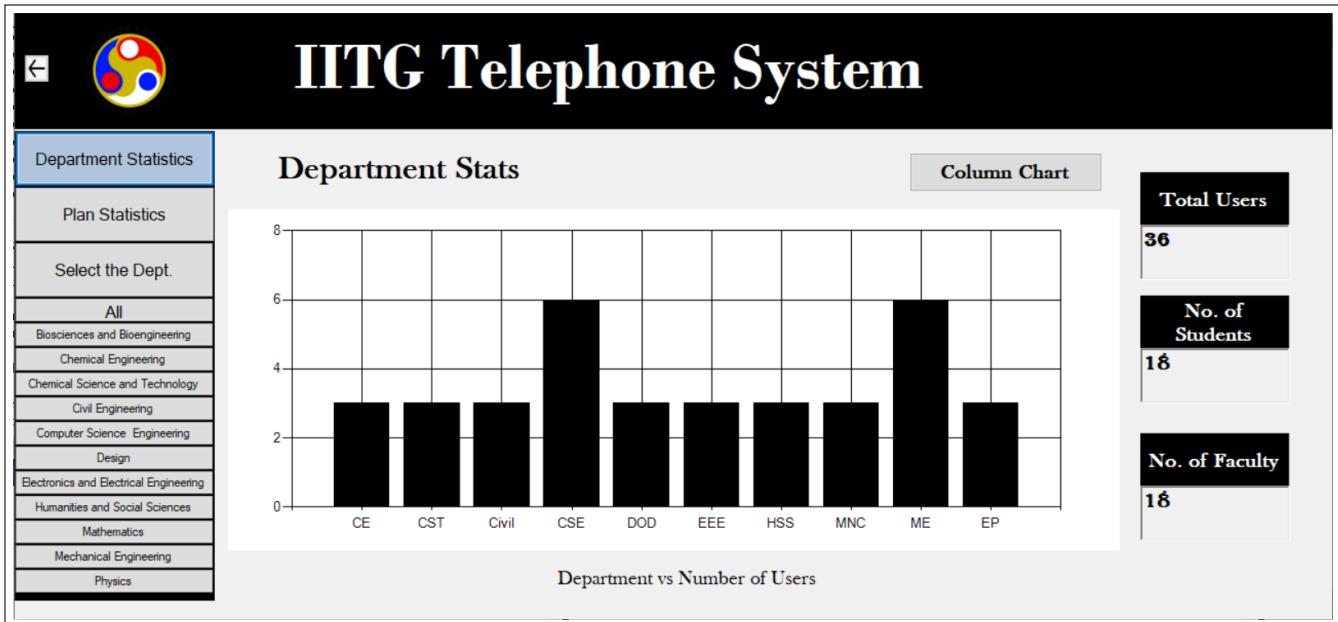


Figure 9: Stats Page Interface

- **Department vs No.of Users:** Displays the number of users in each department.
- **Plan Name vs No.of Users:** Displays the number of users in each plan type.
- **Department wise Stats:** Displays the number of users in each plan type in the selected department. Also shows the total number of users, number of students and number of faculty in the selected department.
- **Chart** The chart shows the data retrieved from the database and displays it in the form of
 - Column
 - Bar Chart
 - Pie Chart
 depending upon the what the user wants.
- **Role-Wise distribution** Textboxes are used for displaying the No. of users , No. of students and No. of faculty in the selected choice.
- **Selecting the department:** A panel is made which expands upon clicking and shows all the departments to choose from.
- **Error handling and edge cases:**
 - When there is no data present in a filter, show an empty graph.
 - Make sure that two different filters can't be selected at the same time.
 - Display an additional "No Plan" column for users not having any current plan, so that the displayed data is not erroneous.

3.8 Query handling

3.8.1 Query handling (Admin Side)

The screenshot shows the 'IITG Telephone System' Admin Side Query Handling interface. At the top, there is a logo and the system name. Below it is a form with fields for Name, IITG Email ID, Phone Number, Role, Current Plan, Expiry, Raised, and Issue. To the right of the form are two buttons: 'Resolve' and 'Search'. Below the form is a data grid showing a list of issues with columns for IssueID, PerformedBy, Issue, and ActionTimestamp.

IssueID	PerformedBy	Issue	ActionTimestamp
1	p.aasneh@itg.ac.in	What are the various schemes that are offered?	03-03-2024 22:52
2	p.aasneh@itg.ac.in	What are the benefits of this application?	03-03-2024 22:53
3	p.aasneh@itg.ac.in	How many plans do you offer?	03-03-2024 22:53
4	p.aasneh@itg.ac.in	Is this application sponsored?	03-03-2024 22:53
5	p.aasneh@itg.ac.in	How did you develop this application?	03-03-2024 22:54
6	a.abhi@itg.ac.in	How many queries are we allowed to ask?	03-03-2024 23:03
7	a.abhi@itg.ac.in	How many plans do you offer?	03-03-2024 23:03

Figure 10: Admin Side Query handling

Technical details and Functionality:

- **Picture Box:** Picture Box is used to display images, icons, or other graphical content on a form.
- **Button:** Button control is a fundamental graphical user interface (GUI) element used to trigger actions or events when clicked by the user. Select *Resolve* to resolve the selected query or *Search* to search for record.
- **Label:** The Label control is used to display static text or descriptive information on a form including *Name*, *IITG Email ID* etc.
- **Data grid:** DataGrid control is to display data in a structured grid format. It provides an organized view of tabular data, making it easier for users to interpret and interact with. It is used to display the various issues raised by users on admin's side.

3.8.2 Query handling (User Side)

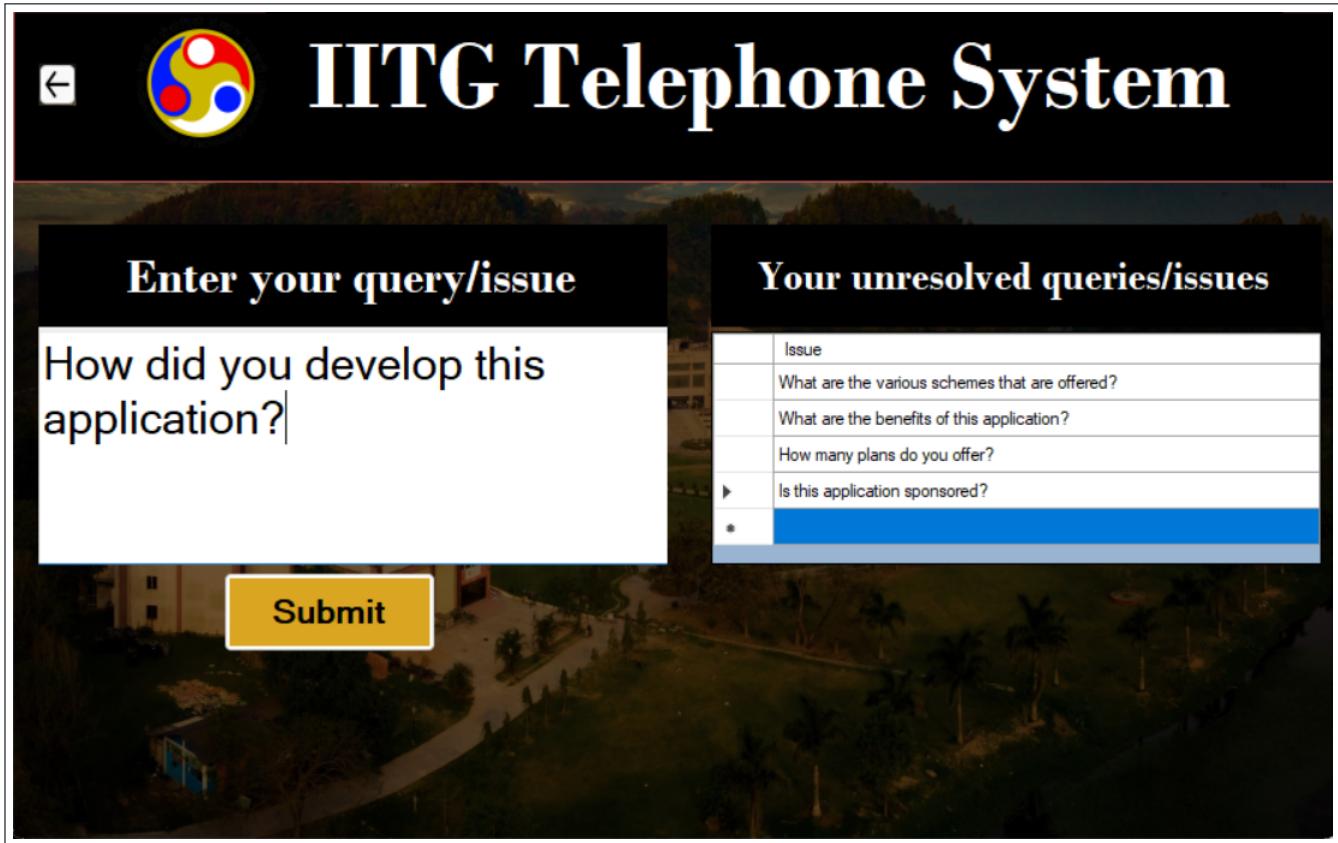


Figure 11: User Side Query handling

Technical details and Functionality:

- **Picture Box:** Picture Box is used to display images, icons, or other graphical content on a form.
- **Button:** Button control is a fundamental graphical user interface (GUI) element used to trigger actions or events when clicked by the user. Select *Submit* to submit a query.
- **Label:** The Label control is used to display static text or descriptive information on a form including.
- **Data grid:** DataGrid control is to display data in a structured grid format. It provides an organized view of tabular data, making it easier for users to interpret and interact with. It is used to display the various issues raised by the user.
- **TextBox:** TextBox control is used to accept and display text input from users. Here it accepts queries from the user.

Error handling and Edge cases

- We must make sure all queries of the user are visible to both the admin and the user.
- After a query is resolved it must be reflected on user and admin sides.

- When the admin searches for a record that is not a valid ID, error must be thrown.
- When the admin searches for a record that does not have a query, error must be thrown.

4 Data Flow Diagrams

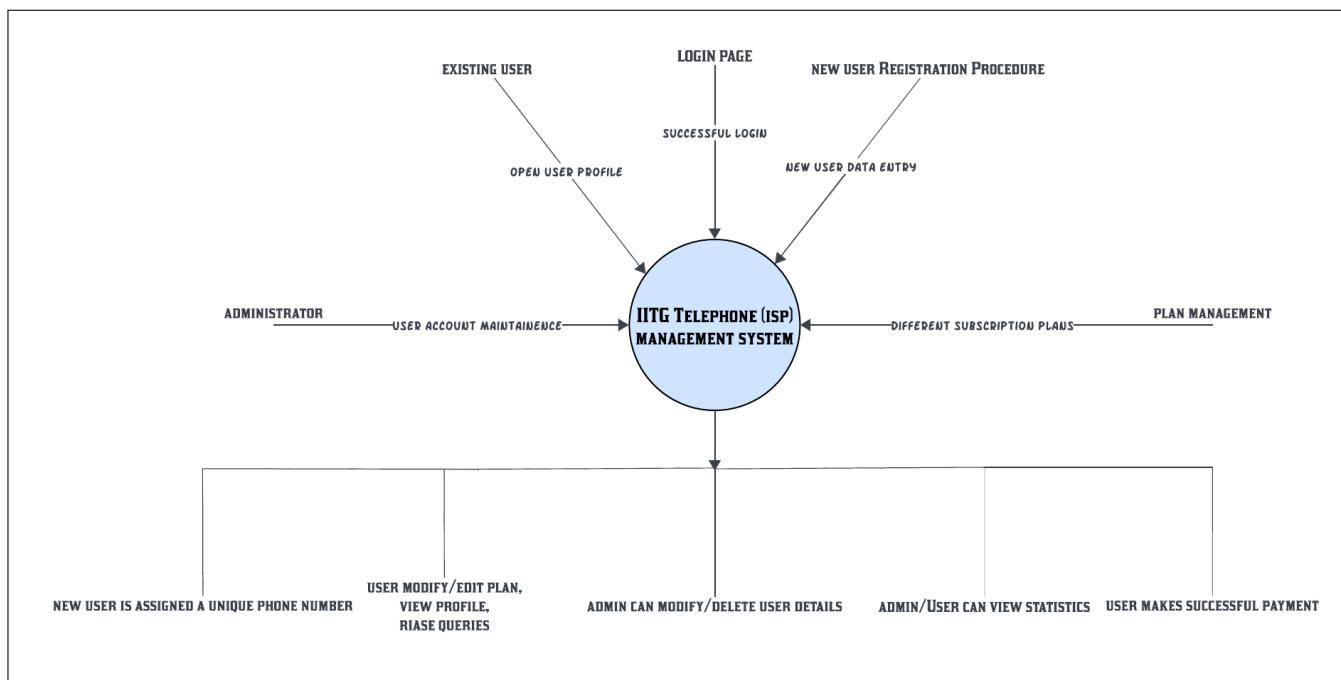
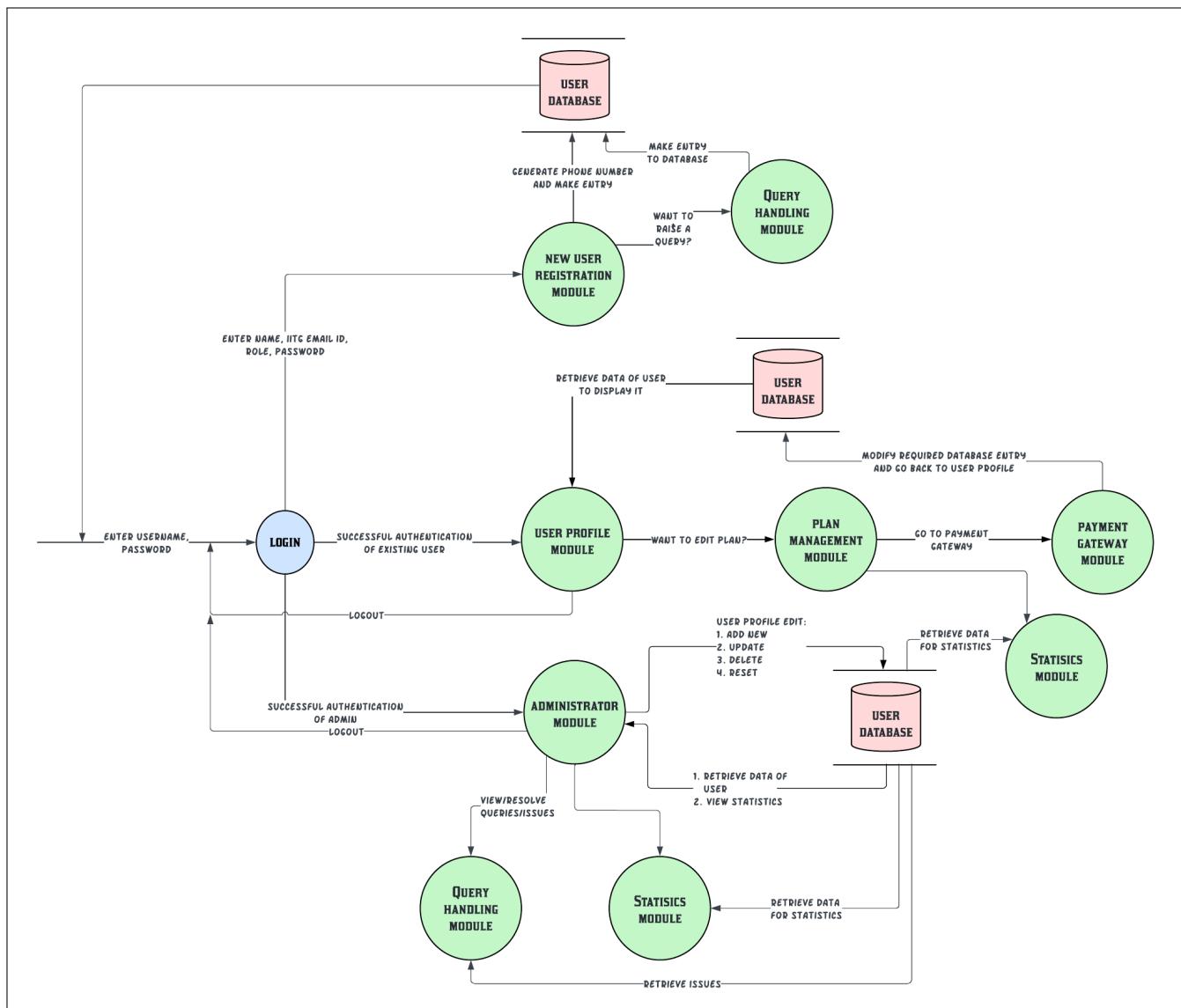


Figure 12: Level 0 Data Flow Diagram



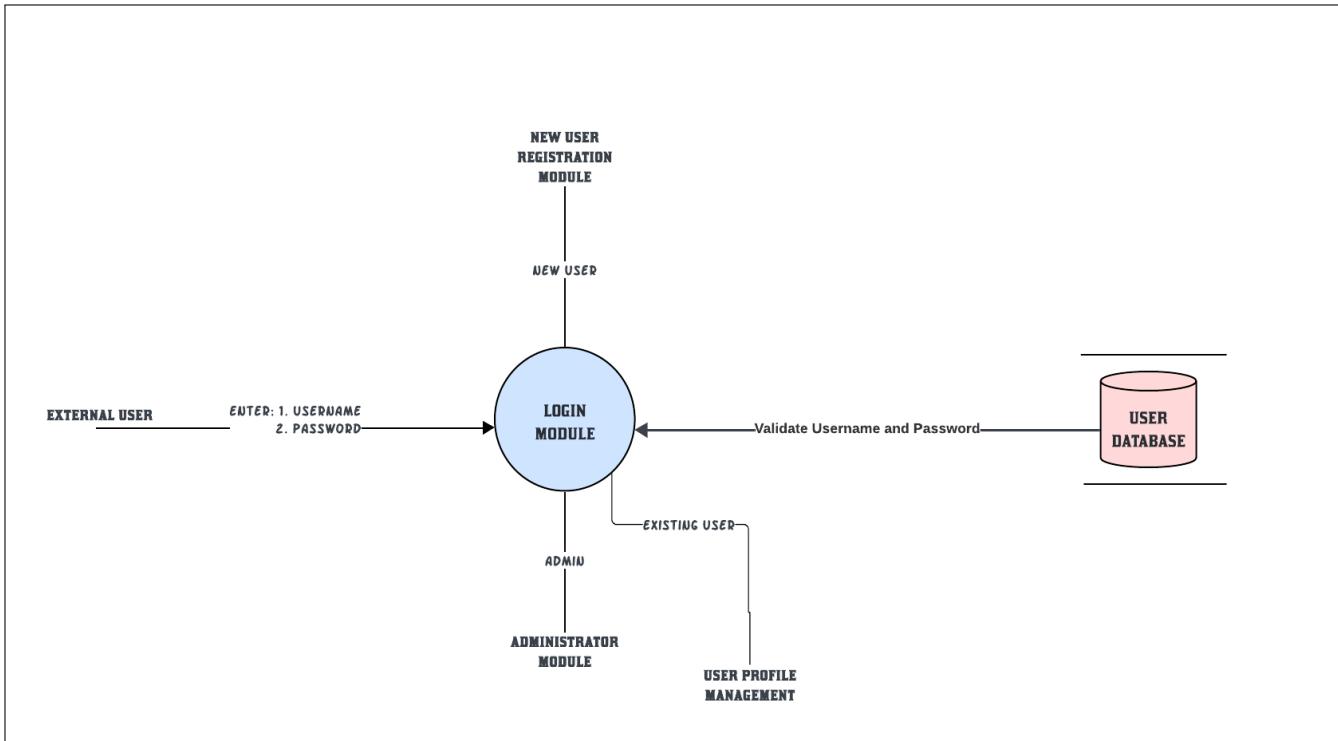


Figure 14: Level 2 Data Flow Diagram : Login Module

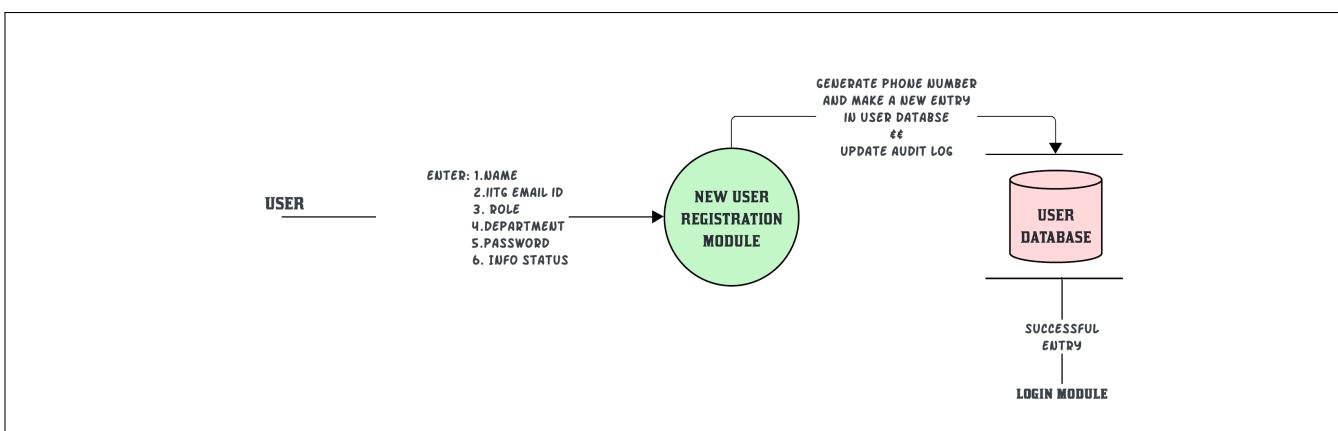


Figure 15: Level 2 Data Flow Diagram : New Registration Module

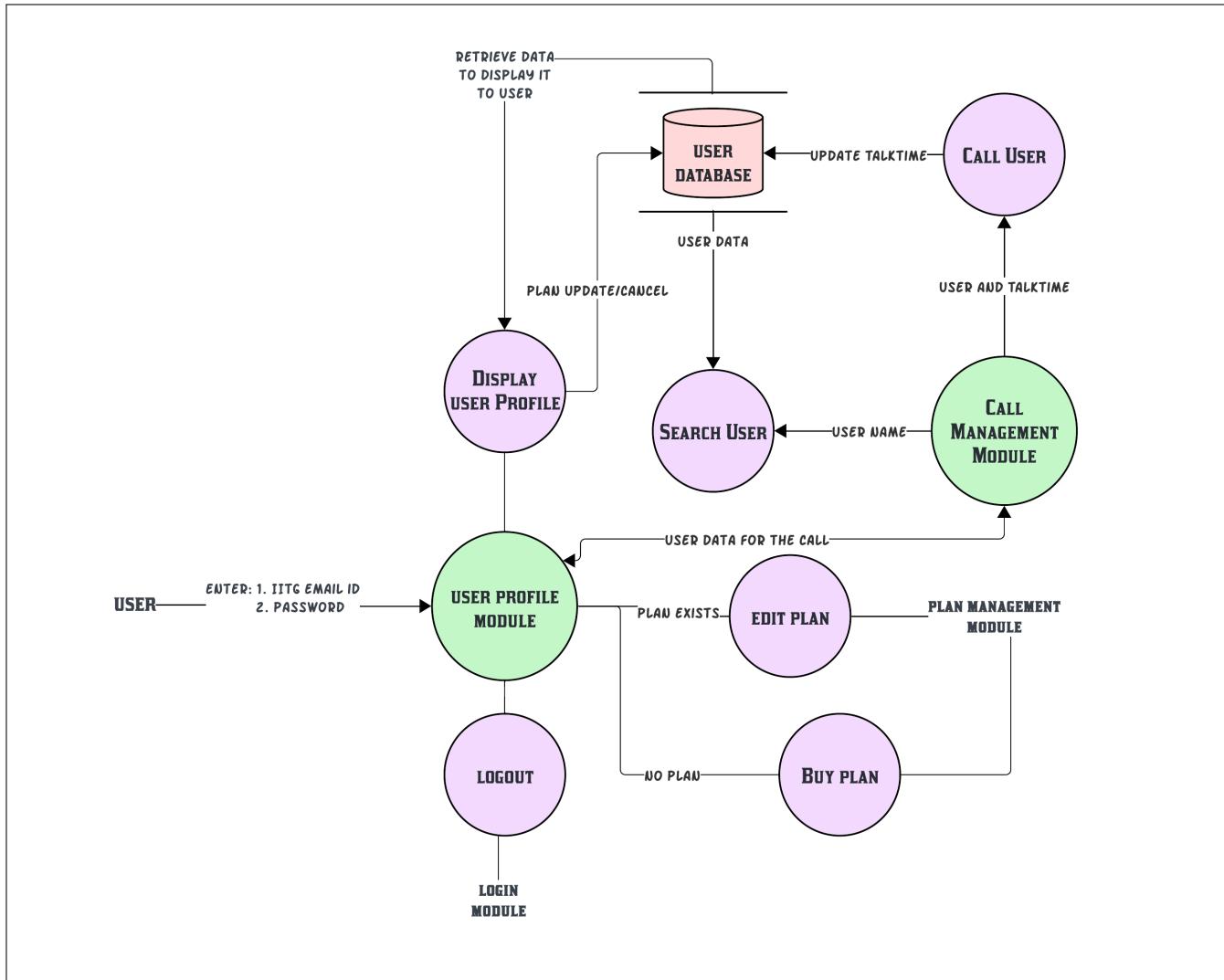


Figure 16: Level 2 Data Flow Diagram : User Profile Module

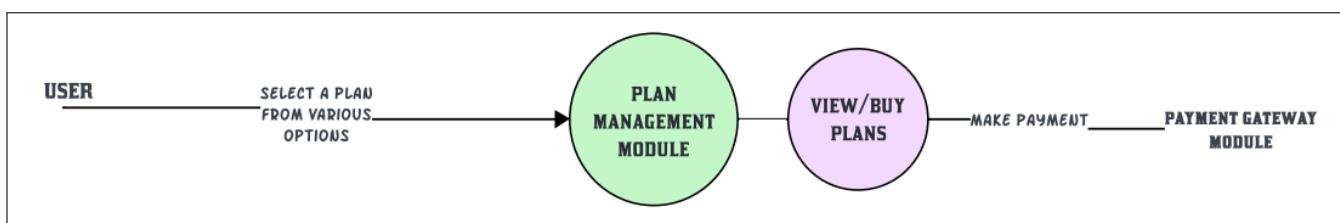


Figure 17: Level 2 Data Flow Diagram : Plan Management Module

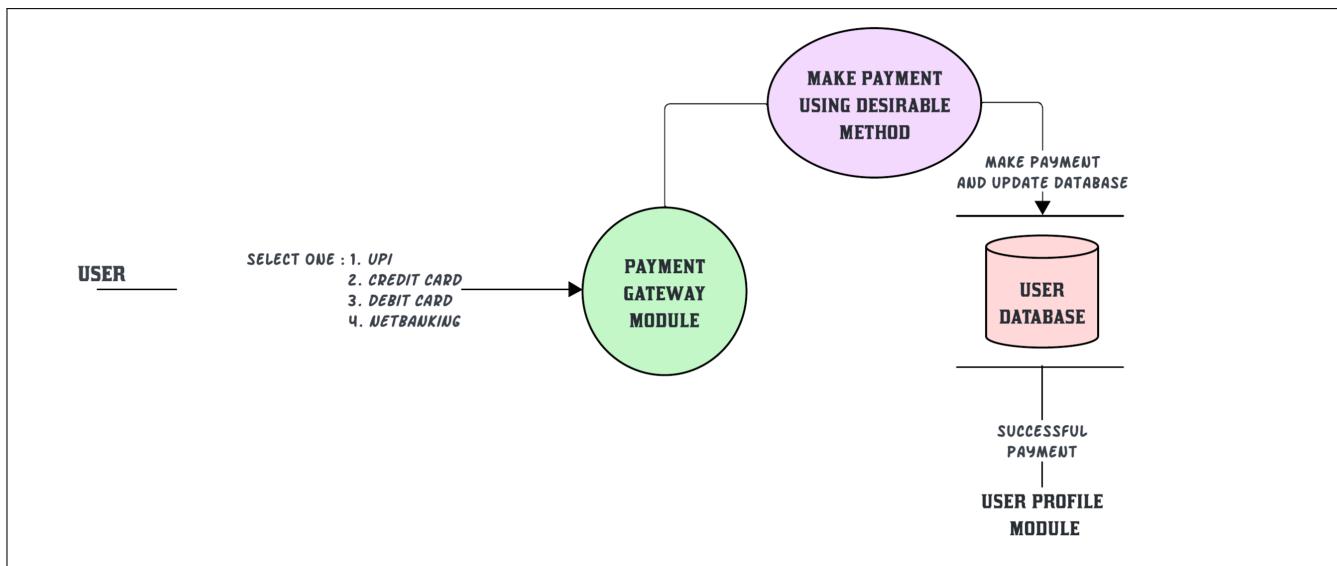


Figure 18: Level 2 Data Flow Diagram: Payment Gateway Module

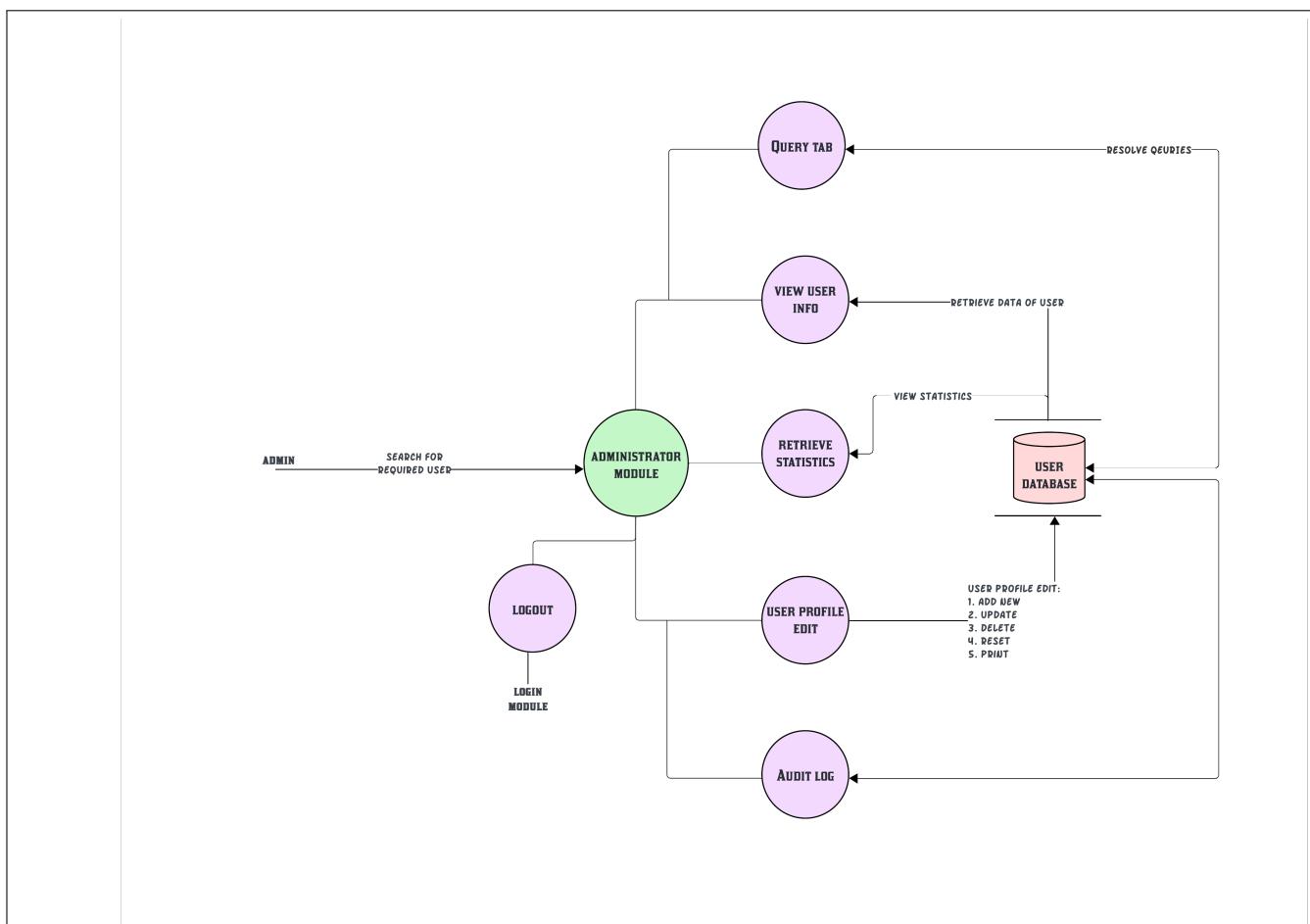


Figure 19: Level 2 Data Flow Diagram: Administrator Module

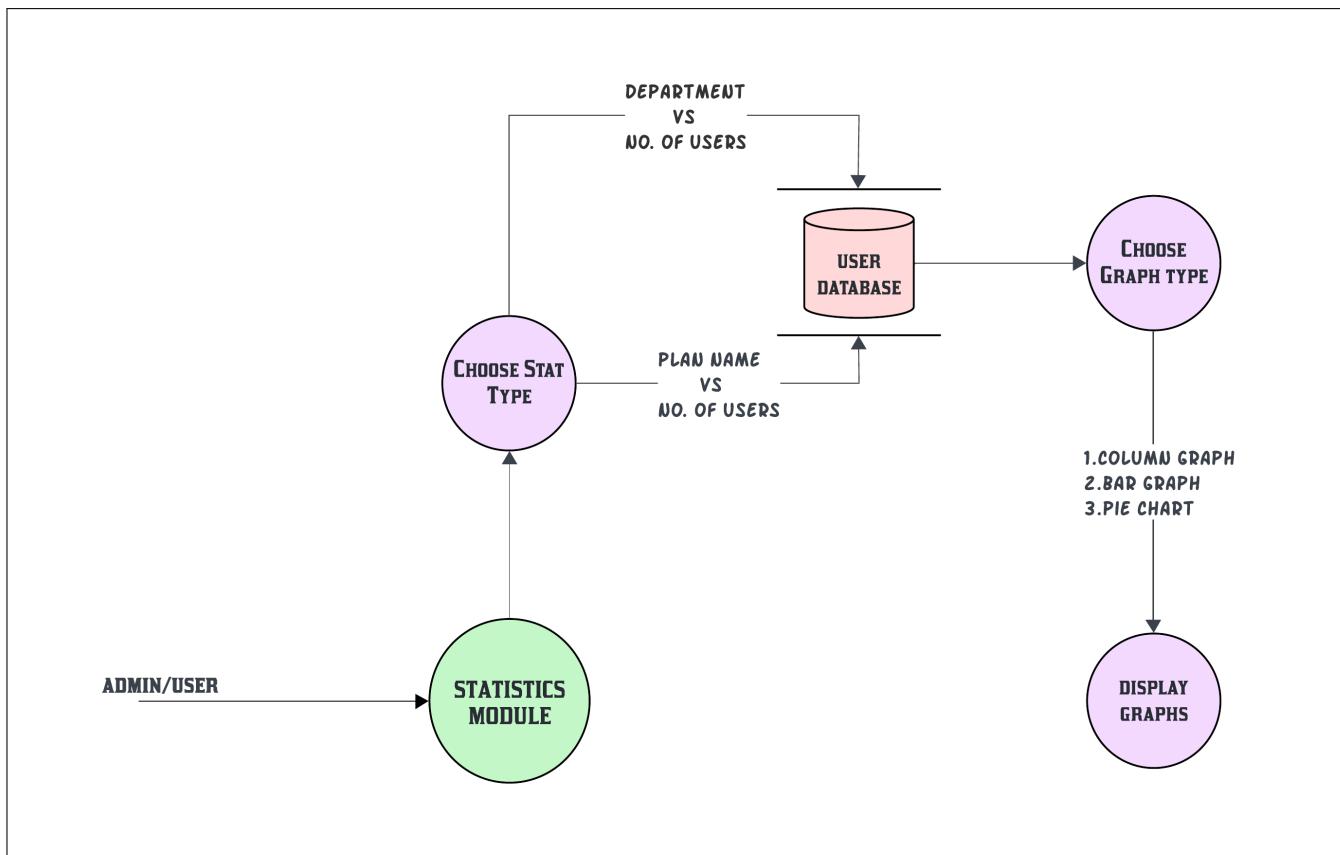


Figure 20: Level 2 Data Flow Diagram: Statistics Module

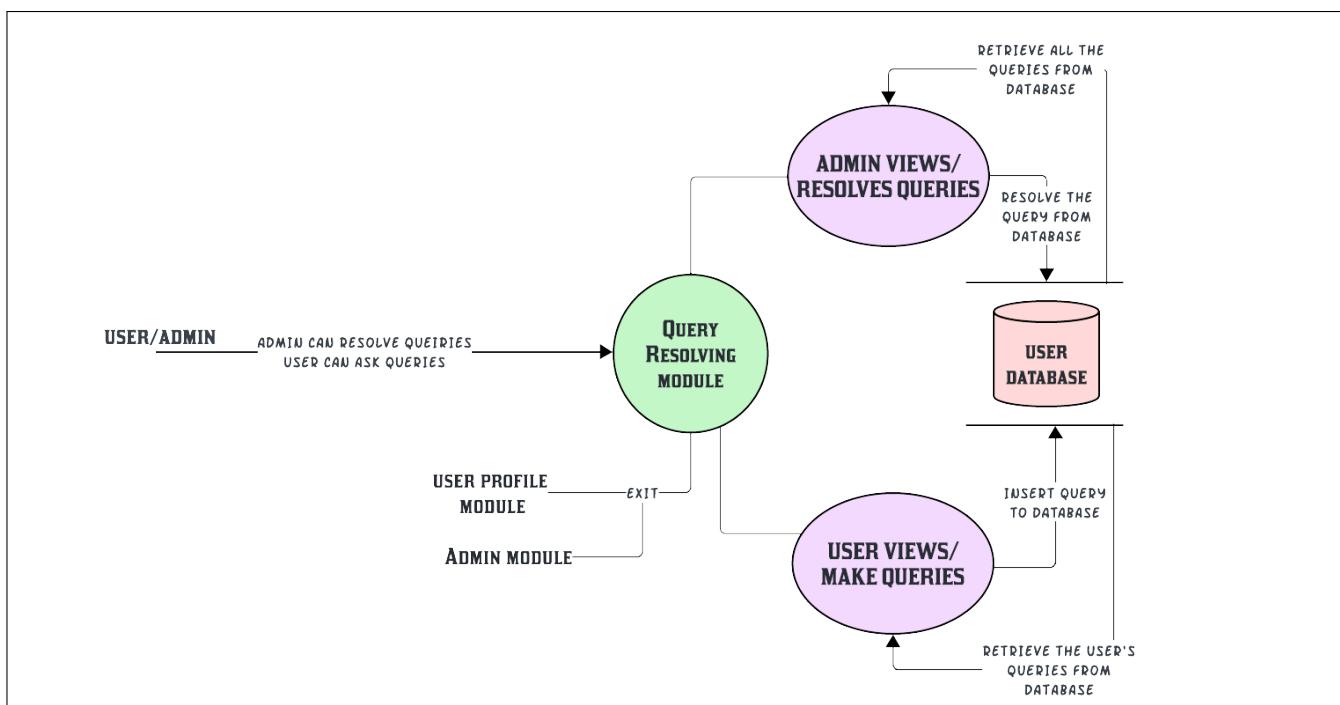


Figure 21: Level 2 Data Flow Diagram: Query Handling Module

5 Database

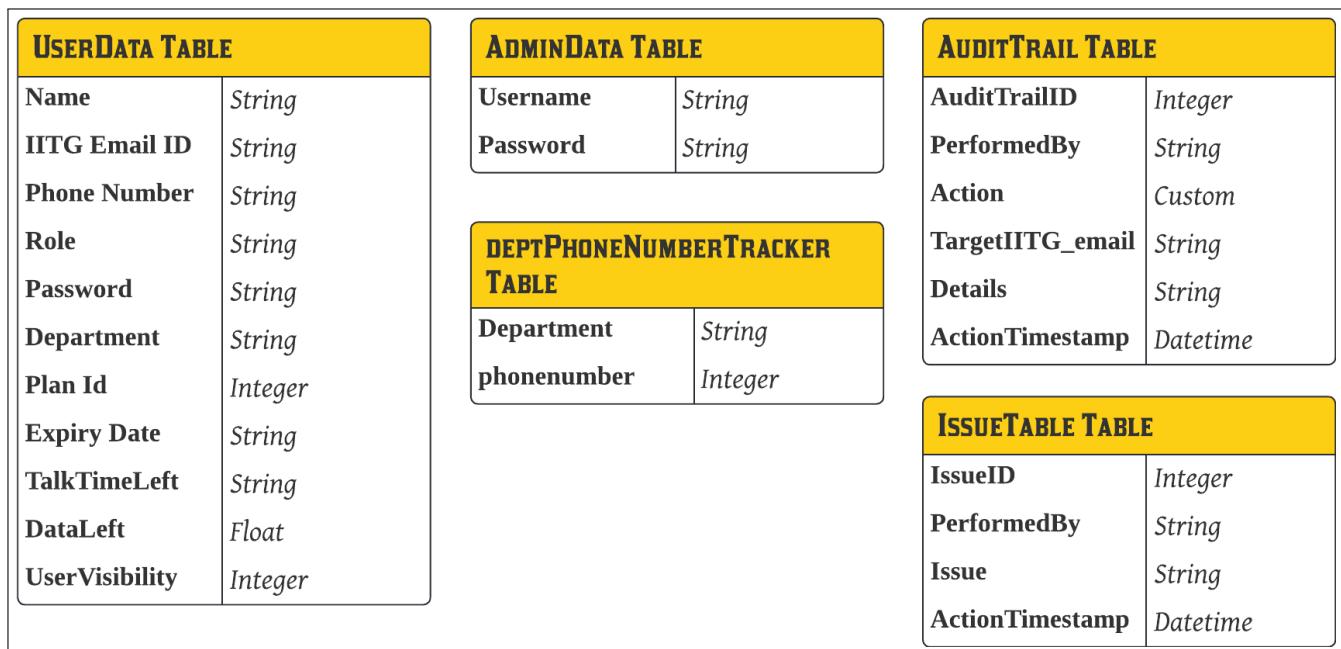


Figure 22: Database of the application

Features:

- **UserData Table:** This is the table that contains all the information about the user such as Name, IITG Email, Hashed Password, Phone number, Role, Department, Plan type, Talktime and Dataleft, and visibility to others.
- **AdminData Table:** This is the table that contains all the information about the Admin such as Username and password.
- **AuditTrail Table:** This is the table that contains all the information about the activities/transactions that take place. It logs the action performed by, type of action, details and Timestamp at which it happened.
- **Issue Table:** This is the table that contains all the information about the queries that are sent out. It logs the action performed by, details of the issue and Timestamp at which it happened.
- **DeptPhoneNumberTracker Table:** This is the table used to generate a unique number everytime we need to allocate the phone number.
- We have integrated our visual basic application using MySql connection version 6.5.4.

6 Model for Development:

Incremental Model:

The Incremental Model, a flexible and adaptive approach to software development, breaks down the project into manageable increments, allowing for iterative enhancements and early user engagement.

Features:

- Divides project into manageable increments.
- Each increment is developed independently.
- System evolves progressively with each iteration.

Phases:

1. **Planning:** Identify requirements and define increments.
2. **Architecture:** Design system architecture, considering future increments.
3. **Implementation:** Develop and deliver each increment.
4. **Testing:** Test each increment thoroughly.
5. **Integration:** Integrate increments into the complete system.
6. **Feedback:** Collect user feedback and make improvements.
7. **Validation:** Validate the complete system after integrating all increments.

Advantages:

- Flexibility to accommodate changes.
- Early user access to partial functionality.
- Continuous risk reduction through iterative development.

Disadvantages:

- Complexity increases with each added increment.
- May require more effort in system integration.
- Not suitable for projects with well-defined and stable requirements.

Why and How Incremental??

We chose an incremental model for its adaptability to changing requirements. Our project follows incremental development by dividing tasks into manageable phases like planning, architecture, and implementation. This approach ensures early user involvement and allows for continuous enhancements based on feedback. Incremental development mitigates risks by addressing concerns in smaller iterations.

7 Conclusion

In conclusion, the development of the Visual Basic Application for Telephone Management System (TMS) tailored specifically for the Indian Institute of Technology Guwahati (IITG) is an attempt in addressing the institution's telecommunication needs.

Throughout the development process, the focus remained on delivering a comprehensive solution that meets the diverse requirements of user registration, profile management, plan management, and administrative functionalities. By leveraging the capabilities of Visual Basic, along with utilizing MySQL for database requirements, we have attempted to craft a robust and user-friendly application.
