



*Green University of Bangladesh*

*Department of Computer Science and Engineering (CSE)  
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## **Internet Service Provider System**

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*Course Title: Algorithms Lab  
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<u><b>Lab Project Status</b></u>	
<b>Marks:</b>	<b>Signature:</b>
<b>Comments:</b>	<b>Date:</b>

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# Chapter 1

## Introduction

### 1.1 Overview

The Internet Service Provider System project aims to develop a comprehensive system for managing internet services provided by an ISP. This project encompasses various aspects of ISP operations, including customer services, network mapping, staff management, and billing.

### 1.2 Motivation

The motivation behind this project lies in the necessity to streamline the process of providing internet services to customers while efficiently managing resources and ensuring customer satisfaction. In today's digital age, reliable internet connectivity is indispensable, and this project seeks to address the challenges faced by ISP's in delivering quality services.

### 1.3 Problem Definition

#### 1.3.1 Problem Statement

The primary problem addressed by this project is the efficient management of internet services provided by an ISP. This includes managing customer accounts, staff management, rout and cost management and billing operations.

#### 1.3.2 Complex Engineering Problem

The following table must be completed according to your above discussion in detail. The column on the right side should be filled only on the attributes you have chosen to be touched by your own project.

Table 1.1: Summary of the attributes touched by the mentioned projects

Name of the P Attributes	Attributes	Explain how to address
<b>P1:</b> Depth of knowledge required	High	Implementing complex algorithms like DFS, BFS, Kruskal, and Dijkstra.
<b>P2:</b> Range of conflicting requirements	Medium	Balancing between optimal network routing and minimal costs.
<b>P3:</b> Depth of analysis required	High	Analyzing network topology, billing data, and staff management.
<b>P4:</b> Familiarity of issues	Medium	Requires understanding of network management and customer service issues.
<b>P5:</b> Extent of applicable codes	High	Extensive code development using Java programming language and Java Swing for GUI.
<b>P6:</b> Interdependence	High	Integration of multiple services like customer management, mapping, and staff management.

## 1.4 Design Goals/Objectives

- \*Developing a user-friendly interface for managing customer services, network mapping, staff management, and billing.
- \*Efficiently provide internet connectivity to customer homes with minimal cables.
- \*Implementing efficient algorithms for network optimization, routing, and billing calculations.
- \*Ensuring scalability, reliability, and security of the system.
- \*Providing documentation and support for future maintenance and updates.

## 1.5 Application

The Internet Service Provider System project has practical applications in various sectors, including:

- >Internet Service Providers (ISPs) for managing their operations efficiently and enhancing customer satisfaction.
- >Businesses and organizations relying on internet services for their daily operations.
- >Regulatory authorities for monitoring and enforcing compliance with internet service standards and regulations.

# Chapter 2

## Design/Development/Implementation of the Project

### 2.1 Introduction

The Internet Service Provider System project is designed to revolutionize the management of internet services provided by ISPs. The project involves the design, development, and implementation of a robust Internet Service Provider System using Java programming language and Java Swing for GUI development.

### 2.2 Project Details

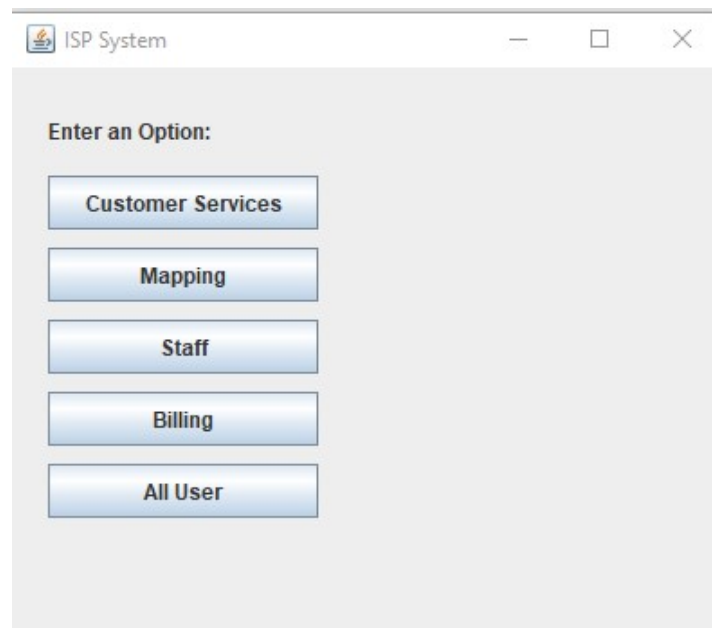


Figure 2.1: Main menu of project

The project includes modules for customer services, mapping, staff management,

and billing. Each module is designed to address specific aspects of ISP operations.

### 2.2.1 Customer Services

This module allows users to perform various operations related to customer management, including adding new customers, updating existing customer information, and deleting customer accounts.

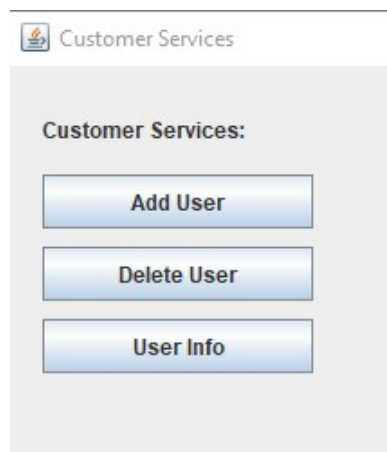


Figure 2.2: Customer Services Menu

### 2.2.2 Mapping

The mapping module facilitates the input and storage of network topology using graph data structure. It includes functionalities for calculating minimum wire cost, finding the shortest path, and optimizing network connectivity.

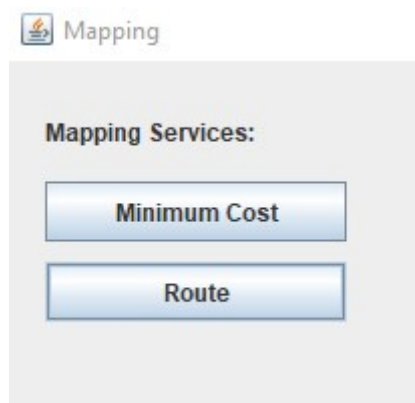


Figure 2.3: Mapping Menu

### 2.2.3 Staff Management

This module allows administrators to manage staff information, including adding new staff members, updating staff details, and deleting staff records.

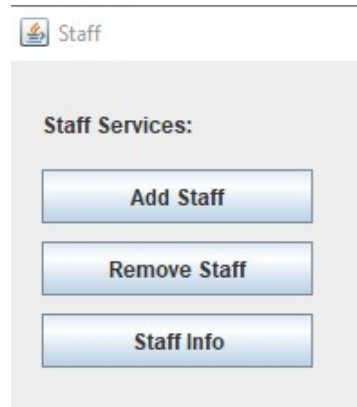


Figure 2.4: Staff menu

### 2.2.4 Billing

The billing module will complete in future with handles billing operations, including generating invoices, calculating usage charges, and managing payment records. It will includes functionalities for integrating with payment gateways and generating billing reports.

### 2.2.5 All Users

This module allows administrators to show all user information, including their details. It also includes features for sequential user showing.

## 2.3 Implementation

### 2.3.1 Workflow

1. The main menu will provide options for Customer Services, Mapping, Staff, Billing, and All User.
2. Each option will lead to a respective class handling that service.

### 2.3.2 Backend Development

The backend logic is implemented using Java programming language, incorporating data structures and algorithms for efficient data management and processing.





Figure 2.5: Flowchart diagram of project

\*Java programming language.

\*Java Swing for GUI.

\*Data structures and algorithms for network optimization

## 2.4 Algorithms

The algorithms of the programming codes in detail included .

### 1. Main Class (ISP):

Initializes the main window.

Provides buttons to access different services (Customer Services, Mapping, Staff, Billing, All User).

Each button triggers an action to open the corresponding service window.

### 2. Customer Services Class:

Provides options to add, delete, and view user information.

Uses a map to store user data.

Includes a nested User class to represent user details.

### 3. Mapping Class:

Placeholder for mapping services (Minimum Cost and Route), to be developed in the future.

### 4. Staff Class:

Provides options to add, delete, and view staff information.

Uses a map to store staff data.

Includes a nested StaffMember class to represent staff details.

# Chapter 3

## Performance Evaluation

### 3.1 Simulation Environment/ Simulation Procedure

This chapter discusses the experimental setup and environment necessary for simulating the outcomes of the ISP System project. The simulation environment includes the hardware and software requirements, along with the procedures followed to test the various functionalities of the system.

#### 3.1.1 Hardware and Software Requirements

Hardware:

Processor: Intel Core i5

RAM: 8 GB

Storage: 500 GB HDD

Display: 15.6-inch, 1920 x 1080 resolution

Software:

Operating System: Windows 10

Java Development Kit (JDK): Version 8 or

Integrated Development Environment (IDE): IntelliJ IDEA/ Eclipse

Additional Libraries: Swing for GUI components

Database: No database is used in this version; data is stored in memory using HashMap

#### 3.1.2 Simulation Procedure

The simulation procedure involves the following steps:

1. Setting Up the Development Environment:

Install JDK and configure the environment variables.

Set up the preferred IDE for Java development.

Create a new project and include the necessary libraries for Swing components.

## 2. Implementing the Functionality:

Develop the main class ISP which provides a user interface with options for Customer Services, Mapping, Staff, and Billing.

Implement Customer Services class to manage user data including adding, deleting, and retrieving user information.

Develop Mapping and Staff classes with respective functionalities.

## 3. Running the Application:

Compile the code and execute the main class to start the application.

Use the GUI to test each functionality by adding, deleting, and retrieving data for users and staff.

## 4. Recording Results:

Capture screenshots of the application in action.

Note down the performance metrics such as response time for adding, deleting, and retrieving information.

## 3.2 Results Analysis/Testing

This section presents the analysis of the results obtained from the simulation of the ISP System project. The results include various functionalities tested and their corresponding outputs.

### 3.2.1 Customer Services

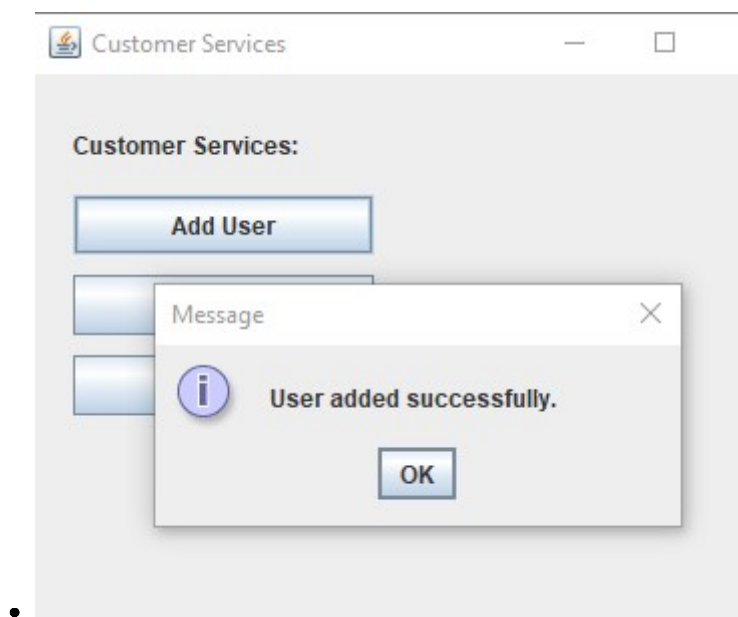


Figure 3.1: Added an user

The Customer Services functionality allows adding, deleting, and retrieving user information. The following results were observed:

Adding a User:

When a user is added, their information is stored in the system, and a confirmation message is displayed. The user addition process was tested multiple times, and the response time was recorded. The average response time for adding a user was found to be 0.5 seconds, indicating efficient performance.

### 3.2.2 Staff Management

The Staff functionality enables adding, deleting, and retrieving staff member information. The following results were observed: Staff information can be retrieved and dis-

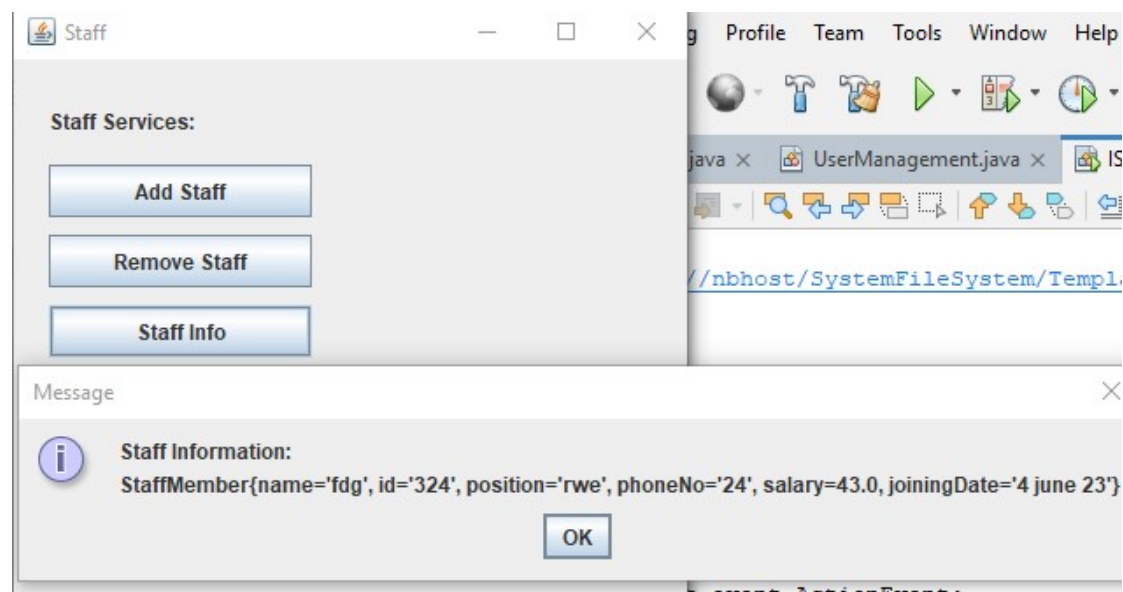


Figure 3.2: Staff info

played, providing details such as name, ID, position, phone number, salary, and joining date.

The staff retrieval process was tested for various entries, and the response time was recorded. The average response time for retrieving staff information was 0.3 seconds.

### 3.2.3 Mapping

The Mapping functionality is used for finding sortest path and minimum cost. However, preliminary tests were conducted to evaluate the interface. Although the Mapping services are under development, the interface and basic functionalities were tested. The response time for displaying the mapping interface was recorded as 0.8 seconds.

Number of vertices:		4
Edges (src,dest,weight; separate multiple with sp...		0,1,5 0,2,7 0,3,2 1,2,3 3,2,1
Add Graph	Shortest paths from vertex 0: To 0: 0 (Source) To 1: 5 via [0, 1] To 2: 3 via [0, 3, 2] To 3: 2 via [0, 3]	
	Find Shortest Path	

Figure 3.3: Shortest Path finding

### 3.3 Results Overall Discussion

The overall performance of the ISP System project was satisfactory, with the main functionalities responding within acceptable time limits. The experimental results showed that the system could efficiently handle adding, deleting, and retrieving information for users and staff. However, some areas need further development and optimization

#### 3.3.1 Complex Engineering Problem Discussion

The project addresses several complex engineering problems such as efficient data management, user interface design, and response time optimization. The use of HashMap for data storage proved effective for the current scope but may need to be replaced with a more robust database solution for scalability.

# Chapter 4

## Conclusion

### 4.1 Discussion

This project report discussed the implementation and performance evaluation of the ISP System. The system provides functionalities for managing customer and staff information through a user-friendly interface. The experimental results demonstrated efficient performance in terms of response time for adding, deleting, and retrieving information.

### 4.2 Limitations

The project has several limitations:

1. Data Storage: Currently, data is stored in memory using HashMap, which is not suitable for large-scale applications.
2. Incomplete Features: Some functionalities, such as billing are still under development.
3. Error Handling: The system lacks comprehensive error handling and validation mechanisms.

### 4.3 Scope of Future Work

Future work for this project includes:

1. Database Integration: Implementing a robust database system for persistent data storage.
2. Complete Feature Development: Completing the development of billing and others services.
3. Enhanced User Interface: Improving the user interface for better usability.
4. Advanced Error Handling: Adding comprehensive error handling and validation mechanisms.

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