আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম

الجامعة الإسلامية العالمية شيتاغونغ

International Islamic University Chittagong

# DEPARTMENT OF CSE

## Project Report

Course Code : CSE-2322

Course Title : Data Structures Lab

Program : BSc. In CSE

### Submitted To

Ashifatul Ferdousi

Assistant Lecturer

Dept. of CSE,IIUC

### Submitted By

Umme Samia Rahman Shose (C233454)

Hure Jannat Tasnim(C233465)

Arifa Jahin (C233468)

## Project name

**Train Ticket Booking System(Console Based)**

## Introduction

Train Ticket Booking System, a console based application aimed at streamlining the process of booking train tickets for passengers. The system provides users with a convenient platform to search for trains, check seat availability, book tickets, and manage reservations efficiently.

### Objective

The purpose of this project report is to create a user-friendly and efficient ticketing system that minimizes manual effort, reduces errors, and enhances customer satisfaction. By automating the booking process, the system aims to provide seamless access to train schedules and booking services while ensuring accuracy and reliability that simplifies the process of ticket reservations and train schedule management for both users and administrators.

### Background

The train ticket booking process can be cumbersome and time-consuming when handled manually. With the increasing demand for digitization, the need for an automated ticketing solution has become more critical.This project aims to develop a computerized system that streamlines the booking process while providing efficient data management for schedules, seats, and passenger information by offering a robust platform that caters to the needs of passengers and railway authorities alike, ultimately improving the overall travel experience. It incorporates advanced data structures like linked lists, binary search trees, and sorting algorithms to ensure speed and reliability.

## Literature Review

### Key Studies

Previous studies in the domain of ticket booking systems focus on web-based platforms and mobile applications. These systems leverage database integration and graphical user interfaces to enhance user interaction. However, limited research has explored the application of advanced data structures in console-based systems.

### Key Features

1. **User Registration and Login**: Allows users to create accounts, log in, and access personalized features securely.
2. **Train Search**: Users can search for trains based on destination, date, and time.
3. **Ticket Booking**: Enables users to book tickets by selecting available trains, class types, and seat preferences.
4. **Booking Management**: View, update, or cancel existing reservations with ease.
5. **Payment Integration**: Processes payments securely to confirm bookings.
6. **Admin Functionality**: Admins can add, modify, or remove train schedules and monitor bookings.
7. **Database Integration**: Maintains a centralized database for train schedules, user data, and bookings.
8. **Error Handling**: Provides feedback for invalid inputs and ensures secure and accurate transactions.

### Research Gap

There is a lack of projects emphasizing algorithmic efficiency in console-based systems, particularly using advanced data structures like binary search trees and graph traversal algorithms for train scheduling. These previous approaches did not optimize resource management or tackle the scalability challenges effectively. My project fills this gap by introducing a more efficient system that leverages these advanced algorithms to improve performance.

### Relevance

This report underscores the critical role of efficient data handling and algorithm design in creating scalable and responsive console-based systems for train scheduling. By focusing on advanced data structures like binary search trees and graph traversal algorithms, it demonstrates how to improve system performance and handle large-scale data effectively. The findings in this report serve as a foundation for developing more sophisticated, real-time systems for train scheduling, laying the groundwork for future innovations in transportation management technologies.

## Methodology

### Design

The system is designed as a console-based application, developed in C++. It includes user and admin modules for booking tickets, managing train schedules, and handling passenger data. The system employs linked lists, binary search trees, and graph algorithms for data storage and retrieval.

### Data Collection

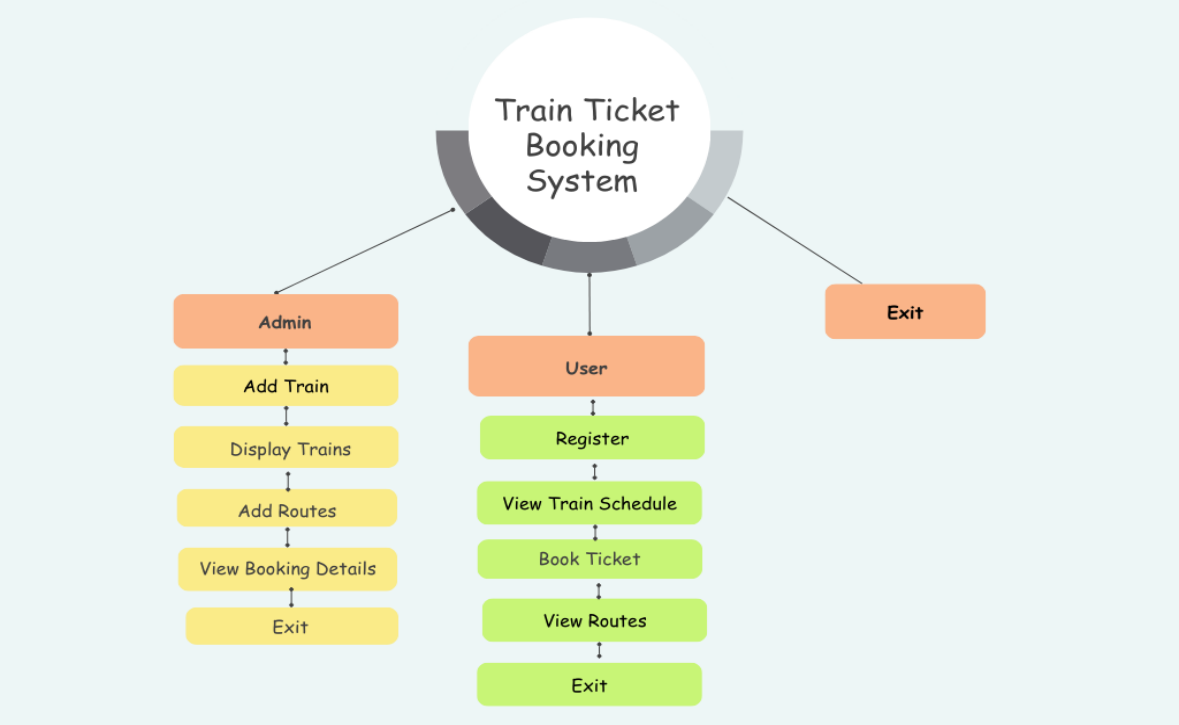
Data for train schedules, seat availability, and user reservations are stored in memory during runtime. Inputs are collected directly from users and administrators through the console interface.

### Analysis

Algorithms such as:

- **Linked Lists**: For managing dynamic passenger records.
- **Binary Search Trees**: For efficient train schedule management.
- **Graph Traversals (BFS/DFS)**: For route planning and schedule verification.
- **Sorting Algorithms**: For sorting schedules and reservation data.

### Flowchart



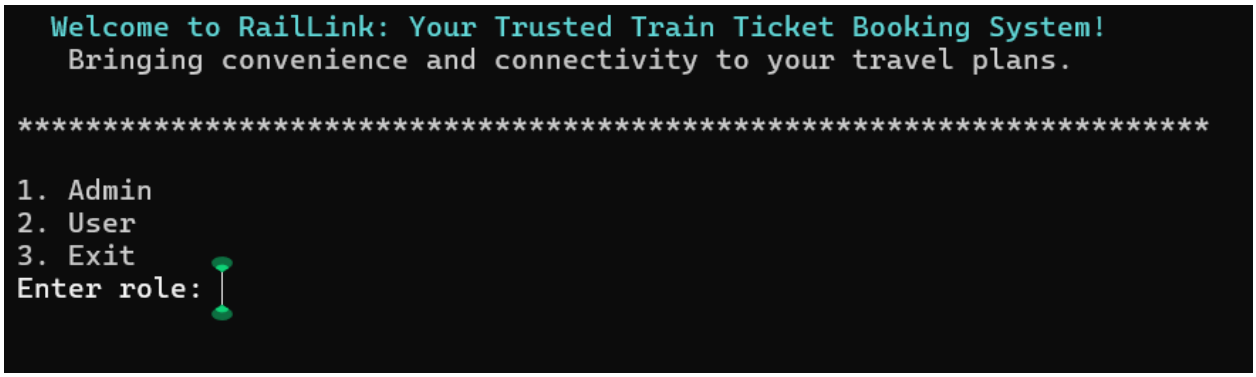
## Results & Discussion

### Results

- Successfully implemented a console-based system that handles ticket booking and train schedule management efficiently.
- Improved data retrieval time through the use of binary search trees and sorting algorithms.
- Real-time seat availability updates and user-friendly navigation in a console environment.

**Console output**

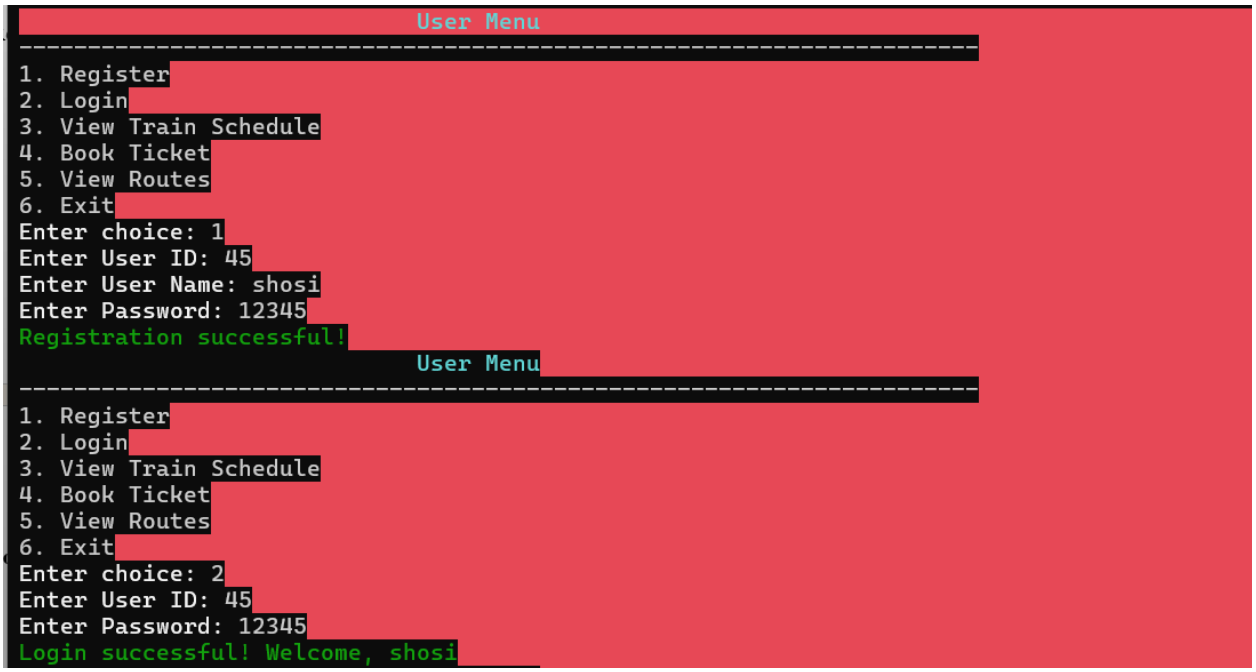
**Main Page :**



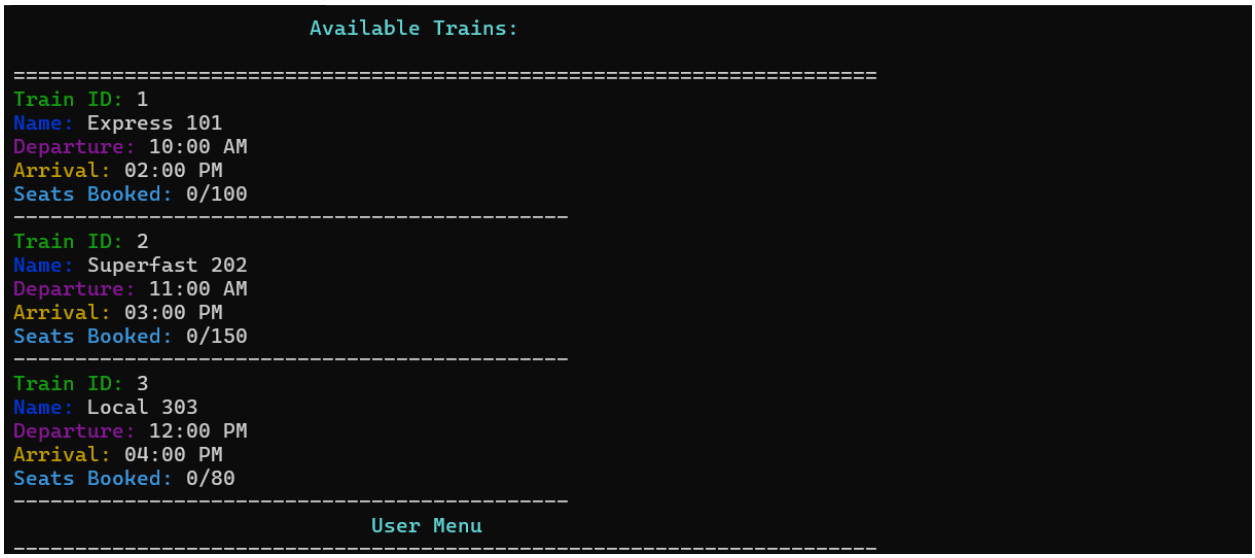

**For Admin :**

**For Users :**

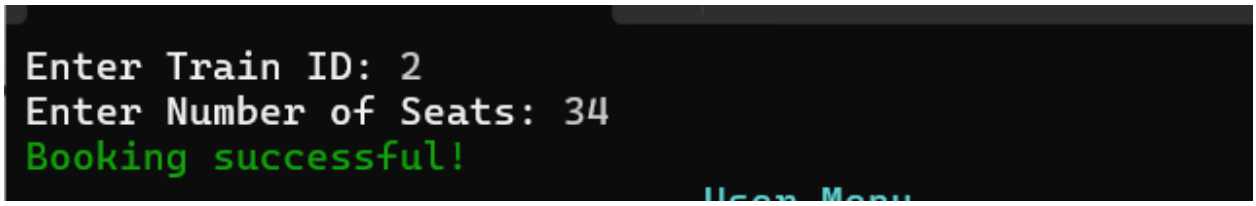

**Registration and login(Users)**



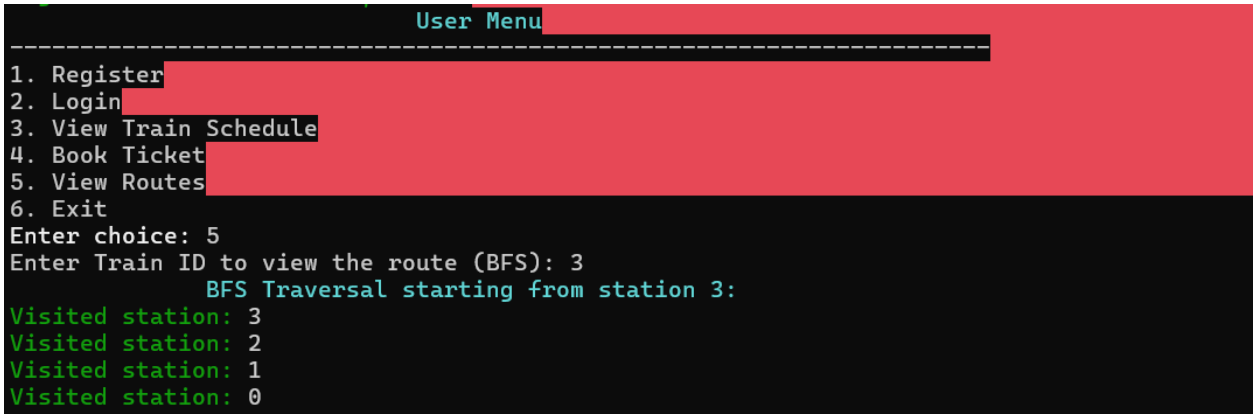
**Train schedule :**



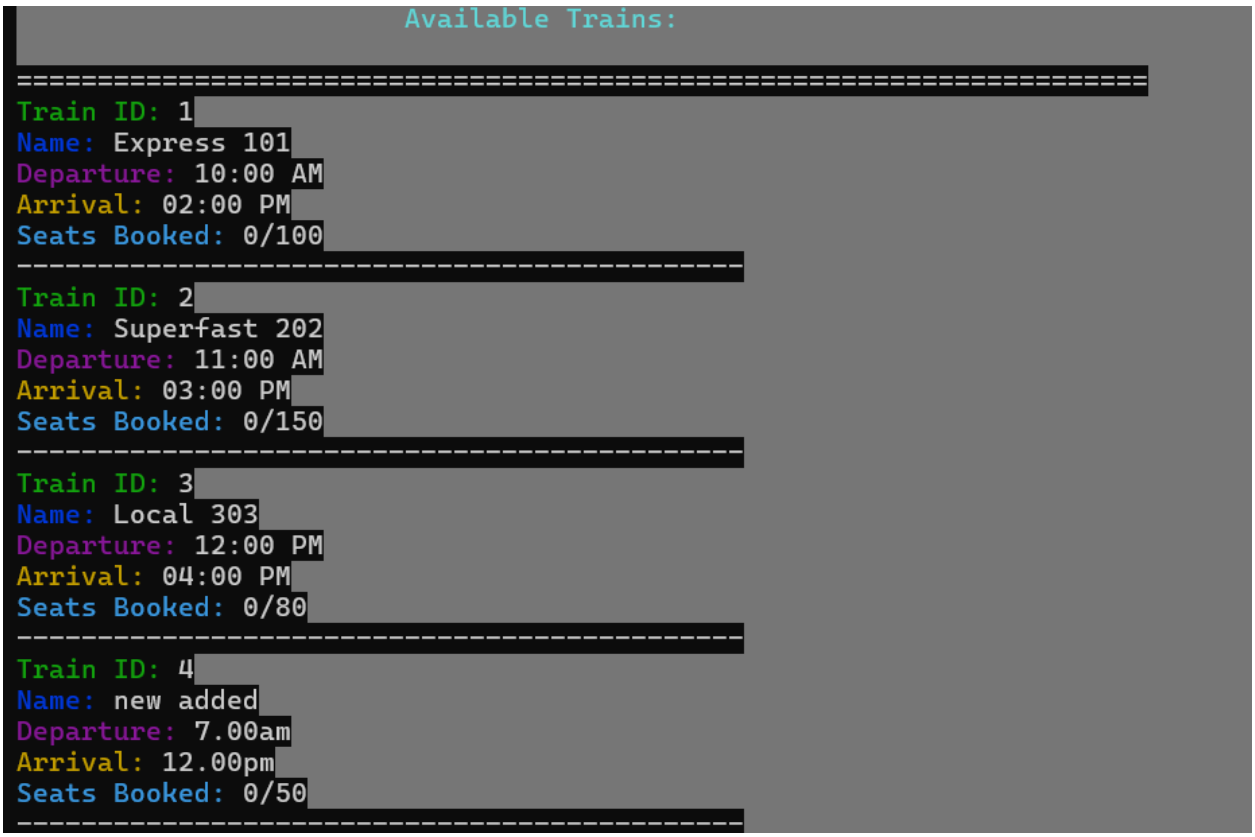

**Ticket Booking(Users)**



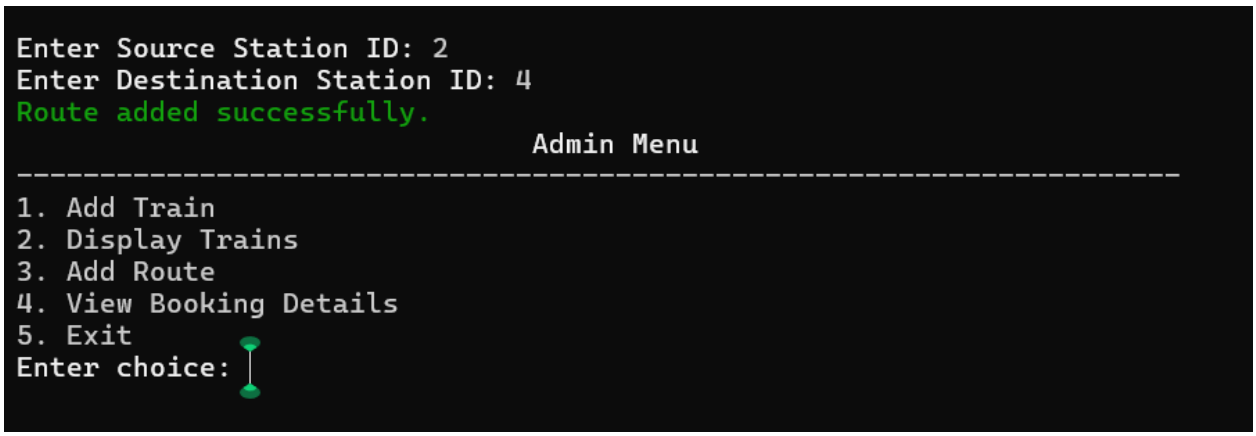

**Routes(Users)**



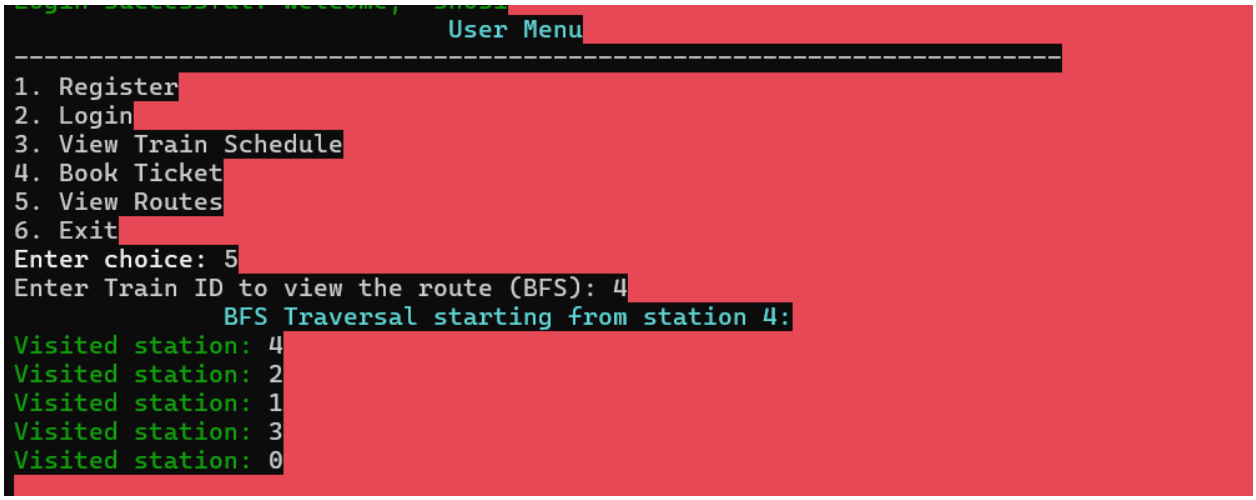
**Admin Adding New Train**

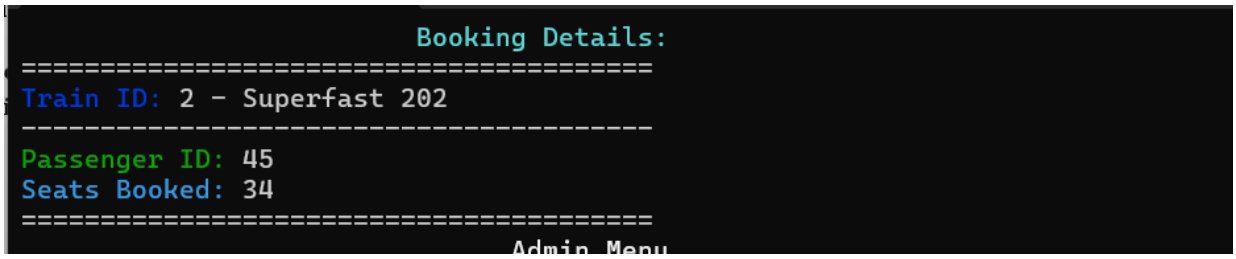
**Adding new routes (Admin)**



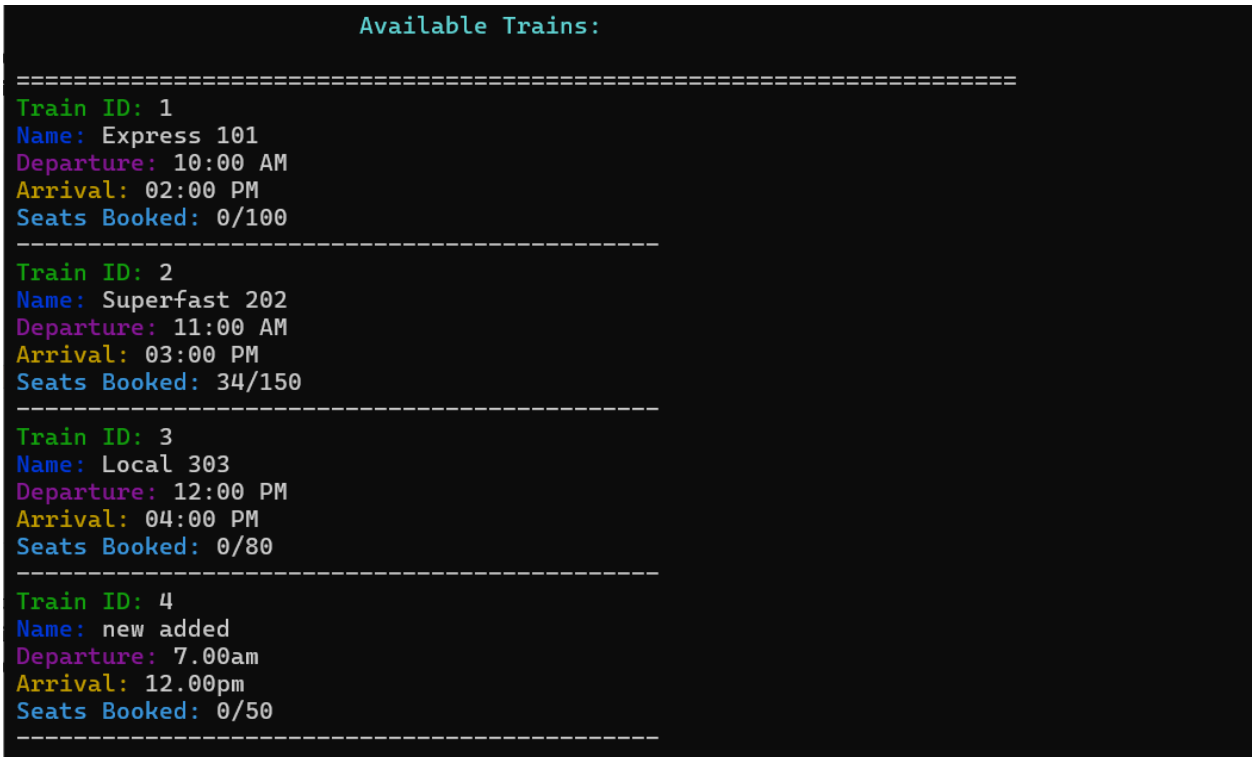

**After updating routes for the Users**




**Booking details(Admin)**



**Updating infos in Trains Informatins**




## Discussion

The system demonstrates significant improvements in efficiency and reliability compared to manual booking systems. The use of advanced data structures minimizes processing delays, making it suitable for real-time applications. Future work could include integrating a graphical interface and database for persistent storage.

## Limitations

- **Scope of Features**: The project focuses on scheduling and lacks features like payment integration or user authentication, limiting its scope.
- **Data Size**: The system's performance with large datasets or real-time data streams needs further optimization.
- **User Interface**: As a console-based system, the interface may not be user-friendly for non-technical users.
- **Environmental Factors**: The system does not account for dynamic factors like delays or track maintenance.
- **System Integration**: The project is isolated and may require further work to integrate with other systems or databases.

## Future Research or Actions

- **Payment Integration**: Implement payment processing features to create a fully functional train ticket booking system with secure transaction capabilities.
- **Real-Time Data Handling**: Investigate methods to incorporate real-time data streams, such as train delays or maintenance schedules, to improve scheduling accuracy and responsiveness.
- **Graphical User Interface (GUI)**: Develop a user-friendly GUI to enhance accessibility and improve the user experience for non-technical users.
- **Advanced Optimization Algorithms**: Explore the use of machine learning or AI-driven algorithms to predict optimal train schedules based on historical data and environmental factors.
- **System Integration**: Integrate the system with other transportation management platforms or external databases to create a more holistic solution for multi-modal transportation management.

## Conclusion

This project successfully developed a Train Ticket Booking System leveraging advanced data structures to improve efficiency and user experience in a console-based application.