RAILWAY RESERVATION SYSTEM

Team – 9

PROBLEM STATEMENT

DEVELOP A RESERVATİON PLATFORM, (HOTEL ROOMS/BUS SEATS/RAİLWAY BERTHS BOOKİNG SYSTEM), WHERE ROOMS/SEATS ARE OFFERED BASED ON USER REQUESTS

PROBABLE FEATURES OF THE SYSTEM:

- DEFİNE RESERVATİON POLİCY
- DİSPLAY VARİOUS DEALS AND PACKAGES
- CREATE A DYNAMİC PRİCİNG RESERVATİON SYSTEM
- SEATS/ROOMS ALLOCATİON POLİCİES (EG. AGED PERSONS WİLL BE ALLOCATED FRONT ROWS/LOWER COACHES)
- TEXT-BASED USER İNTERFACE & AVAİLABİLİTY MATRİX VİSUALİZATİON, REPORT & TİCKET GENERATİON

CONCEPTS REQUİRED

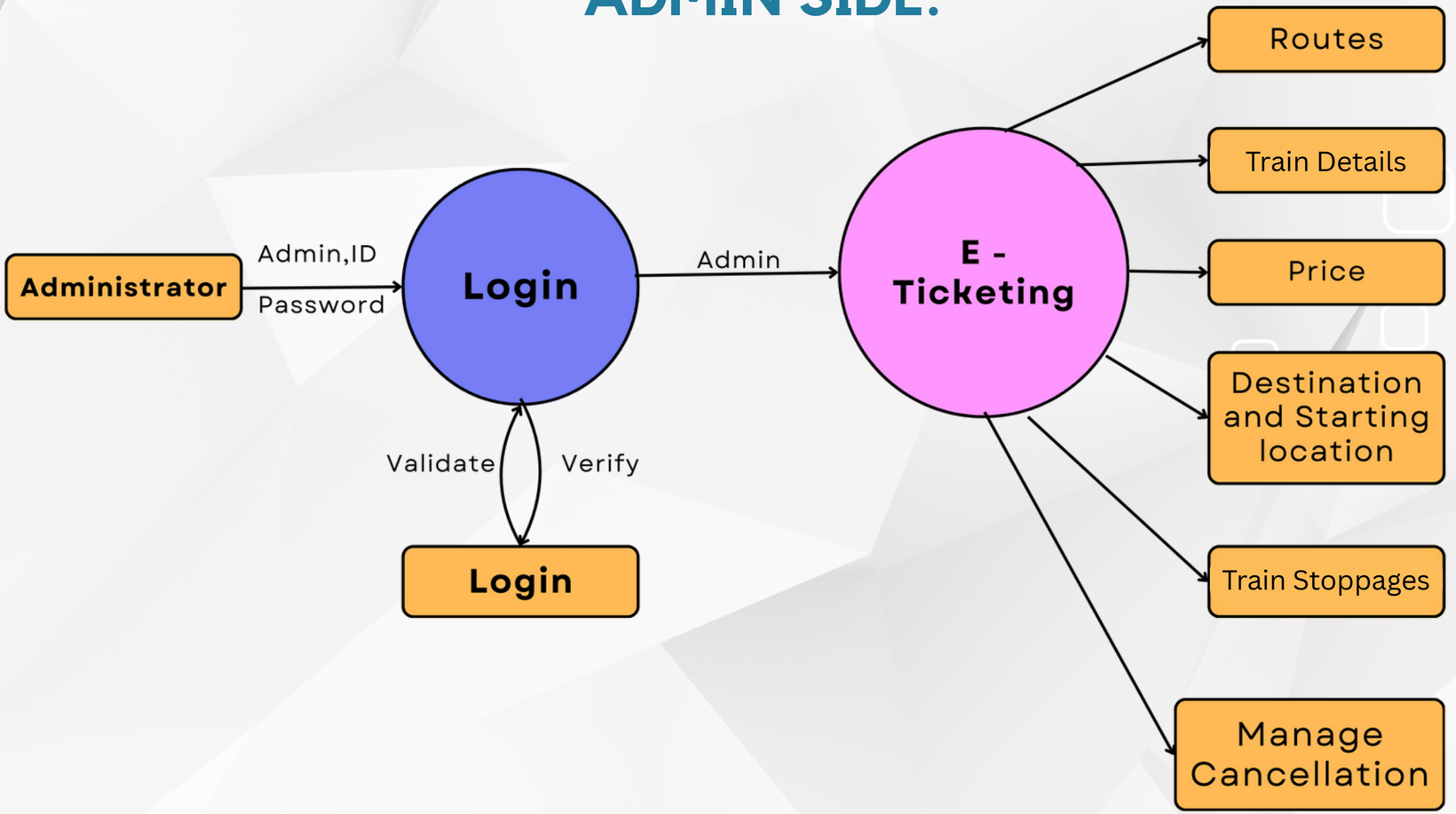
- **Multithreading:** Allows multiple user requests to be handled concurrently for improved performance and responsiveness.
- **Sockets and Networking**: Facilitates communication between client applications and the server for booking requests and data retrieval.
- **Database:** Stores and manages all data related to trains, seats, users, and reservations, ensuring transactional consistency.
- **Transactions:** Ensures that booking operations are atomic, completing fully or rolling back in case of failure.

RESERVATION POLICY

- **Priority Allocation:** Elderly (Age ≥ 60) get lower coaches.
- **Cancellation Rules:** Allowed before departure; no cancellation post-departure.
- **Dynamic Pricing:** +10% price increase when 80% seats are full. Tickets booked on boarding point are 30% more expensive.
- **Group Discounts:**10% off for 3 seats, 20% off for 5 or more.
- **Waitlisting:** Waitlisted seats get updated/promoted as seats become available.

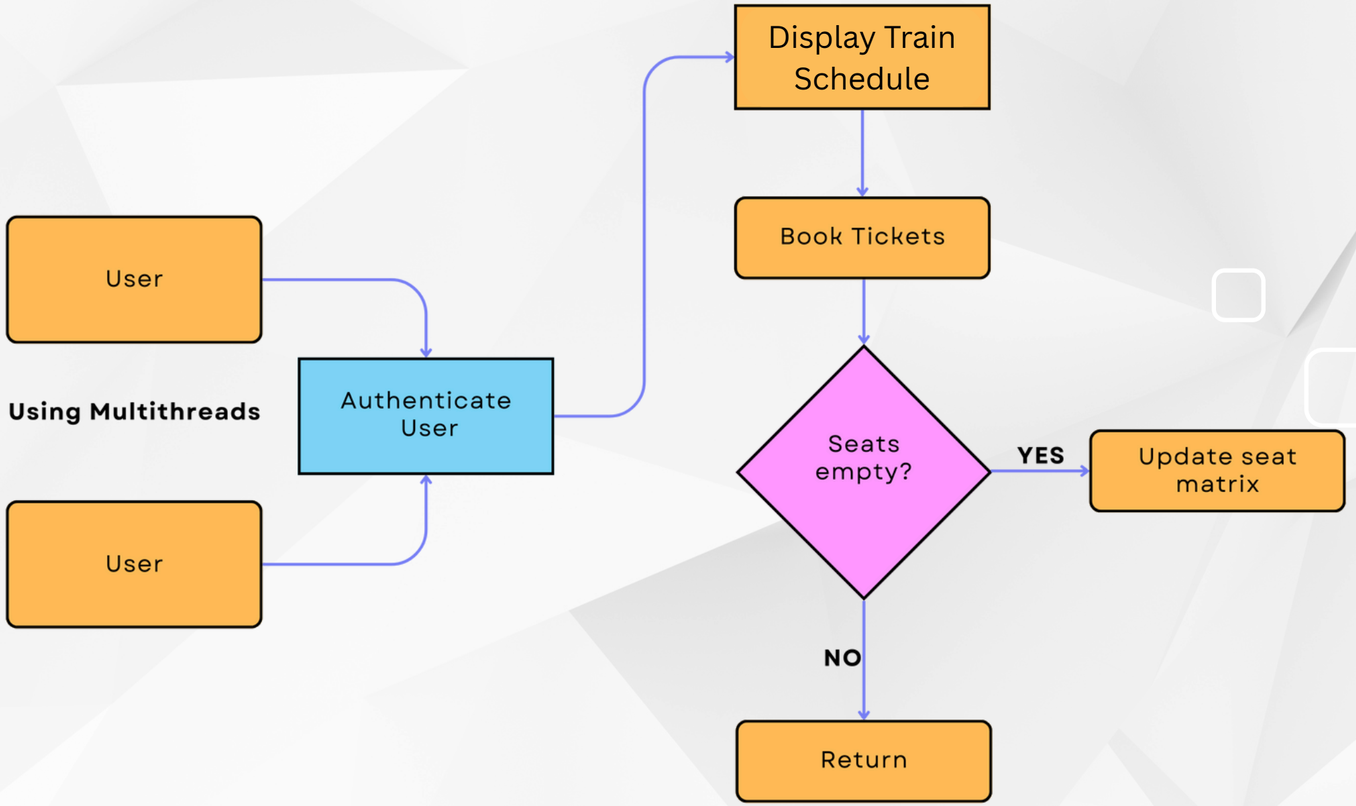
SCHEMATIC OVERVIEW

ADMİN SIDE:

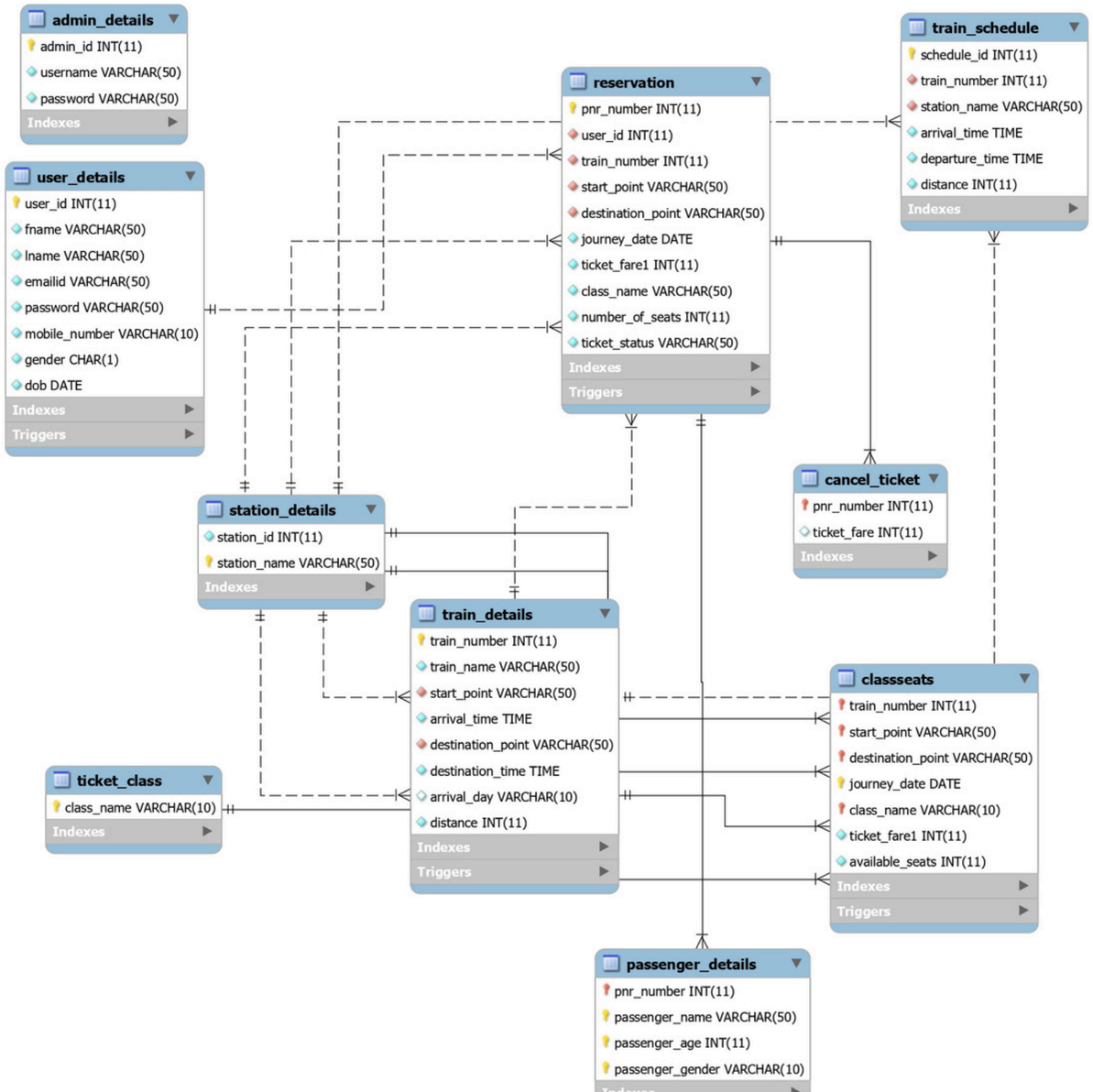


SCHEMATIC OVERVIEW

USER SIDE:



ER Diagrammatic representation



User Interface

Users easily view within the terminal's interactive seat matrix, streamlining the booking process. Once the payment is completed user receive a generated Ticket, all within the intuitive terminal interface for an efficient train booking experience."

```
TRAIN DETAILS
-------------------------------------------------
Train Number      : 56789
Train Name        : Express
Source            : AAA
Destination       : EEE
Price             : $50
Available Seats   : 72

Seat Matrix :
-------------------------------------------------
[ B1 ][  1 ][  2 ]   [ B2 ][  3 ][  4 ]   [ B3 ][  5 ][  6 ]
[    ][  7 ][  8 ]   [    ][  9 ][ 10 ]   [    ][ 11 ][ 12 ]
-------------------------------------------------
[ C1 ][ 13 ][ 14 ]   [ C2 ][ 15 ][ 16 ]   [ C3 ][ 17 ][ 18 ]
[    ][ 19 ][ 20 ]   [    ][ 21 ][ 22 ]   [    ][ 23 ][ 24 ]
-------------------------------------------------
[ D1 ][ 25 ][ 26 ]   [ D2 ][ 27 ][ 28 ]   [ D3 ][ 29 ][ 30 ]
[    ][ 31 ][ 32 ]   [    ][ 33 ][ 34 ]   [    ][ 35 ][ 36 ]
-------------------------------------------------
[ E1 ][ 37 ][ 38 ]   [ E2 ][ 39 ][ 40 ]   [ E3 ][ 41 ][ 42 ]
[    ][ 43 ][ 44 ]   [    ][ 45 ][ 46 ]   [    ][ 47 ][ 48 ]
-------------------------------------------------
[ F1 ][ 49 ][ 50 ]   [ F2 ][ 51 ][ 52 ]   [ F3 ][ 53 ][ 54 ]
[    ][ 55 ][ 56 ]   [    ][ 57 ][ 58 ]   [    ][ 59 ][ 60 ]
-------------------------------------------------
[ G1 ][ 61 ][ 62 ]   [ G2 ][ 63 ][ 64 ]   [ G3 ][ 65 ][ 66 ]
[    ][ 67 ][ 68 ]   [    ][ 69 ][ 70 ]   [    ][ 71 ][ 72 ]
-------------------------------------------------

Note: 'B', 'C', 'D', 'E', 'F', 'G' denote coach/bogey numbers.
      Numbers within brackets denote seat numbers.
```

```
Train Ticket Details
=====================================================
Train Number                    : 56789
Train Name                      : Express
Boarding Station                : AAA
Destination Station               : EEE
Departure from Boarding         : 09:15 AM
Arrival Time to Destination     : 07:30 PM
Date of Journey                 : 2025-05-10
=====================================================

Passenger Details:
=====================================================
Passenger Name(s)               : Priya Sharma, Rahul Verma
Age                             : 28, 42
Seat Number                     : C2/15, C2/16
=====================================================

Ticket Details:
=====================================================
Ticket Price                    : $85.00
Transaction ID                  : TRN987654321
Booking ID                      : TRB987654321
=====================================================
```

CODE SNIPPETS - Client side

```cpp
// Updated: Removed coach index selection from client side; server decides allocation logic
#include <iostream>
#include <string>
#include <arpa/inet.h>
#include <unistd.h>
#include <cstring>
#include <vector>
#include <sstream>
#include <utility>

using namespace std;

class User {
private: ···
public:
    User(int id, string fn, string ln, string em, string mod, char g, string dt) ···
    int getId() const { return user_id; }
    string getFullName() const { return fname + " " + lname; }
};

struct TicketDetails { ···
};

vector<string> split(const string &s, char delimiter) { ···
}

// CoachInfo and TrainInfo definitions remain unchanged
struct CoachInfo { ···
};
```

```cpp
User* handleLoginResponse(string& response) { ···
}

void registrationFlow() { ···
}

void loginFlow() { ···
}

int main() {
    while (true) {
        cout << "\n===== Railway Reservation System =====" << endl
             << "1. Register" << endl
             << "2. Login" << endl
             << "3. Exit" << endl
             << "Enter choice: ";
        int choice; cin >> choice;
        switch (choice) {
            case 1: registrationFlow(); break;
            case 2: loginFlow();        break;
            case 3: return 0;
            default: cout << "Invalid choice!" << endl;
        }
    }
}
```

CODE SNIPPETS - Server side

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <arpa/inet.h>
#include <pthread.h>
#include <semaphore.h>
#include <fcntl.h>
#include <mysql/mysql.h>

#define MAX_BUFFER 8192
#define PORT 5566
#define MAX_PASSENGERS 10
#define MAX_NAME_LEN 64

MYSQL *conn;

// Initialize MySQL connection
void initializeDatabase() {
    conn = mysql_init(NULL);
    if (!mysql_real_connect(conn, "localhost", "mysqldb", "Shivam.1257",
                            "Traintest", 3306, NULL, 0)) {···
        sendResponse(sock, buf);···
        sendResponse(sock, buf);
    } else {
        sendResponse(sock, "ERROR|Invalid credentials\n");
    }
    mysql_free_result(res);
}
```

```c
int main() {
    initializeDatabase();
    int server_sock = socket(AF_INET, SOCK_STREAM, 0);
    struct sockaddr_in server_addr = {0};
    server_addr.sin_family = AF_INET;
    server_addr.sin_port = htons(PORT);
    server_addr.sin_addr.s_addr = INADDR_ANY;
    bind(server_sock, (struct sockaddr*)&server_addr, sizeof(server_addr));
    listen(server_sock, 10);
    printf("[+] Server listening on port %d\n", PORT);
    while (1) {
        struct sockaddr_in client_addr;
        socklen_t addr_size = sizeof(client_addr);
        int client_sock = accept(server_sock, (struct sockaddr*)&client_addr, &addr_size);
        printf("[+] Client connected\n");
        pthread_t tid;
        pthread_create(&tid, NULL, clientHandler, (void*)(intptr_t)client_sock);
        pthread_detach(tid);
    }
    mysql_close(conn);
    return 0;
}
```

🧩 Client-Side Modular Design

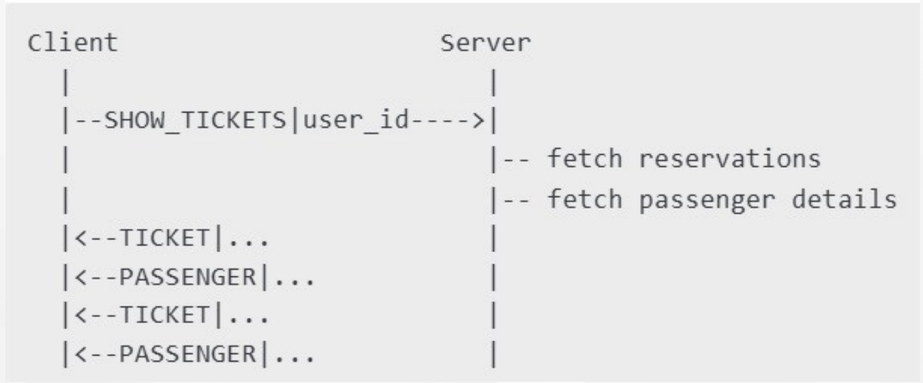
Module Name	Responsibilities	Functions Handling This Module
`User Authentication`	Handles user login and registration. Sends/receives data from server.	`handleLogin()`, `handleRegistration()`
`Booking Management`	Gathers booking details, passenger info, sends booking requests.	`handleBookTicket()`
`Payment Interface`	Displays payment request, handles 2-minute payment timeout and confirmation.	`handleBookTicket()`
`Ticket Management`	Parses and displays booked/cancelled ticket data.	`handleShowTickets()`, `parseTicketDetails()`
`Communication Layer`	TCP socket client, encapsulates client-server communication.	`sendRequestToServer()`
`UI Layer`	Provides interactive CLI for the user (menus, prompts, messages).	`displayMenu()`, `showAvailableTrains()`

🧱 Server-Side Modular Design

Module Name	Responsibilities	Functions Handling This Module
`Request Dispatcher`	Parses incoming client requests and routes to appropriate handlers.	`clientHandler()`
`Booking Handler`	Locks available seats, computes fare, assigns seats, manages semaphores.	`processBooking()`
`Payment Handler`	Records payment status in DB, matches after timeout for ticket confirmation.	`handlePaymentStatus()`
`Ticket Generator`	Builds and sends final ticket response upon successful booking and payment.	`processBooking()`
`Seat Map Manager`	Fetches and formats seat availability per class and coach.	`handleSeatMap()`
`Database Layer`	Centralized SQL logic using MySQL C API (`libmysqlclient`).	`initializeDatabase()` , direct SQL execution
`Thread Manager`	Spawns detached threads to handle individual booking and async client actions.	`pthread_create()` in `clientHandler()`

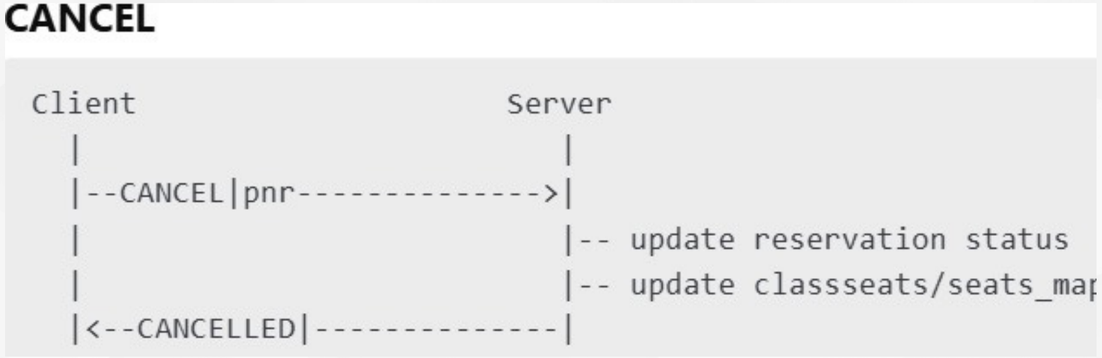
Request Process Flow

SHOW_TICKETS

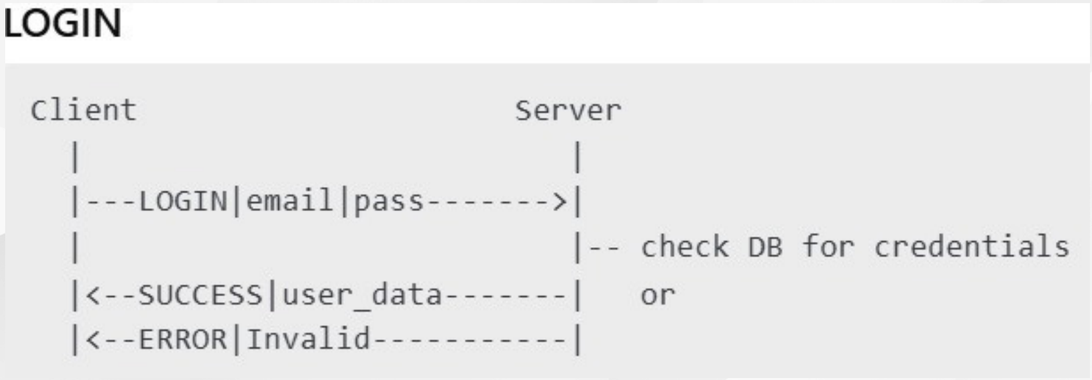


GET_SEATMAP

CANCEL



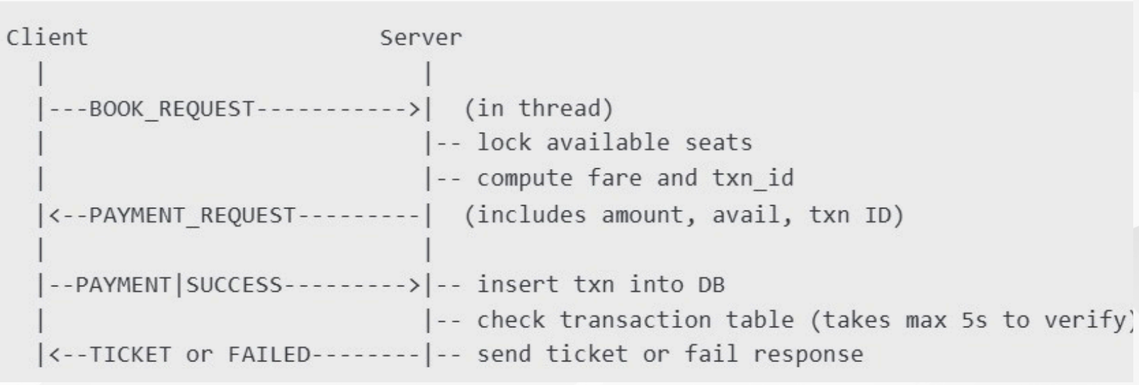
LOGIN



Request Process Flow

LIST_TRAINS

BOOK_REQUEST + PAYMENT + TICKET



REGISTER

TEAM MEMBERS

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Contribution

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Project Planning : All the team members

Resource management : 23CS8189 , 23CS8184, 23CS8191

Coding : 23CS8186 , 23CS8188

Ppt Design : , 23CS8190, 23CS8183

UI Interfacing : 23CS8185, 23CS8181

THANK YOU