SYSTEM DESIGN DOCUMENT - BUS RENTAL AND REVENUE MANAGEMENT SYSTEM

1.Introduction

1.1 Purpose

This document provides a detailed system design for the Bus Leasing and Revenue Management System. It covers system architecture, database design, API structure and security measures.

1.2 Scope

This document presents the system design for a Bus Leasing and Revenue Management System where Adnan Ziyagil can generate revenue by leasing his owned buses to different companies and at the same time monitor the status of his vehicles in detail. This system includes bus rental processes, trip tracking, revenue and expense management and security measures.

1.3 Target Audience

- Software developers

- System architects

- Database administrators

- Product managers

2. System Overview

2.1 High-Level Architecture

The system follows a three-tier architecture:

- Presentation Layer: Web Application.

- Business Logic Layer: RESTful API service.

- Data Layer: My SQL is used to store user and transaction data.

Technology Stack:

- Frontend: React.js

- Backend: Node.js

- Database: MySQL

3. System Components

3.1 User Management Module

- User registration and authentication for company officials and bus owners.

- Role-based access control (RBAC): Managing authorized persons' access permissions to specific data.

- Secure password storage with encryption algorithms.

- Support for password reset and multi-factor authentication (MFA).

3.2 Bus Management Module

- Bus identification: Assigning a unique identification (ID) to each bus.

- Bus details: License plate, model, seat layout, passenger capacity, year of manufacture, mileage and fuel consumption.

- Leasing status: Availability information and tracking of existing lease agreements.

- Maintenance and repair tracking: Inclusion of maintenance costs in expense accounts.

3.3 Rental Management Module

- Creation and management of charter contracts.

- Monthly and per trip pricing policies.

- Mileage-based pricing.

- Pricing flexibility based on firms' trust scores.

3.4 Trip Management Module

- Tracking which routes the buses are used on.

- Service information: Departure and arrival times, total number of passengers, ticket prices.

- Revenue calculations: Calculation of ticket and seat prices per trip.

- Fuel consumption calculations.

3.5 Admin Module

- Managing the companies and the bus owner.

- Monitor the overall performance of the system.

- Income-expense analysis and report generation.

4. Database Design

The system will use MySQL with the following key tables:

1. Firm Table

COLUMN NAME	DATA TYPE	DESCRIPTION
firm_id	INT (PK)	Primary Key for firm_id
trust_score	DECIMAL(3,2) CHECK (trust_score BETWEEN 0 AND 5)	Trust score, can have 2 decimal places
phone	VARCHAR(15) NOT NULL	Firm's contact phone
email	VARCHAR(100) UNIQUE NOT NULL	Firm's email, should be unique
company_name	VARCHAR(100) NOT NULL	Firm's company name
authorized_person	VARCHAR(100) NOT NULL	Name of the authorized person in the firm

2. Bus Table

COLUMN NAME	DATA TYPE	DESCRIPTION
bus_id	INT (PK)	Primary Key for bus_id
plate	VARCHAR(20) UNIQUE NOT NULL	Vehicle's plate number, unique constraint
brand	VARCHAR(50) NOT NULL	Brand of the bus
model	VARCHAR(50) NOT NULL	Model of the bus
seat_layout	VARCHAR(100) CHECK (seat_layout IN ('2+1', '2+2'))	Seating layout information (text)
passenger_capacity	INT (passenger_capacity > 0)	Number of passengers the bus can carry
vehicle_value	DECIMAL(10,2) CHECK (vehicle_value > 0)	Vehicle value (price of the bus)
average_fuel_consumption	DECIMAL(5,2) CHECK (average_fuel_consumption > 0)	Average fuel consumption (L/km)

3. Contract Table

COLUMN NAME	DATA TYPE	DESCRIPTION
contract_id	INT (PK)	Primary Key for contract_id
bus_id	INT (FK) REFERENCES Buses(bus_id) ON DELETE CASCADE	Foreign Key for bus_id
firm_id	INT	Foreign Key for firm_id
monthly_pricing	DECIMAL(10,2)	Monthly pricing for the bus contract
seat_comission	DECIMAL(5,2)	Seat commission for the bus company
ticket_comission	DECIMAL(5,2)	Ticket commission for the bus company
km_commission	DECIMAL(5,2)	Kilometer commission for the bus company

4. Trip Table

COLUMN NAME	DATA TYPE	DESCRIPTION
trip_id	INT (PK)	Primary Key for trip_id
starting_point	VARCHAR(100)	Starting point of the trip
destination	VARCHAR(100)	Destination point of the trip
distance	INT	Distance of the trip in kilometers
ticket_price	DECIMAL(10,2)	Ticket price for this trip
departure_time	TIMESTAMP NOT NULL	Departure time of the trip
arrival_time	TIMESTAMP NOT NULL	Arrival time of the trip

5. Route Table

COLUMN NAME	DATA TYPE	DESCRIPTION
route_id	INT (PK)	Primary Key for route_id
trip_id	INT (FK)	Foreign Key for trip_id
bus_id	INT (FK) REFERENCES Buses(bus_id) ON DELETE CASCADE	Foreign Key for bus_id
owner_income	DECIMAL(10,2) CHECK (owner_income >= 0)	Owner income from this route
total_income	DECIMAL(10,2) CHECK (total_income >= 0)	Total income generated from the route
expenses	DECIMAL(10,2) CHECK (expenses >= 0)	Expenses associated with the route
passenger_count	INT (passenger_count >= 0)	Total passengers for this route

6. Passenger Table

COLUMN NAME	DATA TYPE	DESCRIPTION
passenger_id	INT PRIMARY KEY AUTO_INCREMENT	Primary Key for passenger_id (auto-incremented)
route_id	INT (FK)	Foreign Key for route_id
passenger_name	VARCHAR(100) NOT NULL	Name of the passenger
passenger_surname	VARCHAR(100) NOT NULL	Surname of the passenger

5. Conclusion

This document presents a detailed system design for Adnan Ziyagil's Bus Rental and Revenue Management System. Architectural structure, database design, user management, bus management, rental policies and financial analysis are discussed. The system will be developed with Agile methodology and security measures will be strictly implemented.