Finance Management System Documentation

1. Introduction

The Finance Management System is a web-based application designed to manage operations for loans, fixed deposits, and savings accounts. It allows users to register, log in, create accounts, perform transactions, repay loans, and inquire about balances.

2. Objectives

Summarize the primary objectives of the system:

1. Facilitate user registration and login.
2. Enable account creation for different account types.
3. Handle transactions such as deposits and withdrawals.
4. Provide balance inquiries.
5. Support loan repayments.
6. Display fixed deposit details.
7. Automate interest calculations.

3. Assumptions

List the assumptions made during the design and implementation:

- Each user can have multiple accounts (loan, savings, or fixed deposit).
- Fixed deposit accounts cannot be withdrawn before maturity.
- Interest rates are predefined and fixed for simplicity.
- The system operates in a single currency.

4. Assumptions

4.1 Database Design

- Explain your entity relationships and table structures:
  - `Users`: Manages user data (username, password, email).
  - `Accounts`: Tracks account details (type, balance, interest rate).
  - `Transactions`: Logs deposits and withdrawals.
  - `Loans`: Records loan-specific information (amount borrowed, repaid).

4.2 Technology Stack

- Java 17**:** Backend programming language.
- Spring Boot: Framework for building the backend with RESTful APIs and JWT-based security.
- MySQL: Relational database for data storage.
- React: Frontend framework for building user interfaces.

4.3 Application Flow

- Frontend (React):
  - Provides user interface for registration, login, account creation, transactions, and other operations.
  - Communicates with the backend via REST APIs.
- Backend (Spring Boot):
  - Handles business logic, user authentication (JWT), and secure data management.
- Database (MySQL):
  - Stores users, accounts, transactions, loans, and fixed deposit details.
- Security:
  - JWT tokens ensure only authenticated users can access protected endpoints.

4.4 Security Measures

To ensure secure access to the system, all endpoints are protected using JWT (JSON Web Token) authentication. This approach provides the following benefits:

1. Stateless Authentication: User sessions are managed without storing session data on the server.
2. Secure API Access: Only users with a valid JWT token can access protected endpoints.
3. Tamper Proof: Tokens are signed using a secret key, ensuring integrity.

Implementation:

- Upon successful login, the system generates a JWT token and sends it to the client.
- The client includes this token in the `Authorization` header for subsequent requests.
- The server validates the token to ensure authenticity before processing requests.

Protected Endpoints:

- Account creation.
- Transactions (deposit/withdrawal).
- Balance inquiry.
- Loan repayment.
- Viewing fixed deposit details.

5. Implementation

5.1 Functionalities

- Registration/Login: Users register with a username, email, and password. Validation ensures secure access.
- Account Creation: Users specify account type and initial deposit.
- Transactions: The system validates deposit/withdrawal requests and updates the account balance.
- Loan Repayment: The system calculates the remaining loan balance after each repayment.
- Interest Calculation: A predefined rate is applied to savings and fixed deposit accounts.

5.2 Key Algorithms

- Loan Repayment:

```
Remaining Loan = Total Loan - Sum(Repayments)
```

- Interest Calculation:

```
Savings Interest = Balance × (Interest Rate/100) × (Time in Months/12)
```

6. Implementation

- Synchronizing transaction operations across multiple account types.
- Ensuring accurate interest and loan repayment calculations.

7. Implementation

Summarize the system's impact:

The Finance Management System provides an efficient way to manage banking operations such as loans, fixed deposits, and savings accounts. The design choices were made to ensure scalability and clarity while focusing on core functionalities.