Describe a project you have worked on that involved Java backend development. Include details about the project's objectives, the specific technologies and tools you used (such as AWS services, RESTful APIs, etc.), your role and contributions, and any challenges you faced and how you overcame them. Additionally, explain how you ensured code quality and scalability for your project.

**E-Wallet Application**

One of the most significant projects I have worked on involving Java backend development was an E-Wallet application similar to Paytm. The primary objective of this project was to create a secure, user-friendly digital wallet that allowed users to store money, make payments, transfer funds, and book movie tickets with ease.

**Project Objectives:**

* Develop a secure and efficient digital wallet for financial transactions.
* Enable users to add, store, and manage their funds.
* Integrate a movie review and ticket booking system within the application.
* Ensure high availability, scalability, and security of the application.

**Technologies and Tools Used:**

* **Java**: Core language for backend development.
* **SpringBoot**: Framework for building the application.
* **Hibernate**: ORM tool for database interaction.
* **MySQL**: Relational database management system for storing user and transaction data.
* **AWS Services**:
  + **Amazon S3**: For storing user documents and media files.
  + **Amazon RDS**: For managing the MySQL database.
  + **Amazon EC2**: For deploying and running the application servers.
* **RESTful APIs**: For communication between the client-side and server-side components.
* **JWT (JSON Web Tokens)**: For securing API endpoints.
* **Maven**: For project build and dependency management.
* **JUnit**: For unit testing to ensure code quality.

**Role and Contributions:**

* **Backend Development**: Designed and implemented the backend architecture using Java, SpringBoot, and Hibernate.
* **Database Design**: Created and optimized the MySQL database schema to handle user accounts, transactions, and movie ticket bookings efficiently.
* **API Development**: Developed RESTful APIs for various functionalities such as user authentication, adding and withdrawing funds, transferring money, and booking movie tickets.
* **Security Implementation**: Integrated JWT for secure API authentication and authorization.
* **AWS Integration**: Deployed the application on AWS EC2 instances and used AWS RDS for database management and S3 for storing user documents.
* **Code Quality Assurance**: Employed JUnit for rigorous unit testing and conducted code reviews to maintain high code quality.

**Challenges Faced and Solutions:**

* **Scalability**: As the user base grew, ensuring the application could handle increased load became a priority. To address this, I utilized AWS EC2's auto-scaling features and optimized database queries for better performance.
* **Security**: Ensuring the security of financial transactions and user data was paramount. Implementing JWT for secure API access, encrypting sensitive data, and following best practices for secure coding helped mitigate security risks.
* **Concurrency**: Handling multiple simultaneous transactions required careful management to avoid issues like double-spending. I used synchronized methods and transactions management in Hibernate to ensure data consistency.

**Ensuring Code Quality and Scalability:**

* **Code Reviews**: Regular code reviews were conducted to maintain coding standards and best practices.
* **Unit Testing**: Extensive use of JUnit for unit tests ensured individual components worked as expected.
* **Performance Testing**: Load testing was performed to identify bottlenecks and optimize the application for better performance.
* **Modular Design**: The application was designed with a modular architecture to facilitate easy maintenance and scalability.
* **Documentation**: Comprehensive documentation was maintained for the codebase, making it easier for future developers to understand and contribute to the project.

This project not only enhanced my skills in Java backend development and working with various AWS services but also provided valuable experience in handling real-world challenges related to security, scalability, and performance in a financial application.