Blockchain-based Loyalty Platform using Smart Contracts

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Overview

Traditional customer loyalty programs often suffer from issues such as lack of transparency, high operational costs, and limited flexibility. These issues can lead to low customer engagement and retention rates, ultimately resulting in lost revenue for businesses.

The blockchain-based customer loyalty platform addresses these challenges by providing a secure, transparent, and efficient solution that leverages the power of smart contracts. By using ERC-20 and ERC-721 smart contracts, we enable businesses to create unique and customizable loyalty rewards that can be easily earned and redeemed by customers.

Objectives

The primary objective is to develop an end-to-end system for businesses to deploy loyalty programs for their customer base using blockchain technology.

- Design and implement a user interface for customers to interact with the platform, allowing them to deposit money, make payments, earn loyalty points, and redeem rewards
- Develop an architecture of smart contracts that allows flexibility and scalability
- Provide an interface for system administrators to manage the operations of the system and the smart contracts
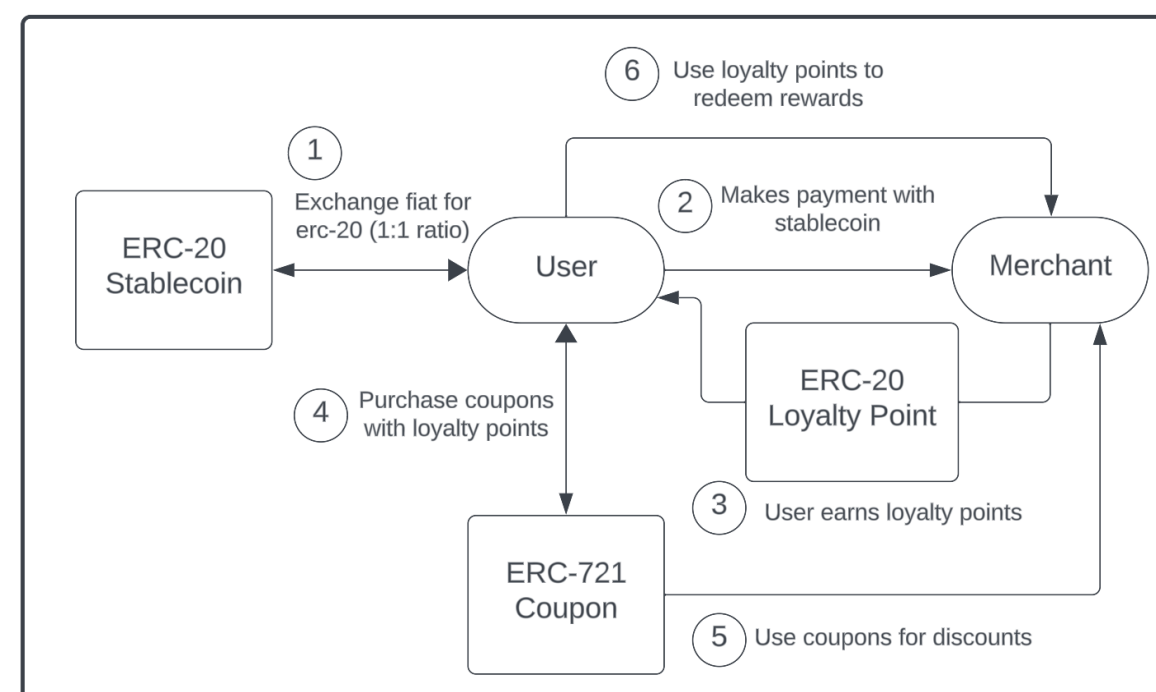
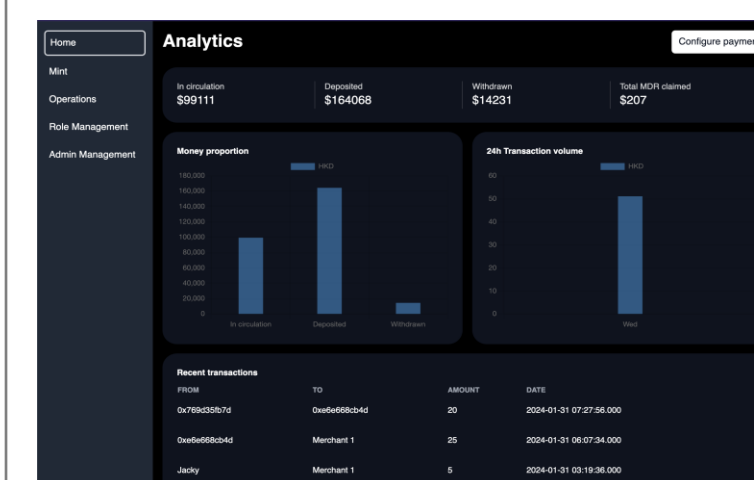## Web App Features
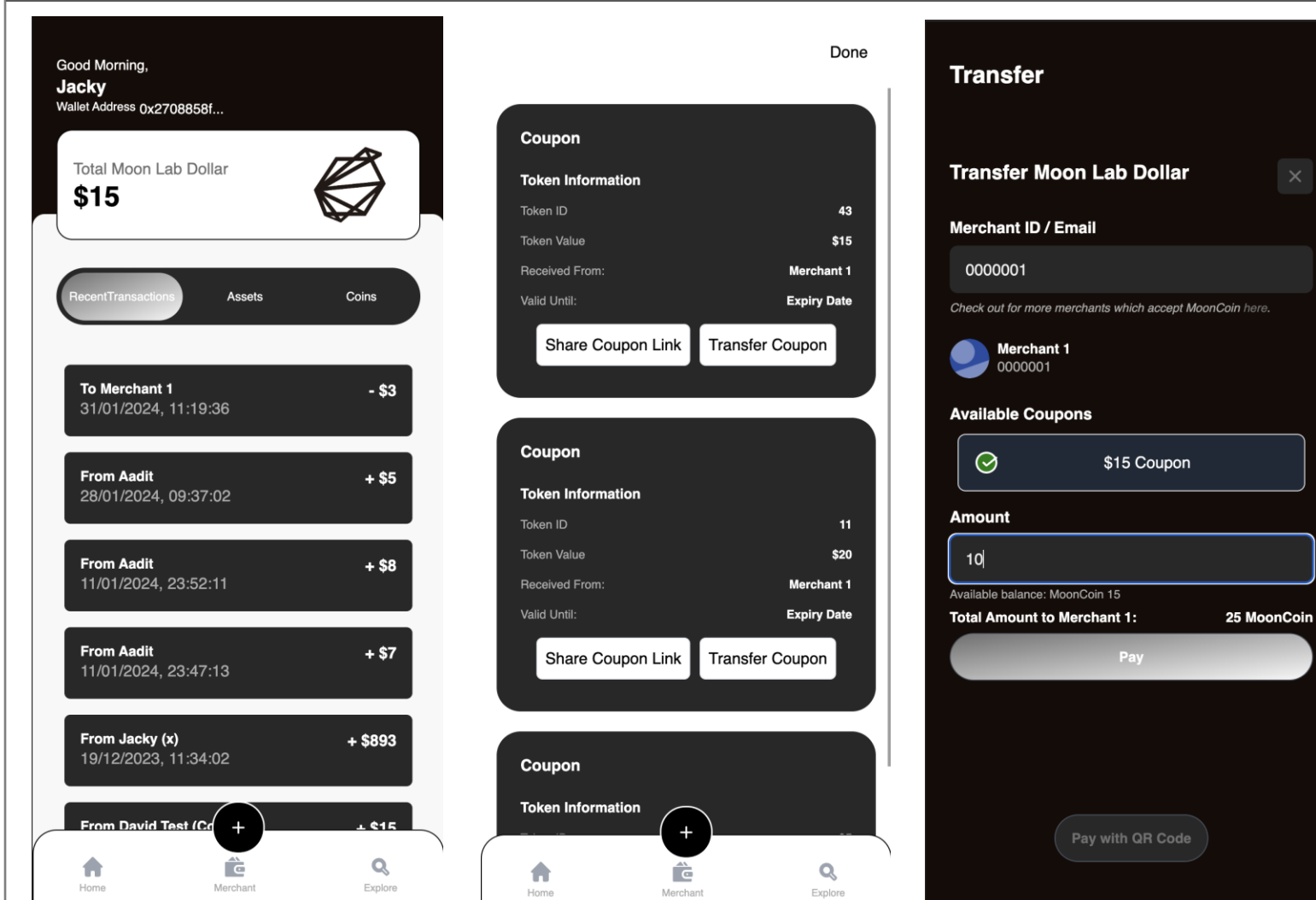
Home Page
Users can view their recent transactions and details of each transaction

View Coupons
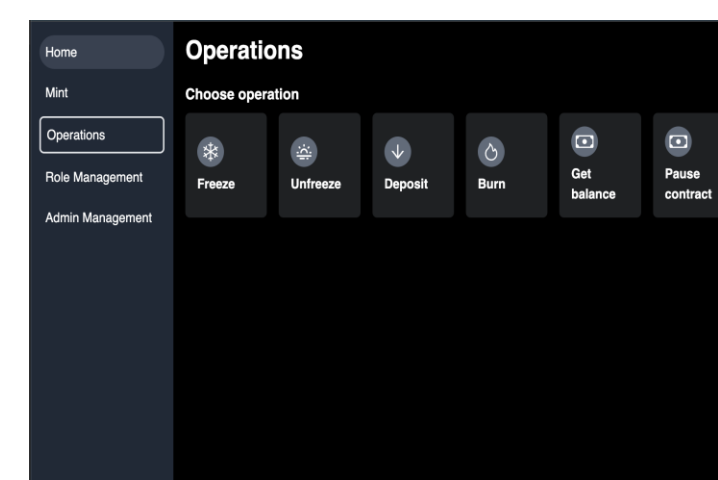Users can view their coupon NFTs and share them with other users.

Make Payment
Users can make transactions with stablecoins and coupon NFTs


Platform Analytics
Administrators can view detailed information and statistics regarding the loyalty platform such as coins in circulation, redemption amount, accumulated points, and all transaction records etc.

Smart Contract Operations
Administrators can trigger smart contract operations through this interface, such as freezing/ unfreezing specific accounts, pausing/resuming the contract, mint/burn coins and NFTs to accounts, as well as giving/revoking smart contract admin privileges.

System Design
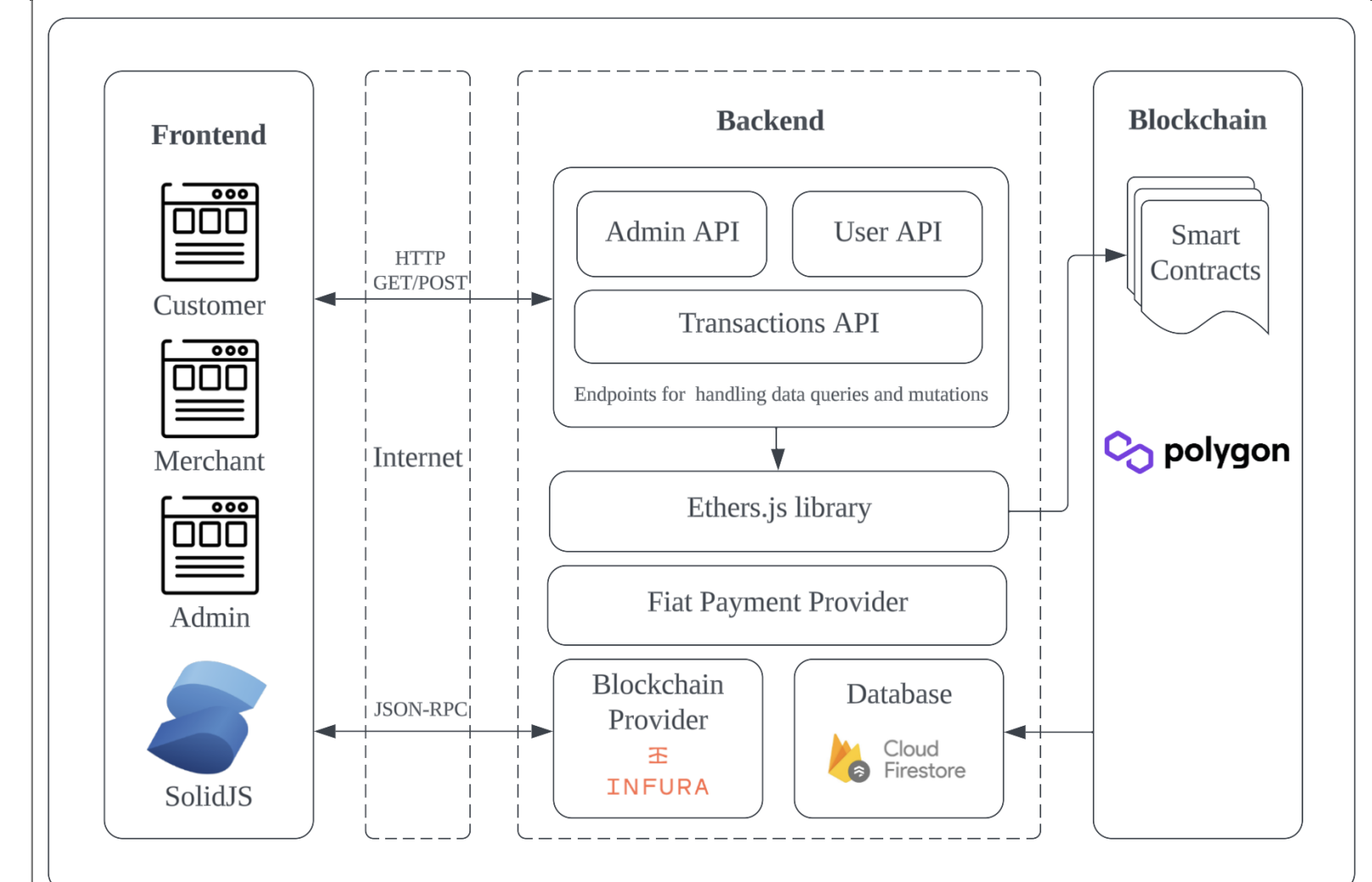
The web application is written entirely in TypeScript, while the Smart Contracts were implemented in Solidity using the Upgradeable Proxy pattern and deployed to the Polygon network. APIs are separated into different modules to serve different functionalities. All data is stored in the Firestore database, and each application module is deployed to the cloud as a separate Docker container.

Conclusion

- **Decentralized and Transparent:** Eliminates the need for a central authority and ensures transparency and auditability of all transactions and loyalty point balances.
- **Secure:** Blockchain technology protects the platform from fraud, unauthorized access, and manipulation.
- **Benefits for Businesses**: Increased customer loyalty, improved customer engagement, and valuable customer data.
- **Benefits for Customers**: Seamless rewards, transparency and trust, and flexibility and choice in earning and redeeming loyalty points.