**AviataChain - Unified Airline Loyalty Platform**

A decentralized airline loyalty platform built on the Cardano blockchain, leveraging Blockfrost API, Mesh SDK, and MeshJS to create a unified, interoperable rewards ecosystem for airlines and travelers.

Please visit our video https://youtu.be/1F-MGQkMqLo?si=6FDOQrSBiyk1r3al

## 🌟 Overview

The Unified Airline Loyalty Platform revolutionizes traditional airline reward programs by creating a blockchain-based ecosystem where loyalty points are tokenized, transferable, and usable across multiple airline partners. Built on Cardano's sustainable blockchain infrastructure, the platform ensures security, transparency, and true ownership of rewards.

## ✈️ Key Features

- **Multi-Airline Integration**: Seamlessly earn and redeem points across partner airlines
- **Tokenized Loyalty Points**: Blockchain-based tokens representing loyalty rewards
- **Smart Contract Automation**: Automated reward distribution and redemption
- **Real-time Tracking**: Live balance updates and transaction history
- **Cross-Platform Compatibility**: Web and mobile-friendly interface
- **Secure Wallet Integration**: Connect with Cardano wallets for secure transactions
- **Partnership Rewards**: Bonus points for cross-airline bookings and partnerships

## 🏗️ Architecture

## 📁 Project Structure

**AviataChain (Unified airline loyalty platform)**

**├── smart-contracts/**

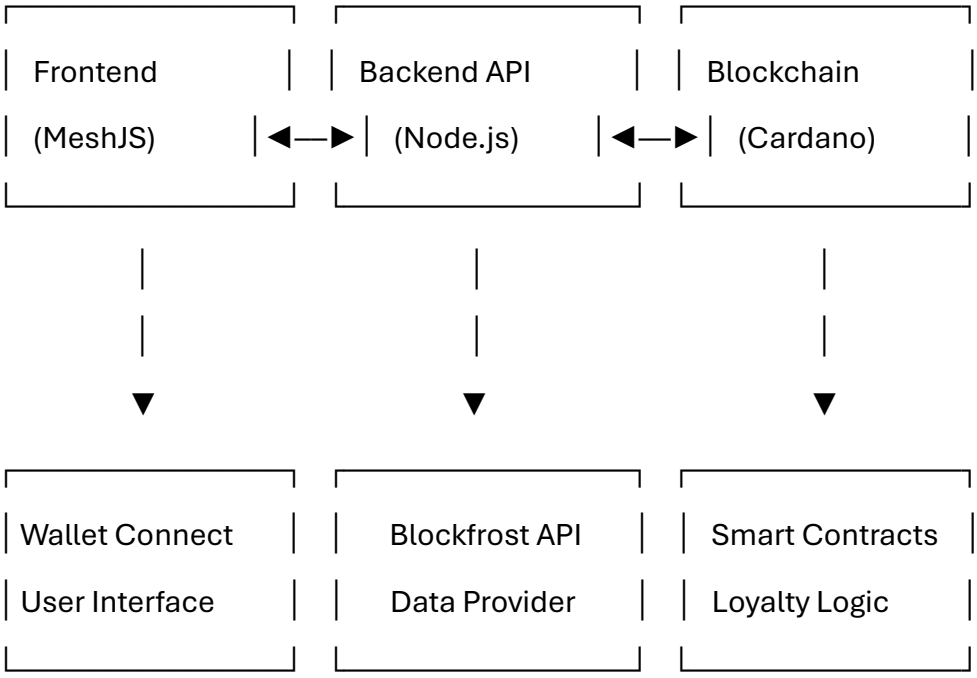
**│ ├── loyalty-token/**

**│ │ ├── LoyaltyToken.hs**

**│ │ ├── TokenPolicy.hs**

```
│   │   └── Validators.hs
│   ├── airline-registry/
│   │   ├── AirlineRegistry.hs
│   │   └── RegistryValidators.hs
│   ├── point-exchange/
│   │   ├── PointExchange.hs
│   │   └── ExchangeValidators.hs
│   └── redemption/
│       ├── Redemption.hs
│       └── RedemptionValidators.hs
├── typescript - frontend/
│   ├── src/
│   │   ├── components/
│   │   │   ├── LaceWalletConnector.tsx
│   │   │   ├── MultiWalletConnector.tsx
│   │   │   ├── SendAda.tsx
│   │   │   ├──WalletConnector.tsx
│   │   │   ├── nft/
│   │   │   │   ├──NFTCard.tsx
│   │   │   │   ├──NFTRewardsGrid.tsx
│   │   │   │   ├──NFTRewardsHeader.tsx
│   │   │   │   └──UserNFTCollection.tsx
│   │   ├── views/
│   │   │   ├── FlightsView.tsx
│   │   │   ├── NFTMintView.tsx
```

```
│   │   │   ├── PartnersView.tsx
│   │   │   ├── ProfileView.tsx
│   │   │   ├── RewardsView.tsx
│   │   │   ├── TransferView.tsx
│   │   │   └── WalletView.tsx
│   │   ├── data/
│   │   │   ├── interfaces.ts
│   │   │   ├── Prototypes.ts
│   │   │   └── types.ts
│   │   ├── contexts/
│   │   │   └── MeshProvider.tsx
│   │   ├── App.tsx
│   │   ├── App.css
│   │   ├── Index.tsx
│   │   ├── Index.css
│   │   └── App.test.tsx
│   ├── package.json
│   ├── tsconfig.json
│   ├── craco.config.js
│   └── README.md
│   │   │   └── Transaction.ts
│   │   └── app.ts
│   ├── package.json
│   └── README.md
```




## 🛠️ Technology Stack

- **Blockchain**: Cardano
- **Smart Contracts**: Plutus (Haskell)
- **API Integration**: Blockfrost API
- **Frontend Framework**: MeshJS + React/Next.js
- **Wallet Integration**: Mesh SDK
- **Backend**: Node.js + Express
- **Database**: MongoDB/PostgreSQL
- **Authentication**: JWT + Wallet signatures

## 📋 Prerequisites

Before running this project, ensure you have:

- Node.js (v16 or higher)
- npm or yarn package manager

- Cardano wallet (Nami, Eternl, Flint, etc.)
- Blockfrost API key
- Git

## 🚀 Installation

1. **Clone the repository**

bash

```
git clone https://github.com/your-username/unified-airline-loyalty.git

cd unified-airline-loyalty
```

2. **Install dependencies**

bash

```
npm install

# or

yarn install
```

npm install @meshsdk/core @meshsdk/react @meshsdk/wallet npm install @blockfrost/blockfrost-js npm install next react react-dom typescript @types/react @types/node npm install lucid-cardano

npm install -D @types/react-dom eslint prettier

npm install @meshsdk/core

npm install @meshsdk/react

3. **Environment setup**

bash

```
cp .env.example .env
```

4. **Configure environment variables**

env

# Blockfrost Configuration

BLOCKFROST_PROJECT_ID=your_blockfrost_project_id

BLOCKFROST_NETWORK=testnet # or mainnet

# Database Configuration

DATABASE_URL=your_database_connection_string

# JWT Configuration

JWT_SECRET=your_jwt_secret_key

# Application Configuration

PORT=3000

NODE_ENV=development

npx create-react-app aviatachain-loyalty-framework --template typescript

# Smart Contract Addresses

LOYALTY_TOKEN_POLICY_ID=your_token_policy_id

REWARDS_CONTRACT_ADDRESS=your_contract_address

5. **Initialize the database**

bash

npm run db:migrate

npm run db:seed

6. **Start the development server**

bash

npm run dev

Visit http://localhost:3000 to access the application.

### 🔧 Key Dependencies

json

```
{
  "dependencies": {
    "@meshsdk/core": "^1.5.0",
    "@meshsdk/react": "^1.1.0",
    "@meshsdk/wallet": "^1.3.0",
    "next": "^13.0.0",
    "react": "^18.0.0",
    "axios": "^1.4.0",
    "cardano-serialization-lib": "^11.0.0"
  },
  "devDependencies": {
    "@types/node": "^18.0.0",
    "@types/react": "^18.0.0",
    "typescript": "^5.0.0",
    "tailwindcss": "^3.3.0"
  }
}
```

### 🎯 Core Functionality

**1. Wallet Connection**

**2. Loyalty Token Operations**

**3. Cross-Airline Redemption**

**Contract Deployment**

bash

*# Deploy smart contracts to testnet*

npm run deploy:contracts:testnet

*# Deploy to mainnet*

npm run deploy:contracts:mainnet

### 🔐 Security Features

- **Multi-signature Wallets**: Enhanced security for airline treasury management
- **Time-locked Contracts**: Prevent unauthorized point manipulation
- **Audit Trail**: Complete transaction history on blockchain
- **Rate Limiting**: API protection against abuse
- **Encrypted Communication**: All API communications are encrypted

### 🧪 Testing

bash

*# Run unit tests*

npm run test

*# Run integration tests*

npm run test:integration

*# Run end-to-end tests*

npm run test:e2e

*# Test smart contracts*

npm run test:contracts

## 🌐 Deployment

### Development Deployment

bash

npm run build

npm run start

### Production Deployment

bash

*# Build for production*

npm run build:production

*# Deploy to cloud provider*

npm run deploy:production

### Environment-Specific Configurations

- **Testnet**: Uses Cardano testnet for development and testing
- **Mainnet**: Production environment with real ADA transactions

## 🤝 Contributing

1. Fork the repository
2. Create a feature branch (git checkout -b feature/amazing-feature)
3. Commit your changes (git commit -m 'Add amazing feature')
4. Push to the branch (git push origin feature/amazing-feature)
5. Open a Pull Request

### Development Guidelines

- Follow TypeScript best practices
- Write comprehensive tests for new features

- Update documentation for API changes
- Ensure smart contract security audits

## 📄 License

This project is licensed under the MIT License - see the LICENSE file for details.

## 🗺️ Roadmap

### Phase 1 (Current)

- Basic wallet integration
- Loyalty token minting
- Simple redemption system
- Multi-airline partnership integration

### Phase 2 (Q3 2025)

- Mobile application
- Advanced smart contract features
- Cross-chain compatibility
- Enterprise airline onboarding

### Phase 3 (Q4 2025)

- AI-powered personalized rewards
- NFT-based premium memberships
- DeFi integration for staking rewards
- Global airline network expansion

## 🏆 Acknowledgments


- **Cardano Foundation** - For the robust blockchain infrastructure
- **Blockfrost** - For reliable API services
- **MeshJS Team** - For excellent developer tools
- **Partner Airlines** - For collaboration and integration support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**Built with ❤️ on Cardano blockchain**