

Department of Computer Science and Engineering, Amrita School of Computing Amrita Vishwa Vidyapeetham Coimbatore Campus

23CSE335-BLOCKCHAIN AND ITS APPLICATIONS 2025-2026-ODD SEM CAPSTONE PROJECT REPORT

Topic- Rich Products: Frozen Food Supply Chain Traceability (Fully Cooked Shrimp)

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Problem Statement

To provide a cost-effective farm-to-fork traceability solution for frozen supply chains involving fully cooked shrimp within Rich's and other related food industries. The supply chain will involve many suppliers, distributors, manufacturers and customers globally. It helps to:

- Prevent food fraud (counterfeit ingredients)
- Enable farm-to-fork visibility and traceability
- Providing consumers limited visibility to supply chain network via lot numbers

Project Objectives

- Implement end-to-end lot-level traceability for fully cooked shrimp supply chain
- Restrict data visibility to authorized supply chain participants
- Enable real-time transaction validation and status updates
- Provide consumer interface for ease of access using a frontend
- Prevent food fraud through blockchain technology

Project Design

Analysis and Design:

The system supports five distinct entity types in the supply chain: Fishing Boats, Warehouses, Factories, Shops, Consumers. Features available include Entity Registration, Lot Creation, Shipping between entities, receiving, Status Updates, Tracking of Lots, etc. Lot Creation is only accessible to Fishing Boat entities. Other entities can ship the lots among themselves and track the lot status. The consumer entities are only able to track the lot status

Technical Architecture:

System Requirements include Ethereum (for a compatible blockchain network using Solidity smart contracts), Web3 enabled responsive web application (Ether.js), local development and testing environment using Hardhat, front end using React and Typescript for UI, Metamask browser extension to simulate wallets and Node.js and npm for package management and dependencies.

Process= Fishing Boat → Creates Lot → Ships to Warehouse → Warehouse Receives → Ships to Factory → Factory Receives → Ships to Shop → Shop Receives → Consumer Tracks Product

Design and Implementation:

```
Key data structures used include
```

```
struct Lot
{
  string productId;
  string lotCode;
  uint256 quantity;
  address currentOwner;
  LotStatus status; // Good, Hold, Recall, Destroy
  string[] parentLots;
  uint256 createdTimestamp;
  string location;
}
struct Entity
{
  string name;
  EntityType entityType; // FishingBoat, Warehouse, Factory, Shop, Consumer
  string location;
  bool isRegistered;
}
```

Key Algorithms and Techniques include

- Access Control: Modifier-based role enforcement
- Inventory Management: Mapping-based ownership tracking
- Privacy: Entity-type based view restrictions

Encryption and Security standards include

- Cryptographic Hashing: Keccak256 used in string comparisons
- Digital Signatures used by MetaMask in signing transactions
- Access Control through Entity-type based function modifiers
- Data Validation: Input sanitization and boundary checks

User interface Design:

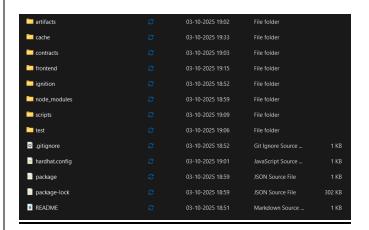
Interface Blocks:

- Consumer Tracking: product tracking using lot id
- Entity Registration: initializing entities before transactions
- Lot Management: creating, viewing and transferring lots among entities
- Inventory Display: ownership tracking of lots

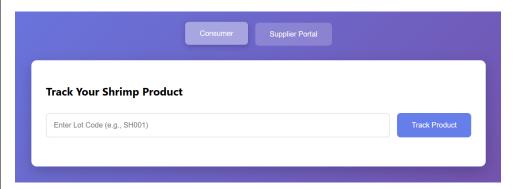
Frameworks and Technologies:

- Frontend: React with TypeScript
- Styling: CSS3
- Blockchain Interaction: Ethers.js
- Wallet Management: MetaMask
- Development Tools: Hardhat, Git, npm

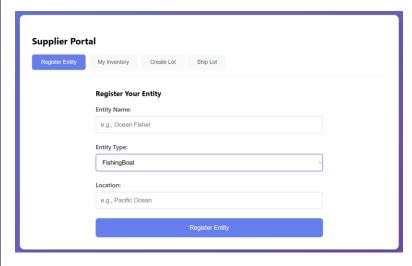
Screenshots:



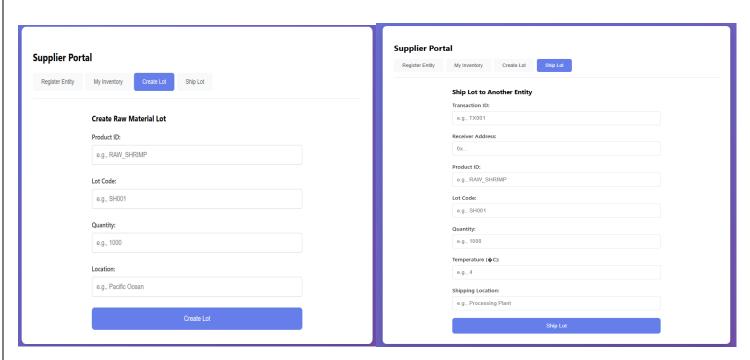
Folder Contents



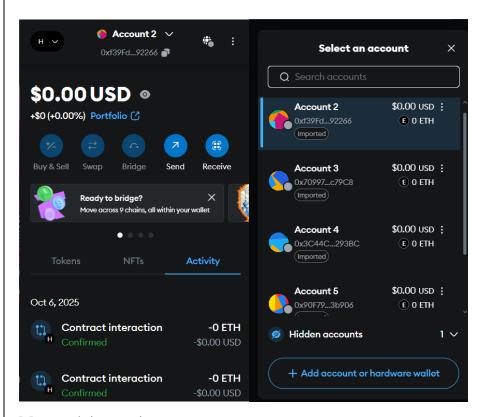
Lot tracking tab



Entity Registration tab



Lot creation tab and Lot shipping tab



Metamask integration

PS C:\Users\sidha\OneDrive\Desktop\ShrimpTrace> npx hardhat node Started HTTP and WebSocket JSON-RPC server at http://127.0.0.1:8545/	Account #10: 0xBcd4042DE499D14e55001CcbB24a551F3b954096 (10000 ETH) Private Key: 0xf214f2b2cd398c806f84e317254e0f0b801d0643303237d97a22a48e01628897
Accounts	Account #11: 0x71bE63f3384f5fb98995898A86B02Fb2426c5788 (10000 ETH) Private Key: 0x701b615bbdfb9de65240bc28bd21bbc0d996645a3dd57e7b12bc2bdf6f192c82
WARNING: These accounts, and their private keys, are publicly known. Any funds sent to them on Mainnet or any other live network WILL BE LOST.	Account #12: 0xFABB0ac9d68B0B445fB7357272Ff202C5651694a (10000 ETH) Private Key: 0xa267530f49f8280200edf313ee7af6b827f2a8bce2897751d06a843f644967b1
Account #0: 0xf39Fd6e51aad88F6F4ce6aB8827279cffFb92266 (10000 ETH) Private Key: 0xac0974bec39a17e36ba4a6b4d238ff944bacb478cbed5efcae784d7bf4f2ff80	Account #13: 0x1CBd3b2770909D4e10f157cABC84C7264073C9Ec (10000 ETH) Private Key: 0x47c99abed3324a2707c28affff1267e45918ec8c3f20b8aa892e8b065d2942dd
Account #1: 0x70997970C51812dc3A010C7d01b50e0d17dc79C8 (10000 ETH) Private Key: 0x59c6995e998f97a5a0044966f0945389dc9e86dae88c7a8412f4603b6b78690d	Account #14: 0xdF3e18d64BC6A983f673Ab319CCaE4f1a57C7097 (10000 ETH) Private Key: 0xc526ee95bf44d8fc405a158bb884d9d1238d99f0612e9f33d006bb0789009aaa
Account #2: 0x3C44CdDdB6a900fa2b585dd299e03d12FA4293BC (10000 ETH) Private Key: 0x5de4111afa1a4b94908f83103eb1f1706367c2e68ca870fc3fb9a804cdab365a	Account #15: 0xcd38766CCDd6AE721141F452C550Ca635964ce71 (10000 ETH) Private Key: 0x8166f546bab6da521a8369cab06c5d2b9e46670292d85c875ee9ec20e84ffb61
Account #3: 0x90F79bf6EB2c4f870365E785982E1f101E93b906 (10000 ETH) Private Key: 0x7c852118294e51e653712a81e05800f419141751be58f605c371e15141b007a6	Account #16: 0x2546BcD3c84621e976D8185a91A922aE77ECEc30 (10000 ETH) Private Key: 0xea6c44ac03bff858b476bba40716402b03e41b8e97e276d1baec7c37d42484a0
Account #4: 0x15d34AAf54267DB7D7c367839AAf71A00a2C6A65 (10000 ETH) Private Key: 0x47e179ec197488593b187f80a00eb0da91f1b9d0b13f8733639f19c30a34926a	Account #17: 0xbDA5747bFD65F08deb54cb465eB87D40e51B197E (10000 ETH) Private Key: 0x689af8efa8c651a91ad287602527f3af2fe9f6501a7ac4b061667b5a93e037fd
Account #5: 0x9965507D1a55bcC2695C58ba16FB37d819B0A4dc (10000 ETH) Private Key: 0x8b3a350cf5c34c9194ca85829a2df0ec3153be0318b5e2d3348e872092edffba	Account #18: 0xdD2FD4581271e230360230F9337D5c04308F44C0 (10000 ETH) Private Key: 0xde9be858da4a475276426320d5e9262ecfc3ba460bfac56360bfa6c4c28b4ee0
Account #6: 0x976EA74026E726554dB657fA54763abd0C3a0aa9 (10000 ETH) Private Key: 0x92db14e403b83dfe3df233f83dfa3a0d7096f21ca9b0d6d6b8d88b2b4ec1564e	Account #19: 0x8626f6940E2eb28930eFb4CeF49B2d1F2C9C1199 (10000 ETH) Private Key: 0xdf57089febbacf7ba0bc227dafbffa9fc08a93fdc68e1e42411a14efcf23656e
Account #7: 0x14dC79964da2C08b23698B3D3cc7Ca32193d9955 (10000 ETH) Private Key: 0x4bbbf85ce3377467afe5d46f804f221813b2bb87f24d81f60f1fcdbf7cbf4356	WARNING: These accounts, and their private keys, are publicly known. Any funds sent to them on Mainnet or any other live network WILL BE LOST.
Account #8: 0x23618e81E3f5cdF7f54C3d65f7FBc0aBf5B21E8f (10000 ETH) Private Key: 0xdbda1821b80551c9d65939329250298aa3472ba22feea921c0cf5d620ea67b97	eth_blockNumber eth_gasPrice
Account #9: 0xa0Ee7A142d267C1f36714E4a8F75612F20a79720 (10000 ETH) Private Key: 0x2a871d0798f97d79848a013d4936a73bf4cc922c825d33c1cf7073dff6d409c6	eth_getBlockByNumber eth_getBalance (6) eth_blockNumber (2)

Hardhat environment initialization

GitHub Link:

https://github.com/sid-error/Capstone Project Blockchain Team 23