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**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:**

artifacts		03-10-2025 19:02	File folder	
cache		03-10-2025 19:33	File folder	
contracts		03-10-2025 19:03	File folder	
frontend		03-10-2025 19:15	File folder	
ignition		03-10-2025 18:52	File folder	
node_modules		03-10-2025 18:59	File folder	
scripts		03-10-2025 19:09	File folder	
test		03-10-2025 19:06	File folder	
.gitignore		03-10-2025 18:52	Git Ignore Source ...	1 KB
hardhat.config		03-10-2025 19:01	JavaScript Source ...	1 KB
package		03-10-2025 18:59	JSON Source File	1 KB
package-lock		03-10-2025 18:59	JSON Source File	302 KB
README		03-10-2025 18:51	Markdown Source ...	1 KB

Folder Contents

Consumer

Supplier Portal

Track Your Shrimp Product

Enter Lot Code (e.g., SH001)

Track Product

Lot tracking tab

Supplier Portal

Register Entity

My Inventory

Create Lot

Ship Lot

Register Your Entity

Entity Name:

e.g., Ocean Fisher

Entity Type:

FishingBoat

Location:

e.g., Pacific Ocean

Register Entity

Entity Registration tab

Supplier Portal

Register Entity

My Inventory

Create Lot

Ship Lot

Create Raw Material Lot

Product ID:

e.g., RAW\_SHRIMP

Lot Code:

e.g., SH001

Quantity:

e.g., 1000

Location:

e.g., Pacific Ocean

Create Lot

Supplier Portal

Register Entity

My Inventory

Create Lot

Ship Lot

Ship Lot to Another Entity

Transaction ID:

e.g., TX001

Receiver Address:

0x...

Product ID:

e.g., RAW\_SHRIMP

Lot Code:

e.g., SH001

Quantity:

e.g., 1000

Temperature (°C):

e.g., 4

Shipping Location:

e.g., Processing Plant

Ship Lot

Lot creation tab and Lot shipping tab

H

Account 2

0xf39Fd...92266

\$0.00 USD

+\$0 (+0.00%) Portfolio

Buy & Sell

Swap

Bridge

Send

Receive

Ready to bridge?

Move across 9 chains, all within your wallet

Tokens

NFTs

Activity

Oct 6, 2025

Contract interaction

Confirmed

-0 ETH

-\$0.00 USD

Contract interaction

Confirmed

-0 ETH

-\$0.00 USD

Select an account

Search accounts

Account 2

0xf39Fd...92266

Imported

\$0.00 USD

0 ETH

Account 3

0x70997...c79C8

Imported

\$0.00 USD

0 ETH

Account 4

0x3C44C...293BC

Imported

\$0.00 USD

0 ETH

Account 5

0x90F79...3b906

Imported

\$0.00 USD

0 ETH

Hidden accounts

1

+ Add account or hardware wallet

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/

Accounts
=====

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 #0: 0xf39Fd6e51aad88F64ce6a8827279cFfFb92266 (10000 ETH)
Private Key: 0xac0974bec39a17e36ba4a6b4d238ff944bacb478cbed5efcae784d7bf4f2ff80

Account #1: 0x70997970C51812dc3A010C7d01b50e0d17dc79C8 (10000 ETH)
Private Key: 0x59c6995e998f97a5a0044966f0945389dc9e86dae88c7a8412f4603b6b78690d

Account #2: 0x3C44CdDdB6a900Fa2b585dd299e03d12FA4293BC (10000 ETH)
Private Key: 0x5de4111afa1a4b94908f83103eb1f1706367c2e68ca870fc3fb9a804cdab365a

Account #3: 0x90f79bf66E2c4f870365E785982E1f101E93b906 (10000 ETH)
Private Key: 0x7c852118294e51e653712a81e0800f419141751be58f605c371e15141b007a6

Account #4: 0x15d34AAf4267D087D7c367839AAf71A00a2C6A65 (10000 ETH)
Private Key: 0x47e179ec197488593b187f80a00eb0da91f1b9d0b13f8733639f19c30a34926a

Account #5: 0x9965507D1a55bcC2695C58ba16FB37d81980A4dc (10000 ETH)
Private Key: 0x8bb3a350cf5c34c9194ca85829a2df0ec3153be0318b5e2d3348e872092edffba

Account #6: 0x976EA74026E726554dB657fA54763abd0C3a0aa9 (10000 ETH)
Private Key: 0x92db14e403b83dfe3df233f83dfa3a0d7096f21ca9b0d6d6b8d88b2b4ec1564e

Account #7: 0x14dC79964da2C08b23698B3D3cc7Ca32193d9955 (10000 ETH)
Private Key: 0x4bbbfb85ce3377467afe5d46f804f221813b2bb87f24d81f60f1fcdcf7cbf4356

Account #8: 0x23618e81E3f5cdF7f54C3d65f7F8c0aBf5B21E8f (10000 ETH)
Private Key: 0xdbda1821b80551c9d65939329250298aa3472ba22feeaa921c0cf5d620ea67b97

Account #9: 0xa0E7A142d267C1f36714E4a8F75612F20a79720 (10000 ETH)
Private Key: 0x2a871d0798f97d79848a013d4936a73bf4cc922c825d33c1cf7073dfff6d409c6

Account #10: 0xBcd4042DE499D14e55001Ccb824a551F3b954096 (10000 ETH)
Private Key: 0xf214f2b2cd398c806f84e317254e0f0b801d0643303237d97a22a48e01628897

Account #11: 0x71bE63f3384f5fb9895898A86B82Fb2426c5788 (10000 ETH)
Private Key: 0x701b615bbdfb9de65240bc28bd21bbc0d996645a3dd57e7b12bc2bdf6f192c82

Account #12: 0xFAB80ac9d68B0B445fB7357272Ff202C5651694a (10000 ETH)
Private Key: 0xa267530f49f8280200edf313ee7af6b827f2a8bce2897751d06aa843f644967b1

Account #13: 0x1CBd3b2770909D4e10f157cABC84C7264073C9Ec (10000 ETH)
Private Key: 0x47c99abed3324a2707c28affff1267e45918ec8c3f20b8aa892e8b065d2942dd

Account #14: 0xdF3e18d64BC6A983f673Ab319CCaE4f1a57C7097 (10000 ETH)
Private Key: 0xc526ee95bf44d8fc405a158bb884d9d1238d99f0612e9f33d006bb0789009aaa

Account #15: 0xcd3B766CCDd6AE721141F452C550Ca635964ce71 (10000 ETH)
Private Key: 0x8166f546bab6da521a8369cab06c5d2b9e46670292d85c875ee9ec20e84ff6b1

Account #16: 0x254668cD3c84621e976D08185a91A922aE77ECEc30 (10000 ETH)
Private Key: 0xea6c44ac03bff858b476bba40716402b03e41b8e97e276d1baec7c37d42484a0

Account #17: 0xbDA5747bFD65F08deb54cb465e887D40e51B197E (10000 ETH)
Private Key: 0x689af8efa8c651a91ad2876025273af2fe9f6501a7ac4b061667b5a93e037fd

Account #18: 0xd02FD4581271e230360230F9337D5c04308f44C0 (10000 ETH)
Private Key: 0xde9be858da4a475276426320d5e9262ecfc3ba460bfac56360bfa6c4c28b4ee0

Account #19: 0x8626f6940E2eb28930eFb4CeF49B2d1F2C9C1199 (10000 ETH)
Private Key: 0xdf57089febbacf7ba0bc227dafbffa9fc08a93fdc68e1e42411a14efcf23656e

WARNING: These accounts, and their private keys, are publicly known.
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eth_blockNumber
eth_gasPrice
eth_getBlockByNumber
eth_getBalance (6)
eth_blockNumber (2)

```

Hardhat environment initialization

## GitHub Link:

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