

Configuration Manual

MSc Research Project
M.Sc. Cyber Security

Shreyas Joshi
Student ID: 23270071

School of Computing
National College of Ireland

Supervisor: Zakaria Sabir

National College of Ireland
MSc Project Submission Sheet



School of Computing

Shreyas Sharad Joshi

Student Name:
Student ID: 23270071
Programme: M.Sc. Cyber Security **Year:** 2025
Practicum
Module:
Zakaria Sabir
Lecturer:
Submission Due Date: 11-08-2025
Project Title: A Blockchain-Based dApp for Secure Communication and Prevention of Phishing Attacks
1045 13
Word Count: **Page Count:**

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Configuration Manual

Shreyas Joshi
Student ID: 23270071

1 Introduction

This Configuration Manual gives a detailed, procedural installation, configuration, and operational methods of the blockchain-based secure files sharing platform designed in a bid to counteract the AI-enhanced phishing attacks. The guide is aimed towards a technical and also non-technical audience.

Project Overview

One is able to do the following on this dApp:

Carry out secure transmission of files and messages by using blockchain

Convenient sporadic encrypting of sensitive material using AES encryption

IPFS (Pinata) storage of files Non-removal

Source proof-of-work (block chain as source hash-checks of the material)

Sender and receiver can only share the hash and it does not allow phishing, smishing or deepfake impersonation attacks.

2 System Requirements and Technologies

2.1 System Requirements

Component	Requirement
Operating System	Windows 10/11, macOS, Linux
Node.js + npm	Node.js v18+, npm v9+
Blockchain Tools	Truffle v5.8+, Ganache CLI (latest)
Wallet	MetaMask (browser extension)
Storage Service	Pinata (with API key)
Text Editor	VS Code / Notepad++
Browser	Chrome / Firefox

2.2 Technology Stack

Layer	Technology
Frontend	React.js
Styling	Standard CSS
Smart Contract	Solidity (Via Truffle)
Blockchain	Ganache CLI (Local)
Storage	IPFS via Pinata
Encryption	AES
Backend	Node.js + Express
Wallet	Metamask

3 Project Setup and Configuration

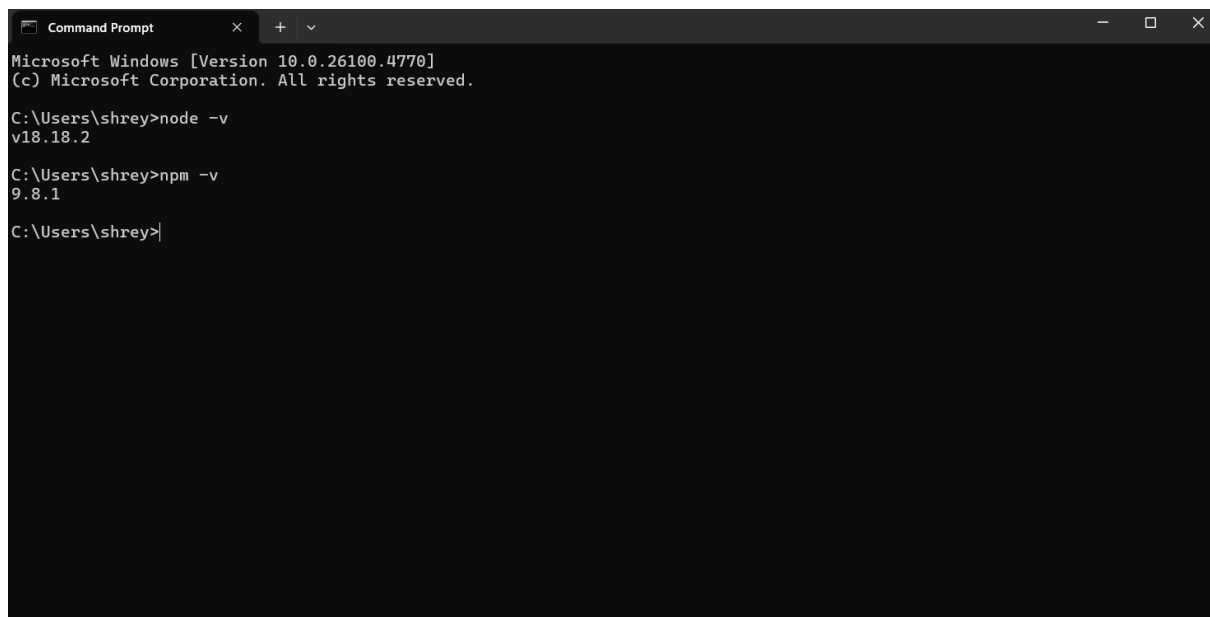
3.1 Folder Structure

```
SecureBlockchain-dApp/  
  backend/      # Express server for IPFS and encryption  
  contracts/    # Solidity smart contracts  
  frontend/     # React frontend  
  migrations/   # Truffle migration scripts  
  build/contracts/ # ABI and deployed contract artifacts  
  .gitignore    # Files/folders to be ignored by Git  
  package.json  # Project metadata  
  truffle-config.js # Truffle configuration
```

3.2 Installation Guide

3.2.1 Install Node.js and npm

- Download and install the LTS version from: <https://nodejs.org>
- Confirm installation:
 1. `node -v`
 2. `npm -v`



```
Command Prompt  
Microsoft Windows [Version 10.0.26100.4770]  
(c) Microsoft Corporation. All rights reserved.  
  
C:\Users\shrey>node -v  
v18.18.2  
  
C:\Users\shrey>npm -v  
9.8.1  
  
C:\Users\shrey>
```

Fig : 1

3.2.2 Install Truffle (Solidity Framework)

- `npm install -g truffle`

Check version:

- `truffle version`

```

Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\TruffleClean> truffle version
Truffle v5.11.5 (core: 5.11.5)
Ganache v7.9.1
Solidity - 0.8.21 (solc-js)
Node v18.18.2
Web3.js v1.10.0
PS C:\TruffleClean> |

```

Fig :2

3.2.3 Install Ganache CLI (Blockchain Emulator)

- npm install -g ganache

3.2.4 Start Ganache

To launch Ganache locally and start a blockchain node with a custom chain and network ID:

`npx ganache --chain.chainId 1338 --chain.networkId 1338`

It will start to enlist the default Ethereum blockchain at `http://127.0.0.1:8545`, and indicates 10 test accounts with their individual private keys and balances. And keep such native terminal up.

Here, in bootstrap, this will trigger the local Ethereum chain at that moment on, `'http://127.0.0.1:8545'` and will list out 10 test accounts, their keys and balances. And keep such native terminal up.

```

PS C:\TruffleClean> npx ganache --chain.chainId 1338 --chain.networkId 1338
ganache v7.8.0 (@ganache/cli: 0.9.0, @ganache/core: 0.9.0)
Starting RPC server
eth_blockNumber

Available Accounts
=====
(0) 0x1F7a3f07579217ba1e3f3070e33f308638D96bD4 (1000 ETH)
(1) 0x333cB9F76aF572D53f64fbFe6C1F0a9848309F46 (1000 ETH)
(2) 0xB7ecB22aD38Bd65cD32db95946092f6e2ec60a2f (1000 ETH)
(3) 0xb1fdC62B9770f125261A473940bc3FF7515e48C7 (1000 ETH)
(4) 0x0AE25D99b099ac16418E31481b545b7fe4631A9 (1000 ETH)
(5) 0x2162655Ea55E796DE3E117c7724D2f6a6AC629C0 (1000 ETH)
(6) 0x6415328f7C46c1e4f3073809bcbE2359890243c (1000 ETH)
(7) 0x214EaDaC57683189A32574Ff1B418690280F2152 (1000 ETH)
(8) 0xd87A49361d18809a2A11c2Aa4753eDC82585D084 (1000 ETH)
(9) 0x4804BE2039A08a3340EF3d9aD76aB8458ba02051 (1000 ETH)

Private Keys
=====
(0) 0x6d62c223dc12a77ab03b212bc2262a03e08dbbc572cb6d52aed0d6fc1813c2cf
(1) 0x2bb0718a7fd34df1f58aee5379a7b9dc79339cba18601c7f93571362ba671f3e
(2) 0x9ba37b7447fa0bf9c1f69c48a05dc5191ade1718f51aa69880e18722ddde7530
(3) 0xccecd10732620130cd2530a350e6b59f4eb3a0898b5e5c29f227300df00068
(4) 0x9e5289dd8ade8367e7409c5c364f7de1fc59e6d9922c9f58762a7adcb604a906
(5) 0x391ca719ed2fe7b9a662c45d2816c772f58fa989740e0645dd503a6239cb0af2
(6) 0xa80855700f9af6ef630e4e47cee3764287d14bcec5c1176a04135b2a80b0731
(7) 0x48b72625285107675b3cbae9e07ffd1e57a8ac4e490ae42a2cddb6885b488c9
(8) 0x688bd3bdc61f232503fb6d95ddf2e74a6b06581a5a31c411aede1451ca57594
(9) 0x85519a381fb9bc521bf7e34676847a7b22808099c4d0debdab164056fc389793

HD Wallet
=====
Mnemonic:      barrel park luxury develop novel remind reveal lizard hawk female van armed
Base HD Path:  m/44'/60'/0'/0/{account_index}

Default Gas Price
=====
2000000000

BlockGas Limit

```

Fig :3

3.5 Install MetaMask (Wallet)

- Download MetaMask: <https://metamask.io>
- Create a new wallet and save your recovery phrase securely

3.4 Create a Custom Network in MetaMask for Ganache

1. Open MetaMask > Settings > Networks > Add Network
2. Enter:
 - Network Name: Localhost 8545
 - New RPC URL: <http://127.0.0.1:8545>
 - Chain ID: 1337 (or leave default)

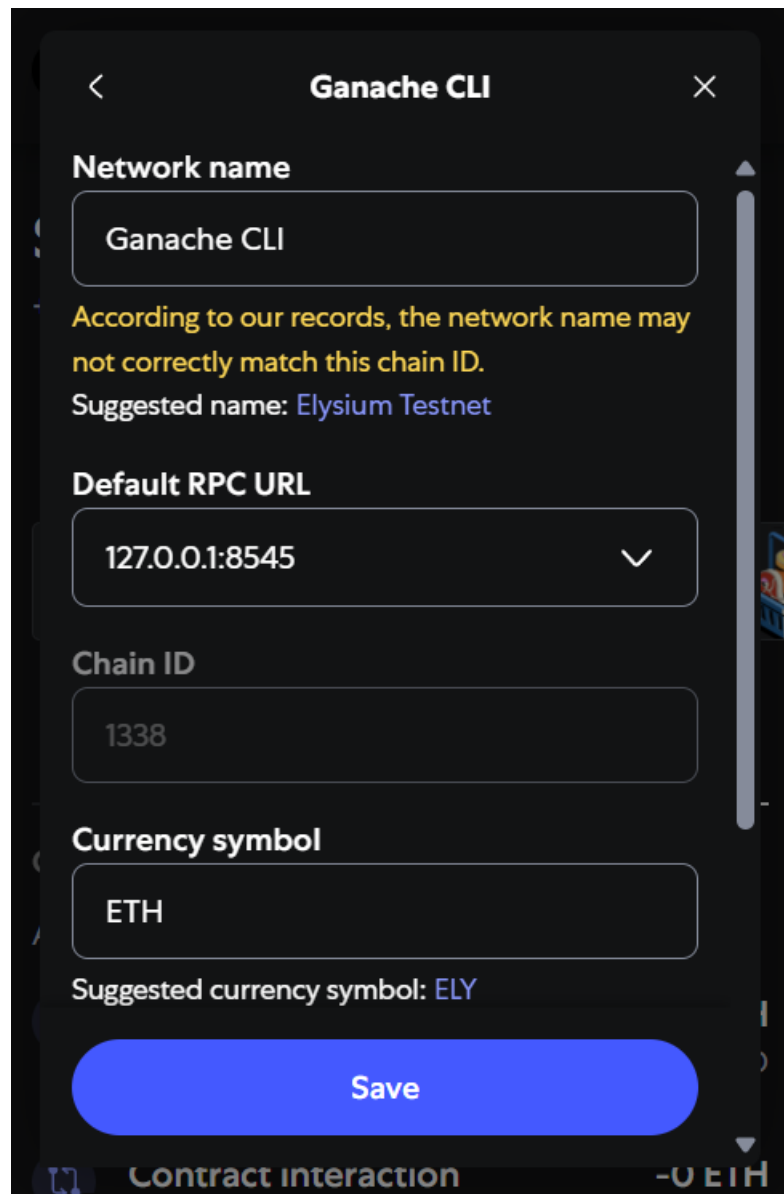


Fig :4

- Save

3. Import a private key from Ganache into MetaMask to use test ETH

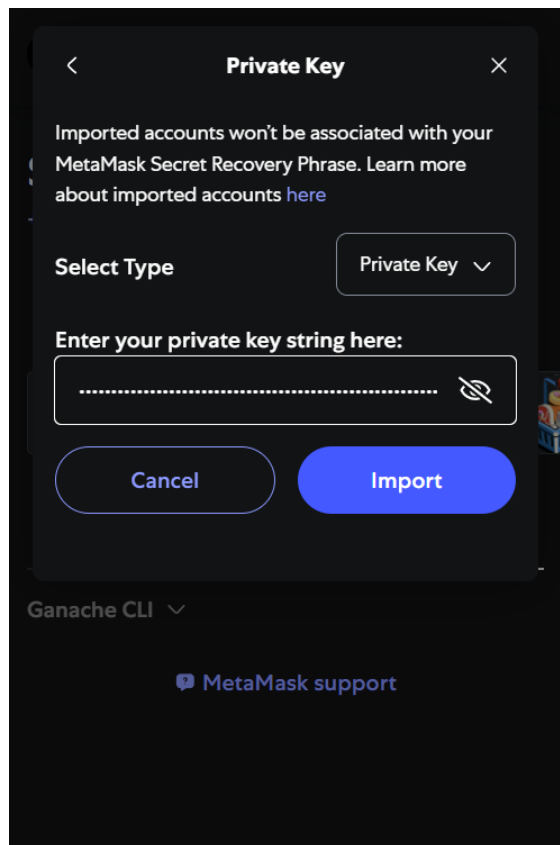


Fig :5

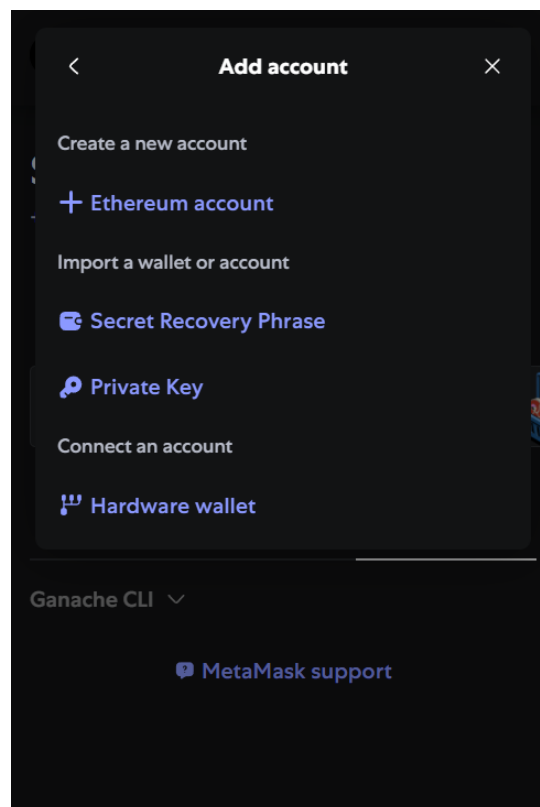


Fig :6

3.6 Create a Pinata Account (for IPFS)

4. Go to: <https://app.pinata.cloud>
5. Register/login
6. Navigate to API Keys
7. Create a new key and copy:
 - API Key
 - API Secret

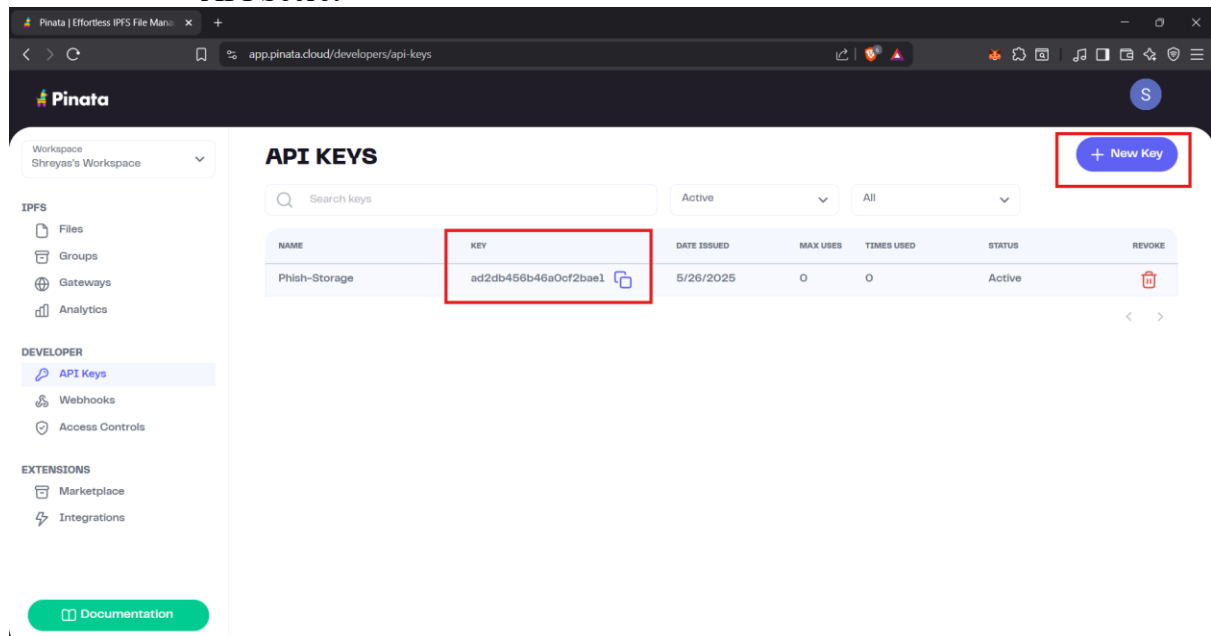


Fig :7

3.7 Install Express and Backend Dependencies

- cd backend
- npm install express cors dotenv axios

This sets up the Express server for encryption and IPFS integration.

3.8 Install Frontend Dependencies

- cd ../frontend
- npm install

Ensure dependencies for React are installed.

4. Configuration Steps

4.1 Backend Setup

1. cd backend
2. npm install
3. Create .env file:
 - PINATA_API_KEY=your_key
 - PINATA_SECRET_API_KEY=your_secret

4.2 Frontend Setup

- cd ../frontend
- npm install

4 Smart Contract Deployment

8. Smart Contract Deployment

8.1 Compile & Deploy Contracts

- `cd ../`
- `truffle compile`

```
PS C:\TruffleClean> truffle compile

Compiling your contracts...
=====
> Compiling .\contracts\Migrations.sol
> Compiling .\contracts\SecureMessage.sol
> Artifacts written to C:\TruffleClean\build\contracts
> Compiled successfully using:
   - solc: 0.8.21+commit.d9974bed.Emscripten.clang
PS C:\TruffleClean>
```

Fig :8

- `truffle migrate --network development`

```
PS C:\TruffleClean> truffle migrate --network development

Compiling your contracts...
=====
> Compiling .\contracts\Migrations.sol
> Compiling .\contracts\SecureMessage.sol
> Artifacts written to C:\TruffleClean\build\contracts
> Compiled successfully using:
   - solc: 0.8.21+commit.d9974bed.Emscripten.clang

Starting migrations...
=====
> Network name:      'development'
> Network id:       1338
> Block gas limit: 30000000 (0x1c9c380)

1_initial_migration.js
=====

Replacing 'Migrations'
-----
> transaction hash: 0x195baf9533bfc46fefde24619133822c5c416d973db7eb70d0e81a0dabb88796
> Blocks: 0        Seconds: 0
> contract address: 0xB5dCA95d2Ec6D94c7D871bF3C1f5Ce87AEBEdaA5
> block number:    1
> block timestamp: 1754782702
> account:         0x1F7a3f07579217ba1e3F3070e33f300638D96bD4
> balance:         999.999171501625
> gas used:        245481 (0x3bee9)
> gas price:       3.375 gwei
> value sent:      0 ETH
> total cost:      0.000828498375 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost:      0.000828498375 ETH
```

Fig :9

```
2_deploy_secure_message.js
=====

Replacing 'SecureMessage'
-----
> transaction hash:    0x26848102e0e7c8783a975f3deeb304b60774e9de67bc8e653605697b8b647413
> Blocks: 0           Seconds: 0
> contract address:   0xB6d064F3A5A644d78080db4E618627B1B8c2c107
> block number:       3
> block timestamp:    1754782702
> account:            0x1F7a3f07579217ba1e3F3070e33f300638D96bD4
> balance:             999.994809425915824993
> gas used:            1327985 (0x144371)
> gas price:           3.171781677 gwei
> value sent:          0 ETH
> total cost:          0.004212078490330845 ETH

> Saving migration to chain.
> Saving artifacts
-----
> Total cost:          0.004212078490330845 ETH

Summary
=====
> Total deployments:   2
> Final cost:          0.005040576865330845 ETH

PS C:\TruffleClean> |
```

Fig :10

Make sure Ganache is running locally before deploying.

8.2 Copy ABI and Contract Address

After deployment, Truffle generates ABI JSON:

- Path: build/contracts/SecureMessage.json
- Copy the entire ABI object and deployed contract address
- Update the frontend file where ABI and contract address are imported (usually frontend/src/config/contract.js)

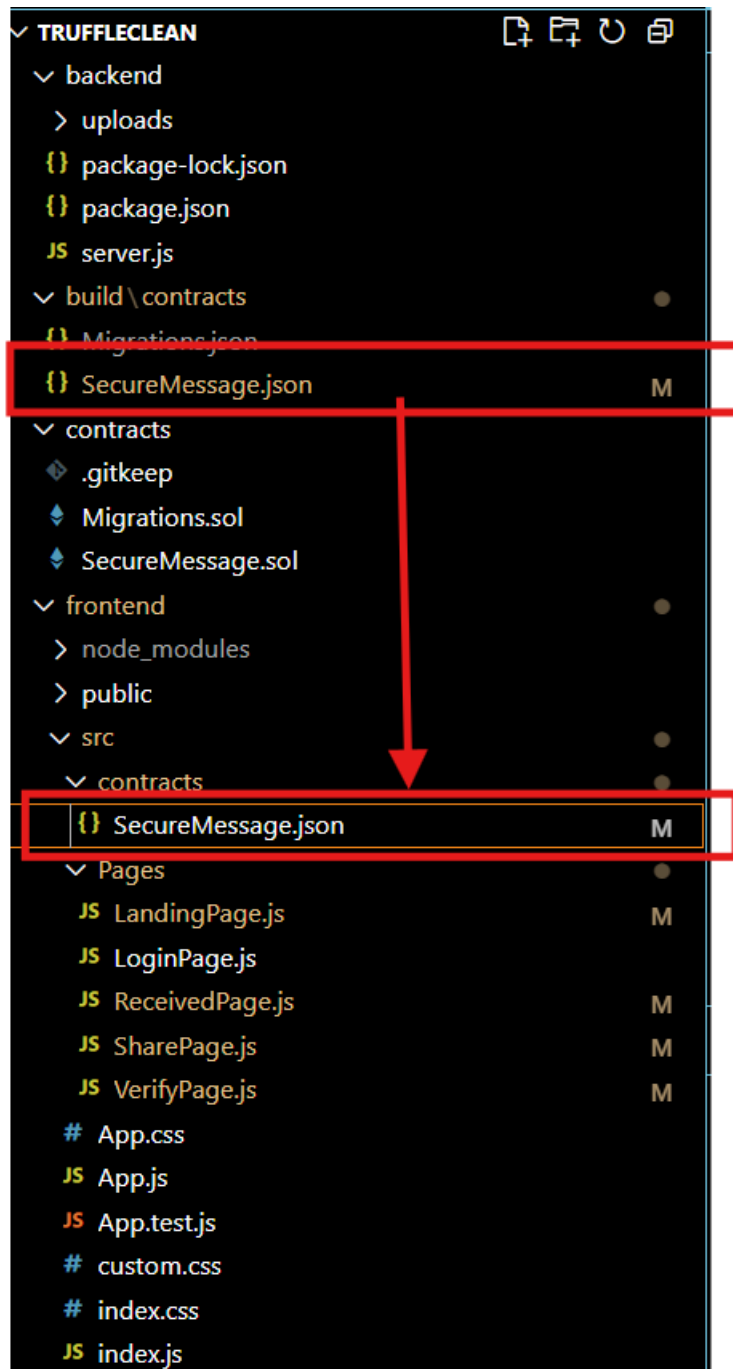


Fig :11

5 Running the Application

5.1. Running Backend Server

To start the backend Express server:

- `cd backend`
- `node index.js`

```

PS C:\TruffleClean> cd backend
PS C:\TruffleClean\backend> node server.js
Server running on http://localhost:5000

```

Fig :12

If your entry point is named something else (like server.js), use:

- node server.js
- npm start

This server:

- Encrypts uploaded files (if selected)
- Pins encrypted file to IPFS using Pinata
- Returns IPFS hash to be stored on blockchain

5.2. Running Frontend Application

- ``bash
- cd ../frontend

```

PS C:\TruffleClean> cd frontend
PS C:\TruffleClean\frontend> npm start

> frontend@0.1.0 start
> react-scripts start

(node:6800) [DEP_WEBPACK_DEV_SERVER_ON_AFTER_SETUP_MIDDLEWARE] DeprecationWarning: 'onAfterSetupMiddleware' option is deprecated. Please use the 'setupMiddlewares' option.
(Use 'node --trace-deprecation ...' to show where the warning was created)
(node:6800) [DEP_WEBPACK_DEV_SERVER_ON_BEFORE_SETUP_MIDDLEWARE] DeprecationWarning: 'onBeforeSetupMiddleware' option is deprecated. Please use the 'setupMiddlewares' option.
Starting the development server...
Compiled successfully!

You can now view frontend in the browser.

Local:      http://localhost:3000
On Your Network: http://192.168.56.1:3000

Note that the development build is not optimized.
To create a production build, use npm run build.

webpack compiled successfully

```

- npm start

Fig :13

1. Open browser at: http://localhost:3000
2. Connect MetaMask (set to Localhost 8545)
3. Upload the ABI and contract address

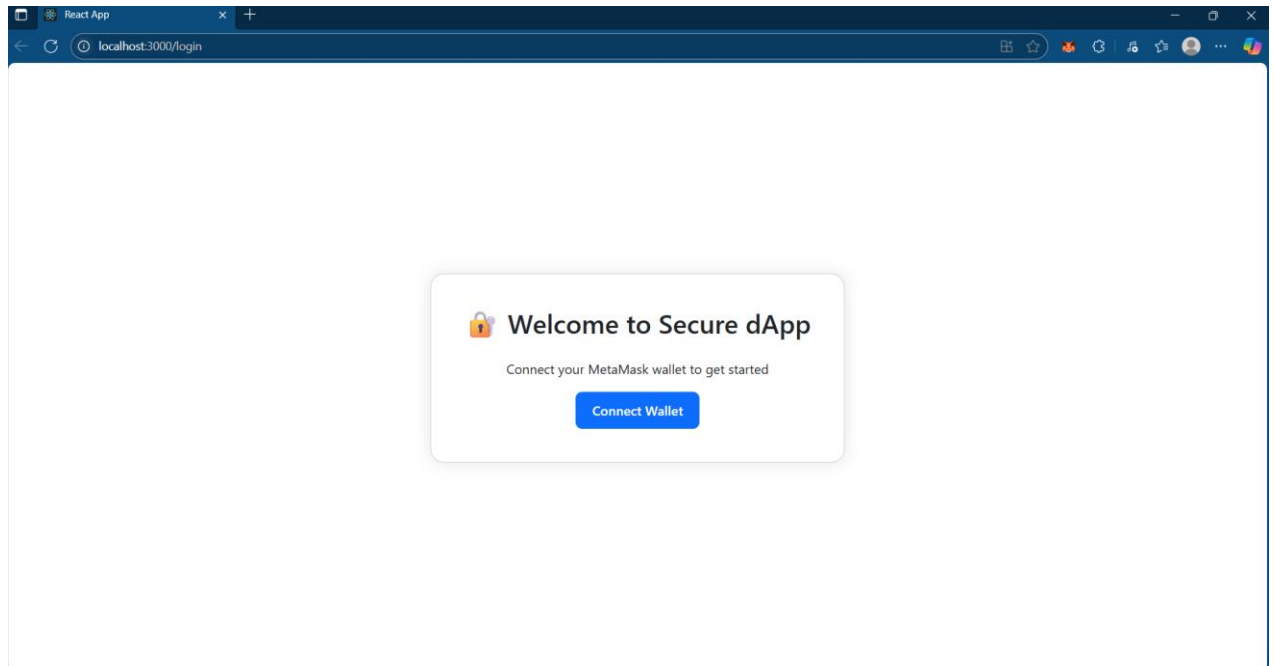


Fig :14

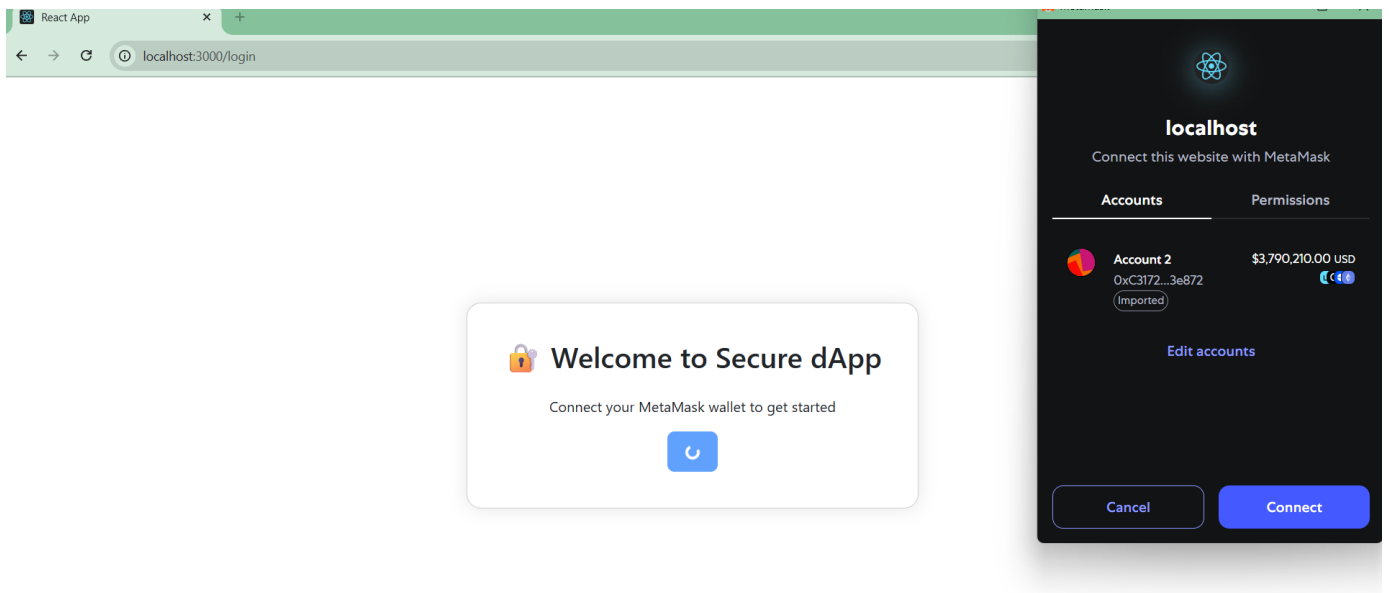


Fig : 15

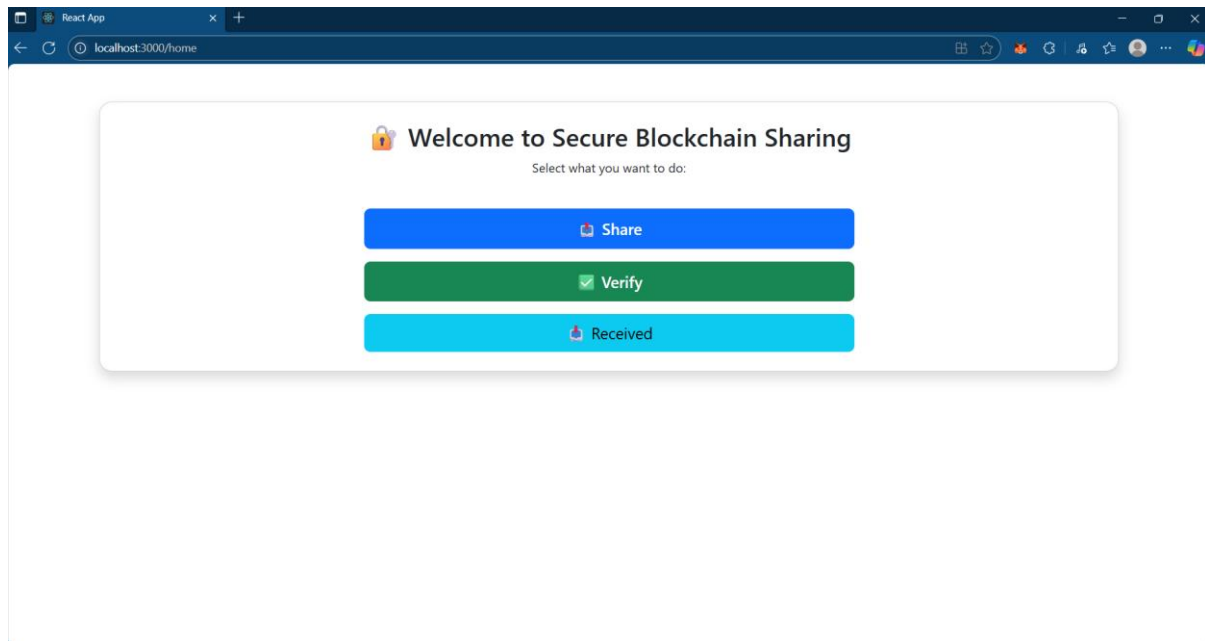


Fig : 16

6 Application Usage

6.1 Using the Application

Such application can be applied locally in single-user application, and two machines (sender and receiver) in multi-user mode. In cases where it is used by two different users, then one should adhere to the extra setup steps included below.

6.2 For Multi-User Usage (Two Different Machines):

6.2.1 Receiver Machine Setup:

1. Clone the GitHub repo:

git clone <https://github.com/ShreyasJoshii/SecureBlockchain-dApp.git>

6.1.1.1 Option B — Using a ZIP File or Local Copy

1. If you have a .zip file:
 - Right-click on the .zip → **Extract All** → choose a folder location.
 - Once extracted, open the folder in your terminal or VS Code.
2. If you already have the full project folder from another source (e.g., USB, email, shared drive):
 - Place it in your preferred location (e.g., C:\Projects or ~/Projects).
 - Open the folder in VS Code or navigate there using:

bash

cd path/to/SecureBlockchain-dApp

2. Install Node.js and npm (if not installed):

3. node -v
npm -v

4. Set up the frontend:

5. `cd SecureBlockchain-dApp/frontend`
`npm install`
6. Start the frontend:
`npm start`
7. Ensure MetaMask is installed and connected to the same Ganache network:
 - Import a Ganache account (from sender or separate instance)
 - Add custom network if not already configured (same Chain ID and RPC URL)
8. Request the sender to share:
 - The blockchain hash
 - The encryption key (if used)
 - Optional: the contract ABI and address (only needed if not hardcoded in frontend)

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