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يونيفرسيتي إسلام انتارابغسا ملايسيا
Garden of Knowledge and Virtue

KULLIYYAH OF INFORMATION & COMMUNICATION TECHNOLOGY

BLOCKCHAIN AND APPLICATION

CSCI 4312

SEMESTER 1 - 2021/2022

PROJECT REPORT

BLOCKCHAIN-BASED SUPPLY CHAIN SYSTEM

PREPARED BY

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1.0 INTRODUCTION

A supply chain is a network of organizations, activities, resources, people, and information, and resources involved in getting a product or service from the manufacturer to the ultimate customer. It is designed to keep the quality of sensitive goods intact during the shipping process. Corruption, fraud, and tampering are all possible with centralized supply chain management systems. Hence, blockchain – the technology behind the Bitcoin cryptocurrency – has been touted as having the ability to overcome the problem of obtaining end-to-end transparency. It is a rapidly growing networking technology for streamlining corporate processes that uses a peer-to-peer (P2P) network to verify and share data. It is a decentralized transaction environment in which all transactions are recorded on a public or private ledger that is visible to users.

2.0 PROBLEM STATEMENT

Today's supply chains are worldwide networks that bring together manufacturers, suppliers, logistics firms, and retailers to get goods to customers. Modern supply chains are growing increasingly complex and disjointed as they grow in size. Despite the fact that the supply chain industry has a great potential for development It has a wide range of supply chain management issues. One of the main issues in the current supply chain system is data management. Traditional supply chains typically rely on paper-based and disconnected data systems, which create information silos and make product monitoring time-consuming. Lack of traceability and transparency is a problem that affects the entire sector, causing delays, errors, and increased expenses. Participants in today's supply chains require a unified view of data while

still being able to independently and confidentially verify transactions like production and transport updates.

3.0 OBJECTIVES

In this project we are aiming to achieve the following goals and objectives:

- Write a smart contract that will simulate a supply chain system .
- The smart contract will contain the basic functionalities in a supply chain system.
- To produce error messages whenever a use case is violated.
- Test the smart contract using unit testing.
- Build a web application using React JS, that will connect with the smart contract.
- Integrate tools like truffle, ganache and MetaMask.
- To deploy Smart Contract from development onto a public test or production network.

4.0 PROJECT MILESTONE

As shown in the use case diagram (Appendix 1), the system is mainly used by three users that perform the presented use cases based on the system scenario. The supply chain system in this project focuses on tracking when and who transferred the package ownership. This allows everyone to see the package ownership in a decentralized method. The project does not focus on the payment process instead it focuses on the shipment ownership. In developing the smart contracts and building the user interface, we used multiple tools such as :

1. Truffle
2. Ganache

3. React JS
4. React-Router
5. Metamask
6. Remix
7. Mocha
8. Chai

The smart contracts were developed with the help of Truffle and Remix. The compilation of the smart contracts was done using *truffle compile* and *deploy using truffle migrate*. For the unit testing we used the truffle test framework. The next step in our project was to build a web interface using React JS and connecting the contracts with the frontend.

5.0 UNIT TESTING

We performed unit testing using the truffle framework. We first wrote a javascript test file that accesses our contract file, and interacts with it over an Ethereum local test network that runs every time we run our tests.

The unit test passes all the requirements listed below:

- Users can be created.
- Package can be added.
- User can log in his account.
- Users can log out of their account.
- Manufacturers and carriers can report lost items.
- Customers can cancel orders.

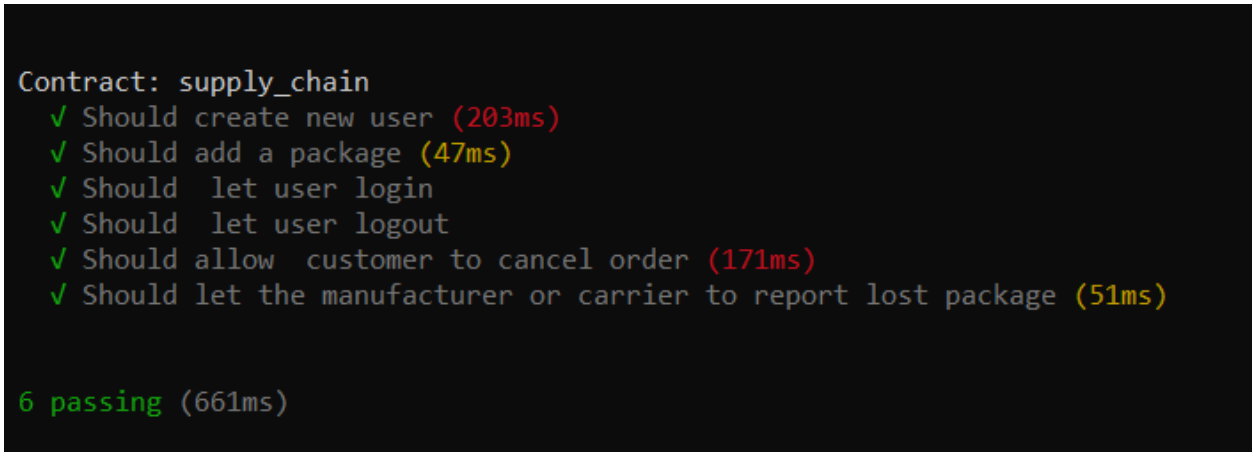

Figure 1: Result of unit testing

6.0 WEB USER INTERFACE

For this project we built a React app to allow any user to interact with the smart contract we developed. While designing the use case diagram, we identified the main roles for the three main actors in the system. The website code can be access from the github repository https://github.com/AdamAmirah/Supply-chain-React

1- Seller / Manufacturer

- Login
- Create user
- Transfer package ownership
- Add a new package
- Report a lost package
- Trace a package
- Logout

2- Carrier

- Login
- Transfer package ownership
- Report a lost package
- Trace a package
- Logout

2- Buyer/ Customer

- Login

- Trace a package
- Logout

6.1 Website main pages

1. Landing page

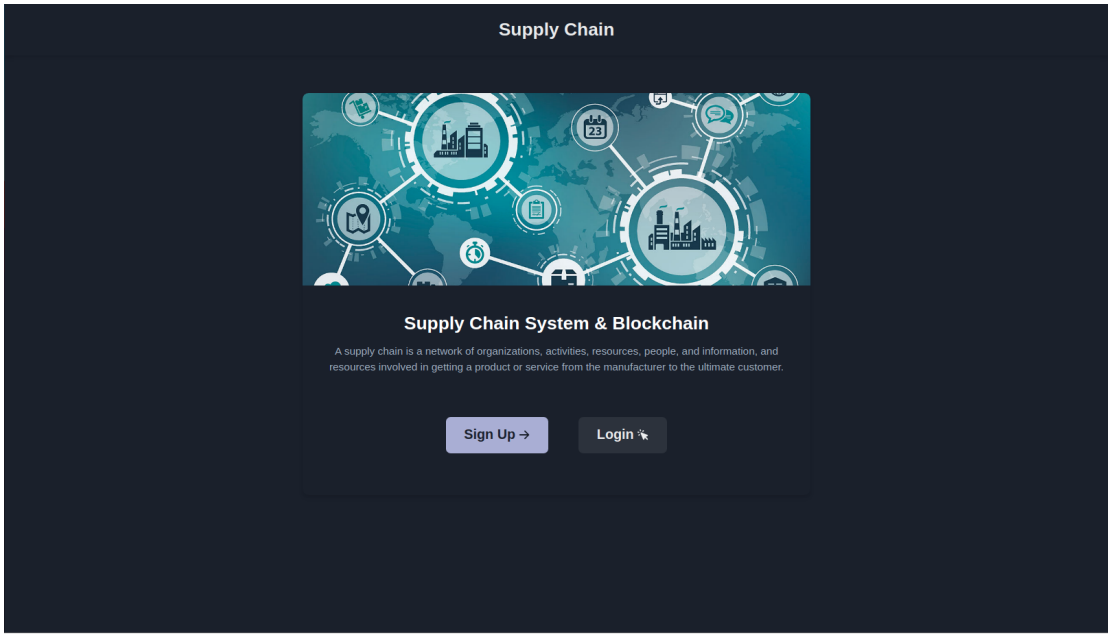

Figure 2: landing page

2. Sign up component

Figure 3: Sign up page

3. Log in takes will be considered as a transaction

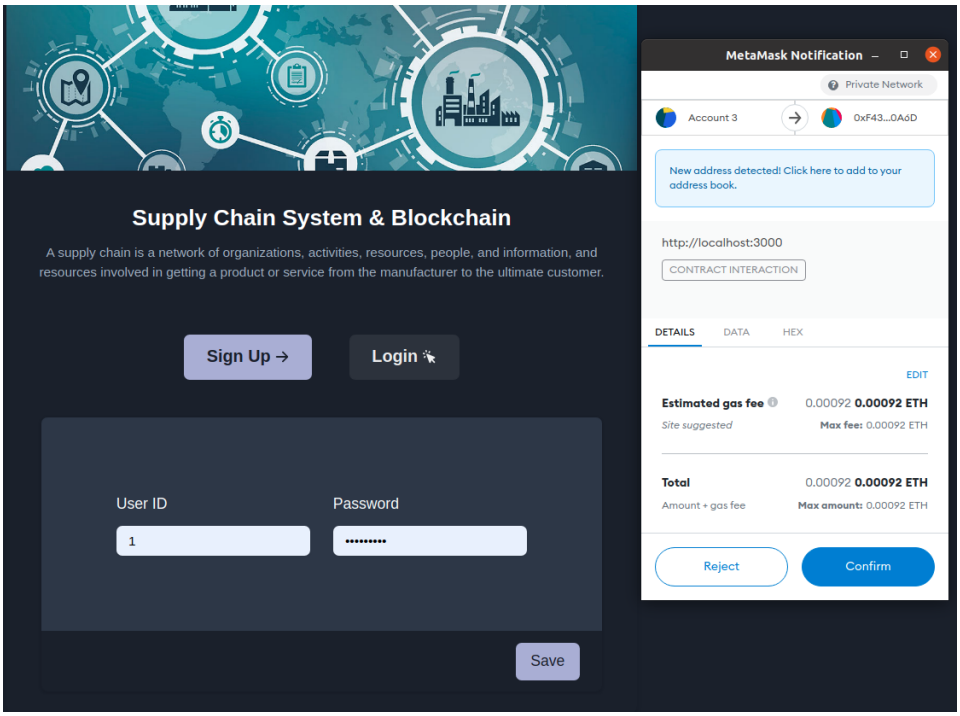

Figure 4: login page

4. View Package Details

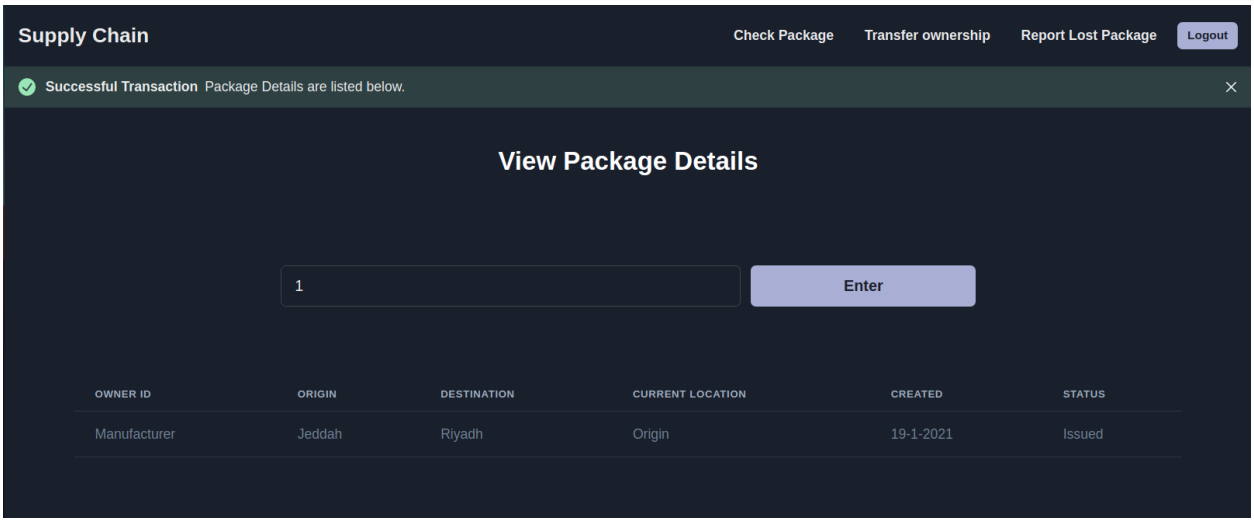

Figure 5 : view package page

5. Add Package

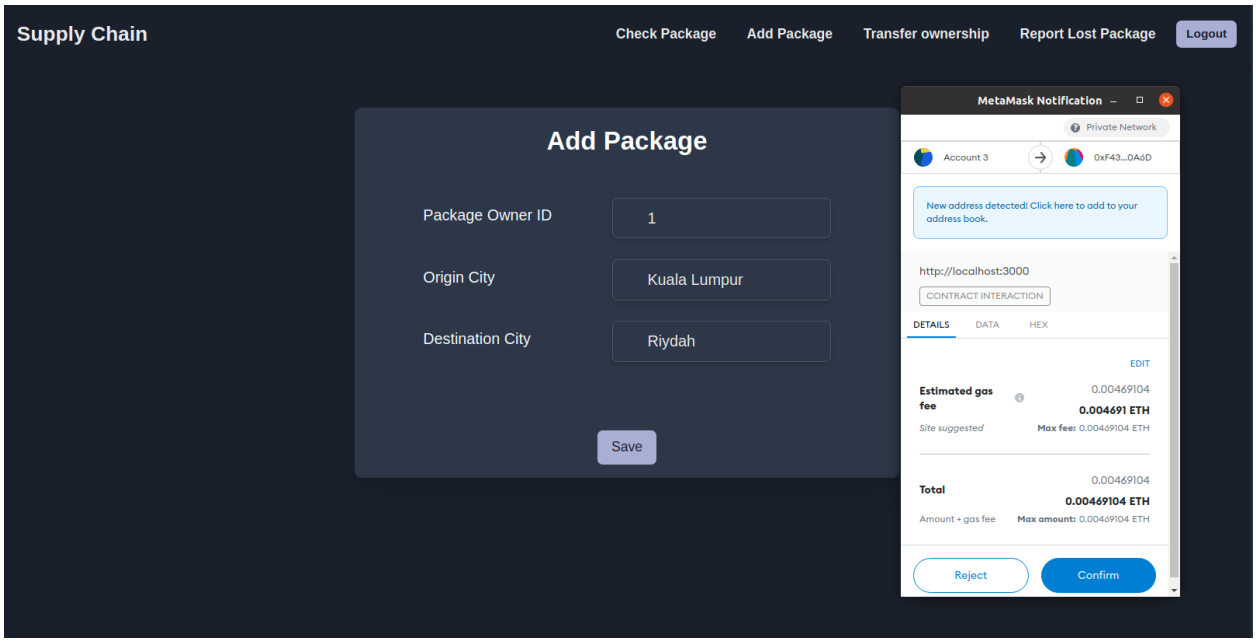

Figure 6: add package page

6. Transfer Ownership

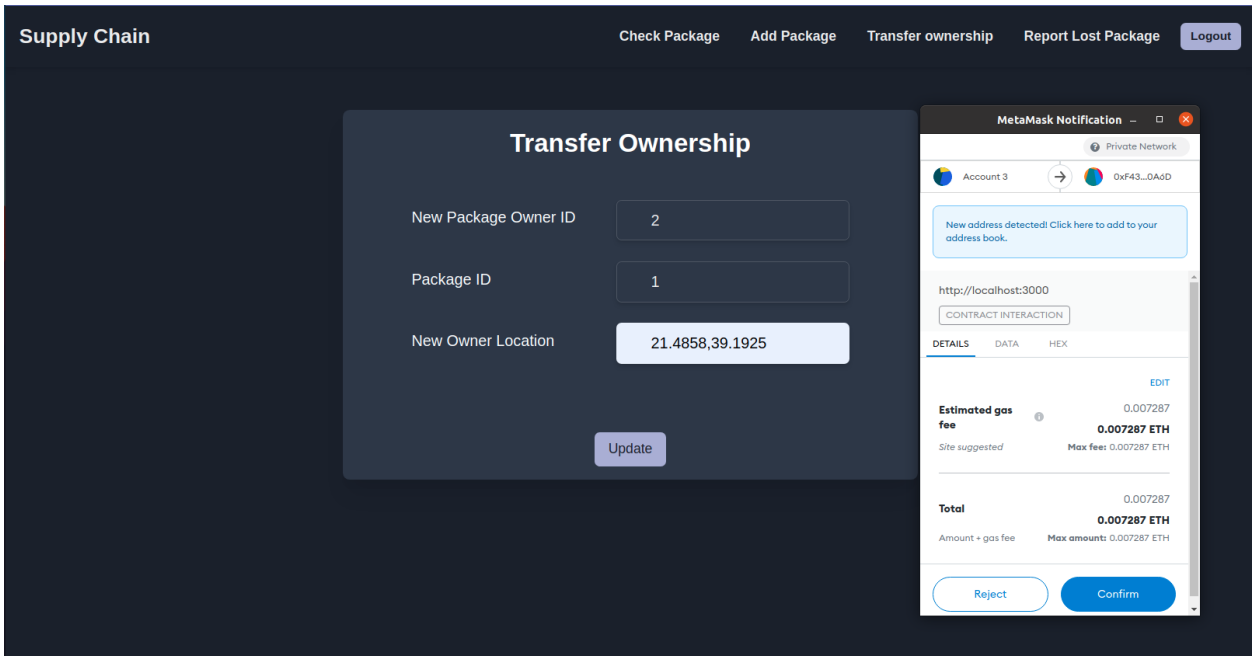

Figure 7: transfer ownership

7. Report Lost package

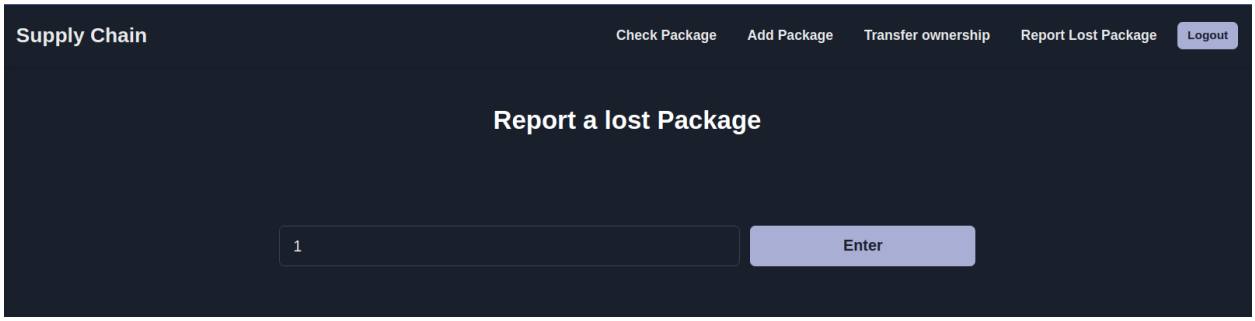

Figure 8: report lost package page

7.0 DEPLOYMENT

To deploy the contract into a network, we first created an account in INFURA . This platform will allow us to deploy our contract. Then we filled the Gorili wallet with ether to continue the deployment process. Next, we modified the truffle-config.js to include the link provided by INFURA and the information about the gas limit. To find the network you can access this link https://goerli.etherscan.io/address/0x03716C2de74Ad606D2EFbCC39e17FC51F327e7Ae

8.0 CONCLUSION

To sum up, although blockchain technology is not a solution for all supply chain management problems, it can help supply chains run more efficiently. Traceability and tracking capabilities can provide the necessary transparency and build confidence throughout the supply chain network. It has the potential to allow participants to trace and track product information from origin to end-users.

9.0 APPENDIX

1. Use case diagram for the supply chain system

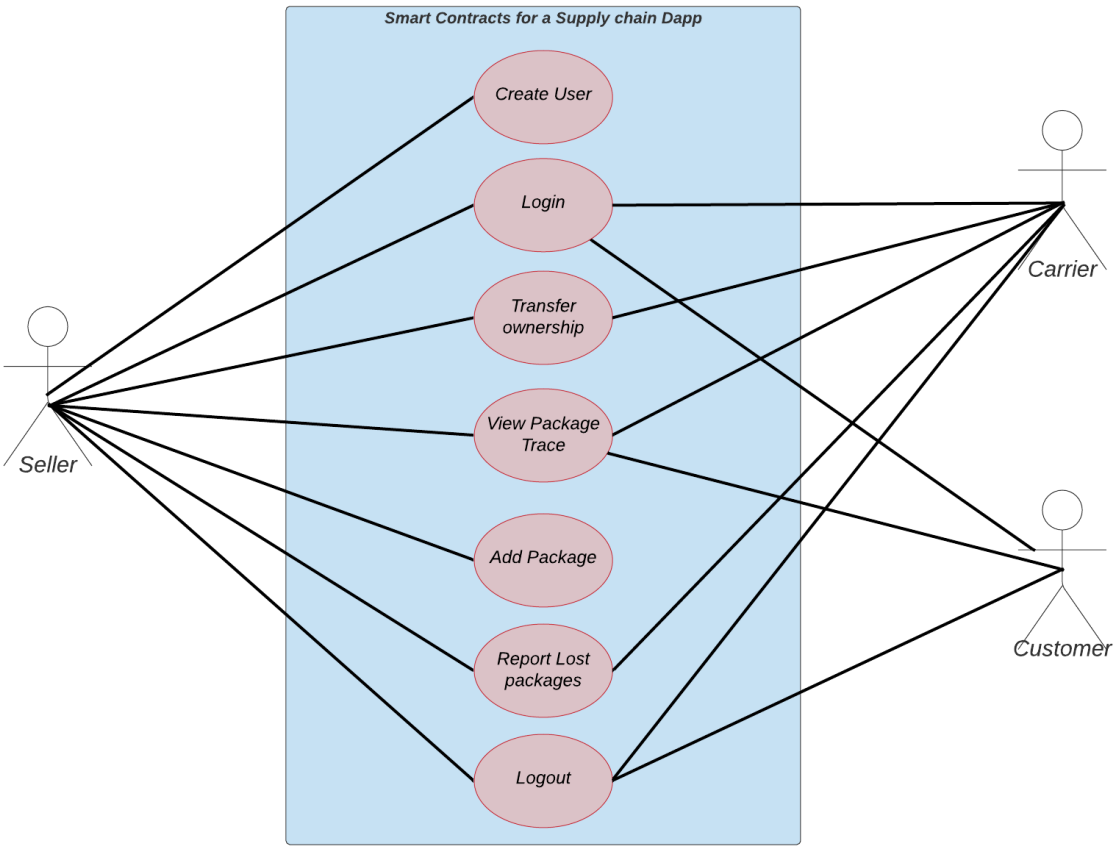

Figure 9: Use case diagram

2. Work Distribution for the project

Members	Roles
Amera Egeh Mohamed Adam	Developing the smart contracts Designing and developing the Web application Documentation & Final Report
Furqan Said Hassan	Tester Documentation & Final Report

10.0 REFERENCES

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