

Modern Business Concept Using Ethereum Blockchain Platform And Google Cloud Platform

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Abstract

Blockchain technology is the choice in technological developments that promote peer-to-peer systems and decentralized data. The supply chain process currently uses traditional technology where the data of products is stored in traditional databases. Blockchain technology has the potential to change the process to be more modern due to transparency in every activity to facilitate tracking and visibility of goods in the supply chain and cause easier auditability of records. For example, Carrefour Italia reported that it has implemented a food tracking system with blockchain. The author focuses on building business solutions in the supply chain transparency sector with the Minimum Viable Product target in the form of Txn supply chain processes. The author uses Ethereum and its Smart Contract products to build a business system on the blockchain. The product of this research is a prototype blockchain system that generates Txn in supply chain processes for transparency in ongoing supply chain business activities. The blockchain can record the data and the entity will find it easier to see blockchain transaction data because transaction data is very transparent.

Keywords: Blockchain, Ethereum, Smart Contract, Supply Chain, Txn

1. Introduction

Blockchain technology is widely recognized as an innovative option for developing technologies that facilitate peer-to-peer distributed information systems for corporate data. Blockchain technology facilitates digital currency transactions. In its current development, the blockchain can update decentralized currency systems such as Bitcoin, Ethereum smart contracts, the Binance smart chain and other resources that can be managed online.

Blockchain technology allows organizations to exchange data and complete transactions in minutes without the need for intervention or verification by third parties, such as banks, when processing customer transactions.

Blockchain technology also ensures the security of distributed information exchange. This may have a significant impact on the management of the organization. It can also change the way companies in the supply chain build relationships and share products and information.

Today, agribusiness supply chains are highly structured, global, and interconnected. Information and documentation of agribusiness products on safety, sustainability, procurement and other features. Information is often recorded and stored on paper or in private databases and can only be viewed by trusted third parties. In this situation, accessing data becomes expensive, time-consuming, and requires action, distortion, and error that threatens the loss of business processes, especially in the financial field.

Although the trend of the digital economy continues, agricultural products are still included in one of the fewest digital industries. In this situation, blockchain technology can affect this situation in a different way in one of the fewest digital industries. The food sector can benefit from decentralized digital smart contracts that operate independently and automatically to process transactions and automation between participants in the supply chain.

The purpose of this study is to model the blockchain system that builds Txn in the supply chain process to ensure that ongoing business activities in the supply chain are transparent. Research

limitations are as follows A Minimum Viable Product in the form of Txn occurs between supply chains using the Ethereum network and a smart contract that resides on the Ethereum network.

2. Reseach Methods

2.1. Ethereum Architecture

The core idea behind the Ethereum architecture is how users perform smart contract functions built to support the business needs of the blockchain. Written with smart contracts, this architecture shows how interconnected technologies that allow the Ethereum ecosystem to work to create blockchain-based blocks containing transaction data from users. A mining node is a mining machine that monitors transactions carried out on the Ethereum blockchain network, and each block contains information already described in Figure 1.

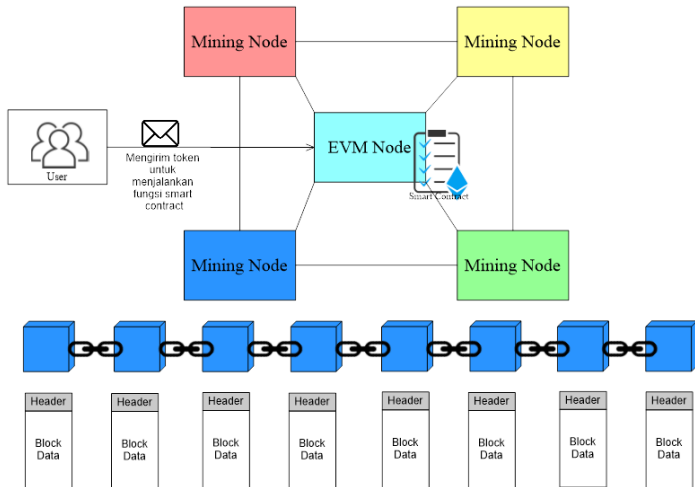


Figure 1. Ethereum Architecture

2.2. Cloud Architecture

In the picture below, it can be seen that the researcher uses the GCP service to make his CMS site online, namely with the Deployment Manager, which has been directly integrated with the Compute Engine and VPC to facilitate work.

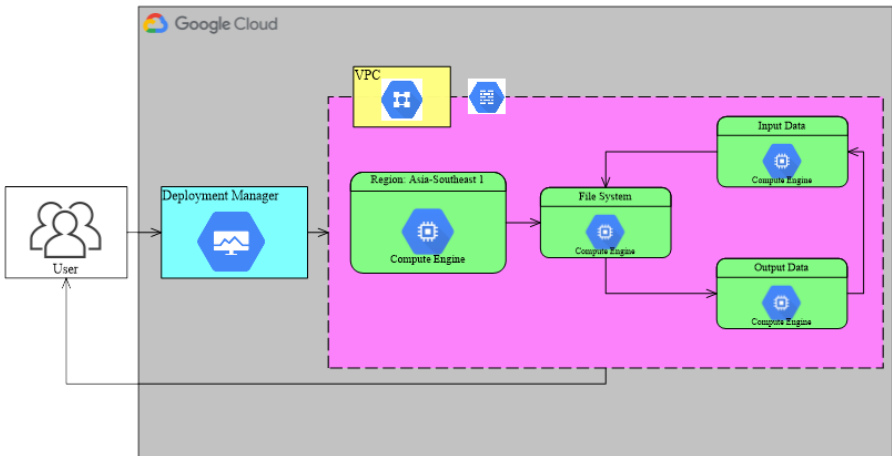


Figure 2. Cloud Architecture

2.3. Create a Smart Contract

In the image below, the user needs to install the MetaMask application and create an Ethereum account to get the Ethereum address that the user will use. It will cost money to create a smart

contract deployed on the Ethereum network. So, first, users must have Ethereum (ETH) by participating in an airdrop or purchasing it from a broker. Once you own Ethereum (ETH), you can then open the Remix Ethereum IDE using Ethereum's dedicated development environment at the following link (remix.ethereum.org). Users can create and edit smart contracts to use according to business needs. For example, you can visit this link to learn about smart contracts (<https://github.com/hanggaa/PrototypeThesis/blob/main/Token/Skripsi/.workspaces/Skripsi2/hanggaa.sol>), which is a smart contract example from a researcher. The smart contract created by the researcher works when creating a new token running on the Ethereum network, allowing entities to send tokens between entities as a condition for writing data on the blockchain. After creating or modifying the smart contract, the next step is to match it with the compiler. Regardless of whether the Solidity version matches or not, if it does not match, the compilation process will fail. The next step is to compile the smart contract. After a successful compilation process, the user can run the smart contract on the EVM node or on the Ethereum network. The deployment process is done by selecting Injected Web3 (MetaMask) as the deploy payment method.

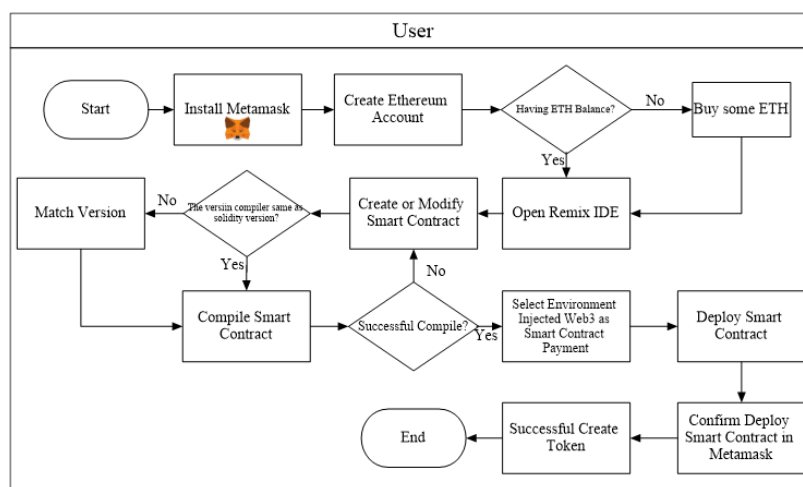


Figure 3. Flow to Create a Smart Contract

2.4. QR Code

The user copies the website link stored in the QR Code, pastes the link into the QR Code, then generates a system that converts it into a QR Code and prints it out while simultaneously assigning it as the product label.

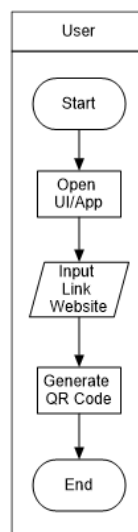


Figure 4. Flow to Create and Printing The QR Code

2.5. Installing Tokens on Metamask

When installing a token on Metamask, the user needs to copy the token contract address that can be opened through the token creation transaction details. After the transaction details are open, copy the token contract address and select "Add Custom Token" in MetaMask. After the custom token opens, paste the token address that was copied earlier.

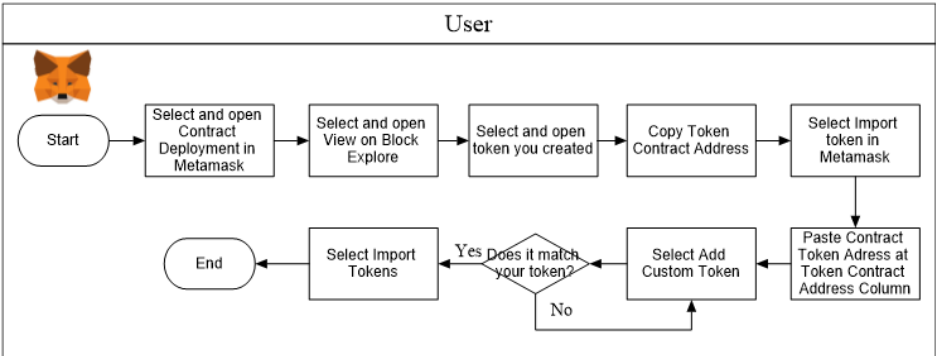


Figure 5. Install Smart Contract Tokens on MetaMask

2.6. Supply Chain Business Processes Using Blockchain

It can be seen that all entities (except retail) create labels for goods to be recorded in the blockchain. Before buying goods between entities, you can read the data on the blockchain through a QR code affixed to the goods to see the entities that worked in the previous supply chain process.

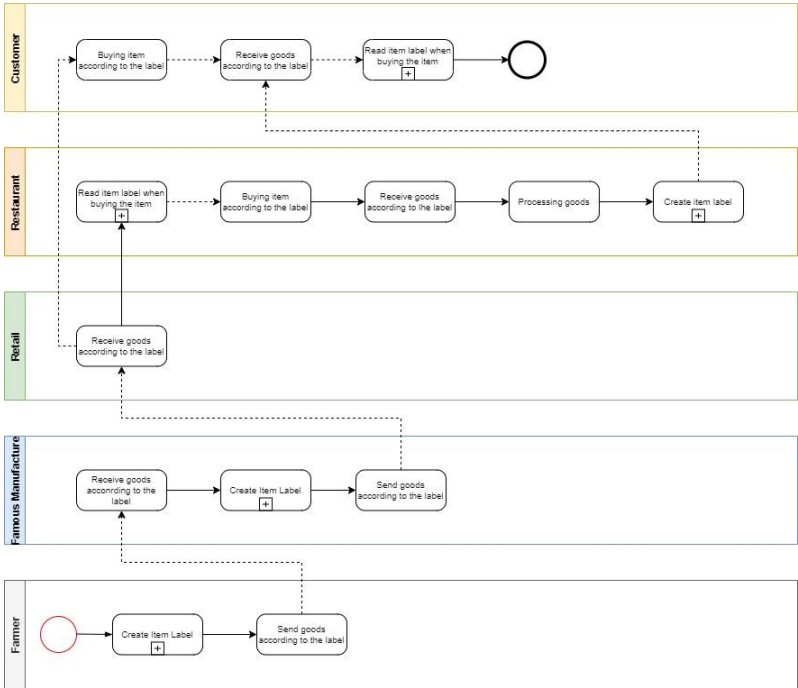


Figure 6. Supply Chain Business Process Using Blockchain (Famous Manufacturer) Level 1

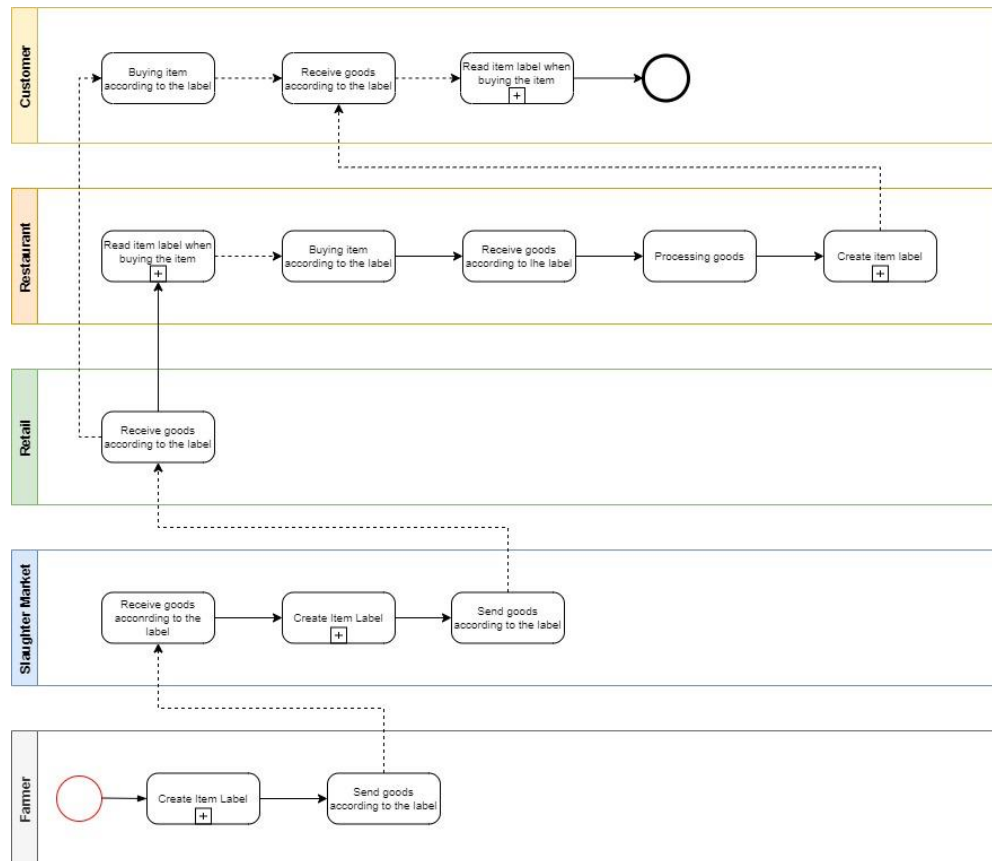


Figure 7. Supply Chain Business Process Using Blockchain (Slaughter Market) Level 1

The picture below is a detail of the activity of creating goods labels and reading labels when you want to buy products. In the process of creating goods labels between entities, it is necessary to enter data into the blockchain by sending the tokens that have been created to the address used by the next entity so that the data transactions are recorded into the blockchain. Once the data is successfully recorded into the blockchain, the next step is for the inter-entities to enter the data into the CMS according to their respective businesses. The browser site link resulting from the data entered into the CMS is converted into a QR Code by the inter-entity and then pasted into the product so that consumers can see the browser site containing Txn (required) and others.

When consumers read the item label, they simply scan the QR code affixed by the supply chain entity to the item to see the supply chain process transactions on the blockchain. Of course, consumers can see the origin of the goods to be purchased (depending on the agreement between the parties).

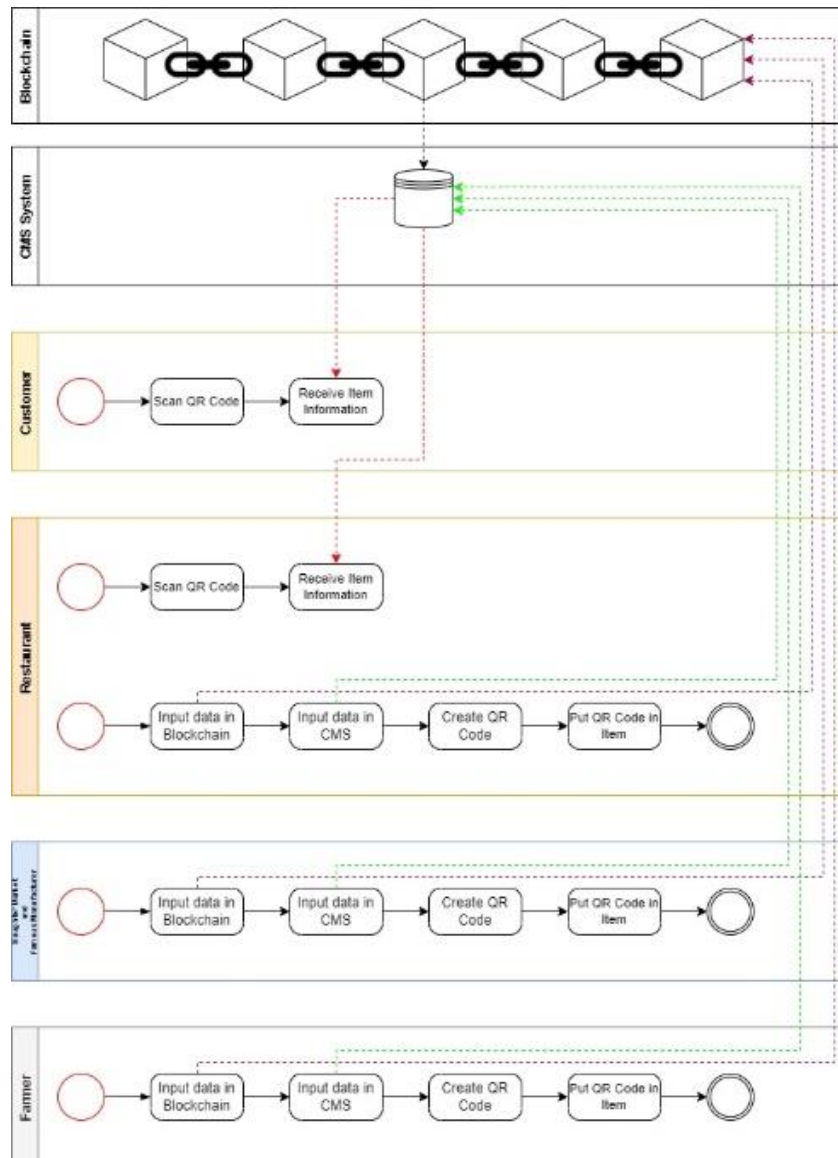


Figure 8. Supply Chain Business Process Using Blockchain (Slaughter Market/Famous Manufacturer) Level 2

3. Result

3.1. Implementation

Some of the specifications, tools, and versions needed in this study are

- Python version 3.8 to run a CMS
- Wagtail Library with Django Framework
- GCP Instance of Asia-southeast zone1-a
- GCP Instances of e2-medium machine type
- Pragma solidity version 0.4.24
- ERC-20 Tokens

3.2. Creating a Smart Contract

Researchers created HAJW tokens with smart contracts using the Solidity programming language version 0.4.24.

```
102 contract HAJW is ERC20Interface, Owned, SafeMath {
103     string public symbol;
104     string public name;
105     uint8 public decimals;
106     uint public _totalSupply;
107
108     mapping(address => uint) balances;
109     mapping(address => mapping(address => uint)) allowed;
110
111     // -----
112     // Constructor
113     // -----
114     constructor() public {
115         symbol = "HAJW";
116         name = "Ayam1";
117         decimals = 18;
118         _totalSupply = 1000000000000000000;
119         balances[0x4c103be00e08978c83e8a77498880f7622ce3075] = _totalSupply;
120         emit Transfer(address(0), 0x4c103be00e08978c83e8a77498880f7622ce3075, _totalSupply);
121     }
122 }
```

Figure 9. Smart Contract Modification

Connect the Injected Web3 environment to an Ethereum account located on MetaMask to pay for deployment fees and be associated with the blockchain.

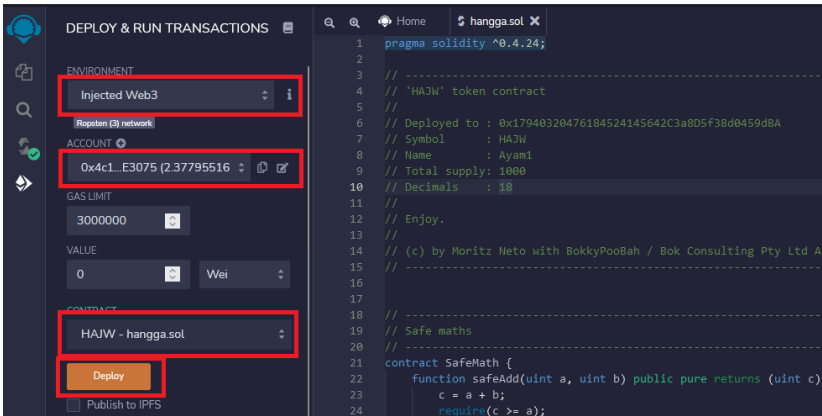


Figure 10. Deploy Smart Contracts With Injected Web3

In the picture below, it can be seen that the process of deploying a smart contract in token creation costs 0.00361184 ETH (Ether).

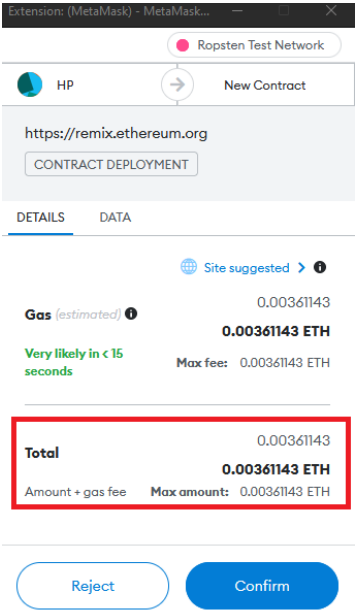


Figure 11. Confirm Deploy Smart Contract

3.3. Input CMS

The image below is the first component encapsulated in a card element containing

- Photos or images of items purchased by customers
- The name of the item purchased by the customer
- Blockchain links of senders and receivers of supply chain entity
- Txn blockchain links
- Reference links from previous supply chain processes

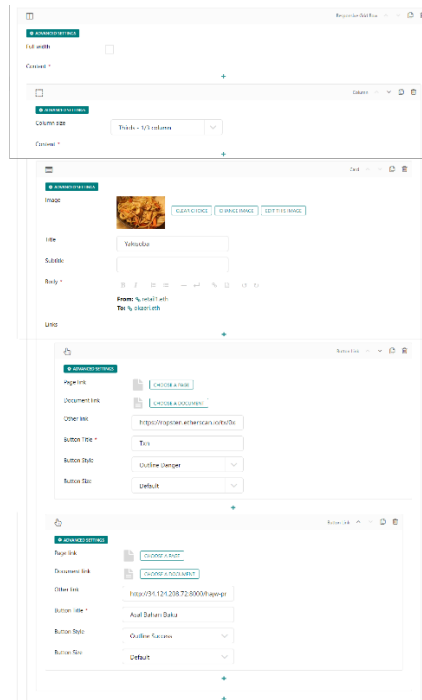


Figure 12. Column 1 Web Page

The picture below is a description of the goods.

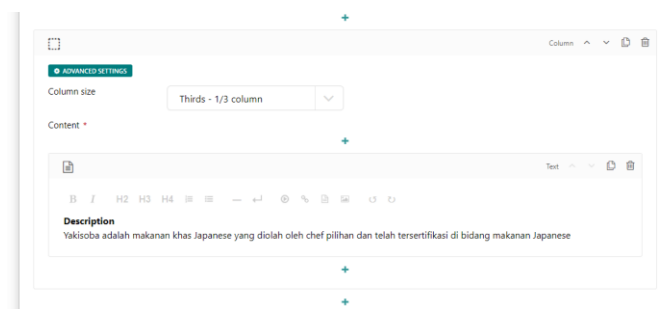


Figure 13. Column 2 Web Page

In Figure 14 is a component that displays a map of supply chain actors. The content entered into the site page is the right of each entity. Researchers create content as above because the content is very transparent to be understood by customers.

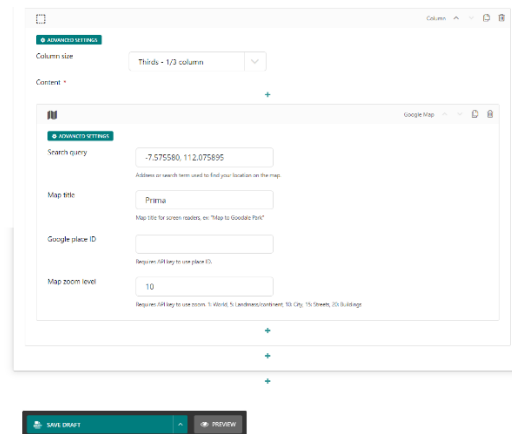


Figure 14. Column 3 Web Page

3.4. Logistics and Transport Process

The picture below is a supply chain process that begins with a purchase order activity (Purchase Order) to the depot, then the depot validates the order and sends an expedition report as well as an order to the warehouse. In the warehouse, the token transfer process, load planning allocation, and expeditions are carried out to be assembled as well as validated orders before being delivered to retail. If the order is not appropriate when at retail, there will be a Proof of Delivery (POD) process where the retail and depot parties must fill out a form according to existing cases such as damaged/lost/exchanged goods, lack of products (missed product), and other cases.

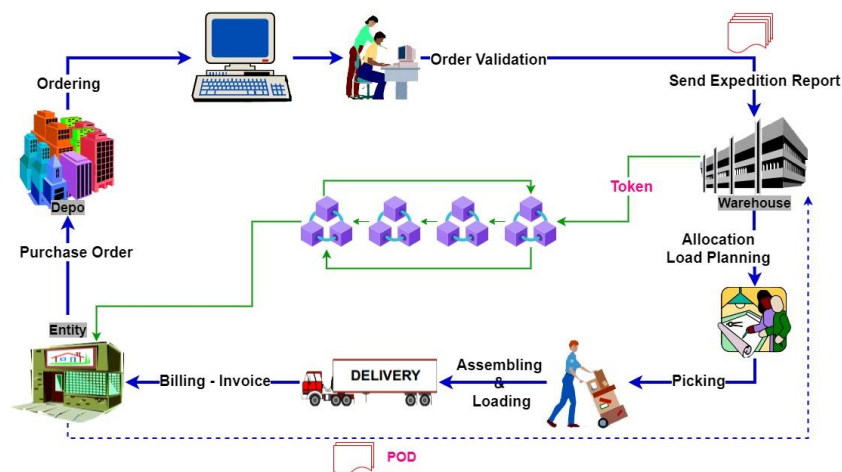


Figure 15. Supply Chain Process

3.5. Use of GCP (Google Cloud Platform) Services

In this study, researchers used the Django Packaged by Bitnami deployment manager to deploy the CMS so that the CMS site was online.

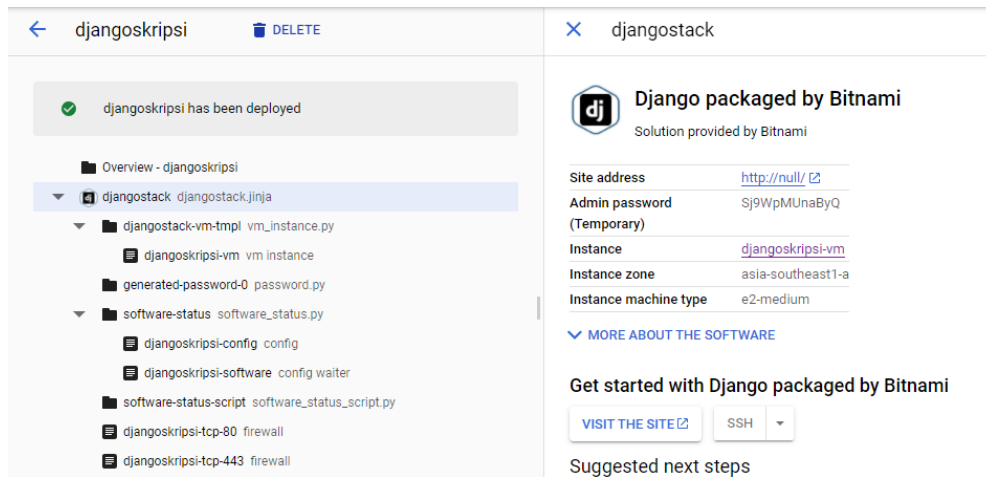


Figure 16. Djangostack Deployment Manager view

In the Compute Engine service there is a view of the server instance with the following details

- Name is the name of the compute engine instance, djangoskripsi-vm.
- Zone is the location of the compute engine instance region zone located in asia-southeast1-a (Southeast asia region zone).
- Internal IP is the IP used to set the server instance.
- External IP is the most important part because external IP will be used to access the CMS.
- Connect is a place to connect to an SSH server.

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VM instances are highly configurable virtual machines for running workloads on Google infrastructure. [Learn more](#)

Filter Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>		djangoskripsi-vm	asia-southeast1-a			10.148.0.5 (nic0)	None	SSH

Figure 17. Server Instance View

In a VPC network, there are network settings so that you can access the external IP consisting of

- Name is the name of the firewall setting
- Type is an option of whether the network is linked to another GCP network service
- Targets are which targets will be linked to the firewall settings that have been set.
- Filters contain the IP range that will be used to run the server.
- Protocols/ports contain number ports whose function is to be able to see the cms site display.

Firewall

Filter Enter property name or value

<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports
<input type="checkbox"/>	default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80
<input type="checkbox"/>	djangoskripsi-tcp-443	Ingress	djangoskripsi-	IP ranges: 0.0.0.0/0	tcp:443
<input type="checkbox"/>	djangoskripsi-tcp-80	Ingress	djangoskripsi-	IP ranges: 0.0.0.0/0	tcp:80
<input type="checkbox"/>	djangoskripsi-tcp8000	Ingress	djangoskripsi-	IP ranges: 0.0.0.0/0	tcp:8000

Figure 18. Firewall Settings view

3.6. Print QR Code

The image below is a QR Code System maker, which contains a link field and file name that must be filled in by users to get the QR Code as shown in Figure 19. The QR Code above will display the link and move the customer to the predetermined link so that customers can see the process of the raw material supply chain until it is processed at the restaurant.



Figure 19. QR Code Result

3.7. Website Display

After the user scans the QR code, a web page like Figure 20 will appear, which contains, according to what has been entered in the CMS, such as photos of purchased goods, information in the blockchain, descriptions of goods, and maps of places of supply chain entities. Users can see the information in the blockchain when selecting the Raw Materials Txn button to ascertain whether it is true that the Ethereum addresses of supply chain actors work together.

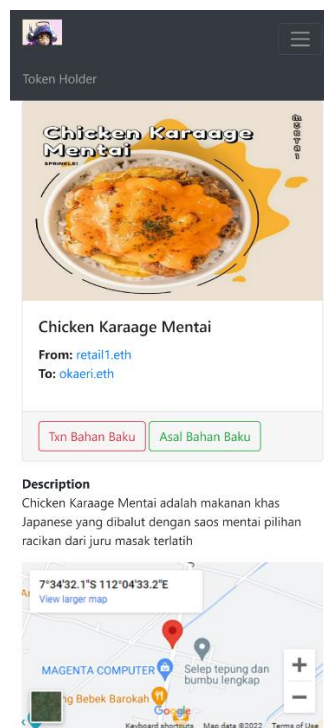


Figure 20. Website View After User Scans QR Code

4. Conclusion

- a. Smart contracts make it easy between entities to get in touch with the blockchain
- b. The design of this system successfully proves that supply chain transactions from upstream to downstream can be recorded on the blockchain
- c. Each entity will find it easier to see blockchain transaction data because transaction data is very transparent.
- d. In blockchain transactions, there is a gas fee or transfer fee, so it should be between entities to think of a special budget for the gas fee.
- e. Using Google Cloud Platform services makes it easy to host a CMS

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