

Low Level Design

Food Traceability System Using Blockchain

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1 Introduction

1.1 What is a low-level design document?

The purpose of a low-level document is to explain the granular level working of the Blockchain based supply chain in food industry. The low-level design document contains all the modules that will be used while programming. The document contains the diagram of the flow of the program as well as the description of each module. This facilitates the programmer to have a clear understanding of the modules they are working for.

1.2 Scope

The document necessarily covers the program flow and the sequences in which the modules function. This process can be used for designing the data structures, for software architecture and the source code. The document merges knowledge from past meetings, from blockchain lectures, and from IT expertise to formulate a plan for a blockchain enabled supply chain for asset tracking.

2. Architecture

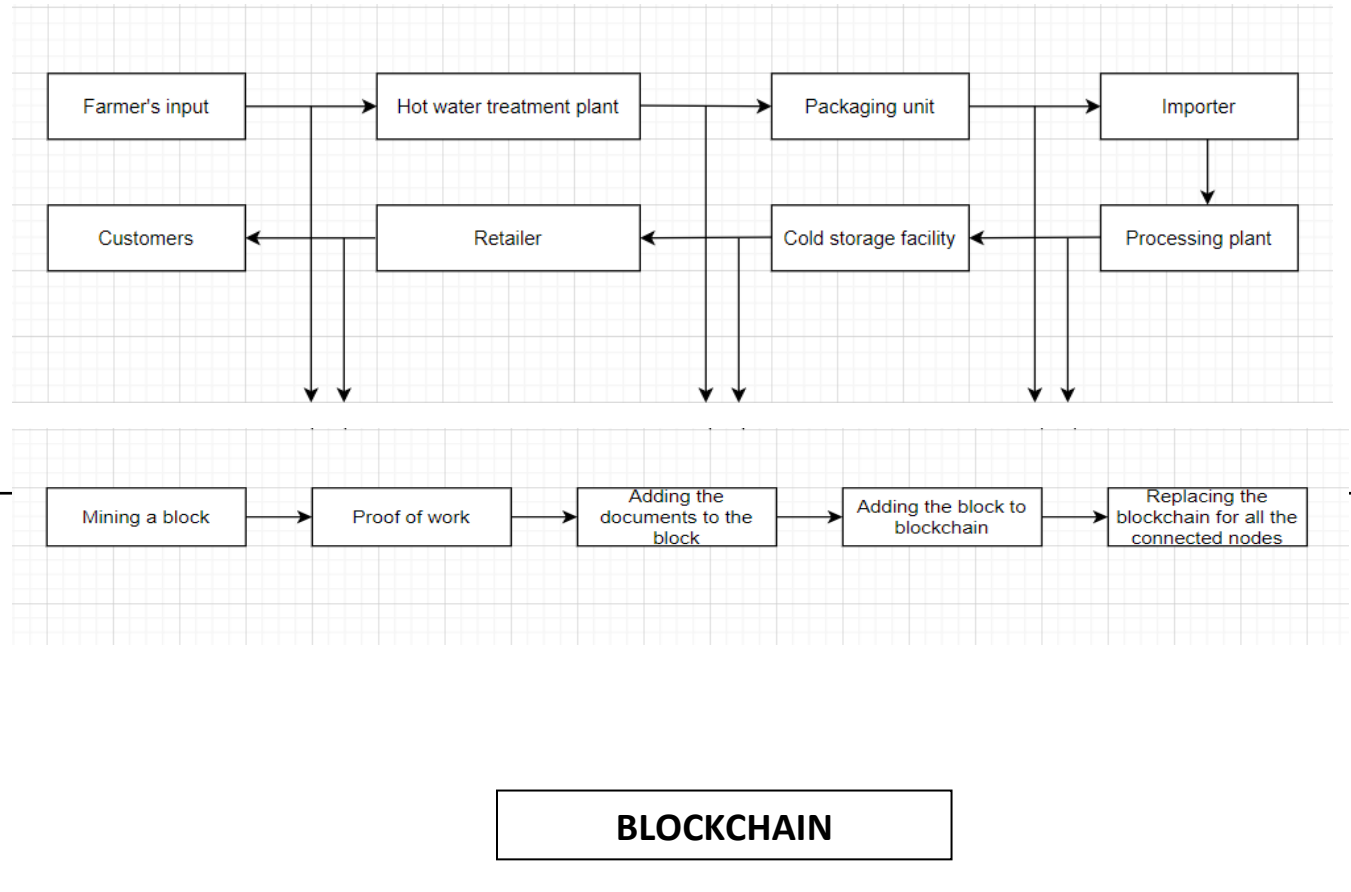


Figure 1: Program Flow Architecture

3. Architecture Description

3.1 Farmer's input

The first step is for the farmer's produce to be entered into the system by the farmers. The information that can be fed into the system would be from which farm the produce is coming, the quantity of produce, fertilizers, insecticides and pesticides used, date of production, etc.

3.2 Hot water treatment plant

Hot water treatment is done to remove or reduce the level of pathogens in vegetables or fruits. Information regarding the temperature of water and how long the fruits or vegetables were treated with hot water are fed into the system.

3.3 Packaging unit

After being treated with hot water, the perishable items like fruits or vegetables are packed into boxes with defined quantities and then sent to the import units.

3.4 Importer

Importers import the packaged boxes to the respective processing plants for further treatment and processing.

3.5 Processing plant

Here, the boxes are received and the items are checked if they are damaged and if their quality is retained.

3.6 Cold storage facility

The perishable food items are stored in storage boxes with least temperatures so that they can be preserved for a longer duration.

3.7 Retailer

From the cold storage units, using various distribution channels, the packed food items are sent to various designated retailers so that they can sell the final products to the customers. Information about the age of produce, quantity, quality, from which farm, the items are coming and for how long the items are going to retain their nutritional value, will be fed into the system.

3.8 Customers

Customer will get to know the information provided by the retailer by scanning a simple QR code or Barcode and then decide whether to go for that purchase or not.

3.9 Mining a block

It is the process of finding the NONCE number in such a way that some hashkeys are generated. The NONCE should satisfy certain HASH conditions. The information provided by each stakeholder will be saved in the blockchain ledger, since it is a distributed network.

3.6 Proof of Work

While mining a block, once the hashkey is generated, the hashkey is verified for the predetermined sequence. If the condition is satisfied, the proof of work is complete. If not, the hashkey is again generated.

Algorithm for Hashing: SHA – 512

SHA 512 has 128 characters as compared to SHA 256 with 64 characters.

The reason for choosing SHA-512:

- It is faster than SHA-256 on 64-bit machines is that has 37.5% less rounds per byte (80 rounds operating on 128 bytes blocks) compared to SHA- 256 (64 rounds operating on 64 bytes blocks)
- It is more secure than SHA 256

3.7 Adding data to block

Once the proof of work is completed successfully, the verified data documents are added to the block.

3.8 Adding to the blockchain

Once the block is created successfully, the block is added by the respective stakeholders to the blockchain.

3.9 Replacing the blockchain for all the connected nodes

Every stakeholder will feed the information into the blockchain which has been updated by the previous one.

Information, in this sense, further gets carried on to the next stakeholder and then, finally reaches the customer.