Produce Tracker

Narain, Shiva Pandey, Supriya Sethi, Yehia Qtaish

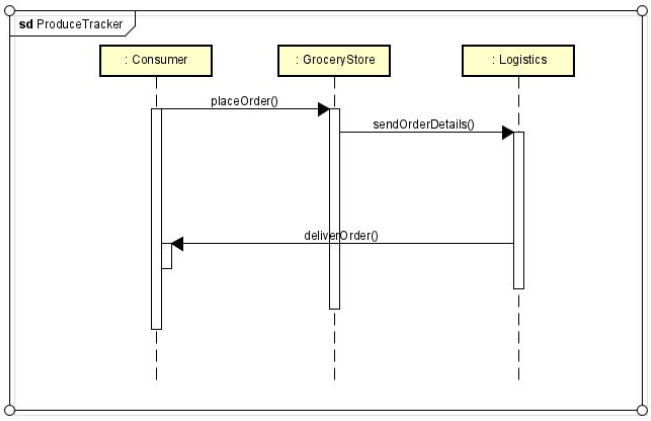
***Abstract* – The supply chain industry is getting complicated when it comes to keeping records and tracking product status. Food borne diseases due to contamination and the rapid spread of Covid-19 virus has increased the challenges for the food supply chain. Consumers are demanding more transparency when it comes to quality of produce delivered to them. If the traceability gets better, it can save people from contracting the disease and reduce the food wastage. In Produce tracker, we are creating a Blockchain network using IBM Blockchain platform,where one can track the product and get the notification alert if the product is delivered by someone who is found corona positive lately.**

Keywords—IBM Blockchain Platform, IBM Kubernetes, AmazonEC2, Supply Chain

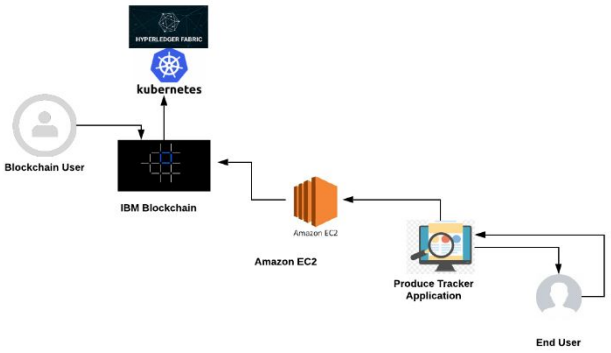
I. Introduction

Health is the prime concern of every individual nowadays as the quality of food delivered to customers is in question due to the spread of COVID-19 virus. This makes the food companies more responsible about the quality of products they are selling.

Produce Tracker application can help these companies to track the source of the product and also who is delivering the product to consumers. It will display the source, logistics and consumer information along with quality of product at each stage in a timeline manner. It will also provide the information related to all the stages such as farm, retailer,logistics service available for any product. All these details can be accessed by entering the Barcode of the product. This application is scalable as it allows the companies to add a new product on a required basis.



ProduceTracker Flow



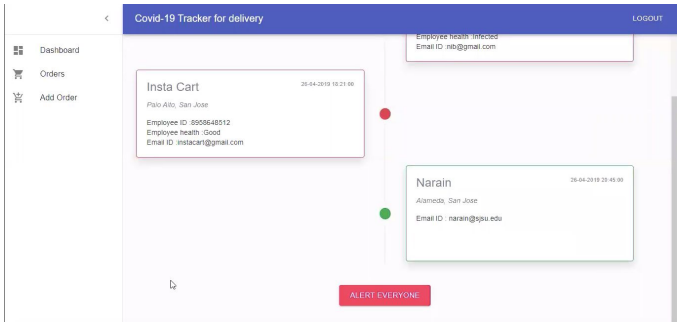
II. Development

A. ProduceTrackerUI

The frontend part of the application was implemented using React JS. React JS is a JavaScript framework which helps developers implement a professional looking website using simple UI libraries along with NodeJS libraries.

Material UI was used in this project as it offers some professional components to use for your React application. The first page is a sign in page for retailers(grocery store) and logistic service which is developed.

The second page of the application contains the Retrieve Order feature which allows the user (Grocery Store/Logistic company) to enter the Barcode Id and it will navigate to the next page with information about the timeline of the product along with the status of the employees handling the product. Also there is a button on the bottom which will send an alert text to the entities associated with the employee ID along with the process.



The Create Order option allows users to create and also gives an option to the user along in the secure blockchain. Also the tab on the left gives the user the option to show all orders.

B. Backend API

For backend framework, we have built an API which will interact with Frontend UI and Blockchain Network. This API will perform following tasks for Retrieve Order and Create New Order

a. Send request to Blockchain Network upon receiving request from Frontend UI.

b. Send the response of the above request back to Frontend UI.

C. Blockchain Network

We built the Blockchain network using IBM Blockchain Platform. Following are the different components of the IBM Blockchain network.

a. Org1CA (Organization Certificate Authority) – For every organization, there should be atleast one CA assigned which generates certificates for all the participants in the network. The CA is used to deploy the nodes, create the admin identities of the organization and submit transactions.

b. Associate Identity - Each CA node is created with CA admin identity which is used to register new users with CA and also generates certificates.

c. Register User - An admin identity needs to be created for the nodes. For this, two users are registered from Org1CA - Org1adminCA and Peer1.

d. Membership Services Provider (MSP) – It provides the identity validation for each peer and authentication processes by issuing and validating certificates to each peer.

e. Peer1 – This is the fundamental element of a network as it hosts the ledgers and smart contracts. Ledgers are used to store every new transaction. We have created one Peer which will store the transactions consisting of information related to grocery stores, logistics and consumers.

f. Orderer CA (Certificate Authority) - Orderer is a logical entity in Blockchain which creates the communication channel between user and peer. It packages the transaction into blocks and sends it to peers.CA is generated for orderer to access the network.

g. Smart Contract – A smart contract is a piece of code developed using NodeJS running on

a Blockchain network. It is defined as a set of rules between different entities such as Logistics, Retailers and Consumers in the Blockchain network.

h. Channel – A channel is a communication subnet for sharing confidential information between multiple network members.

D. SmartContracts

To build the smart contract, we have used Visual Studio code. The smart Contracts are created in NodeJS programming language. It uses IBM Blockchain Plugin to package the smart contract and save it as a .cds file.

E. Deployment

We have used IBM Kubernetes cluster to deploy the IBM Blockchain network created using IBM Blockchain Platform.

III. TOOLS

A. Blockchain

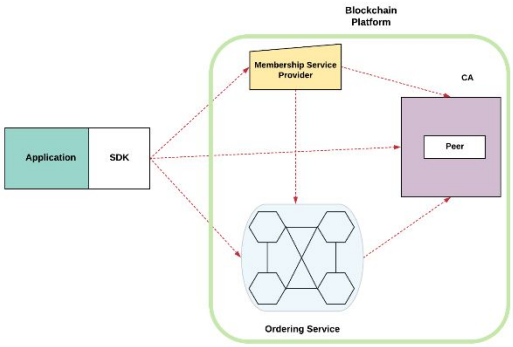
A blockchain is an immutable time-stamped series record of data that is distributed and managed by a cluster of computers. It provides high traceability, commodity management and data sharing. We have used IBM Blockchain Platform to build the network.

B. IBM Blockchain Platform

The IBM Blockchain Platform is a blockchain as a service which allows us to develop, deploy and build blockchain networks. It provides a flexible management platform that runs on Kubernetes. It includes a management console that allows us to easily deploy blockchain components, build a multi-cloud blockchain network, and perform network management and maintenance. It uses Hyperledger Fabric Framework to build the blockchain network.

Hyperledger Fabric is an open source enterprise-grade platform that leverages a highly modular and configurable architecture. Hyperledger Fabric can be used for various industry use cases, which includes, finance, banking, healthcare, insurance, and public sectors, as well as supply chains and digital asset management.

It is a permission based blockchain, more precisely known as Distributed Ledger Technology (DLT).



C. Visual Studio

Visual Studio provides the IBM Blockchain extension to build the smart contracts and package it to deploy to IBM Blockchain Platform.

D. IBM Kubernetes

IBM Cloud provides a wide range of free services to be used for development and deployment. IBM Kubernetes service is an open source Kubernetes Platform for deployment, management and scaling of applications.

E. AWS EC2

We have used Amazon EC2 instances to deploy our application, which is a web service that provides secure ,reliable and scalable compute capabilities on the cloud.

IV. Conclusion

In Conclusion, we can use our Frontend UI to create a transaction by storing in the blockchain and viewing the data in a secure platform. In addition to that this application also gives the information for the employee affected from corona virus and allows responsible entities to send alerts for the same to take further actions.This project can be extended to add more products and peers in our IBM Blockchain network.

Acknowledgment

We are thankful to our professor, Prof. Rakesh Ranjan, who guided us whenever we needed his advice. As the Blockchain technology was new to all of us, he guided us to understand the procedure of using the IBM Blockchain Platform and how our application can be effectively useful in the current COVID-19 situation.

References

[1].https://github.com/IBM/blockchainbean2
[2].https://coding-bootcamps.com/ultimate-guide-for-building-a-blockchain-supply-chain-using-hyperledger-fabric-and-composer.html
[3].https://cloud.ibm.com/docs/services/blockchain?topic=blockchain-get-started-ibp
[4].https://cloud.ibm.com/docs/services/blockchain/howto?topic=blockchain-ibp-console-build-network