BLOCKCHAIN BASED COUNTERFEIT MEDICINE AUTHENTICATION SYSTEM

A PROJECT REPORT

submitted by

MUHAMMED SHAMEEM M (EKC19CS039)

to

The APJ Abdul Kalam Technological University
in partial fulfillment of the requirements for the award of the degree

of

Bachelor of Technology
In
Computer Science and Engineering

Department of Computer Science and Engineering
Eranad Knowledge City Technical Campus
Manjeri
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DECLARATION

I undersigned hereby declare that the project report ”Blockchain Based Counterfeit Medicine Authentication System” submitted for partial fulfillment of the requirements for the award of the degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of Assistant Professor, Ms. Karishma P K. This submission represents my ideas in my own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources. I also declare that we have adhered to the ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma, or similar title of any other University.

Place:
Date:

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MANJERI, MALAPPURAM, KERALA

CERTIFICATE

This is to certify that the report entitled **'Blockchain Based Counterfeit Medicine Authentication System'** submitted by **'Muhammed Shameem M'** to the APJ Abdul Kalam Technological University in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Department of Computer Science and Engineering, Eranad Knowledge City Technical Campus, Manjeri, Malappuram-676122 is a bonafide record of the project presentation carried out by her under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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ABSTRACT

For a few decades, it is a very big challenge to monitor and keep track of genuine medicine in health care. Lacking a trust system and strong monitoring authority, syndicates can make counterfeit medicine easily. With the shifting of life-critical healthcare, it becomes an emergency to ensure substandard drugs. Because counterfeit medicine has a deadly effect on the human body and has disastrous results. To detect the falsified medicine, we proposed a drug tracing system using blockchain technology. Our system is able to detect substandard and anomaly drugs from manufacturer company to patient's hand. Also can verify the defective and expired drugs in the market using smartphones by scanning QR (Quick Response) code. Blockchain security could make the system more transparent and reliable. This paper aims to ensure drug quality, transaction security, and data safety using blockchain technology.

keywords: *blockchain, security, smartphone, traceability, counterfeit.*

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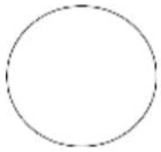
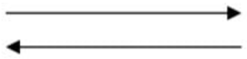
ABBREVIATIONS

LED	Light-emitting diode
QR	Quick Response
USD	United States Dollar
RFID	Radio Frequency Identification
CVR	Central Verification Register

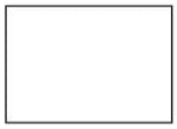
LIST OF SYMBOLS



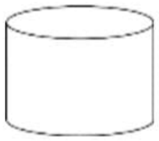
Circle represents process



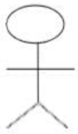
Lines with arrow head represent data flow



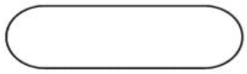
Rectangle represents input/output



Disk represents database



Actor represents Users



Activity performed in activity diagram

CHAPTER 1

INTRODUCTION

Counterfeit medicine authentication is essential for patients' health and business operations. Counterfeiting of several products creates many issues for various manufacturing sectors and causes serious threats to medicine. This is very harmful to public health and also creates profit loss to the pharmaceuticals company. The yearly sales of counterfeit products in the world is 650 billion USD reported on the International Chamber of Commerce of Geneva [8]. To trace counterfeit drugs already several techniques have been used in the medicine supply chain. Authors in [9], proposed the usage of barcode or RFID code on medicine for verifying its legitimacy. Same as, a Data-Matrix tracking process has been proposed in [10], where every medicine has a Data-Matrix where contains Id of Product, Id of Manufacturer ID, unique ID of the package, the authentication code and optional metadata. The central verification register (CVR) is also mentioned. Most of the authors use RFID to their works on the medicine supply chain [1, 2, 10]. But implementation of RFID is costly according to medicine price. In this paper we present a prototype of blockchain system for medicine traceability and regulation that rebuilds the full service architecture, ensuring authenticity and privacy of traceability data, and meantime achieves a ultimately stable blockchain data storage. Pseudocode explains the practical workflow of the medicine supply chain has also been given. This paper is arranged as follows. Blockchain based medicine traceability related works, Design framework of our prototype is explained from three aspects from four aspects, Medicine Supply Chain Data Storage in blockchain, Detecting counterfeit medicine, and Methodology for the prototype work.

1.1 Objective

The project's goal is to authenticate fake medications. From the manufacturer business to the patient's hand, our technology can identify inferior and abnormal medications. Smartphones can also use QR (Quick Response) codes to check for expired and faulty medications on the market. The system might become more trustworthy and transparent thanks to blockchain security.

1.2 Problem Definition

Nowadays counterfeit medicines are being sold in the medical shop and patients who buy and use them unknowingly are vulnerable. We need to develop a safer solution to prevent these counterfeit medicine from being sold on the market. The problem is actually starts from the traditional supply chain of the drugs. Instead of this traditional supply chain using blockchain technology, we can use digital supply chain to protect the privacy of the drugs and prevent the spread of spurious drugs.

1.3 Motivation

The counterfeiting of medicines causes a severe threat to society. The counterfeit medicines make an untoward impression on the health of the people and also cause revenue loss to the legitimate medicine manufacturing establishments. The defective supply chain system is also the reason for counterfeit drugs in the pharmaceutical industry. Thus far various anti-counterfeiting techniques have been offered, but most of the existing systems are not good. Blockchain technology is one of the best alternatives in a series where we need data privacy and data access at the same time. Thus we are attempting to assure the caliber of the drug, the refuge of the transaction, and the surety of the data by using blockchain technology.

CHAPTER 2

LITERATURE SURVEY

For this study project, we have selected a few references from systems with similar functionality. All the systems have been thoroughly compared in order to determine what they all need and how our project may fill that gap.

2.1 A Novel Blockchain Based Product Ownership Management System (POMS) for Anti Counterfeits in the Post Supply Chain[1]

They proposed a novel blockchain-based product owner-ship management system (POMS) for the post supply chain, which makes the efforts of counterfeiters to clone genuine tags redundant since they cannot prove the possession of products on this system. Firstly, the overall practical system requirements have been identified. Then, we have introduced a full-fledged protocol that enables each party, including supply chain partners and customers, to transfer and prove the ownership of RFID tag-attached products. An important advantage of the proposed POMS is that customers can reject the purchase of counterfeits, even with a genuine EPC, under the condition that the seller does not possess their owner- ship. The protocol validation has been shown the validity of our POMS. Based on the proposed protocol, a proof-of- concept experimental system has been implemented on the Ethereum platform.

To realize such a POMS, they leverage the idea of Bitcoin, a decentralized cryptocurrency system in which the possession of user's balance can be proven in the public ledger referred to as blockchain. Specifically, they replace its concept of "proof of possession of balance" with an equivalent concept which we will refer to as "proof of possession of products". A few startup companies have just started (or soon plan to start) services with the blockchain for managing the gen- uineness of products. For example, Everledger appears to be the most successful service specific for dia- monds. Everledger offers a permanent ledger for diamond certification and related transaction history. This special ledger is used for verification for insurance company, owners, claimants and law enforcement. Another example is Blockverify which appears to use the blockchain tech- nology for pharmaceuticals and luxury items3. However, no details whatsoever are available publicly about the proto- col of such commercial services, meaning that its security and privacy issues cannot be reviewed in the context of our paper. Nevertheless, it is clearly of importance to propose a rigor- ous and transparent protocol for blockchain-based POMS.

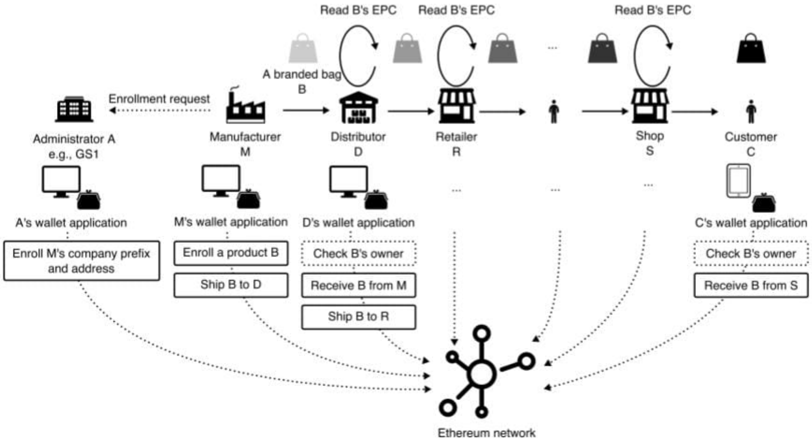


Figure 2.1: Detailed block diagram of the proposed POMS [1]

The design illustrates the detailed system model of the proposed POMS, where two groups of parties are identified. The first one belongs to the supply chain, that is, an administrator, such as GS1, manufacturers, distributors, and retailers. The second group belongs to the post supply chain parties, that is, second hand shops and consumers. Each party possesses Ethereum accounts and manages them with a wallet application operat- ing on personal computers or smartphones/tablets. Next, the procedures on each party in (i) the supply chain and (ii) the post supply chain, will be presented.

Advantages

- Customers can reject the purchase of counterfeits, even with a genuine EPC, under the condition that the seller does not possess their owner- ship.

- The protocol validation has been shown the validity of our POMS.

Disadvantages

- Using RFID code is high costly.

2.2 A Supply Chain Traceability System for Food Safety Based on HACCP, blockchain IOT [2]

In this article, we proposed a new decentralized traceability system based on internet of things and blockchain technology, and explored the challenges in scaling blockchains in general. Moreover, an example scenario was given to demonstrate how it works in the food supply chain with HACCP. This system will deliver real-time information to all supply chain members on the safety status of food products, extremely reduce the risk of centralized information systems, and bring more secure, distributed, transparent, and collaborative. Our system can significantly improve efficiency and transparency of the food supply chain, which will obviously enhance the food safety and rebuild the consumer's confidence in the food industry.

The proposed system is a typical decentralized distributed system, which uses Internet of things (like RFID, WSN, GPS) to collect and transfer, relies on BigchainDB to store and manage relevant data of products in food supply chains. There are many members among the supply chain, including suppliers, producers, manufacturers, distributors, retailers, consumers and certifiers. Each of these members can add, update and check the information about the product on the BigchainDB as long as they register as a user in the system. Each product is attached with a tag (RFID), which is a unique digital cryptographic identifier that connects the physical items to their virtual identity in the system. This virtual identity can be seen as the product information profile. Users in the system also have their digital profile, which contains the information about their introduction, location, certifications, and association with products.

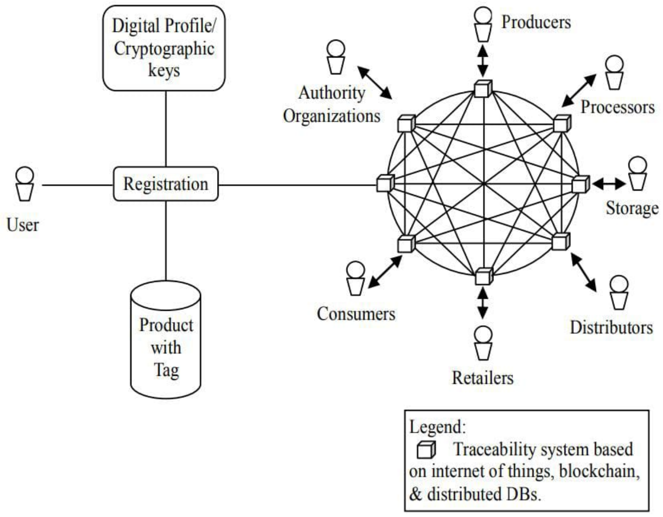


Figure 2.2: Conceptual framework of a blockchain based system [2]

As shown in The proposed system is a typical decentralized distributed system, which uses Internet of things (like RFID, WSN, GPS) to collect and transfer, relies on BigchainDB to store and manage relevant data of products in food supply chains. There are many members among the supply chain, including suppliers, producers, manufacturers, distributors, retailers, consumers and certifiers. Each of these members can add, update and check the information about the product on the BigchainDB as long as they register as a user in the system. Each product is attached with a tag (RFID), which is a unique digital cryptographic identifier that connects the physical items to their virtual identity in the system. This virtual identity can be seen as the product information profile. Users in the system also have their digital profile, which contains the information about their introduction, location, certifications, and association with products.

Advantages

- This system can significantly improve efficiency and transparency of the food supply chain.
- It enhance the food safety and rebuild the consumer's confidence in the food industry.

Disadvantages

- When an error occurs in the smart contract, we cannot pinpoint the exact location of the error.

2.3 On the Integration of Event Based and Transaction Based Architectures for Supply Chainst [3]

This paper introduces a framework that supports supply chain visibility by using a hybrid P2P architecture. Two types of peers are considered, namely X86 peers and mobile peers. Both have the same software architecture but differ in their implementation. Mobile peers have additional function- alities in order to allow them to act as field sensory agents. In addition, an administrative node is introduced in the frame- work in order to help with mobile peers availability, create a persistent record of the exchanges, and facilitate transfer of information between the organizations ERP systems and the proposed HP3D. The proposed framework also introduces a blockchain data model which is based on both private and semi-public ledgers. This model takes advantage of the data validity afforded by the public blockchain ledger while protecting the privacy of the trading partners through the shipmentcentric private sub-ledger. Future work includes further de- velopment and testing of the semi-public ledger and the associated mechanisms for key distribution. Additionally, they would like to investigate suitable sizes for blocks and the time complexity of queries to the semi-public ledger as the number of trucks and the number of monitors increases.

The architecture of the proposed hybrid P2P physical distribution (HP3D) framework consists of a collection of dynamic P2P sub-networks. These sub-networks are created on demand, emulate the end-to-end movement of the ship- ment and terminate when the delivery of goods is completed. Each sub-network allows stakeholders to share information related to a given shipment and provides them with real-time visibility in the physical distribution segment of the supply chain. There are three types of components in HP3D: index server, peers and administrative nodes

Advantages

- The proposed HP3D is based on a P2P architecture which are becoming equally accessible to small, medium as well as large businesses.

Disadvantages

- This configuration addresses the increased traffic issue of the pure P2P configuration but at the expense of an increase in network management complexity.

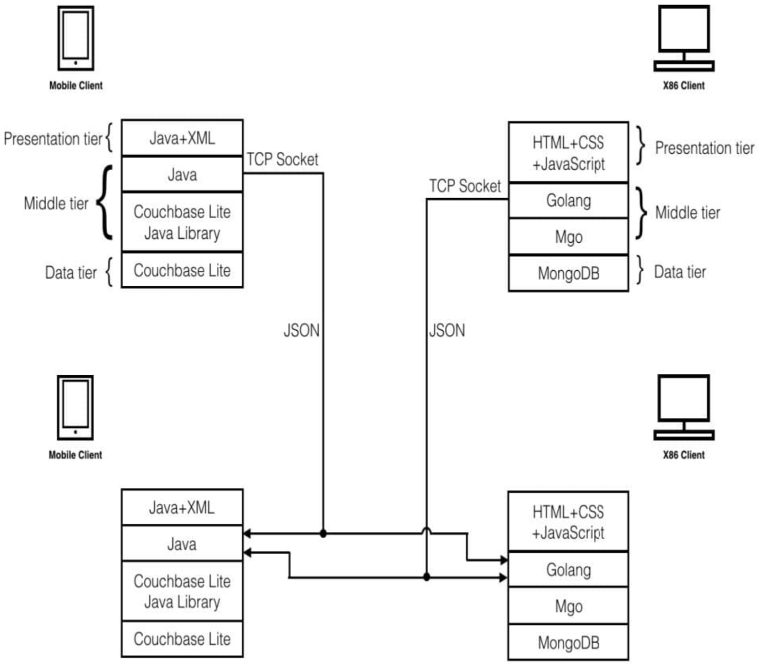


Figure 2.3: P2P Communication Flow [3]

2.4 Blockchains Everyhere - A Use-case of Blockchain in the Pharma Supply-Chain [4]

Blockchains are on the top of the Gartner Hype Cycle 2016 and many start-ups are integrating blockchains into their technology portfolio. While blockchains have emerged in the context of financial applications, non-financial application areas are of interest as well. In this paper, modum.io is presented, a start-up that uses IoT (Internet of Things) sensor devices leveraging blockchain technology to assert data immutability and public accessibility of temperature records, while reduc- ing operational costs in the pharmaceutical supply-chain. The medical industry has many complex and strict environmental control process (e.g., temperature and humidity) to ensure quality control and regulatory compliance over the transport of medical products. The sensor devices monitor the temperature of each parcel during the shipment to fully ensure GDP regulations. All data is transferred to the blockchain where a smart contract assesses against the product attributes. As modum.io is not the only non-financial start-up working with blockchains, a list of areas and other start-ups is provided that aim to reduce bureaucracy, distribute the infrastructure, and saving costs using blockchains.

Blockchain technology provide a decentralized and trusted consensus in which data of medical products during the logistics process can be stored and accessed by both parties being ensured by a smart contract. The idea of smart contracts is to have a protocol or code representing a contract that is self-executing, making a contractual clause and the inclusion of a trusted third party, like a notary service, unnecessary by exchanging it with the consensus system provided by the blockchain. From a business point of view, blockchain and smart contracts allows to reduce the number of intermediaries, while compliance with GDP regulations is ensured by a smart contract self-executing on the data stored in the blockchain. Therefore, reducing the number of intermediaries in the lo- gistics process, less manual intervention will be required, reducing both the operational expenses and the manipulation risks.

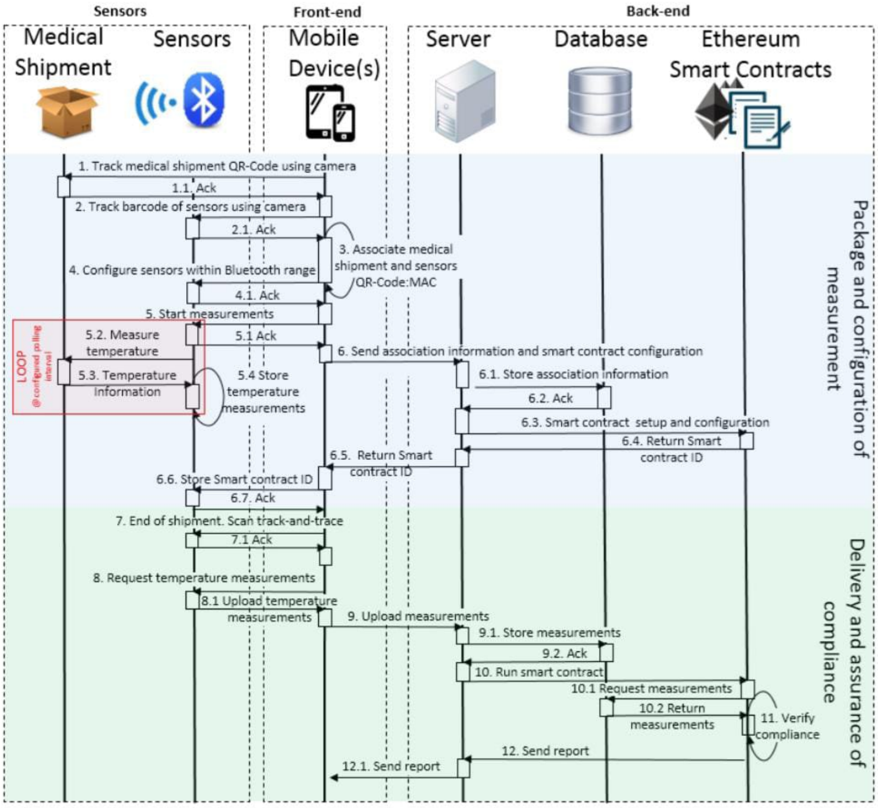

Sensors
Front-end
Back-end
Medical Shipment
Sensors
Mobile Device(s)
Server
Database
Ethereum Smart Contracts
1. Track medical shipment QR-Code using camera
1.1. Ack
2. Track barcode of sensors using camera
2.1. Ack
3. Associate medical shipment and sensors QR-Code:MAC
4. Configure sensors within Bluetooth range
4.1. Ack
5. Start measurements
5.1 Ack
5.2. Measure temperature
5.3. Temperature information
5.4 Store temperature measurements
LOOP
@configured polling interval
6. Send association information and smart contract configuration
6.1. Store association information
6.2. Ack
6.3. Smart contract setup and configuration
6.4. Return Smart contract ID
6.5. Return Smart contract ID
6.6. Store Smart contract ID
6.7. Ack
7. End of shipment. Scan track-and-trace
7.1 Ack
8. Request temperature measurements
8.1 Upload temperature measurements
9. Upload measurements
9.1. Store measurements
9.2. Ack
10. Run smart contract
10.1 Request measurements
10.2 Return measurements
11. Verify compliance
12. Send report
12.1. Send report
Package and configuration of measurement
Delivery and assurance of compliance

Figure 2.4: Modum.io AG Sequence Diagram [4]

Temperature monitoring is initiated with the Android client. To start the process, a sensor device needs to be within Bluetooth range. As a first step, a track-and-trace number, which is typically found on the packet, has to be associated with the MAC-address of the sensor device. Since both, track-and-trace number and MAC-address are barcodes, respectively QR-codes, the An- droid client captures both with its camera. After this process, the Android client starts via Bluetooth LE the temperature measurements on the sensor device, and sends the track- and-trace number/MAC-address association to the server. The sensor also stores the track-and-trace number in case no server access is provided. Thus, a package that has been sent, always has an association between its MAC-address and the current track-and-trace number. The server stores the association and creates, broadcasts the smart contract, and stores the smart contract ID on the sensor device. Now the sensor device can be placed inside the medical products packet. The sensor device is recording every 10 minutes the temperature and stores it in the internal memory on the sensor device.

Advantages

- Participants may driven by the system-inherent proof of a transaction interact reliably and trustworthy without any third party.

Disadvantages

- It only uses the blockchain to store the report; it does not provide the concept of medicine verification, authenticity, or availability.

2.5 Blockchain Technology in Healthcare The Revolution Starts Here [5]

Blockchain technology has shown its considerable adaptability in recent years as a variety of market sectors sought ways of incorporating its abilities into their operations. While so far most of the focus has been on the financial services industry, several projects in other service related areas such as healthcare show this is beginning to change. Numerous starting points for Blockchain technology in the healthcare industry are the focus of this report. With examples for public healthcare management, user-oriented medical research and drug counterfeiting in the pharmaceutical sector, this report aims to illustrate possible influences, goals and potentials connected to this disruptive technology.

The examples described, show that Blockchain offers numerous opportunities for usage in the healthcare sector, e.g. in public health management, user-oriented medical research based on personal patient data as well as drug counterfeiting. The immense potential of this technology shows up wherever, until now, a trusted third party was necessary for the settlement of market services. With Blockchain, direct transactions suddenly become possible, whereby a central actor, who controlled the data, earned commission or even intervened in a censoring fashion, can be eliminated. This disruptive character, which underlies Blockchain technology, will strongly affect the balance of power between existing market players in healthcare. It will also promote new digital business models and digital health initiatives. Due to the fact that, in the future, (data) intermediaries can be avoided, this technology opens new doors with respect to how market interactions in healthcare can be conducted. Blockchain thus has an immense potential for the future and will show disruptive changes in the healthcare industry.

Advantages

- The immense potential of this technology shows up wherever, until now, a trusted third party was necessary for the settlement of market services. With Blockchain, direct transactions suddenly become possible, whereby a central actor, who controlled the data, earned commission.

Disadvantages

- Statistics tool is to use to illustrate the important order of factor based on industry.

2.6 Benefits and Guidelines for Utilizing Blockchain Technology in Pharmaceutical Supply Chains [6]

This thesis, I explore how blockchain technology can improve pharmaceutical supply chain operations and discuss how the technology should be implemented. Furthermore, I study how the life science company Bayer's pharmaceutical division can utilize blockchain technology in its supply chain operations.

I begin by defining the concepts of blockchain technology, smart contracts and pharmaceutical supply chain. Then I discuss the benefits and implementation in different sections: participating entities and information flow, contracts and payments, logistics, transparency and product security and blockchain infrastructure and governance.

Both Bayer and the industry as a whole can benefit from blockchain technology. Blockchain enables for example efficient, safe and private transactions, product transparency and security and open information sharing without exposing trade secrets. For the first time a platform for all stakeholders can be developed that enables transacting information and value simultaneously.

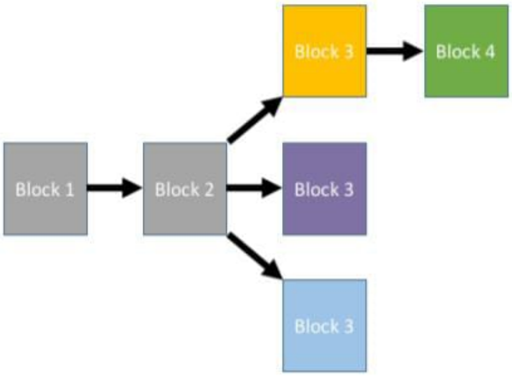


Figure 2.5: Different versions of one blockchain. The longest one will be adopted in the network.[6]

This is then the longest chain in the whole network and all nodes will eventually adopt this fork (Decker Wattenhofer, 2013). Taking into account that it takes ten minutes on average to create one block, this transition does not take long. This mechanism ensures that consensus can be reached in a peer-to-peer network. Because a blockchain can have several forks, transactions only become secure after a few further blocks are created. Transactions in abandoned forks are transferred back to the pool of unverified transactions and get eventually added to the longest chain.

Advantages

- The benefits and implementation were discussed in the parts of participating entities and information flow, contracts and payments, logistics, transparency and product security, and also blockchain infrastructure and governance.
- Blockchain technology provides a platform for transactions and contracts.
- No central intermediary is needed to perform transactions on the blockchain.

Disadvantages

- It is hard to correct a mistake or make any necessary adjustments.

2.7 Untangling Blockchain: A Data Processing View of Blockchain Systems [7]

Blockchain technologies are gaining massive momentum in the last few years. Blockchains are distributed ledgers that enable parties who do not fully trust each other to maintain a set of global states. The parties agree on the existence, values, and histories of the states. As the technology landscape is expanding rapidly, it is both important and challenging to have a firm grasp of what the core technologies have to offer, especially with respect to their data processing capabilities. In this paper, they first survey the state of the art, focusing on private blockchains (in which parties are authenticated). We analyze both in-production and research systems in four dimensions: distributed ledger, cryptography, consensus protocol, and smart contract. We then present BLOCKBENCH, a benchmarking framework for understanding performance of private blockchains against data processing workloads. We conduct a comprehensive evaluation of three major blockchain systems based on BLOCKBENCH, namely Ethereum, Parity, and blockchain and database systems. Drawing from design principles of database systems, we discuss several research directions for bringing blockchain performance closer to the realm of databases.

In this paper, they have conducted a comprehensive survey on blockchain technologies. We laid out four underpinning concepts behind blockchains and analyzed the state of the art using these concepts. We presented our benchmarking framework, BLOCKBENCH which is designed to evaluate performance of blockchains as data processing platforms. Finally, we discussed four potential research directions, inspired by database design principles, for improving blockhchain performance. We hope that the survey and benchmarking framework would serve to guide the design and implementation of future blockchain systems that are not only secure, but scalable and usable in the real world.

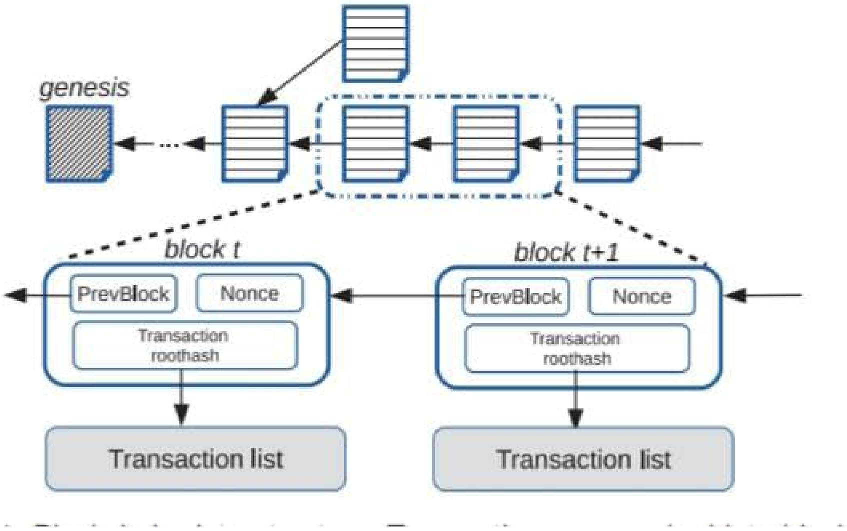


Figure 2.6: Blockchain data structure. Transactions are packed into blocks which are linked to previous blocks. [7]

The above-mentioned system shows the blockchain data struc- ture, in which each block is linked to its predecessor via a cryptographic pointer, all the way back to the first (genesis) block. Because of this, blockchain is often referred to as a distributed ledger.

Advantages

- The results demonstrate several trade-offs in the design space, as well as big performance gaps between blockchain and database systems.

Disadvantages

- They only focus on crypto-currencies, which is an important block- chain application but it does not fully represent the poten- tial of blockchain as a data processing platform.

CHAPTER 3

REQUIREMENT STUDY AND ANALYSIS

System Analysis is a systematic process of gathering, recording, and interpreting facts. It also includes studying the problems encountered in the present systems and planning the development of a system that could overcome the problems.

3.1 Hardware And Software Requirements

3.1.1 Hardware Requirements

- Monitor
- Mouse
- Keyboard
- Ram

3.1.2 Software Requirements

1. **Operating System : Windows 10**

   Windows 10 is a Microsoft operating system for personal computers, tablets, embedded devices and internet of things devices.Microsoft released Windows 10 in July 2015 as a follow-up to Windows 8. Windows 10 has an official end of support date of October, 2025, with Windows 11 as it's successor.

2. **Front End : Python**

   Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.Often, programmers fall in love with Python because of the increased productivity it provides. Since there is no compilation step, the edit-test-debug cycle is incredibly fast. Debugging Python programs is easy: a bug or bad input will never cause a segmentation fault. Instead, when the interpreter discovers an error, it raises an exception. When the program doesn't catch the exception, the interpreter prints a stack trace. A source level debugger allows inspection of local and global variables, evaluation of arbitrary expressions, setting breakpoints, stepping through the code a line at a time, and so on. The debugger is written in Python itself, testifying to Python's introspective power. On the other hand, often the quickest way to debug a program is to add a few print statements to the source: the fast edit-test-debug cycle makes this simple approach very effective.

Figure 3.1: Logo of Python

3. **Back End : Mysql**

MySQL is the world's most popular open source database. According to DB-Engines, MySQL ranks as the second-most-popular database, behind Oracle Database. MySQL powers many of the most accessed applications, including Facebook, Twitter, Netflix, Uber, Airbnb, Shopify, and Booking.com. Since MySQL is open source, it includes numerous features developed in close cooperation with users over more than 25 years. So it's very likely that your favorite application or programming language is supported by MySQL Database.

3.2 Functional Requirements

These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike the non-functional requirements. A system should provide a statement of service which describes how system reacts to inputs provided and should be clear and how a system reacts in a particular situation. Functional requirements are type of requirements that depends upon type of software as different software has a different functional requirement, system on which software is used as it heavily affects functions of software and users to fulfill their requirements. Functional requirement of users is high-level abstract statements. it generally describes of what system should whenever required but system functions should be described in detail by functional system requirements.

3.3 Non Functional Requirements

These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioural requirements. They basically deal with issues like:

- Portability
- Security
- Reliability
- Scalability
- Performance
- Reusability
- Flexibility

It simply focuses on how the end product works and it is not very easy and hard to find out non-functional requirements and captured as a quality attribute. Testing includes performance, stress, security testing, etc. Non-functional requirements are more disapproved and if the non-functional requirements are not fulfilled then complete system is of no use.

3.4 Feasibility Analysis

3.4.1 Technical Feasibility

This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology. The assessment is based on an outline design of system requirements in terms of Input, Output, Fields, Programs, and Procedures. This can be qualified in terms of volumes of data, trends, frequency of updating etc. in order to give an introduction to the technical system. The system requires normal configuration computer system that are commonly available. The software requirements are Python and Android, Windows 8 or higher versions of OS. Thus proposed system is technically feasible.

3.4.2 Operational Feasibility

This analysis involves how it will work when it is installed and the assessment of political and managerial environment in which it is implemented. People are inherently resistant to change and computers have been known to facilitate change. The new proposed system is very much useful to the users and there for it will accept a broad audience. The proposed system offers: Greater user friendliness Better output which can be easily interpreted. Higher speed. Meets the requirements of the organizations.

3.4.3 Economic Feasibility

This involves questions such as whether the firm can afford to build the system, whether its benefits should substantially exceed its costs, and whether the project has higher priority and profits than other projects that might use the same resources. This also includes whether the project is in the condition to fulfil all the eligibility criteria and the responsibility of both sides in case there are two parties involved in performing any project. This study presents tangible and intangible benefits from the project by comparing the developments and operational costs. The technique of cost benefit analysis is often used as a basis for assessing economic feasibility. This system needs some more initial investment than the existing system, but it can be justifiable that it will improve the quality of service. Thus, feasibility study should centre along the following points: Improvement resulting over the existing method in terms of accuracy, timeliness. Cost comparison. Estimate on the life expectancy of the hardware. Overall objective.

CHAPTER 4

SYSTEM DESIGN AND DEVELOPMENT

4.1 System Architecture

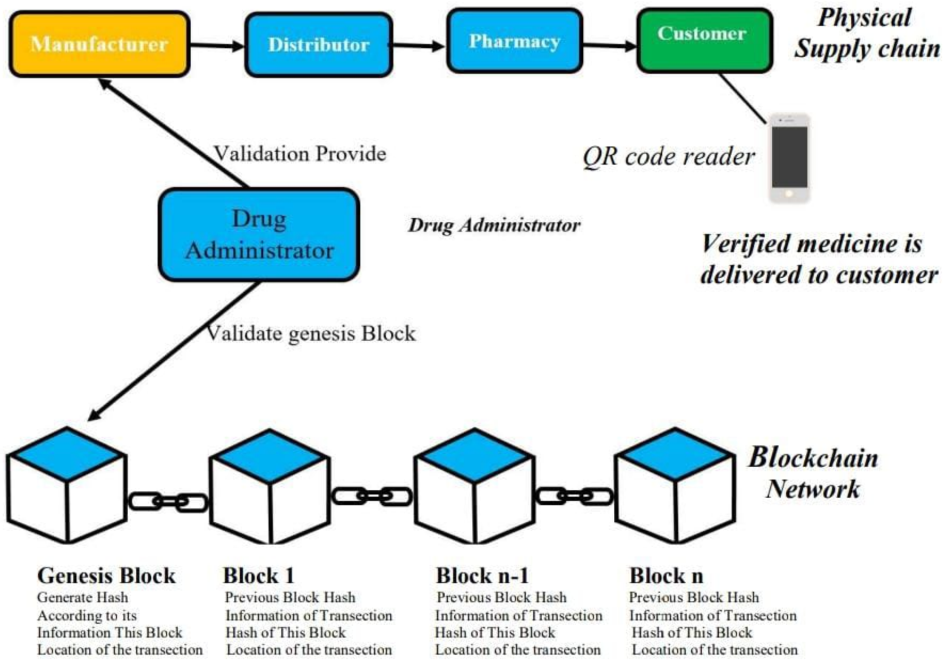


Figure 4.1: Work flow of the prototype

The methodology for prototype work is based on a private blockchain system, where all the participants have to get validation by the drug administrator.The public address of digital signature of a participant will also be provided by the drug administrator authority after, hence the participants are trusted on it.

There are some following steps that we take to ensure medicine safety in the transection of supply chain:

- Transaction between two participants in the network will consist of the public key of a sender, public key of a receiver and the transacted information which is sent by the sender such as basic information and quantity of medicine.

- The participants’ shared information will be encrypted in the block of the chain that can be only shown to the receiver. The quantity and timestamp only be visible to the network that everyone can see on the network.

- Along with the general information of the transaction, the current location of the transaction also added to the block.

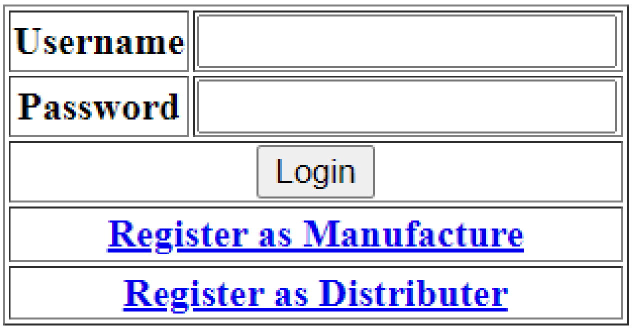
- When the transaction is successful, a new block will be added to the chain then it will be distributed to all the participants on the network and it will repeat in every transaction.

- We introduce a data reducing process in the blockchain where information of expired medicine will be removed from the network.

- Finally a customer can easily scan the QR code to check the validity of the medicine.

4.2 User Interface

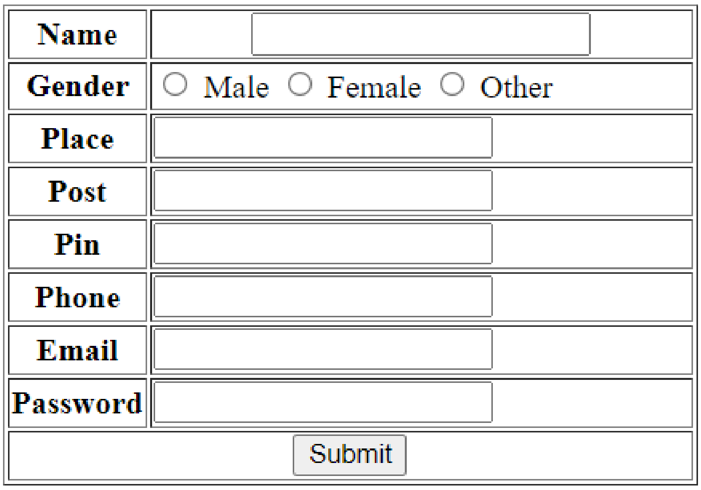
Login



Username	
Password	
Login	
Register as Manufacture	
Register as Distributer	

Figure 4.2: Login

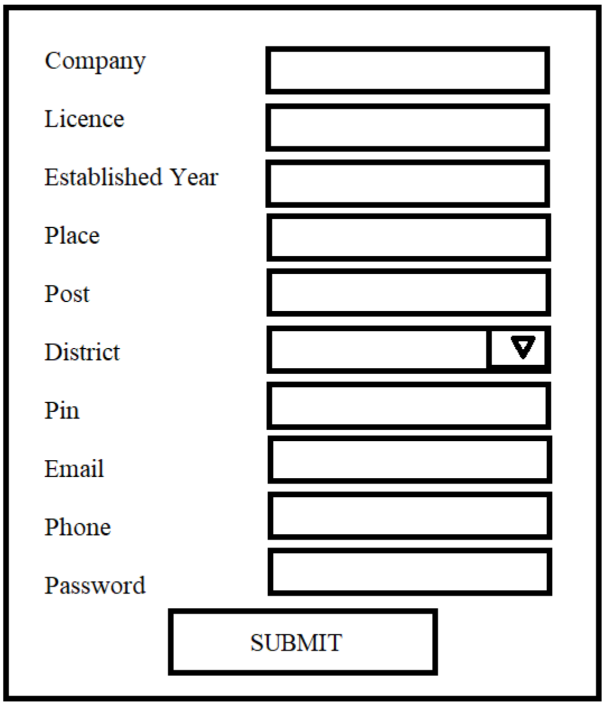
Distributer Sign Up



Name	
Gender	○ Male ○ Female ○ Other
Place	
Post	
Pin	
Phone	
Email	
Password	
Submit	

Figure 4.3: Distributer Sign Up

Manufacture Sign Up



Company

Licence

Established Year

Place

Post

District ▽

Pin

Email

Phone

Password

SUBMIT

Figure 4.4: Manufacture Sign Up

Admin Home

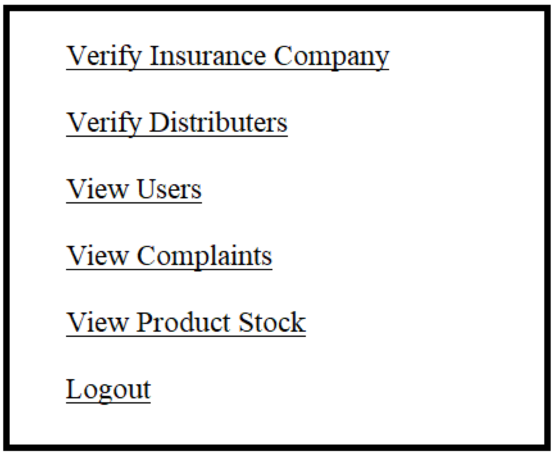
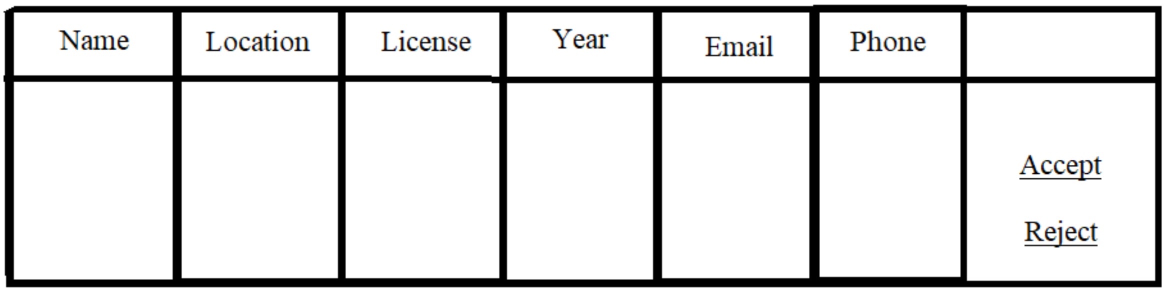


Figure 4.5: Admin Home

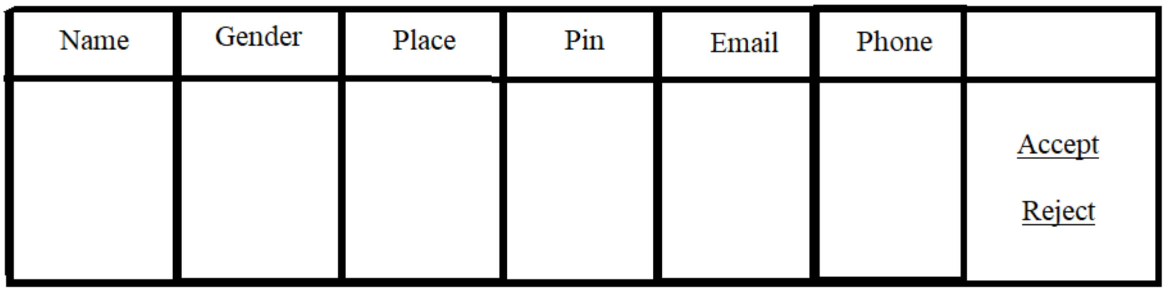
Verify Insurance Company



Name	Location	License	Year	Email	Phone	
						Accept Reject

Figure 4.6: Verify Insurance Company

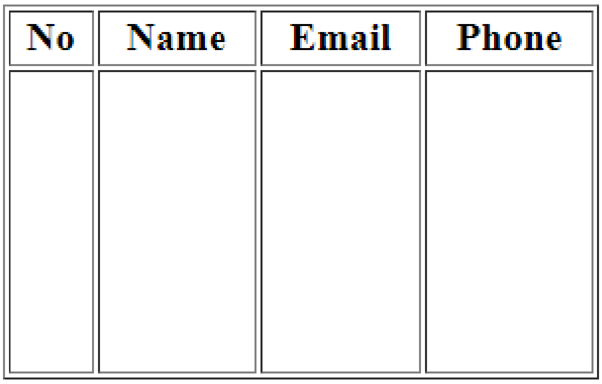
Verify Distributers



Name	Gender	Place	Pin	Email	Phone	
						Accept Reject

Figure 4.7: Verify Distributers

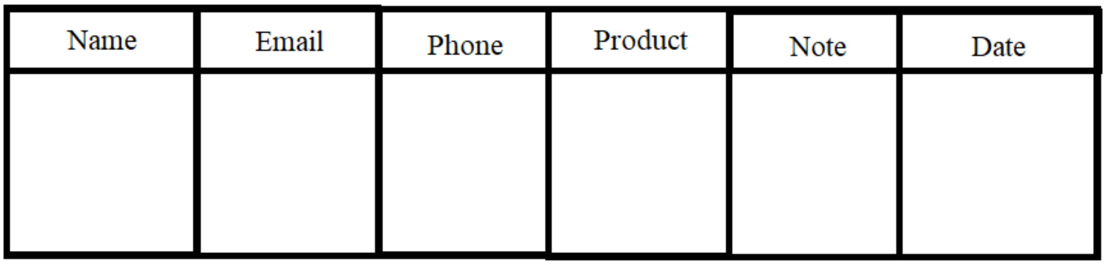
View Users



No	Name	Email	Phone

Figure 4.8: View Users

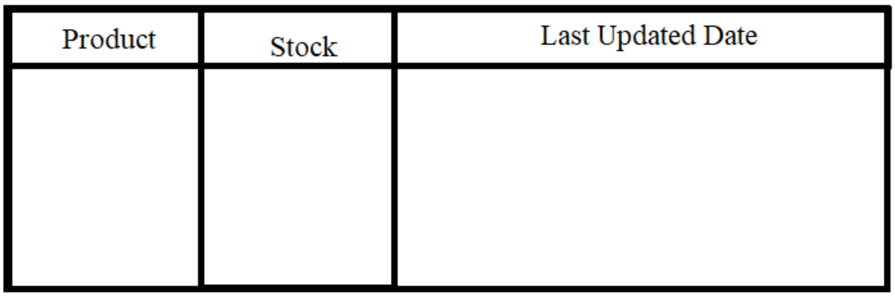
View Complaints



Name	Email	Phone	Product	Note	Date

Figure 4.9: View Complaints

View Product Stock



Product	Stock	Last Updated Date

Figure 4.10: View Product Stock

Distributers Home

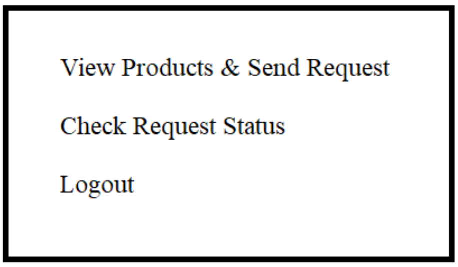


Figure 4.11: Distributers Home

Add Products

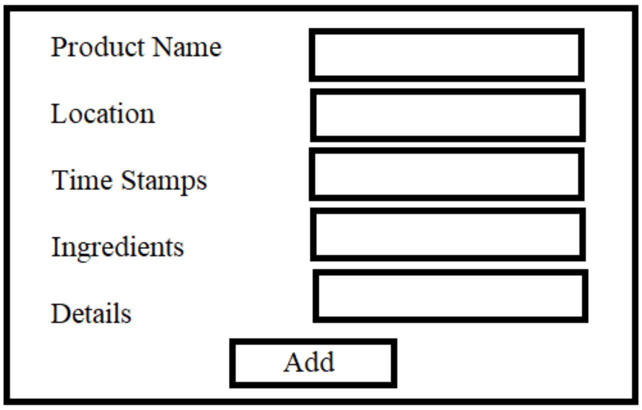
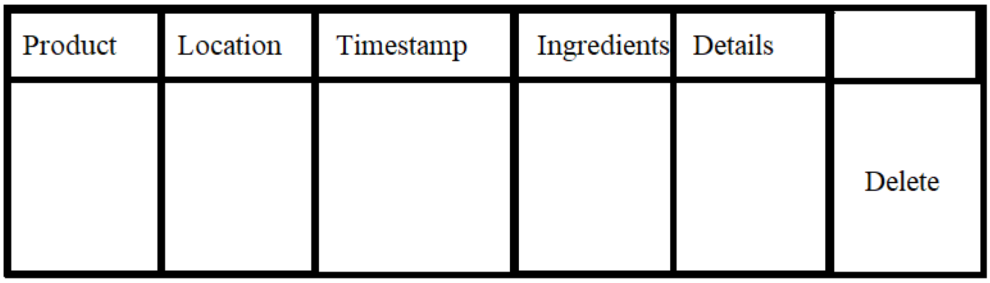


Figure 4.12: Add Products

View Products



Product	Location	Timestamp	Ingredients	Details	
					Delete

Figure 4.13: View Products

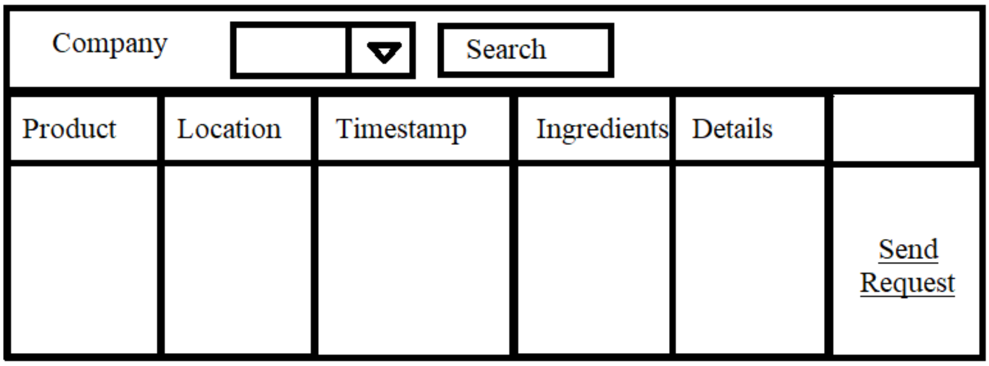


Figure 4.14: View Products

Send Request

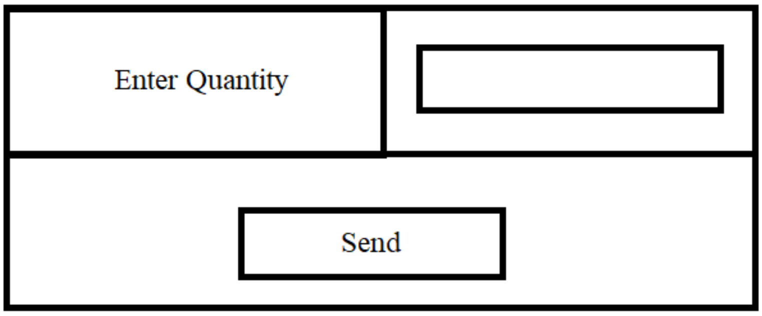


Figure 4.15: Send Request

Verify Request

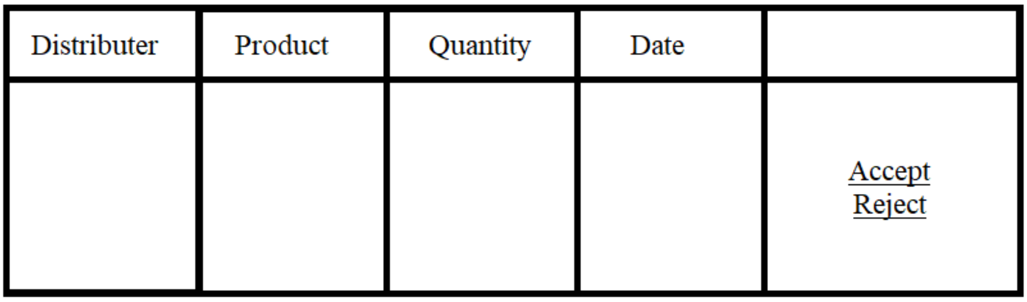
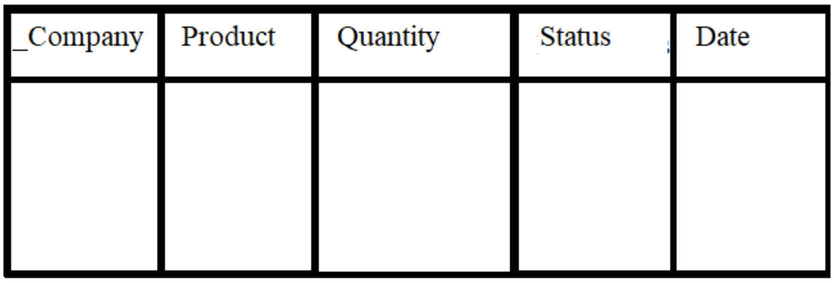


Figure 4.16: Verify Request

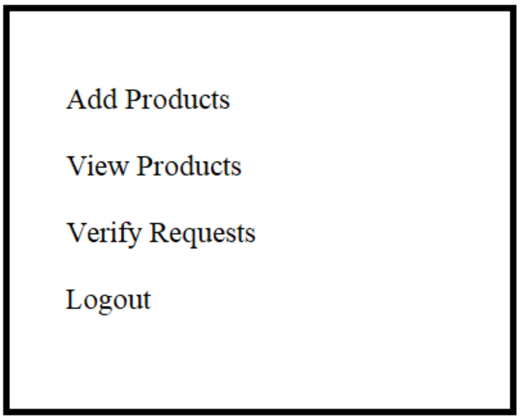
Check Request Status



_Company	Product	Quantity	Status	Date

Figure 4.17: Check Request Status

Company Home



Add Products

View Products

Verify Requests

Logout

Figure 4.18: Company Home

4.3 Modules

1. Administrator Module

This module is mainly meant for maintenance of the data in the dataset.The predictions are not guaranteed to be accurate at that stage. Proper monitoring and continuous improvement are required.Verification authority drug administration verifies several kinds of participants in the blockchain network.

Facilities:

- Accept/Reject distributor
- Accept/Reject request
- Accept/Manage shop
- Add products
- Block distributor

2. Distributor Module

A distributor is an intermediary entity between a producer of a product, or manufacturer, and a downstream entity in the distribution channel or supply chain.The distributor is an integral supply chain component, acting as an intermediary between the manufacturer and the downstream entity. The distributor bridges the gap between upstream and downstream entities while adding important services that help smooth the distribution process.

Facilities:

- Send request view status
- Accept/Reject Shop
- Update

3. Shop module

A pharmacy is a retail shop which provides pharmaceutical drugs, among other products. At the pharmacy, a pharmacist oversees the fulfillment of medical prescriptions and is available to counsel patients about prescription and over-the-counter drugs or about health problems and wellness issues.

Facilities:

- View distributor
- Send request
- View status
- Check fake products
- View block distributor

4. Customer module

It is the main module in which the user interacts with the website. A well-defined and user friendly interface is designed for user interaction. The customer can easily scan the QR code to check the validity of the medicine.

Facilities:

- Verify product

4.4 Data Flow Diagram

A data flow diagram (DFD) or a bubble chart is a graphical tool for structured analysis. DFD models a system by using external entities from which data flow to a process, which transforms the data and creates output data flows which go other process or external entities or files. Data in files may also flow to processes as inputs. DFDs can be hierarchically organized, which help in partitioning and analyzing large systems. As a first step, one dataflow diagram can depict an entire system which gives the system overview. It is called context diagram of level0 DFD. The context diagram can be further expanded. The successive expansion of a DFD from the context diagram to those giving more details is known as leveling of DFD. Thus a top down approach is used, starting with an overview and then working out the details. The main merit of the DFD is that it can provide an overview of what data a system would process, what transformation of data are done, what files are used, and where the results flow.

Level: 0

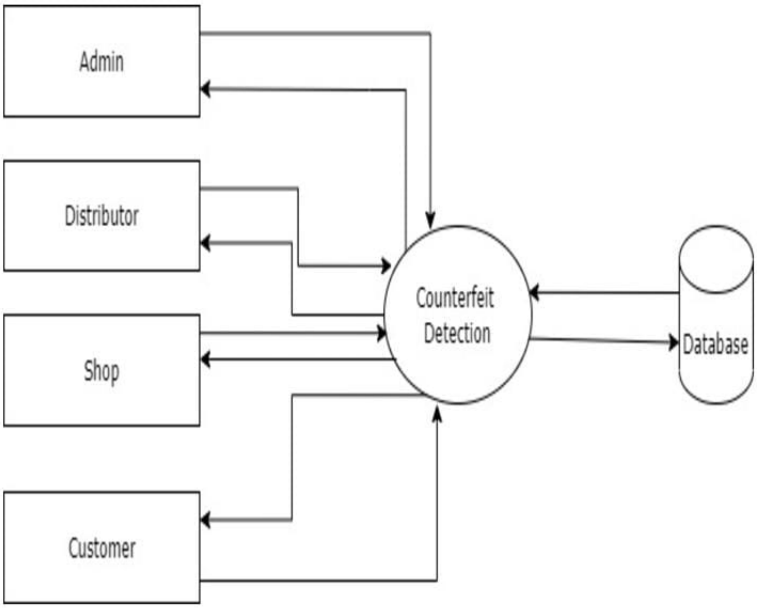


Figure 4.19: DFD Level 0

Level: 1.1

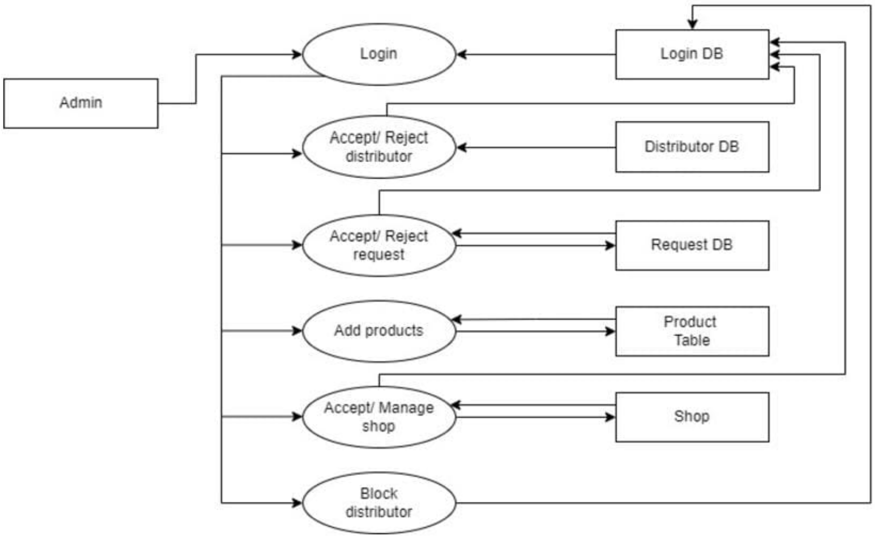


Figure 4.20: DFD Level 1.1

Level: 1.2

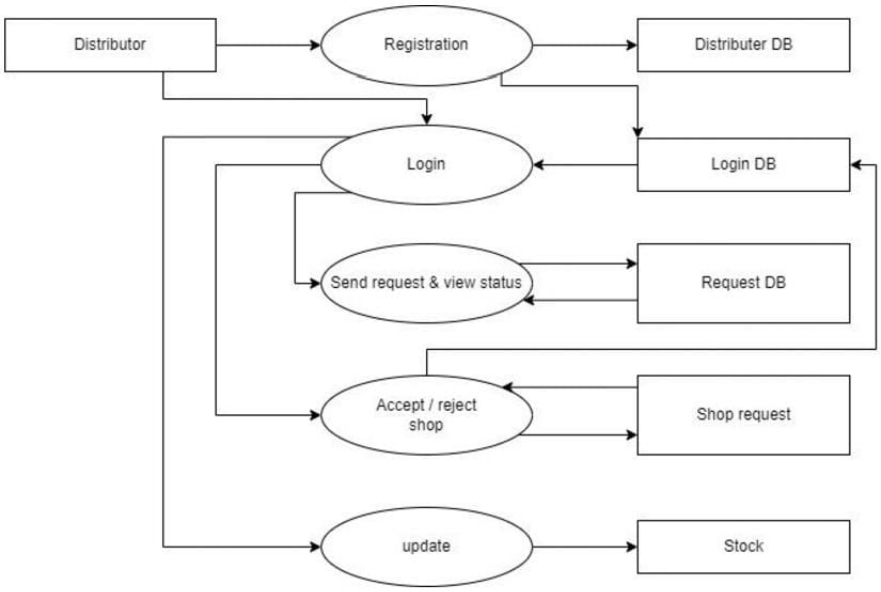


Figure 4.21: DFD Level 1.2

Level: 1.3

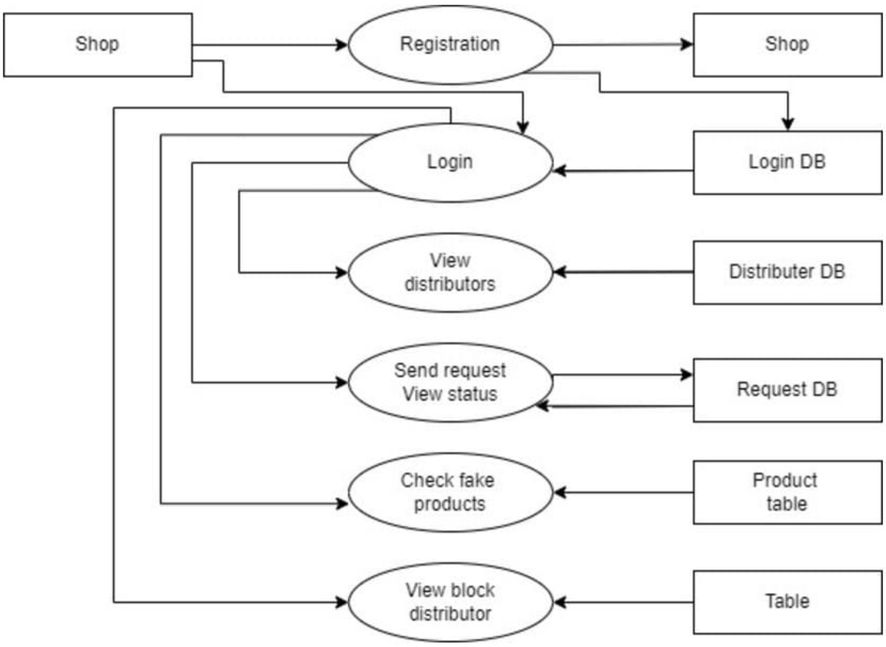


Figure 4.22: DFD Level 1.3

Level: 1.4

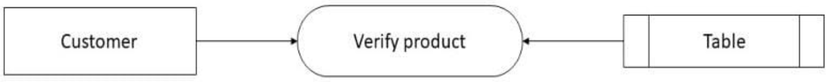


Figure 4.23: DFD Level 1.4

CHAPTER 5

SYSTEM IMPLEMENTATION

Implementation of the system refers to the final installing of the package in its real environment, to the satisfaction of the indeed users and the operation of the system. It is the process of converting a new or revised system design to operation. It is the key stage in achieving successful new system. The process of putting the developed system in actual use is called system implementation. This includes all those activities that take place to convert from the old system to new system. It must therefore be carefully planned and controlled. Proper guidance should be imparted to the users so that he is comfortable in using the application.

5.1 Methodology

At present, we developed a prototype mainly with python and Angular web application framework. The key modules of this prototype include the validation module, blockchain module, key generator module, and transaction logic module. There are some most popular open-source libraries used in the present worked prototype, as SHA256, elliptic, qrious, etc. The key generator module uses elliptic to generate a public and private key for the participants. The validation module gets the pending request of the participant validation and gives them the public and private keys using the key generation module. The validation process is maintained by the drug administrator. The transaction module makes the transaction between participants, when the transaction gets valid the blockchain module adds the transaction on a block to the chain. Currently, we run the prototype on localhost. We use windows 10 operating system to build and run the prototype. Mainly the project is built on pycharm. pycharm is an integrated development environment (IDE) used for programming in Python. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems, and supports web development with Django. Android framework is used for the frontend development. AngularJS is also a JavaScript-based opensource front-end web framework mainly maintained by Google and by a community of individuals and corporations to address many of the challenges encountered in developing single-page applications.

5.2 Implementation of Mobile Application

To develop a blockchain based counterfeit medicine authentication system, the implementation phase involved the utilization of Android and Java to create a mobile application. Android, a popular mobile operating system, provided the platform for building the application, while Java served as the primary programming language for its development. The software development environment was set up, including the installation of Android Studio, the official Integrated Development Environment (IDE) for Android app development. Android Studio provided the necessary tools, emulators, and libraries to create a feature-rich and interactive mobile application. The user interface of the mobile application was designed using XML, a markup language specifically for Android app layouts. XML allowed for the creation of visually appealing and accessible screens, ensuring a positive user experience for autistic children. The layout components were strategically organized, considering the cognitive and sensory needs of the target audience. The application's functionality was implemented using Java, a robust and widely-used programming language for Android development. Java provided a comprehensive set of libraries and frameworks, enabling the integration of various features into the learning management system.

5.3 Implementation of Website

In order to develop a blockchain based counterfeit medicine authentication system, the implementation phase involved the utilization of the Flask framework to create a dynamic website. Flask is a lightweight and flexible web framework written in Python, which provides the necessary tools and features for building web applications. To begin with, the software development environment was set up, including the installation of Python and the Flask framework. Additionally, other required packages and dependencies, such as MySQL for database management and WTForms for form validation, were installed to ensure the smooth functioning of the learning management system. The website's user interface was designed using HTML, CSS, and JavaScript to provide an engaging and interactive experience for autistic children. The Flask framework allowed for the seamless integration of these front-end technologies, enabling the creation of visually appealing and accessible web pages. The Flask framework facilitated the implementation of the various functionalities of the learning management system. Routes were defined to handle different URL requests, allowing users to navigate between different pages and access the desired content. Flask's template engine, Jinja2, was utilized to dynamically generate HTML pages by rendering data from the backend.

CHAPTER 6

TESTING

Software testing is the process of verifying a system with the purpose of identifying any errors, gaps or missing requirements versus the actual requirement. Software testing is broadly categorised into two types - functional testing and non-functional testing. Testing should be started as early as possible to reduce the cost and time to rework and produce software that is bug-free so that it can be delivered to the client. However, in Software Development Life Cycle (SDLC), testing can be started from the Requirements Gathering phase and continued till the software is out there in production. While doing testing, errors are noted, and correction is made. Testing is the process of correcting a program with intend of finding an error. Testing is vital to the system. A series of testing is performed for the proposed system before the system is ready for user acceptance testing success. of the system. Testing is vital to the success of the system. The common view of testing is to bring the program without errors. Software testing is a critical element of software quality assurance and represents the Ultimate review of specification, design, and code generation. In order to find the highest possible number of errors, tests must be systematically, and test cases must be designed using disciplined techniques.

Test procedure:

- Prepare the test case.
- Record the expected result and verify whether in tune with actual results.
- If actual results are not in tune with expected results, do necessary work.
- Test again and check the results.
- High probability of detecting errors.

To detect maximum errors, the tester should understand the software thoroughly and try to find the possible ways in which the software can fail. For example, in a program to divide two numbers, the possible way in which the program can fail is when 2 and 0 are given as inputs and 2 is to be divided by 0. In this case, a set of tests should be developed that can demonstrate an error in the division operator.

    - No Redundancy

    Resources and testing time are limited in the software development process. Thus, it is not beneficial to develop several tests, which have the same intended purpose. Every test should have a distinct purpose.

    - Choose the most appropriate test

    There can be different tests that have the same intent but due to certain limitations such as time and resource constraints, only a few of them are used. In such a case, the tests, which are likely to find a greater number of errors, should be considered.

- Moderate

  A test is considered good if it is neither too simple nor too complex. Many tests can be combined to form one test case. However, this can increase the complexity and leave many errors undetected. Hence, all tests should be performed separately.

6.1 Testing Methodologies

Functional Testing

Functional Testing is a type of Testing which verifies that each function of the software application operates in conformance with the requirement specification. It tests the behaviour of the software under test. This testing is not concerned with the source code of the application. Every functionality of the system is tested by providing appropriate input, verifying the output and comparing the actual results with the expected results. This testing involves checking of the user interface, Database, Security, Client Server applications and functionality of the application under Test. This testing can be done either manually or using automated tools. Each functionality of the software application is tested by providing appropriate test input, expecting the output and comparing the actual output with the expected output. E.g.- Unit testing, Smoke testing, User acceptance testing, Integration testing, and Regression testing.

Non-Functional Testing

Non Functional testing is a type of testing to check non-functional aspects (performance, usability, reliability, etc.) of a software application. It is explicitly designed to test the readiness of a system as per non-functional parameters which are never addressed by functional testing. This testing is equally important as functional testing and affects client satisfaction. It is not feasible to test this type manually, hence some special automated tools are used to test it. Eg: Performance testing, Volume testing, Usability testing, Load testing, Stress testing, Compliance testing, Portability testing, Disaster Recover testing.

6.2 Different Testing Strategies

Unit Testing

The first level of testing is called unit testing. Here the different modules are tested and the specification produced during the design for the modules. Unit testing is essential for verification of the goal and to test the internal logic of the modules. Unit testing is conducted on different modules of the project. Errors were noted down and corrected immediately and the program clarity was increased. The testing was carried out during the programming stage itself. In this step, each module is found to be working satisfactorily as regards to being expected of the module. In this test, two modules had tested and got the correct result as expected. For example, the Login page is tested against three different states that are a positive input, a negative input and a 0 input. Testing with positive input, and with a negative input will behave as expected. Testing with a 0 input however will yield a message to enter. This is just one example of why it makes sense to focus on testing the different states of your code.

Integration Testing

The second level of testing includes integration testing. It is the phase of software testing in which individual software modules are combined and tested as a group. Since a single module consist many forms and much of them are interconnected it was needed to check the working and flow of data items among these. At the same time tests are conducted to uncover errors with the interface. It need not to be the case, that software whose modules when run individually showing results will also show perfect results when run as a whole. The individual modules are tested again and the results are verified. The goal is to see if the modules integrated between the modules gives any error. The need for integrated test is to-find the overall system performance

This testing activity can be considered as testing the design and emphasises on testing modules interaction. This testing was done with sample data. The developed system has run successful for this sample data. The proposed system is tested step by step until the end of the related modules. The proposed system has modules that are integrated with their sub modules, all are linked within the main modules admin module and user module.

System Testing

Testing is an activity to verify that a correct system is being built and is performed with the intent of finding faults in the system. However not restricted to being performed after the development phase is complete, but this is to carry out in parallel with all stages of system development, starting with requirements specification. Testing results, once gathered and evaluated, provide a qualitative indication of software quality and reliability and serve as a basis for design modification if required. A project is said to be incomplete without proper testing. System testing is a process of checking whether the developed system is working according to the original objectives and requirements. The proposed system is tested experimentally with test data to ensure that system works according to the required specification. The system is found working, by testing it with actual data and has checked performance.

Validation Testing

Validation succeeds when the software function in a manner that can be reasonably accepted by the customer. After validation test has been conducted one of the two possible conditions exists. The function of performance characteristics confirms to specification and are accepted, or a deviation from specification is uncovered and a deficiency list is created. The validation testing provides the initial assurance of the proposed system. Whether the software needs all functional, behavioural and performance requirements. In validation testing it tests the data entered is valid or not. The proposed system under consideration has been tested by using validation testing and found to be working satisfactory. In proposed system validation testing, which is carried out in login form produces, When the user gives incorrect username and password it immediately displays a message such as invalid username and password. If the user gives valid user name and password, the user enters into the system and uses it. Thus, the validation testing is performed successfully.

Acceptance Testing

Acceptance testing is last phase in software testing process. It is a testing technique performed to determine whether or not the software system has met the requirement specifications. It is formal testing based on user requirements and function processing. The main purpose of this test is to evaluate the system's compliance with the specified requirements and verify if it has met the required criteria for delivery to end users. User acceptance of the system is the key factor for the success of a system. It is a type of testing which is done by the customer before accepting the final product. The system under consideration is tested for user acceptance by constantly keeping in touch with prospective system at the time of developing and making change wherever required.

White-box Testing

Tests are performed to ensure that all internal operations of the software are performed according to the specifications of the client. This is called White box testing. White-box testing (also known as clear box testing, glass box testing, transparent box testing, and structural testing) is a method of testing software that tests internal structures or workings of an application, as opposed to its functionality (i.e. black-box testing). In white-box testing an internal perspective of the system, as well as programming skills, are used to design test cases. White-box testing can be applied at the unit, integration and system levels of the software testing process. Although traditional testers tended to think of white-box testing as being done at the unit level, it is used for integration and system testing more frequently today. It can test paths within a unit, paths between units during integration, and between subsystems during a system– level test. Though this method of test design can uncover many errors or problems, it has the potential to miss unimplemented parts of the specification or missing requirements. The details entered by the administrator are saved and stored in the database, and testing is done to verify whether the control of each form or action is working in the exact way.

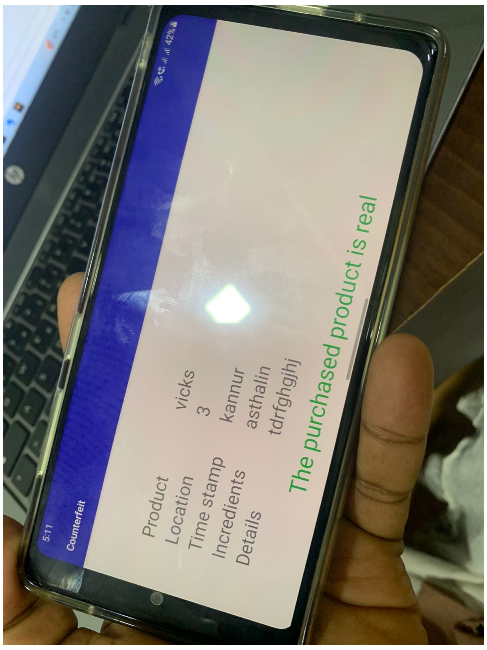
Black-box Testing

Tests are performed to ensure that each function is working properly. This is referred to as Black-box testing. Black-box testing is a method of software testing that examines the functionality of an application (e.g. what the software does) without peering into its internal structures or workings. This method of test can be applied to virtually every level of software testing: unit, integration, system and acceptance. It typically comprises most if not all higher level testing, but can also dominate unit testing as well. Test cases are built around specifications and requirements, i.e., what the application is supposed to do. Test cases are generally derived from external descriptions of the software, including specifications, requirements and design parameters. Although the tests used are primarily functional in nature, non-functional tests may also be used. The test designer selects both valid and invalid inputs and determines the correct output without any knowledge of the test object's internal structure. Testing is conducted in the system so that the functions namely Login, sending requests, searching the nearest donor, getting routes to the nearest blood banks etc... are done properly.

CHAPTER 7

RESULT AND DISCUSSION

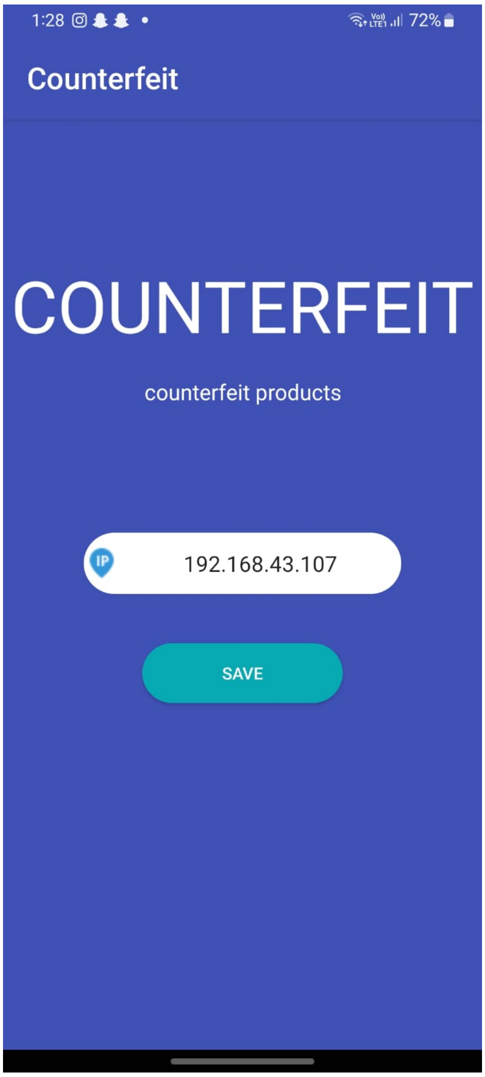
A system for tracking the supply chain of pharmaceuticals must first and foremost be practical. Assuming that dishonest manufacturers or suppliers cannot mix any form of counterfeit medicine in the real supply chain, we created the prototype for use in actual medicine supply chain traceability and regulation. Initially, our prototype protects participant authentication and data privacy. Additionally, the blockchain solution prototype uses the most recent location of the transactions to create blocks, which makes it incredibly simple to identify distributor fraud and pharmaceutical falsification in the supply chain. The prototype is also incredibly user-friendly. Also, there is a user-friendly layout that makes using it easy and motivating. Participants in the blockchain network are subject to access restrictions set by drug administrators. Hence, fraudulent distributors or retailers are unable to conduct any network transactions. Thus, it is also forbidden for players who are not in the drug supply chain or shops with a poor commercial reputation to use the blockchain network. As a result, the prototype is protected from these scams.



Product vicks
Location 3
Time stamp kannur
Incredients asthalin
Details tdrfghgjhj

The purchased product is real

Figure 7.1: output



192.168.43.107

Figure 7.2: Set URL address

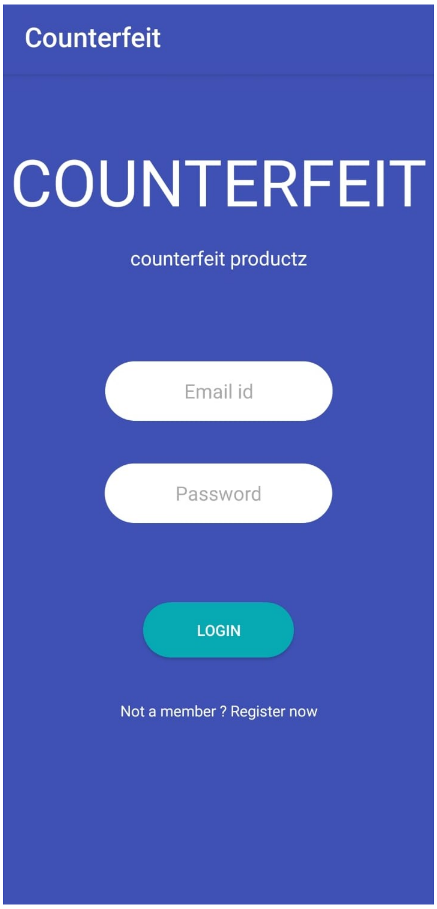


Figure 7.3: Application login

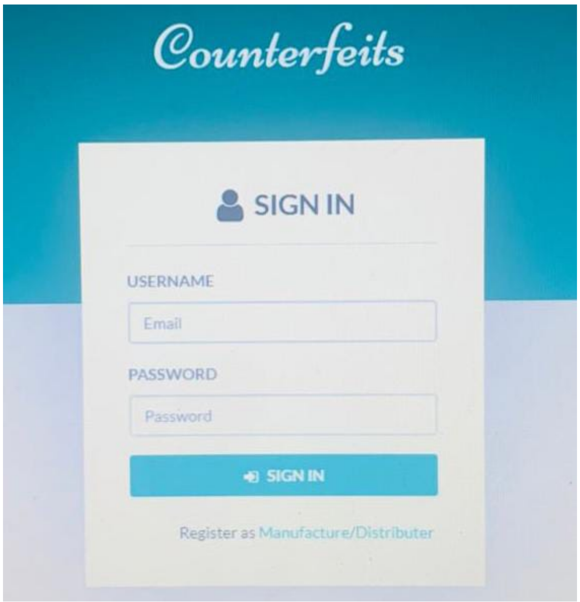
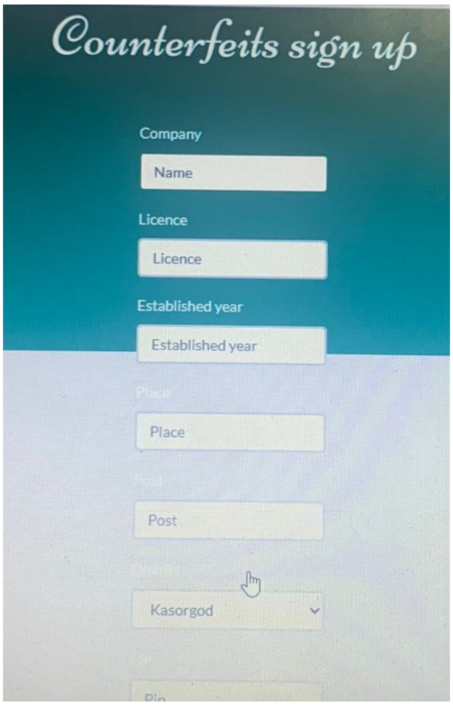


Figure 7.4: Login



Counterfeits sign up

Company

Name

Licence

Licence

Established year

Established year

Place

Place

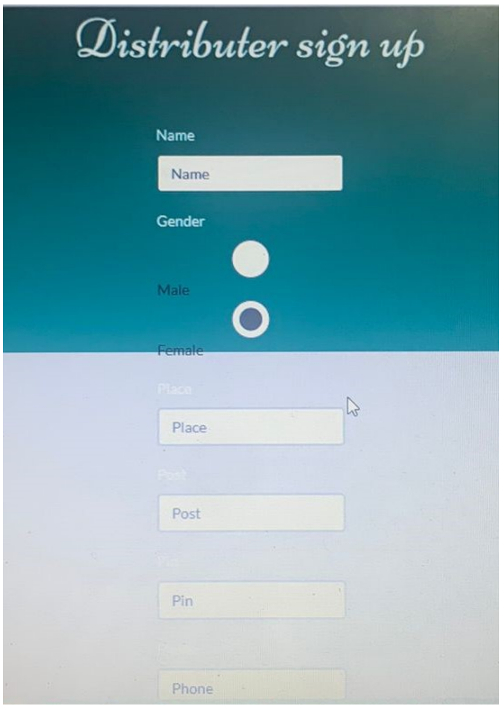
Post

Post

Kasorgod

Pin

Figure 7.5: Counterfeit Signup



Distributer sign up

Name

Name

Gender

○ Male

● Female

Place

Place

Post

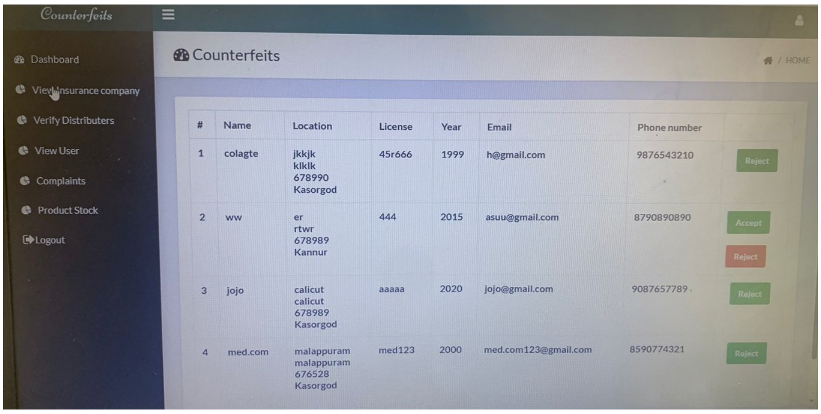
Post

Pin

Pin

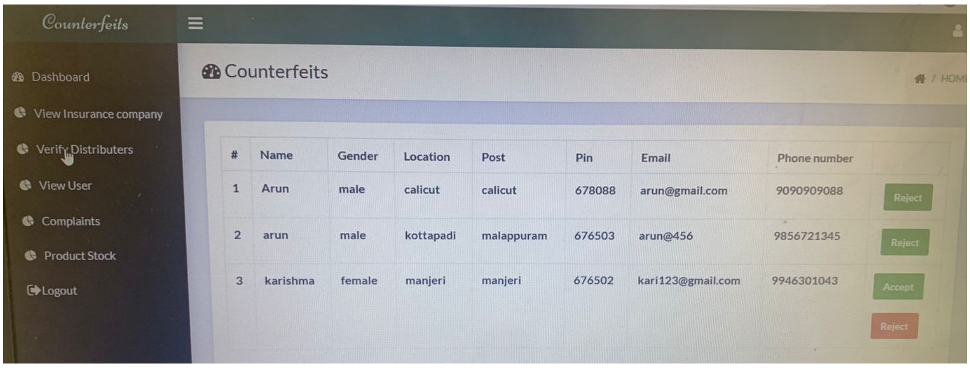
Phone

Figure 7.6: Distributer Signup



#	Name	Location	License	Year	Email	Phone number	
1	colagte	jkkjk klklk 678990 Kasorgod	45r666	1999	h@gmail.com	9876543210	Reject
2	ww	er rtwr 678989 Kannur	444	2015	asuu@gmail.com	8790890890	Accept Reject
3	jojo	calicut calicut 678989 Kasorgod	aaaaa	2020	jojo@gmail.com	9087657789	Reject
4	med.com	malappuram malappuram 676528 Kasorgod	med123	2000	med.com123@gmail.com	8590774321	Reject

Figure 7.7: Verify Insurance Company



#	Name	Gender	Location	Post	Pin	Email	Phone number	
1	Arun	male	calicut	calicut	678088	arun@gmail.com	9090909088	Reject
2	arun	male	kottapadi	malappuram	676503	arun@456	9856721345	Reject
3	karishma	female	manjeri	manjeri	676502	kari123@gmail.com	9946301043	Accept Reject

Figure 7.8: Verify Distributers

Figure 7.9: QR code

CHAPTER 8

CONCLUSION

In this paper, we develop a practical blockchain based secure infrastructure for the medical supply chain among authorized participants on the traditional medicine supply chain. Our application stands on blockchain security to identify the drugs uniquely and individually therefore, a falsified medicine or fraud distributor can be identified easily without any complexity. The prototype reconstructs the whole traditional medicine supply chain service architecture that can provide medicine security as well as authenticity of the manufacturer. It also introduce the current location of every transaction that makes the system more reliable. Optimization of blockchain data storage by removing expired medicine data makes the chain stable and acceptable.

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Appendix A

SOURCE CODE

from DBConnection import Db

from email.mime import image

import smtplib

from email.mime.text import MIMEText

from flask$_{m}ailimportMail$

import datetime

import pyqrcode

app = Flask($_{n}ame_{)}$

app.secret$_{k}ey = ”block”$

path=r”G:021- 2022

”

import json

from web3 import Web3, HTTPProvider

truffle development blockchain address

blockchain$_{a}ddress =' http : //127.0.0.1 : 7545'$

Client instance to interact with the blockchain

web3 = Web3(HTTPProvider(blockchain$_{a}ddress))$

Set the default account (so we don’t need to set the ”from” for every transaction call)

web3.eth.defaultAccount = web3.eth.accounts[0]

compiled$_{c}ontract_{p}ath = r'C :_{m} odules\dot{b}in.json'$

Deployed contract address (see ‘migrate‘ command output: ‘contract address‘)

deployed$_{c}ontract_{a}ddress =' 0xc48020F7dF52486eEf3F5f95121968EE56eD69E4'$

Path to the compiled contract JSON file

@app.route(’/’,methods=[’POST’,’get’])

def login1():

if request.method==’POST’:

username = request.form[’username’]

password = request.form[’password’]

db=Db()

res = db.selectOne(”select * from

login where user$_{n}ame =' ” +$

username + ”’ and password = ’” +

password + ”’”)

if res is not None:

session[’lg’] = ”lin”

session[’lid’]=res[’login$_{i}d'$]

if res[’user$_{t}ype'] ==' admin' :$

return redirect(’/ahome’)

if res[’user$_{t}ype'] ==' manufacturer' : returnredirect('/mhome')$

if res[’user$_{t}ype'] ==' distributer' :$

return redirect(’/dhome’)

else:

return ”’ ¡script¿

alert(”Invalid Username or Password...!!!!”);window.location=’/’ ¡/script¿”’

return render$_{t}emplate(”login.html”)$

@app.route(’/dhome’)

def dhome():

if session[’lg’] == ”lin”:

return render$_{t}emplate(”Distributer/index.html”)$

else:

return redirect(’/’)

@app.route(’/mhome’)

def mhome():

if session[’lg’] == ”lin”:

return render$_{t}emplate(”Manufacture/index.html”)$

else:

return redirect(’/’)

@app.route(’/logout’)

def logout():

session[’lg’]=””

session.clear()

return redirect(’/’)

===admin===================

@app.route(’/ahome’)

def ahome():

if session[’lg’] == ”lin”:

return

render$_{t}emplate("Admin/index.html")$

else:

return redirect(’/’)

@app.route(’/view$_{m}an')$

def view$_{m}an():$

if session[’lg’] == ”lin”:

db=Db()

q=db.select(”select * from

login,company where ins$_{i}d = login_{i}d")$

return render$_{t}emplate("Admin/View_{m}anufacture.html", data = q)$

else:

return redirect(’/’)

@app.route(’/view$_{d}ist')$

def view$_{d}ist():$

if session[’lg’] == ”lin”:

db=Db()

q=db.select(”select * from login,distributer where lid=login$_{i}d")$

return render$_{t}emplate("Admin/View_{d}istributer.html", data = q)$

else:

return redirect(’/’)

@app.route(’/view$_{u}ser')$

def view$_{u}ser():$

if session[’lg’] == ”lin”:

db=Db()

q=db.select(”select * from user”)

return render$_{t}emplate("Admin/View_{u}ser.html", data = q)$

else:

return redirect(’/’)

@app.route(’/view$_{c}om')$

def view$_com()$:

if session[’lg’] == ”lin”:

db=Db()

q=db.select(”select * from user,complaint where complaint.uid=user.user$_id$”)

return render$_template(”Admin/View_com.html”, data = q)$

else:

return redirect(’/’)

@app.route(’/approve/¡i¿’)

def approve(i):

if session[’lg’] == ”lin”:

db=Db()

q=db.update(”update login set user$_type =' manufacturer'wherelogin_id =' ” + i + ”'”)$

return redirect(’/view$_man')$

else:

return redirect(’/’)

@app.route(’/approvedist/¡i¿’)

def approvedist(i):

if session[’lg’] == ”lin”:

db=Db()

q=db.update(”update login set user$_type =' distributer'wherelogin_id =' ” + i + ”'”)$

return redirect(’/view$_dist')$

else:

return redirect(’/’)

@app.route(’/rejectdist/¡i¿’) def rejectdist(i):

if session[’lg’] == ”lin”:

db = Db()

od$_req‘.‘status‘, prod_req.pid, prod_req.idFROM‘distributer‘JOIN‘prod_req‘GROUPBY‘prod_req‘.‘id‘”)$

if str(decoded$_input[1]['bid']) == str()$:

res1=

for k in r:

if k[’pid’]==decoded$_input[1]['bid']$:

res1[’ppid’]=decoded$_input[1]['bid']$

res1[’dname’]=k[’name’]

res1[’qty’]=k[’qty’]