

FOOD SUPPLY CHAIN MANAGEMENT USING BLOCK CHAIN IN FOOD TRACEABILITY

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering

by

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(DEEMED TO BE UNIVERSITY)

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this project report is the bonafide work of **YALLA LALITHA** (Reg. no **37110863**) and **CH. BHAVANA** (Reg. no **37110155**) who carried out the project entitled "**Food Supply Chain Management using Block Chain in Food Traceability**" under my supervision from November 2020 to March 2021.

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Internal Examiner

External Examiner

DECLARATION

IYALLA LALITHA hereby declare that the Project Report entitled “**Food Supply Chain Management using Block Chain in Food Traceability**” is done by me under the guidance of **Mr.R.Sethuraman**, Department of Computer Science and Engineering at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering.

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SIGNATURE OF THE CANDIDATE

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ABSTRACT

In this paper, we propose a blockchain inspired Internet-of-Things architecture for creating a transparent food supply chain. The architecture uses a proof-of-object-based authentication protocol, which is analogous to the cryptocurrency's proof-of-work protocol. The complete architecture was realized by integrating a radio frequency identification (RFID)- based sensor at the physical layer and blockchain at the cyber layer. The RFID provides a unique identity of the product and the sensor data, which helps in real time quality monitoring. For this purpose, a small feature size 900-MHz RFID coupled sensor was fabricated and demonstrated for real time sensor data acquisition. The blockchain architecture aids in creating a tamper-proof digital database of the food packages at each instance. A detailed security analysis was performed to investigate the vulnerability of the proposed architecture under different types of cyber-attacks.

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LIST OF ABBREVIATIONS

JDK	Java Development Toolkit
DEX	Dalvik Executables
TCP	Transmission Control Protocol
IP	Internet Protocol
HTTP	Hyper Text Transfer Protocol
ADT	Android Development Tool

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

we propose a blockchain inspired internet-of-things architecture for creating a transparent food supply chain. The architecture uses a proof-of-object based authentication protocol, which is analogous to the crypto-currency's proof-of-work protocol. The complete architecture was realized by integrating a RFID based sensor at the physical layer and blockchain at the cyber layer. The RFID provides a unique identity of the product and the sensor data, which helps in real time quality monitoring. For this purpose, a small feature size 900 MHz RFID coupled sensor was fabricated and demonstrated for real time sensor data acquisition. The blockchain architecture aids in creating a tamper-proof digital database of the food packages at each instance. A detailed security analysis was performed to investigate the vulnerability of the proposed architecture under different types of cyber-attacks.

1.2 JAVA

Java is an object-oriented programming language developed initially by James Gosling and colleagues at Sun Microsystems. The language, initially called Oak (named after the oak trees outside Gosling's office), was intended to replace C++, although the feature set better resembles that of Objective C.

1.2.1 INTRODUCTION TO JAVA

Java has been around since 1991, developed by a small team of Sun Microsystems developers in a project originally called the Green project. The intent of the project was to develop a platform-independent software technology that would be used in the consumer electronics industry. The language that the team created was originally called Oak.

The first implementation of Oak was in a PDA-type device called Star Seven (*7) that consisted of the Oak language, an operating system called GreenOS, a user interface, and hardware. The name *7 was derived from

the telephone sequence that was used in the team's office and that was dialled in order to answer any ringing telephone from any other phone in the office.

Around the time the First-Person project was floundering in consumer electronics, a new craze was gaining momentum in America; the craze was called "Web surfing." The World Wide Web, a name applied to the Internet's millions of linked HTML documents was suddenly becoming popular for use by the masses. The reason for this was the introduction of a graphical Web browser called Mosaic, developed by ncSA. The browser simplified Web browsing by combining text and graphics into a single interface to eliminate the need for users to learn many confusing UNIX and DOS commands. Navigating around the Web was much easier using Mosaic.

It has only been since 1994 that Oak technology has been applied to the Web. In 1994, two Sun developers created the first version of Hot Java, and then called Web Runner, which is a graphical browser for the Web that exists today. The browser was coded entirely in the Oak language, by this time called Java. Soon after, the Java compiler was rewritten in the Java language from its original C code, thus proving that Java could be used effectively as an application language. Sun introduced Java in May 1995 at the Sun World 95 convention.

Web surfing has become an enormously popular practice among millions of computer users. Until Java, however, the content of information on the Internet has been a bland series of HTML documents. Web users are hungry for applications that are interactive, that users can execute no matter what hardware or software platform they are using, and that travel across heterogeneous networks and do not spread viruses to their computers. Java can create such applications. For those who are new to object-oriented programming, the concept of a class will be new to you. Simplistically, a class is the definition for a segment of code that can contain both data (called attributes) and functions (called methods).

When the interpreter executes a class, it looks for a particular method by the name of **main**, which will sound familiar to C programmers. The main method is passed as a parameter an array of strings (similar to the argv [] of C), and is declared as a static method.

To output text from the program, we execute the **println** method of **System.out**, which is java's output stream. UNIX users will appreciate the theory behind such a stream, as it is actually standard output. For those who are instead used to the Wintel platform, it will write the string passed to it to the user's program.

Java consists of two things:

- Programming language
- Platform

1.2.2 THE JAVA PROGRAMMING LANGUAGE

Java is a high-level programming language that is all of the following:

- Simple
- Object-oriented
- Distributed
- Interpreted
- Robust
- Secure
- Architecture-neutral
- Portable
- High-performance
- Multithreaded
- Dynamic

The code and can bring about changes whenever felt necessary. Some of the standard needed to achieve the above-mentioned objectives are as follows:

Java is unusual in that each Java program is both compiled and interpreted. With a compiler, you translate a Java program into an intermediate language called **Java byte codes** – the platform independent codes interpreted by the Java interpreter. With an interpreter, each Java byte code instruction is parsed and run on the computer. Compilation happens just once; interpretation occurs each time the program is executed. This figure illustrates how it works:

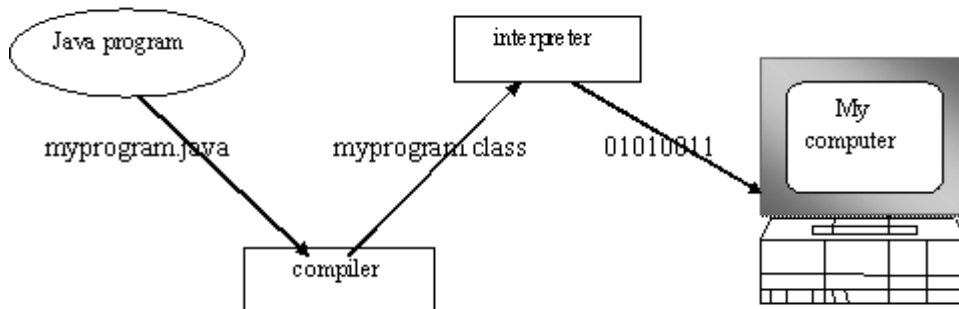


Fig.3.1

You can think of Java byte codes as the machine code instructions for the **Java Virtual Machine (JVM)**. Every Java interpreter, whether it's a Java development tool or a Web browser that can run Java applets, is an implementation of JVM. That JVM can also be implemented in hardware. Java byte codes help make “write once, run anywhere” possible.

You can compile your Java program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the JVM. For example, that same Java program can be run on Windows NT, Solaris and Macintosh.

1.2.3 THE JAVA PLATFORM

A platform is the hardware or software environment in which a program runs. The Java platform differs from most other platforms in that it's a software-only platform that runs on top of other, hardware-based platforms. Most other platforms are described as a combination of hardware and operating system.

The Java platform has two components :

- The Java Virtual Machine (JVM)
- The Java Application Programming Interface (Java API)

You've already been introduced to the JVM. It's the base for the Java platform and is ported onto various hardware-based platforms.

The Java API is a large collection of ready-made software components that provide many useful capabilities, such as graphical user interface (GUI) widgets. The Java API is grouped into libraries (**packages**) of related components. The following figure depicts a Java program, such as an application or applet, that's running on the Java platform. As the figure shows, the Java API and Virtual Machine insulates the Java program from hardware dependencies.

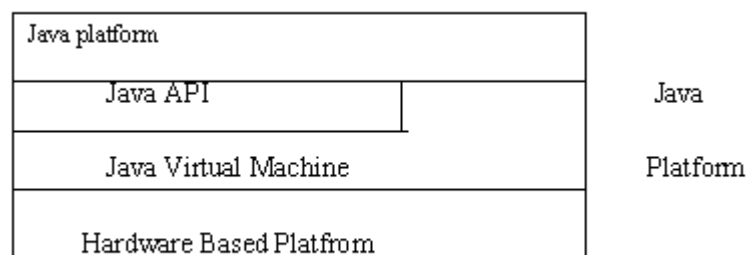


Fig.3.3

As a platform-independent environment, Java can be a bit slower than native code. However, smart compilers, weel-tuned interpreters, and just-in-time byte compilers can bring Java's performance close to that of native code without threatening portability.

1.3 APACHE TOMCAT SERVER

Apache Tomcat (formerly under the Apache Jakarta Project; Tomcat is now a top-level project) is a web container developed at the Apache Software Foundation. Tomcat implements the servlet and the Java Server Pages (JSP)

specifications from Sun Microsystems, providing an environment for Java code to run in cooperation with a web server. It adds tools for configuration and management but can also be configured by editing configuration files that are normally XML-formatted. Because Tomcat includes its own HTTP server internally, it is also considered a standalone web server.

Environment

Tomcat is a web server that supports servlets and JSPs. Tomcat comes with the Jasper compiler that compiles JSPs into servlets.

The Tomcat servlet engine is often used in combination with an Apache web server or other web servers. Tomcat can also function as an independent web server. Earlier in its development, the perception existed that standalone Tomcat was only suitable for development environments and other environments with minimal requirements for speed and transaction handling. However, that perception no longer exists; Tomcat is increasingly used as a standalone web server in high-traffic, high-availability environments.

Since its developers wrote Tomcat in Java, it runs on any operating system that has a JVM.

Product features

Tomcat 3.x (initial release)

- implements the Servlet 2.2 and JSP 1.1 specifications
- servlet reloading
- basic HTTP functionality Tomcat 4.x
- implements the Servlet 2.3 and JSP 1.2 specifications
- servlet container redesigned as Catalina
- JSP engine redesigned as Jasper
- Coyote connector
- Java Management Extensions (JMX), JSP and Struts-based administration
- Tomcat 5.x
- implements the Servlet 2.4 and JSP 2.0 specifications
- reduced garbage collection, improved performance and scalability

- native Windows and Unix wrappers for platform integration
- faster JSP parsing

1.3.1 History

Tomcat started off as a servlet specification implementation by James Duncan Davidson, a software architect at Sun. He later helped make the project open source and played a key role in its donation by Sun to the Apache Software Foundation.

Davidson had initially hoped that the project would become open-sourced and, since most open-source projects had O'Reilly books associated with them featuring an animal on the cover, he wanted to name the project after an animal. He came up with Tomcat since he reasoned the animal represented something that could take care of and fend for itself. His wish to see an animal cover eventually came true when O'Reilly published their Tomcat book with a tomcat on the cover.

1.4 Android Introduction:

Android is a Linux based operating system it is designed primarily for touch screen mobile devices such as smart phones and tablet computers. The operating system has developed a lot in last 15 years starting from black and white phones to recent smart phones or mini computers. One of the most widely used mobile OS these days is android. The android is software that was founded in Palo Alto of California in 2003.

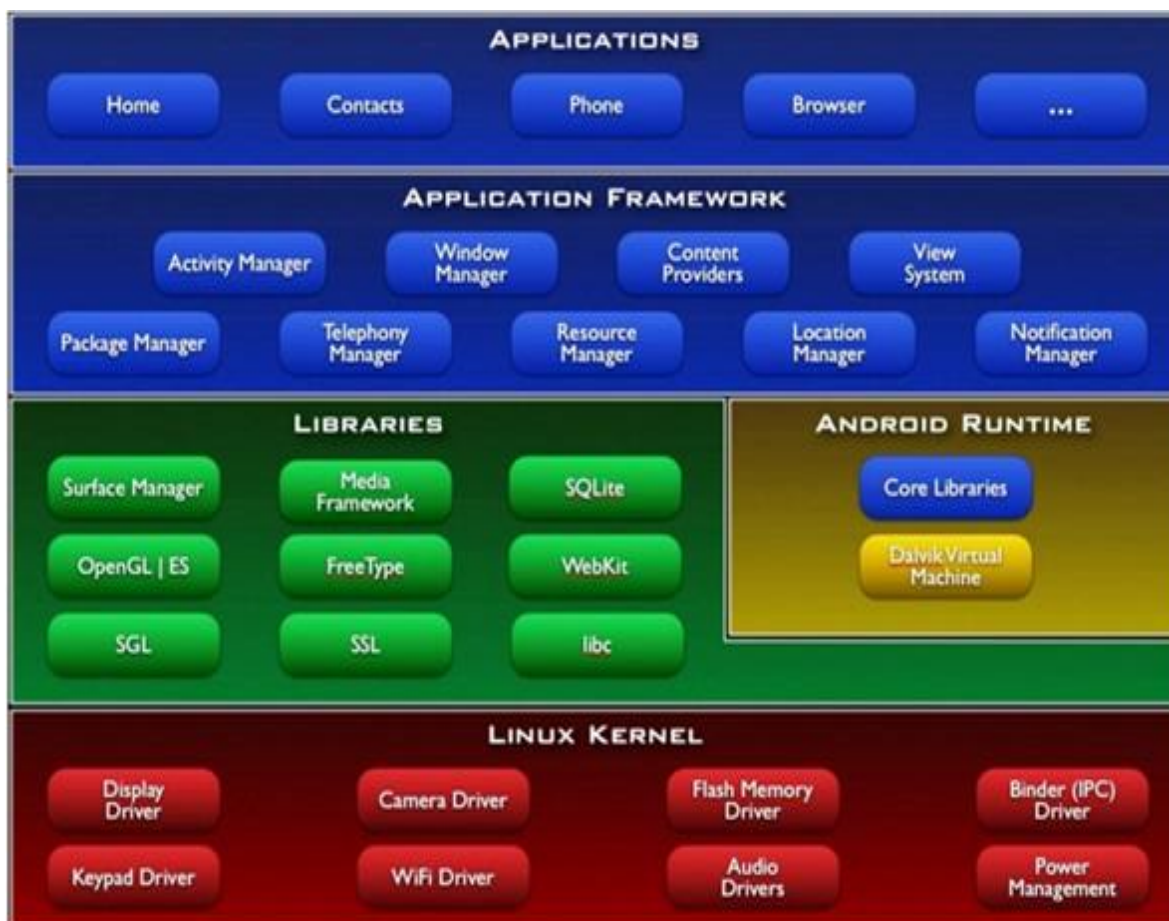
The android is a powerful operating system and it supports large number of applications in Smartphones. These applications are more comfortable and advanced for the users. The hardware that supports android software is based on ARM architecture platform. The android is an open-source operating system means that it's free and any one can use it. The android has got millions of apps available that can help you managing your life one or other way and it is available low cost in market at that reason's android is very popular.

The android development supports with the full java programming language. Even other packages that are API and JSE are not supported. The first version 1.0 of android development kit (SDK) was released in 2008 and latest updated version is jelly bean.

The android is an operating system and is a stack of software components which is divided into five sections and four main layers that is in the below figure.

1.4.1 Linux kernel:

The android uses the powerful Linux kernel and it supports wide range of hardware drivers. The kernel is the heart of the operating system that manages input and output requests from software. This provides basic system functionalities like process management, memory management, device management like camera, keypad, display etc the kernel handles all the things. The Linux is really good at networking and it is not necessary to interface it to the peripheral hardware. The kernel itself does not interact directly with the user but rather interacts with the shell and other programs as well as with the hard ware devices on the system.



1.4.2 Libraries:

The on top of a Linux kernel there is a set of libraries including open source web browser such as web kit, library libc. These libraries are used to play and record audio and video. The SQLite is a data base which is useful for storage and sharing of application data. The SSL libraries are responsible for internet security etc.

1.4.3 Android Runtime:

The android runtime provides a key component called Dalvik Virtual Machine which is a kind of java virtual machine. It is specially designed and optimized for android. The Dalvik VM is the process virtual machine in the android operating system. It is software that runs apps on android devices.

The Dalvik VM makes use of Linux core features like memory management and multithreading which is in a java language. The Dalvik VM enables every android application to run its own process. The Dalvik VM executes the files in the dex format.

Application frame work:

The application frame work layer provides many higher-level services to applications such as windows manager, view system, package manager, resource manager etc. The application developers are allowed to make use of these services in their application.

Applications:

You will find all the android applications at the top layer and you will write your application and install on this layer. Examples of such applications are contacts, books, browsers, services etc. Each application performs a different role in the overall applications.

Advantages:

- Android is Linux based open-source operating system; it can be developed by any one
- Easy access to the android apps

- You can replace the battery and mass storage, disk drive and UDB option
- It supports all Google services
- The operating system is able to inform you of a new SMS and Emails or latest updates.
- It supports Multitasking
- Android phone can also function as a router to share internet
- Its free to customize
- Can install a modified ROM
- Its supports 2D and 3D graphics

CHAPTER 2

LITERATURE SURVEY

2.1 LITEARTURE SURVEY

AUTHOR	YEAR OF PUBLICATION	DESCRIPTIONS	PROS	CONS
Juan F. Galvez	Elsevier, 2018	Food Authentication, Data analysis & Management	Creates the transparency and unique level of credibility	Verification Mechanism and cost of implementing
Miguel Pincheiracaro	IEEE, 2018	Practical Implementation	Ethereum Network, Novel consensus Algorithm, Hyperledger sawtooth implementation	Performance analysis to more constrained hardware Architecture in order to access the suitability of the proposed network
Andreas Kamilaris	Elsevier, 2020	Food supply chain, Benefits & Challenges	Digitalization agriculture, food security	Secure, reliable & Transparent

AUTHOR	YEAR OF PUBLICATION	DESCRIPTIONS	PROS	CONS
Kay Behnke	Elsevier, 2020	Blockchain Technology	BCT Boundary conditions and Traceability	Changes are need in a supply chain before BCT can be adopted
k.Demestichas	Mdpi.com, 2020	Distributed Ledger	To achieve traceability by irreversibly and immutably storing data	User friendly, increases productively and brings added value
S. Mondal	IEEE, 2020	Food supply chain & radio frequency identification	Sensing Modality	Security features and hardware security of sensors ID's and reader
T. Mohan	Psu.edu, 2018	Blockchain model & food	Food provenance,	In capable the

		supply chain		distinguishing the distinctive incentive schemes to be utilized inside the blockchain network.
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2.2 LITERATURE REVIEW

In this section, we are going to discuss and analyse the topics related to the improvement of the food supply chain system. Food safety has become very prominent in recent times for commercial industries. Most of the systems till now are made centralized and these are not secure and only personalized between two persons. So, therefore we have introduced blockchain technology in food supply chain systems to overcome this problem.

As per the [27] creator, Juan F. Galvez and J.C. Mejuto directed illustrative research based on food authentication, data management, and analysis in his he executed an extraordinary spotlight on traceability. He permits every one of the partners to check the whole history and current area and create transparency for all participants. Indeed, irreversibly putting away information and blockchain innovation makes a special degree of validity that adds to a more sustainable industry and reinforce their relationship with current clients and draw in new ones. Also, unfit to deal with the confirmation instrument to demonstrate whether the crude information was right and there is an issue about the general expenditure of blockchain implementation is unpredictable, mainly where the current, extremely develop supply chain system is using from a long period of time. Author [28] Miguel pincheira care and Muhammad deal Ali had profoundly examined the practical implementation of the food supply chain. He executed the Hyperledger

sawtooth and Ethereum networks. He used the Algorithm novel consensus. He unfits the arrangement to improve the presentation investigation to more constrained hardware architecture to evaluate the fitness of the proposed system to applications involving original gateways and IoT devices along the Agri-food supply chain. Going to the creator [29] Andreas families directed distinct exploration dependent on the food supply chain and advantages and difficulties and he expected to set up a demonstrated and confided in climate to assemble a transparent and more feasible food creation and distribution, incorporating key partners in to supply chain and executed on the digitalization agriculture and food security and incapable to secure, reliable and transparency and traceability approach to guarantee food safety and integrity. Author [30] Kay Behnke drove research subject to blockchain development and executed BCT limit conditions and traceability and unfitted the how these troubles could be tended to by government and private undertakings, to set up blockchain advancement as a secured, transparence and dependable way to deal with ensuring food safety and uprightness. It is amazingly entrancing to see how blockchain will be gotten together with otheremerging innovations (robotics, big data, RFID, IoT, Hyperspectral imaging, NFC, etc..), for the higher robotization of the food supply measures, improved with full traceability and transparency. Author[31] Konstantinos Demestichas and Nikolaos peppers coordinated clear exploration subject to the relevance of the blockchain traceability system of agri-food things and executed that using blockchain can helpfully help with achieving traceability by irreversibly and immutability putting away data. Blockchain innovation makes a novel degree of validity and adds to more practical food industry. Albeit guaranteeing food discernibility with blockchain innovation looks empowering, certain limits remained to be considered and tended to, including rules, the association between the parties, information possession, versatility, and so on, In request to see unmistakably and the innovation and maybe, produce new executions, scientists and originators would benefit by the improvement of an overall assessment model. Besides, unsuited execution of another framework to be portrayed viable, this framework should connect with the going with to reduce costs, lessen possibilities, save time, increase trust and transparency and the simple to utilize and grows productivity, and brings added regard. Author [32] Tharun Mohan led research dependent on the blockchain model that can be

actualized in a food supply chain and give its advantages and impediments over customary global positioning framework regarding food provenance and resource traceability from his exploration exertion, it is clear that blockchain can be more proficient in following food provenance, preventing considerable scale pollution of food items, recognize and eliminate the source of foodborne ailment in no time while the contemporary systems could take as much as weeks. It additionally gives more confident customer certainty which reflects in deals and consumer satisfaction. Furthermore, incapable the distinguishing the distinctive incentive schemes to be utilized inside the blockchain network to encourage uniform dispersion of power in regards to how the transactional data can be utilized inside FSC. Creator [33] S. Mondal led research dependent on the food supply chain and radio recurrence distinguishing proof and actualized detecting methodology and enable the security highlights and equipment security of the sensors ID's and reader.

CHAPTER 3

AIM AND SCOPE

AIM

The main aim of the project is to avoid the food adulteration and create transparent food supply chain.

SCOPE

Food adulteration is also a growing concern due to globalization and wide growing supply chain networks. Food wastage due to misconception of the labelled expiry dates, and losses due to spoilage, which have broad impacts on the food security. Traceability has gotten exceptionally muddled in the supply chain the board especially in the food area. Blockchain assumes an exceptionally pivotal part in supplying food in the industrial market. These days clients in the market have gotten specific about the quality and supportability of the item, so utilizing this strategy has gotten simple to recognize the nature of the item. The primary issue in the current system is the centralized system which needs transparency, subtleties, and nature of the item. In which we had made a proposed system called a decentralized system which will be helpful to get the familiarity with the total item supply from one finish to another through every individual engaged with the supply chain. Therefore, the undertaking execution full subtleties of the item and even sum paid details and tracing will be incorporated and can be seen by the client through the uniquely Implemented QR code on every item with a sustainable food supply chain. The fundamental motto of the undertaking is because of its attributes of Transparency, Security, and Decentralization, blockchain technology makes it conceivable to follow the data of food quality in the whole supply chain. This helps extortion in food exchange and diminish the expenses of the food supply chain the management.

CHAPTER 4

METHODOLOGY

SYSTEM ANALYSIS

4.1 EXISTING SYSTEM

In existing system, the food packages does not contains the proper details like food ingredients, packers details, package date and expiry date etc.. So, the end user or customer does not have any awareness of that product details. That product have product id and shop information only. Real-time monitoring of the food quality and visibility of that quality index would prevent outbreak of food-borne illnesses, economically motivated adulteration, contamination, food wastage due to misconception of the labeled expiry dates, and losses due to spoilage, which have broad impacts on the food security

4.1.1 Problem definition

- Food adulteration is also a growing concern due to globalization and wide growing supply chain networks.
- Food wastage due to misconception of the labeled expiry dates, and losses due to spoilage, which have broad impacts on the food security

4.1.2 Advantages

- The RFID provides a unique identity of the product and the sensor data, which helps in real time quality monitoring.

REQUIREMENT SPECIFICATION

(IoT) has huge potential to impact global food supply chain (FSC) by increasing productivity in terms of supply chain performance. Among many challenges, agri-food safety and its impact on the environment due to food wastage are of major concerns. The United States Center for Diseases Control (CDC) estimates that 48 million people get sick from foodborne illness, 128 000 are hospitalized, and 3000 die each year in the U.S. alone. Apart from illness, economically and criminally motivated food adulteration is also a growing concern due to globalization and

wide growing supply chain networks [1]. Real-time monitoring of the food quality and visibility of that quality index would prevent outbreak of food-borne illnesses, economically motivated adulteration, contamination, food wastage due to misconception of the labelled expiry dates, and losses due to spoilage, which have broad impacts on the food security [2]. In order to improve safety and prevent wastage, modern IoTbased technologies are required to monitor the food quality and increase the visibility level of the monitored data. There are a number of IoT-based tracking and tracing infrastructures

4.2 HARDWARE AND SOFTWARE SPECIFICATION

4.2.1 HARDWARE REQUIREMENTS

- Hard Disk : 80GB and Above
- RAM : 4GB and Above
- Processor : P IV and Above

4.2.2 SOFTWARE REQUIREMENTS

- Windows 7 and above
- JDK 1.7
- J2EE
- Tomcat 7.0
- MySQL

4.2.3 TECHNOLOGIES USED

- JAVA
- Android

4.3 Design and Implementation Constraints

4.3.1 Constraints in Analysis

- Constraints as Informal Text
- Constraints as Operational Restrictions
- Constraints Integrated in Existing Model Concepts
- Constraints as a Separate Concept
- Constraints Implied by the Model Structure

4.3.2 Constraints in Design

- Determination of the Involved Classes
- Determination of the Involved Objects
- Determination of the Involved Actions
- Determination of the Require Clauses
- Global actions and Constraint Realization

4.3.3 Constraints in Implementation

A hierarchical structuring of relations may result in more classes and a more complicated structure to implement. Therefore, it is advisable to transform the hierarchical relation structure to a simpler structure such as a classical flat one. It is rather straightforward to transform the developed hierarchical model into a bipartite, flat model, consisting of classes on the one hand and flat relations on the other. Flat relations are preferred at the design level for reasons of simplicity and implementation ease. There is no identity or functionality associated with a flat relation. A flat relation corresponds with the relation concept of entity-relationship modelling and many object-oriented methods.

4.4 Other Non-functional Requirements

4.4.1 Performance Requirements

The application at this side controls and communicates with the following three main general components.

- embedded browser in charge of the navigation and accessing to the web service;
- Server Tier: The server side contains the main parts of the functionality of the proposed architecture. The components at this tier are the following.

Web Server, Security Module, Server-Side Capturing Engine, Pre-processing Engine, Database System, Verification Engine, Output Module.

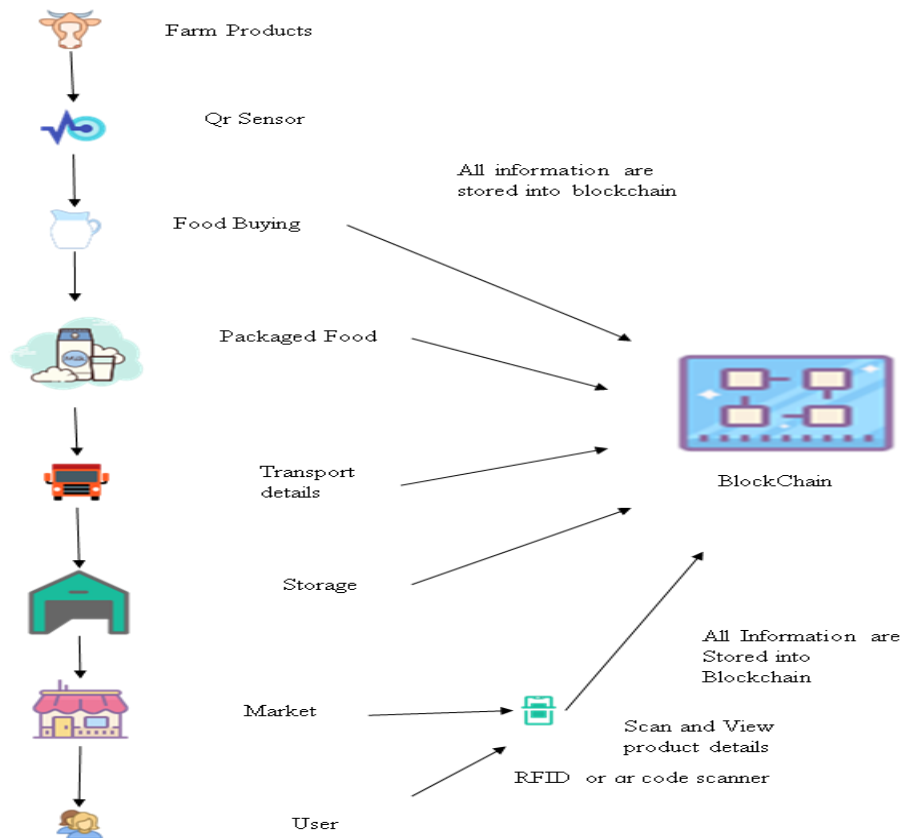
4.4.2 Safety Requirements

- The software may be safety-critical. If so, there are issues associated with its integrity level.

- The software may not be safety-critical although it forms part of a safety-critical system. For example, software may simply log transactions.
- If a system must be of a high integrity level and if the software is shown to be of that integrity level, then the hardware must be at least of the same integrity level.
- There is little point in producing 'perfect' code in some language if hardware and system software (in widest sense) are not reliable.
- If a computer system is to run software of a high integrity level then that system should not at the same time accommodate software of a lower integrity level.
- Systems with different requirements for safety levels must be separated.
- Otherwise, the highest level of integrity required must be applied to all systems in the same environment.

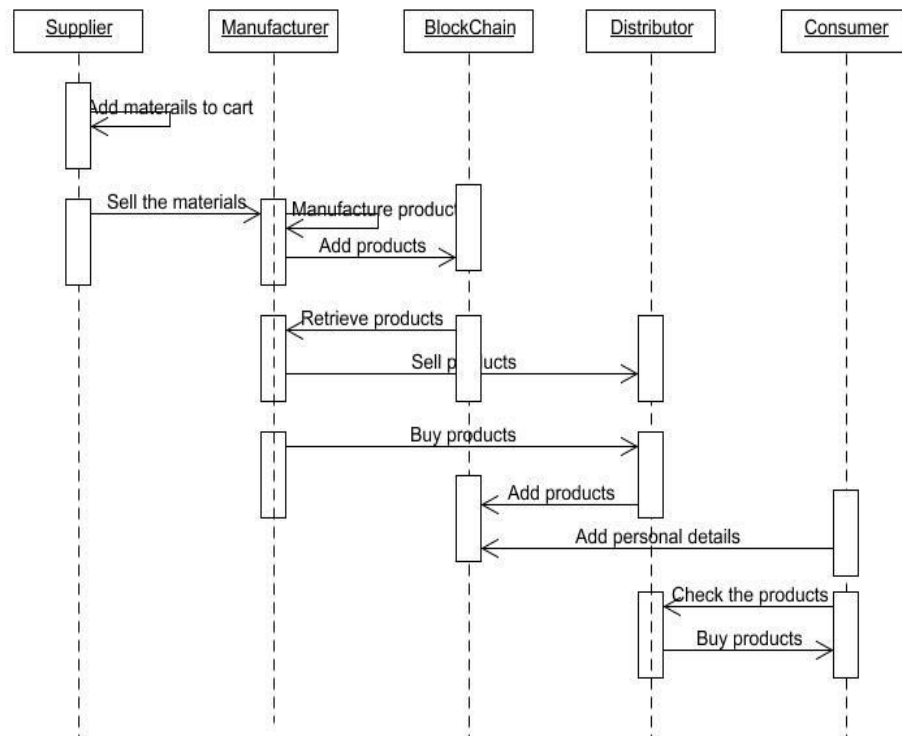
4.5 DIAGRAMS

4.5.1 ARCHITECTURE DIAGRAM



4.5.2 SEQUENCE DIAGRAM:

A Sequence diagram is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of Message Sequence diagrams are sometimes called event diagrams, event sceneries and timing diagram.



Unified Modelling Language (UML) is a standardized general-purpose modelling language in the field of software engineering. The standard is managed and was created by the Object Management Group. UML includes a set of graphic notation techniques to create visual models of software intensive systems. This language is used to specify, visualize, modify, construct and document the artifacts of an object-oriented software intensive system under development.

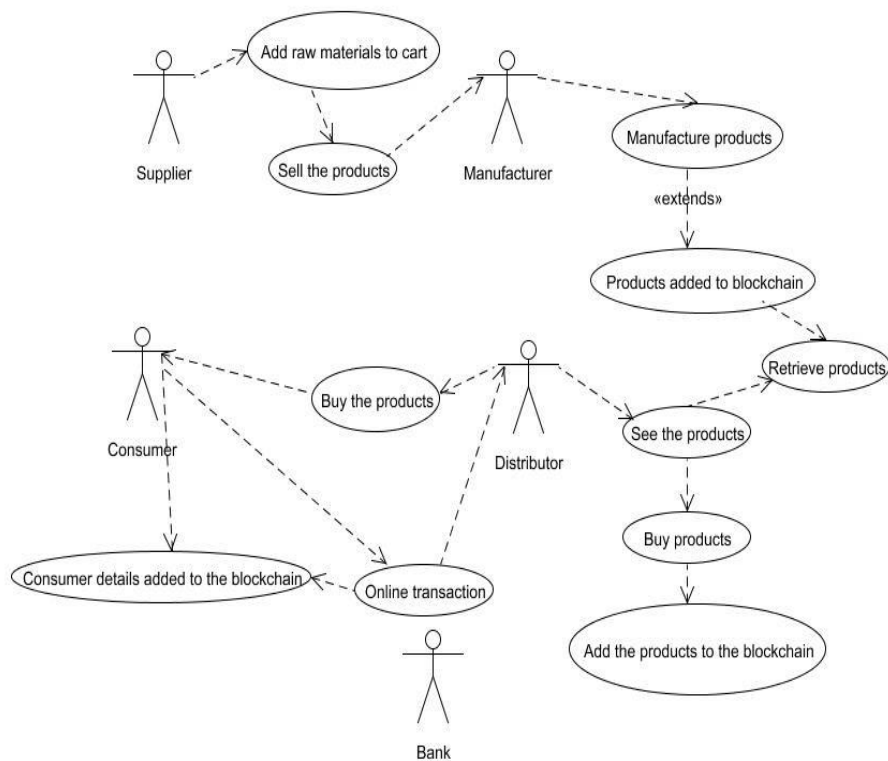
4.5.3 USECASE DIAGRAM

A Use case Diagram is used to present a graphical overview of the functionality provided by a system in terms of actors, their goals and any dependencies between those use cases.

Use case diagram consists of two parts:

Use case: A use case describes a sequence of actions that provided something of measurable value to an actor and is drawn as a horizontal ellipse.

Actor: An actor is a person, organization or external system that plays a role in one or more interaction with the system.



flows of stepwise activities and actions with support for choice, iteration and concurrency. An activity diagram shows the overall flow of control.

The most important shape types:

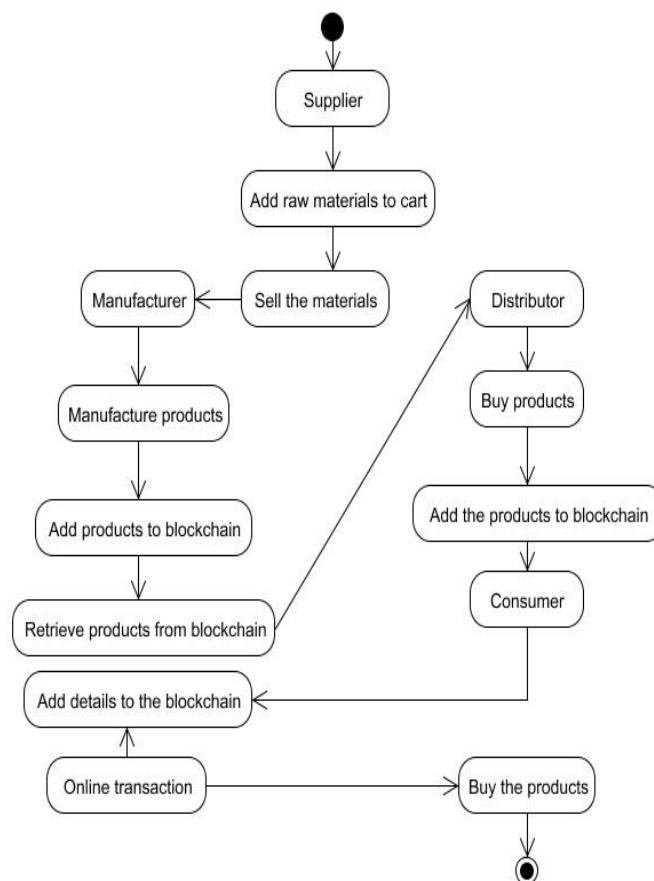
- Rounded rectangles represent activities.
- Diamonds represent decisions.
- Bars represent the start or end of concurrent activities.
- A black circle represents the start of the workflow.
- An encircled circle represents the end of the workflow.

4.5.4 ACTIVITY DIAGRAM

Activity diagram is a graphical representation of workflows of stepwise activities and actions with support for choice, iteration and concurrency. An activity diagram shows the overall flow of control.

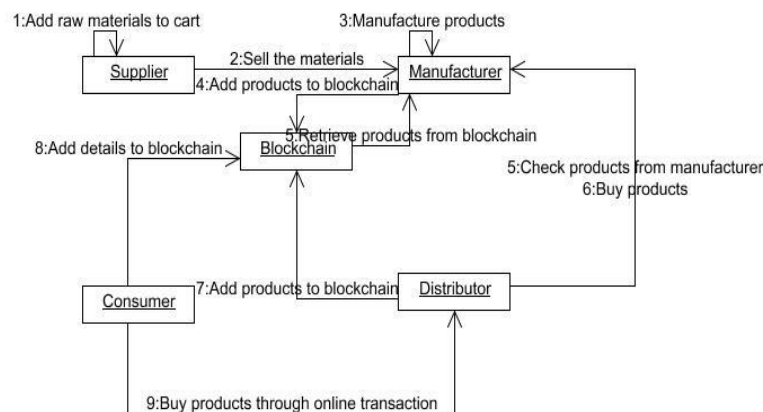
The most important shape types:

- Rounded rectangles represent activities.
- Diamonds represent decisions.
- Bars represent the start or end of concurrent activities.
- A black circle represents the start of the workflow.
- An encircled circle represents the end of the workflow.



4.5.5 COLLABORATION DIAGRAM:

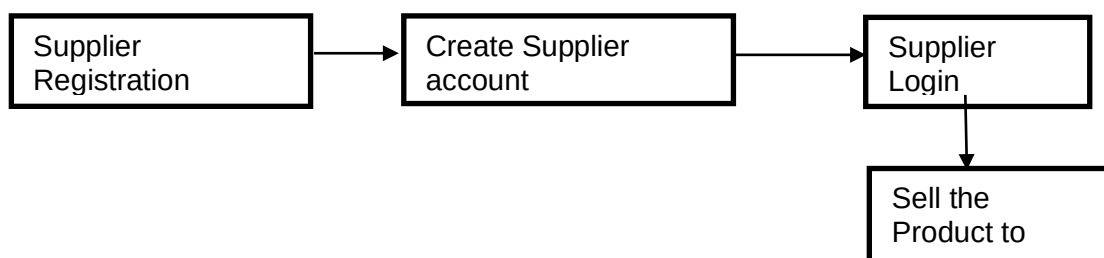
UML Collaboration Diagrams illustrate the relationship and interaction between software objects. They require use cases, system operation contracts and domain model to already exist. The collaboration diagram illustrates messages being sent between classes and objects.



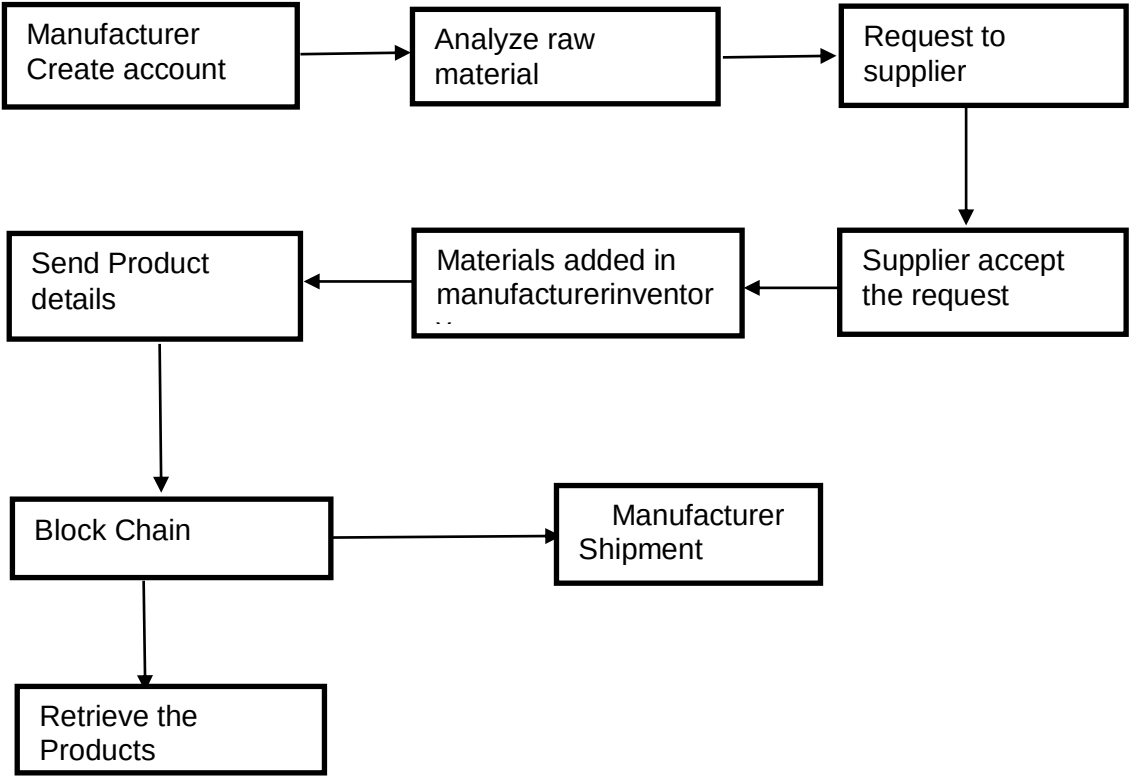
4.5.6 DATA FLOW DIAGRAM:

A Data Flow Diagram (DFD) is a graphical representation of the “flow” of data through an information system, modelling its aspects. It is a preliminary step used to create an overview of the system which can later be elaborated DFDs can also be used for visualization of data processing.

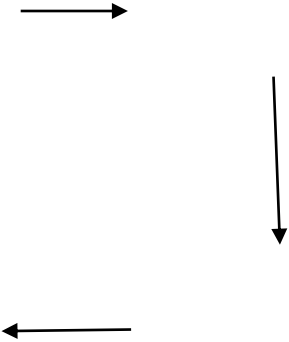
Level 0:

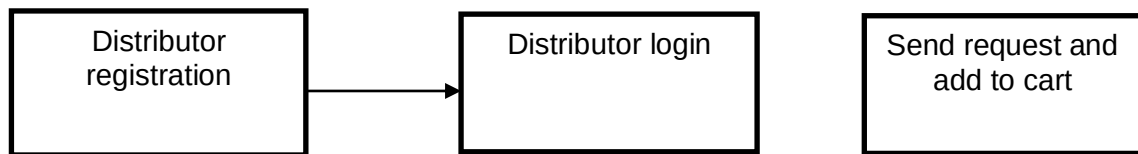


Level 1:

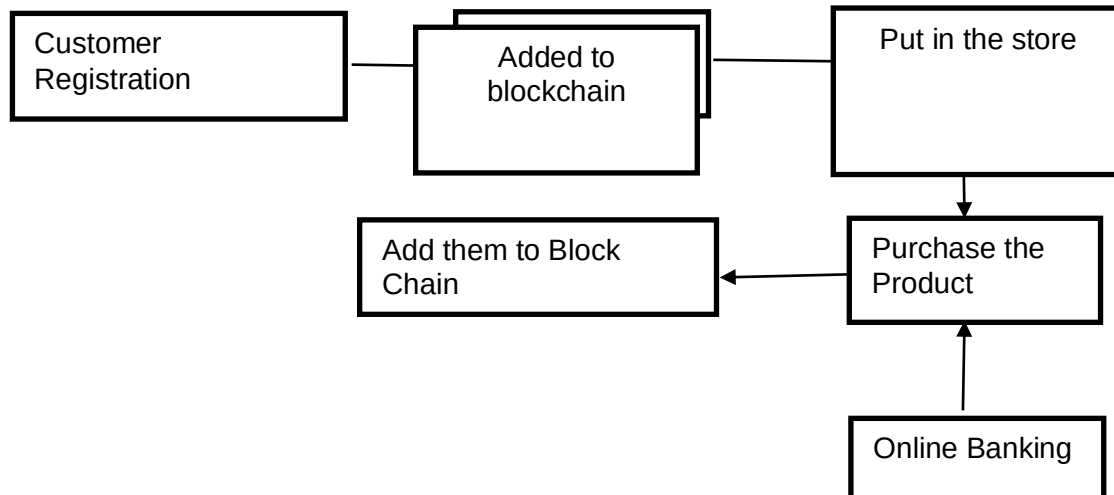


Level 2:





Level 3:



4.6 MODULES

1. Supplier
2. Manufacturer
3. Distributer
4. Consumer

MODULE EXPLANATION:

4.6.1 Supplier:

For each product it contains the barcode number and its number will be passing through food API then ingredients will be taken out by using barcode number. First registration. The registration form contains supplier details. Then login. Supplier sells the products to all manufactures what the produce.

4.6.2 Manufacturer:

The manufacturer initially creates the account. They will analyse the raw materials and the manufacturer will request the quantity of raw materials to the supplier. Then suppliers will accept the request from manufacturer and raw material will be

added to the manufacturer inventory. The manufacture will send the product ID, expiry date, number of packets, etc to the block chain and then the created product will be added to manufacturer shipment. From the block chain the manufacturer will retrieve the product.

4.6.3 Distributers:

First registration. The registration part contains distributor details. And login. The distributor will be seeing the product in the manufacturer cart and then buying product by the distributor will be added to the block chain.

4.6.4 Consumer:

First Registration. The registration form contains user details. Then consumer login. Consumer buys the product from distributor's consumer scan the QR scan by using the mobile app and then view the product in the mobile such as manufacturing date, packing date etc. The consumer will check the product and they will buy the product by using online transaction. Finally, user transaction ID, product name and cost will be added to the block chain.

CODING AND TESTING

4.7 CODING

Once the design aspect of the system is finalizing the system enters into the coding and testing phase. The coding phase brings the actual system into action by converting the design of the system into the code in a given programming language. Therefore, a good coding style has to be taken whenever changes are required it easily screwed into the system.

4.7.1 CODING STANDARDS

Coding standards are guidelines to programming that focuses on the physical structure and appearance of the program. They make the code easier to read, understand and maintain. This phase of the system actually implements the blueprint developed during the design phase. The coding specification should be in such a way that any programmer must be able to understand the code and can bring about changes whenever felt necessary. Some of the standard needed to achieve the above-mentioned objectives are as follows:

Program should be simple, clear and easy to understand.

Naming conventions

Value conventions

Script and comment procedure

Message box format

Exception and error handling

4.7.2 NAMING CONVENTIONS

Naming conventions of classes, data member, member functions, procedures etc., should be **self-descriptive**. One should even get the meaning and scope of the variable by its name. The conventions are adopted for **easy understanding** of the intended message by the user. So it is customary to follow the conventions. These conventions are as follows:

Class names

Class names are problem domain equivalence and begin with capital letter and have mixed cases.

Member Function and Data Member name

Member function and data member name begins with a lowercase letter with each subsequent letters of the new words in uppercase and the rest of letters in lowercase.

4.7.3 VALUE CONVENTIONS

Value conventions ensure values for variable at any point of time. This involves the following:

- Proper default values for the variables.
- Proper validation of values in the field.
- Proper documentation of flag values.

4.7.4 SCRIPT WRITING AND COMMENTING STANDARD

Script writing is an art in which indentation is utmost important. Conditional and looping statements are to be properly aligned to facilitate easy understanding. Comments are included to minimize the number of surprises that could occur when going through the code.

4.7.5 MESSAGE BOX FORMAT

When something has to be prompted to the user, he must be able to understand it properly. To achieve this, a specific format has been adopted in displaying messages to the user. They are as follows:

- X – User has performed illegal operation.
- ! – Information to the user.

4.8 TEST PROCEDURE

SYSTEM TESTING

Testing is performed to identify errors. It is used for quality assurance. Testing is an integral part of the entire development and maintenance process. The goal of the testing during phase is to verify that the specification has been accurately and completely incorporated into the design, as well as to ensure the correctness of the design itself. For example the design must not have any logic faults in the design is detected before coding commences, otherwise the cost of fixing the faults will be considerably higher as reflected. Detection of design faults can be achieved by means of inspection as well as walkthrough.

Testing is one of the important steps in the software development phase. Testing checks for the errors, as a whole of the project testing involves the following test cases:

- Static analysis is used to investigate the structural properties of the Source code.
- Dynamic testing is used to investigate the behavior of the source code by executing the program on the test data.

TEST DATA AND OUTPUT

4.8.1 UNIT TESTING

Unit testing is conducted to verify the functional performance of each modular component of the software. Unit testing focuses on the smallest unit of the software design (i.e.), the module. The white-box testing techniques were heavily employed for unit testing.

4.8.2 FUNCTIONAL TESTS

Functional test cases involved exercising the code with nominal input

values for which the expected results are known, as well as boundary values and special values, such as logically related inputs, files of identical elements, and empty files.

Three types of tests in Functional test:

- Performance Test
- Stress Test
- Structure Test

4.8.3 PERFORMANCE TEST

It determines the amount of execution time spent in various parts of the unit, program throughput, and response time and device utilization by the program unit.

4.8.4 STRESS TEST

Stress Test is those test designed to intentionally break the unit. A Great deal can be learned about the strength and limitations of a program by examining the manner in which a programmer in which a program unit breaks.

4.8.5 STRUCTURED TEST

Structure Tests are concerned with exercising the internal logic of a program and traversing particular execution paths. The way in which White-Box test strategy was employed to ensure that the test cases could Guarantee that all independent paths within a module have been have been exercised at least once.

- Exercise all logical decisions on their true or false sides.
- Execute all loops at their boundaries and within their operational bounds.
- Exercise internal data structures to assure their validity.
- Checking attributes for their correctness.
- Handling end of file condition, I/O errors, buffer problems and textual errors in output information

4.8.6 INTEGRATION TESTING

Integration testing is a systematic technique for construction the program structure while at the same time conducting tests to uncover errors associated with interfacing. i.e., integration testing is the complete testing of the set of modules which makes up the product. The objective is to take untested modules and build a program structure tester should identify critical modules.

Critical modules should be tested as early as possible. One approach is to wait until all the units have passed testing, and then combine them and then tested. This approach is evolved from unstructured testing of small programs. Another strategy is to construct the product in increments of tested units. A small set of modules are integrated together and tested, to which another module is added and tested in combination. And so on. The advantages of this approach are that, interface dispenses can be easily found and corrected.

The major error that was faced during the project is linking error. When all the modules are combined the link is not set properly with all support files. Then we checked out for interconnection and the links. Errors are localized to the new module and its intercommunications. The product development can be staged, and modules integrated in as they complete unit testing. Testing is completed when the last module is integrated and tested.

4.9 TESTING TECHNIQUES / TESTING STRATEGIES

4.9.1 TESTING

Testing is a process of executing a program with the intent of finding an error. A good test case is one that has a high probability of finding an as-yet – undiscovered error. A successful test is one that uncovers an as-yet- undiscovered error. System testing is the stage of implementation, which is aimed at ensuring that the system works accurately and efficiently as expected before live operation commences. It verifies that the whole set of programs hang together. System testing requires a test consists of several key activities and steps for run program, string, system and is important in adopting a successful new system. This is the last chance to detect and correct errors before the system is installed for user acceptance testing.

The software testing process commences once the program is created and the documentation and related data structures are designed. Software testing is essential for correcting errors. Otherwise the program or the project is not said to be complete. Software testing is the critical element of software quality assurance and represents the ultimate the review of specification design and coding. Testing is the process of executing the program with the intent of finding the error. A good test case design is one that as a probability of finding an yet undiscovered error. A

successful test is one that uncovers an yet undiscovered error. Any engineering product can be tested in one of the two ways:

4.9.2.1 WHITE BOX TESTING

This testing is also called as Glass box testing. In this testing, by knowing the specific functions that a product has been design to perform test can be conducted that demonstrate each function is fully operational at the same time searching for errors in each function. It is a test case design method that uses the control structure of the procedural design to derive test cases. Basis path testing is a white box testing.

Basis path testing:

- Flow graph notation
- Cyclometric complexity
- Deriving test cases
- Graph matrices Control

4.9.2.2 BLACK BOX TESTING

In this testing by knowing the internal operation of a product, test can be conducted to ensure that “all gears mesh”, that is the internal operation performs according to specification and all internal components have been adequately exercised. It fundamentally focuses on the functional requirements of the software.

The steps involved in black box test case design are:

- Graph based testing methods
- Equivalence partitioning
- Boundary value analysis
- Comparison testing

4.9.3 SOFTWARE TESTING STRATEGIES:

A software testing strategy provides a road map for the software developer. Testing is a set activity that can be planned in advance and conducted systematically. For this reason a template for software testing a set of steps into which we can place specific test case design methods should be strategy should have the following characteristics:

- Testing begins at the module level and works “outward” toward the integration of the entire computer based system.
- Different testing techniques are appropriate at different points in time.

- The developer of the software and an independent test group conducts testing.
- Testing and Debugging are different activities but debugging must be accommodated in any testing strategy.

4.9.3.1 INTEGRATION TESTING:

Integration testing is a systematic technique for constructing the program structure while at the same time conducting tests to uncover errors associated with. Individual modules, which are highly prone to interface errors, should not be assumed to work instantly when we put them together. The problem of course, is “putting them together”- interfacing. There may be the chances of data lost across on another’s sub functions, when combined may not produce the desired major function; individually acceptable impression may be magnified to unacceptable levels; global data structures can present problems.

4.9.3.2 PROGRAM TESTING:

The logical and syntax errors have been pointed out by program testing. A syntax error is an error in a program statement that in violates one or more rules of the language in which it is written. An improperly defined field dimension or omitted keywords are common syntax error. These errors are shown through error messages generated by the computer. A logic error on the other hand deals with the incorrect data fields, out-off-range items and invalid combinations. Since the compiler s will not deduct logical error, the programmer must examine the output. Condition testing exercises the logical conditions contained in a module. The possible types of elements in a condition include a Boolean operator, Boolean variable, a pair of Boolean parentheses A relational operator or on arithmetic expression. Condition testing method focuses on testing each condition in the program the purpose of condition test is to deduct not only errors in the condition of a program but also other a errors in the program.

4.9.3.3 SECURITY TESTING:

Security testing attempts to verify the protection mechanisms built in to a system well, in fact, protect it from improper penetration. The system security must

be tested for invulnerability from frontal attack must also be tested for invulnerability from rear attack. During security, the tester places the role of individual who desires to penetrate system.

4.9.3.4 VALIDATION TESTING

At the culmination of integration testing, software is completely assembled as a package. Interfacing errors have been uncovered and corrected and a final series of software test-validation testing begins. Validation testing can be defined in many ways, but a simple definition is that validation succeeds when the software functions in manner that is reasonably expected by the customer. Software validation is achieved through a series of black box tests that demonstrate conformity with requirement. After validation test has been conducted, one of two conditions exists.

- * The function or performance characteristics confirm to specifications and are accepted.
- * A validation from specification is uncovered and a deficiency created.

Deviation or errors discovered at this step in this project is corrected prior to completion of the project with the help of the user by negotiating to establish a method for resolving deficiencies. Thus the proposed system under consideration has been tested by using validation testing and found to be working satisfactorily. Though there were deficiencies in the system they were not catastrophic

4.9.3.5 USER ACCEPTANCE TESTING

User acceptance of the system is key factor for the success of any system. The system under consideration is tested for user acceptance by constantly keeping in touch with prospective system and user at the time of developing and making changes whenever required. This is done in regarding to the following points.

- Input screen design.
- Output screen design.

CHAPTER 5

RESULTS AND DISCUSSION

As per the whole project, the result has successfully occurred and as per my analysis, we have been observed the process in different stages. The first stage is like growing and growers tend to sell the material to cooperatives again who will sell those to manufacturers who will check the quality and proceed to continue the process in which we will get the good food quality products. The results in this have many variations and risks in the food supply chain. Risks in these are there will be many periodic changes in exchange rate policies and instability in the customer demand are high rated risks and control in the poor quality of food is low rated risk in the operations of the food supply chain. The performance of the food supply chain is good in many cases but it has major risks under the environmental conditions due to less supply of raw materials and in the condition of financial issues the process will slow down as per the production of raw materials.



Fig. 5.1 Home Page

The above fig.4.1 is the homepage of our project and there we can see the blockchain based poster on the homepage with a title called Food Supply Chain Management using Blockchain. This page will occur through tomcat server login and handled by tomcat server and blockchain server and the tab is named as consumer as shown in the above figure.

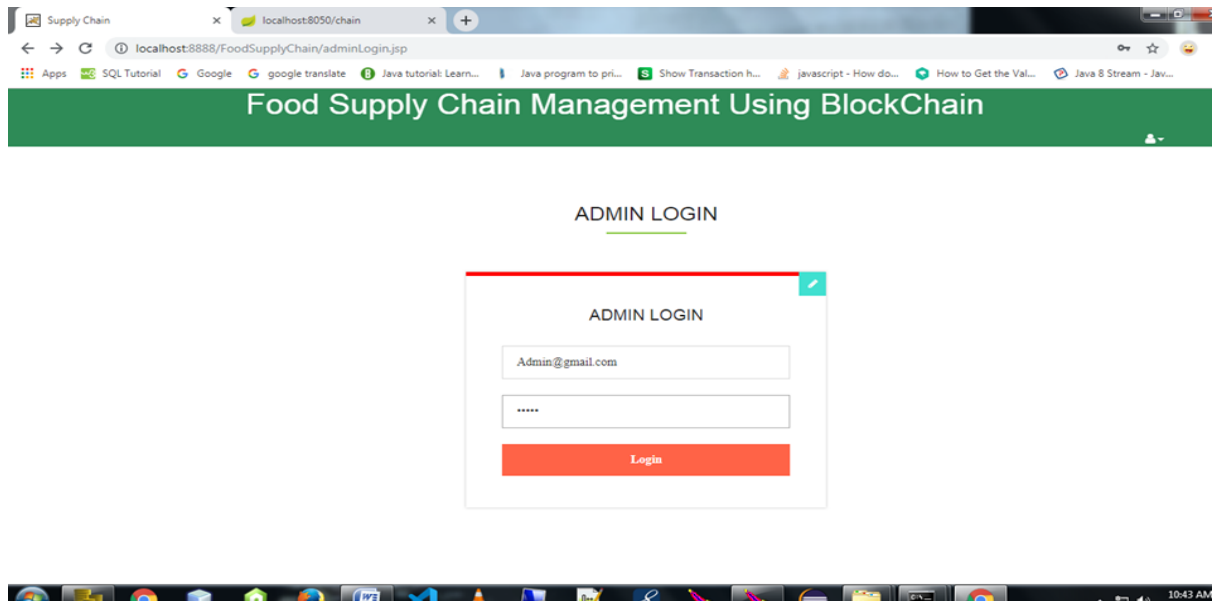


Fig. 5.2 Login page

Here, above shown fig.4.2 is the login page of the admin who is going to handle all the databases stored in the web page and all the databases are stored in the MySQL database. We can see the second tab in the image and that is the blockchain server, we need to refresh the page after every login and acceptance process or else we may get error in page and may slowdown the blockchain server. After logging in four main barcodes will occur and by clicking on the barcodes the items data base will be stored in MySQL as shown in the below figure.

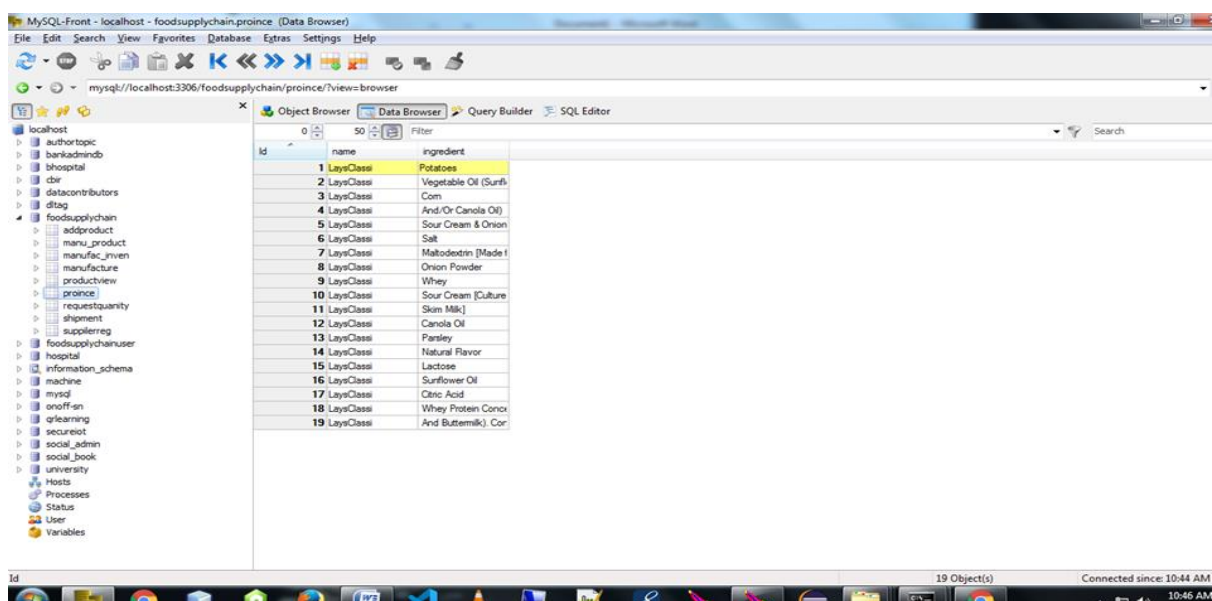


Fig.5.3. Database

The above shown fig.4.3 is the database of the items which we are going to sell and the available items after clicking on the barcode in the admin login page. After adding any product to any account, we can check the database and complete details of the product in the MySQL database. Apache tomcat and blockchain server are internally connected to the database and so all the information is stored in it through API. Here in the database, we can remove the database which we have inserted previously and then all the information the web page will be automatically cleared and then the fresh page occurs to create the new data. All the store product data and bank admin details also will be available here in the database if we forgot the information and also mainly it is very secure and safe in the admin hand.

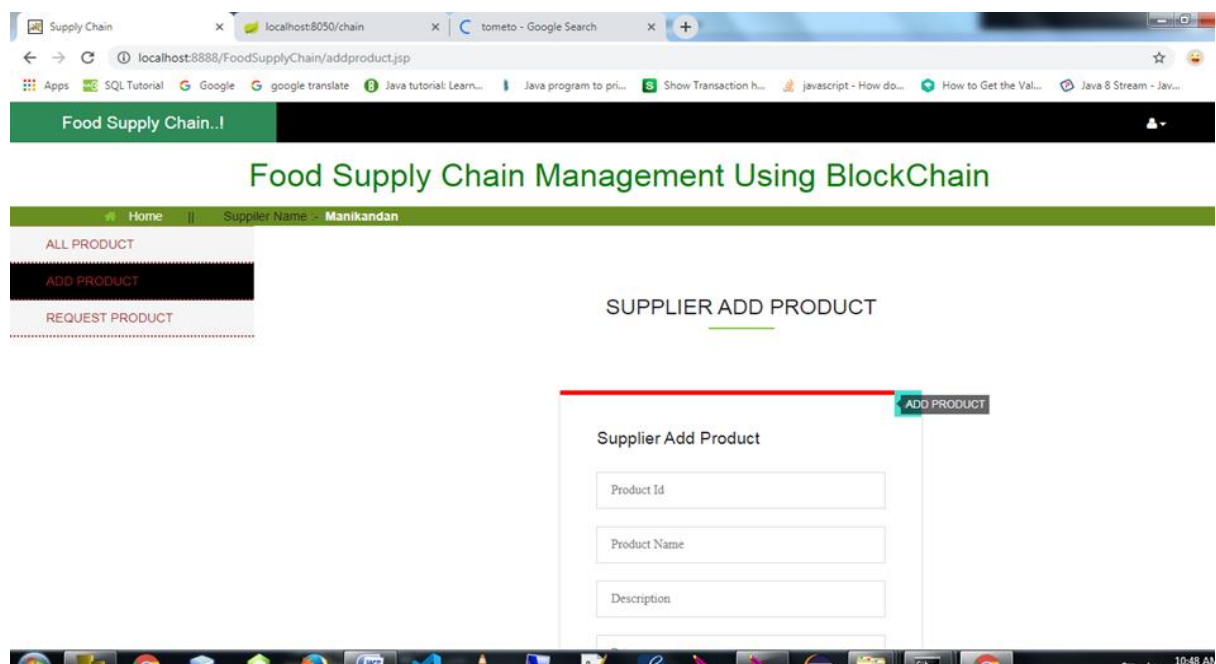


Fig.5.4 Supplier account

In the above figure.4.4 this is the supplier account who is going to supply the raw materials to the manufacturer and firstly there will be a login page for supplier and he is supposed to create an account for him personally and login, but I did not mention the supplier login page here due to number of pages. Then he will go to the add product sector as shown in the figure and then add the products by scrolling down, after adding the products all information which he had added will be available in the all-product option as shown in the figure and in the database too.

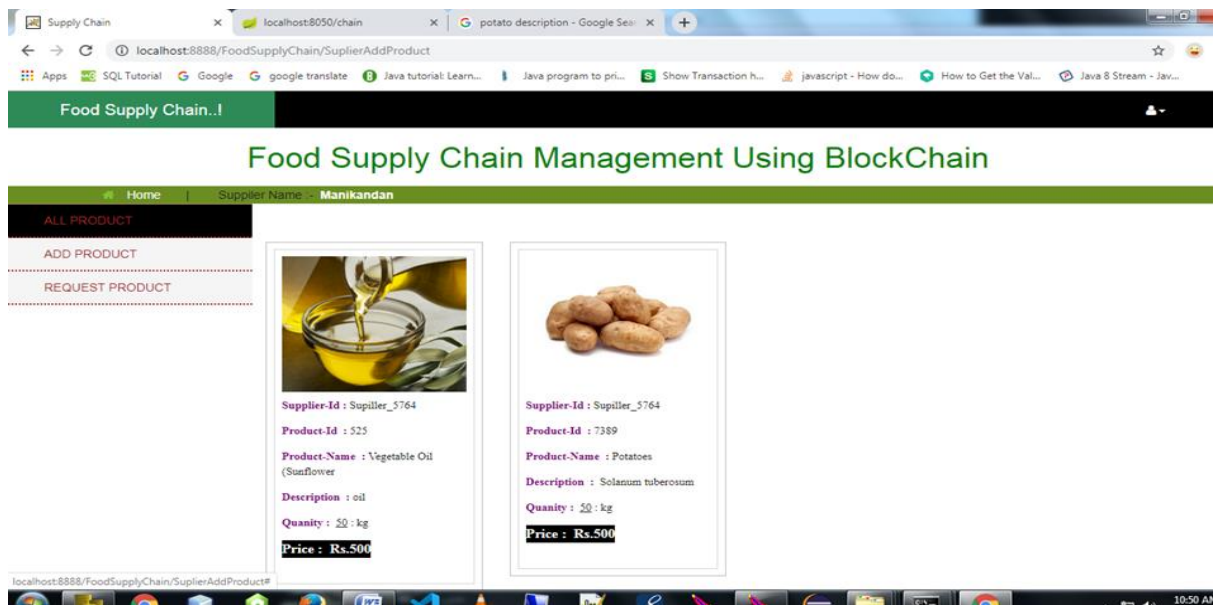


Fig.5.5 Supplier added products

In the above fig.4.5 As we talked before in the figure the all-product sector contains the product which supplier have added and now manufacture login will happen after creating his account. He will request the products from supplier which he had already added in his account. After approving by the supplier by logging in to his account, manufacturer continues next process.

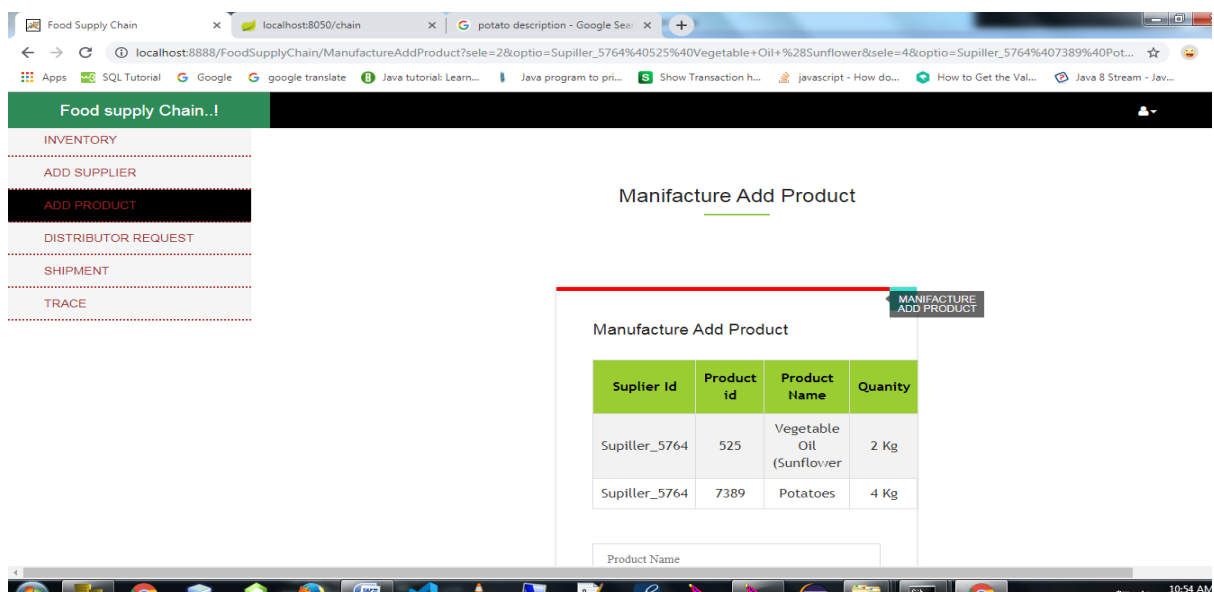


Fig.5.6. manufacturer products

In the above fig.4.6 after the approval of the manufacture request to supplier, he

opens his account and will add the product quantity in his account for the further process. Then the requested product is visible in his account in the distributor request sector as shown in the figure, he will add it to shipment sector through the product id and there we can track it.



Fig. 5.7 Manufacturer product dispatching

In the fig.4.7 after sending the product into the shipment sector through its unique id we can go the trace button and trace the product by clicking on track here button and get the complete details of product until the transaction of the manufacturers supply.

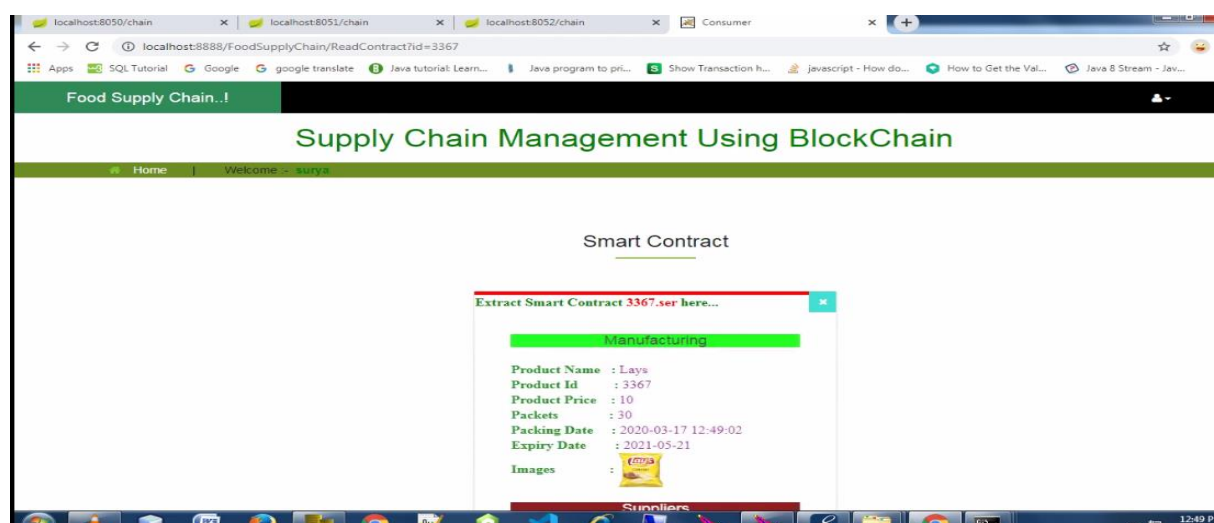


Fig.5.8 Blockchain details after dispatching manufacturer products

In the above fig.4.8 after clicking on the track here button the details of the supplied products will appear in this way as shown in the figure like the product name, product id, price, packing date, expiry date and quantity also supplier and manufacturers details, their transaction details, etc., at last QR code will also appear for every product uniquely and if we scan that product on our phone then the product id will appear on the phone.

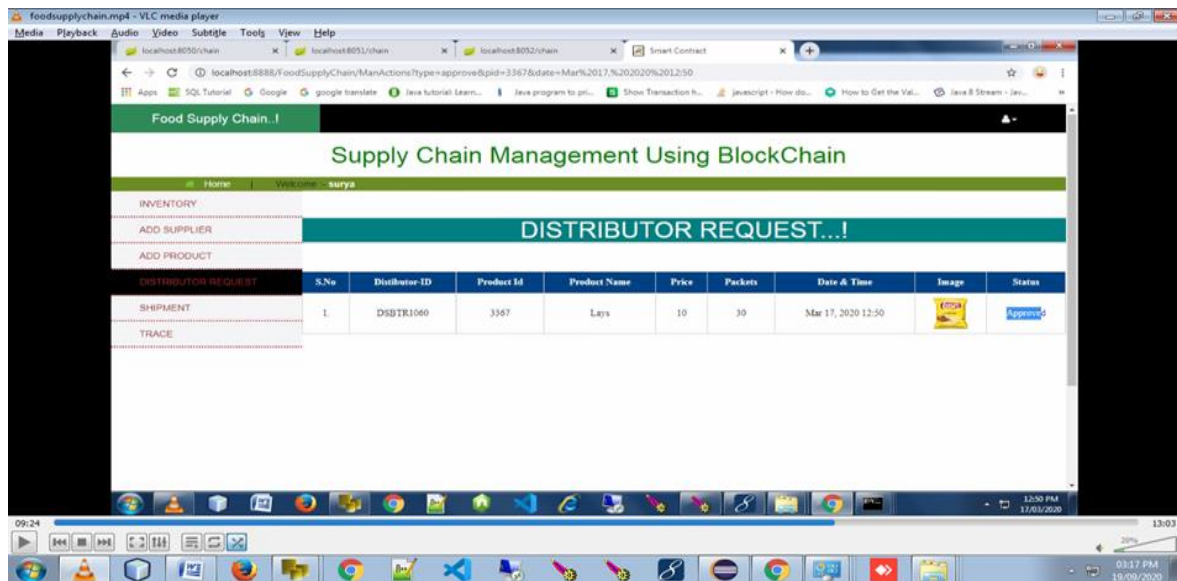


Fig.5.9 Distributor Request

In the above fig.4.9 after dispatching of manufacturer products the next procedure is distributor request. Already we traced the product with unique id in shipment sector so here we can see the status of item that we purchased with details of their distributor id, product id, product name, price, packets, and date and time with status. We can trace whether its approved or not.

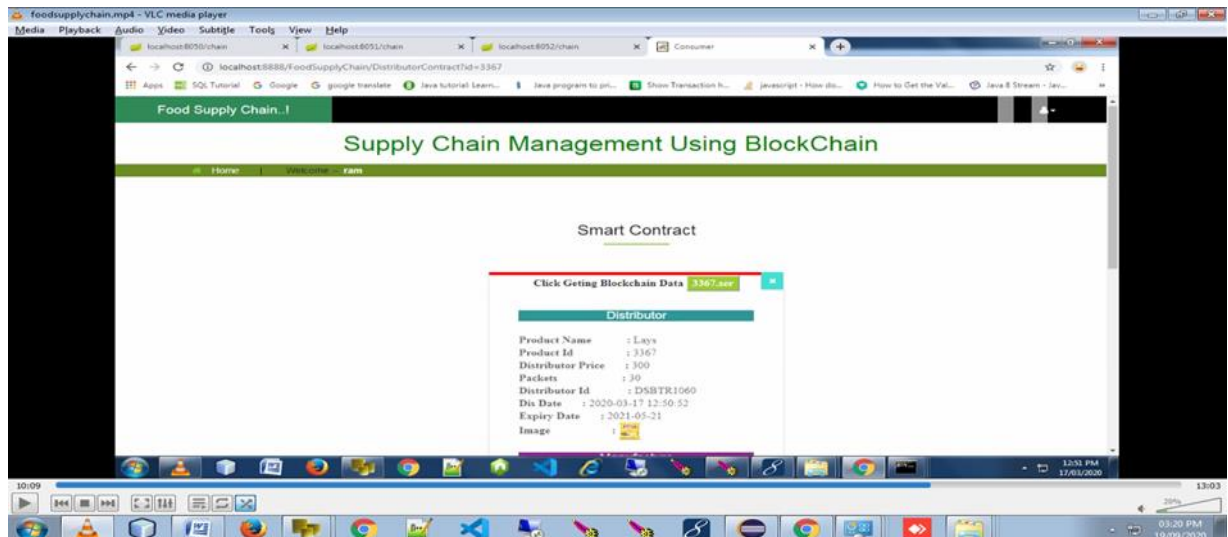


Fig.5.10 Blockchain details of Distributor Products

In the above fig.5.0 after the distributor request here, we can the details of distributor products will appear in this way as shown in the product like the product name, product id, distributor price, distributor id, dis date, expiry date, image and quantity of the distributor details and also with transaction details, etc., at last QR code will also appear for every product uniquely and if we scan that product on our phone then the product id will appear on the phone.

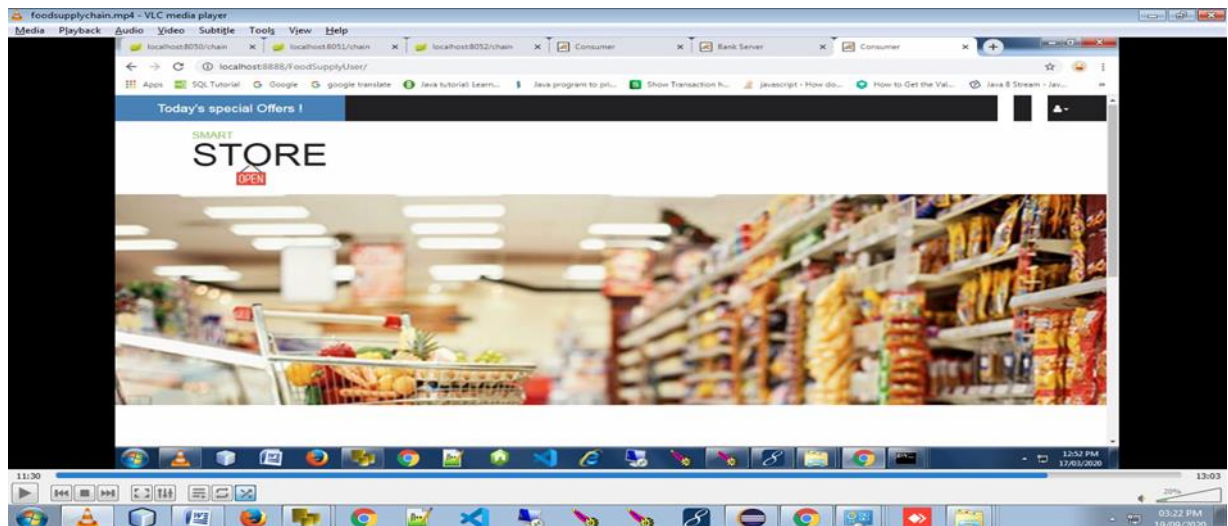


Fig.5.11 Store Main page

In the above fig.5.1 this is the main store page of blockchain here we can see all the information of store regarding the information of buying products with brief description. In this page we can see the number of different products. Here we can add the products in the cart for easy shopping or else we can delete it in the cart. It

will be easy for transactions and by using QR code we can see all the details of product through our phone.

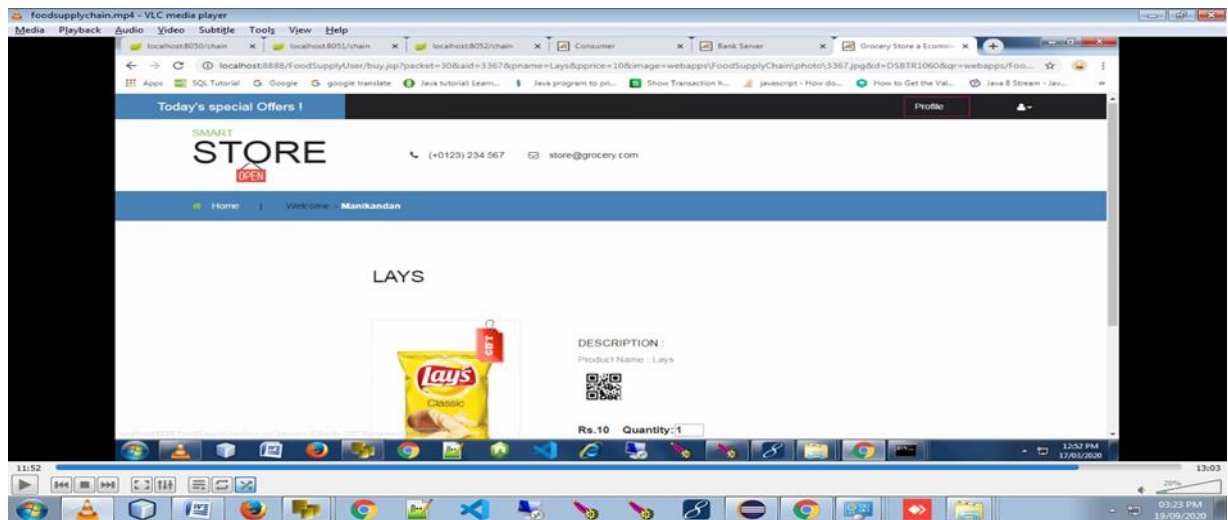


Fig.5.12 Description of product with QR code

In the above fig.5.2 here we can see the description of product with QR code. By scanning the QR code we can see all the details of product like product name, product id, distributor id, date and time, status, dis date, expiry date and quantity and with transaction details. Every product has a unique QR code. By scanning the code, we can see the details of the product as shown in the figure through our phone.



Fig.5.13 Payment Method

In the above fig.5.3 is payment method. After completion of description of product with QR code. Here we have to fill the customer details of account number, Atm pin, and with One time password through our bank for transaction.

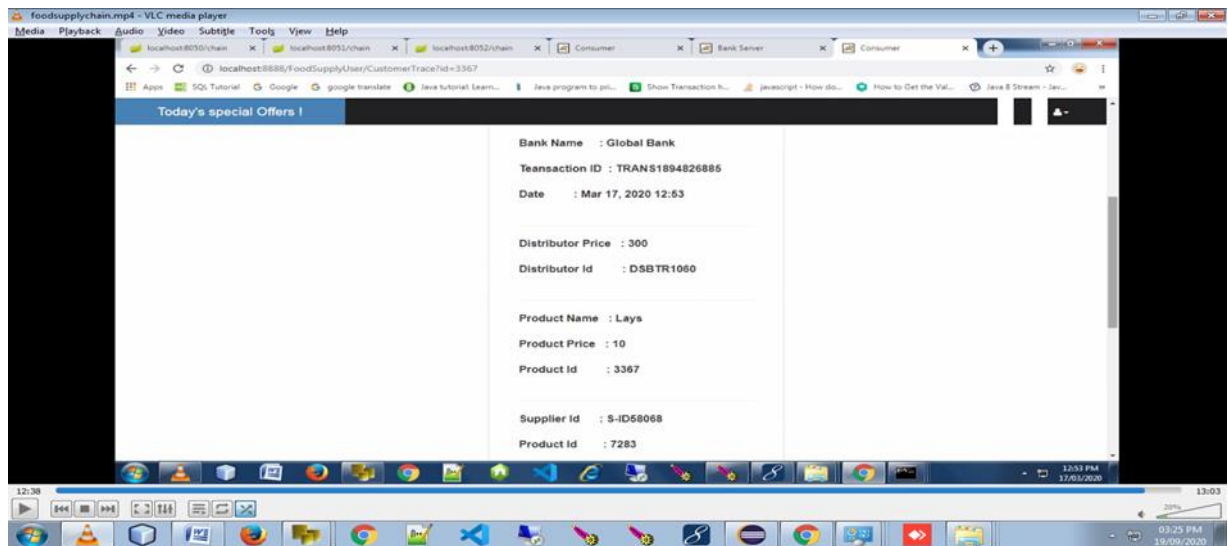


Fig.5.14 Transaction details

In the above fig.5.4 is Transaction details after completion of payment method we get the details of the product like bank name, transaction id, date, distributor price, distributor id, product name, product price, product id, supplier id, etc., This is the details of the product for confirmation of order status.

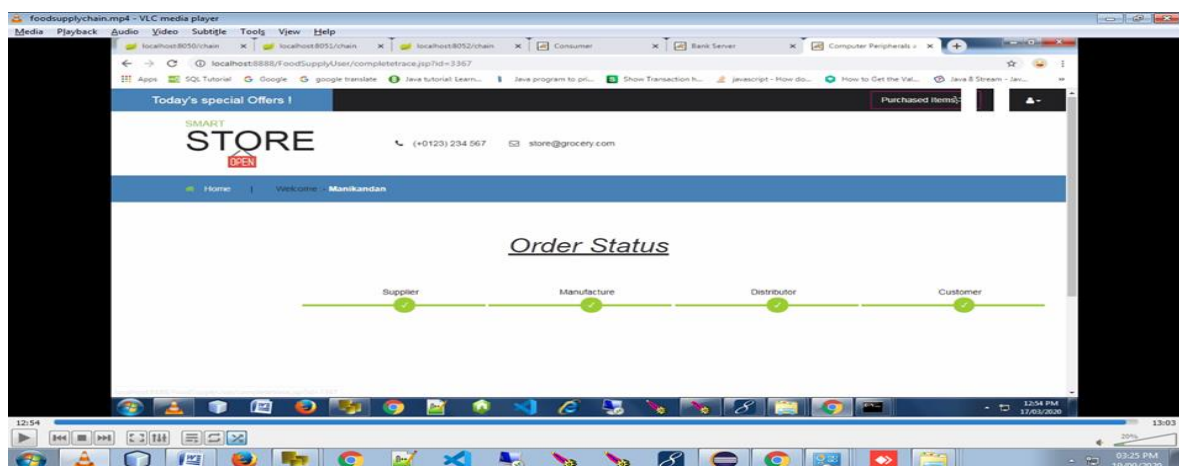


Fig.5.15 Order status

In the above fig.5.4 is order status. After completion of payment method with transaction details by using all that information like supplier, manufacturer,

distributor and customer here the order will be confirmed. As shown in figure here we can see the order status of each procedure of product

CHAPTER 6

CONCLUSION AND FUTURE WORK

Food traceability system has become a need these days. Individuals are currently more worried about food wellbeing. These issues hurt purchaser's health as well as of cripples their trust in food markets. By using blockchain technology, we made a proposed system that will give traceability, transparency, effectiveness, unwavering quality, and security through every one of the phases of a food supply chain. Accordingly, of the project execution full subtleties of the item and even sum paid subtleties and tracking will be included and can be seen by the client through the exceptionally actualized QR check code on every item with the imperishable food supply chain. The main feature of our project is the QR code. The shopper can check the subtleties of the item through it and it is special for each project rear of the parcel. I accomplished it by implementing effectively.

My future work is to actualize that the utilization of blockchain empowers traceability of the resource. From the rancher to the buyer, all through the supply chain, we can keep hints of the resource. We can guarantee that the resource has not been altered. Additionally, the entire supply chain will turn out to be more responsible. Fake inflation of costs for the deceptive benefit of intermediaries can be controlled. The shoppers will likewise profit as they won't be paying inflated costs for the products they purchase. This, in turn, will improve the general way of life of the general public.

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APPENDIX

A. SAMPLE CODE

```
package blockchaincall;

public class BlockChainUrl {

    // -----MANUFACTURE-----
    public static final String MANUFACTURE_TRANS =
"http://localhost:8050/transactions/";
    public static final String MANUFACTURE_MINE =
"http://localhost:8050/mine";
    public static final String MANUFACTURE_CHAIN =
"http://localhost:8050/chain";

    // -----DISTRIBUTOR-----
    public static final String DISTRIBUTOR_TRANS =
"http://localhost:8051/transactions/";
    public static final String DISTRIBUTOR_MINE =
"http://localhost:8051/mine";
    public static final String DISTRIBUTOR_CHAIN =
"http://localhost:8051/chain";

    // -----SELLER-----
    public static final String SELLER_TRANS =
"http://localhost:8052/transactions/";
    public static final String SELLER_MINE =
"http://localhost:8052/mine";
    public static final String SELLER_CHAIN =
"http://localhost:8052/chain";
}

import java.sql.Connection;
import java.sql.DriverManager;
```

```

import javax.servlet.ServletContext;
import javax.servlet.ServletContextEvent;
import javax.servlet.ServletContextListener;

public class DBconnection implements ServletContextListener {

    static Connection connection = null;

    public void contextDestroyed(ServletContextEvent arg0) {
        try {
            System.out
                .println("-----FoodSupplyChain
successfully-----");

            connection.close();
        } catch (Exception e) {
            e.printStackTrace();
        }
    }

    public void contextInitialized(ServletContextEvent arg0) {
        ServletContext context = arg0.getServletContext();
        try {
            Class.forName("com.mysql.jdbc.Driver");
            connection = DriverManager.getConnection(

                "jdbc:mysql://localhost/foodsupplychain", "root", "root");
            context.setAttribute("connection", connection);
            System.out.println("-----connection opened
successfully-----");

        } catch (Exception e) {
            e.printStackTrace();
        }
    }
}

```

```

    }

    public Connection getConnection() {
        return connection;
    }
}

package manufacture;

import java.io.IOException;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.HttpSession;

import com.http.servlet.HttpServlet;

public class ManufactureVi extends HttpServlet {

    private static final long serialVersionUID = 1L;

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, IOException {

        try {

            String id = request.getParameter("proid");
            System.out.println(id);
            HttpSession session = request.getSession();
            HttpSessionhttpSession = request.getSession();
            httpSession.setAttribute("id", id);
            RequestDispatcher rrd = request

```

```

        .getRequestDispatcher("manufacture_menu.jsp");
        rd.forward(request, response);

    } catch (Exception e) {
        e.printStackTrace();
    }
}

}

package com.distributor;

import java.io.File;
import java.io.IOException;
import java.io.PrintWriter;
import java.text.DateFormat;
import java.text.SimpleDateFormat;
import java.util.Calendar;
import java.util.Date;
import java.util.List;

import javax.servlet.RequestDispatcher;
import javax.servlet.ServletException;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpServletResponse;
import javax.servlet.http.HttpSession;

import QrCode.QRCode;

import com.http.servlet.HttpsServlet;

public class DistributorRequest extends HttpsServlet {

    private static final long serialVersionUID = 1L;

```

```

        public void doPost(HttpServletRequest request,
        HttpServletResponse response)
            throws ServletException, IOException {

            response.setContentType("text/html");
            PrintWriter out = response.getWriter();
            try {

                HttpSession session = request.getSession(false);

                String manufacturer =
request.getParameter("man");

                String distributor = (String)
session.getAttribute("did");

                String productId = request.getParameter("pid");

                String productName =
request.getParameter("pname");

                String image = "";
                // -----date-----
                Date d = new Date();
                Calendar calendar = Calendar.getInstance();

                String date =
DateFormat.getDateInstance().format(d);

                Date date1 = calendar.getTime();

                DateFormat format1 = new
SimpleDateFormat("HH:mm");

                String time = format1.format(date1);
                String dateTime = date + " " + time;
                System.out.println(dateTime);
                // -----
                UserDao userDao = new UserDao();
                List<ManPojo> list = userDao.loadInventory();

                String amount = "";
                String packets = "";
                String eDate = "";
                String pDate = "";

```

```

        for (ManPojo manPojo : list) {
            if
(manPojo.getProductId().equalsIgnoreCase(productId)) {
                image = manPojo.getImagePath();
                amount = manPojo.getPrice();
                packets = manPojo.getPackets();
                eDate = manPojo.getEdate();
                pDate = manPojo.getPdate();
                System.out.println("packets -----
->" + packets);
                System.out.println("edate -----
>" + eDate + "--->"
                                + pDate);
            }
        }

```

```

        String ss = productId;
        String qrCodeText = ss;
        String filePath =
"webapps/FoodSupplyChain/photo/" + ss;
        int size = 250;
        String fileType = "png";

        File qrFile = new File(filePath);
        QRCode.createQRImage(qrFile, qrCodeText, size,
fileType);

```

```

        DisPojo disPojo = new DisPojo(manufacturer,
distributor, productId,
                                productName, dateTime, image,
"pending", amount, "0",
                                packets, eDate, pDate, filePath);

        boolean result =
userDao.sendDistributorRequests(disPojo);
        String msg = "";
        if (result) {

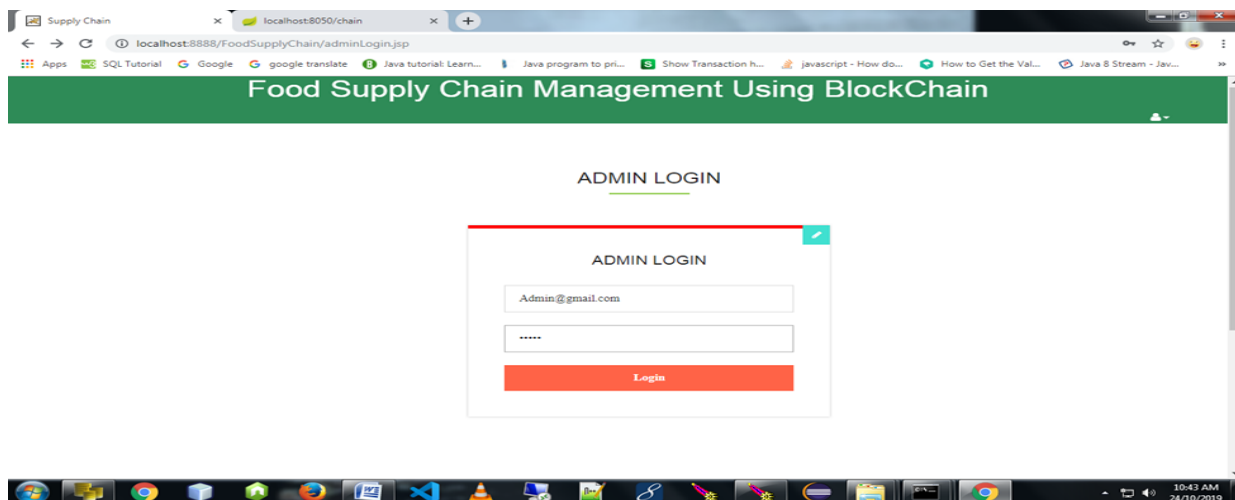
```

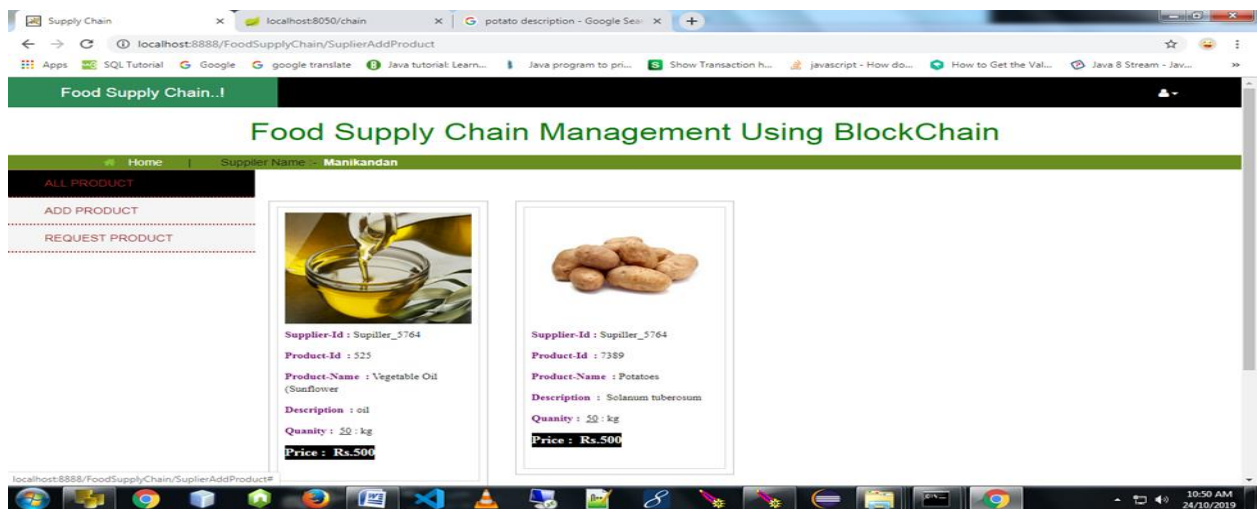
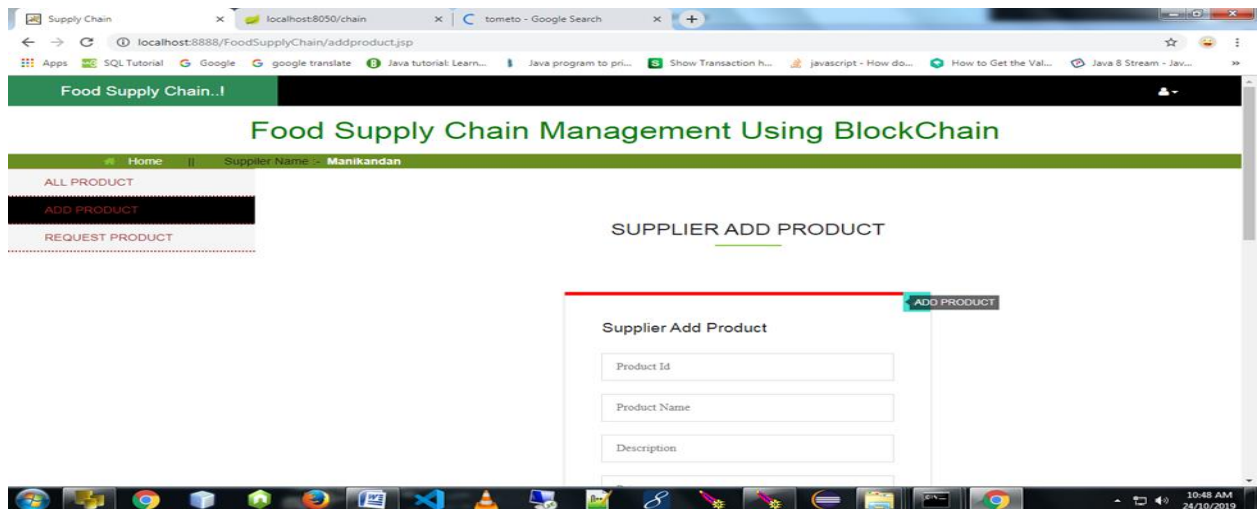
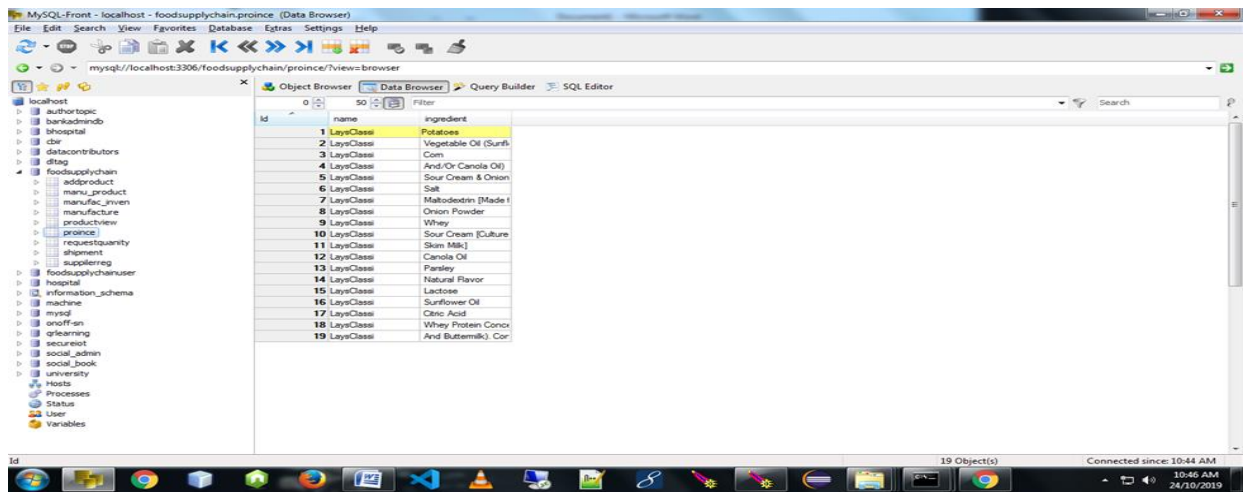
```

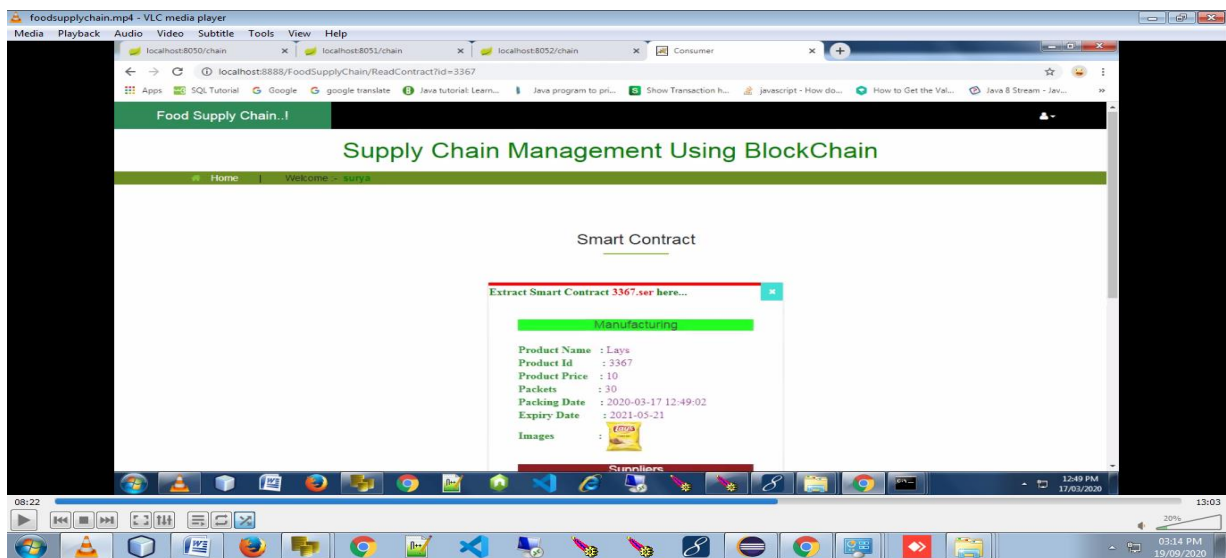
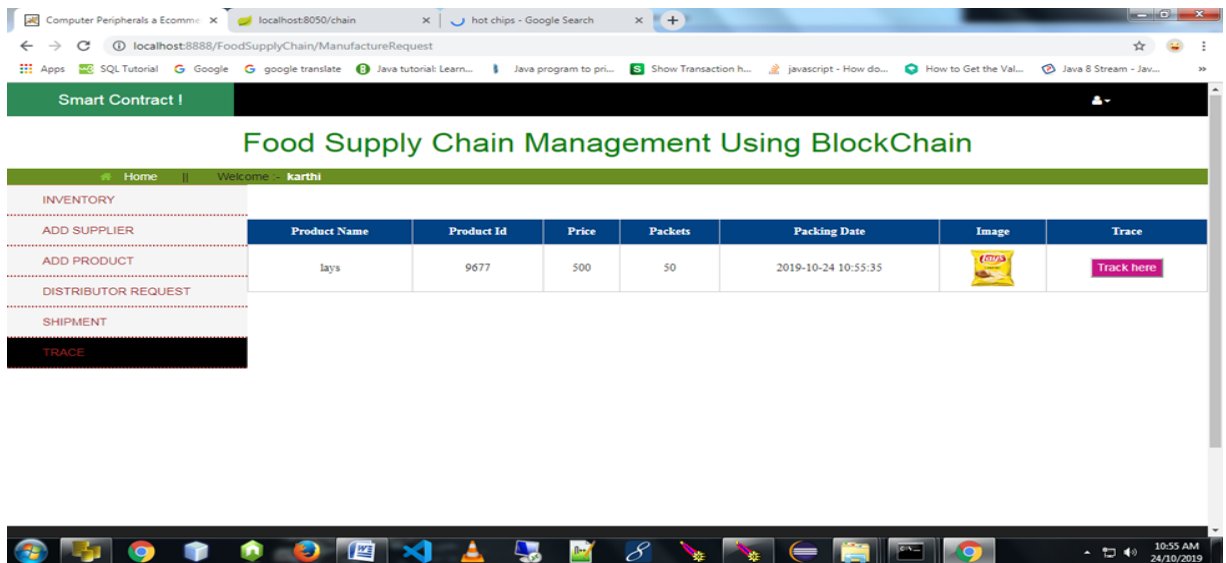
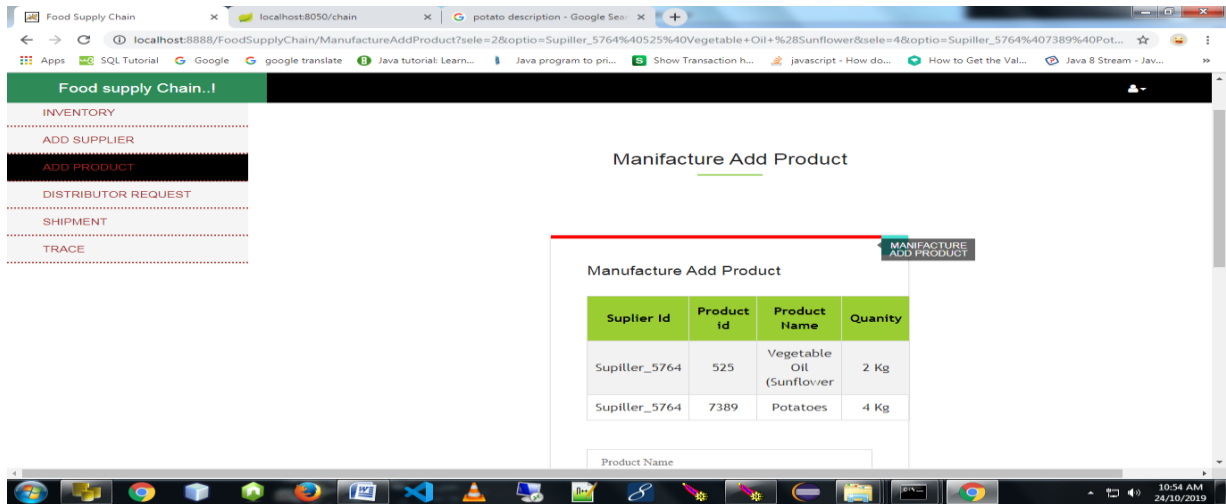
        msg = "Product request sent to the
Manufacturer";
    } else {
        msg = "Failed to sent product request";
    }
    request.setAttribute("msg", msg);
    RequestDispatcher rd =
request.getRequestDispatcher("dmenu.jsp");
    rd.forward(request, response);
    out.close();
} catch (Exception e) {
    e.printStackTrace();
}
}
}

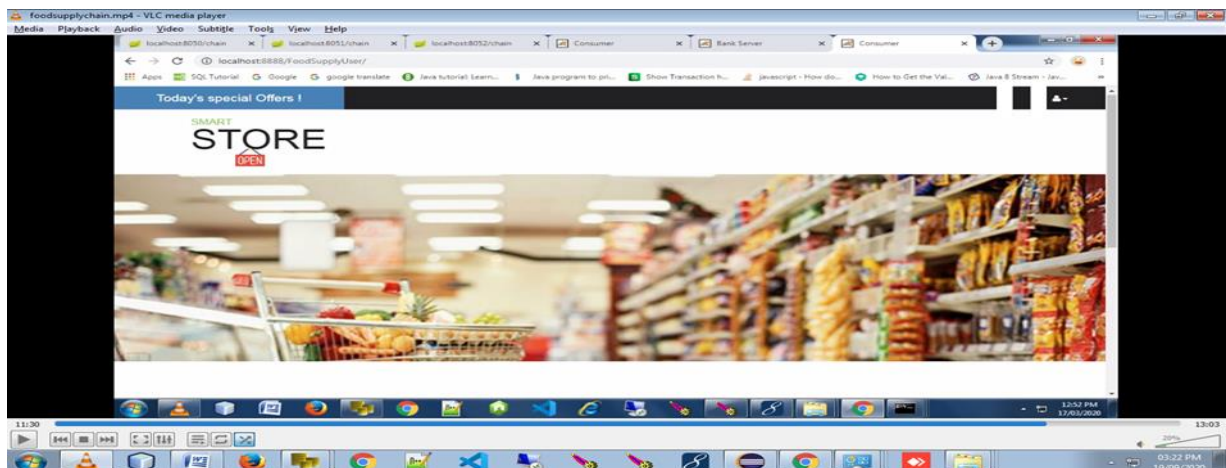
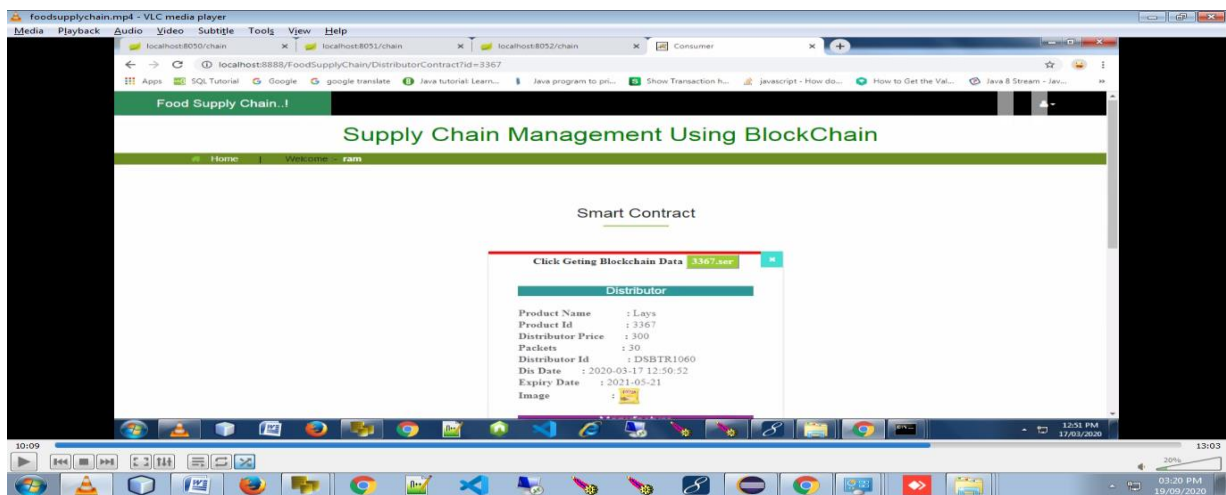
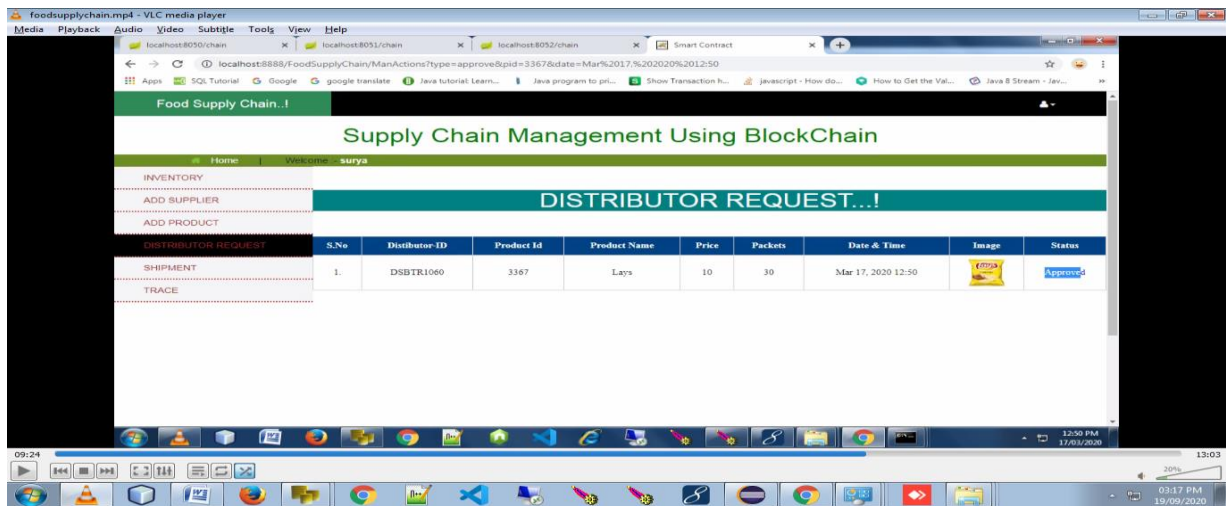
```

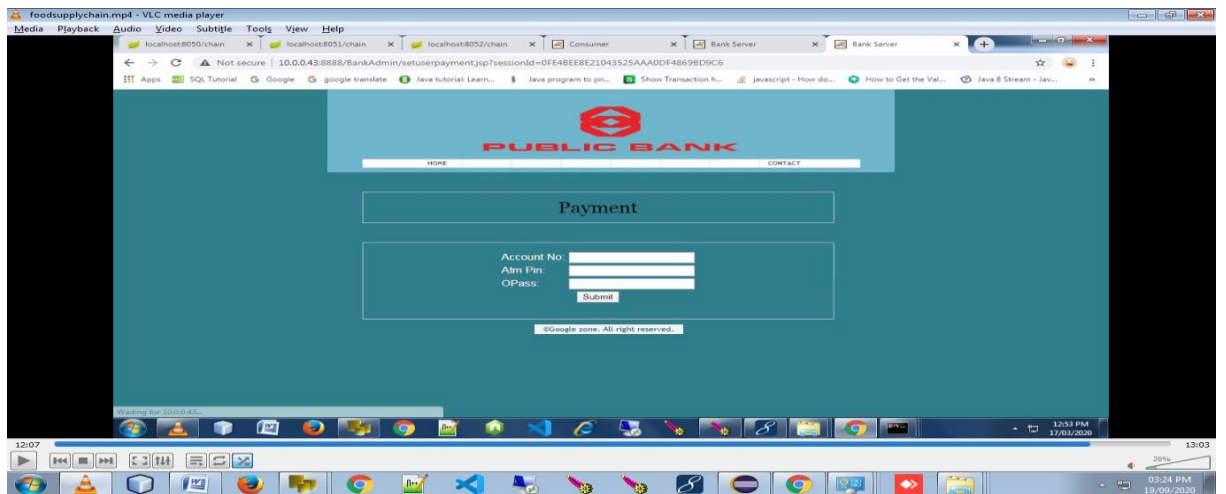
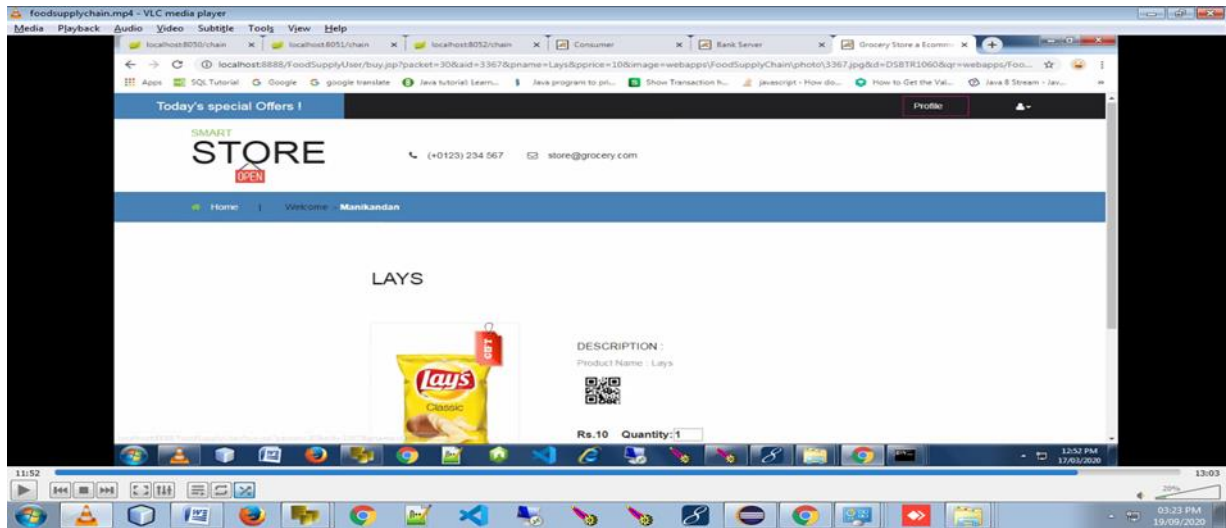
B. SCREEN SHOTS

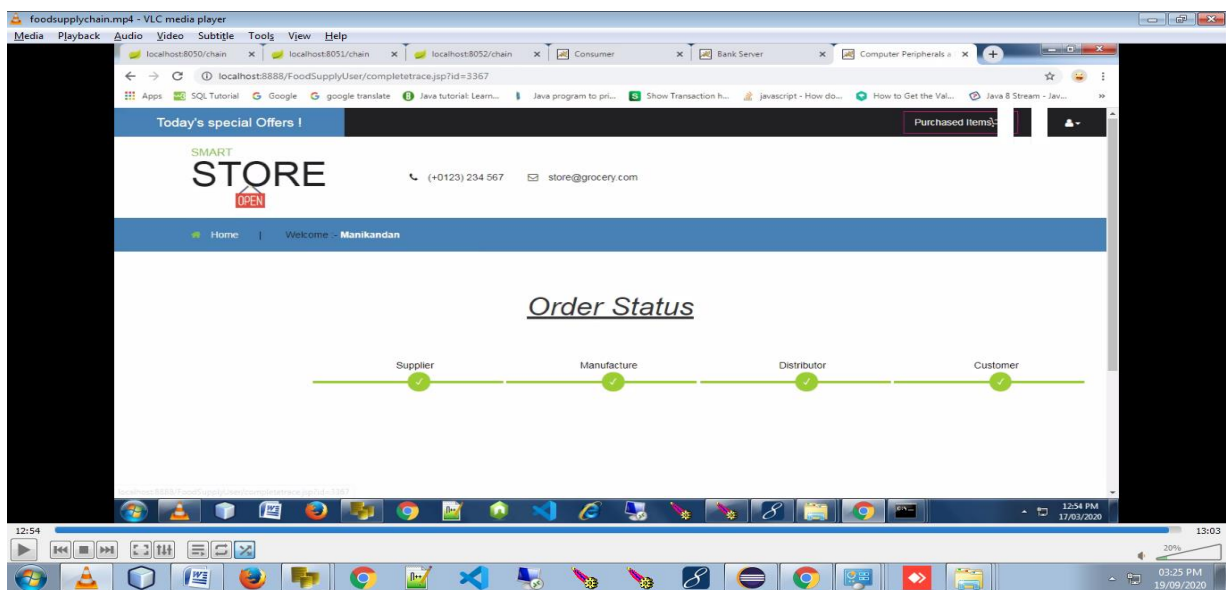
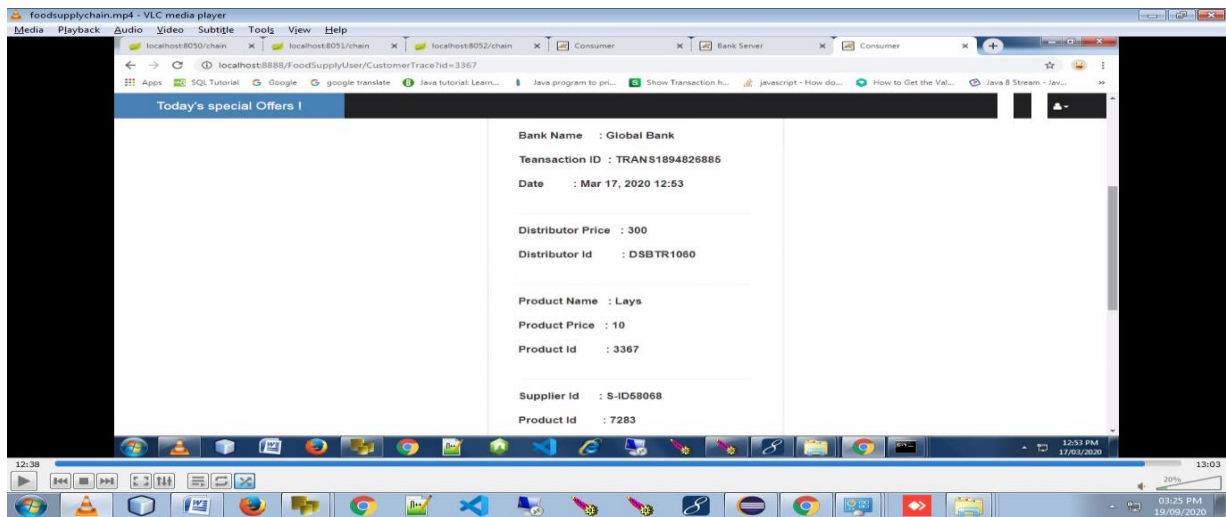












Traceability of Food using Blockchain and QR code

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ABSTRACT

Blockchain food traceability is acquiring energy in the worldwide agri-food area. The capacity to immediately follow the whole lifecycle of food items from cause through each resource on its excursion to the purchaser supports believability, proficiency, and security. As of late, numerous food embarrassments broke out consistently in India, and individuals are shocked. After these threatened occurrences, individuals are presently more worried about food wellbeing. These issues hurt shopper's well-being as well as of cripples their trust in food markets. Since the current food coordination design isn't satisfying the need and needs of the food market, fabricating a protected and dependable food traceability system has become a need. The significance of utilizing this system is customers would trace their food from farmland to fork with a result of QR code. This paper covers the blockchain-and QR code-based food traceability system, benefits, and drawbacks of decentralized systems, finally, the making procedure of the proposed system. The fundamental issue in the existed system is the centralized system which needs visibility, details, and nature of the product. In which we have made a proposed system that will give tractability, visibility, effectiveness, dependability, and security through every one of the phases of a food supply chain. Subsequently, to the project implementation full details of the product and even some paid details and tracing will be incorporated and can be seen by the client through the particularly implemented QR code on every item or product with the enduring food supply network or chain.

Keywords: *Immutability, Disintermediation, QR code, Transparency, Food supply chain.*

1.INTRODUCTION

Blockchain is today perhaps the most intriguing and discussed research subject. A blockchain can be characterized as "an immutable ledger for recording exchanges, kept up inside a conveyed organization of commonly untrusted hubs. A blockchain is a rundown of requested squares, where each square stores a variable size rundown of exchanges". The first blockchain was presented by Satoshi Nakamoto, who proposed the idea of bitcoin cryptocurrency in 2008. This popular and perceived utilization of the blockchain in the monetary field permitted the trading of computerized cash inside an untrusted organization of unknown hubs, without an outsider go-between. Be that as it may, blockchain innovation is as of now utilized in numerous different areas, like medical care, smart urban smart contracts, communities, government, energy markets. The achievement of this innovation mainly exists in the accompanying properties: dependability, immutability, transparency.

Today, by far most conventional strategic data frameworks in Agriculture and food (Agri-food) supply chains just trace and store requests and conveyances, by not giving highlights as traceability, auditability, and transparency. These highlights would doubtlessly improve food quality and security; hence, they are increasingly more mentioned by buyers. In this way, a few Development and Research people group are focusing their endeavours on holding some type of Internet of Things (IoT) future enhancements, for example, wireless sensor networks and RFID's, or ordinary cheap in price associated gadgets, to enabled far off checking of the regulations and conditions present in food transportation situations and at a highly fine granularity along the entire Agri-food supply network or chain. Be that as it may, most of the current Internet of Things arrangements actually depend on cloud infrastructures which is heavily-centralized, where there is normally an absence of visibility, and naturally presents security dangers involving confidentiality, availability, data lock-in, and audibility. Food traceability is the capacity to follow the development of a food item and its fixings through all means in the supply chain, both in reverse and forward. Traceability includes archiving and connecting the production, processing, and distribution chain of food products and ingredients. On account of a foodborne sickness episode or pollution occasion, proficient item following aide's government organizations and the individuals who produce and offer food to quickly discover the wellspring of the item and where defilement may have happened. This empowers quicker expulsion of the influenced item from the commercial center, lessening occurrences of food-borne illness. Presently a day's food tractability is progressively turning into a significant perspective for building trust between food brands and their clients. An ever-increasing number of buyers are keen on following the whereabouts of their food-from a security point of view, just as to guarantee that their food is capably and morally sourced.

In this paper, we present Traceability has gotten exceptionally muddled in the supply chain the board especially in the food area. Blockchain assumes an exceptionally pivotal part in supplying food in the industrial market. These days clients in the market have gotten specific about the quality and supportability of the item, so utilizing this strategy has gotten simple to recognize the nature of the item. The primary issue in the current system is the centralized system which needs transparency, subtleties, and nature of the item. In which we had made a proposed system called a decentralized system which will be helpful to get the familiarity with the total item supply from one finish to another through every individual engaged with the supply chain. Therefore, the undertaking execution full subtleties of the item and even sum paid details and tracing will be incorporated and can be seen by the client through the uniquely Implemented QR code on every item with a sustainable food supply chain.

2. LITERATURE REVIEW

In this paper, the writing audit in the field of food traceability system utilizing blockchain and QR code.

As per the [1] creator, Juan F. Galvez and J.C. Mejuto directed illustrative research based on food authentication, data management, and analysis in his he executed an extraordinary spotlight on traceability. He permits every one of the partners to check the whole history and current area and create transparency for all participants. Indeed, irreversibly putting away information and blockchain

innovation makes a special degree of validity that adds to a more sustainable industry and reinforce their relationship with current clients and draw in new ones. Also, unfit to deal with the confirmation instrument to demonstrate whether the crude information was right and there is an issue about the general expenditure of blockchain implementation is unpredictable, mainly where the current, extremely develop supply chain system is using from a long period of time. Author [2] Miguel pincheira care and Muhammad deal Ali had profoundly examined the practical implementation of the food supply chain. He executed the Hyperledger sawtooth and Ethereum networks. He used the Algorithm novel consensus. He unfits the arrangement to improve the presentation investigation to more constrained hardware architecture to evaluate the fitness of the proposed system to applications involving original gateways and IoT devices along the Agri-food supply chain. Going to the creator [3] Andreas families directed distinct exploration dependent on the food supply chain and advantages and difficulties and he expected to set up a demonstrated and confided in climate to assemble a transparent and more feasible food creation and distribution, incorporating key partners in to supply chain and executed on the digitalization agriculture and food security and incapable to secure, reliable and transparency and traceability approach to guarantee food safety and integrity. Author [4] Kay Behnke drove research subject to blockchain development and executed BCT limit conditions and traceability and unfitted the how these troubles could be tended to by government and private undertakings, to set up blockchain advancement as a secured, transparency and dependable way to deal with ensuring food safety and uprightness. It is amazingly entrancing to see how blockchain will be gotten together with other emerging innovations (robotics, big data, RFID, IoT, Hyperspectral imaging, NFC, etc..), for the higher robotization of the food supply measures, improved with full traceability and transparency. Author[5] Konstantinos Demestichas and Nikolaos peppers coordinated clear exploration subject to the relevance of the blockchain traceability system of agri-food things and executed that using blockchain can helpfully help with achieving traceability by irreversibly and immutability putting away data. Blockchain innovation makes a novel degree of validity and adds to more practical food industry. Albeit guaranteeing food discernibility with blockchain innovation looks empowering, certain limits remained to be considered and tended to, including rules, the association between the parties, information possession, versatility, and so on, In request to see unmistakably and the innovation and maybe, produce new executions, scientists and originators would benefit by the improvement of an overall assessment model. Besides, unsuited execution of another framework to be portrayed viable, this framework should connect with the going with to reduce costs, lessen possibilities, save time, increase trust and transparency and the simple to utilize and grows productivity, and brings added regard. Author [6] Tharun Mohan led research dependent on the blockchain model that can be actualized in a food supply chain and give its advantages and impediments over customary global positioning framework regarding food provenance and resource traceability from his exploration exertion, it is clear that blockchain can be more proficient in following food provenance, preventing considerable scale pollution of food items, recognize and eliminate the source of foodborne ailment in no time while the contemporary systems could take as much as weeks. It additionally gives more confident customer certainty which reflects in deals and consumer satisfaction. Furthermore, incapable the distinguishing the distinctive incentive schemes to be utilized inside the blockchain network to encourage uniform dispersion of power in regards to how the transactional data can be utilized inside FSC. Creator [7] S. Mondal led research dependent on the food supply chain and radio recurrence distinguishing proof and actualized detecting methodology and enable the security highlights and equipment security of the sensors ID's and reader.

3. RELATED WORK

The primary point of the project is to dismiss food contamination and make a transparent food supply chain. Food contamination is additionally a developing concern because of globalization and wide developing supply chain networks. Food wastage on account of the confusion of the stamped expiry dates, and mishaps due to rot, which thoroughly influence food security.

The fundamental motto of the undertaking is because of its attributes of Transparency, Security, and Decentralization, blockchain technology makes it conceivable to follow the data of food quality in the whole supply chain. This helps extortion in food exchange and diminish the expenses of the food

supply chain the management.

3.1 BLOCKCHAIN TECHNOLOGY

Blockchain innovation is portrayed as a decentralized, ledger of the distributed type that records the provenance of the highest level resource. Blockchain is a system of recording data that makes it inconvenient or difficult to change, cheat, or hack the framework. A blockchain is basically a modernized ledger of transactions that are copied and spread across the whole relationship of PC frameworks on the blockchain. Each blockchain in the chain contains various transactions, and each time another transaction happens on the blockchain, a record of transactions is added to each part ledger. The decentralized instructive list coordinated by different individuals is known as Distributed ledger headway. The blockchain is alike DLT where transactions are recorded with a never-ending cryptographic engraving known as a hash. This proposes on the off chance that one block in one chain was transformed, it would be quickly clear it had been played with. In the event that designers or developers expected to destroy a blockchain framework, they would need to change each hinder in the chain, across the amount of the coursed sorts of the chain. Blockchain, for example, bitcoin and Ethereum are unendingly and ceaselessly making as squares are being added to the chain, which all around adds to the security of the ledger.

3.2 FOOD TRACEABILITY

Traceability is indispensably significant for food security just as operational proficiency. With regards to the food and refreshment industry, it's tied in with coming to an obvious conclusion. Traceability alludes to the capacities that follow the progression of foods all through the creation, preparing, and dispersing stages. With traceability, it's conceivable to find an item at any phase of the food chain and inside the supply chain. There is various reasons why traceability is a fundamental objective for the food and refreshment industry. Due to its fundamental part in keeping up food wellbeing, traceability expects makers to have sound, coordinated systems set up to guarantee compelling controls, both in everyday tasks yet additionally on account of defilement or another security issue. Traceability comes down to systems that can address the issues of an inexorably powerful food chain. Cycles should be normalized among makers, providers, and merchants so that, on account of issue, traceability can be an amazing resource in the analysis and recuperation endeavours.

3.3 RFID BASED AUTHENTICATION

Blockchain with the Internet of things is made to bring the blend of a totally wonderful and clear food supply network or chain. Among various devices of IoT, RFID was recommended before because of its immaterial effort and a little size to guarantee food thriving by expanding the obviousness of the food products or items in the food supply network or chain. The importance of the RFID-based temperature sensor names for the cool food supply organization or chain. The sensor-connected with imprints can store the values of the temperature of food bundles separately and track the predictable time period of utilization if there should arise an occasion of any deviations in natural conditions at the time of transportation or limit. The RFID is the arrangement used as proof of article base approval show. The RFID is used to distinguish the article at the actual level and blockchain at the digital level. It is the steady distinguishing segment plan for getting all-out information about the thing and besides called a continuous quality confirmation check.

3.4 QR CODE

QR codes on food can be utilized to lean into a wide range of significant, effective, customer esteems. Furthermore, the principal explanation behind that will be that they're more available than any food marking or food bundling has at any point been. QR code on item bundling can fill in as an incredible asset to keep food from going to junk. Urge clients to check the code to set up reminders on their cell phones about the item, various approaches to utilize the food, date of expiry, and removal techniques if there should arise an occurrence of termination.

5.EXISTING SYSTEM

In the current system, the food packings don't contain genuine details like food fixings, bundle date, and expiry date, packer details, etc, the end-customer or customer doesn't have any consideration regarding the thing details. The item has item id and shop information so to speak. Consistent checking of the food quality and detectable type of that quality rundown would thwart scenes of food-borne disease, economically motivated, adulteration, wastage of food, contamination due to confusion of the stamped date of expiry, and harms as a result of rots, which widely influence the security of food.

5.PROPOSED SYSTEM

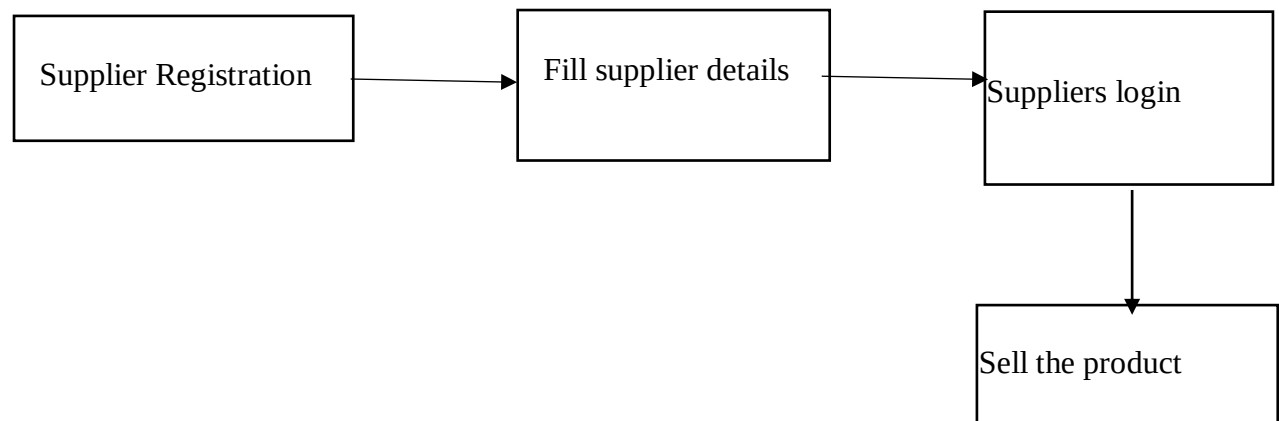
To upgrade food security here we use the blockchain servers which use a decentralized system to follow the preparation of packed food items. Here we make three blockchain servers to screen the activities between the suppliers, produces, and traders. We propose designing to screen the transparency of the food thing. At whatever point a thing will be delivered. The collecting will purchase the trimmings from the individual suppliers. Along these lines, the entire stream in item assembling will be revived in each stage in the blockchain servers. Along these lines, when a customer purchases an item and reliant on the item id, packing date, and the expiry date of all individual trimmings will be slanted to the customer. In this way, the transparency of the item seemed to end the customer or client.

6. METHODOLOGY

Methodology contains complete description about modules and here I am going to discuss two of my four modules as my partner in this project is going to discuss another two modules as per her second paper.

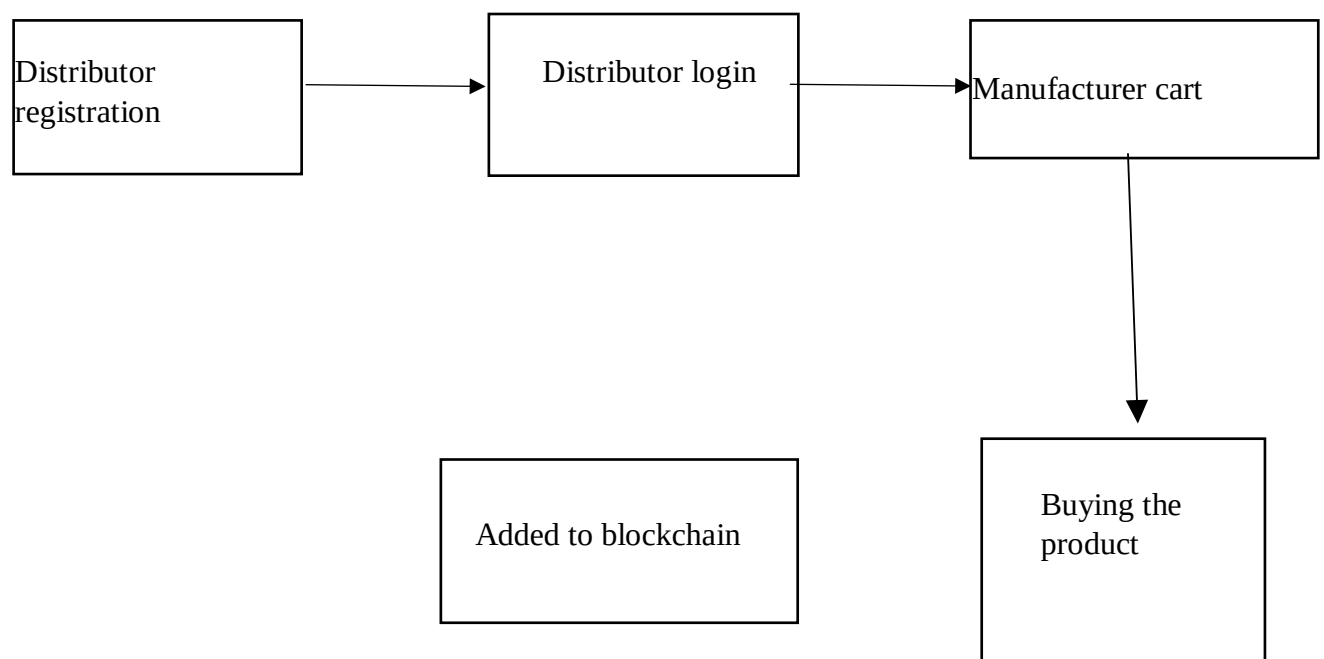
6.1 LYZING THE BAR CODE NUMBER DEPENDENT ON API

Here for every item, it is having the barcode that consists a number and its number will be flow through food API then ingredients will be taken out by using the barcode number. Here we go with the principal enlistment the enrolment structure contains provider subtleties. After finishing registration at that point log in to the account provider offers the item to all manufacturers.

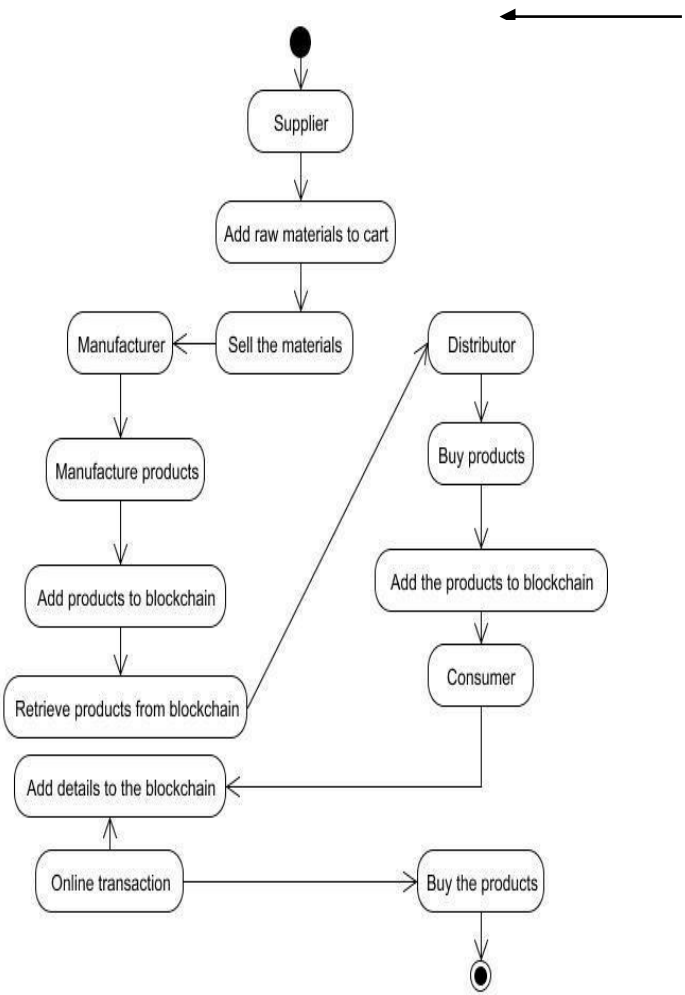


6.2 ACQURING THE PRODUCT BY DISTRIBUTER

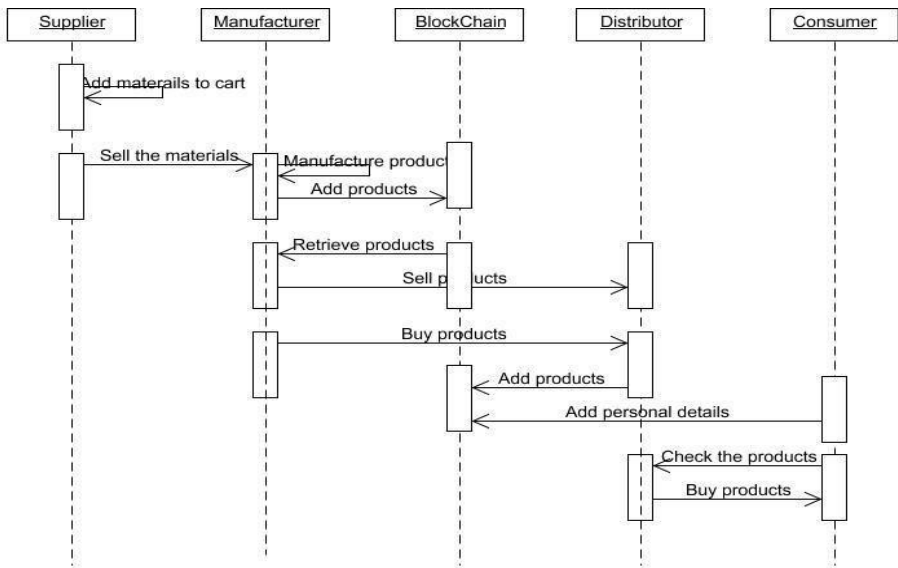
Firstly, perform registration. And then registration session holds distributor data. Next login. The distributor will be monitoring the item in the manufacturer or producer cart and then purchasing product by the distributor will be included to blockchain.



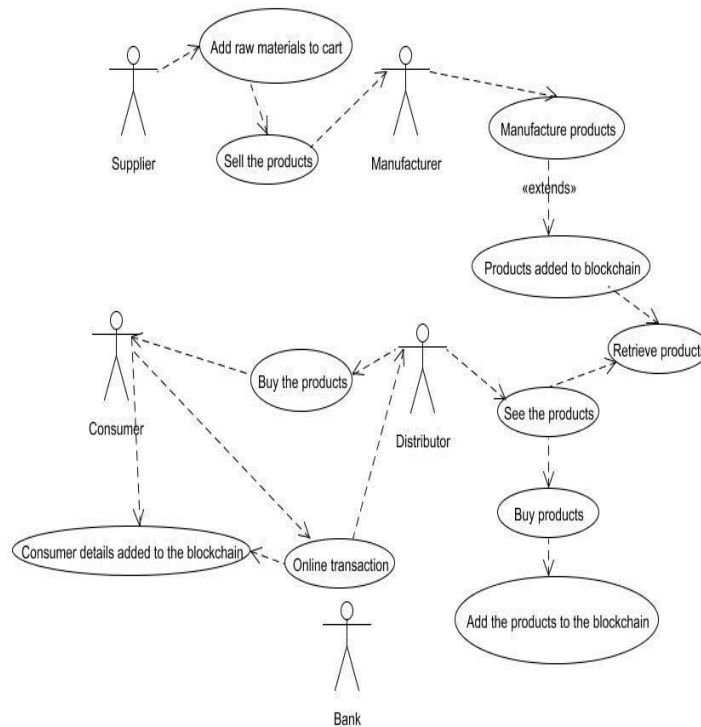
6.3 Activity Diagram



6.4 SEQUENCE DIAGRAM



6.5 USE CASE DIAGRAM



7. SYSTEM REQUIRMENTS

7.1 SOFTWARE REQUIRMENTS

- Windows 7 and Above
- JDK 1.7
- J2EE
- Tomcat 7.0
- MySQL

7.2 SOFTWARE REQUIRMENTS

- Hard Disk: 100GB and Above
- Random Access Memory: 4GB and Above
- Processor: intel i3 and Above

7.3 TECHNOLOGIES USED

- Hyper Text Markup Language (HTML), Cascading Style Sheet (CSS), JavaScript, J2EE (JSP, ServletS), Asynchronous JavaScript and XML (AJAX).
- Hibernateframework.
- MVCPattern.
- **Algorithm:** Secure HashAlgorithm (SHA)-256

8. ALGORITHM

The algorithm we have used in this project is Secure hash algorithm (SHA) 256 and also used in blockchain to get a hash constant of 256 bits every time. This is likewise a piece of encryption technology. These 768 bits is gone through a pressure work c to get a yield of 256 bits as it were. This gives 256 bits is again merged with 512 bits input from block b2. It helps in authenticating hash functions and numerical tasks in an advanced manner. It is utilized for securing passwords at an undeniable level. SHA-256 is one of the SHA-2 algorithms. Hashing is an idea of securing information in a key way that is except if you open a key pass code you won't open it.

9. RESULTS AND ANALYSIS

According to the entire project, the outcome has effectively happened and according to my analysis, we have been seen the connection in different stages. In our endeavor, there are four phases of food traceability using blockchain and QR code. The fundamental stage is a provider here everything contains the number which is on the barcode and its number going through food API then trimmings will be taken out by using the number which is on the barcode. Here the fundamental enrolment structure and contains provider details after fulfillment of enrolment by then sign in. Here provider offers the things to all creators that they produce. The resulting stage is the creator here the maker first makes the history or a record they will isolate the crude materials and the maker will require the number of unrefined materials to the provider. By then the provider will perceive the deals from the maker and unpleasant materials will be added to the creator stock. By at that point, the maker will send the thing id, number of packs, expiry date, and so on, to the blockchain and from there on, the made thing will be added to the creator shipment. From the blockchain, the producer will recover the thing. The third stage is dealers. The enlistment part contains distributor details. In addition, sign in. The distributor will be seeing the thing in the maker truck and from there on buying the thing by the merchant will be remembered for the blockchain. The fourth stage is the client this is the last postponed result of our assignment. First enrolment. The enlistment contains client subtleties. By then buyer login. The customer purchases the thing from the vendor. The client channels the QR appraisal by using the advantageous application and view the thing on the adaptable like gathering date, packaging date, and so on, the purchaser will verify the product and they will purchase the product by using an online transaction. Finally, the client transaction ID, product name, and the price will be stored and added to the blockchain. Here we dismantled that the presentation of the food store network is sufficient in different cases in any case it has basic hazards under ordinary conditions considering less stock of rough materials and in the state of financial issues the cycle will dial down according to the development of crude materials.

10. CONCLUSION AND FUTURE WORK

Food traceability system has become a need these days. Individuals are currently more worried about food wellbeing. These issues hurt purchaser's health as well as of cripples their trust in food markets. By using blockchain technology, we made a proposed system that will give traceability, transparency, effectiveness, unwavering quality, and security through every one of the phases of a food supply chain. Accordingly, of the project execution full subtleties of the item and even sum paid subtleties and tracking will be included and can be seen by the client through the exceptionally actualized QR check code on every item with the imperishable food supply chain. The main feature of our project is the QR code. The shopper can check the subtleties of the item through it and it is special for each project rear of the parcel. I accomplished it by implementing effectively.

My future work is to actualize that the utilization of blockchain empowers traceability of the resource. From the rancher to the buyer, all through the supply chain, we can keep hints of the resource. We can guarantee that the resource has not been altered. Additionally, the entire supply chain will turn out to be more responsible. Fake inflation of costs for the deceptive benefit of intermediaries can be controlled. The shoppers will likewise profit as they won't be paying inflated costs for the products

they purchase. This, in turn, will improve the general way of life of the general public.

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Traceability of Food using Blockchain and QR code

ABSTRACT

Blockchain food traceability is acquiring energy in the worldwide agri-food area. The capacity to immediately follow the whole lifecycle of food items from cause through each resource on its excursion to the purchaser supports believability, proficiency, and security. As of late, numerous food embarrassments broke out consistently in India, and individuals are shocked. After these threatened occurrences, individuals are present more worried about food wellbeing. These issues hurt shopper's well-being as well as of cripples their trust in food markets. Since the current food coordination design isn't satisfying the need and needs of the food market, fabricating a protected and dependable food traceability system has become a need. The significance of utilizing this system is customers would trace their food from farmland to fork with a result of QR code. This paper covers the blockchain-and QR code-based food traceability system, benefits, and drawbacks of decentralized systems, finally, the making procedure of the proposed system. The fundamental issue in the existed system is the centralized system which needs visibility, details, and nature of the product. In which we have made a proposed system that will give tractability, visibility, effectiveness, dependability, and security through every one of the phases of a food supply chain. Subsequently, to the project implementation full details of the product and even some paid details and tracing will be incorporated and can be seen by the client through the particularly implemented QR code on every item or product with the enduring food supply network or chain.

Keywords: Immutability, Disintermediation, QR code, Transparency, Food supply chain.

1. INTRODUCTION

Blockchain is today perhaps the most intriguing and discussed research subject. A blockchain can be characterized as "an immutable ledger for recording exchanges, kept up inside a conveyed organization of commonly untrusted hubs. A blockchain is a rundown of requested squares, where each square stores a variable size rundown of exchanges". The first blockchain was presented by Satoshi Nakamoto, who proposed the idea of bitcoin cryptocurrency in 2008. This popular and perceived utilization of the blockchain in the monetary field permitted the trading of computerized cash inside an untrusted organization of unknown hubs, without an outsider go-between. Be that as it may, blockchain innovation is as of now utilized in numerous different areas, like medical care, smart urban smart contracts, communities, government, energy markets. The achievement of this innovation mainly exists in the accompanying properties: dependability, immutability, transparency.

Today, by far most conventional strategic data frameworks in Agriculture and food (Agri-food) supply chains just trace and store requests and conveyances, by not giving highlights as traceability, auditability, and transparency. These highlights would doubtlessly improve food quality and security; hence, they are increasingly more mentioned by buyers. In this way, a few Development and Research people group are focusing their endeavours on holding some type of Internet of Things (IoT) future enhancements, for example, wireless sensor networks and RFID's, or ordinary cheap price associated gadgets, to enabled far off checking of the regulations and conditions present in food transportation situations and at a highly fine granularity along the entire Agri-food supply network or chain. Be that as it may, most of the current Internet of Things arrangements actually depend on cloud infrastructures which is heavily-centralized, where there is normally an absence of visibility, and naturally presents security dangers involving confidentiality, availability, data lock-in, and audibility.

Food traceability is the capacity to follow the development of a food item and its fixings through all means in the supply chain, both in reverse and forward. Traceability includes archiving and connecting the production, processing, and distribution chain of food products and ingredients. On account of a foodborne sickness episode or pollution occasion, proficient item following aide's government organizations and the individuals who produce and offer food to quickly discover the wellspring of the item and where defilement may have happened. This empowers quicker expulsion of the influenced item from the commercial center, lessening occurrences of food-borne illness. Presently a day's food tractability is progressively turning into a significant perspective for building trust between food brands and their clients. An ever-increasing number of buyers are keen on following the whereabouts of their food-from a security point of view, just as to guarantee that their food is capably and morally sourced.

In this paper, we present Traceability has gotten exceptionally muddled in the supply chain the board especially in the food area. Blockchain assumes an exceptionally pivotal part in supplying food in the industrial market. These days clients in the market have gotten specific about the quality and supportability of the item, so utilizing this strategy has gotten simple to recognize the nature of the item. The primary issue in the current system is the centralized system which needs transparency, subtleties, and nature of the item. In which we had made a proposed system called a decentralized system which will be helpful to get the familiarity with the total item supply from one finish to another through every individual engaged with the supply chain. Therefore, the undertaking execution full subtleties of the item and even sum paid details and tracing will be incorporated and can be seen by the client through the uniquely Implemented QR code on every item with a sustainable food supply chain.

2. LITERATURE REVIEW

In this paper, the writing audit in the field of food traceability system utilizing blockchain and QR code.

As per the [1] creator, Juan F. Galvez and J.C. Mejuto directed illustrative research based on food authentication, data management, and analysis in his he executed an extraordinary spotlight on traceability. He permits every one of the partners to check the whole history and current area and create transparency for all participants. Indeed, irreversibly putting away information and blockchain innovation makes a special degree of validity that adds to a more sustainable industry and reinforce their relationship with current clients and draw in new ones. Also, unfit to deal with the confirmation instrument to demonstrate whether the crude information was right and there is an issue about the general expenditure of blockchain implementation is unpredictable, mainly where the current, extremely develop supply chain system is using from a long period of time. Author [2] Miguel pincheira care and Muhammad deal Ali had profoundly examined the practical implementation of the food supply chain. He executed the Hyperledger sawtooth and Ethereum networks. He used the Algorithm novel consensus. He unfits the arrangement to improve the presentation investigation to more constrained hardware architecture to evaluate the fitness of the proposed system to applications involving original gateways and IoT devices along the Agri-food supply chain. Going to the creator [3] Andreas families directed distinct exploration dependent on the food supply chain and advantages and difficulties and he expected to set up a demonstrated and confided in climate to assemble a transparent and more feasible food creation and distribution, incorporating key partners in to supply chain and executed on the digitalization agriculture and food security and incapable to secure, reliable and transparency and traceability approach to guarantee food safety and integrity. Author [4] Kay Behnke drove research subject to blockchain development and executed BCT limit conditions and traceability and unfitted the how these troubles could be tended to by government and private undertakings, set up blockchain advancement as a secured, transparency and dependable way to deal with ensuring food safety and uprightness. It is amazingly entrancing to see how blockchain will be gotten together with

other emerging innovations (robotics, big data, RFID, IoT, Hyperspectral imaging, NFC, etc.), for the higher robotization of the food supply measures, improved with full traceability and transparency. Author [5] Konstantinos Demestichas and Nikolaos peppers coordinated clear exploration subject to the relevance of the blockchain traceability system of agri-food things and executed that using blockchain can helpfully help with achieving traceability by irreversibly and immutability putting away data. Blockchain innovation makes a novel degree of validity and adds to more practical food industry. Albeit guaranteeing food discernibility with blockchain innovation looks empowering, certain limits remained to be considered and tended to, including rules, the association between the parties, information possession, versatility, and so on, In request to see unmistakably and the innovation and maybe, produce new executions, scientists and originators would benefit by the improvement of an overall assessment model. Besides, unsuited execution of another framework to be portrayed viable, this framework should connect with the going with to reduce costs, lessen possibilities, save time, increase trust and transparency and the simple to utilize and grows productivity, and brings added regard. Author [6] Tharun Mohan led research dependent on the blockchain model that can be actualized in a food supply chain and give its advantages and impediments over customary global positioning framework regarding food provenance and resource traceability from his exploration exertion, it is clear that blockchain can be more proficient in following food provenance, preventing considerable scale pollution of food items, recognize and eliminate the source of foodborne ailment in no time while the contemporary systems could take as much as weeks. It additionally gives more confident customer certainty which reflects in deals and consumer satisfaction. Furthermore, incapable the distinguishing the distinctive incentive schemes to be utilized inside the blockchain network to encourage uniform dispersion of power in regards to how the transactional data can be utilized inside FSC. Creator [7] S. Mondal led research dependent on the food supply chain and radio recurrence distinguishing proof and actualized detecting methodology and enable the security highlights and equipment security of the sensors ID's and reader.

3. RELATED WORK

The primary point of the project is to dismiss food contamination and make a transparent food supply chain. Food contamination is additionally a developing concern because of globalization and wide developing supply chain networks. Food wastage on account of the confusion of the stamped expiry dates, and mishaps due to rot, which thoroughly influence food security.

The fundamental motto of the undertaking is because of its attributes of Transparency, Security, and Decentralization, blockchain technology makes it conceivable to follow the data of food quality in the whole supply chain. This helps extortion in food exchange and diminish the expenses of the food supply chain the management.

3.1 BLOCKCHAIN TECHNOLOGY

Blockchain innovation is portrayed as a decentralized, ledger of the distributed type that records the provenance of the highest level resource. Blockchain is a system of recording data that makes it inconvenient or difficult to change, cheat, or hack the framework. A blockchain is basically a modernized ledger of transactions that are copied and spread across the whole relationship of PC frameworks on the blockchain. Each blockchain in the chain contains various transactions, and each time another transaction happens on the blockchain, a record of transactions is added to each part ledger. The decentralized instructive list coordinated by different individuals is known as Distributed ledger headway. The blockchain is alike DLT where transactions are recorded with a never-ending cryptographic engraving known as a hash. This proposes on the off chance that one block in one chain was transformed, it would be quickly clear it had been played with. In the event that designers or developers expected to destroy a blockchain framework, they would need to change each hinder in the chain, across the amount of the coursed sorts of the chain. Blockchain, for example, bitcoin and

Ethereum are unendingly and ceaselessly making as squares are being added to the chain, which all around adds to the security of the ledger.

3.2 FOOD TRACEABILITY

Traceability is indispensably significant for food security just as operational proficiency. With regards to the food and refreshment industry, it's tied in with coming to an obvious conclusion. Traceability alludes to the capacities that follow the progression of foods all through the creation, preparing, and dispersing stages. With traceability, it's conceivable to find an item at any phase of the food chain and inside the supply chain. There is various reasons why traceability is a fundamental objective for the food and refreshment industry. Due to its fundamental part in keeping up food wellbeing, traceability expects makers to have sound, coordinated systems set up to guarantee compelling controls, both in everyday tasks yet additionally on account of defilement or another security issue. Traceability comes down to systems that can address the issues of an inexorably powerful food chain. Cycles should be normalized among makers, providers, and merchants so that, on account of issue, traceability can be an amazing resource in the analysis and recuperation endeavours.

3.3 RFID BASED AUTHENTICATION

Blockchain with the Internet of things is made to bring the blend of a totally wonderful and clear food supply network or chain. Among various devices of IoT, RFID was recommended before because of its immaterial effort and little size to guarantee food thriving by expanding the obviousness of the food products or items in the food supply network or chain. The importance of the RFID-based temperature sensor names for the cool food supply organization or chain. The sensor-connected with imprints can store the values of the temperature of food bundles separately and track the predictable time period of utilization if there should arise an occasion of any deviations in natural conditions at the time of transportation or limit. The RFID is the arrangement used as proof of article base approval show. The RFID is used to distinguish the article at the actual level and blockchain at the digital level. It is the steady distinguishing segment plan for getting all-out information about the thing and besides called a continuous quality confirmation check.

3.4 QR CODE

QR codes on food can be utilized to lean into a wide range of significant, effective, customer esteems. Furthermore, the principal explanation behind that will be that they're more available than any food marking or food bundling has at any point been. QR code on item bundling can fill in as an incredible asset to keep food from going to junk. Urge clients to check the code to set up reminders on their cell phones about the item, various approaches to utilize the food, date of expiry, and removal techniques if there should arise an occurrence of termination.

4. EXISTING SYSTEM

In the current system, the food packings don't contain genuine details like food fixings, bundle date, and expiry date, packer details, etc, the end-customer or customer doesn't have any consideration regarding the thing details. The item has item id and shop information so to speak. Consistent checking of the food quality and detectable type of that quality rundown would thwart scenes of food-borne disease, economically motivated, adulteration, wastage of food, contamination due to confusion of the stamped date of expiry, and harms as a result of rots, which widely influence the security of food.

5. PROPOSED SYSTEM

To upgrade food security here we use the blockchain servers which use a decentralized system to follow the preparation of packed food items. Here we make three blockchain servers to screen the activities between the suppliers, produces, and traders. We propose designing to screen the

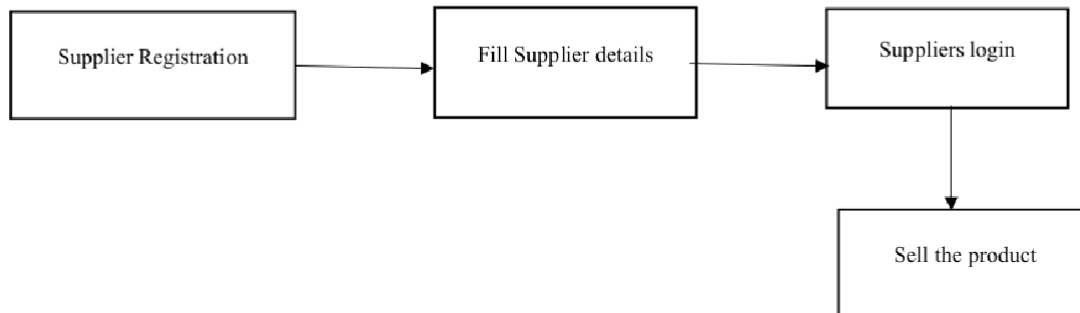
transparency of the food thing. At whatever point a thing will be delivered. The collecting will purchase the trimmings from the individual suppliers. Along these lines, the entire stream in item assembling will be revived in each stage in the blockchain servers. Along these lines, when a customer purchases an item and reliant on the item id, packing date, and the expiry date of all individual trimmings will be slanted to the customer. In this way, the transparency of the item seemed to end the customer or client.

6. METHODOLOGY

Methodology contains complete description about modules and here I am going to discuss two of my four modules as my partner in this project is going to discuss another two modules as per her second paper.

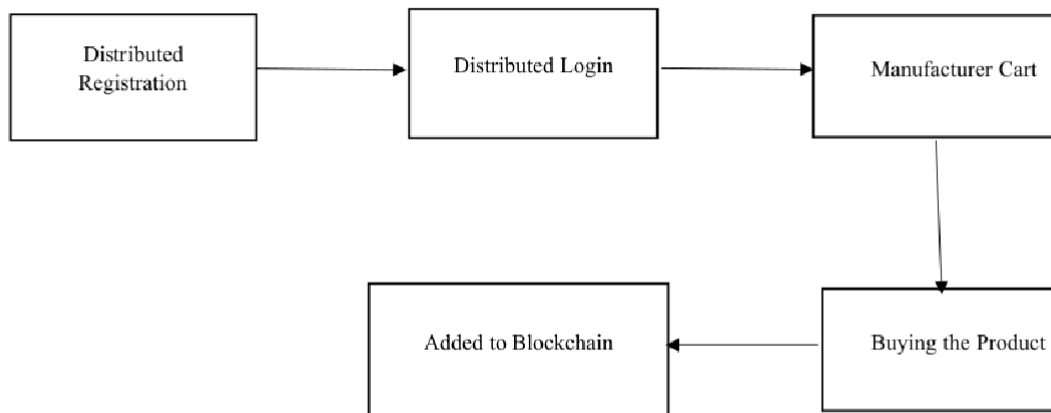
6.1 LYIZING THE BAR CODE NUMBER DEPENDENT ON API

Here for every item, it is having the barcode that consists a ¹number and its number will be flow through food API then ingredients will be taken out by using the barcode number. Here we go with the principal enlistment the enrolment structure contains provider subtleties. After finishing registration at that point log in to the account provider offers the item to all manufacturers.

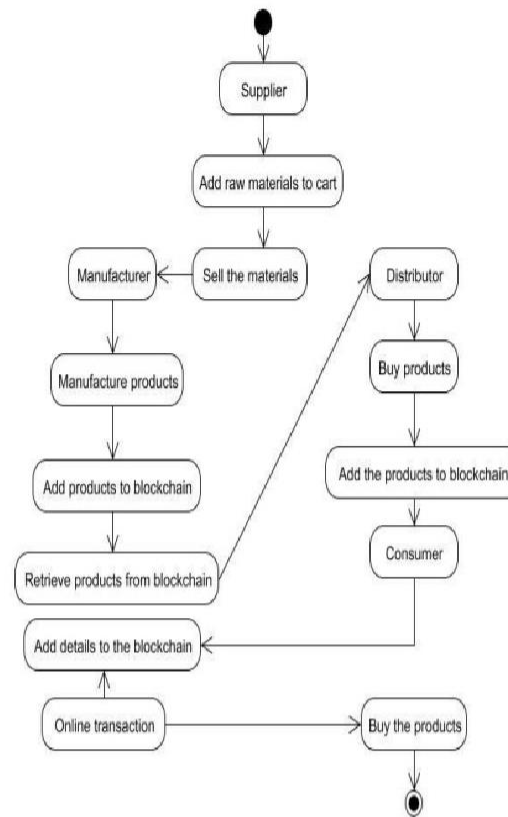


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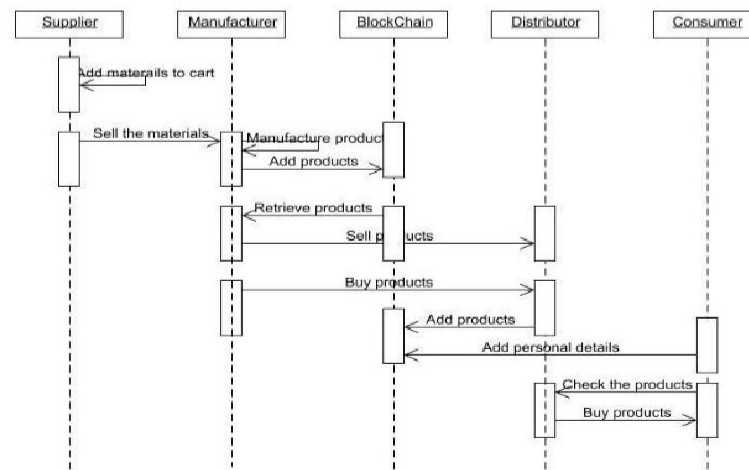
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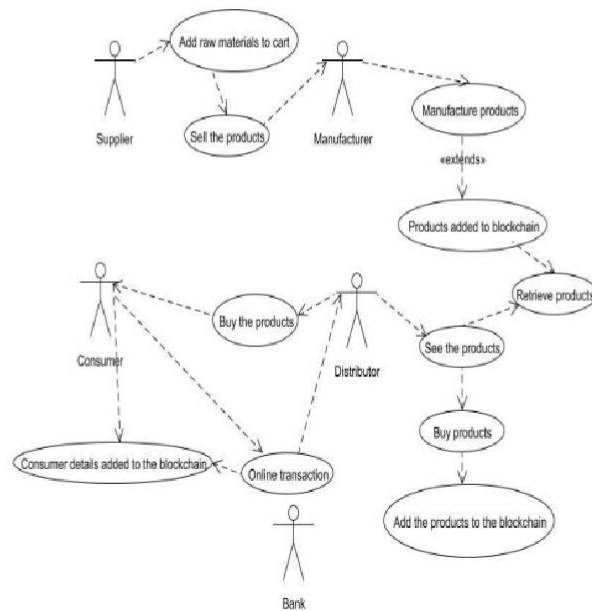
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- JDK 1.7
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- MySQL

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- Hard Disk: 100GB and Above
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- Hyper Text Markup Language (HTML), Cascading Style Sheet (CSS), JavaScript, J2EE (JSP, ServletS), Asynchronous JavaScript and XML (AJAX).
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- MVC Pattern.
- **Algorithm:** Secure Hash Algorithm (SHA)-256

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