FAKE PRODUCT DETECTION USING BLOCKCHAIN

ABSTRACT

There are many fake products in the existing supply chain. It is necessary to have a system for end user to check all details about product they are buying so that customer can decide product is genuine or not. Our system manages ownership of products using IPFS (Inter Planetary File System) which is the Distributed Web. IPFS is more useful than http as it can distribute huge volume of data efficiently and IPFS doesn’t allow duplication. IPFS and the Blockchain are similar. You can address large amounts of data with IPFS, and place the immutable, permanent IPFS links into a blockchain transaction. This timestamps and secures your content, without having to put the data itself on the chain. System maintains information about manufacturer of product, how ownership is changing and customer can check who is current owner of the product. For this purpose customer will be provided a GUI to scan QR code assign to a product and information about that product will be displayed.

CHAPTER-1

INTRODUCTION

* 1. PROJECT DESCRIPTION

The global development of a product or technology always comes with risk factors such as counterfeiting and duplication, which can affect the company's name, company revenue, and customer health. There are so many products that exist in the supply chain. To ensure that the product is real or fake. Because of counterfeit or fake products manufacturers facing the biggest problem and huge losses. To find the genuineness of the product we can use blockchain technology. Blockchain is an arrangement of recording information that makes it troublesome or hard to change, hack, or cheat the framework. A blockchain is essentially a computerized record of transactions that is duplicated and distributed across the entire network of PC systems on the blockchain. Each block in the chain contains multiple transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant’s record. The decentralized database managed by the number of participants is known as Distributed Ledger Technology (DLT). Blockchain is a type of DLT in which transactions are recorded with an immutable cryptographic signature called a hash. Blockchain technology helps to solve the problem of counterfeiting a product. Blockchain technology is more secure. Once the product is stored on the network hash code is generated of that product and it is possible to maintain all transaction records of the product and its current owner as a chain will be created for that product transactions. All the transaction records will be stored in the form of blocks in the blockchain. In the proposed system we are assigning a generated QR code to a particular product and the end customer can scan Vol-7 Issue-4 2021 IJARIIE-ISSN(O)-2395-4396 14881 www.ijariie.com 315 that QR code to get all information about that product. After scanning the QR code we can identify that the product is real or fake.

CHAPTER-2

SYSTEM STUDY

2.1. EXISTING SYSTEM

**1. RFID Based Anti-Counterfeiting Systems:-** The paper entitled 'A Comparison Survey Study on RFID Based Anti-Counterfeiting Systems' describes Radio frequency identification tag Anti-forging is an applied arrangement that has gotten consideration in the previous few years. This system represents a review concentrating on the exploration subject hostile to duplicating items utilizing Radio Frequency Identification tags on the product. Radiofrequency identification (RFID) and remote sensor networks (WSN) are two significant remote advances that have a wide assortment of utilizations and give limitless future possibilities, while RFID tags are like an actuator that requires a control signal and a wellspring of energy. RFID perceives areas and recognizable proof of labeled things yet as opposed to perusing laser light reflections from printed standardized tag names, it uses low-power radio frequencies to gather and store information. In a stockroom or distribution center, this system is utilized to automate information assortment. The transceiver scans radio frequencies and sends them to an RFID tag. The distinguishing data is then communicated from a little microchip inserted in the tag and communicated to the RFID reader.

**2. Fake Product Detection Using AI-Based Technology**:- This system proposes a solution that relies on machine learning-based technology which enables end-consumers to identify and verify products without any special equipment. By using image and text recognition. For identification, the end-consumers take photos of an item packaging, which Contains product text information, logos, and perhaps accreditation marks/logos. These photos will be sent in a solicitation to the worker for processing and confirmation. Afterward, the detection result will be returned to the end-consumer to make a further decision. In the case of fake product detection, the end-consumer can report this counterfeit product to the government system, such as the Safety Gate -EU's Rapid Alert System.

2.2 PROPOSED WORK

There is no proper solution before tackling this problem. As barcodes can be copied easily there is no guaranteed system either, nor a good solution to differentiate fake products from original products. Blockchain technology is one of the promising technologies which is emerging in recent years that can be helpful to tackle such a problem. Blockchain Technology can be used to monitor and regulate the product supply chain in the market so users can only get original products. The project's main goal was to deliver people's original product and help people to identify whether the product they are buying is an original or fake easily. The system prototype will be a decentralized application (Dapp) with a supporting blockchain network. The network will be developed on hyper-ledger fabric which is an open-source Blockchain development tool and uses DPoS/PBFT consensus algorithm by default.

System execution stages:-

**Stage 1: Product enrollment on the network**

The first step is to bring all manufacture into the blockchain network and collect their huge Product database. The manufacture authentication is done via registration and giving them a proper id and password. The manufacturer will be the primary proprietor of the item. The manufacturer will request the administrator to add a product on the network at the time the QR code will get assigned to that product. The administrator will enroll the product and manufacturer on the network if the requestor is a genuine manufacturer. After the product is recorded in a network it will create a smart contract and a unique QR code of the product in which the details of the product are mentioned in an encrypted text form. To Secure the QR code from copying there is a Copy Sensitive digital image in the QR code.

**Stage 2: Shipping of Product**

In the next step, the manufacturer will ship the product to the distributor, and the status is set as shipped; it will not change the ownership of the product until a request from both parties is approved to buy and sell the product. As soon as both parties approve mutually, its ownership in the blockchain network will be transferred in the form of a smart contract automatically after the payment is successful.

**Stage 3: End-user get detail about the product**

In this stage, clients will be given an android application and buyers can scan QR code allocated to the item utilizing the android application. The Scanner scans the product and decrypts the encrypted text in a given algorithm and gets the detail about the product that is the manufacturer and current owner of the product and can conclude if to purchase the item or not.

CHAPTER-3

SOFTWARE REQUIREMENT SPECIFICATION (SRS)

* 1. INTRODUCTION

There are many fake products exist in supply chain and to ensure genuineness of products system is needed. To check genuineness of product Ownership history of the product need to be maintain. IPFS(Inter Planetary File System) is useful to maintain ownership of products. IPFS is peer to peer distributed file system it stores huge volume of data in either object or block or in the file form, it is similar to the Blockchain protocol. Also it is better than http as http downloads file from single device and with help of IPFS network it is possible to distribute huge volume of data efficiently. One more important feature of IPFS is that it doesn’t allow duplication. Once the product is stored on network hash code is generated of that product and it is possible to maintain all transaction history of the product and its current owner as chain will be generated for that product transactions. In proposed system we are assigning a QR code to a particular product and end customer can scan that QR code to get all information about that product.

* 1. OVERALL DESCRIPTION

2.2.1. PRODUCT PERSPECTIVE

1. Enhanced Security: - The information utilized by this methodology is obtained by an organization of distributed computers (nodes) around the world. Every last one of these distributed computers submits its computational ability to make these information bases secure and immutable.
2. Decentralization:- Using decentralized tasks and capacity, every hub of the Blockchain executes the confirmation, conveyance, and the executives of data at the local side. Blockchain technology doesn't depend on an extra outsider control, has no centralized control, and is independent.
3. Privacy:- Is any of my client information openly obvious? No, we use cryptography calculations to enlist simply a special identifier of the individual information and we implant such identifiers in the Blockchains. It is impossible to reproduce the substance from any identifier since we utilize single-direction cryptographic functions (hashes).
   * 1. PRODUCT FUNCTIONS

The first application is the Manufacturers or company side application in which we have to first register ourselves. After registration login into the application, we have some options. One option is to add a product in which the manufacturer can add the product details. Another option is to show the order in which they can see customers' order details and after that, they can decide the accept or reject the order. The manufacturer also can see the product is delivered or not.

A second application is the Customer application in which we have to first register in-app after that we can log in to the application using id and password. In this application, there is an option to show products where customers can see the product details like name, total quantity, price of a product, details of the manufacturer. In that, we can product book the product by inserting the quantity of product. In this application, we can see orders using show my order where we can see the product details, name, quantity, date, time, price, and status of product which is produced is delivered or not. In this app we have a QR code scanner in which we scan the QR code of the product then it shows that the product is fake or real. There is another option which is a blockchain in which it displays the name of generated block product quantity, generated Hash Value, and the product is corrupted or not.

In this project customer login, the in the application. After login, he fills in the details for ordering the product and book the product. The order of the product can be shown to the manufacturer. Manufacturer deciding whether the product request is acceptable or not. After the manufacturer accepting the order of the product it generates the unique QR code of a product. Once an order of product is stored on the network hash code is generated of that product and it is possible to maintain the transaction of the product. In the proposed system QR code is generated for a particular product. Customers scan the QR code on the product or package using the smartphone’s QR code reader application or customer application have the option of QR code scanner. After scanning, we get the result of the product is real or fake. In the end, the Blockchain system holds these product details along with a history of transactions to enable the tracking of the product along the distribution chain.

3.2.3 USER CHARACTERISTICS

* Educational Level:- At least user of the system should be comfortable with English Language.
* Technical Expertise:- User should be comfortable using general purpose applications on the computer system.

3.2.4 CONSTRAINS ASSUMPTION DEPENDENCIES

* The system will run under windows98 or higher platforms of operating system.
* Manufacturer and customer will be having a valid username a password to access the software.
* Software is dependent on access of internet.
  1. NON -FUNCTIONAL REQUIREMENTS

3.3.1. EXTERNAL INTERFACE REQUIREMENT

3.3.2. USER INTERFACE

* Login
* Registration
* Dashboard
* Scanner
* Check Product details
* Generate Qrcode

3.3.3. HARDWARE INTERFACES

The hardware interfaces similar to most of online web applications including a monitor, keyboard and mouse/trackpad. The mouse/trackpad is used to control navigation, a keyboard to control user input, and a monitor for display purpose.

3.3.4. SOFTWARE INTERFACES

The system will include a database to store user information, login information and blockchain stores product details like product id, product name, date of manufacture and other miscellaneous information the system will be separate from the native operating system as it functions entirely as a web application displayed within a web browser.

3.3.5. COMMUNICATION INTERFACES

The system is web application, so it needs to communicate with all web browsers available. the system will HTTP communication standards and will support secure logins to protect users.

* 1. FUNCTIONAL REQUIREMENTS
* User satisfaction:- the system is such that it stands up to the user expectations.
* Response time:- the response of all the operation is good. This has been made possible by careful programming.
* Error handling:- response to user error and undesired situations has been taken care of to ensure that the system operates without halting.
* Safety and robustness:- the system is able to avoid or tackle disastrous action. In other words , it should be foul proof . The system safeguards against undesired events, without human interventions.
* User friendliness:- the system is easy to learn and understand. A native user an also use the system effectively. Without any difficulties.

3.4.1. HARDWARE REQUIREMENTS

For the hardware requirements the srs specifies the logical characteristics of each interface between the software product and hardware components. It specifies the hardware requirement like memory restrictions, cache size, the processor, RAM size etc…those are required for the software to run.

* RAM 256MB
* Cache 512kb
* Processor i5 or i7
* Storage space 15-20 GB

3.4.2. SOFTWARE REQUIREMENTS

* Remix IDE
* VScode
* Xampp
* Ganache
  1. PERFORMANCE REQUIREMENT
* User satisfaction:- the system is such that it stands up to the user expectations.
* Response time:- the response of all the operation is good. This has been made possible by careful programming.
* Error handling:- response to user error and undesired situations has been taken care of to ensure that the system operates without halting.
* Safety and robustness:- the system is able to avoid or tackle disastrous action. In other words , it should be foul proof . The system safeguards against undesired events, without human interventions.
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* 1. DESIGN CONSTRAINTS

There are number of factors in the client’s environment that may restrict the choices of a designer. Such factors include standards that must be followed, resource limits, Operating environment, reliability and security requirments and policies that may have impact on the design of the system. An SRS should identify and specify all such constrains.

* + 1. STANDARD COMPILATION

This specifies the requirement for the standards the system must follow. the standard may include the report format and accounting properties.

* + 1. HARDWARE LIMITATION

The software may have to operate on some existing or predetermined hardware. thus imposing restrictions on the design Hardware limitations can include the types of machines to be used, operating system available on the system languages supported and limits on primary and secondary storage.

* + 1. RELIABILITY AND FAULT TOLERANCE

Fault tolerance requirements can phase a major constrains on how the system to be designed. Fault tolerance requirements often make the system more complex and expensive. Requirements about system behaviour in the face of certain kinds of faults are specified. Recovery requirements are often an integral part here, detailing what the system should do I some failure occurs to ensure certain properties. Reliability requirements are very important for critical applications.

* + 1. SECURITY

Security requirements are particularly significant in defence system and database systems. They place restrictions on the use of certain commands, control access to data, provide different kinds of requirements for different people, require the use of password and cryptography techniques and maintain a log of activities in system.

CHAPTER-4

SYSTEM DESIGN

* 1. DATA FLOW MODEL

A data flow model is **diagrammatic representation of the flow and exchange of information within a system**. Data flow models are used to graphically represent the flow of data in an information system by describing the processes involved in transferring data from input to file storage and reports generation.

4.1.1 USE-CASE DIAGRAM

Use case diagrams are considered for high level requirement analysis of a system. When the requirements of a system are analyzed, the functionalities are captured in use cases.

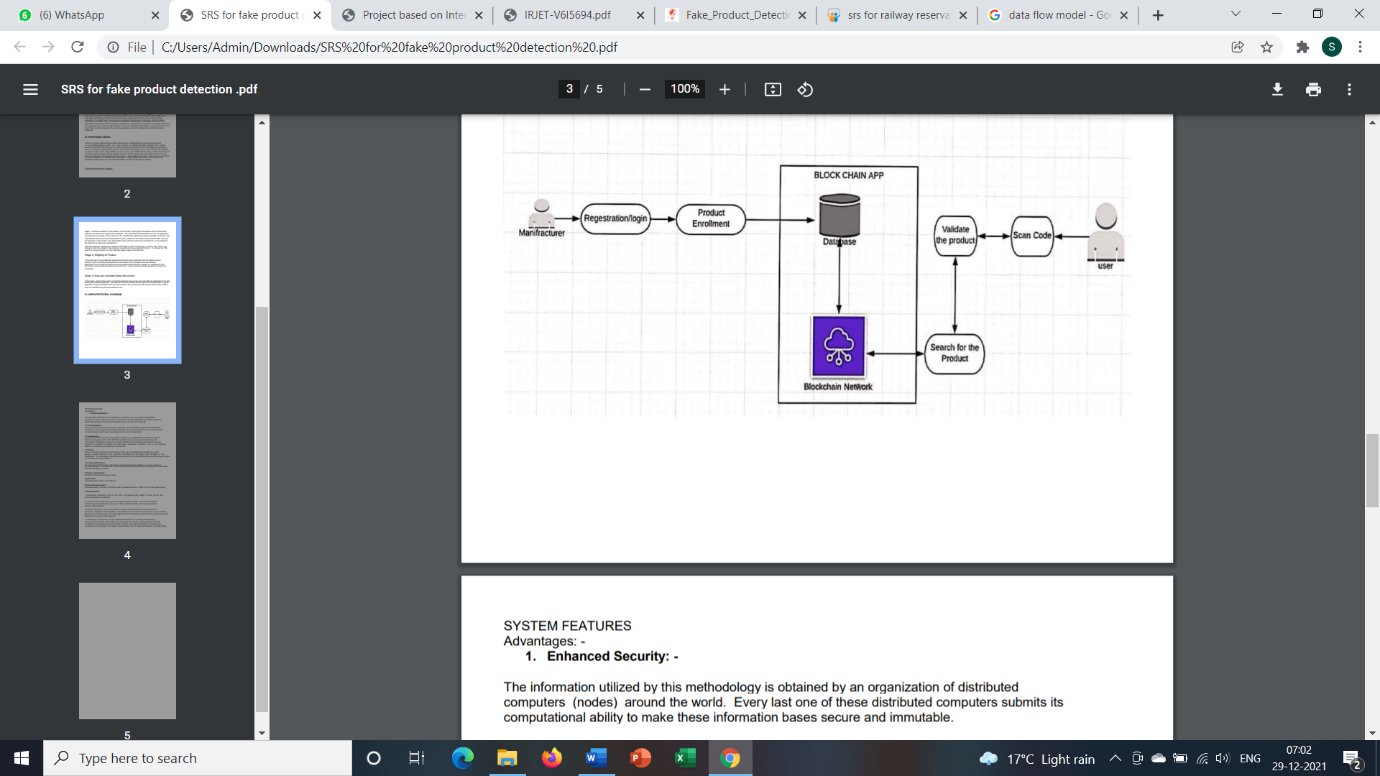
We can say that use cases are nothing but the system functionalities written in an organized manner. The second thing which is relevant to use cases are the actors. Actors can be defined as something that interacts with the system.

Actors can be a human user, some internal applications, or may be some external applications. When we are planning to draw a use case diagram, we should have the following items identified.

* Functionalities to be represented as use case
* Actors
* Relationships among the use cases and actors.

Use case diagrams are drawn to capture the functional requirements of a system. After identifying the above items, we have to use the following guidelines to draw an efficient use case diagram

* The name of a use case is very important. The name should be chosen in such a way so that it can identify the functionalities performed.
* Give a suitable name for actors.
* Show relationships and dependencies clearly in the diagram.
* Do not try to include all types of relationships, as the main purpose of the diagram is to identify the requirements.
* Use notes whenever required to clarify some important points.



4.1.2 DATA FLOW DIAGRAM

A data flow diagram **shows the way information flows through a process or system**. It includes data inputs and outputs, data stores, and the various subprocesses the data moves through. ... You can use these diagrams to map out an existing system and make it better or to plan out a new system for implementation.

**LEVEL 0:**

Fake product detection

**Product fake/real**

Manufacturer

Customer

**details**

**product ID**

**LEVEL 1 DFD –**

manufacturer

customer

Product

QR code details

manufacturer

customer

Product

QR code details

Product QR code

details

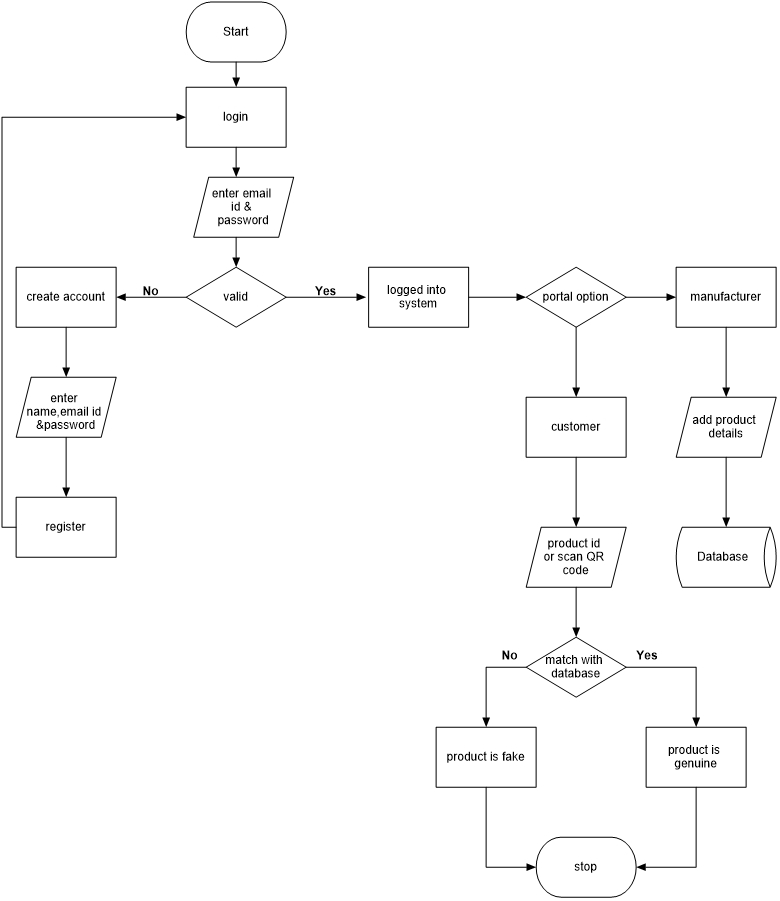
database

Product QR code

details

database

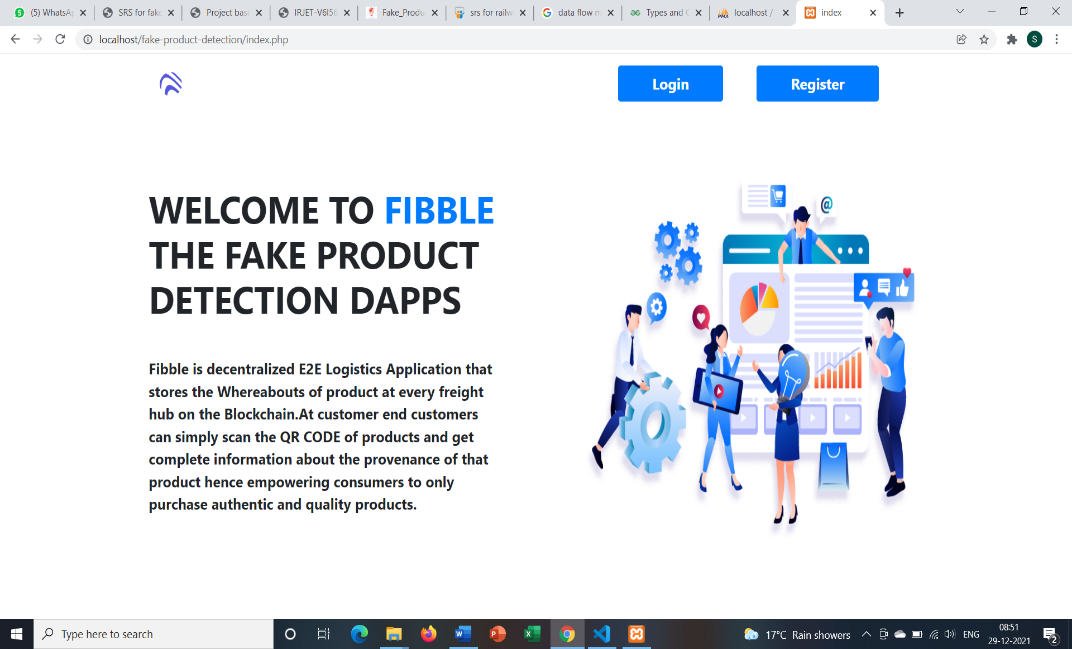
4.2.2 FLOW CHART

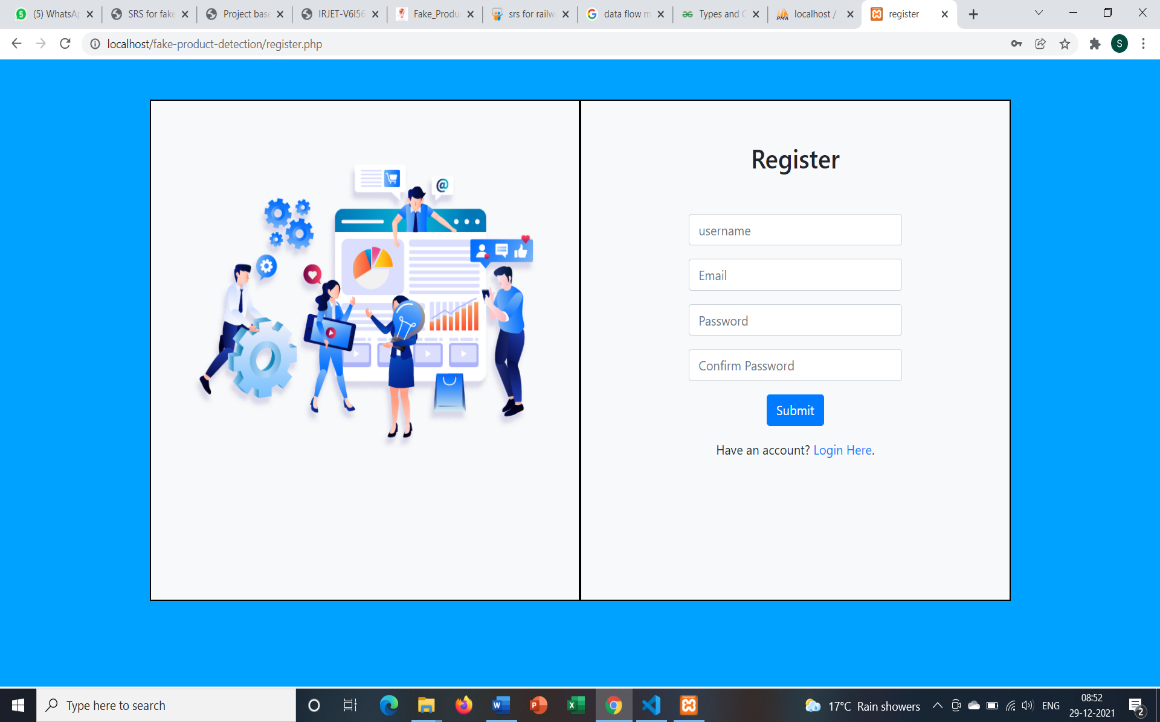


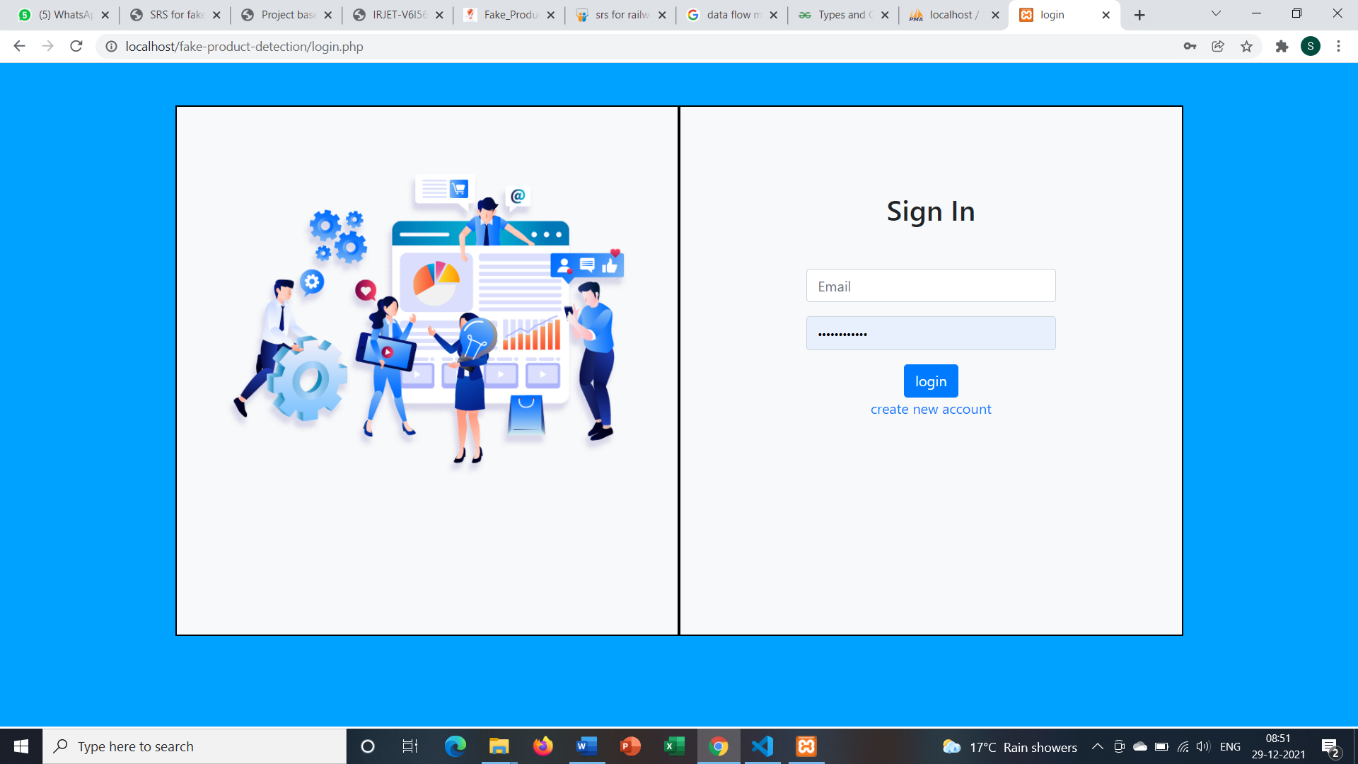
1. **IMPLEMENTATION**

**5.2 INPUT/OUTPUT INTERFACES**

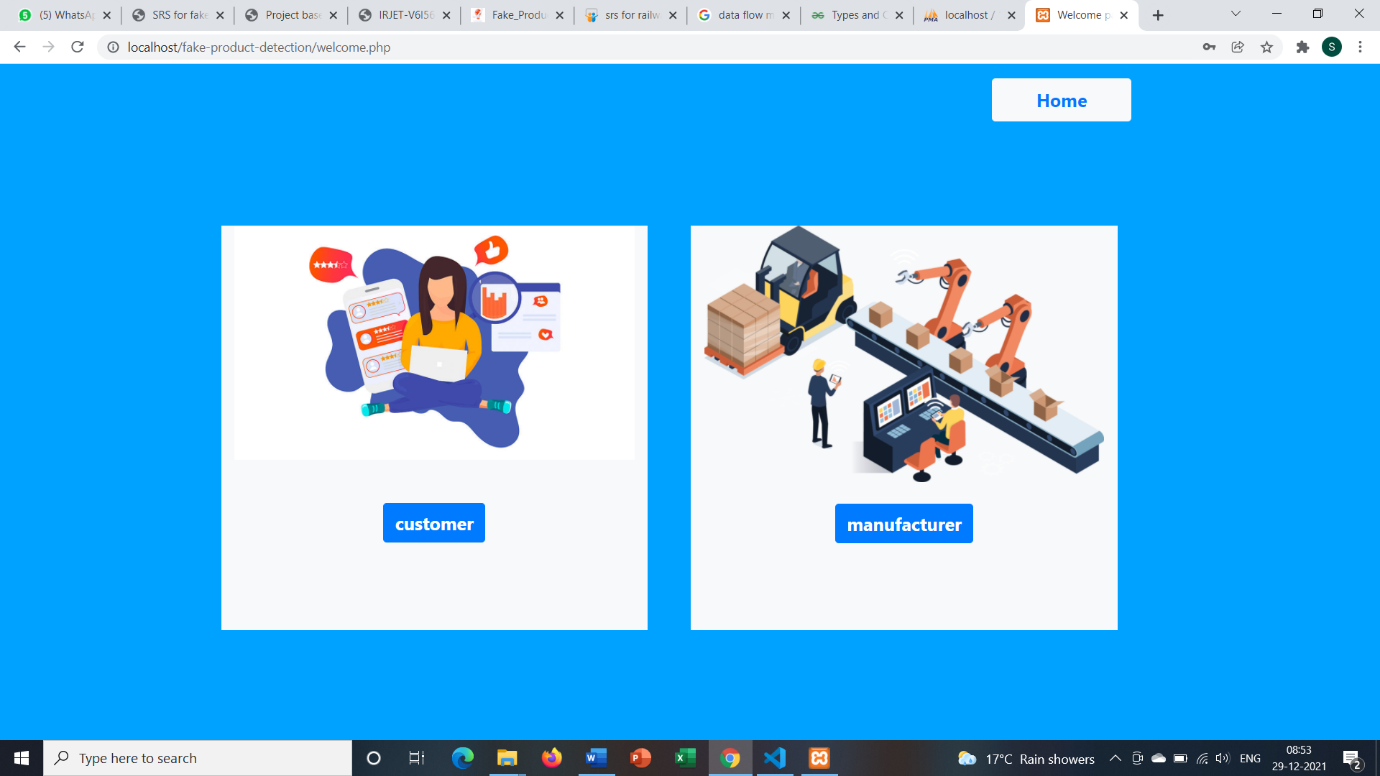
* **Index page**

****

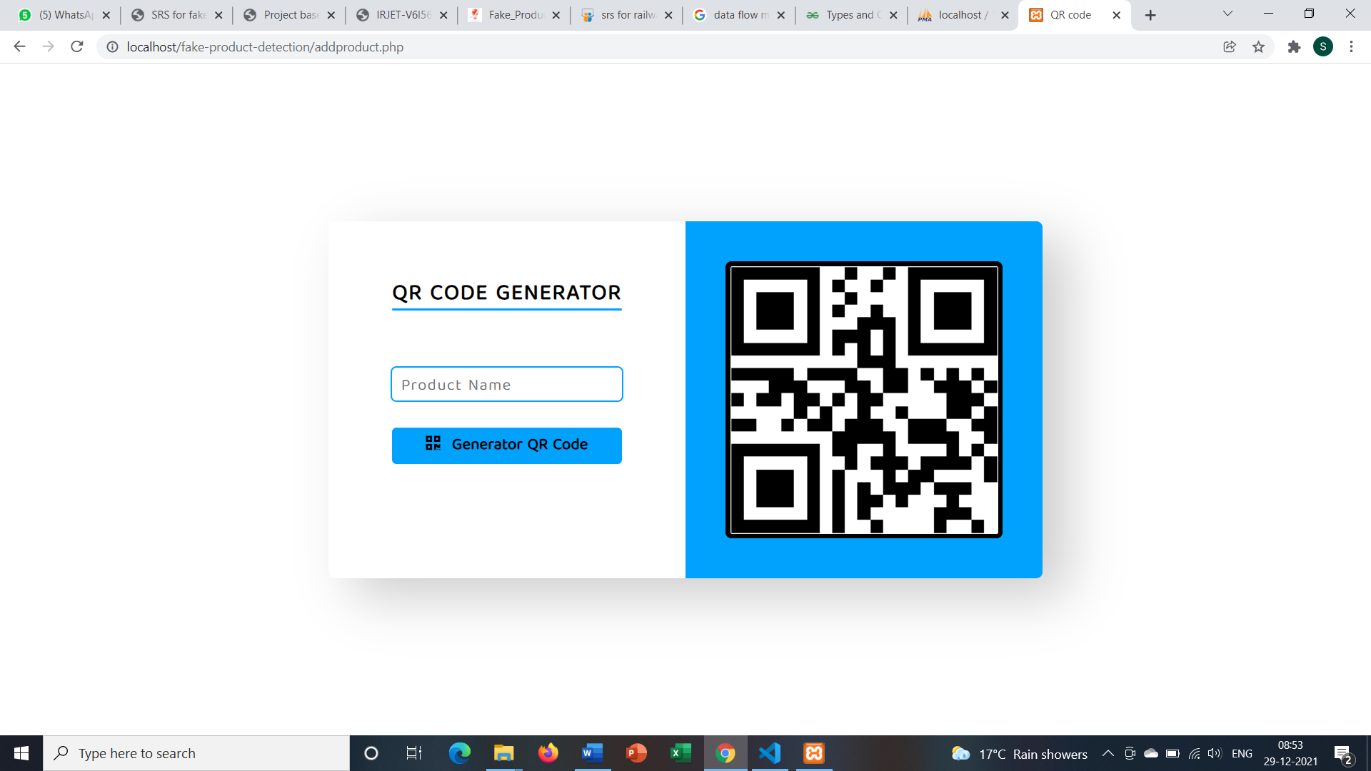
* **Register**
* LOGIN

****

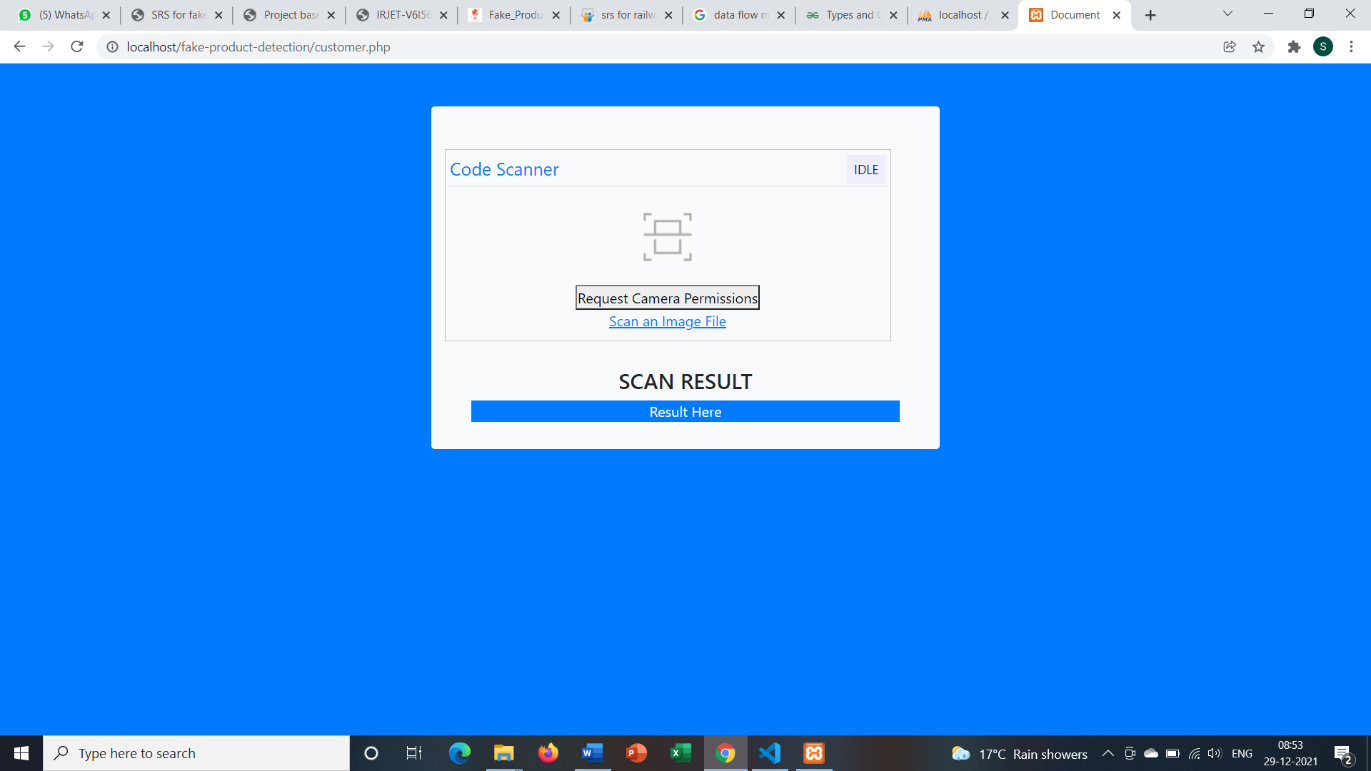
* **Welcome**

****

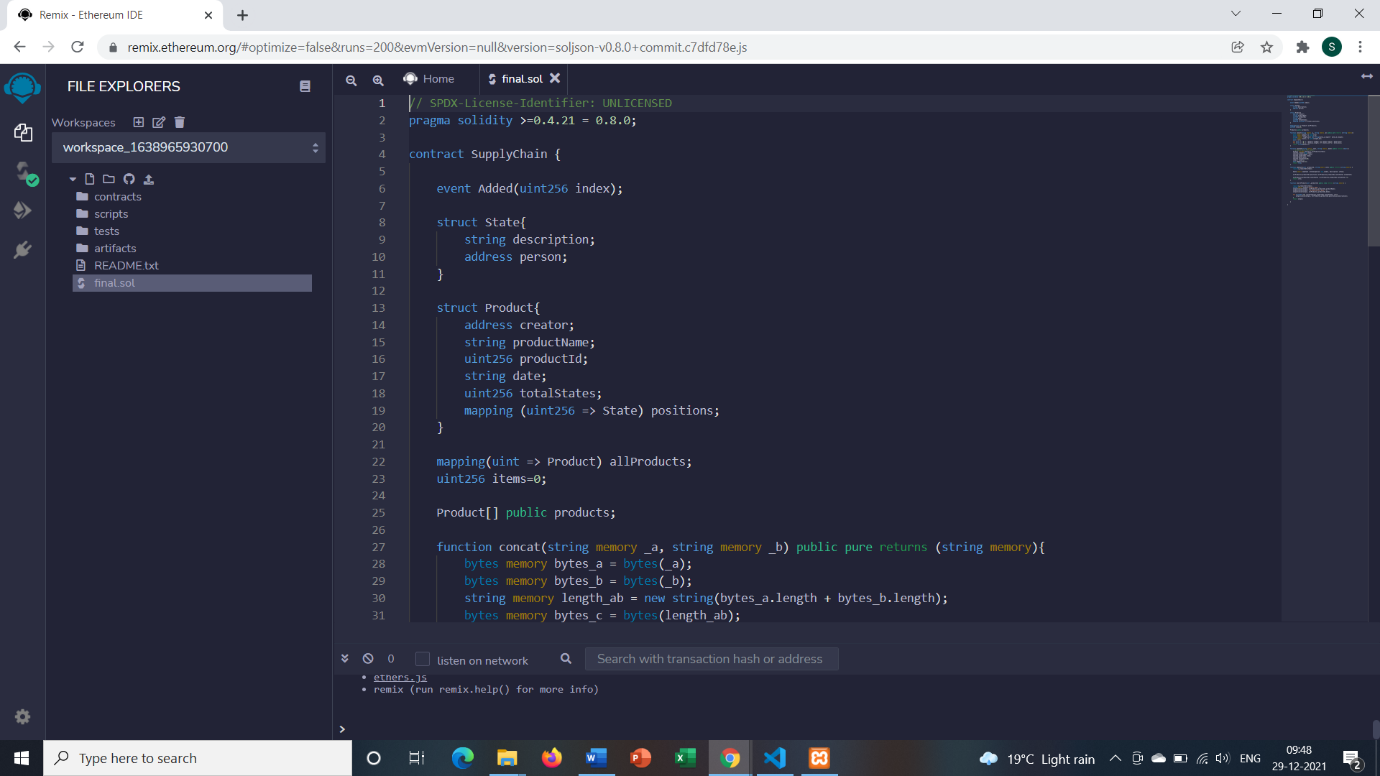
* **Add product details and generate QR**

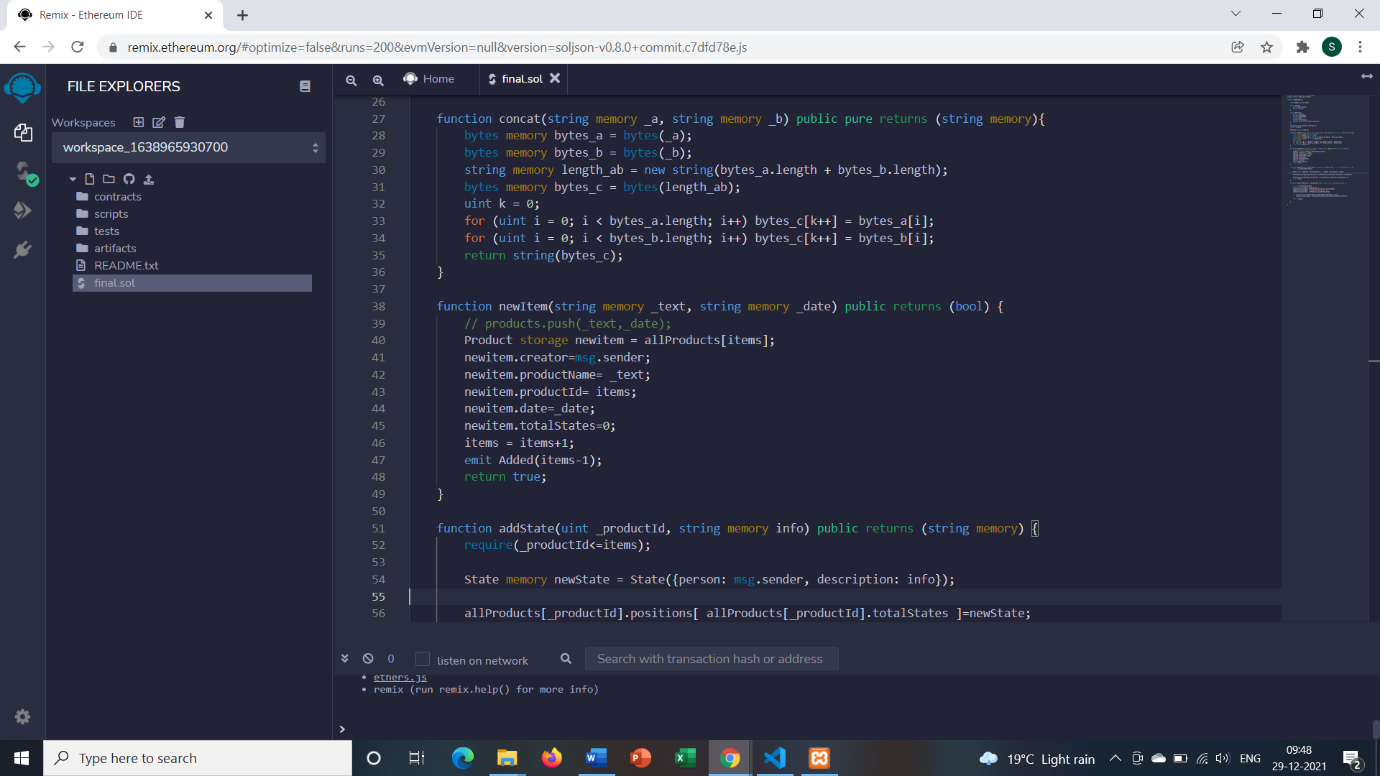
****

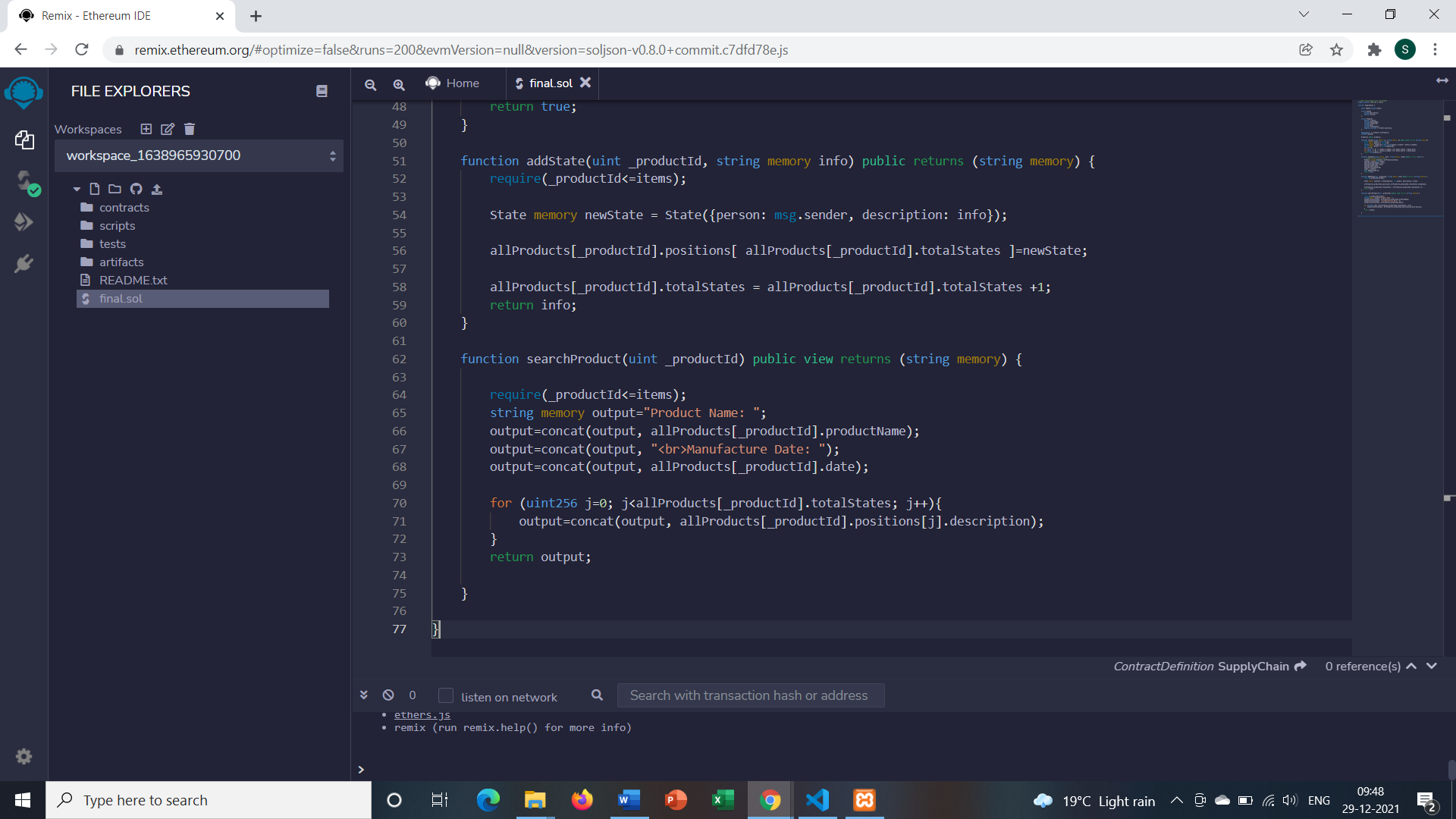
* **Check product details through qrcode**

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* 1. **IMPLEMENTATION**
  2. **CODE DESCRIPTION**

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**6.TESTING**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TEST CASE ID** | **TEST DESCRIPTION** | **TEST STEPS** | **TEST DATA** | | **EXPECTED RESULT** | **ACTUAL RESULT** | **PASS/FAIL** |
| TU01 | Check site | Go to site http://localhost/fake-product-detection/login.php | http://localhost/fake-product-detection/login.php | | Open site | As expected | Pass |
| TU02 | Check to create a new account | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Click Create new account | Username:demoid123  Email:demoid123@gmail.com  Password:demo@123  Confirm password:demo@123 | | Register successfully | As expected | Pass |
| TU03 | Check login with valid data | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Enter email id 3. Enter password 4. Click login | Email:demoid123@gmail.com  Password:demo@123 | | Users should log in to an application | As expected | Pass |
| TU04 | Check login with invalid data | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Enter email id 3. Enter password 4. Click login | Email:demoid123@gmail.com  Password:demo@111 | | Users should not login into an application | As expected | Pass |
| TU05 | Check add product as the manufacturer | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Login 3. Click manufacturer 4. Add product details 5. Click on generate QR code | Product name: Asus rog scar Strix 15 | | Product add and generate QR code | As expected | Pass |
| TU06 | Scan QR code as customer | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Login 3. Click customer 4. Enter product details or Scan QR code | Product name: Asus rog scar Strix 15 or scan QR code | | Shows product details and manufacturer related data | As expected | Pass |
| TU07 | Check for the genuine product | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Login 3. Click customer 4. Enter product details or Scan QR code | Scan QR code | | Shows product is genuine | As expected | Pass |
| TU08 | Check for the fake product | 1. Go to site <http://localhost/fake-product-detection/login.php> 2. Login 3. Click customer 4. Enter product details or Scan QR code | | Scan QR code | Shows product is fake | As expected | Pass |

FOR BLOCKCHAIN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **TEST CASE ID** | **TEST DESCRIPTION** | **TEST STEPS** | **TEST DATA** | **EXPECTED RESULT** | **ACTUAL RESULT** | **PASS/FAIL** |
| TC01 | Check smart contract | 1. Open Ganache 2. Enter transection id of sender 3. Enter amount 4. Enter transection id of receiver 5. Click on send | Transection id sender: **0xe261e26aECcE52b3788Fac9625896FFbc6bb4424**  Amount:100eth  Transection id Reciever: **0x7194d1F1d43c2c58302BB61a224D41B649e65C93** | Transfer of ether | As expected | Pass |
|  |  |  |  |  |  |  |

7. CONCLUSION

Thus, proposed system is useful for end user to detect fake products in supply chain. End user can scan QR code assigned to a product and can get all the information like transaction history, current owner based on which end user can check whether the product is genuine or not. In future we will implement the system which controls and monitors product transportation details.