PROJECT REPORT

FOOD TRACKING SYSTEM

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CHAPTER 1

INRODUCTION

The business requirements for a Food Tracking System on the blockchain are to establish end-to-end transparency and traceability within the food supply chain. This entails creating a secure and immutable ledger that records every step of a food product's journey, from production and processing to distribution and consumption. The system should enable real-time monitoring, authentication of product origins, quality assurance, and rapid response to any contamination or safety issues. Additionally, it should facilitate data sharing among stakeholders, including suppliers,manufacturers, distributors, and consumers, to enhance supply chain efficiency, reduce fraud, ensure compliance with regulations, and ultimately build trust in the food industry.

PROJECT OVERVIEW

The business problem in a Food Tracking System using blockchain technology is the lack of transparency and accountability within the food supply chain. This transparency ensures that consumers can trace the origin of the food they consume, verify its authenticity, and be confident about its safety, while businesses can respond swiftly to issues, reduce waste, and build trust with their customers. The implementation of a Food Tracking System using blockchain technology can have significant social and business impacts.

PURPOSE

This transparency ensures that consumers can trace the origin of the food they consume, verify its authenticity, and be confident about its safety, while businesses can respond swiftly to issues, reduce waste, and build trust with their customers. The business requirements for a Food Tracking System on theblockchain are to establish end-to-end transparency and traceability within the food supply chain. This entails creating a secure and immutable ledger that records every step of a food product's journey, from production and processing to distribution and consumption. The system should enable real-time monitoring, authentication of product origins, quality assurance, and rapid response to any contamination or safety issues

CHAPTER 2

LITERATURE SURVEY

Food Tracking Systems using blockchain technology reveals a growing body of research and practical applications in recent years. These studies emphasize the importance of transparency, security, and traceability in the food supply chain. Researchers have explored various blockchain-based solutions to address issues such as food fraud, contamination, and inefficiencies. Many highlight the potential benefits of blockchain in enhancing consumer trust, reducing waste, and improving supply chain management. Key areas of focus include the development of smart contracts, IoT integration for real-time data tracking, and the use of block chain consortiums for industry-wide adoption. However, challenges remain in terms of scalability, interoperability, and regulatory compliance. Overall, the literature underscores blockchain's transformative potential in ensuring food safety and quality, with ongoing research aiming to refine and expand these applications.

EXISTING PROBLEM

Food Tracking System using blockchain technology is the lack of transparency and accountability within the food supply chain. Traditional supply chains often struggle to provide real-time visibility into the origin, quality, and safety of food products. This opacity can lead to inefficiencies, delays in identifying and resolving issues, and even food safety concerns, resulting in potential health hazards and economic losses.

REFERENCE

PROBLEM STATEMENT DEFINITION

Specify The Business Problem

The business problem in a Food Tracking System using blockchain technology is the lack of transparency and accountability within the food supply chain. Traditional supply chains often struggle to provide real-time visibility into the origin, quality, and safety of food products. This opacity can lead to inefficiencies, delays in identifying and resolving issues, and even food safety concerns, resulting in potential health hazards and economic losses. Implementing blockchain offers a solution by creating an immutable ledger that records every step of a food product's journey from farm to table. This transparency ensures that consumers can trace the origin of the food they consume, verify its authenticity, and be confident about its safety, while businesses can respond swiftly to issues, reduce waste, and build trust with their customers.

Business Requirements

The business requirements for a Food Tracking System on the blockchain are to establish end-to-end transparency and traceability within the food supply chain. This entails creating a secure and immutable ledger that records every step of a food product's journey, from production and processing to distribution and consumption. The system should enable real-time monitoring, authentication of product origins, quality assurance, and rapid response to any contamination or safety issues. Additionally, it should facilitate data sharing among stakeholders, including suppliers, manufacturers, distributors, and consumers, to enhance supply chain efficiency, reduce fraud, ensure compliance with regulations, and ultimately build trust in the food industry.

Literature Survey

A literature survey on Food Tracking Systems using blockchain technology reveals a growing body of research and practical applications in recent years. These studies emphasize the importance of transparency, security, and traceability in the food supply chain. Researchers have explored various blockchain-based solutions to address issues such as food fraud, contamination, and inefficiencies. Many highlight the potential benefits of

blockchain in enhancing consumer trust, reducing waste, and improving supply chain management. Key areas of focus include the development of smart contracts, IoT integration for real-time data tracking, and the use of blockchain consortiums for industry-wide adoption. However, challenges remain in terms of scalability, interoperability, and regulatory compliance. Overall, the literature underscores blockchain's transformative potential in ensuring food safety and quality, with ongoing research aiming to refine and expand these applications.

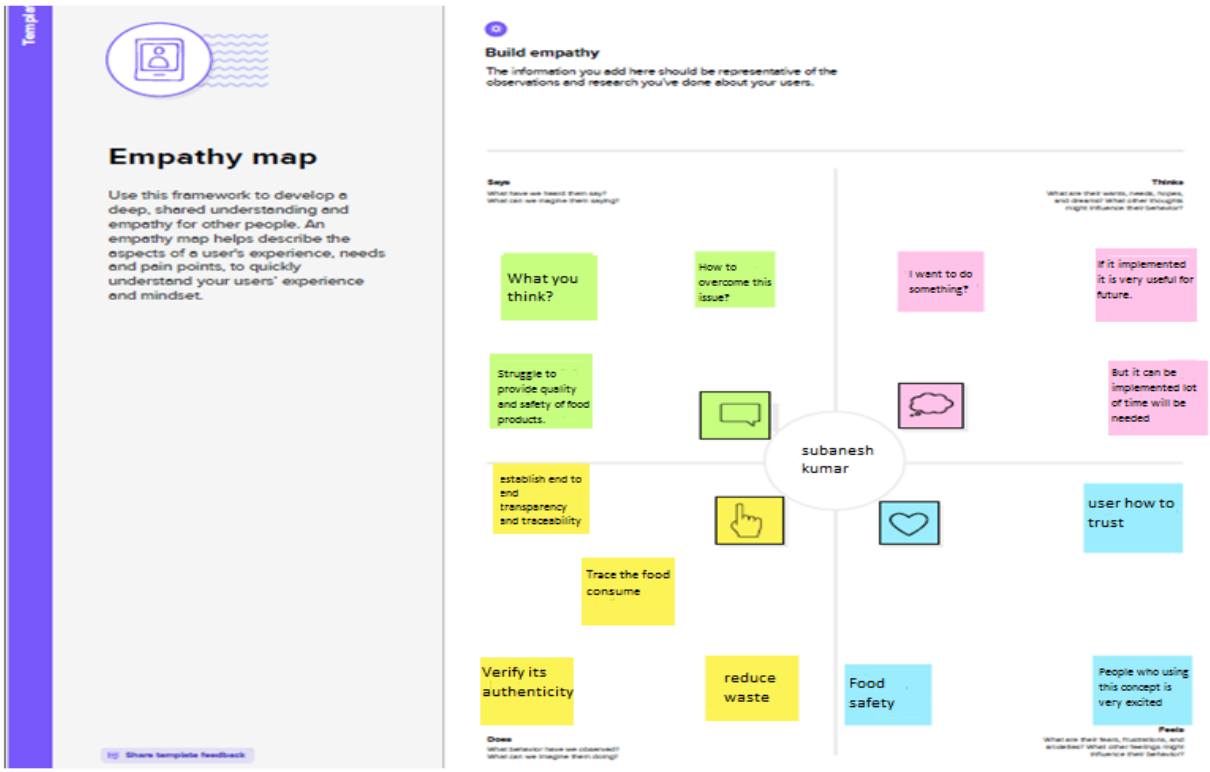
Social Or Business Impact

The implementation of a Food Tracking System using blockchain technology can have significant social and business impacts. On the social front, it enhances consumer confidence by providing transparent and trustworthy information about the origin and safety of food products. Consumers can make informed choices, reduce the risk of consuming contaminated or counterfeit goods, and enjoy greater peace of mind regarding food safety. From a business perspective, blockchain-based food tracking can lead to improved supply chain efficiency, reduced waste, and enhanced brand reputation. It enables companies to respond quickly to recalls or quality issues, streamlines regulatory compliance, and fosters consumer loyalty through increased trust. Overall, the adoption of blockchain in food tracking represents a win-win scenario for both consumers and businesses, with heightened food safety and operational benefits.

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

EMPATHY MAP CANVAS

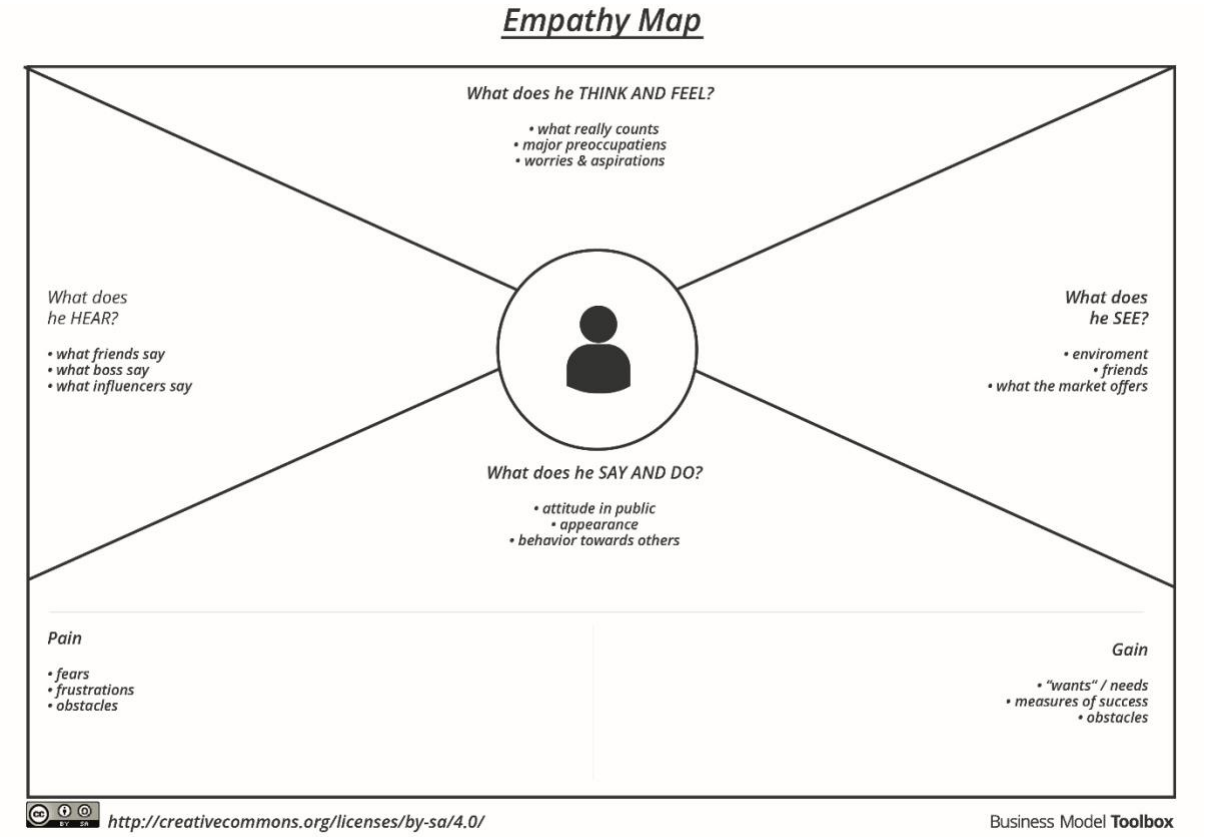


Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.
Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges

Example:



IDEATION & BRAINSTORMING

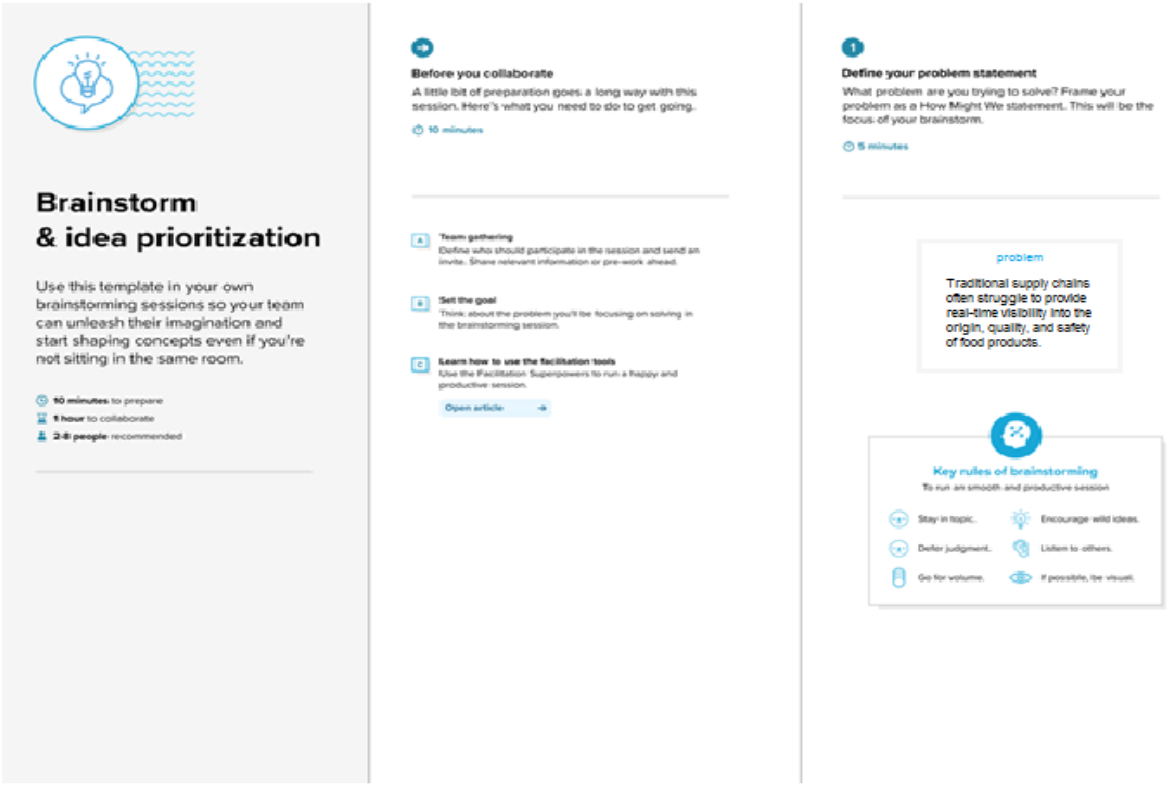
Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

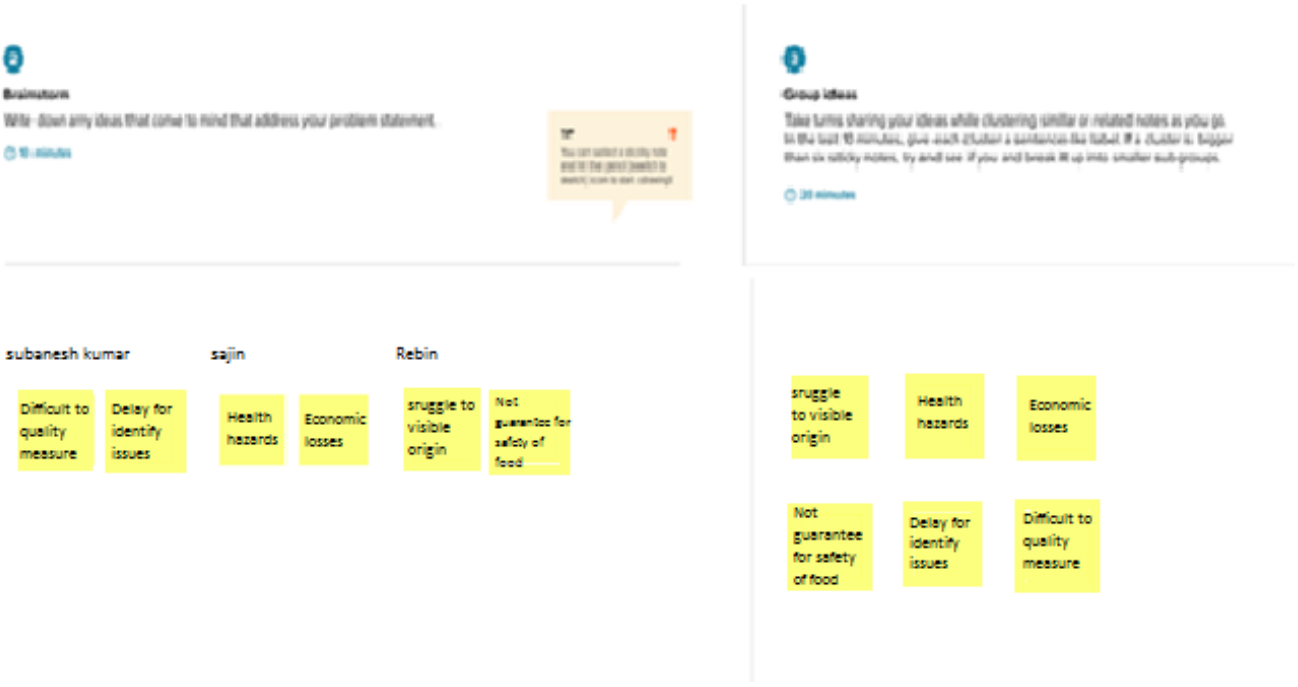
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Reference: https://www.mural.co/templates/empathy-map-canvas

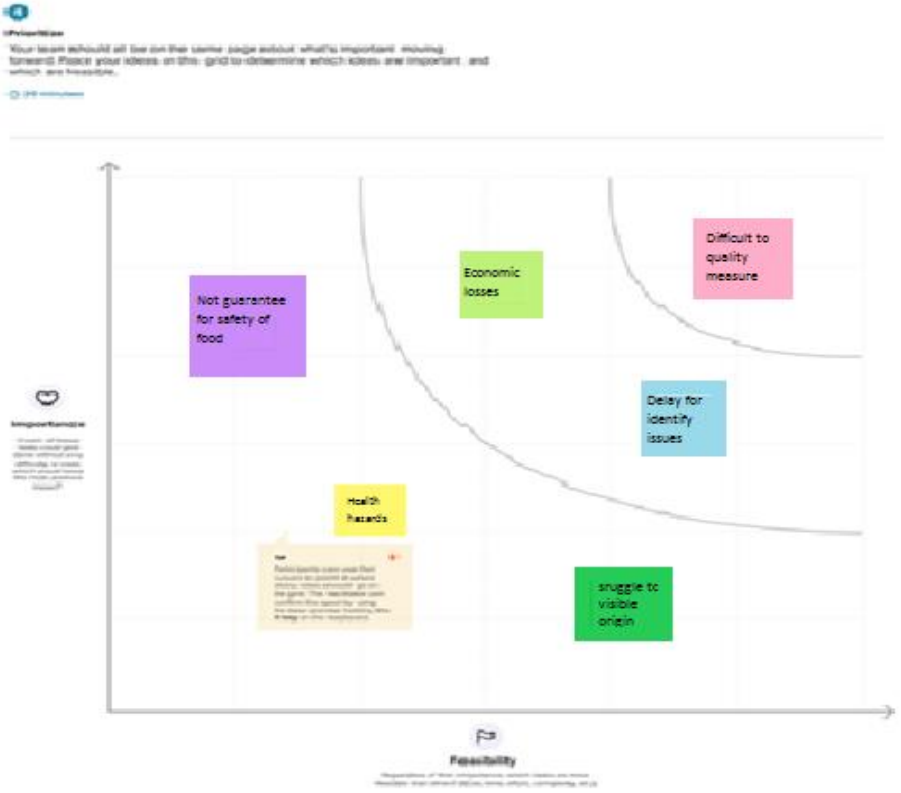
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



CHAPTER 3

REQUIREMENT ANALYSIS

FUNCTION REQUIREMENT:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	establish end-to-end transparency and traceability	Food Tracking System on the blockchain are to establish end-to-end transparency and traceability within the food supply chain
FR-2	Secure food production	This entails creating a secure and immutable ledger that records every step of a food product's journey,.
FR-3	Enable the monitoring system.	The system should enable real-time monitoring, authentication of product origins, quality assurance, and rapid response to any contamination or safety issues.
FR-4	Facilitate data sharing.	, it should facilitate data sharing among stakeholders, including suppliers, manufacturers, distributors, and consumers.
FR-5	To enhance the supply chain	to enhance supply chain efficiency, reduce fraud, ensure compliance with regulations, and ultimately build trust in the food industry.

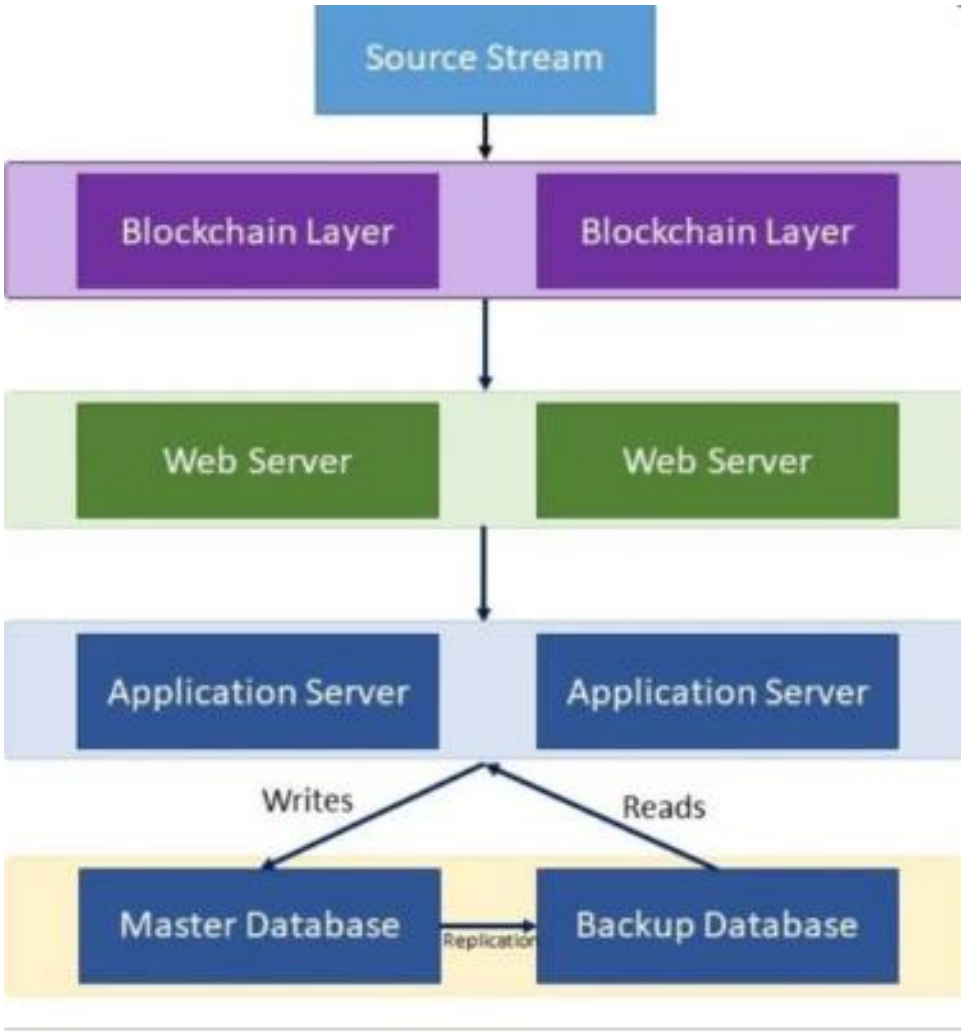
NON FUNCTIONAL REQUIREMENT

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system is mainly used for providing transparent and trustworthy information about the origin and safety of food products. Consumers can make informed choices, reduce the risk of consuming contaminated or counterfeit goods,
NFR-2	**Security**	system should enable real-time monitoring, authentication of product origins, quality assurance, and rapid response to any contamination or safety issues.
NFR-3	**Reliability**	it should facilitate data sharing among stakeholders, including suppliers, manufacturers, distributors, and consumers,
NFR-4	**Performance**	to enhance supply chain efficiency, reduce fraud, ensure compliance with regulations, and ultimately build trust in the food industry. .
NFR-5	**Availability**	blockchain-based food tracking can lead to improved supply chain efficiency, reduced waste, and enhanced brand reputation. It enables companies to respond quickly to recalls or quality issues,.
NRF-6	**Scalability**	Energy consumption is low. Maintenance cost is low. Requires less man power.

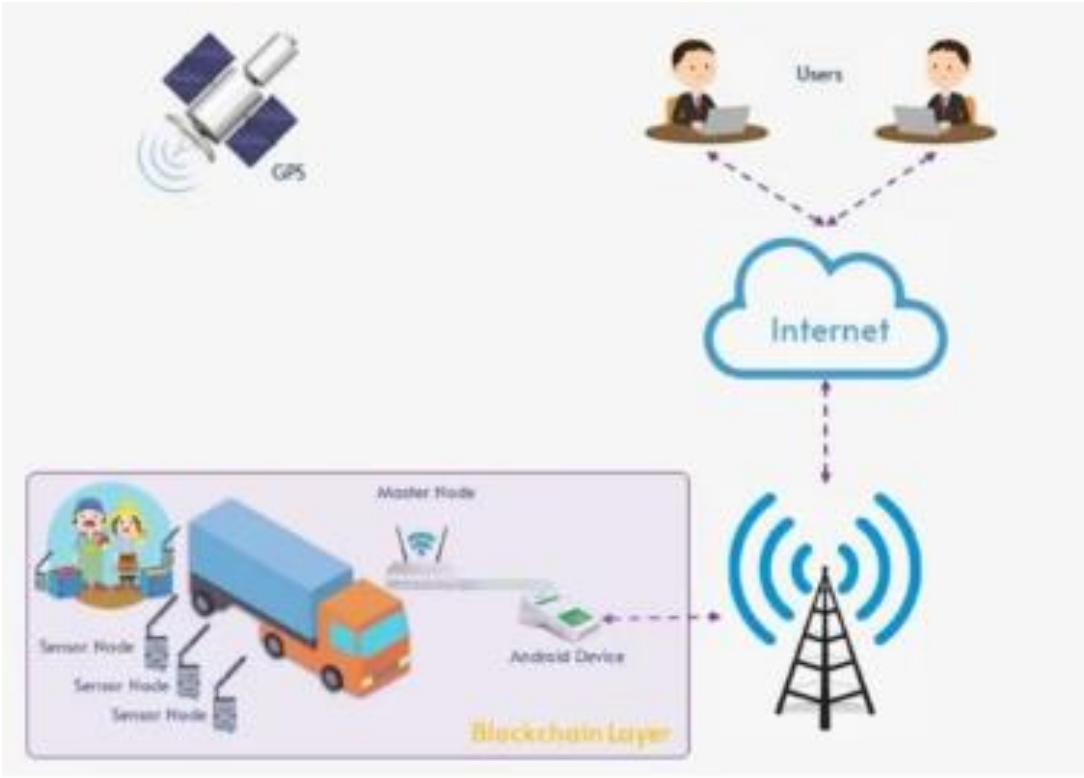
CHAPTER 5

PROJECT DESIGN

Data flow diagram



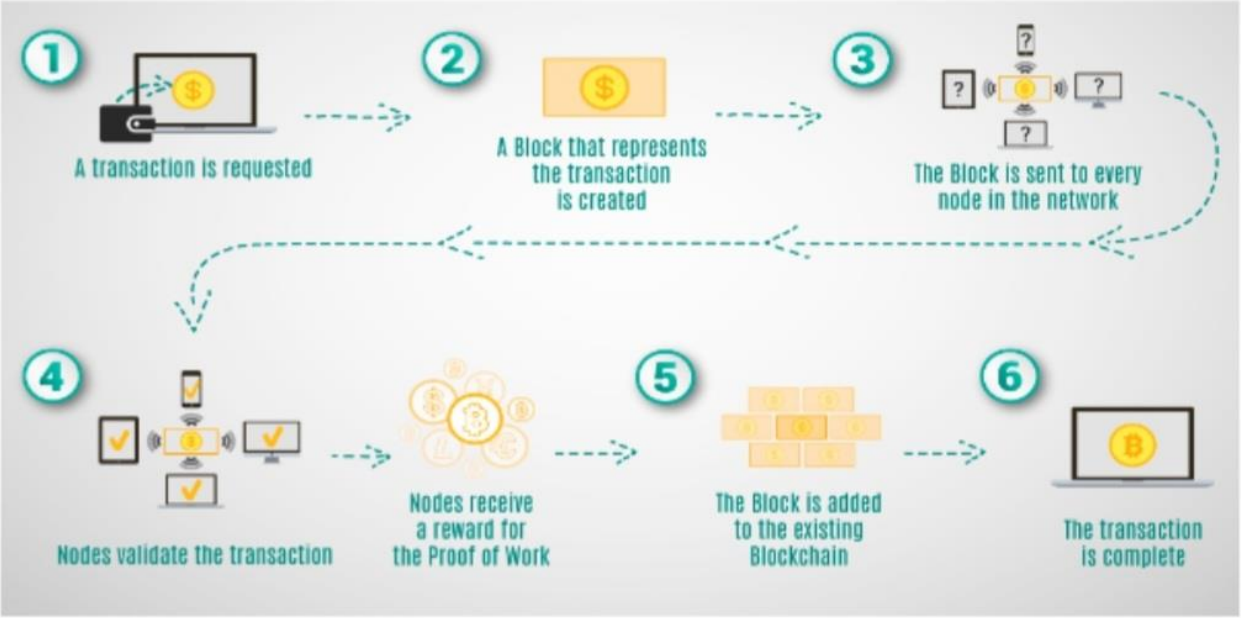
Solution architecture


GPS
Users
Internet
Master Node
Sensor Node
Sensor Node
Sensor Node
Android Device
Blockchain Layer

CHAPTER 6

PROJECT PLANNING& SCHEDULING

Technical architecture



CHAPTER 5

CODING AND SOLUTION

Code:

```
const { ethers } = require("ethers");

const abi = [
 {
  "inputs": [
   {
    "internalType": "string",
    "name": "itemId",
    "type": "string"
   }
  ],
  "name": "consumeFoodItem",
  "outputs": [],
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  "type": "function"
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  "type": "constructor"
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    "type": "string"
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    "internalType": "string",
```

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  {
   "internalType": "string",
   "name": "productName",
   "type": "string"
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   "name": "origin",
   "type": "string"
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  },
  {
   "internalType": "string",
   "name": "",
```

```
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    "name": "",
    "type": "uint256"
   },
   {
    "internalType": "enum FoodTracking.FoodStatus",
    "name": "",
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   }
  ],
  "stateMutability": "view",
  "type": "function"
 },
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  "outputs": [
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    "type": "address"
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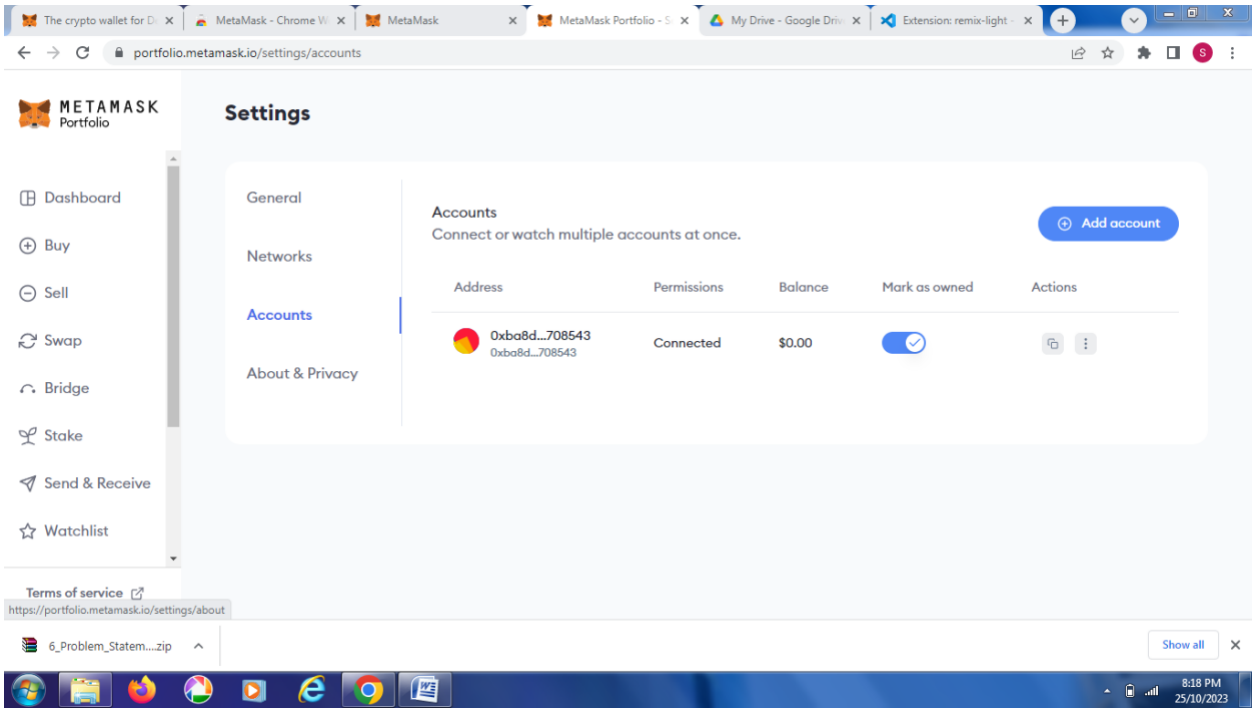
  ],
  "stateMutability": "view",
  "type": "function"
 }
]

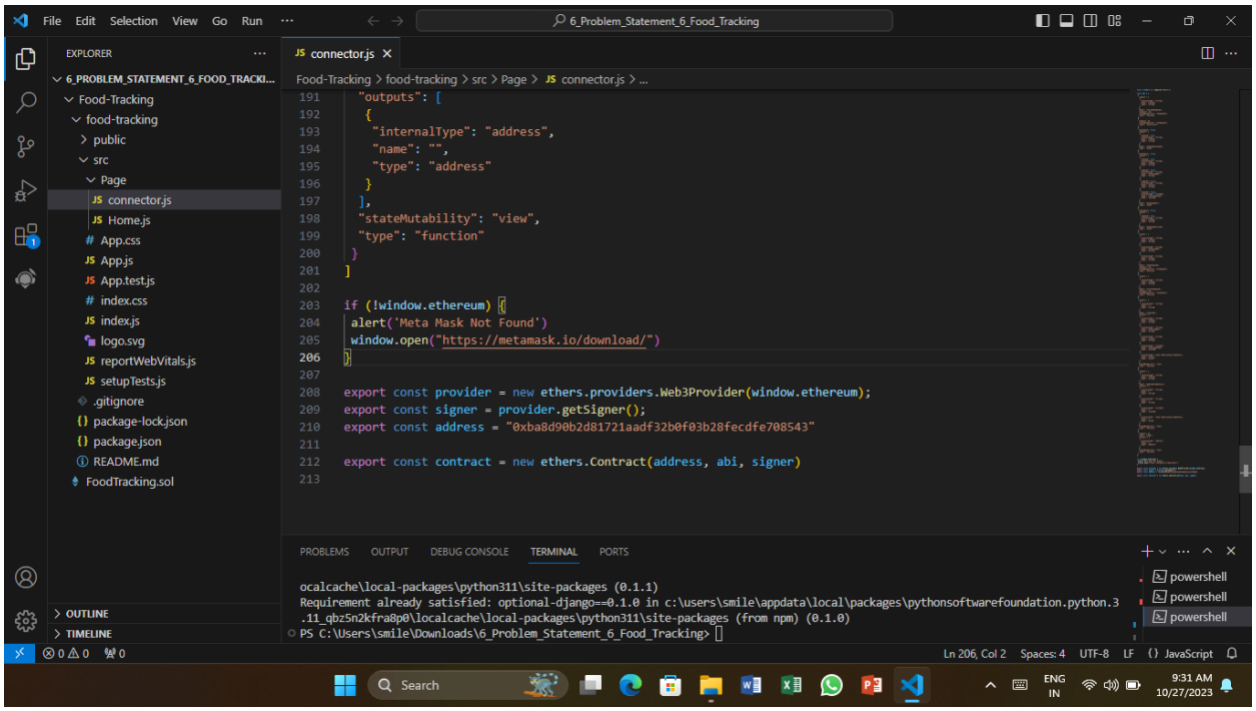
if (!window.ethereum) {
 alert('Meta Mask Not Found')
 window.open("https://metamask.io/download/")
}

export const provider = new ethers.providers.Web3Provider(window.ethereum);
export const signer = provider.getSigner();
export const address = "0xba8d90b2d81721aadf32b0f03b28fecdfe708543"

export const contract = new ethers.Contract(address, abi, signer)
```

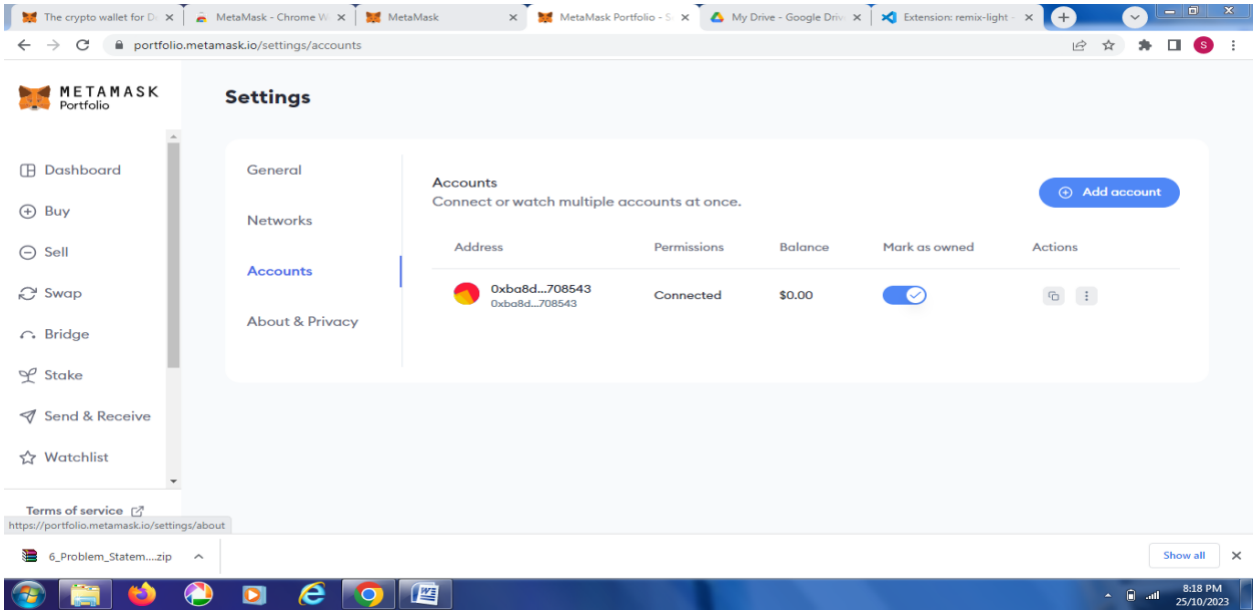
solution

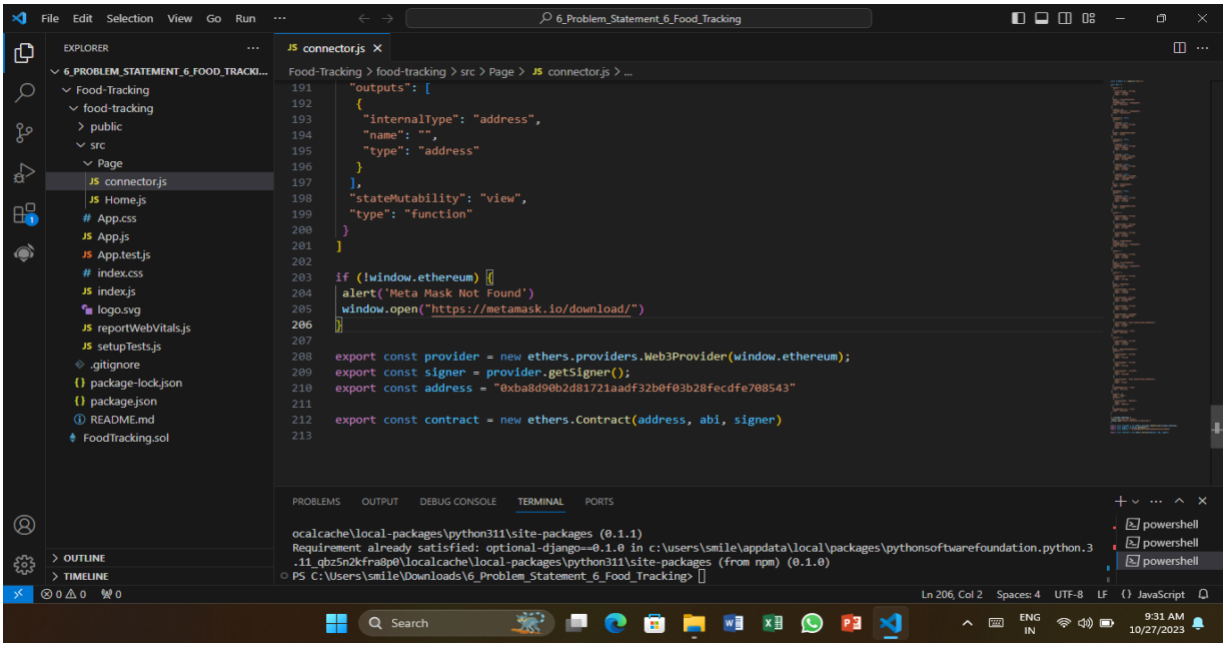

portfolio.metamask.io/settings/accounts
METAMASK
Portfolio
Settings
Dashboard
Buy
Sell
Swap
Bridge
Stake
Send & Receive
Watchlist
Terms of service
General
Networks
Accounts
About & Privacy
Accounts
Connect or watch multiple accounts at once.
Add account
Address
Permissions
Balance
Mark as owned
Actions
0xba8d...708543
Connected
$0.00
https://portfolio.metamask.io/settings/about
6_Problem_Statem....zip
Show all
8:18 PM
25/10/2023


File Edit Selection View Go Run
6_Problem_Statement_6_Food_Tracking
EXPLORER
connector.js
Food-Tracking > food-tracking > src > Page > connector.js > ...
"outputs": [
{
"internalType": "address",
"name": "",
"type": "address"
}
],
"stateMutability": "view",
"type": "function"
}
]
if (!window.ethereum) {
alert('Meta Mask Not Found')
window.open("https://metamask.io/download/")
}
export const provider = new ethers.providers.Web3Provider(window.ethereum);
export const signer = provider.getSigner();
export const address = "0xba8d90b2d81721aadf32b0f03b28fecdfe708543"
export const contract = new ethers.Contract(address, abi, signer)
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
ocalcache\local-packages\python311\site-packages (0.1.1)
Requirement already satisfied: optional-django==0.1.0 in c:\users\smile\appdata\local\packages\pythonsoftwarefoundation.python.3.11_qbz5n2kfra8p0\localcache\local-packages\python311\site-packages (from npm) (0.1.0)
PS C:\Users\smile\Downloads\6_Problem_Statement_6_Food_Tracking>
powershell
powershell
powershell
OUTLINE
TIMELINE
Ln 206, Col 2
Spaces: 4
UTF-8
LF
JavaScript
Search
ENG
IN
9:31 AM
10/27/2023

CHAPTER 8

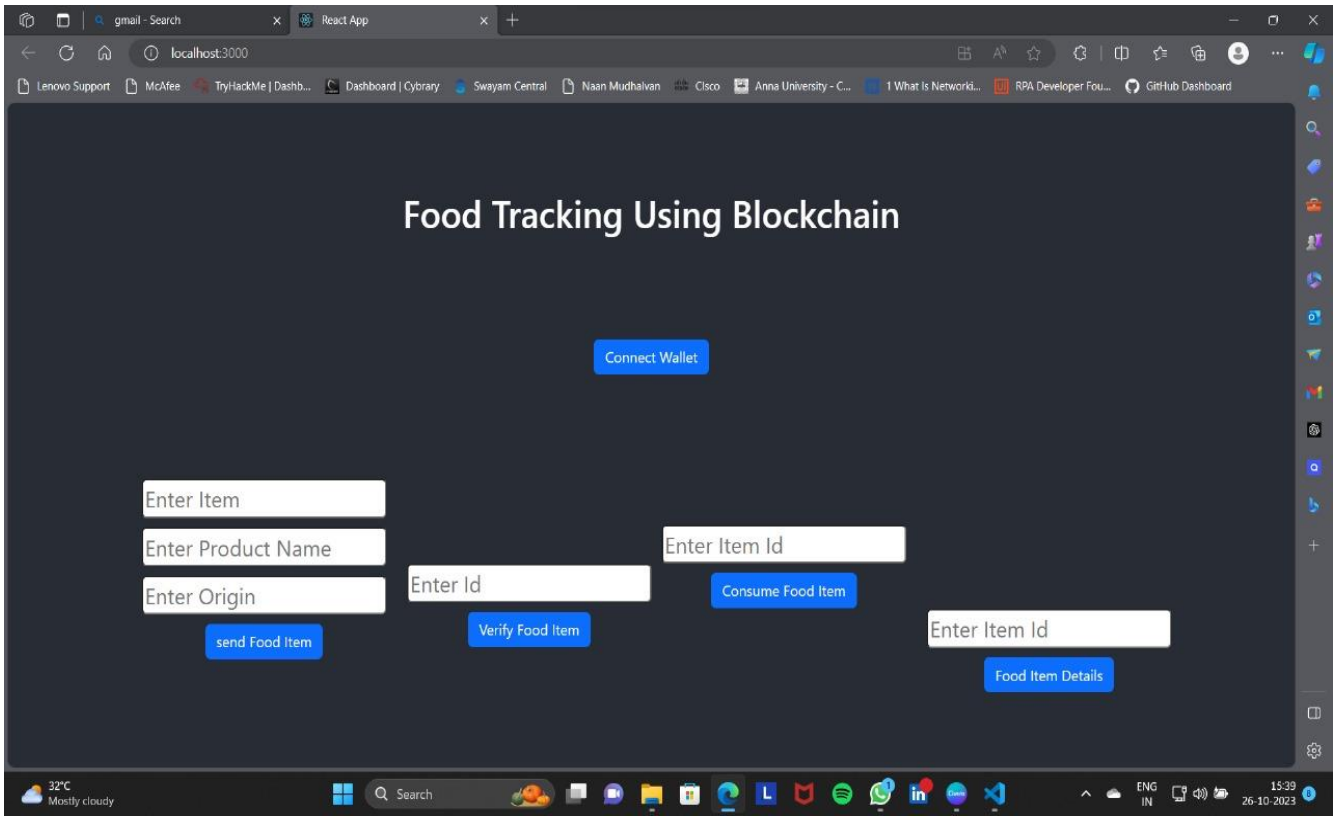
PERFORMANCE METRICES





CHAPTER 9

RESULT



CHAPTER 10

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Accurate and tamper-resistant food data. ...
- Efficiently prevent, contain, or rectify contamination outbreaks while reducing the loss of revenue. ...
- Creates more transparency and trust in the authenticity of Verifiable Credential data.

DISADVANTAGES

- Possibility of disruption of network security. ...
- High costs of implementation. ...
- Inefficient mining process. ...
- Environmental impacts. ...
- Storage problems. ...

CHAPTER 11

CONCLUSION

In this study, the establishment of a blockchain-based food tracking system in Turkey, its performance comparison, the operation of the system, and the results are discussed. The flow of a food tracking system has been demonstrated in Turkey, and accordingly, the 12-step system flow required to develop a blockchain-based food tracking system has been obtained. Comparing the performance data of the established blockchain-based system with other blockchain infrastructures, a value of 0.038 s for latency is 435 times better than Ethereum, one of the most popular blockchain infrastructures. A transmission per second value of 285, reception per second value of 335, and CPU load rate value of 19.22 are obtained with the proposed system. Because it is not currently possible to put such a system into use throughout the country, choosing a pilot region and operating the system in this region and taking their

feedback is essential for obtaining solid evidence to show that the users of the system are looking for such a system to use. For this, a survey study was conducted on the users of the system. We can say that the results obtained are concrete proof of how much the system is needed and that it is favored by the public. The system was used for three months in the selected pilot study area. A total of 7828 users viewed the application. A total of 72.03% of them (5560 users) logged into the application and had a user experience. As a result of the two-question survey directed to these participants, 75.31% of the users who use the application like the interface of the application, while the others have low satisfaction. Considering that this developed application is not a commercial product but a proof of concept (PoC) study, it is obvious that there will be some development needs if it is turned into a commercial product. For this reason, we can say that the rate of 75.31% is acceptable, and the PoC work has been completed with an average/acceptable interface. The majority of the participants, 97.54%, stated that they found the application extremely useful and that they would like to use it again in the future. This shows how positively people approach this concept that we have developed. All these positive results reveal the success and potential of the system we have developed. It demonstrates the great need for such a system in the eyes of the public. In addition, along with the transparency of the food tracking

CHAPTER 12

FUTURE SCOPE

The technology can only enhance the security and privacy of data but also streamline business operations and increase efficiency. It can benefit the industries such as finance, advertising, supply chain, cybersecurity, and more. Blockchain can even prove to be beneficial for government agencies.

CHAPTER 13

APPENDIX

Source code:

```
const { ethers } = require("ethers");

const abi = [
```

```
{
 "inputs": [
  {
   "internalType": "string",
   "name": "itemId",
   "type": "string"
  }
 ],
 "name": "consumeFoodItem",
 "outputs": [],
 "stateMutability": "nonpayable",
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{
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 "inputs": [
  {
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   "internalType": "string",
   "name": "itemId",
   "type": "string"
  },
  {
   "indexed": false,
   "internalType": "string",
   "name": "productName",
   "type": "string"
```

```
  },
  {
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```
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  },
  {
   "internalType": "uint256",
   "name": "",
   "type": "uint256"
  },
  {
   "internalType": "enum FoodTracking.FoodStatus",
   "name": "",
   "type": "uint8"
  }
```

```
 ],
 "stateMutability": "view",
 "type": "function"
},
{
 "inputs": [],
 "name": "owner",
 "outputs": [
  {
   "internalType": "address",
   "name": "",
   "type": "address"
  }
 ],
 "stateMutability": "view",
 "type": "function"
}
]

if (!window.ethereum) {
 alert('Meta Mask Not Found')
 window.open("https://metamask.io/download/")
}

export const provider = new ethers.providers.Web3Provider(window.ethereum);
export const signer = provider.getSigner();
export const address = "0xba8d90b2d81721aadf32b0f03b28fecdfe708543"

export const contract = new ethers.Contract(address, abi, signer)
```

Github and Project video Demo link:

Project video demo link:

https://drive.google.com/file/d/1dn2qe9JfsT-L8AQQBvgIjAvSl-5g8Mw8/view?usp=drive_link

Github link:

subanesh-kumar/NM-BC_NM2023TMID10689

Meta Mask :

0xba8d90b2d81721aadf32b0f03b28fecdfe708543