BHARATHIDASAN ENGINEERING COLLEGE

NATTRAMPALLI – 635854

NAAN MUDHALVAN PROJECT:

ONLINE FOOD TRACKING SYSTEM BY USING BLOCKCHAIN

Submitted By;

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TABLE CONTENT

1.INTRODUCTION :

A food shortage, which has increased with the climate crisis, will be one of the biggest problems of the world, together with water scarcity, in the future and will damage the sustainability of the food supply system. With the effect of the COVID-19 pandemic, food resources are decreasing, and food prices are rising all over the world. The decrease in food sources increases the importance of food tracking even more. The exorbitant price increases after the COVID-19 pandemic are the most concrete indicators of this. Block chain-based food tracking systems will be of critical importance because they will prevent exorbitant price increases with their contribution to food tracking processes, such as reliability and transparency.

In this study, the establishment of a block chain-based food tracking system in Turkey, its operation, and its results will be discussed. It was concluded that 97.54% of the participants using the established system found the application useful and wanted such an application to become widespread. In addition, comparing the performance data of the established block chain-based system with other block chain infrastructures, a value of 0.038 s for latency is 435 times better than Reuther, one of the most popular block chain 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

1.1 PROJECT OVERVIEW :

The awareness of protecting human health, which has increased on a global scale in recent years, has also shown itself in the food industry, and it has gained great importance that food be safe in order to lead a healthy life. Access to and the consumption of safe food is a right that every person should have. Food safety covers the whole process from the production stage of the food until it reaches the consumer . More than 60% or about 1 billion tons of food is wasted within the supply chain while harvesting, processing, shipping, and storing . For instance, nearly 492 million tons of perishable food were wasted in the year 2011 because of the ineffective and poor management of the food tracking systems .

According to the FAO (UN Food and Agriculture Organization), food security is defined as the ability of every person to have access to sufficient, safe, and nutritious food at all times to lead an active and healthy life . Food safety is possible by taking every step of the food under control in the whole process, starting from the raw material until it reaches our table. Especially with the spread of digitization, it is expected that the number and success of food tracking systems will increase . The benefits of digitization will be most clearly and largely achieved through the use of emerging technologies.

With the maturation and spread of emerging technologies, it has started to become a part of our daily life, shaping life and paving the way for digitization . One of the main reasons for digitization is to reduce or even eliminate the need for manpower . Undoubtedly, one of the prominent technologies at this point is block chain technology, which is the infrastructure of cryptocurrencies such as Bitcoin, and many application areas have begun to emerge with the possibility of making transactions without intermediaries. Due to the advantages offered by block chain technology, it has recently gained the notion of being the technological basis on which many applications are developed.

1.2 PURPOSE :

To define block chain technology, it is a technology that eliminates the need for a central trust or authority, allowing trust to be distributed to the participants in the system. This technology can be defined as a decentralized database, and it is a chain of blocks, each of which contains numerical information. These blocks store a set of information or data in general terms. These sets of information hold more transaction information than storing data such as videos or images. After being filled with transaction data, the blocks are chained to the previous filled block. It also contains information such as the time the block was created (timestamp), the hash code of the block, the hash code of the previous block, the index information, and the nonce value. In the block chain network, there are copies of the database at all parties of the distributed system.

A food shortage, which has increased with the climate crisis, will be one of the biggest problems of the world, together with water scarcity, in the future and will damage the sustainability of the food supply system. With the effect of the COVID-19 pandemic, food resources are decreasing, and food prices are rising all over the world. The decrease in food sources increases the importance of food tracking even more. The exorbitant price increases after the COVID-19 pandemic are the most concrete indicators of this. Block chain-based food tracking systems will be of critical importance because they will prevent exorbitant price increases with their contribution to food tracking processes, such as reliability and transparency. In this study, the establishment of a block chain-based food tracking system in Turkey, its performance comparison, the operation of the system, and the results will be discussed.

2. LITERATURE SURVEY :

One of the foremost block chain-based food tracking systems is the “Food Trust” system developed by IBM. Announced for the first time in 2017, Food Trust has provided traceability in the food supply chain to 80 different brands so far by using block chain technology. With this traceability, the supply process from producers to consumers can be followed in detail. IBM’s open-source technology based on Hyper ledger Fabric allows companies to set their own rules on the system. It is argued that the traceability offered by the Food Trust not only helps food safety but also helps producers with food freshness, sustainability, and waste. Announcing that more than 5 million food products already on the shelves are included in the system, IBM seems confident that this platform will grow strongly. Among the companies using this application are giants such as Dole, Kroger, McCormick and Company, Nestle, Tyson Foods, and Unilever .

Walmart has used block chain to record where every piece of meat it buys from China comes from, where it is processed, where it is stored, and all transactions related to its sale, along with its historical course. All detailed information about the farm where the meat comes from, the factory where it is processed, the batch number of the product, the storage temperature of the product, and transportation can be tracked on the block chain. In addition to the benefits of processing speed, information sharing, and transparency, the main purpose is summarized as increasing food safety.

With the use of this example, the aim is that the use of block chain technology will facilitate transparency, tracking, and auditing, thus ensuring the safety of food products, preventing illegal and excessive fishing, and preventing damage to the environment.Kim proposes a block chain-based traceability system with different gerontologist, where each one could accomplish and be part of certain transactions. He offers the use of smart contracts. Reuther, with the Solidity programming language, was used in his study.Feng Tian et al. propose a block chain solution for agriculture traceability to ensure that the HACCP principles and requirements are addressed during the production, transportation, and preservation of a product .

2.1 EXISTING PROBLEM :

focus on the increasingly serious problem of food safety in China and propose a block chain solution for the agriculture supply chain, based on the information and transaction security between all the involved parties. In this work, a PEST (political, economic, social, and technological) environment analysis took place to define the challenges and the opportunities of the DLT (Distributed Ledger Technologies) solution .In addition, Francisco Amarillo et al. offer a block chain-based solution focusing on the animal products supply chain in Italy . Kumar et al. propose a rice supply chain system that uses block chain technology to assure the safety of rice during its flow through the supply chain .

Maria Elena Latino et al. propose another interesting idea regarding the agriculture supply chain and the use of Industry 4.0 principles. They refer to the idea of food democracy, according to which consumers are considered citizens and the food is not a good but a civil right. The authors advertise the idea of voluntary traceability and combine it with Industry 4.0 technologies. The significance of voluntary traceability is highlighted, focusing on the volume and the quality of the data collected for each product, as well as the need for a big data platform to handle them.Islam and others published work about the visualization of food supply chain management. Their research aims to propose a new visualization approach that allows supply chain operators to collaborate effectively in the design process of Fess capable of maintaining streamlined information flow, minimizing information loss, and improving supply chain performance.

Bahga et al. proposed work to monitor the food supply chain tracking system on a cloud-based architecture. The proposed system, called Cloud Track, provides the global information of the entire fleet of food supply vehicles and is proposed to be used to track and monitor a large number of vehicles in real time.Caro et al.

2. REFERENCES :

Blockbusting is a fully distributed system that uses block chain technology in combination with IoT devices to collect and distribute traceability data. The

proposed solution was tested with two Reuther and Hyper ledger Saw tooth block chain platforms. Blockbusting enables the integration of Io T and block chain technologies, creating transparent, fault-tolerant, immutable, and editable records which can be used for an agri-food traceability system.Tian proposes a block chain-based food tracking system, especially to solve the recent problems related to food tracking in China. Arguing that traditional agricultural supply logistics systems do not fully meet market needs, he proposes a more dynamic RFID-based food supply chain management system. With the proposed system, it is advocated that traceability with reliable information in the entire agri-food supply chain effectively guarantees food safety by collecting, transferring, and sharing the original data of agri-food in production, processing, storage, distribution, and sales connections .

Contributions of Proposed Study

The novelty and contributions of this proposed study are:

A total of 0.038 s for latency was gathered with the proposed system, which is 435 times better than Reuther, one of the most popular block chain infrastructures.A transmission per second value of 285, reception per second value of 335, and CPU load value of 19.22 are obtained with the proposed block chain-based system.Through the proposed block chain-based system to be established, suppliers that make unfair price increases in the case of a food shortage, which will become a bigger problem in the coming periods due to the COVID-19 pandemic, will be prevented.

It is the first study in which the live use of the block chain-based food tracking system is carried out and the satisfaction survey is carried out.A total of 75.31% of the users who use the application liked the interface of the application; 97.54% of the users stated that they found the application extremely useful and that they would like to use it again in the future.

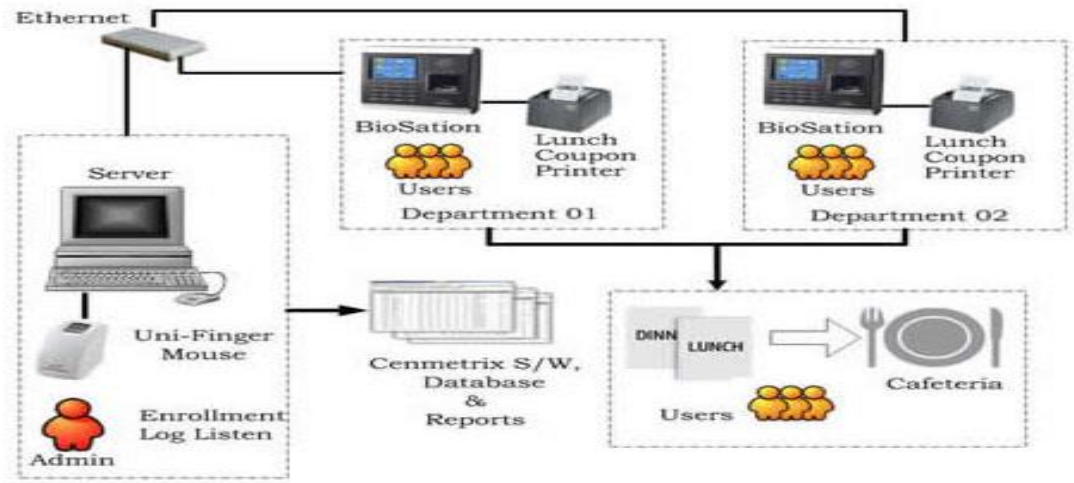
2.3 PROBLEM SATEMENT DEFINATION :

A problem statement is a brief and concise explanation of a problem that needs to be addressed. It should clearly define the problem, its scope, and its impact. A food tracking system is a software application that helps users track their

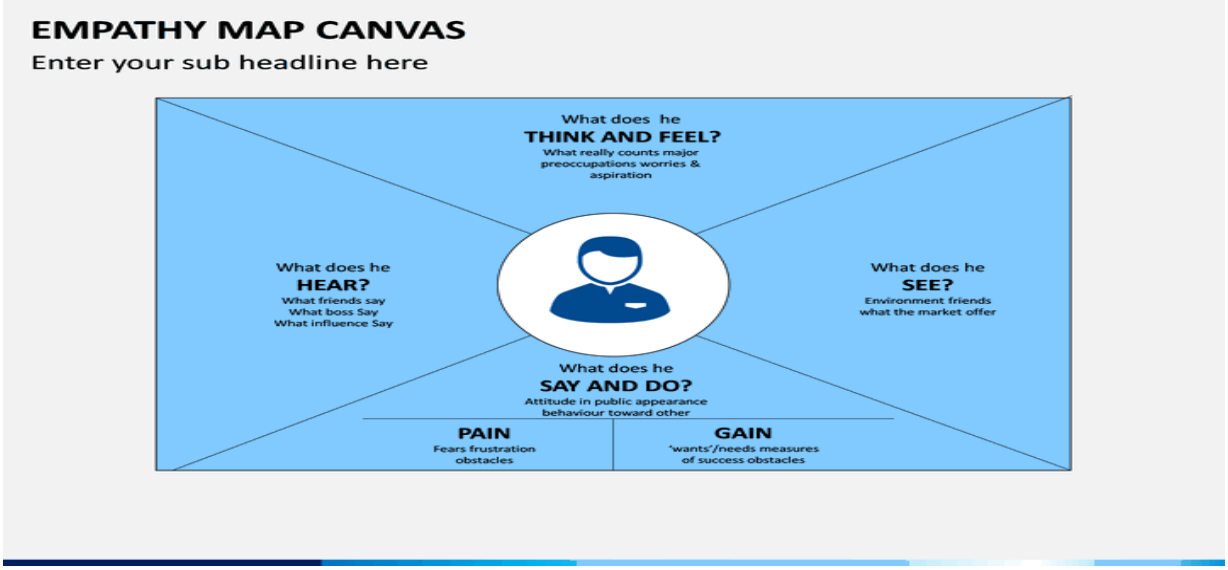
food intake and monitor their nutritional goals. It can also help users identify food allergies and intolerances, and provide recommendations for healthier food choices. Combining these two concepts, a problem statement for a food tracking system could be:

"The lack of an efficient and user-friendly food tracking system makes it difficult for people to monitor their food intake and achieve their nutritional goals. A food tracking system that is easy to use, provides accurate nutritional information, and offers personalized recommendations would help people make healthier food choices and improve their overall health."

3. IDEATION & PROPOSED SOLUTION :



3.1EMPATHY MAP CANVAS :



3.2 IDEATION & BRAINSTORMING :

It seems like you are looking for a food tracking system. There are many food tracking apps available that can help you track your daily food intake, calories, and macronutrients. Some of the popular ones are:

1. **MyFitnessPal**: This app has a database of over 6 million foods and 4 million food barcodes. It allows you to log breakfast, lunch, dinner, and snacks, and provides insights on calories, fat, protein, carbs, sugar, fiber, cholesterol, and vitamins. It is available for both iOS and Android devices **1.**
2. **Ultimate Food Value Diary**: This app not only tracks your food intake but also helps you track your workouts, diet, weight, and measurements. It uses calorific values to calculate food values using the standard macronutrients of protein, carbs, fat, and fiber. It is available for both iOS and Android devices 1.
3. **MyPlate**: This app lets you create customized goals for macro and micronutrients while providing a comprehensive dietary analysis of the food you're taking in. It is available for both iOS and Android devices 1.
4. **Foodcate**: This app provides a comprehensive database of 300,000 foods in supermarkets. You can scan the barcode with your smartphone camera to get an in-depth nutritional analysis of added sugars, trans fats, high-fructose corn syrup, food coloring, genetically modified organisms (GMO), additives, preservatives, and artificial sweeteners. It is available for both iOS and Android devices 1.

4. REQUIREMENT ANALYSIS :

Food tracking systems are designed to trace the movement of food products and their ingredients through all steps in the supply chain, both backward and forward. This involves documenting and linking the production, processing, and distribution chain of food products and ingredients 1. The FDA Food Safety Modernization Act (FSMA) addresses the need for rapid and effective tracking and tracing of foods. FSMA section 204, Enhancing Tracking and Tracing of Food and Recordkeeping, instructs the FDA to develop additional recordkeeping requirements for certain foods' The section has three major requirements: FDA must establish pilot projects in coordination with the food industry to explore and evaluate methods and appropriate technologies for rapid and effective tracking and tracing of foods.

FDA is required to designate foods for which additional record keeping requirements are appropriate and necessary to protect the public health. FDA must publish a notice of final rulemaking to establish such additional recordkeeping requirements for the designated foods, to help in tracing such foods .The Food Traceability Final Rule establishes a standardized approach to traceability recordkeeping, paving the way for industry to adopt, harmonize, and leverage more digital traceability systems in the future 1. The Blueprint for the New Era of Smarter Food Safety outlines the FDA's vision to enhance traceability, improve predictive analytics, respond more rapidly to outbreaks, address new business models, reduce contamination of food, and foster the development of stronger food safety cultures .

4.1 FUNCTIONAL REQURIMENTS :

Functional requirements are certain characteristics or capabilities that a system must have in order to function properly. The following are some functional criteria for a food ordering system:

1. Customers should be able to view the status of their orders, including when they were placed, when they are expected to be ready, and when they have been delivered (if applicable).
2. Order modification: Customers should be allowed to make changes to their orders until they are ready for preparation by the kitchen.
3. Customers should be able to choose goods from the menu and add them to their order, as well as express any special instructions or alterations.
4. Support for numerous locations: If the food ordering system serves many locations, it should be capable of handling orders from different locations and routing them to the appropriate location.
5. Support for mobile devices: The system should be accessible and tailored for mobile use.
6. Integration with other systems: The system should be able to integrate with other systems, such as a POS or kitchen management system.
7. Customers should be able to examine their previous orders and reorder goods from previous orders.
8. Menu display: The system should be able to display the menu items that are available, including descriptions and prices.
9. Payment processing: Customers should be able to enter their payment information and process the transaction using the system.
10. Administrative controls: The system should allow you to manage menu items, prices, and other parameters.

4.2 NON-FUNCTIONAL REQIREMENT :

Non-functional needs are system requirements that are not tied to a single function or service provided by the system, but rather to the system's overall characteristics. Here are a few examples of non-functional criteria for a meal ordering system:

1. Security: The system should prevent unauthorised access or misuse of sensitive information, such as consumer payment and personal information. This could include regulations for the use of encryption, secure servers, and other data integrity safeguards.
2. Scalability refers to the system's ability to accommodate increases in the number of users or orders without deteriorating performance. This could include the capacity to add more servers or other hardware as needed to accommodate rising demand.
3. Reliability: The system should be available and working when required, with as little downtime as possible. This could include requirements for the system's ability to handle failures or unforeseen events, as well as the utilisation of backup systems and processes to assure service continuity.
4. Maintainability: With a clear and well-documented codebase and a solid testing and deployment procedure, the system should be simple to upgrade and maintain over time.This could include requirements for using version control, automated testing, and other tools and processes to keep the system reliable and up to date.
5. Usability: The system should be simple to use for both customers and restaurant employees, with a clear and intuitive interface and simple navigation.This could include criteria for the system's layout and design, the use of clear and simple language, and the provision of assistance and support.
6. Performance: The system should be able to process a high volume of orders efficiently.This could include system speed, the quantity of orders it can process at once, and the ability to handle peak periods of activity.

5. PROJECT DESNING :

A food tracking system is a software application that helps users track their food intake, monitor their calorie intake, and maintain a healthy diet. There are

several components to consider when designing a food tracking system, including the user interface, database, and algorithms for calculating nutritional information.

Here are some resources that can help you get started with designing a food tracking system:

1. System Design: DoorDash1: This article provides a detailed analysis of the component design and architecture of DoorDash, a popular prepared food delivery service. It discusses the data model, scalability, redundancy, fault tolerance, and other important pieces of the puzzle.

2. Smart Expiry Food Tracking System2: This research paper proposes a smart expiry food tracking system that uses RFID technology to track food expiration dates and reduce food waste.

3. How to make a food delivery app and design it in 20233: This article provides a step-by-step guide on how to design a food delivery app in 2023. It covers topics such as user research, wireframing, prototyping, and testing.

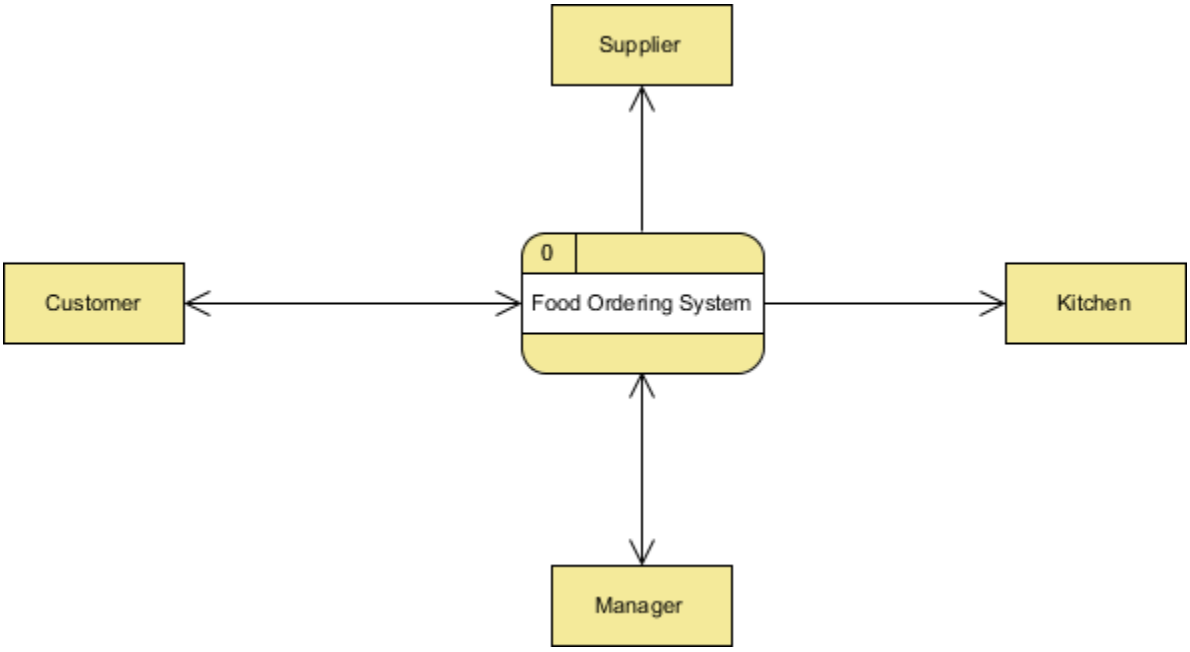
4. Tracking and Tracing of Food4: This FDA article discusses the need for rapid and effective tracking and tracing of foods. It provides an overview of the FDA Food Safety Modernization Act (FSMA) and its recordkeeping requirements for certain foods.

5. Food-Ordering-System5: This GitHub repository contains a core Java OOPS-based application for a real-time food ordering and delivery tracking system.

5.1 DATA FLOW DIAGRAMS & USER STORIES:

A **Data Flow Diagram (DFD)** is a visual representation of the flow of information (i.e. data) within a system. It shows how data enters and leaves the system, what changes the data undergoes, and where the data is stored. A DFD is a useful tool for understanding a system's functionality and identifying potential areas for improvement.

n the context of a **food tracking system**, a DFD can help illustrate how data flows through the system. For example, a DFD can show how a user enters food intake data, how the system processes that data, and how the system stores that data for future reference. Visual Paradigm provides a tutorial on how to create a DFD for a food ordering system.



USER & STORIES:

User stories are a way of describing how a user interacts with a system. They are typically written in plain language and describe a user's goals, needs, and expectations. User stories can help ensure that a system is designed with the user in mind and can help identify potential usability issues.In the context of a **food tracking system**, user stories can help identify the key features and functionality that users expect from the system. For example, a user story might describe how a user wants to be able to easily enter food intake data using a mobile app.

Another user story might describe how a user wants to be able to view their food intake history over time. By identifying these user stories, developers can ensure that the system meets the needs of its users.

5.2 SOLUTION ARCHITECTURE :

A food tracking system can be designed using a micro services **architecture**. This architecture style is well-suited for building scalable and maintainable systems. The following are some of the micro services that can be used to build a food tracking system:

1. **User Management Service**: This service is responsible for managing user accounts, authentication, and authorization.
2. **Food Catalog Service**: This service is responsible for managing the food catalog, including food items, categories, and nutritional information.
3. **Order Management Service**: This service is responsible for managing orders, including order placement, payment processing, and order tracking.
4. **Delivery Management Service**: This service is responsible for managing deliveries, including delivery scheduling, dispatching, and tracking.These micro services can be built using different technologies and programming languages.

For example, the User Management Service can be built using Node.js and MongoDB, while the Food Catalog Service can be built using Java and PostgreSQL.

To ensure that the micro services work together seamlessly, an **API Gateway** can be used. The API Gateway is responsible for routing requests to the appropriate micro service and handling authentication and authorization.In addition to the micro services, a **message broker** such as **Apache Kafka** can be used to enable asynchronous communication between the micro services. This can help improve the scalability and fault-tolerance of the system.

Finally, the system can be deployed using a **container orchestration platform** such as **Kubernetes**. This can help automate the deployment, scaling, and management of the micro services.

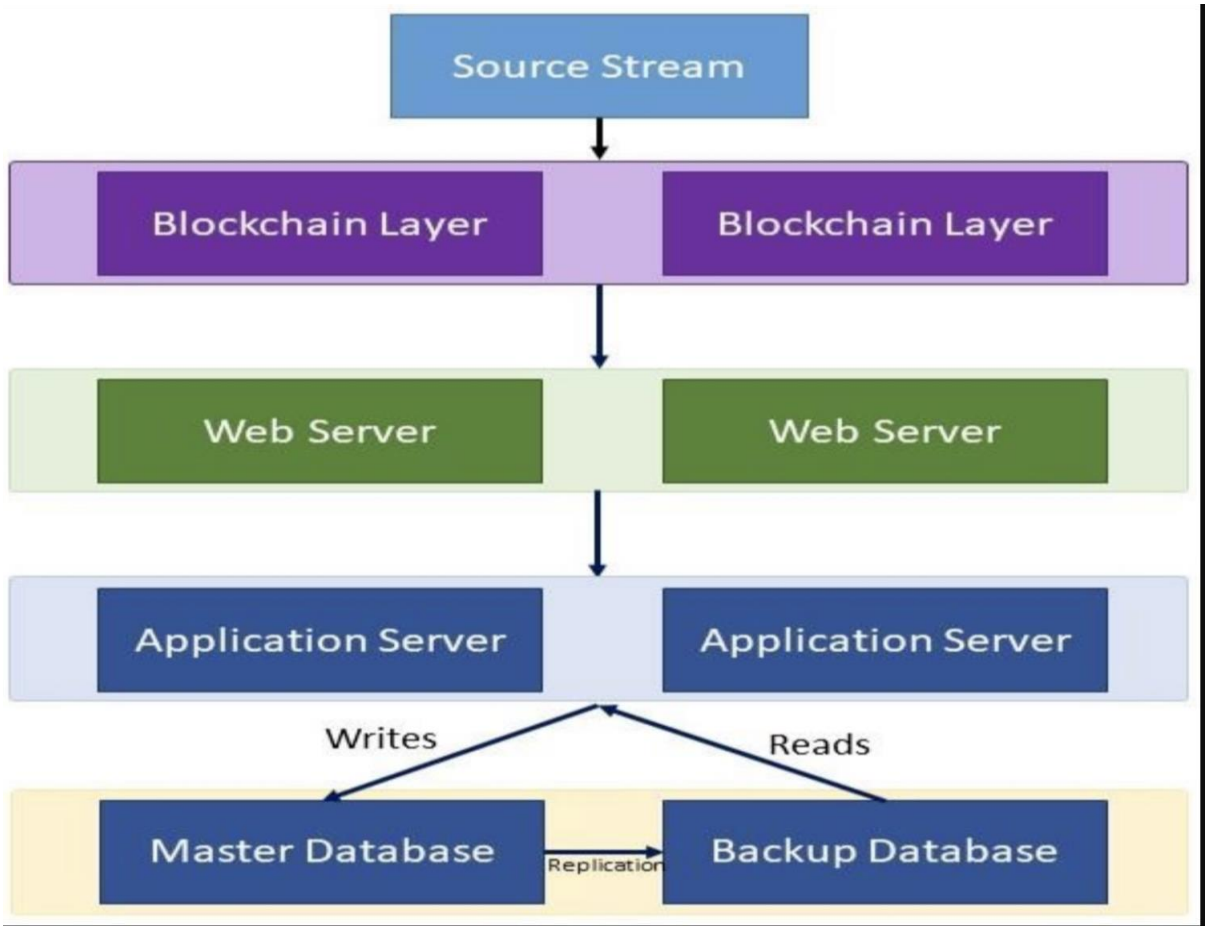
6.PROJECT PLANNING & SCHEDULING :

Project planning and scheduling are two essential components of project management. Project planning involves designing effective policies and methodologies to achieve project objectives, while project scheduling involves assigning tasks to get them completed by allocating appropriate resources within an estimated budget and time-frame

In other words, project planning is about creating a comprehensive document that contains the project aims, scope, costing, risks, and schedule. On the other hand, project scheduling focuses only on the project-related tasks, the project start/end dates, and project dependencies.

The project planning stages include identifying the key project sponsors and stakeholders, prioritizing/setting project objectives, identifying the project deliverables required to attain the project objectives, creating the project schedule, identifying the project risks, if any, and developing suitable mitigation plans, and communicating and presenting the project plan to stakeholders .The benefits of project planning include offering a road-map that gives direction to the project from start to end, documentation of customer requirements, task autonomy, and resource estimation.

6.1 TECHNICAL ARCHITECTURE DIAGRAM :



6.2 SPRINT PLANNING & ESTIMATION :

A traceability system for food manufacturing is a method for tracking the movement of a food product and its ingredients through all steps in the supply chain. It is a component of a food safety management system that provides evidence of compliance to various requirements and standards. It also helps to react to potential hazards, prevent contamination, and protect public health.

6.3 SPRINT DELIVERY SCHEDULE :

A sprint delivery schedule food tracking system can help manage the delivery of food orders efficiently. It typically involves a software platform that enables real-time tracking of orders, delivery personnel, and delivery status. The system can provide updates on order processing, estimated delivery times, and delivery confirmation. Additionally, it can help streamline logistics, improve customer satisfaction, and enhance overall operational efficiency.

7. CODING & SOLUTIONING (EXPLANING THE FEATURES ADDED IN THE PROJECT ALONG WITH CODE):

```
// SPDX-License-Identifier: MIT

pragma solidity ^0.8.0;


contract FoodTracking {

    address public owner;


    enum FoodStatus {
```

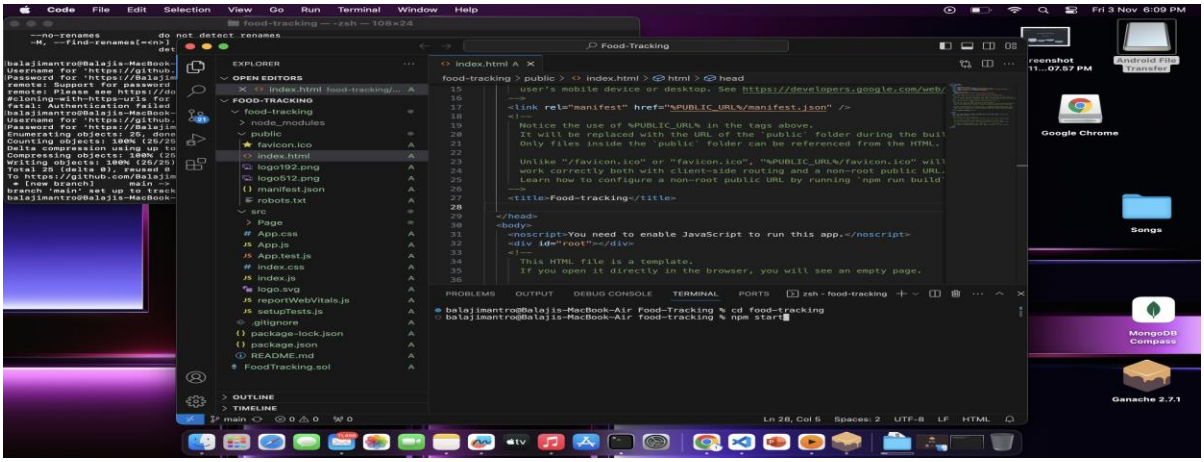
```
    Unverified,
    Verified,
    Consumed
}

struct FoodItem {
    string itemId;
    string productName;
    string origin;
    uint256 sentTimestamp;
    FoodStatus status;
}

mapping(string => FoodItem) public foodItems;

event FoodItemSent(
    string indexed itemId,
    string productName,
    string origin,
    uint256 sentTimestamp
```

```
    );

    event FoodItemVerified(string indexed itemId);

    event FoodItemConsumed(string indexed itemId);


    constructor() {
        owner = msg.sender;
    }


    modifier onlyOwner() {
        require(msg.sender == owner, "Only contract owner can call this");
        _;
    }


    modifier onlyUnconsumed(string memory itemId) {
        require(
            foodItems[itemId].status == FoodStatus.Verified,
            "Item is not verified or already consumed"
        );
        _;
    }
```

```
function sendFoodItem(
    string memory itemId,
    string memory productName,
    string memory origin
) external onlyOwner {
    require(
        bytes(foodItems[itemId].itemId).length  == 0,
        "Item already exists"
    );

    foodItems[itemId] = FoodItem({
        itemId: itemId,
        productName: productName,
        origin: origin,
        sentTimestamp: block.timestamp,
        status: FoodStatus.Unverified
    });

    emit FoodItemSent(itemId, productName, origin, block.timestamp);
```

```
}

function verifyFoodItem(string memory itemId) external onlyOwner {
    require(
        bytes(foodItems[itemId].itemId).length > 0,
        "Item does not exist"
    );
    require(
        foodItems[itemId].status == FoodStatus.Unverified,
        "Item is already verified or consumed"
    );

    foodItems[itemId].status = FoodStatus.Verified;

    emit FoodItemVerified(itemId);
}

function consumeFoodItem(
    string memory itemId
) external onlyUnconsumed(itemId) {
```

```
        foodItems[itemId].status = FoodStatus.Consumed;


        emit FoodItemConsumed(itemId);
    }


    function getFoodItemDetails(
        string memory itemId
    )
        external
        view
        returns (string memory, string memory, uint256, FoodStatus)
    {
        FoodItem memory item = foodItems[itemId];
        return (item.productName, item.origin, item.sentTimestamp, item.status);
    }
}
```



8.PERFORMANCE TESTING :

When evaluating the performance of a food tracking system, several key performance metrics can help assess its efficiency and reliability. Some important metrics to consider include:

1. *Response Time:* Measure the time taken for the system to respond to user requests, including order placement, status updates, and delivery tracking.

2. *Throughput:* Assess the number of transactions or requests the system can handle per unit of time, indicating its overall processing capacity.

3. *Concurrency:* Evaluate the system's ability to handle multiple user requests simultaneously without compromising performance or causing delays.

4. *Server Load:* Monitor the CPU and memory usage of the servers to ensure they can handle the workload efficiently without reaching critical resource limits.

5. *Database Performance:* Analyze the database response times, query execution times, and overall database throughput to ensure smooth data retrieval and manipulation.

6. *Error Rate:* Track the frequency of errors or failed transactions to identify potential issues within the system and ensure error handling mechanisms are effective.

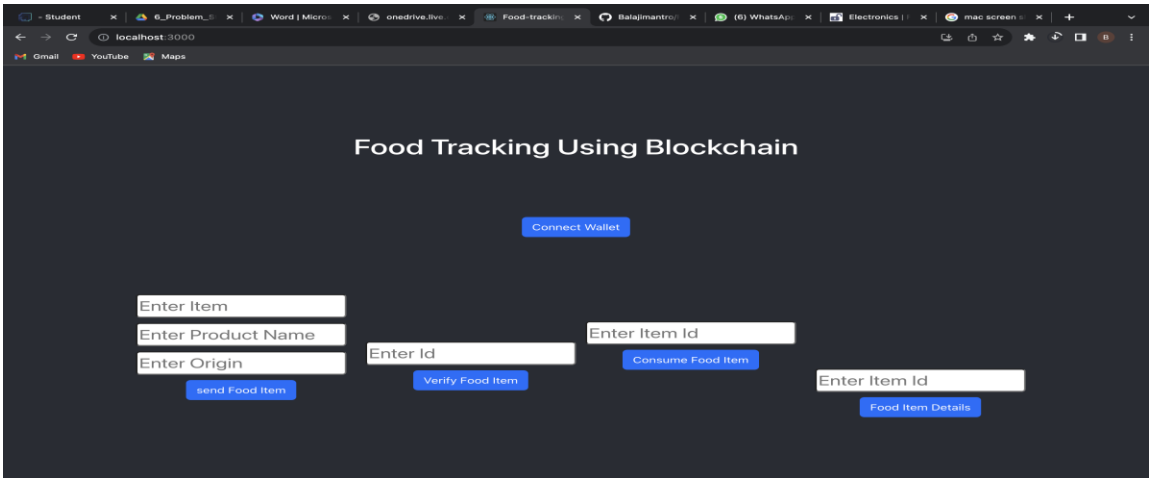
9. RESULT:

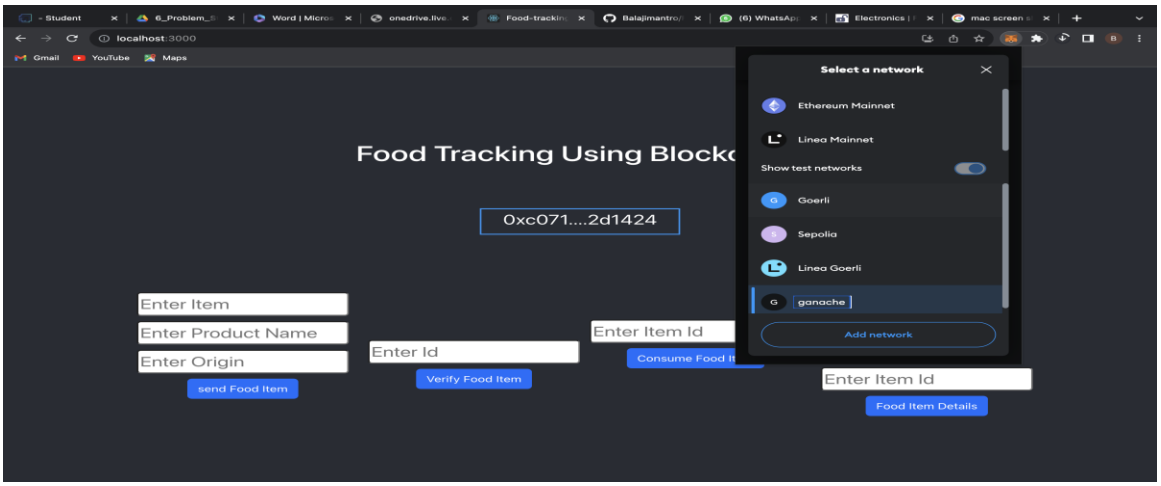
Before using the block chain-based food tracking system, the performance data of the system were obtained. In this way, it will be necessary to prevent problems such as scalability and to stop the work if it is foreseen that the block chain-based system to be used will not reach the desired performance values. The performance values of Reuther and Hyper ledger Sabretooth are used to benchmark the values obtained from the proposed system. A simulation environment has been set up to collect and compare these data using Matlab. The

latency (s), Net Tx (bytes), Net Rx (bytes), and CPU load (%) values are the variables that keep the data obtained in this simulation environment. With the data obtained in this simulation environment, the aim is to reveal the difference with other platforms clearly and concretely.

The latency (s) value in the proposed system was obtained as 0.038. The transmission per second value is 285, the reception per second value is 335, and the CPU load rate value is 19.22. Especially when we evaluate the latency times, the obtained value is at a very good level compared to Reuther. When it is compared with Hyper ledger Sabretooth, it is seen that there is a little more delay. The main reason for this is that the system architecture is more complicated, and the data size obtained is high. This is also evident from the fact that the transmission per second and reception per second values are much higher than Hyper ledger Sabretooth. It has been observed that a rate of 19.22 was achieved in the CPU usage rate. As a result, it is seen that the performance data obtained have a serious advantage over Reuther, especially in terms of latency, and it has started to converge in other). Considering that the real-time operation of the installed system is extremely important, the choice of Hyper ledger Fabric has once again emerged as the right decision.

9.1 OUTPUT SCREENSHOTS :


localhost:3000
Gmail
YouTube
Maps
Food Tracking Using Blockchain
Connect Wallet
Enter Item
Enter Product Name
Enter Origin
send Food Item
Enter Id
Verify Food Item
Enter Item Id
Consume Food Item
Enter Item Id
Food Item Details


localhost:3000
Gmail
YouTube
Maps
Select a network
Ethereum Mainnet
Linea Mainnet
Show test networks
Goerli
Sepolia
Linea Goerli
ganache
Add network
Food Tracking Using Blockc
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Enter Item
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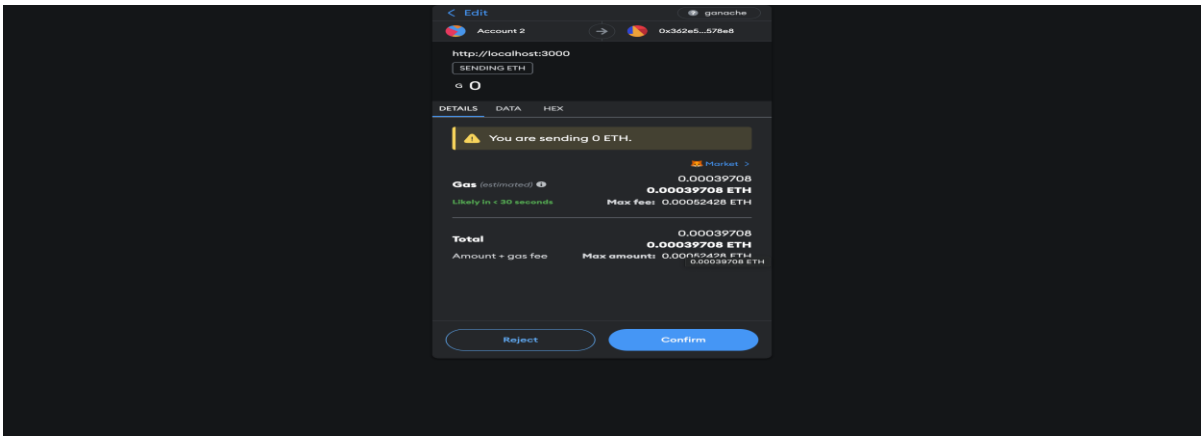
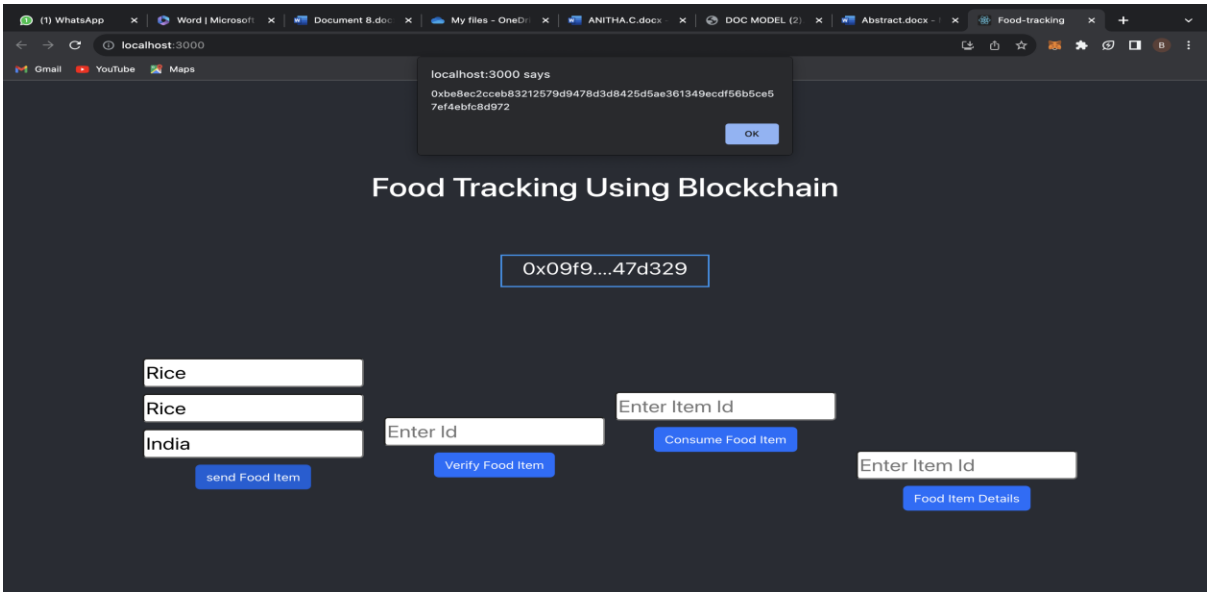
Enter Origin
send Food Item
Enter Id
Verify Food Item
Enter Item Id
Consume Food It
Enter Item Id
Food Item Details


Edit
ganache
Account 2
0x362e5...578e8
http://localhost:3000
SENDING ETH
0 0
DETAILS
DATA
HEX
You are sending 0 ETH.
Market
Gas (estimated)
0.00039708
0.00039708 ETH
Likely in < 30 seconds
Max fee: 0.00052428 ETH
Total
0.00039708
0.00039708 ETH
Amount + gas fee
Max amount:
Reject
Confirm



10. ADVANTAGE AND DISADVANTAGE :

ADVANTAGE :

1. *Improved Efficiency:* Streamlined order management and delivery tracking can enhance overall operational efficiency, reducing errors and improving delivery accuracy.

2. *Enhanced Customer Experience:* Real-time tracking and timely updates can lead to improved customer satisfaction, providing users with transparency and convenience throughout the ordering and delivery process.

3. *Data-Driven Insights:* The system can generate valuable data on customer preferences, popular items, and delivery patterns, enabling businesses to make informed decisions and tailor their services to meet customer demands effectively.

4. *Increased Accountability:* Transparent tracking can encourage accountability among delivery personnel, ensuring timely and accurate deliveries, which can help build trust with customers.

DISADVANTAGE :

1. *Initial Implementation Cost:* Setting up a comprehensive food tracking system may require a significant initial investment in software development, hardware, and infrastructure, which can be a barrier for small businesses.

2. *Technical Challenges:* Integrating complex tracking functionalities may involve technical challenges, such as data synchronization, system integration, and ensuring data security, which can pose obstacles during implementation and maintenance.

3. *User Privacy Concems:* Collecting and storing user data for tracking purposes may raise concerns about data privacy and security, potentially leading to apprehension among users and regulatory compliance issues.

4. *Dependency on Technology:* System downtime, technical glitches, or network issues can disrupt the tracking process, leading to potential delays and inconvenience for both users and businesses.

11.CONCLUSION :

In this study, the establishment of a block chain-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 block chain-based food tracking system has been obtained. Comparing the performance data of the established block chain-based system with other block chain infrastructures, a value of 0.038 s for latency is 435 times better than Reuther, one of the most popular block chain 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. 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

12. FUTURE SCOPE :

The future scope of a food tracking system is promising, with potential advancements and innovations that can further revolutionize the food delivery industry. Some key areas of future development and expansion include:

1. *Integration of IoT and Sensors:* Implementing IoT devices and sensors can enable real-time monitoring of food temperature during transit, ensuring food safety and quality, and enhancing the overall delivery process.

2. *Artificial Intelligence (AI) and Machine Learning (ML) Integration:* Leveraging AI and ML technologies can optimize delivery routes, predict demand patterns, and personalize user experiences, leading to more efficient and data-driven decision-making.

3. *Blockchain Technology Implementation:* Incorporating blockchain technology can enhance transparency and security in supply chain management, ensuring the traceability and authenticity of food products from the source to the final delivery.

4. *Contactless Delivery Solutions:* Developing contactless delivery options, such as drone deliveries and automated pick-up stations, can offer safer and more convenient delivery experiences for users, especially during challenging times such as a pandemic.

5. *Enhanced User Interfaces and Experience:* Improving user interfaces with intuitive designs, interactive maps, and personalized recommendations can enhance user engagement and satisfaction, fostering long-term customer loyalty.