A Mini-Project Report

On

“Shopping List using Smart Contracts”

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Oct - 2024

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This is to clarify that

Suraj Nate (B2 - 733)
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Has satisfactorily completed this project entitled

SHOPPING LIST USING SMART CONTRACTS

Towards the partial fulfilment of the

BACHLOR OF ENGINEERING

IN

(ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

as laid by University of Mumbai.

Prof. Sachine Sir
Guide

Dr. Jyoti Deshmukh
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Dr. Sanjay Bokade
Principle

Abstract

The "Shopping List Using Blockchain" project introduces a novel approach to managing and optimizing personal and shared shopping lists through blockchain technology. By leveraging a decentralized ledger, this project aims to enhance transparency, security, and collaboration in the shopping process. The core functionality includes the creation and management of shopping lists that are immutable and verifiable on the blockchain. Users can create, update, and share lists with others, ensuring that all changes are recorded in a secure and tamper-proof manner. The blockchain-based system facilitates real-time synchronization across multiple users, enabling effective collaboration in both individual and group shopping activities. Key features include transaction history tracking, conflict resolution mechanisms, and integration with smart contracts to automate list updates and notifications. This approach not only improves the reliability and accuracy of shopping lists but also provides a transparent audit trail of all modifications, ultimately fostering a more organized and efficient shopping experience.

Keywords : (blockchain-based, real-time synchronization)

Contents

Chapter 1

Aim

The aim of the "Shopping List using Blockchain Technology" project is to develop a decentralized and secure platform for managing and sharing shopping lists. By leveraging blockchain technology, the project allowing users to collaboratively create, update, and track their shopping lists in a tamper-proof manner.

Chapter 2

Problem Statement

In traditional shopping list management systems, users often face challenges related to data security, transparency, and collaboration. Centralized systems are prone to data tampering, unauthorized access, and lack transparency, leading to issues such as untraceable changes and conflicting updates when multiple users contribute to a shared list. Furthermore, users have limited control over their personal data, which may be exposed to third parties without their consent.

In the context of collaborative shopping, where multiple users are required to update and modify a list, ensuring the accuracy, authenticity, and traceability of changes becomes crucial. Existing systems fail to provide a secure and tamper-proof mechanism for this process, leading to potential confusion, data manipulation, and inefficiencies in managing shopping needs.

The "Shopping List using Blockchain Technology" project addresses these issues by providing a decentralized, transparent, and immutable system. Blockchain technology ensures that all modifications are verifiable, irreversible, and secure, offering a trustless environment where users can confidently manage their shopping lists without fear of data breaches or unauthorized changes.

Chapter 3

Requirement Analysis

Functional Requirements:

1. User Authentication: Secure login using decentralized methods (e.g., wallet/private key).
2. List Management: Create, modify, and delete shopping lists; all changes recorded on the blockchain.
3. Collaboration: Multiple users can edit shared lists with real-time updates.
4. Audit Log: A traceable history of all list changes with timestamps and user IDs.
5. Notifications: Alert users of changes in shared lists.
6. Offline Syncing: Allow offline list updates with blockchain sync when reconnected.

Non-Functional Requirements:

1. Security: Ensure data integrity using encryption and blockchain's immutability.
2. Performance: Minimize latency in list transactions despite blockchain involvement.
3. Scalability: Handle increasing user base and transactions.
4. Usability: User-friendly interface across web and mobile platforms.
5. Privacy: Protect user data through encryption and compliance with privacy laws.
6. Reliability: Ensure high system availability with minimal downtime.

Technical Requirements:

1. Blockchain Platform: Select a scalable, cost-efficient blockchain (e.g., Ethereum).
2. Smart Contracts: Implement contracts to manage list actions and permissions.
3. Off-chain Storage: Use off-chain storage for larger data, storing only references on-chain.
4. User Interface: Develop a responsive, cross-platform UI using modern frontend technologies.

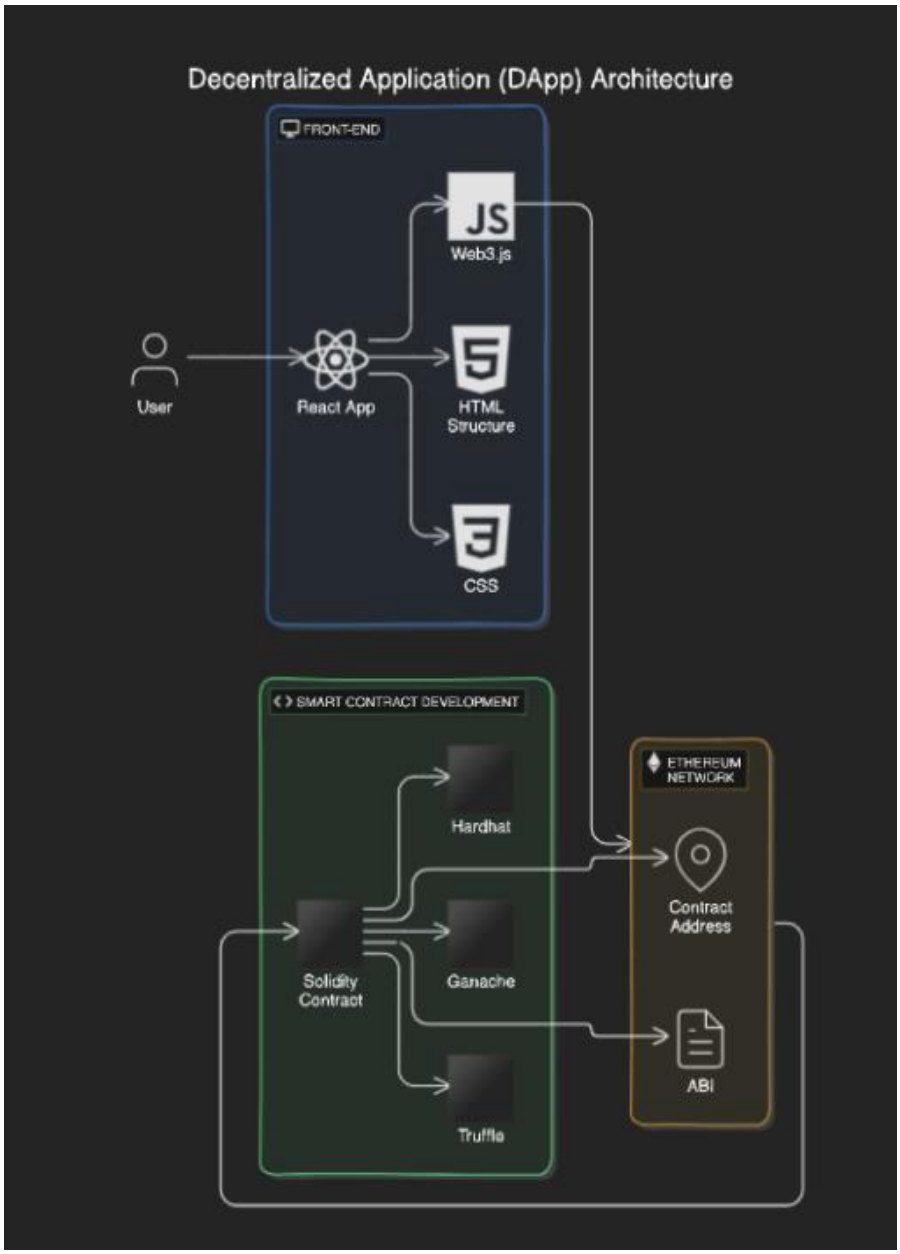
Chapter 4

Constraints

1. **Transaction Costs:** Blockchain fees (e.g., gas fees) may increase the cost of frequent list updates.
2. **Scalability:** High volume of transactions may slow down the system during peak usage.
3. **Data Privacy:** Sensitive user data must be encrypted and protected to comply with privacy laws (e.g., GDPR).
4. **Latency:** Blockchain confirmation times may cause delays in real-time list updates.
5. **Storage Limitations:** Blockchain is not ideal for storing large data; off-chain storage is necessary.
6. **User Usability:** Blockchain wallets and private key authentication may be difficult for non-technical users to adopt.

Chapter 5

Design



Chapter 6

Smart Contracts

A smart contract is a self-executing contract with the terms of the agreement directly written into lines of code. It automatically enforces and executes the agreed-upon conditions when predefined criteria are met. Smart contracts operate on blockchain networks, ensuring that they are transparent, irreversible, and secure.

Key characteristics of smart contracts:

- Automation : Execution happens automatically when conditions are met, eliminating the need for intermediaries (like lawyers or banks).
- Transparency : Since they're stored on a blockchain, all participants can see the contract and its outcomes.
- Security : The contract is encrypted and stored across multiple nodes on the blockchain, making it hard to tamper with.
- Trustless : Participants don't need to trust each other or third parties, only the smart contract code.

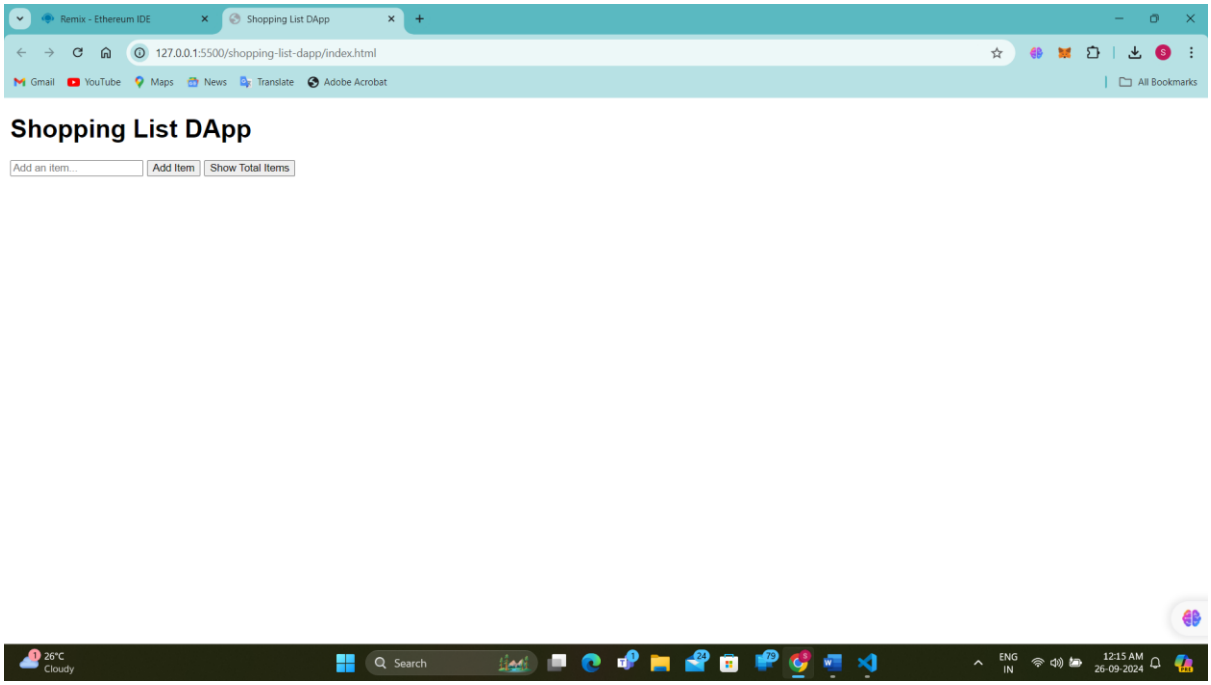
Common use cases:

- Financial services (e.g., automated loan agreements or insurance payouts).
- Supply chain (tracking goods and ensuring conditions like delivery times are met).
- Real estate (automating property transfers when payment is completed).
- Voting systems (ensuring tamper-proof and transparent elections).

Smart contracts are most commonly associated with blockchain platforms like Ethereum.

Chapter 7

Implementation



CODE

Smart Contract

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;

contract ShoppingList {
    // State variable to keep track of the number of tasks
    uint public taskCount;

    // Structure to define a Task
    struct Item {
        uint id;          // Unique identifier for the task
        string content;   // Description of the task
        bool completed;   // Status of the task (completed or not)
    }
    // Mapping to store tasks with their unique ID
    mapping(uint => Item) public items;
    // Events for task creation and completion
    event ItemAdded(uint id, string content, bool completed);
    event ItemBuyed(uint id, bool completed);

    // Constructor to initialize the contract
    constructor() {
        ADDItem("Shopping List");
    }
    // Function to create a new task
    function ADDItem(string memory _content) public {
        require(bytes(_content).length > 0, "content cannot be empty");
        // Ensure task content is not empty
        taskCount++;
        items[taskCount] = Item(taskCount, _content, false);
        emit ItemAdded(taskCount, _content, false);
    }
    // Function to toggle the completion status of a task
    function toggleCompleted(uint _id) public {
        // Ensure valid task ID
        require(_id > 0 && _id <= taskCount, "Invalid task ID.");

        // Use 'storage' to modify the original task
        Item storage taskToUpdate = items[_id];
        // Toggle completion status
        taskToUpdate.completed = !taskToUpdate.completed;
        // Emit completion event
        emit ItemBuyed(_id, taskToUpdate.completed);
        taskCount--;
    }
}
```

Chapter 8

Conclusion

The "Shopping List using Blockchain Technology" project successfully addresses critical challenges inherent in traditional shopping list management systems. By utilizing blockchain technology, we have created a decentralized platform that ensures data security, transparency, and seamless collaboration among users. The immutability and verifiability of blockchain provide a robust framework for maintaining the integrity of shopping lists, allowing users to track changes and contributions with confidence.

This innovative approach not only empowers users to manage their shopping needs effectively but also fosters a sense of trust and accountability among collaborators. The elimination of centralization minimizes the risks of data tampering and unauthorized access, providing users with greater control over their personal information.

In summary, the project not only enhances the user experience but also sets a precedent for future applications of blockchain technology in everyday scenarios. As we move forward, further developments and user feedback will guide enhancements to this platform, ensuring it meets the evolving needs of users in an increasingly digital world. The "Shopping List using Blockchain Technology" thus stands as a pioneering effort in creating a secure, efficient, and collaborative solution for managing shopping lists.

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