**TO-DO LIST DECENTRALIZED WEB APP IN ETHEREUM BLOCKCHAIN**

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**Abstract**: People need to organize their tasks so that they can complete them in-time and be organized about their tasks. This project helps in achieving that by making use of Ethereum blockchain network to run a website for each person to preparing their own list of tasks with priorities. The result of this project is each has their own list to add tasks, modify priority of a task, delete a task, and display the list of tasks and their priorities.

1. **Introduction**

The aim of this project is to create a web application where each user has a to-do list connected to their Ethereum wallet address. The functions of this website include adding tasks to the personal list, changing priority of a certain task in the list, deleting a task from the personal list, and displaying all the tasks to do. This web application is secure because it uses smart contract in the blockchain network.

The learning objectives for this project are how a smart contract works and interacts with the web application, how a transaction happens between externally owned accounts and smart contracts, and how a smart contract is programmed and deployed in the Ethereum network.

In Section 1 of this paper, we describe the organization of the paper. In Section 2 of this paper, we discuss about background of the project which includes information about blockchains and smart contracts. In Section 3 of this paper, we give a brief description of the project and design decisions of it. In Section 4, we describe about limitations and future improvements of the project.

1. **Background**

The project mainly uses the network of Ethereum blockchain and smart contracts to execute. A blockchain is a distributed peer-to-peer network which do not have any central servers and controlled by every individual node in the network. There are many blockchains that have different features and capabilities.

The very first blockchain which was developed is bitcoin. Ethereum is also a blockchain which has more features than bitcoin. These networks are more secure than any traditional online transaction platform and allows to verify transactions by anyone in the network. Recent transactions are verified and bundled together into a block. The block is created by miner nodes and added to the chain of blocks which grows continuously.

At first, blockchain was mainly used for sending and receiving cryptocurrencies. But later, it was found that the secure nature of blockchains can be used for other types of applications such as smart contracts, Internet of Things, healthcare, logistics etc.

Smart contract are programs that are stored on the blockchain network. Gas is required to be paid for computers on the blockchain network for executing the smart contract. The gas costs vary according to how complex the smart contract program is. So, it is important to write a smart contract as efficient as possible. Solidity is the current and most used programming language for writing a smart contract and deploying in Ethereum network.

1. **Description of the project**

In this project, for the user to have their own to-do list they need to have a Meta Mask wallet account with a certain wallet address. To add a task to their list, the user needs to enter the task name and the priority of the task and click on the “ADD TASK” button. Then there will be RPC request to Meta Mask wallet, and the Meta Mask extension pops up asking to pay for gas fee. When the transaction is approved by the user, the function will be performed, and the task will be added to the list connected to the wallet address.

The same process happens to the functions “PRIORITIZE TASK” and “DELETE TASK” except for “DELETE TASK”, the user needs to enter the task id. When it comes to “DISPLAY TASKS” function, the user does not need to pay for gas fee. When this function is called, the tasks in the list that is connected to the wallet address of user will be displayed in the form of a table.

Diagram

Description automatically generated

Fig. 1 shows the process flow diagram of the project

* 1. **Design Decisions**

We have used Ethereum blockchain because it supports smart contracts and the programming language, which is used for smart contract, solidity is a relatively easy to use programming language. For each task there is priority attribute and the name attribute. We used these attributes, because priority attribute will help users to decide which task to do first.

* 1. **Software Architecture**

In solidity we used 4 different functions for four different buttons in HTML. Mapping was used in solidity to set separate lists for every wallet address. Solidity is used for smart contract, which is the backend of the application. HTML and JavaScript are used for the frontend of the project. ABI application program interface is used for connecting the frontend to the backend.

Diagram

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Fig. 2 shows the architecture diagram of the project

1. **Limitations/Future Work**

We could add due date attribute for each task to keep track of deadlines. Using those dates, we could add a calendar which shows all tasks to be completed every week. And using these dates we could add a remainder function where, when a task is near to the deadline the user will be reminded to complete the task. In the current project there is a limitation where the gas consumption is higher than normal. So, in the future we should make the code gas efficient.

1. **Conclusion**

There are multiple uses for Ethereum blockchain including building web applications. Our project demonstrates a public decentralized web application which is deployed in Ethereum blockchain network. Since blockchains are secure and can’t be hacked, using it to create web applications will make web applications secure. In our opinion using a blockchain to create web applications is the best way as they are secure, and it is difficult to track users using only wallet addresses and achieves privacy.