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Decentra-Twitter Using Blockchain

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ABSTRACT

Blockchain nowadays has become a hot topic in technology, finance, regulation, and the wider society in recent years. A plethora of permissions and permissionless blockchain platforms are available in the industry, and some could be used to develop a social networking site. This paper proposes a framework for secure, trustworthy social networking that also creates value for user-generated content by using a blockchain-enhanced framework for social networking. In this work, we design blockchain-based data storage and access a framework that will not totally dependent on centralized Twitter. We use the public blockchain and tools like Ganache, MetaMask, and Ethereum IDE for deploying the contracts. In the proposed work, metadata of the files are stored on the blockchain and we use networks like the goerli test network for occurring the Transactions using peer-to-peer networks. The decentralized data storage will help to eliminate the most traditional data failures and outages by securing and controlling the data.

Keywords : MetaMask, Goerli, Ethereum, Peer-to-Peer, Trustworthy, Decentralization

I. INTRODUCTION

Social media has become an integral part of modern communication, connecting people across the globe and providing a platform for individuals to express their thoughts and ideas. From Facebook and Twitter to Instagram and TikTok, social media has transformed the way we communicate, entertain ourselves, and stay informed.

Social media platforms have enabled people to connect with others from around the world, share their thoughts and experiences, and participate in conversations on a range of topics. Social media has also played a crucial role in social and political movements, allowing people to organize and mobilize around causes they care about. [1]

However, as social media has grown in popularity, it has also faced criticisms and limitations. These include concerns around privacy and data security, the spread of misinformation, and the centralized nature of social media platforms, which can lead to censorship and the suppression of free speech. Present social media systems are centralized platforms that rely on a central authority or organization to manage user data and content. One of the main limitations of centralized social media systems is their susceptibility to censorship and data breaches. Centralized platforms often have strict rules and guidelines on what content is

allowed, which can lead to censorship of certain ideas or opinions.

Additionally, centralization means that all user data is stored on a single server or network, making it vulnerable to data breaches and hacks. Furthermore, centralized social media platforms often collect and monetize user data, which has raised concerns about privacy and data ownership. Users have little control over their data once they upload it to a centralized platform, and they often do not receive any compensation for the use of their data.

In response to these limitations, there has been growing interest in decentralized social media platforms that leverage blockchain technology to create more secure, transparent, and democratic platforms. This project aims to address the limitations of centralized social media systems by creating a decentralized Twitter application using blockchain technology.

Blockchain technology is a decentralized, distributed ledger system that uses cryptography to ensure the security and integrity of data. It was originally introduced in 2008 as the underlying technology for the digital cryptocurrency, Bitcoin. At its core, blockchain technology is a network of nodes that work together to maintain a shared database. Each node has a copy of the database, and any changes to the database are recorded on all nodes in the network. This makes the system highly secure and resistant to tampering or corruption. [2]

One of the most significant benefits of blockchain technology is its ability to provide a transparent and immutable record of data. Once data is recorded on the blockchain, it cannot be altered or deleted, providing a high degree of transparency and accountability

By leveraging blockchain, we can create a platform that is more transparent, secure, and resistant to censorship and data breaches. The decentralized nature of the platform means that user data is not stored on a central server, but rather on a distributed network of computers, making it less vulnerable to hacks and data breaches.

Additionally, the use of blockchain technology allows us to create a platform where users have more control over their data and content. By utilizing smart contracts and NFTs, we can enable users to monetize their content and have greater ownership and control over their data.

This project aims to provide a more democratic and transparent social media platform that empowers users and prioritizes privacy and security. By creating a decentralized Twitter application, we hope to set an example for the future of social media and encourage the adoption of blockchain technology in the industry

II. LITERATURE REVIEW

1) R. Murimi, "A Blockchain Enhanced Framework for Social Networking," Ledger [1] examines the potential benefits and challenges of building a blockchain-based social media platform, including privacy, security, and user adoption. The authors argue that blockchain technology can provide a more secure and transparent platform for social networking, while also addressing issues of censorship and data ownership.

2) P. Chow-White, A. Al-Rawi, A. Lusoli and V. T. A. Phan, "Social Construction of Blockchain on Social Media: Framing Public Discourses on Twitter," Journal of Communication Technology [3] explores the potential benefits of using blockchain to decentralize social media, including increased user privacy, content ownership, and resistance to censorship. The author also discusses potential challenges, such as scalability and user adoption, and offers suggestions for addressing these challenges.

3) D. Brown, "Will Blockchain Put Social Media on a New Path?" THEFORECAST [4] reviews the challenges and opportunities of combining blockchain technology with online social networks, focusing on issues such as user privacy, scalability,

and interoperability. The authors suggest that blockchain technology has the potential to provide a more secure and decentralized platform for social networking, but that further research and development are needed to address technical challenges and user adoption.

4) A. Davies, "How to a Build a Blockchain Social Media Platform for Bloggers?" [5] proposes a novel blockchain-based social media platform that aims to address issues of data ownership, privacy, and security. The author describes a design that incorporates a decentralized architecture, smart contracts, and encryption to provide a more secure and transparent platform for social networking.

III. METHODOLOGY

The process was divided into four steps: Identification, Choice, Assessment, and Validation. Following the identification of the available blockchain platforms, a suitable blockchain platform is chosen to utilize a multi-criteria decision-making process, such as the Simple Multi-Attribute Rating Technique (SMART). Following that, a thorough evaluation of the selected system is conducted, taking into account its architecture, libraries, tools, domain-specific applications, and capabilities analysis of the chosen blockchain platform. Creating an enterprise solution based on blockchain has validated the suggested methodology. Regardless of scale, any stakeholder might choose an appropriate blockchain platform to develop applications using the process protocol outlined in this study.

IV. TECHNICAL OVERVIEW

Coming to the technical aspects of our decentralized blockchain, we have been using NEXT.js for the front end which is an open-source web development framework created by Vercel. It is a React-based web application with server-side rendering and is highly recommended for generating static websites.

The styling has been done by tailwind-css which is an open-source CSS framework. The smart contracts have been written with Solidity. We also use "Open Zeppelin" to ensure that the smart contract complies with the ERC721 Standard.

The smart contract is created to mint and deploy the NFTs. A service named Piñata is used as our interplanetary file system which is also known as IPFS to store the .jpegs onto the blockchain.

Hardhat is also used to compile and deploy the smart contract which works all together to create a complete development environment. Context API is used to manage the state of react. Alchemy API is used as RPC URL with the Sepolia Test network.

For authentication, we use a meta mask, and for our backend database, we have used SANITY.io to store all the tweets and the associated users. We use Etherscan to verify the deployment of the smart contract. The deployment is done using Versailles.

Selection of key factors for evaluation:

Evaluation Factor [6]	Description
Simplicity	Simplicity is one of the key factors for selecting a software development stack, and it means how easy and straightforward a system can be developed using it. Reviewing previous developers' opinions, platform architecture, and details will assist in evaluating the simplicity factor to a certain extent. The complete

	simplicity factor can only be identified after developing a sample project.
Cost	An enterprise system has two types of cost, namely, initial cost and operational cost. Initial cost includes design and development cost. Operational cost includes software license fee, system maintenance fee and platform usage charges. Gas price means the fee the user has to pay for the usage of the blockchain platform. Development cost depends on other factors such as simplicity, ease of learning, among others. Hence, these factors will be considered as separate factors for evaluation. Therefore, it is only necessary to evaluate the operational cost.
Size of the community	This study carried out an analysis of published details, in terms of website, reports, social media, electronic articles, and the like to identify the size of the community. In addition, interest groups, companies and branches, list of partners, and the number of clients were considered
Ease of learning	Ease of learning depends on two factors. The first factor, simplicity, was discussed above. The second factor is identifying the programming languages that are used in the blockchain platform. The programming language is a key factor for platform selection because if the blockchain platform offers commonly known and presently available programming languages, the development process will be expeditious and convenient for system developers
Level of support	Level of support from a company or community is essential for the adaptation of new technology. Therefore, this research has reviewed the availability of services in the forms of online forum, IRC channel, email and email group, live chat, and social media, among others.
Consensus mechanism	Consensus mechanism is one of the paramount features of blockchain technology. The consensus algorithm in blockchain technology refers to a series of procedures related to approving and confirming a transaction or set of transactions [60]. Consensus mechanism ultimately manages agreement between each node regarding the contents in the blockchain network.
Network type (permissioned and permissionless)	Blockchain network may consist of few to thousands of nodes throughout the globe. Based on the network layer arrangement including privileges of nodes to access, check and add transactions to the ledger, and

	arrangement of a network, it can be identified as three types of blockchain networks such as permissionless public networks, permissioned private or consortium networks.
Security	Blockchain technology provides better security compared to traditional software Evaluation Factor Description applications. However, there are some significant differences between permissioned and permissionless blockchain networks.
Availability of training and learning materials	An enterprise system has to communicate with different systems and different technical stacks. And also, blockchain data could only be accessed through APIs due to its data storage mechanism. Therefore, API is one of the critical factors for developing an enterprise system.
Support for web-application and mobile app development with GUIs	GUI is a common feature of any form of present software application. However, most of the blockchain platforms are not capable enough to develop GUI-enabled software apps. Commonly, blockchain platforms provide Software Development Kits (SDKs) to develop software applications to access blockchain data. These SDKs support some of the presently available general-purpose high-level programming languages such as Java, Go, Python, Ruby, Perl, and others. The SDK allows the development of GUI-enabled standard, web, or mobile applications natively or through APIs.
Type of software licenses	Open source and proprietary are the most common categories of software licenses. Cost and freedom factors are the primary outcomes that are linked with the types of licenses. The cost aspect of the licenses was already discussed under the Cost factor. The level of freedom is the most critical factor that is linked with the software license, and it describes the degree of freedom, or what rights you will get. Applicable software licenses are mentioned in Table 2 for each blockchain platform. Most of the blockchain platforms were licensed under popular open-source licenses such as Apache, GNU GPL, GNU AGPL, and MIT license. These open-source licenses provide a greater extent of freedom, mainly related to changing the source code and customizing the original blockchain platform if required

V. IMPLEMENTATION

Choosing a Blockchain platform that is compatible with the Twitter application is a crucial first step. Ethereum is a popular choice for developing decentralized applications, including those that involve social media. Ethereum is an open-source Blockchain platform that allows developers to build and deploy smart contracts on its network. The Ethereum Virtual Machine (EVM) executes the smart contracts and provides a secure and decentralized environment for the Twitter application.

The smart contract is the core component of the Twitter application on the Blockchain. It is a self-executing program that enforces the rules and regulations of the Twitter platform. The smart contract should define the data structures for tweets, user profiles, and any other relevant data. Additionally, the smart contract should include rules for user authentication, ensuring that only authorized users can access and modify the data stored on the Blockchain. [3] [7]

The smart contract is deployed on the Blockchain platform, and the Twitter application is linked to the contract. The smart contract is a self-executing program, and once deployed, it is stored on the Blockchain network. The Twitter application interacts with the smart contract using the Ethereum Application Programming Interface (API). The API allows the Twitter application to read and write data to the smart contract and execute smart contract functions. Once the smart contract is deployed and linked to the Twitter application, users can begin creating tweets and interacting with the Twitter application on the Blockchain.

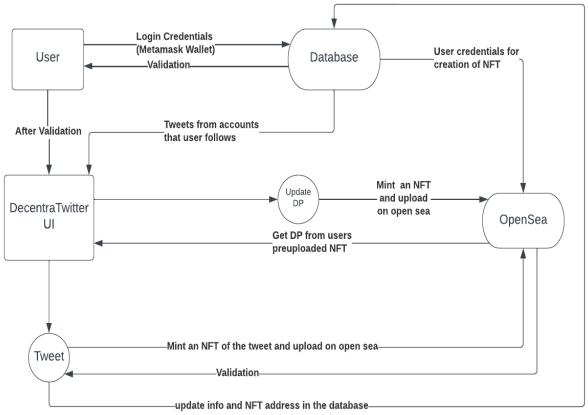
Metamask is a popular browser extension that provides a secure and convenient way for users to interact with Ethereum and other blockchain networks. By integrating MetaMask authentication into a blockchain application, users can authenticate themselves and perform transactions on the blockchain without the need for complex key management. Metamask enables users to store their private keys securely in their browser, making it easy to manage and interact with their accounts. To authenticate themselves and perform transactions, users simply need to grant permission to the application to access their account through Metamask. Metamask authentication provides a seamless user experience and helps to ensure the security of transactions on the blockchain. As such, it has become a widely-used authentication mechanism in the blockchain industry.

When a user creates a tweet, the tweet is sent to the smart contract for verification. The smart contract verifies the tweet and adds it to the Blockchain if it meets the validation rules. The smart contract can also enforce rules to prevent spam or malicious content from being added to the Blockchain. Users can interact with the Twitter application on the Blockchain by reading and writing tweets, following other users, liking, and retweeting tweets. These interactions are all managed by the smart contract and stored on the Blockchain, ensuring transparency and immutability of the data

Profile picture is minted as NFT(Non-Fungible Token) .The NFT should include a unique design and metadata that describe the image. The metadata could include information such as the artist's name, the date it was created, and the type of image. The smart contract should include the metadata for the NFT and specify the conditions under which the NFT can be transferred or sold. The NFT is minted by deploying the smart contract onto a compatible Blockchain platform, such as Ethereum. The NFT is linked to the user's Twitter

account by associating the user's public key with the NFT. This ensures that the NFT is owned by the user and can be transferred or sold at their discretion. The NFT can be displayed on the user's Twitter profile as their profile picture. The image will be linked to the NFT contract, allowing anyone to view the NFT's metadata and verify its authenticity. The user can transfer or sell the NFT to other users on the Blockchain platform. The smart contract will ensure that the transfer or sale is valid and that the NFT ownership is transferred to the new owner.

VI. DESIGN DETAIL



VII. CONCLUSION & FUTURE WORK

The integration of blockchain technology with Twitter could offer numerous benefits, such as improved security and protection of user data, greater decentralization, and control for users. The proposed system eliminates the need for a centralized system, decentralizes the Twitter application, and removes the dependence on centralized computing resources for storing and processing with blockchain, user data would be stored in a decentralized network of computers, reducing the risk of data breaches and hacking attacks [8]. This would give users more control over their personal information, while also increasing the overall security of the platform. Based on the implementation of a decentralized Twitter application using blockchain technology, there are several directions for future work that can be pursued. Some of these include:

- Scalability: One of the challenges in implementing blockchain technology is scalability. Future work could focus on improving the scalability of the decentralized Twitter application to handle an increasing number of users and transactions.

- Token incentives: The implementation of token incentives has the potential to increase user engagement and revenue, but there are so many questions to be answered regarding how incentives could be designed and implemented effectively. Future work could focus on exploring and refining token incentive models to optimize their impact on user engagement and revenue.

- Integration with other platforms: The decentralized Twitter application can serve as a model for implementing blockchain technology in other social media platforms. Future work could focus on exploring the integration of this approach with other popular platforms, such as Facebook, WhatsApp, and LinkedIn.

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