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Decentralized Social Networking Platform: Exploring The Potential of Blockchain in Social media

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Abstract

Social media using blockchain refers to the integration of blockchain technology into social media platforms. This integration allows for a decentralized and secure platform for users to interact, share content and conduct transactions. By utilizing blockchain, social media can offer users greater privacy, control over their data and assets, and eliminate the need for intermediaries. This results in a more transparent and fair system, reducing the influence of centralized entities and enhancing the overall user experience. In the development of a decentralized social media platform, the utilization of public block chain and related tools has been incorporated. These tools, namely Ganache, MetaMask, Hardhat, and Ethereum IDE, have been used to facilitate the deployment of the contracts required for the functioning of the platform. One of the key features of the proposed framework is the storage of metadata of files on the blockchain, thus ensuring transparency and reliability. Furthermore, in order to carry out transactions, peer-to-peer networks such as Mumbai Polygon Testnet have been utilized. This approach aims to provide users with decentralized storage, distributed processing, and efficient lookup capabilities, ultimately resulting in a more secure and reliable social media platform. The integration of blockchain technology into social media has the potential to revolutionize the industry and offer new and exciting opportunities for users.

Keywords: Social media, blockchain, integration, decentralized, secure, transactions, privacy, contracts, peer-to-peer networks, etc.

I.Introduction

Social media has transformed the landscape of communication and interpersonal relationships. It has become a ubiquitous part of our daily lives, with billions of users across the globe using various platforms to share information and connect with others. Social media has brought about many benefits, such as facilitating communication across long distances, creating new opportunities for businesses and entrepreneurs, and providing a platform for people to express their opinions and beliefs. However, with these benefits come a host of challenges, such as privacy concerns, the spread of false information, censorship, and issues of control and ownership. One potential solution to these challenges is the use of blockchain technology. Blockchain is a decentralized, distributed ledger that enables secure and transparent transactions without the need for a central authority. It has been used primarily in the context of cryptocurrency, but its potential applications extend far beyond this field. In recent years, researchers and developers have explored the use of blockchain in social media, in the hope of addressing some of the challenges that plague existing platforms.

This paper aims to provide a comprehensive overview of the research that has been conducted in the area of blockchain and social media. Specifically, we will address three main research questions: (1) What are the different methods and techniques proposed by past studies to leverage blockchain technology in social media? (2) What are the obstacles and drawbacks currently facing the integration of blockchain technology in social media? (3) What are the areas for future research to bridge the gaps in our understanding of the topic? In order to answer these questions, we will first provide an overview of blockchain technology, its main characteristics, and its components. We will then introduce the most popular social media platforms and discuss how they combine with blockchain technology. Following this, we will present the methodology used in this review and provide an overview of selected papers. We will then discuss the main applications of blockchain in social media and provide answers to our research questions. Finally, we will conclude with a discussion of future research areas and suggestions for further study.

Despite the potential benefits of blockchain in social media, there are also several challenges and limitations that need to be addressed. One of the main challenges is the scalability issue, which refers to the ability of a blockchain to handle many users and transactions. Another challenge is the issue of interoperability, which refers to the ability of different blockchains to communicate and exchange data with each other. In addition, there are also issues related to the legal and regulatory frameworks that need to be considered when deploying blockchain in a social media context. In conclusion, the use of blockchain technology in social media has the potential to address many of the challenges that plague existing platforms. By providing improved user privacy, combating disinformation, and enabling secure authentication, blockchain can provide a safer, more secure, and more.

This article presents several contributions, including:

- The use of the Ethereum blockchain, which assigns a unique address to each registered account to serve as the identity for each user in the framework.
- Culmination of research and proposed solutions to the traditional social media problems through the integration of blockchain technology.
- The article expounds on the workings of blockchain and highlights its relevance in addressing the drawbacks of conventional social media platforms.
- This delves into the intricacies of developing a user interface (UI) to facilitate easy navigation and usability of the proposed blockchain-based social media.

II.Related Work

A. Literature review

In this Section, we provide an overview of both the current Decentralized Social Networks and blockchain-based solutions in order to explain the scenario in which our proposal is located:

Yuanzhu Zhan and his colleagues present the report on a conceptual model and case study of blockchain-enabled social media platform. Based on this crypto economy social media model, their study presents the main challenges, discusses the implications based on agency theory, as well as highlights several directions for future research associated with blockchain-enabled social media[1]. Weichu Deng and his colleagues reviewed the key technologies used in Blockchain Building Decentralized Trust Platform. They elaborated the principles and technologies of blockchain in detail focusing on the underlying principles, consensus algorithms, and smart contracts[2]. Mahamat Ali Hisseine and his colleagues analysed A Systematic Literature Review the Application of Blockchain in Social Media. They discuss several challenges in applying Blockchain technologies in social media contexts, and proposes alternative ideas for future implementation and research[3]. Manoj Kumar T and his colleagues have utilized blockchain technology to build a completely decentralized social media platform in which no single organization or individual owns the data. This helps to assuage our privacy concerns[4]. Valeti Deepika and D. Lalitha Bhaskari have used the public blockchain and tools like Ganache, MetaMask, Truffle and Ethereum IDE for deploying the contracts and metadata of the files are stored on the blockchain and used the networks like Ropsten and Rinkebey for occurring the Transactions using a peer - to-peer networks[5]. Mohsin Ur Rahman and his colleagues provide an evaluation of approach by exploiting the Rinkeby Ethereum testnet to deploy the smart contracts[6]. Le Jiang and Xinglin Zhang combined smart contracts, and used the blockchain as a trusted server to provide central control services. They separate the storage services so that users have complete control over their data and used real-world data sets to verify the effectiveness of the proposed framework[7].

B. Decentralized Online Social Networks

During the last years, several Decentralized Social Networks have been proposed. These platforms prioritize content by implementing reward systems, while also addressing privacy issues using blockchain technology:

1. **Peepeth** is a decentralized social media network built on the Ethereum blockchain, where users pay a small amount of Ether to participate. Peepeth is a microblogging platform built on top of the Ethereum blockchain that uses smart contracts to allow users to monetize their content. The platform is transparent, and all posts are stored on the blockchain. Users can interact with smart contracts for decentralization and hide their identity.
2. **Steemit** is a user-generated content and community building platform that blends blockchain technology, social media, and cryptocurrency. Users earn 50% Steem Power and 50% Steem Dollars for creating and curating content. The system automatically distributes Smart Media Tokens based on involvement and upvotes. Users and content creators who wish to monetize their work should use Steemit. It uses a unique consensus algorithm called "Proof-of-Brain," which allows users to upvote and earn Steem tokens by contributing quality content.
3. **Sapien** is a social news platform that rewards content creators through tokenized rewards. It is a democratic platform where users have complete control over their data and time. It is built on the Ethereum blockchain and is a part of the Web3 social network that combats fake news.
4. **Diaspora** is a distributed social network built on the idea of self-contained nodes, known as pods, that make up a network. It is designed to be more secure and privacy-focused than traditional social media, with no single person or company owns the social network, making it immune to corporate takeovers and advertising. Users can follow hashtags, like regular social media sites. The platform is built on three critical factors in terms of functionality and structure.
5. **D.Tube** is a decentralized video platform built on top of the Steem Blockchain and IPFS protocol, providing censorship-free file storage. It is an alternative to centralized platforms like YouTube and enables users to upload, browse, upvote and comment on videos. Its decentralized nature ensures freedom of expression without the risk of censorship or deletion.

III.Existing System

The organization in traditional social media controls and organizes user data, which is all maintained in a central database. As a result, the parent company has unrestricted access to all the data. User interaction with the traditional social media platform occurs through a user interface, which is typically accessed via an application or website. A web-API typically serves as a mediator between the user system and the server, resulting in a three-tier design.

User data is usually stored in data centres across the country by the server in a typical architecture. The data belongs to the organization, and they can use it to offer customized services.

Disadvantages of Existing Social Network Platforms or social media:

- **Privacy concerns**: Social media platforms often collect personal data from their users, which can be shared with third parties without user consent.
- **Centralized control**: These platforms are centralized, with a central authority controlling the flow of information, which can lead to censorship or manipulation.
- **Data ownership**: Users often do not own their data, and social media companies can use their data for advertising or other purposes without their consent.
- **Content moderation**: Social media platforms struggle to moderate content effectively, leading to the spread of harmful or illegal content.
- **Lack of transparency**: Users often do not know how algorithms work or how their data is being used, leading to a lack of transparency.
- **Cyberbullying**: Cyberbullying and harassment have become pervasive problems on social media platforms, with potential to cause severe negative impact on the mental health of users.

IV.Proposed System

In this system, the user interface is also presented to the user through a website. However, instead of using a traditional API, web3 is utilized. This library enables communication with the blockchain directly, rather than communicating with a server. The blockchain in use is decentralized and not controlled by a single entity. All the processing in the system is performed through smart contracts deployed on the blockchain. Additionally, data is stored in IPFS, a distributed storage system that uses hash codes to store and retrieve data.

- **Privacy**: Blockchain can provide a decentralized and secure way of storing personal data, giving users control over their data and who can access it.
- **Decentralization**: Blockchain can enable decentralized social media platforms, giving users more control over the flow of information and reducing the risk of censorship or manipulation.
- **Data ownership**: Blockchain can enable users to own their data and control who can access it, creating a more transparent and fair data economy.

- **Authenticity**: Blockchain can be used to verify the authenticity of news and information, reducing the spread of fake news and misinformation.

- **Fairness**: Blockchain can enable more transparent and fair algorithms, reducing bias and ensuring fair treatment of all users.

- **Content moderation**: Blockchain can enable more effective content moderation by using decentralized and transparent mechanisms for community moderation.

V.Implementation

In the development of decentralized social media, various tools and technologies are utilized. Some of the commonly used tools include Next.js, Tailwind CSS, Solidity for Smart Contract, Hardhat, MetaMask, Ganache, Alchemy, and Mumbai Polygon Blockchain. These tools enable developers to create user-friendly and secure social media platforms that are not controlled by any centralized authority. It is important to note that this application is not built on the Ethereum mainnet but rather on a testnet for testing purposes. By leveraging blockchain technology and these powerful tools, decentralized social media platforms have the potential to provide users with greater control over their data and more secure interactions with others in the online world.

Function Implementation:

1. **Next.js**: Next.js is a React-based framework for developing web applications. It is designed to help developers build scalable and high-performance web applications by providing features such as server-side rendering, automatic code splitting, and optimized performance.

2. **Tailwind CSS**: Tailwind CSS is a utility-first CSS framework that allows developers to rapidly build custom user interfaces. It provides a comprehensive set of pre-defined CSS classes that can be used to style HTML elements in a flexible and intuitive way.

3. **Solidity**: Solidity is a programming language specifically designed for creating smart contracts on the Ethereum blockchain. It is a high-level, contract-oriented language that makes it easy to write secure and reliable smart contracts.

4. **Hardhat**: Hardhat is a development environment that enables developers to build, test, and deploy smart contracts on the Ethereum blockchain. It provides a suite of tools that help to automate the development process and make it easier to manage complex projects.

5. **MetaMask**: MetaMask is a browser extension that enables users to interact with Ethereum-based applications directly from their browser. It provides a secure and easy-to-

use interface for managing Ethereum accounts, signing transactions, and accessing decentralized applications.

6. **Ganache**: Ganache is a personal blockchain that developers can use to test and deploy smart contracts in a simulated environment. It provides a simple and easy-to-use interface for creating and managing local blockchain networks.

7. IPFS: InterPlanetary File System (IPFS) is a distributed file system that is often used in blockchain-based systems to store and distribute large files, such as images or videos. IPFS allows for decentralized and efficient storage and retrieval of data, which can increase the speed and security of blockchain transactions.

8. **Alchemy**: Alchemy is a blockchain infrastructure platform that provides a range of tools and services for building and deploying decentralized applications. It provides developers with a scalable and secure environment for building on top of the Ethereum and Polygon blockchain.

9. **Mumbai Polygon Blockchain**: Mumbai is a testnet for Polygon, a layer-2 scaling solution for Ethereum. It provides a low-cost and high-speed environment for testing and deploying smart contracts, making it an ideal platform for experimenting with decentralized applications.

In the development of a decentralized social media platform, various technologies were used for different functionalities. Next.js and Tailwind CSS were used for the frontend of the application, which provides a responsive and user-friendly design. Smart contracts were written using Solidity, which served as the backbone of the application. The source code written by the developer is compiled into ABI and Bytecode, which is the low-level representation of the smart contract. This bytecode is what is executed on the Ethereum Virtual Machine (EVM). The Application Binary Interface (ABI) defined the way the different pieces of software interacted with each other, working as an API. Hardhat was used to test and deploy the smart contracts, and after compiling, the artifacts folder contained the ABI and Bytecode.

Smart contract helps in making backend part of application, which contains functions such as taking Posts as input and store its encrypted version on blockchain. It also helps in fetching all the posts, posts of user only it is user and to delete the posts. Transactions were carried out using Polygon Matic through MetaMask wallet. Once the transaction is confirmed, the results are displayed on the screen.

The application was then deployed on the Mumbai Polygon testnet, using Alchemy to establish a connection between the platform and the blockchain. Users interact with the

blockchain through MetaMask, which is a crucial component that helps users interact with the decentralized platform. Polygon Matic provides fast and inexpensive transactions.

To use decentralized social media and our application, a user needs to follow these steps:

1. Install a web3 wallet like MetaMask on their browser.
2. Connect the wallet to our decentralized social media application.
3. Create an account by entering a username and profile information.
4. Post texts and images by clicking on the "Create Post" button and entering the content.
5. Follow and unfollow other users to see their posts in their feed or remove them.
6. Like others' posts by clicking on the heart button under the post.
7. Tip the posts of other users to support their content and encourage them by clicking on the "Tip" button.

The decentralized social media application built on blockchain technology is designed to be user-friendly and intuitive. To use the application, users must collect Mumbai Matic tokens in their MetaMask wallet in order to carry out transactions on the network. The application is designed to be decentralized, which means that users have full control over their data and can interact with the network without relying on a central authority. This makes the application more secure and less vulnerable to data breaches or other forms of cyber-attacks. Overall, the application offers a unique and innovative way for users to engage with social media in a decentralized and user-controlled environment.

This application encourages content creators to produce quality content by allowing them to earn tips from users who appreciate their work. This creates a community-driven environment that incentivizes the creation of quality content and fosters interaction between users. Overall, this application provides a more transparent and fair social media experience for users.

VI.Challenges and future directions

Developing social media platforms using blockchain technology is still in its early stages, and there are several challenges and future directions that need to be considered.

- **Challenges:**

1. **Capacity**: The current blockchain technology may not be able to handle the large number of users and transactions required for a social media platform.

2. **User adoption**: It can be challenging to convince users to switch from existing social media platforms to blockchain-based alternatives.

3. **Cost**: Developing and operating a blockchain-based social media platform can be expensive due to the high energy consumption required for mining and the high transaction fees.

4. **Regulation**: Blockchain-based social media platforms may face regulatory challenges, particularly related to data privacy and security.

5. **Interoperability**: Interoperability between different blockchains and social media platforms may be challenging due to the lack of standardization and compatibility.

- **Future directions:**

1. **Hybrid solutions**: Combining blockchain with other technologies, such as cloud computing, can enhance scalability and reduce costs.

2. **Decentralized data storage**: Storing data on a decentralized network, such as IPFS, can increase data privacy and security.

3. **Incentivization**: Implementing incentive mechanisms, such as token rewards, can encourage user adoption and participation.

4. **Interoperability**: Standardization and development of interoperability protocols can enable seamless communication between different blockchains and social media platforms.

5. **Governance**: Developing a decentralized governance system can ensure that the platform operates democratically and transparently.

VII.Conclusion

In this research paper, we proposed an auditable and trustworthy access control system for decentralized online social networks and smart contracts on the Ethereum blockchain. Our proposed solution achieves the auditability and verification properties by ensuring that all actions performed by users are publicly visible on the blockchain and by using a challenge-response protocol to securely verify a user's identity and access permission status. We demonstrated the feasibility of our approach by implementing and evaluating it on the Mumbai Polygon testnet.

As future work, we plan to evaluate our framework in a real scenario and to compare our approach with models to highlight the benefits in a decentralized online social network. By providing a systematic perspective on the architecture of the decentralized trust mechanism built by the blockchain, we hope to contribute to further research in the field and promote the widespread adoption of blockchain technology. Overall, the research presented in this paper provides a novel solution for a valuable contribution to the growing body of

knowledge on blockchain technology. With the emergence of superstar blockchain applications, we believe that the decentralized trust mechanism enabled by blockchain technology will cause profound changes in society soon.

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