Blockchain-Based Integration of Social Media And Music For Enhanced Privacy And Trust In A Decentralized Ecosystem*

Prof Nisha Wandile[1], Ashok Garje[2], Abhishek Bhonde[3], Prathamesh Bhangale[4], Pravin Chavan[5]

Department of Computer Engineering
Jspm's Rajarshi Shahu College of Engineering, Pune, India

Abstract
In this paper, we describe the design and construction of a Social Media Network that is decentralized and built on blockchain and peer-to-peer (P2P) networks. The system provides users a reliable and censorship resistant platform to share information and communicate without a central authority. Blockchain technology is implemented to ensure data integrity, and content is well secured and verifiable. Furthermore, Inter Planetary File System (IPFS) is applied to allow distributed file storage to enable efficient and unchangeable data sharing. The proposed network improves user privacy by giving power to the users to own and control their data such that it is selectively shared. The platform makes provision against single points of failure which improves its resistance to hacking and server downtimes. The network is tested and results show that it can support secure and anonymous communication, which provides an alternative to popular social media platforms.

Keywords: Blockchain, Peer-to-Peer Network, IPFS, Data Privacy, Decentralized Social Media, Web 3.0, Censorship Resistance

I.INTRODUCTION

The Development Of The Digital Music Industry To the Advances In The Digital Music Space In Recent Years, Including The Introduction of Decentralized Applications (Dapps) And User Experience Aspects, Has Been Impressive. This Paper Describes The Design And Deployment of A Music Social Platform That Includes Chat Capabilities, That Is Geared Toward Users Who Are Already Comfortable Using Traditional Centralized Music Platforms, And Enjoy The Advantage of Using Blockchain Specific Technologies Relative To Security, Privacy, And User Ownership.

The platform allows artists to transparently share revenues while ensuring that any data and content owned is kept private on the platform. The system offers decentralized music storage on Inter Planetary File System (IPFS), as a measure for music file tampering and copying. The chat functionality is incorporating a peer-to-peer (P2P) protocol which allows users to chat in real time and not use centralized servers. By removing central servers, it improves privacy and liberates users from a postmodern constraint. This platform is empowering to the artist because they do not need to share revenues with multiple intermediaries and about ownership they are the only owners of the content they created. It also makes it relatively simple to navigate "trustless" spaces where one can search, connect with others, co-create music, and archive that music without disclosing their identity. This platform, in our testing, is verifiably reliable, scalable, and secure which offers a much-needed solution for the modern music industry. he incorporation of decentralized applications (dApps) and user experience factors is significant. This paper discusses the design and implementation of a social music platform with chatting features, targeting users familiar with conventional centralized music platforms while enjoying the security, privacy, and user-centricity of blockchain technology. In addition to enabling transparent revenue sharing for the artists, the platform also ensures

privacy-preserving data and content ownership.

The system in place offers decentralized music storage on InterPlanetary File System (IPFS) as a form of music file tampering and copying. The chat function incorporates a peer-to- peer (P2P) protocol, where users can converse in real time without

II.LITERATURE SURVEY

This paper presents the design of a blockchain-enabled decentralized social network that addresses security, privacy and data challenges in the OSN environment. While ensuring the validity of data, the blockchain component will guarantee its decentralization. InterPlanetary File System (IPFS) deals with distributed and tamper-proof data storage. To foster the help of the users at the helm, a Decentralized Autonomous Organisation (DAO) is incorporated for community participation. By bringing together blockchain and IPFS, the system enhances privacy and security to create a decentralized OSN that rivals centralised options. Users can enjoy sharing and communicating various types of content through the service's front-end modules. The project has been shown to be able to manage social interactions in a way that is scalable and efficient, and in addition, can also give users more control over their data and stop being censored, paving the way for a truly user-centric social media experience.

01] Through decentralization, this work proposes the implementation of a blockchain-enabled decentralized social network which will tackle the security, privacy, and management problems of the traditional Online Social Networks (OSNs). The system offers data integrity and tampering resistance through blockchain and low-security data storage in decentralized way through InterPlanetary File System (IPFS). To facilitate democratic self-governance, the platform has a Decentralized Autonomous Organization (DAO) that enables user participation in decision-making. By using both blockchain and IPFS, we can enhance security, privacy, and performance, while providing a decentralised OSN alternative that's resilient and open. The front-end components have an intuitive UI offers an effortless interaction, sharing of content, and decentralised communication for a groundbreaking user-oriented social experience.

02] The paper presents a decentralized social media network with Web 3.0 features that wants to solve the issues with current Web 2.0 platforms. The suggested system is not like the typical social media system that centralises everything. Rather, it has been constructed for better security, privacy and data ownership through use of blockchain and peer-to-peer (P2P) networks. The module of blockchain saves data regarding music and chat that are not modifiable or changeable. Taking down data governance creates less chances of censorship and one point of failure making it trustless and user-centric. The social media interaction system tries to provide a scalable, transparent, and robust alternative that overcomes existing Web 2.0 problems. With blockchain and IPFS, the platform enables safe content sharing as well as ownership and privacy of data. It is set up for communications of the future over a decentralized web.

03] Mobile gadgets are changing the social networking world making access to web and mobile app easier and better. People are also worried about their privacy because of it. The goal of this study is to test ethical models in socio-technical platforms, raise concerns with big data and dataficiation and advocate the benefits of decentralized architecture and Web 3.0. The users can access and control who has seen what data and how it is stored through the decentralized architecture of social networking. Through the use of decentralised applications, Web 3.0 emphasises the user- centric perspective of technology wherein control of data and identity lies with the user.

04] This paper discusses the development of a decentralized social media platform that prioritizes user privacy, control over personal information, and easy access to content.Rephrase The system we will develop will not depend on cloud-based platforms that have a centralized control. Instead, we will utilize a combination of blockchain technology and peer-to-peer (p2p) networks to safeguard data and ensure

decentralization. This paper outlines a replication protocol that leverages the cyclic patterns of user activity to guarantee data accessibility. The protocol categorizes users based on time, resulting in increased content accessibility without the requirement for extensive replication. Even during periods of low network activity, a group of active peers will guarantee that content remains accessible. Based on the testing and simulation results, the platform demonstrates its ability to maintain content even when the network experiences temporary inactivity. The blockchain section guarantees the accuracy and safety of data. With peer to peer, there will be no censorship, and users will always have control over their content. This enables individuals to interact in a secure and uncomplicated manner.

05] We believe that the power of a decentralized peer-to-peer (P2P) network would complement existing centralized personal group media tools to create a vibrant social community. We intend to create a system that enables scalable sharing of information and goes beyond just sharing tiny bits of information. This system combines powerful tools like Wikis and weblogs to improve the management (creation, sharing, storing, etc.) over infinite, scalable, and growing information by individuals and groups. Eventually we would like to build in peer-to-peer based on the earlier work to reduce admin costs and also provide collaborative groupware.

06] A decentralized social media platform, which will use blockchain technology to promote privacy, data ownership, and security, is the focus of this article. The system has been inspired by the project "Decentralizing Privacy" at MIT Media Lab. Through this project, user data sovereignty is enabled without having to rely on any third-party authenticators. The Project accomplishes data sovereignty without relying on a centralized third-party. Moreover, the user can take ownership of the server logs that carry access credentials and timestamps. The system uses Proof-of-Credibility Score for added security and to escape PoW models for an advanced security model. Through theoretical penetration testing and simulation attacks, they will evaluate the system's additional resilience and dependability with a wealth of findings. In conclusion, the platform achieves the aim of creating a safe, private, reliable and friendly user social media application with blocking immutability, encrypted data and decentralization.

07] We suggest thriving social communities harnessing decentralized P2P networking and centralized personal group media tools. We want to create a thriving environment for the exchange of above-simple information. We want to use powerful and effective Wiki and weblog-type tools for infinite, scalable and growing information management for individuals and groups. We would ultimately like to reduce administrative costs and provide collaborative groupware at P2P basis, which builds on our earlier work.

08] This paper shows a decentralized social media network which solves the problems of privacy, surveillance and security on centralized platforms. The system employs peer-to-peer (P2P) networks to transfer information globally to devices without a central authority. To prevent data breaches and unauthorized access, Gun.js a real-time decentralized graph database is used for data security, encryption, and authorization. It avoids the hoarding of data and the architecture being surveilled by decentralization so only relevant data are available. The coalition guarantees that the information which is used cannot be changed easily due to the chains. So, ultimately the customers get a secure social media platform free of censorship.

10] This document advances a decentralized social media network that mitigates risks and financial burden on central servers. The system does not rely on a central authority but instead offers P2P-network-based decentralized communication and data sharing. The blockchain is used as an unchangeable ledger. Various consensus mechanisms will be used for transaction verification and trust maintenance. This system incorporates dApps and blockchain technology to develop a social and messaging platform that is secure, reliable and immune to censorship. It solves the cons of using traditional communication applications.

11] Collaborating Personally (Using Blockchain) –Building a Decentralised Social Networking Site

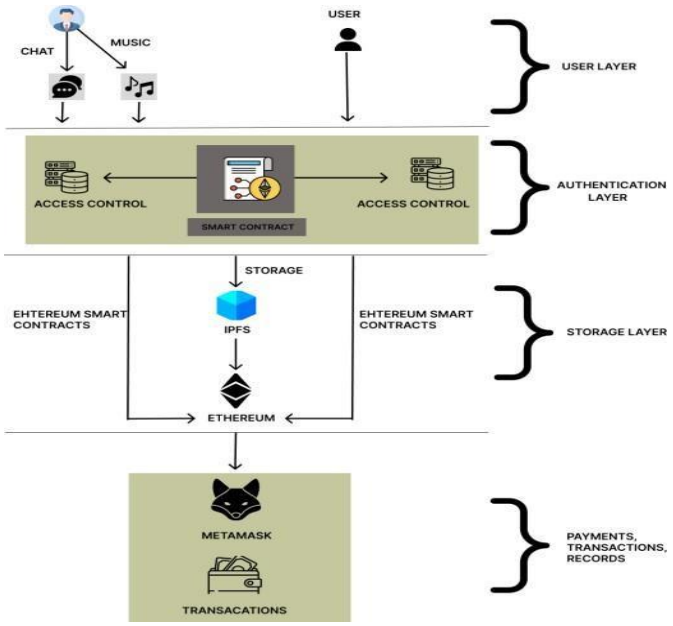
This is meant to address the issues that arise from the centralization of social networking sites that focus purely on maximizing the profit of users. Open-source and decentralized online social networks (DOSN) provide more privacy, data protection and user control than centralisation. By utilizing blockchain technology, the platform offers an infrastructure with low risk that allows for the secure transfer of data that cannot be manipulated. Moreover, smart contracts.

III.SYSTEM ARCHITECTURE

The architecture of our decentralized social media application is designed with a layered approach to ensure modularity, scalability, and trustless interaction. It comprises four major components: the User Layer, Authentication Layer, Storage Layer, and Payments Layer. Each layer plays a criticalrole in delivering a secure, decentralized user experience.

1. User Layer

The User Layer serves as the entry point for the application. Users can interact with various social media features such as chat, music sharing, and multimedia content. This layer includes the user interface components and frontend logic that facilitate communication with the backend smart contracts and storage systems. All user actions originate here and are subsequently handled by lower layers of the architecture.



2. Authentication Layer

This layer is central to enforcing access control and user permissions. It utilizes Ethereum smart contracts to authenticate users and validate access to specific content or functionalities. When a user attempts to perform an action, such as accessing a media file or posting a message, the request is first validated by a smart contract. The contract checks predefined rules and roles to allow or deny the operation, ensuring that all access control is decentralized and tamper-proof..

3. Storage Layer

To decentralize the storage of user-generated content, the system leverages the InterPlanetary File System (IPFS). When a user uploads content (e.g., music, messages), it is stored on IPFS. The resulting content hash is then stored on the Ethereum blockchain through smart contracts. This ensures content integrity and availability while avoiding the inefficiencies of storing large data directly on-chain. The blockchain acts as a source of truth for the data location and ownership.

4. Payments and Transactions Layer

The financial operations of the application, including user transactions, payments for premium content, and tipping mechanisms, are managed through this layer. The system integrates MetaMask, a widely-used Ethereum wallet, to facilitate secure and seamless user payments. All transaction data, including tokens or cryptocurrency transfers, is recorded on the Ethereum blockchain, ensuring transparency and auditability.

DATA flow Summary

- Users initiate interactions from the frontend (User Layer), such as uploading content or making payments.
- The Authentication Layer validates these actions using Ethereum smart contracts.
- Validated content is uploaded to IPFS, with content hashes stored on the blockchain (Storage Layer).
- Any monetary transactions are processed via MetaMask, with results recorded on the blockchain (Payments Layer).

This layered architecture allows the decentralized social media platform to operate in a trustless, secure, and scalable manner without reliance on centralized servers or authorities.

IV.METHODOLOGY

We have developed the decentralised social media and music platform using a modular iterative process focusing security, user control and performance at every step. The steps taken in the methodology are as follows:

1. Requirement Analysis

We started by looking at what the issues were with the centralized platforms which were user privacy, no content ownership, and censorship. We collected requirements for secured sharing of music, chatting in a decentralized way, ownership on the blockchain, and sharing music with others in real-time.

2. System Design

We designed an architectural model that included the blockchain to record transactions and IPFS for decentralized storage. We also planned to use smart contracts to implement ownership rights, access controls, and monetizing content.

3. Smart Contract Development

The smart contracts created using Solidity were deployed within the Ethereum Rinkeby test network. The smart contracts facilitated the management of:
User identity and authentication Metadata for the music file upload Distribution of royalty payments
Permissions for users when sharing content with each other

This framework enabled hashing of the music file upon upload and ensured immutability of the metadata storage on the blockchain.

4. IPFS Integration

Any music files, the logged in user data, and the messages sent, all went through AES as encrypted, before being uploaded to IPFS. Each file generated a hash that was attached to the blockchain for authenticity of the content and safeguarding from alteration.

5.Frontend and Chat

The user interface was developed with ReactJS and to connect with the blockchain Web3.js was used to facilitate communication, and WebRTC connected the peer to peer chat space between users. WebRTC

allowed users to send messages directly with each other from peer to peer without centralized server routing.

6.Backend and API Services

A Node.js backend was created for auxiliary services such as; session tracking, validating metadata, and analytics. Express.js APIs were used to build connections with front-end requests and to call the IPFS and Ethereum nodes when necessary.

7.Testing and Validation

The last thing we want is for users to experience an untrusted or insecure system, so we conducted testing in many facades:

Unit Testing: All smart contracts were rigorously tested with the Truffle framework to verify expected behavior and correctness in isolation. Integration Testing: We verified how the smart contracts interacted with the front-end, IPFS, and the blockchain network and established data flow and intentions were operating correctly across the components. Performance Testing: We monitored response time to upload files, gas costs on average for executing the smart contracts, and our peer-to-peer chat communication delays to check for any issues related to performance.

Security Testing: Security was forefront in testing. For our system, we are dealing with testing for the handling of encrypted data, ensuring that vulnerabilities within smart contracts were considered, and verified that all access control policies were implemented to ensure unauthorized access was prevented.

8. Deployment

For deployment, the platform was first live-deployed in a staging environment for live testing. The pinning of IPFS files was done through Pinata, which retains the content stored. The smart contracts were deployed on the Ethereum Rinkeby Test net for development and verification. The plan moving forward for the production implementation of the solution is to port the system again to a layer 2 platform like Polygon so that it can be more efficient and cost effective to perform transactions.

V.FUTURE SCOPE

Enabling blockchain technology with social media and music platforms presents a revolutionary opportunity to redefine how digital content (eg. Content created, distributed, and monetized). Future development lies in the implementation of decentralized identity frameworks is one of the most promising areas. To gain complete ownership over their digital identities, controlling access to their personal data, profile visibility and access, and content sharing by user; adopting self-sovereign identity (SSI) systems would be major step. Because of it, shift towards user sovereignty would enhance privacy and reduces dependence on centralized authorities, thereby fostering a more secure and trusted environment.

Monetization models and blockchain-enabled micropayments is another direction for future research involves. These mechanisms can empower artists and content creators to receive direct compensation from their audiences, eliminating intermediaries and promoting a more equitable revenue distribution. In particular, through exclusive content or experiences non-fungible tokens (NFTs) offer number of ways to engage with fans and open the door to innovative economic models that reward creativity and community participation.

Interoperability with Cross-platforms would also be a critical area for exploration. As blockchain-based platforms grow in number and complexity. Enabling seamless interaction between different networks and platforms becomes important for standardized protocols. Research into application programming interfaces (APIs) and layers(interoperability layers) could facilitate the creation of a unified decentralized ecosystem, allowing users to retain their data and digital assets while moving between services without friction with more security.

Blockchain technology integrated with artificial intelligence presents a compelling research frontier,

particularly in the domain of content creation. Personalization systems enabled with AI, when combined with the transparency and security of blockchain, without compromising user privacy can deliver customized music and media recommendations. To develop secure and ethical AI systems, decentralized machine learning models and privacy-preserving techniques such as federated learning could help .

Authenticity verification and copyright protection of content could be done by help of blockchain, which warrants further investigation. Content creators can timestamp their work, verify its originality, and automate royalty distributions by blockchain's immutable ledger and smart contracts,. Such systems have the potential to significantly reduce piracy and protect intellectual property rights, offering a robust solution to long-standing challenges in the music industry.

In real-world scenarios, the successful deployment of blockchain-integrated platforms will heavily depend on forming strong collaborations with established industry stakeholders. Future research should highlight identifying and analyzing effective partnership models between decentralized platforms and traditional entities such as record labels, streaming services, and social media companies. To affect adoption will be crucial in fostering innovation gaining a clear understanding of the regulatory, economic, and cultural elements is crucial. This understanding is also key to ensuring the decentralized ecosystem can scale effectively as well as remain sustainable over time.

In summary, the future scope of this research encompasses a broad spectrum of technological, economic, and social innovations that can collectively reshape digital content ecosystems. Ongoing interdisciplinary research and collaboration will be vital in overcoming challenges and realizing the full potential of blockchain-based social media and music platforms.

VI. CONCLUESION

In conclusion, the paper presents a decentralized social media network that integrates music. It provides a safe alternative to social media. This social media platform ensures data ownership and privacy and censorship through the application of blockchain technology and P2P networks. The platform's security will be ensured through an incorporation of all the features that can moderate the content and govern against an abuse through a DAO. This decentralized platform is poised to achieve mass adoption by strategically positioning itself against centralized platforms, emphasizing user education, and actively engaging potential users. Though, with changes in regulation, it can adapt accordingly to ensure sustainability. The project showcases how decentralization of social media can help content creators interact with users in a secure space through Web 3.0.

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