

Digital Identity using Blockchain: Self-Sovereign Identity (SSI) for an Employment Website for Organisations and Freelancers

Abstract—The burgeoning landscape of freelance marketplaces has long grappled with issues like high commission fees, delayed payments, complex communication channels, and susceptibility to fraudulent activities, impeding seamless service exchange. This research introduces a revolutionary solution, Web3Fiverr, a decentralized freelance platform empowered by blockchain and self-sovereign identity (SSI). By leveraging blockchain’s inherent security and decentralization, Web3Fiverr aims to establish a secure, transparent, and trustworthy ecosystem for freelancers and organizations. Key innovations include a smart contract system enabling open project creation, secure minting of career-related data by individuals, and decentralized storage leveraging IPFS and NFT.Storage to safeguard client occupation metadata. Further, the integration of XMTP, a web3 messaging protocol, facilitates secure communication between users. This study delves into the transformative potential of SSI, blockchain, and associated technologies like Next.js, Chakra-UI, Hardhat, and Unstoppable Domain within the freelance marketplace realm. It offers insights into Web3Fiverr’s innovative model, conducting a comparative analysis with existing platforms, focusing on factors such as fees, payment methods, decentralization, user base, and experience. Highlighting the significance of blockchain and SSI, this research illuminates their role in elevating trust, privacy, and efficiency in online employment interactions, heralding a new era in the gig economy.

Index Terms—web3, blockchain, freelance marketplace, IPFS, NFT.Storage, XMTP, Next.js, Chakra-ui, hardhats, Unstoppable domain.

I. INTRODUCTION

The advent of the digital age has ushered in a transformative era in which the way we manage, access, and control our personal information has become a paramount concern. As individuals navigate an increasingly interconnected online landscape, the need for enhanced identity management systems has never been more crucial. It is within this context that the concept of self-sovereign identity (SSI) emerges as a beacon of empowerment, offering users unprecedented control and ownership over their digital identity and personal data.

In a world where the gig economy thrives, freelance marketplace services have become integral in connecting talented individuals with organizations and opportunities eager to harness their skills. These platforms have undeniably democratized access to work, offering a dynamic and versatile ecosystem. However, the rapid proliferation of these services has brought to the fore a host of challenges that impede seamless and

secure interactions. Common issues plaguing conventional freelance marketplaces include exorbitant commission charges, protracted payment processes, intricate communication workflows, complex user interfaces, spam applicants, and counterfeit clients. The culmination of these obstacles has created an environment that undermines user trust, privacy, and data security.

Blockchain technology, celebrated for its foundational principles of decentralization, transparency, and cryptographic security, emerges as a potent antidote to these challenges. Within the decentralized ledger of blockchain, the potential for secure, tamper-proof data storage and trustless transactions is unlocked. It is with this promise that we embark on the development of a groundbreaking project – a web3 freelance marketplace named Web3Fiverr.

Web3Fiverr stands as an emblem of innovation, utilizing blockchain technology and self-sovereign identity to usher in a secure, transparent, and reliable platform for freelancers and organizations. Our pursuit of a decentralized freelance marketplace is underpinned by the ambition to bridge the chasm between talent and opportunity while guaranteeing the security and autonomy of user information.

The central pillars of our project’s contributions encompass the creation of a smart contract system that allows clients to publish open projects, as well as skilled individuals to securely mint their career-related information. Further, we deploy a decentralized storage solution that merges the capabilities of the InterPlanetary File System (IPFS) and NFT.Storage, providing a fortress for client occupation metadata. Facilitating secure and efficient communication among users, we introduce the web3 messaging protocol, XMTP, enabling the exchange of information while upholding privacy. In this research paper, we embark on a comprehensive journey into the multifaceted landscape of Web3Fiverr, unraveling its architecture, methodologies, and comparative advantages over existing solutions. Through this exploration, we aim to showcase the transformative potential of blockchain technology, self-sovereign identity, and a spectrum of associated technologies such as Next.js, Chakra-UI, Hardhat, and Unstoppable Domain within the intricate tapestry of freelance marketplaces.

Our research extends to conduct a comparative analysis, delving into the realms of transaction fees, payment methods,

decentralization, user bases, and user experiences, among other pertinent factors. We seek to elucidate the pivotal role that blockchain and SSI play in fortifying trust, privacy, and efficiency within the dynamic employment ecosystem, heralding a new dawn in the gig economy.

In the subsequent sections of this research paper, we delve into the intricacies of Web3Fiverr, examining its architecture, components, and technology stack in greater detail. We discuss the methodology employed in its development and conduct a comparative analysis to establish its unique standing within the freelance marketplace industry.

II. LITERATURE REVIEW

Advantages and Disadvantages of Conventional Platforms:

The landscape of freelance marketplace services has witnessed substantial growth over the years. Platforms like Fiverr, Upwork, Freelancer, and Guru have become household names, offering a plethora of services that cater to millions of users worldwide [1] [2] [3] [4]. These platforms have undeniably empowered freelancers by providing them with a global stage to showcase their skills and connect with potential clients [1] [2].

Nonetheless, these conventional platforms have their limitations, and these challenges have long been a point of concern. One of the most glaring drawbacks is the exorbitant commission fees they impose on both freelancers and clients. In some cases, these fees can reach as high as 20 % of the total project cost [1]. This practice significantly diminishes the earnings of freelancers, making it a less lucrative option. Additionally, the payment process on these platforms is often lengthy and cumbersome, causing delays in the disbursement of funds [1].

Blockchain Technology as a Disruptive Solution:

In recent years, blockchain technology has emerged as a disruptive force with the potential to reshape the freelance marketplace sector. The fundamental premise of blockchain, a decentralized and immutable ledger, is set to revolutionize the industry [5]. By eliminating centralized intermediaries, blockchain can significantly reduce the exorbitant commission fees, making freelance services more cost-effective for both freelancers and clients. Furthermore, blockchain's innate features, such as its capability to facilitate secure, trustless transactions, have far-reaching implications [6]. Beyond cost savings, blockchain technology enhances transparency in freelance transactions, a pivotal aspect often lacking in conventional platforms.

Decentralized Identity Systems:

A critical challenge within the freelance marketplace industry is the extensive screening and selection process that can be time-consuming and cumbersome [1]. However, blockchain-based decentralized identity systems have the potential to streamline this process and enhance security and trust in these platforms [7]. Decentralized identity systems, rooted in the principles of self-sovereign identity (SSI), empower individuals to assert full control over their digital identity and personal data [7]. By utilizing decentralized identity, freelance

marketplace services can authenticate users efficiently while preserving privacy and security.

It's important to acknowledge the potential downsides of decentralized identity systems, including concerns about identity theft and the need for industry-wide standardization [8].

Previous Work and Research:

This work aligns with previous research in the domain of decentralized identity and blockchain technology. Nakamoto's groundbreaking paper on Bitcoin laid the foundation for blockchain technology, introducing the concept of a peer-to-peer electronic cash system [5]. The Chord Distributed Hash Table, a notable contribution by Stoica et al., expanded the capabilities of decentralized networks [6].

The intersection of blockchain and privacy-preserving smart contracts is explored in the Hawk model, a significant research contribution by Kosba et al. [7]. The study investigates the feasibility of blockchain in ensuring secure, private, and efficient smart contracts.

TABLE I
COMPARISON OF DIFFERENT SOLUTIONS

Solution	Advantages	Disadvantages
Web2 platforms (e.g. Fiverr, Upwork)	Large user base, established reputation	High fees, centralized control, lack of privacy
Web3 platforms (e.g. Ethlance, Bitwage)	Decentralized control, low fees	Limited user base, lack of privacy
Blockchain-based identity solutions (e.g. uPort, Sovrin)	Decentralized control, secure identity management	Limited adoption, complex setup
Digital identity using blockchain (Web3Fiverr)	Decentralized control, low fees, secure identity management	Limited user base (currently in development)

comparison table of existing solutions.

Overall, blockchain technology and decentralized identity systems have the potential to revolutionize the freelance marketplace services industry by offering a more secure, efficient, and affordable platform for freelancers and clients to connect and transact.

III. PROPOSED WORK

A. Architecture:

The Web3Fiverr architecture is built on a decentralized network, which enables users to interact with each other directly without the need for intermediaries. The architecture comprises the following components:

- **Frontend:** The frontend of the platform is built using Chakra UI with a Next.js framework, which provides a user-friendly interface for clients and skilled professionals to interact with the platform. **Backend:** The backend is built using Express.js, a web development framework that enables React-based web applications with server-side rendering and generating static websites.
- **Smart Contract:** Smart contracts are a significant development in blockchain [8]. Smart contracts were first

proposed in the 1990s as a digital transaction protocol to carry out the terms of an agreement [9]. The smart contract system is built using Hardhat, a development environment for Ethereum software. The smart contract manages the interaction between clients and skilled professionals, providing a transparent and secure platform for them to interact with each other. Compared to conventional contracts, smart contracts offer the benefits of reducing transaction risk, reducing administration and service costs, and enhancing the efficiency of corporate processes, since they are often placed on and secured by blockchain [10].

- **Decentralized Storage:** Web 3.0 allows information to be retrieved based on its content that can be kept in several locations at the same time, making it decentralized [11]. The user data is stored on a decentralized network using IPFS and NFT.Storage. IPFS is a peer-to-peer hypermedia protocol designed to preserve and grow humanity's knowledge by making the web upgradeable, resilient, and more open. NFT.Storage is a long-term storage service designed for off-chain NFT data (like metadata, images, and other assets) for up to 31GiB in size per individual upload.
- **Web3 Messaging:** XMTP (Extensible Message Transport Protocol) is an open protocol and network for secure and private web3 messaging. XMTP is used to connect clients and skilled professionals, allowing them to communicate with each other in a secure and private manner.
- **Unstoppable Domain:** Unstoppable Domain is used to provide users with a universal Web3 login that authenticates users.

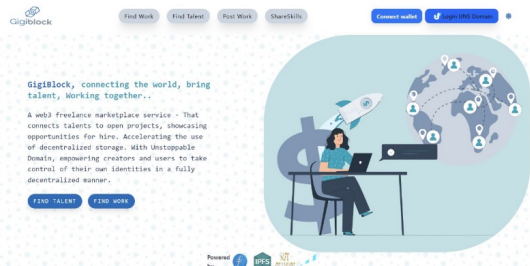


Fig. 1. Home Page of Web Portal.

B. Smart Contract

The smart contract system is the backbone of the Web3Fiverr platform. It manages the interaction between clients and skilled professionals, ensuring that the process is transparent and secure. The smart contract works as follows:

- Clients create a project requirement and add its details to the smart contract.
- Skilled professionals submit their bids for the project by adding their details to the smart contract.
- The smart contract selects the best bid based on predefined criteria.

Fig. 2. Job Posting Form

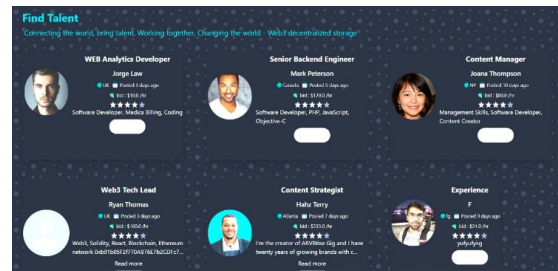


Fig. 3. Talent Search page

- The client and the skilled professional interact with each other to complete the project using XMTP.
- Once the project is completed, the smart contract releases the payment to the skilled professional.

C. User Data Storage

User information and project credentials are stored on the Polygon testnet using IPFS and NFT.Storage. IPFS is a peer-to-peer hypermedia protocol designed to preserve and grow humanity's knowledge by making the web upgradeable, resilient, and more open. NFT.Storage is a long-term storage service designed for off-chain NFT data (like metadata, images, and other assets) for up to 31GiB in size per individual upload.

D. XMTP:

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

E. Unstoppable Domain:

Unstoppable Domain is used to provide a universal Web3 login that authenticates users. Users can log in using their

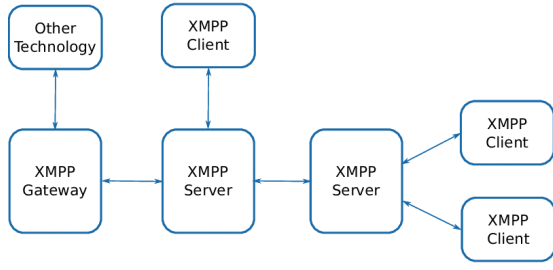


Fig. 4. XMTP Protocol.

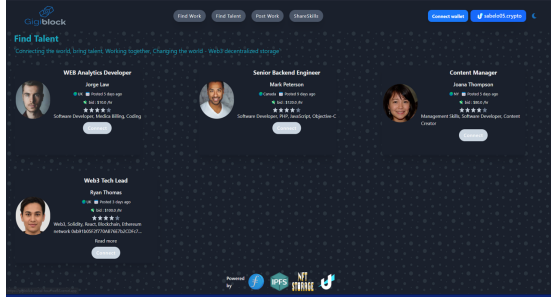


Fig. 5. Client and Talent Interaction using XMTP

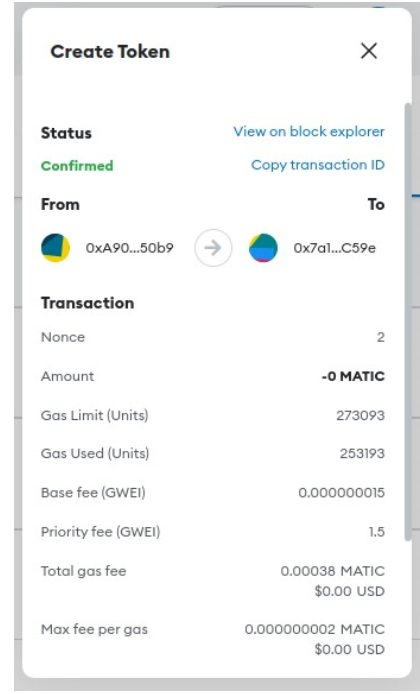


Fig. 6. Gas fees and Transaction Details

Unstoppable Domain and access their information on the Web3Fiverr platform.

F. Advantages:

The proposed solution provides a decentralized and secure platform for freelancers and organizations to connect and work together. By utilizing blockchain technology, Web3Fiverr eliminates high commission charges, long payment processes, extensive screening communication, lengthy selection processes, complex interfaces, spam applicants, and fake clients. The use of IPFS and NFT.Storage ensures that user information is stored securely and cannot be tampered with. XMTP and Unstoppable Domain provide secure and private communication and login options for users.

IV. RESULTS ANALYSIS

A. Transaction Fees:

The web3 freelance platform charges significantly lower fees for transactions compared to Fiverr and Upwork. This lower fee structure can attract freelancers and clients who are looking for cost-effective options.

B. Payment Methods:

The web3 platform likely supports cryptocurrency payments, which can provide faster and more efficient transactions compared to traditional banking systems. Fiverr and Upwork primarily rely on traditional payment methods, such as credit cards or PayPal. Cryptocurrency payments may offer advantages like lower transaction fees, faster settlement times, and borderless transactions. However, it may also introduce complexities for users less familiar with cryptocurrencies.

C. Decentralization and Trust:

Web3 platforms are built on decentralized technologies like blockchain, which can enhance trust and transparency in transactions. Smart contracts can automate payment releases, ensuring fair payment terms and reducing disputes. Fiverr and Upwork operate as centralized platforms, where trust relies on the reputation systems established by the platforms themselves. While these platforms provide dispute resolution mechanisms, they may face occasional challenges in maintaining trust.

D. User Base and Visibility:

Fiverr and Upwork have established a significant presence and user base over the years. They attract a large number of clients and freelancers, resulting in a broader pool of potential projects and opportunities. The web3 freelance platform, being relatively new and charging lower fees, might initially face challenges in building a comparable user base and visibility. It may require additional marketing efforts to attract clients and freelancers.

E. User Experience and Features:

Fiverr and Upwork have developed feature-rich platforms with extensive functionality, including project management tools, messaging systems, and dispute resolution mechanisms. The web3 platform might need to invest in building a user-friendly interface and provide essential features to compete with the established platforms. Continuous improvement and innovation would be crucial to attract and retain users.

F. Regulatory Considerations:

Fiverr and Upwork operate within existing regulatory frameworks, which may provide a level of legal protection and accountability. However, they also come with associated compliance requirements. The web3 platform may operate in a more decentralized and less regulated environment, which can offer flexibility but might lack clear legal protections. It's important to consider the legal implications and stay updated with evolving regulations.

V. CONCLUSION

The main contribution of this project is the development of a decentralized freelance marketplace solution using blockchain technology and decentralized identity systems. This solution provides a more secure and transparent platform for freelancers and clients to transact without the need for intermediaries.

This project improves the existing solutions by addressing their limitations, such as centralized control, lack of security, and limited access to the global market. The proposed solution provides a decentralized and secure platform that allows users to maintain full control over their data, funds, and transactions.

The limitations of this work include the need for further testing and development to improve the performance and usability of the platform. Additionally, there may be regulatory and legal challenges in implementing this solution in some jurisdictions.

The future direction of this work includes exploring the integration of other blockchain-based solutions and decentralized identity systems to enhance the functionality and usability of the platform. Additionally, further research can be done to optimize the performance and scalability of the platform and also implementing the same in the Hyperledger network to introduce more security and giving full control over identity to user.

The potential impact of this project on the freelance marketplace services and decentralized identity systems is significant. This solution has the potential to transform the industry by providing a more secure, transparent, and decentralized platform for users to transact. Additionally, it can promote the adoption of decentralized identity systems, which can improve the security and privacy of online identities.

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