

Revolutionizing Crowdfunding Platform for Security and Efficiency using Blockchain

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Abstract— Crowdfunding allows individuals and organizations to collect resources for specific goals, but traditional third-party platforms suffer from issues such as a lack of transparency, high management fees, and low efficiency. Meanwhile, the blockchain can make the circulation of assets transparent and allows users to cooperate without a centralized organization, and smart contracts can provide a collaborative environment that users can trust. This paper suggests that Decentralized Application, enabled by blockchain technology and smart contracts, can be a potential solution for building a better crowdfunding platform. This paper aims to build a blockchain-based decentralized crowdfunding platform, providing more control to investors and easier fundraising for fundraisers. A decentralized application (D-App) is proposed to build this platform, which consists of two layers: a blockchain layer and a frontend layer. The blockchain layer is developed using Web3 technologies that allow integration of traditional web applications to utilize the potential of the blockchain technology. The frontend layer is a React web page based on Web3.js. The frontend can interact with the blockchain layer and provide a unique identity with the use of a wallet provider such as MetaMask and display campaign information to users. Web3 is the next generation of the internet built on blockchain technology, which aims to establish a decentralized ecosystem that allows users to transact, collaborate, and communicate without the need for centralized institutions or platforms.

I. INTRODUCTION

Crowdfunding is the use of small amounts of money from a large number of individuals, such as a crowd to finance a new business [1]. Crowdfunding makes use of the easy accessibility of large networks of people through social media and crowdfunding websites to bring investors and backers (people who thought of the idea) together, with the potential to increase entrepreneurship by expanding the pool of investors beyond the traditional circle of owners, relatives, and venture capitalists [2].

Accessing and gaining money is key to the growth of any company. It can be easy for larger, more established companies to raise money from investors or to take on additional loans from their lenders. Some companies, though, may come across hurdles that can stifle their growth. This is especially true for smaller companies and startups, which is where crowdfunding comes in handy [3].

Blockchain technology is one of the most prominent technologies that come into picture, when we talk about decentralized data access and an implementation of a pure Peer-to-Peer (P2P) network, [4] in which a shared ledger of transactions is the distributed state of the blockchain that signifies all the transactions that have been approved

on a blockchain network. This ledger contents are approved by the members present on the network, and as a subsequent result a collection of transactions are summed into a block and are added to the ever propagating chain of the network, say Bitcoin. This level of transparency and fluidity of the working of a decentralized network allows it to be utilized in many different applications in a similar way, this also allows entities involved in a crowdfunding platform to perform activities with a zero-trust approach [5].

Blockchain offers a revolutionary level of transparency in crowdfunding by providing a decentralized and immutable ledger of transactions. Every contribution, transfer, or allocation of funds is recorded on the blockchain, creating a transparent trail that backers and supporters can access in real-time. This transparency instills a sense of trust and accountability, mitigating concerns about fraudulent activities or mismanagement of funds that often plague traditional crowdfunding platforms [6]. We have in the past experienced such acts of fraud in international campaigns that trap backers to invest in an idea, but elude with the collected funds and there is no prominent action that can be taken for overseas fraud of such nature. With the ability to track funds from inception to allocation, stakeholders can feel confident in the integrity of the process, thereby increasing a more safe environment for the crowdfunding ventures [7].

The utilization of blockchain in crowdfunding also paves way for easier access of both backers and supporters. By removing intermediaries and utilizing smart contracts, the process becomes streamlined, allowing individuals from all over the world to participate in funding initiatives without encountering the barriers and complexities often associated with the traditional systems [8].

This also enables the platform to impose a lower service charge compared to their centralized counterparts. The removal of intermediaries and the automated execution of smart contracts reduce running costs, resulting in more cost-efficient fundraising for both backers and investors. This reduced fees makes crowdfunding a more viable option for the backers to post their ideas on the platform and engage with the backers for the same [9]. This also enables for the largest portion of the funds to go towards the backer and have a more impactful contribution towards the campaign/ idea.

This platform also enables one to raise debt-free options for the backers idea/campaign and offer enchanting alternatives such as equity share or profit-sharing options to the supporters. This allows entrepreneurs and other small businesses or charity workers to raise capital in a more unrestricted way as it is more comforting to both the backer and investors [13].

Another major matter to point out is that the decentralized nature allows no single entity to hold all the power over the crowdfunding process. Decentralization mitigates the risks of manipulation and favoritism towards any single campaign that could change the natural course of its action on the platform. This structure provides a more trustworthy and resilient crowdfunding environment, built on openness and community consent, as the one campaign resonating most with the crowd of investors will be the most favored [14].

II. PROBLEMS FACED

The traditional crowdfunding platforms have been in the available options for a long time and people have used them as an innovative solution for collecting funds directly from the public domain without much hassle. But this technology too has some disadvantages.

For starters the centralized nature of the platform is one of many concerns to both the patrons and the users of the platform. This allows the whole control of payments and the platform control to be with the developers, this can produce a sense of mistrust in case of financial disputes. This could also provide a probable scheme of denial of receiving funds but in truth the payment was received [16].

Another, major problem is that of transparency and the withstanding nature of some platforms from revealing correct information about what is the actual amount collected, who the real patrons are and other crucial business information that could provide the user with more demographic information of their patron [17]. Withholding of this information sometimes results in the user being unable to accurately take measures for more funding such as targeting the major chunk of donors by asking for their specific needs and their feedback on the user's product or service or skill.

Following on that another major problem that users face is the exorbitant amount charged for the usage of their platform. This causes a large chunk of their donations to be used up by the platform as platform maintenance fees or service fee. This can be as much as 5-8 % to 10-12% on some platforms, which results in very less of the actual amount being transferred to the user. This problem along with no transparency of the payments causes one to doubt the platform and their business model [18].

One other problem that patrons faced on this platform is the widespread attack of ponzi schemes or scams that duped the people of their money. Along with this the addition of projects and their progress being unverified causes people to be easily duped. The platform has no affiliation with such activities but should be held accountable of the people using their platform [19].

The other problem of current platforms is the performance which is not quite pleasant to the user of the platform. This implies a negative impact on the user experience. As a result, many times this results in either a platform failure or a transaction failure which could deprive the platform essentially of its most important functionality [20].

III. PROPOSED SOLUTION

Atluri Divija Choudary [10], has explored the limitations of the current existing crowdfunding platforms as mechanisms that are untrustworthy and propose exorbitant fees. Along with these flaws, there is no guarantee of a person's IP rights being maintained over the same, which could prove to be a very big blow to a budding business. However, with these disadvantages being in place, the author also explored the synergy between the possible implementation of a crowdfunding platform with blockchain as the base of operations (transactions). "Stakeholders would like to keep a track of the way the organization is functioning, whether it is achieving its goals and guide accordingly. This requires 100% transparency, and authentic financial information of the related project activity. Blockchain solves this issue.", as quoted by the author, displayed the effective use of blockchain with such a platform.

Vaibhava Hathwar .T. L, Dr. R. Savitha [11], states that the integration of the current Web 2.0 architecture and the new and improved Web 3.0 architecture fall right into each other as pieces of a puzzle. The new developments in the field of Web3 has allowed for creation of platforms and has allowed developers to enable development of Decentralized Apps (DApps) for accommodating blockchain into the Web 2.0 architecture, this is a clear explanation of what we are trying to achieve in this implementation.

Following these insights, the author also provided the motivation of using such tools for integration of the two architectures namely Web 2.0 & Web 3.0, this has enabled the investors i.e. the crowd and the backer of the idea to communicate, totally anonymous with each other maintaining the zero-trust policy but at the same time, be bound by the non-repudiation enabled by the decentralized ledger and smart contracts.

Prof D. L. Falak, Soudagar Shanawaz, Jadhav Pranav, Katke Kajal, Shukla Utkarsh [12], has highlighted the use and extensive effect of usage of blockchain in crowdfunding applications. They have started one of the first analyses of the usage of crowdfunding as a practical implementation that could result in creating a decentralized nature of platform for creation and interaction of project ideas between backers and the promoter.

The creation of such an Decentralized App promotes usage of fair ways and mechanisms for promoters to present their idea in a more secure and efficient way while also maintaining extra amenities such as Intellectual Property Rights in cases that a project might not be met up to its original contract. Such instances are covered by the usage of Smart Contracts in a blockchain network.

Mithsara, Malithi & Jinasena, [13], has answered some important questions, such as, what is the resulting trust factor, which according to the author increased after the usage of blockchain aspect of the platform, another important question which arises was the cost of the platform fees in the traditional crowdfunding platforms, which were enormous and took up a large sum of the invested money by the crowd resulting in the investors receiving a very small amount of the raised money.

Another prevalent question that was answered revolves around the reduced risk of counterfeit or fraud projects that raised money to dupe the public easily. After using blockchain backed crowdfunding platforms the risks reduced drastically because of usage of smart contracts that enables automatic execution on the blockchain without the involvement of any of the two parties and works upon the zero-trust policy of the blockchain. This enabled both the involved parties to be assured of a safe and secure transaction.

Concluding these works, we can safely assume that the implementation that we have proposed has provided a fitting integration with the current Web 2.0 architecture. The project seamlessly negates the disadvantages of the current crowdfunding mechanisms while at the same time, provides the required transparency, decentralization and anonymity provided by the blockchain to its advantages.

A. Proposed Model

The proposed model is a DApp with the capability of providing the backer of idea and investors a platform for interacting with each other anonymously for the major part, along with it it also provides with other advantages of a traditional blockchain such as decentralization, non-repudiation, low cost of platform usage (convenience for using platform), transparency as the most important feature.

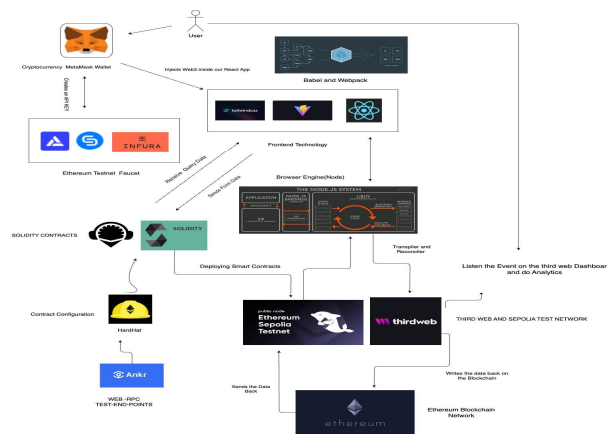


Figure 1: Overall Application Architecture

The application has an overall architecture as designed below. It uses some well-known frontend technologies such as ReactJS and Tailwind, MetaMask as wallet provider and Chainstack as ETH token provider, along with Solidity and Remix IDE for smart contracts. Some involved Web 3.0 technologies are Hard Hat for config, Sepolia as testnet and thirdweb for blockchain abstraction.

B. Working

The application is a platform for both promoters of an idea and investors (crowd) to interact with each other, while being on the same platform. The application provides for the same and allows both to have separate interactions as per their requirements. An investor can also become a backer and at the same time a backer can also become an investor. The only requirement is the connection of their MetaMask wallet to the platform.

The connection of MetaMask is the most important and the first step that is to be taken by any visitor. This allows the visitor to have an identity on the platform, since a blockchain network is decentralized and based on zero-trust policy, the wallet address is the way to identify a person.

A person can make a campaign which represents the cause that the person wants to raise funds from the investors for. The campaign must have a deadline, a description and most importantly a fixed amount that needs to be raised, denoted as target. In case a person wants to find a campaign for investing, they can directly search for it and after maintaining the required balance in their wallet, they can donate to the campaign.

After getting the request to make a campaign a request is generated to the backend browser engine, handled in this case by Node.js, which transpiles and reconciles the request so that it is understood by the third web platform. Thirdweb and the testnet, Sepolia in this case, then communicate and find if the current request is feasible or not. The testnet behaves as a replica of the actual blockchain network (Ethereum). After confirmation from the user, through MetaMask thirdweb then sends the request to the mainnet, after which the transaction becomes a permanent part of the blockchain network and is lodged into the distributed ledger. Similarly all the other investors follow and fund a campaign in a similar fashion. On the other hand when a request to view a campaign is generated, the campaign details are fetched from the blockchain network by thirdweb and is given as a response to an event generated on the thirdweb dashboard, directly to the user. In this process the frontend technologies take the responsibility of how to display the given response to the user.

After the current date equals the date of the deadline, one of two things can occur, either the target is met and the promoter receives the target money, else the target is not met and all the contributors get their money back, however after deduction of some gas charges that were applied while making payments. No mediating third party is used and the process is faster and efficient with the help of third web environment, in comparison to previous traditional methods.

The functions createCampaign is responsible for the creation of a campaign for a promoter, when requested, which requires some data (parameters) such as title, description, deadline and target of the campaign. Similarly getCampaigns provides all the campaigns that are available on the platform.

The function donateToCampaign is the one that does the actual donation to the campaign, it first checks if the donor is able to pay the proposed amount i.e. if the donor has enough balance in the wallet, if yes a confirmation message is sent to donor, which upon accepting triggers the transfer of funds, denial of which cancels the transaction. After successful transaction, the wallet address is added into the donors list and the amount is added to the donations list, hence concluding a successful donation to a campaign.

```

BEGIN

DATA
STRUCT Campaign
owner: ADDRESS
title: STRING
description: STRING
target: NUMERIC
deadline: NUMERIC
amountCollected: NUMERIC
image: STRING
donators: ARRAY
donations: ARRAY

numberOfCampaigns: NUMERIC = 0

PROCEDURE createCampaign : InitializeNewCampaign
// Initializes a new campaign with provided details
// Ensures the deadline is in the future

PROCEDURE donateToCampaign : DonateToExistingCampaign
// Records a donation to an existing campaign
// Updates the campaign's donation amount and donators list

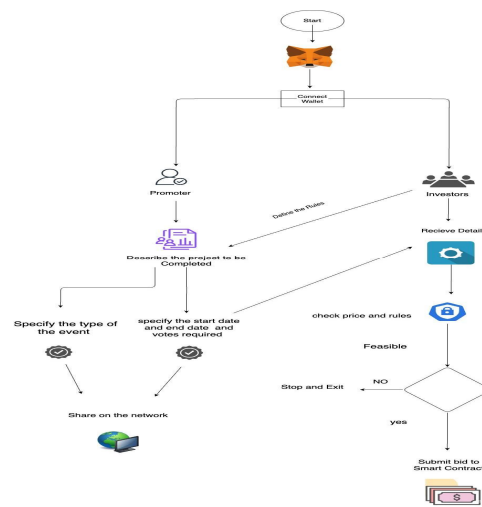
PROCEDURE getDonators : GetCampaignDonators
// Retrieves donator information for a specific campaign

PROCEDURE getCampaigns : GetAllCampaigns
// Fetches information for all available campaigns

END

```

Figure 2: The pseudocode for smart contract



C. Implementation Results

The set-up environment used in the implementation is Vite, which has it's bundler as esbuild which is written in Go and is very much faster than any other JavaScript alternative, here is a comparison

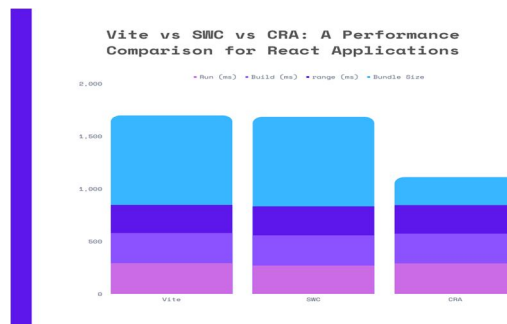


Figure 5: Efficiency of using Vite bundler

The idea of usage of such a tool provided a technological edge on the other ways of deployment of the implementation.

Comparison of webpack as the transcompiler with other products shows that it is one of the most popular and quick transcompiler for usage. This allows for larger community support and due to usage of more popular transcompiler, any error can be handled by developers easily and smaller bugs can be solved by users themselves.

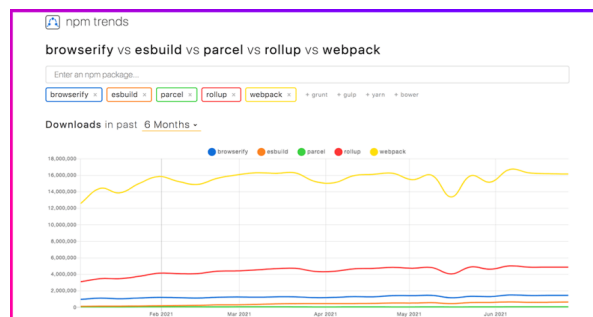


Figure 6: Webpack Transcompiler Trend

The backend HTTP server and router is accommodated by the usage of express which also is one of the best options. The support to the framework provided is very large and is accepted in the community.

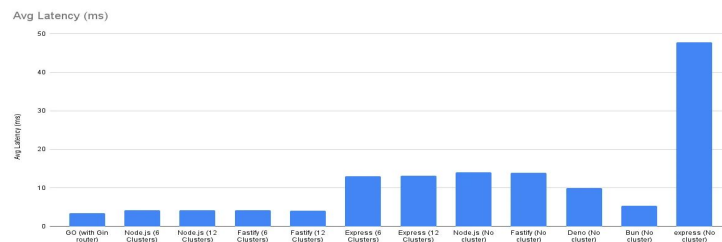


Figure 7: Backend Performance with Node's Engine and Event Loop.

The frontend library that is used is React and is one of the better options for production of a high quality web application such as this. The performance of React in spite of other frameworks such as Angular is very much better, both in terms of time and memory optimization.

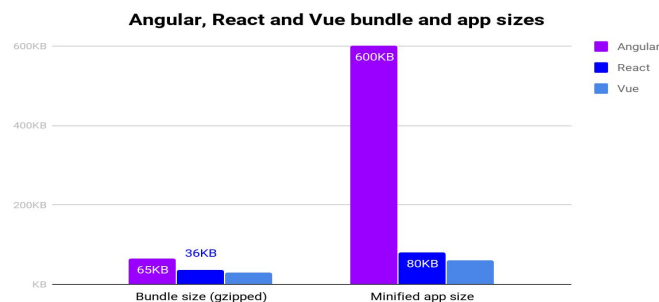


Figure 8: Performance of React over other javascript libraries

The package manager used in the implementation was npm which is one of the most widely used package managers for Node.js which is the backend engine. The other most popular alternative is YARN but npm is a better performer. The result depicts the average latency of similar operations of both package managers.

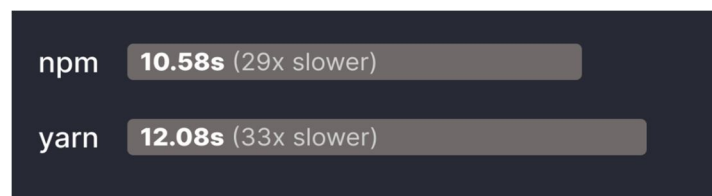


Figure 9: npm as Package Manager

IV. CONCLUSION

To sum up all of the information presented in this paper, we can arrive at the conclusion that the traditional crowdfunding and crowdsourcing mechanisms, while providing a great solution to many people, are also prone to many problems which are addressed by the introduction of blockchain technology into the picture. Blockchain allows to mitigate some of the most prominent problems from traditional mechanisms such as that of centralization, non-transparent behavior of platforms, high commission fees and many other problems. Using blockchain and its supporting environment for web development, intuitive solutions such as this one can be attempted to create more transparent and independent solutions to people who want to have an alternative to current platforms.

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