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DECENTRALIZED CROWDFUNDING APPLICATION USING BLOCKCHAIN

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Abstract: In recent years, crowdfunding has emerged as a powerful tool for individuals and startups to raise capital for innovative ideas. However, traditional crowdfunding platforms are often centralized, lack transparency, and are prone to fraud or mismanagement of funds. This project presents a decentralized crowdfunding application built using blockchain technology, offering a secure, transparent, and trustless alternative. Leveraging Ethereum smart contracts written in Solidity and integrated through a React-based frontend, users can create and contribute to fundraising campaigns with MetaMask acting as the bridge for seamless blockchain interactions. The application ensures that funds are only released when campaign goals are met, and all transactions are immutably recorded on the blockchain. This solution aims to redefine the crowdfunding ecosystem by minimizing third-party interference and maximizing donor trust.

Keywords: Crowdfunding, Decentralized platform, Smart contract, Solidity, MetaMask wallet, Transparency, Efficiency, User Interface

I. INTRODUCTION

Crowdfunding has become an essential method for raising financial support in sectors such as startups, social causes, and creative projects. Despite its popularity, conventional platforms suffer from centralization, lack of transparency, and potential misuse of funds. With the advent of blockchain technology, it is now possible to build decentralized applications (dApps) that operate without intermediaries, ensuring trust, transparency, and security.

This project introduces a decentralized crowdfunding platform that utilizes the Ethereum blockchain to execute smart contracts written in Solidity. These smart contracts handle campaign creation, funding, and disbursement of funds based on predefined conditions. The frontend of the application is built using React, providing a responsive and intuitive user interface. MetaMask integration allows users to connect their Ethereum wallets and interact with the blockchain effortlessly.

By decentralizing the core operations of crowdfunding, this application empowers users to manage funds securely and transparently, ensuring that only successful campaigns receive funding and that all contributors can verify the flow of funds on the blockchain ledger.

II. LITERATURE SURVEY

Several researchers have explored the use of blockchain, smart contracts, and cryptographic techniques to improve transparency, efficiency, and security in crowdfunding systems. The following studies form the foundation for the development of decentralized crowdfunding platforms:

[1] S. Aghav and S. Panmand (2023)
Title: *Crowd-Funding using Blockchain Technology*
This study proposed a decentralized crowdfunding platform built on the Ethereum blockchain. All data related to funds, campaigns, donations, and withdrawals are stored on a public ledger accessible to all users. The aim was to eliminate data duplication and enhance transaction transparency and security through smart contracts.

[2] N. A. Nik Ahmad and S. A. H. Syed Abdul Rahman (2021)
Title: *Applying Ethereum Smart Contracts to Blockchain-Based Crowdfunding System to Increase Trust and Information Symmetry*
The authors created a crowdfunding platform that uses smart contracts to automatically execute transactions based on predefined rules. The study improved transparency but noted that the absence of token integration could be a usability limitation for non-technical users.

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[3] N. Kshetri (2018)
Title: *Blockchain's Roles in Meeting Key Supply Chain Management Objectives*
While focused on supply chains, this research highlighted blockchain's strengths—such as transparency and real-time tracking—that are directly applicable to crowdfunding. The study emphasized the need for regulatory frameworks and interoperability for broader adoption.

[4] L. Sangar et al. (2021)
Title: *Decentralized Crowdfunding*
This study discussed the role of asymmetric key cryptography in securing blockchain transactions. The paper explained how public-private key pairs ensure secure data exchange, reinforcing blockchain's reliability in financial applications like crowdfunding.

[5] Y. Huang, B. Wang, and Y. Wang (2021)
Title: *Research and Application of Smart Contract Based on Ethereum Blockchain*
The authors detailed Ethereum's account model—distinguishing between external and contract accounts—and explained how smart contracts automate batch transactions. This structure supports secure and scalable crowdfunding scenarios.

III. SYSTEM ARCHITECTURE

The decentralized crowdfunding platform is designed with a simplified yet robust architecture leveraging Ethereum blockchain technology and modern web development tools to facilitate transparent and trustless fundraising. At the core of the system lies the **Solidity-based smart contract**, which governs the logic for campaign creation, contribution handling, and fund withdrawal. These smart contracts are deployed directly on the **Ethereum blockchain**, ensuring tamper-proof and automated execution without the need for centralized control or intermediaries.

The **frontend** of the application is built using **React.js**, providing users with an interactive and responsive web interface. This interface communicates with the blockchain using **Web3.js** or **Ethers.js**, allowing users to initiate blockchain operations such as starting a new campaign, viewing available campaigns, or contributing funds. **MetaMask**, a browser-based Ethereum wallet, is integrated into the system to enable secure user authentication and seamless blockchain interactions. Once installed, MetaMask injects the necessary Web3 environment into the browser, letting users connect their Ethereum accounts, approve transactions, and view balance updates in real time.

When a user creates a new campaign, the smart contract is invoked to store campaign details such as title, description, target amount, and creator address on the Ethereum blockchain. Similarly, when contributors fund a campaign, their transactions are recorded immutably on-chain. All interactions are processed directly between the user's MetaMask wallet and the smart contract, ensuring end-to-end decentralization. This architecture emphasizes trust, transparency, and security, offering a streamlined solution for decentralized crowdfunding with minimal infrastructure dependencies.

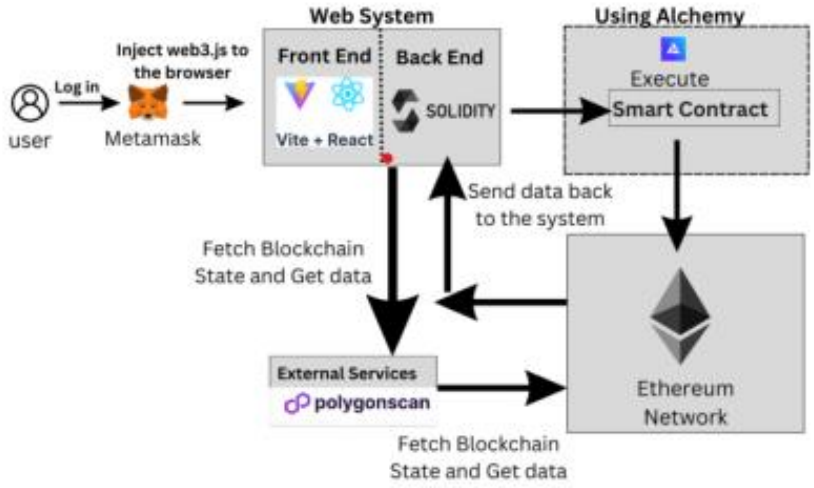

Fig. 1 .Architecture Diagram of Crowdfunding using Ethereum, smart contract and Metamask.

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IV. IMPLEMENTATION AND RESULTS

In this section, included present key findings and discuss the results of the research on decentralized crowdfunding using smart contracts and MetaMask. The crowdfunding process begins when users log into their cryptocurrency wallet, leveraging MetaMask to assess project feasibility. MetaMask, a widely adopted Ethereum-based wallet, securely stores users' private and public keys. Upon login, MetaMask retrieves the available balance associated with the user's address and private key. The MetaMask extension injects Web3.js (or ethers.js) into the browser, establishing a connection to the blockchain and enabling execution of backend programming. The backend pipeline connects Node.js to ethers.js (or Web3.js). Subsequently, a smart contract is developed using the team's preferred programming language and deployed on the Ethereum blockchain. To obtain transactional data, including sender, recipient, amount, and timestamp, Polygon Scan is utilized. Polygon Scan extracts transaction information from the blockchain, presenting it in the user interface. This transparent display in the interface enables users to monitor and track crowdfunding transactions throughout the process. The comprehensive integration of MetaMask, Web3.js, Node.js, and Polygon Scan ensures a seamless and secure crowdfunding experience for project users.

A. Smart-Contract Deployment After deploying the smart contract on “MumbaiPolygonScan”, it can be verified by finding the smart contract on the blockchain explorer.The smart contract was deployed from the wallet address “0x1280Ddff8687bB3642F77b3564705e80cD7ef248” and contract address is generated accordingly.

B. Home: After deployment, the deployed contract is fetched by the frontend. The home page displays the list of all the deployed campaigns along with the address of the smart contract on Ethereum Blockchain. The option includes either creating a new campaign or view an existing one. The home page of the crowdfunding platform serves as a comprehensive hub, featuring both active and inactive campaigns.Clicking on a specific campaign unveils vital details, including the remaining duration of the fundraising period, the total Ether raised, and the number of backers supporting the initiative. Additionally, users can access information about the campaign's originator,presenting the creator's name, associated blockchain address, and a compelling narrative outlining the project's objectives and utilization of funds. The transparency of the platform extends to showcasing the list of donors and their respective blockchain addresses, ensuring accountability and fostering a sense of community engagement within the crowdfunding ecosystem. Fig. 3 is the campaigns home page, retrieved from the output generated of the smart contract deployment.

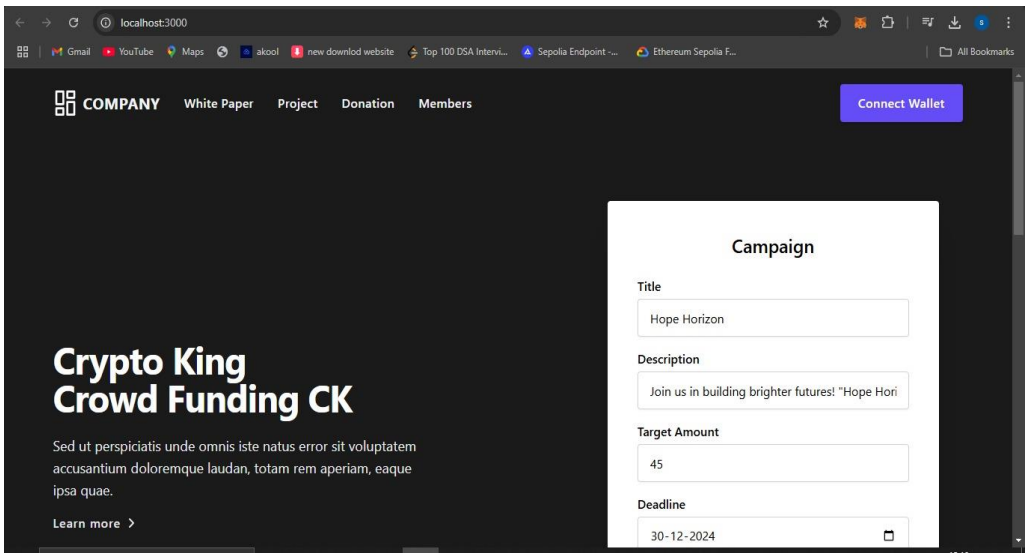

Fig 2 : Campaigns Home page, retrieved from the output generated of the smart contract deployment

C. Campaign Creation : The frontend retrieves the deployed contract following deployment. Every campaign that has been deployed is displayed on the home page, along with their Ethereum Blockchain addresses. Users have the option to view or create new campaigns. Both active and inactive campaigns are shown on the home page, which serves as a hub. Vital information such as the amount of Ether raised, the number of backers, and the remaining duration can be seen by clicking on a particular campaign. Users can also obtain details about the person who started the campaign, such as their name, the blockchain address linked to it, and the goals of the project.In an effort to foster accountability and community involvement within the crowdfunding ecosystem, the platform is transparent enough to list donors along with their blockchain addresses.

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D. Campaign Details : Upon successfully connecting their cryptocurrency wallet, users gain the ability to initiate the creation of a distinctive crowdfunding campaign within the decentralized application (DApp).This process involves entering comprehensive campaign details to provide potential backers with a clear understanding of the initiative. Users input vital information such as the Campaign Name, which serves as a concise identifier, the Campaign Title, offering a succinct description of the fundraising cause, and a Campaign Photo that visually represents the campaign. Fig. 4 is the transaction, Retrieved from the Metamask processing the crowdfunding using Gas fee.

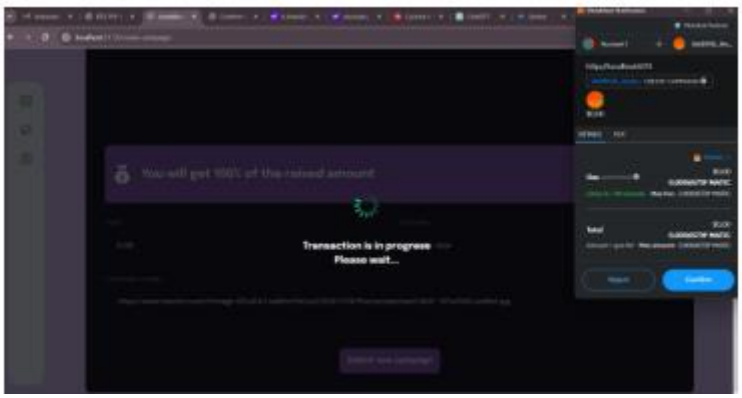

Fig. 3. Transaction, Retrieved from the Metamask processing the crowdfunding using Gas fee

Additionally, users can articulate the campaign's purpose and goals through the Campaign Story section, elucidating the motivations and intended impact. To enhance engagement and visual appeal, users can attach a Campaign Image that resonates with the cause. Finally, users specify the Campaign End Date to establish a timeframe for the fundraising efforts and set the Fund-Raising Amount, indicating the financial goal of the campaign. Fig. 5. Is the transaction details , retrieved from the Metamask Wallet during transaction phase.

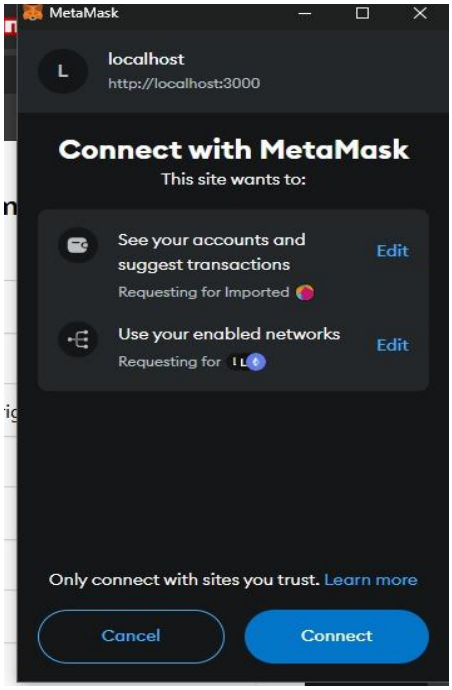

Fig. 4. Transaction details , Retrieved from the Metamask Wallet during transaction phase

This comprehensive input ensures a well-rounded and compelling presentation of the crowdfunding initiative, fostering transparency and encouraging user participation. Fig. 6 is campaign details, retrieved after processing the transaction of the crowdfunding.

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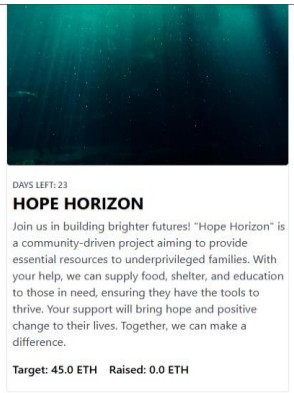

Fig. 5. Campaign details, Retrieved after processing the transaction of the crowdfunding

E. Contributers: Users that contribute to and finance campaigns are known as contributors. The campaigns they wish to fund can be found by searching after they've connected their Metamask wallet to the application. The money will be sent to the campaign's address rather than to the campaign's creator, improving process efficiency and thwarting fraud. Fig. 7 is the funded campaign, retrieved after someone funds the campaign for a cause.

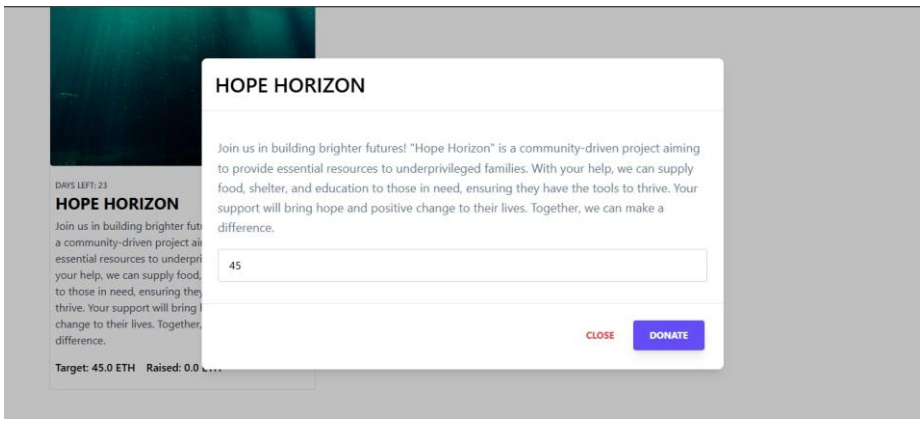

Fig. 6. Funded Campaign , retrieved after someone funds the campaign for a cause

V. TESTING

The testing of the decentralized crowdfunding platform involved deploying smart contracts on the Polygon Mumbai Testnet and integrating MetaMask for secure wallet interactions. Users could connect their wallets, create campaigns, and contribute funds, all of which were successfully recorded and tracked on the blockchain. The frontend, built with React and Vite, dynamically displayed deployed campaigns, showing real-time data such as total funds raised, number of contributors, and campaign durations. Transactions were processed via MetaMask, with gas fees confirmed during execution. PolygonScan was used to verify transaction details, ensuring transparency. The system effectively demonstrated seamless interaction between the frontend, smart contracts, and blockchain, validating the core functionalities of campaign creation, contribution, and data retrieval.

VI. CONCLUSION

In conclusion, the exploration of alternative architectures in crowdfunding for Web 3.0 and decentralized systems offers a promising avenue to address concerns tied to traditional models. Emphasizing peer-to-peer networks and consensus protocols, the research aims to eliminate middlemen, ensuring the protection of contributors' and campaign creators' sensitive data. Blockchain integration enhances transparency through smart contracts, fostering trust and preventing fraud. Despite Ethereum's high gas prices, ongoing developments, such as EIP 1559 and Ethereum 2.0, signify efforts to improve scalability and reduce costs. While alternatives like Binance Smartchain emerge, Ethereum remains a stronghold for those prioritizing data security. These advancements collectively signify a shift towards decentralized, secure, and transparent crowdfunding solutions, instilling trust for both creators and contributors in the evolving landscape of Web 3.0.

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