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Ethereum Based Fundraising Tracking System for Efficient and Transparent Disaster Relief and Humanitarian Aid

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Abstract:

Donors are frequently unsure about how their contributions are used for disaster relief and humanitarian aid activities due to a lack of transparency and accountability in charitable organisations. This lack of confidence can stymie social investment and undermine the effectiveness of humanitarian initiatives. To address this issue, the Blockchain decentralised network is proposed, which uses the Ethereum blockchain and smart contract-based incentives to promote openness and accountability in disaster relief and humanitarian aid donations. The network allows for independent confirmation and public access to the impact of social initiatives, giving contributors more confidence in the utilisation of their gifts. Blockchain simplifies transaction monitoring and aids in restoring trust in social organisations participating in disaster relief and humanitarian aid activities.

Keywords —Blockchain, Ethereum, Gas, Donation System, Blockchain, Smart-contracts, Ethereum, Tracking Donation, Transparency.

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I. INTRODUCTION

The current fundraising procedures in the field of disaster relief and humanitarian help are similarly lacking in openness. Donations to assistance organisations are frequently not fully documented, and the existence of dishonest persons within these organisations can weaken public trust in this vital cause. To solve this issue, the purpose of this paper is to propose a new fundraising tracking system based on blockchain technology in order to improve transparency in transactions involving donations and monies provided by the government or other contributors.Donors will be able to trace their donations and maintain financial security by using blockchain technology, which ensures immutability, tamper resistance, and accountability. Donors will be more interested in knowing the impact of their contributions to disaster relief and humanitarian aid initiatives if openness is improved, reversing the public's falling trust in fundraising for these essential causes. Traditional and online crowdfunding donations for disaster relief and humanitarian help necessitate greater transparency in philanthropic data, and the suggested charity chain system based on blockchain technology will offer better transparency and accountability in charitable donations.

II. LITERATURE SURVEY

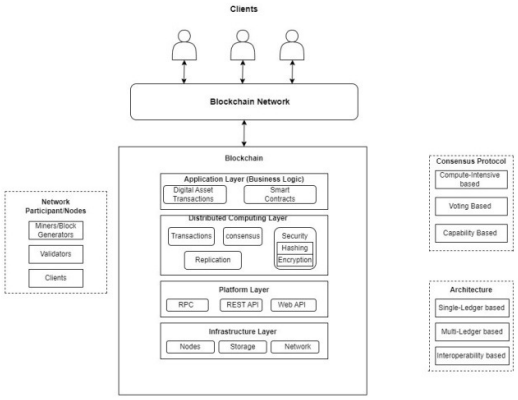
The blockchain enables the establishment of a decentralised transaction ledger that may be used to produce, validate, and perform transactions with other network nodes. The numerous cryptographic hash methods used by various cryptocurrencies add to the level of security required for financial transactions. Businesses and industries can use blockchain to transparently fund disaster relief and humanitarian help, as well as for financial and healthcare services.[2].

Today, a technique for validating a charity application is independent of other applications or systems. Blockchains are employed because they are independent of any single system and can independently verify the consistency and integrity of transactions. Ethereum was chosen as a blockchain because it is more scalable and operates on a public platform. It has a transaction rate of 7 to 20 transactions per second.[3].No single authority will be able to control the philanthropic system with the use of blockchain. The general public will be able to quickly examine the transactions and check that their money is being spent for the intended objectives. The Chinese government is an excellent example of how to effectively use blockchain technology. It is the first blockchain-based government programme. There is an increase in confidence among citizens, the government, and producers. It is used to ensure the freshness of perishable foods. The programme securely transmits the product's status at each stage. Production, delivery, and marketing are the steps.[4]. Like India, China has a sizable population. Despite this, it has successfully used Blockchain to increase public trust in the government by making the production of food resources transparent. All transactions are documented and made clear in the event of a discrepancy, which encourages fair resource distribution to the public and increases government accountability. Similar use cases can be used in India to manage its vast population. Blockchain is being used by financial organizations to increase cyber security. The advantages of blockchain include its quickness, low cost, decentralized registry, and capacity to transmit secure payment data[5]. Every resident of India is given anAadhar number, which verifies their biometric data as well as their location and other details. Voting and healthcare are only two examples of the many uses for Aadhar with blockchain technology[6]. Data loss caused by single points of failure and privacy disclosure can be eliminated by blockchain[7]. The consensus protocol is crucial because it establishes the standards by which a new node must pass verification. When utilizing the application, using the wrong consensus process could result in undesirable results[8]. Resource needs and scalability are challenges a blockchain application faces[9].

III. BLOCKCHAIN OVERVIEW

The use of blockchain technology ensures secure and decentralized transactions by creating an unchangeable record of all transactions in a distributed ledger. This ledger consists of connected blocks that contain the transactions[10]. Blockchain technology comprises three key elements: distributed ledger, consensus protocols, and cryptography[11]. Although these technologies are not new, their combination with blockchain makes them a unique technology. In digital partnerships, the distributed ledger eliminates the need for a reliable third party and reduces the risk of a single point of failure. In a peer-topeer network like a blockchain, each node has a synchronized copy of the ledger, which enhances fault tolerance. Consensus protocols are used by blockchain to validate transactions and update the ledger. The more nodes there are in the network validating a state change, the more secure the network becomes. Cryptography technology verifies all transactions using a set of participant-owned public and private keys, providing each participant with a secure digital identity. An overview of blockchain technology is shown in the figure: The blockchain architecture is composed of three levels: the infrastructure layer, the platform layer, and distributed computing layer. The infrastructure layer includes the hardware necessary to operate the blockchain, such as nodes, which are the participants in the network. Nodes can perform various actions, including initiating and validating transactions, creating blocks, and maintaining a copy of the ledger. The infrastructure layer also includes the network infrastructure required for communication within or between blockchains. The platform layer provides the means for clients to communicate with the blockchain network using Remote Procedure Calls (RPCs)[12], web APIs, and REST APIs[13]. The distributed computing layer of the blockchain architecture ensures that transaction data is locally accessible, fault-tolerant, immutable, private, authentic, and secure. The application layer handles the business

logic specific to the needs of blockchain users. The blockchain's ledger is duplicated among distributed nodes in a peer-to-peer network to ensure fault tolerance and immutability. The blockchain network uses a consensus method to determine the next block, the order in which transactions should be processed, and how the ledger should be updated. Lastly, the distributed computing layer provides user authentication through encryption and data privacy through hashing. Overall, the blockchain architecture is designed tomaintain the integrity and security of the transaction data while providing decentralized, transparent, and trustworthy systems for various applications.



The blockchain architecture is designed to offer several key features, including decentralization, transparency, immutability, traceability, and trust lessness. Decentralization means that a distributed ledger can be shared directly among network nodes without the need for intermediaries. Transactions are processed and stored by network nodes, and once a consensus is reached, the ledger is updated.

Transparency is achieved by replicating transaction data on network nodes as a chain of connected transactions, starting with the first transaction. Any changes to the network are made public knowledge, making the network highly secure. Immutability is maintained by storing transactions as blocks, with each block connected to the one before it using a cryptographic hash function. Attempting to modify a block would require modifying every block that follows it, which is challenging due to the replication of chained blocks across numerous nodes. Traceability is enhanced by the transparent and distributed nature of blockchain technology, making it easier to track complex transaction events, such as those in a supply chain. The source of each change in an asset's condition can be determined, improving security, effectiveness, and transparency.

Finally, the trust lessness of blockchain enables the transfer of assets between unidentified parties without mutual confidence. The ledger is dispersed among multiple network nodes, and transactions are validated through consensus, ensuring their legitimacy in an untrusted environment.

PROPOSED MODEL

This section presents the system model, which divides application users into three categories based on their roles: Donors, Organizations (Beneficiaries), and General Users.

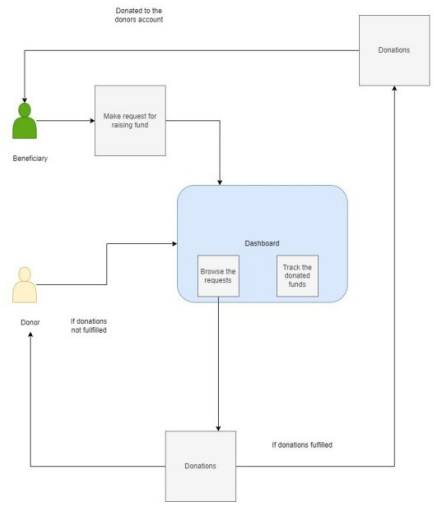
Organizations (Beneficiaries): refer to NGOs, social businesses, or other groups that require resources, and they can post their requirements on the Charity-Chain platform in a pre-determined format. They will also play a crucial role in the mining process.

Donors: are organizations that view the requests made public by various groups, and if their offer is accepted, they can contribute to the cause based on their abilities and preferences.

General Users: these are those who visit the platform for the first time and have not yet decided to become donors or beneficiaries.

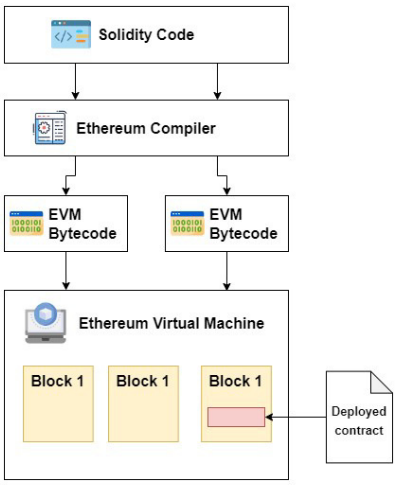
The platform allows organizations (beneficiaries) to create requests for raising funds by specifying a target amount and a time period for completing the target. Donors can view these requests and donate funds according to their preferences. The platform is open for anyone in need to create a request for funds. Donated funds are kept in a smart contract until the target amount is reached or the time period ends. If the target amount is achieved within the specified time, the funds are transferred to the beneficiary. Otherwise, the donated funds are returned to the donors. Our application becomes strong by using the Ethereum blockchain because it offers transparency, scalability, and security. With Ethereum, users can

track the history of their account address and see where their funds go, which increases transparency and encourages more people to donate to those in need. Centralized systems are vulnerable to attacks and data loss, which can be detrimental to users. Additionally, if a platform with many users is not able to scale properly, it can result in the loss of those users. To avoid these issues, we propose using the Ethereum blockchain for fundraising. This blockchain is public and transparent, making it a safer and more reliable choice for users.

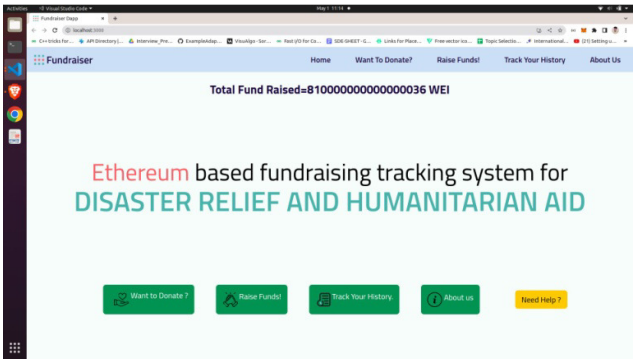


DESIGN AND IMPLEMENTATION

1)Ethereum Blockchain : Our fundraising system utilizes the public Ethereum blockchain network, which enables anyone to participate and track transactions through their address. To implement the business logic, we chose to use Solidity programming language, which is similar to widely-used programming languages like Java, Python, and JavaScript. The Solidity code is compiled by the Ethereum compiler, which identifies any errors and generates bytecode. This bytecode is executed by the Ethereum virtual machine. After deployment, the contract is verified by miners who are nodes on the network that confirm transactions. Ethereum employs a proof-of-work algorithm to select miners.



2)Smart Contracts : The backbone of a blockchain network is its soul, which is composed of smart contracts that regulate all transactions that occur within it. Smart contracts are a set of rules created to process any transaction on the blockchain network. They are lines of code that run on top of a blockchain and dictate a set of rules that multiple parties must agree to for them to interact. If predetermined conditions are met, the smart contract is automatically executed. Smart contracts can facilitate connections between individuals, organizations, and

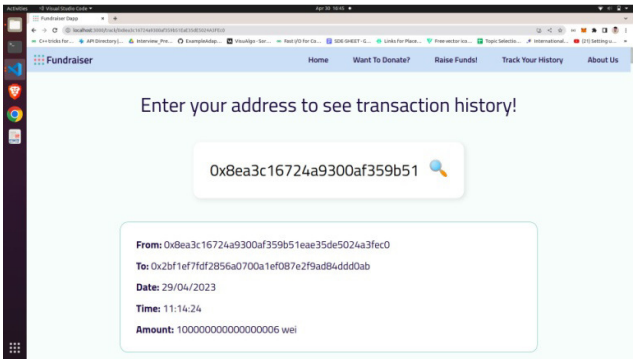


their assets while reducing transaction costs. By standardizing transaction rules, smart contracts are self-executing codes that indirectly reduce the cost of reaching an agreement, formalization, and enforcement. Dapps or Decentralized Applications are created by using such smart contracts.

3)EVM : The Ethereum Virtual Machine provides a secure environment for executing smart contracts. It

is sandboxed and completely isolated, which means that contracts operating within it have no access to the internet, file systems, or other processes. Transactions are objects that link to accounts or users, and each transaction has a specific amount of Gas added to it. The primary purpose of Gas is to reduce the effort required for a transaction and cover its execution costs.the EVM processes a transaction according to rules specified in the smart contract, the Gas is gradually reduced. The gas price is determined by the transaction author and must be paid from the transmitting account.

4)Consensus Protocols: Consensus protocols play a critical role in blockchain technology, enabling distributed and peer to peer systems to agree on a single value of data. Whenever a new transaction is ready to be added to the network, all participants are notified and have the option to accept or reject it. Consensus is reached when a majority of parties agree to the transaction. Because blockchains are decentralized, malicious players may attempt to introduce errors and disrupt important transactions. Without a robust and proven consensus method, the reliability promises of blockchains become meaningless. The lack of a central authority to take responsibility and correct mistakes only exacerbates theproblem. Consensus protocols ensure consistency and stability in a network comprised of numerous random and unreliable nodes. However, reproducing or duplicating consensus protocols is challenging, as they require significant time and computational resources to execute. The specific mechanisms of consensus vary depending on the blockchain validating the blocks. The most efficient way to reach consensus remains a topic of ongoing discussion. Several protocols are currently being used in blockchain applications, including Proof of Stake.



(PoS), Proof of Work (PoW), Delegated Byzantine Fault Tolerance (dBFT), Delegated Proof of Stake (DPoS), Proof of Existence (PoE), and Proof of Activity (PoA).

A. Platform Functionalities

The Proposed system has the following functionalities:

- *Create Fund Request :* The creation of fund requests by different organizations (beneficiaries) is managed by a Create Fund Request function. While creating a fund request, the beneficiary must specify the desired target amount, the final deadline, and provide reasons for the request.

  Browse The Requests : The function has the charge of finding fund requests made by beneficiaries and isresponsible for searching through the requests that have been created.

- *Donate The Funds :* Donating funds to requests made by beneficiaries is the responsibility of Donate The Funds function, which will allow donors to browse specific requests and contribute ethers. This function is considered the core of our proposed system.

- *Tracking The Donations :* As Fig 5 shows, The primary function of our system is to monitor the donations contributed by donors, and this task is accomplished through the utilization of the Ethereum blockchain. Byleveraging the blockchain's transaction tracking capabilities, we can keep tabs on the donations made.

- *QR Code Generation :* To simplify the process of providing a beneficiary address when making a donation by using a QR code. The QR code can be generated to contain the necessary address information, which can be scanned by the donor's device to automatically populate the address field in the donation form. using QR codes can be a convenient and efficient method for specifying beneficiary addresses during the donation process.

FUTURE SCOPE

The future scope of blockchain-based fundraising systems is vast the work can collaborate in the AI/ML domain to support the development of decentralized AI/ML platforms. These platforms can be used to enable the creation and training of AI/ML models in a decentralized and secure manner, without the need for centralized data repositories. This can help to increase data privacy and security, while also enabling greater collaboration and innovation in the field of AI/ML.

Also, The integration of blockchain technology in AI/ML platforms can improve data privacy by giving users more control over their data. With blockchain, users can share their data selectively, based on a need-to-know basis. Additionally, blockchain ensures the security and immutability of all data access and usage records.

CONCLUSION

The proposed system aims to monitor donations and provide updates to donors once their funds have been received by the intended recipient. To facilitate the tracking of donations, charity chains will utilize smart contracts. The Ethereum platform, being a public platform, is chosen for this purpose. By ensuring transparency in the donation process, donors are likely to contribute more significant amounts to this flexible and efficient system.

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