

Organ and Blood Donation Using Blockchain Technology

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Abstract — Organ and blood donation is a critical process that saves countless lives every year. However, there are challenges such as inadequate tracking systems and lack of transparency that hinder the efficiency and effectiveness of the donation process. This study proposes the use of blockchain technology to improve the organ and blood donation system. Blockchain, with its decentralized and immutable nature, provides a transparent, efficient, and secure platform for tracking and managing organ and blood donations. Using blockchain, a transparent and decentralized registry can be established, eliminating the need for intermediaries and ensuring the integrity of the data. Patients, donors & hospitals can have real-time access to the information, enabling better coordination and matching of organ and blood donations. Smart contracts can be utilized to automate and streamline the process, ensuring that all the necessary steps for successful donation are followed. The implementation of blockchain technology in organ and blood donation can address the current challenges, increase trust among stakeholders, and ultimately improve the availability and accessibility of organs and blood for those in need.

Keywords: Blockchain, Authentication, Donation, Ethereum

I. INTRODUCTION

Blockchain technology offers a secure and decentralized solution to these problems. By utilizing a distributed ledger system, all information regarding organ and blood donations can be recorded, tracked, and verified in real-time. This ensures transparency and eliminates the possibility of fraud or manipulation. Furthermore, blockchain facilitates seamless coordination and communication among multiple stakeholders involved in the donation process, including donors and hospitals. The decentralized nature of blockchain enables these parties to access and update information instantly, leading to faster and more accurate matching of donors with recipients. Blockchain enables the secure storage and sharing of medical records, ensuring that crucial information about a person's health history is accessible to the appropriate parties.

II. LITERATURE SURVEY

1) Repeated execution of a set of statements on satisfaction of a condition is not supported in traditional blockchain based smart contract developments. This is however important when multiple statements have to be inferred to derive towards a decision orientation system. Also, if the nature of the data is dynamic rather than fixed state one and if there is an availability of firmware to analyze the data, then the traditional approaches to perform experiments fail. Hence, there is a need to set up the code in a manner that complies well with the aforementioned issues to provoke a smoother execution across the nodes. In addition to this, a compatible software testing framework is to be worked on to derive better outcomes.

The implementation if in place will serve to be beneficial for multiple smart home based secure data across via blockchain network. [1]

- 2) Blockchain can be used in integration with various other domains such as machine learning, IoT, data analytics etc to solve the issues relevant to security, confidentiality and authentication. Different implementations of blockchain deal with different real-time scenarios based on the nature of emerging data. For example, ethereum is found to be efficient to prove security and decentralization properties, but scalability is still a challenging aspect to be proved. If there are users who want to attain better returns in the long run, then a compromise on decentralization is not possible [2].
- 3) Blockchain Technology has been suggested and used by Kim et al. to regulate the blood cold chain. Using Hyperledger Composer, they put the prototype into practice. They have demonstrated the traceability of blood between various parties with their concept. Additionally, they have reasoned for rejecting blood if the blood temperature in storage is outside the typical range. [3]
- 4) For their investigation, Lakshminarayanan et al. studied 10 hospitals and two blood banks within a five-kilometre radius when they planned and constructed a blood donation system utilising Hyperledger Composer. The best blood is matched for a request based on blood group, location, and blood expiration date. When blood is used, the donor is informed, and if the blood is inappropriate for donation, the donor is also informed, and the blood is discarded. [4]
- 5) Mary Subaja Christo et al introduced Blockchain Technology as a deposited solution to providing protection when obtaining a people's clinical record. This proposed framework may also ensure patient protection and, besides maintain the health care system's security and trustworthiness. The key core is to validate and acquire successful knowledge resources for today's social security systems using creativity in the squares network. [5]
- 6) Mehmet and colleagues suggested the KanCoin Ethereum blockchain-based architecture in a chapter to manage and modify processes for effective distribution planning in the blood supply system from donors to distribution centers and patients at medical centers more efficiently than conventional procedures. [6]
- 7) Le, Hai Trieu, and colleagues proposed BloodChain in 2022 as an upgraded blood information management system that will provide more precise information about blood, such as blood use and disposal. For B2B (Business to Business) transactions, a private blockchain called BloodChain is being created. Performance evaluation of the system is carried out for several scenarios once it is constructed using Hyperledger Fabric. [7]

III. PROJECT CONCEPT

A. Blockchain

Blockchain is a distributed database that can manage an ever-growing list of named logs (blocks), with each block containing a timestamp and a link to the previous block. Each set of transactions is linked to a series, which gives all participants a comprehensive picture of the entire system. The series of blocks is designed so they can retain the data stored in them without modification, meaning information is stored in a cluster chain. It is therefore impossible to falsify a block or add other non-genuine information without the approval of all parties involved.

B. Methodology

In this paper, the system proposed is a blockchain-based organ & blood donation system that would secure and automate the organ donation process while protecting sensitive patient and donor medical records using blockchain technology to eliminate any possibility of any possibility of manipulation. It is designed specifically for use in the medical field related to organ donations, hospitals, the System Centralized Distributed Decentralized donation process, and making it accessible while maintaining the integrity of the system. It will provide an easy solution to maintain the anonymity of medical records. In this paper, the system proposed is a blockchain-based website that would secure the organ donation process while protecting sensitive patient and donor medical records using blockchain technology to eliminate any possibility of manipulation. It is designed specifically for use in the medical field related to organ donations, hospitals, and patients, organizing the donation process, and making it accessible while maintaining the integrity of the system. It will provide an easy solution to maintain the anonymity of medical records. The system has three modules with the following functions:

Patient:

- 1) Register
 - a) Contact details + blood group
- 2) Login
- 3) Search organ/blood
 - b) Show record on matching (blood group)
- 4) Request organ/blood
- 5) View request status

Donar:

- 6) Register
 - c) Details
 - d) Blood group
 - e) Report
- 9) Search patient-required organ/blood
- 10) Approve the request of patients
 - f) Create blockchain transaction
- 11) View approved request
- 12) View request status

C. System Architecture

In this system, we are proposing a secure method of organ donation over a decentralized platform. This system will be implemented via a web portal that connects organ donors with

organ receivers and is administered by hospitals. The participants of the proposed system are donors, hospitals, and patients. As the participants are specific private blockchain model is adopted. Organ receivers and administered by hospitals. We are trying to completely avoid third-party interference and protect the integrity of the patient data and identification of the donated organs. This will be attained with the help of smart contracts. Smart contracts will contain the protocols that will govern our organ transaction process and facilitate smooth transactions without intermediaries. These smart contracts will be deployed on a blockchain-based distributed computing platform, Ethereum. All transaction-related information and patient data will be bundled into a smart contract and pushed into the blockchain. The donor is a new user so every personal detail will be registered in a separate account. Donor's data is collected when they donate blood. Various details collected, such as Donor name, age, gender, phone number, and blood group are checked, and the same is entered in a register during blood collection. The reorganized health statement is encrypted using the Data Encryption and the encrypted information is accumulated in the confidential cloud, wherever we can recognize the site effortlessly. Concentrate on the encrypted information in the confidential cloud that is hoarded in the blockchain. The hospital keeps a record of all donors who are registered. But for them also the donor details are not able to be accessed. If somebody is trying to access the information the corresponding message is getting into the donor's mobile as well as email. If it is unethical, then the donor can make a complaint against this department. Using blockchain technology, the confirmation is carried out to check the legal person who requests to monitor the donor's medical report. The authoritative person preserves to append or recover the health statement through the donor's consent. However, he/she cannot transform the donor's health record. The proposed system of organ and blood donation using blockchain technology has the potential to revolutionize the donation process by improving transparency, accountability, and efficiency. The blockchain system provides a tamper-proof layer of security and a decentralized database for recording and sharing data relevant to organ and blood donation. This decentralized system makes it easier to track and manage organ and blood donations, leading to faster and more reliable access to life-saving resources.

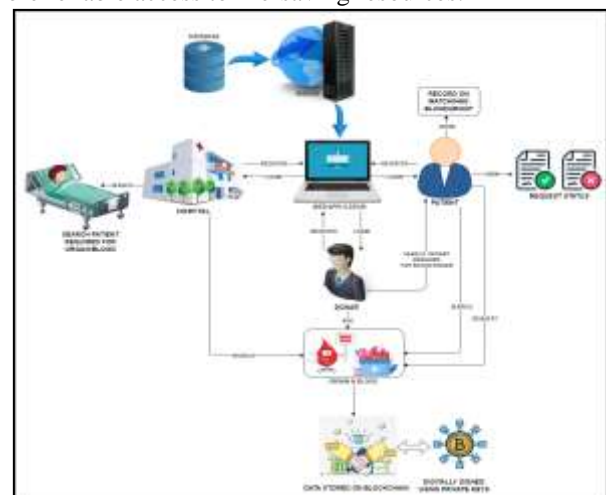


Fig. 1: Architecture

D. System Necessity

Hardware:

- 1) Processor – i3
- 2) Hard Disk – 5 GB
- 3) Memory – 1GB RAM

Software:

- 1) Operating System – Windows
- 2) Front End – HTML, Javascript, CSS
- 3) Library – ReactJs
- 4) Framework – Bootstrap
- 5) Software – VS studio, Ganache, Node Js

E. Future scope

The adoption of blockchain in organ and blood donation has tremendous future scope in improving the donation process. By using blockchain, the organ and blood donation process can become more transparent and accountable. This technology allows donors to track the usage of their organs and blood donation. Blockchain's decentralized nature can enhance security in the management of patient data, making it more secure and resistant to hacking. Adoption of blockchain technology can result in increased efficiency, allowing for faster, more reliable access to life-saving resources. The blockchain's smart contract feature can be used to automate the donation process, from registration to distribution, resulting in quicker procurement and transfer of organs or blood. The blockchain can simplify the management of inventories, tracking of medical devices, and provision of human resources, resulting in an improved supply chain model. Blockchain can integrate various medical records from different organizations, giving doctors more information, and thereby improving the success rates of transplants. The adoption of blockchain technology can save costs for hospitals and organizations working in the field of organ and blood donation.

IV. CONCLUSION

In conclusion, the application of blockchain technology in organ and blood donation has the potential to revolutionize the donation process. It can improve transparency, security, and accountability in the management of patient data and the donation process. The blockchain can enhance efficiency, making it faster and smoother to access life-saving resources, which can save countless lives. Blockchain's global reach can remove geographical barriers and allow people living in remote areas to access life-saving resources. It can automate the donation process, making it quicker and more reliable to procure and distribute organs and blood donations. Adoption of blockchain can also improve the tracking of inventory and supply chain management, making it easier to provide support for organ and blood donation. Overall, blockchain has significant potential for healthcare and can make the organ and blood donation process more accessible, efficient, and transparent. The technology has a bright future for healthcare and has the potential to revolutionize the way organizations handle the donation process.

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