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# Leveraging Blockchain for Transparent Organ Allocation: Incorporating a Backend Cryptocurrency Wallet for Record Tracking

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**ABSTRACT:** It's hard to understand the level of urgency and desperation someone feels when their loved one needs an organ transplant but they can't find a suitable donor. Organ donation is a critical procedure that can potentially save lives, but there are several obstacles that make it challenging, such as a shortage of donors and complicated systems of third-party intermediaries. Blockchain technology offers many features, including decentralization, transparency, and privacy that make it an important tool for digital automation. The proposed system is a decentralized web-based application that offers an effective platform for hospitals, organ recipients and donors to connect. The architecture allows users to interact with a smart contract on the blockchain without having to manage their own keys, while still maintaining the security and transparency advantages of using a decentralised system. As a result, it can offer a good balance between decentralisation and convenience. The use of on-chain and off-chain databases will improve data security, accessibility, and overall efficiency. Using all of these features can solve several Interplanetary File System healthcare sector problems such as eliminating the complicated network of intermediaries and improving transaction traceability. Moreover, this solution is cost-effective and can help patients avoid the expensive cost of transplantation.

**KEYWORDS:** Organ donation, Transplant, Urgency, Donorshortage, Blockchain technology, Decentralization, Transparency, Privacy, Smart contract, Data security

## I.INTRODUCTION

Organ transplantation is a critical healthcare sector that faces challenges such as lack of communication between donors and recipients, organ scarcity, and transparency issues like organ trafficking. Blockchain technology can help address these issues by providing an immutable, decentralized ledger for transparent organ donation transactions, reducing fraud, ensuring a clear audit trail, and boosting system confidence. Blockchain can also make it easier to track organs and their related data, ensuring proper matching and access to all pertinent data. Blockchain technology can also improve privacy and security by shielding private donor and recipient data from illegal access and security lapses [1]. This essay proposes a decentralized application using Ethereum Blockchain technology to address these issues, using Smart Contracts to manage every step of the procedure, from adding donors to performing transplants.

Tests on the Ethereum Goerli test network showed that the proposed solution can provide a transparent, safe, and effective organ transplantation system. The authors emphasize the importance of careful coordination and communication between recipients, potential contributors, and medical specialists in organ donation. Software applications can streamline the process by automating processes, managing large amounts of data, and ensuring legal compliance[2]. They also aim to ensure fair and equitable distribution of organs, prioritizing objective norms like medical urgency over subjective factors like socioeconomic background or ethnicity.

## II.RELATED WORK

To simulate the information exchange between recipient hospitals, regulators, and donor hospitals, the authors of [3] developed a multi-agent software framework. This platform increases productivity through the simplification of pre-transplant processes. It also makes it possible to save data on possible donors and promotes more effective direct communication amongst all parties engaged in organ transplantation. We estimated that we might be able to save three to five hours by simulating an information process using the built platform. The Transnet, which is detailed in [4],

assists in the labelling, packing, and monitoring of transplantable biological components during organ recovery by use of barcode scanning technology. During organ recovery, procurement coordinators print labels and scan all delivered organs using the OR's system. The logistics sector has embraced these technologies in a manner akin to how numerous supply chain management solutions have used barcodes, RFID tags, and Electronic Product Codes (EPC) to identify and share product information [5]. Last but not least, the authors in [6] suggested a controllable method, MIN, for online matching of deceased organs to donors in an effort to improve productivity and equality in patient selection within the present system in Australia. The patient whose |KDPI-EPTS| is the lowest is awarded the organ when it becomes available via the MIN process, which breaks ties first by waiting list position and then by chance. The Kidney Donor Patient Index (KDPI) can be used to determine the kidney's quality. On the other hand, the Expected Post-Transplant Survival Score (EPTS) measures the recipient's quality of life following transplantation. The authors of [7] suggest a decentralized organ donation software built on the blockchain. After being input into a web application, the patient's medical identity number, organ and blood type, and even their home state, may all be kept in a central database. The system would operate on a first-in, first-out (FIFO) basis, unless the patient was really sick. It made the process faster, more transparent, and safer. To fulfill local standards and adhere to local laws, however, it could be required to make local changes. Similar to this, the authors of [8] developed a web-based application that uses FIFO to select an organ donor for each legitimate patient in need of a transplant, prioritizing such patients in case of an emergency. Furthermore, [9] proposes a blockchain-based app for organ transplantation and donation, in which the registered hospital accepts the registered donors and registers the beneficiaries in order to match each request with a suitable donor. A smart contract that is signed by both the donor and the patient formalizes organ donation when the patient requests a transplant.

### III. PROPOSED METHOD FOR ORGAN DONATION AND TRANSPLANTATION

Our goal is to in order to ensure decentralized, secure, dependable, traceable, auditable, and trustworthy organ donation and transplantation administration, the system offers a private Ethereum blockchain solution. Through the creation of events for every necessary step involved in organ donation and transplantation, the system generates smart contracts that ensure data provenance and register actors. The source code for the smart contract is available for viewing on GitHub. The system may pair donors and receivers automatically by using a smart contract and a predefined set of parameters. For six distinct algorithms, the system offers thorough implementation, testing, and validation data. The system will do a security analysis once a solution is offered to make sure it is protected against typical security risks. We present a comparison between our approach and the state-of-the-art to illustrate its uniqueness. Our recommended approach's adaptability makes it appropriate for implementation in a variety of comparable programs. Compared to existing approaches, the technology offers a blockchain-based organ donation system that is safer and faster. An automated process for organ donation is part of the proposed system.

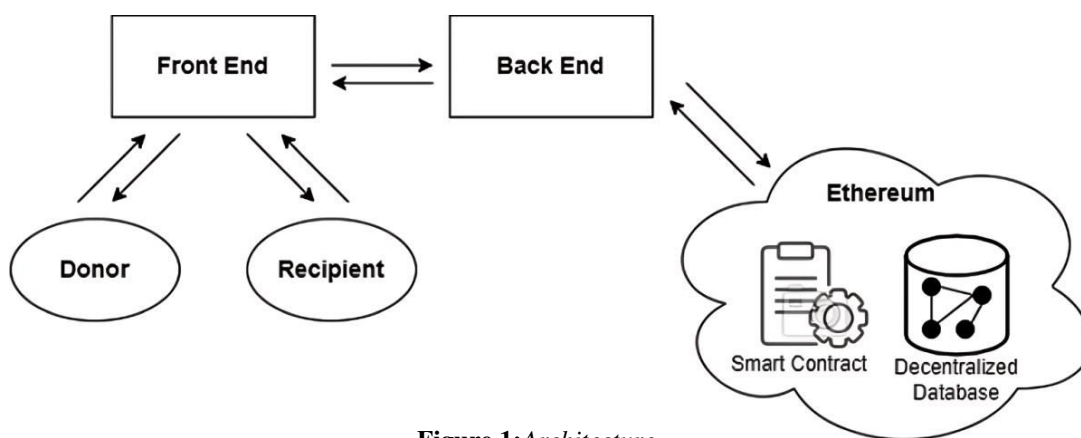


Figure 1: Architecture

#### 1.1 MODULES

• Donors

The donor will register in order to provide the hospital with their donor data. Once the hospital has their information, they may send details about their organ donation, view their profile, and track the progress.

• Admin



The Hospital Administration and Transplant Management module is a comprehensive system designed to empower administrators with tools for efficient management of organ donation, patient records, pledges, and transplant matching within the hospital. It provides a centralized platform for overseeing critical administrative tasks and facilitating seamless coordination among various stakeholders involved in the organ donation and transplantation process.

• **Hospital**

The Hospital Donor and Transplant Management module serves as a comprehensive system for managing organ donors, patient records, pledges, and transplant matching within the hospital. It enables hospital staff to efficiently handle the complexities of organ donation and transplantation processes, ensuring optimal patient care and resource utilization.

### IV.RESULTS AND DISCUSSION

We compare our method with other available blockchain-based solutions. Comparisons are made using key parameters such the blockchain platform, mode of operation, generation of smart contracts, traceability, real-time monitoring, deployment, and development of decentralized applications. Our method and the one described in [3] both made use of a private Ethereum network setup. No specific blockchain platform was mentioned in the other solutions. Right now, the only options are [10], which suggests a similar technique based on smart contracts, and our proposal. Finally, [10] and our solution do not allow users to utilize the front-end decentralized apps that [5] and [3] established. Fig. 2,3 displays the output screens that were produced after the system was ran and executed. It could also outline the modifications needed to the solution in order to use it in other situations. If a significant quantity of data needs to be retained, off-chain storage is necessary since the participants in the application and their interactions may differ. The series of visuals presented below showcase the sequential development of our project, which involved the establishment of a Smart contract.

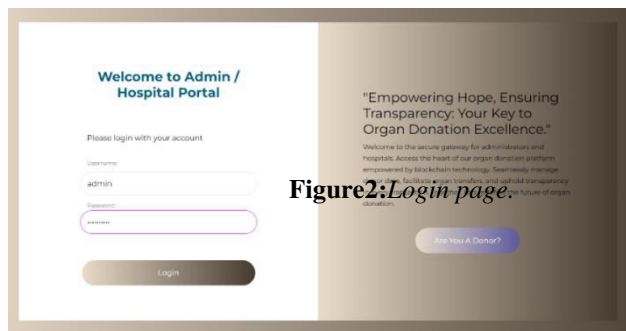


Figure2:Login page.

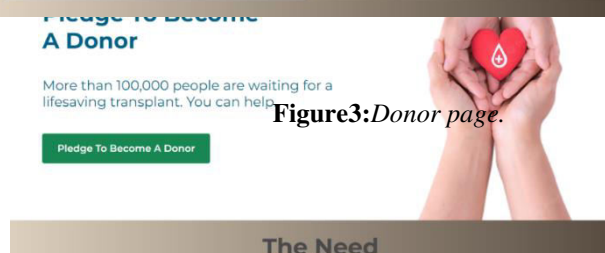


Figure3:Donor page.

### V.CONCLUSION AND FUTURE SCOPE

A private Ethereum blockchain-based system for the reliable and decentralized administration of organ donation and transplantation is suggested by this study. We were able to develop a system that automatically tracks events, ensuring the legitimacy of the data, by utilizing smart contracts. We offer details on the creation, examination, and validation of six distinct algorithms. We look into the security of the suggested fix to ensure that smart contracts are secure against frequent assaults and flaws. We assess our method by contrasting it with current blockchain-based solutions. We describe how readily our technique may be modified to meet the needs of other systems with similar problems. Developing a fully functional decentralized application is one of our system's possible future improvements. Furthermore, the smart contracts may be tested and deployed on an actual, private Ethereum network. Lastly, because only authorized parties may view transactions between companies on the Quorum platform, it can provide greater privacy than our present system.

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