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BLOCK CHAIN BASED MANAGEMENT OF BLOOD DONATION

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Abstract – In order to automate blood donation management procedures in a way that is completely decentralized, traceable, transparent, auditable, private, secure, and reliable, we suggest using a private Ethereum block chain. To get around the storage restrictions, we combine the decentralized Interplanetary File System (IPFS) storage system with the private Ethereum block chain. We create two smart contracts and algorithms to put functions into place and set guidelines for managing blood donations. We assess the created smart contracts and the suggested blockchain-based blood donation management system using security analyses. Additionally, we contrast our suggested strategy with the current fixes. Our suggested block chain-based blood donation management system is general-purpose and can be tailored with little effort to satisfy the requirements of different industrial applications.

1. INTRODUCTION

One of the most important bodily fluids is blood. It helps supply the vital and necessary nutrients needed for life to the organs. Since there is a greater need for blood than for any other medical necessity, governments frequently organize awareness campaigns to inform the public about the significance of blood donation. It was anticipated that 136,908 donors contributed to a total of 216,639 donations in the years 2018 and 2019.Generally speaking, most healthy people donate blood every 56 days. According to estimates from the World Health Organization (WHO), 112.5 million units, or roughly 50 million liters, of blood are donated annually. However, the development in new diseases has led to a shortage of blood donors, making it more important than ever to facilitate trustworthy and effective blood donation management. The field of patient blood management (PBM) is large and difficult. The efficient operation of the supply chain is restricted by the limitations and inadequacies in the current blood management system
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According to Hannon et al., blood componentwaste rates typically range from 1% to 5%, and the amount disposed of is neither disclosed or made readily apparent to provide an explanation. Therefore, any advancement or development is crucial to the provision of high-quality healthcare globally. Using centrifuges, entire blood units are divided into constituent parts such as red blood cells, platelets, and plasma. Testing is then done to confirm the blood type and identify any infectious conditions. Units suitable for transfusion are then labeled and kept in walk-in cool and freeze rooms or freezer lockers when test findings are confirmed. Red blood cells should be kept in refrigerators at 6ºC with a 42-day expiration date, in accordance with guidelines set forth by the Food and Drug Administration (FDA) and the American Association of Blood Banks (AABB). In accordance with FDA regulations, plasma is frozen in freezer upto one year. Platelets can be kept for up to five days at room temperature or frozen for up to a year in freezers.

2. LITERATURE SURVEY

For the benefit of their patients. Lastly, hospitals continue to transfuse blood to patients after receiving blood units. Blood-related data may include blood type, blood condition, blood donor's medical history, blood donation date, and other pertinent readings. Although transfusions between blood banks have certain advantages, hospitals are generally afraid of obtaining the wrong blood, or worse, blood contaminated with HIV, hepatitis, or other related illnesses. Infectious donated blood poses a number of concerns when it moves through the supply chain. However, another issue in the supply chain is the counterfeiting and forging of medical products, where an illegally made fake copy of the original product might be mistaken for the genuine one. This means that the blood may be switched out for a different kind or a fake label may be applied to hide the real blood. Researchers and other interested parties have taken notice of these significant supply chain management system road blocks. In the blood supply chain, block chain-based technologies can help lower the risks described above. The newly developed technology offers multiple ways to confirm where the given blood came from.

Pharmaceutical companies are required by the Drug Supply Chain Security Act (DSCSA) of the United States to implement internal electronic systems that will detect prescription medications as they are being distributed around the nation. In a similar vein, China mandates that all parties involved in healthcare supply chains make use of a dedicated IT system in order to document product information whenever goods are transferred to or from their warehouses. As a result, a number of supply chains included traceability as a crucial component of creating legitimacy throughout their networks.

3. OVERVIEW OF THE SYSTEM

3.1 EXISTING SYSTEM

A central server is used by many traceability solutions to address the visibility and traceability issues. An increasingly common method for tracking and keeping an eye on blood bags is to use radio frequency identification, or RFID, technology.

The great importance of RFID technology in supply chain management makes it stand out. This technology further recognizes tagged goods and uses radio frequency waves to communicate data in industrial applications. The RFID-based dynamic blood information management system was presented by Davis et al. to track blood products in blood centers.

3.1.1 DISADVANTAGES OF EXISTING SYSTEM

- The blood donation system does not use block chain technology, and radio frequency identification (RFID) is a widely used yet inaccurate method of tracking and monitoring blood bags.
- Because the system is not general, it cannot be easily modified and tailored to suitthe requirements of different industrial applications.

3.2 PROPOSED SYSTEM

The Online Blood Bank site, the suggested system, uses block chain technology to address the shortcomings of the current system. The Blood Bank assists those in need of blood by providing them with general information about blood donors in their city who have the same blood type. Use block chain technology to secure these data. The advantages of the proposed system are listed below.

Collecting blood units

Delivery process

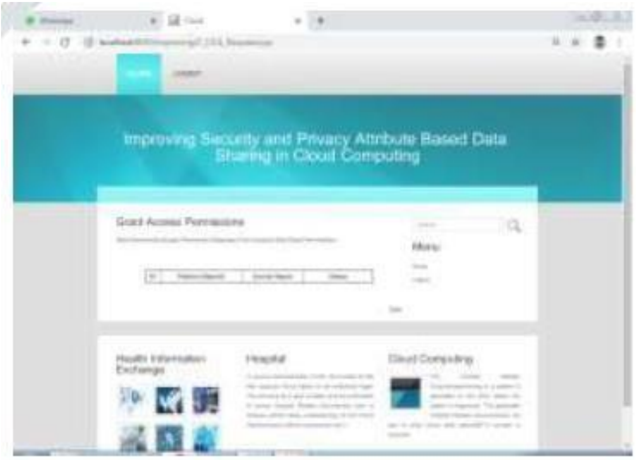
Creating component blood units

Requesting order

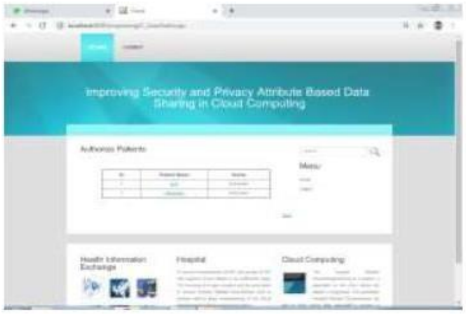
Approving order

Collect whole blood unit: The functionality of the smart contract's owner adding the donor ID was tested in this function. The function has executed successfully, and the related events and logs are shown.

Create blood unit: The primary function in this contract that is most crucial is the Create blood unit function. It provides information on the specifics of the blood



component units created. The enumeration variable "Blood component Type," as was previously mentioned, accepts values in the form of uint8, where "0" denotes "re delete," "1" denotes "plasma type," and "2"



denotes "platelets type." Consequently, Figure 7 shows the successful completion of the plateletunit creation process.

Blood unit Requested: The physician requests a blood component unit from the smart contract. The Blood unit Requested () method is used for this. the logs after the doctor's request. The blood component unit type, quantity, and requested date are all included in the request.

Blood Unit Prescription: The ability of the doctor to enter the prescription's details was examined in this feature. The function has executed successfully, and the related events and logs are displayed.

Blood Unit Transfusion: The nurse uses the Blood Unit Transfusion function to administer the blood component unit to the patient as the last step in this procedure.

4. ARCHITECHTURE

Fig 1: Framework of proposed method

5. RESULTS SCREEN SHOTS

Home Page:

Upload Data:

Choose options:

Predict Result:

6. CONCLUSION

In this work, we have presented a decentralized, transparent, private, secure, auditable, and block chain- based blood donation management system that tracks the blood's origin. The suggested method used the private Ethereum block chain's smart contract feature to automatically log and record events.

In order to address the issue of limited storage, we merged the IPFS with the private Ethereum block chain. Using the Remix IDE, we verified and tested our solution's functioning. The code for our created smart contracts is accessible on the GitHub site. In order to demonstrate that the suggested blood donation management system is strong and secure enough against significant security flaws and assaults, we carried out a security analysis. Furthermore, we juxtaposed our suggested methodology with the current solutions.

7. FUTURE ENHANCEMENT

Our goal is to create an end-to-end Dapp and test our solution on the actual Ethereum network in the future.

Additional monitoring for violations will be implemented to bolster the security of the blood cold supply chain even more.

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