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NBA Accredited

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UNIVERSITY OF MUMBAI

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A Project Report on

A Comprehensive Blockchain Based Framework for Bloodbanks

Submitted in partial fulfillment of the degree of

Bachelor of Engineering(Sem-8) in
INFORMATION TECHNOLOGY By

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1. Project Conception and Initiation

1.1 Abstract

- Our system intends at enhancing the existing blood supply management systems. Due to the several limitations which existing blood management systems possess like scarcity of data on blood bags, inability to display real-time updates, and the trust factor, we urge on an innovative web framework based on Blockchain technology using a distributed ledger structure which would serve complete transparency and security to the framework.
- Blockchain offers the opportunity to maintain a transparent management system, particularly since data cannot be falsified and tampered with. This proposal is to allow hospitals that are far from the blood banks to accrue blood supply in emergencies.

1.2 Objectives

- Security and Traceability.

Blockchain is a distributed ledger data structure so all the nodes will be having a copy of the blockchain. This architecture makes this system incredibly secure and tamper-proof because if anyone tampers with a single block then the whole chain will become invalid and we can verify from other nodes.

- Transparency.

Being a decentralized platform, one of the most beneficial advantages of blockchain is transparency. All the nodes will have a copy of the blockchain which makes it easy to verify the donor history from each node in the blockchain.

- Availability

Along with the other things it is necessary that people should know the availability of blood bags. Lack of proper updates can be detrimental for patients. As blockchain is a decentralized and distributed platform it will be simple to check the availability of blood concerning blood banks

1.3 Literature Review

In today's era of a globalized supply chain of goods and services, the supply chain has now involved various actors and entities from different parts of the globe who have never seen each other and may not trust the genuineness of either one or multiple parties/actors. With such complex issues in hand, the main concerns are the lack of transparency and traceability[1]. This is where Blockchain technologies can help us create more efficient and effective supply chains with the above concerns minimized or even completely diminished in some cases. Blockchain Technology has been accepted and adopted in past years throughout the technological globe. A blockchain is a form of database storage that is non-centralized, reliable, and difficult to use for fraudulent purposes[2]. Ethereum is explained as a Next-Generation Smart Contract and Decentralized Application Platform that was created by a cryptocurrency researcher and programmer named Vitalik Buterin [3]. It uses a Blockchain-based distributed computing platform with a Turing complete scripting language that enables the processing of smart-contracts on blockchain. It is also now used in healthcare industry to protect patient privacy, procure untampered history.

1.4 Problem Definition

- Existing blood management systems in India function as information management systems that lack dynamic updates of blood usage and detailed blood trail information, starting from donation to consumption.
- The most beneficial medical methodology is Blood Transfusion which saves many lives and improves health, but it can be the case where several patients requiring exchange of blood, don't get handy access to safe blood. Ensuring blood safety and availability must be a key component of healthcare policy of every country. For this to happen smoothly the coordination between blood banks and hospitals should be in a proper manner.
- To overcome all these problems, the need is to have a decentralized platform for all the entities in the blood ecosystem which should be able to portray the true availability and create transparency through the whole system where hospital can keep the track of available blood and donors can also check the status of donated blood.

1.6 Technology stack

- Ethereum Blockchain (Ganache)
- Solidity (smart contracts)
- Truffle framework (to compile and deploy smart contracts)
- npm, reactjs, web3.js (web framework)
- Metamask (cryptocurrency wallet)

1.5 Scope

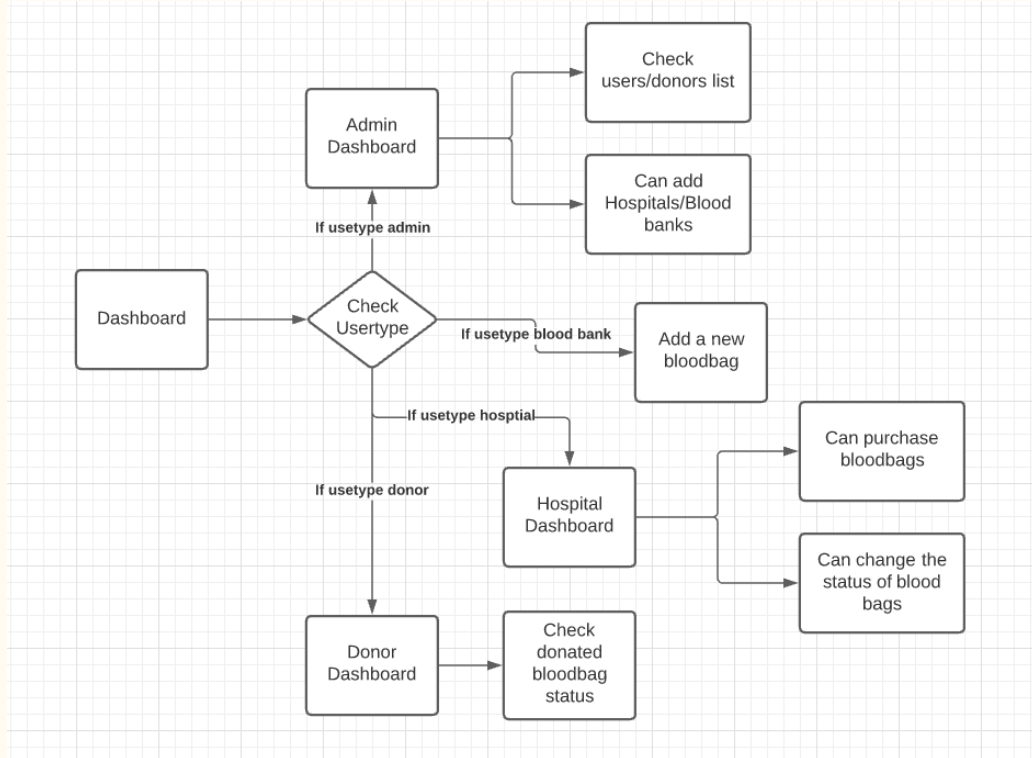
- The proposed system, brings more transparency to the blood donation process by tracking the blood trail and also helps to curb unwarranted wastage of blood by providing a unified platform for the exchange of blood and its derivatives between blood banks.
- Proposed system, can be applied in areas where political interference and chances of data tampering for personal benefits are high. Due to presence of web application, system becomes more user friendly and can be reached to more population.

1.7 Benefits for environment & Society

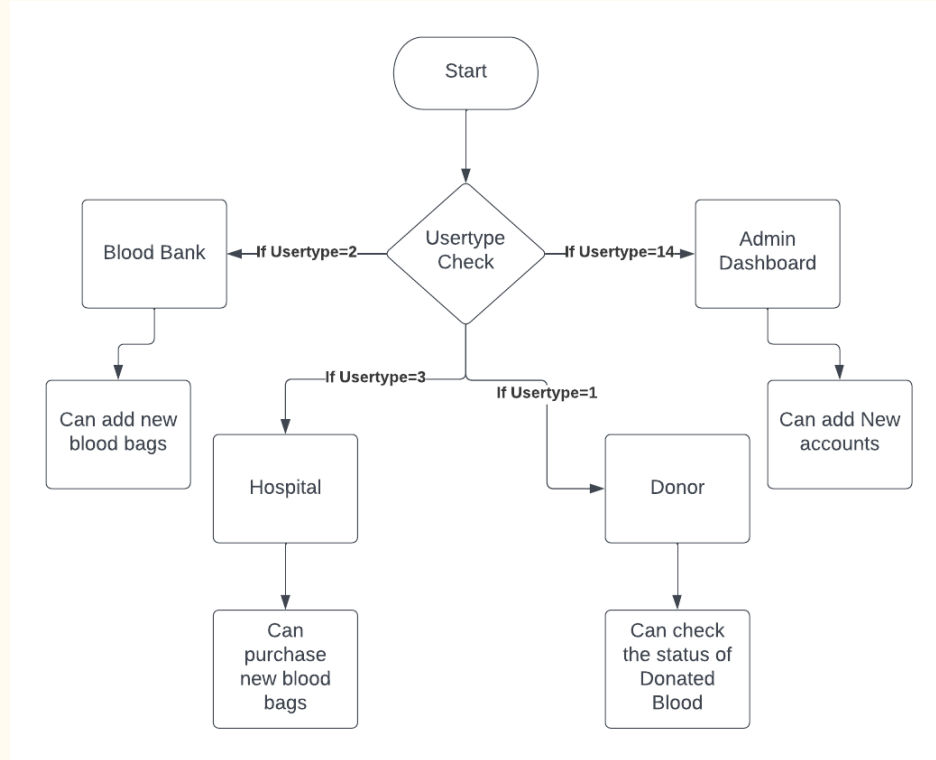
- This can be achieved by the different entities in the chain; verifying the quality/expiry of blood from the blockchain that provides the trust factor that is required.
- The donor details could also be verified by the collection centers to ensure unsafe donors are excluded. As a fallout, all the stakeholders will be able to know the availability of blood in different blood banks

2. Project Design

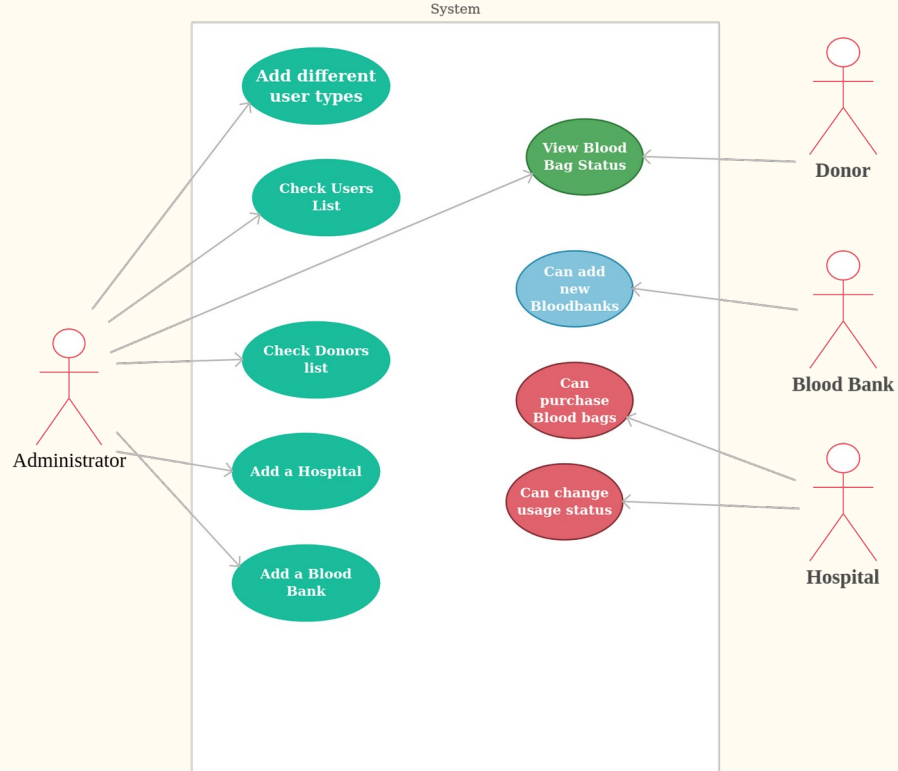
2.1 Proposed System



2.2 Design(Flow Of Modules)



2.3 Use Case Diagram



2.3 Description Of Use Case

- There are 4 major actors in our framework i.e Administrator, Bloodbank, Hospital and Donor.
- Administrator has the authority to add new accounts of Blood Banks and Hospital.
- Hospital can purchase new blood bags and can also change the status of the usage of blood. Blood Banks can add new blood bags with their details.

3. Implementation

3.1 Implementation

Activities Firefox Web Browser Nov 10 6:28 PM

Blood Bank Framework +

localhost:3000

Welcome to Blockchain Blood Bank

0x4B1CCfde7B477537E4DE2Bb4Ee52495b215A6ef

Welcome **Admin.**

Add Bank

User Name User Address User City Add Bank

Add Hospital

User Name User Address User City Add Hospital

Show donor list

#	Name	Address	User Type	User City
6	Chinmay Dharap	0x39B561F50A9AefE43aB95DAD4d6e57175171359f	Donor	Thane
5	Tejas Jadhav	0xb9b43B9fDD9278f7671C019977f6917701fB50F6	Donor	Thane
4	Prajwal Sonar	0x0838E350cD267b460FB36C97FE7C7344AB0F25b9	Donor	Mumbai
3	Mumbai Hospital	0x0c7eD5d8400d8Ec302C4cEf1Bca3baA8C0059E3	Hospital	Mumbai
2	Mumbai Blood Bank	0xB624c39D8c67fDfC6B354a6014B93Bd6B986e532	Bank	Mumbai
1	Chinmay	0x4B1CCfde7B477537E4DE2Bb4Ee52495b215A6ef	Admin	Mumbai

3.1 Implementation

Activities Firefox Web Browser Nov 10 6:30 PM

Blood Bank Framework localhost:3000

Welcome to Blockchain Blood Bank 0xB624c39D8c677DC6B354a6014B93Bd6B96e532

Welcome Mumbai Blood Bank.

Add Bags

Donor address :

Donor name :

Donor number :

Blood group :

Expiry :

City :

Add Blood Bag

#	Donor	Owner	Blood Group	Expiration Date	Expiry Status	Usage Status	City
3	Chinmay Dharap	Mumbai Hospital	A+ve	Mon Jan 24 2022 17:29:38	false	true	Mumbai
Address:	0x39B561F50A9aefE43aB95DAD4d6e57175171359f	0x0c7eD5d8400d8Ec302Ce4cE1Bca3baA8C0059E3					
2	Tejas Jadhav	Mumbai Hospital	B -ve	Sun Jan 23 2022 10:30:48	false	true	Mumbai
Address:	0xb9b43B9fD9278f7671C0199776917701FB50F6	0x0c7eD5d8400d8Ec302Ce4cE1Bca3baA8C0059E3					
1	Prajwal Sonar	Mumbai Hospital	A+ve	Thu Dec 23 2021 20:45:12	false	true	Mumbai
Address:	0x0838E350cD267b460FB36C97FE7C7344AB0F25b9	0x0c7eD5d8400d8Ec302Ce4cE1Bca3baA8C0059E3					

3.1 Implementation

Activities Firefox Web Browser Nov 10 6:29 PM

Blood Bank Framework +

localhost:3000

Welcome to Blockchain Blood Bank 0x0c7a05d8400b8Ec302C4c4E1Bca3baA8C0059E3

Welcome Mumbai Hospital.

Your Current Inventory

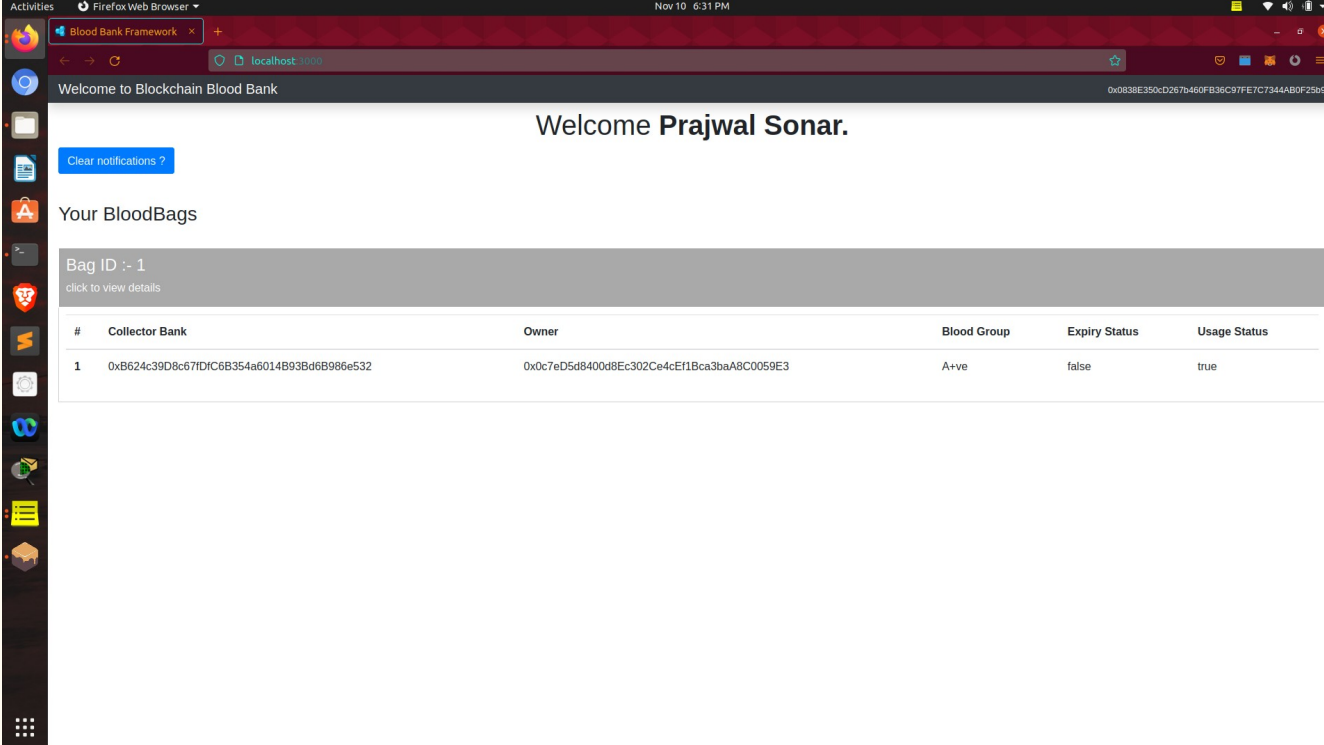
#	Collector Bank's (Name and Address)	Blood Group	Expiry	Usage Status
1	Mumbai Hospital 0xB624c39D8c67DfC6B354a6014B93Bd6B986e532	A+ve	Thu Dec 23 2021	Bag used
2	Mumbai Hospital 0xB624c39D8c67DfC6B354a6014B93Bd6B986e532	B -ve	Sun Jan 23 2022	Bag used
3	Mumbai Hospital 0xB624c39D8c67DfC6B354a6014B93Bd6B986e532	A+ve	Mon Jan 24 2022	Bag used

Available blood bags

Search Blood Bags

#	Collector Bank's (Name and Address)	Current Owner's Name and Address	Blood Group	City	Expiry	Action
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3.1 Implementation



The screenshot shows a web browser window with the title "Blood Bank Framework". The address bar shows "localhost:3000". The page content includes a header "Welcome to Blockchain Blood Bank" and a user greeting "Welcome Prajwal Sonar.". Below this is a "Clear notifications ?" button and a section titled "Your BloodBags". A grey box displays "Bag ID :- 1" with a link "click to view details". A table follows, listing blood bag details.

#	Collector Bank	Owner	Blood Group	Expiry Status	Usage Status
1	0xB624c39D8c67IDIC6B354a6014B93Bd6B986e532	0x0c7eD5d8400d8Ec302Ce4cEf1Bca3baA8C0059E3	A+ve	false	true

4. Testing

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5. Result

6. Conclusion and Future Scope

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Conclusion and Future Scope

- Thus we have made a web based framework for blood banks which uses blockchain in backend to store the data of blood donations. This is a centralized platform for the blood ecosystem so that it can solve the issue of improper co-ordination in demand and supply and create no misunderstandings between blood banks and hospitals. It also helps donors to check the blood bag's usage and expiry status. The platform proposed will help avoiding any kind of interference in blood donation drives for personal benefits.
- The system that has been proposed will help in avoiding the unwarranted wastage of blood by offering a unified platform for the exchange of blood and its derivatives between blood banks which brings more transparency to the process of blood donation by tracking the blood trail. It can be beneficial in the areas where political interference and chances of data tampering for personal benefits are high.

References

1. Z. Zheng, S. Xie, H. Dai, X. Chen and H. Wang, "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends," 2017 IEEE International Congress on Big Data (BigData Congress), 2017, pp. 557-564, doi: 10.1109/BigDat-aCongress.2017.85.
2. Sylim, Patrick & Liu, Fang & Marcelo, Alvin & Fontelo, Paul. "Blockchain technology for detecting falsified and substandard drugs in the pharmaceuticals distribution system". In: JMIR Research Protocols. Vol. 7. (2018).
3. Feng Tian. "An agri-food supply chain traceability system for China based on RFID & blockchain technology". In: Service Systems and Service Management (ICSSSM), 13th International Conference on. IEEE, pp. 1–6, (2016).
4. Davis, R. & Geiger, Bradley & Gutierrez, Alfonso & Heaser, Julie & Veeramani, Dharmaraj. "Tracking blood products in blood centers using radio frequency identification: A comprehensive assessment". In: Vox Sanguinis, vol. 91, pp. 50-60, (2009).

Paper Publication

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Status: Rejected

Thank You

