

FeelGood

A decentralized blood donation system app based on smart contracts

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Opportunity

Short abstract:

FeelGood is a blood donation system application based on blockchain which provides end to end traceability through web and mobile. Not only does the app make actors such as donation centers, testing centers and hospitals accountable by digitally signing a smart contract, but it also empowers a patient to verify details of blood being transfused to him/her.

Background:

Human blood is invaluable. It can't be manufactured like electronic devices and there is no substitute to it. Every 2 seconds, someone in the US needs blood. Even though, we 'donate' blood, the industry in itself holds a market value of a massive \$4.5 billion USD annually in the US^[1].

Unfortunately, there have been cases of innocuous and malicious blood donation, which has led to diseases like HIV AIDS and Syphilis to patients accepting blood from donors.

- In the early 1990s, America's industry leader in blood supply, Red Cross closed its center in Washington DC after it was discovered that 235 people who had received blood from their donors tested positive for HIV AIDS virus^[2].
- In the year of 2008, the Center for Disease Control (CDC) uncovered 3 cases in Colorado where patients received contaminated blood which caused AIDS^[3].
- These number of cases are miniscule compared to those happening in developing countries like Sri Lanka and India^[4].

Thus, we decided to add transparency to the supply chain by leveraging the power of blockchain.



Novelty/USP of our research:

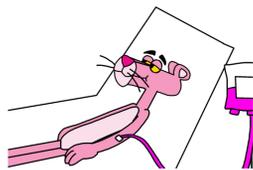
- FeelGood provides accountability and traceability of blood bottles in an inexpensive way. The donation center, testing center and health center each need an iOS/Android based app called uPort^[5] in their smart phones to digitally sign a smart contract and attest quality of blood.
- Moreover, our application also generates QR code labels for bottles/pints of blood which can be just read by a simple camera from a smart phone to sign contracts on the blockchain. This technique is especially useful for blood donation systems in developing countries which do not have access to laptops and tablets.

Note: This kind of a technology used by FeelGood is completely unique and hasn't been implemented before.

Approach

To solve the problem of making the blood donation system accountable and traceable, we used a public ledger platform called Ethereum^[6] which supports smart contracts.

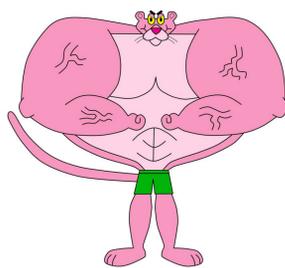
1. A donation center authorized by the government (Like Red Cross, Boston) takes donors' information and signs it using uPort. The application then calls a smart contract which logs the information and stores it using events.



2. A testing center will have a laboratory assistant verifying the quality of blood after conducting tests like - Rho, Alpha, HIV and Syphilis. The assistant will scan the QR code attached on bottle and confirm the transaction, thereby broadcasting the results to the public ledger.



3. A health center will be able to view all transactions' history (ie. Information was verified by the donation center, and blood was tested in the lab) and then gets to filter the blood group they need for a patient. The doctor will only be able to view blood pints which are verified and unexpired. After utilizing the blood resource, the doctor will sign a transaction confirming the consumption.

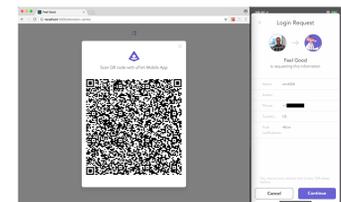


Impact

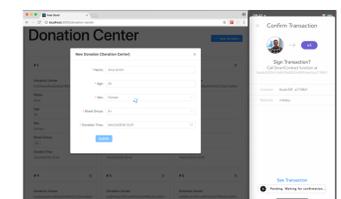
- By adding end to end traceability in the supply chain of blood donation system, not only are we empowering patients/doctors to view complete transaction history of each bottle of blood but also making donation centers and testing centers accountable.
- Most importantly, this project caters to the needs of a new industry in itself which requires blood being transported across countries like in the case of the catastrophic earthquake in Haiti^[7] where blood was donated from countries like South Africa, Italy and the US to the residents of Haiti.
- As a long term goal, with the help of blockchain, the industry can benefit by diminishing the overall amount of blood stock stored in reserves and thereby reducing costs of transfusion to patients

Results/Demo

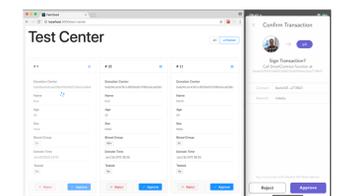
These are the results/screenshots of our application, FeelGood version 1.6. The left half of the screen represents our web-app and the right side mirrors a user's smart phone screen while using our app.



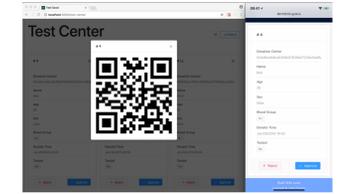
STEP 1: Login into FeelGood as a donation center without username and password by using uPort's smart contract.



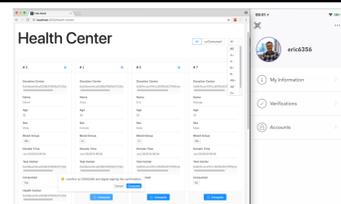
STEP2: (Donation Center) Accept blood from a donor and verify his/her details into the app by signing a smart contract.



STEP3: (Testing Center) Verify the history of blood and perform tests on it, thereby approving or rejecting a pint of blood and submitting results on the blockchain.



STEP 3-B: (Testing Center) For developing nations with no access to laptops, the lab assistant can scan a QR code and digitally sign the contract JUST by using a smart phone with a camera.



STEP 4: The health center can examine the history of each bottle and transfuse blood to a patient.

Thus, FeelGood builds a verifiable chain of trust across the entire supply chain of blood.

References

- [1]. <https://www.forbes.com/sites/erincarlyle/2012/06/27/blood-money-the-guys-who-trade-your-blood-for-profit/#66d9aeba282e>
- [2]. <http://www.nytimes.com/1991/07/07/business/all-about-blood-banks-a-multibillion-dollar-business-in-a-nonprofit-world.html?pagewanted=all>
- [3]. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm591a3.htm>
- [4]. <https://www.sciencealert.com/blood-transfusions-have-given-hiv-to-more-than-2-000-people-in-india>
- [5]. <https://www.uport.me/>
- [6]. <https://www.ethereum.org/>
- [7]. <http://www.redcross.org/news/article/Red-Cross-Working-across-Borders-to-Ensure-Haitis-Blood-Supply>

★ We will be thrilled to show you our demo live! ★