IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

The Reliable Blockchain Powered Smart Rental Application Using Smart Contract

Ketaki More[1], Disha Gaikwad[2], Akanksha Thombare[3], Pritam Gholap[4], Prof. Tushar Phadtare[5]
Students, Department of Computer Engineering[1,2,3,4]
Assistant Professor, Department of Computer Engineering[5]
JSPM's Bhivarabai Sawant Institute of Technology & Research, Pune, Maharashtra, India

Abstract: *Usually whenever we take a subscription from any OTT platform we often use it only for 5-10% of time we subscribe for, but we end up paying for the whole lot of time. Also, often users keep sharing their subscriptions with their friends and a single screen subscription ends up running on multiple devices. It causes losses to service providers. So, a more smooth and efficient subscription system is needed and it would benefit both the parties - Customers and Service Providers. Since Ethereum has been an open source development platform, the industry has taken advantage of decentralized application or DApp where by the application is based on Smart Contract, a set of programming written code becomes the law of in agreement.*

Keywords: Blockchain, Ethereum, Rental application, Smart contract

I. INTRODUCTION

1.1 Overview

This Project facilitates the user to buy or rent subscriptions of several online streaming platforms (OTT's) under one roof via NFT's for a custom amount of time. Using this project platform anyone can rent out their OTT subscriptions while they are not using it and monetize on it. Users can take subscriptions for whatever time they like by making customized plans. All of this would be done by using decaying NFTs. NFT based subscription makes it easy for service providers to validate the user identity, otherwise users keep sharing their passwords with their friends and family. While the user is not using his/her subscription package, the user can lend it to other users willing to rent/watch by sharing the time bound decaying NFT. This way users can make extensive use of the membership and also monetize it if the user is not using it personally by renting it on the platform.

1.2 Motivation

The supply chain of evidence directly or indirectly deals with the lives of millions of people. This particular sector can be easily exploited with the kind of architecture it currently possesses. This can cause a serious life threat to all the people connected to this supply chain. Counterfeit evidence can be introduced easily in current processes. Thus, it well-being of millions of people. Features like traceability, detectability, tracking, verification and accountability should be introduced in the courtroom to improve its overall efficiency.

1.3 Background

To improve the supply chain's traceability and security, Blockchain technology has been producing interesting research zones due to its inventive attributes that give productive answers for the current loopholes identified. In simple terms, Blockchain can be defined as a conveyed information base, which is shared among and concurred upon by a distributed organization, also known as a peer-to-peer network. When a component is annexed to the blockchain, it can't be altered, making a blockchain into a changeless record of past movement, thus helping to improve overall performance and security. To conclude, the following features make Blockchain an ideal solution:

1. Immutability
2. Transparency
3. Verification of information
4. Secured by cryptography

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

II. LITERATURE REVIEW

2.1 Existing Methodologies

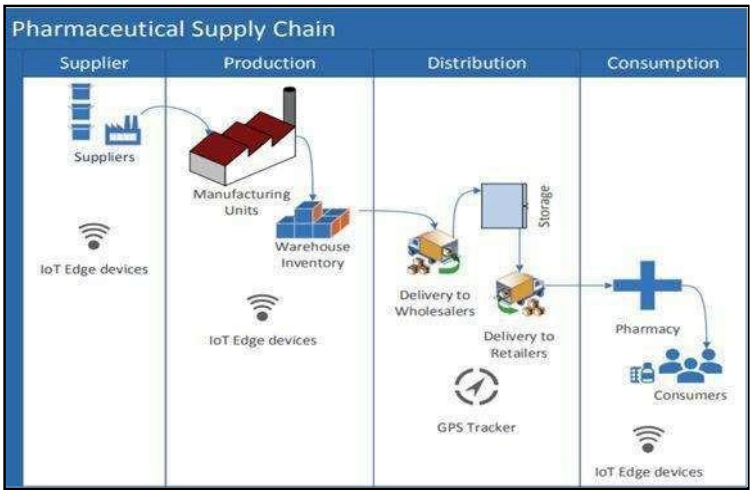


Fig. 2.1: Current system architecture

The overall process can be divided into four steps:

1. Supply
2. Production
3. Distribution
4. Consumption

- The core design relies on intelligent devices connecting the different parts of the supply chain, which in turn are connected to a cloud backend through intranet.
- The system architecture is powered by technologies such as IoT edge devices and GPS tracker to improve its efficiency.
- IoT devices and GPS tracker help to improve traceability of the system.

The indicative approach for each of the nodes in the supply chain are described above in the illustration.

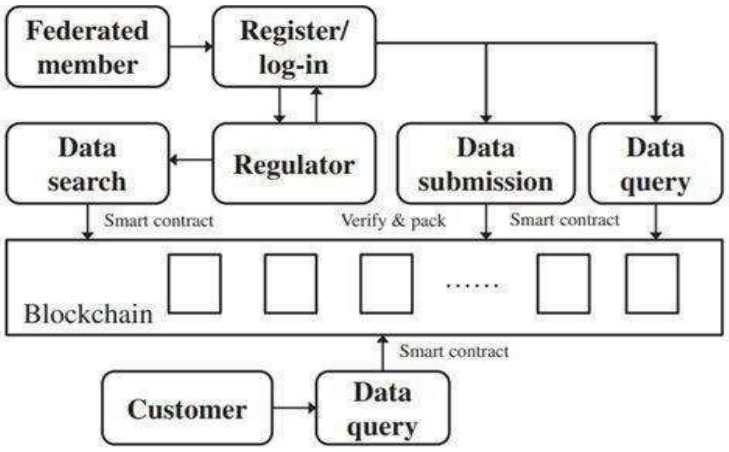


Fig. 2.2: Functionality of traceability system

- Controllers and unified individuals are needed to sign into the framework before additional activity.
- The enlistment records and access records would all be put away on the blockchain as confirmation.
- Combined individuals can submit medication data and inquiry recently submitted information by conjuring shrewd agreements.
- The submitted medication data will be confirmed by the participants and distributed on the blockchain.
- For the controllers, they search any data that exists in the record.
- While for clients, they just can inquire about the data related to medicines.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

III. REQUIREMENT SPECIFICATION AND ANALYSIS

3.1 Problem Definition

To enhance the approach of the traditional Subscription Business model using Blockchain to ensure source to consumer traceability and tracking which helps to improve efficiency in the industry by ensuring consumer protection, building trust, improving quality of service and overcoming gaps exploited by password sharing.

3.2 Concept

Supply chain management systems include all the steps of any evidence life-cycle, from buyer to seller. The system can be exploited by introducing counterfeit evidence in the chain. It becomes really important to secure the overall chain. Thus, blockchain technology can be used to store the data securely and in-turn improve its overall efficiency.

3.3 Objectives

The core objectives of this project are:

1. Create an application where Buyer can Buy the OTT service directly from a service provider.
2. Renter can Rent the user's services for x amount of day by paying the price per day in ETH tokens.
3. Users can add your OTT service organization and verify a few checks using their social profiles and register their service for user's to buy.
4. Speed up the data retrieval.
5. Design of distributed databases to avoid single point of failure.

3.4 Project Requirements

A. Functional Requirements

- Stable internet connection
- Enough storage space to store and display information

B. Non-functional Requirements

- Usability
- Legal or regulatory requirements
- Reliability
- Performance

C. Hardware Requirements

Basic required storage capacity on the device, RAM usage (min 8 GB), and bandwidth are enough. No other special hardware is required for this project.

D. Software Requirements

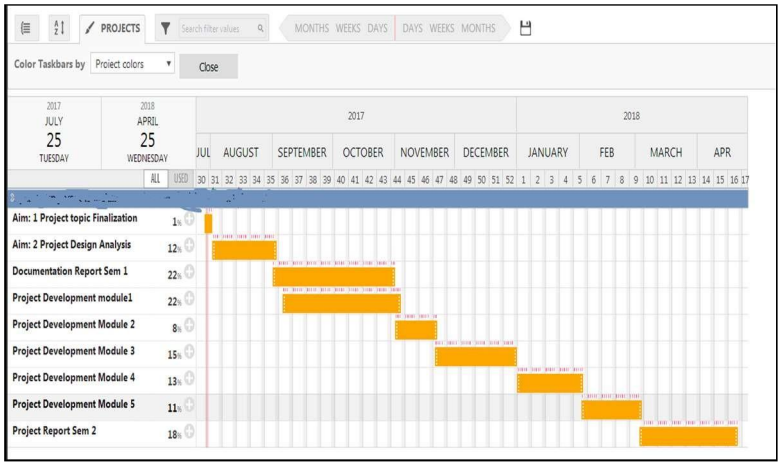
- Operating System: Linux.
- Internet Browser: Chrome(preferable), Mozilla Firefox, Internet Explorer.
- Front-end: HTML 5, CSS, JavaScript, ReactJS.
- IDE: Visual Studio CODE.
- Backend: NodeJS, Ganache, Truffle, Express JS, Redis

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

E. Action Plan

Work Task	Description	Duration
Literature Search	Related work done for conceptual data similarity	6 weeks
System analysis	Critical analysis and comparison of technologies studied and results achieved in research	4 weeks
Design and Planning	Modelling and design and dataset searching or creation	8 weeks
Implementation	Divided into phases	
Phase A	Implementation module 1	2 weeks
Phase B	Implementation module 2	2 weeks
Phase C	Implementation module 3	3 weeks
Phase D	Implementation module 4	4 weeks
System Testing	Test system quality, fix errors if any and improve if needed. Test system for differe nt datasets	3 weeks
Initial Report	Prepare and upload Initial Report	2 weeks
Final Report	Prepare and upload Initial Report	2 weeks

F. Project Plan Execution



G. Technologies Used

1. **Ethereum:** Ethereum is the second largest cryptocurrency platform by market capitalization, behind Bitcoin. It is a decentralized open source blockchain featuring smart contract functionality.
2. **Truffle:** A world class development environment, testing framework and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM), aiming to make life as a developer easier.
3. **Ganache:** Ganache is a personal blockchain for rapid Ethereum and Corda distributed application development. You can use Ganache across the entire development cycle; enabling you to develop, deploy, and test your dApps in a safe and deterministic environment.
4. **Metamask:** MetaMask is an extension for accessing Ethereum enabled distributed applications, or "Dapps" in your browser. The extension injects the Ethereum web3 API into every website's javascript context, so that apps can read from the blockchain.
5. **Express:** Express is a web application framework for Node.js, another MERN component. Instead of writing full web server code by hand on Node.js directly, developers use Express to simplify the task of writing server code.
6. **React:** React is a JavaScript library for building user interfaces. React anchors the MERN stack. In a way, it's the defining feature of the stack.
7. **Node.js:** Node.js is a cross-platform JavaScript runtime environment. It's designed to build scalable network applications and can execute JavaScript code outside of a browser.

H. Module Split-up

1. **Scalability:** No databases. Zip, nothing, nada. We use the Ethereum blockchain for maintaining authentication of users and use Sawo Labs for registering new buyers and lender allowing for limitless scalability.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

2. **Order Status:** Lenders can use the platform to update the status of the orders, letting the buyers know on the fly. This feature allows for complete transparency between the lender and the buyers.
3. **Authentication:** When Metamask easy no password login meets the security of the blockchain, magic happens. The Web App handles all authentication with Ethereum - the users just have to deal with the simple Metamask form. Integration of a passwordless login system on top of Blockchain means no more unreadable addresses - just a simple email-based login.

IV. SYSTEM ANALYSIS AND DESIGN

4.1 Activity diagram

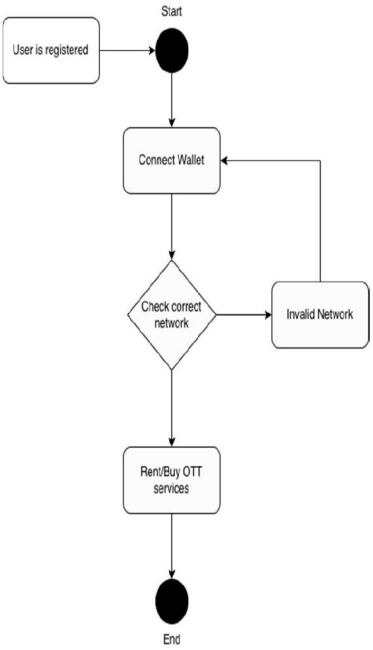


Fig. 4.1: Activity diagram

4.2 Use Case Diagram

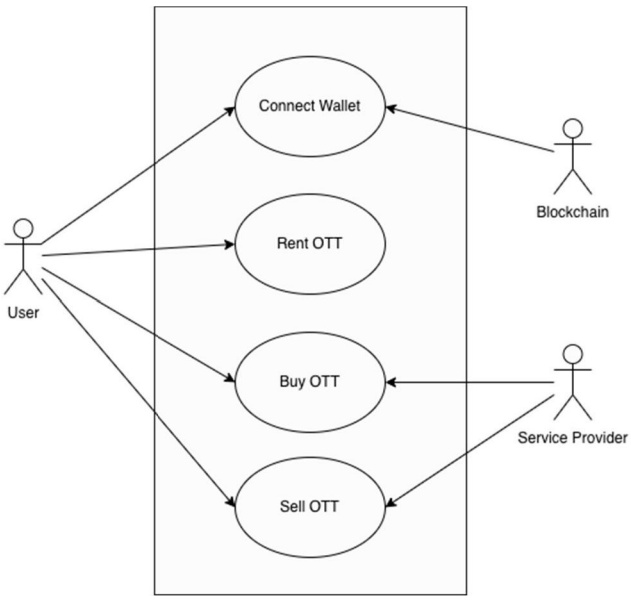


Fig. 4.2: Use-case diagram

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

4.3 Data Flow Diagram

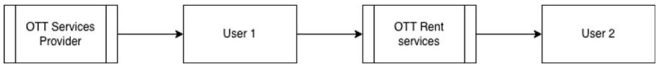


Fig. 4.3: Data Flow diagram

V. IMPLEMENTATION

5.1 Proposed Methodology

Blockchain technology provided the base for the peer-to-peer digital currency and led to the bitcoin platform. But the applications of blockchain technology are far more than crypto-currencies, and it can provide an excellent solution for tracking drugs in the pharmaceutical supply chain. So, let's understand the working of the blockchain network and how it can solve the problem of drug-counterfeiting

Blockchain is nothing but an immutable distributed ledger shared by a group of nodes over a peer-to-peer network. Each activity on this network is called a transaction. A group of such transactions forms a block. A block is associated with a hash value, timestamp, and hash of the previous block. This chaining of blocks together makes the ledger tamper-proof and immutable.

The blocks are added to the network after verification by the Proof-of-Work consensus or any other custom consensus algorithm, which provides accountability and integrity to the blockchain network. The ability to store the transactions based on their sequence makes blockchain an ideal candidate for solving traceability problems in the supply chain management system.

VI. CONCLUSION

There are many stages in supply chain management which can be exploited and thus it becomes important to secure them to avoid counterfeit evidence. Malfunctioning can take place in the system which cannot be even tracked using the current architecture. Thus, technology like Blockchain can be used to provide security to the system, thus improving overall efficiency of the system.

If any duplicate product has been introduced, it can be tracked along with its location of introduction. Thus, the proposed architecture also helps in reverse tracking of the system which inturn helps to secure the process.

6.1 Limitations

Scalability can be one of the major limitations of this project. Energy requirements can also pose a challenge during implementation of this project.

VII. FUTURE SCOPE

1. Including a 5% commission to service providers and 2% commission to platform developers whenever users rent their subscription NFT's between each others for the business aspect of the platform.
2. Currently there is some work left with the renting options, in the coming future rental feature will be fully functional
3. Using pinata services for IPFS node and option for users to view their NFT's on Opensea
4. Making platform more interactive with UI-UX and including more customizable options for users and service providers like:

- Service providers get a feature to give users the option to renew the same subscription plan at a discounted rate of 10% before the current plan ending period. Users get notifications in their wallets 2 days before the ending period.
- Trending services page.
- Feature for users to review subscriptions by giving stars and comments.
- howing total active users on each service etc.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

REFERENCES

[1]. Shi, Jianfeng & Yi, Dian & Kuang, Jian. (2019). Pharmaceutical Supply Chain Management System with Integration of IoT and Blockchain Technology. 10.1007/978-3-030-34083-4_10.

[2]. Tseng JH, Liao YC, Chong B, Liao SW. Governance on the Drug Supply Chain via Gcoin Blockchain. Int J Environ Res Public Health. 2018 May 23;15(6):1055. doi: 10.3390/ijerph15061055. PMID: 29882861; PMCID: PMC6025275.

[3]. Haya Hasan, Esra AlHadhrami, Alia AlDhaheri, Khaled Salah, Raja Jayaraman, Smart contract-based approach for efficient shipment management, Computers & Industrial Engineering,ISSN 0360-8352,doi:10.1016/j.cie.2019.07.022

[4]. Sunny, J., Undralla, N., Madhusudanan Pillai, V., Supply Chain Transparency through Blockchain-Based Traceability: An Overview with Demonstration, Computers & Industrial Engineering (2020), doi: https://doi.org/10.1016/j.cie.2020.106895

[5]. T. Bocek, B. B. Rodrigues, T. Strasser and B. Stiller, "Blockchains everywhere - a use-case of blockchains in the pharma supply-chain," 2017 IFIP/IEEE Symposium on Integrated Network and Service Management (IM), Lisbon, 2017, pp.772-777, doi: 10.23919/INM.2017.7987376.

[6]. Akhtar, Mohd & Rizvi, Danish. (2020). Traceability and Detection of Counterfeit Medicines in Pharmaceutical Supply Chain Using Blockchain-Based Architectures. 10.1007/978-3-030-51070-1_1.

[7]. B. M. A. L. Basnayake and C. Rajapakse, "A Blockchain-based decentralized system to ensure the transparency of organic food supply chain," 2019 International Research Conference on Smart Computing and Systems Engineering (SCSE), Colombo, Sri Lanka, 2019, pp. 103-107, doi: 10.23919/SCSE.2019.8842690.

[8]. Haq, Ijazul & Muselemu, Olivier. (2018). Blockchain Technology in Pharmaceutical Industry to Prevent Counterfeit Drugs. International Journal of Computer Applications. 180. 8-12. 10.5120/ijca2018916579.

[9]. K. M. Botcha, V. V. Chakravarthy and Anurag, "Enhancing Traceability in Pharmaceutical Supply Chain using Internet of Things (IoT) and Blockchain," 2019 IEEE International Conference on Intelligent Systems and Green Technology (ICISGT), Visakhapatnam, India, 2019, pp. 45-453, doi: 10.1109/ICISGT44072.2019.00025.

[10]. Supply Chain Management based on Blockchain: A Systematic Mapping Study Youness Tribis, Abdelali El Bouchti, Houssine Bouayad MATEC Web Conf. 200 00020 (2018) DOI: 10.1051/matecconf/201820000020

[11]. Gregor Blossey, Jannick Eisenhardt, Gerd Hahn, “Blockchain Technology in Supply Chain Management:An Application Perspective”, doi:10.24251/HICSS.2019.824

APPENDICES

Base Paper

- T. Bocek, B. B. Rodrigues, T. Strasser and B. Stiller, "Blockchains everywhere - a use-case of blockchains in the pharma supply-chain," 2017 IFIP/IEEE Symposium on Integrated Network and Service Management (IM), Lisbon, 2017, pp. 772-777, doi: 10.23919/INM.2017.7987376.
- K. M. Botcha, V. V. Chakravarthy and Anurag, "Enhancing Traceability in Pharmaceutical Supply Chain using Internet of Things (IoT) and Blockchain," 2019 IEEE International Conference on Intelligent Systems and Green Technology (ICISGT), Visakhapatnam, India, 2019, pp. 45-453, doi: 10.1109/ICISGT44072.2019.00025.
- Akhtar, Mohd & Rizvi, Danish. (2020). Traceability and Detection of Counterfeit Medicines in Pharmaceutical Supply Chain Using Blockchain-Base Architecture. 10.1007/978-3-030-51070-1_1.