

BLOCKCHAIN-BASED E-COMMERCE ONLINE APPLICATION

Mrs. M Harshini
Department of Information Technology
MLR Institute of Technology
Hyderabad, India
harshinimacherla90@gmail.com

Singi Reddy Satvik Reddy
Department of Information Technology
MLR Institute of Technology
Hyderabad, India
satviksingireddys@gmail.com

Shreyas Goparapu
Department of Information Technology
MLR Institute of Technology
Hyderabad, India
shreyasgoparapu@gmail.com

Swethan Deekonda
Department of Information Technology
MLR Institute of Technology
Hyderabad, India
swethan1010@gmail.com

K Harini Reddy
Department of Information Technology
MLR Institute of Technology
Hyderabad, India
harinikyasaram@gmail.com

Abstract— E-commerce is one of the world's major industries. E-commerce platforms require enormous power and storage space to manage large amounts of data and other services. The industry is doing very well right now, but there are ways to make it even better and address key data security concerns. This is made possible by blockchain technology. Blockchain helps e-commerce companies process data more efficiently. The platform can organize and store information about users, products, orders, shipments, manufacturers, merchants, etc. on the blockchain network. Blockchain is known for its security features that provide an added layer of security for the e-commerce sector. The proposed system will develop blockchain-based applications for e-commerce, improve security and reduce middlemen, thereby facilitating peer-to-peer transactions. Due to its efficient traceable nature, customers can avail an end-to-end order and product tracking.

Keywords— *E-commerce, blockchain, security, product*

I. INTRODUCTION

Our daily lives have been intertwined with the Internet and the demand for online services is constantly increasing. The world of computerization has had an enormous impact on global e-commerce platforms. Online business platforms bring the convenience and flexibility of different businesses to many network users. For example, the registration and transaction process can also be easily completed through the online platform. For this reason, cyber attacks are increasing at an unexpected rate around the world. As a result, the future of e-commerce platforms has gotten a major threat in the form of network architecture security. [3] Organizational data and customer trust are essential to a successful organizational development cycle. Data is very important for organizations to run and manage data, and also contributes to decision making. [2] Based on this, data can only be accessed by management and stakeholders to ensure privacy and compliance for the organization and its customers while maintaining customer loyalty. Therefore, it

is essential to use reliable tools and technologies to protect this valuable resource from illegitimate access [12]. The idea of a distributed ledger technology-based digital currency known as Bitcoin was put out in 2008 by its creator using the alias Satoshi Nakamoto. [16]. The underlying technology of Bitcoin is decentralized and encrypted in detail to ensure data integrity and accountability. For this reason, this technology is gaining traction and acceptance in many industries. It collects and encrypts data in a chain of backlinked information blocks to create a distributed database immutable against unauthorized access. Smart contracts have also become one of the key features of blockchain. It is a self-executing agreement between two or more parties used to manage access to data storage nodes. [1]

II. LITERATURE SURVEY

In our results, we found several relevant research papers describing various aspects of blockchain, decentralization, and e-commerce that will help us develop this project. [7]

The importance of blockchain technology in today's world and its major applications in various fields are discussed. This paper contains the history of Bitcoin and some literary reviews about it. A detailed explanation of how blockchain works, its traceability and accountability was provided. [8]

This article examines the intentions of users to transact via e-commerce technology and the impact of cybercrime on their perceptions. The study recommends that developers and architects incorporate key security features into future e-commerce technologies to reduce breaches and vulnerabilities and increase user confidence in e-commerce systems. [9]

This research proposes the development of decentralized applications on the Ethereum blockchain. Centralized applications had their drawbacks. The main reason is that it requires third-party approval and slows down transactions. Blockchain does not require a central central

authority to approve transactions or perform operations. This is a peer-to-peer based network operated by participating nodes. I had a model where the application worked over the network. This model states that a node must have some incentive for other nodes to trust it. These incentives are used to execute or execute transactions on the blockchain.^[10]

This white paper compares the use of traditional databases and blockchain technology in terms of performance and associated risks. We have elaborated on the fundamental difference between blockchain and traditional databases, distributed ledger technology (DLT), and its true value or potential.^[11]

This paper provides an overview of our work on e-commerce in agriculture and the development of e-commerce platforms using various technologies. The benefits of using direct marketing and eliminating third party services were discussed.^[12]

This white paper discusses the changing landscape of the e-commerce sector, especially after his COVID-19 pandemic. Potential blockchain advantages for retail e-commerce challenges are listed below. B. Reduce costs, ensure data security, and optimize supply chain management.^[13]

This white paper highlights the fact that blockchain security is one of the key factors for successful blockchain business applications. increase. Important security risks associated with existing systems are listed and briefly described. The data structure of blockchain technology has inherent security qualities as it is based on the principles of consensus, encryption and decentralization. This ensures that your data is immutable.^[14]

GAP ANALYSIS

Most of the e-commerce applications that we currently use have centralized databases and they have third party involvement who charge around 5-10% of the price as commission. The existing applications have their own merits and demerits. One of the main disadvantages of the current system is that the centralized database is heavily dependent on network connectivity. Thus, the slower the internet connection, the longer the database access time. Another major disadvantage with the current e-commerce platforms is Data Security. The data stored with the corporations is accessible to them and a potential for data being misused is very high. To overcome these limitations we intended to develop a blockchain based application for e-commerce. By using blockchain, our proposed methodology serves as the neutral computing system and the middle man involvement can be avoided which in turn reduces the prices and provides transparency. The decentralized application provides peer-to-peer connectivity that provides high data security as the data is incorruptible in the public ledger. Our approach is designed to overcome the limitations of conventional storage systems and thrive into a modern form of application interface utilizing blockchain technologies.

EXISTING SYSTEM

Existing systems that use centralized databases present a higher risk of a security breach. In today's e-commerce applications, all customer and product details are stored and managed on a single centralized server and if that server crashes due to too many requests or unforeseen circumstances and if the server is hacked, the services will not be available to other services. client. As cyber attacks have increased in severity recently, data breach issues have become important for individuals and organizations trying to ensure their privacy and security. Based on research, data breaches have increased at an unexpected rate, data breach incidents in 2016 were recorded at 36.6 million and increased to 197.6 million in 2017 then created a new record of 446.5 million data exposures in the following year^[17]. The problem of data breaches not only occurs in large companies but also occurs in small companies and they are more easily attacked and ransomed. Attackers have threatened and ransomed companies with stolen data. To overcome this, we are migrating e-commerce application to Blockchain, which will keep data across multiple nodes/servers and if one node goes down, clients can get data from different nodes. other active button.

DISADVANTAGES OF EXISTING SYSTEM:

- Centralized control
- Data security
- Lack of transparency
- Limited payment options
- Potential risk of increased security breaches

III. PROPOSED SYSTEM

The main objective is to develop a blockchain based application for e-commerce. In this, consumers can browse through the products that are present and place orders, whereas suppliers can easily add products onto the platform and check recent orders. The main area of focus is to address the centralized databases & data security issues and transparency. In this article, an e-commerce application is being migrated to Blockchain. This application will keep data on multiple nodes/servers and if one node goes down, customers can get data from public nodes or other kernels. Another advantage of Blockchain is that it has inherent support for data encryption and immutability (data cannot be modified by unauthorized users) and it will treat each data as a transaction/block and bind each block of storage with a unique hash and before storing a new record hash code of the previous blocks is verified and if all the nodes of the blockchain network verify successfully, the data is considered safe. To implement the proposed system, we used the Ethereum blockchain with Truffle to store e-commerce data. Ethereum is Since Blockchain cannot store images, we store product images in IPFS (Interplanetary File Storage) server and this server will store the images and return the hash of the saved images store and using this hash we can fetch the image from IPFS. A few modules were identified to begin with the pilot level implementation and deployment of the E-Commerce application.

ADVANTAGES OF PROPOSED SYSTEM

- Improved Data Security
- Transparency
- Lower transaction costs
- Better customer privacy
- Increased trust

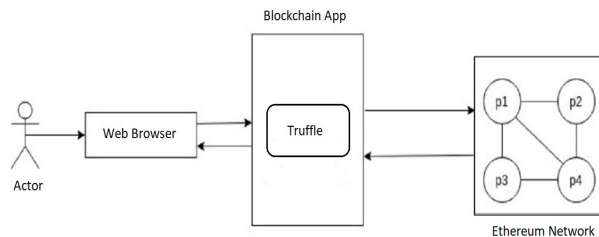


Fig 3.1. System Architecture

a) *Actor* : An entity that can participate in an action or a blockchain network is called an actor.

b) *Web Browser* : Web3 browser helps users interact with decentralized applications based on blockchain technology. Web3 technologies such as distributed ledgers, artificial intelligence, Metaverse and others aim to create the next generation Internet that everyone can access and benefit from.

c) *Blockchain App* : A blockchain application is a decentralized application that runs on a distributed ledger.

d) *Truffle* : Truffle is the framework for smart contract development. Ganache helps you set up your personal Ethereum blockchain for development and testing on the local network. Drizzle serves as a repository of ready-to-use components and is an indispensable tool in dApp UI development.

e) *Ethereum Network* : Ethereum is a decentralized blockchain platform that establishes a peer-to-peer network that securely executes and verifies application code, known as smart contracts. Smart contracts allow participants to transact with each other without the need for a trusted central authority.

IV. MODULE IDENTIFICATION

An E-Commerce application has two important factors - suppliers and consumers/customers. Suppliers are the ones who sell their products on the platform. There are specific actions for each of the stakeholders while there is also an operation which is common to both such as registering their details. To implement the aforementioned system in the rudimentary form, we have designed the following modules:

a) *Signup* - This is the common point of operation for both the consumer and supplier. Using this module,

product providers and consumers can register with the application to set a username and password.

b) *Login* - This is an action which is specific to the consumer and supplier. They log on to their respective pages. Using this module, they can get into the application.

c) *Add Product* - Through this module, vendors can add new product details with appropriate images in the blockchain.

d) *Update Quantity* - In this, the no. of products in the blockchain is updated by the seller. This is used to maintain inventory control.

e) *View Orders* - This is a supplier side functionality which allows the suppliers to view the total numbers orders received from customers for their products.

f) *Browse Products* - This is a customer side functionality. Using this module, customers or consumers can search for the available products and make an order.

After identifying the above basic modules, we have implemented the e-commerce application on blockchain using various tools at disposal of Web3 and blockchain. A web browser is required for the user application interface. By using Solidity, which is the programming language used to write smart contracts, interaction with blockchain takes place. In Solidity, user defined functions such as registration, adding products and placing orders are created and then deployed to the Ethereum Blockchain. This Solidity smart contract

V. RESULTS AND DISCUSSIONS

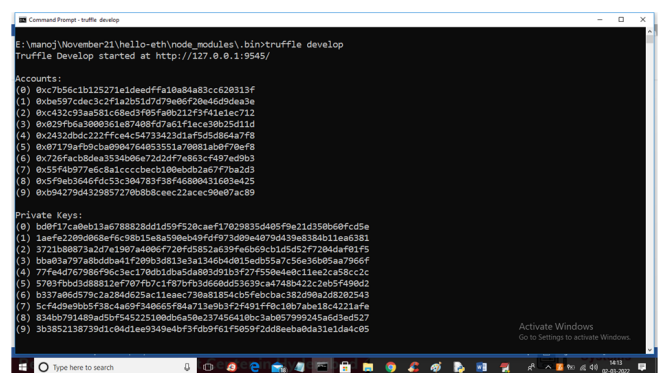


Fig 5.1

The above Figure 5.1, displays the successful connection to the private blockchain network. We are using the testing Ethereum network provided by the Truffle suite.

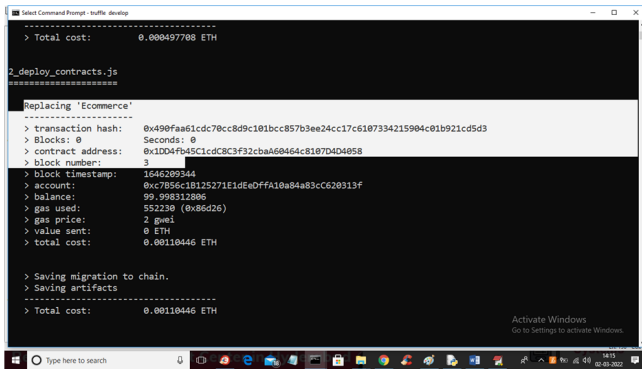


Fig 5.2

In the above figure 5.2, the highlighted text shows the successful migration and deployment of the project onto the blockchain network, with the contract address that is specified to be used in Python code to access the deployed contract.

The following are the snapshots of the e-commerce platform with various user options and features being displayed:

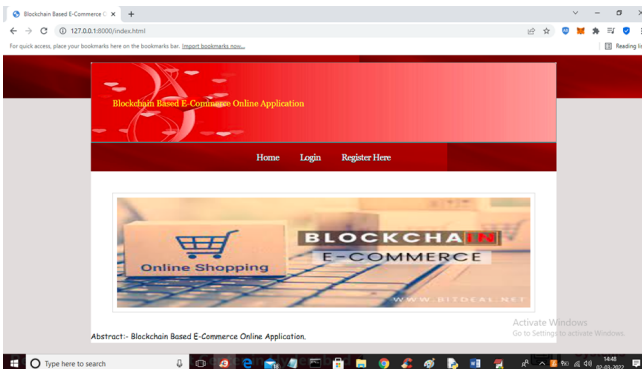


Fig 5.3

In Figure 5.3 above, click the "Register Here" link to register two users, such as a consumer and a provider.

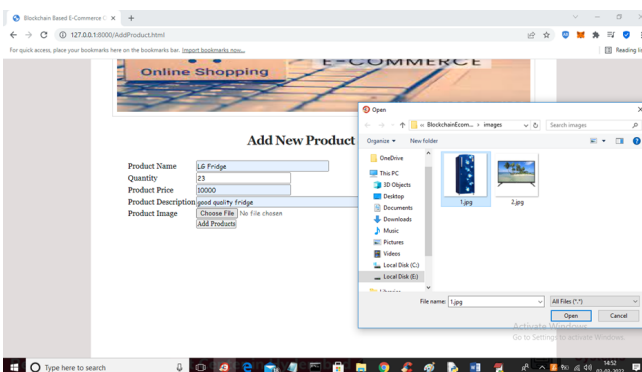


Fig 5.4

In Figure 5.4 above, enter new product details with image, then click "Add Product" button to add details in Blockchain.

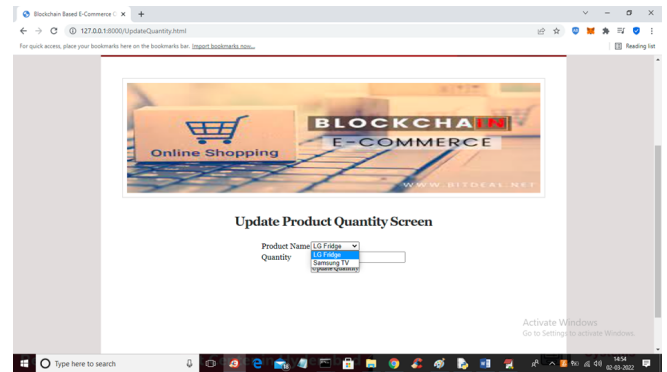


Fig 5.5

In Figure 5.5 above, choose any product name and enter new quantity.

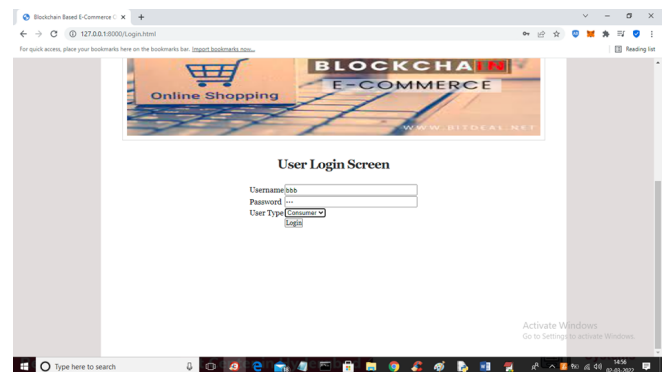


Fig 5.6

In the above figure 5.6, the client is logging in.

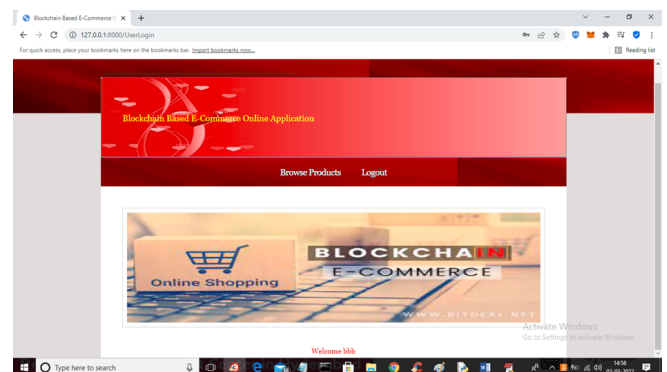


Fig 5.7

In Figure 5.7 above, click the "Browse products" link to get the product list.

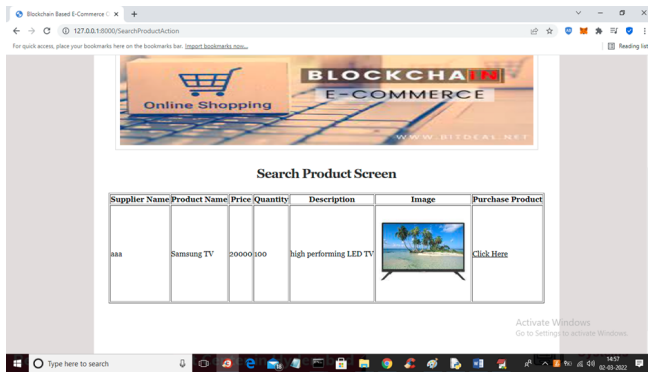


Fig 5.8

In Figure 5.8 above, the user can view the product list and then click the "Click here" link to order this project.

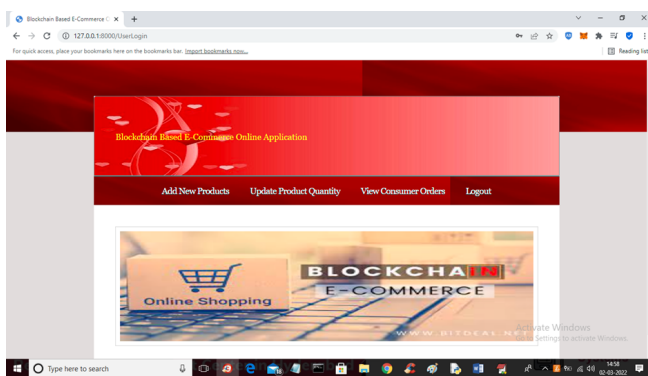


Fig 5.9

In Figure 5.9 above, click the "View Consumer Orders" link to view the order details below.

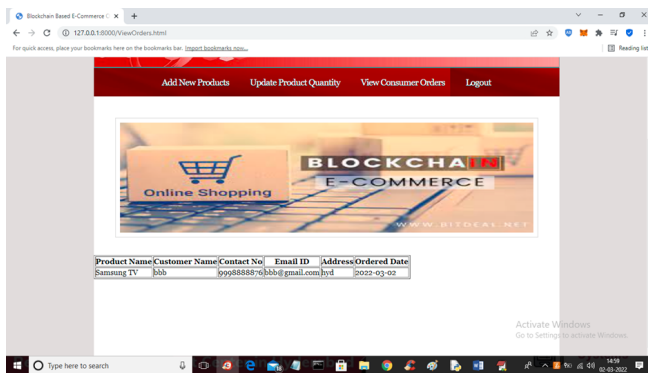


Fig 5.10

In Figure 5.10 above, the supplier can see the customer's phone number and address. Likewise, you can add products and make purchases as many times as you like.

VI. CONCLUSION AND FUTURE SCOPE

Here, we can summarize that the integration of blockchain technology in the database system of e-commerce trading platforms is essential to protect data from data breaches. Whether. This method is much better than implementing a traditional system because it uses a database system that is

vulnerable to hackers or ineffective for day-to-day business processes. A developed system can support an online retailer's business operations with its efficient and stable repository of properties. However, research limitations, including costs, need to be improved by further research on blockchain technology. Furthermore, a highly qualified technical team is required to support this system. This is also one of the organizational challenges that needs to be addressed in future detailed studies. This system is a basic one which encompasses the two major aspects of an e-commerce application - suppliers and customers. The next step for this proposed system would be to add a secure payment methodology involving digital wallets of cryptocurrency. As it is an Ethereum based project, there are many projects under development which can all deliver in building an inclusive and wide array of Web3 ecosystems. Blockchain-based e-commerce applications can enable decentralized marketplaces where buyers and sellers can transact without the need for intermediaries, reducing transaction costs and increasing efficiency. By involving features of Web3, shopping experiences can be changed for better and immersive applications.

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