Smart Start: Decentralized Electronic Marketplace

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ABSTRACT

Centralized online marketplaces like eBay offer consumers alternative options to sell and buy items in a relatively simple way. These marketplaces have some drawbacks. The platform has the right to block merchants; it charges a fee for listing and selling goods and does not protect the user's data. Lock-in effects exist in today's centralized e-commerce platforms. Both the content provider and the customer are targeted by the platform-binding effect during the purchase of digital content. A centralized platform offers multiple value propositions to the content creators and this causes lock-in effects Our paper proposes an application that utilizes the Ethereum Blockchain to address these issues. The Truffle development framework was used to create the app. The operations of the program were incorporated into an Ethereum smart contract, which was subsequently moved to the Ethereum network. We offer a strategy for decentralizing value propositions and dispersing them among various participants. As a result, we create a decentralized app using smart contracts and blockchain technology

Keywords—Blockchain, Ethereum, Crypto currency, Truffle-framework, Decentralized application, Smart Contract, Electronic commerce

I. INTRODUCTION

Centralized e-commerce platforms promote the purchasing of digital content. The content creators can sell the digital content to the buyer through the platform. The platform provides technical processing of payments, the content delivery network for the delivery of the purchased content to the buyer; digital rights management for authorization, technical solutions, and marketing services for the content creator, and allows the buyer to explore and access the content. However, these platforms charge for their services and are capable of compromising and selling user data.

Blockchain is referred to as a distributed database that stores data in blocks that are chained together. Each block has some storage capacity and when it is full, it is closed and linked to the previous block. This link constitutes a chain of data where the data is chained in chronological order. The most well-known use of blockchain is in cryptocurrencies. Cryptocurrency is a form of digital money that can be used for activities like purchasing and selling. Bitcoin, Litecoin, Ether, and Dash are examples of cryptocurrencies. With the entrance of Bitcoin, Blockchain has been gaining recognition. Another application of blockchain technology is developing decentralized application, besides cryptocurrency applications.

Decentralized applications don’t rely on a central authority. By using blockchain, the user would gain more control over their data and information. Also, it would reduce the costs associated with using the platforms. It is feasible to have each user protect their data in a decentralized system. Ethereum blockchain is found to be the most suitable platform to develop such an application. Ethereum makes use of ethers as a standard currency. Ether is the second- largest cryptocurrency. Ethereum has an easy to use framework and there are many applications built on the network. Ethereum allows the use of smart contracts. Smart contracts are codes that are activated when certain conditions are satisfied. These are then interpreted by the Ethereum web3.js API. The extension used by the users to interact with Ethereum is called Metamask.

R. Vishnu Prasad, Ram Dantu, Aditya Paul, Paula Mears and Kirill Morozov [1], proposed an application using Ethereum blockchain technology. Additionally, the application made use of many frameworks and technologies, including Truffle development framework, web3.js API, and Ethereum smart contracts. The use of this application was found to be cheaper than other auction marketplaces like eBay and Sotheby’s. Hence, the application was found to be successful in eliminating the limitations of the current auction marketplaces.

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II. PROBLEM DEFINITION

Existing centralized marketplaces have several flaws:

1) The corporation has complete control over the sellers: being the central point of authority, the firm has the right to prevent the sellers from transacting on their platform. With this ability of the firm, the sellers can lose their job at any time.
2) The seller's profit margin is lowered as the firm charges the seller a fee as a listing fee and receives compensation on sales. To deal with this, the buyer prices are raised.
3) Users of the platform do not own any of their data. User data, such as reviews, purchase history, and personal information is owned by the firm, and platform users have no authority over data acquired by the company. As a result, switching suppliers may be challenging for sellers.

The above issues occur as a result of the presence of a central point of control, or we can say that the firm acts as a middle man between the buyer and the seller. With blockchain technology, we can eliminate this middleman and hence provide enhanced security over user data and reduce costs.

The application's goal is to allow vendors to put their digital products on the marketplace and sell them without having to pay a transaction charge. The buyer should be able to select the product they want to purchase. Once the transaction is complete, ethers are delivered directly from the buyer's account to the seller's account, bypassing the use of an intermediary. In the form of blocks, all of the statistics about every transaction and event will be recorded on the blockchain.

The lack of a profit-making middleman characterizes the model. Failure's central points A middleman, for example,is a person who acts as a link between two parties.

III. LITERATURE AND COMPETITION SURVEY

N. Nizamuddin, K. Salah, M. Ajmal Azad, J. Arshad, M.H. Rehman [2], used blockchain technology, smart contracts, IPFS file system along with some tools like ChainSecurity and Oyente to develop a decentralized framework for document sharing. Version control, security, and the elimination of third-party dependencies were all advantages of this framework.

Hemang Subramanian [3], In this paper, the author has made a comparison between traditional e-commerce and a decentralized marketplace. The author also mentions the use of blockchain for prediction and financial analysis. Blockchain can also be employed with artificial intelligence applications, according to the author. Decentralization, according to the author, can complement and even compete with traditional e-marketplaces if done correctly.

Gimun Kim, Hoonyoung Koo [4], discovered that trust and perceived risk are the two most important factors influencing online transaction involvement. To determine the most important factor, a bidirectional model is created. According to the findings, trust is more important than perceived risk.

Myla M. Arcinas [5], has proposed an article related to blockchain in education. In this article, the author has mentioned the benefits and drawbacks of using blockchain technology in education system. Also, a blockchain-based architecture was presented to secure student information.

Millicent N. Ubaka, Ambrose A. Azeta, Aderonke A.Oni, Hilary I. Okagbue [6], created a blockchain architecture to protect the e-learning platform since it could give a system with vast openness, an online secure database, and other features that e-learning platforms require. The suggested blockchain system improves data security and eliminates trust issues between users and third-party entities that access applications and services. The methodology suggested has been shown to lessen the security and privacy risks associated with e-learning platforms.

Antonio Ramón Bartolomé, Carles Bellver, Linda Castañeda and Jordi Adell [7], strive to present learners with resources and links that will aid in their comprehension of blockchain technology. In addition, the use of blockchain technology in education is discussed. According to the writers, there will be an increasing interest in this technology in the next few years.

Marcel Muller, Jacek Aleksander Janczura, and Peter Ruppel [8], developed DeCoCo, a decentralized application to eliminate lock-in effects in e-commerce workflows. DeCoCo divides business logic in the digital content acquisition process and distributes it among different roles. To represent content ownership and execute remuneration through the transfer of bitcoin, a blockchain-based architecture with cryptographic tokens is deployed. As a result of this study, DeCoCo was found to successfully eliminate the lock-in effect.

Shadab Alam, Huda Abdullah Yousef Ayoub, Rafan Abdulhaq Ahmed Alshaikh, Asmaa Hayawi Hussen AL-Hayawi [9], This study provides a thorough examination of blockchain security, privacy, and trust. It goes on to look at the applications of

blockchain technology in the field of education, as well as the issues that come with them. Finally, it proposes a blockchain-based system for managing student records securely and reliably. Blockchain, the authors conclude, is a rapidly expanding technology that will become a pillar for many applications in the next few years.

PM Srinivas, Supriya B Rao, Shailesh Shetty, Shiji Abraham [10], offer a paper on the potential of blockchain in pandemic prevention. According to the report, blockchain technology can aid in the prevention of pandemics, tracking medication trials, early detection of epidemics, and outbreak management and treatment. A model is proposed that employs blockchain, with each block including information about covid-19 patients, making it easier to track and count infected people, while also ensuring that data is secure and may be used for future analysis.

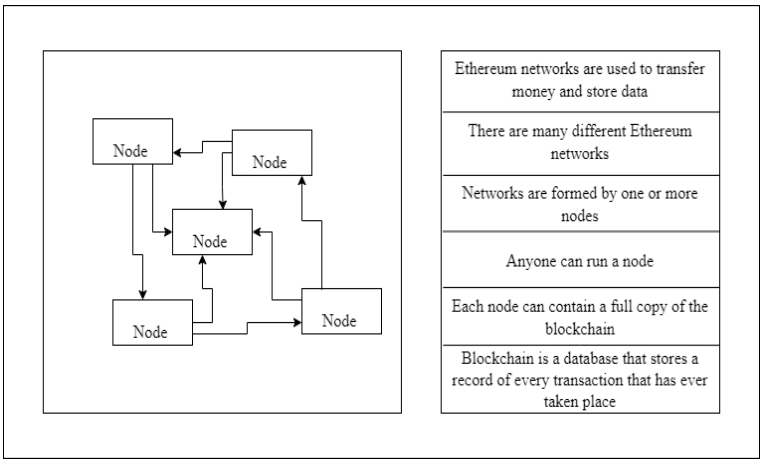


Fig. 1. An Ethereum Network

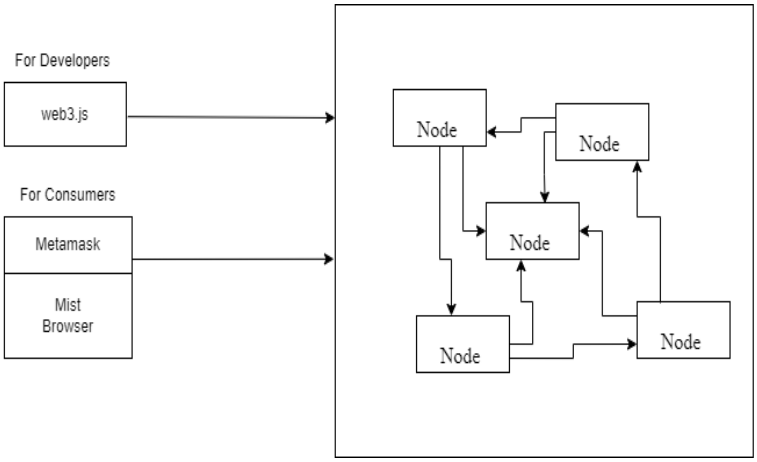
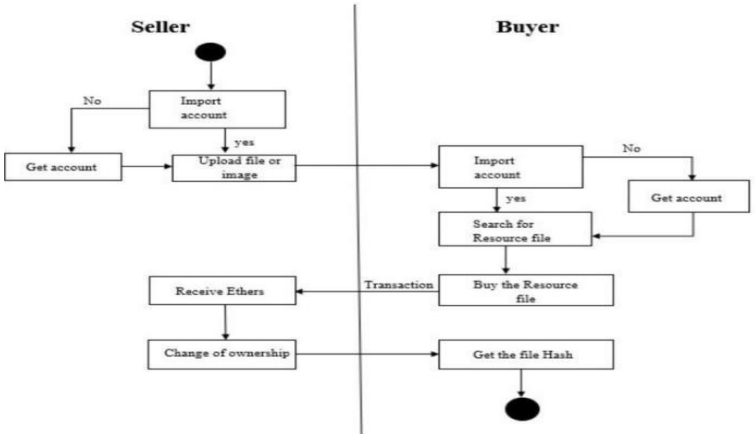


Fig. 2. Interfacing with an Ethereum Network.

IV. IMPLEMENTATION

The Ethereum blockchain was used to develop Smart Start. During the creation of Smart Start, we employed the Truffle-Framework. It includes tools for creating, deploying, and testing Ethereum smart contracts. To ensurecompatibility with commonly used development patterns, we employed implementation of the Ganache, truffle, solidity, mocha and chai.js.



Our application will be built on the truffle platform, we will be using ganache and metamask Ethereum wallet for the transfer of cryptocurrency, that is ether.

So basically, our project is all about buying and selling courses using cryptocurrency. Consider a seller who wants to create, upload and sell his course, so first, he will import an account from metamask, if he does not have an account then a new account has to be created. After importing an account, the seller can upload his course, at that time the course is owned by the seller himself. Now the courses are displayed to the buyer, at the buyer's end, the buyer has to import an account from metamask if he does not have an account a new account is created. After getting an account the buyer can see the displayed available course, if a buyer intends to buy a course he makes a payment using cryptocurrency ether,

This transaction is done directly between the buyer and the seller so the transaction is recorded and the cryptocurrency ether is received by the seller. Initially, the course owner was the seller, after the transaction is completed the course ownership is changed to the buyer i.e., now the course is owned by the seller. Now the buyer can access the course.

Our project's excepted outcomes are that we should be able to sell and buy the courses directly between the seller and the buyer without the involvement of any third parties as it reduces the commission, also there will be a secured transaction as the data is recorded on the blockchain with an immutable ledger i.e. the data will remain unchanged.

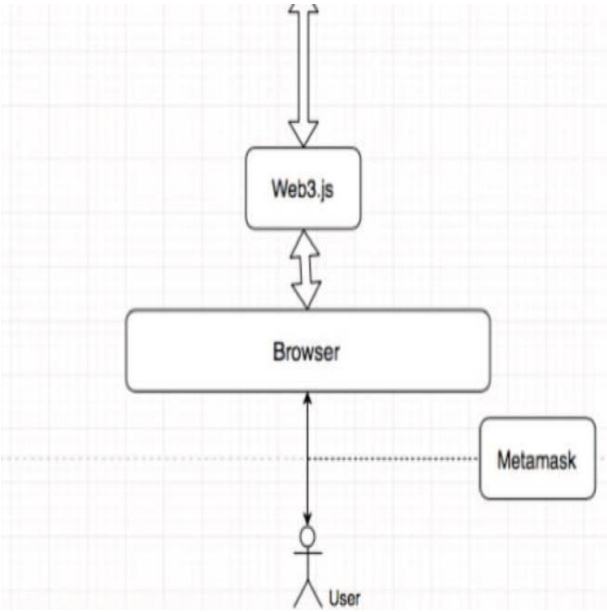


Fig: Marketplace Infrastructure

V. RESULTS AND DISCUSSION

We investigate the approach's viability by comparing the expenses of purchasing digital content via typical e-commerce methods.

Gas units are used to pay for transaction charges in Ethereum. The more computationally difficult the transaction, the more gas it will cost. The cost of deploying a smart contract or running a function is stable as long as the input parameters are consistent.

However, the exchange rate between ether and gas (gas prices) is continually changing. The amount of money that users are willing to spend to complete their transactions determines the exchange rate.

As network traffic increases, miners will be more likely to undertake transactions at higher gas prices. As a result, gas price volatility is factored into gas estimations as a critical factor. To determine the computational complexity of the application's transactions, gas consumption was monitored. The quantity of gas expended, as shown in Fig. 6, is proportional to the transaction's computational complexity and is estimated by the Ethereum network. This is because nodes choose to do less computationally difficult tasks, which slows down transactions that require a lot of gas to complete. The typical transaction costs 4.6 gwei and takes 3.8 seconds. It only takes a fraction of a second to form a contract. This illustrates that the test network is responsive to transaction requests from the application and, as a result, is quite fast.

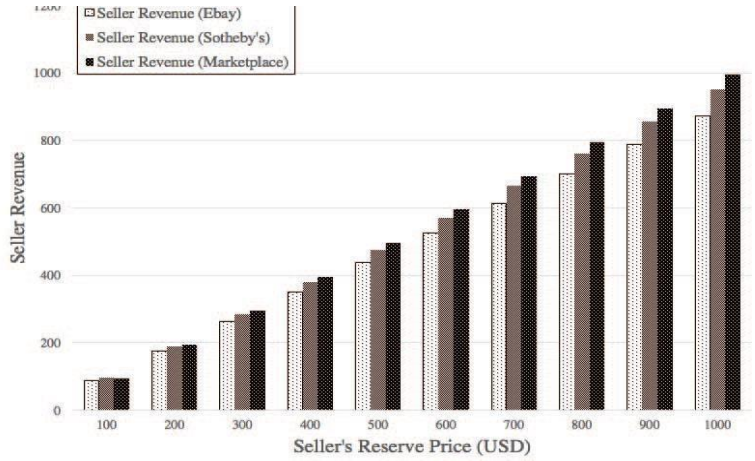


Fig. a: A comparison of the seller's reserve price and seller revenue.

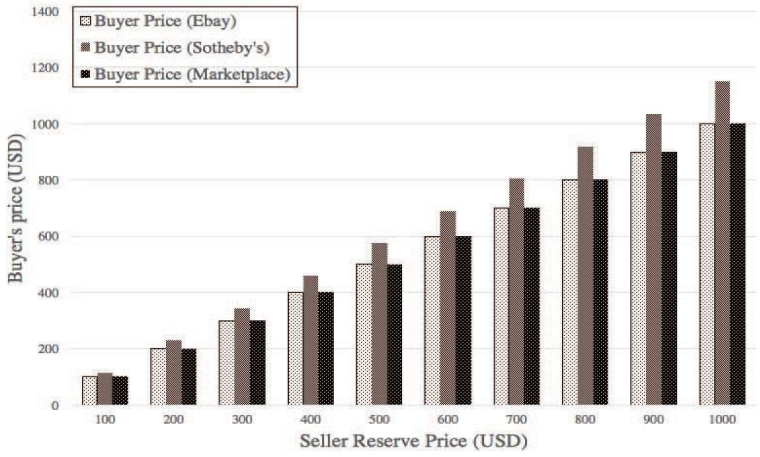


Fig. b: eBay's data nearly coincides with the Marketplace's data.

VI. CONCLUSION

This article divides business logic in the digital content acquisition process and distributes it among several roles. A blockchain-based architecture with cryptocurrency is utilized to indicate content ownership and demonstrate payment with bitcoin. As a result, content creators have the freedom to pick their collaborative partners without fear of being locked in.

Our application is successful because: The implementation of smart contracts eliminates the need for a third party, lowering expenses and reducing the risk of third-party manipulation. The application's cost analysis reveals that it is not costly for the seller, lowering the buyer's pricing. Openness is a system feature that can be verified by the public. The Ethereum architecture protects user data by ensuring that no one may access the information of another user.

The concept's direct integration into web protocols will be the focus of future efforts. There are currently projects in place for centralized marketplaces. W3C's payment request API is one such project. This requires a similar level of integration so that customers can acquire content licenses directly through their user agents in a smooth manner. The parties engaged, for example, can point directly to smart contract addresses using an enhanced set of HTTP headers. A header-based extension would allow for interoperability with different payment mechanisms, request monitoring, and resource discovery.

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