Product Grading System Using Blockchain

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ABSTRACT

Ratings and Reviews affect our decision making drastically, the current review systems are usually centralized and can be tampered. In today's era, choosing the right product has become an arduous task. So many options are available in the market, so many products are being advertised which make similar claims that the buyer gets confused which one is true and should be relied upon. It breeds a lot of dilemma in the mind of the customer. Essentially, a review helps to get the insight of the product, typically it describes what sets the product apart from others. A review offers valuable guidance from people who have used the product, it indicates what's the worst or best that could happen. This paper presents a decentralized approach which avoids the central authorities by using blockchain technology. Survey has been done by studying different approaches for making a decentralized system for taking reviews.

Keywords: Blockchain, Smart contracts, Ethereum ,IPFS, Online Consumer Reviews.

I. INTRODUCTION

Blockchain is a distributed ledger technology (DLT), that makes the history of any digital asset unalterable and transparent with use of decentralization and cryptographic hashing. Basically, it is a decentralized, distributed and a digital ledger having records known as blocks. The distributed ledger records the provenance of a digital asset. Each block has cryptographic hash of previous block, connecting the two. The linked blocks form a chain.

An Enormous usage and growth has been seen in online reviews recently. These ratings and reviews are used for various purposes by Tripadvisor, Airbnb, Amazon, Alibaba, eBay etc. The trustworthiness of these reviews has been (and is being) questionable, as these reviews can be tampered by the central authority. Customers give reviews to express their experience with the product. A highly rated product is the first thing the customer look at and can be deciding factor to choose between products [1,2].

Consumers that rely on reviews have to trust atleast two parties involved, i.e the authors of the reviews and the operators of online portals. Untrustworthy reviews of single authors, e.g., an extremely positive review in between negative reviews, can possibly be recognized by consumers. The operators acts as central authority and can modify the data throughout this complete review process. In worst case, they can even exclude consumers from submitting their review [2].

Revain[5,1] is a platform for user reviews that uses IBM's artificial intelligence. It filters out the potential

fake and low quality reviews and the good quality reviews are stored on Ethereum blockchain. The system consists of three components – firstly a stable token system using token (R and RVN). Secondly, IBM 's AI system for filtering out the quality reviews. Finally a immutable blockchain to store reviews so that they never get tampered with.

In this paper, we study a decentralized review system using blockchain to resolve the problem of central authorities. Consumers no longer need to rely on central authorities as blockchains operate decentrally across a network of several nodes, in which every user can participate [2]. Rating and reviews can be stored on the block using smart contracts and assures distributed trust since it is nearly impossible to modify any transaction stored in the blockchain. The information stored in the blockchain is public , i.e anyone can search the chain for historical transactions, enabling consumers to submit and access trustworthy reviews.

Ethereum is a blockchain, developed in 2014 by Vitalik Buterin. In comparison to the Bitcoin blockchain, which handles accounts and transactions, Ethereum stores programming logic also. When paying for its execution, any turing-complete script can be run on Ethereum. Thereby, it enables decentralized apps without any possibility of downtime, censorship, or third-party interference[2,9]. Smart Contracts were first introduced by Szabo [8] in 1994. These are self-executing contracts that operate autonomously. In Ethereum, smart contracts can be written by Solidity. Contracts are executed on several nodes within Ethereum virtual machines (EVM). After executing a contract, nodes must reach a consensus of the calculated result [2,8].Once the consumer gives the review , the review will be stored on to the block and nobody can modify those reviews. These reviews can be referred as untampered reviews [2].

After publishing a smart contract, the contract is executed by sending transaction to the contact address. This implementation can be done in two ways.

The first way is by handling the transaction at the backend. The key pair(private and public keys) will be generated at the backend. The signing of transactions also is also done in the backend[2]. The other way is using an app for creation and generation of the keys like metamask.

The drawback of the first way is that the keys are stored on the backend which acts as a central database which can be exploited.

Metamask can be used for generating of keys and helping in transaction. Along with Metamask, customer reviews are stored into the blockchain which can increase the storage cost. To reduce this cost, a distributed file-system can be used such as InterPlanetary File System(IPFS), each item on IPFS can be identified by a hash and can be accessed by URL. The hash came from IPFS, then can be stored onto the blockchain which reduces the storage cost.
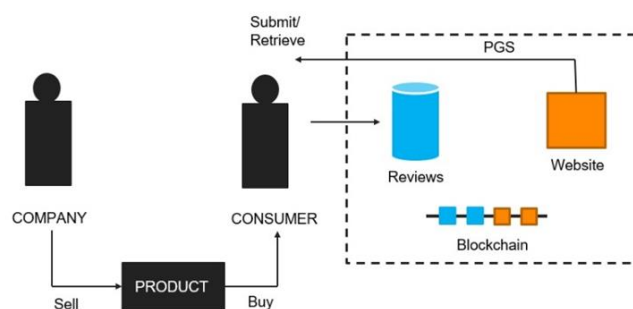
II. PGS APPROACH

Figure 1: PGS Approach

The fundamental goal of PGS is to avoid central authority and to create a system that will give access to give review, rating and store the data which cannot be tampered by any third party user, as in the centralized approach central authorities can exclude

specific users to submit their ratings and reviews and as these reviews are stored on the central database, they can modify the existing reviews and also can add fake reviews from fictional consumers. In PGS approach, it is no longer possible, once the review is stored on the blockchain, it cannot be modified as shown in Figure 1. We would be using Ethereum virtual machine (EVM) which is a design based on peer-to-peer network protocol. Anyone can participate in the network and play the role of a verifier, i.e, a miner, which is a basic element in EVM. This virtual machine is an environment that runs smart contracts.

This approach must fulfill some requirements-

1) Consumer must have purchased the product.
2) Consumer must be distinguishable.
3) Consumer must have a crypto-wallet in order to sign the transactions for submitting the review.

III. IMPLEMENTATION CHALLENGES

A. Validating that the consumer bought the product

Unfortunately, it is difficult to solve the issue of knowing that the consumer has bought the product and giving rating on the basis of his/her experience. In PGS approach, it is compulsory to upload a image of the product explaining why they are happy/sad with the product while giving a review. The same image cannot be used by others as no duplicate images can be uploaded which will be explained in the next point.

B. Reducing costs of data storage

Another challenge is of storage of these images on to the blockchain. Storing data on the blockchain can be extremely expensive. For example, if you want to store 1GB of data in a Blockchain system, the estimated cost would be around 100$. In order to tackle this problem we use a versioned file system which makes use of cryptographic hashes. We are going to discuss about two solutions on how to encounter this challenge-

The first one is by using a database like MySQL for storing the hash of the images along with the image and make the hash field has primary key which will ensure that no duplicate images can be entered. The image which is uploaded by the user is first converted into a Base64 format string value. This string value is then converted into a hash-code using the SHA-256 algorithm, which is the most effective hashing algorithm. Once the image is converted into its equivalent hash value, it is then stored in the MySQL database. Same images will produce same hashes and can be detected from the database. Incase of failure of giving a review, the uploaded image is deleted from the database.

The other approach is by using InterPlanetary File System(IPFS). IPFS is a peer-to-peer network protocol which is used to store and share data in a distributed file system. Blockchain used together with IPFS gives rise to a decentralized file storage system which allows one to keep track of files and their respective versions from everyone in a network. This file system is indisputable as it is similar to the blockchain network and doesn't allow any tampering of data. On storing something on the IPFS, it returns a hash value which can be stored on the smart contract and the content can be accessed the uploaded content using the hash.

IV. IMPLEMENTATION DETAILS

Smart Contract was implemented using Solidity programming language and tested using Remix IDE. In order to get access to the facilities of the website, the consumer first needs to register themselves. After registering, for a consumer to a give a review, consumer needs to upload an image after which they can rate and give review for the product. Consumer

has to sign transaction for account creation and every time they are giving a review.

V. LITERATURE REVIEW

[1] K. Salah, A. Alfalasi, M. Alfalasi (2019). In this paper they have proposed a blockchain-based review system which is used to store the reviews on the blockchain. They have combined the use of Ethereum networks and smart contracts with Inter-Planetary File System(IPFS). IPFS will act as storage system in which reviews will be stored and the hash of that file will be stored in the blockchain along with the reviewer's Ethereum address. The Service Provider will issue tokens and the user can submit the review using that token, the token will get verified and the user will be rewarded.

[2] Daniel Martens, Walid Maalej (2018). They have proposed a decentralized review approach which resolves the problem of central authorities, being able to influence the review processes and have also summarized the implementation, challenges and discuss design alternatives.

[3] Ching-Nung Yang, Yi-Cheng Chen, Shih-Yu Chen, Song-Yu Wu (2019). They have introduced a system that tried to resolve a problem of online shopping scams by making an alliance with e-commerce companies and trusted organization to establish a credible product grading system. After verification and product grading , the manager of alliance will write the data onto the blockchain operating a smart contract and the customer may buy product with high grades to insure product quality.

[4] Zibin Zheng,Shaoan Xie, Hong-Ning Dai, Weili Chen, Xiangping Chen, Jian Weng, Muhammad Imran(2019). They have given an overview of blockchain and smart contracts. They have also compared the advantages of smart contract over conventional contracts which includes reducing risks, cutting down administration and service costs and improving the efficiency of business processes. The paper also tells about the creation, execution and deployment of smart contracts and also about creation challenges.

[5] Revain: White paper. This document describes the Revain-plaform. It creates an easy-to-use service that would help companies to receive constructive feedback for their projects. Revain is the first review platform that implements blockchain technology for ensuring the feedback to be genuine and legitimate. In addition, it also discusses about the problems occurring in the current scenario and mathematical formulas for calculating bonuses that make submitting fake reviews unprofitable.

[6] ChengjunCai, HuayiDuan, and Cong Wang, (2018). In this paper, they have establish a set of design principles which will facilitate the development of secure blockchain applications and security management against known attacks like DDoS, Eclipse attacks in the network layer and recovering strategies to deal with massive attacks, consensus protocols and security enhancement.

[7] Gábor Magyar (2017), defines blockchain as the chain of blocks using immutable key referencing mechanism. There is no central authority responsible for governing and managing the data in the blockchain. The values recorded in the blockchain are synchronized between all the peers on the network and the consensus mechanism provides the commonly accepted validity of data. The paper introduces a new approach to an healthcare information model using blockchain.

[8] Nick Szabo. 1994. This paper describes about digital cash protocols as example for smart contracts, defining smart contract as a computerized transaction protocol that executes the terms of a contract , it gives a brief about

cryptographic protocols and how smart contracts can bring a difference in the future.

[9] Vitalik Buterin. In this paper author has discussed about the history of bitcoin as a state transition system, mining, merkle trees, about Ethereum and applications of Ethereum.

[10] Daniele Magazzeni and Peter McBurney, William Nash (2017). In this paper, they have explained about blockchain as a type of distributed ledger in which data is stored in blocks which are linked together to form a sequential chain. They have also discussed about distributed ledger-technologies, shared state, smart contracts and verification and validation of those smart contracts.

[11] Weiqi Dai, Chunkai Dai, Kim-Kwang Raymond Choo, Changze Cui, Deiqing Zou, and Hai Jin (2019). They explain the conventional data trading system which comprises of 3 parties including middle person. The seller will send the data on the trusted platform and set a selling price. The buyer will select product of interest and order similar to e-commerce transaction. However if the dataset cannot be directly used by buyer, then buyer will need to re-process the dataset to require the results satisfying the buyer's need. This paper analyzes the market and sets new rule for trading in the market using smart contracts to implement secure data trading platform(SDTP) on Ethereum.

VI. CONCLUSION

Product's rating highly influence customer's decision. A highly rated product is the first thing the customer looks at and if that rating/review is tampered or manipulated , the customer can get trap into these scams. This paper studied the existed problem which involves central authorities acting as operators. This paper presents a decentralized approach which avoid central authorities by using blockchain technology, enabling customers to submit and retrieve unmodified reviews. This paper also highlight some of the implementation challenges encountered undergoing our approach on the public Ethereum blockchain and discuss possible alternatives.

VII. REFERENCES

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