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Blockchain Based Decentralized Social-media to Prevent False Copyright Infringement

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ABSTRACT

Social Media Networks have become a vital part of everyone's daily life. Social Media plays a crucial role in connecting people. Most of the social media sites like YouTube, WhatsApp, Twitter, etc. that exist today operate in a centralised manner. It means a single organisation is responsible for managing all the activities, like the regulation of business rules, terms and conditions, maintenance, and development of social media. These companies solely control the content removal with respect to copyright and other false content. We provide a Decentralised system where people who use the platform—social media like SteemIt, Ushare, Mastodon, etc.—get power to manage the critical aspects like features needed for the platform's development and the reduction of false copyright infringement.

Keywords: Decentralized social media, Blockchain

I. INTRODUCTION

In recent days, most people depend on social media for a living. For example, professional YouTubers, Instagrammers, etc. These platforms handle copyright infringement in a centralised manner, which means if a user finds his or her content posted by another user, he files a copyright report, which will be evaluated by the company. If the company finds the report to be legitimate, it will discard the copyrighted post, and the user who posted the post will be demonetized or penalised in other ways. Dapps uses PoS, DPoS, PoT, etc. for consensus. It has created a major problem as the copyright content might be fake and a single central company has no time to evaluate all the reports. Modern social media sites like YouTube assume that a user with a higher number of subscribers is legitimate. This has led to many legitimate YouTubers getting demonetized, which can affect their major source of income. On a centralised platform, companies with a single brand make the mark of the company's popularity and reputation, which holds the trust of the people on the platform. They control the activities, such as launching a new feature or event that can officially represent the platform and encourage people to use it more often. Centralization gives control to the company or stakeholders to apply their ideas, which they believe are best for the people.

To combat this problem of copyright infringement, we are designing a decentralised social media platform based on the principles of blockchain. Social media will not be controlled by a single person or organisation.

Control is distributed into the hands of several witnesses who are elected in an election similar to DPOS. Everyone who is part of the process will get a proportion of the reward based on their nature of work.

II. LITERATURE SURVEY

A. Incentivized Blockchain-based Social Media Platforms: A Case Study of Steemit

Steemit is operated by a decentralized community, where 21 members are periodically elected to cooperatively operate the platform through the Delegated Proof-of-Stake (DPoS) consensus protocol proposed by Li et al. [1]. It includes the decentralisation of data generated on the platforms and the deep integration of social platforms with the underlying cryptocurrency transfer networks. It is also the first blockchain-powered social media platform that incentivizes both creators of user-generated content and content curators. A few of the advantages of Steemit are that the data stored on the blockchain is publicly accessible and hard to manipulate. Also, on Steemit, users can maintain complete anonymity. Steemit uses its native cryptocurrency, STEEM. Thus, it is not dependent on any other platforms. It is completely censorship-free. But this could be misused also; hence, it has a few limitations. If the size of the group is too large, it won't be feasible foronly21memberstovalidateallposts.Powerofbigshareholders: It is observed that most of the time, the 21membersareconstitutedbybigstakeholders,whichsuppressesdecentralisation.RewardsystemsinSteemitmay also be misused by some users in ways that deviate from theoriginal intended goal of Steemit, such as buying votes frombots to promote some meaningless posts for profit.

B. Social-Chain: Decentralized Trust Evaluation Based on Blockchain in Pervasive Social Networking

The authors of [2] proposed the Proof-of-Trust consensus mechanism, which is lightweight and thus can be feasibly deployed in a mass of resource-limited PSN nodes. They proved the security of the Social Chain, which overcomes the risk of centralization and fork issues appearing in many existing blockchain systems. The experimental results further show its effectiveness and efficiency. Mining Winner Selection uniquely selects a block from multiple candidates, so a blockchain fork can be avoided. Specifically, they limit the total number of wins by an individual miner in a specific period to ensure decentralisation. Peng et al. [2] proposed that PoT, a newly generated block, can be confirmed as the next block if and only if it is approved by a sufficient number of miners with a sufficient sum of trust values. Miners can determine the correctness of the blockchain by verifying hash values. In PSN, it lacks a centralised party to perform information collection, social data aggregation, and trust evaluation, which should be self-organised by involved parties in practise. Proof-of-Trust can be easily hijacked if the number of malicious users is greater than a certain threshold. Most of the existing consensus mechanisms may not be applicable as they use cryptocurrency as an incentive. They cannot solve the problems of centralization and forking at the same time.

C. A Blockchain Enhanced Framework for Social Networking

User activities in SNSs are stored in the blockchain, along with queries for the data that are generated by APIs. Murimi et al. [3] implemented a blockchain that stores information about user content, preferences for sharing, rewards for sharing content, and records about data access. They define transactions as the set of actions performed on various websites. The user can choose the sharing preferences for her data. Thus, sharing preferences are not just dictated by the network or website settings on privacy and sharing. A user can control

the subset of her friends on a SNS that can access her data and can choose what portion of her anonymous data is available for access by other users. This framework is capable of data attribution on both anonymous and non-anonymous networks. It can be used to effectively track the number of users that engage with content of various kinds. Users can be rewarded for their transactions on the network by choosing reward algorithms that are suited to their privacy and monetization preferences. These rewards can be in the form of digital tokens and are also stored on the blockchain in the BEV-SNS version. Even though the user wants to stay anonymous, he will expose quite a lot of personal data in his posts. Anonymity and monetization cannot be achieved at the same time. It still has the problem of resource consumption for consensus as it uses Proof-of-Work.

D. Ushare: user controlled social media based on blockchain

In this system, users would be able to share their data with their circle of friends, family, and others. Chakravorty et al. [4] introduced a Personal Certificate Authority (PCA) for each user that would remain outside the blockchain in their personal space as client software. The PCA would issue certificates based on the circles created by a user to share their data. This allows only members belonging to a user's particular circle to view the content shared with that circle on the blockchain. Ushare consists of four key components: the blockchain, a hash table with encrypted content shared by a user, a Turing complete relationship system to control the maximum number of shares performed by the user's circle members, and a local PCA that manages the user's circles and encrypts data to be shared. The PCA creates an encrypted version of the data with the circle's public key and stores it in a distributed hash table. The user shares the hash ID of the encrypted data with each member of their circle. This enables the maintenance of precise traceability and control over shareability. The distributed hash table stores posts hashed at both the user level and group level, making them more secure and available only to members of that group. With the growth of the blockchain with multiple circles and members, key management issues could have a major impact on security and performance. It still has problems with the consensus algorithm, which was discussed in previous papers.

III. THE PROBLEM OF FALSE COPY RIGHT INFRINGEMENT

A. Copyright Management in Centralized social media

In modern-day centralized social media, a single organization is involved in taking down copyrighted content. As a result, a single organization has to perform all the validation of the reported content, which becomes the bottleneck in the system. So, centralized social media has chosen an easy way of dealing with this problem, which is to favor the user or content creator who has more subscribers or followers on their platform. The problem with this approach is that if a user with large subscribers decides to claim others' original work, social media will favor the user with large subscribers instead of favoring the person with original work. This has become an everyday problem at the moment. So, a different approach has to be taken to eliminate this problem.

B. Decentralizing the socialmedia

Decentralising can be applied at various levels in a system. Some of the possibilities are

- Physical decentralisation (P2P networks): It involves decentralisation at the server. Any group of people can host their own server and start using social media. They can choose to remain anonymous or have open communication with people on other servers. e.g.: Mastodon.

- Logical decentralisation: Unlike physical decentralisation, there will be a single unit of servers connecting all the users around the world, but the decentralisation is applied at the data storage level. It could be storing the entire data of the network in a blockchain-based database, as shown in Figure 1, instead of a traditional database, or using the principles of blockchain to monitor the problems. e.g.: Steemit.

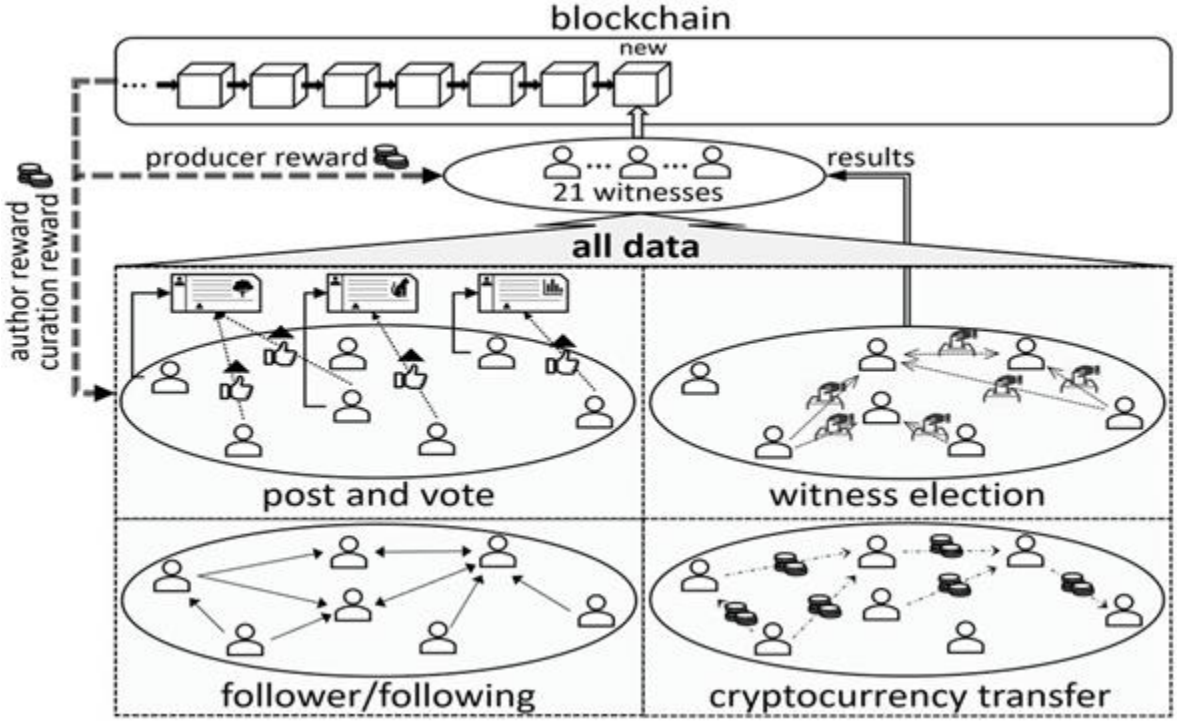

Figure1:BlockchainLogicalDecentralization

IV. DATASTORAGE

It is known that a lot of data is generated on social media. Based on the nature of the data, we may need to store it in different ways. There are posts, comments, user data, user activities, and cryptocurrency exchanges; we will suitably categorize and store them as per the needs. Blockchain design becomes a crucial part of our social media. There are various design approaches, so it is important to decide the tradeoffs of these designs. The proposed model uses blockchain as an immutable ledger. Instead of storing every social media activity on blockchain, which will unnecessarily increase the storage space. We are storing only those activities that are required to be stored as immutable. Some of them include witnesses validating posts, election data, cryptocurrency transfers, etc.

A. Abbreviations and Acronyms

- Dapps: DecentralizedApps
- PoT: ProofofTrust
- PoS: ProofofStake
- DPOS: DelegatedProofofStake
- SNS: SocialNetworkingService

B. Equations

A user in the platform can have the power vested in it and gain rewards due to up votes to the post. Up vote and Down vote will consider the user's powers to gain rewards.

Cost of 1 vote = (User's Power / Total Power in thePlatform)*k

k-Numbertocalculatethecostof1votewhichisgreaterthan1

Users get power p for each upvote by a person upv in aplatformconsideringthepreviousupvotesupvpreviousandtheirpower.

p=A*p+upvprevious

A-MovingAverageConstant

The total revenue generated is distributed in two ways. 60% isdistributedtostakeholdersandplatformmaintainers,and 40%isheld as stake convertible power P. Power can be convertedintomoneyK(Moneyperunitpower).

- Money M obtained through the conversion of a certain amountofpowerp,M=p*K
- Powerleftp'afterconversionintomoney,p'=P-p

The top20%ofthepeopleontheplatformcanparticipateintheelection. 5% of them will be elected as miners up to amaximum of 25 members. The number of miners is always odd.In the event of a copyright infringement issue occurrence,minerswillvotetodecidetherighteousowner.Theonewiththe maximum number of votes will be considered therighteousownerofthecontent.

V. USER GROUPS

There will be mainly two user classes: miners and normal users. Normal users can post content and upvote or downvote others' posts. They can join any group of interest, and their goal is to earn more reward points and become a miner in their group. Miners have the additional responsibility of validating other users' posts, even though it is completely voluntary. The Miner's goal is to correctly validate posts and remove malicious miners. There will be an organization to manage the rules and protocols of social media. The organization only deals with the management of social media, like hosting, adding new features, and other rules. This organization defines sets of rules and regulations even though it has no control over aspecific group or post.

VI. ALGORITHM

A. Consensus Algorithm

Every user will have some power. His or her power increases when they post good content (based on upvotes), and their power decreases when they post malicious content (based on downvotes and reports). We are using a modified version of Delegated Proof of Stake (DPOS). In each group, an election is conducted at specific time intervals. In each group, 20% of people compete in elections (based on the value of power they hold), and the rest of the people vote for witnesses for their groups. Our algorithm should take care that the same people do not become witnesses many times in a row.

B. Incentives Algorithm

The fund is generated through the cryptocurrency market and ads. There will be mainly two types of incentives: cryptocurrency rewards and power. When a user posts good content and gets upvotes, he can withdraw the incentive in the form of both cryptocurrency reward and power (e.g., 50% cryptocurrency reward and 50% power, or 100% power). Cryptocurrency rewards can be directly converted into fiat currencies for spending. Power adds more weight to the user's profile. But power is not directly convertible into fiat currencies. A user with higher power can participate in elections and get higher rewards for his or her posts in the future. When a user chooses to keep power instead of a cryptocurrency reward. He or she is indirectly investing in the cryptocurrency blockchain, which helps to increase the price of cryptocurrency. So, it is profitable for both users and the cryptocurrency market.

C. Revenue Model

Revenue is generated from ads and cryptocurrency trading. As users post good content, they receive cryptocurrency or power. When they receive power as a reward, they are indirectly contributing to the rise in the value of cryptocurrency. So, it is profitable for both users and cryptocurrency traders.

D. Solving Copyright Issues

When a user notices that his content is posted by another user, he will report that post for copyright infringement with a detailed report and proof of his original work. This report will be reviewed by multiple witnesses, depending on the power of the copyright claimant. The first step is the verification of digital signatures by using the user's public key. If the content is found to be copyrighted, the user's power will be suitably decreased, and that post will be taken down. If the copyright claim is false, the claimant's power will be suitably decreased. We assume that more than 50% of witnesses are honest and evaluate correctly. Even if a group of malicious witnesses tie up and perform malicious activities, they will be taken down in the next election by users, and the power of malicious witnesses will be suitably decreased. A newly created user account will have zero or negligible power. So, creating multiple accounts will not give any profit to the user since all of them will have zero power. If spamming is detected by witnesses, it will decrease the power of spammers. So, a user who has made efforts to gain power will not tend to do it. A user with zero power spamming will have no effect, as those posts are considered to have very little weight.

VII. RESULTS AND DISCUSSIONS

Copyright infringement, when raised by users, can be solved by miners; if miners are biased and malicious, they can be eliminated in the DPOS's next election and different miners elected. Assuming that more than 50% of the network is non-malicious, the risk of malicious users taking over the network is prevented. Users are rewarded with cryptocurrency for their honest actions, which in turn benefits social media as well. Instead of storing all the data in the blockchain like some of the current decentralized social media, which affects the performance as blockchain databases are not as fast as modern databases, only the data that needs to be preserved immutably is stored in the blockchain, and the rest of the content is stored in the modern database.

VIII. CONCLUSION

Copyright issues are increasing with the development of technology and the use of social media. We provide a solution to this issue with a blockchain-based approach. This idea can be successful if a large number of people start using decentralized social media because we need a large number of legitimate users to nullify the effect of malicious users.

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