
ISSN: 2321-2152
IJMECE
International Journal of modern
electronics and communication engineering
E-Mail
editor.ijmece@gmail.com
editor@ijmece.com
www.ijmece.com

ISSN2321-2152www.ijmece .com
Vol 10, Issue.3July 2022

DECENTRALIZED WEB HOSTING USING BLOCKCHAIN

KARNATI NIKITHA, NARALA RENUKA , BOLLAM PAVANI , GUNDAGONI NIKHILA
SUPERVISOR M RAMBABU

***Abstract**: This paper proposes a decentralized solution for web hosting based on an interplanetary file system (IPFS) and Ethereum blockchain. Particularly, we use Ethereum smart contracts to manage the IPFS network and the web hosting service. IPFS platform is used to store data and to host websites. All storage miner nodes on the IPFS network offer the pinning service to ensure that source codes of the websites and users' data are retained long-term. Moreover, these nodes also enable the interplanetary name space (IPNS) service for creating and updating mutable links to IPFS contents. TXT record is also used in the domain name system (DNS) to map domain names to IPNS addresses for hosted websites. For privacy-preserving data storage, websites need to be deployed an encryption algorithm. The proposed model combines between the IPFS and blockchain networks to form a platform providing the decentralized web hosting service. Experiment illustrates building and hosting a web application on the IPFS network. Experimental results show that, compared to the traditional web hosting model, the hosted web application on the proposed platform ensures confidentiality, integrity, and availability.*

I. INTRODUCTION

Today's web apps provide several advantages to businesses and their customers. that allows users to do things like shop, connect with friends, do banking, do research, check email, engage with content, etc. The client-server model is the basis for almost all current web app implementations. As part of this design, web servers host websites' data and source code, and browsers relay requests from users to these servers. However, the following are some of the architecture's drawbacks: (i) Data security: anybody with access to the systems may read, change, or delete any information stored on those systems.

Associate Professor
ANURAG ENGINEERING COLLEGE
AUTONOMOUS
(Affiliated to JNTU-Hyderabad,Aprroved by AICTE-New Delhi)
ANANTHAGIRI (V) (M), SURYAPETA (D), TELANGANA-508206

Data is accessible through IP-based geolocation in terms of availability (ii). Centralised systems prevent users from accessing their data in the event of a failure (such as an attack, a denial of service, a distributed denial of service, or a system fault). To get over these restrictions, we offer a blockchain-based, IPFS-based decentralised web hosting solution. The IPFS platform has the benefits of being both decentralised and content-addressable. While maintaining privacy, transparency, decentralisation, and auditability, the Ethereum blockchain is a viable alternative. Smart contracts are used for the administration of the IPFS network and its users.

Blockchain technologies are often used in the development of decentralised applications. Interplanetary File System (IPFS) allows decentralised and distributed data storage and retrieval for distributed applications. The next several sections detail the primary benefits of using blockchain technology, the Ethereum blockchain, smart contracts, and IPFS.

A Blockchain is a distributed, encrypted, and often public digital ledger that consists of blocks of data. Each block includes transaction data, a timestamp, and a cryptographic hash of the prior block. The data in a blockchain is inherently tamper-resistant because once recorded, it cannot be changed without also changing all of the blocks that came before it. Participants may independently check and audit transactions at cheap cost using the aforementioned approach. Mass participation driven by individual motives ensures their veracity. For instance, this kind of layout supports dependable workflow in which users' worries about data security are minimal. Blockchain technology eliminates a digital asset's capacity for limitless replication. It proves that no money was spent twice, a longstanding issue in financial transactions. A blockchain is a mechanism for transacting values, as has been explained. A blockchain may help secure property rights by creating an immutable record of offers and acceptances.

Like bitcoin, Ethereum operates as a digital money. Ethers is the common name for the money.

The miners are rewarded in ethers if their job is verified. The amount of ETH in each wallet is constant. There are two types of participants on the Ethereum network: user accounts and contracts.

The ability to make and activate a contract is available to all accounts. Encryptions are used for transaction verification. These cyphers are examples of symmetric encryption. In most cases, the sender's private key is used to sign a transaction. In this case, we utilised truffle to represent Ethereum.

The Ethereum blockchain inherently assigns a proportionate fee in gas for each transaction based on the amount of resources used. The "gas price" in terms of ethers paid to miners. A miner will have greater motivation to include blockchain if petrol costs more.

The primary function of smart contracts is to serve as triggers, initiating a chain of events that must occur automatically and without human intervention. The primary goal of the smart contract is to eliminate the possibility of a third-party interfering with the agreement. Since there is no middleman to cause problems, smart contracts are often employed when exchanging money. Our research included the usage of smart contacts for the purposes of authenticating the storage miner node and processing transactions.

II. LITERATURE SURVEY

Tas R and Tanrıover O [11] had proposed a decentralized web application solution that have developed with blockchain. They had simulated the blockchain with truffle, a development environment. Ganache is a personal block chain for Ethereum development and used to deploy contracts, develop applications, and run tests and solidity to write smart contracts. Gourisetti S N G, Mylrea M and Patangia H [2] discussed about the different types of blockchains and provided a comparative study between the different algorithmic approaches. Provides deep insight and comparison of multiple commonly used mechanisms based on user requirement in [13] had proposed a modified blockchain framework, which aims to reduce the size of blocks in the blockchain to improve decentralization. Weber I, Staples M, Zhu L, Bosch J, Bass L, Pautasso C and Rimba P [12] have developed about the architecture and the algorithms that used in the blockchain and listed out some of the challenges and difficulties by comparing blockchain protocols in different respects and provided some existing approaches to solve the problems. Guerar M, Merlo A, Migliardi M, Palmieri F and Verderame L [3] have proposed a model that projects their end outcomes in which securing data using blockchain and providing a decentralized way using IPFS. Zheng Q, Li Y, Chen P and Dong X [14] had

proposed an IPFS-based blockchain based data storage model to solve storage issues in blockchain using IPFS to improve the scalability. The data volume of blockchain grows continuously due to the features that cannot be deleted and can only be added. Hence, the miners deposit the transaction data into the IPFS network and pack the returned IPFS hash of the transaction into the block. Utilizing the characteristics of the IPFS network and the features of the IPFS hash, the blockchain data has greatly reduced. Kumar R and Tripathi R [7] had proposed a model to solve storage issues in IPFS based blockchain. IPFS creates hash for all the files in their system. The system generally accesses using a distributed hash table. Kumar R, Marchang N and Tripathi R [6] had proposed a decentralized solution for maintaining the records of the patients rather than storing in a centralized database. Jianjun S, Ming L and Jingang M [5] had proposed a solution for data sharing with the help of Ethereum block chain and IPFS. Here they had used block chain to provide the integrity and verification of the users and for faster access and better availability, IPFS has been used as they are in a decentralized manner. Singla V, Malav I K, Kaur J and Kalra S [9] had proposed a leave application with the help of Truffle based on Ethereum with smart contracts. Chen Y, Li H, Li K and Zhang J [1] had proposed a storage model to improve the blockchain storage model. IPFS was a peer-to-peer version-controlled file system that synthesizes learnings from successful systems. Huang H, Lin J, Zheng B, Zheng Z and Bianhad J [4] summarized about the blockchain based distributed file systems and about IPFS and swarm systems discussing the open issues and series of challenges that constrain their development. Pham V, Tran C, Nguyen T and Nguyen Had T [8] had proposed a secure decentralized model, which has built in the combination of IPFS, ABE and MA-ABE. The encryptions standards have used to encrypt the document that was need to be share between multiple organizations. Steichen M, Fiz B, Norvill R, Shbair W and State R [10] had proposed a blockchain based extension to IPFS to provide access control (ACL-IPFS). The ACL-IPFS leveraged smart contracts in Ethereum to handle the access control list. The user could register files, grant or revoke access to through the smart contracts.

III SYSTEM DESIGN

SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

ISSN2321-2152www.ijmece .com
Vol 10, Issue.3July 2022

The system development life cycle adopted in this project is the waterfall model which is based on a sequential design process. This methodology was adopted because of the flexibility offered to researchers in terms of the sequential approach to solving problems. This methodology certifies that each stage of the design process has been successfully completed and thus guaranteeing that all stages are completely dealt with.

The various phase of the waterfall model includes

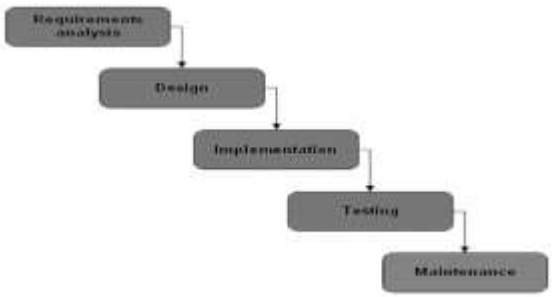


Figure 1: Waterfall model of the system development life cycle.

Advantages of the Waterfall Model

There are certain advantages of the waterfall model, which causes it to be the most commonly used model. The model presents four key advantages as follows:

- Design errors are captured before any software is written saving time during the implementation phase.

The approach is very structured and it is easier to measure progress by reference to clearly defined milestones.

SYSTEM ARCHITECTURE:

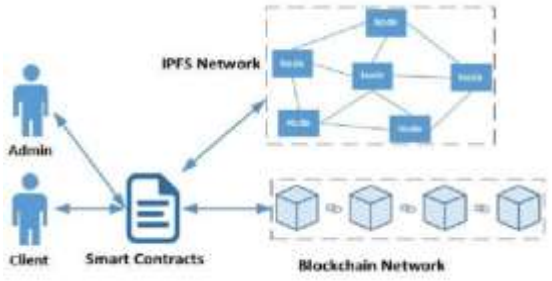
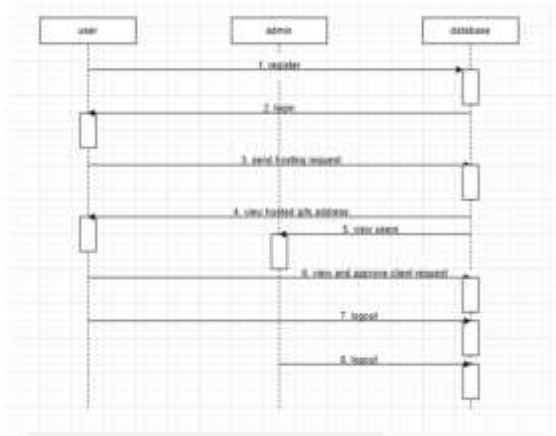


Figure 2: System Architecture

Sequence diagram:

A sequence diagram represents the interaction between different objects in the system. The important aspect of a sequence diagram is that it is time-ordered. This means that the exact sequence of the interactions between the objects is represented step by step. Different objects in the sequence diagram interact with each other by passing "messages".



ISSN2321-2152www.ijmece .com
Vol 10, Issue.3July 2022

Figure 6: Sequence Diagram

IV IMPLEMENTATION

PYTHON

Python is a high-level, object-oriented, general-purpose, interactive, and general purpose interpreted programming language. Python is an interpreted language with a design philosophy that prioritizes code readability. For example, instead of using curly brackets or keywords to delimit code blocks, Python uses whitespace indentation. Python also has a syntax that enables programmers to express concepts in less code than they might in languages like C++ or Java. It offers building blocks that make it possible to programme clearly on both small and large dimensions. There are Python interpreters for many different operating systems. The community-based development model is shared by nearly all of Python's variant implementations, including Python, the standard implementation. The non-profit Python Software Foundation is in charge of running Python. Python has an autonomous memory management system and a dynamic type system.

DJANGO

A high-level Python web framework called Django promotes quick iteration and logical, elegant design. It was created by seasoned programmers and handles a lot of the hassle associated with Web development, freeing you up to concentrate on building your app without having to invent the wheel. It is open source and free. Django's main objective is to make it simpler to create intricate, database-driven websites. Django places an emphasis on quick development, the don't repeat yourself principle, and the reusability and "pluggability" of components. Everywhere, including in the configuration files and data models, Python is used.

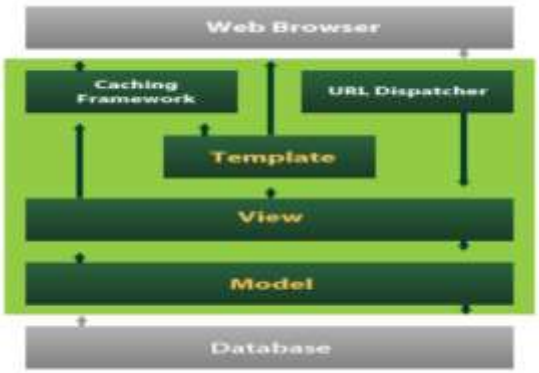


Figure 7 : Django Architecture

Additionally, Django offers a customizable administrative creation, read, update, and delete interface that is dynamically built by introspection.

ISSN2321-2152www.ijmece .com
Vol 10, Issue.3July 2022

Figure 8 : Django Process

IPFS Hyper core

Protocol For storing files in a decentralised network, use IPFS. Since any file in the IPFS network can be accessed using a unique hash value, websites can be stored there without the need for a centralised server. Every user on the network is linked since the system has a peer-to-peer architecture. The network's nodes then get some of the smaller chunks that were previously dispersed along with the files that were broadcast to the network. Any node in the network that possesses a file's chunks can supply them to any other node in the network that requests one. A decentralised network can host webpages using the IPFS protocol. Hyper core Protocol Another option for storing files in a decentralised network is the Hyper core Protocol. Public-key based addressing, which is how files are addressable on the Hyper core Protocol network, can also be used to store websites without the need for a centralised server. The architecture of the system is peer-to-peer, allowing each peer to connect and choose what it wishes to seed. Small pieces of files that are published via the hyper core Protocol are kept in a Merkle tree. Any node in the network has the ability to request a file and any other node may supply its portions. A website can be hosted via the hyper core Protocol, a system designed for hosting files.

Zero Net

Another tool that permits publishing web pages in a peer-to-peer network is called Zero Net. To enable decentralised website publishing, Zero Net employs the BitTorrent technology to distribute files between its peers. It operates through a background-running programme on the user's device and gives them access to the internet via a localhost address. As a result, any browser can be used to view the sites; the only prerequisite is that the programme must be open on the device. The network also enables the owners of the files to post changes and have them propagate throughout the network. The network's files are accessible and delivered in the same way as any other file in the BitTorrent network.

Google Chrome

ISSN2321-2152www.ijmece .com
Vol 10, Issue.3July 2022

According to statistics, Google Chrome is the most widely used web browser worldwide right now. This browser is built on the chromium open-source engine, and as its name suggests, Google created it. Without any plugins, this browser does not support the IPFS or hyper core protocols.

Comparison of Approaches

The protocol must provide addressable content in order for websites to be hosted and accessed within its network, which is its most important need. Furthermore, it is crucial for the thesis project's outcome that the investigated methods remain in use and are instead brought up to speed with contemporary technology. The final criterion is taken into account because a protocol that was developed with website hosting in mind may function a little bit better than one that wasn't. The requirements that were investigated on the protocols under consideration are shown in figure 8 as a Pugh matrix.

Criteria	Importance Weight	IPFS	Hypercore	ZeroNet
Addressable content	5	1	1	1
Continuous develop-ment	3	1	1	-1
Website fo-cused	2	1	0	1
Total		10	8	4

Table 5.1: Pugh matrix over protocols requirement analysis.

In order to guarantee that most testing tools and frameworks would support the chosen browser, the most crucial condition for the browsers was that they were widely used and compatible. figure 9 shows a Pugh matrix of the specifications and their weight for each of the browsers taken into consideration.

V RESULTS

Figure 9 : Decentralized Web Hosting Interface

In above screen click on last button called ‘Find Near Duplicates Images’ button to allow application to find near duplicates and to get below screen

Figure 10 : New User Signup Screen to Enter Credentials

Figure 24 : Hosted Website

VI CONCLUSION

This paper has proposed a decentralized platform for web hosting. The proposed system takes the advantages of the blockchain technology, IPFS, and encryption. That allows clients to host websites without using any central system from service providers. We have also proposed the combination model between IPFS and blockchain, and build the workflows for managing the decentralized web hosting service and the IPFS network. Experiment results show that hosted websites on the IPFS network have high availability, ensure data security and privacy. In our future work, we will build smart contracts to provide access control features and optimize protocols to make the functions more efficient.

VII FUTURE ENHANCEMENT

1. Smart Contract-based Hosting: Smart contracts on the Ethereum blockchain can be leveraged to automate and manage various aspects of web hosting. Enhancements can be made to create standardized smart contracts that handle hosting agreements, resource allocation, payment mechanisms, and dispute resolution. This would streamline the hosting process and ensure transparency and efficiency.

2. Content Distribution Networks (CDNs): To improve the performance and availability of decentralized websites, you can explore integrating content distribution networks. CDNs help distribute website content across multiple nodes globally, reducing latency and enhancing the user experience. By integrating CDNs with decentralized web hosting, you can achieve faster load times and better scalability.

3. Incentive Mechanisms: Designing effective incentive mechanisms is crucial for encouraging users to participate in decentralized web hosting. You could explore token-based economies where participants are rewarded for hosting websites and providing computing resources. Incentives could be based on factors like uptime, bandwidth

contribution, and storage capacity. These mechanisms can encourage individuals and organizations to contribute to the decentralized hosting ecosystem.

4. Interoperability and Standards: To ensure widespread adoption and seamless integration, it is important to establish interoperability standards for decentralized web hosting. Creating open protocols and APIs that enable different hosting platforms and applications to communicate and interact with each other would foster a thriving ecosystem. This would allow developers to build on top of existing infrastructure and facilitate collaboration among various decentralized hosting projects.

5. User-Friendly Interfaces: One critical aspect of any successful project is to provide intuitive and user-friendly interfaces for both website owners and visitors. Improving the user experience by developing easy-to-use tools, content management systems, and web development frameworks would make it more accessible for individuals and businesses to host and interact with decentralized websites.

6. Governance and Consensus: Enhancing the governance and consensus mechanisms of the decentralized web hosting project can contribute to its long-term sustainability. You can explore various methods, such as decentralized autonomous organizations (DAOs), where stakeholders can participate in decision-making processes, resource allocation, and protocol upgrades. Implementing effective governance models ensures that the project evolves in a decentralized and community-driven manner.

7. Privacy and Security: Addressing privacy and security concerns is paramount in any web hosting project. Enhancements can be made to ensure end-to-end encryption, data integrity, and secure user authentication for decentralized websites. Additionally, incorporating decentralized identity solutions, such as self-sovereign identity (SSI), can provide users with control over their personal data and enhance privacy protection.

8. The platform is currently purpose-built to host static websites only, but in the future, it may be extended to host dynamic websites as well. Also, our project does not use blockchain yet, so we may host our website on blockchain in the future.

9. We believe that the future of decentralized hosting will be built on the foundation of Web3 and blockchain

technology. Using a client-side access to the Ethereum blockchain, our offering allows for greater security and privacy, consistent performance and lower costs.

10. Decentralized hosting is a new breed of internet infrastructure that uses the blockchain. Decentralized hosts are accessible through the browser and don't require installation of software on a user's computer to run. The concept is to create a new type of network for hosting large files, which can compete with traditional cloud-based providers like Amazon Web Services (AWS) in terms of performance and cost/performance.

REFERENCES

[1] Z. Xiao, S. Wen, H. Yu, Z. Wu, H. Chen, C. Zhang, and Y. Ji, "A new architecture of web applications-The Widget/Server architecture," in 2010 2nd IEEE International Conference on Network Infrastructure and Digital Content, IEEE, 2010, pp. 866-869.

[2] M. Steichen, B. Fiz, R. Norvill, W. Shbair, and R. State, "Blockchain- Based, Decentralized Access Control for IPFS," in 2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (Green Com) and IEEE Cyber, Physical and Social Computing (CPS Com) and IEEE Smart Data (Smart Data), IEEE, 2018, pp. 1499-1506.

[3] A. Narayanan, J. Bonneau, E. Felten, A. Miller, and S. Goldfaden, "Bitcoin and cryptocurrency technologies: A comprehensive introduction," Princeton University Press, 2016.

[4] Z. Zheng, S. Xie, H. N. Dai, and H. Wang, "Blockchain challenges and opportunities: A survey," in International Journal of Web and Grid Services, 2016.

[5] V. Buterin, "A next-generation smart contract and decentralized application platform," white paper 3, 2014, 37.

[6] N. Atzei, M. Bartoletti, and T. Cimoli, "A survey of attacks on Ethereum smart contracts (sock)," In International Conference on Principles of Security and Trust, Springer, Berlin, Heidelberg, 2017, pp. 164-186.

[7] A. Ramachandran, and M. Kantarcioglu, "Smart Provenance: a distributed, blockchain based data provenance system," in Proceedings of the Eighth ACM Conference on Data and Application Security and Privacy, ACM, 2018, pp. 35-42.

[8] G. Singh, "A study of encryption algorithms (RSA, DES, 3DES and AES) for information security," International Journal of Computer Applications, 67(19), 2013.

[9] T. Nie, and T. Zhang, "A study of DES and Blowfish encryption algorithm," in Tencon 2009-2009 IEEE Region 10 Conference, IEEE, 2009, pp. 1-4.