Blockchain based Decentralised File Storage System

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Abstract: Cloud systems offer low-cost, low-cost computing and storage models. Many organizations and individual end users use cloud storage services to back-up their important data. However, this security infrastructure suffers from various threats and security issues. Before sending data to the cloud server, some data protection measures should be implemented to ensure security. Blockchain is an advanced technology that stores data in a distributed manner and provides more storage. Therefore, we propose a blockchain-based system with ciphertext encryption principles of identity-based encryption to provide user access control and encryption methods in cloud security systems to solve the above problems. Our system provides three important features to provide a secure environment. First, a blockchain network was designed to register data owners and issue permissions using key generation algorithms. Second, data owners and authorized users store public information in the blockchain system, set access policies, and create user private keys to solve escrow issues. Third, real-time identity modification is applied to achieve granular access control using user removal techniques. Test results, analysis and performance analysis show that our system provides a suitable and reliable location.

Keywords: Blockchain, IPFS, Node-Based-Storage, Cloud-Based-Storage.

1. INTRODUCTION

1.1 Definition:

Data generation is soaring, with a projected 175 zettabytes by 2025, according to the IDC. Cloud storage, popular for its cost-efficiency and security, dominates, led by giants like Google and Amazon. However, concerns linger over privacy and costs, especially for individual users. Enter blockchain, initially introduced through Bitcoin, offering a decentralized, secure ledger beyond finance. Platforms like Sia and Storj leverage blockchain for file storage, promising enhanced privacy, security, and cost-effectiveness. Users can rent out personal hard drive space, decentralizing data storage and management. Blockchain's distributed nature ensures transparency and reliability, making it an enticing solution amidst data storage dilemmas.

1.2 Goal:

File generation is at its all-time peak. People also tend to share these files via cloud-based applications. The policy of such cloud-based companies are too scary and also cost users huge amounts of money if the file is too big in size or has too many small files that exceed their free limit. So, in this project, what we have tried is to create a Web App for storing and sharing huge files privately via IPFS on a blockchain network for very cheap.

1.3 Scope:

Future advancements in decentralized blockchain-based storage systems include improving scalability through solutions like sharding and layer 2 protocols, ensuring interoperability with traditional storage systems, enhancing privacy using advanced techniques such as zero-knowledge proofs, refining incentive mechanisms like Proof of Replication to incentivize reliable storage, integrating decentralized storage into content delivery networks for improved global content distribution, developing plugins and APIs for seamless integration with existing platforms, ensuring regulatory compliance with data protection laws, and exploring energy-efficient consensus mechanisms to promote sustainability.

2. Overall Description:

2.1 Product Perspective:

The project perspective involves developing a blockchain-based system with ciphertext encryption to enhance security for cloud storage, focusing on key generation, access control, and real-time identity modification, with rigorous testing and analysis to ensure reliability and compliance.

3. System Analysis:

The system analysis of future advancements in decentralized blockchain-based storage involves assessing requirements, functions, technical feasibility, cost-benefit, risks, and impacts. This analysis informs decision-making and guides development efforts effectively across scalability, interoperability, privacy, incentives, integration, regulatory compliance, and sustainability aspects of decentralized storage systems.

4. Requirement Specifications:

4.1 Hardware requirements:

This subsection will provide the minimum requirements that must be fulfilled by the hardware components. The hardware requirements are as follows: -
- PC/Laptop/Smartphone
- Any Browser (e.g. Chrome, Firefox, Edge, Safari, Brave etc.)
- Good Internet Connection

4.2 Software requirements:

This subsection will provide the versions of software applications that must be installed.
The software requirements are as follows: -
- Visual Studio Code
- HTML, CSS, JS
- MetaMask, IPFS
- Node.Js

4.3 Features Requirements:

4.4 Reliability:

In case of hardware or software failures, the system cannot connect to the central database, ensuring data integrity.

4.5 Availability:

Available only to the authorized users for verifying and confirming the transactions, ensuring data integrity.

4.6 Portability:

The project achieves portability through compatibility across platforms, integration with major clouds, containerization, modular design, API-based interoperability, adherence to open standards, and comprehensive support.
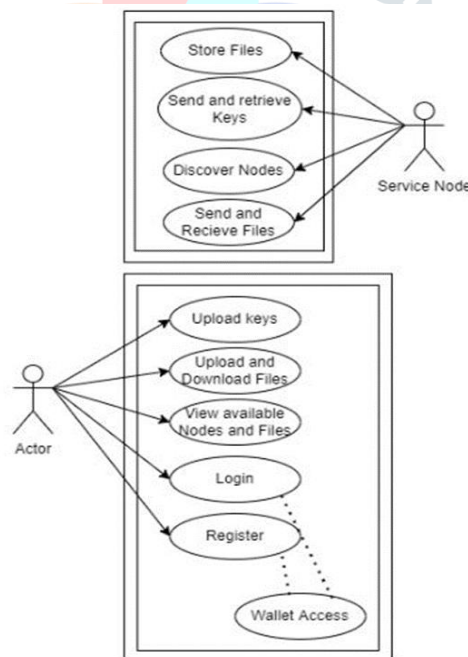
USE CASE DIAGRAM

fig.1: user case diagram

5. Software Description:

5.1 Visual Studio 2021:

Visual Studio 2021 is a comprehensive integrated development environment (IDE) developed by Microsoft, designed to facilitate software development across multiple platforms and languages. It offers a rich set of features and tools that streamline the entire development process, from code writing and debugging to testing and deployment.

5.2 Pinata Cloud:

Leading IPFS provider since 2018, offering APIs and SDKs for Web3 infrastructure and NFTs. Used for decentralized storage of images/files.

5.3 Solidity:

Contract-based language for Ethereum smart contracts, integrating C++, Python, and JavaScript. Enables self-executing transaction logic and immutable transaction records.

5.4 Node.js:

Cross-platform server environment running JavaScript. Event-driven architecture and asynchronous I/O optimize throughput for web and real-time applications.

5.5 MetaMask:

Wallet for Ethereum-based cryptocurrencies and tokens, facilitating transactions and connecting to decentralized applications. Offers integrated token exchange service and had over 21 million monthly users as of November 2021.

6. Dataflow:

fig.2 dataflow

fig.3 dataflow
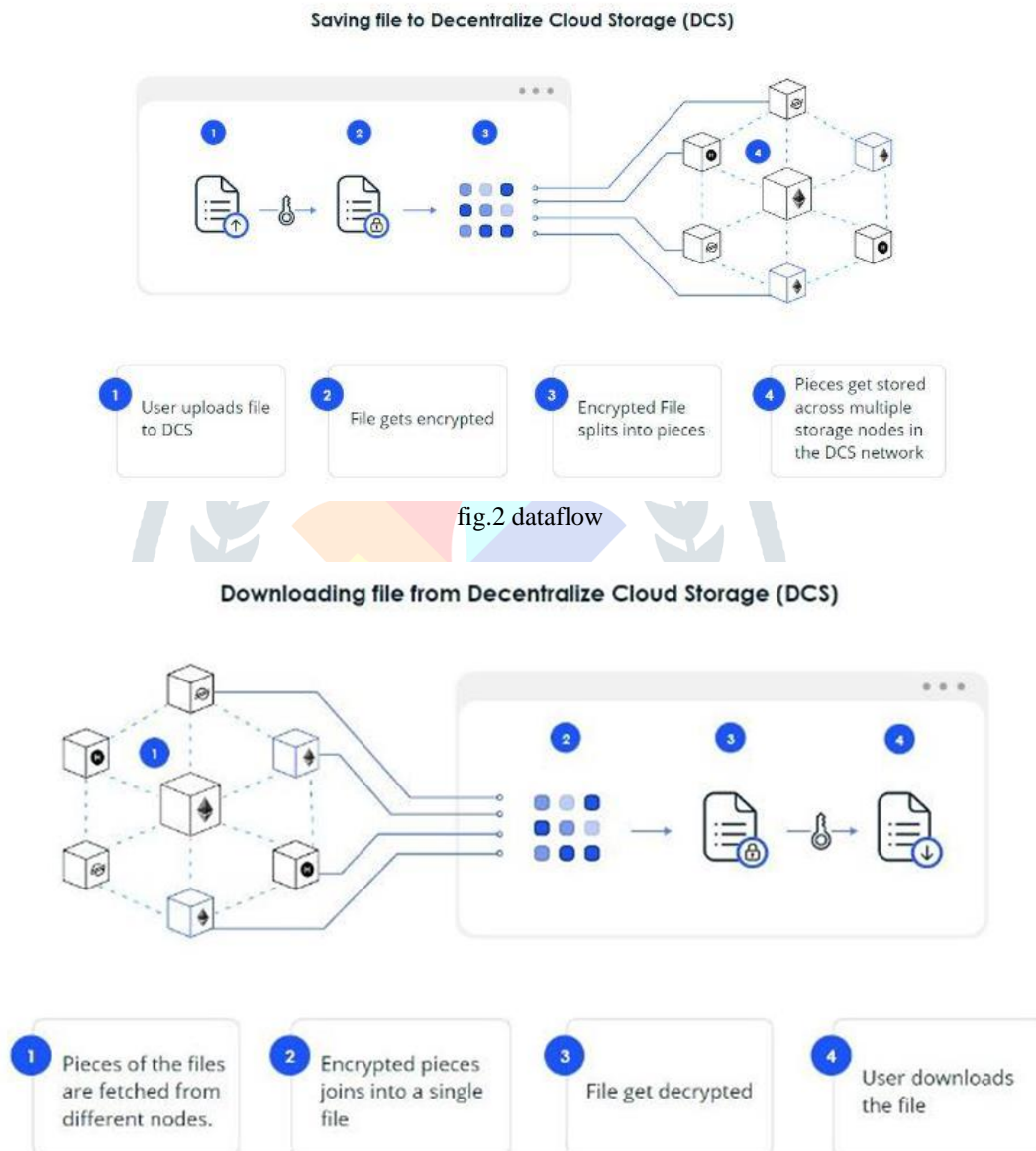
7. Project Description:

7.1 Problem definition:

Creating a cloudless file storage system using Blockchain to ensure safety of data and ease of access with minimal to no cost.

7.2 Project Overview:

In this project, we aim to address the challenges of file sharing and storage by developing a Web App. Utilizing IPFS on a blockchain network, our solution enables private sharing of large files at minimal cost, countering the limitations and high expenses associated with cloud-based applications.

8. System Testing:

After code generation, systematic testing is performed by storing and retrieving the data also transaction in metamask wallet are checked to verify whether the transaction is successful aiming for optimal system functionality, behavior, and performance.

9. System Maintenance:

Software Maintenance extends beyond bug identification, encompassing environment changes, system functionality improvements, and failure elimination, ensuring consistent system performance and adaptability.

10.Snapshots:

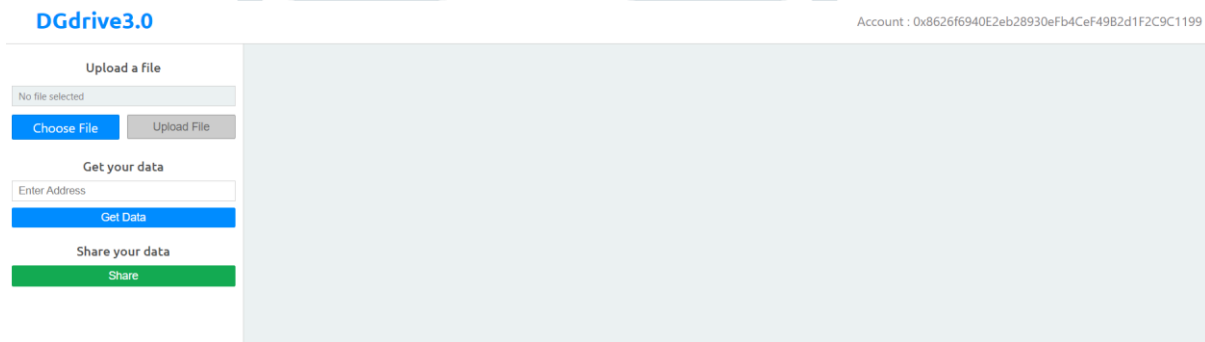fig.4 user interface (account not connected)
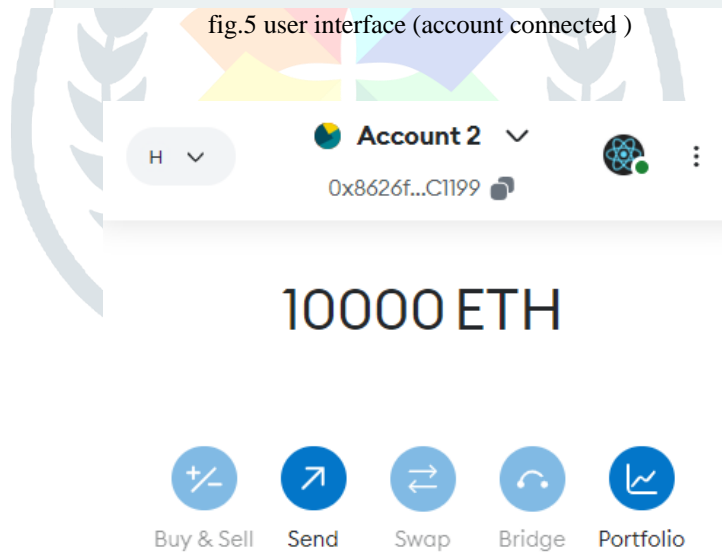

fig.5 user interface (account connected)
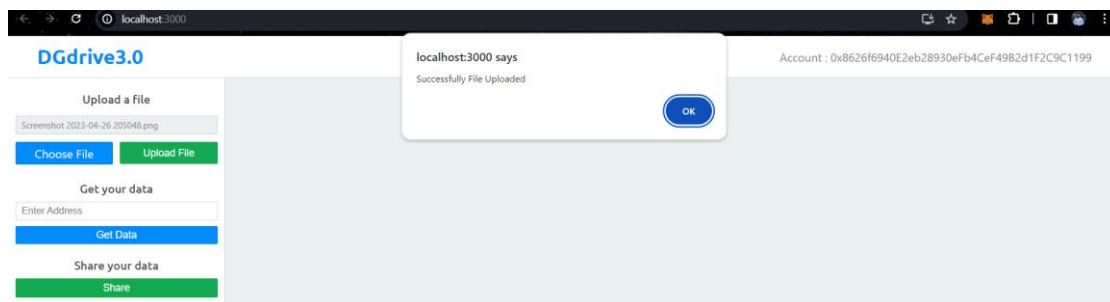

fig.6 ethereum account balance

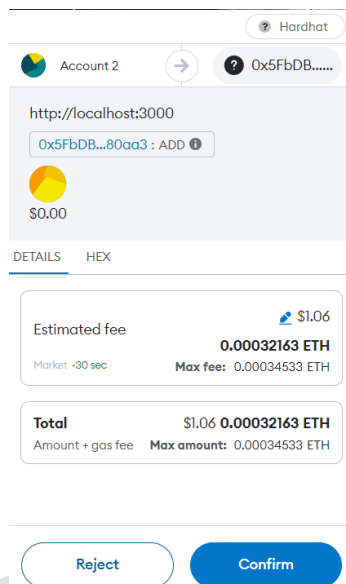

fig.7 file successfully uploaded

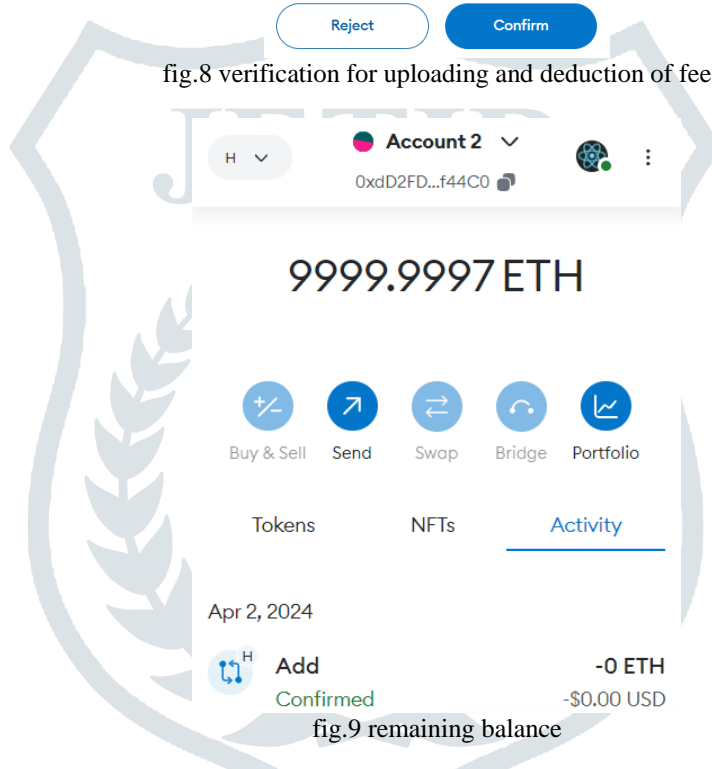fig.8 verification for uploading and deduction of fee
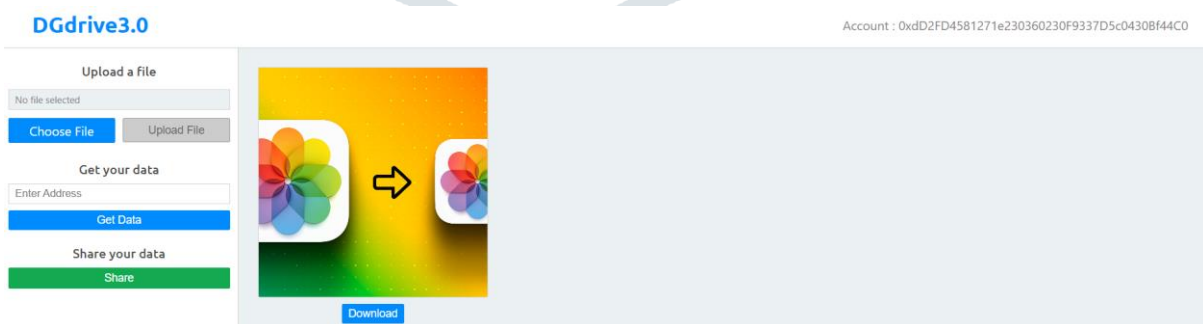

fig.9 remaining balance

fig.10 file successfully retrieved

11. Conclusion:

11.1 Conclusion

Our project seamlessly integrates blockchain with IPFS, ensuring secure and efficient data storage and sharing. Key achievements include bolstered security, enhanced data management, and automated transactions. We prioritize scalability, user education, security updates, and compliance. Our goal is to revolutionize digital data handling for a more secure and decentralized future.

11.2 Scope of Future Development:

The scope for future development of the **Decentralised Blockchain Based File Storage System** is vast and promising. Integration with emerging technologies can further enhance real-time monitoring and data collection capabilities. Implementation of advanced analytics and machine learning algorithms could provide valuable insights into patterns and predictive analysis. Additionally, incorporating biometric authentication methods can strengthen security measures and accuracy. Furthermore, expanding compatibility with various devices and platforms, and integrating with different solutions can enhance scalability, accessibility, and data storage capabilities, catering to evolving organizational needs and technological advancements.

12 Reference:

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