International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Cloud-Share

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Abstract—Traditional file-sharing systems rely on centralized servers, leading to issues such as data breaches, censorship, high storage costs, and single points of failure. This paper introduces **Cloud Share**, a decentralized file-sharing system that leverages blockchain technology and the InterPlanetary File System (IPFS) to address these challenges. The system integrates **React.js** for an intuitive user interface, **Pinata** for IPFS-based storage, **MetaMask** for secure authentication and transactions, and **Hardhat** for Ethereum-based smart contract deployment. Cloud Share ensures data security, transparency, and user control while eliminating dependence on centralized storage providers. This paper explores the problem, objectives, scope, proposed framework, and algorithmic implementation of Cloud Share, demonstrating its potential to revolutionize secure and censorship-resistant file sharing.

I. INTRODUCTION

The increasing reliance on centralized cloud storage has raised concerns about **data security, privacy, and ownership control**. Traditional file-sharing systems are vulnerable to **data breaches, censorship, and single points of failure**. **Cloud Share** addresses these challenges by utilizing **blockchain and decentralized storage technologies**. By integrating **Ethereum smart contracts for security, IPFS via Pinata for decentralized file storage, MetaMask for authentication, and React.js for an intuitive user interface**, Cloud Share enables **secure, transparent, and tamper-proof file sharing**. This decentralized approach ensures that users retain **full control over their data**, eliminating reliance on centralized authorities while enhancing privacy and cost efficiency.

II. LITERATURE REVIEW

[1] **Blockchain-based storage solutions** leverage **Ethereum smart contracts** to provide **secure, transparent, and tamper-proof file access**. [2] Projects like **Filecoin** and **Storj** focus on **decentralized storage marketplaces** but lack direct peer-to-peer sharing. [3] The **InterPlanetary File System (IPFS)** has been widely studied for its **content-addressed storage, peer-to-peer file retrieval, and censorship resistance**, making it a strong alternative to traditional cloud storage. [4] However, challenges such as **high transaction fees, scalability issues, and network latency** remain prevalent in decentralized file-sharing systems. [5] **Cloud Share** addresses these gaps by integrating **Ethereum smart contracts, IPFS via Pinata, MetaMask authentication, and a React.js frontend** to enable **secure, transparent, and user-controlled file sharing**.

III. PROPOSED SYSTEM

The proposed system, Cloud Share, is a decentralized file-sharing platform designed to address the limitations of centralized systems—such as security vulnerabilities, lack of user control, and dependency on third-party providers—while overcoming the gaps in existing decentralized solutions, including complex interfaces and high blockchain costs. Unlike traditional platforms like Google Drive or early decentralized systems like BitTorrent, Cloud Share leverages the InterPlanetary File System (IPFS) for distributed file storage and the Ethereum blockchain for secure transaction and metadata management, ensuring data integrity, transparency, and user autonomy.

A. ARCHITECTURE

The architecture of Cloud Share is designed as a modular, decentralized system integrating frontend, storage, and blockchain components to ensure efficiency, security, and usability. The system comprises the following layers:

- **Frontend Layer (React JS)**: A responsive web interface built with React JS provides users with an intuitive platform to upload, manage, and share files. It handles user inputs, displays file statuses, and communicates with backend services, ensuring a seamless experience across devices.
- **Storage Layer (IPFS via Pinata)**: Files are uploaded to IPFS through Pinata, a pinning service that ensures data persistence and availability across the distributed network. Each file generates a unique CID, which serves as its address for retrieval, eliminating reliance on centralized servers.
- **Blockchain Layer (Ethereum with MetaMask and Hardhat)**: Ethereum smart contracts, developed and deployed using Hardhat, manage file metadata (e.g., CIDs, ownership, access rights) and enforce transaction logic. MetaMask integrates wallet functionality, enabling users to authenticate, sign transactions, and interact with the blockchain securely.
- **Communication Layer**: The frontend communicates with IPFS via Pinata's API for file operations and with Ethereum nodes through MetaMask's Web3 provider for blockchain interactions, ensuring smooth data flow between layers.

The workflow begins when a user uploads a file via the React interface, which is sent to Pinata for IPFS storage, generating a CID. The CID and associated metadata are recorded on Ethereum
through a smart contract, with MetaMask facilitating the transaction. Other users can access shared files using the CID, with access permissions verified on-chain, ensuring security and transparency. This architecture balances decentralization with usability, leveraging Pinata's reliability, Ethereum's immutability, and React's interactivity to deliver a robust file-sharing system.

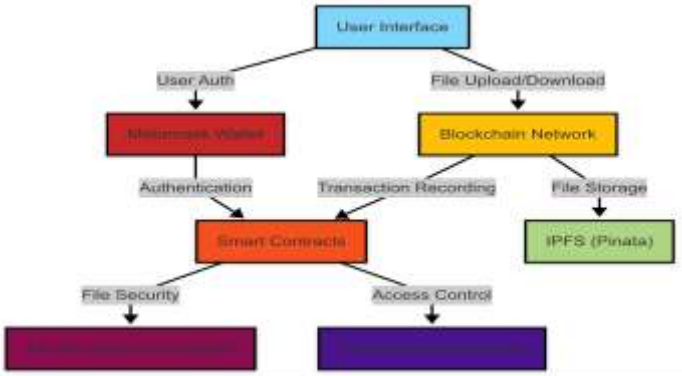

Fig 3.1 : Basic Architecture diagram

IV. RESULT

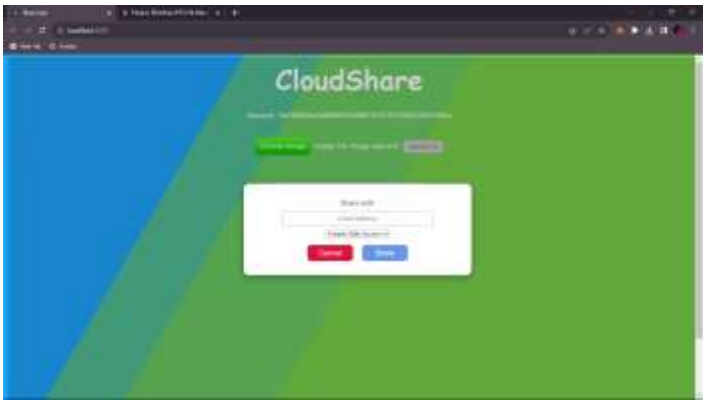

Fig 4.1 : Home / Address page

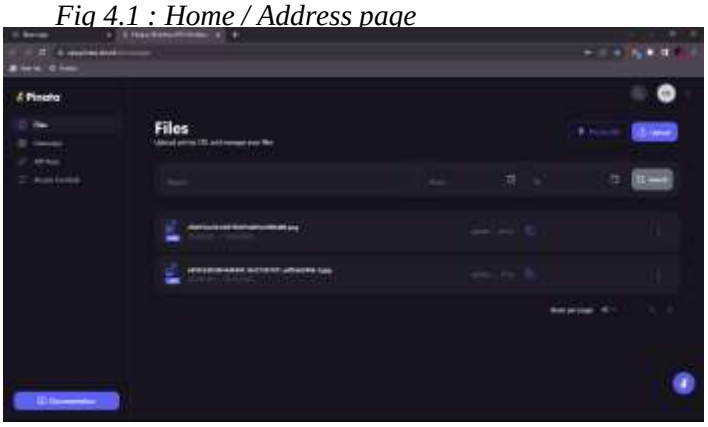

Fig 4.2 : Pinata's IPFS Storage

Fig 4.3 : Hardhat-Localhost Connection

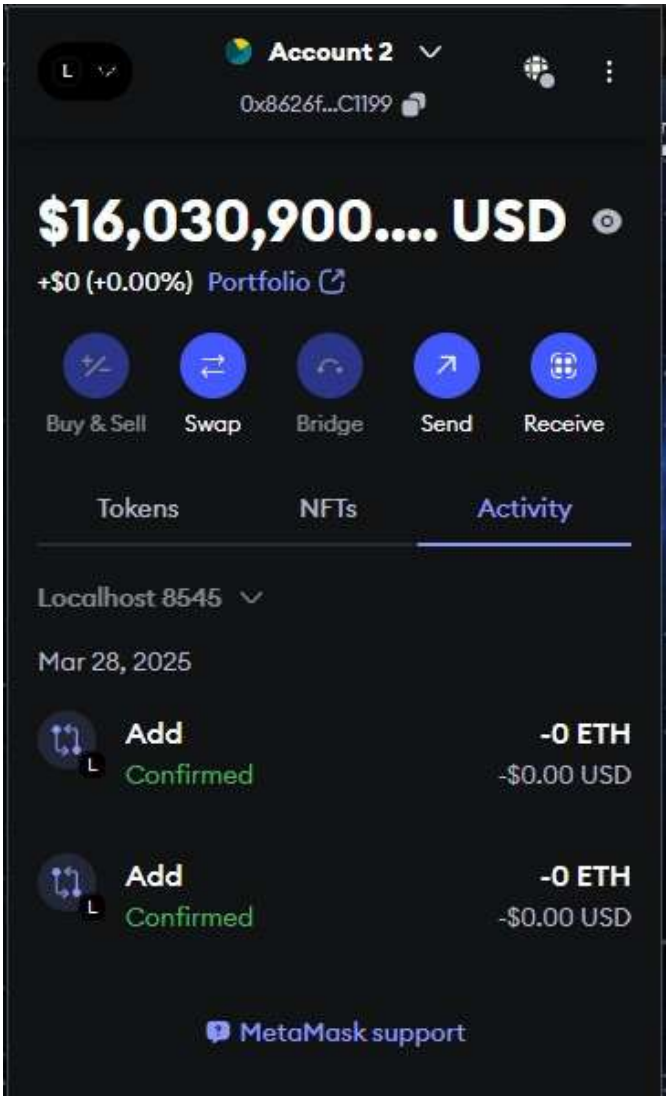

Fig 4. : Metamask-Hardhat Connection

V. CONCLUSION

Cloud Share demonstrates a viable solution to the challenges of centralized and early decentralized file-sharing systems by integrating IPFS and Ethereum blockchain technologies. Through its use of React JS for an accessible frontend, Pinata for efficient IPFS storage, MetaMask for secure wallet authentication, and Hardhat for reliable smart contract deployment, the system achieves a balance of security, transparency, and user-friendliness. It addresses critical issues such as data breaches, lack of user control, and high operational costs while overcoming research gaps like limited tool integration and complex interfaces. Preliminary testing of the prototype indicates successful file uploads, secure sharing, and blockchain-based access control, validating its potential as a decentralized alternative. Cloud Share not only contributes to the growing ecosystem of decentralized applications (dApps) but also lays the groundwork for future advancements in secure and autonomous file management.

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VI. FUTURE SCOPE

The current implementation of Cloud Share serves as a proof-of-concept with significant potential for expansion and refinement. Future enhancements include:

- End-to-End Encryption: Incorporating encryption mechanisms to secure files before uploading to IPFS, enhancing privacy and protecting sensitive data.
- Advanced Access Control: Developing granular access policies within smart contracts, allowing users to set time-based or role-based permissions for shared files.
- Cost Optimization: Exploring layer-2 solutions like Polygon or Optimism to reduce Ethereum gas fees, making transactions more affordable for frequent use.
- Mobile Application: Extending the React JS frontend to a mobile app using React Native, improving accessibility for users on smartphones and tablets.
- Incentivization Mechanisms: Integrating a token-based system inspired by Filecoin to reward IPFS nodes for storage, ensuring long-term data availability.
- Scalability Improvements: Optimizing IPFS node interactions and smart contract efficiency

to handle larger user bases and higher file volumes.

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