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Fusion Track: Disk Space Renting System Using Blockchain

¹Dr. A. B. Gavali, ²Shrinath S. Mundhe, ³Srushti K. Gonjari, ⁴Diksha D. Jadhav, ⁵Onkar A. Londhe

^{1 2 3 4 5}Department of Computer Engineering

S. B. Patil College of Engineering Indapur, Pune, India

Email: dnyane.ash@gmail.com, shrinathmundhe25@gmail.com, gonjarisrushti10@gmail.com, jadhavdiksha803@gmail.com, onkarlondhe1139@gmail.com

Peer Review Information	Abstract
<p><i>Submission: 11 Sept 2025</i></p> <p><i>Revision: 10 Oct 2025</i></p> <p><i>Acceptance: 22 Oct 2025</i></p> <p>Keywords</p> <p><i>Blockchain, Disk Space Renting, Smart Contracts, Decentralized Storage, Data Security, Cloud Alternatives.</i></p>	<p>The Disk Space Renting System using Blockchain is a decentralized platform where users can rent out unused disk space and earn income, while others can rent affordable storage. Providers list available space with price and duration, and renters choose and pay via smart contracts. Blockchain ensures transparency, records transactions securely, and prevents tampering. Smart contracts automatically handle rental terms and payments. Firebase manages authentication, profiles, and real-time data. Security is ensured as renter's files are encrypted before storage, preventing providers from accessing them. This project reduces dependency on centralized providers, ensures data security, and creates a cost-effective, user-friendly storage marketplace.</p>

Introduction

The rapid growth of digital data has created a huge demand for storage solutions. Existing centralized cloud providers such as Google Drive and Dropbox are costly and vulnerable to security risks, including hacks and server failures. Moreover, users lack transparency in how their data is stored. Many individuals and organizations have unused disk space that goes to waste. To address these issues, a decentralized, transparent, and secure storage renting system is required. This paper introduces Fusion Track, a blockchain-based disk space renting system that ensures trust, transparency, and affordability. To address these issues, Fusion Track introduces a blockchain-based disk space renting system that ensures trust, transparency, affordability, and security. By decentralizing storage, it allows users to monetize unused resources while giving renters reliable, encrypted storage.

This project, Fusion Track: Disk Space Renting System Using Blockchain proposes a decentralized platform where storage providers can lease their unused disk space to renters in exchange for incentives. Data uploaded by renters is encrypted, fragmented, and distributed across multiple nodes, thereby ensuring confidentiality, redundancy, and fault tolerance. Blockchain integration guarantees that all storage.

In recent years, the volume of digital data generated worldwide has grown exponentially, driven by the widespread use of internet services, multimedia applications, and the proliferation of Internet of Things (IoT) devices. This surge has created an unprecedented demand for secure, reliable, and scalable storage infrastructures. Traditional cloud storage solutions offered by centralized providers such as Google Drive, Amazon Web Services, and Microsoft Azure remain dominant; however, they

present several challenges. These include high subscription costs, limited transparency, risk of single-point failures, and potential misuse of user data due to the control exerted by central authorities.

Decentralized storage has emerged as a promising paradigm to overcome these shortcomings by enabling individuals to share and utilize unused storage capacity across a distributed network. Blockchain technology plays a vital role in ensuring trust, security, and transparency in such systems. Its inherent properties: immutability, decentralization, and verifiable transactions— make it an ideal backbone for designing peer-to-peer disk space renting models. Smart contracts further enhance this framework by automating storage agreements, payment processes, and service enforcement without relying on intermediaries. This paper, Fusion Track: Disk Space Renting System Using Blockchain proposes a decentralized platform where storage providers can lease their unused disk space to renters in exchange for incentives. Data uploaded by renters is encrypted, fragmented, and distributed across multiple nodes, thereby ensuring confidentiality, redundancy, and fault tolerance. Blockchain integration guarantees that all storage and financial transactions remain transparent and tamper-proof.

Literature Survey

1. Erik Blasch - A Review of Distributed Ledger Technologies for Satellite Operations. (2025)

“A Review of Distributed Ledger Technologies for Satellite Operations.” Explores distributed ledgers such as DAGs and sharded blockchains; provides insight for secure decentralized storage. Explores Distributed Ledger Technologies (DLTs) like DAGs, Sharded Blockchains. Future Scope: Address storage limits, asynchronous consensus, and regulatory frameworks for space applications.[1]

2. Abdullah Al-Khatib - Blockchain Empowered Resource Trading for Optimizing Bandwidth Reservation in Vehicular Networks. (2024)

“Blockchain Empowered Resource Trading for Optimizing Bandwidth Reservation in Vehicular Networks.” Demon states dynamic trading models using smart contracts, applicable for disk space renting. Blockchain smart contracts, provider selection algorithm, decision making algorithm for trading. Future Scope: The project can adopt dynamic resource trading models where unused disk space is traded like bandwidth, with smart contracts.[2]

3. Abdullah Ayub Khan - Secure Remote Sensing Data With Blockchain Distributed Ledger Technology : A Solution for Smart Cities. (2024)

“Secure Remote Sensing Data with Blockchain Distributed Ledger Technology.” Focused on security with proxy re-encryption and ANN classification, relevant for large-scale secure storage. Blockchain distributed ledger with Partial Swarm Optimization, NuCypher- proxy encryption Future Scope: Integrate AI/ML and proxy re encryption to optimize rented disk allocation and ensure secure large-scale storage.[3]

4. Laila Junaid et al. - Blockchain Enabled Framework for Transparent Land Lease and Mortgage Management (2024)

“Blockchain-Enabled Framework for Transparent Land Lease and Mortgage Management.” Addresses transparency and immutability, useful for preventing double allocation in renting agreements. Blockchain based framework with transparency, immutability, user participation. Future Scope: Implement transparent blockchainbased leasing models to prevent double allocation of storage and ensure auditability of renting agreements.[4]

5. Nwosu Anthony Ugochukwu et al. - Enhancing Logistics with the Internet of Things: A Secured and Efficient Distribution and Storage Model Utilizing Blockchain Innovations and IPFS. (2023)

“Enhancing Logistics With IoT and Blockchain Innovations Using IPFS.” Proposes IPFS and SHA-256 hashing for decentralized storage. Blockchain with InterPlanetary File System (IPFS), SHA 256 hashing, and smart contracts for secure logistics data. Future Scope: Integrate IPFS and SHA-256 hashing to ensure decentralized file distribution.[5]

6. Shashank Motepalli et al. - Blockchain for V2X: Applications and Architectures (2022)

“Blockchain for V2X: Applications and Architectures.” Focused on lightweight blockchain scalability. Blockchain based architecture for secure, decentralized V2X networks. Future Scope Lightweight blockchain, interoperability across domains, and real-time consensus for vehicular systems.[6]

7. Myeonghyun Kim - Design of Secure Decentralized Car Sharing System Using Blockchain. (2021)

“Design of Secure Decentralized Car-Sharing System Using Blockchain.” Introduces

pseudonym-based authentication for privacy, applicable to renters and providers. Blockchain based decentralized car-sharing with secure authentication, pseudonyms for anonymity, AVISPA & BAN logic validation. Future Scope: Applying blockchainbased secure authentication protocols and pseudonym-based anonymity to protect renter and provider identities.[7]

8. Pronaya Bhattacharya et al. - Coalition of 6G and Blockchain in AR/VR Space: Challenges and Future Directions. (2021)

“Coalition of 6G and Blockchain in AR/VR Space.” Explores blockchain for ultra-low latency secure environments, extendable to storage renting. Survey and taxonomy of 6G and blockchain integration for AR/VR security, access control, and resource management. Future Scope: Support ultra-fast 6G-enabled storage sharing for AR/VR content with blockchainbased digital asset protection.[8]

9. Xiaodong Yang - Medical Data Sharing Scheme Based on Attribute Cryptosystem and Blockchain Technology. (2020)

“Medical Data Sharing Scheme Based on Attribute Cryptosystem and Blockchain Technology.” Demonstrates attribute-based encryption for finegrained access control: Attribute Based Encryption (ABE) and Attribute Based Signature (ABS) integrated with blockchain for secure and verifiable sharing. Future Scope: Use attribute-based encryption and signatures to enable fine grained access control for rented storage data.[9]

10. Umair Khan et al. - A Blockchain Ethereum Technology-Enabled Digital Content: Development of Trading and Sharing Economy Data. (2020)

“Ethereum TechnologyEnabled Digital Content Economy.” Uses smart contracts for transparent, tamper-proof data sharing. Ethereum blockchain with smart contracts and encryption for content protection. Future Scope: Enable transparent, tamper-proof content transactions on rented disk space using Ethereum smart contracts.[10]

11. Xiao Chen et al. - Hyper BSA: A High-Performance Consortium Blockchain Storage Architecture for Massive Data. (2020)

“Hyper BSA: High Performance Consortium Blockchain Storage Architecture.” Discusses efficient large-scale storage management. Hyper BSA architecture dividing data into continuous and state data, with index-based storage engine. Future Scope: Adopt Hyper BSA- like architecture

with indexing and caching to support largescale rented disk space efficiently.[11]

12. Xinyi Huang et al. - Blockchain Based Secure Data Storage and Sharing for Cloud Environments. (2020)

“Blockchain-Based Secure Data Storage and Sharing for Cloud Environments.” Provides blockchain framework for secure data sharing. Blockchain based framework with smart contracts and encryption for secure storage and controlled data sharing. Future Scope: Extend to large scale deployments, improve efficiency and scalability.[12]

13. Mahmoud M. Badr et al. - Smart Parking System with Privacy Preservation and Reputation Management Using Blockchain. (2020)

“Smart Parking System with Privacy Preservation and Reputation Management Using Blockchain.” Introduces reputation systems, applicable to building user trust. Consortium blockchain with PIR (Private Information Retrieval), anonymous payments, and blockchain based reputation system. Future Scope: Large-scale deployment in smart cities, integration with IoT-enabled vehicles.[13]

14. Yan Zhuang et al. - A Patient Centric Health Information Exchange Framework Using BT (2020)

“Patient-Centric Health Information Exchange Using Blockchain.” Provides secure and transparent data access mechanisms. Blockchain with smart contracts, patient-controlled permissions, and data segmentation for secure HIE. Future Scope: Enhance scalability, interoperability, and real-world deployment.[14]

15. Wenli Yang et al. - A Survey on Blockchain Based Internet Service Architecture: Requirements, Challenges, Trends, and Future. (2019)

“Survey on Blockchain-Based Internet Service Architecture.” Discusses decentralized internet services, security, and scalability. Survey of blockchain for decentralized Internet services, addressing security, trust, and scalability. Future Scope: Develop decentralized Internet protocols, improve consensus efficiency, apply to IoT, cloud, and social services.[15]

16. Xinting Yang - A Trusted Blockchain Based Traceability System for Fruit and Vegetable Agricultural Products. (2018)

“Trusted Blockchain-Based Traceability System for Agricultural Products.” Highlights blockchain

traceability concepts, relevant for file storage verification. Blockchain based traceability for transparent, tamper-proof food supply chain. Integration with IoT sensors, scalability for global agricultural supply chains.[16]

Research Gap

- Centralized free space renting systems depend on third-party providers, which increases operational costs for users. These systems also lack transparency, as users cannot verify how or where their data is stored.
- Decentralized storage platforms often fail to provide detailed access permissions and robust encryption. Users cannot easily define who can view or modify their rented data, this lack of control and security.
- Blockchain-based storage systems can become slow and expensive as network activity increases. Each transaction requires significant computational power, leading to delays and high costs, this reduces efficiency.
- Many current systems rely on manual handling of rentals and payments, which is time-consuming and prone to disputes. Without smart contracts, tasks like rent payments and lease term enforcement cannot be automated.
- Most free space renting systems are complex and designed for technically skilled users. Nontechnical users often find it difficult to navigate blockchain operations or manage data. This lack of user-friendly design limits accessibility.

Problem Statement

Traditional cloud storage systems are centralized, costly, and prone to privacy risks. At the same time, large amounts of unused disk space on personal and institutional devices remain unutilized. There is no mechanism to fairly rent this space in a secure, transparent, and automated way. Fusion Track addresses this by introducing a decentralized storage marketplace powered by blockchain, smart contracts, and encryption, ensuring fair incentives for providers, reliability for renters, and transparency for all parties.

Conclusion

Fusion Track proves that blockchain + decentralized storage can disrupt traditional cloud markets. It boosts resource utilization, lowers costs, and enhances trust in automating rental agreements through smart contracts, protecting data with encryption and distributed

storage, ensuring transparency with immutable blockchain records. With AI-driven allocation, cross-chain interoperability, and global adoption, Fusion Track could evolve into a universal peer-to-peer storage infrastructure, reducing dependence on tech giants like Google Drive or AWS.

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