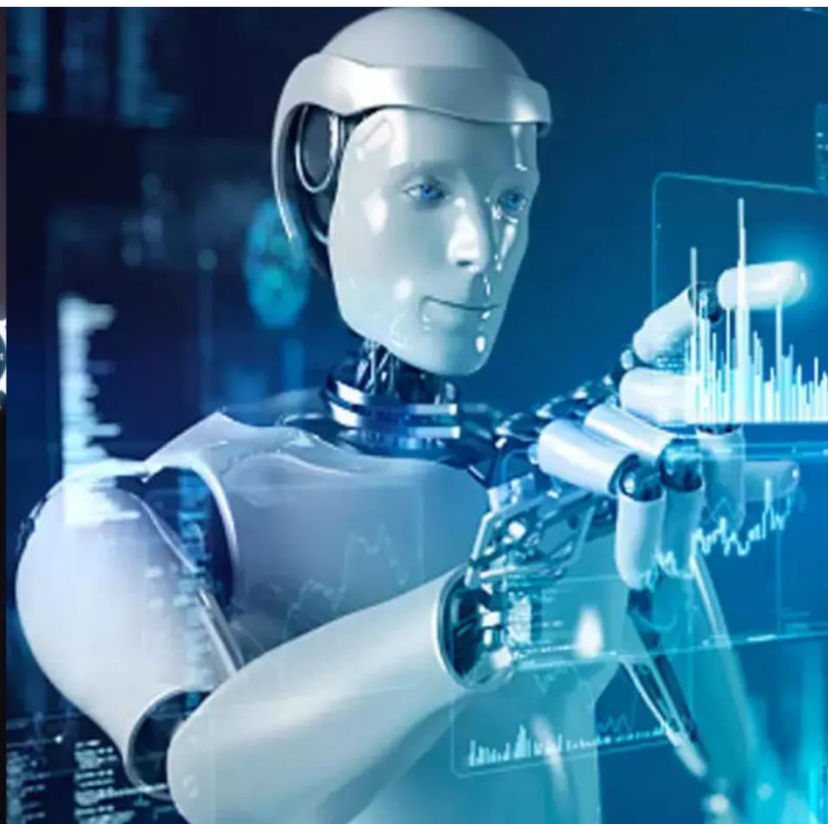




International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 11, November 2025

Blockchain-Based Rental Lease Management System

Prof. Dhage S.A¹, Yash Sonawane², Pratik Anarse³, Omkar Mete⁴

Associate Professor, Department of Computer Engineering, VACOE, Ahilyanagar, Maharashtra, India¹

U.G. Student, Department of Computer Engineering, VACOE, Ahilyanagar, Maharashtra, India²

U.G. Student, Department of Computer Engineering, VACOE, Ahilyanagar, Maharashtra, India³

U.G. Student, Department of Computer Engineering, VACOE, Ahilyanagar, Maharashtra, India⁴

ABSTRACT: The traditional rental management industry is often hindered by inefficiencies, a lack of transparency, and a significant reliance on intermediaries, which increases costs and the risk of disputes. This project introduces a decentralized rental lease management system that leverages blockchain technology to revolutionize the rental process. By utilizing a decentralized and immutable ledger, the system enhances security, transparency, and traceability for any rental commodity. Key processes such as lease agreements, payment methods, and identity verification are automated through smart contracts, which reduces the potential for fraud and builds trust between landlords and tenants. This platform aims to streamline operations, lower transaction costs, and redefine the dynamics between landlords and tenants by creating a more efficient and secure rental ecosystem.

KEYWORDS: Blockchain Technology; Smart Contracts; Rental Lease Management; Transparency; Security; Decentralized System.

I. INTRODUCTION

The landscape of rental lease management has long relied on traditional methods that are proving insufficient in the modern digital world. These conventional systems are characterized by a heavy dependence on intermediaries, laborious paper-based agreements, and manual processes that are both time-consuming and prone to error. This approach often leads to a lack of transparency, creating an environment where disputes between landlords and tenants can easily arise from a lack of accessible and verifiable records. While digitalization has introduced some efficiencies, it has not fully eliminated the complexity and expense associated with third-party involvement.

This project proposes a revolutionary shift by incorporating blockchain technology into the rental management process. Blockchain offers a decentralized, immutable, and secure ledger that can fundamentally transform rental transactions. This technology facilitates peer-to-peer interactions between landlords and tenants, removing the need for traditional middlemen like brokers and lawyers. The goal is to build a system that not only automates and secures the rental lifecycle but also fosters a new level of trust and efficiency, redefining the relationship between all parties involved.

II. EASE OF USE

This system is designed to transform the complex process of managing rental leases into an efficient and smooth experience for commodity managers, owners, and tenants. It makes renting more accessible by providing all legally necessary documents to understand lease terms, tenant/landlord rights, and payment obligations in one place. For tenants, the system offers significant benefits, such as access to simplified rental records, the ability to pay rent electronically, and a direct way to submit maintenance requests, which improves the overall rental experience. By increasing transparency, accountability, and security, the platform simplifies the entire leasing process for all parties involved.

III. ABBREVIATIONS AND ACRONYMS

1. RLM - Rental Lease Management
2. IoT - Internet of Things
3. PoS - Proof of Stake
4. PoW - Proof of Work
5. NFT - Non-Fungible Token
6. IPFS - InterPlanetary File System

IV. MODULES

The proposed system is composed of several integrated modules designed to handle the end-to-end rental process:

- **Identity and Profile Management Module:** This module allows landlords and tenants to create secure, verifiable digital identities on the blockchain. It handles the registration and authentication of users, ensuring that all participants in the network are legitimate.
- **Property Listing and Discovery Module:** Landlords can use this module to list their rental properties with detailed descriptions, images, and terms. All listing information is stored securely, and tenants can browse and search for properties in a transparent manner.
- **Smart Lease Agreement Module:** This is the core of the system, where smart contracts are used to create, negotiate, and execute digital lease agreements. The terms of the lease are encoded into the contract, which automatically enforces the rules and obligations for both parties.
- **Automated Payment and Deposit Module:** This module leverages smart contracts to automate rent collection and security deposit management. Funds for security deposits can be held in escrow by the smart contract and released automatically only when the lease conditions are met, eliminating disputes and the need for third-party escrow services.
- **Decentralized Ledger Module:** This is the underlying blockchain network that functions as a distributed and immutable database. It records every transaction—from lease signing to payment history—creating a permanent and unalterable audit trail that is accessible to authorized parties.

V. TOOLS AND TECHNOLOGY

The development of a blockchain-based rental system relies on a combination of foundational blockchain principles and associated modern technologies. The core components include:

- **Blockchain Platforms:** The system can be built on established platforms that support smart contracts, such as Ethereum or Hyperledger Fabric.
- **Core Concepts:** The architecture is built on a peer-to-peer network that maintains a distributed ledger. The automation and enforcement of rules are handled by Smart Contracts.
- **Consensus Mechanisms:** To secure the network and validate transactions, consensus algorithms like Proof of Work (PoW) or Proof of Stake (PoS) are utilized.
- **Associated Technologies:** To enhance functionality, the system can integrate with:
- **InterPlanetary File System (IPFS)** for decentralized, off-chain storage of large files like documents and images

VI. SYSTEM ANALYSIS AND INNOVATION

Limitations of Existing Systems

Traditional rental management systems, even with digital enhancements, suffer from several critical weaknesses:

- **Manual and Inefficient:** The reliance on paper-based agreements and manual record-keeping is slow and susceptible to human error.
- **Lack of Transparency:** Centralized record-keeping means that there is no single, shared source of truth, often leading to misunderstandings and disputes over lease terms and payments.
- **High Costs:** The involvement of intermediaries such as property managers, agents, and lawyers adds significant fees and complexity to the rental process.
- **Security Risks:** Centralized databases are vulnerable to fraud, data breaches, and unauthorized modifications.

VII. PROPOSED SYSTEM AND INNOVATION

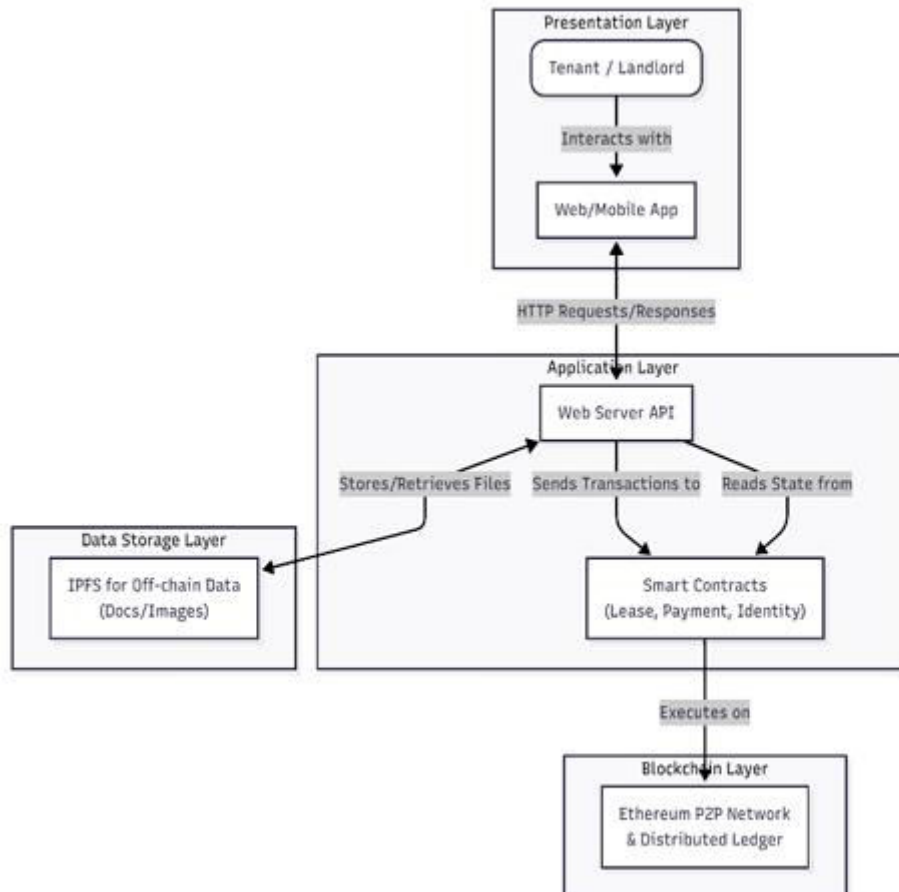


Fig: Proposed System Architecture

- **Enhanced Trust and Transparency:** The system's core innovation is its use of a decentralized ledger. This provides a shared, single source of truth that is accessible to all participants, fostering unprecedented trust and openness between landlords and tenants.
- **Process Automation with Smart Contracts:** By automating rent payments, security deposit handling, and lease enforcement, smart contracts eliminate the need for manual intervention, reduce delays, and ensure that the terms of the agreement are executed precisely as written.
- **Disintermediation:** The platform facilitates direct peer to-peer transactions, removing the need for costly intermediaries. This innovation not only reduces transaction costs but also simplifies the entire rental process for all users.
- **Immutable Records:** Every transaction and agreement recorded on the blockchain is cryptographically secured and cannot be altered or deleted. This immutability provides a robust and tamper-proof history of the entire rental lifecycle, significantly lowering the risk of fraud.

VIII. BACKGROUND REVIEW AND LITERATURE REVIEW

The application of blockchain technology to real estate and rental management is an emerging field of research. A review of existing literature reveals several key areas of exploration and identifies common challenges. Studies have demonstrated the potential of using blockchain to manage land records and implement land titling systems, aiming to

overcome the issues present in traditional registries. In parallel, the vehicle rental industry has seen proposals for blockchain-based platforms like "Cryptober," which focus on creating cost-optimal and secure car sharing networks, sometimes integrating IoT for features like keyless authentication. Specifically for housing, researchers have proposed secure rental platforms that utilize advanced cryptographic methods like homomorphic encryption and zero knowledge proofs to protect user data. However, across these applications, the literature consistently identifies several significant hurdles that must be overcome. These include challenges with scalability (handling a large volume of transactions), data storage, privacy concerns, and the lack of established rules and regulations to govern such systems. Our project builds on this foundational research by proposing a comprehensive architecture that addresses the core rental lease lifecycle while remaining mindful of these known limitations.

IX. APPLICATION OF *CYBERFEDDEFENDER*

The primary application of this system is to revolutionize the rental management industry by improving security, transparency, and efficiency. Specific applications include:

- **Secure Lease Agreement Management:** Creating, storing, and enforcing rental agreements on an immutable ledger, reducing the possibility of unauthorized modifications and disputes.
- **Automated and Transparent Payments:** Using smart contracts to automate rent collection and the management of security deposits, ensuring timely payments and fair handling of funds.
- **Verifiable Identity and Tenant Screening:** Securely storing and exchanging data like rental history and references to facilitate tenant verification while maintaining privacy.
- **Trustworthy Property Listings:** Providing a transparent platform for property advertisements where data is verifiable and resistant to fraudulent entries.
- **Broader Asset Management:** The principles can be applied beyond housing to manage the rental and leasing of other assets, including land titles and vehicles.

X. FUTURE DIRECTIONS AND RESEARCH OPPORTUNITIES

While the proposed system offers a robust foundation, there are several avenues for future enhancements and research:

- **Integration with IoT:** A key future direction is to integrate the blockchain platform with Internet of Things (IoT) devices to prevent data threats and enable smart property management, such as automated access control with smart locks or predictive maintenance alerts from sensors.
- **Addressing Scalability:** Future work must focus on solving scalability issues to ensure the system can manage enormous amounts of data and a high volume of transactions efficiently, which is a current limitation of some blockchain technologies.
- **Developing Regulatory Frameworks:** A significant opportunity lies in collaborating with regulatory bodies to create transparent legal and regulatory frameworks that govern blockchain-based rental agreements, which is essential for widespread adoption.
- **Enhancing System Intelligence:** The technology can be further developed to support more complex transactions and integrate with advanced AI for dynamic pricing, tenant risk assessment, or optimizing property management.

XI. CONCLUSION

This project demonstrates the transformative potential of blockchain technology in the rental lease management sector. By designing a system that is transparent, secure, and efficient, we address the fundamental weaknesses of traditional rental processes. The automation of key tasks through smart contracts and the elimination of intermediaries create a streamlined, cost effective, and trustworthy environment for both landlords and tenants. The modular architecture ensures that the platform is robust and scalable for future development. While challenges such as regulatory adoption and scalability remain, this work provides a strong foundation for the future of rental management. Future enhancements could include the integration of IoT devices for smart property management, which would further secure and automate the rental experience.

REFERENCES

1. V. Thakur, M. N. Doja, Y. K. Dwivedi, T. Ahmad, and G. Khadanga, "Land records on Blockchain for implementation of Land Titling in India," International Journal of Information Management, vol. 52, p. 101940, Jun. 2020, doi: 10.1016/j.ijinfomgt.2019.04.013.
2. V. Hassija, M. Zaid, G. Singh, A. Srivastava, and V. Saxena, "Cryptober: A Blockchain-based Secure and Cost-Optimal Car Rental Platform," Aug. 2019, doi: 10.1109/ic3.2019.8844943.
3. K. M. Alam, J. M. A. Rahman, A. Tasnim, and A. Akther, "A blockchain-based land title management system for Bangladesh," Journal of King Saud University - Computer and Information Sciences, vol. 34, no. 6, pp. 3096-3110, Jun. 2022, doi: 10.1016/j.jksuci.2020.10.011.
4. U. Majeed, L. U. Khan, I. Yaqoob, S. M. A. Kazmi, K. Salah, and C. S. Hong, "Blockchain for IoT-based smart cities: Recent advances, requirements, and future challenges," Journal of Network and Computer Applications, vol. 181, p. 103007, May 10.1016/j.jnca.2021.103007. 2021, doi:
5. R. Yu, Z. Wang, C. Zhang, and S. Guan, "A secure blockchain-based housing rental platform," Jun. 2021, doi: 10.1109/imcec51613.2021.9482058.
6. Q. Xue, Z. Hou, H. Ma, H. Zhu, X. Ju, and Y. Sun, "Housing rental system based on blockchain Technology," Journal of Physics, vol. 1948, no. 1, p. 012058, Jun. 2021, doi: 10.1088/1742 6596/1948/1/012058.
7. S. Auer, S. Nagler, S. Mazumdar, and R. R. Mukkamala, "Towards blockchain-IoT based shared mobility: Car-sharing and leasing as a case study," Journal of Network and Computer Applications, vol. 200, p. 103316, Apr. 2022, doi: 10.1016/j.jnca.2021.103316.
8. Dr. N. Jesse, "Cut out the middleman' Automating Business Processes with Blockchains and Smart Contracts," IFAC-PapersOnLine, vol. 55, no. 39, pp. 352-357, 2022, doi: <https://doi.org/10.1016/j.ifacol.2022.12.079>.
9. M. Sankar, S. Pachiyappan, S. Paramasivan, and A. Srivastava, "Adoption of blockchain technology in the real estate sector toward the improvement of smart cities," in Elsevier eBooks, 2023, pp. 187-198. doi: 10.1016/b978-0-323 95407-5.00002-5.
10. S. Sharma, A. Kumar, N. Sengar, and A. Kaushik, "Implementation of Property Rental Website Using Blockchain with Soulbound Tokens for Reputation and Review System."



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details