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Transforming Land Registration: Harnessing Blockchain Technology for Secure Land Registration Systems

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***Abstract* - Systems for land registration are vulnerable to fraud, lack of transparency, and complexity. In order to overcome these problems, this study suggests a blockchain-based platform that provides a decentralized, impenetrable platform for tracking property ownership information. Through the conversion of tangible land assets into token assets based on blockchain technology, the system guarantees digitally safe and transparent ownership records. An implementation that shows feasibility and efficiency with shorter transaction processing times takes inspiration from the Ethereum blockchain. The study, which focuses on India, promotes the use of blockchain technology to expedite land register procedures and highlights the function of smart contracts for safe and automated transactions. Through the modernization of land registration, our research helps to create a real estate ecosystem that is more transparent, safe, and effective.**

Keywords: Blockchain, Decentralized, Ethereum, Land Registration, Smart contracts.

I. Introduction

Blockchain technology has been a game-changer for a number of applications because of its capacity to build transparent and safe decentralized ledgers. Because it permits several users to manage digital record books concurrently, it essentially eliminates the possibility of illegal changes, ensuring data integrity. Unlike other decentralized technologies, blockchain is immutable and has security features. Notably, professionals believe that this design is most suited for intricate transactions with several steps and a variety of stakeholders, like trade finance, real estate transactions, and land registration procedures.

Blockchain presents a potential answer in the area of land management, where poor governance and corruption have long been problems. Conventional land registration procedures might result in income losses due to corruption and unequal access. The distributed ledger technology of blockchain lowers the possibility of fraudulent activity by offering a safe, visible history of every transaction. The integration of blockchain technology into land registration enhances security and transparency while fortifying the system against illicit activity linked to transactions.

Moreover, the incorporation of blockchain technology into land registration streamlines the digitization of procedures, mitigating security issues that are common in online platforms. Online platform security assaults are increasing even as digitization continues. Blockchain guarantees data security and organized information organization with its strong encryption techniques, such as the SHA256 algorithm. With each block corresponding to a crucial piece of information about a land transaction—such as the property ID, owner data, transaction amount, and manner of payment—this technology presents a chance to build a robust digital identity system.

II. Literature Survey

In the domain of land registration, leveraging blockchain technology has demonstrated notable progress and promising applications. Several studies have investigated the incorporation of blockchain into land registration systems, with a focus on bolstering data security, property ownership privacy, and record management. This approach facilitates the establishment of distinct profiles for both landowners and relevant authorities, thereby ensuring confidentiality and integrity in land ownership transactions. These endeavors underscore the potential of blockchain technology in tackling significant hurdles within the realm of land registration.

This study presents a comprehensive exploration of implementing a secure land registration framework using blockchain technology. It begins by discussing the challenges inherent in traditional land registration systems, highlighting issues such as fraud, incomplete records, and lengthy litigation. The authors propose a blockchain-based solution to address these challenges, emphasizing the immutability and transparency of blockchain records. The proposed scheme involves a decentralized application built on Ethereum, utilizing smart contracts to handle land ownership transfers

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securely. The architecture and model of the system are detailed, emphasizing decentralized consensus mechanisms and selective data visibility. The paper evaluates the system's performance in terms of transaction cost, time complexity, and resilience to adversarial attacks. It concludes by highlighting the advantages of blockchain-based land registration systems, including transparency, reduced costs, and enhanced security, while acknowledging challenges such as scalability and fluctuating transaction costs.[1]

The paper highlights the significance of blockchain technology in revolutionizing land registration processes. It emphasizes the benefits of distributed ledgers, such as immutability and security, which make alteration of data virtually impossible without consensus. The paper also discusses the challenges faced in traditional land registry systems, including trust issues, fraud cases, time delays, and human errors. Moreover, it explores the potential of blockchain technology to address these challenges by introducing transparency, efficiency, and security into land registration processes. Additionally, the paper delves into the concept of smart contracts, their role in facilitating transactions, and the benefits they offer in terms of automation and security. Through a detailed examination of blockchain technology and its applications in land registration, the paper contributes to the existing literature by providing insights into how emerging technologies can reshape public sector services and improve trust and efficiency in property transactions.[2]

The paper highlights how crucial precise property records are to safeguarding ownership rights, stopping fraud, and settling conflicts. It draws attention to the difficulties and inefficiencies that come with using conventional land registration procedures, especially in India. The study suggests developing a decentralized land registration network that uses blockchain technology—more especially, Ethereum—to remove middlemen, improve transparency, and expedite the ownership transfer procedure. The technology leverages blockchain's immutable ledger and smart contracts to address issues including fraud cases, middleman involvement, and delays in land registration. The report also explores how the efficiency and security of the land register system could be improved by adding features like the ability to sell land assets with bitcoin.[3]

This piece underscores the significance of digitizing land registration processes in India to enhance efficiency and security. It explores the increasing number of security threats in online systems and proposes blockchain technology as a solution to ensure the integrity and transparency of land records. The study discusses the fundamental concepts of blockchain technology, emphasizing its immutable and transparent nature. It reviews previous research efforts, such as U. M. Ramya's proposal of a blockchain system for land registration, which utilizes a private-permissioned blockchain for faster processing. Additionally, it examines the application of smart contracts in land registry systems, highlighting their role in automating transactions and ensuring trust among parties. The paper concludes by outlining the steps for implementing blockchain-enabled land registration systems and emphasizes the importance of securing land records to prevent fraud and unauthorized alterations.[6]

III. Methodologies

The software platform that utilized to create this framework and its benefits. The most well known and important components of this framework's implementation, Ethereum and Interplanetary File System (IPFS), are also described in the next section.

A) Ethereum

Ethereum plays a pivotal role in the world of blockchain as a decentralized platform that enables smart contracts and decentralized applications (DApps). It's a blockchain network designed not just for cryptocurrency transactions (like Bitcoin) but also for executing code in a trustless and secure manner. Ethereum's native cryptocurrency, Ether (ETH), powers these smart contracts and transactions, serving as both a digital currency and a fuel for executing operations on the network. This innovative approach to blockchain has led to the creation of a wide range of applications, from decentralized finance (DeFi) platforms to non-fungible tokens (NFTs) and more, making Ethereum a driving force in the evolution of blockchain technology.[4]

B) The Smart Contract

A set of instructions that can be used to complete any blockchain transaction is known as a smart contract. This piece of code is executed when users send transactions. They use the blockchain directly for their operations, making them resistant to alteration and manipulation. Contracts can program any kind of blockchain activity using the Solidity programming language. After they have completed the necessary tasks, the programmers can compile the had a program. After that, they might be used. Following compilation, on the Ethereum blockchain. JavaScript is a language for programming that uses Ethereum's writing the code for the smart contract in Solidity.[7]

C) Inter Planetary File System

IPFS is a peer-to-peer network distributed data storage solution. Any effort to modify data stored on IPFS must change the identifier since IPFS data is secure and

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invulnerable to manipulation. Therefore, it offers a cryptographic identity to guard against data manipulation. The hash value of each data file kept on IPFS is produced cryptographically. It is used to identify data files saved on IPFS and has a single value. A peer-to-peer connection with an IPFS object—which has links and data—is used by the IPFS protocol. The connection is a disordered binary value, and the data is a range of disorganized binary values.[7]

D) Ganache

It is a local Ethereum blockchain for the rapid creation of decentralized programs. Ganache can be used to deploy, develop, and test in a predictable and secure environment throughout the development cycle. It works both ways: as a desktop program and as a command-line tool.[9]

E) MetaMask

It is an entry point that allows you to view the decentralized web of the future in your browser right now. It allows you to execute Ethereum decentralized applications without having to run a full Ethereum node in your browser.[8]

IV. System Design

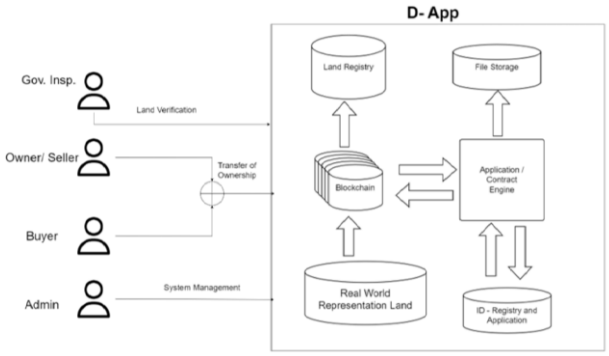

Figure 1: System Architecture

User Registration: Users (Buyers, Sellers, Land Inspectors) sign up on the web application by providing necessary details such as name, contact information, and creating a unique login ID along with a password. Each user is associated with a blockchain wallet, and they receive a unique identifier (e.g., public key) linked to their wallet.

Listing Land: Sellers create detailed listings for the land they wish to sell. They input information such as location (including coordinates if available), size (in square meters or acres), price (in a chosen currency or cryptocurrency), relevant documents (such as deeds or surveys), and any additional notes or comments.

Viewing Listings: Buyers browse through the available listings on the platform. They can filter and search for properties based on various criteria such as location, price range, size, etc. Each listing displays detailed information provided by the seller.

Initiating a Purchase: When a buyer finds a property they are interested in, they initiate a purchase request through the web application. This request includes specific details of the property they want to buy, including the proposed purchase price and any other conditions or requirements they may have.

Smart Contract Execution: Upon receiving the purchase request, a smart contract is deployed on the blockchain to facilitate the transaction. The smart contract contains predefined terms and conditions agreed upon by both parties, including details of the property, purchase price, and any relevant deadlines or milestones.

Verification by Land Inspector: A designated land inspector is assigned to verify the authenticity and legality of the property. The inspector physically visits the land to confirm its location, boundaries, and legal status. They may also review documents provided by the seller to ensure they are genuine and up-to-date.

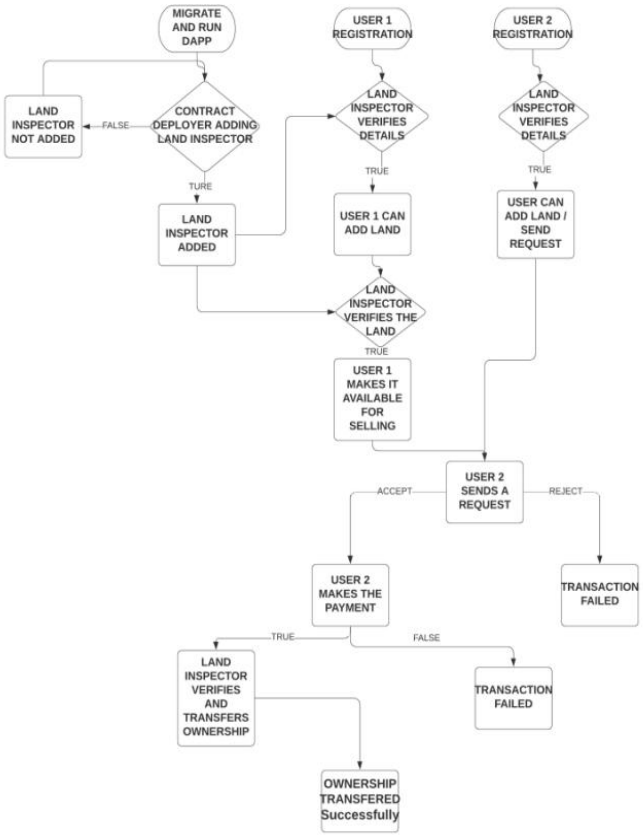

Figure 2: Data Flow Diagram

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Confirmation of Verification: After completing the verification process, the land inspector updates the status of the property on the blockchain. This update confirms that the property has been verified and meets the necessary criteria for the sale to proceed. The smart contract progresses to the next stage based on this confirmation.

Escrow and Payment: The buyer places the agreed upon funds into an escrow account managed by the smart contract. The escrow account ensures that the funds are held securely until all conditions of the sale are met. The seller is notified of the verification and confirms their readiness to proceed with the sale.

Transfer of Ownership: Once payment is confirmed and verification is completed, the smart contract executes the transfer of ownership from the seller to the buyer. This transaction is recorded on the blockchain as an immutable record, providing proof of the transfer of ownership.

Release of Funds: Upon successful completion of the transfer of ownership, the funds held in escrow are released to the seller. The smart contract automatically releases the funds according to the predefined terms and conditions agreed upon by both parties.

Finalizing Transaction: Once the transaction is completed, a document confirming the transfer of ownership and the release of funds will be generated. This document serves as official proof that the property now belongs to the new owner. Both the buyer and the seller will receive confirmation of the successful sale through the web application.

V. Implementation

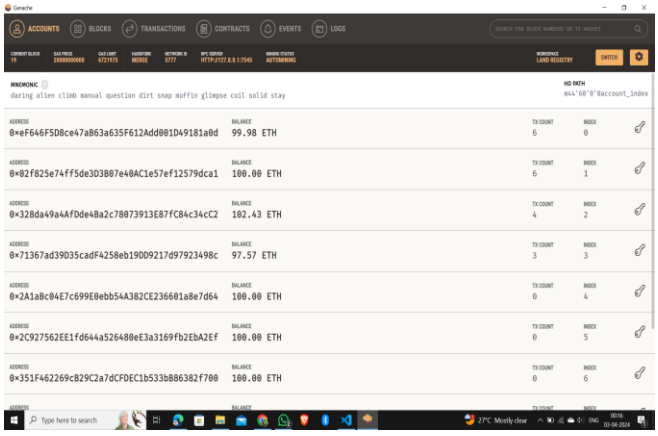

Figure 3: Ganache Setup

Fig. 3 shows entire ganache setup. It is a local blockchain network which is present in our system. It provides us dummy blockchain addresses with each of 100ETH.

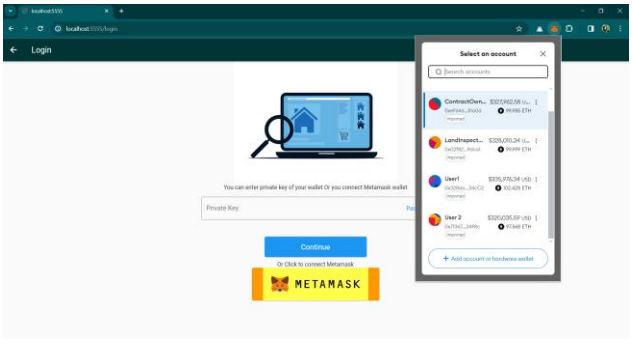

Figure 4: Login page

Fig. 4 illustrates the retrieval of blockchain addresses from Ganache, enabling connection to user accounts via Metamask for accessing and managing accounts seamlessly.

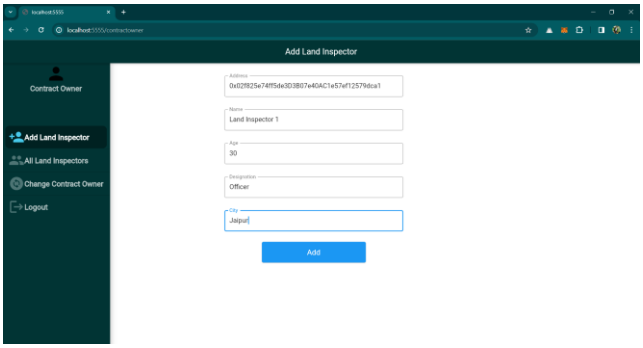

Figure 5: Contract Owner Dashboard

In Fig. 5 the Contract Owners Dashboard simplifies land inspector management, enabling seamless addition/removal and effortless contract ownership transfer, enhancing efficiency in land management.

Fig. 6 provides a comprehensive overview of land registration activities. It allows inspectors to track land ownership, monitor property transfers.

In Fig. 7 the dashboard simplifies property management for landowners, facilitating customizable listings, seamless transitions to selling status, and effective tracking of requests for smooth communication and transactions.

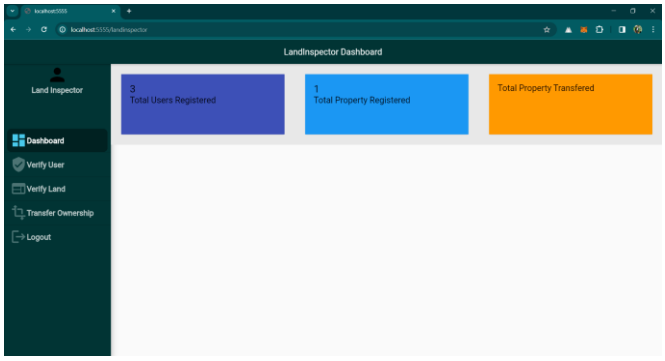

Figure 6: Land Inspector Dashboard

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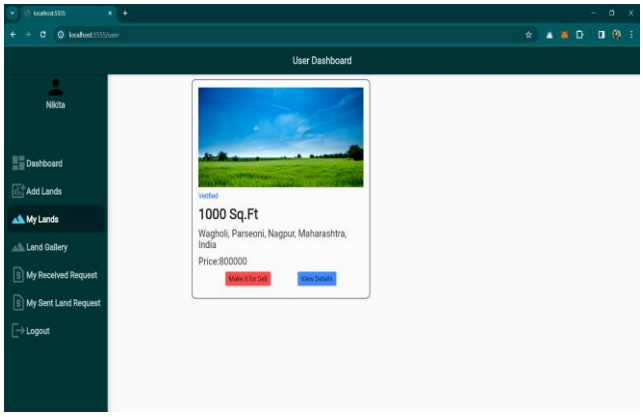

Figure 7: User Dashboard

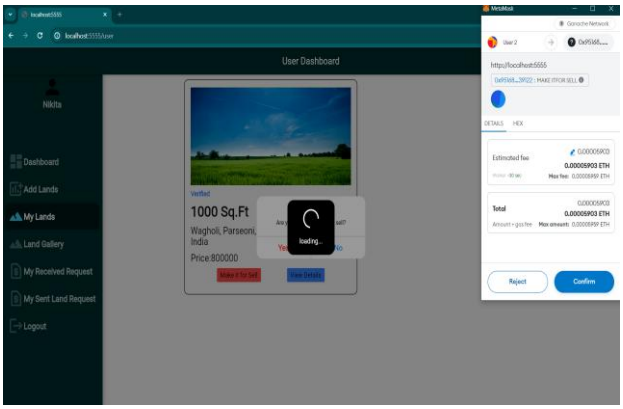

Figure 8: Transaction

Fig. 8 exhibits an Ethereum transaction via MetaMask, illustrating sender and recipient addresses, transaction amount, and gas fees, showcasing Ethereum's seamless and secure transfer process.

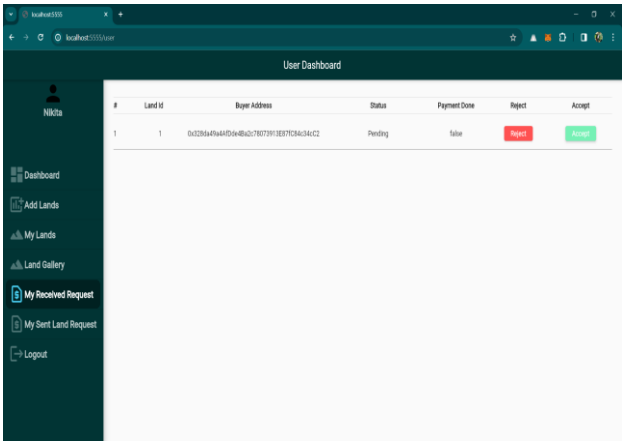

Figure 9: Accept or Reject Request from User

In Fig. 9 the user interface presents options to accept or reject a request for purchasing land from another user, streamlining the decision-making process with clear and intuitive controls.

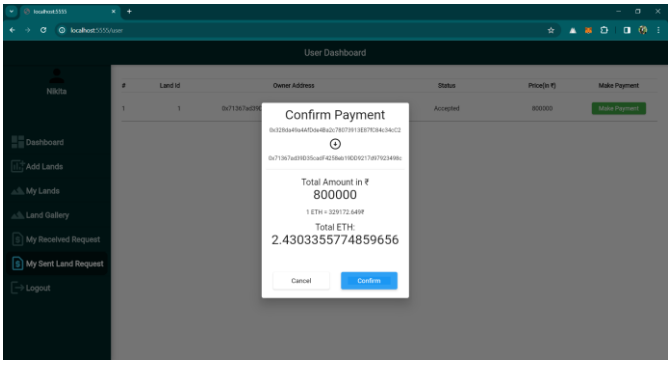

Figure 10: Total Amount in Ethers

Fig. 10 confirms payment of total land cost in rupees, converted into ethers at the current exchange rate, ensuring seamless transaction completion.

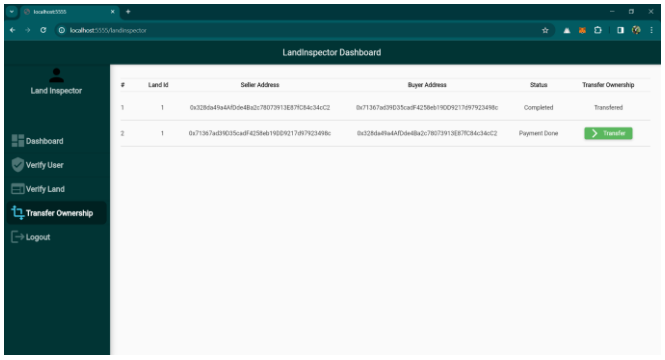

Figure 11: Transfer Ownership

Fig. 11 shows the land inspector receiving a transfer request following the completion of payment for the land transaction.

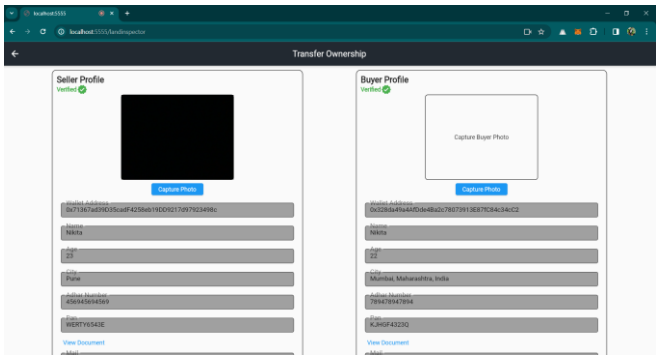

Figure 12: Transfer Details

Fig. 12 is displaying comprehensive transfer details of land ownership, including the identities of both seller and buyer, essential transaction particulars, and legal documentation for the transfer process.

Fig. 13 shows a document confirming the successful transfer of ownership, complete with relevant details and signatures, ensuring legal clarity and accountability.

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In Fig. 14 an NFT account displaying a comprehensive storage of all legal documents involved in the land registration process, ensuring secure and transparent recordkeeping.

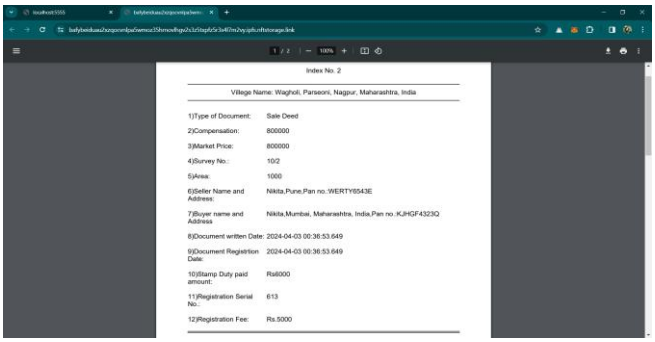

Figure 13: Document Generated

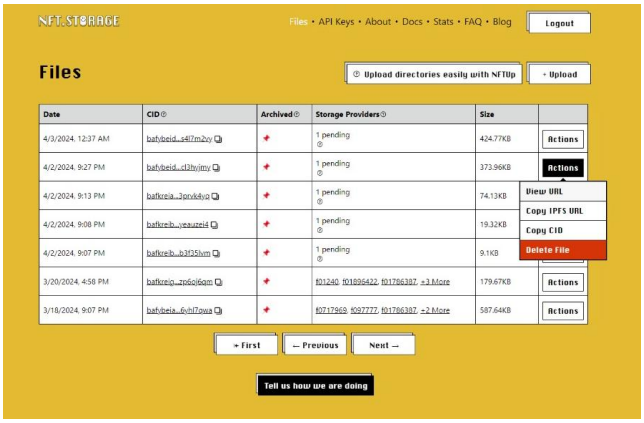

Figure 14: Document Generated

VI. System Features

A) Immutable Record-Keeping

All land-related transactions, including sales, purchases, and transfers, are recorded on the blockchain, creating an immutable ledger that cannot be altered retroactively. This feature ensures the integrity and permanence of the land ownership records.[1]

B) Smart Contracts for Property Transactions

Smart contracts can be utilized to automate and enforce the terms of property transactions. These contracts can facilitate the transfer of ownership rights, manage escrow agreements, and automatically execute specific actions once predefined conditions are met, thus streamlining the overall process. [3]

C) Decentralized Ownership Verification

Blockchain technology allows for the verification of land ownership without the need for intermediaries, as the information is stored in a decentralized and transparent network accessible to authorized parties. This feature can help prevent fraudulent claims and disputes over property ownership. [3]

D) Time-Stamped and Authenticated Records

Each entry in the blockchain is time-stamped and authenticated, providing a reliable and transparent record of all past and present land transactions. This feature enables stakeholders to track the history of land ownership and transactions, thereby increasing trust and accountability.[2]

E) Enhanced Security and Privacy

With robust cryptographic techniques, blockchain ensures secure data storage and transmission, protecting sensitive information related to landowners, properties, and transactions. This feature helps safeguard the privacy of individuals while maintaining the integrity of the land registration system.[4]

F) Streamlined Transfer of Property Titles

Blockchain technology simplifies the transfer of property titles by enabling efficient and transparent verification of ownership. This feature reduces the administrative burden and minimizes the risk of errors or discrepancies in the transfer process.[5]

G) Integration with Legal and Regulatory Frameworks

The system can be designed to integrate seamlessly with existing legal and regulatory frameworks, ensuring compliance with regional and national land registration laws. This feature helps establish a standardized and legally recognized process for recording and managing land-related transactions.[2]

VII. Challenges

A) Middlemen, Brokers

The intermediaries and brokers are an essential component of any firm, holding significant knowledge regarding the current market worth. Because they are laypeople, buyers and sellers call them in order to gain a thorough understanding of the market and prices that are higher or cheaper for the trade. The computation of the execution of real estate transactions by middlemen is the cause of the information about traders and mistakes in land papers. Due of the large number of parties involved—local governments, brokers, lenders, and intermediaries—the process also becomes costly.

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B) Fraud cases

Pretenders pretending to be the sellers of land or other properties occur frequently. An imposter can simply flee with the money if they are successful in posing as the owner. Until the land register discovered the scam as part of a spot check operation, both the vendors and the buyers were frequently unaware of it.

C) Time delays

The Land Registry procedure takes a considerable time to finish the registration. A minimum of two to three months are required from completion to registration.

D) Human error/intervention

Error likelihood increases with human interaction. This increases the likelihood of mistakes in the land registry system as a whole and increases the vulnerability of the land registry process.

VIII. Conclusion

The authors of this research suggested a smooth, user friendly and hassle-free platform that may be used to streamline the land registration process. Numerous issues exist, including delays in processing, the involvement of intermediaries or brokers, etc. With the use of this platform, land registration issues in India and many other countries would be resolved. The article goes into great depth about each phase of the land registration process. In addition to simplifying the procedure, going paperless for land registration will protect ownership documents from both natural and man-made calamities. Blockchain technology is growing quickly because of its secure qualities. Thus, the creation of immutable records can be achieved by utilizing blockchain technology to store land record transactions. The land registry platform can be enhanced with a plethora of new functionality. Land is not a liquid asset these days. Through the use of the platform, land assets can also be sold using bitcoin, which correlates with the land record that a seller has generated on the site. As a result, the platform's scope is broad and its use cases are numerous.

IX. Future Scope

After studying Blockchain technology, it can be easily said that it can be definitely used for land registrations as the transactions will be transparent that's what we need in a good governance. The elements like transparency as well as efficiency and ability to store the history of transactions is present. The unique identifier (survey no) can be stored by which each land is numbered. Blockchain based land registry platform will bring transparency in the system as buyers and sellers can directly communicate with each other and also each user can access the records easily. Third party's that are involved in the land registration process keeps information that one cannot access, or you do not have the permission to access in a land transaction system.

REFERENCES

[1] Meghali Nandi, Rajat Kanti Bhattacharjee, "A secured land registration framework on Blockchain", - 2020 Third ISEA Conference on Security and Privacy (ISEA-ISAP).

[2] Archana Sahai, Rajiv Pandey, "Smart Contract Definition for Land Registry in Blockchain" 9th IEEE International Conference on Communication Systems and Network Technologies, 2020-IEEE.

[3] Rijwan Khan, Shadab Ansar, Sneha Jain, "Blockchain based land registry system using Ethereum Blockchain", Journal of XI an university of architecture and technology, April 2020.

[4] Muhammad Aquib, Lachhman Das Dhomeja, Kamran Dahri,Yasir Arfat Malkani, "Blockchain-based Land Record Management in Pakistan", 3rd International Conference on Computing, Mathematics and Engineering Technologies – iCoMET 2020.

[5] Krishnapriya S, Greeshma Sarath, "Securing Land Registration using Blockchain", Third International Conference on Computing and Network Communications.

[6] R.C.Suganthe, N.Shanthi, R.S.Latha, "Blockchain enabled Digitization of Land Registration", 2021 International Conference on Computer Communication and Informatics.

[7] Alkhansaa Abuhashim, Chiu C. Tan "Smart Contract Designs on Blockchain Applications" 2020, IEEE Xplore.

[8] Rishikesh Kadam, Vishakha Vidhani, Anushree Bane, Bhavika Valecha and Dr. Nupur Giri, "Land Records System Using Hybrid Blockchain", 2020 IEEE International Conference on Convergence to Digital World – Quo Vadis (ICCDW 2020).

[9] Ameya Thosar, Mayur Harne, Ashutosh Sarode, Dr. Parminder Kaur, "Land Registry Management using Blockachain", 2020, IEEE Xplore.

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