Advances in Parallel Computing Algorithms, Tools and Paradigms
D.J. Hemanth et al. (Eds.)

doi:10.3233/APC220062

A Secure E-Governance System Using Blockchain Techniques

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Abstract.Secure data and property transmission between two parties is a difficult task in the real world. The existing system for e-governance operations is riddled with inefficiencies and dishonesty, resulting in records that are not safeguarded, and people are the ones who face the brunt of it. The proposed system is built upon utilizing blockchain principles to securely transfer E-governance processes from one party to another. It is an electronic record of data that necessitates the use of digital security. All of the data in the blockchain is immutable; it is almost impossible to modify the value of data once it has been placed into the blockchain. The proposed model is based on blockchain technology and implements a secure E-governance system in land registration. It aids in the upliftment of the disadvantaged and underprivileged sections of society by combating illicit land authorization. Because of this, the suggested system outperforms the current system.

Keywords. Smart Contract, Gabache, Truffle Migrate, E-Governance, Land Registration system.

1. Introduction

Blockchain is a method of securely conveying data, such as records, events, or transactions, from one person to another. Because it is an electronic record of data, digital security is essential. All data on the blockchain is immutable since it only allows adding features. It is almost impossible to change the value of data after it has been entered into a blockchain. The land register uses Blockchain to ensure the safe transfer of land property.The application of Blockchain technology to land registration is proving to be extremely beneficial in this ever-changing era. It is aiding in the upliftment of vulnerable and impoverished parts of society by eliminating unauthorized land use.

According to one definition, "Legal documents" are maintained and administered by government authorities, encompassing all relevant information about the property, one of which is the current legal owner of the asset or property. It aids in the acquisition of a detailed back-dated history of ownership of that property, as well as any information on previous owners. The legal rights to property are passed down from generation to generation. It might be difficult to figure out who is the legal owner of an object or piece of property. The legal owner and the claiming owner are in a land

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dispute, and the claiming owner may file a lawsuit against the legal owner to acquire title to the property.

The disadvantages of the current method of transferring ownership for land records are that the current procedure takes a long time. This method is less secure than land registration using blockchain technology. There is no transparency in it. The procedure isn't as well coordinated. The old approach has a low level of data integrity. The proposed system would be created to remedy all of the present system's flaws.

2. Related Work

This section relates the related work for the proposed system. Wu et al. [1] use blockchain to provide solutions for electronic health records. To guarantee data integrity, it implements PDP-like data verification techniques. The results of the experiments reveal that the MB-EHR has excellent throughput performance [13]. Frauenthaler et al. [2] "propose a new relay strategy that combines a validation-on-demand pattern with economic incentives to cut the cost of running a relay across To solve the 51 percent attack problem, Yang et al. [3] present a solution that combines the history weighted information of miners with overall calculation complexity. According to the analysis, the new approach increases the cost of a standard attack by two orders of magnitude [17].

We enhance the linear structure of the classic blockchain protocol by utilizing the Directed Acyclic Graph (DAG) structure, as proposed by Yang et al. [4]. Blocks are grouped into levels and widths in the new layout, resulting in a condensed DAG structure to make CODAG more efficient and safe, we provide algorithms and protocols for properly placing newly created blocks. [5] Dabboussi et al. [6], [12] Salman and colleagues the probabilistic blockchain idea is extended in this work. It is proposed to create a reputation management system suited for such blockchains. The framework was created to meet the needs of a diverse set of applications. Moschou et al. [7] provide a methodology for comparing the performance of two distinct transaction processors on the Hyperledger Sawtooth platform. We conducted an experimental evaluation of the approach and are sharing the findings, which may be valuable to blockchain practitioners for future solution designs. [8].

Malik, et al. [14] in this paper, "authors offer TrustChain, a three-layered trust management paradigm that uses a consortium blockchain to track supply chain interactions and dynamically award trust and reputation ratings based on these interactions". In their article, Su et al. [9] developed a secure data exchange method based on blockchain technology and proxy re-encryption technology. The solution is made up of two components: a data sharing model and a data sharing protocol.Wang et al. [10], [11] propose the ChainSplitter, a hierarchical blockchain storage structure. The suggested design, in particular, has a hierarchical storage structure, with the bulk of the blockchain being kept in the clouds and the most recent blocks being saved in the overlay networks of specific IIoTnetworks [15,16].

3. Proposed E-Governance System Architecture

This section outlines the proposed system architecture for a secure land registration system. Figure 1 gives information on smart contract creation and smart contract

interaction. It shows the complete steps to creating a secure land registration system using blockchain methodology.

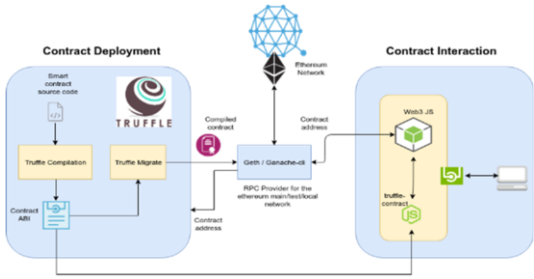

Figure 1. Creation of Smart Contract for Land Registration System

Registration Module:It collects information about the owner of the asset, account, address details, and asset data. After collecting all the information, it is stored in a database. The buyer can only enroll in the user enrolment portal. The seller has to enroll in both the user and asset enrolment portals.

Steps for Registration Module:

Step 1: Read Account address which uniquely identifies a peer.

Step 2:IF the peer is seller:

Read Asset detail which is going to be sold.

Step 3: Click Submit to store data.

Verification Module: Each account is uniquely identified by its account address. So, we can perform a linear search on it.Using this module, the seller and buyer can verify their own and each other's data. This has been done before any transaction begins.

Steps for Verification of Buyer and Seller Data's Searching (via Account Address):

Step 1: Read Account address from input box.

Step 2: perform a Linear Search on the available peers.

Step 3:IF Detail Found

Output the detail related to that account address.

Record Module: Anyone can see and check the data available for selling and people who are willing to buy land to give proposals. This is only a view.

Steps for Record Module:

Step 1: Read All Account address from Blockchain.

Step 2:IF Detail Found related to some particular account

Output the detail related to that account address.

Mutation Module: Steps for Mutation Module:

Step 1: Read seller Account Address.

Step 2: fetch the Seller Detail.

Step 3: Read the Buyer Account Address

Step 4: fetch the Buyer Detail.

Step 5: If seller wants to sell the land the seller enter password

The transaction initiated and seller address is replaced with buyer address

ELSE

Password wrong abort transaction and reload page

Step 6: Buyer read the detail via his Account Address and entered password
Step 7:IF the password is correct and current balance > land value:
Ether debited from buyer account and credited to seller Account
ELSE
Transaction aborted and page reloaded.
Steps for Vendor list: Using the append only feature of the blockchain and storing the hierarchy of the vendor.
Step 1: for every Transaction of land there must be a plot number.
Step 2: Read Plot.no
Step 3:If Plot.No have some data:
Show all buyer and seller names and current Owner of land.
ELSE
Show Current Owner of Land.
The seller only wants to know the buyer's address: The seller enters his own account address and password and the buyer's account address to initiate the transfer of land power of attorney. Since it is open to all, anyone can enter the address, but since the password is not known to anyone, it is confidential. That's why only an authorized person can register the land to the buyer.
The buyer only wants to know the seller's address: The buyer enters his account address and password and the seller's account address to initiate the transfer of money. Here also, the same security is maintained as mentioned above.
Steps for Implementation of a Secure E-Governance System
Step 1: First start Ganache to create a blockchain locally:
Step 2: Open the folder of the project in VS Code:
Step 3: Host my webpages on the Vs code default server:
Step 4: Next, create the smart contract to run the ganache first and then use the truffle to create the smart contract.

4. Experimental Results for E-Governance

The following section explains step-by-step the experimental results for the E-Governance system.
Step 1: Entering seller's information and land details: Figure 2 collects the information from the seller's information and land details for further processing. Enter the same account number to link the asset with the owner. Similarly, create a buyer profile but without any asset details and avoid filling in the asset form.
Step 2: Verify the buyer's and seller's information in the records associated with their respective assets. Figure 3 shows details of the buyer and seller data's.
Step 3: In the search section, double-check the details by entering the seller's account address. Figure 4 search for land information and other information about the seller. After doing the verification, contact that person and get the further deal. Once the deal is done, then ask them to initiate the transfer of power of attorney. Figure 4 lists the information about land details.
Step 4: To transfer power of attorney, go to the Mutation section where the seller can enter the account address and be able to transfer the power of attorney. Enter the password and the buyer's id and click transfer. Any error will abort the transaction and reload the page. Figure 5 shows the transfer of power of attorney.After this, on the buyer's side, when he sees that the land has been transferred, he provides his password

and once clicked validate, the amount held by the buyer in his wallet in the form of ether will be automatically deducted and credited to the seller's account. Figures 6 and 7 show the completion of money transferred from buyers to sellers. Figure 8 gives property owner details.

Table 1. Experimental Results and Figure Titles

Experimental Results	Figure Title
	**Figure 2**. Enter Seller Land Information
	**Figure 3.** Verification of Buyer and Seller Information
	**Figure 4.** Searching for Land Information and address
	**Figure 5.** Power of Attorney Transfer
	**Figure 6.** Successful completion of Money Transferred
	**Figure 7.** Seller's and Buyer's Account Details
	**Figure 8.** Property Owner Details

Step 5: Proposed system should check the hierarchy of the buyer and seller of the land by entering the plot number in vendor list section. It also displays the current vendor of the property, eliminating the possibility of fraud.

5. Conclusion

Using blockchain techniques, the proposed secure E-Government system gives the following benefits: The land register in Blockchain is one of the most important uses of e-government systems. The property owner can verify whether they are entitled to transfer legal ownership to others or sell the property automatically. Because the blockchain channel links users through a single platform, the buyer and seller are both users of the blockchain channel and can easily communicate with one another. Property and land records verification becomes highly accessible and simple for everyone. Once

completed, users can access the records. Who are buyers and sellers can immediately go to the next step in the registration process, which is the transaction. A smart contract is used to effectuate the purchase of land or assets. The seller gives the buyer ownership of the property. The transaction is completed automatically by sending funds from the buyer's account to the seller's account. The blockchain smart contract platform allows everyone, including the buyer, seller, and bank, to monitor the status of the contract. In the future, blockchain principles might be extended to additional e-government applications.

References

[1] Wu H, Paik HY ,Li Land Kanhere SS, "MB-EHR: A Multilayer Blockchain-based EHR," 2021 IEEE International Conference on Blockchain and Cryptocurrency (ICBC), pp. 1-3, 2021.
[2] Frauenthaler P, SpanringC, Sigwart M, Sober M and Schulte S, "ETH Relay: A Cost-efficient Relay for Ethereum-based Blockchains," 2020 IEEE International Conference on Blockchain, pp. 204-213,2020.
[3] Yang X, Chen X and Chen Y, "Effective Scheme against 51% Attack on Proof-of-Work Blockchain with History Weighted Information," 2019 IEEE International Conference on Blockchain, pp. 261-265,2019.
[4] Yang S, Xu M, Ming Z,Chen Z, Cui L, and Xu K, "CoDAG: An Efficient and Compacted DAG-Based Blockchain Protocol," 2019 IEEE International Conference on Blockchain (Blockchain), pp. 314-318, 2019.
[5] Dabboussi D, Victor F and Prinz W, "BCDM - A decision and operation model for blockchains," 2021 IEEE International Conference on Blockchain and Cryptocurrency, pp. 1-3, 2021.
[6] Salman T, Jain R and Gupta L, "A Reputation Management Framework for Knowledge-Based and Probabilistic Blockchains," 2019 IEEE International Conference on Blockchain, pp. 520-527, 2019.
[7] MoschouKet al., "Performance Evaluation of different Hyperledger Sawtooth transaction processors for Blockchain log storage with varying workloads," 2020 IEEE International Conference on Blockchain, pp. 476-481, 2020.
[8] Malik S, Dedeoglu V, Kanhere SS and Jurdak R, "TrustChain: Trust Management in Blockchain and IoT Supported Supply Chains," 2019 IEEE International Conference on Blockchain, pp. 184-193, 2019
[9] Su K, Wang H, Wang H and Shi X, "A Financial data security sharing solution based on blockchain technology and proxy re-encryption technology," 2020 IEEE 3rd International Conference of Safe Production and Informatization (IICSPI), pp. 462-465, 2020.
[10] Wang G, Shi z, Nixon M and Han S, "ChainSplitter: Towards Blockchain-Based Industrial IoT Architecture for Supporting Hierarchical Storage," 2019 IEEE International Conference on Blockchain, pp. 166-175, 2019.
[11] Wang G, Nixon M, and Boudreaux M, “Toward cloud-assisted industrial iot platform for large-scale continuous condition monitoring,” Proceedings of the IEEE, vol. 107, no. 6, pp. 1193–1205, June 2019.
[12] Kosba A, Miller A, Shi E, Z. Wen Z, and Papamanthou C, “Hawk:The blockchain model of cryptography and privacy-preserving smart contracts,” in 2016 IEEE symposium on security and privacy (SP).IEEE, pp. 839–858, 2016.
[13] Dorri A, Kanhere SS, Jurdak R, and Gauravaram P, “Blockchain for iot security and privacy: The case study of a smart home,” in Pervasive Computing and Communications Workshops, 2017 IEEE International Conference on. IEEE, pp. 618–623,2017.
[14] Da Xu L, He W, and Li S, “Internet of things in industries: A survey,” IEEE Transactions on industrial informatics, vol. 10, no. 4, pp. 2233–2243, 2014.
[15] Senthilnayaki B, Anbarasi N, Prasath Kumar S, Mahalakshmi G, Duraimurugan J, “IoT: Analysis of Various Attacks Using AODV Protocol", International Journal of Progressive Research in Science and Engineering, Vol.2, No.11, Pp 29-32, 2021.
[16] Senthilnayaki, B., Venkatalakshmi, K., & Kannan, A. Intrusion detection system using fuzzy rough set feature selection and modified KNN classifier. Int. Arab J. Inf. Technol., 16(4), 746-753, 2019.
[17] Velner Y, Teutsch J, and Luu L, “Smart contracts make bitcoin mining pools vulnerable.” IACR Cryptology ePrint Archive, vol. 2017, p. 230,2017.