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Blockchain in Land Registry

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Abstract

Blockchain technology that is increasingly developing can be a solution to land disputes. By designing a land title certificate system based on Blockchain technology, which has complete verification and recording of data history. So that it can help the government's efforts in Agrarian Reform. This research resulted in a system of recording of data history of Land Certificate. that can prove the Blockchain concept where every change that occurs in land title certificate data can be recorded, and distributed to all participants involved in the system.

Keywords: Blockchain, Agrarian Reform, Land Certificate

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INTRODUCTION

Presently Blockchain technology is a new subject matter amongst archivists in various nations. one of the uses of Blockchain technology is inside the land sector in Indonesia thinking about that Indonesia is an emergency land dispute. Because Blockchain has the smart contract and Decentralization features, so that land title certificate data is no longer centered on just one node. And for every land title certificate data recording, it will be followed by using a Hash Transaction value at the registered land title certificate, thereby increasing the system of verifying land title certificate records (Zheng et al., 2021). Implementation of a land registration system the use of blockchain technology in Indonesia to deal with the urgency of agrarian reform (Thamrin et al., 2021).

Smart contracts work through following simple “if/when…then…” statements which can be written into code on a blockchain. A network of computer systems executes the moves when predetermined situations had been met and validated. those movements ought to encompass freeing finances to the suitable events, registering a automobile, sending notifications, or issuing a price ticket. The blockchain is then up to date whilst the transaction is finished. meaning the transaction can not be changed, and most effective events who have been granted permission can see the results. Inside a smart agreement, there may be as many stipulations as had to fulfill the participants that the task will be completed satisfactorily. to establish the phrases, individuals need to determine how transactions and their information are represented on the blockchain, agree at the “if/when...then…” policies that govern the ones transactions, discover all feasible exceptions, and define a framework for resolving disputes (IBM 2023). The data that is processed in the smart contract is land title certificate data, which contains *Nomor Identifikasi Bidang* (NIB), *Nomor Induk Kependudukan* (NIK), Land Area, Measurement Letter. inside the smart contract implementation process will go through the proof of work data Consensus stage. the consensus process will check and validate data

for all blocks in all Nodes with the condition that the data input is NIB, NIK, Land area, Land measurement certificate. the data that is input is data that is only input once or is not inputted double or repeatedly and the data used in transactions from the child block is data that has been registered inside the parent block. This data consensus process will produce NONCE, namely number only used once, a one-time use number created to prevent replay of previous transactions, nonce is the only data that can be added by using miners to change the hash output in next transactions, so that it could form a derived block. or new block (E. Tan et al., 2022). For each transaction, the input data for NIB, NIK, Land area, measurement letter will be processed and converted into a hash value. This system makes use of the SHA-256 hash function algorithm to generate hash values.

Blockchain creates an audit path that records the origin of an asset at every step in its transaction process. All completed and valid transactions could be broadcast to all Nodes (Javaid et al., 2021). on this system there are three interconnected nodes, namely Node 1 (primary BPN), Node 2 (regional BPN), Node 3 (regional BPN). So that every Nodes on this system could have the same transaction history records. All nodes have access to the distributed ledger and its immutable transaction records (Javaid et al., 2021). With this shared ledger, transactions are recorded only once. No participant can change or tamper with the transaction after it has been recorded in the ledger. If the transaction record contains errors, a new transaction should be added to reverse the error, and both transactions are visible (Y. Gao et al., 2021). Without blockchain, each organization could have to maintain a separate database. because blockchain uses a distributed ledger, transactions and data are recorded identically in multiple nodes. All network participants with authorized access see the same data at the same time, providing complete transparency. All transactions are immutability, equipped with a hash value on each land asset that is registered and time stamped. This permits participants to view the entire transaction records and truely eliminates opportunities for fraud. The efficiency of resolving land disputes through the use of blockchain technology and smart contracts (Krishnapriya S et al., 2020). in the process of verifying the registered land certificates data, participants only need to check the transaction hash code on the land certificates to ensure that the land certificates data is valid or not.

The purpose of this research is generating a data recording system and data information on Land title certificate with Blockchain technology. those who have complete information, have a security system with smart contracts, a data history recording system and exact data distribution and can be accessed by using the general public more easily. also to prevent the settlement of land dispute cases that arise inside the community through courts which require a completely long time, so that it can accelerate the processing time for the issuance of Land Title Certificate.

METHOD

Blockchain

Blockchain is a series of blocks, which keep a complete list of transaction records like a conventional general ledger.

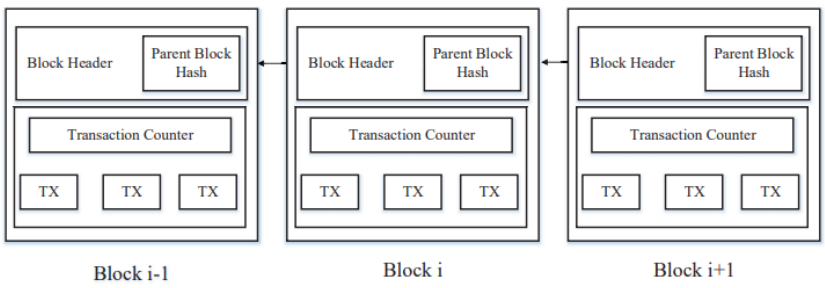

Figure 1. Blockchain consisting of a continuous series of blocks.

Figure 1. illustrates an example of a blockchain. With the previous block hash contained in the block header, a block has only one parent block. It should be noted that the child blocks (children of the parent block) hashes will also be stored on the blockchain. The first block of the blockchain is called the genesis block which has no parent block.

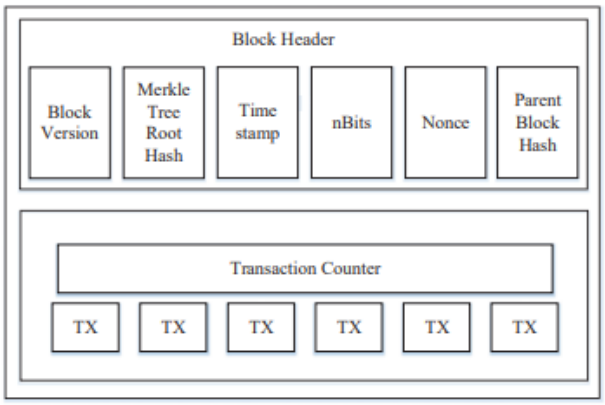

Figure 2. Structure of a block

Figure 2. illustrates the structure of a block. Blockchain is composed of 3 (three) main components, namely:

1. Block : block is a list of transactions that are stored in the ledger at a certain time. Each block has a block header which contains the following information:
   a. Block version : indicates the block validation rule set, which must be followed from the previous block.
   b. Merkle tree root hash : the hash value of all transactions Each user has a private key and a public key pair.
   c. Time Stamp : Time Record
   d. Nonce (number only used once) , hexadecimal data which is the key to process the block. 4-byte field, which usually starts with 0 and increases with each hash calculation.
   e. Parent block hash: 256-bit hash value representing the previous block.
2. Chain : is the hash value that links one block to another, technically linking them together. The hash in the blockchain is created using the hashed result of the previous block. The hash is fingerprint of the data and locks the position of the block based on the sequence of block number and transaction time. Blocks in the blockchain can be analogous to the pages of a book and the chain is the page number of the book. The interaction between block and chain can be summed up as a book containing information in pages marked with page numbers. Page numbers between one another are related and sequential, so the information on the page is also interrelated.
3. Network (Network) : the network is filled by nodes. A node is a computer that runs an algorithm for cryptography as part of the blockchain. Each node has a complete record of the transactions that have occurred in the blockchain. Nodes can be located all over the world and can be run by anyone. Blockchain uses a peer to peer network system, meaning that every node that runs a cryptographic algorithm as a supporter of the blockchain system is directly connected to each other without any intermediary or central authority.

Land Registry

Land ownership certificates is a certificate of evidence of land rights, management rights, waqf land, ownership rights to flat units and loan rights, each of which has been recorded within the applicable land book. based on *Pasal 19 ayat (1) UUPA*, related to land registration, it's far mandated to set up a central authority regulation to adjust it. so that *Peraturan Pemerintah No. 10 Tahun 1961* concerning Land Registration, which changed into later amended by using *Peraturan Pemerintah no. 24 Tahun 1997* (Negara et al., 2021).

Peraturan Pemerintah No. 24 Tahun 1997 concerning Land Registration stipulates that land registration is a series of activities finished by means of the government continuously, consisting of collection, processing, bookkeeping and presentation and maintenance of physical records and juridical statistics within the shape of maps and lists (Negara et al., 2021). Regarding plots of land and rental gadgets, which include the issuance of a certificate of name for land parcels that have already got rights and possession rights over flat devices as well as sure rights that encumber them. The significance of land registration in step with *Peraturan Pemerintah Pasal 3 No. 24 Tahun 1997*, is stated as follows:

1. To offer legal reality and criminal protection to holders of rights to a plot of land. apartments gadgets and different registered rights if you want to without difficulty prove themselves as holders of the rights in query.
2. To offer information to involved events consisting of the authorities so that you can without problems reap the facts needed to perform criminal actions regarding registered land parcels and condo devices.
3. For the implementation of orderly administration.

RESULTS AND DISCUSSION

There are several previous research that discuss Blockchain. Research by Krishnapriya S et al., (2020) uses the SHA-256 Algorithm, but user information is stored on a trusted third-party server signed by an elliptic curve cryptographic algorithm. While in this research, uses the SHA-256 Algorithm for data hashing. But, data is stored in three nodes which are participants involved in the Blockchain system of land title certificates. All three nodes have the same record of transaction data history.

In the traditional land registration process, the initial process is that citizens want to register their land. The citizen must have a Akta Jual Beli (AJB) obtained at the time of the sale and purchase of land, mediated by a notary. Then, the citizen can register his land to Badan Pertahanan Nasional (BPN), after going through the verification stage of land data in the field. After that the citizen who owns the land can obtain a physical land ownership certificate. The land certificate data will be entered into the land title certificate data center owned by BPN, but it's still centralized data (Thamrin et al., 2021).

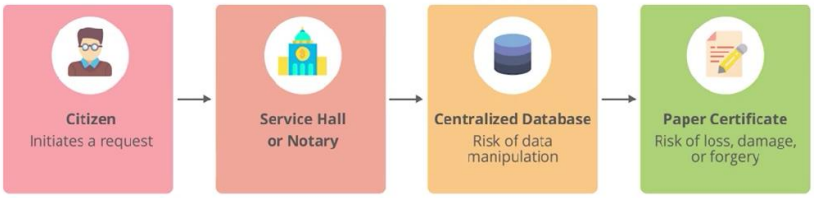

Figure 3. Traditional Land Registry

Figure 3. illustrates the stages of the Traditional land registration process. There are several weaknesses in the land registration process, Centralized Database. Data stored on 1 center, so not all participants who involved have copies and records of data transaction history. it has a high risk of data manipulation (Krishnapriya S et al., 2020).The land registration process will take a long time, and the data verification process will also take a long time if there is a dispute on the land. because there is no record of transaction history from land certificate data. Paper Sertificate have a risk of loss, damage, or forgery (Negara et al., 2021).

In land registry system that uses blockchain, there are several participants as a node of the blockchain network, there is Central *BPN*, Regional *BPN*, and another Regional *BPN*. process steps are illustrated in the Figure 4.

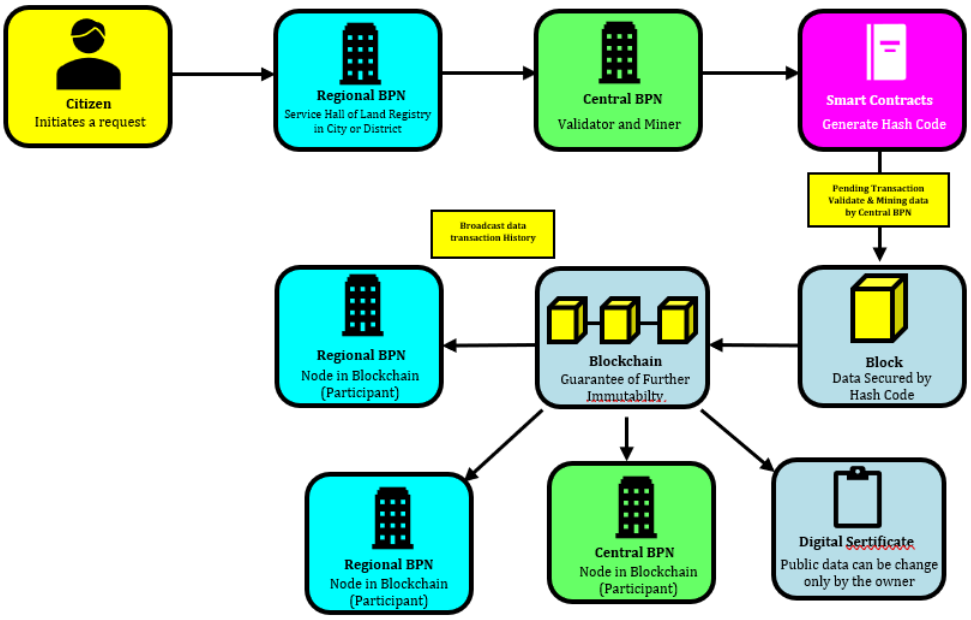

Figure 4. Blockchain in land registry

Figure 4. illustrates the stages of the Blockchain in land registry process. There are several process of the Blockchain in land registry process, Citizen that has a *Akta Jual Beli (AJB)*. Initiates a request of land title certificate to Regional *BPN*. Regional *BPN* as service hall of land registration in city or district. Will verify the data on land owned by the Citizens. Then, report the data to Central *BPN*. Central *BPN* as a Validator and Miner in blockchain. Will validate the data in pending transaction session, and mining the data to blockchain with Smart Contract (Y. Gao et al., 2021). Smart Contracts is a digital version of the standard paper contract will generate hash code, that automatically verifies fulfillment and enforces and performs the terms of the contract. Hash functions are very useful for validating information and they are used to prove things with Smart Contracts as well as on the blockchain itself. Blocks are data structures that store transaction data. Blocks are the fundamental foundation of blockchain technology. Each block contains a reference to the block before and after it in the form of a hash. After the data transaction is successful, the data will be stored in the blockchain, automatically broadcast the data transaction history to all participants in blockchain (Zheng et al., 2021). After all processes are completed, the central BPN will publish a digital certificate through the regional *BPN* in the city or district.

CONCLUSION

Based on the results and discussion in this study, it can be concluded that Blockchain in land registry has advantages over traditional Land Registry. Decentralized data, all participants in the blockchain have a copy of the transaction data history. all participants in the blockchain have a copy of the transaction data history. so that if there is data manipulation, then all data in the blockchain will change. Data transparency, all participants in the blockchain can access the data logs. Immutability, data will be bound by smart contracts. Equipped with Block Hash and Transaction Hash Code. So that if there is data manipulation, then all Block Hash and Transaction Hash Code will be change.

RECOMMENDATION

In further research will discuss more deeply in the smart contract section. Because, in this section will adjust to government regulations.

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