ISSN: 2414-1895 DOI: 10.6919/ICJE.202109_7(9).0060

Design and Research on the National Policy and Law Sharing Platform based on Block Chain

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Abstract

Under the present pattern of policy and regulation communication in China, there exist such problems as the unknowable sources of information of policies and regulations, unverifiable truthfulness of the contents of political and regulatory information, delay in implementing policy information and the possibility of distortion, and limited ways for citizens to obtain information. Based on the need of synchronized sharing of policies and regulations, this paper proposes a national policy and regulation sharing platform based on block chain technology, which provides a kind of thinking with practical value in the field of policy & regulations sharing. The aim is to break down the information barriers between government departments at all levels and between citizens and governments by relying on block chain technology, improve the safety and traceability of searchable policies and regulations, reduce the cost of manual operation, increase throughput and response speed, and provide a new theoretical framework and application paradigm for realizing efficient, safe and credible policy and regulatory sharing.

Keywords

Block Chain; Policy Regulation; Intelligent Contract; Sharing Platform; Safe and Reliable.

1. Introduction

1.1 Analysis of Background and Present Condition

China's current policy implementation experiences constitutes the political system of "the central-provincial-city-county-village", which adopts the hierarchical governance promoted by the top down. At present, there still exist the problems of duplication of “database construction” [1,3] and information exchange between governments at all levels and departments. At the same time, national policies and regulations from the central to the local through the layers of communication, the citizens on the Internet to find or people' s word of mouth of part of the policy of authenticity and source can not be very good verification. On the other hand, the existing database of policies and regulations is limited, and existing databases can not trace items to their source [2] or view derivatives. In addition, if the policy objectives of the central government conflict with those of local governments, there will be passivation or deviation of policy goals, and central policies will not be effectively implemented. For government departments, their own organizational structure is linear, with vertical leadership at all levels of administration from top to bottom, a process in which top-down information is transmitted, policies are implemented with time delays and the possibility of distortion.

Nowadays, block chain technology has been rising continuously, but the value of the shared data presented by the "block chains + policies and regulations" model has not been fully developed [2]. It is an urgent problem to solve how to share data securely across departments and ensure that the sources of data are known when they are shared, ensure the authenticity and integrity of the data, prevent data privacy from being leaked, avoid denials by data users after using illegal data or data providers providing counterfeit data and guarantee the rapid transmission of instructions [1].

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1.2 Scheme ideas and implications

By studying the whole process of issuing policies and regulations, this paper provides an advanced feasible way to solve such problems according to the relevant characteristics of block chains, establishes block chain system based on the Fabric Union Chain, ensures that data can not be tampered with by preselected nodes, improves the efficiency and controllability of cooperative sharing across sectors, and can be traced back to a set of national logic blocks [2]. It aims to break down the information barrier between government departments at all levels and between citizens and governments through the model of "block chain + policies and regulations", improve the security and traceability of searchable policies, regulations and rules, solve the problem of information island, promote the development of transparent government, enhance the credibility of management departments, and promote modernization of national governance system and governance capability.

This paper provides an advanced and feasible way to solve this kind of problem by studying the whole process of policy and regulation promulgating, according to the relevant characteristics of the block chain, establishing the blocks chain system based on the Fabric Union Chain, ensuring that the data can not be tampered with and controlled by preselected nodes, improving the efficiency and controllability of cross-sectoral collaborative sharing [2], and designing the MD5 blocks of policies and regulations by smart contract. It aims to break down the information barrier between government departments at all levels and between citizens and governments through the mode of "block chain + policies and regulations" [6], improve the security and traceability of searchable policies, regulations and rules, solve the problem of information sharing, help build transparent government, enhance the credibility of management departments [3], and promote the modernization of national governance system and governance capability

2. Design scheme of the platform

2.1 Principles of scheme design

2.1.1 Block chain storage structure ensures tamper proof and traceability

Block chain is a kind of technology to realize central-free distributed general ledger, and its chain structure is the important content of block chain to prevent tampering. A block chain is linked by blocks, each block is similar to a page in the book, and a block contains the previous Block Hash, time stamp, Nonce, Block Hash, Block height and block difficulty factor to record all published information. The block sheet is bound in chronological order to form a complete block book [8]. Each of these blocks contains a Hash that is the hashed value for all information published in the area, a summary of the information extracted from the data message is recorded as Hash (A), and so on. Each message release calculates one Hash (B), Hash (C) and Hash (D), Then the hash values hash (AB) and hash (CD) are calculated again by pairwise connection, and then calculated upward to the top layer, that is MerkleRoot [5], Then information of the block is recorded by random miners, the Hash is obtained, broadcast, and stored successfully in block chain to ensure that the information can not be tampered with, see Figure 1. It can guarantee the data can not be tampered with, realize the distributed storage and dissemination of data and improve the security and fault tolerance. While protecting the safety and security of information data, it also contributes to information audit. Traditional methods of transmission require monitoring at the nodes necessary to prevent information from being compromised and to retroactive when needed, but occasionally can be blocked by untraceability, and the risk of tampering with the information can not be avoided. The block chain technology can solve the above problems perfectly. It can not only trace the source, but also has high security. The false information will be received by all parties in the node.

2.1.2 Encryption algorithms and consensus mechanisms to create credibility

Block chain is a distributed storage architecture which generates data by consensus algorithm, stores data with encrypted chain block structure, operates data through intelligent contract, and constructs a trust system based on block chain technology, which has the attributes of "information is tamper proof"," privacy protection, traceability and so on [7]. With the aid of asymmetric cryptography, we

ISSN: 2414-1895 DOI: 10.6919/ICJE.202109_7(9).0060

can sign the information publication and protect the unique information identity with digital signature. Consensual mechanism technology realizes consensus among multiple nodes to verify the consensus and consistency of information data in a distributed, central-decentralized network environment [9]. Consistency is to ensure that the block chain data maintained by each individual node is consistent across the blocks chain network. Consensus means that all consensus nodes perform the same when participating in the command of data change. Based on the consensus mechanism of POW (Proof of Work) [9], this paper completes the bookkeeping according to the computational power of the computer, which means that the publishers of information will be permanently sealed into the block chain by random third parties.

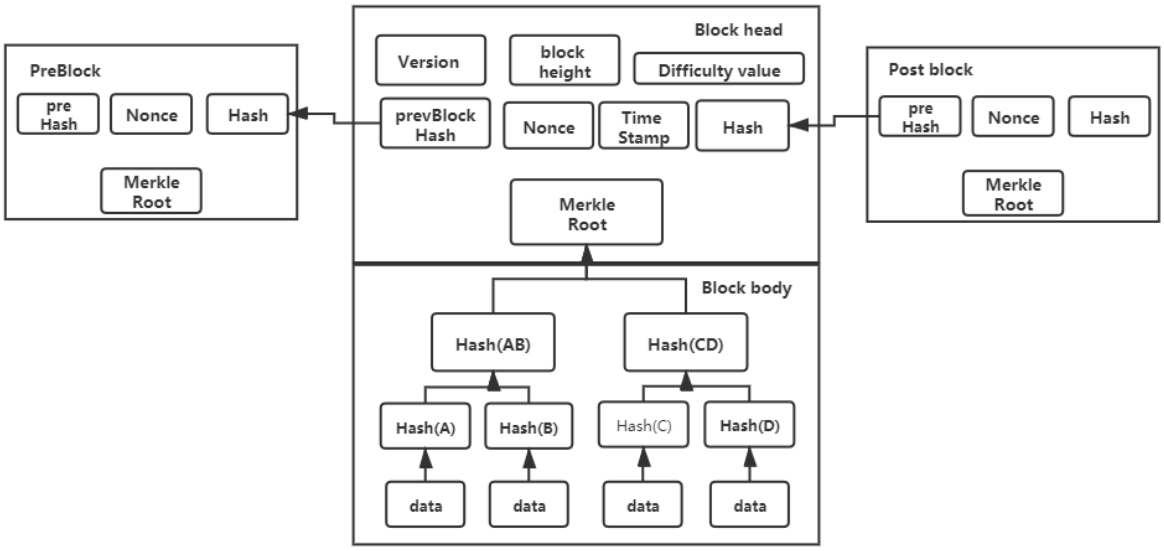

Figure 1. Chain structure of Block chain

2.2 Mechanisms for scheme design

2.2.1 Platform users

(1) Government information disseminators at all levels

They include the central government, provincial governments, municipal governments and county-level and rural governments responsible for the publication of information on policies and regulations, who, as publishers of policy and regulatory information, need first to register and verify their status.

(2) All citizen users

as readers of information on policies and regulations, they can browse and search through the National Platform for the Sharing of Policies and Regulations for all published policy and regulatory information. They can use the Platform' s advantages to access the shared information at any time in real time.

(3) Consortium chain node

as a core component of the Consortium, responsible for maintaining data links in the chain of blocks on the Platform for the Sharing of Laws and Policies across the country and for ensuring the smooth and normal operation of a chain system for entire blocks [4]. Transactions on the system are stored in a block chain through a consensus mechanism and are accounted for and rewarded by the nodes of the union chain.

2.2.2 Platform architecture design

After studying the mechanism of current national policies and regulations, this paper designs a new platform for policy and regulation sharing based on etheric block chain, see Figure 2. Platform architecture is divided into application, contract, consensus, security, network and data layers [5].

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The application layer encapsulates the application of the design platform, including publishing policy and regulation information, browsing and searching policy regulations information. The contract layer encapsulates smart contracts, algorithms, and Web3.js scripts. The Consensus layer encapsulates the consensus mechanism of POW (Proof of Work); The security layer encapsulates hashing algorithm asymmetric encryption algorithm digital signature etc.. The network layer encapsulates the P2P network mechanism, data dissemination mechanism and verification mechanism. The data layer encapsulates block data, Merkle tree, time stamps, chain structures.

The system platform of this project adopts the distributed architecture based on the Fabric alliance chain, which is mainly maintained by each alliance participant as the bookkeeping node. The information dissemination process includes: information broadcast on net, information included in the block, acknowledgment of book-keeping right, validation of validity, and finally formation of block [8] to ensure information sharing. By guaranteeing the security, authenticity, immutability and traceability of the information, the responsibilities, rights, obligations and interests of individuals involved in the contract can be clearly defined. The platform cleans, calculates and generates policy and regulation data report form through the script to the information data row number. After the current data report is generated, the MD5 code of the report generated by a digitally signed private key signing script is written into the block as follows:

(1) Information network wide broadcasting

When new policy and regulatory information is released, the broadcast mechanism is responsible for broadcasting policy regulations and regulations information to the network-wide public, so that each node can update the block chain information synchronously.

(2) Information inclusion block

When the broadcast mechanism has already broadcast new policy and regulatory information to the entire network, each node will receive the policy regulations information, and each nodes will incorporate the information received into one block, updating the block chain information of the nodes and synchronizing the update status.

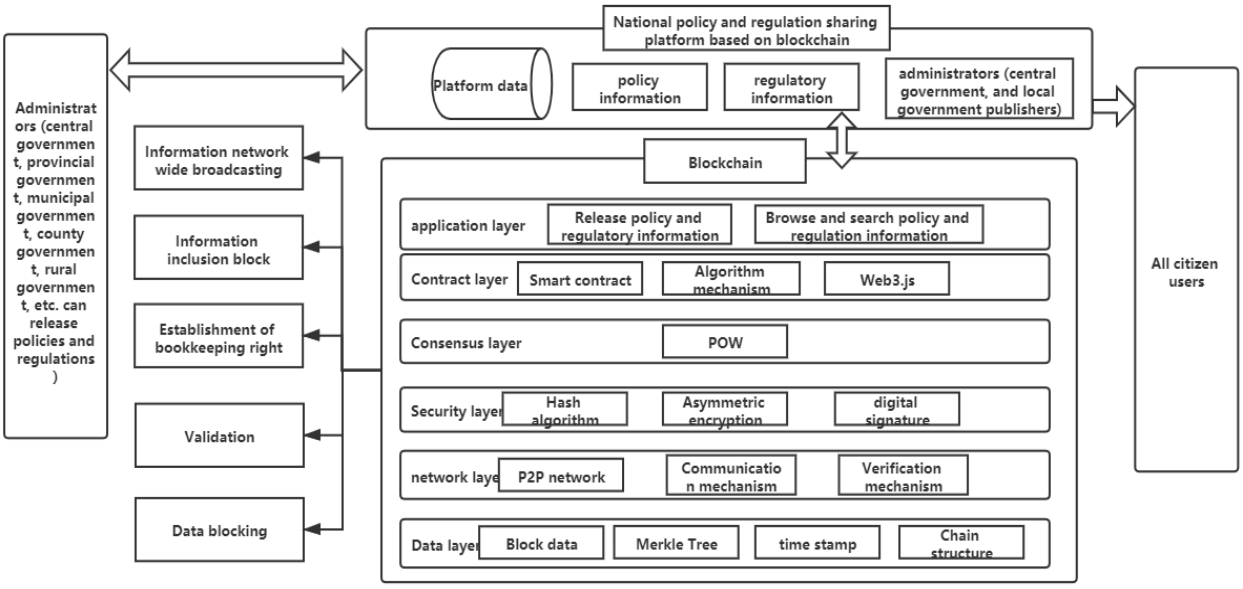

Figure 2. Platform architecture diagram

(3) Establishment of bookkeeping right

Each node attempts to find a workload proof in its own block that is sufficiently difficult, and when a node finds a workloads certificate, it has a book-keeping right and broadcasts it to the whole network;

ISSN: 2414-1895 DOI: 10.6919/ICJE.202109_7(9).0060

(4) Validity confirmation

The validity of the block is recognized by the other nodes only if and to the extent that all transactions included in the Block are valid and have not previously existed.

(5) Data blocking

The other nodes indicate that they accept the block, and the method of acceptance is to create a new block to extend the chain after following the end of the block, and treat the random hash value of the accepted block as the random hash value that precedes the new area.

2.3 Workflows for the policy regulation sharing platform

2.3.1 Platform functions

The national policy law sharing platform based on the block chain, through combining the advantages of the etherworkshop chain technology, constructs the policy and law platform suitable for both individual and government users, and its work flow is shown, see Figure 3. This platform is better realized through block chain technology:

(1) The Central Government issues policies and regulations, receives them safely and securely at all levels and shares them with other parts of the country, thus providing a reference for the governments of all regions to govern.

(2) The Central Government makes corrections to existing policies and regulations, systematically displays the corrected information and updates the database in a timely manner.

(3) The establishment of derivative policies and regulations at the local level may be connected with the central local regulations.

(4) Citizens' users can consult at any time, anywhere, the policies and regulations issued by governments at all levels that can be traced back.

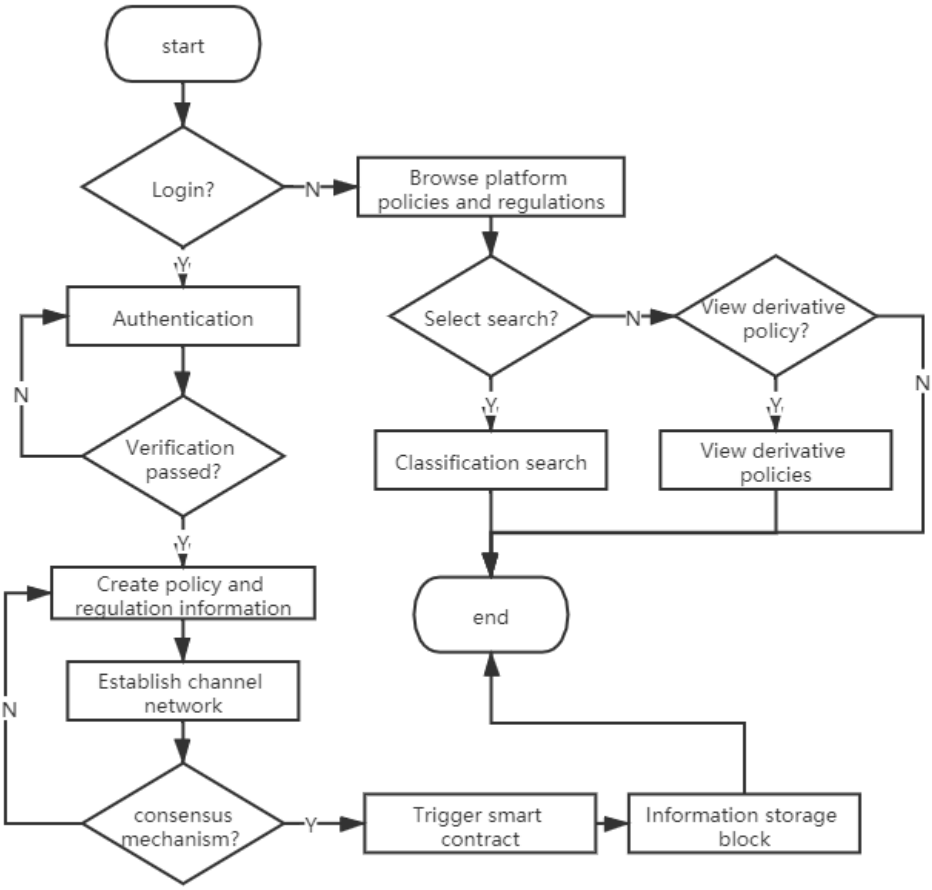

Figure 3. Workflows for the policy and regulatory sharing platform

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2.3.2 Issue policies and regulations

Login function is for all levels of government with the authority to issue policy, policy dissemination function for each level of governments that have been certified, only after the correct login can be issued policy operations, and policy query function to all citizens users. Special attention needs to be paid to the fact that ordinary citizen users can not perform the function of logging in and issuing policies, which can be accessed and disseminated by government departments at all levels. When the central government or local governments at all levels (provincial, municipal, county, rural and citizen users) issue policies and regulations, information dissemination based on the block chain technology system is conducted, the release time, content and sources of information are set up, a network of blocks is triggered, and the smart contract mechanism is pushed to each node of the blocks.

2.3.3 Query policies and regulations

In this platform, all users (including the central, provincial, municipal, district, village and citizen) can consult the policies and regulations through the shared platform at any time. They do not need to log in to see the policy shown in the classification and click directly to the details page. It is also possible to enter keywords in the search box to search for relevant policies, real-time access to all published policies and regulations, as well as all the content of this policy and regulation information, such as: policy issuing time, policy promulgator, and corresponding block information and policy regulations derived from various policies.

3. Application Value and Prospect of Policy Regulation Sharing Based on Block Chain

The policy law sharing platform based on block chain takes the information chain as the core idea, which changes the delay and possibility of miscommunication caused by layers in the past, and sometimes the authenticity of some policies and regulations obtained by citizens can not be well verified. The model of "block chain + policies and regulations [10]" is put forward, which is mainly embodied in information sharing, data storage and information evidence. By constructing a credible sharing chain system, it can help eliminate" information uncertainty' and "delay of information transmission', and improve the security and traceability of searchable policies, regulations and rules of governments at all levels. In contrast, the main advantage of the policy and regulation sharing platform based on the block chain lies in breaking down the information barrier between government departments at all levels and between citizens and governments, improving the security and traceability of searchable policies and regulations, and providing a new direction for the governance system of decentralized policies to face and solve the corresponding drawbacks. A highly autonomous State that is fully fair, just, open and transparent, using block chain technology.

3.1 Solving the Problem of "Data Isolation'' and Promoting the Governance of Cross-level Data Sharing

The national policy and regulation sharing platform based on block chain constructs a policy, law and regulation platform suitable for individual users and government users by combining the technical advantages of Ethereum block chain.The policy and regulation chain is a national government policy platform based on the block chain, which is based upon the requirement of synchronization of the openness of policies and regulations. In the chain of policies and regulations, there are all policy collections, legal texts, etc. issued by government departments at all levels of the political system from the central, provincial, city, county, village and so on, and the laws, regulations and policies issued will be packaged into blocks. Block chains, with their trustworthiness, security and immutability, provide a powerful guarantee for open sharing of large data under privacy protection, and block chains liberate larger data. At the same time, the block chain can further standardize the use of data and refine the authorization scope. After desensitization data transaction flow, is conducive to break through the information island, gradually promote the formation of the modernization process of national governance system. This platform provides a unified policy data platform, breaks down barriers to data interoperability at all levels [6], and supports the threshold for

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cross-level data application development. Make the data easy to collect, store, understand, process and valuable.

3.2 Contribute to the Establishment of Transparent Government and Promote Public Credibility

The establishment of transparent government and the enhancement of the credibility of government management have always been the key points to guarantee the effectiveness and legitimacy of governments in the performance of their functions [2]. The application of block chain technology can simplify the information delivery service and make the service separate from manual intervention. Through smart contracts, the trust of information access parties can be enhanced to monitor and safeguard the actions of governments and citizens at all levels. The platform provides a perfect standard system, laws and regulations database, and access rights of users and citizens to help build political system. The block chain can provide an accommodating and trusted infrastructure for this network of policy and regulatory circles, reduce the operating and credit costs of centralised equipment [11], and improve operational efficiency and asset utilization in the industry. According to the characteristics of the block chain technology, the contract government at various levels is expected to solve the drawbacks of policy promulgating mode, optimize the governance mode of government departments, promote the construction of transparent government, facilitate safe and credible access to policy information data between governments and citizens at different levels, bring new promotion forms and enhance the credibility of management departments.

3.3 Effective governance and modernization of national governance systems and capacities

Smart contract based on block chains are computer programs running on distributed shared ledgers that automatically trigger follow-up actions such as information release and dispatch when acts that meet the terms of the contract occur. At present, the enactment of policy law generally relies on human services, and the application of block chain technology can simplify information delivery services and remove services from human intervention [10,11]. The block chain can provide an inclusive and trusted infrastructure for this network of policy and regulatory circles, reduce the cost of operating and credit for centralised equipment, and improve operational efficiency and asset utilization in the industry. The contract type policies and laws of the governments at all levels are all intelligentized, and the contracts between the two parties are implemented automatically by using the intelligent contracts, which eliminates the human interference factor and is helpful to reduce the cases that the policy and regulations are wrong in transmitting information due to human negligence. All local governments and citizens can receive the new policies and regulations as soon as possible, without any worries about the authenticity of the information. This not only eliminates the problem of falsification of contract information, but also reduces the cost of human resources.

4. Conclusion

Policy and regulation information sharing is the key content of China's government construction. With the continuous rise of block chain, policy and regulation information sharing still hasn't got out of the dilemma of "information island", and the "block chain + policy and regulation" model still has great development potential. The national policy and regulation sharing platform based on block chain proposed in this paper constructs a policy, law and regulation platform suitable for individual users and government users by combining the technical advantages of Ethereum block chain. Through block chain technology, this platform better realizes the distributed sharing of national policies and regulations, ensures the decentralization, security and user privacy of transactions in the sharing process, and designs a complete set of front-end operation logic to ensure the authenticity of policy and regulation information sources and information contents, as well as the timeliness of policy and regulation information transmission, It provides a good consensus trust mechanism for governments at all levels and citizen users, and provides a very valuable idea for the actual implementation of the "block chain + policies and regulations" model. In practice, it can effectively balance the tension between technology application and government information sharing needs, and promote the

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intelligent development of cross departmental data collaboration and government services An autonomous government environment, realize the development of information sharing of policies and regulations, and promote the modernization of the national governance system and governance capacity.

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