Design and Analysis of Enterprise Management System Framework Based on Blockchain Technology

Leilei Jiang¹*, Ke Dong¹

¹Anhui Radio and TV University, Hefei, Anhui, 230022

*Corresponding author e-mail: ahtvujl@ahtvu.ah.cn

Abstract. With the advent of the data age and the rapid development of Internet of things technology, blockchain technology has been proposed. Since the advent of blockchain, it has been widely concerned. Its tamper proof, traceability, anonymity and openness have attracted more and more people's interest. Many researchers and practitioners have stepped into this field. In this paper, the related technical concepts of blockchain are described, and the blockchain technology is integrated into enterprise management innovation to provide new ideas for enterprise management. This paper designs an enterprise management system based on blockchain technology according to the requirements, and carries out bug monitoring and pressure test on the system, and the results show that the system can be used well.

Keywords: Data Age, Blockchain Technology, Enterprise Management, Stress Testing

1. Introduction

With the development of Internet technology, big data has been paid more and more attention. Wealth is not just money. Data is becoming a new wealth of the times. Enterprises can fully reflect the huge wealth behind it by analyzing and processing relevant data. In order to develop the value behind the data, it is necessary to share the data among national administrative organs and enterprises in the whole industry to achieve win-win results. Mining the value behind data and sharing wealth with others has become a hot topic in the contemporary era. The original common method of sharing data resources is to store and provide for use through centralized processing of the third generation. Users themselves can not directly access data for use, and there is a certain risk of data leakage. In enterprises, data leakage means confidential disclosure. Therefore, in view of the serious problem of data leakage, scholars and experts began to study the direction of data storage security, hoping to meet the basic needs of data security on the basis of data exchange and sharing. With the emergence of blockchain technology in the 21st century, the technology has the characteristics of decentralization and trusted accounting. These characteristics meet the requirements of data sharing and security protection, and provide new solutions for relevant experts and scholars in the direction of data security.
and sharing [1].

In the second half of the 20th century, with the development of Internet infrastructure and software and hardware, the efficiency of human information exchange has been explosively improved, which has brought about the rapid development of various industries. Human beings have entered the information age [2]. Blockchain technology is actually a collection of distributed storage, P2P network and secret algorithm. Bitcoin is based on relevant technologies of blockchain [3]. With the advent of intelligent technology, due to the dispersity and unforgeability of blockchain, blockchain is considered to be able to establish information in various actual business scenarios and improve transparency, reliability and security. The combination of blockchain and cloud computing, artificial intelligence, Internet of things and other fields will also bring great development opportunities. One day in the 21st century, a group of people put forward the concept of bitcoin, and pointed out that blockchain technology is the basic technology of building bitcoin system. With the popularity of Internet, enterprise management has broken through the traditional single form, and network management has been promoted. However, these new forms of management are facing a serious crisis of trust [2]. In addition, in the field of traditional enterprise management, there are still some problems, such as incomplete and opaque process records. The employer can not verify the authenticity of the information of job seekers when recruiting personnel, which brings a lot of trouble to the recruitment work of employers. Therefore, the storage technology to meet the needs of distributed is particularly urgent, it can manage and store all the management records and information data of the enterprise, at the same time, it will not be modified and damaged. This technology can meet various forms of recording functions, open to all network terminals and meet the basic needs of security, and blockchain technology can meet these requirements. The discovery and use of blockchain technology can not only bring irreplaceable convenience to enterprises and social information sharing, but also pave the way for the development of centralized information processing [3]. At the same time, it also provides recognition opportunities for these industry certification, and blockchain technology is widely accepted by enterprises.

In view of the above-mentioned enterprise management problems and the advantages of blockchain. This paper will elaborate the concept of blockchain related technology, analyze the relevant algorithms, design and develop an enterprise management system based on blockchain technology, test and run it, and analyze its practical operation ability in enterprise management.

2. Blockchain Technology and Related Concepts of Enterprise Management Innovation

2.1. Blockchain

Distributed shared digital integration is always suitable for the characteristics of blockchain. The technology is supported by cryptology and stored centrally in chronological order. Because of the many characteristics of blockchain, which makes it unable to change the information at will and the traceability of transactions, more and more enterprises, companies and institutions begin to focus on the research of this technology. Blockchain is based on P2P network. Each node in the network maintains a public ledger. The public ledger is a chain in which all data blocks (blocks) are connected in chronological order [4]. The public ledger ensures that all data is open and transparent. Undeniable? Nodes reach a consensus on the transaction through consensus algorithm, record the transaction in the block, and ensure that the transaction will not be tampered with by cryptography. Bitcoin based on blockchain also proves that the main reason why blockchain is widely concerned is that it has the following characteristics:

Centralization: the whole blockchain network is jointly maintained by all participants, and there is no third-party organization. Through distributed storage and P2P network mechanism for information transmission and verification. Any node problems will not affect the operation of the entire network.

De Trust: Based on mutual trust and value-based encryption algorithm, without the need for both sides to exchange data.
Interworking and sharing: all users can view the data on the blockchain to ensure data sharing on the chain and promote data exchange between nodes.

Trusted database: each node has a complete data account. Unless most nodes can be controlled, the data loss or modification of any node is not enough to affect the data of the whole blockchain network [5].

Traceability: the blockchain adopts chain data structure, and time stamp is marked on the block to make the data traceable [6].

2.2. Ether

Ethereum is the cryptocurrency of Ethereum. Users can acquire ether by mining, buying from the market or other users. Token is a cryptocurrency, which is implemented in the form of smart contract and runs on Ethereum [7]. The development of token contracts should follow a standard (e.g., ERC < 20 [52]) so that the front end (e.g., wallet) can identify token activities (e.g., token transfers) [8]. The token contract maintains a mapping table, and each entry records a token holder (that is, an account) and the token balance that belongs to him. Unlike ether transactions, token holders transfer their tokens to another token by calling specific functions implemented in the contract. If some tokens are successfully transferred, the mapping table is updated accordingly. Token contracts should issue event notifications to inform other applications of token changes, such as wallets, trading markets, etc. Any application can know the execution result of token contract by listening for the event sent out. In addition to standard functions and standard events, the token standard also allows developers to implement nonstandard functions and nonstandard events. The ERC20 standard defines six standard function interfaces and two standard events. For example, the declaration of the event transfer is "event transfer (address indexed from, address indexed to, uint256 Value "means the address From will Value token transferred to address to.In addition, whenever the ERC or the transition function requires a non-standard token to be issued, the event should be notified.

2.3. Cryptography Technology

Cryptography is a technical science dedicated to the study of how to compile and decrypt passwords, which involves information security related issues, such as authentication and data encryption and decryption [9].

2.4. Management Information System

(1) Management information system (MIS) is an organization method that can provide the expected information of past, present and future. It provides standardized information where appropriate to support the planning, control and business functions of the organization to assist in the decision-making process.

(2) The integration of collection, related processing, preservation and publication functions for decision support, coordination and control. It can help internal members to analyze related topics, visualize complex problems, and create new products.

(3) The system has always carried out the basic concept of people-oriented. It uses computer hardware, software, network communication equipment and other office equipment to process the required information, including collection, storage, calculation and processing, protection, etc., to organize strategic competition and improve efficiency. A complete man-machine system can support high-level decision-making, middle-level control and grass-roots operation.

2.5. Characteristics of Management Information System

(1) Provide decision support management. The system can provide relevant information for managers and senior managers of enterprises, so that managers can analyze the information needed to make decisions from the data, provide relevant decision suggestions for managers, and serve for managers to make decisions.
(2) Omnidirectional characteristics. From a certain point of view, the system is an integrated system platform for comprehensive management and analysis of an enterprise, organization and other institutions. In establishing and creating the system, enterprises can distribute the management and information of all levels to each subprogram in the system, and then integrate the information through the subsystem, so as to achieve the purpose of comprehensive management of all classes of enterprises and institutions, and assist the senior management.

(3) The combination of man and machine. The ultimate purpose and result of the management system are to assist users or enterprise executives to make corresponding decisions, and the final decisions are not issued by the system, but by the users. Therefore, the use and management of the system must be the combination of human and system. In the management system, all levels of managers and users are not only a user of this system, but also the manager of users. Therefore, in the process of developing this system, it is necessary to correctly distinguish the status distribution and related functions of man-machine in the system, so that both the system and individual users can play their own advantages and improve the performance and management efficiency of the system [10].

2.6. The Following Problems Exist in the Internal Management of Enterprises Under the Environment of ERP System

(1) ERP system equipment security can not be guaranteed, which may be affected by natural disasters, equipment failure or loss and other factors;
(2) Internal personnel can tamper with or delete part of the data for their own interests;
(3) Information input error will affect the follow-up business of the whole system;
(4) Once ERP system is infected with virus, it may cause data leakage in the process of information transmission;
(5) ERP system is complex and needs a large number of compound talents, but there is no complete incentive mechanism.

2.7. Related Formula

(1) Hash Function:

$$Addr = H(key)$$

(2) Bayes Theorem

Basic solution formula:

$$P(A|B) = \frac{P(AB)}{P(B)}$$

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)}$$

(3) POW Consensus Mechanism

Calculation of difficulty value:

$$K = k*\left(\frac{t_{pasttime}}{20160\text{min}}\right)$$

3. Enterprise Management Innovation System Experiment Based on Blockchain Technology

3.1. Selection of Test Objects

In this paper, according to the social research, technical negotiations, and reached a practical agreement with an enterprise in our city, we try to run the enterprise management innovation system
based on blockchain technology in the reform enterprise, test the reliability and practicability of the system, and conduct practical research in the enterprise, and analyze the popularity of the system.

3.2. Experimental Steps
According to the system stress test, bug number monitoring and other aspects, test the operation of blockchain in the enterprise management system. The specific test results are shown below.

4. Test Results of Enterprise Management Innovation System Based on Blockchain Technology

4.1. System Bug Number Test

![Bug distribution](image)

**Figure 1. Bug Distribution**

In the functional test, 97 tests were designed, 95 were effective, and 185 bugs were found. Among them, 97.1% were mild and general bugs, and there were no fatal bugs. All bugs have been fixed and closed. In the data accuracy test, 50 test cases were designed, 50 were effective cases, and 43 bugs were found. Among them, 100% were moderate and general bugs, and there were no fatal bugs. All bugs have been fixed and closed. The function of the system meets the requirements of users.

4.2. System Compression Test

| Scene         | Execute Script | Number of Concurrent Users | Loading mode                  | Concurrency Strategy | Results of Enforcement |
|---------------|----------------|-----------------------------|--------------------------------|----------------------|------------------------|
| System login  | System login   | 19                          | loading 10 people              | No                   | 19                     |
|               |                |                              | load 2 people every 10 seconds |                       | 0                      | Good                   |
| System login  | System login   | 50                          | One time load                  | No                   | 48                     |
|               |                |                              |                                |                       | 2                      | Good                   |
Based on the different pressure of the design system, the compression performance of the platform is tested. According to the data in Table 1, the processing results of the platform system for concurrent login of users meet the test requirements, and there is no platform crash or obvious performance defects due to a large number of concurrent logins.

4.3. Usage Survey

![Usage Survey Graph]

According to figure 2, the picture is changed to the views of the 100 employees of all classes selected by the enterprise on the introduction of the system. More than 90% of the middle and low-level employees in the enterprise welcome the system, and four senior managers say they are not optimistic about the system.

5. Conclusion

This paper analyzes and designs an enterprise management system based on blockchain technology through the related elaboration of blockchain technology and the related technology of enterprise management. The system combines the advantages of traditional management system and blockchain technology, such as decentralization, to give full play to the advantages of personal and computer, meet the needs of enterprise management, and provide the future enterprise management with the
advantages of personal and computer. It provides a new way of thinking. Through the reliability test and bug detection of the system, this paper analyzes the stability of the system, and draws the conclusion that the system can help the enterprise to manage well. However, the blockchain technology is still not mature enough. How to improve the level and efficiency of enterprise business management through blockchain is still the focus of current and future research.

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