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Developing Enhanced Features in the Application Security System Design by Leveraging Blockchain Technology in the Internet of Things (IoT)[1]

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ABSTRACT

In view of the current status of Internet of Things applications and related security problems, the architecture system of Internet of Things applications based on blockchain is introduced. First, it introduces the concepts related to blockchain technology, introduces the architecture system of IOT applications based on blockchain, and discusses its overall architecture design, key technologies and functional structure design. The product embodies the whole process of the Internet of Things platform on the basis of blockchain, which builds an infrastructure based on the Internet of Things and solves the increasingly serious security problems in the Internet of Things through the technical characteristics of decentralization.

INTRODUCTION

The Random Internet of Things is a highly integrated and comprehensive application of the new generation of information technology, which is of great significance to the new round of industrial reform and the green, intelligent and sustainable development of economic society [1]. The development of the Internet of Things has guided the evolution of global information infrastructure and promoted the development of traditional products, equipment, processes and services to digital, networked and intelligent. With the intelligent upgrade of the Internet of Things, the integration of the Internet of Things and information systems is accelerating. In this process of development and transformation, many problems and challenges have been brought. Therefore, in view of the current status of Internet of Things applications and related security problems, the architecture system of Internet of Things applications based on blockchain is introduced [2].

Blockchain is a decentralized, immutable, traceable, distributed database maintained by multiple parties that can build reliable trust between parties that do not know each other. It revolutionized trusted data sharing and peer-to-peer value transfer without the coordination of third-party intermediaries, including distributed ledgers, asymmetric encryption and authorization technologies, consensus mechanisms, smart contracts, and more. With the requirement of traditional business development, there is a trend of quantification of business and data, which greatly increases the difficulty of data management and restricts the innovation and development of related businesses. The traditional centralized

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management mode can no longer meet the demand, so many research institutions at home and abroad have taken blockchain technology as a new solution [3-4].

BLOCKCHAIN TECHNOLOGY

A. Blockchain Architecture

Blockchain has three main layers, namely protocol layer, extension layer and application layer.

The protocol layer is further divided into the storage layer and network layer, including the bottom data block and basic data, basic algorithms, etc. Network layer: includes networking mode, data transmission mechanism, and data verification mechanism. The extension layer is further divided into the contract layer and the incentive layer, whose main function is the extension and development based on blockchain, making the use of blockchain more convenient, flexible and practical. The incentive layer refers to the development of some relevant systems and measures to ensure the construction and maintenance of participating nodes and blockchain security; The contract layer contains script code, algorithms, profile applications, smart contracts, etc. The application layer is related to the actual business, which refers to the implementation and scenarios of blockchain-based business[5-7].

B. Internet of Things security solution based on blockchain

Internet of Things security is a thorny issue. It is not enough to ensure the security of personal devices, but also to protect the security of devices in connection mode, network and scalability. Given that the application of blockchain technology can enhance the security of the Internet of Things, the application of blockchain in this field is possible [5].

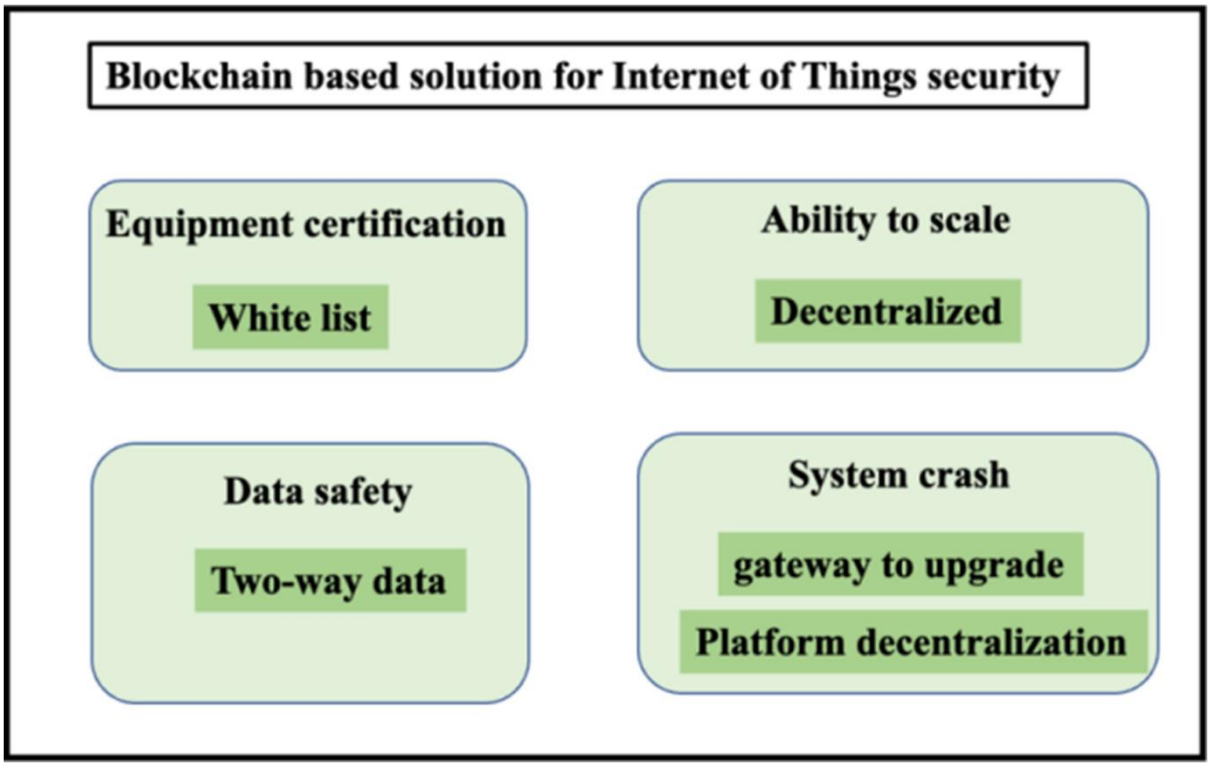

Figure 1: Blockchain based solution

(1) In terms of device authentication, device access to the Internet of Things is carried out through verification whitelist. The whitelist is stored in a centralized manner and may be tampered with. Using blockchain technology, a secure device identity authentication system, identity authority management and multi-party consensus can help identify illegal nodes and prevent malicious nodes from accessing and doing evil in time.

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(2) With the "decentralized" mechanism of blockchain, the device access, management, protocol conversion and other capabilities can be placed under the edge of iot agents. In addition, iot agents and tube platforms are connected via blockchain. The property management platform only controls the core content or is used for backup, and the iot agent serves the equipment within the business scope. The content of the original core node is completed by flexible collaboration mode and related consensus machine.

(3) Blockchain technology can solve the security problem of the Internet of Things. Data transmitted to the blockchain needs to be accessed through authentication, ensuring the security of data.

By using blockchain technology, the platform is decentralized and the gateway is upgraded. The gateway is connected with blockchain to jointly monitor, identify and process the network activity of equipment, so as to ensure and enhance network security.

THE OVERALL ARCHITECTURE

The overall architecture of its external environment is divided into perception layer, network layer, business and application support layer and application layer. The main function of the perception layer is data collection. The network layer transmits all kinds of information from the perception layer to the application layer by means of various network transmission. The application layer is the processing function. This layer is the application solution that combines the Internet of Things technology with the industry to achieve the interconnection of things in a wide range of field (Figure 2).

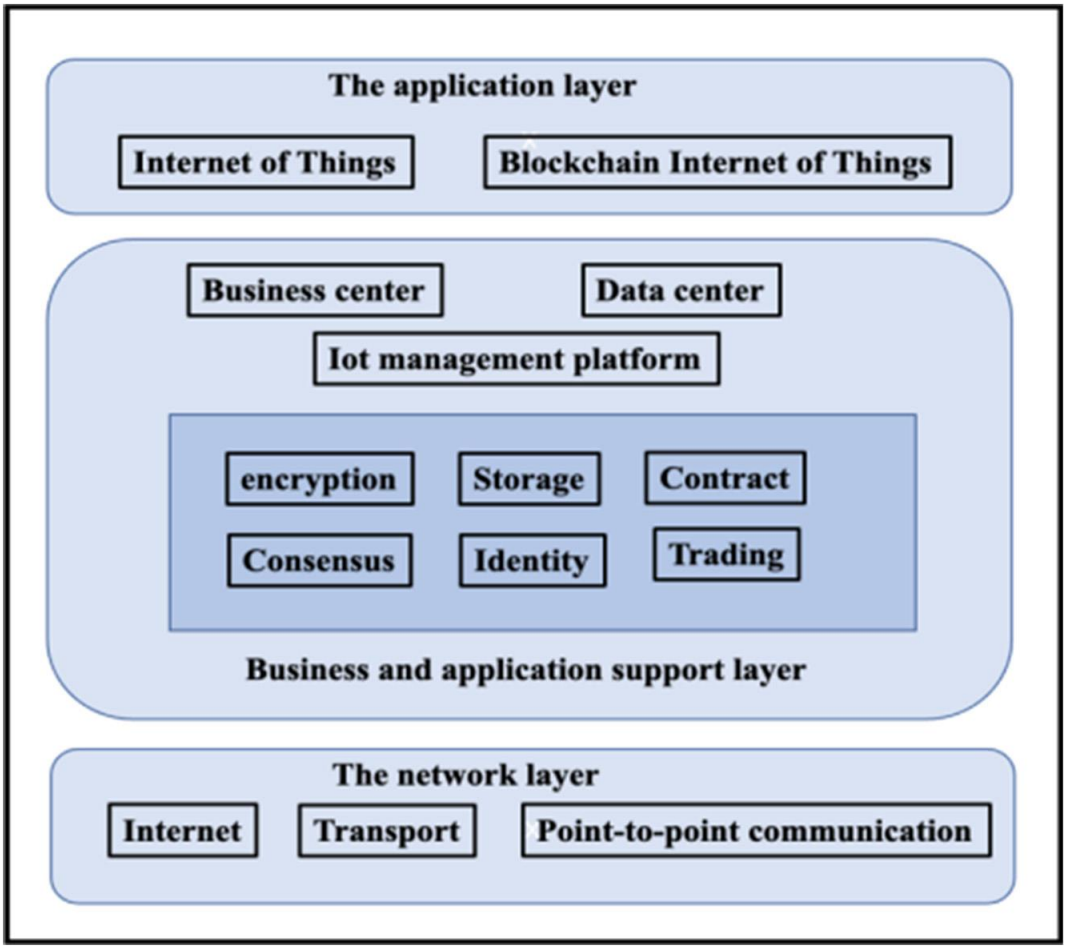

Figure 2: Overall Diagram

THE KEY TECHNOLOGY

Blockchain-based IoT applications build a decentralized, expanding universal IoT that guarantees privacy, security and trust-free transactions. The key technologies are shown in the figure 3

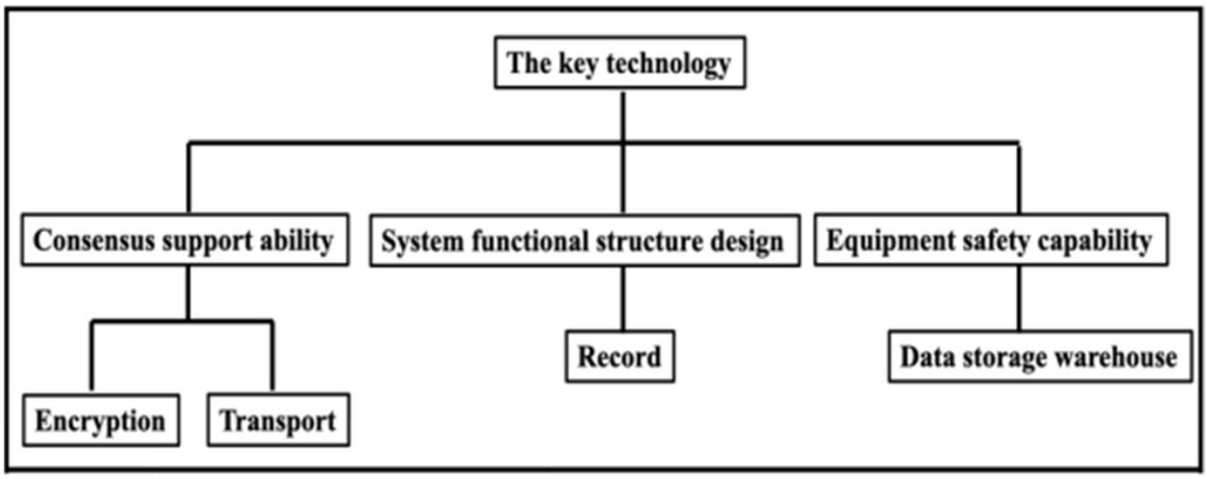

Figure 3: The Key Technology

A. Consensus Support Ability

In the framework of blockchain-based IoT applications, consensus mechanisms establish a decentralized, expanding universal Internet of Things that can guarantee privacy, security and trust-free transactions. Consensus support capability refers to the selection of algorithms and how to use them. In the process of consensus formation, the relevant nodes will calculate the legitimacy of the transaction and agree with the result with the consensus of other nodes. Smart devices in the Internet of Things do not participate in calculations but encrypt and transmit data, which is broadcast across the blockchain as a transaction. Run smart contract interaction to deal with transactions related to blockchain and consensus, and conduct consistency processing of block nodes and interaction of network layer transactions.

B. System Functional Structure Design

The blockchain-based IoT business platform is "decentralized". The architecture of the system ensures that the participating entities cooperate with each other based on the characteristics of "decentralization" to ensure normal functioning.

Under this architecture, the participants in the IoT business platform are independent of each other. As part of the business platform, applications, businesses and devices jointly provide IoT services. In addition, in the "decentralized" mode of work, it is no longer considered whether the actor is on the system side or the end side. Different types of IoT business platforms can be built on the same or different underlying infrastructure for communication (e.g., network, cloud, big data, security, management, etc.).

C. Equipment Safety Capability

IoT blockchain can support identity and permission management, as well as anonymous transactions. Under this architecture, the device is identified and authenticated by the system before working. The whole identification process does not need the help of third-party equipment and technology to achieve, further improve the efficiency of identification, ensure the accuracy of data, and ensure the data security and cannot be forged. Therefore, in the process of transmission and transaction, the function of unique record can be realized through blockchain technology, so that data security can be better protected. At the same time, blockchain technology can monitor and manage equipment for a long time. If there is an anomaly in the data information in the Internet of Things, blockchain technology will immediately issue corresponding instructions through the data protection program to prevent information leakage and prevent network viruses and hackers from attacking.

CONCLUSION

Based on the analysis of traditional Internet of Things applications and blockchain-related technologies, this paper expounds on the current status of Internet of Things applications, related security issues, introduction of blockchain technology, architecture system, key technologies and functional structure of blockchain-based Internet of Things applications. The security architecture of the Internet of Things application based on the blockchain ensures the security and scalability of the Internet of Things by taking advantage of the characteristics of the blockchain, such as the data cannot be tampered with, forged, traceable and traceable, and the system architecture is decentralized. This test also supports heterogeneous systems, and the system of blockchain-based IoT applications is not only a technical match but also derived from unlimited business possibilities.

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