Design of Distributed Environment Monitoring Management System from The Perspective of "Trust"

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Abstract. Pick to: in view of the city noise pollution monitoring method of the single, tamper with the problems such as low efficiency and environmental monitoring data, based on the concept of intelligent city innovation thinking of urban environmental regulation, through the block chain technology in the "wisdom" environmental protection system for analysis, clear target of urban environment health supervision agreement mechanism demand, based on the analysis of environmental monitoring business block chain design train of thought, on the basis of block chain technology of urban environmental noise distributed monitoring as an example, based on the technology of block chain distributed noise monitoring procedures and processes, to explore the applications on the "wisdom" environmental protection system and draw inspiration.

1. Introduction
In view of the "trust" dilemma caused by the lack of "consensus" mechanism in environmental monitoring system, such as decentralized device identification, data protocol and service interface, etc\cite{1}. Given environment, a distributed monitoring system based on block chain technology application design, through the "M2M" (the Machine to Machine), under the decentralized distributed peer-to-peer networks, using distributed approach to collective, build P2P self-organizing network, environmental monitoring scene perception system (all kinds of smart sensors, RFID or embedded systems), monitoring process and equipment, all levels of management information nodes effectively link, for the environmental protection department to provide more intuitive, convenient and safe means of regulation, to ensure that the monitoring data of real and effective.

2. Strategic thinking on urban environmental supervision under the concept of smart city
Through the decentralized supervision mode of intelligent urban environmental monitoring and the establishment of the technical scheme of collective maintenance of the database by de-trusting method \cite{2,3}, automatic monitoring of key pollution sources, online monitoring of environmental quality and comprehensive improvement of the government's environmental supervision capacity can be effectively realized.
2.1. Application analysis of "smart environmental protection" environmental monitoring and management block chain

Reference in the power block chain technology, using the chain block consensus mechanism [4], environmental data is stored in decentralized sharing books, for the environmental monitoring data acquisition, storage, transmission, application and evaluation of the whole process management, can effectively improve interactive transparency, shorten processing time and reduce the cost, significantly improve security, reduce tampering, fraud and other illegal violations, currently working environment monitoring the whole process of precise management [5, 6].

The decentralized trust mechanism of Internet based on block chain technology. First, the block chain is used to prevent forgery and tampering, and the identification of monitoring objects is confirmed and recorded in the block chain to ensure accurate identification of monitoring objects. Second, accurate record of environmental monitoring objects. Block chain traceability is used to ensure accurate record of monitoring objects through certification technology. Third, the block chain smart contract technology is used to match environmental monitoring data standards, falsification and environmental violations to achieve full tracking of environmental monitoring data. To realize the system docking with transportation, security and other fields, and form a credit system with user experience as the core to provide security, and provide scientific basis for the decision-making management.

2.2. Implementation of "Smart Environmental Protection" Environmental Monitoring and Management Block Chain

2.2.1. Block chain application mode of environment monitoring business. Blockchain application mode refers to the conceptual model of what services specific blockchain applications provide to users (specific goals and functional frameworks) and how to provide services (ways of service delivery and solutions to achieve this way). There are three main application modes in environmental monitoring:

One is storage mode, including information storage and value storage mode. The open source shareable feature of blockchain is suitable for environmental monitoring data authenticity verification, etc. Information storage mainly uses the advantages of block chain in distributed storage to save monitoring data and graphs. The value storage mode includes public records and ownership certificates to facilitate the access and management of these value information.

Second, transfer mode, including information transfer and value transfer mode. Through distributed storage, encryption transmission and consensus algorithm and other mechanisms to achieve the safe and reliable transmission of value. All nodes in the network receive the data information, and open the information through the private key node to realize the security of information transmission and the information transmission path is not tracked.

The third is intelligent service mode, including intelligent management mode and platform mode (that is, multi-service integration). More service integration platform model, by creating open chain or chain, the chain of private customized alliance, for comprehensive environmental monitoring, monitoring content and technical standards, the overall environment control, business operation regulation, environmental information service quality supervision, emergency linkage mechanism and collaborative management in areas such as application provide contract technology application development, operation or service platform.

2.2.2. Block chain design idea of environmental monitoring business. Since the business operation is based on the cooperation between government departments and third-party environmental monitoring agencies, and polluters are relatively fixed, the alliance chain is selected as the block chain model, and the detailed design ideas are as follows:

In terms of block organization, based on data insertion, modification and chain structure extensibility advantages, chain structure is selected for block chain of environmental monitoring business. Block chain node types can be divided into government department nodes, third-party
environmental monitoring agency nodes and public nodes (third-party information providers are also classified as such nodes).

In terms of data security, each type of node needs to be encrypted with the public key of the recipient node (mainly the government regulatory department) during the transaction transmission process, and signed with the private key of the sender node. The encrypted data is submitted to the block chain to copy the data to ensure that it will not be tampered. Through private key authorization, a user's query is deemed to be delivered once, and it is an irreversible operation to ensure that the source of the query can be traced.

In business process transformation, and in the most complex environmental monitoring business processes is a third-party environmental monitoring agency to cause pollution enterprise pollution monitoring, monitoring of each time is likely to cause pollution enterprise monitoring data is updated, so you need to consider to update a record each block of data, can draw lessons from the etheric fang the status of the implementation method of the tree.

In terms of consensus mechanism, from the perspective of business continuity, the environmental monitoring business block is generated by the environmental monitoring business node, and the specific third-party environmental monitoring agency node generates the block, and the selection algorithm and consensus mechanism can be formulated according to the business status.

In terms of the use of smart contracts, considering the current block chain technology development status and the implementation efficiency of environmental monitoring business block chain, the open source ethereum block chain platform is selected to transform the block chain technology. Intelligent contracts can be used to realize contracts and agreements between the public (general residents, scientific researchers, etc.), enterprises (polluters, operators) and governments (administrative supervision, environmental assessment management and decision-making and planning departments), as well as information disclosure automation and intelligence [7].

3. Distributed noise monitoring steps and processes based on block chain technology
Adopting distributed P2P model set of calibration technology, each other at the same time through decentralization, to trust, and the encryption algorithm, realize the design of the equipment real-time access to the thing, build Internet monitoring system based on the technology of block chain structure, with Android 4 g city noise monitoring distributed system design, for example, the decomposition process as shown in Fig1:
Fig. 1 Distributed Noise Monitoring Steps Based on Block Chain Eehnology

(1) Sampling sensor. Adopt the architecture of Internet of things, take the mobile phone as the sensor node, use the microphone connected to the Android mobile terminal (mobile phone) as the sensor, measure the urban noise environment parameters, and complete the monitoring data automatic collection, remote control and other business functions. AudioRecord is selected as the method to obtain noise data. The maximum average amplitude is taken to calculate the decibel value. Weight is used to equivalent continuous sound level. Call the API of baidu map to realize the map function, and use the location service class provided by Android to write code to realize the location function; In order to complete the data security guarantee function, the sensing data is encapsulated regularly, tamper-proof protection is carried out by using hash algorithm, and the signature is signed by using asymmetric encryption communication technology, and then sent to the trusted storage service module through 4G network.

(2) Trusted storage module. Unpack and verify sensor data to check data reliability; The sensor data after unpacking and verification is stored in the database, the Shared interaction details of each block and the unique signatures of both or more parties are combined and encrypted to obtain the whole network verification, and the sensor data is stored in the encrypted digital block chain.

(3) Database. Receive the sampled data (provided by the trusted storage module) for upper application query and service use. In actual operation, relational databases such as MySQL and MSSQLServer can be used, and NoSQL databases such as MongoDB can also be used.

(4) Services and applications. Block chain is used to verify the system database to quickly and safely provide users with online monitoring of urban environment sampling data, analysis display and other common applications to ensure the authenticity of sampling data.

4. Conclusion
In this paper, based on block chain city noise monitoring distributed system provides to the machine or machines to interactive information sharing scheme, implementation for real-time sensor access equipment, sewage discharge, the entire digital tracking, block chain public/private key system is adopted to establish the account authentication mechanism, prevent stolen account data, due to human
intervention, tamper with the monitoring data of [8], at the same time, the environmental protection department for the record companies all materials and pollution equipment for centralized management, to establish intelligent contract correct system management norms and standards, these as a basis for the environmental protection tax, which can effectively prevent the enterprise tax evasion behavior [9]. We have reason to believe that environmental control has been improved in terms of safety, efficiency and process simplification, providing a new and high-performance technological means to implement green administration and smart city construction.

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