Research on Security Strategy of Ecological Environment Informationization Construction Data Center

Ying Yu [a], Kangping Zhao [a], Zhiyang YU [b], Zhiyu Lang *[c]

[a] Sichuan Academy of Environmental Policy and Planning, Chengdu, Sichuan, China;
[b] International Education College, Henan Agricultural University, Zhengzhou, Henan, China;
[c] CETC Cyberspace Security Technology Co.,Ltd., Chengdu, Sichuan, China

* Corresponding author: zhiyu126@163.com

Abstract. Ecological and environmental informatization is not only an important component of national cyberculture and informatization construction, but also the core content and support guarantee of ecological and environmental protection work, which is related to the performance ability of ecological and environmental departments at all levels. The construction of ecological environment informatization cannot be inextricably linked to data support. Ecological environment protection work involves multi-source heterogeneous data, including meteorology, transportation, water sources, infrastructure, environmental pollution, environmental quality, etc. Establishing a data center for effective analysis and application of such data can maximize the level of ecological environment governance system and capacity. However, in practical applications, due to various malicious codes on the Internet, the vulnerability of network channels, and the theft or tampering of data during transmission, sensitive information and data can be leaked, seriously affecting the security, scientifically, and standardization of ecological environment protection planning, and even threatening national security. This article focus on the security issues faced by multi-source heterogeneous data onto storage and transmission during the construction of ecological environment informatization data centers, and conducts research on security strategies for ecological environment informatization construction data centers. On the basis of continuous improvement on standardized data storage, this plan effectively ensures the security of various types of data onto transmission, provides strong technical support for the formulation of ecological environment protection planning and environmental policy formulation in Sichuan Province, and promotes high-quality economic development and high-level ecological environment protection.

Keywords: Information Security; Data center; Ecological Environment

1 INTRODUCTION

Comprehensively encouraging the development and application of big data and accelerating the construction of a data powerhouse has become China's national strategy. China attach great importance to the position and role of big data in promoting eco-

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logical civilization construction. With the rapid development of information technology represented by big data and cloud computing, the modeling methods and practices of future environmental planning and policy simulation will be rapidly developed. By utilizing digital and intelligent methods such as mathematical models, computer technology, and geographic information systems to conduct research on environmental planning and policy simulation, it will help achieve refined management of the ecological environment and comprehensive decision-making of the environmental economy.

2 CURRENT STATUS OF RESEARCH ON ECOLOGICAL ENVIRONMENT INFORMATION SECURITY

China attaches great importance to the position and role of big data in promoting ecological civilization construction. In April 2014, Article 7 of the newly revised Environmental Protection Law clearly stated that it is necessary to promote the construction of environmental protection informatization and improve the scientific and technological level of environmental protection [1]. In August 2015, the State Council issued a notice titled "Action Plan for Promoting the Development of Big Data" (Guo Fa [2015] No. 50), which pointed out that big data is a collection of data characterized by large capacity, multiple types, fast access speed, and high application value [2]. It is rapidly developing into the collection, storage, and correlation analysis of data with large quantity, scattered sources, and diverse formats, discovering new knowledge and creating new value from it a new generation of information technology and service formats that enhance new capabilities [3]. In 2016, the Ministry of Environmental Protection issued a notice titled "Overall Plan for the Construction of Ecological Environment Big Data" (Environmental Affairs Office [2016] No. 23), proposing to focus on improving environmental quality, strengthen top-level design and overall coordination, improve system standards, unify infrastructure construction, promote information resource integration and interconnection, open data sharing, promote business collaboration, promote big data construction and application, and ensure data security [4]. On the basis of strengthening top-level design, the Ministry of Ecology and Environment has implemented five key tasks and established and improved five systems. One is to establish an information technology application system for ecological environment management [5]. The second is to establish an ecological environment information resource management system. The third is the ecological environment big data innovation decision-making system. The fourth is the ecological environment e-government service system. The fifth is the "ecological environment cloud" infrastructure guarantee system. In summary, the construction of ecological and environmental informatization in China is based on the current development status and environmental situation in China, and big data technology is used to continuously improve the practical issues related to data collection, data analysis, data storage, and data application in ecological and environmental protection work [6].

With the continuous support of various information technologies for ecological environment protection work, various types of ecological environment informatization construction have also confronted different information security risks [7]. Such as DDoS attacks, channel blocking, data leakage, data theft, and data tampering at the network level, as well as risks in data exchange and data transmission channels between terminal devices at the system level, as well as security risks such as hidden dangers in external devices and a series of incorrect operations at the user level [8].

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3.1 Overall Design Concepts

In order to effectively enhance the scientifically, standardization, and operability of ecological environment protection planning, assist in achieving refined management of ecological environment and comprehensive decision-making of environmental economy, the data center security service platform for ecological environment informatization construction deploys a password service system to provide password computing capability for data transmission. This article starts from the actual need in the process of ecological environment informatization construction, and studies the security guarantee strategy of the ecological environment informatization construction data center. The architecture of the ecological environment information construction data center is shown in Figure 1.

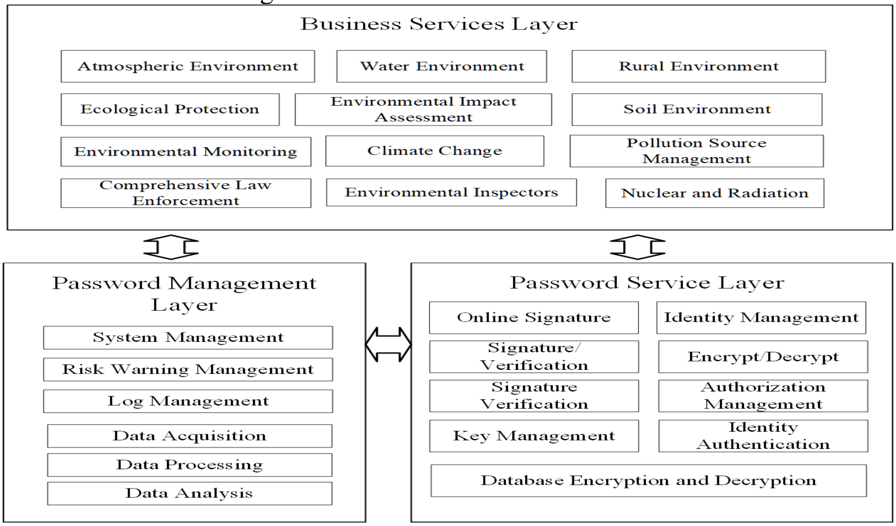

Fig. 1. Architecture diagram of ecological environment informatization construction data center.

Implement network isolation and security protection for the information security service center running on the backend of the ecological environment information platform. When PC terminals and mobile terminals access the service center, they use national security algorithms for user identity authentication and access control; The Information Security Service Center needs to authenticate all terminals; When the data service center interacts with external systems across the network, the national security algorithm is used for dual end identity authentication and end-to-end data transmission security protection; The data server of the Information Security Service Center uses national encryption algorithms to encrypt and protect critical data, ensuring data security. The key communication between terminal devices in the information security center of the ecological environment information platform adopts security protection measures based on national security algorithms. When implementing information exchange, dual end identity authentication and data integrity protection should be carried out. For the open network communication channels of the ecological environment information platform, the national security algorithm is used for link protection to establish a secure channel. When issuing control instructions, the Information Security Service Center should encrypt the transmission and verify its integrity.

Ecological environment informatization construction data center security service platform includes three parts: password service layer, password supervision layer, and business application layer. The first is that the cryptographic service layer consists of two parts: cryptographic service and gateway, providing basic capabilities such as key management, signature/verification, encryption/decryption, authorization management, one-way hash, database encryption/decryption trust service, channel protection, application authentication, permission authentication, load balancing, routing and forwarding, which are the foundation support of the cryptographic service layer. The second is to apply the capabilities provided by the password service layer in the business application layer, providing standard password service capabilities for various scenarios such as atmospheric environment management, water environment management, rural environment management, soil environment management, natural ecological protection, emergency response and petition, environmental impact assessment, and providing various password services. Thirdly, the password supervision layer implements compliance and effectiveness supervision of password applications under a unified regulatory system, providing differentiated functions such as system management, early warning management, log management, as well as visual supervision capabilities such as data collection, data processing, and data analysis for password application parties, platform management parties, and password supervision parties, and monitoring the availability and security status of the password service layer in real-time, Real time grasp of the compliance of the business application layer.

3.2 Main Strategy Research

In the overall architecture of the ecological environment informatization construction data center security service platform mentioned above, the password service layer acts as underlying basic support. Next, we will summarize the main processes involved in the security service platform set out in the present article from the perspective of password management. The data security module provides data encryption and decryption as shown in Figure 2.

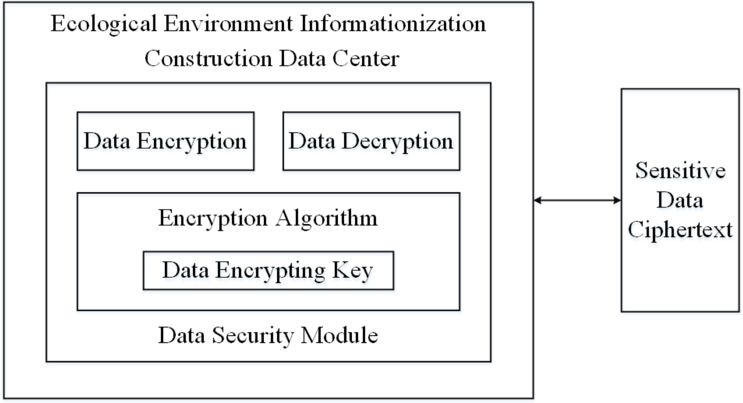
Ecological Environment Informationization Construction Data Center
Data Encryption
Data Decryption
Encryption Algorithm
Data Encrypting Key
Data Security Module
Sensitive Data Ciphertext

Fig. 2. The data security module provides data encryption and decryption.

The full lifecycle management of keys in the ecological environment information construction data center security service platform includes the entire process of key generation, key distribution, key storage, key update, key backup, key recovery, and key destruction. The data security module provides data integrity protection and detection as shown in Figure 3.

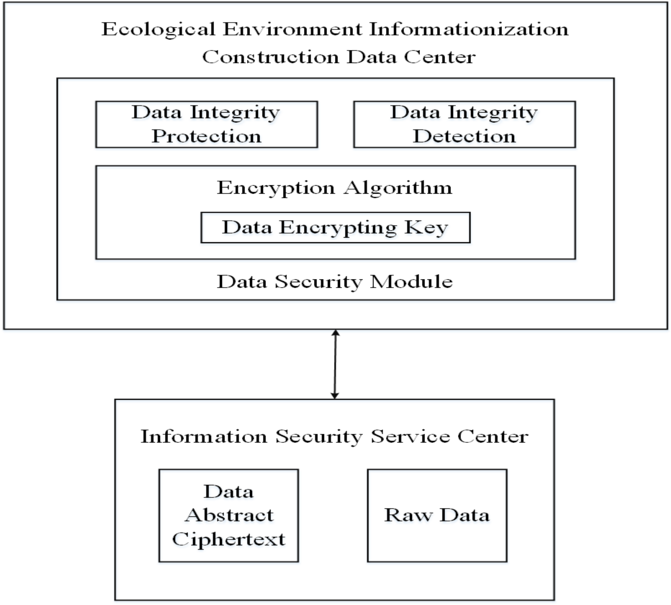
Ecological Environment Informationization Construction Data Center
Data Integrity Protection
Data Integrity Detection
Encryption Algorithm
Data Encrypting Key
Data Security Module
Information Security Service Center
Data Abstract Ciphertext
Raw Data

Fig. 3. The data security module provides data integrity protection and detection.

(1) Key generation

The key of the Ecological Environment Information Security Service Center will be generated by the key management system using password devices that comply with national security regulations. According to agree rules, the same communication key will be used for communication, and a device can have multiple different communication keys.

(2) Key distribution

The communication key is encrypted and distributed using the public key in the application certificate.

(3) Key storage

The communication key is securely stored in the password module and protected by the main key of the password module.

(4) Key updates

The communication key has a certain validity period and needs to be regenerated and issued after expiration. Set a certain length of the transition period during the key update stage, during which the terminal side has both new and old communication keys; After receiving the encrypted message, the device prioritizes using the new key to decrypt the message. If decryption is unsuccessful, the old key will be used for decryption.

(5) Key backup and recovery

The communication key is backed up and restored by the key management system during its validity period. If the device loses the key during its validity period, it needs to re authenticate and apply to the key management module.

(6) Key destruction

The communication key expires after the transition period, and is erased and destroyed from the storage area.

4 CONCLUSION

The construction of a security service platform for the ecological environment informatization data center is a systematic and long-term work, involving a large amount of data, rich data types, and a wide range of segmented fields. Therefore, while effectively promoting the construction of ecological environment informatization, it is important to focus on the research of ecological information security strategies and the construction of related systems. On the basis of referring to relevant national regulations and standards such as environmental information systems and information system password applications, combined with the current situation of ecological environment information security, this article studies the actual need of current data center security strategies. On the basis of continuously improving data standardized storage, it provides security guarantees for various types of environmental data during transmission and storage processes. The next step will focus on the landing and implementation of the ecological environment information data center security service platform, enabling it to effectively ensure the construction of ecological environment information security and contribute to China's ecological civilization construction.

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