Research on Big Data Analysis and Mining Technology of Smart Grid Based on Privacy Protection

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Abstract: With the development of new technologies, the construction of smart grid big data systems is gradually developing towards digital. However, due to the impact of massive data, the leakage of user information in the smart grid big data system has also become increasingly prominent. Therefore, based on the theoretical basis of smart grid big data technology and the premise of protecting privacy and security, this paper puts forward three kinds of smart grid big data analysis and mining technology, encryption and key management technology, data disruption technology and digital signature technology, in order to provide theoretical reference for enterprise power grid construction.

1. Research background

1.1 Literature review

Currently, smart grids are gradually becoming one of the areas where big data is widely used.Meng Xiangjun et al. analyze the basic characteristics of smart grid big data and the current business needs of enterprises. Then combined with the key technologies of big data, the application structure of big data business is proposed, which is beneficial to realize internal data sharing of smart grid and provide technical support for related business application and development (Meng et al, 2015).Under the background of rapid development of high technology, Pan Peng and Tian Dongdong are based on the characteristics of high-dimensional, multi-source and heterogeneity of smart grid control technology, and deeply analyze the current data monitoring technology of large-scale smart grids, and propose the application methods of related technologies, which is beneficial to Meet the centralized regulation and integration of smart grid big data (Pan and Tian, 2018).With the advent of the era of big data, it has provided great convenience for people's life and enterprise technology applications.Cai Ning found through research that the current big data technology brings challenges to human life, and draws the need to strengthen personal self-discipline and industry self-discipline construction, strengthen national data literacy education, promote the transparency of big data technology information and cultivate good privacy ethics. Methods such as ethics are used to maintain personal privacy information in the era of big data, to ensure the security of personal information, and to contribute to the good development of society (Cai, 2016).Luo Zhihua takes hospital patients as the main entry point. By studying the problems of patient privacy protection in the context of big data, he proposes ways to strengthen privacy protection in the context of medical big data and establish patient privacy protection legislation to protect patient privacy information. Strengthen the privacy protection of residents under big data and create a good data and information application environment for the public (Luo, 2015).

1.2 Purpose of research

Since entering the 21st century, smart technology has developed at the speed of light, and grid data has expanded rapidly (Tan, 2016).In the process of smart grid construction, the smart grid operates safely and steadily, ensuring data security to a certain extent, and providing great convenience for residents' lives and work (Yang et al, 2014).However, with the complexity of the data application environment and the large amount of related data, in the big data of smart grid, the problem of user security and privacy protection is gradually becoming prominent, and the data use

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efficiency is gradually reduced, which is not conducive to the conversion of data by relevant personnel or organizations. And the application, but also reduce the level of intelligent grid.On this basis, this paper further analyzes and explores the smart grid big data analysis and mining technology, and proposes corresponding application methods for the application characteristics of different technologies, which is conducive to the further mining of big data by related enterprises, aiming to increase the high value-added services of enterprises.

2. Overview of the theory of smart grid big data technology

The grid business data is mainly divided into grid operation data, management data, power enterprise marketing data and monitoring data. In the actual operation of the power system, big data is widely used in all aspects and can generate more data. Among them, the application of large-scale data mainly includes three parts: power generation, transmission and power consumption. Take the power generation side as an example. With the installation and deployment of smart terminals and smart meters on different nodes, many interactions gradually occur. However, due to the data between the current user and the power company, automatic updates are performed at regular intervals. Therefore, enterprises need to collect and classify user data in real time in different time periods, and then form user-side big data based on user data, which provides greater data support for enterprise operations. In the process of using smart grid big data, it has the characteristics of large data volume, low value density and many data types. These characteristics promote the related information in big data, which gradually emerges inside the enterprise and forms an agglomeration effect. Massive big data systems promote the construction and development of current smart grid big data.

In recent years, smart grid big data processing technology has become one of the hot topics in different fields, which plays a vital role in the development of the first-level field. The smart grid big data processing technology mainly involves data collection, classification, screening and application. Among them, different links have different key supporting technologies to achieve effective application of relevant data.

At present, the application of smart grid big data processing technology in the power industry is still in its infancy, and only some simple data can be stored and identified. In this context, some power companies have set up a dedicated team to study the development and design of smart grid big data, and even created a new smart grid big data system to improve the effectiveness of enterprise data applications. The foreign data processing technology based on smart grid has formed a complete data application system, which is conducive to the effective conversion of internal data. For example, Kyushu Power Company of Japan uses Hadoop cloud computing platform to effectively collect and organize user data to realize the effective application of internal data.At the same time, the company also developed data batch processing software for smart grid big data processing technology, which promoted the internal data conversion rate significantly improved. As far as Chinese enterprises are concerned, the application of smart grid big data processing technology can basically meet the operation of enterprise grid system and software, and has certain scalability and reliability. However, for the smart grid big data processing technology inside the enterprise, there are also problems such as leakage of user data information, which greatly reduces the effectiveness of data application. At the same time, the academic research on smart grid big data processing technology is still in its infancy. A solution to the smart grid big data technology that has been formed can only be used to support data aggregation calculations. Therefore, it is necessary to conduct in-depth research based on the privacy-protected smart grid big data analysis and mining technology.

3. Smart grid big data analysis and mining technology based on privacy protection

3.1 Encryption and key management technology

In the context of big data, power companies are provided with basic data by third-party service

providers. Then, with the company's internal system, the data is stored, managed and maintained. The technology used by power companies for data collection is mainly encryption and key management technology. The technology is currently recognized as a data protection technology in the industry, which can complete the protection of related data by means of its own system. For power companies, if the company wants to operate well, effective and secure data is the basic operational guarantee. When improving data security, encryption and key management technologies have become a necessary condition for the enterprise system to operate well. Encryption and key management technology can complete the security protection of private data, creating a safe and effective data conversion environment for enterprises and improving internal data security.

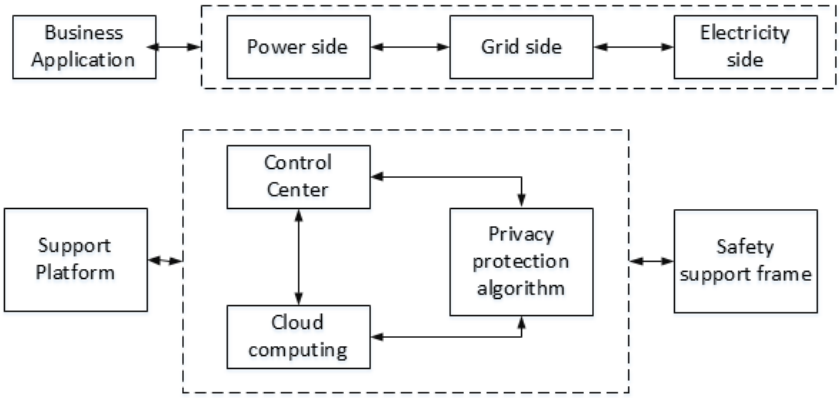

Figure 1. Encryption and Key Management Technology

3.2 Data scrambling technology

Within the power enterprise, data scrambling technology has great application value. Data scrambling technology can add artificial variables to the relevant data through the methods of replacement, anonymity and disturbance. It can perform processing on related data, replace some sensitive information, and add disturbance information to internal data to form enterprise fuzzy. The data set is conducive to creating a fuzzy big data center, increasing the difficulty of data theft of bad molecules and improving the security of user information. In the future, the research on data scrambling technology in the relative field mainly aims to ensure the data leakage risk and balance the accuracy of data, selectively publish relevant data within the scope of the enterprise, and selectively hide relevant information, greatly improving data security. . Data scrambling technology has better application performance within the enterprise and can effectively maintain user information security. Therefore, when enterprises are building smart grid big data centers, it is necessary to introduce data scrambling technology to ensure the reliable operation of the system.

3.3 Digital signature technology

Digital signature technology is to add some specific codes required by enterprises to relevant documents while publishing electronic documents, and then use the identity of the issuer to identify them accordingly, and increase the discriminability of related documents. In judging the document transmission process, the enterprise needs to determine whether the document is used or tampered with by other organizations. At this point, the signature of the document can be verified by means of digital signature technology, thereby ensuring the security of the entire document.From the point of view of the use characteristics of digital signature technology, this technology is mainly to maintain the correctness and integrity of documents in a specific time. Especially for the construction of enterprise smart grid big data system, it is necessary to actively adopt digital signature technology to ensure that the system can protect data security from the document itself while being interfered by the outside world. At the moment when digital signature technology is widely adopted, when an internal user accesses a related network and a big data system and performs data query and the like, it can provide effective and correct information for the user. In the user's cut into the relevant system, you need to perform the signature operation before you can log in to the corresponding system. Under this operation, it is possible to effectively prevent some unscrupulous molecules

from intruding into the system for data theft when the user enters the database, thereby ensuring data security from the aspect of user identity authentication.

4. Conclusion

The discussion on privacy protection was formed in the context of the gradual development of smart grids. In the process of technology research and development, enterprises mainly focus on protecting user privacy information, and pay attention to the application of smart grid big data analysis and mining technology. Especially in the context of the continuous expansion of the smart grid scale, a new impact on user privacy data, in order to achieve a good protection effect, it is necessary to increase the application of smart grid big data analysis and mining technology from the perspective of data security, and then promote the sound development of power companies.

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