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Research on Big Data Platform of Power Grid Enterprise Accounting Business Based on Cloud Computing Analysis

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ABSTRACT. *With the rapid development of digital technologies such as big data and cloud computing, smart grids have also made considerable progress. A large number of sensors are embedded in the existing power grid system, and modern information technology is used to control and monitor them. These sensors collect a large amount of data, and the existing traditional financial management system cannot process and analyze the huge data in a timely and accurate manner. This paper proposes the use of big data to process and analyze the accounting data of the smart grid, so that the financial system of the grid company can better serve the grid company. Hope to help grid companies in financial management.*

KEYWORDS: *Cloud Computing, Big Data Platform, Accounting Business, Power Grid Enterprise, Time Series Analysis*

1. Introduction

With the continuous development of computers and the Internet, human society has officially entered the age of network information. Today's grid operation is gradually evolving into a sensor-embedded network (ie smart grid). Various types of sensors generate heterogeneous data during the operation of the smart grid. A large amount of data management is stored in the data center, and the types are various. The traditional accounting information system processing model has been unable to meet the needs of the financial management of power enterprises. Using the fast and accurate technical advantages of cloud computing, let cloud computing enter the field of financial management and be widely used in financial work. It can provide more effective solutions for the financial management of power companies [1, 2]. This article explores the establishment of a big data platform for the accounting business of electric power enterprises based on cloud computing analysis, improves the financial management level of electric enterprises from many aspects, establishes a modern big data accounting processing center, integrates

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comprehensive financial management information, and effectively protects the economic and social benefits of electric enterprises.

2. Characteristics of Financial Information Data of Electric Power Enterprises Based on Cloud Computing

The rise of cloud computing has had a strong impact on the informatization and modernization of enterprises. Various types of sensors generate a large amount of heterogeneous data during the operation of the smart grid. The traditional accounting information system of electric power enterprises faces the collection and processing of large quantities of heterogeneous data. In addition to the four "V" characteristics of general big data, these accounting heterogeneous data also have the characteristics of intangibility and stickiness:

2.1 Large scale of data

With the rise of computer technologies such as cloud computing and the Internet of Things, various intelligent mobile terminal devices have been continuously developed, and the amount of Internet data has greatly increased, and the amount of data has grown rapidly and large in scale. The unit of measurement of data size is not GB or TB, but PB.

2.2 Multiple data sources, multiple data types and strong correlation between data

Most of the data collected and processed by grid companies are traditional transaction data, but with the development of the Internet and the Internet of Things, more types of data such as social networking sites and sensors have been brought. These data include not only structured data such as numbers, but also heterogeneous data such as audiovisual and animation. The data are interleaved with each other and the correlation is strong.

2.3 Real-time data analysis and efficient processing

The data of traditional power companies are usually waiting for batch processing. However, with the development of big data in the Internet of Things, more data processing requires real-time analysis and efficient processing, and cannot wait for batch processing. More efficient and accurate analysis of more and more data is the manifestation of the value of big data analysis.

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2.4 Low value density

Although the power company accounting has a large amount of data that is constantly generated, only a very small part of it shows value. Take surveillance video data as an example. During continuous monitoring, the potentially useful data is only one or two seconds.

2.5 The intangibility and stickiness of the financial data of electric power enterprises

The data information collected on the current smart grid is mainly non-value quantitative information. These data can be directly sensed by sensors and then spread out; but the financial data of electric power companies is intangible data and cannot be directly sensed by sensors. These financial data are directly tied to the business data and cannot be stripped separately. Therefore, the financial data of power companies is intangible and sticky.

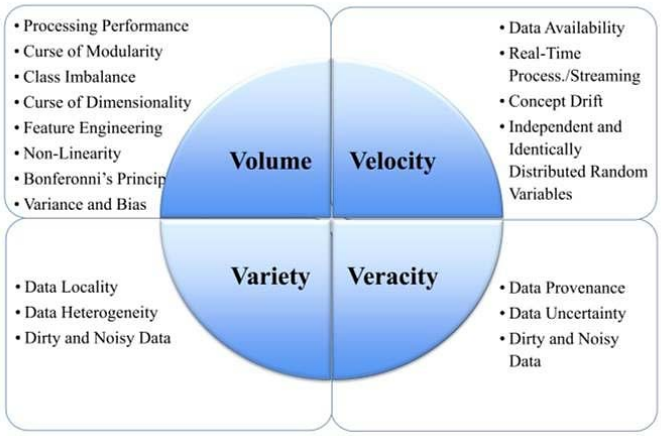

Figure. 1 Big data features

3. The Main Problems in the Financial Management of Traditional Power Companies

In traditional power companies, the power grid obtains the management of financial information through related software and technology. Most of the finance department focuses on accounting. It is only responsible for accounting and fund collection work such as reimbursement and voucher entry, which is relatively loose. Few companies have a complete financial management system. Moreover, most companies only have traditional single financial management skilled talents, and

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lack compound talents who can integrate financial management with corporate strategy.

The financial management techniques of traditional power companies are backward. At present, most power companies in my country are local enterprises, and most companies still use traditional financial management methods. As the application of the Internet and computer technology in power companies has become more extensive and mature, the scale of data in power companies has become larger and larger, and it has gradually shown an explosive phenomenon. Existing financial management technology cannot play the role of financial management better.

4. Construction of an Accounting Big Data Analysis Platform Based on Cloud Computing

4.1 Financial needs analysis

Cloud computing is a business computing model. By storing computing tasks in a cloud data warehouse, different application systems can capture the data and information they need through their own needs, thereby obtaining more and more effective computing capabilities. The construction of an accounting data analysis platform must follow the requirements of accounting standards and relevant laws and regulations, so this makes the platform big data and Internet big data have three major differences:

(1) In the Internet scenario, most big data applications need to scan the entire data set one by one. However, Hive or Impala cannot fulfill the indexing requirements well; in the big data analysis of electric power enterprise accounting, multi-dimensional area query is very common, and because there is no index, a large amount of unnecessary data is accessed, which greatly reduces the performance of the query and produces low Value density. Due to the characteristics of multi-dimensional area query, it is necessary to design a more reasonable index structure and a more appropriate data retrieval mechanism.

(2) A prominent feature of cloud computing big data is "write once and extract multiple times". HDFS and Hive cannot meet the data rewrite (update or delete) mechanism, and can only achieve indirectness by simply overwriting all existing data. The purpose of rewriting data. This will flood the system with a lot of useless rewrite statement data, which will lead to low work efficiency. So we need to design a more efficient data rewriting mechanism.

(3) Nowadays, with the rapid development of big data, enterprises can choose the most suitable query language for enterprises according to their own needs. Most of the accounting data analysis systems of electric power companies are written in standard SQL language, which requires a lot of manpower and material resources to convert existing SQL statements into equivalent HQL statements. Therefore, a new design needs to be established to automatically convert the SQL language to the

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HQL language, which can speed up the migration faster and realize the seamless and smooth migration of the accounting data analysis service of the electric power enterprise.

4.2 Overall platform design

This platform uses Hive as the data warehouse analysis software, builds a distributed system infrastructure with Hadoop, and develops multi-dimensional indexing based on grid files, automatic conversion tools from SQL to HQL, and large data features for power enterprise accounting based on query rewriting.. Key technologies such as the data update hybrid storage model provide good scalability and scalability for data operations.

Figure 2 shows the entire process of power companies' financial data from collection to analysis and calculation. Sensors and smart grids continuously send collected data to the data center. The platform continuously collects errors or omissions in the original data. Then put the original data into the front-end buffer pool for decoding and preprocessing. Then the data is analyzed and processed according to the logical analysis sequence, and finally the analysis results are synchronized to the cloud storage system. Customers enter the system to query, and the platform grabs data that meets user needs from the cloud storage system and feeds it back to users.

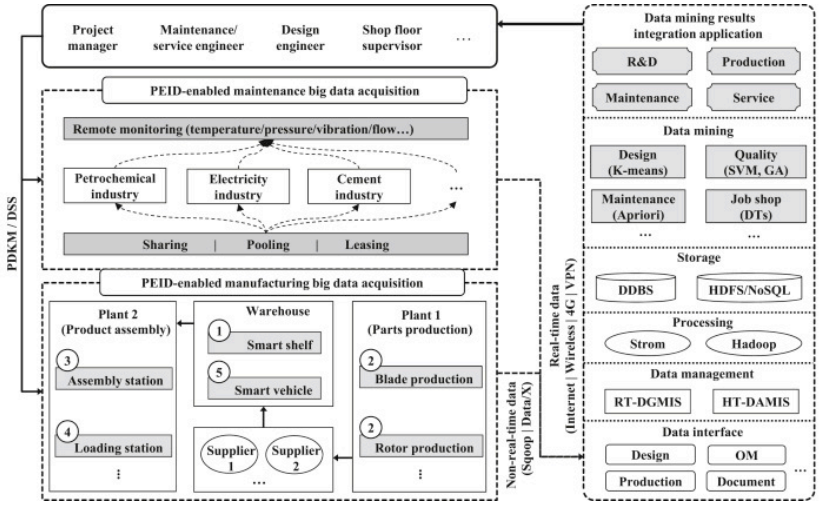

Figure. 2 Power accounting big data flow process

The power big data analysis system architecture is shown in Figure 2. There are mainly 5 modules:

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(1) In the entire analysis system, the Distributed File System (HDFS) [3-5] module is the core basic module, which is mainly used for the persistent storage function of accounting big data in electric power enterprises. HDFS is mainly used to process large files, and its design architecture follows the GFS paper, and metadata is stored on mds. The file is divided into 64MB data blocks and distributed to different data servers. Each data block has 3 copies, which are distributed on different nodes. If the replica cannot be accessed, the system will automatically create a new replica to maintain load balance.

(2) Hadoop [6] is a distributed open source framework for storage and operation. Its main components are HDFS and MapReduce. MapReduce mainly distributes computing tasks to servers in the cluster to run, and then the task scheduler analyzes the tasks through distributed computing.

(3) Hive [7] is a big data analysis and calculation data warehouse system based on the Hadoop platform, which implements SQL-like query functions by converting data files into database tables.

(4) Resource management and scheduling tools. Zookeeper is a resource integration and scheduling system for complex distributed systems. Its main function is to manage complex and error-prone key services, and convert them into simple, easy-to-use, and efficient services for users. In the scenario where multiple jobs are running at the same time, effectively coordinate and allocate cluster resources to maximize resource utilization.

(5) The development tool set includes a series of tools such as index management, SQL translation, task management, and parallel ETL tools, which can better provide the system with interface optimization and system configuration management.

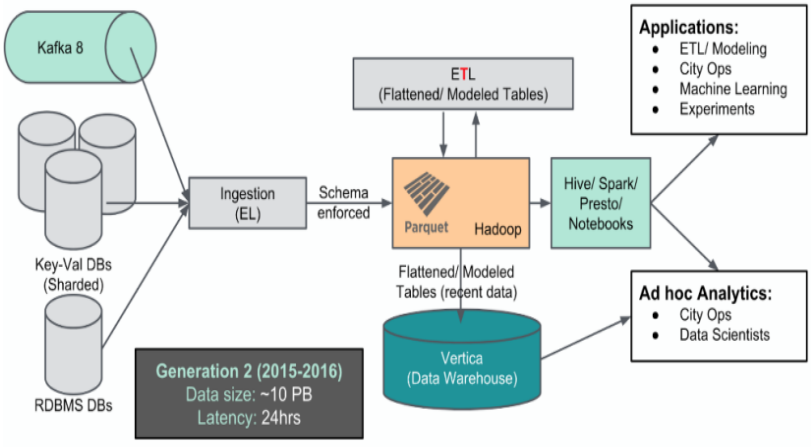

Figure 3. Design of a big data platform for electricity billing based on cloud computing

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4.3 Practice case analysis

Through the analysis of the problems often encountered in the accounting system of electric enterprises. For example: equipment operation, maintenance and scrap, etc. During the entire use of the equipment, cost accounting is always changing. For example, at the initial stage of equipment use, its maintenance and operation costs are lower. As the service life of transformers increases year by year, maintenance and operating costs will also increase year by year. Therefore, if the accounting cost of the substation is compared and analyzed year by year, it will be more effective to budget and calculate the annual cost, so that the budget work can be done in advance and the ability to perform financial control better. This article takes a certain substation as an example, according to the calculation and statistics of cost data over the years, the introduction of big data and cloud computing technology for analysis is shown in Table 1.

Table. 1 Cost of a substation (unit: yuan)

Year	Original sequence	Fitting sequence
2010	177038.8	178049.8
2011	193482.3	191165.3
2012	204815.8	202271.8
2013	221810.3	217623.3
2014	232476.8	231338.8
2015	248965.3	248544.3
2016	259556.8	258890.8
2017	273258.2	274881.2

Therefore, it can be seen from the above example that the operation and maintenance costs of the equipment are increasing year by year over time. The longer the investment, the more maintenance or technical improvement costs will be added. Through the analysis of the big data platform, it is possible to predict in advance in which year the equipment operation and maintenance costs will suddenly increase. In this way, the power company can make arrangements in advance to prevent this from happening suddenly, which can better reflect the financial prediction and The ability of management and control can better provide a solid analysis foundation for the company.

5. Conclusion

This article summarizes and analyzes the characteristics of the accounting data of electric power companies, and for these characteristics, the concept of big data and financial data are effectively combined, and cloud computing methods are introduced into the analysis process. Listed practical cases of the operation and maintenance costs of power grid enterprises' substations. It demonstrates the more

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effective analysis and processing capabilities of the big data analysis system for the accounting data of electric power companies. Provide a new idea for the combination and application of big data and grid enterprise accounting data.

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