Research on Cloud Platform for Power System Automation Operation Status Monitoring

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Abstract: The management and control system of power system to maintain the normal operation of electric power is of great significance in providing reliable guarantee for the transmission of electric power. With the progress of science and technology, the application and popularization of automatic control technology make it possible to improve the high load brought by manual control in power transmission. In view of this, power system automation has become the key development direction of the current power system transformation and upgrading. In this situation, this paper focuses on the analysis of the construction of power system automation operation status platform, which is based on cloud computing technology, and enriches the platform content according to the corresponding design objectives, thus realizing the effective integration of power system resources and promoting the efficient operation of power system.

1. Introduction

At present, as an important resource of human life, electric power has a key impact on human life and production. Therefore, to ensure the power transmission is not only a guarantee for human development, but also an inevitable requirement for social development [1]. On this premise, as an important power transmission system, it is of great practical significance to do a good job in technical support of power system. At present, with the rapid development of power system, automatic regulation system plays a significant role in technical support and service support [2]. In the power system with the increasing degree of automation, the operation intellectualization has a great correlation in the horizontal and vertical aspects of the equipment, and checks and balances each other, which leads to the complication of the corresponding relationship. In addition, the increasing demand of people leads to the increase of business system, which makes the pressure of operation and maintenance tremendous [3]. The corresponding traditional operation monitoring system has a large technical rectangle, and it is difficult to achieve the overall unified monitoring, so the effectiveness of monitoring can not be improved [4]. Therefore, in this context, the operation and management of power grid is moving towards self-reliance. With the development of dynamic, integrated and centralized technology, the application value of power system operation monitoring system has been improved. This paper makes a detailed analysis of this.

2. Main Design Objectives of Cloud Platform for Power System Automation Operation Status Monitoring

The core technology of cloud platform is the platform service of cloud computing. At present, China's power grid system is an independent unit at the provincial level, and interconnected through the corresponding tie lines to form a large power grid structure [5]. This will greatly increase the corresponding scale of the power grid, resulting in the operation burden of on-line dynamic analysis and control of the power grid beyond the current actual configuration. To solve these problems, we can build a private cloud system based on cloud computing platform and optimize the configuration of current data and processor resources with corresponding control algorithms to improve the overall computing capacity. On this basis, through the clamping of automation technology to build a state of operation monitoring system, thereby achieving a unified scheduling, its corresponding

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specific scheduling objectives are shown in the following aspects [6].

2.1. Unified storage platform for distributed large power data

Firstly, relying on distributed file system, the related data resources and processor resources in provincial-level power grid system are unified stored and managed. The corresponding data resources are mainly the unified management of system operation status, data resources of data system, task execution and so on, so as to optimize resource management. Provide technical support.

2.2. Classified management of massive data collected

Classification management of data is the prerequisite for efficient use of data, which requires that the operation monitoring system should be able to classify the relevant collected data according to a certain category reasonably and build a dedicated database of data applications, thus laying a good foundation for subsequent optimization of data utilization rate and improvement of data use value.

2.3. Construction of data analysis tool library

Data analysis is an important method and tool for utilizing data. Under the background of the trend of power data showing sea quantification, it is very necessary to effectively mine the valuable power information contained in these data, provide help for platform monitoring, and construct a data analysis tool library that meets the requirements of current power system development. . In the era of artificial intelligence, the development of intelligent, automated power system and its monitoring system has a very realistic significance for the operation and maintenance of the overall power grid, which can provide decision support for the decision-making level to put forward relevant improvement measures.

3. Analysis of Cloud Platform System Architecture for Power System Automation Operation Status Monitoring

For the cloud platform system of power system automation operation status monitoring, Using Distributed Multi-tier Structure and modular construction is an important way to improve the corresponding processing capacity of the system [7]. The main framework of the system is shown in Fig. 1.

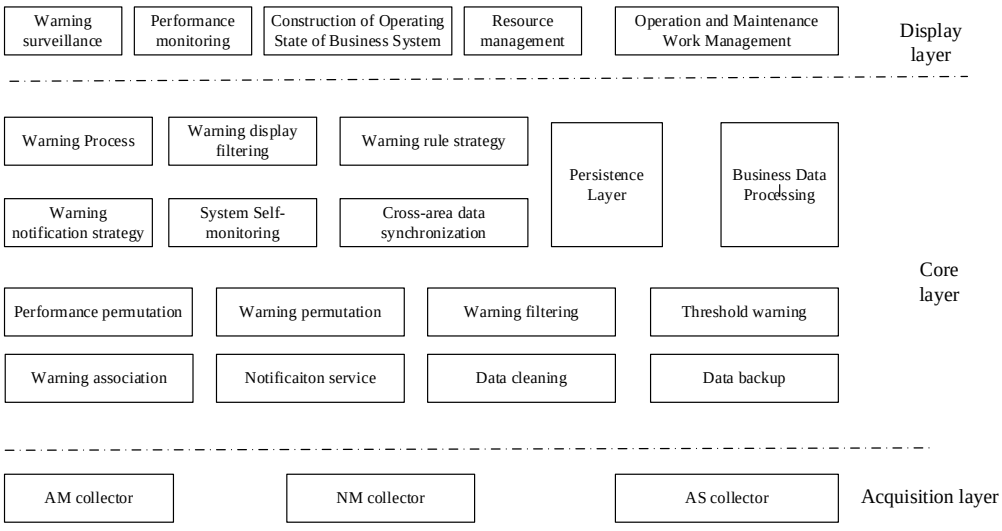

Fig.1. Architecture of cloud platform for power system automation operation status monitoring

As can be seen from Fig.1, the cloud platform system for power system automation operation status monitoring is mainly divided into three levels, namely, acquisition layer, core layer and

display layer. The function of the acquisition layer is to effectively manage the data of security management, network management platform and corresponding automation system, and transmit the corresponding data to the core layer for processing. The acquisition layer has a certain degree of complexity, which is divided into three aspects: security collector, network management collector and automation system collector. The function of security collector is to receive data related to security management platform. The function of network management collector is to receive data related to network management platform, while automation. The system collector receives relevant data of the automation system. The main function of the core layer is to analyze and process data from the acquisition layer. Its main functions are embodied in the core library, responsible for receiving and analyzing data, business services, business data processing, database and so on. The function of the display layer is to provide services for user operation query, such as system operation status monitoring, alarm, performance monitoring, real-time data query and so on [8].

In addition, the system bus used to connect each module needs to follow the SOA architecture. The corresponding bus has a certain expansion ability, and can have the characteristics of diversified operation and diversified functions. The corresponding system can also be developed for exclusive and personality design, and according to the design principles to carry out this matter.

4. Functional Structure Analysis of Cloud Platform for Power System Automation Operation Status Monitoring

4.1. Functional analysis of cloud platform safety monitoring system for power system automation operation status monitoring

For provincial level power grid, the corresponding security protection zones are generally four, i. e. safety I, II, III and IV zones, safety I zones are real-time control zones, II zones are non-control production zones, III zones are production management zones and IV zones are management information zones. For information management, it is mainly maintained in the data acquisition layer. Therefore, the focus of security monitoring for the platform is to effectively manage the first three security protection zones mentioned above. The function of Secure III is to process the corresponding data, that is, to collect and store the data of Section I and Section II. The function of Secure III is to integrate the application, that is, to collect, analyze and display the data of the three Secure Zones. Secure Zone I and II, as important data management links, has a visual operation interface to provide monitoring assistance for the corresponding monitors. The main functions of this interface are as follows [9]:

(1) Effective monitoring and processing of the corresponding operation of basic power system facilities such as the automation system, including alarm information, measurement information, security information and risk information;

(2) Effective management of some resource information in automation system, such as hardware resources such as server equipment, network equipment, security protection equipment and software resources such as business system, database, risk, etc.

(3) Provide basic management functions for the monitoring system, such as the management of parameters, permissions, users and logs related to the basic operation of the monitoring system.

4.2. Functional analysis of cloud platform alarm query system for power system automation operation status monitoring

The function of alarm information inquiry is mainly embodied in real-time alarm information inquiry and historical information inquiry, and its information content mainly includes alarm information source, classification, level division, occurrence time, specific alarm and so on. In the aspect of police reporting, it is generally distinguished from the distinct different backgrounds and warned by sound and light. At the same time, it can provide a quick preview for the relevant monitoring personnel through certain filtering screening, thus facilitating the maintenance of the system by the relevant personnel [10].

The basis of alarm query is data management, and the key of data management is data storage.

Current data storage is mainly in relational databases, such as MySQL. Of course, the scale of current data is getting larger and larger. Traditional MySQL-related databases can no longer afford data storage services efficiently. At this time, we need to rely on cloud platform technology and NoSQL database as the underlying database management system. On this basis, we adopt HBase, an open source database with distributed architecture. It is used for unstructured data storage and enhances the efficiency of query through column query, so as to realize the convenience of query. The corresponding HBase structure is shown in Table 1 below.

Table 1 HBase table structure

row key	column-family	
	column1	column2
Key1	t1:abc	t2:abcd

According to Table 1, the corresponding HBase data need to be determined by the following four-dimensional constraints (see equation 1). In the process of query, we rely on these four-dimensional constraints to achieve data filtering and screening, so as to improve query efficiency.

$$\{\text{row key}，\ \text{column-family}，\ \text{column}，\ \text{timestamp}\} \tag{1}$$

5. Conclusion

At present, with the increasing scale of power grid, the corresponding monitoring data presents a huge trend of development. The traditional power system automated operation status monitoring system, due to its limitations in structure, leads to the corresponding processing capacity is effective. In addition, due to the decentralization of the power system, the corresponding management platform is decentralized, and the corresponding monitoring data can not be managed uniformly, which reduces the effectiveness of the platform. Aiming at these two problems, relying on the current advanced cloud platform technology, this paper constructs a cloud platform system for power system automation operation status monitoring. Through the management of the platform, the decentralized monitoring system is effectively integrated, and the corresponding power data, logs and alarms are effectively and uniformly managed. By using multi-tier distributed architecture and HBase database to manage these data, the scale of data management and query efficiency are improved, and the efficiency of system operation is improved through modular design, thus providing reliable, multi-dimensional and comprehensive monitoring data for relevant managers, so as to facilitate related personnel to quickly discover system problems. Improve the efficiency and level of monitoring and management.

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