Database dynamic update management system for power system

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Abstract: Through the use of smart terminal equipment such as smart meters, the operating data of the entire power system can be collected, and then the collected power big data can be processed and analyzed systematically, thereby real-time monitoring of the power grid; further, combining big data analysis and power system models, can diagnose, optimize and predict the operation of the power grid, and provide guarantee for the safe, reliable, economical and efficient operation of the power grid. The data sources of the power industry are mainly derived from the power generation, transmission, transformation, distribution, power consumption and dispatching of power production and use of electricity, which can be roughly divided into three categories: one is grid operation and equipment detection or monitoring data; two is the marketing data of electric power companies, such as data on transaction electricity prices, electricity sales, and customers. Third is the management data of electric power companies. Through the use of smart terminal equipment such as smart meters, the operating data of the entire power system can be collected, and then the collected power big data can be processed and analyzed systematically to achieve real-time monitoring of the power grid; further combining big data analysis and power system models for the power grid diagnose, optimize and predict the operation, and provide guarantee for the safe, reliable, economical and efficient operation of the power grid.

1. Introduction
In the era of rapid development of high technology, everything we need is moving towards intelligent development, and the aspect of power systems that people can't leave at all times requires intelligent development. The smart grid is to make society use electricity to "live". For example, when we are sitting at home, we need to turn on the air conditioner to adjust the indoor temperature. With a touch of a finger, we can turn on the air conditioner, and we can see the power consumption and power consumption of the air conditioner at any time. We can make adjustments at any time according to our needs. Our household electricity consumption can also be viewed through smart meters, real-time data on electricity consumption, and can also be paid directly on Alipay or WeChat, which is very convenient.

With the increase of the number of users in the power system, the database dynamic update management system is very important. When we search for something in the power system, if there is no rapid response from the data network, we can only update and check the system by human resources. This is not realistic. An ordinary large-scale power system basically needs to process tens of thousands of query requests every second, and the database needs to execute these query tasks simultaneously, and the response time needs to be very short. In short, from all aspects of the power
system, as long as there is data, a database dynamic update management system is used. The power system is no exception, and there is a special place in the power system's requirements for the database. Because of frequent changes, the dynamic update capability is particularly strong. This paper attempts to design a database dynamic update management system suitable for urban power systems.

2. Application of database dynamic update

2.1. The need for dynamic database updates
In a common network structure, every time a database query and update is performed, a database connection and database statement need to be established. Of course, you can get the database connection by writing this way, but when we need to change the database connection, we have to change the code every time, which delays the development efficiency. Therefore, in order to improve the development efficiency, we need to write a general method or class. No matter which database is connected or the database connection is changed, we only need to change a few main parameters. Great improvement.

2.2. Uniqueness of dynamic queries
With the maturity of cloud computing technology, in order to save costs and enhance system flexibility and resilience, enterprises are increasingly interested in migrating applications from internal data centers to cloud platforms. Although elasticity is an important attribute of cloud computing, as mentioned in application systems migrated to the cloud platform will not automatically inherit this elasticity. In order to take full advantage of the elastic nature of cloud computing, application systems need to have the ability to dynamically scale at the code level. We have experienced this in the process of building a flexible cloud data warehouse HashData based on the open source MPP database Greenplum Database. In this article, we will use the solution of dynamic addition and deletion of nodes in the database.

![Figure 1: Data architecture for power systems](image)

After receiving the query request from the client, the master node optimizes the query through the optimizer. The output of the optimizer is called the "query plan". The query dispatcher assigns the query plan to the compute nodes, the compute nodes process them, and send the calculation results back to the master node. Finally, the master node aggregates the data and forwards it to the client. The data exchange network supports high-speed network protocols with multiple processes across the
network and is an important part of the Greenplum Database pipeline processing model.

3. Dynamic data update of power system

3.1. Digitalization of power systems

![Data sources for modern power systems](image)

Figure 2: Data sources for modern power systems

The dataization of modern power systems means that the system has a high degree of openness and sharing, and the power grid has become a comprehensive energy service platform. Power, gas, heat, energy storage and other resources are interconnected through the power grid to optimize the efficiency of comprehensive energy utilization. The Internet concept runs through all kinds of electricity business and forms a transparent and open service network. Supports distributed energy and friendly access to various energy-using equipment.

Consistency is very important for a power system with a large number of users. For a consistent hash, the total amount of data to be moved will increase from 1 to $1 / N$ when one node is added or subtracted ($N$ is the number of original nodes in the system). It is not difficult for the attentive reader to find that there is a problem with the consistency hash described above: when adding or removing nodes, only the data on some nodes may need to be moved. This will cause an imbalance in the available resources on the nodes in the system, resulting in a greater impact on the user's normal business logic.
3.2. Application of Power System Database Update System

Figure 3: Structure of database dynamic update system

Although many companies are now slowly adopting the SM architecture, in fact, its essential development process is basically the same as that of SMS, including the JEECG framework. The SSM framework, as the name suggests, is Spring + SpringMVC + mybatis. Through Spring, the layers are integrated, the persistence layer (mybatis) is managed through spring, and the handler is managed through spring. In short, spring boot is to integrate the various layers.

Ajax is asynchronous JavaScript and XML or HTML (a subset of the standard universal markup language). Ajax is a technique for creating fast and dynamic web pages. Ajax is a technology that can update part of a web page without reloading the entire web page. With a small amount of data exchange with the server in the background, Ajax enables the web page to update asynchronously. This means that parts of a web page can be updated without reloading the entire web page. Traditional web pages (without Ajax) need to reload the entire web page if content needs to be updated.

4. Conclusion

Power systems are vast and well-organized countries, which are very important infrastructures, but building a high-performance and flexible big data analysis engine has never been an easy task. In this article, we discussed the issues that need to be considered during the dynamic scaling of the database of the power system and possible solutions, especially how to efficiently redistribute data and optimize the running queries during the scaling process. With the continuous advancement of HashData data warehouse development, we will explore more implementation details in subsequent research.

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