Research on the Large-scale Database Optimization Algorithm under the Environment of Cloud Computing and Internet of Things

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Abstract. In this paper, we conduct research on the large-scale database optimization algorithm under the environment of cloud computing and Internet of things. Based on cloud computing technology and huge amounts of data, the database for many aspects of adjustment and optimization to improve the efficiency of the operation of the database system to the greatest extent and reduce the resource consumption of the system operation, making the response of the huge amounts of data greatly increased efficiency. The adjustment and optimization of database including multiple layers, it contains the database runtime environment optimization, the database parameter optimization and application of the optimization of three levels. The numerical analysis proves the feasibility and effectiveness of our proposed approach.

Keywords: Large-scale Database; Cloud Computing; Internet of Things (IOT); Structure Optimize.

Introduction

With the extensive and in-depth application of cloud computing, massive amounts of data processing and rapid response is particularly important, the adjustment and optimization of the database occupies the core status. Based on the database system performance bottleneck problem of digging, rely on the database performance tuning and optimization method, the greatest degree of improve the efficiency of the operation of the database system, reduce the resource consumption of the system operation, making the response of the huge amounts of data greatly increased efficiency. The adjustment and optimization of database including multiple layers, it contains the database runtime environment optimization, the database parameter optimization and application of the optimization of three levels. From the operating system level, the database file is stored on disk and composed of a file and therefore, the optimization of its physical structure determines the efficiency of database. Dynamic change in the cycle, the increase of database application system constantly narrowing, or little impact on its efficiency and reasonable, but the situation in the dynamic change of cycle will be a sharp drop in performance, this is caused by the dynamic extension.

In the process of dynamic extension, on the lines to create and change the default value, must according to the requirements of storage expansion and allocate new storage space, and the expansion of the form will further lead to the growth of the data file, table space, these extensions will make slow system response. In order to avoid this situation, using the method of optimization is to establish a good space pre-allocated when to meet enough growth, when an object set up according to the size of the application actually count them fully, makes the database on the physical storage and achieve a better balance in terms of dynamic growth, achieve these objects are neither frequent growth, but also take up much of the database resources. The Internet of things is through the RFID and intelligent computing technology equipment interconnection networks around the world. IOT than traditional Internet and sensing network has more thoroughly, it is using anything that can sense, measure, capture and transmit information

anytime and anywhere equipment, system or process, easy to take immediate response and long-term planning. The IOT could be separated into the following sections. (1) Perception layer is the basis of Internet of things, used for collecting information from the object. Through various types of sensors for material properties, environment status and behavior tendency of static/dynamic information on a large scale, we could get the distributed information retrieval and state identification. (2) Communication layer information channel is the Internet of things, the cognitive layer for information transfer, including communications and Internet network, network management center, information center and intelligent processing center, etc. Communication layer and subdivided into Internet access part, parts and service management. (3) Intelligent application part of the application layer is the Internet of things, can combine with industry demand, realize intelligent extensively. IOT data sequence and dynamic flow characteristics: in the Internet of things system, in order to query a sensor at a moment's condition is not simply based matching time point.

Cloud computing is with the rapid development of computing, storage and communication technology in a new business computing model based resource sharing. Data center is the foundation of cloud computing, companies relying on the business operation data center, the service provider to profit by data centers to provide services, content providers relying on data centers to provide useful content and make a profit. The distribution of cloud computing environment storage technology research on the data in the data center storage, organization and management and to the upper application to provide a safe, reliable, scalable and efficient data storage services [1-3].

In this paper, we conduct research on the large-scale database optimization algorithm under the environment of cloud computing and Internet of things. In the figure one, we show the basic structure of the large-scale database with cloud and IOT designed in the research.
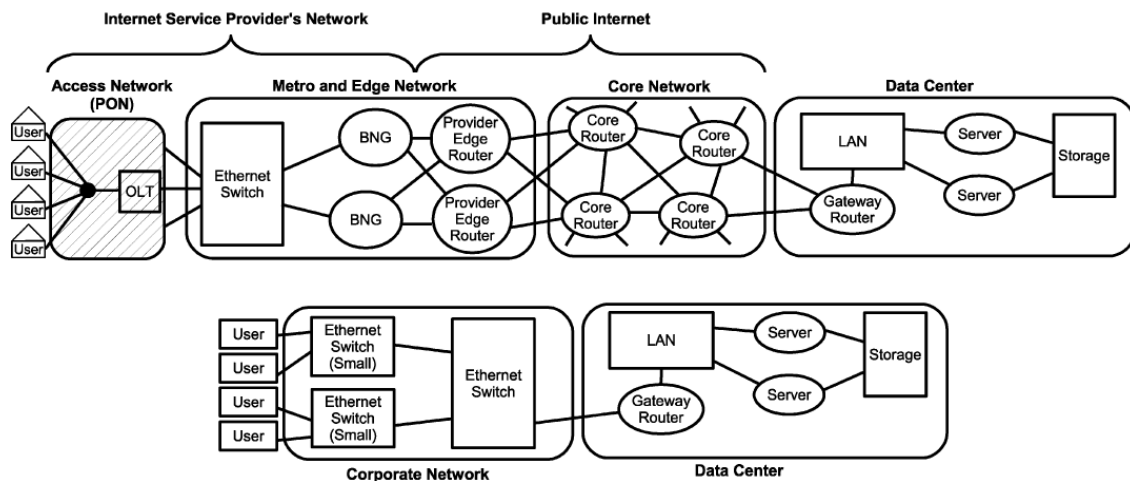

Fig. 1The Basic Structure of the Large-scale Database with Cloud and IOT

The Principles of Our Research

The Core Techniques of Internet of Things. The Internet of things is the mobile Internet after the third wave of the Internet revolution. Internet network can have a lot of kinds, the basis of available according to the need of application which can use the public communication network, private network, or the industry even new dedicated to Internet network. Usually the Internet the most suitable as the basis of Internet of things network, especially when physical

interconnection is beyond the scope of the network, and when you need to use public sites when transmitted to processing and utilization of information. Sensor network is made up of a large number of sensor nodes deployed in monitoring area, through wireless communication mode to form a multiple hops self-organizing network system. Node deployment is through proper policy arrangement to satisfy the needs of a specific sensor node. In sensor network, the node can be by plane or artificial arrangement, a large number of deployed within the perceived object or nearby.

These nodes through self-organization way constitute the wireless network, real-time perception in the form of collaboration, collecting and processing the information in the network coverage area, and the data through multiple hops network via the Sink node link information transmitted to remote control in the whole area management center. Remote management center, on the other hand which also can to control and manipulate the network nodes. Network architecture is a set of network protocol layer and network protocol, is to the network and its components shall complete function by the definition and description. For wireless sensor network, the network system structure is different from traditional computer networks and communication networks. In practical application, there are a large number of sensor nodes in sensor networks, high density, network topology in the node failure occurs, is likely to change which should consider the feature of self-organizing network, automatic configuration ability and extensible ability. Because of the sensor network is the bottom of the Internet and the information source, the network performance parameters, such as one's own integrity, integrity and efficiency is critical. In the figure two, we illustrate this point visually.
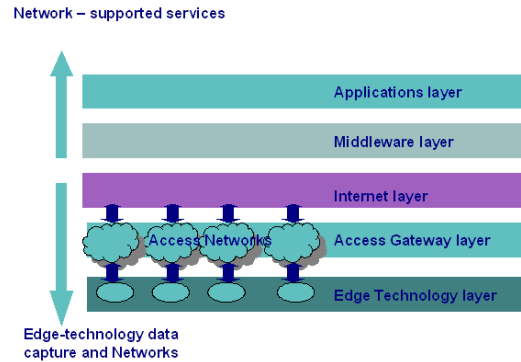

Fig. 2The General Visual Pattern of the Internet of Things

The Cloud Computing Environment. Cloud computing is a provide users with configurable, the foundation of the Shared resources of the calculation model, it enables the user to the cloud service providers rarely involved in cases, convenient, real-time access to the network, storage and computing resources. Cloud computing providers by putting a lot of nodes and the network devices connected together, to build one or several large-scale data center, and then on the basis of the data center to provide customers with various levels of service, such as infrastructure services, platform service, storage services and software services. Cloud computing has a very large scale, high scalability, high reliability, virtualization, on-demand service and the price is low wait for a characteristic which can well meet the requirements of mass data storage. Cloud computing is a new type of super calculation way, with data as the center, is a kind of data-intensive supercomputing. In the aspects of data storage, data management, programming model has its own unique technology. In order to guarantee high town, high reliability and efficiency, cloud computing with the method of distributed storage to store data, adopt the way of redundant storage to ensure the reliability of data storage, which is the same data store multiple copies. In addition, cloud computing system needs to meet the needs of a large number of users at the same time, in parallel to serve a large number of users. The cloud data storage technology, therefore, must

have the characteristic of high throughput and high transfer rate.

Cloud computing technology has the following characteristics. (1) High availability. Through the integrating mass storage and high performance computing, cloud can provide higher quality of service. Cloud computing system can automatically detect the failure nodes, and to exclude failure nodes, does not affect the normal operation of the system. (2) Provide reliability in redundancy mode. Cloud computing system consists of a large number of commercial computer clusters to provide data processing services to users. With the increase of computer quantity, the system greatly increases the probability of error. Without dedicated hardware parts, under the support of reliability with the method of software, the data redundancy and distributed storage to ensure the reliability of data. (3) Cloud computing is a service provided by the system. The implementation of the service mechanism is transparent to users and need to know the detailed mechanism of cloud computing, can get required service. (4) High-level programming model. Cloud computing system provides a high level of programming model. (5) Economy. Form a cluster using a large number of business units into relative to the same performance of super computer spends money a lot less. (6) Diversity of service. Users can pay the different cost, to achieve different levels of service, etc. In order to better define cloud computing, must from the cloud computing service users, service providers, organization, internal implementation mechanism and so on at the same time definition.

The Large-scale Database Optimization Algorithm. Due to the large database processing the amount of data is very big, if not to design a reasonable database model, not only can increase the programming of client and server program and the difficulty of maintenance, but also affects the performance of the system operation. Improving the performance of a system, not only needs to commissioning or maintenance phase deep optimal performance, and not just the development phase, but need to note, throughout the system life cycle and work effectively to achieve. Relationship normalization is according to the unified standard optimize the relationship, in order to improve the quality of the relationship, to construct an efficient database application system to lay the foundation. To construct a good database schema, must make its relational schema properties meet some inner semantic condition, and the connection can be divided into several levels of relationship of different requirements, that is the relationship between standardization. The relationship between the basic table and its fields, we should try to meet the third normal form. However, meet the third paradigm of database design, often not the best design. Sometimes in order to improve the operation efficiency, it is necessary to lower the standards of paradigm, the appropriate redundant data. In the following figure three, we demonstrate the large-scale database optimization methodology.
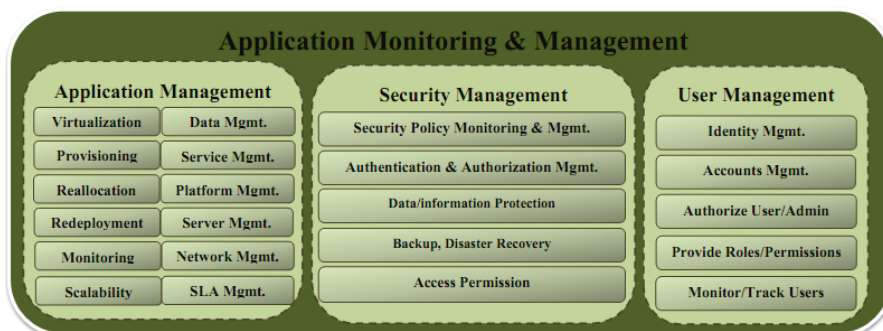

Fig. 3The Demonstration of Large-scale Database Optimization Methodology

CONCLUSIONS

In this paper, we conduct research on the large-scale database optimization algorithm under the environment of cloud computing and Internet of things. With the popularity of database application, the database application increasingly becomes large scale. The increase of the number of users, the response speed of the decline in database application system, performance problems become more and more prominent especially the application of data warehouse and decision support system. The amount of data table and index is growing fast. This gives the data security and execution efficiency brings a big problem. Improve data access efficiency, adjustment and optimization of the performance of the database system for the normal operation of the whole system plays an important role. Our method combines the cloud and IOT to optimize the current method which performs better.

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