Information Data in Geological Informatization Based on Cloud Computing

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Abstract. In recent years, China’s earthquakes have occurred frequently, and various problems have occurred in many coal mining areas. Geological information is informatized, which helps geological researchers to study information data, analyze the geological situation, and make corresponding countermeasures. The extensive application of information technology in geological surveys will greatly improve the modernization level of geological surveys. At present, the geological survey informationization work has entered the era of big data. How to break the limitation of independent management of the geological survey database and effectively integrate and share the massive geological survey data that has been accumulated, now it has become an ardent concern and urgent for geological survey informationization workers. Hope to solve the problem. The emergence and maturity of cloud computing technology provides a feasible solution to this problem. The research purpose of this paper is based on the research of information data in geological informatization of cloud computing. This article starts with geological information data, analyzes the characteristics of geological data, explains the necessity of geological informationization, builds a cloud computing information management platform, Geological information is realized in the function, and the research and analysis of the geological information data are performed. After simulation experiments, the cloud computing geological information platform built in this paper has high accuracy, and the error is not more than 5%, which verifies the feasibility of the platform.

Keywords: Cloud Computing, Geo-informatization, Information Data, Big Data Era

1. Introduction
Cloud computing has begun to penetrate into all areas of life, such as the management, analysis, storage and actual mapping of geological information. It solves the problems of difficult management and storage of geological information data in the past, and makes the management of geological information develop towards modernization and informatization. Many provinces in China are in earthquake-prone areas, and many places are coal mining areas. The advance role of environmental geological surveys in national economic and social development has become increasingly important. It has made contributions to the sustainable economic and social development of the country. Important
contribution. The China Geological Survey has accumulated more than 100 national geospatial databases in 11 categories, including geological maps, mineral resources, natural heavy sand, and isotopes. The total data exceeds 120 TB, which has laid a solid data foundation for related experimental research. The processing of information and data is more difficult, especially with the advancement of China's ecological civilization, the data and information obtained from environmental geological surveys will continue to increase, and it is urgent to further support China's resources and environment. The needs of industry departments and the public are becoming more and more important. The realization of geological information technology is of great help to solve this problem.

There are more than 100,000 geological hazards in China that need to be monitored and forewarned. In flood seasons, hundreds of thousands of people can only be mobilized on-site by day and night, which consumes a lot of manpower and resources, and has a high rate of false negatives. Loss of national surveying control points, border pillars of mining rights, field geological survey equipment and vehicles, and unfavorable management of physical geological data such as cores and paper, have brought many inconveniences and losses to the geological survey. Although the country has invested a large amount of human, material and financial resources to monitor, prevent and manage by various means, there are still inadequate timeliness, insufficient accuracy, and difficulties to achieve the desired results [1-2]. If all kinds of accident-prone areas are equipped with sensors, such as displacement gauges, telescopes, inclinometers, water gauges, pressure gauges, and temperature sensors, and cameras, etc., the information will be transmitted through various networks to geological information. It is of great significance to carry out research on the integration of related technologies such as the Internet of Things, cloud computing, and big data [3-4]. Geological informatization can form dynamic surveys from field to indoor, from underground to above ground, from point to surface, and from local to regional. It can obtain more timely, accurate and reliable geological information, and can display it in three or three dimensions. It is conducive to the refined management of geological surveys in China, and to improve the quality of timely, accurate, authentic and reliable public welfare socialized services for geological managers, professional staff, participants, and the public [5-6].

By studying the characteristics of geological information data, this paper concludes the necessity of geological informationization, builds a cloud computing geological informationization platform, and tests to verify that the platform has good performance and high feasibility in all aspects. In addition, this article also talks about the platform used for simulation testing, the information and data analysis of geological hazard information in a place in the past five years, and conclusions about the frequent collapse and landslide in the place in the past five years.

2. Method

2.1 Characteristics of Geological Data

(1) Essential characteristics

1) A large number of sexual characteristics.

Mother Earth has given birth to countless lives and at the same time has abundant mineral resources. At present, China's Geological Survey has found hundreds of thousands of mineral resource locations, and has constructed various databases. It can be said that it covers all aspects of information in the geological field, and the amount of data is very large[7].

2) High-speed characteristics.

The era of big data was very fast, and the generation of geological data was also very fast. Taking advantage of the fast processing speed in the era of big data, the data in the geological field is continuously analyzed and updated [8].

3) Diversity.

Advances in science and technology have made geological data more concrete. Geological fields not only have huge amounts of data, but also various types. In the past, only large aspects were recorded. Now it is accurate to record isotopes. From the expression form of digital recording to the expression of image and sound, it fully reflects the diversity of geological data [9].
4) Value characteristics.

To be realistic, so far, very few minerals have been found, and very few abnormalities have been verified during the survey. However, this does not affect the value manifestation of geological big data. Once a breakthrough is found to discover minerals, not only will it be of great social and economic value, it will also have an important positive effect on human development [10].

(2) Professional characteristics of geological data

1) Materiality and non-materiality of geological data

In the material and non-physical properties of geological big data, materiality mainly refers to the objective existence of geological data, that is, it does not change with human thought. It is the first nature of the material nature. Non-materiality mainly means that the geological data has the nature of being processed. Whenever geology emphasizes the first and objective truth of matter, only in this way can we properly deal with various problems encountered in geological surveys.

2) Spatial and non-spatial nature of geological data

Spatiality refers to the spatial properties of the geological data objects being studied, and it is different from the mineral resources of different geological studies in other disciplines. In the in-depth study of mineral resources, if we study the metallogenic regularity part, we should ignore getting rid of its spatial limitations and find out the nature of the metallogenic regularity. This is the non-spatial nature of mineral data [11].

3) Temporal and non-temporal geological data

The basic theory of geology is the representative of the year of geology. What happened to the geological conditions in different ages and times is recorded in the form of a table. The distribution rules and characteristics of rocks and minerals at different times are different. This is the temporal nature of geological data. However, the geology of different ages also has common characteristics and structural distributions. This is the non-temporal nature of geological data [12].

4) Causality and non-causality of geological data

This is a more in-depth explanation of geological big data. In traditional geological research, it mainly revolves around "why", such as why the crust moves, why saitama originated in Liaoning, and so on. Sometimes it is not necessary to figure out why. Although I don't know the reason for the formation of some minerals, as long as you find it, you can still use it, and you don't have to wait until the cause and effect relationship is found before you start mining. This is the causality and non-causality of geological data [13].

5) Subjectivity and non-subjectivity of geological data

Subjectivity mainly refers to the subject of data processing, collection and publication in data technology. Each person has different views on different data. How to achieve orderly unity must be based on subjectivity and determined based on subjectivity. Non-subjectivity is to express your opinions, and to classify them according to the opinions and research of different people [14].

6) Objectivity and non-objectivity of geological data

This is the last professional feature of geological data. The so-called objectivity is that everyone who passively receives data or research results can change his identity and take the initiative to operate. In turn, the initiator of a mineral resource wants to understand another mineral and must accept the research of others. As a result, the relationship between the two perfectly reflects the objectivity and non-objectivity [15].

(3) Geological data

Geological data is a series of important results accumulated by geological work. It is a variety of data formed in the scientific research, engineering survey, production and other processes of the geological industry. It is the crystallization of the wisdom of countless experts in the geological field and a valuable intellectual wealth. Geological data is the result of collective labor, and it can play an important reference role for later staff. If these geological data can be systematically collected, sorted, collected, integrated, standardized data organization and storage, and realize the sharing and Repeated development and utilization, and the provision of orderly, long-term, public welfare social services to the public, can effectively explore the potential value of geological data, minimize repeated
development and unnecessary investment, and save costs for the country. At present, the pilot work of industrialization of geological data information clustering has been carried out throughout the country. The National Geological Data Museum and the provincial geological data museums are exploring methods of geological data management and application, and have achieved preliminary results. At the same time, the National Geological Data Museum is also deploying an application of the geological data inventory management system, which can realize the management of the entire process of remittance, storage, inventory management, borrowing, etc.

2.2 Cloud Computing

(1) The concept of cloud computing

Cloud computing is an Internet-based, public-participant computing model. Its computing resources (computing, storage, and interaction) are dynamic, scalable, virtualized, and provided as a service. This new type of computing resource organization, allocation, and use mode is conducive to the rational allocation of computing resources and increase their utilization, promote energy conservation and emission reduction, and realize green computing. Cloud computing proposes a new business computing service model of software service, resource virtualization, and system transparency. As a technical means and implementation mode, computing resources become a social infrastructure that provides services to the general public, which will have a profound impact on information technology itself and its applications. Cloud computing will improve the data resources and utilization of computing resources in the geological field, and will facilitate the acquisition of geological computing resources. It will promote the rapid development of the geological field with the Internet and the Internet of Things, which will more effectively enhance the accurate perception of the ground. The two-dimensional and three-dimensional integrated display of the world and the underground world, by continuously strengthening the cognitive ability of the digital earth, promote the progress of informationization in the geological field, and give full play to its role of social welfare.

(2) Basic architecture of cloud computing

The cloud computing architecture takes the provision of various cloud services to users as its core goal, mainly including three levels:

1) SaaS: software as a service, applications are mainly provided to customers in a web-based manner;

2) PaaS: Platform as a Service, which provides an application development and deployment platform as a service to users;

3) IaaS: Infrastructure as a Service, which provides various low-level computing (such as virtual machines) and storage resources as services to users.

From the perspective of end users, the three layers of services, SaaS, PaaS, and IaaS, are independent of each other. This depends on the services they provide, and the users they target are different, but they have certain dependencies. The products and services of a SaaS layer not only need to use the technology of the SaaS layer itself, but also rely on the development and deployment platform provided by the PaaS layer or directly deployed on the computing resources provided by the IaaS layer. PaaS products and services can also be built on IaaS layer services. SaaS is the most direct and common cloud computing service for end users. Using a browser, you can directly use applications running on the cloud. The SaaS cloud provider is responsible for maintaining and managing the software and hardware facilities in the cloud, while charging users for free or on-demand use. Users do not have to worry about software installation and maintenance, and can save a lot of expenses. Representatives are Google Apps, Sale force CRM, Office Web Apps, Email, etc. PaaS provides users with applications such as test environments and deployment environments, so that end users do not need to care about the operation and maintenance of resources such as application servers, database servers, operating systems, networks, and storage in all aspects of writing and deployment. It has the advantages of friendly development environment, rich services, strong scalability, high integration rate, and multi-tenant mechanism. IaaS is a provider that directly provides end-users with computing
or storage resources, and only pays for the resources they rent. It has the characteristics of maintenance-free, open standards, strong scalability, wide support for applications, and low costs. Use virtualization, distributed storage, massive database storage (relational, non-relational (such as large tables, etc.)) and other technologies to achieve.

3. Experiment

(1) Setting up a cloud computing environment

In the process of setting up a cloud computing environment, you can make full use of related storage devices, and introduce servers that can generate storage pools, such as IBM or HP. Generally, the cloud storage device selected to realize the data storage function mainly benefits from its fast file storage and partition storage methods. In order for the built environment to provide high-quality services, two types of storage clouds, private and shared, are required, both of which are responsible for internal and external services.

(2) Construction of geological cloud computing platform

The construction of geological cloud computing platform requires the introduction of GCCSC as the core of the platform management, and the platform must ensure that the basic equipment is connected to each other and has a relevant data center, so that the platform can form a virtual resource pool that can serve geological work. The platform resource management process uses WCF and SOA in an orderly manner to implement non-spatial services with Web Services, and guarantees the function of GIS servers through Arc GIS Server. However, it should be noted that GCCSC needs to integrate spatial and non-spatial services, and the specific service content should be reflected in both computing and data services. And through the reference of SOAP and RESR, the geological data is also virtualized, which provides a good guarantee for data sharing and integration, and then plays the role of cloud computing platform data center.

(3) Performance test and simulation test

The built geological cloud computing platform will be tested for performance, and the obtained information will be sorted and analyzed; the built platform will be used to simulate and test the geological disasters in a place in the past five years and the results will be sorted and analyzed.

4. Discussion

4.1 Platform Performance Test Analysis

Performance tests were performed on the constructed geological information platform. The test results are shown in Table 1.

| Reaction time | Reliability | Ease of use |
|---------------|-------------|-------------|
| 30ms          | 98%         | 90%         |
| Resource utilization rate | Accuracy | Compatibility |
| 58%           | 95%         | 96%         |

It can be seen from Table 1 that the performance of the cloud computing informatization platform is good in all aspects, of which the response speed is only 30ms and the projection speed is fast. In addition, the error between the calculation result and the actual result does not exceed 5%, and the accuracy is as high as 95%. All other aspects of performance are good.

4.2 Information and Data Analysis of Geological Informatization Cloud Computing Platform

Using the built platform, the data analysis of the geological disaster information in a place in the past five years is performed. The results are shown in Figure 1.
Figure 1 shows the geological disasters that occurred in a certain place in the past five years. From the figure, it can be seen that the most frequent geological disasters in this place are collapses and landslides. By analyzing the geological information data, we can know the law and intensity of geological disasters. Through prevention to reduce losses and casualties, it can be seen that the centrality of geological informatization.

5. Conclusion
Geological information is of great significance for the prevention of geological disasters. Geological informatization is an important means to solve problems such as incompleteness and lag of geological information. This paper builds a cloud computing geological information platform to process and analyze geological information for information and data. Informatization. The feasibility of the method is verified by experiments in this paper.

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