Construction of Seismic Cloud Platform Based on OpenStack

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Abstract. Based on virtualization technology, cloud computing realizes resource sharing according to its application to meet business requirements. Such a platform can effectively save resources and provide customers with more quality services. Due to the large amount of seismic data processing and that of computing tasks of seismic cloud platform, the whole cloud computing technology and cloud computing platform construction need to be ensured. At present, there is no large-scale application of the current computing platform, it mainly focuses on the construction and research of private platform. Based on the standard system of OpenStack, this study first analyzes the current situation and problems of seismic cloud platform, then designs the seismic cloud platform, and finally elaborates the construction, deployment and functional application of the platform from the perspective of heterogeneous cloud.

Keywords: Seismic Cloud, Platform Construction, Openstack, Technical Architecture, Heterogeneous Cloud

1. Introduction
In the process of construction, the seismic cloud platform should provide more perfect functions for the upper layer according to certain principles, so that various resources and businesses can be stored and extracted more conveniently and quickly, and the support capacity of the seismic cloud platform should be enhanced, and the platform is finally open and shared. Private ownership accounts for a high proportion of the seismic cloud computing platforms in the industry, and all resources and services operate independently [1]. In this study, the author mainly analyzes the current situation according to the actual situation of the China Seismic Network Center and the Second Monitoring Center of the Seismological Bureau, and further studies the remote seismic cloud platform, so as to build a remote dual-center platform and realize resource sharing and improve the construction of our country's seismic cloud platform [2-3].

2. The Current Situation and Problems of Seismic Cloud Platform
In the earthquake research industry, many companies have built cloud computing platform, and the collected resources and applications are widely used, but private ownership is still the main position. Open source in IAAs layer is relatively rich, but in recent years, OpenStack and CloudStack are still highly recognized [4-5]. The current private cloud platform (OpenStack + KVM) shows obvious open structure. This framework based on OpenStack has become the mainstream framework with high recognition in the industry [6]. The final standard framework can realize resource management of
virtualization, networking, storage and security in heterogeneous environment. As a cloud service, it can provide more resources. The virtual layer will gradually become the mainstream framework because of the stable performance of KVM and the recognition of server virtualization framework, which can provide reliable guarantee for the operation of business [7-8].

Thanks to the construction of cloud computing resources, domestic IT system integration, multi-business resource sharing, and system construction cost control have been obviously promoted, but there are also many problems [9]. (1) There is no unified site for resource management in the industry, and the resources of different sites cannot be effectively shared. In addition, the construction cost is high. Finally, the whole seismic cloud platform is rich in resources, but the resource utilization rate is low. (2) The virtualization of the server is low, and minicomputers and disks still occupy the main position in the traditional architecture of resources, which will increase the cost of resource system expansion, and have a negative impact on the maintenance of the platform. (3) There is no suitable platform for management of cloud resource site in the industry. The resource management mode and maintenance mode are relatively old, and there is still a certain space for improvement and exploration [10-11]. As a result, resources can not be centrally deployed, coordinated and managed in a centralized manner.

3. Design of The Platform According to the Standard System of Openstack

With the convenience brought by cloud computing, enterprises and governments can effectively realize digital transformation, and the innovation of the entire business also has more accurate data and a safer platform. However, with the gradual development of public ownership and private ownership, they gradually show their own differences. The security construction of the private platform is well done, while the types and resources of the public cloud occupies an absolute advantage. But customers definitely need both high security and rich resources and types. Enterprises and governments are gradually considering the strategy of providing services by multiple cloud platforms. Therefore, when building seismic cloud platforms, heterogeneous clouds still occupy a major position. According to national documents, the construction of seismic cloud platform can be divided into two levels: a first-level control platform and a second-level service platform. The former is mainly responsible for overall planning and scheduling, while the latter is to provide an overall framework for resource allocation and scheduling. Such a construction mode can not only make the resource level have better convergence, so that computing resources, storage resources or network resources can realize remote control and realize the unified management of dual-center resources on the basis of remote location. It can also realize unified service overall operation at the overall business level, and the resource application, monitoring and alarm of remote cloud are all interconnected, and unified management can be achieved on the platform.

Based on this information, the overall structure of seismic cloud platform shown in Figure 1 can be designed. Among them, the national cloud computing center manages the entire heterogeneous cloud platform, while the industry builds its own cloud computing center, which is managed by the local provincial government.
In order to realize the secondary construction architecture of national cloud computing center and sub cloud computing center, the resource management of heterogeneous cloud in different places needs to meet the actual needs. In the current development of cloud computing, private cloud computing and public cloud computing mode are rich, and the core work of management is the management of underlying heterogeneous cloud platform. It can be directly connected with the underlying cloud platform through RestAPI or other interfaces. After docking, according to the underlying heterogeneous platform interface, it can well complete the calculation and storage of data resources, assist the management of network security and access rights, and finally realize the unified management and maintenance of the underlying resource section. In cloud computing, heterogeneous cloud management platforms are required to implement such functions, which can be met by the design of two-level architecture. Due to the difficulty of maintenance, differences and compatibility, the API of current mainstream cloud computing platforms will choose RESful. OpenStack is taken as the benchmark of open source system, and the design of standardized interface can be expanded as shown in Figure 2, so as to better realize the management of two centers in different places. In this way, on the basis of ensuring security and stability, the sharing of resources and information can be maximized, and independent services can be more supported. The creation, release and scaling of the whole resource can be realized conveniently. In addition, heterogeneous cloud management platform can also realize dynamic monitoring on the whole platform, and the auxiliary resource allocation and scheduling work can well meet the needs of the market. Specifically, monitoring is mainly to monitor the implementation of virtual machine, storage and database, which can effectively evaluate the overall use of resources. Furthermore, monitoring can also monitor and manage the security issues of host, virtual machine, network and data, making the whole platform more healthy. In the management process, the design of standard cloud monitoring interface and high compatibility directly determines the overall transmission situation. When the lower-layer device makes the call of RestfulSPI, it is consistent with the interface data of the upper-layer cloud supervision platform, so that effective cloud service resource interface integration and resource exchange can be realized.

**Figure 1.** The architecture of seismic cloud platform based on OpenStack
4. The Construction, Deployment and Functional Applications of Platform from the Perspective of Heterogeneous Cloud

After the initial construction of the platform is successful, in order to ensure that the seismic cloud platform can operate and manage more efficiently and stably, it can unify the interface and upgrade the management platform version under the unified software and hardware environment of the two places to ensure the upper and lower heterogeneous clouds, so as to ensure that the upper and lower heterogeneous cloud management platforms have a high matching degree, which can effectively improve the business operation and management maintenance, as well as data reliability and data stability. At this time, according to the deployment of containerized deployment and joint cluster deployment, three high-performance servers can be selected for the deployment of heterogeneous cloud management platforms, which can effectively avoid single-node failure and system crashes. After the standard interface is connected, efficient and seamless management of resources can be realized at the resource level, and resources such as computing, storage, and network can realize unified monitoring of remote dual centers. The business level can also meet the application, monitoring and alarm of remote dual-center resources. Such a non-differentiated management solution enables the construction and deployment of the entire platform to roughly meet the needs of customers. The entire networking can be expanded from Table 1.

The specific function application can be carried out according to the actual situation of the two places. In the process of resource application, it can be set as secondary approval by default. That is, after the ordinary user completes the submission form of resource application, the first level organization administrator will review and approve the record, and the second level management staff will carry out the CMP transfer management approval according to the resource location. Please refer to figure 3 for details. After the remote dual center resource monitoring is completed, the function of cloud service can manage all levels, and finally apply for remote resources on demand. With the work order as the submission mode, the administrator can approve level by level to allocate resources uniformly. When applying for virtual machine service, the resource domain can be unified and coordinated according to the resource utilization rate of each center at the bottom. Such unified resource management also realizes the balanced and dynamic utilization of resources.
**Table 1.** Networking of heterogeneous clouds in the management platform

| Part name         | Introduction                                                                 |
|-------------------|-----------------------------------------------------------------------------|
| Master node       | It is also called Master node. It is an important role in the server and responsible for deploying components. |
| Cluster node      | It is also called Cluster node. It is also a server role, and forms a cluster combined with the Master node. |
| Server cluster    | Server cluster refers to a cluster that manages servers and platforms in a heterogeneous cloud, and it has an inclusive relationship with the above nodes. |
| Management network| The network that needs to be used for access is the network when the management platform communicates with the sub-business. |
| Cluster network   | Cluster network is the network used by each node for communication and communication in a cluster. |
| Storage network   | The network is provided when the device needs to be stored after the platform is connected successfully. |

**Figure 3.** The design of resource application process of seismic cloud platform

5. **Conclusion**

With OpenStack as the basic management platform, virtualized KVM technology is selected, and the seismic cloud platform is designed from the idea of two-level management, which can promote the management of business resources. The construction of seismic cloud platform enables the information sharing of various monitoring resources in our country, so that unified management, global arrangement of resources and dynamic on-demand use can well promote the development of the industry. However, it is worth noting that its drawbacks are that alarms and logs cannot be managed in a unified manner. In addition, the underlying information still needs to be logged in and inquired from the management platform. In the future, it is necessary to further improve the management mechanism and management platform to realize the overall management from the resource and management level.
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