**Course Report of Software Architecture and Design Pattern**



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| **Title：** | Talk about Cloud Computing |
| **Student Number：** | **201632120124** |
| **Student Name：** | **李伟** |
| **Final Score：** |  |
| **Review Date：** |  |
| **Supervisor Signature：** |  |

**Talk about the Cloud Computing**

**Abstract.** In recent years, the word cloud computing has emerged more and more frequently in our vision, and the technology related to cloud computing has always influenced and changed our lives. Nowadays all aspects of people are linked to cloud computing, which also brings convenience to people. This paper will introduce the concept, development and technology of cloud computing, and give you a brief introduction of what cloud computing is, and a brief introduction of cloud computing. I hope you can get some benefit from it.

**Keywords:** Cloud Computing

1. **Concept**

Cloud computing in a narrow sense refers to the mode of delivery and use of computer infrastructure. It refers to the acquisition of required resources (hardware, platform, software) through the network in an on-demand and scalable manner. The network that provides resources is called the cloud. The resources in the cloud seem to be infinitely expandable to users, and can be accessed at any time, used on demand, expanded at any time, and paid for by use.

Broad cloud computing refers to the mode of delivery and use of services, which means to obtain the required services through the network in an on-demand and scalable manner. This kind of service can make computers and software, Internet related, and other services.

**2 Development**

When we talk about the development of cloud computing, we have to mention several computing methods which are of great significance to cloud computing.

1. **Distributed Computing:** Distributed computing is a computing method that divides applications into several parts and then allocates them to multiple computers for processing.
2. **Parallel Computing:** Parallel computing, is relative to serial computing. It is an algorithm that can execute multiple instructions at a time. Its purpose is to improve the computing speed and solve large and complex computing problems by enlarging the scale of problem solving.
3. **Utility Computing:** Utility computing is a service delivery model in which service providers provide computing resources and infrastructure management needed by customers, and charge according to the resources occupied by applications, rather than just at a rate.

The above three computing methods are closely related to cloud computing, and besides these three computing methods, there is also a computing method that has a great relationship with cloud computing, which is grid computing.

1. **Grid Computing:** In fact, grid computing is a special kind of distributed computing. The essence of grid computing is to utilize heterogeneous coupling resources in an efficient and optimized way. It is necessary to talk about the basic form of grid computing, which is an independent management of resource combination across regions, even countries, or even continents. Resources are managed independently, not in the form of unified arrangement and arrangement. These resources in grid are heterogeneous, without emphasizing any unified arrangement. From this point of view, it is not difficult to understand its essence, aggregate and distribute resources, support virtual organizations, and provide high-level services.

In fact, cloud computing is very similar to grid computing in terms of concept and mode of operation. It can even be said that cloud computing is the "commercial" mode of grid computing.

In fact, there are some differences between them. In short, cloud computing is a relatively centralized resource, running decentralized applications (a large number of decentralized applications are executed in several large centers); while grid computing is the aggregation of decentralized resources to support large centralized applications (a large application is executed in many places).

But fundamentally speaking, they are consistent in response to the characteristics of Internet applications, in order to support applications in the Internet environment, solve the problems of heterogeneity, resource sharing and so on.

In any case, with the help of these technologies, cloud computing has developed very rapidly in recent years, and now cloud computing services are divided into three categories:

1. **LaaS(基础设施即服务):** Consumers can access services from a sound computer infrastructure through the Internet. For example: Oracle Cloud Database.
2. **PaaS(平台即服务):** PaaS actually refers to software development platform as a service, submitted to users in SaaS mode. Therefore, PaaS is also an application of SaaS mode. However, the emergence of PaaS can accelerate the development of SaaS, especially the development of SaaS applications. For example: Sina micro-blog.
3. **SaaS(软件即服务):** It is a mode of providing software through the Internet. Instead of purchasing software, users rent Web-based software from providers to manage business activities. For example: Google Docs.
4. **Core technology**
5. **Virtualization Technology:** Virtualization is one of the most important core technologies of cloud computing, which provides infrastructure support for cloud computing services.

Technically, virtualization is a computing form that simulates computer hardware in software and serves users with virtual resources. The purpose is to rationally allocate computer resources and make them provide services more efficiently. It breaks down the physical division between the hardware of the application system, thus realizing the dynamic architecture and centralized management and use of physical resources. The greatest advantage of virtualization is to enhance the flexibility and flexibility of the system, reduce costs, improve services, and improve resource utilization efficiency.

In terms of form, virtualization can be divided into two application modes. One is to virtualize a powerful server into several independent small servers, serving different users. The second is to virtualize multiple servers into a powerful server to perform specific functions. The core of these two modes is unified management, dynamic allocation of resources, and improvement of resource utilization. In cloud computing, these two modes have more applications.

1. **Distributed Data Storage Technology and Resource Management:** Another advantage of cloud computing is that it can process massive data quickly and efficiently. In today's data explosion, this is crucial. In order to ensure high reliability of data, cloud computing usually uses distributed storage technology to store data in different physical devices. This mode not only gets rid of the limitation of hardware devices, but also has better scalability and can respond to the changes of users'needs quickly. Distributed storage is not exactly the same as traditional network storage. Traditional network storage systems use centralized storage servers to store all data. Storage servers become the bottleneck of system performance and can not meet the needs of large-scale storage applications. Distributed network storage system uses scalable system structure, uses multiple storage servers to share storage load, and uses location servers to locate and store information. It not only improves the reliability, availability and access efficiency of the system, but also is easy to expand.

In the current cloud computing field, Google's GFS and Hadoop's open source system HDFS are two popular cloud computing distributed storage systems.

Cloud computing uses distributed storage technology to store data, so it is natural to introduce distributed resource management technology. In multi-node concurrent execution environment, the state of each node needs synchronization, and when a single node fails, the system needs an effective mechanism to ensure that other nodes are not affected. Distributed resource management system is just such a technology, it is the key to ensure the state of the system. In addition, the resources processed by cloud computing systems are often very large, with a few hundred servers and tens of thousands of servers.

At the same time, they may span many regions. And there are thousands of applications running in cloud platforms. How to effectively manage these resources and ensure their normal service delivery needs strong technical support. Therefore, the importance of distributed resource management technology can be imagined.

1. **Programming mode:** In essence, cloud computing is a multi-user, multi-task, concurrent processing support system. Efficiency, simplicity and rapidity are its core concepts. It aims to distribute powerful server computing resources to end users conveniently through the network, while guaranteeing low cost and good user experience.

In this process, the choice of programming mode is very important. Distributed parallel programming mode will be widely used in cloud computing projects. The original intention of the distributed parallel programming mode is to make more efficient use of software and hardware resources, so that users can use applications or services more quickly and simply. In distributed parallel programming mode, background complex task processing and resource scheduling are transparent to users, so user experience can be greatly improved.

MapReduce is one of the main parallel programming modes in cloud computing. - The ap2education mode divides tasks into several sub-tasks automatically, and realizes task height and assignment in large-scale computing nodes through Map and Reduce.

1. **Large-scale data management:** Massive data processing is a major advantage of cloud computing. So how to deal with it involves many aspects, so efficient data processing technology is one of the indispensable core technologies of cloud computing. For cloud computing, data management faces enormous challenges. Cloud computing not only ensures the storage and access of data, but also can retrieve and analyze massive data. Cloud computing needs to process and analyze massive distributed data, so data management technology must be able to manage a large amount of data efficiently.

Google's BigTable data management technology and the open source data management module HBase developed by Hadoop team are typical large-scale data management technologies in the industry. BT（BigTable）Data management technology: BigTable is a non-relational database, a distributed, persistent multi-dimensional sorted Map. Bigtable is designed to handle PB-level data reliably and can be deployed on thousands of machines.

HBase is a sub-project of Apache's Hadoop project, located in a distributed, column-oriented open source database. As a highly reliable distributed storage system, HBase performs well in terms of performance and scalability. Using HBase technology, large-scale structured storage cluster can be built on cheap PCServer.

1. **Cloud Computing Platform Management:** Cloud computing resources are huge, and servers are numerous and distributed in different locations. At the same time, hundreds of applications are running. How to manage these servers effectively and ensure that the whole system provides uninterrupted services is a huge challenge. The platform management technology of cloud computing system needs the ability to allocate a large number of server resources efficiently and make it work better together. Among them, easy deployment and opening of new services, rapid detection and recovery of system failures, and reliable operation of large-scale systems through automation and intelligent means are the key technologies of cloud computing platform management.

For providers, cloud computing can be deployed in three modes: public cloud, private cloud and hybrid cloud. The three modes have different requirements for platform management.

For users, the scale and manageable performance of cloud computing systems required by enterprises are also quite different due to the different control of ICT resource sharing, system efficiency requirements and ICT cost budget. Therefore, cloud computing platform management scheme should take more customization requirements into account, and be able to meet the application needs of different scenarios.

Many vendors, including Google, IBM, Microsoft and Oracle/Sun, have introduced cloud computing platform management solutions. These schemes can help enterprises to achieve infrastructure integration, achieve unified management of hardware and software resources, unified allocation, unified deployment, unified monitoring and unified backup, break the monopoly of application on resources, and give full play to the value of Enterprise Cloud Computing platform.

1. **Characteristic**

**(1) Very large scale**

"Cloud" has a considerable scale, Google cloud computing has more than 1 million servers, Amazon, IBM, Microsoft, Yahoo and other "cloud" have hundreds of thousands of servers. Enterprise private clouds typically have hundreds of thousands of servers. "Cloud" can give users unprecedented computing power.

**(2) Virtualization**

Cloud Computing supports users to access application services at any location using various terminals. The requested resources come from the "cloud" rather than a fixed physical entity. The application runs somewhere in the cloud, but in fact the user does not need to know or worry about the specific location of the application. With a laptop or a mobile phone, we can use network services to achieve everything we need, even tasks like supercomputing.

**(3) High reliability**

"Cloud" uses such measures as data multi-copy fault tolerance, isomorphic and interchangeable computing nodes to ensure high reliability of services. Cloud computing is more reliable than local computers.

**(4) Universality**

Cloud computing is not specific to specific applications. It can construct a variety of applications under the support of "cloud". The same "cloud" can support different applications at the same time.

**(5) High scalability**

The scale of "cloud" can be scaled dynamically to meet the needs of application and user scale growth.

**(6) On-demand services**

"Cloud" is a huge resource pool, you can buy it on demand; cloud can be charged like tap water, electricity and gas.

**(7) Extremely cheap**

Because the special fault-tolerant measures of "cloud" can adopt extremely cheap nodes to form the cloud, the automated centralized management of "cloud" makes a large number of enterprises need not bear the increasingly high cost of data center management, and the universality of "cloud" makes the utilization of resources greatly improved compared with traditional systems, so users can fully enjoy the low-cost advantages of "cloud", often only at a cost of several hundred. Dollars, a few days to complete the previous needs of tens of thousands of dollars, months to complete the task.

Cloud computing can radically change people's future life, but at the same time, we should also pay attention to environmental issues, so that we can truly contribute to human progress, rather than simple technological upgrading.

**(8) Potential danger**

Cloud computing services provide not only computing services, but also storage services. But cloud computing services are currently monopolized in the hands of private institutions (enterprises), which can only provide business credit. Government agencies and business organizations (especially those with sensitive data such as banks) should be vigilant enough to choose cloud computing services. Once commercial users use cloud computing services provided by private institutions on a large scale, no matter how strong their technological advantages, these private institutions will inevitably coerce the whole society with the importance of "data (information)". For the information society, "information" is very important. On the other hand, data in cloud computing is confidential for users other than data owners, but there is no secret for businesses providing cloud computing. All these potential risks are an important prerequisite for business and government agencies to consider when choosing cloud computing services, especially those provided by foreign organizations.

1. **Summary**

Cloud computing has developed rapidly in recent years, and many cloud computing technologies have been applied in our lives, such as cloud federation, cloud security, cloud games and so on. Cloud computing has also brought great convenience to our lives, but this does not mean that the current cloud computing technology has developed to the bottleneck, and the security of cloud computing is still a huge problem. The challenge awaits many people to overcome. Cloud computing in the future will have more services and a wider range of services than it does now, and we will eventually benefit a lot.

**References**

1. Baidu Encyclopedia: https://baike.baidu.com/item/云计算/9969353;
2. <https://www.cnblogs.com/doit8791/p/6448177.html>;
3. Some papers searched online