

## Cloud Computing Research and Development Trend

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**Abstract**—With the development of parallel computing, distributed computing, grid computing, a new computing model appeared. The concept of computing comes from grid, public computing and SaaS. It is a new method that shares basic framework. The basic principles of cloud computing is to make the computing be assigned in a great number of distributed computers, rather than local computer or remoter server. The running of the enterprise's data center is just like Internet. This makes the enterprise use the resource in the application that is needed, and access computer and storage system according to the requirement. This article introduces the background and principle of cloud computing, the character, style and actuality. This article also introduces the application field the merit of cloud computing, such as, it do not need user's high level equipment, so it reduces the user's cost. It provides secure and dependable data storage center, so user needn't do the awful things such storing data and killing virus, this kind of task can be done by professionals. It can realize data share through different equipments. It analyses some questions and hidden troubles, and puts forward some solutions, and discusses the future of cloud computing. Cloud computing is a computing style that provide power referenced with IT as a service. Users can enjoy the service even he knows nothing about the technology of cloud computing and the professional knowledge in this field and the power to control it.

**Keywords**- Cloud Computing ; SAAS; Google Apps; Grid computing

### I. INTRODUCTION

Cloud computing, a new kind of computing model, is coming. This word is a new word that appears at the fourth season, 2007. It is an extend of changing with the need, that is to say the manufacturer provide relevant hardware, software and service according to the need that users put forward. With the rapid development of the Internet, user's requirement is realized through the Internet, different from changing with the need. In fact cloud computing is an extend of grid computing, distributed computing, and parallel computing. Its foreground is to provide secure, quick, convenient data storage and net computing service centered

by internet. The factors that impel the occurring and development of cloud computing include: the development of grid computing, the appearance of high quality technology in storage and data transportation, and the appearance of Web2.0, especially the development of Virtualization[1].

The character of cloud computing is in the virtualization, distribution and dynamically extendibility. Virtualization is the main character. Most software and hardware have provided support to virtualization. We can virtualize many factors such as IT resource, software, hardware, operating system and net storage, and manage them in the cloud computing platform; every environment has nothing to do with the physical platform. Carries on the management, the expansion, the migration, the backup through the hypothesized platform, all sorts of operations will be completed through the virtualization level. Distributional refers to the physical node which the computation uses is distributed. Dynamic expandability is refers to through the dynamic extension virtualization level, then achieves to above applies carries on the expansion the goal. Has broken between the physical structure barrier, represents is transforming the physical resources for logic may manage the resources the inevitable trend. In the future, all resources transparently will move in each physical platform, the resources management will carry on according to the logical way, will realize the resources automated assignment completely, but the virtualization technology realizes this ideal only tool. In view of the cloud computation, the virtualization technology's fusion and the application should face the high-quality hypothesized main engine, the application and the resources, as well as aspects and so on virtualization memory [2].

### II. WHAT IS CLOUD COMPUTING

#### A. The background of cloud computing

In recent 10 years, Internet has been developing very quickly. The cost of storage, the power consumed by computer and hardware is increasing. The storage space in data center can't meet our needs and the system and service of original internet can't solve above questions, so we need

new solutions. At the same time, large enterprises have to study data source fully to support its business[3]. The collection and analysis must be built on a new platform.

Why we need cloud computing? It is to utilize the vacant resources of computer, increase the economic efficiency through improving utilization rate, decrease the equipment energy consumption.

### *B. Cloud computing principle*

It is difficult to define the cloud computing. Computing is a virtual pool of computing resources. It provides computing resources in the pool for users through internet. Integrated cloud computing is a whole dynamic computing system. It provides a mandatory application program environment[4]. It can deploy, allocate or reallocate computing resource dynamically and monitor the usage of resources at all times. Generally speaking cloud computing has a distributed foundation establishment, and monitor the distributed system, to achieve the purpose of efficient use of the system[5].

Cloud computing collects all the computing resources and manages them automatically through software. In the process of data analysis, it integrates the history data and present data to make the collected information more accurate and provide more intelligent service for users and enterprises[6]. The users need not care how to buy servers, softwares, solutions and so on. Users can buy the computing resource through internet according to their own needs.

Cloud computing does not depend on special data center, but we can look it as the inevitable product of grid computing and efficiency computing. However, compared with general network service, cloud computing is easy to extend, and has a simple management style. Cloud is not only simply collect the computer resource, but also provides a management mechanism and can provides services for millions of users simultaneously. Nowadays, virtualization is entering every field of data center[7]. It has become useful tool and improved service capacity. When the storage and computing capacity of the server cluster are surplus, we need not purchase servers, all we need to to is to add a virtual machine running on the server. If the cluster is large enough, the request of adding server will have marginal effect, and then we can save the money that should be used in purchasing new servers. At the same time, cloud computing provides powerful supports for SAAS(software as a service)[8]. It integrates all the companies that provide similar services in the internet in order that users can compare and select service providers. Cloud computing provides dependable and secure data storage center, provides immense possibility for internet application, provides infinite space for storing and managing data, provides powerful computing capacity for users to complete all kinds of application. Future computer may only be used for connecting internet to implement services based on cloud computing. Users will change their habit of using computer totally, from services centered by desktop to services centered by Web.

Cloud computing's blueprint is coming: in the future, we only need a notebook pc or a mobile phone, then we can

complete what we want through net service including the huge tasks such as super computing. So end-user is the true owner of cloud computing. The aim of application of cloud computing is to combine all the resources, and let anyone can use it. From the most basic significance, cloud computing is to utilize software and data of the internet. [9].

### *C. Cloud computing style*

Though people have different views on the cloud computing, they have already reached an agreement on the basic style on it. Its style is as follows:

#### *1 SAAS(Software as a service)*

This kind of cloud computing transfer programs to millions of users through browser. In the user's views, this can save some cost on servers and software. In the provider's views, they only need to maintain one program, this can also save cost. Salesforce.com is so far the most famous company that provides this kind of service. SAAS is commonly used in human resource management system and ERP(Enterprise Resource Planning). Goole Apps and Zoho Office is also providing this kind of service.

#### *2 Utility Computing*

Recently Amazon.com, Sun, IBM and other companies that provide storage services and virtual services are appearing. Cloud computing is creating virtual data center for IT industry to make it can provide service for the whole net through collecting memory, IO equipment, storage and computing power to a virtual resource pool.

#### *3 Network service*

Net service has a close relation with SAAS. The service providers can help programmers develop applications based on internet instead of providing single machine procedure through providing API(Application Programming Interface).

#### *4 PAAS( Platform as a service)*

Platform as a service, another SAAS, this kind of cloud computing providing development environment as a service. You can use the middleman's equipment to develop your own program and transfer it to the users through internet and servers.

#### *5. MSP (management service provider)*

This is one of the ancient applications of cloud computing. This application mostly serves the IT industry instead of end users. It is often used in mail virus scanning and program monitoring.

#### *6. Commercial service platform*

The commercial service platform is the mixture of SAAS and MSP(Mixed signal Processor), this kind of computing provides a platform for the interaction between users and service provider. For instance, the user individual expense management system can manage user's expense according user's setting and coordinate all the services that users purchased [10].

#### *7. Integrating internet*

It can integrate all the companies that provide similar services, so that users can compare and select their service provider.

### *D. The characters of cloud computing*

#### *1 Ultra large-scale*

The scale of cloud is large. The cloud of Google has owned more than one million servers. Even in Amazon, IBM, Microsoft, Yahoo, they have more than hundreds of thousands servers. There are hundreds of servers in an enterprise. Cloud enlarge the user's computing power.

#### 2. Virtualization

Cloud computing makes user get service anywhere, through any kind of terminal. The resources it required come from cloud instead of visible entity. You can complete all you want through net service using a notebook pc or a mobile phone. Users can attain or share it safely through an easy way, anytime, anywhere. Users can complete a task that can't be completed in a single computer.

#### 3 High reliability

Cloud uses data multi-transcript fault tolerant, the computation node isomorphism exchangeable and so on to ensure the high reliability of the service. Using cloud computing is more reliable than local computer. [11].

#### 4 Versatility

Cloud computing doesn't aim at certain special application. It can produce various applications supported by cloud, and one cloud can support different applications running it at the same time.

#### 5. High extendibility

The scale of cloud can extend dynamically to meet the increasingly requirement.

#### 6. On demand service

Cloud is a large resource pool that you can buy according to your need; cloud is just like running water, electric, and gas that can be charged by the amount that you used.

#### 7. Extremely inexpensive

Because the cloud's special fault tolerance can be built by very inexpensive nodes, the centered management of cloud make the enterprise needn't undertake the management cost of data center that increase very fast. The versatility can increase the utilization rate of the available resources compared with traditional system, so users can fully enjoy the low cost advantage. You can spend only a few hundred dollars and a few days to accomplish a task that you must do it spending thousands of dollars and several months before.

### III. CLOUD COMPUTING DEVELOPMENT PRESENT SITUATION AS WELL AS APPLICATION

#### A. Cloud computing present situation

Amazon is using Elastic Compute Cloud( EC2) and Simple Storage Service(S3) to provide computing and storage service for enterprises. The payment of services include storage server, bandwidth, CPU resource and monthly charge. Monthly charge is like the telephone's monthly charge. Using storage server and bandwidth are charged by content. Using CPU is charged by time. Apart from the above, users must pay for the network flow. Amazon didn't spend much time to make cloud computing a big business. The number registered developer reached 440,000 in less than two years, among them there are many enterprise users. Amazon's earnings related with cloud computing had reached more than one hundred million

dollars. Cloud computing has become one of the most businesses that increase rapidly [12].

Cloud computing developed very quickly in our country. IBM created China's first cloud computing center at Taihu Lake new city science and education industry park in WuXi, China, on May 10, 2008[13]. IBM created China's second cloud computing center, IBM China area cloud computing center on June 24, 2008. Wang Jianzhou, the president of China Mobile think that cloud computing and removability of internet is development direction of future [14].

Dawning company has launched a macro plan facing region and field's super computing center, which aimed at improving the level of regional information construction, promoting the level of regional IT platform to serve the regional economy construction. Based on the brand of dawning, the successful case of building super computing center, and the experience of running super computing center, Dawning built many super computing centers in many center cities in many provinces (including municipalities). Now the company has cooperated with many organizations in Hefei, Xian, Shanghai, and built high quality computer research center based on grid research, and produced many high quality computer such as 4000A, 4000H, 4000T series to support the core computing environment of Chinese grid.

#### B. Cloud computing application and advantage

1 Cloud computing do not need high quality equipment for user, and it is easy to use.

2 Cloud computing provides dependable and secure data storage center. You don't worry the problems such as data loss or virus [15]

3 Cloud computing can realize data sharing between different equipments.

4 Cloud provides nearly infinite possibility for users to use internet.

### IV. CLOUD COMPUTING EXISTENCE QUESTION AS WELL AS HIDDEN DANGER

#### A. Cloud computing existence question

First, if you use cloud computing without technical layout, that is very dangerous. It is just like using electric. If a company or a family think electric is infinite, you can use it casually, then not only it is a big waste, but also it will cause fire hazard of failure of power because of large power consumption. So layout is very important [16].

Second, if the initial investment of every project is small, it is probable that many projects will be launched in haste. It is just like that someone has many children, but he can't foster them.

Finally, its result is variable, so the requirement will change with it. The management cost will increase sharply.

So we must know clearly, that cloud computing can actually solve some existing questions. But it will bring some new questions as well. In fact whether you choose it is a kind of balance between old and new questions.

### B. Cloud computing hidden danger

In the middle ten days of February this year, the Amazon network host service, S3 (Simple Storage Service) was broken down for 4 hours. This made people think about the security of cloud computing again. Since Amazon provides S3, it has attracted a lot of entrepreneur on Web 2.0 put their website on the data center of Amazon to save a large hardware investment. But when security questions appear, the confidence of these entrepreneurs will decrease. When users are using cloud computing, they will let other store their data, so it will happen that losing business or user's private information. Now cloud computing is still not admitted by users. The production or service of cloud computing is not stable and believable. It only one of the hazard of cloud computing.

In fact, the most worrying question is the privacy of cloud computing. It is reported by world privacy forum that the data based on cloud computing include: the client's record, tax data, finance data, Email, health record, word processing document, excel and powerpoint document. The most popular business application based on internet is salary and client account management. This information is very sensitive. These things happened more than once, and every time the data loss is very big. [17].

### C. Solutions

The Berkeley paper's solution is the data encryption. The data encryption can alleviate with has no intention or the evil intention disclosed that an information related part of privacy risk - this kind of encryption already aims at the memory on the cloud computing service provider's server's data, but also aims at transmits to end-user's data. In addition, implements the double factor proof scheme to control some people the data which visits the cloud computing service provider to save, guarantees hopefully only then may visit the data the user to be able right to see the data. May also through the hypothesized decompose ration user secret room (through encryption technology for each user assignment independent virtual space, prevents others visit) the procedure, perhaps is worth studying, but must first solve limits Domain 0 Admin the privileges, does not let him intrude each Virtual OS Instance at will inside, consults each data file.

Also has some detail aspect also to pay attention: In it trusts in the stand do not open the suspicious email; If opens the document, must guarantee that the network visit underwent the encryption; Guarantees own cloud API (application programming interface) the key security, if some people have gotten so far as your visit key, can visit your all data. Requests the provider to provide many for you the key, uses in protecting the different risk category each group of data. Must place the production data in an account, to place the development data in another account. This may reduce some people to intrude the risk which Pentyl entire development machine does not bring; And Responsible Bill" the (HIPAA) related laws and regulations. Finally, I thought that the cloud calculates the provider to be able to prove, he realizes to the cloud computing environment security crack; One have not waited for others to point out where has the security crack.

I thought that the encryption cannot 100% place guarantee data not decipher. Much less encrypts to the application procedure is a very big modification, is one consumes the resources very much the work. Perhaps thorough settlement's means do not have. Can only depend upon to the cloud calculates supplier's trust. No matter what an incoming letter they will not steal the data. Then, how can the people be far away from the puzzle which the security problem brings, a best solution is constructs a perfect safe supervisory system."But I believed that once the field found the more perfect safety control solution, the cloud computing's popularization application unrest will be irresistible.

### V. THE FUTURE OF THE CLOUD COMPUTING

The following is a summary of ten cloud computing industry trends:

1. Cloud computing is widening, but focus on an open platform mainly.
2. Windows Azure is mostly a better platform of Exchange.
3. Google would increase the area of investment in the enterprise, more business users will use Google Apps.
4. The first batch of SaaS 1.0 companies will face the risk of bankruptcy.
5. The number of firms who abandon the use of its own server increased significantly.
6. Private cloud computing services have been popular.
7. Business Intelligence (BI) will be SaaS's next target.
8. SAP or Oracle will enter PaaS (Platform as a Service, PaaS, Platform as a service) area.
9. Enterprise adoption and use of social networks faster.
10. Force.com the creation of software products worth at least 1 billion dollars.

### VI. CONCLUSIONS

Among the many IT giants driven by trends in cloud computing has not doubtful. It gives almost everyone has brought good news. For enterprises, cloud computing is worthy of consideration and try to build business systems as a way for businesses in this way can undoubtedly bring about lower costs, higher profits and more choice; for large-scale industry, After the financial turmoil will be the cost of infrastructure for large-scale compression seems likely; developers, when in the face of cloud computing, through the PaaS model can effectively improve their own capacity, Therefore, the impact of cloud computing on the ISV is the largest of the many roles; for engineers and developers are concerned, the advent of cloud computing will shrink to the development of comprehensive Web-centric development, so that a lot of complex technology to reduce the learning accelerated the pace of career development. There is the advent of cloud computing is bound to birth a number of new jobs. The clouds will grow in size as soon as available bandwidth and the corresponding service model mature enough, cloud computing will bring a revolutionary change in the Internet. Cloud computing announced a low-cost super-computing services to provide the possibility, while there are a large number of

manufacturers behind, there is no doubt that cloud computing has a bright future.

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