Research Journal of Applied Sciences, Engineering and Technology 4(2): 120-122, 2012
ISSN: 2040-7467

Submitted: September 23, 2011 Accepted: November 02 , 2011 Published: January 15, 2012

Research on Comparison of Cloud Computing and Grid Computing

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Abstract: The development of computer industry is promoted by the progress of distributed computing, parallel computing and grid computing, so the cloud computing movement rises. This study describes the types of cloud computing services, the similarities and differences of cloud computing and grid computing, meanwhile discusses the better aspect of cloud computing than grid computing, and refers the common problems faced to the both computing, and some security issues.

Key words: Cloud computing, grid computing, services

INTRODUCTION

Since distributed computing, grid computing and SOA (Meng, 2009) has been widely used, the cloud computing movement has emerged. It needs three parts to achieve the cloud computing, thin clients (or be able to switch between fat and thin client), grid computing and utility computing. Grid computing makes full use of idle resources to connect the independent computer to a large infrastructure; utility computing is to pay for the services used on the shared server, as if to pay for public utilities (such as electricity, gas, etc.). Through grid computing, computing resources can be provided as a public utility that can turn on the closed utility, while to further cloud computing, it can provide computing resources on demand, so we can avoid excess supply when using public price, to meet the millions of users demand also eliminates the need for over-supply.

Types of cloud computing services: Consumers can get services from the perfect computer infrastructure through the Internet, such services as infrastructure services (Infrastructure as a Service), Internet-based service is a part of infrastructure services. Other types of Internet services includes platform services (Platform as a Service) and software services (Software as a Service). Platform services provide the full or partial application development that the user can access, and software services provide a complete application that can be used directly, such as managing the enterprise resource through the Internet.

Infrastructure services are in a wide range of practical applications. For example, The New York Times used hundreds or thousands of Amazon EC2 instances processed TB level documentation of data within 36 hours, without EC2, the New York Times dealing with these data will take several days or several months. Infrastructure services have two types of usage, public and private. Amazon EC2 uses public server pool in the infrastructure cloud, more privation of services will use a set of public or private server pool within the enterprise data center, if the software development in the enterprise data center environment, then both types can be used, and the cost of using EC2 temporary extension resources is low. Such as testing, a combination of the two can develop applications and services more quickly, reduce development and testing cycles (Ruan and Xu, 2009).

Using EC2, customers can create their own Amazon Machine Images (AMI) (Qiao and Zhu, 2011), including the operating system, applications and data, and control that in a given time how many instances of each AMI are operating, the customer takes an instance of time and bandwidth fees, increase the computing resources when the peak, reduce the computing resources when not needed. EC2, Simple Storage Service, and other Amazon products can provide the services to millions of users through the Internet. Amazon offers from single-core x86 server to 8-core x86-64 server, five different types of servers. When providing the services instances, we have no need to know which server was used; the instance can be put in different geographical location and region. Amazon allows using the flexible IP addresses that can be assigned to the instance dynamically.

SIMILARITIES AND DIFFERENCES BETWEEN CLOUD COMPUTING AND GRID COMPUTING

Cloud computing: Using cloud computing, the enterprise will be able to increase their computing power substantially, without the need to invest in new infrastructure, develop new training or purchase new software licenses. Cloud computing is most suitable for the small and medium enterprises that want to outsourced

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all the data center infrastructure, or the large enterprise that want to build the bigger data center to achieve higher load capacity without the high cost (Chang, 2010). In either case, the service consumers use the required service on the Internet and only pay for the used services. Service consumers do not keep the PC side, use the application on the PC, or buy for a particular smart phone, PDA and other devices version. Consumers do not have to have a cloud infrastructure, software and platform, therefore reducing the upfront costs, capital expenditures and operating costs. Consumers also have no need to care about how to maintain the server and network in the cloud, the consumers can access multiple servers anywhere, without needing to know which server is used and their location.

Grid computing: Cloud computing is coming from the evolution of grid computing, and can provide resources on demand. Grid computing can in the cloud or may not, this depends on what kind of users use it. If the user is an administrator and integrator, they will care about how to maintain the cloud, and upgrade, install, and virtual servers and applications. If the user is a consumer, it will have no need to care about how the system is running. Grid computing requires the use of software can be divided into multiple parts, and the fragments of the program as a great system image are passed to thousands of computers. One problem of the grid is that if the software fragment on a node is failure, it may affect the piece of software on the other nodes. If the fragment is on other nodes, we can use failover components to alleviate the problem, but if the software segment relies on other software segment to complete one or more pieces of task, then the problem still can be solved. The large system image and the related hardware used for operation and maintenance may result in high capital and operating expenses (Gao, 2009).

Similarities and differences: Cloud computing and grid computing are scalable, the scalability is achieved through load balancing of the application instance that run independently on a variety of operating systems connected through Web service. Distribute and recovery CPU and network bandwidth as needed, and the system storage capacity adjust according to the number of users, the number of instances and the amount of data transferred based on specific time.

Two types of calculations are related to multi-tenant and multi-task, that is, many users can perform different tasks, access one or more application instances. We can reduce infrastructure costs and improve the peak load capacity through the large pool of users sharing the resources. Cloud computing and grid computing offer a Service Level Agreement (SLA) to ensure the availability, if the service can reach the normal running time, the consumers will receive services compensation because of data delay.

Amazon S3 is provided storage and data retrieval Web service in the cloud, you can store the object of only one byte, also the objects of 5GB even TB-level. The storage location of S3 for each object uses the bucket as the container. These data adopt the same data storage infrastructure with Amazon e-commerce sites to achieve storage safely. Although the storage computing in the grid is very suitable for the data-intensive storage, from economy it is not appropriate to store the object of one byte size. In the data grid, it can achieve maximum efficiency under the situation that the amount of distributed data large enough.

Computational grid concerns the operations with very large computation, while the Amazon Web Services provides two instances, standard and high CPU.

THE PROBLEMS OF CLOUD COMPUTING AND GRID COMPUTING

Threshold strategy: Suppose that there is a program for credit card verification in the cloud, and met the sales season in December, so that a higher demand was discovered, we need to create more instances to meet this demand. With the sales season past, this demand will reduce, and the resource instances will be recycled and reassigned to other applications. To test the program can work, before the program transferred into a real production environment, we need to develop, improve, and achieve a threshold strategy in the feasibility test stage. We will see that whether this strategy could find the sudden increase in demand to create more instances in order to meet these needs, also we will see that how to recovery the unused resources and transfer to the other work.

Interoperability issues: If outsourcing or create the application with a cloud computing provider, you may find it difficult to turn to other providers who adopt proprietary API or has different import and export data formats. This has resulted the interoperability issues between the two cloud computing providers, and it is possible to change the data format or application logic. Although there is no API or the cloud computing industry standard of data import and export, IBM and Amazon Web Services launched cooperation in order to achieve interoperability (Shen, 2009).

Implicit cost: Cloud computing does not tell what the cost implied. For example, if the enterprise uses the storage services provided by service provider and the database applications that contains TB-level data, he may need to pay a very high network cost. This fee is higher than the saving costs in purchasing new infrastructure, training new employees and purchasing new software licenses. Another example of network cost is that, if the enterprise is far from the cloud providers, it wills experiment a long delay, especially in high traffic situations.

Abnormal behavior: Assuming that the credit card verification applications runs well in the enterprise data center, it needs to test the applications in the cloud by testing the feasibility to check for the unexpected behavior. For example, review the application how to verify the credit card, how to distribute the resources, how to release the idle resources and to other tasks in the sales of December. When verifying the card and releasing the idle resources appear the abnormal results, then you need to solve these problems before putting them in the cloud.

Security issues: Amazon S3 and EC2 may experiment down in the actual using. Although the SLA provides data recovery and the compensation for this situation, the user lost the sale opportunities during the period, and the executives can get the important business information. Do not passively wait for the occurrence of down, the users should check the security to see the providers can recover the data on which extent. Test is very simple, and it does not require the special tools, just need to request the last stored data to see how long it takes to recover by the provider. If the time is long, ask the provider how much service compensation we can get under different situations, and check whether the checksum matches the original data.

One aspect of security testing is to encrypt data with a reliable algorithm on the local machine, then access the data on a remote server of the cloud with the decryption key. If you can read the data that have been accessed, so that the encryption key is destroyed or the providers use their own encryption algorithm. It needs to learn the algorithm to the provider. Another is the potential problem in the cloud, in order to protect the data, you may need to manage your own private key and ask for the management of the private key to provider. If signed, Amazon will provide the certificate.

THE ADVANTAGES OF CLOUD COMPUTING

Software development in the cloud: Using high-end database to develop the software, the most likely option is to use the cloud server pool within the enterprise data center. Amazon Web services temporary expansion resources can be used when testing, so that the project managers can better control costs, manage security problems and distribute resources. The project managers can distribute different hardware resources to different cloud types, Web develop cloud, test cloud and product cloud, the cost of different types of clouds is not the same. The cost per unit time of the cloud development may be lower than the product cloud, because such as SLA and security and additional features are distributed in the product cloud (Xiaopeng and Cao, 2011).

The project can be limited as the specific cloud by the managers. For example, the part service of product cloud can be used for product configuration, and the service of develop cloud is only for development. In order to optimize the assets of the different stages of software development project. If you find that the cost is high, then the managers can spend low cost to use Amazon CE2 temporary extension resources, as long as security and data recovery issues have been solved.

Cloud computing of environment-friendly: One motivation of cloud computing is more environment-friendly. First of all, the hardware what the enterprise dada center needs to run the applications reduced, and using cloud computing instead can reduce running hardware and reduce the power required by the temperature (Wang and Xu, 2010). Integrate these systems to the remote center, you can manage more effectively. Secondly, the cloud computing technology improve the telecommunications technology. Such as remote printing and file transfer, may reduce the needs of office space, purchasing new furniture and out of the old one, cleaning office and others, also reduce the need to drive to work and the emissions of carbon dioxide.

CONCLUSION

In the present and the future, cloud computing will play a very important role in the technology industry, and it will provide IT as a service to the users eventually. This paper presents how to solve the problems in the cloud computing and grid computing, and the data recovering of the environment in the subscription and the security issues of managing the private key to help make preparations to use cloud computing. To the potential demand of the greater Internet capacity, the users posed a challenge to the developers and the project team members. Handle the designing and potential safety issues of Web application well can reduce the trouble that the development team met.

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