Cloud Computing: An Overview

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ABSTRACT

Cloud Computing came into existence in 1960 by Joseph Carl Robnett Licklider by his work on ARPANET. It is a technology which is based on distributed computing, web services and networking technologies. In this paper we will be focusing on various aspects of cloud computing and the different issues involved in cloud computing. We will also be comparing cloud computing and grid computing and analyze which is the best. We will also try to focus on latest trends in Cloud Computing along with its impact on Techmarket.

Keywords: Grid computing, Utility computing, SaaS, PaaS, IaaS, Cyber infrastructure.

Introduction

"Cloud computing" is the next step in the revolution of on-demand information technology services and products. Most of cloud computing concept is based on the virtualized resources. The term became "popular" around in October 2007 when Google and IBM make a collaboration in the domain of cloud computing. It can be defined as paradigm where a huge pool of systems are connected to one another in a private or global networking order to provide a scalable infrastructure which can be used by and for an application, data and storage. Cloud computing makes reuse of IT resources based on the concept of reusability.. The Internet is the backbone to utilize the resources available on a particular cloud. There is an agreement between the providers and consumers of the resources called service level agreement (SLAs). In cloud computing platforms the resources may be dynamically reconfigured and aggregated through virtualization. The changes may be implemented according to the need of the consumer.

1.1 Cloud Models

The services provided by the cloud computing may be seen from different viewpoints:

Software-as-a-Service (SaaS): In this it provides the host and manages a complete application in their own data center and ensures it availability to all users present on web. The Internet is used to serve the different types of applications to the user, For Example Google Docs.

Platform-as-a-Service (PaaS): (SPI) Special Application Programming interfaces for building different types of applications over the Internet, For example Force.com (Force.com is a suite of point-and-click tools that make creating custom employee-facing apps)

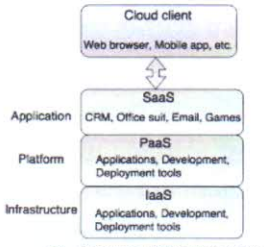


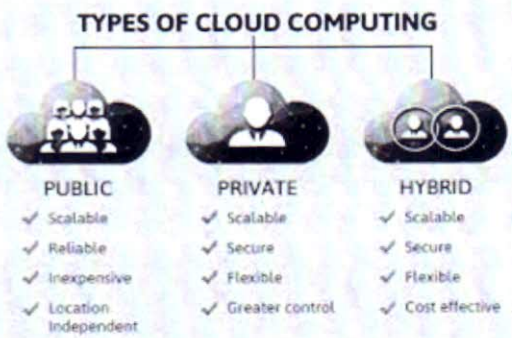
Fig. - Categories of Cloud Computing

Infrastructure-as-a-Service (IaaS): In general as the name suggest it provides the services that are used for basic storage and computing. The different services now available are: Amazon web services, Google compute engine, GoGrid etc.

The grid computing is also the related term concerned with high performance computing over the internet.

Grid computing is the collection of computer resources and related devices from multiple locations to reach a common goal. The grid can be thought of as a distributed system with non-interactive workloads that involve a large number of files.

1.2 Category of Cloud



Benefits of Cloud Computing

- Cost Reduction
- Increased Storage
- Flexibility
- Elasticity
- Resource Utilization

Another term called **utility computing** is concerned with the services sold by the cloud provider, if a cloud is available as pay and go manner to the general users then it is called a public cloud, if the cloud is not available for the general user then it is called a private cloud, it consists of the internal data centers of an organization. So we can say that cloud computing consists of the SaaS and utility computing.

Utility computing usually conceive of some form of virtualization so that the amount of storage or computing power available is considerably larger than that of a single time-sharing computer. Multiple servers may be used on the back end to make this possible. These might be a dedicated computer cluster specifically built for the purpose of being rented out, or even an under-utilized supercomputer

Different utility computing software are available in the marketplace, one may be differentiated from another on the basis of level of abstraction and management of the available resources for a particular cloud. Every application needs a model of communication, storage and computation, the thing which is of utmost importance is how to automatically fulfill the demand of the user, however the infinite capacity resources are available on demand.

Another term called **cyber infrastructure** is useful for the construction and deployment of the applications. We can reduce the efforts made by scientists and engineers for the development of different programs by using cyber infrastructure. Cyber infrastructure increases efficiency, quality and reliability by capturing the common needs for any application by the user for different equipments and services.

Comparative Analysis between Grid and Cloud Computing

CLOUD COMPUTING	GRID COMPUTING
Client-server computing architecture.	Distributed computing architecture.
Centralized Executive.	Decentralized Executive.
Resources used in centralized pattern.	Resources used in collaborative pattern.
More flexible	Less Flexible
Users pay for the use.	Users do not pay for use.
Accessed through standard web protocols.	Accessible through grid middleware.

2. Hopes and Hurdles in the Growth of Cloud Computing

Google Search has very good reputation in the availability of cloud resources; however organizations have fear whether the computing services are available easily or not. So there is a number of technical and non technical issues in the growth of cloud computing. We are trying to address some of these issues in the following points.

2.1 Non Technical issues

The large business organizations and customers generally not rely on the cloud providers they believe on the independent software stacks may be provided by different companies, because a cloud provider may be out of service due to non technical reasons also (may be due to some government policies or less number of customers/users). Although this is generally not true the cloud provider always tries to provide the high availability and reliability at lesser prices. The mantra for high availability computing community is "no single point of failure". Due to this reason large internet service provider use a number of providers in order to remove the chances of failure due to a single company.

2.2 Confidentiality of data

The security is the most critical threat on the cloud computing, the companies ask to the cloud provider that how we can make trust upon the confidentiality of important data, the

security threats may be inside or outside depends on the data that however we kept it and how the data are travelled from one node to another when multiple computers are connected to each other. The application-level security is the responsibility of cloud user. The responsibility of cloud provider is for physical security, and enforcing external firewall policies. The security for the software stack available on the intermediate levels may be shared by the user and the operator if required.

The clouds which are available in today's scenario have the virtualization as a fundamental security tool. The tool is useful for protecting the users from one another as far as interference is concerned. However it is not possible to virtualize all resources and all virtual environments may not be bug free. These are some challenges which must be faced by the cloud computing environment. However these challenge also be faced by the non cloud computing environments.

2.3 Hindrance in Data Transfer

There are numerous problems whenever we transfer data from one machine to another or from one networked device to another device which is a part of the communication. Sometimes the cost incurred to transfer data from one location to another is more than the physical transfer of the data. It has been observed by the researchers that to transfer one terabyte of data across the boundaries of clouds costs approximately 6000 INR to 9000 INR. So, if the applications are more data intensive it is advisable to ship data disks from one place to another to avoid high cost of data transfer using the internet.

2.4 Scalability and elasticity in storage

It has been observed that the resources are distributed in a fine grained manner; the resources may be occupied by the running programs in real time, sometimes without user having to design the system for the peak loads. This is still an open research problem that is to create storage systems that would meet the existing programmer's expectations in connection with high availability, durability, management capability and querying data, but combine them with the advantages of cloud computing for scaling arbitrarily up and down on demand.

2.5 Errors due to Distributed Environment

One of the biggest threat in cloud computing is the occurrence of errors or bugs, because in a

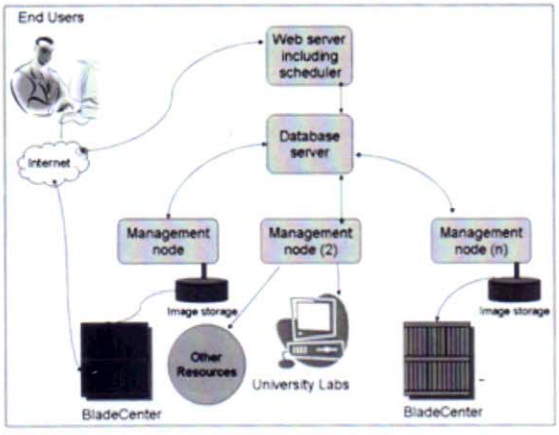


Figure 2.1 Cloud computing with different servers

distributed system a number of networked devices, computers and related devices are connected together to form a larger network in a fashion that the systems can coordinate and distribute the assigned computational task efficiently and effectively. If any networked device, computer or related device suffers from the errors or bugs, it is not easy to detect as well as to correct the bug encountered within any program. There are also greater chances that the other systems may be infected. However there are fewer chances for errors in the small systems. So debugging feature must be required in the cloud computing environment.

2.6 Faster enhancement

The loads may be increased or decreased on the cloud servers on some specific times or may be any time depending upon the requirement of cloud users, So in order to manage the loads on peak hours however we have a number of tools. For example Google App Engine automatically manages the load whenever the load increases or decreases. And users may be charged accordingly, however some cloud providers may charge a fixed amount of money and they can manage the load on peak hours. So the scaling may be quick and faster but sometimes it may be slow. Even that some providers may allow dynamic scaling and some may be static of the cloud network. Indeed, one focus of the UC Berkeley Reliable Adaptive Distributed Systems Laboratory is the pervasive and aggressive use of statistical machine learning as a diagnostic and predictive tool to allow dynamic scaling, automatic reaction to performance.

2.7 Possible degradation in time

Internet connection is a necessity to run the small businesses by using cloud computing, so it depends on the reliability of the internet that how well it works. Sometimes when the internet is not working properly or working slowly, it may be harmful to our business very much specially on the peak hours. In such type of cases the cloud computing may not be a good option for the small level enterprises.

2.8 Reputation degradation issues

The primary issue for the companies providing cloud computing services has its own reputation for providing the related services for customer support, but sometimes suspicious activities of some organizations are observed by the security agencies. If any cloud computing service provider restricted for providing the services, this incidence may obviously affect the similar types of organizations which provides same type of services. It may be happened that some organizations suffer from the losses or may be out of business.

The secondary issue is that the providers must take utmost care for choosing the customers to which the services are provided; some customers may use the services in wrongful manner or for some bad purpose, so care must be taken from the customer side also.

3. Conclusion and future work

After discussing the growth of cloud computing from various viewpoints, we conclude that this field will grow rapidly, so developers of these applications will take it into consideration. From low level to higher level of abstraction. We believe storage, computing and networking must all focus on horizontal scalability of virtualized resources instead of on single node performance.

The competition is increased in the cloud space today for innovative services and products.

Some researchers find that after a vendor establishes a new product or service, its passion for innovation drops considerably. Researchers suggest that companies need to help their clients to adopt the new innovative offerings.

References

[1]. B rodkin, J. Loss of customer data spurs closure of online storage service 'The Linkup.' Network World (Aug. 2008).

[2]. Fink, J. FBI agents raid Dallas computer business (Apr. 2009); http://cbs11tv.com/local/Core.IP.Networks.2.974706.html.

[3]. G arfinkel, S. An Evaluation of Amazon's Grid Computing Services: EC2, S3 and SQS. Tech. Rep. TR-08-07, Harvard University, Aug. 2007.

[4]. G ray, J., and Patterson, D. A conversation with Jim Gray. ACM Queue 1, 4 (2003)

[5]. D.E. Atkins et al., ' Revolutionizing Science and Engineering Through cyberinfrastructure: NSF, Report of the National Science Foundation Blue-ribbon Advisory Panel on cyberinfrastructure, January 2003, http://www.nsf.gov/od/oci/reports/atkins.pdf

[6] R. L. Dennis et al., "The Next Generation of Integrated Air Quality Modeling: EPA's Models-3", Atmospheric Environment, Vol. 30 (12), pp. 1925–1938, 1996

[7] The Grid: Blueprint for a New Computing Infrastructure, 2nd Edition, Morgan Kaufmann, 2004. ISBN: 1-55860-933-4

[8] Cloud Computing, Dr. Wendy A.Warr, Wendy War R & Associates, November 2009, http: //www.warr.com

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