Cloud Computing: The Need to Today's Greed

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Abstract: *Cloud computing has dramatically changed the way in which people consume information. It has affected the present technology with increasing competitiveness through cost reduction, greater flexibility, elasticity and optimal resource utilization. Many businesses large and small use cloud computing today either directly (e.g. Google or Amazon) or indirectly (e.g. Twitter) instead of traditional on-site alternatives. In this paper, we present a survey of cloud computing, highlighting its key concepts. The aim of this paper is to provide a better understanding of the topic and identify important research directions in this important area.*

Keywords: Optimal resource utilization, cloud computing, Data Centers, virtualization, grid computing, AAS.

1. Introduction

Cloud computing is typically defined as a type of computing that relies on *sharing computing resources* rather than having local servers or personal devices to handle applications alone. In cloud computing, the word cloud is used as a metaphor for "the Internet" so the phrase cloud computing means "a type of Internet-based computing," where different services such as servers, storage and applications are delivered to an organization's computers and devices through the Internet. Cloud computing is comparable to grid computing.

1.1 Data Center

Data centers are physical or virtual infrastructure for housing computer, server and networking systems and components for a company's IT needs.
The main room in a datacenter is the servers. They are just regular machines except that these might be rack mounted machines.

Figure 1: The view of a data center

The power for these switches comes from the hydroelectric power while some data centers have solar panels.
WUE (Water Usage Efficiency) = Annual water usage/ IT Equipment power. (Low is good)
PUE (Power Usage Efficiency) = Annual power usage/ IT Equipment power. (Low is good)

When there is power, there are servers, there is heat. And so there is cooling, different datacenters use different cooling techniques. [10]

2. Present Day Uses

Cloud Computing has been one of the hottest buzzwords over the last few years and surprisingly we have been using it for more than 10 years whether we realize it or not. Gmail, Facebook, Dropbox, Skype, PayPal, and Salesforce.com are all examples of cloud solutions. The main idea behind the cloud is that we can access all our information over the internet without having any detailed knowledge of the infrastructure used to enable it.

3. Why Cloud?

3.1 Flexibility

Scale up and down to meet our organization's requirements. In today's economy, this flexibility is key. IT expenditures can be adjusted to meet our organization's immediate needs. We no longer need to be constrained by decisions made or contracts signed in the past.

3.2. Security

The data is assured to be more secure in the cloud, than it is in our unsecured server rooms.

3.3. Capacity

A lot of IT budget used to be spent on human resources (that is, the employees that took care of software) for software management. With cloud computing, that's no longer an issue. Now, the focus can be on how the solution will help further in our mission because the IT piece belongs to somebody else and there is no real need to have detailed knowledge if the infrastructure.

3.4. Cost

Using cloud technology reduces the maintenance fees. No more servers, software, and update fees. Many of the hidden costs typically associated with software implementation, customization, hardware, maintenance, and training are rolled into a transparent subscription fee.

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177

3.5 Its open

Internet standards and web services allow us to connect services to each other. This means that we can centralize our information and access it from anywhere in the world, on any computer or mobile device, at any time. When an organization moves IT to the cloud, it greatly reduces the need to maintain in-house expertise, leaving it, instead, in the hands of its cloud computing and managed services provider. Since the provider already has a robust system in place, the organization is then easily able to scale IT up as needed, without the need to plan for large hardware, software, and personnel upgrades. Whether a start-up or a fortune 100 (or both), reducing the cost of IT is imperative to keeping the bottom line in check. By moving to the cloud, companies only pay for what they need and when they need it. Rather than have to worry about constant hardware and software upgrades necessary to keep their system up-to-date, by operating in the cloud, organizations are able to rely on expert providers to keep their systems running on all cylinders at all times no matter how big (or small) their needs.

4. Services

Each cloud provides services to users at a different level of abstraction which is referred to as service model in NIST definition [6]. Some of the service models or the *AAS (As a Service) [10] classification is:

4.1 Haas

Hardware as a service- Getting access to hardware machines. We can do whatever we wish to with them. Ex, our own cluster. Haas is not always a good idea because of the security risks connected to it.

4.2. Iaas

Infrastructure as a service-Allows us to get access to machines, and install our own OS but without having the security holes of the Haas. This is one of the most popular ways of using public clouds todays.

4.3. Paas

Platform as a service- It's a consolidated form of Iaas. We don't get access to VM's but we can write our code and it's tightly intimidated with the software platform. It's easier but is less flexible than Iaas.

4.4. Saas

Software as a service- We get access to software services, when we need them. Ex, Google docs, MS office on demand.

5. Types of Cloud

There are different types of clouds depending on who owns and uses them. This is called the cloud deployment model in the NIST definition model. The common models are:

5.1 Private Cloud

A cloud that is used exclusively by one organization. That is, the computing infrastructure is dedicated to a particular organization and not shared with other organizations. These are more expensive and secure when compared to the public clouds.

5.2 Public Cloud

A cloud that can be used (for a fee) by the general public. That is, the computing infrastructure is hosted by the cloud vendor at the vendor's premises.

5.3 Community Cloud

A cloud that is shared by several organizations for their specific use. The organizations generally belong to the same community.

5.4. Hybrid Cloud

A cloud that is set up by using a mixture of two or more deployment models stated above. Each cloud in the hybrid model could be independently managed but all the data and applications would be allowed to move across the hybrid cloud.

6. Application

6.1 Infrastructure as a service (IaaS) and platform as a service (PaaS)

When it comes to IaaS, using an existing infrastructure on a pay-per-use scheme seems to be an obvious choice for companies saving on the cost of investing to acquire, manage and maintain an IT infrastructure. There are also instances where organizations turn to PaaS for the same reasons while also seeking to increase the speed of development on a ready-to-use platform to deploy applications.

6.2 Private cloud and hybrid cloud

Among the many incentives for using cloud, there are two situations where organizations are looking into ways to assess some of the applications they intend to deploy into their environment through the use of a cloud (specifically a public cloud). While in the case of test and development it may be limited 6n time, adopting a hybrid cloud approach allows for testing application workloads, therefore providing the comfort of an environment without the initial investment that might have been rendered useless should the workload testing fail. Another use of hybrid cloud is also the ability to expand during periods of limited peak usage, which is often preferable to hosting a large infrastructure that might seldom be of use. An organization would seek to have the additional capacity and availability of an environment when needed on a pay-as you-go basis.

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178

6.3 Test and development

Probably the best scenario for the use of a cloud is a test and development environment. This entails securing a budget, setting up your environment through physical assets, significant manpower and time. Then comes the installation and configuration of your platform. All this can often extend the time it takes for a project to be completed and stretch your milestones.

6.4 Big data analytics

One of the aspects offered by leveraging cloud computing is the ability to tap into vast quantities of both structured and unstructured data to harness the benefit of extracting business value. Retailers and suppliers are now extracting information derived from consumers' buying patterns to target their advertising and marketing campaigns to a particular segment of the population. Social networking platforms are now providing the basis for analytics on behavioral patterns that organizations are using to derive meaningful information.

6.5 File storage

Cloud can offer you the possibility of storing your files and accessing, storing and retrieving them from any web-enabled interface. The web services interfaces are usually simple. At any time and place you have high availability, speed, scalability and security for your environment. In this scenario, organizations are only paying for the amount of storage they are actually consuming, and do so without the worries of overseeing the daily maintenance of the storage infrastructure. There is also the possibility to store the data either on or off premises depending on the regulatory compliance requirements. Data is stored in virtualized pools of storage hosted by a third party based on the customer specification requirements.

6.6 Disaster recovery

This is yet another benefit derived from using cloud based on the cost effectiveness of a disaster recovery (DR) solution that provides for a faster recovery from a mesh of different physical locations at a much lower cost that the traditional DR site with fixed assets, rigid procedures and a much higher cost.

6.7 Backup

Backing up data has always been a complex and time-consuming operation. The traditional way of ensuring a backup is not immune to problems such as running out of backup media and there is also time to load the backup devices for a restore operation, which takes time and is prone to malfunctions and human errors. Cloud-based backup, while not being the panacea, is certainly a far cry from what it used to be. You can now automatically dispatch data to any location across the wire with the assurance that neither security, availability nor capacity are issues.

7. Challenges

Cloud computing has been widely practiced. But, research at it is still at an immature stage. It faces the challenges of meeting the requirements of next generation cloud architectures, also the challenges of allowing applications and development platforms to take advantage of the benefits of cloud computing [2]. Some of the challenges are:

7.1. Virtual Machine Migrations

Applications are not hardware specific. Many programs may run on one machine or many machines may run one program. If the server needs to be shut down for maintenance, the software components are needed to be shut and then restarted, which affects system availability. VM Migrations allows us to move an entire VM (with its OS and applications) to another and continue its operations on the second machine [5]. And it is not very easy to move an application from an enterprise to a cloud computing environment or even within different cloud computing platforms because different providers support different application architectures.

7.2 Service Level Agreements

Service Agreements level agreements like replication of several instances of one application on multiple servers if need arises. A big challenge for Cloud customers is to evaluate SLAs. SLAs should reflect the customer's needs if they address the required issues at the right time. Many vendors create SLAs to make a defensive shield against any legal action.

7.3 Internet Dependency

These services rely fully on the availability, speed, quality and performance of internet as it works as a medium between consumer and service provider[6].

7.4 Data Management and Internet Security

This is another important research topic in cloud computing. Since service providers do not really have access the physical security system of the data centers, they must rely on infrastructure provider for full data security. The infrastructure provider, must achieve the following: Audit ability- for attesting whether security setting of applications has been tampered or not. Confidentiality- for secure data access and transfer [2].

7.5 Downtime

Downtime is an important concern, because for every minute of downtime an important business application can't be performed, which degrades the performance as well as the reputation.

7.6 Energy Management

Improving energy efficiency is another major issue in cloud computing. Saving the energy of a data center without sacrificing SLA are an excellent economic incentive for data

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179

center operators. The goal is not only to cut down energy cost in data centers, but also to meet government regulations and environment standards

8. Related Technologies

8.1. Grid Computing

Grid computing is allowing the resources of many computers in a network to a single problem at the same time, usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data. Using this network of computers, large and complex computing operations can be performed.

8.2. Virtualization

Virtualization introduces a layer between hardware and operating system. The virtualization forms the foundation of cloud technology. Using virtualization, users can access servers or storage without having any knowledge about their details. The virtualization layer will execute user request for computing resources by accessing appropriate resources. Typically server utilization in data centers can be as low as 10%. Virtualization can help in improving server utilization.

8.3. Utility Computing

Utility computing is a type of service provided on the pay-per-use basis. The service provider provides the customer only that infrastructure and computing resources that are needed by him, and the charges applied are the specific rates rather than flat rates.

8.4. Autonomic Computing

Autonomic computing is a self-managing computing model named after, the human body's autonomic nervous system. An autonomic computing system would control the functioning of computer applications and systems without input from the user. The goal of autonomic computing is to create systems that run themselves, capable of high-level functioning while keeping the system's complexity invisible to the user.

9. Conclusion

Cloud computing has become the IT buzzword for the past few years. It has been often used with synonymous terms such as software as a service (SaaS), grid computing, cluster computing, autonomic computing, and utility computing. It's a commercial infrastructure paradigm that promises to eliminate the need for maintaining computing facilities [8]. It used to take years to grow a business to several million customers, now it only takes few months. With cloud computing, it has now become possible to access the world of internet without having any detailed knowledge. No servers are needed to be maintained because the cloud computing providers take care of everything. The hardware and software cost is reduced. But horns accompany every rose. Likewise, along with everything that Cloud Computing provides us, it also leaves us with certain disadvantages which make us question the use of these services. For the commercial success of this new computing paradigm, the ability to deliver Quality of Services(QoS) guaranteed services is crucial[9] and we've described about the challenges that is paradigm faces and the research areas that are still needed to be looked at in this paper.

10. Acknowledgement

Reference

[1] Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, Randy H. Katz, Andrew Konwinski, Gunho Lee, David A. Patterson, Ariel Rabkin, Ion Stoica, Matei Zaharia 2009. Above the Clouds: A Berkeley View of Cloud Computing.
[2] Rabi Prasad Padhy, Manas Ranjan Patra, Suresh Chandra Satapathy 2011. Cloud Computing: Security Issues and Research Challenges.
[3] IIango Sriram, Ali Khajeh-Hosseini. Research Agenda in Cloud Technologies.
[4] Mohiuddin Ahmed, Abu Sina Raju Chowdhury, Mustaq Ahmed, Md. Mahumudul Hasan Rafee. An Advanced Survey on Cloud Computing and State-of-the-art Research Issues.
[5] Suruchee V. Nandgaonkar, Prof. A. B. Raut. A Comprehensive Study on Cloud Computing.
[6] IEEE no. 6808484 - A Scientometric Analysis of Cloud Computing
[7] Alexandru losup, Radu Prodan. Performance Analysis of Cloud Computing Services for Many-Tasks Scientific Computing.
[8] Kaiqi Xiong and Harry Perros. Service Performance and Analysis in Cloud Computing.
[9] Video lectures from University of Illinois at Urbana-Champaign.