

# Study of the Implementation of Cloud Computing: Applications and Challenges

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## Abstract

*Cloud computing is a new computational model which is primarily based on grid computing. Cloud computing are often outlined as a computing surroundings wherever computing wants by one party are often outsourced to a different party and once would like be arise to use the computing power or resources like information or emails, they will access them via web. This paper is for anyone who will have recently detected regarding cloud computing and desires to grasp a lot of regarding cloud computing. During this paper, we described Cloud Computing, Architecture of Cloud Computing, Characteristics of Cloud Computing, issues and challenges' and different Services.*

Keywords: introduction, building blocks, services, challenges and issues

## Introduction

Internet has been a driving force towards the various technologies that have been developed.

In current IT/ITES market where most of the organization started to implement the “Integration of Service based Methodology” for their clients and also for the internal structure of organization (especially for the dedicated IS team of the organization).The “Cloud Concept” built upon the three pillars of current computing system such as “Infrastructure”, ”Platform” and the “Software” or applications. The business benefit of “Cloud” is it use to provide “On demand Service” which helps to full fill the demand of chain execution can be the cause of reducing expenses of implementation of multiple processing units. Cloud provides the concept of updating of resources without affecting the underlying infrastructure, which reduce the need of backup system and encourage the continuous execution of application. Cloud provides potential “Reliability” and “Scalability” for the applications either deployed or are running on cloud. Since, cloud use to assure out most security for any business application, it provides a “Private Cluster” for each application

## What is Cloud Computing?

Cloud computing is an umbrella term used to refer to Internet based development and services. The cloud is a metaphor for the Internet. A number of

Arguably, one of the most discussed among all of these is Cloud Computing. Over the last few years, cloud computing paradigm has witnessed an enormous shift towards its adoption and it has become a trend in the information technology space as it promises significant cost reductions and new business potential to its users and providers . The advantages of using cloud computing include:

- i) Reduced hardware and maintenance cost,
- ii) Accessibility around the globe, and
- iii) Flexibility and highly automated processes wherein the customer need not worry about mundane concerns like software up-gradation.

Cloud Computing frequently is taken to be a term that simply renames common technologies and techniques that we have come to know in IT.

Cloud computing represents a different way to architect and remotely manage computing resources. One has only to establish an account with Microsoft or Amazon or Google to begin building and deploying application systems into a cloud. They can be web applications that require only http services.

characteristics define cloud data, applications services and infrastructure.

Remotely hosted: Services or data are hosted on someone else’s infrastructure. Ubiquitous: Services or data are available from anywhere. Co modified: The result is a utility computing model similar to traditional that of traditional utilities, like gas and electricity. You pay for what you would like.

## CHARACTERSTICS OF CLOUD COMPUTING

In cloud computing, users access the information, applications or the other services with the assistance of a browser notwithstanding the device used and also the user's location. The infrastructure that is mostly provided by a third-party is accessed with the assistance of web. Price is reduced to a major level because the infrastructure is provided by a third-party. Less IT skills are needed for implementation. Reliable services are often obtained by the employment of multiple sites that is appropriate for business continuity and disaster recovery. Sharing of resources and prices amongst an outsized assortment of users permits economical utilization of the infrastructure. Maintenance is simpler just in case of cloud computing applications as they have not been put in on every

user's pc. Pay per use facility permits activity the usage of application per shopper on regular bases. Performance is often monitored and so it's ascendible. Security is often pretty much as good as or higher than ancient systems as a result of suppliers are able to devote resources to resolution security problems that several customers cannot afford. However, security still remains a crucial concern once the information is sort of confidential [6]. Cloud could be a massive resource pool that you just should buy in keeping with your need; cloud is simply like running water, electric, and gas which will be charged by the quantity that you just used. Cloud computing makes user get service anyplace, through any reasonably terminal. The resources it needed return from cloud rather than visible entity. Users will attain or share it safely through a simple method, anytime, anywhere. Users will complete a task that can't be completed in an exceedingly single personal computer [7].

### Software as a Service (SaaS)

SaaS is a model of software deployment where an application is hosted as a service provided to customers across the Internet. SaaS is generally used to refer to business software rather than consumer software, which falls under Web 2.0. By removing the need to install and run an application on a user's own computer it is seen as a way for

businesses to get the same benefits as commercial software with smaller cost outlay. SaaS also alleviates the burden of software maintenance and support but users relinquish control over software versions and requirements. They other terms that are used in this sphere include *Platform as a Service* (PaaS) and *Infrastructure as a Service* (IaaS).

### CLOUD STORAGE

Several large Web companies (such as Amazon and Google) are now exploiting the fact that they have data storage capacity which can be hired out to others. This approach, known as 'cloud storage' allows data stored remotely to be temporarily cached on desktop computers, mobile phones or other Internet-linked devices. Amazon's Elastic Compute Cloud (EC2) and Simple Storage Solution (S3) are well known examples.

### Data Cloud

Cloud Services can also be used to hold structured data. There has been some discussion of this being a potentially useful notion possibly aligned with the Semantic Web [2], though concerns, such as this resulting in data becoming undifferentiated [3], have been raised.



### CLOUD COMPUTING BUILDING BLOCKS DEPLOYMENT MODELS

In the cloud deployment model, networking, platform, storage, and software infrastructure are provided as services that scale up or down depending on the demand as depicted in figure 1. The Cloud Computing model has four main deployment models which are: Private Cloud: Private cloud is a new term that some vendors have recently used to describe offerings that emulate cloud computing on private networks. It is set up within an organization's internal enterprise

datacenter. In the private cloud, scalable resources and virtual applications provided by the cloud vendor are pooled together and available for cloud users to share and use. It differs from the public cloud in that all the cloud resources and applications are managed by the organization itself, similar to Intranet functionality. Utilization on the private cloud can be much more secure than that of the public cloud because of its specified internal exposure. Only the organization and designated stakeholders may have access to operate on a

specific Private cloud. One of the best examples of a private cloud is Eucalyptus Systems [3]. Public Cloud: Public cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who shares resources and bills on a fine-grained utility computing basis. It is typically based on a pay-per-use model, similar to a prepaid electricity metering system which is flexible enough to cater for spikes in demand for cloud optimization [1]. Public clouds are less secure than the other cloud models because it places an additional burden of ensuring all applications and data accessed on the public cloud are not subjected to malicious attacks. Examples of a public cloud include Microsoft Azure, Google App Engine. Hybrid Cloud: Hybrid cloud is a private cloud linked to one or more external cloud services, centrally managed, provisioned as a single unit, and circumscribed by a secure network [2]. It provides virtual IT solutions through a mix of both public and private clouds. Hybrid Cloud provides more secure control of the data and applications and allows various parties to access information over the Internet. It also has an open architecture that allows interfaces with other management systems. Hybrid cloud can describe configuration combining a local device, such as a Plug computer with cloud services. It can also describe configurations combining virtual and physical, collocated assets -for example, a mostly virtualized environment that requires physical servers, routers, or other hardware such as a network appliance acting as a firewall or spam filter. An example of a Hybrid Cloud includes Amazon Web Services (AWS). Community Cloud: Infrastructure shared by several organizations for a shared cause and may be managed by them or a third party service provider and rarely offered cloud model. These clouds are normally based on an agreement between related business organizations such as banking or educational organizations. A cloud environment operating according to this model may exist locally or remotely. An example of a Community Cloud includes Face book.

## **RESEARCH CHALLENGES IN CLOUD COMPUTING**

Cloud Computing research addresses the challenges of meeting the requirements of next generation private, public and hybrid cloud computing architectures, also the challenges of allowing applications and development platforms to take advantage of the benefits of cloud computing. The research on cloud computing is still at an early stage. Many existing issues have not

been fully addressed, while new challenges keep emerging from industry applications. Some of the challenging research issues in cloud computing is given below:

- Service Level Agreements (SLA's)
- Cloud Data Management & Security
- Data Encryption
- Migration of virtual Machines
- Interoperability
- Access Controls
- Energy Management
- Multi-tenancy
- Server Consolidation
- Reliability & Availability of Service
- Common Cloud Standards
- Platform Management

Cloud computing is the development of parallel computing, distributed computing, grid computing and

Virtualization technologies which define the shape of a new era. Cloud computing is an emerging model of business computing. In this paper, we explore the concept of cloud architecture and compares cloud computing with grid computing. We also address the characteristics and applications of several popular cloud computing platforms. Cloud computing is a complete new technology. It is the development of parallel computing distributed computing grid computing, and is the combination and evolution of Virtualization, Utility computing, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). Cloud is a metaphor to describe web as a space where computing has been pre installed and exist as a service; data, operating systems, applications, storage and processing power exist on the web ready to be shared. To users, cloud computing is a Pay-per-Use-On-Demand mode that can conveniently access shared IT resources through the Internet.

## **APPLICATIONS**

There are a few applications of cloud computing [4] as follows:

- 1) Cloud computing provides dependable and secure data storage center.
- 2) Cloud computing can realize data sharing between different equipments.
- 3) The cloud provides nearly infinite possibility for users to use the internet.
- 4) Cloud computing does not need high quality equipment for the user and it is easy to use.

## **ISSUES IN CLOUD COMPUTING**

More and more information on individuals and companies is placed in the cloud; concerns are beginning to grow about just how safe an

environment it is? Issues of cloud computing [3] can summarize as follows:

Privacy  
Reliability  
Legal Issues  
Compliance  
Freedom

Cloud computing refers to the provision of computational resources on demand via a computer network, such as applications, databases, file services, email, etc. In the traditional model of computing, both data and software are fully contained on the user's computer; in cloud computing, the user's computer may contain almost no software or data (perhaps a minimal operating system and web browser only), serving as little more than a display terminal for processes occurring on a network of computers far away. A common shorthand for a provided cloud computing service (or even an aggregation of all existing cloud services) is "The Cloud". The most common analogy to explain cloud computing is that of public utilities such as electricity, gas, and water. Just as centralized and standardized utilities free individuals from the difficulties of generating electricity or pumping water, cloud computing



frees users from certain hardware and software installation and maintenance tasks through the use of simpler hardware that accesses a vast network of computing resources (processors, hard drives, etc.). The sharing of resources reduces the cost to individuals.

The phrase "cloud computing" originated from the cloud symbol that is usually used by flow charts and diagrams to symbolize the internet. The principle behind the cloud is that any computer connected to the internet is connected to the same pool of computing power, applications, and files. Users can store and access personal files such as music, pictures, videos, and bookmarks or play games or use productivity applications on a remote server rather than physically carrying around a storage medium such as a DVD or thumb drive. Almost all users of the internet may be using a form of cloud computing though few realize it. Those who use web-based email such as Gmail, Hotmail, Yahoo, a Company owned email, or even an e-mail client program such as Outlook, Evolution, Mozilla Thunderbird or Entourage are making use of cloud email servers. Hence, desktop applications which connect to cloud email would be considered cloud applications.

*Web-based emails, social networking sites,*

*blogging... All these data are stored "in the clouds."*

## Opportunities and Challenges

The use of the cloud provides a number of opportunities:

- It enables services to be used without any understanding of their infrastructure.
- Cloud computing works using economies of scale. It lowers the outlay expense for start up companies, as they would no longer need to buy their own software or servers. Cost would be by on-demand pricing. Vendors and Service providers claim costs by establishing an ongoing revenue stream.

- Data and services are stored remotely but accessible from 'anywhere'.

In parallel there has been backlash against cloud computing:

- Use of cloud computing means dependence on others and that could possibly limit flexibility and innovation. The 'others' are likely become the bigger Internet companies like Google and IBM who may monopolies the market. Some argue that this use of supercomputers is a return to the time of mainframe computing that the PC was a reaction against.
- Security could prove to be a big issue. It is still unclear how safe outsourced data is



and when using these services ownership of data is not always clear.

- There are also issues relating to policy and access. If your data is stored abroad whose FOI policy do you adhere to? What happens if the remote server goes down? How will you then access files? There have been cases of users being locked out of accounts and losing access to data.

### **Cloud Computing Pros**

- Requires good speed internet with good bandwidth
- Limited control on infrastructure
- Restricted or limited flexibility
- Ongoing costs
- Security

### **Advantages of Cloud Computing:**

We'll start with the many advantages offered by cloud computing.

Here's what you get when you move into the cloud:

- Lower computer costs. You don't need a high-powered and high-priced computer to run cloud computing web-based applications. Since applications run in the cloud, not on the desktop PC, your desktop PC doesn't need the processing power or hard disk space demanded by traditional desktop software. When you're using web-based applications, your PC can be less expensive, with a smaller hard disk, less memory, more efficient processor, and the like. In fact, your PC in this scenario doesn't even need a CD or DVD drive, as no software programs have to be loaded and no document files need to be saved.
- Improved performance. With fewer bloated programs hogging your computer's memory, you'll see better performance from your PC. Put simply, computers in a cloud computing system boot and run faster because they have fewer programs and processes loaded into memory.

▪ Reduced software costs. Instead of purchasing expensive software applications, you can get most of what you need for free.

▪ Instant software updates. Another software-related advantage to cloud computing is that you're no longer faced with choosing between obsolete software and high upgrade costs. When the app is web-based, updates happen automatically and are available the next time you log into the cloud. When you access a web-based application, you get the latest version—without needing to pay for or download an upgrade.

▪ Improved document format compatibility. You don't have to worry about the documents you create on your machine being compatible with other users' applications or operating systems. In a world where Word 2007 documents can't be opened on a computer running Word 2003, all documents created by web-based applications can be read by any other user accessing that application. There are no format incompatibilities when everyone is sharing docs and apps in the cloud.

▪ Unlimited storage capacity. Cloud computing offers virtually limitless storage. Your computer's current 200 gigabyte hard drive is peanuts compared to the hundreds of petabytes (a million gigabytes) available in the cloud. Whatever you need to store, you can.

▪ Increased data reliability. Unlike desktop computing, in which a hard disk crash can destroy all your valuable data, a computer crashing in the cloud shouldn't affect the storage of your data. That also means that if your personal computer crashes, all your data is still out there in the cloud, still accessible. In a world where few individual desktop PC users back up their data on a regular

basis, cloud computing is the ultimate in data-safe computing.

- Universal document access. Ever get home from work and realize that you left an important document at the office? Or forget to take a file with you on the road? That's not a problem with cloud computing, because you don't take your documents with you. Instead, they stay in the cloud, and you can access them whenever you have a computer and an Internet connection. All your documents are instantly available from wherever you are; there's simply no need to take your documents with you.

- Latest version availability. Another document-related advantage of cloud computing: When you edit a document at home, that edited version is what you see when you access the document at work. The cloud always hosts the latest version of your documents; as long as you're connected, you're never in danger of having an outdated version.

- Easier group collaboration. Sharing documents leads directly to collaborating on documents. To many users, this is one of the most important advantages of cloud computing—multiple users can collaborate easily on documents and projects. Because the documents are hosted in the cloud, not on individual computers, all you need is a computer with an Internet connection, and you're collaborating.

- Device independence. Finally, here's the ultimate cloud computing advantage: You're no longer tethered to a single computer or network. Change computers, and your existing applications and documents follow you through the cloud. Move to a portable device, and your apps and docs are still available. There's no need to buy a special

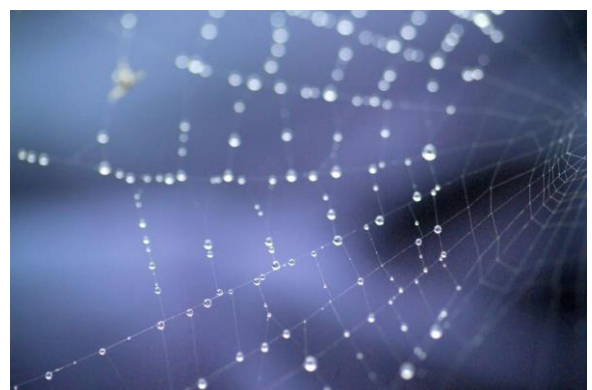
version of a program for a particular device, or to save your document in a device-specific format. Your docs and their apps are the same no matter what computer or other device you're using. The cloud has a trajectory that is hard to plot and a scope that reaches into so many aspects of our daily life that innovation can occur across a broad range. The cloud computing benefits are so immense that it is looked upon as a utility model of computing, with which an application can start small and grow to be enormous overnight. This paper is a brief survey based of readings on “cloud” computing and it tries to address, related research topics, challenges ahead and possible applications.

## **The Future**

Many of the activities loosely grouped together under cloud computing have already been happening and centralized computing activity is not a new phenomena: Grid Computing was the last research-led centralized approach. However there are concerns that the mainstream adoption of cloud computing could cause many problems for users. Whether these worries are grounded or not has yet to be seen.

Another multimedia impact of cloud computing would be the so-called broadband cloud. The digitizing of television, said to be launched on February 17, 2009, would introduce video-on-demand in TV's in the US.

## **The Semantic Web**



The realization of a semantic web co-existing with cloud computing would make things a whole lot



easier for everybody, to say the least. That would be powerful computing at its finest. Some are pessimistic that the semantic web cannot be brought to reality, just as there are skeptics on cloud computing. Mobile phones, laptops and desktops would be devoid of software, and secure browsers are all we'd need. Of course who knows if this is achievable, we must wait a few more years.

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