



# Cloud Computing for Academic Environment

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## ABSTRACT

In traditional computing, we install software programs on system (computer) update the hardware as per our requirements. Documents we create or save are stored in our computer. Documents are accessible on our own network, but they can't be accessed by computers outside the network. Using of cloud computing, the software programs aren't run from one's personal computer, but are rather stored on servers accessed via the Internet. Cloud Computing provides resources and capabilities of Information Technology (e.g., applications, storages, communication, collaboration, infrastructure) via services offered by CSP (cloud service provider). Cloud Computing has various characteristics as shared infrastructure, self-service, pay-per use model, dynamic and virtualized, elastic and scalable. Cloud computing in academic environment will be benefitted by every student and staff where lots of collaboration and safety of data is needed in academic. Academic has various departments and many semesters where lots of students need to access the computing a need for highly available up-to-date software and hardware is must. Cloud computing has the capacity of scaling and elasticity which is perfect for such an environment.

**Keywords:** *Cloud Computing, Web service, Virtualization, Grid Computing, Virtual Computing Lab, higher education institutions*

## I. INTRODUCTION

Cloud computing growth has taken all the attention of various communities like researches, student, business, consumer and government organization. Big data is the main reason for coming of cloud computing in the show, everyday lots of data in the size of PETA bytes are uploaded in the digital world which required lots of storage and computing resources. Cloud Computing is a marketing term which is also known as utility computing deliver the service as software, platform and infrastructure as a service in pay-as-you-go model to consumers. Berkeley report says on this services as "Cloud computing, the long held dream of computing as a utility, has the potential to transform a large part of the IT industry, making software even more attractive as a service.

Education has been gradually expanded, and the education object has slowly turned to social staff. The teaching method from black board to online is growing fast than ever. An online tutor which helps has to take class in any hour is an advance of learning using technology. E-learning and online solution is what we required in education environment.

With the increasing number in receiving education, a series of new problems have emerged. For example: As teaching methods change, the existing teaching-learning methods cannot meet demand; and with the constant expansion of education, the existing teaching facilities also need to constantly update. When Cloud Computing appears, it provides a new solution to establish a unified, open and flexible network teaching platform and reduce the hardware input [10].

Internet is the resource where we can transform cloud computing, it can deliver the most advanced software and educational materials, hardware resources and services to students and educators in even the most impoverished or remote school districts in the state, without the need for advanced IT expertise at those locations. At the same point, it does more for significantly less, providing needed relief for currently strained education budgets [12]. IT companies are eager to encourage educational adoption of cloud computing; for example, Google Apps for Education Suite comprises Google Mail, Calendar, Talk, Docs, Sites and Video with zero cost and without advertisements [1]. According to a Forrester cost analysis [9], Google Apps is more effective than a Microsoft Exchange e-mail. Based on CSU research, the costs of software licensing, server hardware and staffing to support 50,000 users by using Microsoft Exchange e-mail (the number of undergraduate e-mail accounts at CSU) would be \$9,774,000 per year [2]. The cost of Google Apps for businesses is \$50 per user per year, or with 50,000 users, \$2,500,000 per year. The cost of Google Apps Education Edition, however, is \$0 per year [2]. As we can see from this example, the industrial cloud computing solution for the educational institution already gave an estimated savings from about \$9,774,000 per year to \$2,500,000 per year in the "businesses version" or to zero cost of licensing and equipment in the "educational version". Taking into account the last two examples, we can see that both approaches, industrial (or commercial) and non-commercial cloud computing solutions can be successfully employed within educational institutions and another example, IBM launched IBM Cloud Academy that



is provide a global forum for educators, researchers and IT professionals from education industry to pursue cloud computing initiatives, develop skill and share best practices for reducing operating costs while improving quality and access to education. In this way users do not need to buy a server, only need to purchase related "services" can create an efficient network teaching platform [10]. Using of cloud computing in academicians in universities are not aware of benefits and characteristic of minimizing the cost of cloud computing. From an IT-management view, it radically reduces resource management costs—including electric power, cooling and system management personnel, while driving up the utilization of servers and software licenses, which in turn reduces purchasing requirements [12].

## Benefits of Cloud Computing

- Reduced implementation and maintenance costs
- Increased mobility for a global workforce
- Flexible and scalable infrastructures
- Quick time to market
- IT department transformation (focus on innovation vs. Maintenance and implementation)
- "Greening" of the data center
- Increased availability of high-performance applications to small/medium-sized businesses [3]

## II. RELATED WORKS

Invent of Internet changes the way we use of computer. From mail to shopping we all depend on this huge group of network computer. Cloud computing has entirely changes what the internet means. Powerful of desktop application is available on net and storage is available online wherever we go from any device. E-Learning and web 2.0 learning totally changes of education system. Teacher and student work together in online project not in school or colleges but from home also. Teaching has never been easy without cloud computing [10].

## III. PURPOSE OF RESEARCH

Students' learning is no longer confined within the classroom in the era of e-learning 2.0[11]. The environment of IT education could be improved to let student access learning resources anywhere. IGNOU (Indira Gandhi national Open University) is the good example of e-learning. The free software can be adopted for constructing the cloud computing service for the environment of IT like OpenOffice.org such as word processing, spreadsheets, and presentations. Only a browser is needed for students to connect to the cloud computing service for learning.

## Lab Problem

The maintenance of dozens of computers in the labs becomes a burden for the system administrator. This paper proposed diskless cluster computing environment in a computer classroom and the development of teaching network management system in computer classroom.

In this paper we discuss the "Cloud Computing" paradigm and characteristics, service and deployment models, implementations of cloud services at universities, and various opportunities and benefits of Cloud Computing for universities & academic institutions. Finally, we suggest a design prototype of Cloud Computing for Academic Environment.

## IV. Cloud Computing

Definitions of cloud is defined by many expert, but the National Institute of Standards and Technology (NIST) definition is a generally accepted standard: "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (such as networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."<sup>4</sup> More simply, a cloud can be considered to be a collection of hardware, software and other resources that can be accessed over the Internet, and used to assemble a solution on demand (that is, at the time of the request) to provide a set of services back to the requester.

When analyzed the definitions, there is a consensus on few key points; (1) Cloud Computing ensure on-demand access to a pool of computing resources, (2) dynamically scalable services, (3) device and media independency, and (4) easier maintenance of applications due to do not need to be installed on users' computers. Cloud computing should be elasticity and scalability. Figure (1) [5], adapted [4] shows six phases of computing paradigms, from dummy terminals/mainframes, to PCs, networking computing, to grid and cloud computing.

In phase 1, many users shared powerful mainframes using dummy terminals.

In phase 2, stand-alone PCs became powerful enough to meet the majority of users' needs.

In phase 3, PCs, laptops, and servers were connected together through local networks to share resources and increase performance.

In phase 4, local networks were connected to other local networks forming a global network such as the Internet to utilize remote applications and resources.

In phase 5, grid computing provided shared computing power and storage through a distributed computing.

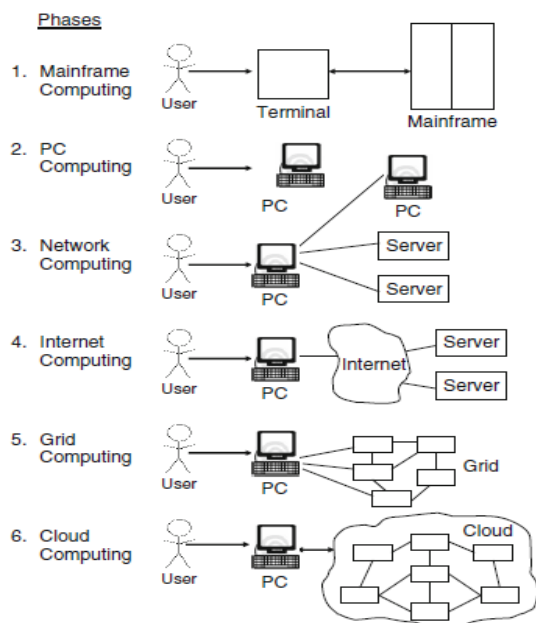


Figure 1. Six computing paradigms

Image source: smart-cloud-computing.blogspot.com

## V. CLOUD PLATFORMS AND SERVICE DEPLOYMENT MODELS

### A. Essential Cloud Characteristics

- ❖ On-demand self-service
- ❖ Broad network access
- ❖ Resource pooling
  - Location independence
- ❖ Rapid elasticity
- ❖ Measured service

### B. Cloud Service Models

- ❖ Software as a Service (SaaS)
  - Use provider's applications over a network
- ❖ Platform as a Service (PaaS)
  - Deploy customer-created applications to a cloud
- ❖ Infrastructure as a Service (IaaS)
  - Rent processing, storage, network capacity

### C. Cloud Deployment Models

- ❖ Public-Sold to the public, mega-scale infrastructure
- ❖ Private-enterprise owned or leased
- ❖ Hybrid-composition of two or more clouds
- ❖ Community-shared infrastructure for specific community

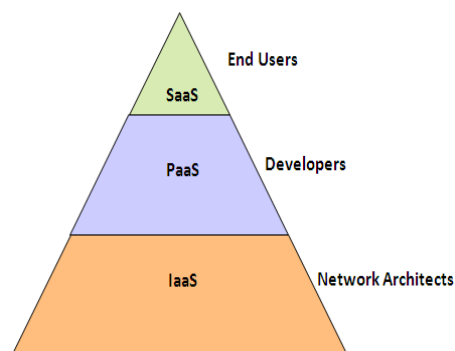


Figure 2. Cloud computing service models

## VI. CLOUDS COMPUTING IN UNIVERSITIES

A Cloud-computing service that will let universities and colleges build custom private clouds that can be integrated into public cloud services [10]. Three main factors interests in Cloud Computing: 1) rapid decrease in hardware cost and increase in computing power and storage capacity, and the advent of multi-core architecture and modern supercomputers consisting of hundreds of thousands of cores; 2) the exponentially growing data size in scientific instrumentation/simulation and Internet publishing and archiving; and 3) the widespread adoption of Services Computing and Web 2.0 applications.

For example, a university student taking a college math course could access a cloud from his or her door room, to obtain a physical or virtual server (with the necessary storage) and a copy of Maple or MATLAB software running on it to use for homework or a class project. Likewise, an elementary school teacher could access the same cloud to request one virtual machine for each of his or her students running Mathmedia software, as part of his or her classroom instructional activities [12].

## VII. PRIVATE CLOUD FOR UNIVERSITIES

Private cloud (also called internal cloud or corporate cloud) is a marketing term for a proprietary computing architecture that provides hosted services to a limited number of people behind a firewall.

Advances in virtualization and distributed computing have allowed corporate network and datacenter administrators to effectively become service providers that meet the needs of their "customers" within the corporation.

Marketing media that uses the words "private cloud" is designed to appeal to an organization that needs or wants more control over their data than they can get by using a third-party hosted service such as Amazon's Elastic Compute Cloud (EC2) or Simple Storage Service

(S3) [6]. Fig. 3 Represent the private cloud of an organization.



Figure 3: Example of Private cloud in organizations

## VIII. PROPOSED EDUCATIONAL CLOUD INFRASTRUCTURE PROTOTYPE

Design of Cloud Infrastructure needed the following service and application

### • Collaboration Application

Moving email and PIM (personal information manager) to managed service providers. IDC says that 67 percent of survey respondents believe collaboration applications such as email, chat, conferencing and collaborative file sharing solutions such as SharePoint are a great fit for the cloud because they reduce costs in the short term [7]. For collaboration application GMAIL apps come in handy without any charges. For our International conference I have uploaded spreadsheet for collaboration work where any person involves in maintaining the office work is done online.

### • Web Serving

Moving web servers, management and analytic tools to the cloud is also at the top of the prioritized list, because this will reduce maintenance costs and reliance on subscription models as well as improve rapidness of deployment [7]. Cloud Server is the key part of the computing platform to ensure its scalability. All the resource can be store at this cloud server which includes online videos, audios, pictures, and course wares etc. This web server infrastructure in cloud computing can share resources for educational and research purposes.

### • Cloud Backup

Some companies like Asigra are moving disaster recovery and back-up to the cloud. As IDC says, in spite of cloud security concerns, 60 percent of enterprises are still considering moving back-up off-site to the cloud to protect against natural disasters, IT mishaps, power outages and other unforeseen catastrophic events [7]. Drop Box is a free service to take back up of our data in cloud environment it enable synchronize with any device wherever drop box is install. A cloud backup service can

be enabling on university campus to safeguard of student, staff, and lecture data.

### • Business Applications

Hosted in the cloud are probably the most promising cloud service and the most interesting topic for computer science education because it can give businesses the option to pay as they go while providing the big-impact benefit of the latest technology advancements [7]. The involvement of students in such type of projects with real customers is mutually beneficial to students, faculty and businesses.

### • Personal Productivity Applications

CIchannelinsider.com predicts that hosted mobile applications through carriers and mobile software providers as well as document-editing applications like those from DataViz and Quick office are also expected to gain traction [7]. Mobile phone is widely used among student and staff application or service develop in university campus can be used in mobile device also which means every time we are connected to university campus. A university mini Facebook would be a great deal to share and update news among the student and staff.

## IX. SUGGESTED ACADEMIC CLOUD ENVIRONMENT

The study aims to suggest a cloud environment for academic purposes. Academic environment is where lots of computer is uses and many of them are not in use which lead to malfunction of computer and maintenance is highly complicated due to lack of staff.

The propose cloud computing environment will be of storage infrastructure, development platform, and software delivering. Changing of hardware resources and lots of storage capacity is required in academic environment computing lab [11]. Many universities and colleges started using thin client technology to reduce the cost but thin client is not suitable for high performance computing.

Office applications, programming language, and multimedia developing courses are not only for IT department but too many departments also. Also every year, the new versions of applications were used for courses with respect to the needs of industry. As a natural result of this progress, new software cause new hardware costs [11]. Installing and maintaining will be free from everyone. Whenever any new software appears many of hardware don't support and everyday many bytes of storage are required where loss of data is very high due to improper handling of computer by many student. Student mistakenly or unknowingly deletes other data.

By using cloud computing in academic environment collaboration among the staff and student will be more like using Google docs or any other private



collaboration design on office 635. Cloud Computing will be of great help. By giving a virtual machine to everyone and a secure password student and staff will work on their own virtual machine and if anything happens will only crash the virtual machine not the entire system.

Below Fig. 4 represents the proposed cloud computing for academic environment. By this way, lecturers will focus their basic tasks and not lose their workforce. With this cloud computing environment student can work from their lab as well from home. Where there data and application will be available always.

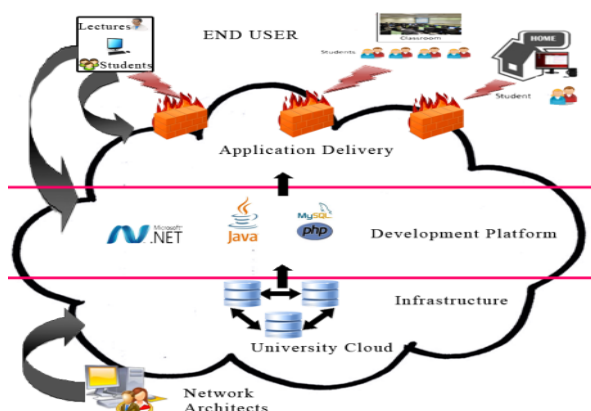


Figure 4: Academic Cloud Computing

Image source: [http://www.pixel-online.net/edu\\_future/common/download/Paper\\_pdf/ENT30-Erkoc.pdf](http://www.pixel-online.net/edu_future/common/download/Paper_pdf/ENT30-Erkoc.pdf)

## X. CONCLUSION

Cloud computing is a solution to many problem of computing. Even we are in IT ages complication of computing has created much disaster to computer world. Lots of crisis has happen in business world as well as in academic environment. Data security, storage, processing power is limited while using traditional computing. Data are also in risk and not available all time. But by using of cloud computing the entire problem is solve. Computer in academic environment must have the latest hardware and software. Due to cost many couldn't fulfill the availability of resource to student and staff by using cloud computing in academic environment we can solve all the issue. Cloud computing is new technology suitable for any environment.

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