Role of Cloud Computing in Higher Study

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Abstract— With the growing demand of higher education in IT services, institutions are adopting cloud computing technology to meet their needs. In traditional computing, we install software programs on computer, update the hardware as per our requirements. Documents that 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. This cloud computing is going to prove to be of immense benefit to students as well teachers due to its flexibility and pay-as-you-go cost structure. Cloud Computing provides resources and capabilities of Information Technology (e.g., applications, storages, communication, collaboration, infrastructure) via services offered by CSP (cloud service provider). Public cloud computing—delivering infrastructure, services, and software on demand through the network—offers attractive advantages to higher education. This computing approach is based on a number of existing technologies, e.g., the Internet, virtualization and grid computing. Higher Education Institutions have various departments and many students with up-to-date Hardware and software requirements ,cloud computing has the capacity of scaling and elasticity which is perfect for such an environment.

***Keywords*- Public Cloud Computing, Virtualization, Grid Computing, Web Services**

I. INTRODUCTION

Cloud computing as "a model for enabling convenient, on-demand access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned". Cloud computing is a new term in the computing world .Cloud Computing makes computer infrastructure and services available "on-need" basis. The quick development of cloud computing is being fuelled by the emerging computing technologies which allows for reasonably priced use of computing infrastructures and mass storage capabilities. The computing infrastructure could include hard disk, development platform, database, computing power or complete software applications. To access these resources from the cloud vendors, organizations do not need to make any large scale capital expenditures. Organization need to "pay per use" i.e. organization need to pay only as much for the computing infrastructure as they use.

Cloud Computing is accessing the services thru internet. Apart from IaaS, SaaS, PaaS, XaaS is possible in case of cloud. Users will be charged based on utility computing. Cloud uses virtualization as its key technology [1]. When end user submits their requirement a separate Virtual Machine is created to run their specific application. In a single host machine itself multiple Virtual Machines can be run to utilize the resources.

Cloud computing is becoming an adoptable technology for many of the organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. Cloud storage is provided storage services, storage services through the network data stored in local storage service provider to provide online storage space [2]. Furthermore, most of today's smart phones and tablet devices have good support for diverse networks and protocols. Thus, connectivity can be established between mobile participants via 4G, Wi-Fi, and Bluetooth [3]. And the generation of youth are almost sixty percent and they are used tablet, samrtphone etc. So in E-Commerce play an emerging role for on demand and online shopping site through customers. Physical machines may be dynamically allocated to virtual machines (VMs) which in turn may be migrated to other physical machines in case of machine faults. While this kind of flexibility increases availability and reduces cost, the highly dynamic nature in which VMs are allocated and migrated raises security concerns. Actually, Cloud computing is not a completely new concept. It has similar features as Grid computing that has been investigated for more than a dozen of years.

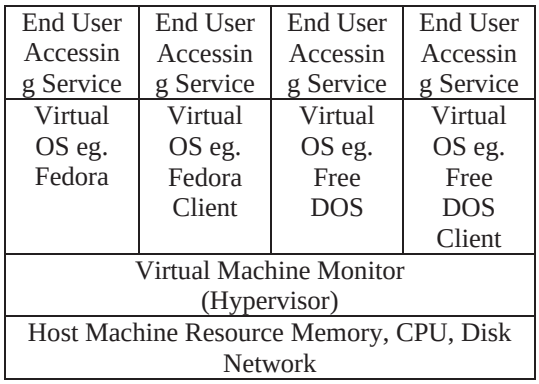

Figure 1: Visualization Technique

II. HISTORY OF CLOUD COMPUTING

The origin of the term *cloud computing* is unclear. The expression *cloud* is commonly used in science to describe a large agglomeration of objects that visually appear from a distance as a cloud and describes any set of things whose details are not inspected further in a given context.[5]

In analogy to above usage the word *cloud* was used as a metaphor for the Internet and a standardized cloud-like shape was used to denote a network on telephony schematics and later to depict the Internet in computer network diagrams. With this simplification, the implication is that the specifics of how the end points of a network are connected are not relevant for the purposes of understanding the diagram. The cloud symbol was used to represent the Internet as early as 1994,[6][7] in which servers were then shown connected to, but external to, the cloud.

The popularization of the term can be traced to 2006 when Amazon.com introduced the Elastic Compute Cloud.[8] In Early,1950s, The underlying concept of cloud computing dates to the 1950s, when large-scale mainframe computers were seen as the future of computing, and became available in academia and corporations, accessible via thin clients/terminal computers, often referred to as "dumb terminals", because they were used for communications but had no internal processing capacities. To make more efficient use of costly mainframes, a practice evolved that allowed multiple users to share both the physical access to the computer from multiple terminals as well as the CPU time. This eliminated periods of inactivity on the mainframe and allowed for a greater return on the investment.

In the 1990s, telecommunications companies, who previously offered primarily dedicated point-to-point data circuits, began offering virtual private network (VPN) services with comparable quality of service, but at a lower cost. By switching traffic as they saw fit to balance server use, they could use overall network bandwidth more effectively. They began to use the cloud symbol to denote the demarcation point between what the provider was responsible for and what users were responsible for. Cloud computing extends this boundary to cover all servers as well as the network infrastructure.[10] As computers became more prevalent, scientists and technologists explored ways to make large-scale computing power available to more users through time-sharing. They experimented with algorithms to optimize the infrastructure, platform, and applications to prioritize CPUs and increase efficiency for end users.[15]

In early 2008, Eucalyptus became the first open-source, AWS API-compatible platform for deploying private clouds. In early 2008, Open Nebula, enhanced in the RESERVOIR European Commission-funded project, became the first open-source software for deploying private and hybrid clouds, and for the federation of clouds.[11] In the same year, efforts were focused on providing quality of service guarantees (as required by real-time interactive applications) to cloud-based infrastructures, in the framework of the IRMOS European Commission-funded project, resulting in a real-time cloud environment.[12] By mid-2008, Gartner saw an opportunity for cloud computing "to shape the relationship among consumers of IT services, those who use IT services and those who sell them"[13] and observed that "organizations are switching from company-owned hardware and software assets to per-use service-based models" so that the "projected shift to computing ... will result in dramatic growth in IT products in some areas and significant reductions in other areas."[14]

In 2010, Rackspace Hosting and NASA jointly launched an open-source cloud-software initiative known as OpenStack. The OpenStack project intended to help organizations offer cloud-computing services running on standard hardware. The early code came from NASA's Nebula platform as well as from Rackspace's Cloud Files platform.[16]

In, 2011, IBM announced the IBM SmartCloud framework to support Smarter Planet.[17] Among the various components of the Smarter Computing foundation, cloud computing is a critical piece.

In, 2012, Oracle announced the Oracle Cloud.[18] While aspects of the Oracle Cloud are still in development, this cloud offering is posed to be the first to provide users with access to an integrated set of IT solutions, including the Applications (SaaS), Platform (PaaS), and Infrastructure (IaaS) layers.[18][19][20]

III. CLOUD COMPUTING

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. In cloud computing, the word cloud (also phrased as "the 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, a type of computing where unused processing cycles of all computers in a network are harnesses to solve problems too intensive for any stand-alone machine.

The goal of cloud computing is to apply traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second, in consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive computer games. Cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing.

IV. CLOUD COMPUTING LAYERS

Cloud computing is defined as delivery of hosted services over the Internet in an on-demand model. A cloud provider offers resources (hardware, software or development stacks) as services over the internet that can be consumed on a pay-as-you-use basis. The cloud offerings can be broadly divided into three categories. Vendors whose offerings fall into each of these categories call themselves providers of cloud services. Let us take a look at these layers keeping in mind that the definitions of each of these are still open to debate

Application Cloud – Software as a Service (SaaS)
"Software as a Service is the hosted delivery of Software that consumers can access over the internet." This definition is rather simplistic. By this definition web based email services such as Gmail, Hotmail etc are SaaS applications. Two features of a SaaS application are scalability and configurability. SaaS applications should be able to quickly scale with demand. In mature SaaS applications, the customer should be able to customize their instance of the software using meta-data. Depending on who you talk to multi-tenancy is yet another feature of SaaS applications. Multiple customers share a single instance of the software and the provider can optimize the resources to suit individual demands. Google Apps - a SaaS version of desktop applications where the software is hosted on google's servers. Salesforce - SaaS CRM products.

Platform Cloud – Plateform as a Service (SaaS)
Platform as a Service offers a complete platform and the tools to develop and deploy applications on the platform. Typically the PaaS vendors also provide tools and other services that enable rapid application development. Applications developed on the platform are tied to the platform. Each platform has its own development model (can be more aptly called quirks) and developers need to be aware of these.
App Engine is a PaaS offering from Google. Applications are developed and deployed on Google's infrastructure. Google App Engine uses big table to store data. This is an example of platform specific development, a change that

traditional developers will have to face when they move to App Engine. It does not support relational databases. Force.com is a PaaS offering from Salesforce. Developers can create applications that run on the force.com platform. It includes database, workflow and UI tools. Applications can be built using their proprietary Apex programming language or using Visual Force (a tag based markup language). Microsoft Azure is Microsoft's platform as a service offering. It includes an OS with .NET runtime, a database (SQL Azure) and other services that make it easier to couple on-premise and off-premise applications.

Infrastructure Cloud- Infrastructute as a service (IaaS)
Infrastructure as a Service is the hosted delivery of infrastructure services such as servers, networks and other hardware to consumers. IaaS provides consumers access to on-demand, scalable storage and compute power. **Amazon EC2** is an example of IaaS which provides scalable compute capacity in the cloud. Basically, consumers get a machine that they customize and use. This is an example of hardware as a service.

A different way to think about the different layers of cloud computing is to think in terms of control that the customer has has:

- With SaaS you use the application with little customization.
- With PaaS you create applications that run on the platform. You are limited by the platform as to what applications you can create.
- With IaaS you build applications without any tie in to the platform.

V. USAGES OF CLOUD COMPUTING

There was a time when, to use files (word processing files, spreadsheets, etc.) on different computers. Cloud computing is a new business model wrapped around new technologies like virtualization, SaaS and broadband internet. The safety, stability, and ease-of-use of cloud computing in education is resulting in widespread adoption in educational institutions of all sizes and types. loud computing entails using a network of remote servers hosted on the internet as opposed to a local server. This helps cut IT costs as well as simplifies content management processes for schools and educational systems. The results of a survey that have been completed in 2009 by Gartner analysts (Figure 1) about the IT trends (especially cloud computing) show that it is being used more in the areas of finance and business when compared to other sectors.

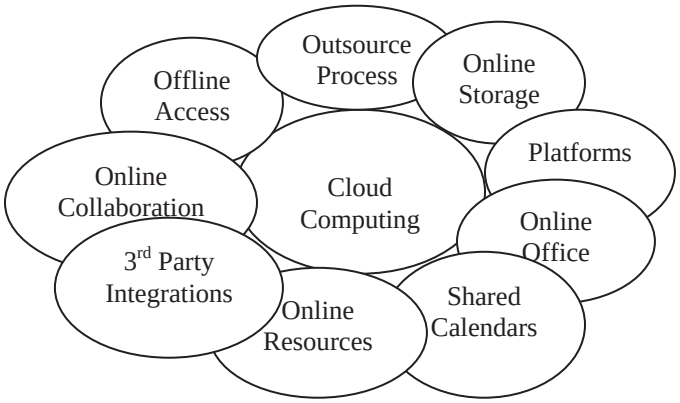

Figure 2: Cloud Usage

1. Back Up An important function of the Cloud is that it automatically saves content, making it impossible to lose or delete any valuable material. This means that even if a computer crashes, all documents and content will remain safe, saved, and accessible in the cloud.
2. Storage The Cloud allows its users to store almost all types of content and data including music, documents, eBooks, applications, photos, and much more. We share the information of Attendance and Assignment in our Institute of students in Google doc and share all the information of students on doc via using an ERP Software and utilize the cloud resources.

3. Accessibility Any data stored in the Cloud can easily be accessed from almost any device including mobile devices such as phones or tablets. In our institute an URL provide to the students for accessing the data inside the campus or outside the campus.
4. Collaboration The Cloud allows multiple users to work on and edit documents at the same time, it enables effortless sharing and transmission of ideas. It also provides the security to edit only those people who gain the right from admin. With this feature, group projects and or collaborative lesson plans can be optimized for both teachers and students.
5. Resource and Time Conscious With the availability of content online, it is no longer necessary for teachers to spend time and resources printing or copying lengthy documents or lesson plans. Now, students are able to access homework assignments, lesson notes, and other materials online like ERP Systems of education institute and parents also see the details of the students. Cloud can be used in underdeveloped or emerging countries creating a way of being able to teach children who would not ordinarily have access to education. Students and teachers can share their work without having to use paper. Using paper is costly both to the environment and in monetary terms and is therefore no longer a viable way to educate.

VI. BENEFITS OF CLOUD COMPUTING

No more carrying around devices, such as thumb drives or CDs. You don't need to worry about losing the device, breaking the CD, or not having your information load properly.
Easy access! Lesson plans, labs, grades, notes, PowerPoint slides – just about anything digital that you use in teaching is easily uploaded and accessed anytime.
Stability: cloud computing is now to the point of being a very stable technology that you can rely on.
Security: Your data, content, information, images – anything you store in the cloud usually requires authentication (ID and password, for example) – so it is not easily accessible by anyone. In addition, should something happen to the technology at school, your content will still be available to you and your students if it is stored elsewhere.
Shareability: Working on an instructional assignment with other teachers? You can share some or all of your files that you have stored in the cloud. No more obtaining an extra thumb drive or burning another CD or DVD. You just need to send a link to the file(s) destination.
Trackability: Make changes to a lesson and want to change it back? No problem. Cloud computing will save multiple revisions and versions of a document so that you can chronologically trace back the evolution of an item.
Collaboration: You can set-up various student groups to work on projects and assignments in the cloud.
Good-bye copier! That's right! With cloud computing, the amount of photocopying is reduced significantly – even more so if each student has their own smart device (computer, laptop, tablet, etc.). Quizzes, tests, assignments all can be taken, scored, shared with student and parents, and stored.
Good-bye file cabinets! With cloud computing redundancy, there is no longer the need to both save files digitally as well as in paper format. Cloud computing systems are regularly backed-up, so the chances of losing content are quite small. And, no more file cabinets means more classroom space for you and your students! - See more at:

In the early 1980s, There are some instances where paper is still the preferred format. Even though we have e-books, people still prefer to hold an actual paper book in their hand. There are situations, however, that going digital makes sense. Classroom and school administrative management is a perfect example. If your school has information technology infrastructure (wired and/or wireless), it is easy to implement cloud computing. And, the advantages of cloud computing far outweigh any disadvantages. From the administrative perspective:

- Staff and teacher time spent printing, filing, and distributing can be better used on more educationally-directed activities that impact student learning.
- Cost savings in terms of buying, leasing, and maintaining photocopiers and printers, ink cartridges, and paper.
- Return-on-investment by not needing to invest in purchasing, housing, and maintaining servers, software, and related IT items, such as thumb drives, and CD-ROMs.
- Greater efficiencies as teachers and staff can easily access documentation anytime, anywhere without needing to rely on someone being at their desk to sign-out a paper file.
- Streamlined workflow: Workflow can be tracked using various analytical tools to see how often files are accessed, busiest times of the day and days of the week, etc.

- Short learning curve: It does not take long – a few hours (if that) – to learn how to manage digital documents in the cloud.

Going from paper to digital requires a big leap of faith. We want to hold onto that paper item because we can feel, see, and touch it – something not available with a digital object. However, think of it this way. Let's say you store your documents in the cloud and back it up in paper format. Along comes a major hurricane and wipes out the paper, yet the digital items are safe and sound and easily accessible because they are stored in a secure environment. No need to worry about having to try and replicate all those paper documents – a task that would literally be impossible to accomplish.

VII. CLOUD COMPUTING CHALLANGES

The reason for the success of Cloud computing lies in its easy-to-use computing model and the benefits it brings to the users. Cloud computing has emerged as an important solution offering enterprises a potentially cost effective model to ease their computing needs and accomplish business objectives. Some features of cloud computing are:

Optimized Server Utilization As most enterprises typically underutilize their server computing resources, cloud computing will manage the server utilization to the optimum level.

On-Demand Cloud computing provides users with customized environments that are tailed to individual requirement. This feature is more user friendly than Grid computing where the application has usually to be adapted to the target architecture.

Dynamic Scalability Many enterprises include a reasonably large buffer from their average computing requirement, just to ensure that capacity is in place to satisfy peak demand. Cloud computing provides an extra processing buffer as needed at a low cost and without the capital investment or contingency fees to users.

Disaster Recovery It is a concern of enterprises about the resiliency of cloud computing, since data may be commingled and scattered around multiple servers and geographical areas. It may be possible that the data for a specific point of time cannot be identified. Unlike traditional hosting, the enterprise knows exactly where the location is of their data, to be rapidly retrieved in the event of disaster recovery. In the cloud computing model, the primary CSP may outsource capabilities to third parties, who may also outsource the recovery process. This will become more complex when the primary CSP does not ultimately hold the data. The Cloud technology is currently still in the development phase. As the sensitive applications and data are moved into the cloud data centers, run on virtual computing resources in the form of virtual machine. One of the most significant advantages to cloud computing is how it changes disaster recovery, making it more cost-effective and lowering the bar for enterprises to deploy comprehensive DR plans for their entire IT infrastructure.

Cloud Computing delivers faster recovery times and multi-site availability at a fraction of the cost of conventional disaster recovery. With cloud computing, warm site disaster recovery becomes a very cost-effective option where backups of critical servers can be spun up in minutes on a shared or private cloud host platform. Applications and servers that are deemed less critical in a disaster can be tuned down with less resources, while assuring that the most critical applications get the resources they need to keep the business running through the disaster[4].

VIII. SECURITY ISSUES

In cloud computing we are saving our important and crucial data in one place and it will be easy for hack Protection of data is a major security issue. Educational Institutions may consider that their data is more secure if it is hosted within the institution. Transferring data to a third party for hosting in a remote data Centre, not under the control of the institution on and the location of which may not be known presents a risk. Some cloud providers now provide guarantees in their contracts that personal data will only be stored in particular countries. It has been suggested that the provision of cloud services through a single provider is a single point of failure and that it would be better to contract more than one cloud provider in order to minimize risk. Another security issue is Unsolicited advertising in which cloud providers will target users with unsolicited email or advertising[21].

IX. CONCLUSION

Cloud computing in higher studies open avenues for better research, discussion and collaboration. It also provides a software desktop environment, which minimizes hardware problems. Cloud computing also enables classes to be run on remote locations. Many institutes have moved their resources online with libraries filled with hundreds of thousands of books that students can access at any time. It will expand a lot within the coming few years. Some problems such as platform security, technical standards, regulatory and other services are not well resolved yet in practice, pending further research and exploration. Either way, e-learning application model based on cloud computing will not stop its pace to proceed. As the cloud computing technologies become more sophisticated and the applications of cloud computing become increasingly widespread, e-learning will certainly usher in a new era of cloud computing.

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