Scope of Cloud Computing in Education Sector: A Review

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Abstract - **Education has a pivotal role in the economic growth of a country. Nowadays, educational institutions are exploring new ways to provide effective teaching to their students. One such technique which is largely being incorporated in the teaching process is cloud computing. Cloud computing helps deliver quality education by providing latest infrastructure in terms of hardware and software. But there are certain issues that need to be taken care of while implementing cloud computing in education sector. This paper attempts to discuss both the pros and cons of using cloud computing in education.**

Keywords – benefits, challenges, cloud computing, education, services

I. INTRODUCTION

Cloud computing is the buzz phrase nowadays which is finding its application in almost every area including education. Broadly speaking, cloud is an on-demand computing service, available to anybody with an internet connection. NIST (US National Institute of Standards and Technology) defines cloud computing as; "A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (eg networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction"[4].

The cloud computing market is projected to grow from $40.7 Billion to $240 Billion in 2020 [6]. Cloud computing provides networks of data centers / storage systems, remote servers to multiple customers that can be dynamically allocated depending upon the demand. Customers can, according to their requirement, increase or decrease the use of resources and the best part is they pay only for the services which they use. Hence cloud computing gives the impression of infinite scalability to its users. Cloud computing has totally transformed the thought process related to data storage and access, communication, computation and collaborative work. And education sector is rapidly recognizing the huge benefits that cloud computing offers.

Today, education is heavily dependant on Information Technology in terms of content delivery communication and collaboration. Teaching is now not just confined to classroom with students demanding more Information Technology services from their respective institutions. Moreover, the rate at which IT technology is changing has put an additional financial burden on the institutions. Continuous upgrades in hardware and software are difficult to procure and maintain but also require skilled personnel to operate them which further incur cost to the institution. Cloud computing not only provides solution to these problems but also presents numerous other benefits which go a long way in imparting quality education with lesser resources at affordable prices. Students, teachers, parents can access information using any device from anywhere.

II. TYPES OF CLOUD SERVICES AND THEIR IMPLEMENTATION IN EDUCATION SECTOR

Cloud computing services are categorized into three different levels:

2.1 Infrastructure as a Service (IaaS)

Here basic computing resources like storage and processors are available to consumers on rent basis. This service is a great boon for the educational institutions since they can have access to an awesome computing power without the need to install new hardware, hence providing cost effectiveness. Amazon Elastic Cloud is an example for IaaS.

2.2 Platform as a Service (PaaS)

Here, customers can develop new applications using the platform provided by the service provider. In the nutshell, PaaS is the operating environment in which students and teachers can run their applications; hence the need to buy and manage the associated hardware and software is eliminated. Examples are google Apps Engine, Amazon's Relational Data Services etc.

2.3 Software as a Service (SaaS)

Education is believed to be benefitted the most from this service. This service provides software usage to its customers. Based upon the need, the user can choose his/her software from the lot provided by the service provider. Here not only data is stored but the applications as well. Students and staff can access special

software required to run experiments without putting any financial burden (involved in procurement of these softwares) on the institution. Examples are Google Apps for Education and Microsoft Live@edu.

III. BENEFITS OF CLOUD COMPUTING TO EDUCATIONAL INSTITUTIONS

Some of the major advantages of implementing cloud computing in education sector are listed below:

3.1 Personalized Learning

Cloud computing offer unlimited choice in learning for students. Students are exposed to a wide variety of resources and software tools, providing a flexible and an enriched environment.

3.2 Economies

Continuous upgrades of software and hardware are putting an inevitable pressure on the budgets of educational institutions. In such a situation, cloud computing comes to rescue. Cloud computing provides hardware and software computing and other resources on pay per use basis which enables educational institutions to accelerate the use of new technologies and focus on imparting quality education.

3.3 Elasticity and Scalability

The major benefit of cloud computing is that consumers are not confined to a particular set of resources. Educational Institutions can begin with small scale services and then gradually build them up without bearing any significant rise in investment cost. Institutions can scale up to more resources or storage when user load increases or scale down when the need shifts.

3.4 Accessibility

Users can access resources 24/7/365 from anywhere. This is possible due to quality service provided by superior resources and skills.

3.5 Lesser Carbon Imprint

Cloud computing enable educational institutions to reduce power consumed by them. This in turn leads to lesser carbon emissions. Moreover, cloud providers are making sincere efforts to create eco-friendly data centers which will further reduce carbon emissions.

3.6 Standardization

Cloud computing provides software standardization for use by educational institution individually or district wide. For example an institution can develop its own set of applications/solutions and reuse them several times. This will result in lowering of cost and increase in reliability and reduction in implementation time.

IV. CHALLENGES TO CLOUD COMPUTING FOR EDUCATION

There is no doubt that cloud computing opens up a world of opportunities for educational institutions. But nonetheless, there are concerns which cannot be ignored. Like all the new technologies, cloud computing also faces certain challenges which need to be overcome in order to fully exploit its benefits.

4.1 Security

The major concern for any educational institution is the security of data. In cloud computing, important and crucial data is stored in one place and hence prone to hacking [1]. A survey of chief Information Officers and IT executives by IDC (International Data Corporation) rated security as their main cloud computing concern [2]. Cloud computing seems risky because its perimeter cannot be secured [3]. Institutions consider data to be more secured if it is hosted within the institution instead of any remote data center, not under their control and whose location is unknown. Cloud services by educational institutions will have to wait until the legal issues related to security of data are fully addressed.

4.2 Compliance Issue

Several cloud providers have set up their data centers across the world, which expose the data to several risks legally and practically. In a shared services environment, institutions do not know or control as to where their important data is stored and accessed by whom. In such a situation, data residing in foreign countries may be more readily subject to seizure and disclosure [5]. UK's Data Protection Act (DPA) 1998 prohibits the transfer of data outside the European countries [2]. Hence, the cloud providers are left with no choice other than setting up a data center within the country to comply with the regulations. This may pose as a big challenge for the cloud providers.

4.3 Lock-in

Currently most of the cloud providers offer their services through proprietary APIs (Application Programming Interface) [2]. These results in lack of interoperability as a universal set of standards and interfaces have not yet been defined. Institutions are at a risk of vendor lock-in wherein they get associated with the products of a particular vendor. If some other cloud provider comes up with a better product, it would be quite difficult for the institution to migrate from its current widely used system to a totally new system. This would also impose significant financial burden on the institution.

4.4 Reliability

Since the cloud providers use their resources to the maximum advantage, this sometimes results in unexpected failure of the

system. Amazon's S3 (Simple Storage Service) and EC2 (Elastic Compute Cloud) suffered a 3 hour outage in February 2008. Later in July, the same year, S3 again suffered an 8 hour outage. In early 2009, Google's Gmail went down for 3 hours, thus preventing its 113 million users from accessing their emails or the documents which they store online as "Google Docs" [2].

V. CONCLUSION

Cloud computing has evolved as a technology which strictly works on pay-as-use basis. This technology is extremely beneficial in terms of cost for the educational institutions, which otherwise would have to spend a hefty amount in procuring latest hardware and licensed software. One can view cloud computing as an empowering tool which helps institutions create an enriched learning experience for the students and that too at a very affordable price. But cloud computing does come with problems too. The issues of security, reliability, interoperability are some of the major problems that need to be dealt with if cloud computing is to be implemented in education sector.

REFERENCES

[1] Kiran Yadav, "Role of Cloud computing in Education", International Journal of Innovative Research in Computer and Communication Engineering, Vol 2, Issue 2, February 2014

[2] Nabil Sultan, "Cloud computing for Education: A new dawn", International Journal of Information Management 30 (2010) 109-116

[3] www.microsoft.com/educloud

[4] Mell, P., Grance., Final Version of NIST Cloud Computing Definition, NIST, 2011, http://www.nist.gov/itl/csd/cloud-102511.cfm (25.01.2013)

[5] Karla Hignite, Richard N Katz, Ronald Yanosky, Shaping the Higher Education Cloud", An EDUCAUSE and NACUBO White paper, May 2010

[6] Stefan Ried, Holger Kisker, "Sizing the Cloud", Forrester Research, April 21, 2011