CLOUD COMPUTING IN EDUCATIONAL RESEARCH

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Abstract: Cloud computing, a fast advancing technique in IT has conveyed new change and prospects to the field of information technology as well as education. Education plays a critical part in the monetary development of a nation. Cloud computing is an incredible option for educational institutes, which are particularly facing deficiency of funds. Such institutes can fulfill their IT needs without spending money for buying PCs and networking hardware. These days, the institutes are focusing on exploring new methods to make teaching more effective and cloud computing is one of those techniques which is to a great extent being fused in field of education for this purpose. Cloud computing provides infrastructure which helps in enhancing the quality of education in educational institutes. Still there are some weaknesses that should be dealt with while executing cloud computing in educational institutes. This paper is an attempt to analyze the significance of cloud computing in Indian education system.

Keywords: Cloud Computing, Education, e-learning

1. Introduction

Indian educational framework traditionally takes into account the grades and numbers. However, practical knowledge, experience and analytical thinking are essential to survive in today's competitive world. In schools, colleges and even in the universities, the contemporary education system has failed to deliver. Due to the new techniques, it has become possible to demonstrate things practically utilizing presentations and animations, making it simple to envision the things now. One of the biggest achievements of this era is Cloud Computing. Using this technology, education can reach to masses even in far flung areas. Cloud computing can be utilized to construct a high quality education system.

Cloud computing is a sort of computing which is exceedingly versatile and use virtualized assets that can be shared by the clients [Ercan, 2010]. Clients need not bother about background information about the services. An Internet user can interact with multiple servers at a time and the servers can also trade data with each other [**Hayes, 2008**]. Cloud Computing is one of the latest innovations which have a visible effect on the education environment. Senior executives who head their respective departments face the issue of upgrading their IT operations to uplift their departments in order to cope up with ever changing trends in technology so that they can achieve their organizational goals. Rising demands are compel IT personnel to go for better alternatives to reallocate their constrained resources to provide improved services to their clients. Therefore, they need to depend intensely on third party services to expand their in-house abilities and fulfill the requirements of their clients.

2. ROLE OF CLOUD SERVICES IN FIELD OF EDUCATION

Various Cloud services and their role in the field of education are listed below:

2.1 Infrastructure as a Service (IaaS)

The customers are rented the primary resources like storage space and processor etc. This service provides an extraordinary aid in the field of education as educational institutes can access a great computing power without installing new hardware, consequently giving cost viability. An example for IaaS is Amazon Elastic Cloud.

2.2 Platform as a Service (PaaS)

Here, the service provider provides a platform to customers for developing new applications. In short, PaaS provides a platform that is used by teachers and students to run their applications; thus, they need not purchase the related software and hardware and can use cloud infrastructure for this purpose. Google Apps Engine, Amazon's Relational Data Services are some examples of PaaS.

2.3 Software as a Service (SaaS)

This service has great application in the field of education. It gives software usage to its clients. The client can pick the software from various options given by the service provider according to his/her need. Here data as well as applications are stored. Teachers and students get access to particular software based on their need without putting any budgetary burden on the institute. Google's Education Apps and Microsoft live@edu are best examples for PaaS.

3. DEPLOYMENT MODELS

The cloud space is quickly receiving a plenty of new short structures and expressions to assign diverse parts of the offering, which is the bringing revolutionary changes in the Internet. The National Institute of Standards and Technology (NIST) definitions given below are utilized for deployment models:

3.1 Private cloud

Such cloud works exclusively for a particular institute. It might be maintained by the organization itself or some third party and may exist in camps or outside the campus.

3.2 Community cloud

Various organisations can share the cloud infrastructure. Community cloud provides support to a particular community having same interest (e.g., mission, security prerequisites, etc). It might be overseen by the organization itself or an external entity and may exist on camps or off campus.

3.3 Public cloud

This cloud infrastructure provides service to general public or a substantial industrial group. The ownership of such cloud resides with the association offering cloud services.

3.4 Hybrid cloud

Such cloud is an organization of two or more clouds (private, community, or public) that while remaining distinct parts yet are integrated by institutionalized or exclusive technology which empowers portability of applications and data. (For example, cloud blasting used to adjust load among clouds).

4. ATTRIBUTES OF CLOUD COMPUTING

The five attributes given below, as characterized by NIST, are viewed as fused in the cloud computing services [**Mell and Grance, 2011**]

4.1 On-Demand Self-Service

Clients can consequently procure computing abilities and resources as and when required on their own without requiring third person intervention.

4.2 Broad Network Access

The network provides access through standard equipments. For example, phones, laptops, PDAs, and so forth.

4.3 Resource Pooling

Using a multi-tenant model, pooling of various resources is done to provide service to various customers at the same time. These resources include network bandwidth, virtual machines, processing power, storage capacity, etc. That is; virtual and physical resources are powerfully allocated and deallocated taking into account needs and requests by the clients

4.4 Rapid Elasticity

Resources and capabilities can be rapidly and automatically assigned and scaled at any time and in any quantity depending upon the demand and needs of the customers.

4.5 Measured Service

Automatic monitoring of the use of resources and services by customer is done. Controlling and reporting offers transparency for the client as well as vendor.

It is necessary to comprehend that the service models, deployment models and the five attributes of cloud computing as depicted by NIST do not run autonomously however are fundamentally integrated and associated with each other. This visual exhibits that a cloud-based technique can provide various configurations based upon the organisational needs. It is not phenomenal for institutes' to start with one service model, for example, SaaS and a Public Cloud deployment model as a pilot, and after that gradually scale if the pilot model is proved to be effective. It is additionally conceivable to utilize various deployment models to bolster one or more service models.

5. ADVANTAGES OF CLOUD COMPUTING IN EDUCATIONAL INSTITUTES

Various benefits of executing cloud computing in educational institutes are illustrated below:

5.1 Personalized Learning

Cloud services provide diversity in learning to students. A dynamic and effective learning environment is provided to students by exposing them to various resources and software tools.

5.2 Economies

Need of consistent software and hardware updates put an inescapable burden on the financial plans of institutes. In these circumstances, cloud computing acts as the savior. Cloud computing empowers educational institutes to go for the implementation of new technologies and concentrate on improving the quality of education by providing them hardware, software and other resources on pay-per- use basis.

5.3 Elasticity and Scalability

The significant advantage of cloud computing is that clients are not limited to a specific domain of resources. Institutes can start with services on a small scale and after that slowly enhance them without putting much financial burden on themselves. Institutes are provided flexibility by giving them option to upgrade to more resources if the load increases or scale down if the load decreases.

5.4 Accessibility

Clients can get to resources from any place day in and day out and throughout the year. This is conceivable because of the high quality services provided by high quality resources.

5.5 Lower Carbon emission

Cloud computing empower organizations to cut down their power usage. It reduces the carbon emissions. In addition, cloud service providers attempt to establish eco-friendly data centers that will save environment.

5.6 Standardization

Cloud computing gives provisions for standardizing software to be used by educational institutes exclusively or district wide. For instance, an institute can build up its own application and reuse it again and again. This will bring down expenses, enhance the reliability and reduce the implementation time.

6. CHALLENGES TO CLOUD COMPUTING FOR EDUCATION

It is certain that cloud computing provide great opportunities in education sector. Yet there are issues which cannot be disregarded. As all the new technologies do, cloud computing also likewise confronts various difficulties, which should be overcome to make full use of its advantages [**Anand and Kamayani, 2015**].

6.1 Security

Security of data is the most important issue for an educational institute. In cloud computing, there is centralized storage of sensitive and vital information, therefore prone to hacking [**Yadav, 2014**]. A survey conducted by IDC (International Data Corporation) on IT executives appraised security as their principal cloud computing issue [**Sultan, 2010**]. Cloud computing appears to be unsafe on the grounds that its border can't be secured. Organizations consider information to be safer if it resides inside the organization rather than any remote location which is not under their supervision and whose location is obscure. Implementation of cloud services in educational institutes is not feasible until the lawful security issues identified are not completely resolved.

6.2 Compliance Issue

In cloud computing, decentralization of data centres all around the world make the data prone to several risks. In a distributed service environment, institutes are not aware of the fact that where their important information is stored and who has access to their information, moreover organizations cannot control their data. In such circumstances, information stored in remote nations might be more promptly prone to hacking and exposure [**Hignite et al., 2010**]. UK's Data Protection Act (DPA) 1998 restricts the exchange of data outside the European nations [**Sultan, 2010**]. Henceforth, the cloud service providers have no decision option other than setting up data centers inside the nation in order to abide by the directions. This may act like a major test for the cloud providers.

6.3 Lock-in

Now the exclusive Application Programming Interface is provided by cloud providers to provide their services [**Sultan, 2010**]. These outcomes in absence of interoperability as an all-inclusive set of norms and interfaces have not yet been characterized. Organizations face the problem of vendor lock-in wherein they are bound to the products given by a specific seller. If another cloud provider provides better services, it would be very troublesome for the organization to move from its current presently` utilized framework to an absolutely

new system. This would likewise force critical monetary burden on the institute.

6.4 Reliability

The money-making tendency of cloud providers make them utilize their resources to their maximum capacity, this occasionally brings about failures in the system. In February 2008, Amazon's S3 and EC2 went through a 3-hour blackout. Later in July 2008, S3 once again endured an 8-hour blackout. In mid-2009, Google's Gmail went down for 3 hours, depriving its 113 million clients from getting their mails and access to their online documents stored as "Google Docs" [**Sultan, 2010**].

7. TRENDS OF CLOUD COMPUTING TECHNOLOGY FOR E-LEARNING SYSTEM

Cloud computing providing E-learning solutions to Academic Institutions [**Rani & Singh, 2015**]:

Infrastructure: It can be utilized as an e-learning framework by using supplier's Infrastructure.

Platform: It can be utilized as an E-learning system by utilizing provider's interface.

Service: It can be utilized as an E-learning framework by using provider's services.

Cloud computing creates a parallel and distributed infrastructure which is suitable for education sector. Some suitable trends available in E-learning system are:

Content Management: It becomes easy for teachers and students to access data and learning resources if they are arranged in systematic manner. Cloud helps the educational institutes in systematically gathering educational material and arranges it in an effective manner as contents are arranged and put away in partitions [**Hayes, 2008**].

Management of Educational Resources: With the amalgamation of cloud computing with distributed computing, Educational material is accessible anytime anywhere. This innovation improves the collective resources process.

Correspondence Management: Cloud computing provides services like E-mail, workshops, seminars, conferences on remote servers.

Management of Learning Activity: Management of learning activities of students like study pattern and individual models becomes easy with the help of cloud computing. By this, students are given opportunities to improve their study pattern and searching techniques thus properly managing their learning activity [**Zhang et al., 2010**].

Administration of Access: A service provider interacts with teachers and students by using internet and provides a vast variety of resources and study material

8. CONCLUSION

Cloud computing has emerged as an IT innovation which entirely deals with the principle of pay-as-use. This innovation has proved to be cost effective to a great extent for the educational institutes, which generally would need to spend a robust sum in acquiring latest equipments and licensed softwares. Thus, cloud computing is a milestone in the field of IT that helps institutes in developing an enhanced learning environment for the students and that too at an exceptionally reasonable cost. However, cloud computing comes with some issues as well. The problems related to security, reliability, interoperability are some issues that should be managed if we want to use cloud computing in education sector.

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