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Effective use of Cloud Computing in Educational Organizations

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Abstract:- When people discuss about the new technologies evolved in IT field, one of the technologies comes to their minds is Cloud Computing. Cloud Computing is a recent technology emerged in IT field and has been spread widely over the world. It is an internet-based computing service on-demand. One of the main uses of Cloud Computing is in the educational field. This technology helps the educational institutes to easily shift from traditional teaching methods and ways into modern and sophisticated teaching. It offers attractive advantages to higher education. This paper mainly focuses on security and usefulness of cloud computing applications in educational field. This also focus on historical view of Cloud Computing, implementation of various service models like Infrastructure as a service(IAAS), Software as a service (SAAS) and Platform as a service(PAAS) as per education institutions' requirement. As well as it considers the challenges and barriers of cloud computing in educational field.

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1. INTRODUCTION

Nowadays maintaining education quality has become the main concern of most of the academic institutes. Many researches revealed that the quality of education can be improved by implementing and adopting different technologies to achieve better quality of teaching outcomes. One of these technologies is cloud computing.

Cloud Computing is an Internet-based distributed computing technology that provides the users of this technology with storage, software, infrastructure, platform on-demand as a service. The users of this facility have to pay according to their consumption. It is considered as a facility to enable the users to get the computing services with less complexities of computing resources. This paper discusses the following: section one will brief the historical view of cloud computing. Second section will explain the different layers of cloud computing. Third section will list the benefits of adopting cloud computing in academic institutions. Fourth section will discuss the different challenges and barriers face the academic institutes when implementing the cloud computing.

2. HISTORICAL VIEW OF CLOUD COMPUTING

This section will focus on the evaluation of cloud computing over the year.

The cloud computing concept is dated back to 1961 when John McCarthy opined that "Computation may someday be organized as a public utility" [1]. The term cloud had come into commercial field in early 1990s and applied to ATM (Asynchronous Transfer Mode) Networks [1].

In the beginning of 21st century, the term cloud computing appeared widely to the public where the most focus that time was restricted to software as a service (SaaS).

In 2000s, Microsoft extended SaaS through developing web services [1]. In 2007, Google, IBM and number of different universities started large scale cloud computing research project [1]. The figure below illustrates the popularity of cloud computing in comparison to some different technologies including "Grid Computing" and "Cloud Computing" [2].

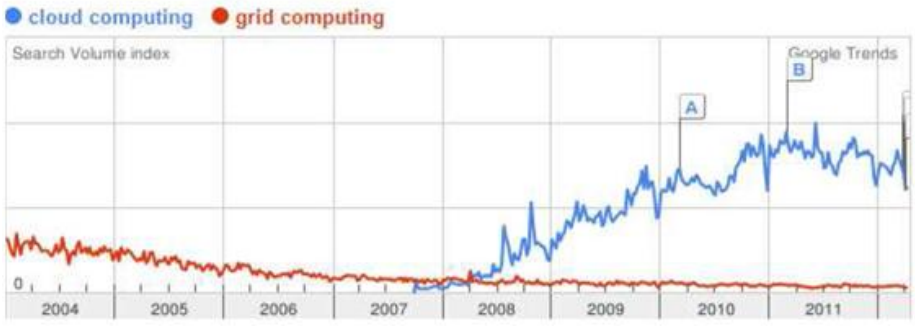

Fig1. Cloud Computing vs. Grid Computing

As shown above in the graph, the term cloud computing was not presented before 2007. In mid of 2007, cloud computing started its raise when grid computing was slightly decreased and keep decreasing among the years while cloud computing has recorded a sudden increase in ends of year 2008 and keeps increased till the date.

In 2006 Amazon started to provide the service of cloud computing in a form of S3 (Simple Storage Service). The service allowed the users to store & retrieve the data anywhere, anytime through the internet. The service was fast, secure, reliable, highly scalable and inexpensive [3].

In 2007, Facebook provided tools based on cloud computing which enable users to create social experiences for global audience [4].

The figure below illustrates the cloud computing history.

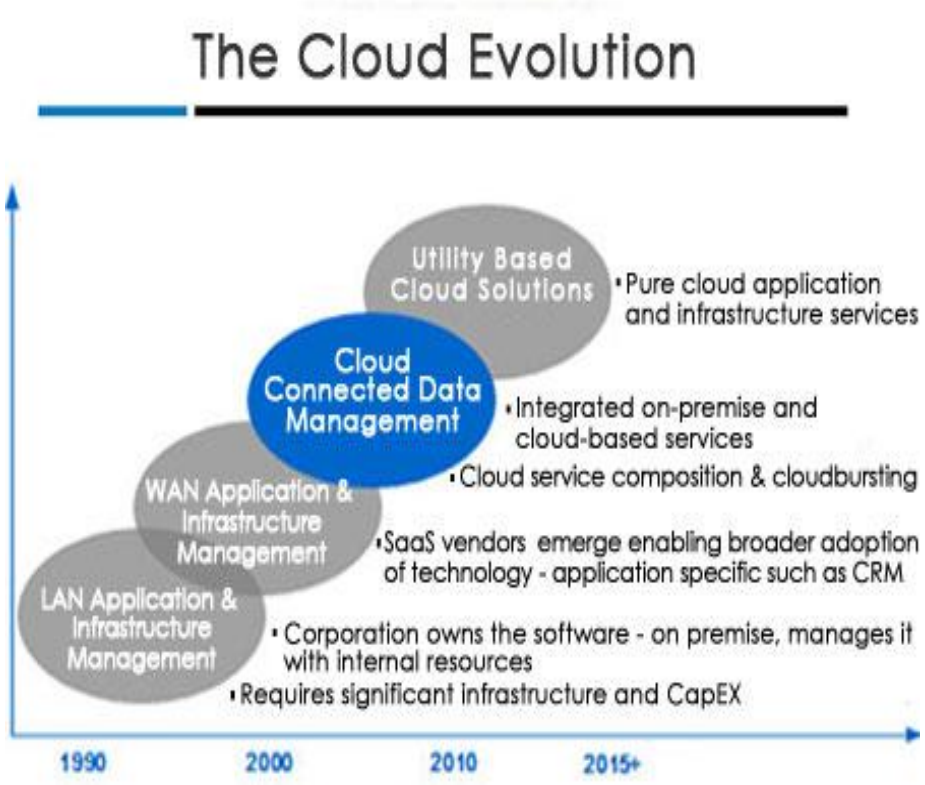

Fig2. The Cloud Evolution

3. WHAT IS CLOUD COMPUTING?

Cloud Computing defined by National Institute of Standards and Technology (NIST) as a model for enabling convenient, on-demand access to a shared configurable computing resources (e.g.: Network storage, servers, applications, services, etc.) [5].

Cloud Computing is an Internet-based distributed computing technology that provides the users of this technology with storage, software, infrastructure, platform on-demand as a service. The users of this facility have to pay according to their consumption [6].

Overall, cloud computing is the facility which enables the users to get the computing services with less complexities of computing resources.

4. MODELS OF CLOUD COMPUTING (LAYERS).

In order to deliver the required service to the users of cloud computing, it is divided into three main models or layers. The following section will illustrate the three layers of cloud computing:

- **Infrastructure as a Service (IaaS):**
  It is considered as the lowest layer and the basic layer of computing resources. It provides users with full infrastructure required to accomplish their functions. For example: servers, software, storage are considered as a network infrastructure and the customer can rent such facilities. This layer enables the users to manage and configure the cloud servers in the same way as they have it physically. This

facility will reduce the overload of maintenance, upgrading software and purchasing the latest technology. Elastic Cloud Computing (EC2) from Amazon is an example of IaaS.

- **Software as a Service (SaaS):**
  The users may require to access or use particular software, so, instead of installing such applications, they can request the cloud providers to provide the software which can be accessed through the networks from various clients such as: web browsers, PDA, etc. One example of SaaS is Google Mail and Google Docs. Another example for SaaS is Customer Relationship Management (CRM) from Salesforce.com where the users don't need to configure or install any particular application but instead; they can access the app online and pay for their consumption only [7].
- **Platform as a Service (PaaS):**
  It is the next level up of cloud services. The service allows users to install their own application using a platform specified by the service provider [10].

5. CLOUD COMPUTING IN EDUCATIONAL FIELD

According to [8], IT companies encourage the academic institutions to adopt the cloud computing by providing them with cloud-based services e.g. Google Apps for Education. It includes Google Mail, Calendar, Talk Docs, sites and video with zero cost. Moreover, IBM has established "IBM Cloud Academy" which provides a global forum for educational cloud computing initiatives.

Recently, many academic institutions started to recognize and understand the usefulness of using and applyingcloud computing as one of teaching technologies to follow [9].

- **Benefits of adopting Cloud Computing in educational field**
  Recently, many educational institutes begun to apply cloud computing in their institutes by outsourcing the students' emails. This is done because email service can be easily controlled and provided by a third party. Google and Microsoft offer mail services for free to educational institutes [10]. Google Apps and Microsoft live @edu contains different communication tools such as instant messages, contact management and calendar software. Furthermore, there are some document creation applications allow users to produce word processed documents, spreadsheets and presentations.

Some educational institutes nowadays are using cloud computing for hosting their Learning Management Systems (LMS) in the cloud. This helps the institutes to reduce the costs of purchasing, maintaining and supporting of hardware and software [10].

The following will explain and illustrate the major benefits of cloud computing for the academic institutions and their students:

- **Cost Saving:**The main advantage of applying cloud computing is cost factor. When outsourcing different services such as email service for free, this will save the cost of hosting the service in-house.
- **Flexibility:**Cloud computing allows Higher Educational Institutes (HEIs) to begin with small-scale services and grow up the services slowly without any extra expenditures. It also provides the HEIs with rapid development in regard of demand of teaching at peak time such as beginning of the academic year or exam periods [10].
- **Extended availability:**The educational institutes get a high benefit of cloud computing through availability. As cloud is hosted with out-house company through internet, the downtime will be less due to due to superior skills and services available to the cloud providers. As all educational institutes aim to provide the services all the time and availability is the main concern (e.g. LMS), Google offers 99.9% availability for its educational applications [10].
- **End user satisfaction:** The user satisfaction can be achieved by cloud computing by providing availability for students to access the applications anywhere at any time without any restrictions. Also, the cloud providers keep updating the apps and provide new applications to their clients periodically. The providers offer latest tools and features [10]. The students get high benefit and use the applications without purchasing, installing or keep these applications on their computers. Also, the clients will feel comfortable about their data. They don't have to worry about backing up or losing data [10].

6. CHALLENGES, BARRIERS AND RISKS OF ADOPTING CLOUD COMPUTING

Although there are many advantages of adopting cloud computing in academic institutes, there will be some

challenges and barriers to implement it. The following section will illustrate some of these challenges:

- **Security:** The main concern in all corporations is data security and how much their data is secure. The academic institutes will keep worrying about their data confidentiality and privacy in cloud. They may consider their data more secure if it located within in-house. To overcome these barriers, the client may ask the provider to provide some guarantees to ensure non-disclosing of the confidential data.
  Another risk of cloud computing that the servers in the cloud can be a target of different threats. This includes denial of service attack. The suitable solution is to provide a provision of cloud services through a single provider as a single point of failure [10].
- **Bandwidth:** Another challenge that may face cloud providers is insufficiency of bandwidth as all services of cloud computing are internet-based service and required a sufficient bandwidth [11].
- **Acceptance:** Because cloud computing is still considered as a new technology, it is a difficult task to convince the management and decision makers in educational institutes to shift from traditional services into cloud services[11]. So, client acceptance of this new technology play important role in affecting the adoption of cloud computing in the academic institutes.

CONCLUSION

To conclude, Cloud Computing is a recent technology emerged in IT field and has been spread widely over the world. It is an internet-based computing service on-demand. One of the main uses of Cloud Computing is in the educational field. The paper discussed cloud computing history, the layers of cloud computing. It also presented the benefits of applying cloud technology in teaching sector. The paper concluded with the challenges and the barriers in adopting the cloud technology in the educational field.

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