CLOUD COMPUTING INTEGRATED E-LEARNING:THE NEXT GENERATION TECHNOLOGICAL LEARNING

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Abstract— Today's world is filled with technology and every development in the technology and computing are influencing all the areas, sectors and departments of life. One such area is 'learning'. With the growing technology of Internet plays a major role in learning and the enhancement of learning over Internet has become one of the hottest topics for the researchers. As technological development increases, this results in the expenses of the infrastructure to meet the demands of the customer or clients. One solution for all such problem is 'Cloud Computing'.

Keywords— Technology, learning, Internet, researcher, cloud computing

I. INTRODUCTION

In the recent times the rapid growth of technology has made most of the organization and individual technology dependent. One such development is the growth of Internet which has totally changed the pace and the life style of all individuals. At present the growth of Internet has developed a tremendous impact in the education sector. Most of the learners and the educational institutions are nowadays dependent on the Internet resources. But several factors affect the educational institutes in the usage of Internet such as increase in bandwidth, infrastructure, download capacity, data storage issues, performance and the most important is the cost. To overcome all such issues many educational institutes are now adopting a new growing technology of cloud computing.

Cloud computing is a new style of computing which is dynamic, scalable and often virtualized resources is provided as a service over the Internet. NIST defines cloud computing as one of the most convenient, on demand network access to shared pools of configurable computing resources that can be rapidly provisioned and released with minimal management effort or cloud service provider intervention and interaction. Due to the dynamic feature in nature cloud computing can be used as one of the adoptable technology for many educational institutes. In the recent times the level of the education has increased at the same time all the educational institutes have also grown in terms of infrastructure, data storage and resources. The educational institutes are opting for new mode and procedure for teaching purpose which has given a new opportunity to many new computing devices. Today's learner has come out of traditional learning method (classroom teaching) to the web-based learning mode. Many educational institutes have constructed their own personalized web based system which is maintained by the institutes itself. Most of the educational institutes have very limited learning resources and materials which need to be updated every time. As a result educational institutes needs to spend huge amount to update the resources regularly and heavy investment for their system maintenance which is putting and extra burden in terms of expense on the educational institutes. The rising level of education and the increasing knowledge of the learner is forcing him to come out of the educational institutes in search of new resources and learning materials which the learner may not get from their respective institutes. This gives an opportunity to the learner to explore new technologies and adopt to new learning system called as ‗e-learning system'.

II. CLOUD COMPUTING

In the current period cloud computing has become one of the hottest areas of research in IT sector. Due too many of its good characteristic many organization and educational institutes are trying to adopt the emerging technology. Since cloud computing is an Internet based computing the only requirement is to have a good speed and continuous connection of Internet. The main idea of cloud computing is to have all the resources at one end as a result of which all the required software, information and all the other resources can be shared with different users on demand with the meter payment i.e. PAYGO (Pay As You Go). Cloud computing also allows all the subscribers to use the required application or software without the need to purchase and physically install in their computers or laptops and enable them to access their information, files and folder from any part of the world 24/7, by using any Internet enabled devices such as laptop, smart-phones, I-pad etc.

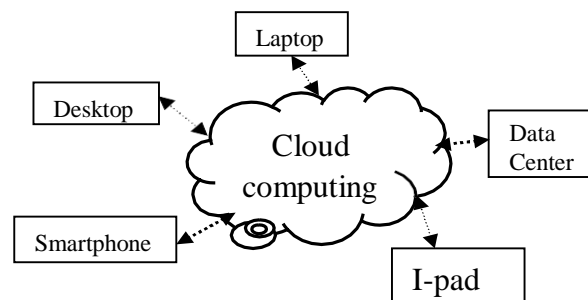Following figure shows cloud computing.

Fig1. Cloud Computing

As cloud computing uses the PAYGO payment mode the user has to pay according to the usage of the service offered by the CSP (Cloud Service Provider). Some of the good features of the cloud computing are- virtualization technology, disk storage, fast Internet access, inexpensive servers. But the most important and popular feature is its scalability.

The advancement of cloud computing has put a great impact on service delivery, infrastructure thereby allowing more efficient and fast computing process by centralizing storage memory, processing and bandwidth without investing in new infrastructure, training new personnel, purchase software or licensing new software. The development of technology are bringing all the resource together under one pool offering a new opportunities in teaching and learning and cloud computing plays a very vital role in the field of education.

Following are some of the important characteristic of cloud computing,

1. On demand access: The learner or consumer can demand and access any required resource at any point of time without any interaction of the cloud service provider.
2. Broad network access: Continuous connection of Internet is one of the important requirements of cloud computing. As shown in figure 1 all computing devices can be connected to the network.
3. Pool of resources: In cloud computing all the resource from multi-tenants can be brought together under one pool. Hence the required resource can be allotted to the consumer or learner easily.
4. Flexibility of the service: As per the requirement and demand of the consumer all the services can be flexibly allocated and released.
5. PAYGO (Pay as you Go): All the required and demanded resource by the consumer are charged according to their usage, hence no resource are misused by the consumers.

With the increasing level of education and resources required, it is very difficult for the educational institutes to cope with the rising infrastructure, types of application and software

installation which in turn increases the overhead for the educational institutes. To solve such type of problem and control the rising expense educational institutes can use the required resources from cloud on demand and in PAYGO basis. In cloud computing the resources can be either private or public. The private cloud is built for the individual organization where the users can make use of the facility without any change and store their sensitive data, whereas the public cloud offers access to the external users who are billed according to the usage of the resources.

Following diagram shows private and public cloud.
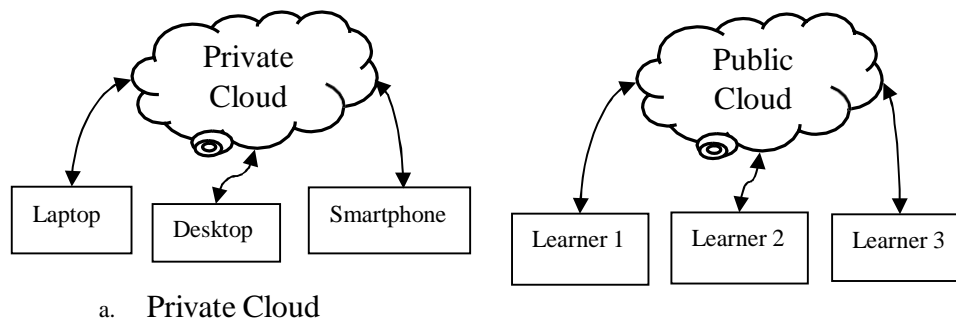

a.   Private Cloud

Fig2. Private and Public cloud

b.   Public Cloud

With the variety of cloud offering, the user has full flexibility to choose from the variety of service offered by the cloud. User priorities and security requirements determine the level of cloud capabilities to explore. The main and common services include-
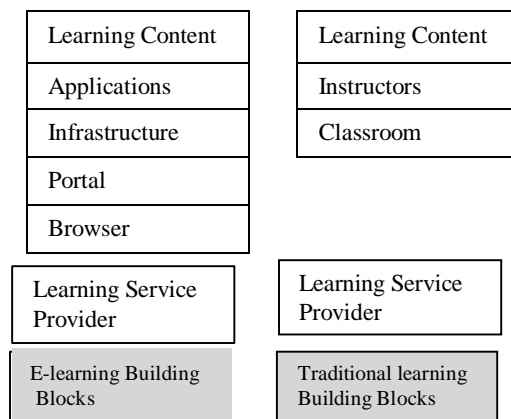
a. *IaaS (Infrastructure as a Service) – provides all the virtualized resources, networks which is very beneficial to the organizations and has the ability to replace the entire data center when necessary.*
b. *PaaS (Platform as a Service) – gives the customer a platform where the customer can run their existing application without worrying about the maintenance and updating of the operating system.*
c. *SaaS (Software as a Service) – it is one of the most popular service opted by the customer as it provides all types of complex applications over Internet and provides a reliable storage for the applications.*

III.   CLOUD COMPUTING AND E-LEARNING

Learning is a continuous process and today's learners have come out of the traditional classroom lectures. The learner tries to explore the variety of information from the computers and web based training (WBT). E-learning has evolved since computers were first introduced in education. As a result the recent trend is to have a blended service, where computer based activities are integrated with practical or class room activities. When a learner tries to access the service for learning and educational purpose, then this type of special service is termed as ‖Educational and Learning as a Service (ELaaS)‖. It is very much similar to the computer based learning (CBT) in which the user decides his learning activities which is accessible and done through computer. It's a linear learning fashion in which the user can refer to use the online books, journal, publications etc., leaving the traditional classroom based learning. Using ELaaS is one good solution to continue education over Internet through cloud without worrying about the strength of the class, reading materials, the knowledge and skills obtain in traditional methods. The students can have access to a variety if studying materials or can have audio video learning using animations.

Following diagram shows the different blocks used in E-Learning and traditional learning system

Learning Content	Learning Content
Applications	Instructors
Infrastructure	Classroom
Portal	
Browser	

Learning Service Provider	Learning Service Provider
E-learning Building Blocks	Traditional learning Building Blocks

Fig3. Building blocks of E-
Learning and
Traditional

To support the student community who want to continue their higher studies many universities have come forward and now they are offering online education through cloud.

A. **HOW CLOUD COMPUTING HELPS IN E-LEARNING AND IN HIGHER EDUCATION?**

In higher education the learner cannot only depend on the traditional class room teaching as he has to refer many learning materials. Due to the limited resources, the learner finds all the required learning resources from Internet, hence termed as E-learning. E-learning is an Internet based learning process which uses the Internet technology to spread knowledge to all learners in the various parts of the world. It is a fast, easy and makes use of all the modern educational technology provided with a new mechanism of communication and resources rich environment to achieve a new way of learning. As a result the learner can plan, design, select, manage and implement his own learning materials and skills which can be veryadvantageous to learner thereby improving the efficiency of education.

The major benefit of using E-learning is that it can be used in all sectors of education such as academic course, training courses, company training, continuous education etc. and the two major components that contribute to E-learning process are the a) learner himself and b) the trainer. Using E-learning the learner can -

a. *Take all the courses online irrespective of the location*
b. *Take online exams from any location*

c. *Send feedbacks to the trainer*
d. *Send homework and projects to the trainer from any part of the world.*

While the trainer can –

a. *Deal with the course and content management referring to the other materials also*
b. *Can prepare and put tests for the learner from any location at any time*
c. *Can mark the homework, projects at any time from any location*
d. *Communicate and send feedback to the learner*

Generally, E-learning system is considered as a distributed system, which includes client side applications, an application server, a good database consisting with all necessary learning materials and the required hardware components and all connected with good network.

Following diagram shows E-Learning system
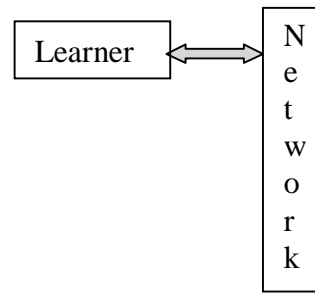
Learner	E-Learning System
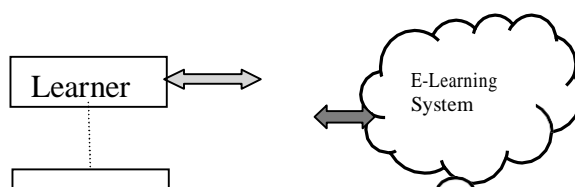
Fig 4. E-Learning System

As E-learning is very important in higher education, in the same way cloud computing plays a major role in learning by making use of its computing tools effectively thereby enhancing the level of education. Since cloud computing is known for its dynamic scalability and availability of virtual resources many educational universities and institutes can adopt their technology for learning process. By using cloud computing universities and institutes can focus more on research based teaching rather than wasting time in complexity of traditional system. Cloud computing can be one good solution when cooperative learning can be achieved by collaborating all the technologies.

Since cloud computing provides variety of services it can be a good solution for E-learning. For providing E-learning the universities can directly contact the cloud service provider. By making an agreement with the cloud service provider the universities can access all the virtualized resources, can have centralized storage system and make routine monitoring. Byusing the services and the virtualized resources from cloud computing the universities can collaborate with different universities, libraries of various universities can be merged, thereby creating a virtual environment for learning by reducing the expenditure, manpower and time required to make a good computer lab. Due to the wide availability of resources, data centres, services cloud computing is one of the developing technology that put a good effective impact on E-learning and teaching environment.

IV.   CLOUD ARCHITECTURE FOR E-LEARNING

The version of this template is V2. Most of the formatting instructions in this document have been compiled by Due to the rapid development and growth in IT many educational institutes are facing a high level of challenges in their learning andteaching environment. The major worries are about the infrastructure and the expenditure to remain competitive. Once again cloud computing can be a solution due to its variety of features. In any cloud environment it has 3 main components;

a. *Service consumer - is a client who needs to access the resources and services 24/7 that are easy to use from anylocation.*
b. *Service creator – needs different tools and capabilities to offer varieties of service to their consumer on demand andensure that the service consumer uses the service.*
c. *Service provider – are responsible for implementing the service that the consumer requested for.*

Keeping all the benefits and features of cloud computing in mind author tries to construct a new architectural model for cloud computing so that it can be introduced in E-learning system thereby increasing the scalability, flexibility, usability and its availability.

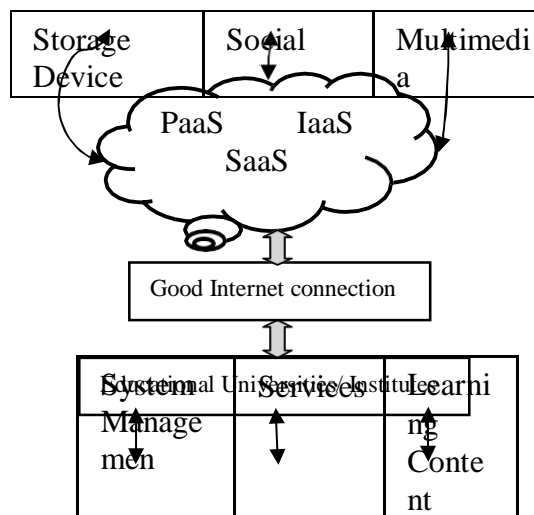Following diagram shows E-Learning architecture using cloud computing

Fig5. E-Learning architecture using cloud computing

V. ADVANTAGES AND DISADVANTAGES OF USING CLOUD COMPUTING IN HIGHER EDUCATION

A. ADVANTAGES

1. *Data and the applications can be accessed from any location*
2. *All the resources used for teaching and learning can be monitored and metered properly*
3. *Cost of the resources are not fixed they are charged as per the learners usage*
4. *Infrastructure and resources can be accessed 24/7*
5. *Due to the wide varieties and availability of resources learners have developed the interest for research and have given the new opportunities for the learner to access new technology.*
6. *Since everything is online green environment is created.*

B. DISADVANTAGES

a. *Though all the resources are available in cloud, it is very necessary to get the organizational support for adopting cloud computing technology.*
b. *Due to lack of customization many applications don't run in cloud*
c. *Since data is the most valuable resource, customers are worried about the security and protection of their sensitive data.*
d. *Though cloud computing lacks proper security consumers have lack of confidence in subscribing the services*
e. *Since one of the requirement of cloud computing is continuous connection of Internet at a high speed, which is always not possible and hence it can affect the learning.*
f. *Cloud computing should follow the standards.*

VI. CONCLUSION

When traditional learning is getting bored nowadays learning through technologies has created

some of sort of interest in education and adapt to E-learning. Introducing the pool of technology and resource which the user can access on demand has made E-learning and education easy for the learner. Introduction of cloud computing in E-learning has opened new doors for the learner, educational institutes and universities for further enhancements. Due to many advance features and characteristic of cloud computing with respect to learning has given a new dimension to the educational sector to transform the level and type of learning. As a result the learner can access the information 24/7 from any location, while the educational institutes have reduced the burden of expenses spend on the infrastructure and other aspects with respect to learning

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