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Cloud Computing in E-learning for different Perspectives of Teacher Education

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Abstract
This paper deals with the characteristics of the current E-Learning and then analyses the Concept of cloud computing and describes the different perspectives of cloud computing platform by combining the features of E-Learning. The authors have tried to introduce cloud computing to e-learning, build an e-learning cloud, and make an active research and exploration for it from the teaching learning process and frequent advancing in information technology has becomes a great challenge in every academic institution in providing necessary ICT infrastructures. Constantly updating of ICT infrastructures in academic institutions for education process, research and development of training activities is becoming a big issue in this crucial financial crisis facing by every national economy. In such situation a relatively new concept and constantly evolving cloud technology is starting introduce across the world in academic institutions. This fairly short theoretical paper we have given the attention to possible adoption of cloud computing technology in higher education particularly discussed on teacher training college where use of ICT is gaining momentum and interest thought the world. Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources, no matter the hardware or software, the storage or the computation capability; they all can be utilized under circumstances where the availability of resources is limited. When Cloud Computing appears, it provides a new solution to establish a unified, open and flexible network teaching platform and reduce the hardware input. Obviously, E-learning systems are developed as distributed applications, but not limited to. The e-learning system, developed as a distributed application, includes a client application, an application server and a database server, beside the hardware to support it such as client computer, communication infrastructure and servers. E-learning system E-learning systems can use benefit from cloud computing using to the needs of students.

Keywords: ICT, academic institution, cloud computing, e-learning, teaching and learning process.

1. Introduction
Introduction of ICT in education system, the college, institutes, and universities clearly changes the way education is conducted. To serve the purpose of data storage processing and reporting for teaching, learning and for administration, the use of ICT is very needful in the educational field. According to the needs of learners, the teacher educators have to improvise them to use the modern technology like cloud computing. In present scenario of new education system teaching is becoming one of the most challenging professions where knowledge is expanding rapidly and much of it is available to students as well teachers at anytime and anywhere. As teacher education is primarily directed towards preparing adoption of ICT to meet the quality of teacher training education worldwide today. Otherwise the teachers will become out-dated in the coming future and it will deteriorate the quality of teacher education. Since the decade ICT infrastructures adoption in teacher education has provided new possibilities to get an effective teaching and learning process and for continuously development in teaching profession. In this 21st century education system a successful well-established and properly maintained ICT infrastructure is becoming very essential tool to bring a quality teacher education. However, such infrastructures facilities make available to all the learners is a major problem in the education institutes arising from budgetary constraints. And most of the higher education training college or institutions are facing difficulties like Lake of ICT infrastructure due to the cutting budgetary allocation in education. Electricity power energy supply is an input source to get work ICT infrastructure. This electricity - an ICT enable infrastructure, is required available in regular mode and enough backup facilities in the institute. In case of irregularities, use of alternative power energy resource like power generator has shown a high recurring expenditure in annual budgetary of college or institutions. In such scenario cloud computing is becoming an alternative to the use of present financial crisis. This technology has a dynamic scalability of resources that can be used

Ircumstances where the availability is limited. The present, most of the conventional education forms are becoming not being suitable for requirements of social progress and educational development and not being able to catch up with the changes of learning demand in time, thus computer networks have brought opportunities for it. Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources; it can be utilized under circumstances where the availability of resources is limited. As cloud computing has become a research hotspot among modern technologies, researchers pay more attentions to its applications. In the field of education, cloud computing a lot of problems had been studied, such as the technology for future distance education cloud [1], teaching information system [2, 3, 4], the integration of teaching resources [5], teaching systems development [6]. In integration of e-learning and network, emphasis is placed on building of software and hardware platform of e-learning system, functional structure, network security management and training, information technology integration to teaching [7], campus network environment [8], online education [9], semantic web technologies-based multi-agent system [10, 11]. From the above we can see that until now, scholars have made a lot of researches on the following two aspects: cloud computing used in the field of education, and integration of network and e-learning. The former places the emphasis on distance education, information system application, instructional system design, information resource development, online course-building, etc. The latter's emphasis is placed on construction of campus e-learning system, e-learning model on campus network, e-learning system based on agent model and e-learning grid and so on. In order to give a full play for the advantages of cloud computing, in this paper, we tried to attach cloud computing to e-learning, build an e-learning cloud, and made an active teaching learning process for it.

2. Use of ICT in Education

The basic understanding of ICT suitable in education is vital in keeping abreast of rapid technology change. Infusion of ICT in higher education institutions all over the world are under continuously increasing in presence of its benefited to faculty members, students, staff, and management where lots of collaboration and safety of data is need in academic. The main goal of ICT adoption in teacher education is to meet the demand and challenge of the 21st century education system that making education more affordable and accessible. The modern age of information technology scenario has lead to integrate ICT in teaching and learning process for the welfare of faculty members and students. The continuously increasing the growth of quality information available on the web and then has become a great resource of teaching and learning. However ICT infrastructure available in the most of the teacher training institutions to make the facility of accessing the required right quality information from anywhere, any time in the country are not at par of satisfactory. The implementation of ICT network infrastructure and integration of ICT in teaching and learning is becoming a challenge in teacher education. Adoption of ICT in teacher education is still at infant stage compel up with issue that are limiting it. Some issues that are limiting the adoption of ICT in teacher education in Manipur could relatively consider the following three – Firstly, Inadequate of ICT infrastructure and lack of access. Here underlying assumption of ICT infrastructure is considering related to network and universal access to the network. The infrastructure issue can be viewed from two main dimensions i.e. Lake of investment and Lake of maintenance on such infrastructures. Secondly, Poor maintenance of equipment and lack of technical support Maintenance. It has a great role to keep the equipment in well working condition but there is a technical knowledge must to have. Technical know how to operate or work will not serve for proper maintenance. At any given point of time, one or two computers are suddenly down with some technical problem or other in the computer hence teachers are looking for technical support. In such cases teachers are little frustrated with technical problem as they are far from technical knowledge. Due to such poor maintenance and lake of technical support has result the teacher in loss of instructional time and the teaching and learning materials that will get from web resources. Lastly, High cost and low reliability of power supply. Availability of electricity is an important input element to keep on work all the electric gadgets. Now at the edge of information technology a real issue and challenge in educational institutions is availability of electricity power supply both in terms of quality and quantity. However, the present status of electricity power supply to the educational institutions has only some few hours rather than sufficient supply within working hours. In such scenario it is madding to start new ICT project and even it become worse to embark on executing the ICT project. In addition high cost of electricity power supply is directly linked with the use of ICT infrastructure for the teaching and learning. Alternate sources of power supply for using the computer is increasing to recurring cost and college cannot foot to high cost of bill for marinating oil consume by the generator per hour.

3. Cloud Computing As Shared Resources

Cloud computing and network helps the resources to achieve coherence and economies of scale, similar to a utility over a network. The foundation of cloud computing is the broader concept of converged shared services and infrastructure [20]. Cloud computing, or in simpler shorthand just "the cloud", also focuses on maximizing the effectiveness of the shared resources, but also fulfill the needs of the individual demand. This can work for allocating resources to users. For example, a cloud computer facility that serves European users during European business hours with a specific application (e.g., email) may reallocate the same resources to serve North American users during North America's business hours with a different application (e.g., a web server). This approach should maximize the use of computing power thus reducing environmental damage as well since less power, air conditioning, rack space, etc. are required for a variety of functions. With cloud computing, multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications [21]

The term "moving to cloud" also refers to an organization moving away from a traditional CAPEX model to the OPEX model such as, the use of shared cloud infrastructure and pay as one uses it. This new concept of computing technology allows the user to use the hardware and software applications on demand networks access without installed in end user computer. The user can access their personal files at any computer, anywhere, anytime trough internet network access on PAYGO (Pay-as-you-go) basis [20, 21, 22]. There is currently no universal definition of cloud computing, but

diverse interpretation, probably because in information technology domain and academic field the concept is very young. The most widely used and normative definition is that issued by the US National Institute of Standards and Technology: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction." [12]. This technology allows for much more efficient computing as it use the centralizing storage, memory, processing of central remote servers to maintain data and applications through it three service.

They are - Infrastructure as a service (IaaS) - Processing Clouds service that provides scalable and mostly affordable computing resources like individual servers, disk drives, email servers etc.

Platform as a Service (PaaS) - It is a storage cloud that offered an alternative to local file systems. A platform that has the applications run on, it also provides platform which will execute software application with no requirement for administration of the lower level components. And

Software as a Service (SaaS) – An Application Clouds llow to the user to access all required application on demand without client installation through completely hosted external infrastructure. The four main stakeholders that can be considered to use the three cloud service model in the teacher training college are faculty, student, administration, and library.

These four main stakeholders can be assigned the various service model of cloud. Faculty and student need to access Google documents for their project preparation that comes under the Paas model. And they need to word processor or other software for their project then they need to access over the net that comes under the Saas. Similarly, other stakeholder like library, linkage of their service delivery is shown in the figure 1.

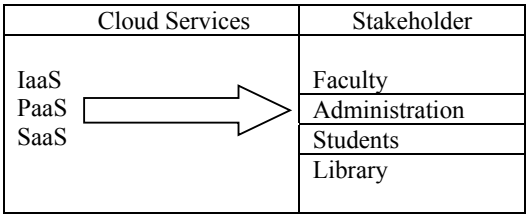

Fig. 1: Cloud services delivery in Educational Institutions

4. Cloud Computing In E-Learning

Cloud Computing Technology The Internet and network technologies are now transforming to the next generation. The development of these technologies is fast and rapidly evolving for an advanced utilization to support usage in everyday life. There are many modules, services and technologies which are dependent on the functionalities and several factors to sustain any Internet activities. Cloud computing system, being a popular technology at the present, is used entirely for the server side services. The problem is that everyone seems to have a different definition [13, 14, 15]. The cloud computing is a technology that uses the Internet and central remote servers to maintain data and applications. This technology allows much more efficient computing by centralizing data storage, processing and bandwidth. It also allows consumers and businesses to use applications without installation and access to their personal files at any computer. Cloud computing technologies can be implemented in a wide variety of architectures, under different service and deployment models, and can co-exist with other technologies and software design approaches. Paul Pocatilu, *et al.*, measured the positive impact of using cloud computing architectures upon the e-learning solutions development [16]. They advanced a set of cloud computing efficiency metrics for enhanced e-learning implementation process control. Also, the long-term overall efficiency of cloud computing usage in the field of e-learning system was evaluated. The measured results showed that cloud computing system can reduce the cost of infrastructure maintenance, risk of hardware failure of e-learning system. Normally, E-learning systems usually require much more hardware and software resources. There are numerous educational institutions that cannot afford such investments, and cloud computing is the best solution for them. The e-Learning platform classified in to three types, i.e., the standalone system, the server-client system and cloud computing system. A lot of applications are working as a standalone system, such as I Spring, Cam Studio, etc. They do not need the network infrastructure, but they require installation of software application in Original source owned by Ref. [17]

5. E-Learning Platform

The Slide Generation (SG) algorithm user's computer. Web-based Synchronized Multimedia Lecture (WSML) framework was initiated for supporting the Web-based classroom. The WSML system integrates more vigorous types of media such as pictures, streaming audio/video, and animated navigation events with traditionally text media like static HTML pages. The WSML system provides an authoring tool to record the temporal and spatial relationships among media involved and thus can facilitate the synchronized presentation and cross-media access. They used three servers for server side, such as HTML, AV and Event servers. For the teacher who requires to create a content, media files must have been uploaded to the AV server. Authoring tool used to record the relations between media objects or navigation events with a global timer and store relation events on the Event server. For the student, they implemented JavaScript code and dynamic HTML for rendering the learning content to display in a web browser. A little problem of the system is that it requires high bandwidth and stable network connection for uploading media files. They have initiated an online community for practice of teachers and designed an online platform where teachers can share vivid images and videos of their teaching practices with other teachers. They used Web 2.0 technology to create the website platform prototype. They also built tools and services for their platform. Their proposed platform is only used to share content, but it could not synchronize video and representation slides together. Not only in the academic research but also several commercial authoring tool products are available for producing video-based original source owned by Ref. [18]

6. Cloud Computing Usage in Education

The Cloud delivers computing and storage resources to its users/customers. It works as a service on demand policy. Cloud computing is a new business model wrapped aroundnew technologies like virtualization, SaaS

and broadband internet.
Recent interests offered new applications and elastic scalabili ty with higher computing parameters. So that, these positive effects have shifted to outsourcing of not only equipment set up, but also the ongoing IT administration of the resources as well [19]. The results of a survey that have been completed in 2009 by Gartner analysts 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 [20]. Cloud computing technologies that were previously expensive or unavailable are now becoming free to anyone with a web browser. This is true for all web sites, blogs, video sharing, music sharing, social sharing, collaboration software, editing, publishing, and computing platforms in the "cloud". These technologies already used in practical way by the students. In the professional world, the trend of discovering and using technologies in our personal life is called consumerization, which means we should demand and consume the required services. Our education system should take advantage of this same trend, which will both enrich our student's technology-enabled education, and importantly, reduce the budget impact in academic institutions.

7. Benefits of Cloud Computing in E-Learning

Cloud computing is one of the most interesting applications in educational field. The educational cloud computing can focus the power of thousands of computers on one problem, allowing researchers search and find models and make discoveries faster than ever. The universities, colleges and schools can also open their technology infrastructures to private, public sectors for research advancements. The effectiveness of cloud computing can help academic institutions keep pace with ever-growing resource requirements and energy costs. Students expect their personal mobile devices to connect to campus services for education. Faculty members are asking for efficient access and flexibility when integrating technology into their classes. Investigator wants instant access to high performance computing services, without them responsibility of managing a large server and storage farm. The role of cloud computing at university education should not be underestimated as it can provide important gains in offering direct access to a wide range of different academic resources, research applications and educational tools. Obviously, E-learning systems are developed as distributed applications, but not limited to. The architecture of an e-learning system, developed as a distributed application, includes a client application, an application server and a database server, beside the hardware to support the E-learning systems. The benefit from cloud computing using:

A. Infrastructure: Infrastructure provider's usage in e-learning solutions

B. Platform: e-learning solutions based on the provider's development interface

C. Services: e-learning solutions given by the provider. [19]

A. *Low cost:* E-Learning users need not have high end configured computers to run the e-learning applications. They can run the applications from cloud through their PC, mobile phones, tablet PC having minimum configuration with internet connectivity. Since the data is created and accessed in the cloud, the user need not spend more money for large memory for data storage in local machines. It is cheaper and need to pay only for the space they need in organization user.

B. *Improved performance:* The cloud based e-learning applications have most of the applications and processes in cloud, client machines do not create problems on performance when they are working.

C. *Instant software updates: A*lways e-learners get updates instantly since, the cloud based application for e-learning runs with the cloud power; the software's are automatically updated in cloud source.

D. *Improved document format compatibility:* As the cloud based e-learning applications open the file from cloud. Since some file formats and fonts do not open properly in some PCs/mobile phones, the cloud powered e-learning applications do not have to worry about those kinds of problems.

E. *Benefits for students:* Students get more advantages through cloud based e-learning. They can take online courses, attend the online exams, get feedback about the courses from instructors, and send their projects and assignments through online to their teachers.

F. *Benefits for teachers:* Teachers also get numerous benefits over cloud based e-learning. Teachers are able to prepare online tests for students, deal and create better content resources for students through content management, assess the tests, homework, projects taken by students, send the feedback and communicate with students through online forums.

G. *Data security:* A very big concern is related to the data security because both the software and the data are located on remote servers that can crash or disappear without any additional warnings. Even if it seems not very reasonable, the cloud computing provides some major security benefits for individuals and companies that are using/developing e-learning solutions.

8. Conclusion

Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources, no matter the hardware or software, the storage or the computation capability; they all can be utilized under circumstances where the availability of resources is limited. While appears Cloud Computing, it provides a new solution to establish a unified, open and flexible network teaching platform and reduce the hardware input. In this paper, the definition of cloud computing, discuss the main existed cloud provider in the world such as Microsoft, Google, Amazon, IBM and so on, analyze the development of the cloud computing in education, propose a new E-learning structure based on private cloud, present the expected benefits from the proposed architecture. The private cloud is in the education field chosen firstly, and then expended to the community cloud, assessed the existed public cloud at any time. The proposed architecture includes

educational administration, on-line learning, teaching resources, virtual lab and online communication. The users can benefit it in five aspects, such as virtualization, collaborative learning, personalized learning, computational ability and storage capability, cost. In academic institutions can do the future research will include regarding the attitude, strategy for migration to the proposed architecture based on clouds and the migration from E-learning to Mobile-learning which is a challenge with suitable in our Indian educational system.

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