A Proposed Architecture of Cloud Computing based e-Learning System

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Summary
The wide use of ICT based e-technologies represents a great opportunity for underserved segments of the population, especially with the aim of reintegrating excluded individuals back into society through education. This is particularly true for people who may have difficulties while attending traditional on-site learning or traditional learning programs in schools , institutes or universities programs that are typically based on class room , books or printed learning resources. The creation and provision of accessible e-learning contents may therefore become a key factor in enabling people with different access needs to enjoy quality learning experiences and services.
In modern time Computer Education is now indispensable for people of every stratification but due to the poor economic condition many in many states of our country and other countries are unable to introduce their citizens with rich technologies and innovation developed by computer system.
Consequently a cloud based shared based system may help for uniform distribution of resources between people of every stratum. In this research work we are introducing an architecture of Cloud based e-Learning system for education sector and discuss the impact of our propose architecture on the availability of widespread resources to all around the country. We are presenting here a comparative analysis of our proposed architecture with the existing one to demonstrate the advantages of the proffered architecture over the current one.

Keywords:
e-Learning ,Cloud computing , SaaS , PaaS , Cloud computing in education , Data center

1.INTRODUCTION

Offering an increasing access to a wider range of learners in a country like India is usually considered one of the main benefits provided by e-learning systems [4]. However, on-line educational and training services are frequently based on anytime technologies that do not cope with “everyone” and “everywhere” dimensions [5]. Commonly, e-learning materials are designed to be used with a specific hardware device, with a particular software technology and a specific (fixed up) configuration. This is particularly true when e-learning materials are mainly based on rich media contents.

In the recent years cloud computing is considered as the most promising technology for its easy deployment and scaling applications which is derived gradually from the perception of virtualization, distributed composition, grid and enterprise IT administration [1]. However cloud computing can propound different services for diverse users if we can facilitate virtualization technology and provide powerful storage and computing capacity of PC’s and servers. Cloud computing features can be fragmented into three distinct segments; software as a service (SAAS), platform as a service (PAAS) and infrastructure as a service (IAAS) each of which accomplishes a specific purpose and supports different products for organization and individuals throughout the world [6]. In addition we can also provide e-Learning service to the students of schools , institutes or universities which include management utilities and interfaces to support the part of learning process [7]. The different segments of cloud computing features are offered to the user through a variety of ways such as pay per use, fee-based infrastructure with value-added application services, or free services for vendors but sharing of revenues generated from consumer. In Section 2 of this paper I we provide a brief overview of the structure of our e-Learning system, in Section 3 we are introducing our proposed architecture. Section 4 describes the benefits of our proposed architecture by a comparative analysis with the structure of current education system. Finally the paper is concluded in last Section of paper .

2. EARLY WORK

In 1991 Weiser announced the era of ubiquitous computing and described a vision of proliferation of computational resources that provide access to information when and wherever desired [14]. This proliferation has indeed occurred, with a wide range of commonly used devices such as mobile phones, personal digital assistants (PDAs), palmtops or laptops.
The education sector in our country is divided into different segments namely Primary Level ,Secondary Level, Higher Secondary Level, and University level Higher Education . On each level there is a need of different requirements of educational resources like hardware, software, study materials et,) for each of these

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levels of users. Recently the government is giving maximum priority to human resource development through education and tries to percolate education for all people over the country. Although the government and private sectors player using a good budget for the development of its educational arena in the recent decades but still the literacy rate is not increasing commensurately.
The main reason is the improper distribution of educational resources such as teaching tools, teaching stuffs and lack of monitoring as well as inefficient administrative procedure. In addition this is not an easy way to implement the governmental policy in regard of educational course curriculum due to lack of communication. As cloud computing technology binds the resources into a single domain, we believe this technology can be a prominent solution for solving the education sector problems .

3.WHY CLOUD COMPUTING

In recent years, cloud computing as a new kind of advanced technology accelerates the innovation for the computer industry. Cloud computing is a computing model based on networks, especially based on the Internet, whose task is to ensure that users can simply use the computing resources on demand and pay money according to their usage by a metering pattern similar to water and electricity consumption.
Therefore, it brings a new business model, where the services it provides are becoming computing resources [12].
Cloud computing is highly scalable and creates virtualized resources that can be made available to users. Users do not require any special knowledge about the concept of Cloud computing to connect their computers to the server where applications have been installed and use them. Users can communicate through Internet with remote servers. These servers can exchange their computing slots themselves
[13].Cloud computing is one of the new technology trends likely to have a significant impact on the teaching and learning environment [14]. In Cloud computing, resources can be either externally owned (public Cloud – as provided by Google and Amazon) or internally owned (private Cloud).
Praveena and Betsy [17] have described the application of Cloud in universities. Delic and Riley [18]
assessed the current state of enterprise knowledge management and how it would turn into a more global,
dependable and efficient infrastructure with Cloud computing. They have discussed architecture as well as applications. Cloud computing attributes can be visualized from the following comparison.

4. TRADITIONAL E-LEARNING AND CLOUD BASEDE-LEARNING

e-Learning is an Internet-based learning process, using Internet technology to design, implement, select, manage, support and extend learning, which will not replace traditional education methods, but will greatly improve the efficiency of education. As e-Learning has a lot of advantages like flexibility, diversity, measurement, opening and so on, it will become a primary way for learning in the new century as in Figure 1.

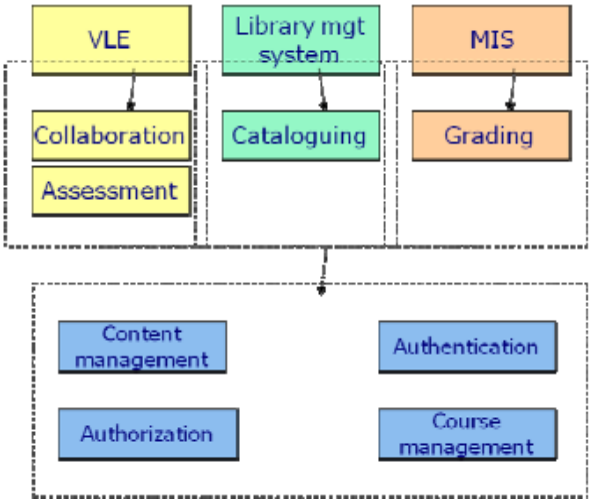

Fig. 1 TRADITIONAL E-LEARNING

This paper is going to propose an innovative e-learning ecosystem based on cloud computing and Web 2.0 technologies. The paper analyses the most important cloud-based services provided by public cloud computing environments such as Google App Engine, Amazon Elastic Compute Cloud (EC2) or Windows Azure, and highlights the advantages of deploying E-Learning 2.0 applications for such an infrastructure. The authors also identified the benefits of cloud-based E-Learning 2.0 applications (scalability, feasibility, or availability) and underlined the enhancements regarding the cost and risk management.
Our proposed system primarily is composed of different cloud partners, local servers and cloud central system. The architecture is depicted in Figure 2 .
According to our proposed architecture each individual PC act as a cloud partner which offers the necessary resources to the cloud system from its available resources. However each of these individual PC is the property of a particular educational institute or University study center whereas all these partners or users owned those tablet PCs like “aakash” from the budget sanctioned by the government for that particular institute or University . There is a local server associated with individual study center of a institute who monitors everything ranging

from PC status to individual requests for that institute. The users associated with a particular local server submit their request to the cloud via the local server. The local server collects the entire request from the clients in its domain within a specific time period and forward those request after verification. In addition there are some providers who have the agreement with the cloud system and offers different services to the user.

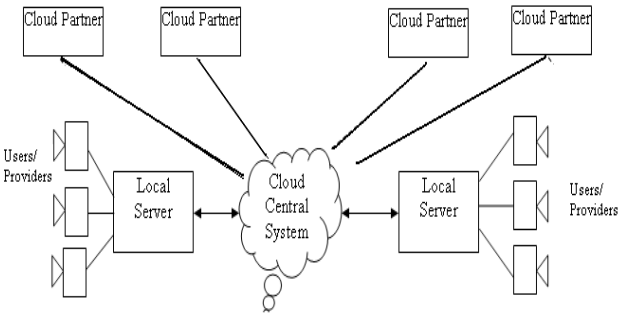

Fig. 2 CLOUD BASED E-LEARNING

The proposed e- learning cloud architecture can be divided into the following layers: Infrastructure layer as a dynamic and scalable physical host pool, software resource layer that offers a unified interface for e-learning developers, resource management layer that achieves loose coupling of software and hardware resources, service layer, containing three levels of services (software as a service, platform as a service and infrastructure as a service), application layer that provides with content production, content delivery, virtual laboratory, collaborative learning, assessment and management features. A. Infrastructure layer is composed of information infrastructure and teaching resources. Information infrastructure contains Internet/Intranet, system software, information management system and some common software and hardware; teaching resources is accumulated mainly in traditional teaching model and distributed in different departments and domain. This layer is located in the lowest level of cloud service middleware, the basic computing power like physical memory, CPU, memory is provided by the layer. Through the use of virtualization technology, physical server, storage and network form virtualization group for being called by upper software platform. The physical host pool is dynamic and scalable, new physical host can be added in order to enhance physical computing power for cloud middleware services.

5. BENEFITS FROM THE ARCHITECTURE

1) Powerful computing and storage capacity: Cloud based E-learning architecture locates the computing and data in a large number of distributed computers, the sea of clouds in the tens of thousands of computers to provide powerful computing power and huge data storage space, puts the "cloud" as a service available to students via the Internet.

2) High availability. Through the integration of mass storage and high-performance computing power, this system can provide a higher quality of service. Cloud computing system can automatically detect the node failure and exclude it, do not affect the normal operation of the system.

c) High security. In the cloud computing model, data is storied intensively. Relying on one or more data center, the managers manage the unified data, allocate the resources, balance load, deploy the software, control security, and do the reliable real time monitoring, thus guarantee the users' data security to the greatest possible degree.

d) Virtualization. Virtualization is the most important characteristics of this type of architecture. Each application deployment environment and physical platform is not related. It is managed, expensed, migrated, and backup through virtualization platform. It put the underlying hardware, including servers, storage and networking equipment, comprehensive virtualization, in order to build a resources pool of shared, distributed on-demand.

e) The major advantage of the proposal is that it aims at providing easy access to costly software running on high performance processors to rural students at institutions which lack considerable facilities. Considerable investment would be required to implement this architecture, but the benefits would easily justify the cost.

6. CONCLUSION

The e-Learning model cannot completely replace teachers; it is only an updating for technology, concepts and tools, giving new content, concepts and methods for education, so the roles of teachers cannot be replaced. The teachers will still play leading roles and participate in developing and making use of e-learning cloud. The blended learning strategy should improve the educational act. Moreover, the interactive content and virtual collaboration guarantee a high retention factor. On the other hand, E-learning cloud is a migration of cloud computing technology in the field of e-learning, which is a future e-learning infrastructure, including all the necessary hardware and software computing resources engaging in e-learning. After these computing resources are virtualized, they can be afforded in the form of services for educational institutions, students and businesses to rent computing resources.

Present economic situation will force different educational institutions and organizations to consider adopting a cloud solution. Universities have begun to adhere to this

initiative and there are proofs that indicate significant decreasing of expenses due to the implementation of cloud solutions. The aim of our work was to identify an architecture which will be using Cloud Computing within school level or higher education. Mainly, we have considered the benefits of cloud architecture. Future research will include a study regarding the attitude and strategy for migration to the proposed architecture based on clouds.

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