Application of Cloud Computing to Academic Environment

VARUN DEEP KORRAPATI1, BHAVANAM.SASIDHAR REDDY2, V.V.S.KIRAN2, T.SRI DUTT3
1, 2, 3 Final Year B.Tech, Dept. of ECE, K L University, Vaddeswaram, Guntur, India

ABSTRACT
During the past few years, cloud computing has become a key IT buzzword. Although the definition of cloud computing is still “cloudy”, the trade press and bloggers label many vendors as cloud computing vendors, and report on their services and issues. This paper discusses the use of cloud computing in the educational and learning arena, to be called “Education and Learning as a Service” (ELaaS), emphasizing its possible benefits and offerings. It is envisioned that, in the near future, cloud computing will have a significant impact on the educational and learning environment, enabling their own users (i.e. learners, instructors, and administrators) to perform their tasks effectively with less cost by utilizing the available cloud-based applications offered by the cloud service providers.

Keywords: Cloud computing, Saas, IaaS, PaaS, Elaas

1. INTRODUCTION
Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing data storage, processing and bandwidth.

A simple example of cloud computing is Yahoo email, Gmail, or Hotmail etc. All you need is just an internet connection and you can start sending emails. The server and email management software is all on the cloud (internet) and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. The analogy is, “If you need milk, would you buy a cow?” [1] In both academia and industry, cloud computing has been recently attracting significant momentum and attention as one of those opportunities that could prove to be of immense benefits and empowering in some situations, due to its flexibility and pay-per-use cost structure, for organizations. In the educational and learning arena, this will be called “Education and Learning as a Service” (ELaaS).

2. CLOUD COMPUTING
Definitions of cloud is defined by many expert, but the National Institute of Standards and Technology (NIST) definition is a generally accepted standard and it is given as; Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

This cloud model is composed of five essential characteristics, three service models, and four deployment models.

2.1 Essential Characteristics:

On-demand self-service:
A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Broad network access:
Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g. mobile phones, tablets, laptops, and workstations).

Resource pooling:
The provider’s computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

Rapid elasticity:
Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

Measured service:
Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

2.2 Service Models:

**Software as a Service (SaaS):**
The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user specific application configuration settings.

**Platform as a Service (PaaS):**
The capability provided to the consumer is to deploy onto the cloud Infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

**Infrastructure as a Service (IaaS):**
The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).[2]
2.3 Deployment Models:

**Private cloud:**
The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

**Community cloud:**
The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

**Public cloud:**
The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.

**Hybrid cloud:**
The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

![Cloud Computing Types](image)

Fig. 3. Deployment models of clouds

3. APPROACHES TO E-LEARNING SERVICES:
E-learning services have evolved since computers were first introduced in field education. Approaches towards E-learning have been transforming continuously from the day of E-learning’s inception. Some of the popular E-learning approaches are

3.1 **E-Learning programs based on computer:**
This approach is otherwise known as computer based learning or CBL. Here, computer is the most vital aspect of the entire educational environment. Existence of computers in classroom is a must in this type of E-learning program. There are several advantages of Computer Based Learning Programs. Some of them are
1. Collaborative learning system for more uniformity and enhancement of teaching and learning standard
2. Effective data management for repeated sessions.
3. Portability and minimal use of technological devices in the class room
4. Making the class room interior more spacious.

3.2 **Computer Based training**
This e-learning approach is a highly transformed version of CBL and is popularly known as CBT. In this approach, activities related to learning are self-paced ones and are easily accessible through computers or any handled device. CBTs typically present content in a linear fashion, much like reading an online book or manual. CD-ROM is an integral aspect for the success of this approach. Advantages of computer based training programs are
1. A cost effective alternative of web-based training
2. Facilities to assess the improvement in a hassle free and error-free manner with help of software applications
3. Facility to provide feedback of the end user in an instant manner.
4. More interactive and student-friendly compared to traditional teaching approaches.
3.3 Computer-supported collaborative learning approach

This is one of the latest and most sophisticated approaches in the direction of making E-learning more interactive and target audience oriented with help of latest IT techniques. The major objective if this approach is to make the learning process more collaborative one. To achieve this aim, Computer-supported collaborative learning approach (CSCL) focuses on behaviour of students in class room, sharing of information, interaction. Blogs, wikis and Google Docs are commonly used CSCL mediums within the teaching community. The ability to share information in an environment that is becoming easier for the lay person has caused a major increase of use in the average classroom. One of the main reasons for its usage states that it is "a breeding ground for creative and engaging educational endeavours."

Advantages of CSCL are:
1. More emphasis on group learning than individual learning to enhance the interaction within the class room.
2. Less burden on the instructor, here the instructor acts as a base and facilitator of knowledge and skills.
3. Enhanced interactive experience for both instructor and the learners.
4. Use of Sophisticated IT instruments to show information in its exact manner.

4. CLOUD BASED E-LEARNING ARCHITECTURE

- **Infrastructure resources Layer**
  The base layer of e-learning cloud shares IT infrastructure resources and connects the huge system pool together to provide services. Cloud Computing allows the hardware layer to run more like the internet, to make the hardware resources shared and accessed as data resources in secure and scalable way. Information infrastructure contains Internet/Intranet, system software, information management system and some s/w and h/w: teaching resources is accumulated in traditional teaching model and distributed in different departments and domain. Through the use of virtualization technology, physical server, storage and network form virtualization group for being called by upper software platform. Virtualization technology separates the physical hardware from operating system, which on one hand can make computing and storage capacity of the existing server into smaller size and reintegration, to improve the utilization and flexibility of IT resource; on the other hand can provide a common interface for large-scale cloud computing integration that enables the publication of calculation. The physical host pool is dynamic and scalable.

- **Software resource layer**
  This layer is composed by operating system and middleware. Through middleware technology, a variety of software resources are integrated to provide a combined interface for software developers, so they can develop a lot of applications based on Software resources and embed them in the cloud, and making them available for cloud computing users.

- **Resource management layer**
  This layer is the key to achieve loose coupling of software resources and hardware resources. Through integration of virtualization and cloud computing scheduling strategy, on-demand free flow and distribution of software over various hardware resources can be achieved.

- **Service layer**
  Has three levels of services namely, SaaS (Software as a service), Paas (Platform as a service), IaaS (Infrastructure as a service). In SaaS, cloud computing service is provided to customers. As is different from traditional software, users use software via the Internet, not to need a one-time purchase for software and hardware, and not to need to maintain and upgrade, simply paying a monthly fee. The platform layer of e-Learning cloud With the support of the powerful hardware, platform layer carries out the tasks of data storage, computing and software development, and it can even achieve the tasks of completion of the original mass data storage, business intelligence processing and so on which have been difficult to complete. Users can choose the devices and the number of devices according to the complexity of dealing with the content. Virtualization technology enables the platform to show a strong level of flexibility.

- **Application layer**
  This layer is the specific applications of integration the teaching resources in the cloud computing model, including interactive courses and sharing the teaching resources. The interactive programs are mainly for the teachers, according to the learners and teaching needs, taken full advantage of the underlying information resources after finishing made, and the course content as well as the progress may at any time adjust according to the feedback, and can be more effectiveness than traditional teaching. Sharing of teaching resources include teaching material resources, teaching information resources (such as digital libraries, information centres), as well as the full sharing of human resources. This layer mainly consists of content production, educational objectives, content delivery technology, assessment and management component. The applications software or services provided by a school or university, the students to pay in the similar way of on-demand access,
according to the amount to calculate the cost, complete the production, marketing, trading and management. E-Learning cloud environment provides user-oriented ubiquitous adaptive hardware resources, computing environment and software services. In e-learning cloud space, users can access to digital services transparently at any time anywhere. The users can obtain the necessary network and computing services very naturally at any position. The information space and physical space will be integrated because of ubiquitous computing capability. And the ubiquitous information terminals together with the embedded system equipment will be the vehicles of ecommerce in the future.

5. CONCLUSION:
Through the research we believe in can create an e-learning application model based on cloud computing. Some problems such as platform security, technical standards, regulatory and other services are not well resolved yet in practice. These concerns are considered key obstacles to broader acceptance of cloud computing, making them areas of active research and argue among cloud computing practitioners and advocate. It has the major span to change the whole education system.

In present situation the e-learning is getting the popularity and this application in cloud computing will surely help in the development of the education offered to people which will increase the quality of education offered to them. Cloud based education will help the students, staff, Trainers, Institutions and also the learners to a very high extent and mainly students from rural parts of the world will get an opportunity to get the knowledge shared by the professor on other part of the world. Let us hope that government implements this system in schools and colleges for a better education system and a better society.

REFERENCES

AUTHOR BIOGRAPHY:
K. Varun Deep was born in Guntur District; Andhra Pradesh, India on 3rd January 1992. He is currently pursuing his B.TECH final year in Electronics and Communication Engineering in K.L.University. His areas of interest are Radar Communications, information theory and coding, Antennas and Signal processing.

Sridutt Tummalapalli was born in Eluru in the year 1992. He is currently pursuing his bachelors of Technology in Electronics and Communication at K L University, Vijayawada. His research interests include VLSI, Signal Processing and Communications.

Vadde Venkata Sai Kiran was born in East Godawari District, Andhra Pradesh, India on 21st March 1991. He is currently pursuing his B.TECH 4th year in Electronics and Communication Engineering in K.L.University with specialization in Signal processing.

Bhavani Mam. Sasidhar Reddy was born in Guntur, Andhra Pradesh, India on 30th April, 1992. He is currently pursuing his B.TECH final year in Electrical and Electronics Engineering. His areas of interests are Renewable sources, Power Systems, and Power Electronics.