An Innovation in Education Through Cloud Computing

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Abstract Today most of the learning activities are concerned on Web-based learning environment and it has become a major area on researching for remote education. The technique of cloud computing has got great recognition in many organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. Cloud computing is changing the way industries and enterprises do their businesses in that dynamically scalable and virtualized resources are provided as a service over the Internet. In this chapter, we discuss 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 that will have a significant impact on the educational environment in the future. The concept of cloud computing is an excellent alternative for educational institutions which are constrained to a limited budget in order to operate their information systems effectively without spending any more capital for the computers and network devices. Universities take advantage of available cloud-based applications offered by service providers and enable their own users/students to perform business and academic tasks. In this chapter, we will review what the cloud computing infrastructure will provide in the educational sector, especially in the universities where the use of computers are more intensive and what can be done to increase the benefits of common applications for students and teachers.

Keywords Cloud computing · Virtualization · SaaS

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Introduction

Cloud computing has emerged as an important factor for fulfilling educational computing needs. The term includes both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services [1]. Another definition is given in (Cloud Computing, retrieved [2]): Cloud computing uses the Internet and central remote servers to maintain data and applications which is broken down into three segments: "applications", "platforms", and "infrastructure". The cloud is the term for networked computers that distribute processing power, applications, and large systems among many machines. The concept of cloud computing offers the educational sector a way to increase IT capacity and add on the fly capabilities without investing in new infrastructure, new training, or licensing new software. There is no need to setup, configure, and manage large physical installations of hardware and networks. This technology allows much more efficient computing by centralizing storage, memory, processing, and bandwidth. It reduces/eliminates problems associated with software version installation, control, and updates.

Approaches to E-Learning Services

E-learning services have evolved since computers were first used in education. There is a trend to move toward blended learning services, where computer-based activities are integrated with practical or classroom-based situations.

Computer-based learning:

Computer-based learning (CBL), sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes.

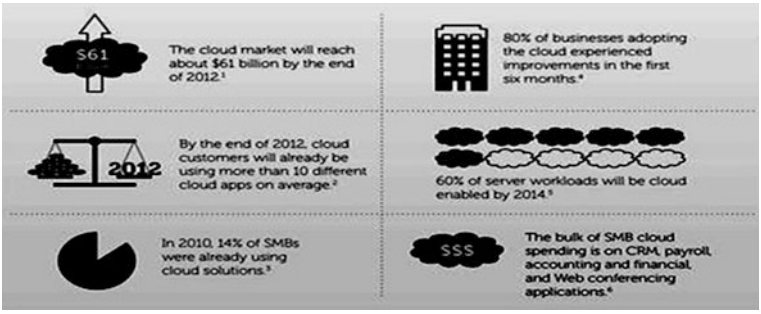
Computer-based training:

Computer-based trainings (CBTs) are self-paced learning activities accessible via a computer or handheld device. CBTs typically present content in a linear fashion, much like reading an online book or manual. For this reason they are often used to teach static processes, such as using software or completing mathematical equations. CBTs provide learning stimulus beyond traditional learning methodology from textbook, manual, or classroom-based instruction. For example, CBTs offer user-friendly solutions for satisfying continuing education requirements. Instead of limiting students to attending courses or reading printed manuals, students are able to acquire knowledge and skills through methods that are much more conducive to individual learning preferences. For example, CBTs offer visual learning benefits through animation or video, not typically offered by any other means and certificate programs via the Internet at a wide range of levels and in a

wide range of disciplines. In addition, several universities offer online student support services, such as online advising and registration, e-counseling, online textbook purchase, student governments, and student newspapers.

Educational Usage of Cloud Computing

The recent trend in the E-Learning sector is screencasting. There are many screencasting tools available but the latest buzz is all about the web-based screencasting tools which allow the users to create screencasts directly from their browser and make the video available online so that the viewers can stream the video directly. The advantage of such tools is that it gives the presenter the ability to show his ideas and flow of thoughts rather than simply explain them, which may be more confusing when delivered via simple text instructions. With the combination of video and audio, the expert can mimic the one on one experience of the classroom and deliver clear, complete instructions. From the learner's point of view this provides the ability to pause and rewind and gives the learner the advantage of moving at their own pace, something a classroom cannot always offer.



Cloud computing is a new business model wrapped around new technologies like virtualization, SaaS, and broadband internet. The cloud delivers computing and storage resources to its users/customers. It works as a service on demand policy. Recent interests offered new applications and elastic scalability with higher computing parameters. So that, these positive effects have shifted to outsourcing of not only equipment setup, but also the ongoing IT administration of the resources as well. The results of a survey that have been completed in 2009 by Gartner analysts (Fig. 1) 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 [3]. Results are shown as a pie chart and the labels on each different slice represent different industrial sectors and services. The "/" is used to separate different sectors with the same percentage.

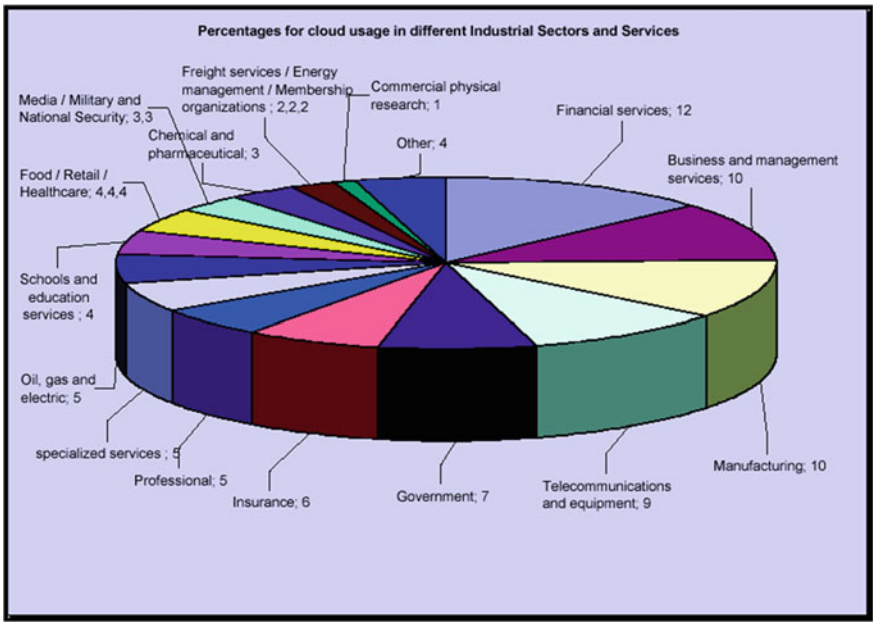


Fig. 1 Cloud usage

Services of Cloud Computing

IaaS

Infrastructure layer corresponds to IaaS infrastructure services, is the lowest layer of the network. Users can household to provide standard services, including computing power and storage resources. It turn the memory, storage, and computing power into a virtual whole resource pool for the entire industry to provide the required computing power and storage resources.

PaaS

Platform layer corresponds to platform as a service (PaaS) that made a higher level of abstraction on the base of Iaas layer to provide a development environment, test environment, server platforms, and other services, users can develop applications based on Internet and other servers service providers infrastructure, then share it to other users.

SaaS

Software as a service (SaaS) is a software distribution model, designed for web delivery, user can deploy and access through the Internet hosting. SaaS providers need to build information for all network infrastructure, software, hardware, operating platform, and is responsible for the implementation of all post-maintenance and other services. Compared with the traditional method of service, SaaS not only reduces the cost of traditional software licensing, and vendors deploy application software on a unified server, eliminating the end-user's server hardware, network security devices and software upgrade, and maintenance expenses, the customer does not need other IT investment in addition personal computers and Internet connections to obtain the required software and services.

Framework for Cloud-Based E-Learning

The Base Layer of E-Learning Cloud

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. 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 re-integration, 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 base layer can provide the basic hardware resources for the platform layer, and the users can also make use of it the same as using a local device.

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.

The Application Layer of E-Learning Cloud

The application softwares 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 in 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 e-commerce in the future.

E-Learning Application Model Based on Cloud Computing

With the progress and application of technology, the emergence of cloud computing offers e-learning good opportunity to develop, so we are convinced that it also can resolve the problem mentioned above properly. School or the enterprise neither needs to worry about the construction of the environment of e-learning software and hardware nor invest enormous capital and human and material resources to construct the system. All those issues can be handed to service providers of e-learning cloud, who can customize for users. In e-learning cloud model, data storage is highly distributed, data management is highly centralized, and data service is highly virtualized, all of which offer a much safer data service. Intelligent business policy-making. E-leaning cloud environment provides large data center with mass data storage and high-speed computation. This architecture for the cloud platform provides a variety of user interface forms, such as Web Service interfaces, Java interfaces, C interfaces, Shell interface, etc. Cloud computing platform provides resource services to teachers and students in the form of rental. A module is designed which is based on the consumption billing to ensure that users only pay for the resources they have used.

A promise of the cloud computing is the virtualization which reduces the number of servers required. Therefore, the key is to identify the user to meet the expected demand for the infrastructure needed to balance the amount of cloud: too few computing resources, the request from the user must wait for the release of resources or reject those requests until more hardware is added to the environment. Too much computing resources, hardware costs, and other expenses will be denied cost-cutting promises of cloud computing. In the cloud platform, teachers and administrators enter their requests for IT resources website (server, software, storage, etc.), immediately know whether these resources are available. If resources are available, submit a request immediately and automatically routed to the cloud administrator for approval. This process is automated, so it can be met in a very

short period of time. Resource use planning and management are important activities of the cloud. Handled properly, the plan will provide needed capacity computing resources to create new solutions and to meet application performance goals, promote teaching, and researching goals.

Conclusions

Cloud computing as an exciting development is a significant alternative today's in educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. The gradually removal of software license costs, hardware costs, and maintenance costs, respectively provides great flexibility to the university/corporate management. From the points of advantages provided by cloud, there is a great advantage for university IT staff to take them away the responsibility of the maintenance burden in the university. Through the research we believe that, we can create an e-learning application model based on cloud computing by means of cloud computing's mass data storage, high-speed computing capabilities, as well as its ideal allocation, and the sharing mode of resources. Some problems such as platform security, technical standards, regulatory, and other services are not well resolved yet in practice, pending further research and exploration. Either way, e-learning application model based on cloud computing will not stop its pace to proceed. As the cloud computing technologies become more sophisticated and the applications of cloud computing become increasingly widespread, e-learning will certainly usher in a new era of cloud computing.

Adopting cloud network redundancy eliminates disaster recovery risks and its high costs. There can always be new tools and applications to improve IT features. There are of course some disadvantages too. The cloud computing services needed to deliver the majority of IT services needed by customers do not yet exist. There are still problems and constraints with application offerings, service-level agreements, more importantly security issues. All of the cloud providers do not have the same capability for their technological levels.

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