AN E-LEARNING ECOSYSTEM BASED ON WIRELESS CLOUD COMPUTING

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Abstract- Cloud computing is all about implementing processes online instead in our local gadgets. Data and process could be done online without the need of any local software or client. It refers to application delivered as a service over the internet (SaaS), the hardware and system software in the data centers that provide those services (PaaS) and Infrastructure as a service (IaaS). This paper discusses on what cloud computing is all about, its various delivery models, its advantages and disadvantages. The heart of the paper contains the idea which is been proposed with the motive of promoting e-Learning to the student community in a much easier way (Community cloud computing). In short, the introduction of e-learning through Cloud Computing. This is then further made hardware simplex using wireless technology. In the above application SaaS delivery model is used. Many companies and educational institutes abroad are just beginning to realize the benefits of cloud computing applications that have traditionally required concurrent site licensing which is a type of software license that allows the user to install a software package in several computers at a particular site or facility. Depending on the amount of price paid, the license may be unlimited or may limit simultaneous access to a certain number of users, installation and subsistence.

Index terms- Anna University, cloud computing, E-Learning Ecosystem, Wireless Technology.

I. INTRODUCTION

The promise of cloud computing

Cloud computing seems to offer some incredible benefits for communicators: the availability of an incredible array of application software, access to lightning-quick processing power, vast storage, and the potential to effortlessly share and process information. All of this is obtainable through your browser any time you can access the Internet. While this might all appear alluring, there still remain issues of consistency, portability, privacy, and security.

The Notion of Cloud Computing

Cloud computing is a model for enabling 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.[1] Cloud computing is a complex infrastructure of software, hardware, processing, and storage that is available as a service. Cloud computing provides immediate access to large numbers of the world’s most sophisticated supercomputers with their corresponding processing power, interconnected at diverse locations around the world, offering speed in the tens of trillions of computations per second. All of this is available through a simple Internet connection using a standard browser or other connection. Services range from the uplifting—financial analysis, medical information and analysis, and document creation and collaboration—to the quirky—computer gaming. Cloud computing is comprised essentially of applications running remotely (in the cloud, so to speak) that typically reside on personal computers and local servers.

In recent years e-learning has grown into a widely accepted learning model. Innovative changes of e-learning applications have also been witnessed. Recently the research community has believed that an e-learning ecosystem is the next generation e-learning. [4][5] The current models of e-learning ecosystems lack the support of underlying infrastructures [5][6], which dynamically allocate the required computation and storage capacities for an e-learning ecosystem. Infrastructure is one of the important constituents of an e-learning ecosystem and has the direct impact on the flourish and sustainability of an ecosystem. Cloud computing has been a hot topic of computing paradigm. Enterprises currently employ cloud services to improve the
scalability of their services and to deal with bursts in resource demands. Cloud computing is the promising infrastructure which can provide tremendous values to e-learning ecosystems, due to its abilities of delivering computation and storage resources as services.

The main contribution of this paper is to introduce Cloud computing into an e-learning ecosystem as its infrastructure to build a sustainable and flourishing e-learning ecosystem. This allows for some crucial and amusing features: (1) to track the situation of resource configuration and utilization in real time, allocate resources on demand, and make full use of resources; (2) to allow workloads to recover from unavoidable hardware/software faults; (3) to promote the evolvement or extinction of learning species (including learning contents, services, and applications). This paper is organized as follows. **Section 1** describes what Cloud computing can provide to an e-learning ecosystem. **Section 2** describes what Cloud computing can provide to an e-learning ecosystem. **Section 3** demonstrates how wireless technology can be used effectively in this application of e-learning ecosystem based on Cloud computing infrastructure. **Section 4** the architectural plan involved in application of cloud computing in Anna University (community cloud).

1. CLOUD COMPUTING

Cloud computing has become one of the hottest buzzwords in the IT area. Many companies and institutions are rushing to define clouds and provide cloud solutions in various ways. However, there is still no widely accepted definition for Cloud computing. A cloud is a type of distributed data center which delivers infrastructures as services. It consists of massive resources, and provides some mechanisms to provide, reimage, workload rebalance, de-provide, and monitor those resources. It represents as one or more unified resource entities, and renders users/applications with services to access those resources without knowing the detailed information. One of the most important feature ideas behind Cloud computing is scalability, and the key technology which makes it possible is virtualization[7]. Cloud computing allows an e-learning ecosystem with the infrastructure which is reliable, flexible, cost-efficient, self-regulated. The Contribution of Cloud computing to an e-learning Ecosystem mainly contains those aspects as follows:

1. Cloud provides QoS-guaranteed infrastructures, e.g., time, cost, reliability, and hardware performance like CPU bandwidth and memory size, and sustain SLA-oriented resource allocation [8].
2. Cloud provides the support of varies of applications, making it convenient and rapid to get the required computation and storage resources.
3. Cloud provides real-time configuration information and resource utilization information, allocates resources on demand, and improves the usage rate of resources.
4. Through the automatic resource management, emergencies can be solved rapidly, and labor-intensive jobs can be achieved. Therefore, the cost is cut down.

2. AN E-LEARNING ECOSYSTEM BASED ON CLOUD COMPUTING INFRASTRUCTURE

**Architecture**

An e-learning ecosystem based on Cloud computing infrastructure is composed of three layers: Infrastructure layer, Content layer, and Application layer. It is also with four *ad hoc* modules: monitoring module, policy module, arbitration module, and provision module. **Infrastructure layer** is the resource pool of an e-learning ecosystem. The infrastructure is managed by Cloud computing platform. Hardware and software virtualization technologies are used to ensure the stability and
reliability of the infrastructure. Supplying computation and storage capacities for higher layers, it is the energy source of an e-learning ecosystem.

Content layer mainly consists of e-learning contents, such as Web file systems, database systems, Web Services, and so on. Except for content storage and maintenance, this layer exposes the standard interfaces and APIs of contents for higher layers. Application layer consists of e-learning services, systems, tools, and so on. It also provides functions and interaction interfaces for users or other programs. Monitoring module is keeping track of the executions of requests, the real-time configuration information and resource utilization levels of species, including the health of CPU, memory, I/O, and so on. Policy module establishes and maintains the teaching and learning strategies, the run-time and resource scheduling strategies. According to the data from monitoring module and the strategies of its own, policy module establishes specific solutions, and then triggers provision module. Policy module also decides which species to get higher priorities on resource scheduling according to some e-learning policies in order to safeguard the running of critical businesses. Policy module is the core of an e-learning ecosystem. In the arbitration module, some policies are made by experts manually; requests from users are completed; and some disputes among species within the e-learning ecosystem are solved. Arbitration module amends, adjusts, and improves the resource allocation and management. It also establishes usage modes for different kinds of users based on the learning styles, learning preferences, and cognitive levels. Arbitration module is an efficient complement to the policy module, while the privilege of its policy is higher than the one in the policy module. Provision module starts the execution of resource allocation solutions set by the policy module and arbitration module, and deploys resources referred to users or species automatically in a short time. If the request comes from a user, some related information such as IP, user name and password will be supplied.

3. INTRODUCTION OF WIRELESS TECHNOLOGY INTO CLOUD COMPUTING

With the rapid development of wireless telecommunication technology and increment of bandwidth, more people are using their wireless handheld devices for web surfing when they are on the move. However, wireless handheld devices with constrained functionality such as small screen, limited computing power and so on, restrict the user oriented QoS provided for wireless web surfing. It is crucial for wireless mobile users to browse large web page designed for PC users comfortably. Researchers have recommended some valid algorithms that split web page into multiple blocks relevant for exhibiting on small screen device. It is required to put these current web adaptation engines into practice. Most of existing engines are carried by proxy or server when they are implemented. We have implemented a web page adaptation engine for wireless devices based on proxy mode[10]. Whereas, by experiments, it is found that the proxy will be more inefficient as more wireless terminals appear. In order to solve the issue, by introducing a P2P collaborative mode for wireless web surfing that wireless devices associate with one another, thus forming a P2P collaborative system[11]. Each device of the system can contribute their ability and quantity of storage to the one that needs them. On the contrary, the system will be more efficient as more wireless terminals join the system. However, the characteristics of wireless computing environment such as mobility, high frequency disconnection, network condition diversity, and network communications dissymmetry and so on, cause the system owns few peers at most time, exhibiting a low efficiency.

There exists a strong desire to consider the data in the emerging cloud computing infrastructure because of its strong value propositions. A cloud computing infrastructure, such as Amazon Elastic Computing Cloud provides huge potential computing ability, typically in the form of virtual machines, to end users on-demand from remote
locations in the Internet. Cloud presents many value propositions which include: the cloud provided an abstraction of some part of the environment such that the user didn't have to perceive nor care about it; besides, cloud is currently a storage place for data and applications and that it will move to being “like electricity” in its accessibility to developers and users alike. In addition, because of its scale and expertise, Cloud could provide a much more reliable and secure infrastructure than most enterprises could afford. For example, Amazon has multiple data centers and each data center also has multiple backup power generators. Amazon also has strong security measures to guard against not only physical security breach but also hacker attacks. By means of the existing web page adaptation engine that has been proposed, and by referring to cloud computing infrastructure, a new wireless web access mode is proposed. A distributed web page adaptation engine is designed firstly for the convenience of the following deployment so that the engine can be carried by computing cloud distributed and parallel. Then a distributed web page blocks management which is based on cloud computing is provided and a specific algorithm is designed to designate engine processing task, coordinate working between each computing cloud. Furthermore, a prototype system as well as a set of evaluation experiments has been carried out.

From the system framework, we can conclude that a distributed web page adaptation engine and distributed web page blocks management based on cloud computing must be designed so that the engine can be carried by computing cloud distributed and parallel[10]. The main purpose on introducing wireless networking in cloud is to make hardware simplex. Wireless supports this application as cloud already contains enormous storage capacity and there is no need to worry about the storage capacity of the wireless network.

4. APPLICATION OF WIRELESS CLOUD COMPUTING IN ANNA UNIVERSITY

A. Cloud computing Offerings

Cloud computing gives the illusion of near-infinite resources available on demand. Exposure to cloud computing tools and technologies is believed to be crucial in preparing undergraduates for the industry as these skills will be in demand. In order to prepare students, university has to take action in embracing cloud computing into the proceeding. Mass amount of information and knowledge is made available via cloud. Therefore, University need to identify and leverage emerging cost-effective technologies which enable feasible and equitable access for students and staff. With cloud computing platform, students and staffs will have access to ubiquitous resources via Web browsers. The need for hardware and software is being shifted from being on-premises to being in the cloud. Software and files are no longer installed or stored in a single machine. The basic requirements are a web browser and a cheap access device, broadband in the schools or else wireless hotspots.

![Fig.4 How to use E-learning In Cloud](image)

For example, in teaching students of data center ascendency and high availability, cloud computing enables students a data center-like experience by working hands-on with load balancers, web server front ends and etc without building or managing a data center. Furthermore, by adapting to cloud computing applications, students and staffs can now gradually move both their work and used tools into the cloud, making both accessible from any computer, using tools that are free or very inexpensive. Cloud-based applications can provide students and teachers with free or low-cost alternatives to expensive, proprietary productivity tools. Universities can take advantage of ready-made applications hosted on a dynamic, robust cloud that enable end users to perform tasks without having to acquire concurrent site licensing which is a type of software license that allows the user to install a software package in several computers at a particular site or facility, installation, and maintenance of individual software packages, media editing, Email, spreadsheets, word processing, presentations, collaboration, and more can all be done inside a web browser, while the
software and files are held in the cloud. Regardless of the capability of their own hardware, students and staff will have ample computing resources to utilize the software. This in turn provides the universities with tremendous productivity increase, along with cost, and energy savings because the same cloud infrastructure can be used for teaching and research, and by many users. Apart from that, universities can use cloud computing technology to improve communication and collaboration with others in order to develop dynamic teams and interactive collaboration globally. Infrastructure as a service (IaaS) and software as a service (SaaS) technology demonstrated by cloud computing facilitates students and faculties to have 24/7 access to latest enterprise infrastructure and software without having to upgrade their hardware systems or expand their data centers using minimal web infrastructure. Active and dynamic collaboration within user-friendly clouds between academics and researches worldwide is a critical success factor for University to develop quality work through iterative processes. Applications in the cloud also enable users to share documents easily, perform collaborative editing, and manage versions effectively. Services via browser-based applications like YouTube (http://www.youtube.com), and Blogger (http://www.blogger.com), include a set of powerful cloud-based tools. This set of technologies has clear potential to distribute applications across a wider set of devices and greatly reduce the overall cost of computing. The support for group work and collaboration at a distance embedded in many cloud-based applications could be a benefit applicable to many learning situations. Additionally, University may facilitate students and faculty to effectively, safely and conscientiously find, assess, use, and add online course contents via cloud. Course contents evolve constantly through collaboration and interaction and updates. Information and knowledge can be acquired; developed, shared and retained easily thus providing up-to-date course contents. Therefore, course management will be made easier.

Cloud can be used as a personal workspace, a tool to employ in the scholarship of teaching and learning and also as an alternative personalized tool for Virtual Learning Environments (VLEs). Thomas also pointed out that using cloud eliminates the need to back up everything to a thumb drive and transferring it from one device to another. It means that user can have a life-long repository of information within clouds while utilizing large amounts of processing power comparable to supercomputer level. Specifically, the cloud platform can support academics in preparing teaching portfolio, preparing a presentation on teaching to a local audience; conduct a conference presentation; create a manuscript to be submitted for publication, etc. It may also include a self-report that summarizes academics major teaching triumph and strengths in the form what they teach and how well they teach, why they teach, the way the teach and whether or not it works with evidences. Academics can improve their teaching methods via feedback that they receive from peers and student evaluation.

B. Cloud computing Challenges

The cloud does have certain drawbacks. Unlike traditional software packages that can be installed on a local computer and are available as long as the operating system supports them, cloud-based applications are services offered by companies and service providers in real time. Clients must attain the confidence that the service provider will continue to be in presence, even in case of changing market and other conditions before establishing their work and information in clouds. Cloud computing makes it possible to deliver everything in digital form.

Copyright law and patent law strive to protect the intellectual property of the owners’. Open source and community source software has become a commonplace. Course contents, instructional framework and syllabi are made transparent and accessible to all. Therefore, in practice, many factors affect a University’s decision whether to move to the cloud. The main concern is related to who controls the data. Factors like economics, technical considerations, data privacy, analysis ability and also the issues of privacy, security, obscurity, telecommunications capacity, government surveillance, accuracy, existence, support, interoperability and conformity among others have to be worked out for the cloud to gain wide acknowledgement.

Adopting clouds means that user no longer has their data, applications and computing resources under their control. Ensuring 100% availability of cloud services is only possible if high availability architecture is adopted and both the platform and applications are fully tested. Universities must guard service level agreements (SLAs) and take safety measures like maintain a backup on fixed storage, or by using a backup cloud, or simply by not storing mission-critical data on the cloud as a part of their emergency plan when a cloud is not functioning.

In terms of applications, the Universities may keep an on-premises version of the software application which may help them to work even on offline while the cloud is down. Universities must ensure viable vendors are selected to ensure the integrity of
information being placed in clouds. Cloud computing vendors must take up the most refined and up-to-date tools and agendas and makes sure to provide better privacy and security than that is available for on-premises computing. Cloud services should be designed for easier usability with support provided better than what the users are accustomed to with on-premises computing. Nonetheless, the economics of cloud computing are increasingly compelling. Cloud computing offers a cost-effective solution for many institutions and associations to the problem of how to provide services, data storage, and computing power to an increase in the number of Internet users without investing fund in physical machines that need to be sustained and upgraded on-site.

II CONCLUSIONS

Physical machines in most of the traditional e-learning ecosystem are generally simple and exclusively stacked. Most of the resources are deployed and authorized for some specific tasks. Moreover, the utilization of those resources becomes a demanding problem. In this paper, an e-learning ecosystem based on Cloud computing infrastructure is presented. Cloud computing realizes an e-learning ecosystem with the infrastructure which is reliable, flexible, cost-efficient, self-regulated, and QoS-guaranteed. It has some mechanisms to guarantee the teaching and learning activities, the quality and the functioning of the ecosystem. The introduction of wireless technology has made the major contribution in this paper.

REFERENCES


