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Cloud supported e-learning framework for cost effective online learning

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Abstract - Software as a Service has been with us for some time like use of email services. This is a decades old concept. Educators to provide online contents , have been using cloud hosted services to deliver education for over a decade. This paper aims to propose an online learning management system (OLMS) delivered via the cloud in form of a web application seamlessly delivered over the Internet, and accessible from anywhere in the world. It is hosted on servers at a third parties' data center. The use of the Online Learning Management System is rented. The cost can be minimized as the software is updated frequently, and does not have to be maintained by the customer. This paper analyzed the difference ,that what a user should expect from the cloud: in terms of features, security, redundancy, scalability, automation and cost reduction .

Keywords : Cloud , Software as a Service, OLMS, data center, cloud security

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1. INTRODUCTION

From the user standpoint, the concept of cloud computing can best be explained as a collection of server delivering resources that can be accessed remotely via the Internet in real-time. These servers are housed in a bunker like structure called a Data Center. In other words, your data, your software applications are not housed on your computer; they're on a service's cloud of web servers (often virtual servers) usually accessed by you via the Internet using a browser like Chrome or IE. You are renting the use of the software and storage space. The cloud is effectively a group of servers; more specifically– "virtual servers"–which simulate running multiple computers on a single piece of hardware. This is beneficial since it's possible to get more use out of the piece of hardware than if it was just doing the work of one. A simple explanation: if I have ten Dell servers each at 10% utilization I will have ten physical pieces of equipment to maintain and upgrade or using the cloud I can have only one server at 100% utilization. The term cloud leverages the fact that these virtual servers can be started up, shut down, upgraded, moved from physical machine to physical machine, etc all through software and in response to demand or other event. For example, you might want to have more web servers running during the day when traffic is high and fewer during the evening when traffic is low. Typically cloud servers cost out per hour. This can be more economical than keeping all of your web servers running all of the time.

2. CLOUD COMPUTING FOR E-LEARNING

Clouds are defined by the technology they provide: computation, software, data access, and storage services. A cloud can be defined as a place for users to create or store files, but has alternative meanings that, for example, explain how using a cloud can optimize processing power on the user end through its network. Services now deliver software such as Microsoft Office from the cloud. This means a computer user is renting the use of the software-usually via a monthly payment automatically deducted from a credit card.

Enterprises have been using hosted applications for learning software for over a decade. Software as a service (SaaS) is one type of computing that is almost always in the cloud and delivers a single application through the browser to thousands of customers using a multitenant architecture. The biggest change in attitude towards the cloud has come over time as Chief Technology Officers realize they do not have to maintain software and services within their own buildings and can maintain the same control via renting the software and server capacity. Or, the CTO realizes their kingdoms are at capacity and welcome departments outsourcing to the cloud. Think– enterprise sales tracking installed on each

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salesperson's desktop containing a copy of ACT or a ten dollar a month bill for each salesperson's online log-in to SalesForce.com.

So it goes for distance education using the Internet. Advanced Learning Management Systems now also come with services attached. Often administrative support and consulting services are included on the use of the software, allowing the customer to build corporate eLearning viability and online education business offerings.

2.1 Learning Services: Delivery of Learning

A learning management system (LMS) delivered via the cloud is generally a web application seamlessly delivered over the Internet, accessible from anywhere in the world. It is hosted on servers at a third parties' data center. The use of the Learning Management System is rented. Advantages for the enterprise are that the software is updated frequently, and does not have to be maintained by the customer. The application is essentially "version-less" in the customer's mind since only one active code release exists. Usually the LMS SaaS provides updates on a quarterly or bi-yearly basis. The using enterprise does not have to purchase hardware or people to operate/set up the servers. And during peak usage the cloud service increases capacity to service more users. Sophisticated clouds will automatically spawn virtual services to meet increasing demand. Some purists claim that this capacity to automatically spawn virtual services is a key part of being a cloud service. Others use the term more loosely.

2.2 Learning Objects/Modules

The e-Learning pundits are talking about for 2012 is authoring content in the cloud. The cloud provides the capability for collaborative development tools for creating, reviewing, and publishing interactive tutorials, assessments, and learning objects. Typically the control of authoring eLearning content rested with individuals working with specific authoring software installed on desktops. Project managers looking for efficiency and repeatability have longed for online systems that allowed for distributed workflow that is scalable. Imagine an online system where subject matter experts can review module pages anytime/anywhere and comment in context and where comments are captured in a database. The pundits are saying that if websites can be built on a "what you see is what you get" model so should it be for eLearning content.

3. CONCERNS BEFORE DEPLOYMENT

As an eLearning manager, it's imperative to make sure you're getting the advantages of the cloud when a company uses the buzzword in their product promotion. Perhaps some of the biggest concerns hidden in the haze of the cloud's popularity are its ability to deliver on the promise of redundancy, scalability, and security. Where these virtual servers are housed is a legitimate question to ask. There are no guarantees. Amazon had a 2011 publicized service hiccup due to human error and Sony has been hacked. Known security issues exist with larger brands, whereas many good SaaS providers have impeccable records. So go figure. Here are few topics to ask questions about.

3.1 Redundancy and Scalability

The key to redundancy is to design an architecture that does not have any single point of failure. A cloud computing system must make multiple copies of client information and store it on other devices and transfer workloads for easier information retrieval or in case of a break down. Redundancy enables the central server to access backup machines to retrieve data that otherwise would be unreachable. The redundancy associated with clouds is not always a given, but it's easier as a side effect of this structure. Since most of the cloud serving a site should be made out of disposable machines (since it's ideal to shut them down, start them back up, rebuild them, clone them frequently) the loss of one or more virtual machines due to a software or hardware issue is less of a problem than it would be otherwise. This doesn't apply to all, but to most.

3.2 Security

The security of the software running on the cloud is up to whoever's managing it. The security benefits of running in the cloud at a reputable data center must meet certain physical location security measures to accommodate; like HIPPA or other guidelines. Some data centers are certified (SSAE 16) and must submit to security audits. Regularly performing a security analysis is vital to the security of any network. It is the only way to ensure that firewalls and access controls are properly configured and that server updates have been applied. Consider the importance of both physical and electronic security: escort-only physical security, alarm system, video surveillance, motion detectors and glass break detectors, and dedicated network security experts. Ask your cloud provider if the data center is certified.

All of this can be thrown out of the window when talking about many uses of the cloud. It's a big buzz word/ marketing term and gets thrown around a lot. In some cases it means that someone has placed one or more constantly running virtual machines on a provider, but it isn't anything new. It just has a new name.

As an eLearning manager looking to deliver, author and store content in the cloud, you should be asking questions about auto redundancy, scalability and security. A reputable company with a handle on these important aspects of cloud computing is much more reassuring than just a brand name.

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.

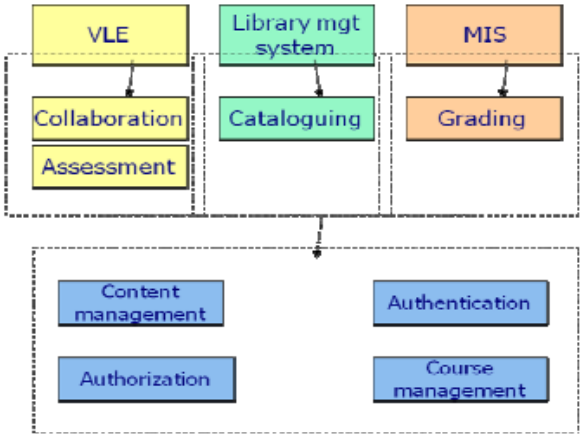

Figure 1: Traditional E-Learning

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 .

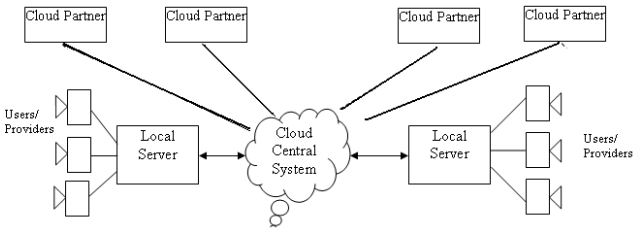

Figure 2: Cloud Based E-Learning

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.

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

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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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