Conceptual Framework For Cloud Based Model

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Abstract- *The nature of the Internet was constantly changing from a place used to read web pages to an environment that allows end-users to run software applications. The need for education is increasing constantly and the development and the improvement of the e-learning solutions is necessary. Also, the e-learning systems need to keep the pace with the technology, so the new direction is to use cloud computing. Cloud computing is highly scalable and creates virtualized resources that can be made available to users.*

Cloud computing will have a significant impact on the educational environment in the future. Cloud computing is an excellent alternative for educational institutions which are especially under budget shortage in order to operate their information systems effectively without spending any more capital for the computers and network devices. Academic institutions take advantage of available cloud-based applications offered by service providers and enable their own students to perform academic tasks. In this paper, we will discuss what can be done to increase the benefits for students and teachers.

I. INTRODUCTION

Cloud computing is becoming an adoptable technology for many of the organizations with its dynamic scalability and usage of virtualized resources as a service through the Internet. Most of the conventional education forms are becoming not being suitable for requirements of social progress and educational development and not being able to catch up with the changes of learning demand in time, thus computer networks have brought opportunities for it. In traditional web-based e-learning mode, system construction and maintenance are located in interior of educational institutions or enterprises, which results in a lot of problems like more investment.

The nature of the Internet was constantly changing from a place used to read web pages to an environment that allows end-users to run software applications. The need for education is increasing constantly and the development and the improvement of the e-learning solutions is necessary. Also, the e-learning systems need to keep the pace with the technology, so the new direction is to use cloud computing. Cloud computing is becoming an attractive technology due to its dynamic scalability and effective usage of the resources; it can be utilized under circumstances where the availability of resources is limited. The need for education is increasing constantly and the development and the improvement of the e-learning solutions is necessary. Also, the e-learning systems need to keep the pace with the technology, so the new direction is to use cloud computing.

This paper aims to explore the educational potential of "cloud computing", and how it could be exploited in enhancing engagement among educational researchers and educators to better understand and improve their practice, in increasing the quality of their students' learning outcomes.

II. CLOUD COMPUTING

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. Therefore, a new business model is being created where the services it provides are becoming computing resources [19].

Cloud computing consists of three layers.
Infrastructure as a service (IaaS)
Platform as a service (PaaS)
Software as a service (SaaS)

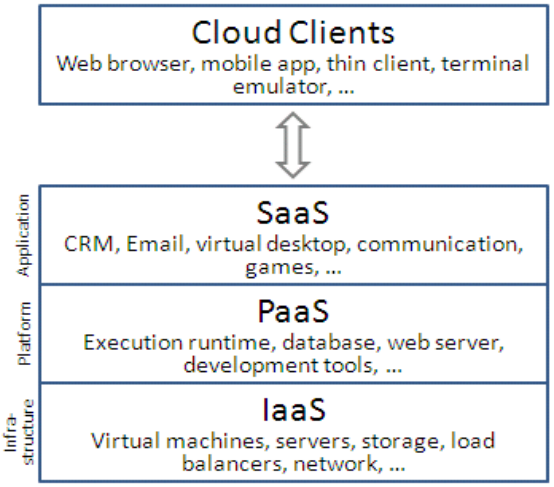

Fig. 1: Three Layers of Cloud Computing

Depending on the requirements, the customers can choose one or more services provided. The customers are renting or simply accessing the needed processing capacity from the data center using the client applications. The quality of the service becomes a crucial factor of the cloud computing success. 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.
In Cloud computing, resources can be either externally owned (public Cloud – as provided by Google and Amazon) or internally owned (private Cloud). Public Clouds offer access to external users who are typically billed on a pay-as you-use basis. The private Cloud is built for the access within the enterprise where the users can utilize the facility without any charge.

Why cloud computing for E-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.

E-learning is widely used today on different educational levels: continuous education, company trainings, academic courses, etc.

There are various e-learning solutions from open source to commercial. There are at least two entities involved in an e-learning system: the students and the trainers.

The students:

- Take online course
- Take exams
- Send feedback
- Send homework, projects

The teachers:

- Deal with content management
- Prepare tests
- Assess tests, homework, projects taken by students
- Send feedback
- Communicate with students (forums)

Usually, e-learning systems are developed as distributed applications, but this is not necessary so. The architecture of a distributed e-learning system includes software components, like the client application, an application server and a database server and the necessary hardware components (client computer, communication infrastructure and servers).

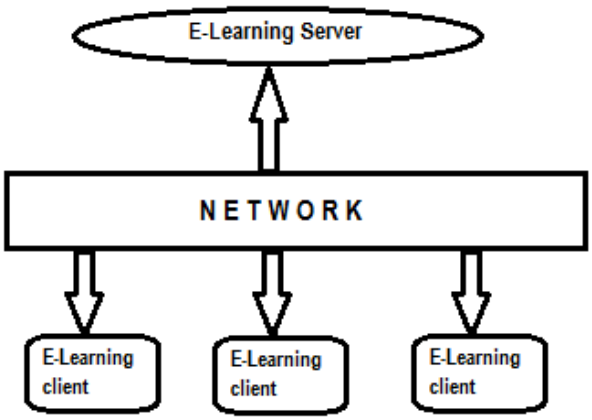

Fig. 2: E-Learning System

A. Why Cloud Computing in Higher Education?

Cloud computing has a significant place in higher education in that the appropriate use of cloud computing tools can enhance engagement among students, educators, and researchers in a cost effective manner. There are security concerns but they do not overshadow the benefits.

By using Cloud Computing educational institutes can concentrate more on teaching and research activities rather than on complex IT configuration and software systems management. Complexity can be reduced with Cloud Computing. Cloud solutions can be used to support cooperative learning and socially oriented theories of learning, using computer technologies to support collaborative methods of instruction. Cloud computing offers many benefits to e-learning solutions by providing the infrastructure, platform and educational services directly through cloud providers and by using virtualization, centralized data storage and facilities for data access monitoring. Using cloud computing educational institutions can collaborate with each other and create a common virtual there by reducing the expenses and the man power required to install a well equipped computing lab.

Because of the following reasons like costs increase, institutional performance, competition, Cloud computing

becomes an important requirement for many educational institutions.

III. CLOUD COMPUTING ARCHITECTURE

Cloud computing is one of the new technology trends likely to have a significant impact on the teaching and learning environment [30].

The challenges that are faced by higher education institutes are the ever changing environment. Economical issues and the requirement to reduce the operating cost to remain competitive. Cloud computing provides services that are easily configured, deployed, dynamically-scaled, and managed in virtualized environments. It provides the foundation and capabilities for the dynamic infrastructure through a consumption and delivery model for services in which the user sees only the service and has no need to know anything about the technology or implementation.

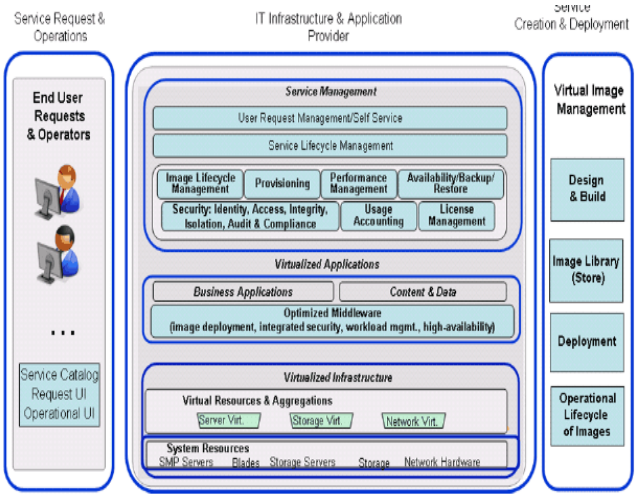

Fig. 3: Cloud Computing Architectural Model

The key roles in a cloud environment include the service consumer, the service creator and the service provider. The cloud service consumer needs a secure anytime anywhere access to low cost services that are flexible and easy to use. The biggest hurdle to adoption of cloud has to do with consumers discomfort in the following areas: security of both service and the underlying data, service availability and reliability, service management to ensure service level agreements, ensuring control over access and policies, and the appropriate administration to facilitate flexible pricing structures. A service does not exist unless someone actually creates it. The cloud services creator needs tools and capabilities to offer differentiated services, offer incentives to ensure that consumers keep coming back to use the services, and the ability to change services on-demand to stay competitive and address threats. Finally the service provider actually runs the service that the service consumer wants and was designed and developed by the service creator.

The key capabilities of the reference architecture are defined in the service provider component. The lowest layer of the architecture defines the capabilities of the virtualized infrastructure. These capabilities facilitates virtualization of all IT resources: server, storage and network. These virtualization capabilities can handle all types of IT resources, e.g. both mainframe and distributed servers. The next layer provides an optimized middleware with capabilities for image deployment, integrated security, workload management, and high-availability. The optimized middleware is used as the way to deliver services and information built according to well defined SOA and Information architectures. The central piece of the component is service management which provides the capabilities to manage a cloud service. These services include capabilities to handle user requests: managing the self service requests made by users, the lifecyle of images, and the provisioning of images based on the request. The capabilities also handle many of the qualities of service associated with delivering images, including availability, backup and restore, security and compliance, and performance management. To facilitate delivery through flexible models, the capabilities also support usage accounting and license management.

The reference architecture provides a comprehensive set of capabilities to ensure that cloud services can be built, deployed, accessed, delivered and managed. Each of these capabilities are supported by the appropriate standards, technologies and tools - all integrated to work together to deliver cloud computing. As shown in the figure, many of the components need management - from the virtualized resources through the workloads and into the images, usage and service requests. The virtualized resource management focuses on deploying cloud services on virtualized resources and managing cloud services, images, and resources. The workload scheduling and management focuses on defining workloads along with Qualities of Service (QoS) requirements, assigning resources to workloads, adding/removing resources based on workload needs, and monitoring workloads. Image lifecycle management which focuses on designing and building images for cloud services, and managing images through their lifecycle. Service automation management which streamlines and automates management of cloud services and addresses all aspects of the cloud service lifecycle. Finally, usage and accounting management which helps define business and IT metrics, meter usage of services and resources, and accounting based on delivery model, e.g. subscription, pay-as-you-go, etc.

The service provider needs their IT resources integrated so their usage is optimized, the ability to add/remove resources on demand, a non-disruptive way to save money, and the means to charge for usage. There are three basic categories of cloud services: infrastructure services which provides access to a virtualized pool of resources, platform services that provide middleware or an application stack (hardware, operating system, software), and application services that provide access to a specific application or business process Where these services are deployed defines the type of cloud service. Private cloud services are hosted within the intranet while cloud services deployed in the internet are called public cloud services. It is critical to understand the workload characteristics to identify deployment strategies for a specific service.

The study reports that the cloud as a ubiquitous computing tool and a powerful platform can enable educators to practice new ideas. One of the most useful free "cloud computing" applications are the Google Apps for Education which is a free online suite of tools that includes Gmail for e-mail and Google Docs for documents, spreadsheets, and presentations. Using the cloud approach, everybody can work on the same document at the same time to make corrections as well as improve it dynamically in a collaborative manner.

Chandran [28] focused on current e-learning architecture model and on issues in current e-learning applications. The article presents the Hybrid Instructional Model as the blend of the traditional classroom and online education and its customization for e-learning applications running on the cloud computing infrastructure.

The authors underline the e-learning issues, especially the openness, scalability, and development/customization costs. The existing e-learning systems are not dynamically scalable and hard to extend – integration with other e-learning systems is very expensive.
The article proposed the hybrid cloud delivery model that can help in fixing the mentioned problems.

In this paper a new paradigm is highlighted in educational area by introducing the cloud computing in order to increase the scalability, flexibility and availability of e-learning systems. The authors have evaluated the traditional e-learning networking model, with its advances and issues, and the possibility to move the e-learning system out of schools or enterprises, inside a cloud computing infrastructure. The separation of entity roles and cost effectiveness can be considered important advantages. The institutions will be responsible for the education process, content management and delivery, and the vendor takes care of system construction, maintenance, development and management. The e-learning system can be scaled, both horizontally and vertically, and the educational organization is charged according to the number of used servers that depends on the number of students.

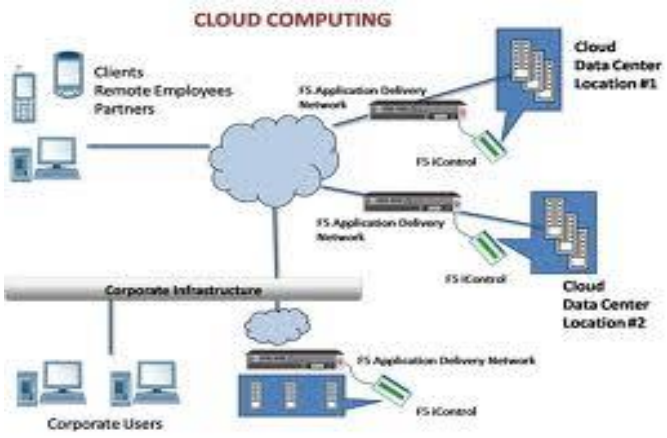

Fig. 4: Cloud Computing Infrastructural Model

The analysis of cloud computing in higher education should be done in the both the views, ie., benefits and limitations.

Main Benefits and Limitations of Using Cloud Computing in Higher Education

Benefits

- Access to applications from anywhere
- Support for teaching and learning and accounts management
- Software free or pay per use
- 24 hours access to infrastructure and content
- Opening to business environment and advanced research
- Protection of the environment by using green technologies
- Increased openness of students to new technologies
- Increasing functional capabilities

Limitations

- Not all applications run in cloud
- Risks related to data protection and security
- Organizational support
- Dissemination politics, intellectual property
- Security and protection of sensitive data
- Maturity of solutions
- Lack of confidence
- Standards adherence
- Offline usage with further synchronization opportunities

- Speed/lack of Internet can affect work methods

The main risks in cloud computing are security and data protection risks.

Issues regarding the security of cloud computing are:

- loss of governance
- lock-in
- isolation failure
- compliance risks
- management interface compromise
- data protection
- insecure or incomplete data deletion
- malicious insider
- protection of intellectual property and of the data in cloud

Security is a critical issue largely in public or shared environments, where the cloud provider needs to make sure that data privacy and compliance is guaranteed. Secure and efficient data exchange across the enterprise and clouds, as well as secure application connectivity are the major security concerns. Image management is important both in private and public clouds, as images are fast becoming the core object for deployment in data centers as a way to bypass installation problems. In this context, organizations need a way to organize, secure, manage and deploy images to the various virtualized platforms in a scalable manner. Once deployed, organizations need a way to manage the virtual images, which includes monitoring, updating, tracking, change management and auditing

In case of educational institutions sensitive data like students records, employees accounts and research results etc., must be paid special attention. In cloud there are many solutions for ensuring security and protection of data like mask the data, firewalls and encryption and key management. To choose solution for data protection and security the risk and cost of implementation must also be considered. To protect data against unauthorized access in the cloud environment data encryption can be used. The data can be encrypted before transferring it in the cloud.

IV. CONCLUSION

As a conclusion of Cloud Computing in educational institutes, we may say that the payment per use model and the management policies of risks and security represent positive factors in taking the decision of using Cloud Computing. Moreover, Cloud Computing adds value with small capital expenses, assuring at the same time the protection of the environment.

By including the cloud services, academic institutions achieve a substantially decreasing of expenses with software licensing and at the same time to reduce the campus IT staff by 75% employees with full working schedule.

The use of Cloud Computing becomes a necessity and not an option for many Institutes. This aspect is due to a various factors such as costs increase, the pressure of income increase, students' success, institutional performance and competition.

At the end, educational Institutes may value the opportunities offered by Cloud Computing through researchers and students and thus leading to innovation.

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