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AN ARCHITECTURE FOR LEVERAGING CLOUD SERVICES USING ACADEMIC CLOUD-MIGRATING TOWARDS VIRTUAL TECHNOLOGY

[1] Syeda Farhath Begum, [2] Firdous Rehana, [3] Farheen Sultana
[1,2,3] Department of Computer Science and Engineering, Nawab Shah Alam Khan College Of Engineering And Technology, Hyderabad.

Abstract— Cloud computing technology developed to provide efficient online services and infrastructure for various organizations to operate and process their activities using external and internal networks without need to install real IT system environment. Universities all around the world play a vital role in improving the society. But in the current economic crisis, they are facing difficulties in providing necessary resources for research and educational purposes. The Higher Education(HE) institute must exploit the opportunities afforded by Cloud while minimizing the associated security risks to allow access to advanced IT infrastructure, data centres, and applications and protect sensitive information.

Keywords—Academic Cloud, Cloud Migration, Higher Education.

I. Introduction

Universities all around the world play a vital role in improving and shaping societies. But in the present economic crisis, they are facing difficulties in providing necessary resources for research and educational purposes. The solution of this problem is in the use of Cloud Computing. Cloud computing considered as trusted IT resources developed to process the users and organizational activities [1]. However, the main objective of cloud computing is to centralized the processes of IT services and infrastructures and gather the information with user's through many applications through internal or external network. Cloud computing is like virtual machine that contain central information, services and hardware as one main system for all employees and departments inside the organization rather than IT system for each sector in the organizations[2]. The initial idea of cloud computing was founded by IBM in 1950's by developed processing machines called "Remote Job Entry" with special features such as speed CPU's and large storages capacity to allow many user's to use the same machine at the same time[3]. Therefore, cloud computing technology developed to provide efficient services online and infrastructure for several organizations to operate and process their activities using external and internal networks without need to install real IT system environment.

The Higher Education(HE) institute must exploit the opportunities afforded by Cloud while minimizing the associated security risks to allow access to advanced IT infrastructure, data centres, and applications and protect sensitive information

Computer Education is now indispensable for people up to their stratification but due to the poor economic condition many countries are unable to introduce their inhabitants with rich technologies and innovation developed by computer system. Consequently a shared based system evokes for uniform distribution of resources between people of every stratum. In this research work we are introducing an architecture of Cloud Computing for education sector and discuss the impact of our propose architecture on the availability of widespread resources to all around the country.

II. Literature Survey

A. Cloud computing Implementation In Higher Educational Institutions

This section will discuss the cloud computing implementations in universities of India to clarify the implementations approach, characteristics and benefits of adapting cloud computing technology in higher educational organizations.

a)Implementation of Cloud computing Indian Universities

Educational organizational structure in India is more complex than other educational systems. Thus, the student's records, results and information in middle and high education levels interrelated with each other. In other words, the students accepted in universities based on their results of the last7 years. Therefore, the student's information processing is continues. On other hand, many educational institutions in India still use the papers system to record the information and provide various services. Moreover, the resources costs are bold issue in India due to low budgets of IT systems in educational institutions. The cloud computing technology considered as powerful solutions for various and complex problems of Indian educational institutions [5], [6].

B)Cloud Architecture for HE Institutions

For successfully migrating from the traditional system in the HE institute towards cloud-based architecture requires adequate thinking, well-defined strategy and properly framed architecture. This will help HE institute to overcome the challenges associated with cloud environment such as data privacy and protection issues,

[1]Corresponding Author

risk and non performance issues, organizational support and acceptance, network related issues, contractual and jurisdictional issues, etc. The cloud architecture for the HE institute will encompass three cloud service models, and four cloud deployment models. These models will be oriented towards satisfying the five essential characteristics that a typical cloud environment should possess.

Table 1: The main problems of the current system in universities of (India) and the success factors of cloud computing

University	Main problems of existing systems	Current management system	Success factors of cloud computing
Indian	Complexity of the educational structure which need high management for IT infrastructure and services. Thus, the expenses of traditional management systems are huge	Traditional IT resources	The information, services and infrastructure centralization and accessibility lead to minimize the current expenses and maximize the management level of educational information and services

C)Cloud Educational Models

A Federation Model for Education Using Hybrid Cloud Computing A federation model was proposed in order to bring the advantages of cloud computing assisted instructions into full play. The model showed how an educational application model of software (SaaS), platform (PaaS), and infrastructure (IaaS) leverages multiple independent clouds by creating a federation among the university private clouds and public clouds. A broker mechanism is proposed for better inter-cloud and inter-layer interoperation. The research has significance in constructing more scalable educational application environment based on cloud computing gathering resources from different universities and public providers, also in improving the effectiveness and quality of teaching [7].

III. Proposed System

Cloud computing enables universities to offer the services over the Internet for their users to meet their growing needs. These services could be cost effective option for universities; minimizes both operational and maintenance cost, enhances infrastructure, and improves academic service potentially. The features of Cloud computing such as architecture, services, deployment models, scalability, cost, are considered in the proposed model

We investigate security concerns, challenges of migration from existing IT infrastructure to Cloud resources in academic cloud environment. The users are staff (both teaching and non-teaching), students, and specific users shall be authorized to access the enhanced resources. Furthermore, we proposed a framework model of migration to resource-rich environment by naming it as ACADEMIC CLOUD.

A.Proposed Service Framework Architecture For Academic Cloud

The Academic cloud service framework architecture comprises of four layers

- Physical Resources layer,
- Resource abstraction and Control layer,
- Deployment Models layer and
- The Services layer.

Physical Resources layer: It consists of the facilty and the hardware which is at the cloud providers end and it is generally distributed over multiple locations but work together seamlessly as a single system.

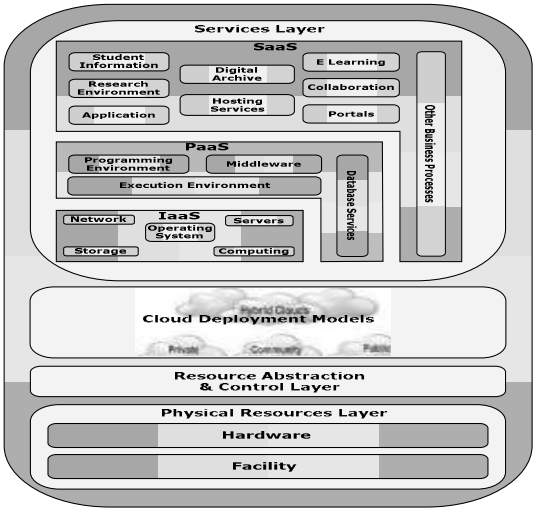

Figure 1: Service Framework Model

B. Migration from traditional IT to Cloud

a). Cloud Migration

The term cloud migration is derived from cloud technology and it operates with a view to transfer all or a part of the organization's assets in the form of data from the existing hosting servers to the cloud servers [8].

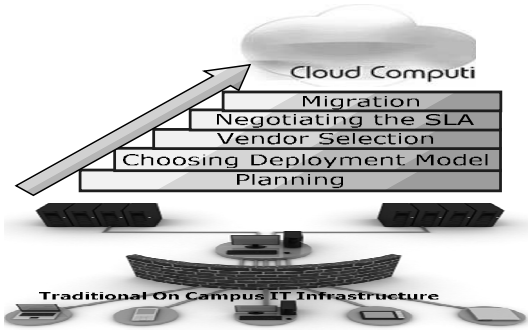

Figure 2: Cloud Migration

The migration of tradition IT infrastructure to cloud resources should be systematic and on priority. The low risk applications should be migrated first, this will give the university time to analyze whether the migration is worthy or not. The migration should go through the stages; Planning, Choosing the deployment model (Private, public, Community or Hybrid), Choosing the most suitable service model, Vendor Selection, Negotiating the SLA and finally the migration.

c)The 7-Steps For Migrating Into Cloud:

1. At first any academic institution should start with assessment of migration related issues such as code, design, architecture, tools being used, functionality, and configuration of the software applications.

2. In the second step; systematic and environmental dependencies of software applications must be isolated within data center.

3. In the third step is the mapping of message and environment to separate the components residing in data center.

4. In the fourth step, parts of applications which cause loss of functionality have to be re-architected and implemented in the cloud.

5. In the fifth step, applications are augmented by using the features of cloud computing services.

6. In the sixth step, applications are tested and validated by using a test suit for application on the cloud.

7. In the seventh step, after the completion of testing, iteration and optimization are required for the migration to be successful.

D)Benefits of Academic Cloud

• Storage

• Back-Up and recovery

• Accessibility

• Availability

• Collaboration

• Minimizing IT costs

• Online services

• Efficiency

• Scalability."

ACADEMIC CLOUD - Proposed Cloud based educational framework for Universities

When it comes to migrating to cloud, it is always the big and high risk decision.

Hence, the following factors are to be carefully analyzed:

1. Know your security and compliance needs- Can the provider meet them? Transparency, compliance controls, certifications, and auditability are some of the key criteria to evaluate.
2. Compare vendor offerings—it is not just for features and costs but also for uptime, security, and flexibility.
3. Ask whether service levels are negotiable - And what happens if the vendor falls short—are there meaningful penalties?

Software as a Service Options for Education

1. E-mail, calendar, and instant messaging
2. Desktop productivity, such as document creation and sharing
3. Collaboration and presence
4. Payment processing
5. Identity and relationship management

Platform as a Service Options for Education

1. Coordinating collaborative software development projects that involve multiple departments.
2. Developing applications that can be shared by many users simultaneously.
3. Creating social networks or communities according to grade, school, or area of study
4. Porting on-premise, line-of-business applications to the cloud
5. Deploying Web services quickly
6. Creating mash-ups of data to meet accountability and assessment needs

Infrastructure as a Service Options for Education

1. Hosting community and other public-facing Web sites.

2. Storing—especially public data. The public cloud might even be a safer place to store data than your own data centre.
3. Testing large-scale applications in a discrete environment before deploying publicly.

The cloud deployment model (Academic Cloud) is advised for Higher education. It is a combination of Private Cloud & Public Cloud (commonly termed as Hybrid Cloud). The reason to opt for a hybrid cloud is to ensure that adequate security is maintained when it comes to sensitive information on the cloud. The grades of student's thesis and research work along with their details and faculties personal details are to be stored on to a private cloud whereas the applications and assessment details can be stored on to a public cloud.

IV. Conclusion

Cloud technologies have become the most appropriate solution for the complex academic services where the amount of data is huge, confidential, and sensitive. Cloud offer all IT resource as service and support scalability, reliability, massive computing, bulk storage, sufficient bandwidth. And the economic model is pay-on-consumption for subscriber over the Internet at large and Academic Cloud in specific. It enhances existing IT infrastructure, services, and minimizes cost. ACADEMIC CLOUD is designed and proposed to achieve the enhanced efficient services by adopting Cloud migration techniques from existing IT infrastructure to resource-rich Cloud. This also supports the growing needs of resources in universities and its associated (community) colleges as private-community deployment models.

The ACADEMIC CLOUD is capable to offer the services for faculty, students, and other authentic users. We will also carry out work onto cost-benefit analysis for showing minimization of operational cost and maximization of resources.

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