

A Study on Security Challenges in Higher Education using Cloud Computing

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Abstract: - Cloud computing is a higher educational organization with a wide range of benefits with new capabilities to join in the higher educational process. However, the cloud services are prone to a variety of security challenges. It's important role plays on key challenges in educational sectors. The cloud computing applied sciences is a provisioning of a tightly closed cloud infrastructure. In this paper, cloud benefits in the higher education sectors and discuss limitations of main cloud services as well as highlight security challenges in educational sectors. In this survey was conducted in several of higher educational institutions to study on views of stakeholders in the cloud security vulnerabilities and procedures used to overcome.

Keywords: Cloud Computing, Higher Education, Security

I. INTRODUCTION

Cloud computing plays an important role in improving the quality of education to achieve required performance by offering many benefits for education such as providing low- cost infrastructure, flexibility, scalability, collaboration, and ease-of-use. Furthermore, it allows users to store their critical information and access it on-demand from anywhere via the internet. The cloud services and applications enable users to store and access their local data in the remote data center by using their personal computers, or mobile devices.

In higher educational organizations, the stakeholder term refers to anyone who has access to educational services, including students, lecturers, researchers, staff members, etc. Figure 1 shows the main stakeholders of cloud computing in higher educational organizations.

II. LITURATURE SURVEY

Khalil H. A. Al-Shqeerat et al[1], This category entails issues related to the physical equipment used as a backbone for cloud infrastructure as well as the virtual software used to operate cloud resources. The cloud infrastructure involves main features of cloud service models and is particularly associated with virtualization environment. Virtualization is a fundamental technology used by cloud vendors to achieve multi-tenant architecture, where it divides the computing resources of cloud server into multiple execution environments [12], associated with virtualization environment. Virtualization is a fundamental technology used by cloud vendors to

achieve multi-tenant architecture, where it divides the computing resources of cloud server into multiple execution environments [13].

R. Velumadhava Raoa, K. Selvamanib, et al[2] Cloud Computing trend is rapidly increasing that has an technology connection with Grid Computing, Utility Computing, Distributed Computing. Cloud service providers such as Amazon IBM, Google's Application, Microsoft Azure etc., provide the users in developing applications in cloud environment and to access them from anywhere.

Mell, P and Grance, T. et al[3], NIST is responsible for developing standards and guidelines, including minimum requirements, for providing adequate information security for all agency operations and assets; but such standards and guidelines shall not apply to national security systems. This guideline is consistent with the requirements of the Office of Management and Budget (OMB) Circular A-130, Section 8b(3), "Securing Agency Information Systems," as analyzed in A-130, Appendix IV: Analysis of Key Sections. Supplemental information is provided in A-130, Appendix III.

Kiran Yadav et al [4], Role of Cloud Computing in Education. Education plays an important role in maintaining the economic growth of a country. Now a days the classroom teaching is changing and students are becoming more technology oriented and Therefore in his changing environment, it's important that we think about the latest technologies to incorporate in the teaching and learning process. One of the latest technologies prevailing now days is Cloud Computing. By sharing IT services in the cloud, educational institution can outsource noncore services and better concentrate on offering students, teachers, faculty, and staff the essential tools to help them succeed.

Niall Sclater et al[5], Educational institutions throughout the World have become highly dependent on information on technology to service their business requirements. Procuring and maintaining a wide range of hardware and software require substantial, ongoing investment and the skills to support them. The economies of scale and other features of cloud computing are likely to mean an increasing shift away from institutionally-hosted services. These services are increasingly provided using Internet technologies to staff and students and accessed from web browsers.

III. APPROCHES

a. Cloud Deployment Models

Cloud computing deployment models were defined by the National Institute of Standards and Technology (NIST) and classified into four common modes; private, public, hybrid and community clouds.

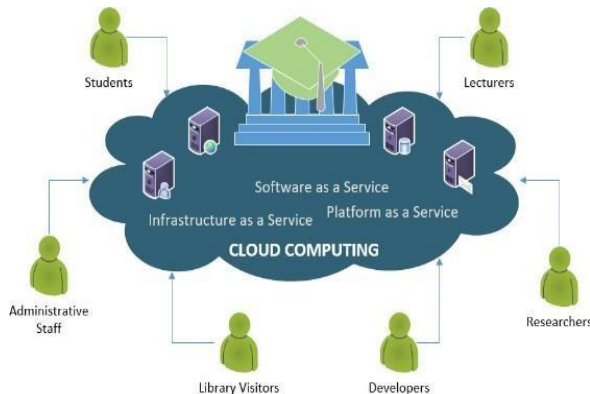


Fig. 1: Stakeholders of cloud in an educational institution.

Private cloud is deployed inside the boundary of the organization and is provisioned for exclusive use by specific consumers, its data and services cannot be accessed from outside of an organization.

Public cloud is owned and managed by a business, academic, or government organizations that provide cloud services for open use to the public.

The hybrid cloud is a composition of both public and private clouds characteristics.

In the community cloud, the infrastructure and services are provisioned for use by the specific community of consumers or among several organizations that have same mission or target. It can be operated and managed internally in the community or by a third party.

b. Cloud Service Models

In general, three main types of services the user in the educational institution can gain when access cloud. Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) [4]. These services are built on the cloud upon each other as shown in figure.

In the SaaS model, users gain access anytime and from anywhere to applications provided and managed by the service provider. Currently, SaaS is considered the most interested for stockholders in education. Google Drive, Twitter, Dropbox, YouTube, and OneDrive are general examples of

cloud-based services. Both Microsoft and Google provide some services that are suited for education such as Live@edu and Google Apps.

In PaaS, the service provider offers for developers development tools to build or customize their applications or services in the cloud independent of the platform to run. The best-known example of PaaS is the Google App Engine where a developer can install and customize their

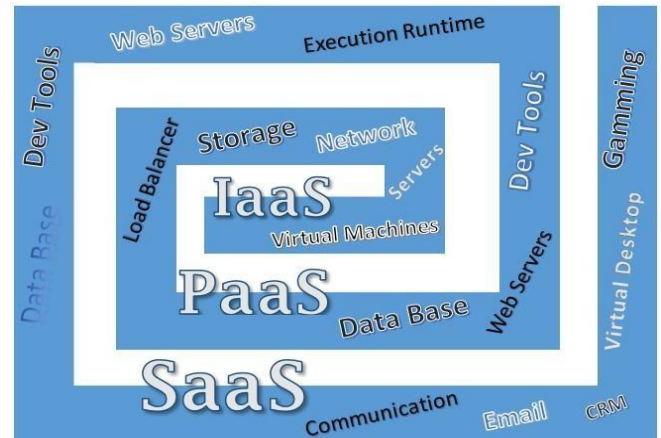


Fig. 2: Cloud service models.

IaaS is a self-service model, the cloud vendor allows developers to access, monitor and manage computing resources (processors, storage, networks, etc.) in the data center remotely, and use them to run own operating systems and applications. The big advantage of using IaaS is that it offers an on-demand data center without requiring you to purchase or install new expensive equipment. Amazon's Elastic Compute Cloud is one common example of IaaS.

c. Cloud Benefits in Educational Institutions

There are various advantages may be granted when adopting cloud computing technologies in higher education institutions. Some universities have adopted cloud computing in their programs for economic purposes, while other institutions use the cloud to provide scalable and flexible IT services [5].

The key benefits of cloud computing in education can be categorized according to stakeholders who use cloud resources and services in higher education institutions:

Benefits for students:

The first beneficiary of the cloud technology in the educational institutions must be students [6].

Some of the cloud benefits directed to students are reviewed:

Cloud computing releases services for students with new capabilities that were not served well by traditional ways. Nowadays, the students can store anything electronically such as their schedule, class notes, reports and any other documents. Furthermore, they are able to back up their files to the cloud and retrieve them when needed.

Students can earn e-copy of textbooks and have access to quality learning materials of their courses. This solves the problem of the student's reluctance to gain textbooks due to their high-cost prices. Furthermore, cloud-based textbooks solve the problem of using outdated materials in many of institutions and allow students to access the most updated learning resources.

The lab's applications and auxiliary resources that may be implemented on the Internet enable students to perform lab's tasks from anywhere and by low-cost personal devices. Therefore, the students do not need anymore to buy expensive hardware or install special software.

Students have the opportunity to access the system easily at any time to get courses online, attend the online exam, and upload their assignments and projects through the cloud to the instructors.

Real time collaboration between students themselves as a team or between students and their instructors on the other hand.

Benefits for faculty:

The faculty also can get various advantages over cloud-based applications [7]

Cloud technology offers for instructors an easy and flexible platform to prepare their course tutorials, presentations, conferences, articles, etc.

The faculty may be able to exchange experiences by establishing remote seminars to overcome the lack of skills among some faculty members.

Providing opportunities for instructors to work from home and use their own devices to finish assignments, prepare on-line tests, grading, and scheduling.

Collaboration with other instructors and sharing educational resources to avoid conflict and duplication of effort.

Getting feedback from students about the educational process.

Cloud provides for researchers a discussion area and accessibility to global computing resources and sufficient storage capacity.

Even though the great benefits of using cloud

computing in educational institutions, there are some challenges that hinder the wide scale adoption of this technology in various sectors of the university. In the current circumstances, it is not easy to track the variety security issues in cloud computing environments. The security issues are related mainly to three requirements: confidentiality, integrity, and availability.

The confidentiality is defined as a set of rules that prevent unauthorized user from accessing sensitive information, while integrity is a way to protect data from being modified by unauthorized user and ensure that data are retrieved accurately and trustworthy, and the availability concerned with enabling authorized users to access data reliably when needed, especially during difficult circumstances and emergencies [8]. This study aims to address the key security challenges of adopting cloud computing in higher education institutions.

The rest of the paper is organized as follows. The literature review is mentioned in the next section. Section III presents an overview of the security issues in the cloud service models. In section IV, the security challenges and risks are discussed. The survey results and discussion are presented in section V. Finally, section VI provides helpful recommendations to avoid security challenges efficiently for adopting cloud computing in higher educational institutions.

IV. CONCLUSION

Cloud computing represents an opportunity for universities to take advantages of the enormous benefits of cloud services and resources in the educational process. However, the cloud users remain concerned about security issues that represent the major obstacle that may prohibit the adoption of cloud computing on a large scale. In this paper, the authors have provided an overview of cloud computing benefits for key stakeholders in the higher educational institution.

The limitations of cloud service models were investigated in addition to challenges and risks threaten cloud computing. This study shows that the stakeholders are not familiar with possible security risks or procedures used to protect data or cloud application. Furthermore, it indicates that the most serious attacks might threaten cloud networks are Denial of Service (DoS) and phishing attacks.

A comprehensive list of recommendations has been provided to avoid security risks efficiently when adopting cloud computing in

educational institutions. In the future research, the security risks and challenges of virtualization technology will be covered in details to provide a secure infrastructure for IaaS service in the Educational cloud. In addition to focusing on improving QoS provided in cloud computing.

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