

# CLOUD COMPUTING: A NEW PARADIGM FOR DATA STORAGE IN INDIAN UNIVERSITIES

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## Abstract

This article focuses on the future scope of cloud computing for universities in India. Such new technology can be utilized in management of educational activities using IT for modernization and development of educational systems with increased volume of data. By means of cloud computing, an IT administrator can deal with the maintenance of the university components like labs, library, and research facilities at various locations in the university. The implementation of cloud computing will help the universities by reducing the expenditure with decreasing their demand for software licensing and it has operational benefits. Here, we suggest that, in developing countries like India, the concept of cloud computing will offer pooling of resources, which will ultimately cut the incurred expenditure. Cloud computing services can provide inter-organizational collaborations and thus they will enhance the research level of the country.

**Keywords:** Information Technology (IT); Higher Education; Cloud Computing

## 1. Introduction

The universities all over the world are under increasing pressure to employ the Information Technology (IT) for the welfare of faculty members, students, operational staff and management. The different stakeholders of a university like students, parents, employees, management, and administrators are continuously engaged in the process of educational planning, growth and other activities. The modern age of educational scenario has led to the growth in data as the quantity of information and data collected and processed for the planning and management of educational activities has been constantly increasing. In order to provide various facilities to the students, faculty, management and for the operation, the university needs storage and computing system that would integrate multiple services and concerned request. However, the universities in India are facing a number of challenges related to their management due to increased number of students.

When it comes to implementations of information technology, the universities in India have taken up a steady growth. With reference to this, the network information storage system has become key component to the university infrastructure. The information systems of universities are critical because they generally throw huge amount of data and centrally store these data generated from office, students, teaching faculty members, financial records, scientific research etc. Use of IT requires strong financial readiness and competent human resource. Privatization of higher education has also given cut throat competition, especially, in the field of usage of IT and data storage. Since the universities has migrated to afford the ability to provide improved collaboration and research capabilities, and hence at the same time, they face challenges to cut IT costs in

providing the better levels of computing services. It is magnified by the need to pare overhead costs at a time when public and private institutions are coming up with significant budget shortfalls.

University laboratories are important components for experiments and research. An IT administrator, who is always attached with each lab at various locations in the university, has a lot to deal with their maintenance along with servers associated with each lab in the university.

The university IT policies are made, such as, who can access what files and which types of access? This has compelled the institutions to examine how it can procure secure, affordable, reliable and accessible computing environment. There are also some other reasons which rather obligated them to find appropriate storage solution for the universities like

- Every time the data is transferred for storage should be well encrypted for security reasons and safe storage.
- A continuous process is required to provide new backups as the file changes. Whenever there is some change in the file, the particular change needs to be backed up and not the whole file.
- Since the university also includes students, teachers from non-computer background, so the accidental deletion of the file may be regular phenomenon. There must be some provision of getting the file back even if it is deleted from PC.
- There must be multiple versions of the file so that if a file got corrupted during transfer or update process, one can get it back.
- Data can be accessed from anywhere.

In recent years, cloud computing is an emerging trend for business and other fields. The success of cloud computing in business motivated us to find out its scope in universities of developing countries like India. Moother and Bhatt (2009) have already made analysis of cloud computing in North Carolina State University [1]. In India, it is a demand of time for taking initiatives to employ cloud computing in the universities to enhance computing for accessing and storing huge amount of data. The concept of public cloud is similar to concept of cable T.V. on demand. One has to pay for the movies he wants to watch. Of course, there are certain concerns over the security.

## 2. Theoretical Concept of Cloud Computing

The cloud computing is considered as fifth generation of computing with reference to mainframe, personal computer, client sever computing, and the web [13]. In essence, cloud computing is a construct that allow you to access applications that actually reside at a location other than your computer or other Internet-connected device; most often, this will be a distant datacenter. It allows the viewers like student, faculties and staffs to use applications and access the information from any computer with internet access. The National Institute of Standards and Technology (NIST) defines cloud computing as a model for enabling on demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management efforts or service provider interaction. Cloud computing is a general term for anything that involves delivering hosted service over the Internet. The beauty of cloud computing lies in the fact that, other company hosts your application and they can handle the costs of servers and manage the software updates, and on the basis of the contract one will pay less for services.

### 2.1 Features of cloud computing

Cloud computing offers the following characteristics [2-4]:

- An illusion of the availability of infinite computer resources on demand
- On-demand self sufficient service, thereby eliminating the need for cloud user to plan ahead
- Ubiquitous network access, which enables the resources to be accessed from anywhere
- Location independent resource
- Rapid elasticity
- It offers the ability to pay for the use of computing resources on a short term basis as needed, and release them when they are no longer useful, which leads to significant economic benefits

Its advantages [5-12] are

- It can reduce skilled labor cost by 50% in configuration, operations, management and monitoring
- It can improve capital utilization by 75% by significant reduction in the license costs
- Reduce provisioning cycle times from weeks to minutes
- It can reduce end user IT-support significantly

Public cloud computing delivery model can be distinguished based on the level of abstraction; they export to cloud users and the level of computing resource management which they offer. Based on the categorization, cloud delivery model can be classified into three categories:

**(i) Infrastructure as a service:** Cloud service provider offer computational resources such as servers, network and storage from a shared facility managed by the provider to cloud user on demand basis.

**(ii) Platform as a service:** Cloud service provider export application development platform for certain class of applications.

**(iii) Storage as a service (SaaS):** Cloud storage involves storing data with a cloud service provider rather than a local system. The term storage as a service means that a third party provider rents space on their storage to end users who are incapable to bear the budget or capital budget on their own. It is equally applicable when technical personnel are not available or have inadequate knowledge to implement and maintain storage infrastructure. This is an ideal solution for all the stated above problems in various universities in India.

### 3. Cloud Computing for Universities

The above types of services are already popular in small and medium sized businesses and same can be implemented in universities. The universities need not to maintain the storage servers for its data generated at various sections, including laboratories. Here, the storage is rented from the provider using cost-per-gigabyte-stored or cost-per-data-transferred model. The university administration needs not to pay for infrastructure; they simply pay for how much they transfer and save on the provider's servers. The storage service provider manages the complexities of backup, replication, and disaster recovery needs, hence the stakeholders need not to worry even if some file is deleted accidentally. The university data stored with service provider becomes a windfall when the universities are effected due to natural calamities like flood, earthquakes etc. Back ups stored locally doesn't help if there is fire or hurricane to clean the university, hence cloud storage allow university to protect their data.

At the most rudimentary level, in a cloud storage system a subscriber copies files to the server over the Internet. When a client retrieves the data, he or she accesses the data server with web based interface, and the server then either sends the files back to the client or allows the client to access and manipulate the data itself.

In order to secure the data, cloud storage provider uses a combination of techniques like Encryption technique (A complex algorithm is used to encode information), Authentication Process and Authorization practices. Cloud computing will help the universities to go green by centralizing all resources and efficient utilization. It can reduce the power consumption, the air-conditioning and electronic waste that can be caused by number of datacenters. Instead of duplicating these facilities, with cloud, one can offer centralized infrastructure that can be efficiently used to minimize pollution. There are seemingly endless benefits to be gained from the cloud in spite of certain risk factors to be considered.

### 4. Conclusion

This article suggests the implementation of cloud technology for data storage in universities of India. Although the technology of cloud computing is highly beneficial in business and industrial purposes, it is recommended here for its operation in universities on a large scale. Through the cloud computing virtualization the separation of hardware and software data storage problem in developing countries like India can be solved. The technology of cloud computing allows us much more efficient computing by means of centralizing storage, memory, processing, and bandwidth. In this regard, Indian Universities can be treated in an efficient manner. Looking into the benefits of cloud computing and storage services, universities of India should pool resources. This will help the universities in cutting down the cost by reducing their need for software licensing and offer the operational benefits. After detailed analysis, the IT heads of the universities and research institutes should show concur for cloud computing to make the model for future of information technology utilization. Despite the security risks posed by cloud services, one can argue that cloud computing provides more security than on-campus solutions. Furthermore, cloud computing services can facilitate inter-organizational collaborations as they are easily accessible by different stakeholders at disparate institutions, and they can enhance the research level of the country.

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