The Role of Cloud Computing in Education Sector

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Abstract - Cloud computing is an emerging distributed computing technology that delivers software and hardware through Internet. Cloud computing services have become the necessity for business organizations as well as for educational institutions. Cloud computing provides resources to consumers like servers, database, network on demand basis. Nowadays the students are becoming more technology savvy, so it becomes important that we think about the newest technologies to incorporate in the teaching and learning process. Cloud technology allows sharing IT services within the educational institution offering students, teachers, and staffing the essential tools to help them to concentrate on their success. It will definitely lead to improving the quality of education by making learning process more interactive and interesting. This paper focuses on the role of cloud computing in education sector.

Keywords: Cloud computing, quality of education, teaching, learning, institutes

I. INTRODUCTION

Cloud Computing refers to the services distributed over the Internet to the consumer on demand basis. Gartner defines cloud computing as a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies. These services are scalable on demand and priced on a pay-as-you-use basis.

Education plays an important role in maintaining the economic growth of a country. Enhancement in quality education has become necessary. Cloud computing has been growing rapidly with new inventions in communication and IT technology. Indian education system faces the challenge in providing required infrastructure and if available then maintenance of that infrastructure. Another problem is Procuring and maintaining a wide range of hardware and software, ongoing investment and the skills to support them

It ensures quality education to the institutes and help teachers to maintain student attendance, class performances etc without worrying for the infrastructure issue. The cloud provides students, teachers, parents, and staff on-demand access to critical information using any device from anywhere. Both public and private institutions can use the cloud to deliver better services, even as they work with fewer resources. This paper discuss on the present education system in India, cloud technology, implementation of cloud based education system and its benefits.

II. PRESENT EDUCATION SYSTEM

Today's private educational institutions have become highly reliant on information technology services. These services are distributed and consumed over internet by the faculties and students via web browsers. Most of the colleges are providing free Wi-Fi services in the campus. These services can be offered cheaply and with higher availability through the adoption of cloud computing. So that institutions no longer required to host their own data centers with expensive hardware, power bills, staff salaries and computing resources which are rarely fully utilized. This policy briefs the rising benefits and challenges of cloud computing for the educational sector. But in most of the government schools and colleges in India IT plays very limited role. Most of the work is done manually from recording the attendance, classroom teaching to examination and admission system.

III. CLOUD COMPUTING

According to the NIST definition, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Cloud computing is delivering various computing services such as servers, storage, databases, networking, software and analytics over the Internet. Companies that are providing these computing services are called cloud providers and usually charge for cloud computing services based on usage.

Fundamental Characteristics of cloud computing:

On-demand self-service: Consumers can unilaterally prerequisite computing capabilities like server time and network storage, as needed automatically without requiring human interaction with each service's provider.

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client devices.

Resource pooling: The provider's computing resources are pooled to serve the customer using a multi-tenant model and assigned according to customer's demands. There is a sense of location independence in that the customer generally has no control. These resources include storage, processing, network bandwidth, and virtual machines etc.

Rapid elasticity: The benefit of cloud computing comprise the ability to scale elastically. In cloud for consumer, the capabilities available for provisioning appear to be unlimited and can be consumed as per the requirement at any time.

Measured Service: It provide the transparent monitoring and control in the utilization of resources.

Cost: Cloud computing eliminates the expenses of buying required software and hardware as well as setting up and managing data centers.

Reliability: Since data is replicated at multiple redundant sites on the cloud provider's network data backup, disaster recovery become easier and less expensive.

Service Models of Cloud Computing:

Software as a Service (SaaS): This is the method of providing the capability to the consumer to use the provider's software applications running on cloud infrastructure. Provider's host and manage the software application and underlying infrastructure with limited user-specific application configuration settings. Some of the applications are Learning Management System, e-Campus solutions etc.

Platform as a Service (PaaS): It includes the cloud computing services that supply an on-demand environment for developing, testing, delivering and managing software applications. PaaS makes it easier for consumers to quickly create web or mobile apps, without worrying on setting up or managing the infrastructure of servers, operating systems, storage, network and databases needed for the development.

Infrastructure as a Service (IaaS): It provides IT infrastructure like storage, networks virtual machines, and servers that able to deploy and run arbitrary software on pay-as-you-use basis. It offers unlimited supply of processors, hardware and network bandwidth.

Communications as a Service (CaaS): CaaS is built on basic foundation of Software as a Service (SaaS), with some requirements unique to communications applications including voice over IP (VoIP or Internet telephony), instant messaging (IM) and videoconference applications using fixed and mobile devices.

Following are three different ways to deploy cloud computing resources:

Public cloud With a public cloud, all hardware, software and other underlying infrastructure is owned by a third-party cloud provider. You access these services and manage your account using a web browser.

Private cloud A private cloud refers to cloud computing resources like servers, virtual machines that are used utterly by a single organization or business. The services and infrastructures are maintained on a private network.

Hybrid cloud A hybrid cloud combines public and private cloud together with the technology that allows data and applications to be shared between them. Hybrid cloud gives organizations greater elasticity and additional deployment options.

IV.   IMPLEMENTATION OF CLOUD TECHNOLOGY IN EDUCATION SYSTEM

Traditional methodologies in Education systems cannot incorporate the new software, updated platform and high technical infrastructure due to lack of finance and cooperation between the institutions. At university level many aided and non-aided colleges are affiliated university. The university maintains all the required information about courses, structures and students over the cloud server. Each institute should maintain their own server to overcome the centralized communication problems. Different software solutions and information systems are required to manage the following Student Activities like download marks cards, view attendance status, E-learning, online notes, projects, assignments, circulars, videos, interaction with subject experts and other college students-By forum and knowledge sharing. Faculty also needs systems for their activities like online attendance and marks, notices, online academic resources, subject expert interaction, Research, sharing of knowledge between research scholars and for sharing papers, notes, results etc. Portals can be developed for parents Activities to view the status of attendance and results of their son/daughter and for interaction with faculties. The stakeholders as Management or Trustees, Principal, staff could use various tools for College Management Activities such as for accrediting process, admission and fees payment, lesser cost of maintenance.

In today's era of Internet there is a need for automation & process management in Indian educational institutes. Educational institutions in the country have acknowledged the need for technology to get in higher transparency, set governance standards, improves the interactive standards between faculty and students. Various technical solutions and wide-ranging ERP applications can be deployed on the cloud to address the needs of educational institutes. Many institutes are working on paperless admission system, where the entire process of application handling is managed though the web. It could also include the counseling of students and parents as well as the fee payments for courses. Some of the higher educational institutions have started adopting a few technology solutions like Smart Card reader, dynamic websites & portals, admission portals, faculty portals, placement portal etc. Certain colleges have implemented software such as learning management system, document management systems and student management system etc.

Cloud computing provides substantial benefits to users all over the fields. Cloud computing allow users to access software, infrastructure and platforms anytime and anywhere all over the Internet. Cloud provides computing services on demand and pay-as-you-use basis. Cloud computing enables user to control and access the computing services via the Internet. The core users of a education cloud include students, Faculty, administrative staff, Examination committee and Admission Branch. All these main users of the institution are connected to the cloud. Separate login is provided for all the users for their respective work.

Teachers can upload their class Tutorials, assignments, and tests on the cloud server which students will be able to access. All the teaching material provided by the teachers via internet at home and college will be available for 24X7. This system will help teachers to identify problem areas in which students tend to make mistakes, by analyzing students' study records. It will also allow teachers to improve teaching materials and methods. Implementation of cloud computing services will reduce the cost of operation because servers and learning materials are shared with other colleges. Teachers and students can prepare their own documents and share it with the others. They could also change the documents dynamically to show animations or perform experiments on the documents. This will enhance the imagination and will make the learning process more creative and interesting.

The basic problem identified in traditional educational methods is the problem in sharing the resources or willingness to do so. Institutions with good reputations protect their high quality resources on some level without sharing with others. Institutes are ready to adopt the emerging technologies but with minimum investment and with lesser maintenance requirements. The resources are available in utmost unlimited quantity to the user. Cloud computing allows to implement the high end technologies with minimum expenses and with no maintenance requirements. It allows users to pay-as-per-use basis. The efficiency of cloud computing can help institutions keep pace with ever-growing resources requirements and energy cost.

Software as a Service (Saas)

Majority of research suggested that Software as a Service (Saas) is the most suitable for educational purposes*. B*ig vendors like Microsoft, IBM, Oracle and SalesForce.com offers various educational software and applications in less cost. The software that can be used by academician and students are Microsoft 365, SalesForce.com, Google Big Query etc.

The widely used school management software in India is Vidya Dhan which is integrated with mobile apps for students, parents, teachers and management. It ensures smooth working of the day-to-day school operations and also enables parent-school interaction in an instant manner. Key Features of Vidya Dhan are accounting, attendance management, Database backup, examination Management, Email integration etc.

Creatrix Campus has provided a cloud based web and mobile application specially designed for higher education system. Creatrix Campus integrated its modules such as Admissions, Finance, course Management, Student Evaluations, Documents and many more with the existing systems.

A **massive open online course** (**MOOC**) is an online course aimed at unlimited participation and open access via the web. It provides interactive user forums to support community interactions among students, teachers, and parents. SWAYAM is an imminent MOOC platform by the Indian government. It is the one platform that would bind Indian higher education, both online and offline.
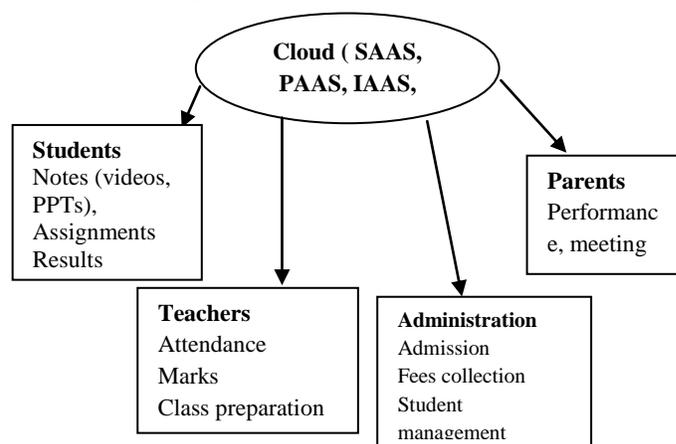
Benefits of Cloud Computing in Education System

- The power of cloud computing enables institutions to teach their students in new, innovative ways and help them manage projects and massive workloads.
- Access at anytime and anywhere: Videos, assignments, lesson plans, notes, PowerPoint slides will get digital that we use in teaching is easily uploaded and accessed anytime.
- Security: Data, content, information stored in the cloud usually requires authentication. But sometimes it will be easy to hack.
- Collaboration: One can set-up various student groups to work on different projects and assignments in the cloud.
- Easy to share: Quizzes, attendance records, tests, results, assignments all can be taken, scored, shared with student and parents, and stored.
- Availability of the services is for 24/7 as desired by the user through an education cloud.
- Upgrades and migration: The cloud model provides the ability to rapidly acquire, provision, and deploy new IT platforms, services, applications, and test environments.
- Disaster recovery: Cloud virtualization technologies allow regular backups and restoring that will save data loss in various natural disasters.

- Reliability: With a managed service platform, cloud computing is much more reliable and consistent.
- Cost Saving: Cloud computing enables institutions to cut down on their expenses. It allows for a low cost computing system with no maintenance.
- Provides benefits like personalized learning, user friendly interfaces etc.
- No need to carry storage devices, such as drives or CDs.
- Cloud helps in saving energy use and hardware use that leads to go green approach.

V. CONCLUSION

Cloud computing services offer significant benefits in terms of cost saving and maintenance of tools and technologies. Cloud computing seems to be worth exploring from small businesses and major enterprises to privileged universities and online colleges. The cloud is poised to revolutionize the educational sector, and schools and learning institutions. Basically, cloud computing will enable learners to formally undergo education. The cloud technology allows us to access services anywhere, anytime and share it with anyone. Modernization of learning and teaching processes in classrooms encourage students to develop skills and knowledge necessary for achieving their academic and professional goals. Implementation of the cloud and open technologies can help to increase learning opportunities for students and in the long run contribute to equipping future generations to be more creative and to adopt the competences for career advancements.

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