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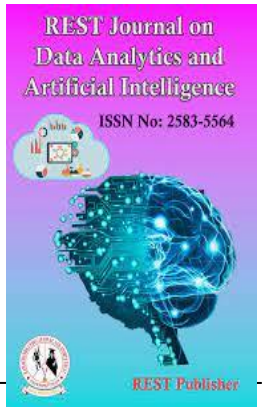

Role of Cloud Computing in Education

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Abstract. *The ever evolving and dynamic field of education constantly hunts for options which are cost efficient and can optimize the progress and performance of learners. The data centers of Cloud Computing can be further segmented into multiple servers or VMs (Virtual Machines). By doing so, these problems can be effectively tackled as it leads to need based access to computing services via the cloud module. In addition, this form of cloud computing finds utility in the field of research across countless platforms as well. These days, the world of academics cannot function without automation and computing. And, in this respect, one can easily implement the available software servers to accomplish this easily. This research paper sheds light on the role of cloud computing in the academic setups. Almost every organization, including the academic industry seeks ways and means to effectively manage their available manpower and other resources. In this respect, the dynamic and newly trending field of Cloud computing which opens up a plethora of avenues relating to computing services. The aim of this paper is to highlight how cloud computing has found its way into educational institutions and the key elements which make it lucrative for academicians to integrate it into their working model.*

Keywords: *Cloud computing, virtualization, E-learning, academic institution.*

objective: *The objective of this paper is to study:*

1. *Cloud computing and its types*
2. *Opportunities in the field of education*
3. *Implementation of cloud technology in education system*

1. INTRODUCTION

These days, there is a gap between the academic and industrial world; while the educational framework in India revolves around marks and grades, it sometimes overlooks the aspect of application of knowledge, analytical way of thinking and so on. However, these skills are detrimental in order to survive in the industry. Despite this awareness, most contemporary academic institutions are unable to do justice to this critical aspect of learning. In response to this need, there are various methods to demonstrate the techniques using presentation and animation tools. These audio-visual mediums enhance the learning and let the students get a glimpse of the practical aspects of the theory learnt. A major game changer in the field of technology is Cloud Computing. By adapting this technology, academic institutions can have a better reach way beyond the geographic and demographic boundaries. By this, these institutions can design a robust and enhanced education system. The world of academics and education has seen rapid progressions and transformations. In the modern era, there is a evident shift in the education from teacher centric to learner centric. Implementation of all the levels of the Blooms Taxonomy have now become a cake walk using cloud computing, whereby there are numerous aids, thus expanding the learning horizon, and taking it to unimaginable dimensions [7]. E-Learning and online sessions are now in much demand, taking the world of education beyond the four walls of the classroom. This shift did not come without its roadblocks, and with each roadblock and new demand, the IT department undertook a new challenge to add yet another milestone to the world of digital learning. Thus, cloud computing has indeed changed the face of the education sector to a very great extent. Cloud computing has given wings to the education system, and made it fly way beyond our imagination and comprehension. Hence, it has added a lot of value to the existing system of education and learning. Understanding this, numerous renown and start-up academic institutions have integrated cloud computing into their everyday functionality as well as academic curriculum. Through this paper, I wish to highlight how cloud computing has an impact on academic institutions and the reasons why these institutions are eager to integrate this system into their academic and functional aspects. Cloud computing, by virtue of definition means making use of the internet to avail numerous services. The most commonly used resources include basic functionality tools or applications which enable one to store data in a secure manner, making use of servers and databases, availability of networking and other software. Defining Cloud in layman terms is also quite simple. To illustrate, one can consider it as a cluster of distributed computers

such as server farms and others. These clusters are available to users and people can make use of their resources or services on demand by means of the Internet or any other network form [9]. Delving deeper into this aspect of Cloud Computing, one can segregate it into three main types, namely, Infrastructure, Platform as a Service, and Software as a Service. Each of these is defined as follows:

1. Infrastructure as a Service (IaaS): Infrastructure includes various hardware components including servers, storage devices, processors, and network which form part of the IaaS [1]
2. Platform as a Service (PaaS): In case one makes use of any programming platform or tools such as Java, Python, .Net, MySQL or APIs, it falls under the category of PaaS. This can be availed through the Web. Users who avail PaaS do not have to worry about the cumbersome task of software or hardware management.
3. Software as a Service (SaaS): in this, readymade applications can be used and implemented through the Internet. This helps the users to avoid the challenges and limitations of installing and maintaining the software.

On the basis of the resources that are shared to the clients, Cloud Computing is further divided into four times, namely, Private Cloud, Community Cloud, Public Cloud, and Hybrid Cloud [5]. Each of these is briefly explained below:

1. Private cloud: This form of Cloud Infrastructure is shared within an organization or firm. Access is denied to people who are not part of the organization. Many organizations manage this infrastructure themselves using inhouse teams, while others prefer to outsource it to third-party providers. These days, Eucalyptus, VMware and OpenStack are the reigning service provides in the industry, and new names are added each day, showing the immense potential of this industry.
2. Community cloud: This form of cloud is shared by multiple organizations, who have a shared interest. These are more cost effective when compared to private clouds, as the cost is shared by all the organizations using it.
3. Public cloud: By availing a third-party service, the general masses can access and use the cloud infrastructure. Some of the key players in Public Cloud include AWS, Rackspace, and Google App Engine.
4. Hybrid cloud: Here, a combination of multiple cloud infrastructures are used. These are interlinked via interfaces which allow them to share data applications as well as other computational resources.

Merits of Cloud Computing

1. The Return on Investment (ROI) is very lucrative.
2. The implementation and maintenance cost are considerably lower.
3. There is better mobility in respect to a global workforce.
4. The infrastructure is scalable and flexible.
5. It does not require a lot of time to promote and market them.
6. It enables the IT department to do away with the mundane maintenance tasks and rather channelize their energies on innovation.
7. “Greening” of the data center

2. RESEARCH METHODOLOGY

The review of Cloud computing and its types, Opportunities in the field of education, current education system and Implementation of cloud technology in education system is done in thispaper [3]. This is a literature review. The secondary data is collected using websites, journal, publications, and different research paper.

3. RELATED WORKS

The World Wide Web has transformed the entire globe and has created a revolution in terms of technology. From being a stand-alone device, the computer has now become a medium to interact, shop, study, and a lot more. With the addition of Cloud Computing, the dimension of the already expanding world of Internet have widened to even greater spheres. The availability of robust desktop applications and databases, available at our disposal from any device have opened up endless avenues and opportunities in the field of education, enabling but not limited to eLearning, interactive sessions, and online projects and practical study and a lot more.

1. Enhance Economies of Scale: It is common for students to be reluctant in posing queries to the teacher in the traditional classroom setup. Further, at times, if they do muster the courage, there is possibility of paucity of time, due to which the question may not be addressed. All these limitations can easily be solved online, whereby the teachers can focus on all the cohorts equally. This will further enhance their learning and improve the economies of scale beyond their class boundaries.
2. Improve Collaborative Work: The virtual shared platform enables students to engage and indulge in collaborative projects with other batchmates and likeminded people beyond their geographic reach. Thus, the students can collaborate and work more efficiently, thus enhancing their quality and at the same time adhering to their deadlines.
3. Easy Access to Resources and Effective Sharing: The key benefit of Cloud Computing is that it helps educational institutions in drastically limiting the funds they need to allocate to infrastructural development, purchase and

procurement of journals, research books, software and a lot more. By making all these facilities available online, the institution can channelize these funds in other spheres such as research development and a lot more. Further, from the student's perspective, they will have a lot more resources at their disposal, than they could possibly have in the traditional setup. Keeping this in mind, the institutions need to discuss and chalk out a strategy to implement cloud and enhance the learning and managing aspect, which will be a win-win situation, for mentors, students as well as the management.

4. PURPOSE OF RESEARCH

The world of education has now developed wings, and in the technology driven era it has already surpassed the four walls of classroom learning. eLearning techniques are rapidly gaining popularity and acceptance worldwide. Thus, observing this shift, the IT department could work towards enhancing and adding value to resources that are available to students on the digital platform. Academics who are reticent in adapting to change, or do not have adequate funds can opt for basic cloud computing services in the form of OpenOffice.org, and so on. Anyone with access to a browser can use this to connect to this service and use it. Open Office offers numerous handy tools for presentations, record maintenance in the form of spreadsheets and a lot more.

5. THE CURRENT EDUCATION SYSTEM

Flowing with the tide, many academic institutions depend on technology to impart education more effectively and efficiently. Most of these services can be accessed through any web browser. While some of them do levy a nominal charge to use, most of them are available without any cost if it is to be used for educational purposes.

6. IMPLEMENTATION OF CLOUD TECHNOLOGY IN EDUCATION SYSTEM

With the help of cloud computing, one can easily fill the gaps that prevail in the education system. Cloud computing enables stakeholders to use the Internet to gain access to the data stored in the cloud. In the prerogative of an academic institution, the various stakeholders include the teaching as well as non-teaching staff, and the students. Some of the key stakeholders in the academic setup are listed in Figure 1. Various levels of access rights are provided to each stakeholder category depending on the nature of their job.

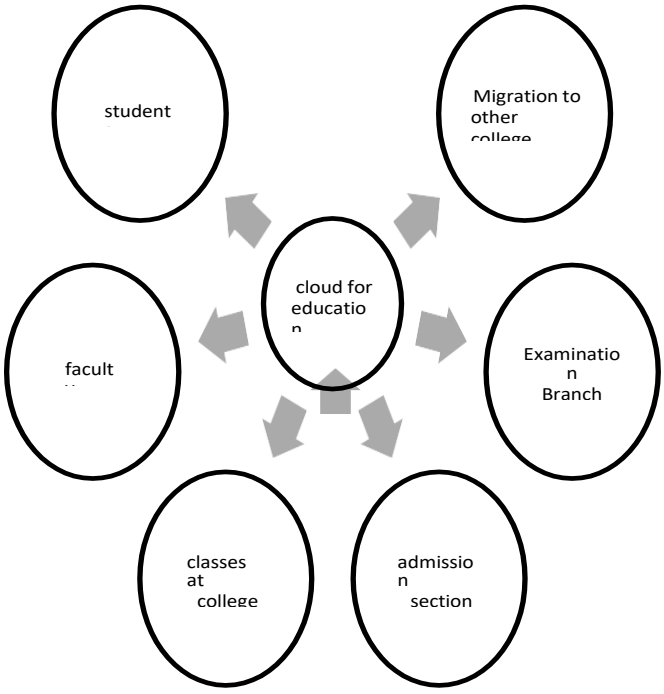

FIGURE 1. Services Attached to Education Cloud

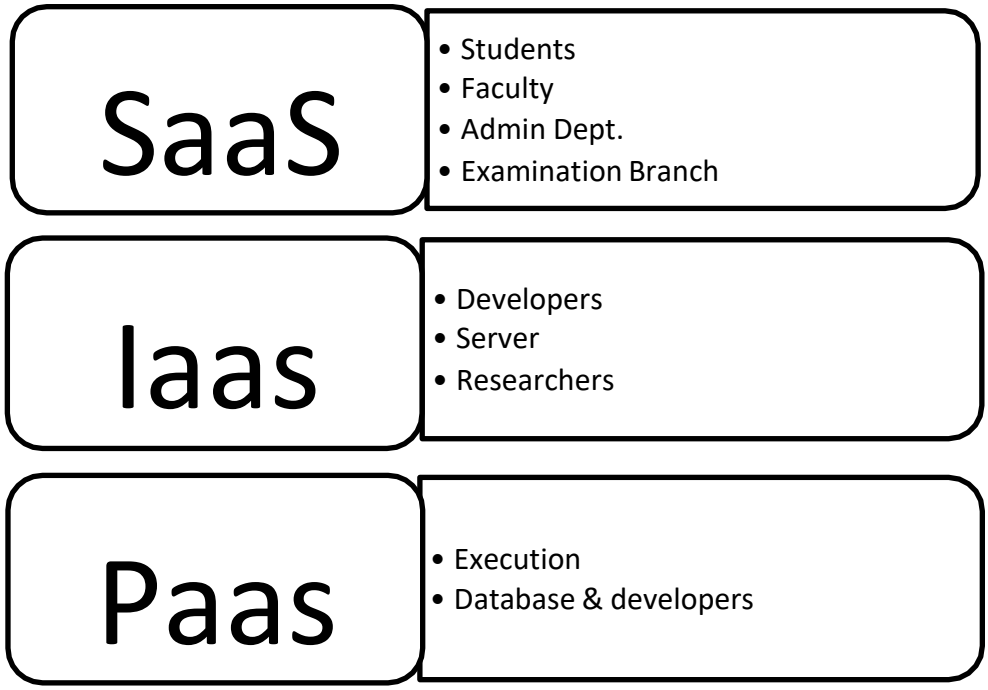

FIGURE 2. Users of an Education Cloud Computing System

7. FUTURE SCOPE

There is very bright future of cloud computing in education. Cloud computing is a way to make quality education accessible to all. But it is a long way to go, before cloud computing can well and completely be implemented in the area of education. Nonetheless, it has begun taking baby steps in this direction.

8. LIMITATIONS

Due to costly cloud computing models in academic setups there are huge gaps in evaluating the successful application of the cloud computing model in education.

9. RESULT

We seem to be heading into a world where, owing personal data centers and maintaining costly hardware will become a thing of the past. Instead, all of this would be hosted in a cloud, which could be available and accessed by all the stakeholders [2]. Here, we aim to analyze some of the advantages and limitations of applying and using cloud computing in the academic setup.

10. CONCLUSION

The existing issue of a huge nation like India is the challenge of making technology reach remote locations. However, keeping in mind the dictum of “equal and quality education to all”, cloud computing comes as a feasible solution. By using basic gadgets like smart phones or tabs, people are saved the cost of investing in infrastructure. Besides, this also helps to do away with the challenging task of licensing and hiring support staff. Thus, “Big Data” and Cloud Computing has played a pivotal role in easing the work for students, mentors as well as research scholars. Coupled with Governmental Support, and keen investment interest by the large organizations and the public sector, cloud computing is well within the reach of almost everyone. Through this paper, one can easily understand the immense power and potential which is being harnessed by educational institutions, and how they have successfully managed to reduce the cost and effort while increasing their mobility, efficiency and quality. As a reference, this paper cites examples from Microsoft, App, IBM and others who have successfully implemented and integrated cloud computing into their functionality.

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