

## Cloud Computing Technology in Education

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### Abstract

In ancient India gurukul were the temples where the students received knowledge and get educated. The clock rotates with the entrance of British rule the position of these gurukul were taken by schools. The sole purpose of starting schools was to make education available to each and every person in the country without the difference of cast, creed, or any type of financial issues. But till now hundreds of years have been passed but still there are places in India where getting proper education is just a dream. There are isolated areas situated not only at villages but also outside the major cities where schools are not present, if schools are there then no good teachers available. At several places they have only middle schools and no high school. Thus these type of problems keep emerging out and put hindrance to dawn of education to reach everywhere in India. Various surveys conducted by government put ahead the result that present system of education is not worth and has many loop holes associated with it. Cloud computing is the knowledge which has built by years of study in Distributed systems, grid computing etc and thus by using this technology we can make available the answers to all the short comes and promise to provide quality education to each and every citizen of India

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### Introduction

Government of India is promoting the education and encouraging students to join schools, motivating parents to send their ward to schools and thus ensuring that education will helps a person to achieve heights in his carrier and life. Various catchy slogans are given by government and various good schemes like education to everyone, education for all, SSA, RMSA and RUSA are started by the (MHRD) government. But all these goes in vain when government not able to provide best facilities to the students. The various schemes makes students reaches to the schools but lack of facilities, good teachers, lack of latest books and labs facilities seriously causes affects on their results and thus discourages them to continue their education. Thus all the thousands of crores of budgets which the government approves every year for education goes in vain and hinders the process of growth of that student and also of the country in a very large extent as all these processes are interrelated. Thus by implementing cloud computing technology we have the hope that we can overcome all these short comes and maintained a proper centralized system where all the authorities can check the education system from each and every aspects and continue monitor and guide the system. They not only check the needs of the institutions but also ensure that quality education provide to every student and also his attendance, class performances etc can be effectively maintained.

### Services of Cloud

With an aim of reducing the expenditure of the universities and institutions for IT infrastructure and the complexity faced by universities and institutions, the traditional installed software on the campus computers are now replaced by cloud computing. With

the power of cloud, today higher education can gain significant flexibility and agility and can migrate the sensitive data into remote and world wide data center ‘ the cloud’ itself. To use the cloud services the universities and the institutions has to first define their requirements and has to take a special attention for the privacy and critical issues.

There are several cloud services as follows:

1. **Infrastructure as a Service (IaaS):** can be used to satisfy the infrastructure needs of the students, faculties or researcher globally or locally with some specific hardware configuration for a specific task.
2. **Platform as a Service (PaaS):** certain providers are opening up application platforms to permit customers to build their own application without the cost and complexity of buying and managing the underlying hardware and software layers.
3. **Software as a Service (SaaS):** Software applications as services are presented on The Internet rather than as software packages to be buy by any client. Examples are Google web-based office
4. **Computing as a Service (CaaS):** providers offer access to raw computing power on virtual server such as Amazons service.
5. **Data as a Service (DaaS):** A particular type of service in the cloud that offers features for storing, managing and accessing data.

Following figure shows the university using the services of cloud computing.

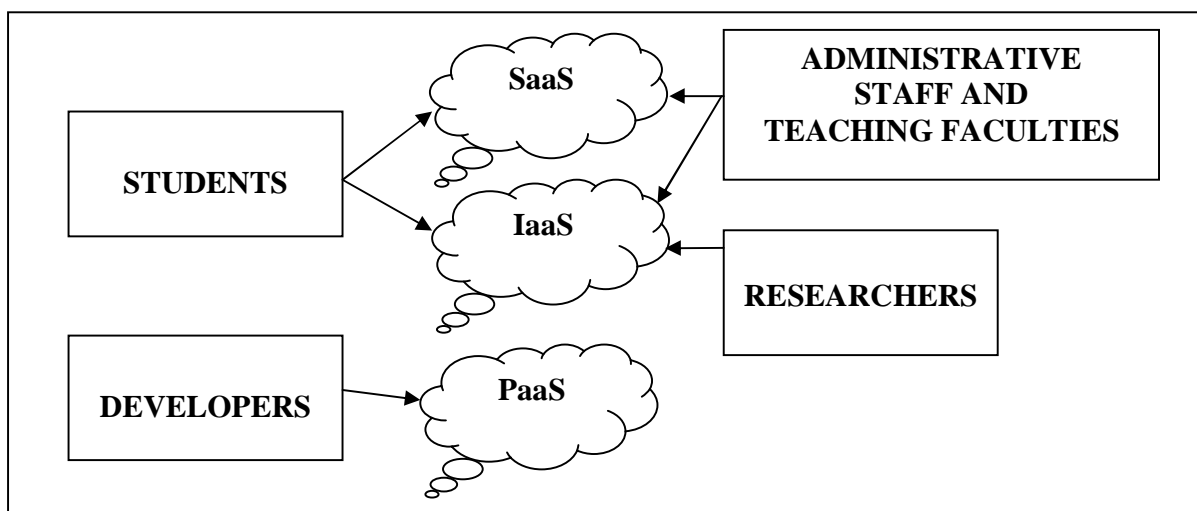


Figure: 1 University using the services of cloud computing.

### IT in Present Education System

IT and education system, both the terms are not in any sort of relation in the present day situation. Role of IT is very partial in school level education system. Entire works in school are mostly done in the form of hand written clerical work. We can witness for taking attendance teachers have attendance registers, Fee in most schools are recorded on the fees registers and many other work mostly done in the form of paper work and there is no system to monitor a student at a particular day or particular time thus as a result no monitoring can be done by the government. Also the quality of teachers on whom we are putting our faith that they will teach our wards at very best are not professional experts and they are adopted as a faculty because they are ready to work at minimum salary. Also the parents cannot see the usual or monthly growth of their

wards and no structure for daily monitoring of attendance of students (in both private and government schools) and teacher (in government schools).

### **Implementation of Cloud Computing Technology**

Cloud computing technology promises to provide solutions for all the desired problems mentioned above. Once any of the computer system connected with internet gets started then it will directed the student, teacher or in better words a whole institute to the cloud. In cloud both the students and teachers have to login with their separate id and from here the first best feature that is to monitor attendance of teacher and student is possible, secondly Live and recorded both type of the lectures can be seen by the student. The best part of this facility is that a student studying at any school and another student studying at any big name school both are attending the same tutorial from a highly skilled faculty at the same time. Thirdly entire examination process is changed and now the exams will be conducted on cloud and the results of each and every exam that is even a class test is reported directly to the concerned authority. With this new system parents can be able to monitor their ward attendance and his growth in the class. This new system also helps the students to prepare well for the upcoming competitive exams like NTSE, IIT JEE, AIEEE, AIPMT etc and stop the fashion of joining big coaching and spending their parents hard earned income.

Figure 2 and 3 shows the private and educational cloud architecture for education. Institutes can develop their own cloud called as 'private cloud' by making use of their existing resources or multiple universities can come together and can develop a hybrid cloud called as 'educational cloud', in which they can share all the resources from the various universities. Private cloud makes use of the local network whereas the educational cloud makes use of public network to access the services provided by the cloud. Both private and educational cloud which is developed for education has to specify the services provided by them.

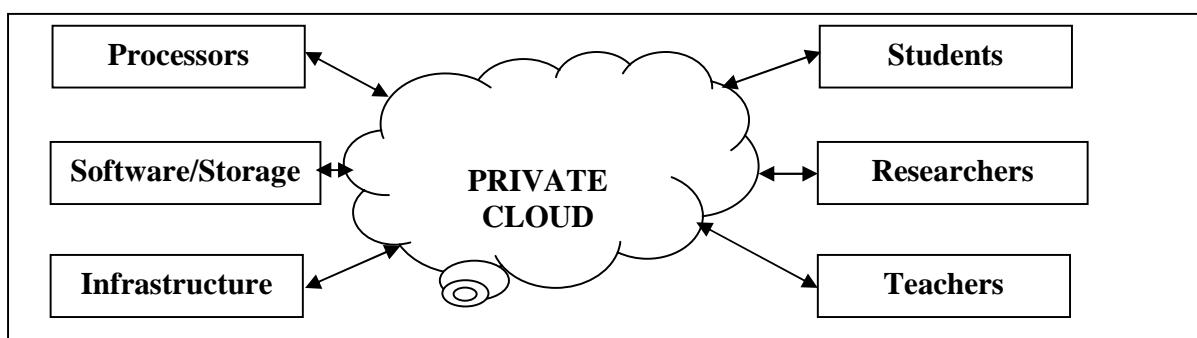
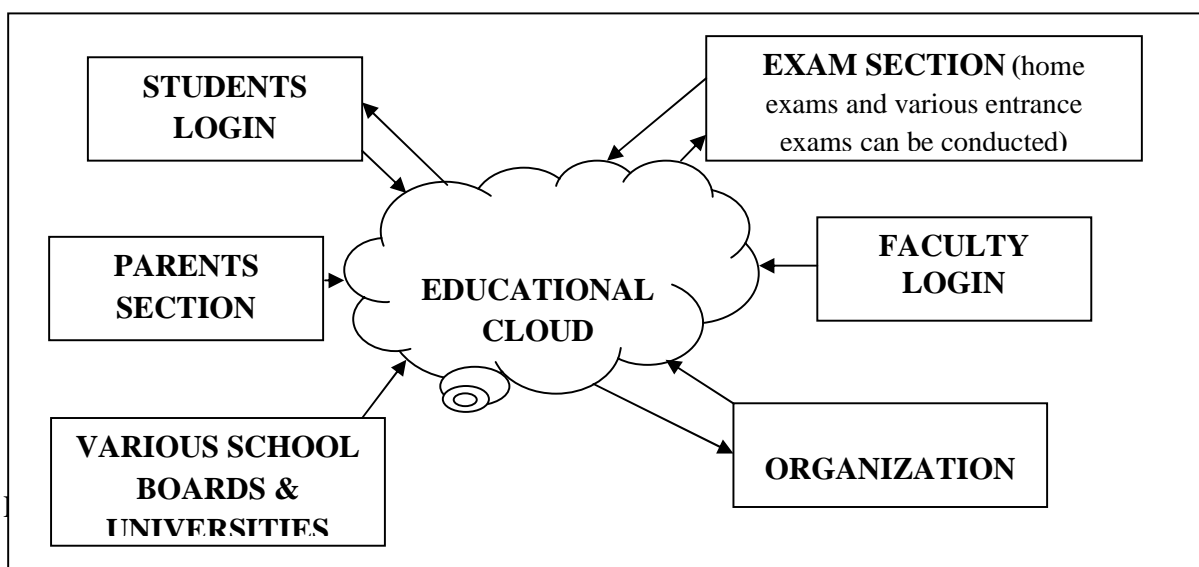


Table: 1. Differences Between Private and Educational Cloud.

Cloud Feature	Private Cloud	Educational Cloud
Owned and managed by	Single university	Service Provider (many universities)
Access	Limited to employees and students of single university	By subscription
Control and customization	Yes (By university)	None

### Adoption Barriers

However, there are also several adoption barriers in developing countries that have been discussed in general, for example, lack of connectivity, inadequate bandwidth, and instable power supplies (Greengard, 2010). Furthermore, Truong and Dustdar (2011) have discussed barriers for small groups to adopt cloud computing for computational science and engineering. In principle, groups in our study face these barriers as well. However, there are several other adoption barriers for groups in our study that are very specific to the characteristics of these groups in developing countries. In the following,

we will present concrete barriers for research and educational groups given analyzed requirements in Table 2.

Table: 2. Cloud Computing Requirements for Research and Educational Groups.

Cloud Service	Teaching Activities	Research Activities
<b>SaaS</b>	<ul style="list-style-type: none"> <li>• Need to run standardized/known educational applications (such as simulation, accounting, business process)</li> <li>• Need to share educational applications among institutions.</li> </ul>	<ul style="list-style-type: none"> <li>• Need to perform research applications (such as computational simulations, scientific workflows, high performance data visualization)</li> </ul>
<b>PaaS</b>	<ul style="list-style-type: none"> <li>• Need PaaS for students to learn how to write applications. This is mostly for students in computer science, computational science and engineering, and economics.</li> </ul>	<ul style="list-style-type: none"> <li>• Need PaaS for developing research applications and algorithms.</li> </ul>
<b>IaaS</b>	<ul style="list-style-type: none"> <li>• Need to provide machines for basic courses, such as operating systems and basic IT skills.</li> </ul>	<ul style="list-style-type: none"> <li>• Machines provisioning based on application requirements.</li> </ul>
<b>DaaS</b>	<ul style="list-style-type: none"> <li>• Need data services for storing lectures, papers, dataset for testing algorithm, presentations, etc. Most data is free and open.</li> </ul>	<ul style="list-style-type: none"> <li>• Data for research purposes. Information security concerns are important as many data are sensitive.</li> </ul>

### Potential Benefits of Cloud Computing

**General Cloud Computing Benefits:** Many studies show that cloud computing has some distinct benefits such as cost reduction, efficient resource utilization and flexible and elastic provisioning (Armbrust, et al., 2010). These benefits are applicable to a wide range of applications of cloud computing, including research and teaching activities.

Table: 3. Cloud computing support for teaching and research activities.

Cloud Service	Teaching Activities	Research Activities
<b>SaaS</b>	<ul style="list-style-type: none"> <li>• Students can use standardized/well-known applications for laboratories. For example, in engineering, students can use simulation SaaSes to run experimental models. In business, ERP and accounting SaaSes can be used as application platforms for students to practice. Google Docs can help students with practicing work or spreadsheet processing.</li> <li>• Institutions can jointly establish educational application stores and SaaSes in order to reduce investment cost and to improve collaboration in teaching activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Research applications and tools (e.g. computational simulations, scientific workflows, high performance data visualizations, etc.) can be provided and accessed via SaaSes.</li> </ul>
<b>PaaS</b>	<ul style="list-style-type: none"> <li>• Particularly useful for computing students who can use PaaS for learning and practicing programming tools and environment. For example, students can use Google App Engine, Amazon Hadoop or similar PaaSes to practicing web programming.</li> <li>• Students in economics, computational and scientific disciplines can also utilize PaaSes (e.g. MathLab/R computational platform) to build their custom simulation and analysis tools.</li> </ul>	<ul style="list-style-type: none"> <li>• Similar to teaching activities, PaaSes can be used as platforms for developing custom research tools to support research activities.</li> </ul>
<b>IaaS</b>	<ul style="list-style-type: none"> <li>• Provide on-demand machines for student laboratories and personal use. Students can acquire and design customized virtual machines that may include OS, laboratory exercises, communication and collaboration tools, IDEs, etc., for their course work. From universities' perspective, for exercises that require lots of machines in a short period, such as parallel processing, IaaSes can be used to save cost and management efforts.</li> </ul>	<ul style="list-style-type: none"> <li>• Computational requirements for research are usually adhoc, particularly in computational and scientific disciplines. For some computational models, the resource required can be scaled up to a very large extent only for a short time. IaaSes are good solutions in these cases.</li> </ul>
<b>DaaS</b>	<ul style="list-style-type: none"> <li>• For teaching, DaaSes can be used to store and provide teaching materials such as lecture slides, course contents, exam papers, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• DaaSes can be used as the sources of research data and publications and also as means for sharing these resources.</li> </ul>

Table 3 shows a summary of how cloud service models could be used for teaching and research activities. In parallel with the use of cloud computing services, research and educational groups in academic institutions in developing countries can also provide and utilize different cloud deployment models. Such provisioning and deployment will help

to address some issues discussed in the requirements of cloud computing. Table 4 summarized different cloud computing deployment models that can be used to address different issues of these institutions.

Table: 4. Requirements addressed by deployment models.

Deployment Model	Requirements Addressed	Why
Private cloud	<ul style="list-style-type: none"> <li>• Reduce cost</li> <li>• Deal with the lack/inefficiency of collaboration</li> <li>• Eliminate the habit of owning facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Resources are centrally invested and managed. This method will eliminate the fragmentation and heterogeneity of investment and enable best resource utilization with limited finance.</li> <li>• Researchers can get access up to the maximum amount of invested resources when they need. Hence big resource problems can also partially be addressed.</li> <li>• Students can flexibly get access to virtual laboratories and materials from anywhere, e.g. their home PCs, laptop and Smartphone etc. This will reduce the burden of universities in investing laboratory facilities and staff.</li> </ul>
Public cloud	<ul style="list-style-type: none"> <li>• Reduce cost</li> <li>• Access to latest technologies</li> <li>• Access to large pools of computational resources for research problems of almost any sizes</li> </ul>	<ul style="list-style-type: none"> <li>• Institutions do not need to invest and house large IT infrastructures for teaching activities, which are only needed for a short time.</li> <li>• New technologies from developed countries are quickly available in public clouds so students can access these technologies instantly.</li> <li>• For researchers, public clouds offer them to access any size of resources, enabling them to think and work beyond small research problems.</li> </ul>
Hybrid cloud	<ul style="list-style-type: none"> <li>• Balance between investment on private IT infrastructure and utilization of publicly available clouds</li> </ul>	<ul style="list-style-type: none"> <li>• In order to save money on investing resources public clouds are used as backup facilities and during peak computation period</li> </ul>
Federated private and public clouds	<ul style="list-style-type: none"> <li>• Motivate the sharing of computational resources and educational applications</li> <li>• Coordinate resource investment</li> </ul>	<ul style="list-style-type: none"> <li>• Federation of private cloud creates a larger pool of resources. It can be used to deal with big problems, and also to efficiently improve utilization of idle resources.</li> </ul>



### **Benefits of better services**

- **Elasticity of service:** In a single moment many students and teachers can store data, and the best part is that there is no limitation of space and thus user's capacity to store data increase to a larger extent.
- **Quality of service:** Service quality is the most important feature and in maximum cases where exact necessities have to be fulfilled by the outsourced resources and outsourced services.
- **Availability:** Availability of the services is the most important and desired by the user using the education cloud 24/7/365 is the availability that is needed by this system without failure.

### **Economic and technical Benefits from educational cloud**

- **Reduction of cost:** Cloud system that proposing is friendly to our pockets and it will reduce the cost by allowing us the facility of Pay per use. That is we have to pay only for the resources which we are using and thus it does not put any financial burden on any of the institute, government or student.
- **Focus on education only:** Schools and governments are now free to focus on there goals that is making more research facilities available to the students and making the environment global in spite wasting time on worrying about the buildings, labs, teachers etc.
- **Going Green:** Education cloud will surely reduced the carbon footprint.
- **User friendly:** This new facility is user friendly and no need to worry about the complexity. It is easy to understand and easy to operate.
- **Free from boundation of locations:** From anywhere a teacher can login and take the lecture. Anywhere a student can login the check his grades, submit assignments etc.
- **Management of data:** A large amount of data is generated by each school and thus to maintain them effectively and to use it appropriately when needed is the best feature of the education cloud.

### **Security of our important data**

With this education cloud we are saving our important and crucial data in one place and it will be easy for hackers to get it at once. One more important point of concern is that we do not have cloud in our country and if we are using other countries cloud then that also a matter of concern. So the best solution for this outsourcing of our data is that CBSE board make a education cloud for all the school (both state and central boards affiliated) under 1 roof and thus we do not need to send our data outwards to other countries and thus our crucial data will remain safe.

### **Conclusion**

With this proposed system we promise about a single and unique education system and stop the children and the parents to worry about the brand name of schools. This system will also be a boon to stop the coaching culture and helps to save hard earned income of parents. The best part of this system is that the boards' difference which arises due to standard of different boards (different state boards and central governed boards) will come to an end. And no matter a professor of physics taking lecture of class 12<sup>th</sup> in Delhi can we view at the same time from a student sitting in a village of Bijapur district. Thus this new system will spread the quality education to each and every part of India.



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