

APPLICATION OF CLOUD COMPUTING IN EDUCATION

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ABSTRACT

In maintaining the economic growth of a country, education plays an important role. Education system in Indonesia is always based on the marks, grades and numbers. But in real life the practical knowledge, profound thinking, and some experience is required to remain in competition. In schools and even in the colleges, the traditional education system is applied which is proved useless many years ago. 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. Because of the technology, it is possible to give the demonstration of the experiments, using presentation and the animation; it is now very easy to imagine the things. 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. By using cloud computing, we can build the good education system and increase the quality of the system.

Keywords: Cloud Computing, Higher Education, SaaS, PaaS, IaaS, Virtualization, Cloud architecture,

I. INTRODUCTION

Education system is mainly moving around the books, exams, marks and grades, where the creative learning lies far miles away. Teachers/Dosen teaches within the syllabus, students studies that part only, gives exams and it's all over! But change is occurred by creative thinking, and deeper thinking. That only occurs when you take your learning seriously but not the exams. So how do you improve it? Technology can be used as primary key in this situation. Now-a-days situation is changed, in many schools and colleges, the internet facility is available and even teachers use power-point presentation for teaching that improves easy understanding.

Cloud computing can be proved the boon in this scenario. Using Cloud Computing we can access any file or any document or even videos from any corner of the world. So it helps to give the basic lessons to those students who cannot afford it. Using the cloud computing, we can give easy and creative learning experience to the people and make the country more educated, that's why this new technology is used in worldwide now-a-days.

Cloud computing is a network of computing resources—located just about anywhere—that can be shared. Thus by implementing cloud computing technology we can overcome all these short comes and maintain a 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 is provide to every student and also his attendance, class performances etc can be effectively maintained without worrying for the infrastructure issue.

The cloud helps ensure that students, teachers/dosen, faculty, parents, and staff have 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.

II. CLOUD COMPUTING OVERVIEW

Cloud computing predecessors have been around for some time now [1-3], but the term became “popular” sometime in October 2007 when IBM and Google announced a collaboration in that domain [4-5]. This was followed by IBM’s announcement of the “Blue Cloud” effort [6]. Since then, everyone is talking about “Cloud Computing”. Of course, there also is the inevitable Wikipedia entry [7]. It is conceivable that August 24, 2006 will go down as the birthday of Cloud Computing, as it was on this day that Amazon made the test version of its Elastic Computing Cloud (EC2) public. This offer, providing flexible IT resources (computing capacity), marks a definitive milestone in dynamic business relations between IT users and providers. The term first became popular in 2007, to which the first entry in the English Wikipedia from March 3, 2007 attests, which, again significantly, contained a reference to utility computing. Today, Cloud Computing generates over 10.3 million.

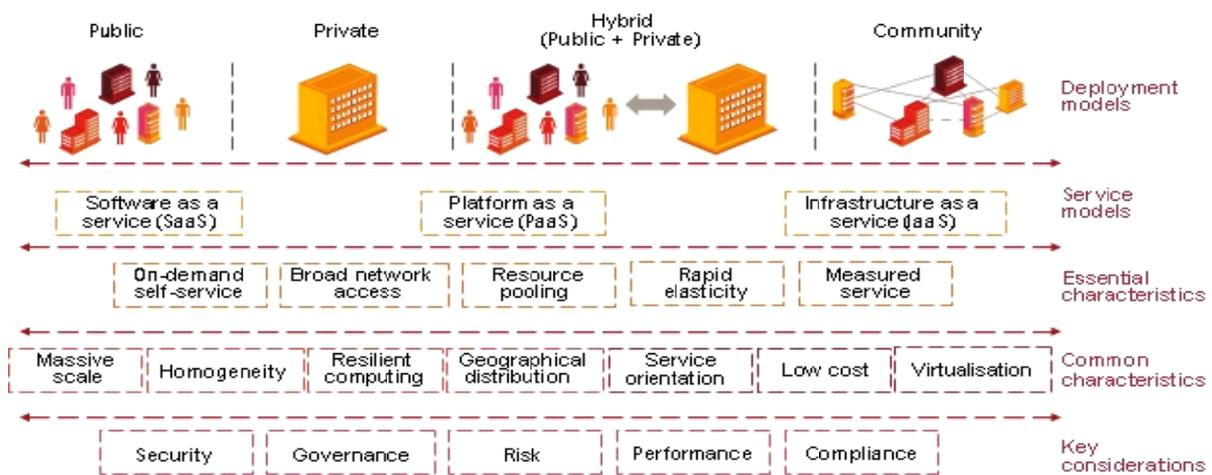


Fig.1. Model and Characteristics of Cloud Computing

The National Institute of Standards and Technology (NIST) defines *cloud computing* as

a model that helps enable ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (eg, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

Essentials Characteristics

- **On-demand self-service:** A consumer can unilaterally obtain computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.
- **Broad network access:** Cloud capabilities are available over a network and can be accessed through standard mechanisms that promote use by (multiple) client platforms (e.g., mobile phones, laptops, and personal digital assistants (PDAs)).
- **Resource pooling:** One of the great strengths of cloud computing is that the provider is able to pool computing resources, such as storage, processing, memory, network bandwidth, and virtual machines, to serve multiple consumers with different physical and virtual resources dynamically assigned and reassigned according to the consumer demand. The subscriber generally has no control over or knowledge of the exact location of the provided resources.

- **Rapid elasticity:** IT capabilities can be rapidly and elastically provisioned, in some cases automatically, according to the scale required. To the consumer, the capabilities available often appear to be unlimited and can be purchased in any quantity at any time.
- **Measured service:** Cloud systems automatically control and optimise resource use by filtering service appropriately by its type. Resource use is monitored, controlled, and reported, providing transparency for both the provider and consumer of the service.

Service Models

- **Software as a service (SaaS):** This model allows the consumer to use provider's applications running on a cloud infrastructure. Applications can be accessed from various client devices through a thin client interface such as web-based e-mail. The consumer does not manage or control underlying cloud infrastructure, including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings. The best known examples are Google Apps for Education and MicrosoftLive@edu which provide communication and office applications such as email and spreadsheets.
- **Platform as a service (PaaS):** PaaS allows the consumer to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure, including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations. Examples of PaaS include Microsoft's Azure Services Platform (Microsoft, 2012), Salesforce's Force.com development platform, Google Apps Engine, Amazon's Relational Database Services and Rackspace Cloud services.
- **Infrastructure as a service (IaaS):** This model allows the consumer to obtain processing, storage, networks, and other fundamental computing resources and be able to deploy and run a range of software. The consumer does not manage or control the underlying cloud infrastructure but controls operating systems, storage and deployed applications and may have limited control of select networking components (eg, host firewalls). Examples of IAAS providers include: Amazon EC2, Google Compute Engine, HP Cloud, Rackspace, and Ready Space Cloud Services.

The three cloud service models appeal to distinct user groups. While enterprises that want complete control over data will look to migrate towards the IaaS model, programmers and developers will focus on the PaaS model. On the other hand, SMEs or business units looking for low-cost alternatives to traditional software and infrastructure will focus both on the IaaS and SaaS models.

Globally, cost reduction seems to be the major driver for cloud adoption followed by increased productivity and innovation. While, 25% of the companies worldwide feel that the adoption of cloud helps reduce cost, 20% feel that cloud adoption will fuel innovation and increase productivity.

According to the results of our 15th Annual CEO Survey, 53% of CEOs say that lack of the right skills is their biggest talent challenge and 75% of them say they will change their strategies for managing people and talent. Cloud computing being a new technology, it is critical for companies to educate the relevant stakeholders within their organisations about the benefits of cloud adoption. Companies will also have to address the need for skilled manpower, to implement and use this technology.

Deployment Models

- **Private cloud:** Operated solely for an organisation, a private cloud may be managed by the organisation or a third party and may exist on or off the premises.

- **Public cloud:** The infrastructure is made available to the general public or a large industry group and owned by an organisation selling cloud services.
- **Community cloud:** A community cloud is shared by several organisations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organisations or a third party and may exist on or off premises. For example, a state government may set-up a community cloud infrastructure for all its separate organisations to pool resources.
- **Hybrid cloud:** This infrastructure combines two or more clouds (private, community, or public) that remain unique entities but are bound together by standardised or proprietary technology that enables data and application portability (eg, cloud bursting, or a dynamic redistribution of resources between clouds to handle the demand surge and balance loads).

As more companies consider the use of clouds, one of their first decisions is whether to use a private or a public cloud or a hybrid. Many companies are favoring private over public cloud. Twenty-six percent companies worldwide are presently investing in public cloud applications, 20% in public cloud and 38% in private cloud infrastructure.

One of the major advantages of a private cloud is its greater security via dedicated resources under the control of one user. Private clouds also offer the highest level of customisation as per the company's needs. However, the downside is increased cost over public cloud options. Its greatest advantage includes scalability and lower costs. However, because it is a form of shared assets, public cloud providers are able to offer minimal customisation. In addition, security of the public cloud depends on the provider. Hence, it is advisable that the reliability of any public cloud provider must be evaluated thoroughly.

III. PRESENT EDUCATION SYSTEM

Most of the private educational institutions have become highly dependent on information technology to service their requirements. These services are increasingly provided using Internet technologies to faculty and students and accessed from web browsers. The services are offered cheaply or freely to education, often with much higher availability than can be provided by the educational institution.

Are we therefore facing a future where the majority of educational services will be hosted in the cloud and institutions no longer host their own data centers with expensive hardware, power bills, staff salaries and computing resources which are rarely fully utilized? This policy brief has analyzed some of the emerging benefits and challenges of cloud computing for the educational sector. But in most of the government schools and colleges in Indonesia IT plays very limited role. Most of the work is done manually from attendance to classroom teaching to examination system.

IV. IMPLEMENTATION OF CLOUD TECHNOLOGY IN EDUCATION SYSTEM

Cloud computing technology can provide solutions for the above mentioned problems in education system. Cloud computing enables users to control and access data via the Internet. The main users of a typical higher education cloud include students, Faculty, administrative staff, Examination Branch and Admission Branch as shown in Figure 2. All the 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 using computers and other electronic devices both at home and college and 24 x 7. The education system will make it possible for teachers to identify problem areas in which students tend to make mistakes, by analyzing students' study records. In doing so, it will also allow teachers to improve teaching materials and methods.

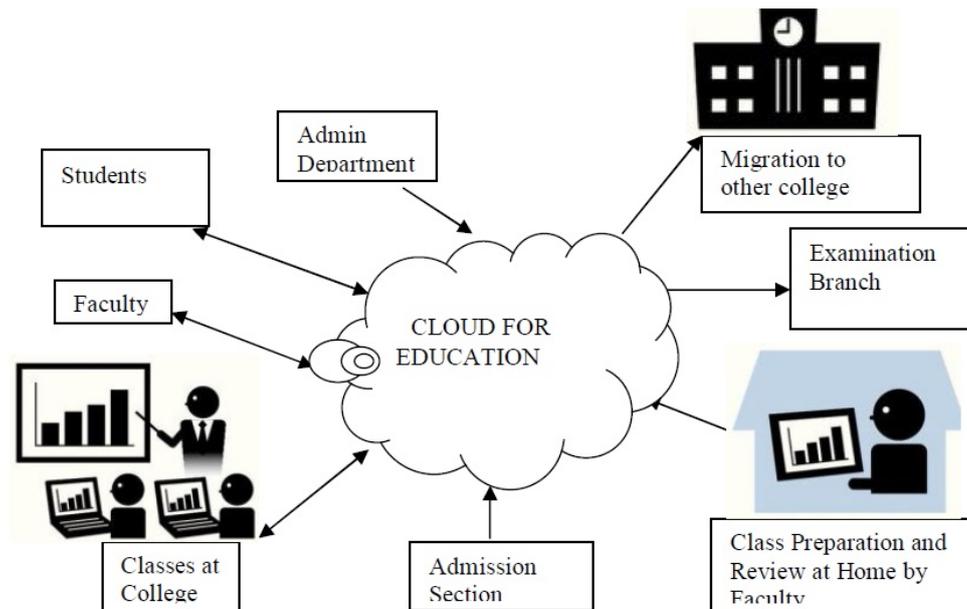


Fig.2. Services attached to Education Cloud

This will not only make it possible for students to use online teaching materials during class but they will also be able to access these materials at home, using them to prepare for and review lessons. Utilization of cloud computing systems will reduce the cost of operation because servers and learning materials are shared with other colleges.

In the traditional deployment model, all Information Technology resources are housed and managed in-house. Many aspects of these services and tools may be migrated to the cloud and consumed directly over the Internet either as fully functional applications (SaaS), development platforms (PaaS) or raw computing resources (IaaS). Figure 3 shows how the different categories of university users may consume cloud services.

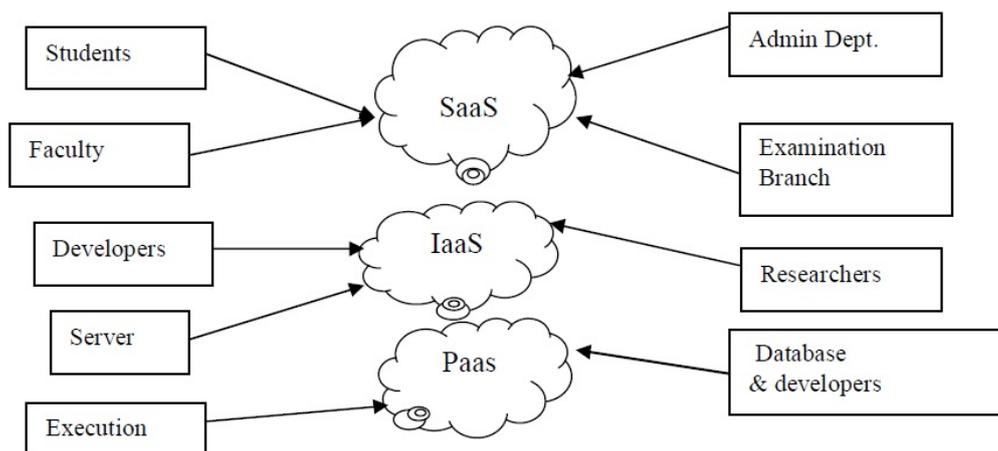


Fig.3. Users of an Education Cloud Computing System

V. BENEFITS OF CLOUD COMPUTING FOR INSTITUTIONS AND STUDENTS

- **Personalized Learning:** Cloud computing affords opportunities for greater student choice in learning. Using an Internet-connected device, students can access a wide array of resources and software tools that suit their learning styles and interests.
- **Reduced Costs:** Cloud-based services can help institutes reduce costs and accelerate the use

of new technologies to meet evolving educational needs. Students can use office applications for free without having to purchase, install and keep these applications up to date on their computers. It also provides the facility of Pay per use for some applications.

- **Accessibility:** Availability of the services is the most important and desired by the user using the education cloud. 24 x 7 is the availability that is needed by this system without failure. From anywhere one can login and access the information.
- **Improved administrative efficiency of schools and universities:** Colleges and the administrative staff can focus on the core functions of the institution instead of futile efforts on IT infrastructure and the applications set-up.
- **No Extra Infrastructure:** Colleges and governments are now free to focus on their 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.
- **Higher quality of education delivered anytime, anywhere:** Courses with updated content can be delivered consistently across all locations.
- **Standardisation of content:** Courses delivered over cloud through a central location will lead to a standard content delivery to multiple remote virtual classrooms.
- **Collaboration:** Students and Colleges can collaborate on studies, projects using collaboration solutions.
- **Agility to rollout new courses:** Cloud-enabled technologies ensure rapid access to infrastructure services thereby rendering agility in rolling out newer products.
- **Improved administrative efficiency of schools and universities:** Teachers and the administrative staff can focus on the core functions of the institution instead of futile efforts on IT infrastructure and the applications set-up.
- **Scalability:** Scalable systems on cloud to provision big data platform for research and analysis.
- **Go Green:** Education cloud will surely reduce the carbon footprint.

VI. CONSIDERATIONS, SECURITY ISSUES AND LIMITATIONS

Areas Where Cloud Computing Can Have An Impact

Category	Description
Classroom Technology	
Engagement	<ul style="list-style-type: none"> ▪ Centralised faculty assisted by local teachers ▪ Students interaction with teachers, delivering lectures, presentations or response to polls and questions
Collaboration	<ul style="list-style-type: none"> ▪ Students and teachers collaborating on projects by creating and sharing content ▪ Communication by messaging or video
Mobility	<ul style="list-style-type: none"> ▪ Extend classrooms and labs with mobile devices such as smartphones, ▪ Tablets virtual desktop technologies facilitate remote access
Real-time assesment	<ul style="list-style-type: none"> ▪ Adapting lessons based on observations of student interactions, notes taken ▪ Content can be highlighted, annotated or updated via electronic media
Administrative Technologies	
CRM	<ul style="list-style-type: none"> ▪ Student life-cycle management enables better management of recruitment and admissions, student financial aid and billing, student records and performance, transfers and alumni relationship
ERP	<ul style="list-style-type: none"> ▪ Educational institutions manage internal and external resources including physical assets, financial and human resources
Business Intelligence	<ul style="list-style-type: none"> ▪ Teachers and students use analytics in classrooms; evaluating and

	establishing curriculum
Smart campus	<ul style="list-style-type: none"> ▪ Universities appear to be cities in themselves ▪ The CIO is responsible for public safety, transportation, energy and water management, building maintenance, student services

Key considerations

As barriers to technology adoption reduce and education industry looks to leverage technology to drive business advantage, following are the key questions to consider:

- Is there a business case for cloud?
- Which cloud service or deployment model is the most appropriate for my organisation?
- How can one profile, prioritise and architect services to migrate to cloud?
- How can cloud help me as I plan for a technology refresh or data center expansion?
- How should I create my vendor selection process and structure contracts and SLAs?

Security Issues

In cloud computing we are saving our important and crucial data in one place and it will be easy for hack. Protection of data is a major security issue. Educational Institutions may consider that their data is more secure if it is hosted within the institution. Transferring data to a third party for hosting in a remote data Centre, not under the control of the institution on and the location of which may not be known presents a risk. Some cloud providers now provide guarantees in their contracts that personal data will only be stored in particular countries. It has been suggested that the provision of cloud services through a single provider is a single point of failure and that it would be better to contract more than one cloud provider in order to minimize risk. Another security issue is Unsolicited advertising in which cloud providers will target users with unsolicited email or advertising.

Limitations

Following are the limitations of the Cloud in the education:

- Though the initial cost the system is very low, maintenance cost of the system is high.
- The security of the cloud is also the important issue need to be considered. Less secured cloud can be attacked from outsiders easily.
- Not all applications support the cloud structure.
- Low internet speed is major issue in the rural areas, where internet service provider may or may not have station. So due to less internet speed, the system should not be prove effective.
- The major problem about rural areas is the load shedding or lack of electricity. Without electricity, this all system is just a big zero.

CONCLUSION

The cloud allows us to access our work anywhere, anytime and share it with anyone. It frees us from needing a particular machine to access a file or an application like a word processor or spreadsheet program. In the present paper a cloud education system is introduced and how it is beneficial for students, faculty and the educational institutes for providing quality education.

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