
A NOVEL STUDY ON HYBRID CLOUD COMPUTING IN EDUCATION

Dr.S.R.Swarnalatha¹ Mrs.P.Vanitha²

¹Assistant Professor and Head, Department of Computer Science, Patel Institute of Science and Management, Bangalore, India

Email- swarni.ila@gmail.com

²Assistant Professor, Department of Computer Science, Patel Institute of Science and Management, Bangalore, India

Email- vanithavn@gmail.com

Abstract:

Cloud computing is an emerging topic in today's education style in publications and among users. In today's education sectors, cloud computing is an essential technology is taking beyond classrooms. Cloud computing provides many kinds of services in education system example like online education, distance education, higher education etc. Cloud computing provides platform for innovative teaching practice and useful in this covid situation. In this paper, we have analysed various services provided by cloud computing and different types of deployment model which is helpful in educational sectors and we have discussed about benefits of this techniques of technology and listed out the challenges too. We concluded that the cloud computing with hybrid model provides very efficient way of service in educational system and more successful model.

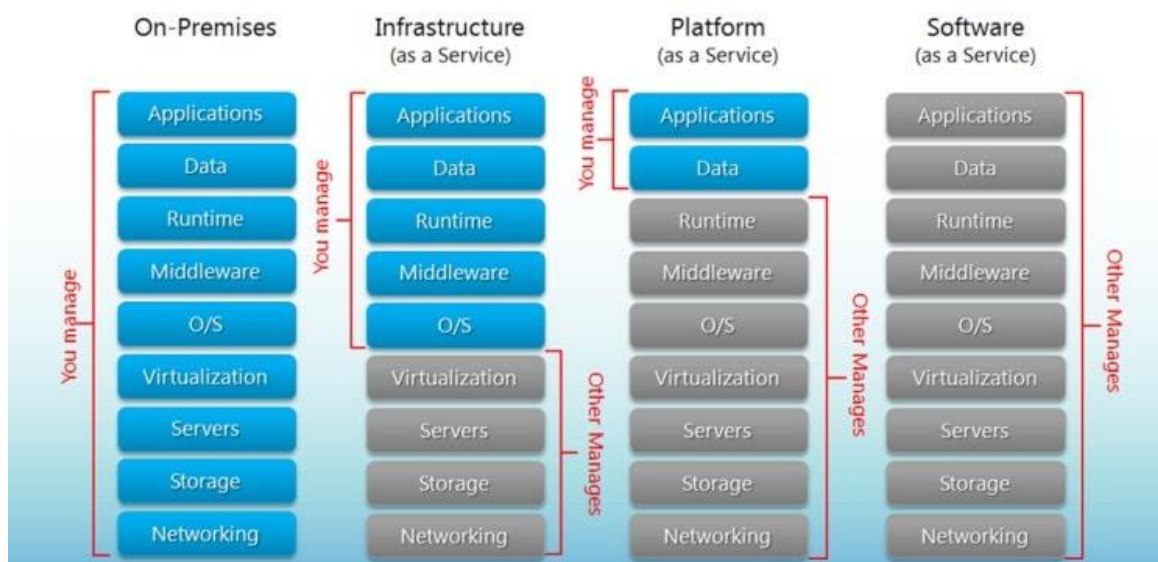
Keywords: Cloud Computing, Hybrid Cloud Computing, Private Cloud, Public Cloud, Cloud data storage, Cloud data security, Deployment Model, Service Model.

Introduction:

Cloud Computing is a type of internet based computing which provides services via the internet and access the resources within the user enterprises either in a private own cloud or Hybrid cloud server on demand. Hybrid model combines two models – private and public which helps educational systems gain more flexible in service delivery. Hybrid Cloud computing can construct and maintain application dynamically It provide data storage online and infrastructure required for our application. Cloud computing is able to assign the on demand resources to any client. The clients do not require any cost for computing infrastructure building or maintenance cost of any hardware or

software. The clients only need to connect their computer or network to the cloud computing services and pay based on usage. A study on distinctive hybrid cloud organisations and models accessible in the cloud computing field. In the advanced education system, moment the capability to fleetly borrow new literacy, tutoring and business models have academic and executive leadership conferring with lot CIOs to more aggressively pursue IT and business transformation that improve offerings while also reducing costs. Hybrid clouds also supports online learning initiatives the increase enrolment and revenue, as well as lower operational requirements for research computing environments while simplifying, securing and improving access to associated computing power and data. This paper portrays the hybrid cloud model in education system.

Services in cloud computing: SaaS



In SaaS we have to pay-as-you-go basics to Cloud service provider to get a complete software solution. In an organisation user connect the rented app by using internet, usually with a web browser. Here the service provider's data centre will underlying the infrastructure, middleware, app software and app data .With the service agreement the cloud service provider will manage the hardware, software and infrastructure, and also ensure the security of the app and the data as well. With the minimal cost upfront SaaS allows the organization to get quickly up and running with an app. Common examples of the SaaS are E-mail, calendaring and office tools. For illustration, Hinds

Community College uses a mail result hosted in the cloud computing. Scholars now have the free collaboration tools they want, people on lot have the tools they need to work together, and administrators are finding it easier and more cost-effective to manage.

Education in SaaS:

Microsoft Live@edu is a program that provides scholars, staff, faculty, and alumni long-term, primary e-mail addresses and other applications that they can use to collaborate and communicate online—all at no cost to education institutions. Scholars will be using Microsoft products same to those used in numerous workplaces that help to prepare them for jobs after college.

Reduced time: SaaS can be quickly installed and configured and allows instant use of education tools. Software deployment can also be reduced.

Lower the costs: Has there is no up-front licence fee in SaaS the initial cost will be less. SaaS cloud service provider owns the environment which is spitted among many educational institutions and customers will reduce the maintenance cost.

Integration and scalability: As the SaaS reside in cloud it is scalable and have integrations and for us no need to buy another server or software .Based on our need we can able to scale our SaaS.

PaaS (Platform-as-a-Service):

In this service the cloud service provider will provide development tools, infrastructure and operating system to the user. A developer has to rent everything they need to build an application. Here development environment is not hosted locally ,as PaaS is accessed over any internet connection, user can able to work on the application from anywhere .Developers will have less control over the environment .Generally PaaS vendors will include the following offerings development tools, Middleware, operating systems, Database management, and infrastructure other servicers may also include by the vendors . New application can be developed by using PaaS in the cloud with independent platform and we can make them available globally to users through internet

.Collaborating on , hosting ,testing deploying and maintaining applications can be delivered by PaaS.

Education of cloud PaaS:

The education institute can able to design a virtual lab for their students using PaaS. By programming language, services and tools an institute can able to create and customize acquired applications .for this they have to hire an IT team to develop the application.

IaaS Infrastructure-as-a-service:

IaaS is also known as on demand data centres. According to the resource need Cloud computing provider provide memory, storage and computing power based on pay-as-you-go. In IaaS data centre is available on cloud based, so that user no need to install new equipment or to wait for the hardware. Service provider will provide all the capacity you need the user is responsible for monitoring on demand infrastructure. We can get the IT resources in educational Institute .Other services provided in IaaS includes security, load balancing, log access and clustering. Here the customers will log in by using IaaS platform and a virtual machine is created so that operating system is installed in virtual machine. Databases, storage buckets for workloads will be deployed. Service provider will provide the customer's to track balance network, monitor performance and troubleshoot application .

Education in IaaS:

IaaS puts computing power huge even in smallest education Institute, on demand data centre is available virtually by internet connection. Education institutes that work to integrate IaaS into their technologies will meet computing needs of both faculty and students.

Benefits of hybrid cloud computing in Education Era:

1. The application provided by Hybrid cloud computing can be accessed for anywhere.
2. Cloud computing applications will always support for learning and teaching.
3. The infrastructure and the content provided by the service provider can be accessed by the educational institute any time.

4. New technologies are always open for the students through online.
5. By using cloud computing cost can be reduced for the educational Institute.
6. Gives a great opportunity to concentrate more on research activities and remote teaching.
7. High performance can be achieved by cloud computing.
8. Modernizing learning environments.
9. Better support for a remote workforce. ...
- 10.Reduced costs. ...
- 11.Improved scalability and control. ...
- 12.Increased agility and innovation. ...
- 13.Business continuity. ...
- 14.Improved security and risk management. ...
- 15.Hardware costs. ...
- 16.Need to manage multiple vendors and platforms.

Cloud Deployment Model – Hybrid

Hybrid cloud is the combination of private cloud with one or more public cloud services, with proprietary software enabling communication between each distinct service[1]. A hybrid cloud model provides greater flexibility in business by moving workloads between cloud results as needs and cost effective. Every hybrid model will be different from each other, and should select the best fit for the organization on their unique requirement. Organization requirements for higher security may be maintain of their on-premises infrastructure and use a cloud instance to host less-critical resources, for instance, while enterprises with lot more dynamic workloads and a need for high availability may be suitable for a private cloud with the ability to shift to the public cloud model during high resource peaks. Instead of having multiple deployment models, hybrid cloud is the one suitable to create a seamless, secure, and automated environment for ultimate productivity and flexibility to replace[2] multiple models. Organizations are enabled to integrate secret data from the private platform with their applications running in the cloud. The organization decides the applications, data, and resources can be put in the public cloud, which need to be kept in a

private environment, and how this information is sent and received between them. One of the major advantages of the hybrid cloud is that organizations can both reap the benefits of the speed and flexibility of the cloud while not having to throw down the existing technology or purchase new infrastructure.

Table 1: Comparative Analysis of Cloud deployment model

The selection of a cloud deployment model is one of the most significant decisions that IT managers in academic institutions will face. Cloud computing can be applied in academic institutions using different deployment and technology

Key Factors	Private	Public	Community	Hybrid
Model setup	Easy setup	Needed professional team	Needed professional team	Needed professional team
Privacy & Data security level	Low	High	Very high	High
Flexibility & Scalability	High	High	Fixed	High
Operational Cost	More economical	Most expensive	Cost is divided between members	Cheaper than private & Expensive than public
Reliability	Low	High	Higher	High

models [3]. The problem of modelling infrastructure is specific in terms of resource supplying and how to deploy virtualized services.

Academic Institutions cloud models:

The public cloud model to be selected where the infrastructure is available to be a general public to all and is owned by firm selling cloud services. Public cloud model is delivering the benefits to academic institutions that is not yet achieved high levels of computerization, or will create the problems in the recruitment of staff with IT skills, or capability to protect and secure their data. By contracting a cloud service provider, the academic institution can adopt state-of-the-art applications and services, allowing the academic institution to skip a lot of the weakening and costly challenges. The main drawback of cloud computing is that

it is maintained and supervised by the third party. Therefore, the services and security little bit low in sometimes. In addition, privacy is one of the important factors which have to be taken care for cloud computing [4]. In public cloud model, users will not have security control or know where their data is being stored.

Another option is to build their own private cloud. In the private cloud model, academic institutions develop or buy their own dedicated cloud-computing environments rather than simply using the existing services offered by third-party providers. Academic institutions can moderate many of the challenges mentioned above the model by building a private cloud with the trust of knowing that it has already been instituted and tested in its own data Centre, or parts of the environment, depending confidence level, to another cloud deployment model. Private clouds reduce the risks related to service providers, more secure, more customizable, can quickly respond to changes in demand, deliver high quality, focus on academic institutions core concerns and provide regular service or facility to researchers and students. There is also a hybrid option where an organization might use a public cloud for some functions and their private cloud for others. The cloud deployment model is a challenging task for IT managers in academic institutions that the academic institutions should take into account the special security measures of higher education and the available cloud service solutions[5]. In Addition, academic institutions need to follow all the rules and regulation of the state and country for developing a cloud for education as many countries are very strict in cross broader transfer of information.

Deployment model	Management and Ownership	Location	Access Right	Customization and Control
Private	Academic institutions	Within or outside the academic institutions	Limited to students, staff of the academic institutions	Yes
Public	Cloud provider	Outside the academic	By subscription	No

		institutions		
Hybrid	Academic institutions and cloud provider	Within or outside the academic institutions	On both	Depend on academic institutions

Table 2: Cloud Computing Deployment Models

Challenges of hybrid cloud computing in education:

1. It is not easy to run all the application
2. Data protection, security and accounts management may have risk related factors.
3. Lack of internet can affect the learning.
4. Education institution support
5. Security and data privacy have to be maintained.

Conclusion:

From the above discussion about educational sectors, found that hybrid cloud computing plays and most important role in improving the interest of study atmosphere through different services in educational sectors. This paper presents about cloud computing in education sectors and how the universities and institutions are using this technology, not only in cost but also efficiency security, reliability and portability. The cloud computing in educational sector has also some pitfalls but can be handled by various new methodologies.

References:

1. H. L. Truong, T. V. Pham, N. Thoai, and S. Dustdar, "Cloud computing for education and research in developing countries," *Cloud Comput. Teach. Learn. Strateg. Des. Implement.*, pp. 64–80, 2012, doi: 10.4018/978-1-4666-0957-0.ch005.
2. P. kumar BV, S. kommareddy, and U. R. N, "Effective Ways Cloud Computing Can Contribute to Education Success," *Adv. Comput. An Int. J.*, vol. 4, no. 4, pp. 17–32, 2013, doi: 10.5121/acij.2013.4402.
3. D. WAGA, E. MAKORI, and K. RABAH, "Utilization of Cloud Computing in Education and Research to the Attainment of Millennium Development

- Goals and Vision 2030 in Kenya,” *Univers. J. Educ. Res.*, vol. 2, no. 2, pp. 193–199, 2014, doi: 10.13189/ujer.2014.020212.
4. J. P. Mishra, S. R. Panda, B. Pati, and S. K. Mishra, “A novel observation on cloud computing in education,” *Int. J. Recent Technol. Eng.*, vol. 8, no. 3, pp. 5262–5274, 2019, doi: 10.35940/ijrte.C5910.098319.
 5. N. Goyal and D. Goyal, “Cloud Computing in Educational Research,” *Int. J. Recent Eng. Res. Dev.*, vol. 01, no. 02, pp. 1–5, 2012, [Online]. Available: www.ijrer.com
 6. [https://www.bing.com/search?q=link+for+ 2](https://www.bing.com/search?q=link+for+2).
 7. www.sam-solutions.com/blog/four-best-cloud...
 8. myventurepad.com/the-pros-and-cons-of-hybrid
 9. community.spiceworks.com/cloud/articles/2504
 10. www.tutorialspoint.com/cIoud_computing/cloud
 11. www.coursehero.com/file/pvI9c3b/This-model
 12. www.branex.com/blog/cloud-service-models-saas