



Adoption of hybrid cloud in education system

Bharath Kumar D, Monisha Singh

Department Of Computer Science
Christ University, Bangalore

Abstract: Cloud computing plays an important role in education increasing access to extensive variety of educational institutions. This incorporates access to infrastructure, storage and platform whenever and wherever needed with internet. The clients of cloud computing in education institutions incorporate teaching staff, non-teaching staff, students, developers, programmers and researchers. The education institutions in India is discriminated with institutions consisting of research and highly skilled faculties and on the other hand there are institutions which are not even close to providing quality education, one of the major reasons for this discrimination in education would be the government that is not monitoring the education system as there is no centralized system to monitor. Cloud computing is maturing and advancing rapidly, Hybrid cloud model is seen as a more adaptable way in educational institutions to make use of resources by using public and private cloud. In this paper an architecture for hybrid cloud in education system is proposed where the private data of the institution is stored on premises and other data like study materials and areas of research are shared in public cloud, this public data is collaborated with other institutions and also some international institutions to look for the loopholes in the Indian education system. The combination of both the cloud would form the hybrid cloud which is monitored by the government to provide quality education.

Keywords: Adoption, Cloud Computing, Cloud Strategy, Education Institutions, Hybrid Cloud.

INTRODUCTION

There are various cloud architectures that have been introduced with their implementation for several areas. The cloud architecture can be tailor-made according to the users or the organisations requirements. The cloud environment has been proved significant in developing different sectors, with the integration of the required custom features with the existing models to create a new cloud architecture [10][11]. Education institutions need to be more innovative and competitive so that the students can have quality education which can fit them well in the job market after graduation. Cloud computing can provide a way in giving quality education and required skills to the students and faculties. Among the cloud deployment models, hybrid cloud is most widely used in the education sector as it provides a more flexible way by leveraging the advantages offered by public and private cloud. Hybrid cloud helps efficient management of capital and expenses so that education system can make optimal use of on-premises resources by moving some resources to the public cloud. The main aim of hybrid cloud computing is to create

75 | Received: 5 November Revised: 13 November Accepted: 22 November

Index in Cosmos

Volume 7 Number 12

UGC APPROVED



an open and extensible cloud ecosystem that integrates an education system's services with public and private cloud together to provide portability and interoperability of information. The proposed architecture of hybrid cloud in education system incorporates collaboration between the Indian institutions as well the foreign institutions to share the advancements of education trends, where the government would precede a strategy to monitor the system to provide quality education to all the institutions.

CLOUD SERVICE MODELS

Cloud computing is composed of three service models based on the type of service offered. They are Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS).

I. SaaS

SaaS furnishes clients with access to applications over a wide scope of gadgets through a program interface or a thin client by using a web browser over the web. Clients can get to these applications whenever and wherever needed with the capability to proceed from any place they ceased the past time. Due to the likelihood of getting to course content anywhere and anytime, sharing of knowledge can be enhanced among users in educational institutions.

II. IaaS

IaaS furnishes clients with access to computer processing resources like storing, processing and networks over the web. This enables clients to have the capacity to run applications and save their information on the given resources without worrying about the maintenance and management of the resources.

III. PaaS

PaaS enables clients to convey their own particular applications onto the cloud and gives them control over their applications. The service provider is left with the obligation of overseeing and controlling the fundamental framework, such as servers, networks, operating systems and storage.

CLOUD DEPLOYMENT MODELS

Private cloud: private cloud is provisioned for the exclusive use of a particular organization comprising of multiple clients like in educational institutions with different lecturers and departments. Private cloud is owned, operated and managed by a specific organization, owning the infrastructure. The infrastructure can be on premises or off premises [12]. This deployment model gives the organisation more secure and control of the resources and data because it is owned by that organisation.



Public cloud: public cloud can be used by general public. It is accessible by anyone in the outside world like government organizations and business organizations etc., the public cloud is owned by a service provider who has full control over the cloud [12].

Community cloud: The infrastructure of community cloud is for the use of two or more organisations with similar objectives with similar objectives. For example, two or more institutions can collaborate in a cloud making use of infrastructure owned by a service provider [12].

Hybrid cloud: hybrid cloud is the combination of two or more clouds or deployment models, typically private and public cloud [12]. Educational institutions can make use of private cloud for sensitive data and public cloud for less sensitive data.

LITERATURE REVIEW

Authors of this paper[2] conveys the division of higher level education institutions, on one side there are top institutions with high quality reputation and on the other side there are institutions which are not even near to good reputation. If we find the reasons for this is checked then the major issue is that there is no centralized system present in the government to monitor the educational institutes from which not only the result of every year is checked but also there is a thorough monitoring of all the educational institutes in India. The implementation of cloud computing technology composes solution to all the mentioned deficiencies and provides quality education to every citizen of India.

In this paper [3] the author attempts to figure out the problems in educational institutions and suggests corrective measures to face the challenges in the fast moving world of education with new models, innovation and leadership to ensure that education meets the generation needs. Cloud computing is the new revolution for the storage of data and handled to play a vital role in the future. So, this paper explores how Cloud can be used to leverage higher education institutions to overcome the obstacles.

[4] Cloud gives essentially everything as services and resources to provision over the web and storage as a service. These services utilize storage and processing abundant data over the internet. Usage of mobile phones are increasing day by day and it plays a crucial part in human life as it is the most used communication tool which is highly portable. Cloud computing plays a vital role in educational sector, due to rapid growth in education sector there is requirement for a cloud architecture that helps storing and processing of abundant data produced by the educational institutions. The rapid growth of applications and emerging cloud technology in mobile cloud computing for services like health care(M-Health), Commerce(Mcommerce), Gaming(M-Gaming) etc., Mobile cloud computing can be a solution for storage and processing of educational data. So, the author of this paper is proposing a MobiHybrid educloud with the combination of public and private cloud for educational institutions, in this case cloud computing makes it simpler for students and teachers to have access to data through their cell phones.



In this paper [5] the author presents the usability of public cloud applications among educational institutions in Pakistan from teachers and students perspective. The results of the experiment show that there is lack of knowledge among the teachers and students for using cloud based services for accessing educational data. By adopting public cloud services educational institutions can save recurring costs such as hardware/software, backups, maintenance. The author presents a usability evaluation of the various cloud based services in a particular atmosphere prior to their adoption.

In this paper[6] the author presents the impact of cloud computing in education with a point of decreasing the use of the colleges for IT framework and the intricacy confronted by colleges furthermore, the customary introduced programming on the PCs are currently supplanted by cloud computing. With the energy of cloud, today advanced education can pick up noteworthy adaptability and readiness and can move the important information into remote and overall servers “the cloud” itself. To utilize the cloud benefits the college and organizations needs to first characterise their necessities and needs to take a unique consideration for the protection and basic issues.

In this paper [7] the authors present an exploration of cloud enhanced learning in private educational institutions among many campuses of South Africa, with a developed framework for the cloud based virtual cloud computing labs for higher education institutions. As virtual computing labs (VCL) provides scalable, on-demand computing resources, which can be provisioned and scaled over the web, this could be a better method to meet the challenges arising from adopting the trending technologies in education.

In this paper [8] the author reviews the cutting-edge technologies in cloud computing through the three service architectures of human resource management system (HRIMS) in domestic and global level which meets major obstacles in today’s generation to overcome these challenges, this paper proposed a cloud based human resource management (CHRIMS). This architecture is composed of different layers from different system components.

In this paper [9] the authors explore the research on cloud computing in distance education system which consists of various problems such as difficulty in sharing data, weak system expansion capability, lack of real interaction, the difficulty of real-time communication. This paper proposes a design for distance education system using cloud computing. The system combines infrastructure as a service, platform as a service, and software as a service. The architecture is composed of different layers such as platform layer, application layer, and infrastructure layer, which has made good progress on providing educational service, and share teaching data.



ADVANTAGES OF HYBRID CLOUD IN EDUCATION SYSTEMS

Not completely dependent on IT support: work always outnumbers the number of people in an organization. Hybrid cloud provides educational institutes to flexibly extend on-premises legacy systems and stress out on the IT teams by moving some applications into public cloud.

Protect confidential student data: systems containing confidential student and administrative data can remain on-premises and protected by firewall where the institution would have full control, helping to safeguard privacy of the student and the institution by meeting the regulations.

Broaden application needs: hybrid cloud optimizes the IT infrastructure to meet the needs and diverse work requirements, for applications requiring rapid deployment or rapid scaling may be perfect for public cloud. Some legacy systems may span clouds for longer time, for example the database running on-premises in a private cloud and the front end layer can run in public cloud. With hybrid cloud educational systems dynamically move workloads between on-premises and off-premises based on the performance or needs of specific systems in specific period of time

Achieve unparalleled agility: educational systems make use of hybrid cloud to achieve rapid deployment and scaling of applications to meet administrative staff, student, or other regulatory needs. Needless to install infrastructure in the institutions, the system can deploy applications in a small amount of time and add capacity to system in minutes.

Cost efficient : Hybrid cloud can help saving money in the educational institutions by shifting certain workloads like e-mail or collaboration sites to cost efficient public cloud environments, IT staff can convert off-premises public cloud expenses to OpEx (operational expenses) using “build the base, rent the spike” deployment model.

This helps institutions achieve efficient total cost of ownership (TCO). Public cloud can cost effectively gain new capabilities, such as disaster recovery facilities, that were not possible for many educational institutions.

PROPOSED ARCHITECTURE

The proposed methodology or architecture is designed to implement the functionality of the cloud to make it tailor-made according to the requirements of the educational institutions. With hybrid cloud interface, different users from different educational institutions can collaborate in the cloud and interact with the international organisation and can be monitored by the government through the centralized system of hybrid cloud, the international institutions share specific data in the public cloud that can be utilized by the Indian institutions through the public cloud and get to know the curriculum or the trends followed in the universities abroad, the data entered in the



public cloud by the institutions would have something in common between each educational institutions.

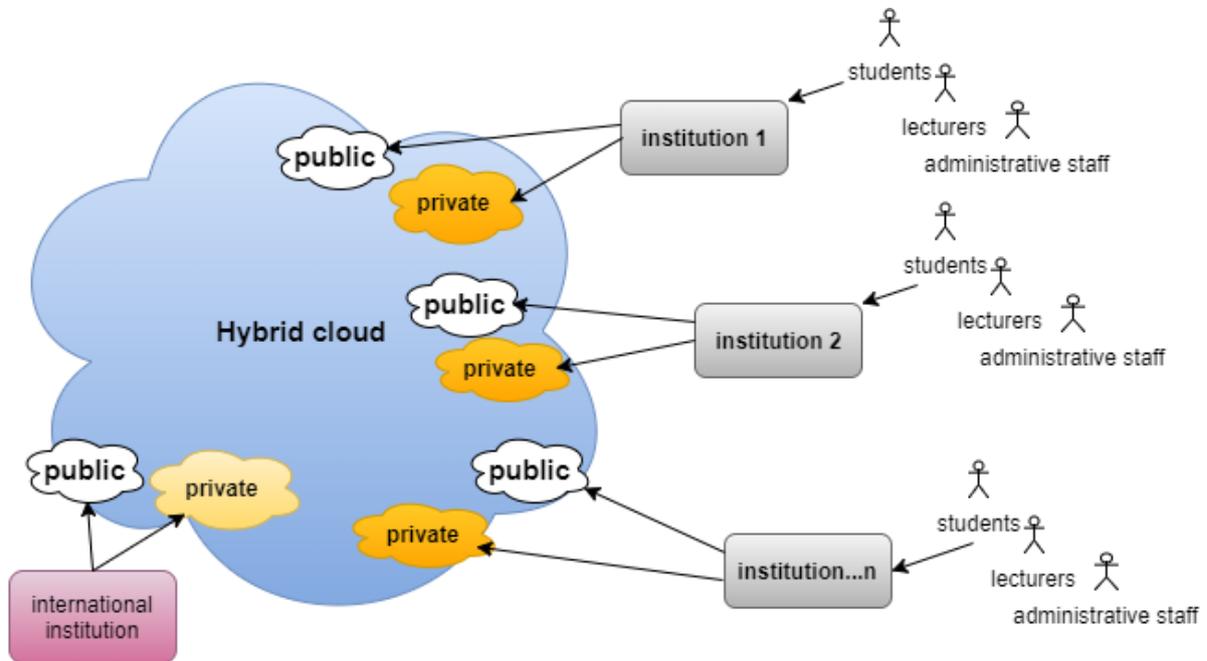


Fig.1 Architecture of hybrid cloud in educational sector

METHODOLOGY (STRATEGY FOR THE GOVERNMENT TO PROCEED)

If cloud is been implemented in all the educational institutions there must be a centralized system that the government can use to monitor the education system followed in each institution where the data shared in the public cloud by the institutions can be monitored by the government. There are certain steps that the government has to undergo.

1. Creating knowledge base to the staff in the educational institutions by means of seminars, meet-ups, webinars and conferences. Only if the teachers are familiar with the cloud technology then only they can teach the students with the same and lead them with advanced trends in education followed across the world.
2. Checking as per legal and regulatory issues depending on the deployment model i.e. when the institution is adopting hybrid cloud, the legal and regulatory issues are important for the education institutions and the government to consider. Education institutions should understand the legal issues involved with the different locations where the data is stored and the location of service providers, as different regions or countries have different legal requirements.



3. Confirmation of acceptance to the institutions from the government so that the connectivity via cloud is confirmed and the government must ensure that the institution is following all the legal and regulatory issues of cloud by protecting private student from the hands of unauthorized users.
4. Providing facilities via cloud, all the facilities must be provided to all the educational institutions equally via cloud, the government has to evaluate the present stage of different institutions and provide various facilities such as personalized learning, reduced costs, accessibility anywhere and anytime and a user friendly understanding of the system.
5. Maintenance or support by the government must be provided 24x7 as the movement of data can be anytime and anywhere by the faculties or the students. Maintenance of the cloud is a very challenging task but the equipments such as connectivity, network issues must be monitored to provide the optimal way of utilizing cloud.

CHALLENGES OF HYBRID CLOUD IN EDUCATION SYSTEM

The benefits of hybrid cloud computing can make a good change in the educational institutions but the deployment models are still maturing, and combination of two clouds public and private brings IT service staff with many technical challenges.

Internet access: The internet access in educational institutions is growing but remains under 10 percent in most of the developing countries and also institutions with internet lack high speed connectivity. This can be a major drawback for the institutions to adopt hybrid.

Portability of infrastructure and application: The infrastructure of hybrid cloud must have the ability to support dynamic movement of virtual environments in both public and private cloud, portability is tough when the institution wants to go hybrid.

Security: Security is a major challenge in hybrid cloud adoption. The data shared in public cloud can be accessed by an unauthorized person. As a result, it is necessary for the users to ensure that the private student data must not shared in the public cloud and take stringent measures to ensure data protection in the institution.

Monitoring and maintenance : monitoring and maintenance of cloud environments are critical, as there is lack of visibility in predicting the resources needed because workloads change frequently in the institution, it is required to forecast the capacity to know when more server resources are required.

CONCLUSION

The proposed architecture of the hybrid cloud poses a new change for the educational system. The goal of hybrid cloud computing is to create an extensible cloud ecosystem that connects an



education system's cloud (public and private) to provide interconnectivity and portability. This system provides a way to communicate with the universities abroad and have advancements shared between one another that can improvise the Indian education system. The architecture takes care of all the legal and regulatory issues in the education institution and government. Also this system helps provide quality education to every institution thus getting equality in education.

REFERENCES

- [1] Van Belle, Jean Paul (2014), IEEE 6th International Conference on Adaptive Science & Technology (ICAST), Cloud computing in higher education: A snapshot of software as a service.
- [2] G.Bhatia, A.Lala (2014), Third International Conference on Computing, Communication and Networking Technologies (ICCCNT'12), Implementation of Cloud Computing technology in Indian education system.
- [3] G. David, R. Anbuselvi (2015), International Conference on Soft-Computing and Networks Security (ICSNS), An architecture for Cloud computing in Higher Education.
- [4] Shaik Nabi, Dayakar Gurram, Mohd. Ali (2015), International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Mobile hybrid Cloud computing for educational institutions: Mobihybrid educloud.
- [5] Sadaf Riaz, Jan Muhammad (2015), International Symposium on Mathematical Sciences and Computing Research (iSMSC), An evaluation of public cloud adoption for higher education: A case study from Pakistan
- [6] Saju Mathew (2012), International Journal of Computer Theory and Engineering,
- [7] N. Madhav, Meera Joseph (2016), IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech) Cloud-based Virtual Computing Labs for HEIs.
- [8] Qun Chen, Jun Ni (2013), Seventh International Conference on Internet Computing for Engineering and Science, Systems Architecture Design of Cloud-Based Human Resources Information Management Systems (cHRIMS) for Higher Education Institutions.
- [9] Hongyu Zhao, Yongqiang Wang, Liyou Yang (2011), 6th International Conference on Pervasive Computing and Applications, Research on distance education based on cloud computing.
- [10] Amab Dutta, Guo Peng, Alok Choudhary (2013), Journal of Computer Information Systems, Risks in Enterprise Cloud Computing: The Perspective of IT Experts.



INTERNATIONAL JOURNAL OF BASIC AND APPLIED RESEARCH

www.pragatipublication.com

ISSN 2249-3352 (P) 2278-0505 (E)

- [11] Choi Eunjeong (2013), SERI Quarterly, How Cloud Computing Is Revolutionizing the Future.
- [12] P.Mell, T. Grance (2011), the NIST Definition of Cloud Computing Recommendations of National Institute of Standards and Technology.