



Emerging Trends of Cloud Computing in Education Methodologies: A Review

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Abstract— *Cloud computing and various education terminologies are rising speedily and plays a vital and powerful role in the field of education and learning. Cloud computing is becoming an adoptable technology in the field of education with its active scalability and usage of virtualized resources as a service through the Internet. Students and administrative personnel have the prospect to quickly and economically access various application platforms and resources through the web pages on-demand. Cloud storage services meet this demand by providing transparent and reliable storage solutions. Now a day, cloud in education is becoming very popular and powerful trend. They are based in the use of approaches with miscellaneous functionality like e-mail, Web pages, online forums, learning stages, and so on as a support of the process of teaching-learning. Providing various e-learning services using a cloud-based platform can reduce costs, can be easier to maintain and update, and offer benefits to end users in terms of security and compatibility*

Keywords— *Cloud Computing, e-education, Data Center*

I. INTRODUCTION

In India the academic sector has been conventionally thoughtful to accept new technology due to various challenges. But due to the challenges laid by 21st century, colleges and universities along with schools are allowing themselves to agree upon the new technological methods in education sector. For this situation, cloud offers a framework which is highly based upon the new technology to the education sector.

As per the Indian context, we could say that cloud technology has already shown his presence in education. Top most colleges of India have already started various cloud based apps for delivering various services to their students. Also, different online programs have been started by universities for their students through cloud technology.

In the present paper author has tried to review the present status of cloud in education as per the Indian context. In the paper, author has proposed an academic model through cloud computing through which we could encourage the advance teaching methodology.

II. CLOUD COMPUTING

In general, cloud means the allocation of resources like hardware, software through the Internet. Cloud computing also provides the facility of on-demand resources through a shared-pool of data.

Virtualization [1] is the process of cloud computing which provides a framework of pay-as-per usage model in computer science. Cloud framework ensures the availability of services as per the SLA's (Service Level Agreement) which has to be signed between provider and user before initializing of cloud services.

Widely accepted definition of cloud computing is given by NIST [2] (National Institute of Standards and Technology) US (United States) who says "The entire cloud computing services could be divided among three services and four deployment model), as discussed below:

A. Cloud Service Model [3, 4]

- 1) *IaaS (Infrastructure as a service)*: Sharing of fundamental resources like storage model, network architecture etc. is done under IaaS. These resources are used for running various applications present in SaaS/ PaaS (Software as a Service/ platform as a service, discussed below). The IaaS layer is use for establishing and sharing of the Data Center. Some basic examples like storage facility provided by Gmail to its email users, is the best explanation of IaaS layer.
- 2) *PaaS (Platform as a service)*: Platform layer is use to provide the resources for development of cloud apps. This layer works in combination with IaaS layer for testing and designing of applications. Microsoft Azure is one of the best examples for PaaS platform provider. Users working at this layer are not responsible for maintenance of software of hardware cloud service provider will take care of the entire process.
- 3) *SaaS (Software as a service)*: This is the Initial/ top most layer of the cloud computing. This layer works on top of the IaaS and PaaS layer. Google play store and Microsoft office 365 is the best example for explaining SaaS layer. SaaS layer is use to provide market based applications at inexpensive costs.

At last, some major benefits of cloud have been discussed by the author of this paper as follows:

- Low cost of implementation is major benefit of cloud technology.
- Easy accessibility of information over the cloud.
- Sharing of data over cloud is effective.
- Purchasing of software/ license could be avoided under this scheme.
- Maintenance is Easy in cloud environment.

B. Cloud Deployment Model

As per NIST definition cloud technology is divided among three services (as discussed above) and four deployment model [5]. Following are the four deployment model required for discussing the education model.

- 1) Private Cloud
- 2) Public Cloud
- 3) Hybrid Cloud &
- 4) Community cloud

- 1) *PRIVATE CLOUD*:The cloud developed as per the rules of single organization is known as Private Cloud. This cloud could be developed for specified premises. This cloud could be used as per our security requirements i.e. mostly dedicated to a single organization. Multi-tenant and Scalability are some feature of this model. For e.g. Rackspace and VMware are the companies providing private cloud facility.
- 2) *PUBLIC CLOUD*:Cloud which shares all its resources among the public is known as Public cloud for e.g. using of resources over Internet. Most of the public cloud deployment models are used by the organizations where security or confidentiality of information is not a major issue. It works in a multi-tenant environment where a single service could be shared by multiple users. This deployment model reduces the costs and increases the use of technology. Using of google is one of the examples.
- 3) *HYBRID CLOUD*:This framework is developed by combining private and public cloud as per the requirements. One special aspect about this cloud is that it could be managed by more than one service providers as compare to other models i.e. private or public cloud. This architecture is use to provide more and better deployment opportunities to our organizations. It is mostly helpful for the organizations where highly changeable environment is present. BIG data processing is the major area of hybrid cloud computing where data analysis could be performed.
- 4) *COMMUNITY CLOUD*:Sharing of infrastructure between organizations about a specific community is done under this cloud deployment model. This model may be deployed on/off the premises both. Education portal/ Hospital portal development is the best example of community cloud deployment model.

III. CLOUD COMPUTING IN EDUCATION IN INDIA

Presently ICT in Indian education sectors limited to class rooms or labs of private/government organizations.As per the survey [6] 80% of teaching in India is done through traditional methods/ tools. For improving the education services in India government has taken the serious steps towards the development of basic infrastructure. Therefore, by improved infrastructure, use of Cloud computing in education sector has to be promoted as it offers infrastructure, softwares and platforms at lower costs. Cloud computing offers services [7] like student information system etc. The SaaS model of cloud could enables the use of school management softwares at low costs, presently these softwares requires a very high license fees. Various research departments could be benefited by implementation of cloud in their respective departments as sharing of data/information could be done easily. Using of Private cloud in confidential departments like exam etc. at university/college level could help in secure access of that data through web browsers.

Getting of the low cost infrastructure at school or college level through IaaS layer of a cloud also helps in encouraging the use of cloud computing in education sector in India.

IV. BENEFITS OF THE PROPOSED MODEL

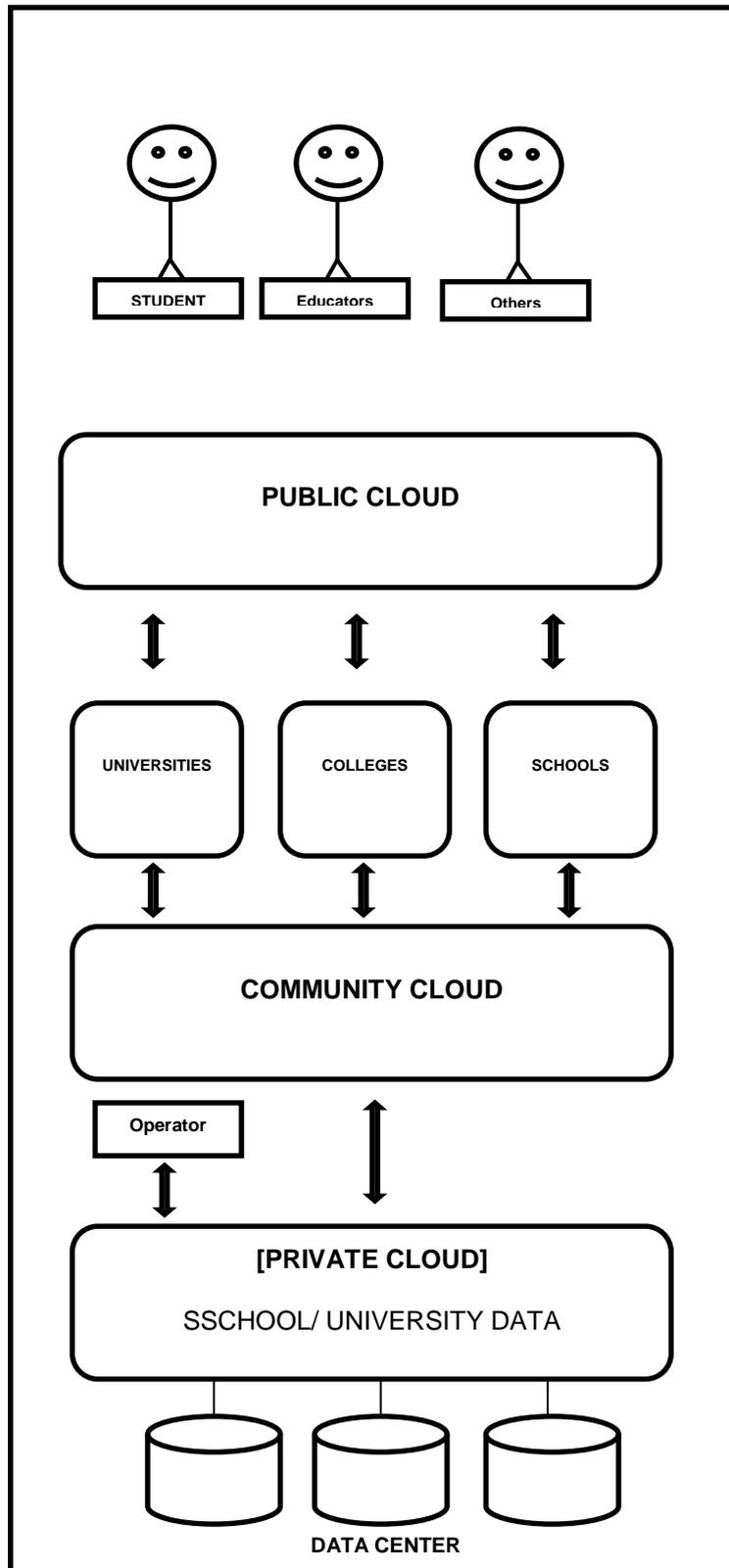
By implementing the present model in education sector, one can get the following benefits:

- By adopting cloud computing model in education, deployment and maintenance of software services is done by the organization providing cloud services. Therefore this reduces the cost and time.
- Universities/colleges implementing cloud based model are need not to worry about how the system will work they need to care only about contents.
- Research activities get encouraged, by using the proposed model.
- Proposed model could encourage the use of e-books instead of regular text books.

V. PROPOSED MODEL FOR EDUCATION CLOUD

Explanation of the Proposed Model

In the proposed model, as shown above, three different clouds are present. Initially we need a data center to store the data received from different sources i.e. state networks. For maintaining the data we need a team of experts who will be responsible for the entire management of data. Firewall enabled network is required at private cloud.



After development of private cloud, as we already aware that due to various security reasons direct access to data center is not possible, so we need to develop a community cloud first, through which various organizations can retrieve/access the data center present at private cloud level. This cloud development may help in categorizing the data as per the users i.e. universities/colleges/schools requirements. Due to security reasons we will provide the cloud based apps for community cloud assessors, as these apps are designed by keeping all the security parameters in our concern. Now another concern is using of the data/information by students/ academicians we are proposing the development of public cloud i.e. Internet based apps could be developed so that academicians/ students could retrieve the data as per there requirement. We must also ensure that cloud apps should be designed in a way that all the security concerns must be taken care off before presenting any information/data to students/academicians. Various research portals could be connected through public cloud so that research activities could be shared among all the users.

VI. FUTURE OF CLOUD COMPUTING IN EDUCATION SECTOR

In India technology can be used for accelerating the growth of education sector. The digital divide in India can be one of the obstacles in using technology for education sector. As per the survey analysis, growth of IT sector in India is upto US \$ 700 million upto 2012 [8]. Therefore, satisfactory growth of IT in India makes progress towards adopting cloud technology in Education sector of India.

Cloud technology could be used for the following aspects in future as follows1:

- Development of a web based portal [9] where all the Universities of India could share their data. Though, the same could also be possible by without cloud but it requires a huge infrastructure to be setup by the government. This parameter may slowdown the process of connecting the Indian universities, so we could use the cloud technology as one of the substitute because it provides all the requirements at very reasonable cost for connecting the Indian Universities. This sharing of information between Indian Universities may help them to enhance their academic quality more and more.
- Mobile based education is another future scope of cloud in education. Using of cloud based application makes the reach of study material to the students mobile. This may help in providing the study material at low cost and also sharing of research in students' mobile itself

VII. CONCLUSION

After implementing the proposed model in education sector we are in a position to get the reliable and effective results of cloud computing. Role of cloud in education plays a vital role in improving the present status of education sector of India. Cloud based apps could benefit the Indian education system mostly at primary level. Also, Universities/College system could get additional benefits by implementing cloud computing in their working environment.

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