

CLOUD OFFERINGS FOR EDUCATION AND LEARNING

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Abstract: Every student in today's competitive world wants to study in such an institution which is well equipped with high technology and well established laboratories. The institutions have to spend a lot of money in setting up computerized experimental laboratories. The amount of money involved in setting up the infrastructure and services inflates the educational costs. Hence, higher education in India is becoming expensive day by day. The technology of virtualization, if adopted, will change the scenario. It will reduce the expenditure upto a large level. This paper proposes cost effective solutions for education and learning using Cloud Computing..

Keywords: cloud computing, Software As a Service(SaaS), Platform As a Service(SaaS), Infrastructure As a Service(IaaS)

I. INTRODUCTION

A variety of laboratories are required in an educational institution for research and experimentation purposes and for running various operating systems, softwares and pro-gramming languages. An infrastructure of high complexity is required for setting up such a variety of laboratories which results in spending huge capital. Hence, there is a need of a complete economical approach for the implementation of large number of laboratories.

A. Advantages of Virtualization

- A major chunk of money is saved by reducing the over-head cost in setting the various computerized laboratories for various purposes.
- The running cost involved in managing a number of laboratories and the cost involved in hiring IT professions for managing those laboratories is reduced.

II. CLOUD OFFERINGS FOR EDUCATION AND LEARNING

Cloud Computing provides unlimited computing power. Based on the resources provided, Cloud computing services can be mainly divided [1] as follows:

- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)
- Software as a Service (SaaS)

Through PaaS [2], Cloud provider provides platform for computing to the users like operating system, databases, environment for programming language's execution. Google App Engine is an example of PaaS.

Through IaaS [2], the service provider will provide virtual environment to the client such as IP address, memory, storage space etc. A complete working environment is provided by the provider to the client. Amazon E2 is an example of IaaS[6]. Through SaaS [2], the service provider will provide the software as required. The client will pay only for the time for which the software is being used by him. There will not be any issues of purchasing the licences, installation etc. An example of SaaS is Google Apps.

The environment through the above services will provide the students with the facility of computerized laboratories, costly softwares and e-Books and many more. Hence, the facility of making payment according to the amount of time for which the client uses the services, will make it possible for institution to provide education facilities at a reasonable prices.

There are various deployment models of Cloud Computing:

- Public: Cloud model being run by a third party and everything is public.
- Private: Company owns the servers and controls how the applications are deployed on it.
- Hybrid: This model has the benefits of public and private cloud.
- Community: Cloud services shared among the organizations having common concerns.

Due to the demand of security, the institutions can host student related information on the private cloud. For research institutes, community cloud will provide the facility to share the study material among several organizations with common concerns. This provides the ease of access to the students and researchers. Cloud services enables the access to the databases, e-learning material, tools, softwares, platforms to the faculty and students. Cloud facilitates the broad access to network and various services that are ubiquitous and pervasive through the modern gadgets like mobile phones, laptops etc. This will bring all the students on the same platform. It will not only accelerate the education and learning but will also provide sharing of information among the students.

III. STRATEGY FOR MIGRATING TO THE CLOUD SERVICES

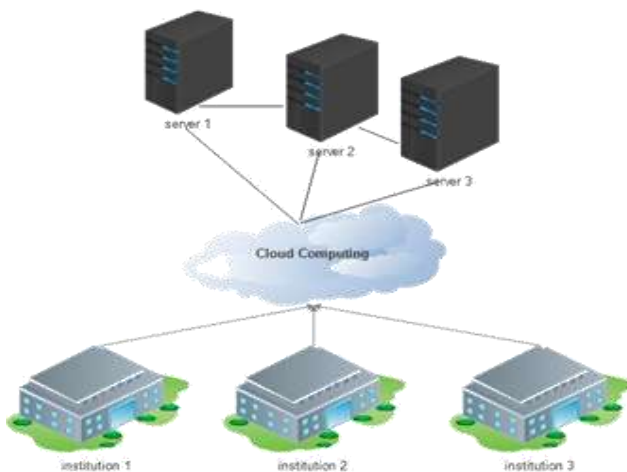


Fig. 1. Cloud Computing in Educational Institutions

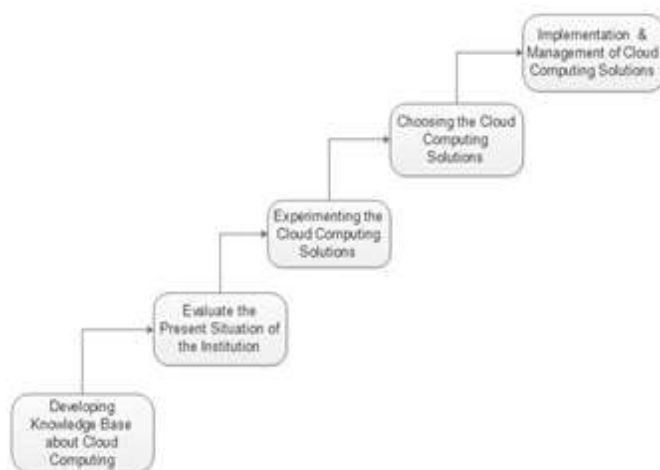


Fig. 2. Strategy[4] for Migrating to the Cloud Services

There is a need of a perfect strategy for the easy and systematic migration from the present services to the cloud services. By following the strategy [3], the institution will come to know about the appropriate cloud services to be used while taking care of the actual needs of the institution. The various stages of the strategy involves [4] following steps as indicated in Figure 2 .

- Developing knowledge base about Cloud Computing.

- Evaluate the present stage of the institution
- Experimenting the Cloud Computing solutions.
- Choosing the Cloud Computing solution.
- Implementation and management of the Cloud Computing solutions.

1) The initial step involves creating an awareness about the benefits about Cloud Computing. The institution must know that how the approach of cloud computing will change the present ongoing educational and teaching practices. With the knowledge about cloud computing, the potential users must be ready psychologically and technologically to adopt that technology. The administrative bodies of the institution will be convinced to invest in that only after knowing the benefits of the Cloud Computing.

2) The second step involves the evaluation of the organization/institution in terms of technological needs. The institution will decide which services should be maintained in the institution itself and which services should be migrated.

3) The third step of experimenting the solutions of cloud computing involves trying to implement the services in smaller domain first and afterwards selecting the suitable solutions out of them.

4) Fourth step is to evaluate the cloud providers regarding the offering, pricing schemes, licensing schemes and service delivery.

1) Last step involves implementation of the most suitable solution. A service level agreement (SLA) is being signed between the cloud provider and the organization's administrative staff.

IV. SALIENT FEATURES OF CLOUD SET-UP IN AN

EDUCATIONAL INSTITUTION

Cloud set-up for educational institutions is totally different from that of commercial institutions in terms of services and infrastructure. An educational institution consists of various branches like information technology, mechanical, civil, electrical etc. Each department requires computer laboratories having various kinds of softwares according to the requirements. The educational institution has to buy those expensive softwares installed on every computer in various laboratories. By setting up cloud, there is no need to do so. All the softwares will be installed at a single place i.e. cloud server only once. The given set-up includes the common request patterns being observed among the students and teachers of various branches and streams.

FACULTY

- User-name - Employee Id.
- Password - User-Defined.
- Rights to upload/download study material.
- Rights to upload/download application softwares.
- Rights to upload announcements.
- Rights to upload syllabus.
- Rights to upload on-line quizzes/tests.

EXAMINATION CELL OFFICIALS

- User-name - Employee Id.

- Password - User-Defined.
- Rights to upload notices regarding examination like date-sheet.
- Rights to upload examination results.
- Rights to upload sitting plan for students at the time of examination/quizzes.

ADMINISTRATOR

- User-name - Employee Id.
- Password - User-Defined.
- Rights to upload notices regarding students/faculty.
- Rights to upload new policies for students/faculty.
- Rights to upload suggestions for students/faculty.

STUDENT

- User-name - Student Id.
- Password - User-Defined.
 - Rights to access, read or download study material
 - Rights to access/download application softwares.
- Rights to take on-line quizzes.
- Rights to read the announcements/notices.
- Rights to give feedback to the faculty.
- Rights to view the examination results.

V. IMPLEMENTATION OF CLOUD COMPUTING SOLUTION

The major users of educational cloud comprises of students, faculty, research scholars and many more. Login is provided to every user for their respective purposes. Teachers can upload the study material like tutorial sheets and e-Books on the cloud server. The students can access it from anywhere and anytime. Utilization of Cloud services will reduce the overall cost as the servers are being shared by the other institutions also.

The Cloud Computing model used for sharing of educational resources has layers[5] as follows:

- Infrastructure Layer
- Virtual Resources Layer
- Cloud Sharing Platform Layer
- Application Service Layer

- 1) Infrastructure layer includes network devices, servers, computers and other hardware. This layer resides at the bottom of the architecture. It provides storage and computing layers for the upper layers.
- 2) Virtual Resources layer is located on the infrastructure layer. This layer integrates the physical resources using virtualization. Through virtualization technologies and by using distributed storage technology, a large number of basic educational resources are stored.

3) Cloud Sharing platform layer manages the underlying resources and supports applications of upper layer like load balancing, data mining etc.

4) Application Service layer is the top most layer of the architecture. It provides facilities like on-line viewing, data downloading etc. Web technologies like Java

Script, HTML, CSS creates a user interface which inter-acts with the back-end.

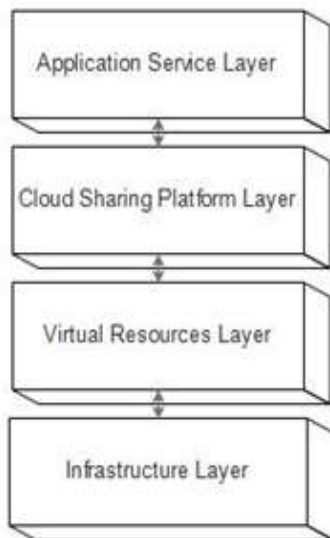


Fig. 3. Layers[5] of Cloud Computing Model for Sharing of Educational Resources

VI. PROPOSED 3-TIER ARCHITECTURE OF CLOUD FOR EDUCATIONAL INSTITUTION

The proposed 3 -tier architecture of cloud meets the requirements of the educational institutions. The architecture uses the IaaS, PaaS and SaaS to implement the various layers for the implementation of the cloud.

- In the cloud architecture, SaaS provides Application Layer which comprises of facilities like providing application softwares, antivirus, firewall, email accounts , online browsing and facility to upload/download re-sources, conduct/take online quizzes, provides programming environments to the student, faculty, examination cell authorities, administrative staff, university management, researchers and software developers.
- PaaS provides the Cloud Sharing Platform Layer which comprises of resource management, load balancing, dispatching model, computing model, data sharing, web development, hosting softwares and tools.
- IaaS provides the Virtual Resource Layer and Infrastructure Layer. The Virtual Resource Layer comprise of storage virtualization, service virtualization, network virtualization and computing virtualization.
- The Infrastructure Layer comprises of high performance computers, servers, storage devices, network devices and other hardware equipment etc.

The researcher scholars and software developers in the institution will require specialized software and hardware which will be needed for large computation and experimentation which is provided by the Application Layer and Infrastructure Layer.

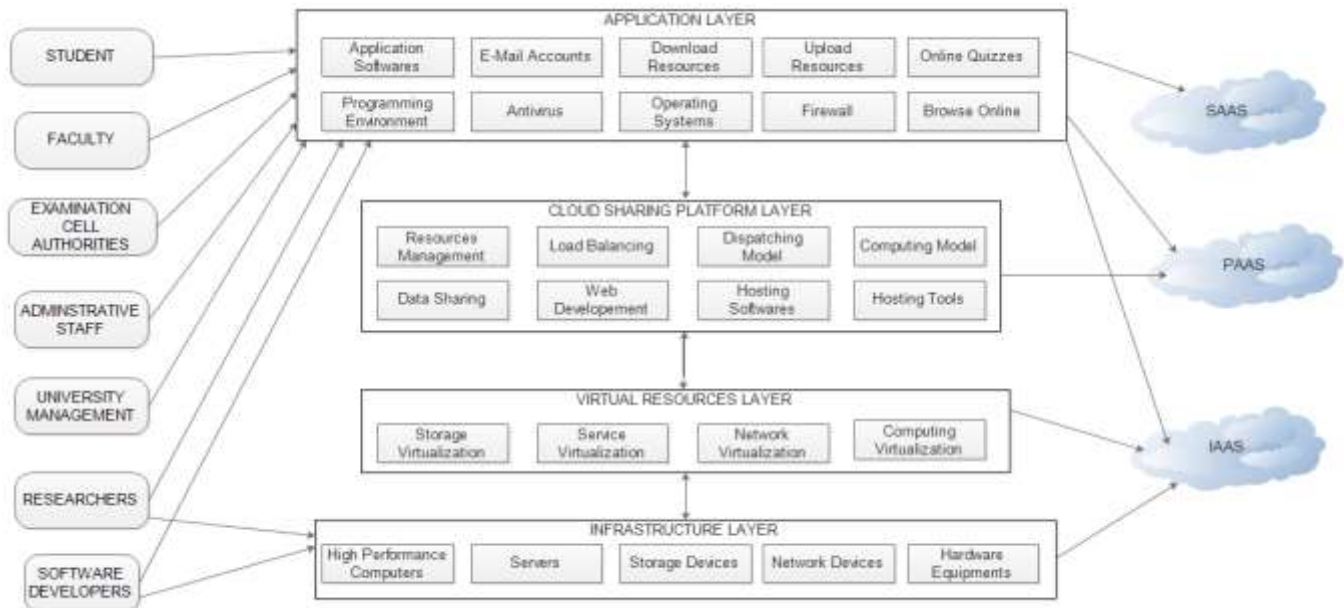


Fig. 4. 3-Tier Architecture of Cloud for Educational Institution

VII. CONCLUSION

In the present scenario, there is very less sharing of educational resources. Through Cloud Computing, there will be unlimited sharing of educational resources. Cloud Computing provides us the flexibility, scalability and the services which are being paid on the basis of the duration for which the user uses the services. It will become easy to upgrade the services. The cost incurred in setting up of various labs for various branches will be reduced. It will lead to openness and transparency in the educational system. The boundaries between the educational institutions and the world outside those educational institutions will become transparent.

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