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Open Online University Platform Powered By Cloud Computing Architecture

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Abstract: Bringing an entire university on a computer screen is a challenging task, mainly because of the ever increasing load caused by large number of requests from the large strength of university's members,i.e. the faculties and students. Hardware virtualization using cloud computing can help provide reliable services in such loads while allowing customisation on the go. Thus, using cloud computing architecture can be very obliging. This endeavour makes classroom education archaic and promotes self-learning by pioneering methods.
Index Terms: Cloud computing, e-Learning, Virtualization.

I. INTRODUCTION

The purpose of Open Online University Platform is to bring the entire University experience online.Students can attend the lectures at their own leisure. Tests/Exams can also be conducted.It will evaluate each student throughout the semester and a final report card will be generated.This platform also provides interactive forums for online discussion.In essence, students just have to login to the platform and the entire university will be available to them online, on demand.It would be a generic platform to be used by any university.

The main purpose for writing this paper is to provide a guide to any organization who want to launch a social platform in its environment. Further the paper also elucidates the importance of cloud in such systems and explains the cloud architecture deployed in this system.

II. CLOUD COMPUTING AND E-LEARNING

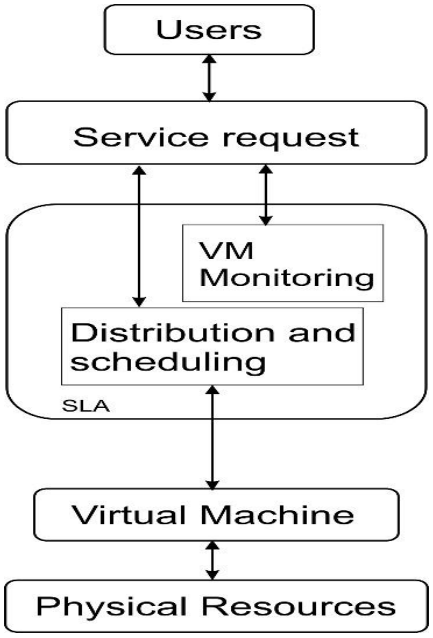
Cloud computing is a means of sharing and distribution and sharing of hardware and software resources via the internet rather than establishment of expensive infrastructure to fulfil the system requirements.

This platform can also be categorized as an e-learning application. Such applications have shown to be highly volatile in terms of their requirements of resources.

Their requirements change in a haphazard manner. Hence, a solution needs to be found out to fulfil the varying requirements of such systems. Catering to such systems by physically installing of infrastructure would be infeasible. The reason being that as the users increase so does the load on the system. At one point of time it is possible that the existing resources may not be enough. Further the resource requirements of such systems may decrease if the users of such systems decrease. In such a case most of resources may remain idle. Cloud computing model caters effectively to this situation. The salient features of cloud computing are its cost effectiveness and scalability. If such a system is deployed on cloud then there would be no requirement to install expensive infrastructure, thereby saving costs. Also the stake holders would have to pay only for the resources that they utilize thereby saving costs. Thus the service providers may allocate newer virtual machines if the demand increases and also remove those machines and free up resources if their demand decreases[7].

III. USE OF CLOUD COMPUTING

Cloud computing is described as a type of computing that relies on sharing computing resources thereby not requiring the maintenance of local computing hardware to handle applications.A myriad of applications are supported due to the versatile nature of the cloud. The applications incorporating cloud have the capacity to cater to multiple users simultaneously.The other term for cloud computing is "Internet-based computing," in where usually inseparable computer resources such as CPU cycles, storage and applications are provided to the user over the internet[4].



To support the functioning of this system a large database is required to be maintained for each university. Further each university requires large amount of storage for maintaining video libraries as well as document archives. The size of the database of any university will increase depending on the usage of the platform by the university as well as the number new students and faculties in the university. Also the storage requirement for the university is bound to increase with time as more videos and other material are stored. If a dedicated hardware is deployed for the above task then each university needs to be provided with large amount of reserve resources so that it may not run short of resources in the future. But this approach is not efficient because for most of the time these resources are idle. If lesser resources are deployed for each university then they may pose problems in the future when these resources run out. Further the issue of data security also needs to be addressed and a proper backup mechanism is to be formulated to ensure the safety of the data. Thus, dedicated hardware for deploying this application is not cost efficient.

The other option is to deploy this application on the cloud. The major part of the database is stored on the cloud server and the remaining on the web server. Also the video libraries and other material is stored on the cloud. If all the universities are provided with a common virtual machine then they have to share common resources, with no demarcation on how much resources a specific university has the right to use. Hence in this case if a university is allocated extra resources then it is possible that other university may use them up. Hence to address this problem of allocation of resources, each university is provided with a separate virtual machine on the cloud. Thus, oneuniversity cannot access the resources outside its own virtual machine. Hence the issue of oneuniversity using up the resources of another university does not occur.

Each virtual machine is provided with 512MB RAM, 1 CPU and 10GB hard disk initially. Now, if in the future, the database size increases and its resource requirements increase beyond the allocated resources then additional resources can be easily allocated to the university. Same is the case with videos and other documents of the university. Thus this approach is both time as well as cost efficient.

The cloud middleware used for this application is Open Nebula.

The benefits of cloud computing are many and its deployment is generally motivated by a good business sense.

Time efficient deployment -

Requires much lesser amount of deployment time than installation of actual hardware to meet the requirements

Scalable Levels of Service -

The concept of Cloud computing caters to the ever changing demands of resources for an organization. Hence if the resource requirement increases or decreases for an organization then the resources provided to the organization can be easily upgraded or downgraded. This would have been difficult if the organization had deployed hardware for the task.

Access to Expertise -

The cloud can be accessed remotely from any location via the internet provided that the person accessing the cloud has proper credentials. Hence the engineers and experts who understand your system can be easily dealt with, without the requirement of them being physically being present at the organisation. Thus, the organization can benefit from the reliable accessibility and ever improving IT services

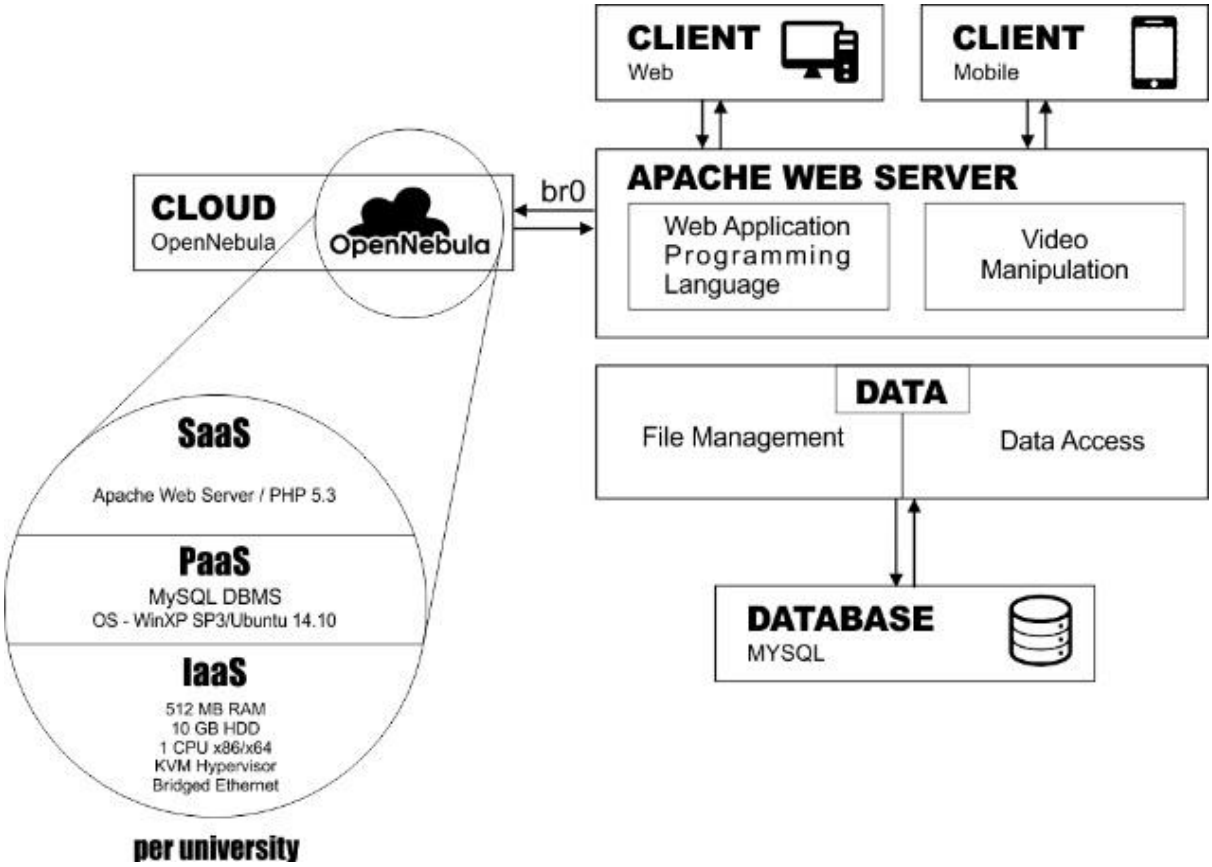
Data security -

The data stored on a cloud is one of the most secure forms of data storage, since no one knows where actually the data is stored physically. Hardware always poses the risk of being damaged, thereby risking loss of valuable information which is not the case if the data is stored on cloud[3].

IV. LITERATURE REVIEW

Open Online University platform aims to bring the entire university experience online. It is a social networking platform that caters specifically to educational universities. Each university is provided with a virtual machine on the cloud. The deployment of the universities on virtual machines addresses the problem of variable and ever changing demands of resources for the universities. Thus high cost effectiveness is achieved and provided to the users of this system. Fernandez et al(2012)[2] claimed that separation of the service consumer from service providers in such a system has proven financially beneficial to the service consumer and reduced the financial risk. Armbrust et al.(2010)[1] states that cloud computing allows the users to temporarily get resources to tackle peak load and idle states of a system, thereby providing the user a control over its infrastructure.

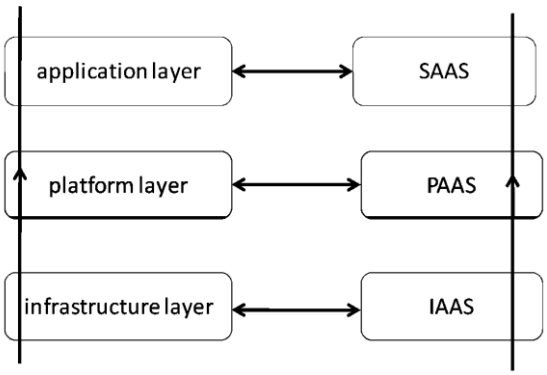
According to Olga et al. (2014) cloud computing technology is an effective solution to enhance the security in computing applications[8]. Weimin et al. (2009) state that the threats of internet have also affected the social networking domain, and people are more susceptible while using these as they are less alert.



Conceptual System Architecture

PLATFORM ARCHITECTURE

Cloud computing is a calculation of providing leasingservices to users, the user can use a simple terminal to access powerful computing capabilities, regardless of the complexity of the background. To meet the users' needs, which the back-end cloud concerns care is the number of machines required to achieve cooperation.



It is obvious that cloud platform back-end is a large distributed system, rather than a single machine which user interface displayed. Cloud computing turn the hardware resources into virtual resources with virtual machine monitor, and manage hardware resources with virtual architecture.

A. IAAS

Infrastructure layer corresponds to IaaS.Infrastructureas a service, is the lowest layer. Users canhousehold to provide standard services, including computingpower and storage resources.
For each virtual machine deployed for an university we are providing the following infrastructure services:

i) 512 MB RAM
ii) 1 CPU x86/x64
iii) 10 GB HDD

The hypervisor used for managing the VMs on the cloud host is KVM on Ubuntu 14.10.

Network connection for each VM is a little complicated. Since several VMs will be deployed on a cloud host, we need to bridge the network connections of each VM with the cloud host.

This is achieved by editing the network interfaces file.
We are using DHCP for IP allocation, accordingly the configuration is as follows:

```
#network interface config:
#vi/etc/network/interfaces

auto lo
iface lo inet loopback

auto br0
iface br0 inet dhcp
bridge_ports eth0
bridge_fd 9
bridge_hello 2
bridge_maxage 12
bridge_stp off
```

After editing the interfaces file, we need to turn the bridge **br0**on.
It can be achieved by first restarting the networking service and then manually turning the bridge on (for verification only).

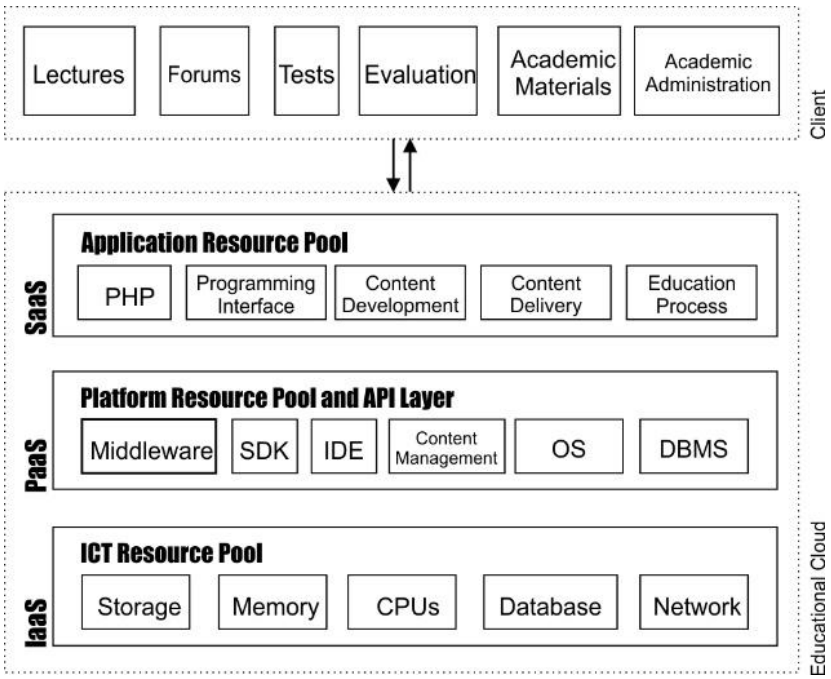
```
#ifdown br0
#ifup br0
```

Also, each VM must get a unique IP address from the list of freely available IP addresses. To achieve this, we need to create a file - **mynetwork.one**in the **oneadmin**home directory. The information about the network bridge should also be saved in this file.
This creates a new network interface for the cloud.

```
oneadmin$vi mynetwork.one

NAME = "private"

BRIDGE = br0

AR = [
      TYPE = IP4,
      IP = 192.168.0.110,
      SIZE = 3
```

]

This configuration file tells OpenNebula to create a virtual network named “private” by using the bridge “br0”.
The address range to be used is indicated by AR. The type of IP address used is IPv4 and the starting IP address is 192.168.0.110.



Layered Cloud System Architecture [7]

B. PAAS
Platform layer correspond to PaaS(Platform as a service)that made a higher level of abstraction on the base of Iaaslayer. Itprovides a development environment, testenvironment, server platforms and other services.PaaS can provide custommiddleware platform that provides application development,database, application server, testing, hosting and applicationservices for individual users or corporate team.

Our system provides Ubutu OS/Windows OS to be installed on the university’s VM as per their requirement. MySQL is deployed on the guest OS for providing database services on this layer of the cloud.

C. SAAS
SaaS(Software as a service) is a software distributionmodel, designed for web delivery, user can deploy and access through the Internet hosting. SaaS providers need tobuild information for all network infrastructure, software,hardware, operating platform, and is responsible for the implementation of all post-maintenance and other services[3].

We are running APACHE WEB SERVER with PHP 5.3 on this layer. Thus, universities can host their web applications on the cloud which can be accessed by the students / faculties.
To access a web application hosted on the cloud, the IP address of the VM (guest OS) is required. It can be accessed from the global IP table we are maintaining for each university (or VM). This way an application stored in a directory, say “foo” on a VM with IP address, say 192.168.0.110 can be accessed from a client by redirecting their browser to the following URL:
`http://192.168.0.110/foo`

All applications using the following web technologies are supported:
- PHP
- MySQL
- Javascript
- jQuery
- Any other Javascript library (with all dependencies installed)

For desktop applications that cannot be deployed on a web server, a direct stream of the VM can be accessed using the SPICE protocol.

For a VM with a given IP Address, say 192.169.0.110, its SPICE stream can be accessed via the following URL:
`SPICE://192.168.0.110:1234`
Where 1234 is the PORT on which the VM is listening.

To view SPICE streams, a SPICE viewer must be installed on the client. Is SPICE is not available, we can also provide VNC stream via the VNC protocol. It can be accessed it a similar way, except VNC protocol will be used instead of SPICE.

But, since a single VM can only broadcast the same screen to each SPICE/VNC client, this method can only be used for group work projects or in situations where a single console can suffice.If multiple consoles are required, then the university will have to demand for more VMs according to their demand.
This problem will only arise if a specific desktop application is required to be deployed on the cloud host.

V. CONCLUSION

This application consists of a large database to ensure smooth functioning. Further it requires a large storage to store the video lectures and other academic documents. Further as the number of users increase over time the size of the database increases. As more and more academic material and lectures are uploaded the size of the data stored online increases. If resources are provided sparingly to the university involved then eventually the resources will run out. If large amount of resources are initially provided to the university then for most of the initial phase the resources remain idle. To tackle these issues cloud computing hardware virtualization is utilized. It allows for temporary allocation of resources to the university. Cloud computing is a viable and cost effective solution to the above cited issues as the universities have to pay only for what they use. Further as the resource requirements vary resources can be allocated or de-allocated. Hence in such applications the use of cloud computing is imperative.

REFERENCES

[1]Armbrust M., Fox A., Griffith R. et al(2010), “A View of Cloud Computing: Clearing the Clouds Away from the True Potential and Obstacles Posed by this Computing Capability”, Communications of the ACM, Vol. 53, No. 4, pp. 50-58.
[2] Fernandez A., Peralta D., Herrera F. and Benitez J. (2012): “An Overview of e-Learning in Cloud Computing”, Workshop on LTEC, AISC, Vol. 173, pp. 35-46, Springer-Verlag.
[3] GaiZhen Y., Zemin Z., Fen Z. (2011): “The Application of Saas-based Cloud Computing inthe University Research and Teaching Platform”, International Conference on Intelligence Science and Information Engineering, IEEE.
[4] Huaglory T. (2011): “Cloud Computing Architectures”, IEEE.

[5]Ignacio L.: “Why OpenNebula? Because It Simply Works!”,http://opensource.sys-con.com/node/2343612.

[6] Masud A., Huang X. (2012): "An e-Learning System Architecture Based on Cloud Computing", World Academy of Science, Engineering and Technology, Vol. 62, pp. 74-78.
[7]Narayan J. (2014): "Performance-Centric Cloud-Based e-Learning", The IUP Journal of Information Technology, Vol. X, No. 2.
[8]Olga W., Dieter S., Ralf S. (2014): "Towards Establishing Security-Aware Cloud Markets", 6th IEEE International Conference on Cloud Computing Technology and Science pp. 237-242.
[9] Panagiotis K.(2011): "Cloud Computing Learning", IEEE.
[10]Saira B., Muhammad K.: "Potential of Cloud Computing Architecture".
[11] Xiaomei W. and Xiaoqiang J. (2010): "Cloud Computing on the Impact of Higher Education", Science and Information Technology, pp. 397-398.
[12] Zhongze Y. (2010): "The Basic Principles of Cloud Computing and its Impact on Education", Satellite TV and Broadband Multimedia, pp. 67-70.