Designing Virtual Labs Using Cloud Computing

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Abstract: Cloud computing is the style of computing where massively scaled IT related capabilities are provided as a service across the internet to multiple external customers and are billed by consumption. Google, Microsoft, Yahoo, IBM and Amazon have started providing cloud computing services. Amazon is the pioneer in this field. A customer is the ultimate beneficiary of this technology as they can access, share and send data through an email server without any type of installation or hard disk storage. In this paper, we have addresses the concept of Cloud Computing and its application in the field of Education. In the Engineering courses the students often face the problem that all the software cannot be accessed from a single laboratory. Also college needs to pay more for buying different software for each PC and have to manage their updates. In this paper ,we have discuss how to provide accesses to the required software from a single Lab .We will be setting up a Virtual Private Cloud Server and deploying the required software on that server. Students will get to access all the software from those labs which are connected to this Private Cloud.

Keywords: cloud computing , virtualization ,education

I. INTRODUCTION

Consider a large corporation, the basic aim in such corporations is to make sure that every employee should have proper hardware and software they need to do their jobs. One way for achieving this is to buy new computer for each employee but it is not enough as we also need to purchase software or software licenses to provide employees the tools they require. And whenever new employee is added we have to buy more software or make sure that current software license allows another user.

Instead of installing a suite of software for each computer, we can only load one application which would allow workers to log into a Web-based service which hosts all the programs the user would need for his or her job. Remote machines owned by another company would run everything from e-mail to word processing to complex data analysis programs. It's called cloud computing.

II. LITERATURE SURVERY

Concept of Cloud Computing
NIST definition of cloud computing says that, cloud computing is model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Principal of Cloud Computing
The main enabling technology for cloud computing is virtualization. Virtualization generalizes the physical infrastructure, which is the most rigid component, and makes it available as a soft component that is easy to use and manage. By doing so, virtualization provides the agility required to speed up IT operations, and reduces cost by increasing infrastructure utilization.

Evolution of Cloud Computing
The underlying concept of cloud computing dates back to the 1950s, when large-scale mainframe computers became available in academia and corporations, accessible via thin clients/terminal computers, often referred to as "static terminals", because they were used for communications but had no internal processing capacities. To make more efficient use of costly mainframes, a practice evolved that allowed multiple users to share both the physical access to

the computer from multiple terminals as well as to share the CPU time.

In the 1990s, telecommunications companies, began offering virtual private network (VPN) services with comparable quality of service, but at a lower cost. As computers became more prevalent, scientists and technologists explored ways to make large-scale computing power available to more users through time sharing, experimenting with algorithms to provide the optimal use of the infrastructure, platform and applications which prioritized the CPU and efficiency for the end users.After the dot-com bubble, Amazon played a key role in all the development of cloud computing by modernizing their data centres. In early 2008, Eucalyptus became the first open-source, AWS API-compatible platform for deploying private clouds.

On March 1, 2011, IBM announced the IBM SmartCloud framework to support Smarter Planet. Among the various components of the Smarter Computing foundation, cloud computing is a critical piece.On June 7, 2012, Oracle announced the Oracle Cloud.The present availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, autonomic, and utility computing have led to a growth in cloud computing.

Standards Of Cloud Computing

The Seven Standards of Cloud Computing includes World class security, Trust and Transparency ,True Multitenancy ,Proven scale ,High performance ,Complete disaster recovery ,High availability

Service Models

Table 1: Shows different service models comparisions

Service models	Characteristics	Benefits
Infrastructure as a Service (IAAS)	Resources are distributed as a service Allows for dynamic scaling Has a variable cost, utility pricing model Generally includes multiple users on a single piece of hardware	Scalability No hardware investment Hardware security No single point of failure Utility style cost
Platform	Tools to handle billing and subscription	PaaS is useful
as a Service (PAAS)	management Multi-tenant architecture Integration with web services and databases. Built in scalability of	where developers wish to automate testing and deployment services. Key benefit of Paas is agility
Software as a Service (SAAS)	Web access to commercial software. Software is managed from a central location Software delivered in a "one to many" model. Users not required to handle software upgrades and patches.	SaaS applications are available from any computer or any device – anytime, anywhere. SaaS applications are subscription based. No license fees mean lower initial costs.

Deployment Models

Model Name	Services
Public	A cloud is called a "public cloud" when the servic rendered over a networks project requires a sign level They have a significant physical footprint, req allocations of space, hardware, and environmental controls These assets have to be refreshed periodically, re in additional capital expenditures.
Private	Cloud infrastructure for single organization only, may be managed by the organization or a 3rd party, on or off premise. Private cloud is cloud infrastructure operated solely (only) for a single organization, whether managed internally or by a third-party and hosted internally or externally. Undertaking a private cloud project requires a significant level and degree of engagement to virtualize the business environment, and requires the organization to re-evaluate decisions about

Comm unity	Cloud infrastructure shared by several orgs that have shared concerns, managed by organization or 3rd party. Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized.
Hybrid	Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and/or dedicated services with cloud resources.

Cloud Companies

Company Name	Services
Google	Google cloud print: Connects printers to web Google cloud platform : Enables developers to test and deploy applications on Go infrastructure. Google cloud messaging: Is a service that allov to send data from your server to your users' Ar powered device
Amazon	Amazon Elastic Compute Cloud (EC2):It pr scalable virtual private servers using Xen. Amazon Elastic Map Reduce (EMR): It allows businesses, researchers, data analysts, and developers to easily and cheaply process vast amounts of data Cloud offerings: Amazon Web Services, a half-dozen services including the Elastic

	Compute Cloud, for computing capacity
Microsoft	The Cloud Services for Windows Azure comprise one aspect of the PaaS offerings from the Windows Azure Platform.
SalesForce	Sales cloud : The Sales Cloud includes a rea sales collaborative tool called Chatter. Service cloud: allows external developers to add-on applications.
Exact Marketing Cl	It includes Email, mobile, social & website mar
AT&T	Synaptic Hosting, an application hosting servic offers pay-as you-go access to virtual server storage integrated with security and netw functions

III PROPOSED SYSTEM

3.1 **Steps to build your own cloud**

Building a cloud is a step by step process as we shown in fig.1.. Big enterprises to the general developers are building cloud for their system as they are seeking fast and easy implementation, lower cost, and better flexibility. Suppose a developer wanted to build a cloud for his household business; he must be absolutely clear as to why is he considering a Cloud deployment and so he will try to minimize expenditures. He should ensure that his system will get enough bandwidth/access available so that applications deployed on cloud will get smooth and quick access. Similarly to setup a cloud in a company, it should ensure about enough bandwidth

Initially, a company/developer will select a service model. If they don't have anything means they don't have any legacy cloud infrastructure system, then they have to start with very initial phase i.e. Infrastructure as a service model. This is the

fundamental model for a cloud setup. IaaS provides the on demand computing infrastructure.

Is there any special requirements for security or agreement for an application of company? How much growth do company expect to see for each app over the next couple of years? These things are studied. There are many companies provide server, storage, network, bandwidth, backup, load balancing, cloud monitoring service by charging some amount according to our usage. Different companies have their different plans which vary on the basis of Usage, Infrastructure Service Level, and Operating System. While buying these services developer/company must do the above analysis.

Obviously developer will have many applications that to be deployed on cloud, for each app developer wants to move, decide which type of cloud it needs: public, private or hybrid. .

The website needs little security, while the database needs a dedicated environment. When demand increases, the website can scale up by adding servers in the public cloud; meanwhile, the database remains secure in its private cloud.After installation and configuration of hardware the cloud infrastructure is completed for further use. The developers/company having legacy cloud infrastructure, they just have to modify it according to their need and then they can directly start with the second phase of building a cloud i.e. setting up PaaS.

The second phase of cloud computing is creating the platform which allows developers to develop application quickly and easily. Either company should create their own software which will suit to the infrastructure and will provide platform to develop required application or company should buy the software from PaaS providers. But while buying the software developer/company should think of their application objective, specification, language. Windows Azure, Salesforce, gCloud3, Google, Red Hat

OpenShift are some PaaS providers which can be chosen on the basis of budget, operating system, features and limitations of each providers' product. Thus application centric environment setup is ready.
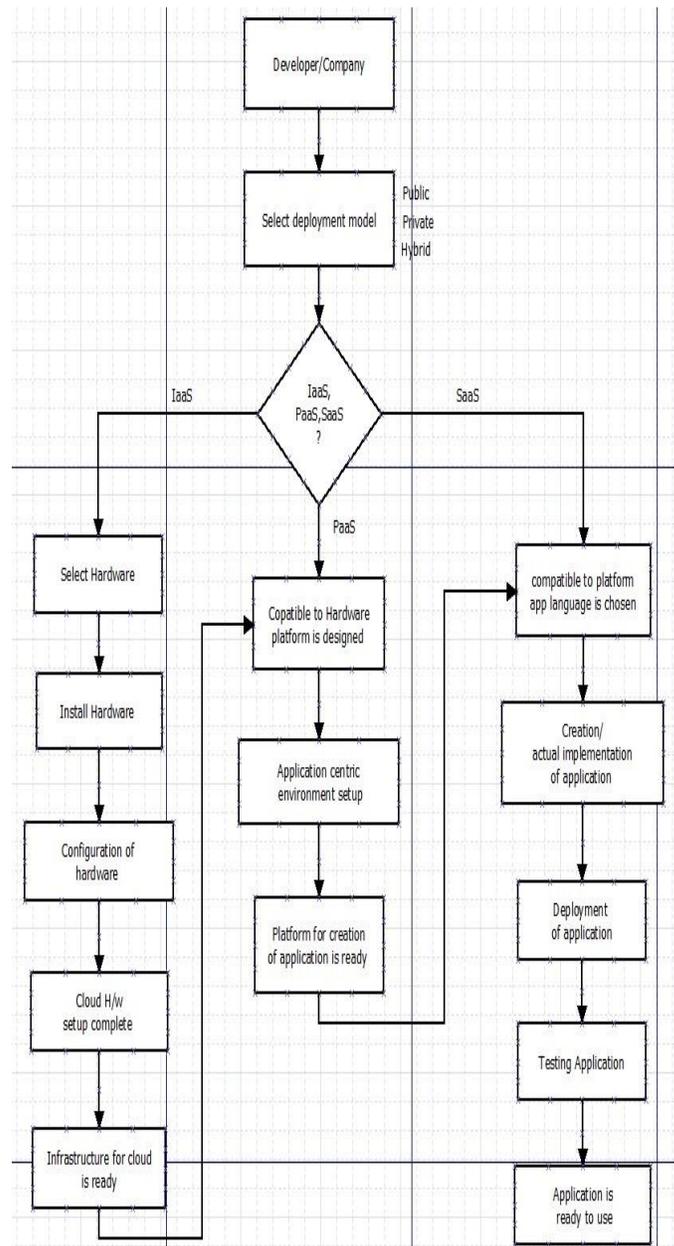

Fig 1 : Shows the steps to build your own cloud.

Finally, the last and most important phase is to create and deploy the software over the internet. Previously we have chosen the infrastructure and platform on which we have to create application, we know that the each of the company

software is created for a particular Operating system like Windows-Azure is for Windows OS, Ubuntu Openstack using MAAS and JUJU is for LINUX OS and etc. These software support some languages and only that languages can be used to build the application. After that actual implementation of application is starts.

After creating application using PaaS software tools, it is delivered over the internet. Once all the applications are properly deployed then developer should test the application. Then the application is monitored and maintained. Application can be made available to the users on the on-demand service or through a subscription, so these all features can be added in this final stage.

Thus, the applications are ready to use on cloud
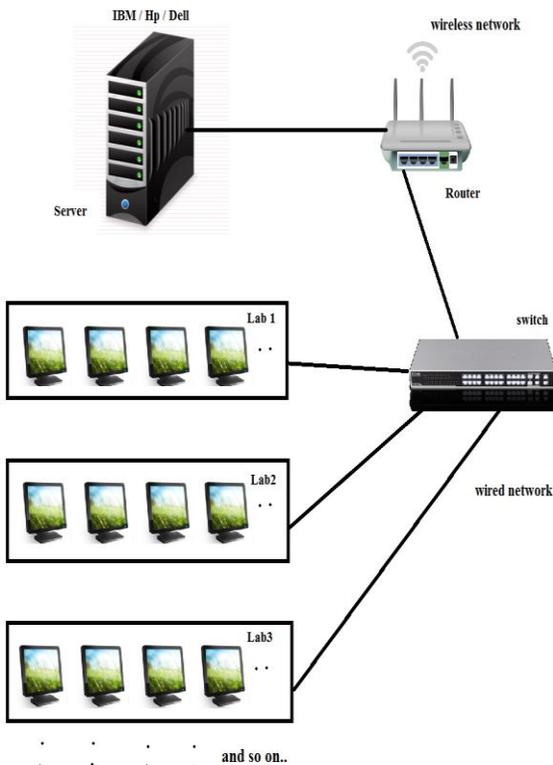
3.2 Architecture of Proposed system

fig. Architecture of Virtual Labs

Fig2 : Shows architecture of proposed system

The cloud server and its network are the hearts of the architecture. Here the server is chosen on the basis of its configuration and features such as storage capacity, capacity of handling number of users in parallel, capacity of connecting required number of nodes. The server is the device where actually process of deploying and running the software is done.

The second and the most important part is the cloud network which is responsible for providing service to the devices connected to it. To create this network Routers and Switches are used. Routers here are directly connected to server through LAN. Routers provide two features, one is to provide wi-fi network and other is, it allows to expand network by using uplink port i.e. RJ45 port. Now the wi-fi network is a wireless network; the devices which are is this wireless network, are allowed to connect network and can use services provided by the cloud server.

Wired network is expanded simply by connecting multiple switches to routers. These switches connect all the computers in the lab to the router, and from router to the server. Finally, the computer labs consist of an interacting monitor and interface for identifying users and selecting softwares to be run.

3.3 Steps for Setting up A Cloud Infrastructure for Virtual CS Labs

- **Server Setup:**
1. Download the latest version of LTS i.e. Long Term Service from the Ubuntu web site, choose the LTS version based on the architecture of the machine.
2. Install MAAS and select "Multiple server install with MAAS".
3. Note the user name, password and more importantly the Ubuntu MAAS API address.
4. Once the installation is completed, open the web browser and enter the address in web browser.
5. Create a super user account using proper commands and log in on the server.
6. Add nodes to MAAS by filling the required details like MAC address.
7. The node is added to MAAS if the status the node is "Ready".

- **Setting up juju:**
1. An API key is required from MAAS so that the Juju client can access it.

2. To get an API key, log on to the server and choose Preferences from the drop-down menu that appears when clicking your username at the top-right of the page.
3. Add SSH key by clicking "Add SSH key".
4. Create or modify "~/.juju/environments.yaml" with the content specified in the installation guide.
5. To install juju, first grab the latest juju core package and install it by using proper commands listed on Ubuntu web site.

- **Deploying Software**
1. Download the charms for the Soft wares that are to be deployed.
2. If there is some application which requires access to the database then we need to download both the application and the database charms.
3. Open the juju interface and the select the charms for required applications by dragging them onto the canvas.
4. If some application requires database access then click on application charm and select "build relation" and connect it to the database charm.
5. To destroy any service (software) just type the destroy command and specify the name of that software charm.

- **Interface Designing**
1. Develop an interactive web site using any of the suitable languages.
2. Registered user needs to enter his/her valid username and password.
3. After authenticating the user will be able to access all the soft wares which he has permission to access.

IV CONCLUSION

Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications which allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. Computers and technology is becoming so much necessary that it has become one of the basic needs of our life, this technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth.

In proposed system ,we have seen how this technology can be used in education system and setup a cost effective virtual labs.

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