A Survey on Cloud Computing-Deployment of Cloud, Building a Private Cloud and Simulators

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Abstract. Cloud computing is emerging in the mainstream as a powerful and important force of change in the way of management of information. Cloud computing is also consumes and provides information services like Software as a Service (SaaS), Platform as Service (PaaS), Infrastructure as a Service (IaaS) as a standard services. These services are served with different deployment of cloud like private cloud, public cloud hybrid cloud and community cloud. In this paper study of cloud, its deployment and building of Private cloud is done. Simulators play important role during the implementation. So, different simulators of cloud computing are compared and analysed for suitability with which deployment of cloud it suits. The study also suggests having private/public cloud according to the need of the organization.

Keywords: Cloud computing, Private cloud, Cloud simulators.

1. Introduction

The chief scientist of the Advanced Research Projects Agency Network (ARPANET) and author of the journal paper ‘A vision of Internet’ Leonard Kleinrock said that “As of now, computer networks are still in their infancy, but as they grow up and become sophisticated, we will probably see the spread of ‘computer utilities’ which, like present electric and telephone utilities, will service individual homes and offices across the country” [1]. Leonard gave the vision of Internet which became one of the utility. To develop an Internet usage as a utility the new technology is evolved that is Cloud Computing, which is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources like networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud is having five essential characteristics like on-demand self-service, Broad network access, Rapid elasticity, Measured service, Resource pooling and three standard service models such as Software as a Service, Platform as a Service and Infrastructure as a Service with four deployment models are: Private cloud, Public cloud, Hybrid cloud, Community cloud.

A consumer expects to have all computing capabilities such as server time and network storage whenever he requires. For such requirement he is not required to interact with service provider every time. Automatically he can avail all such utilities provided by service provider as on-demand self-service. Broad network access is another character which provides capabilities over the network and accessed through standard mechanisms. Some of the mechanisms promotes the use of mobile phones, tablets, laptops, etc. Multiple consumers with multi tenant models of different physical and virtual resources dynamically assigned are having pool of services by providers. The provider computes the resources according to the requests of consumers. This feature is considered as resource pooling. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location like country, state or datacentre at a higher level of abstraction. Examples of resources include storage, processing, memory, and network bandwidth. The following characters are rapid elasticity and measured services. Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities are available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time. Cloud systems automatically control and optimize resource use by leveraging a metering capability one at some level

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Cloud computing is also a paradigm of distributed computing to serve the consumer need and serve his requests with new techniques like Service–Oriented–Architecture (SOA) and Virtualization. Cloud computing is partitioned into three parts as Providers, Customer and users. The providers provide the three standard services: Platform as Service (PaaS), example for this is Google App Engine. Software as a Service (SaaS) and Infrastructure as a Service (IaaS). There are many services such as Data as a Service (Daas), Identity and Policy Management as a Service (IPMaaS), Network as a Service (NaaS), etc [1–5]. For any type of service there must be any one type of deployment like private cloud, public cloud, hybrid cloud and community cloud [6].

Cloud computing can be deployed as private clouds which hosts inside an organization’s firewall primarily for use by the organization’s own employees. Public clouds—is infrastructure or applications hosted by service providers and offered as services to enterprises that have decided to get outsource some applications for financial, architectural, management, or other business reasons. Hybrid clouds—the combination of private clouds and public clouds. Another typical type of deployment is Community cloud, its setup is for sole use by a particular community cloud of consumers from organizations that have common views. This setup may reside inside or outside the cloud service provider premises. This cloud setup could be controlled, maintained or maneuvered by a third party or combination of the organizations itself [7–9].

The most important feature of information technology and network infrastructure is continuous growing which created a prosperous market for Managed Services (MS). Public sector and private sector companies operate in mixed-mode with internally deployed but externally hosted Information Technology (IT) applications and resources. As a result, Managed Service Providers (MSPs) are assuming operational IT responsibility for the enterprise while the customer maintains management oversight. While this MS business model has many advantages, information security remains an inherent weakness. This has lead to the adoption of Private Clouds [10].

The private cloud model, which is defined as cloud computing on private networks or internal clouds, is having a best example of private cloud - Defense Information Systems Agency (DISA). It is a private cloud available at its in-house Defense Enterprise Computing Centers (DECC) on which it currently hosts an MSP’s CRM software. The MSP centrally maintains and upgrades the software on the DECC platform. According to result of survey of information technology decision makers on the predict of private and public cloud computing through 2014, 44% are considering a private cloud. For a private cloud deployment virtualization is a natural and necessary step. The next steps include mechanisms to implement show back and self-service provisioning. With careful plan and right choice of technology from the beginning of the transition, anyone can build private cloud by evolving whatever the organizations have rather than ripping out and replacing infrastructure as organization go. Building private cloud is discussed in the next section [11]. The Aerohive suggests choosing the deployment of cloud according to need [12] with preference to private cloud. Table 1 shows the deployment ratios of different clouds [13,14]. The figure 2 depicts details of deployment. From this figure it is found that private cloud is preferable.

2. Building Own Private Cloud

Cloud can also be implemented with simulators like GreenCloud, CloudSim, MDCSim, etc. Simulators are discussed in the next section. Own virtualized private cloud can be built with following requirements:
Table 1. Percentage of different cloud deployments.

<table>
<thead>
<tr>
<th>Deployment of Cloud</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Cloud</td>
<td>36.6%</td>
</tr>
<tr>
<td>Public Cloud</td>
<td>24.4%</td>
</tr>
<tr>
<td>Hybrid Cloud</td>
<td>12.2%</td>
</tr>
<tr>
<td>Community Cloud</td>
<td>12.2%</td>
</tr>
<tr>
<td>Other</td>
<td>14.5%</td>
</tr>
</tbody>
</table>

Figure 2. Detailed information of deployment.

- **Hardware requirements**
  - Processor: One Processor core or Hyper thread for each virtualized CPU.
  - RAM: Minimum 2 GB
  - Hard Disk: Minimum 6 GB free disk space per guest.

- **Software requirements**
  - Hypervisor: Examples for hypervisor. Xen, KVM, Citrix Xen Server, VMWare. Xen and KVM are the open source and remaining are the commercial.
  - Middleware: Examples for middleware are Nimbus, OpenNebula, Cloud Stock, OpenStock.
  - Host: Example any Linux, Unix or Windows.

2.1 *Steps to build a private cloud*

- Install any Linux/Unix OS on all machines.
- Middleware node and Hypervisor node(s).
  - Hypervisor Node(s): for one or more machine.
  - Middleware Node: One machine is sufficient.
- On Hypervisor node install co
  - Middleware Client Component
  - Hypervisor and Virtualization components.
  - Setup local DHCP server on hypervisor node to allocate IP address to VM running.
  - Configure Bridge Network.
- Middleware Node: Install M/W server. The inbuilt components are:
  - Scheduler
  - Network
In this setup there will be three nodes like Cloud client, Cloud Server, Hypervisor Node which have to interact with each other dynamically [4–6, 15]. Virtual Machine (VM) is the software which runs an operating system and applications. An Operating System on a VM is called a guest operating system. Hypervisor is thin software layer which is also referred as Virtual Machine Manager (VMM). It creates and controls VM and other subsystems. Hypervisor is the key component of virtualization.

Hypervisor’s main job is to control the sharing of system resources across multiple VMs. It is available at time of booting for this function. It allows multiple software to run concurrently on a host computer. It is capable to dynamically partitioning and sharing the physical resources such as CPU, storage, memory and I/O devices. The other function of hypervisor is to provide isolated environments for each virtual machine. The architecture in which privileged partitions have visibility and control over the VMs will establish the controllable environment and can perform additional security tool [15]. Xen, KVM, Citrix Xen Server, VMWare are examples of hypervisor.

2.2 Virtual machine creation

The user request is sent to middleware which act as a manager. At middleware, scheduler component in VM node selects best physical node which acts like resource provider and provides.

CPU, RAM, IP to the VM from available nodes and transfers the image.

Now VM is ready to use. User name and Password and IP are provided to the user through Portal and user can access VM through SSH Connection.

3. Cloud Computing Simulators

Information Technology (IT) is such a field in which everyday evolvement of new technology will be there. Cloud computing is another face of IT which is putting its effort to provide services of IT as one of the utility. In real time it is very difficult for implementing and testing new methodologies. So, simulation tools take the important
Table 2. Comparison of cloud simulators.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>MDCSim</th>
<th>CloudSim</th>
<th>GreenCloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Network</td>
<td>Limited</td>
<td>Limited</td>
<td>Full</td>
</tr>
<tr>
<td>Graphical Support</td>
<td>None</td>
<td>Limited(Cloud Analyst)</td>
<td>Limited(Netw&amp;Anim)</td>
</tr>
<tr>
<td>Availability</td>
<td>Commercial</td>
<td>OpenSource</td>
<td>OpenSource</td>
</tr>
<tr>
<td>Platform</td>
<td>CSIM</td>
<td>SimJava</td>
<td>NS2</td>
</tr>
<tr>
<td>Application Models</td>
<td>Computation</td>
<td>Computation and Data Transfer</td>
<td>Computation Data Transfer and Exec. deadline</td>
</tr>
<tr>
<td>Simulation Time</td>
<td>Seconds</td>
<td>Seconds</td>
<td>Ten of Minutes</td>
</tr>
<tr>
<td>Language/ Script</td>
<td>C++/Java</td>
<td>Java</td>
<td>C++/Tcl</td>
</tr>
<tr>
<td>Physical Models</td>
<td>None</td>
<td>None</td>
<td>Available using plug in</td>
</tr>
<tr>
<td>Energy Models</td>
<td>Rough</td>
<td>None</td>
<td>Precise(servers + networks)</td>
</tr>
<tr>
<td>Support Of TCP/IP</td>
<td>None</td>
<td>None</td>
<td>Full</td>
</tr>
<tr>
<td>Power Saving Modes</td>
<td>None</td>
<td>None</td>
<td>DVFS, DNS And both</td>
</tr>
</tbody>
</table>

while developing the software for cloud as well as other applications. Cloud can be implemented with simulators like CloudSim, MDCSim, GreenCloud, Network CloudSim. Table 2 gives detailed information about these simulators. Following is the comparison table of various Clouds computing simulator on basis of their characteristics. Table 2 shows the comparison of cloud simulators with various parameters [16–19].

4. Conclusion

From the study it is concluded that cloud computing is a new delivery model and is proving challenges of record keeping professionals and being an abstract marketing with design concepts for all but the most innovative organizations. With any type of deployment it serves for the request by client. Private cloud is considered as the secured cloud it can be implemented with GreenCloud simulators which is better than MDCSim and CloudSim. Any organization can adopt cloud computing but, in future, research is required into its nature, as progression is from the early stages of adoption, and into the interdependencies, particularly the challenges of ensuring that the data, wherever it resides, in the view of wider governance and assurance strategy. The datacentres should be of eco-friendly means consuming less power to store these data.

Acknowledgement

The encouragement given by all faculties of Alliance College of Engineering and Design of Alliance University, Dean and stakeholders is highly acknowledged.

References

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