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"ANALYSIS OF PERFORMANCE FACTORS FOR CLOUD COMPUTING"

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"Analysis of Performance Factors for Cloud Computing"

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Abstract – Cloud computing is widely used technology. Day by day numbers of cloud users are getting increase. These users are always demanding better performance. It is always challenging for researchers to improve the Performance of cloud computing due to various sensitive issues. Performance of cloud computing depends on various factors such as correct load distribution by load balancer, network performance, cloud infrastructure performance, geographical contents, application performance and effect of these parameters on each other. Cloud serves different services such as PaS, SaS and IaS to cloud user on pay and use basis. A cloud user always demands for better network performance and high speed for execution of heavy applications. It requires better network performance, which are not in sole of cloud service providers. To improve the performance of cloud system at hardware and software level, optimization techniques are required. Performance improvements by hardware level changes are very costly and not optimistic. So software level changes are much better economically as well as technically. In this research paper we are presenting analysis of various performance threads in cloud computing and also shows comparison of various cloud management and performance measuring tools.

Keywords- Cloud Computing, Hardware Based Performance, Software Based Performance.

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1. INTRODUCTION

Cloud computing is a distributed computing paradigm that focuses on providing a wide range of users with distributed access to scalable, virtualized hardware and/or software infrastructure over the internet. Potentially it can make the new idea of 'computing as a utility' in the near future. Despite this technical definition cloud computing is in essence an economic model for a different way to acquire and manage IT resources. An organization needs to weigh cost, benefits and risks of cloud computing in determining whether to adopt it as an IT strategy. The availability of advance processors and communication technology has resulted the use of interconnected, multiple hosts instead of single high-speed processor which incurs cloud computing. Recently, public cloud is made available as a pay per usage model while private cloud can be built with the infrastructure of the organization itself. Web Services, Google App Engine, and Microsoft Azure are examples of public cloud. The service provided by the public cloud is known as utility computing. As benefit, users can access this service "anytime, anywhere", share data and collaborate more easily, and keep data safely in the infrastructure. Although there are risks involved with releasing data onto third party servers without having the full control of it.

2. CLOUD COMPONENTS-

Cloud computing is the dynamic provisioning of information technology capabilities (hardware, software, or services) from third parties over a network (Damanal and Mahana, 2014). Any cloud computing system consists of three major components such as clients, datacenter and distributed servers. These components are shown in Figure 1. Brief discussion of specific role and purpose of each component is presented in the following-

a) **Client-** End users interact with the clouds to manage information related to the cloud. Clients generally fall into three categories-

- **Mobile-** windows mobile smart phone like a blackberry or an I Phone.
- **Thin-**They don't do any computation work. They only display the information. Servers do all the work for them. The clients don't have any internal memory.
- **Thick-**These use different browsers like internet explorer or Mozilla Firefox or google chrome to connect to the different cloud.

b) **Datacenter-d**atacenter is nothing but collection of servers hosting different applications. An end user connects to the datacenter to subscribe different applications. A datacenter may exist at a large distance from the clients.

c) **Distributed Servers-**A server, which actively checks the services of their hosts, known as Distributed server. Distributed servers are the part of a cloud which is available throughout the internet hosting different applications. But while using the application from the cloud, the user would feel that he /she is using this application from its own machine.

3. TYPES OF CLOUD COMPUTING-

The types of cloud computing technology can be viewed from two perspectives: Capability and Accessibility (Ray and Sarkar, 2012).

a) Based on Type of Capability-

According to this categorizations, cloud system provides three different types of services as follows-

- **Software-as-a-Service (SaaS) -** SaaS focuses on providing users with business specific capabilities such as email or customer management. In SaaS organizations and developers can use the business specific capabilities developed by third parties in the "cloud". One of the examples of SaaS provider is Google Apps that provides large suite of web based applications for enterprise use.

- **Platform-as-a-Service (Paas)-** Paas is a service model of cloud computing. In this model clients create the software using tools and libraries from the provider. Clients also control software deployment and configuration settings. The provider provides the network, servers and storage. One of the examples of PaaS is Google App Engine that provides clients to run their applications on Google's infrastructure. '

- **Infrastructure-as-a-Service (IaaS) -** IaaS provides mainly conceptual infrastructure over the internet (e.g. compute cycles or storage). IaaS allows organizations and developers to extend their IT infrastructure on demand basis. One of the examples of IaaS providers is Amazon Elastic Compute Cloud (EC2). It provides users with a special virtual machine that can be deployed and run on the EC2 infrastructure.

b) Based on Accessibility Type-

On the basis of accessibility clouds are of two types, as mentioned in the following: \

- **Public Cloud-** In public cloud resources are offered as a service, over an internet connection, for a pay-per-usage fee. Clients do not need to purchase hardware to get the service and can also scale their use on demand.

- **Private Cloud-** In private clouds resources are deployed inside a firewall and managed by the client's organization. Organization owns the hardware and software infrastructure, manages the cloud and controls access to its resources.

3.1 Benefits of Cloud Computing-

Progress of Cloud Computing is enormous with respect to personal uses and business uses. Users of cloud computing can utilize or maintain the online resources. Among several advantages or benefits, few are discussed below-

a) **Scalability-** Scalability is the capability of a system to increase total throughput under an increased load when resources are added. Resources can be hardware, servers, storage, and network. The user can quickly scale up or scale down the resources in cloud computing according to their need without buying the resources.

b) **Virtualization-**In cloud computing, virtualization is a concept where users have a single view of available resources irrespective of their arrangement in physical devices. So it is advantageous for the providing the service towards users with less number of physical resources.

c) **Mobility-** Cloud Computing means mobility because users can access applications through internet easily at any point of time.

d) **Low Infrastructure Costs-** The pay-per-usage model is supported in cloud computing. It actually helps an organization to pay for the resources they need, not to make any investment for the resources available in the cloud. Moreover, the provider does not require any infrastructural maintenance or upgrade costs.

e) **Increased Storage**- Users or clients in cloud computing can store more data in cloud than on private computer systems, which they use regular basis. It not only relieves them from buying extra storage space, but also improves performance of their regular system, as it is less loaded. On the other hand, data or programs are accessed anytime through internet, since they are available in cloud.

3.2 Limitation of cloud computing-

The cloud computing provides several advantages with form of elasticity, availability and expandability on-demand. Still it has some constraints or limitations as discussed in the following-

a) **Latency-** Low latency has always been an important consideration in telecom networks for voice, video and data. As cloud based architecture can easily be accessed through the internet, so high latency is an important issue in every communication between client and provider.

b) **Platform or Language constraints-** Adaptation of platform or language always plays an important role. Till today, cloud providers support specific language or platform that does not interoperable with other providers. So a universal set of standards needs to be defined in case of language or platform adaptation.

c) **Resource Control-** Controlling of resources in cloud is not always in scope of client. It may vary between different cloud providers. Sometimes resource isolation is very much needed but it is very hard to isolate for the client to identify the exact resource. At the same time, resources may exhaust for keeping data or providing services, so data or program may need to migrate over other resources. This is also major and challenging issues in cloud computing. So, controlling resources and distributing loads through migration (if possible) between different resources is very much essential.

4. CLOUD MANAGEMENT TOOLS

Cloud management is to provide the automation in provisioning of resources as per the configuration requested. Once the resources are configured they are to be monitored for their utilization. They abstract the complexity involved in different architecture. It is also useful in providing integration of different type of cloud. Private, Public, and Hybrid are the three types of cloud deployment models.

4.1 Types of Cloud Management tools-

1. **Open Source -**Open source tools have gained huge popularity and constitute a sizeable market share. Majority of the organizations are adopting cloud computing to reduce their upfront cost, improving the existing services or need to support new services or new models etc.

Open source tools are- Abiquo, Cloud stack, Apache Hadoop, Open Nebula, Eucalyptus.

2. **Proprietary-** In case of the proprietary tools, users need to subscribe, even though free version are also provided by some of the vendors like RightScale but they provide limited functionalities.

Proprietary tools are- Kavoo's IMOD, Right Scale, Monitis, Path X6, IBM Tivoli's and Enstrates.

Vendor name	Types of OS supported	Types of cloud supported	Open Source/ Proprietary
Abique	Linux, Windows, Mac	Public, private	Open source
Kavoo's IMOD	Linux	Public, private, hybrid	Proprietary
Right Scale	Windows, Linux	Public, private,	Proprietary
Apache's Hadoop	Linux	Public	Open source
Monitis	Linux, Windows	Public, private	Proprietary
rPath	Linux, Windows		Proprietary

Table 4.1 Comparisons of various monitoring tools

5. CLOUD PERFORMANCE

To monitor the performance in the cloud computing, a number of automated performance monitoring (APM) tools from various vendors are available which provide the monitoring in real time as well as on historical data. Majority of them enable the user to monitor the details of their cloud using wide variety of devices such as smart phones to laptop devices. Some of these tools have been defined as in table 5.

Types of Cloud performance factors-

5.1 Hardware based performance- In cloud computing following hardware factors can affect performance

- *Network bandwidth*
- *Hardware load distribution by load balancer*
- *Network performance,*
- *Cloud infrastructure performance*
- *Geographical contents*

5.2 Software based performance- In cloud computing following software factors can effect performance-

- Load balancing
- Data storage and retrieval
- Application
- Number of user and VMs

S.No.	Provider	APM Tool	Factors monitored
1.	Netinst (http://www.netinst.com/-products/observer-reporting-server/index.php)	Observe reporting system	• End user page response time • Transactions processed • Network error, latency & utilization
2.	Copper Egg (http://copperegg.com/revealup-timewebsite-monitoring/)	RevealUptime	• URL, port, & site latency, response time, uptime, health. • Worldwide real time data collection coverage, analytics, alarms. • Troubleshooting, multi-user access
3.	Hyperic (http://www.hyperic.com/products/cloud-status-monitoring)	Cloudstatus	• Monitor service availability, response time, latency, and throughput • Provides real-time reports • Application availability and performance
4.	CA technologies	CA virtual assurance	• Infrastructure response time, latency time • Monitor the

Table 5.1 Cloud performance monitoring tools

6. CONCLUSIONS

In Cloud computing performance play an important role. Performance of cloud computing defends on various factors. According to prediction and evaluation of cloud computing performance, we can reach different conclusions. This paper provides a comparative analysis of cloud management tools and cloud performance measuring factors and tools.

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