



**RESEARCH ARTICLE**

# Performance Analysis of Cloud Computing for Distributed Client

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*Abstract— Cloud Computing is a basic requirement today, while everybody want to secure their data from natural disaster. The application framework of Cloud provides wings to the Distributed Computing, now client not only save data to the server but client can also use the computing resources of the server over the Cloud. It is a new phase of Information Technology, where companies are competition by offering free cloud storage with attractive interface. The Cloud itself has distinguish meaning when integrate it with internet as bridge, so any computer from the internet can access the cloud. The data and applications are stored over the Cloud, so anybody can easily access data anytime, anywhere through internet. Cloud computing incorporates the concepts of Grid and distributed computing. It supports the sharing of hardware (i.e. server memory) and software (i.e. data and applications) simultaneously with multiple users. This research mainly focuses on the performance analysis of the Cloud Computing, whereas results are based on Load allocated to the Distributed Client.*

**Key Terms:** - Cloud Computing; Cloud Analyst; Distributed Computing; Simulation; Load balancing; AppEngine

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## I. INTRODUCTION

Cloud computing is a fast new area in computing research and industry today. It has the possible to make the not so new idea of 'computing as a utility' a actuality in the near future [2]. Cloud computing is an on demand service in which provide a shared resources (information, software and other devices) according to the clients requirement at specific time [6]. It's a term which can be used in case of Internet. Cloud Computing is internet based technology which produce pay per service and demand service like PAAS (Platform as a service), SAAS (Software as a service), MAAS (Monitoring as a service), CAAS (Communication as a service), and IAAS (Infrastructure as a service) [6].

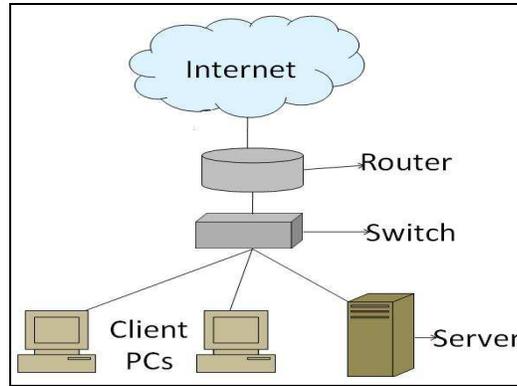


Figure 1: A cloud is used in network diagrams to depict the Internet

Cloud computing is a new able model in distributed and parallel computing [10]. It can offer utility-oriented IT services based on a pay-as-you-go model [10]. It has the budding to convert a large part of the IT industry, building software even more interesting as a service and shaping the way IT hardware is designed and purchased”. It can make good use of economies of range and dynamically deliver/configure almost any IT related services on demand [8].In private clouds, virtual machine (VM) based applications for common uses are getting famous, such as virtual desktop, virtual classroom and virtual laboratory.

However, since private clouds have some unique features and special requirements, it is still a strong problem to effectively schedule VM requests onto compute nodes, especially with multiple objectives to meet. This problem cannot be avoided, for it could directly affect the scaling capacity of the entire system, which is one of the key features of clouds. The VM scheduling problems has been about studied in previous researches; however it is always restrained in the scenario of cluster computing, grid computing or commercial clouds, with one or two objectives considered instantaneously. Cloud computing is an internet based computing model that consists of tens of thousands of computers as well as servers are connected into a computer cloud [2].

The characteristics cloud computing

- On-demand self-service:-Individuals can set themselves up without demand anyone’s help [11].
- Ubiquitous network access:-Available through standard Internet-enabled devices.
- Location independent resource pooling:-Processing and storage application are balanced across a common infrastructure with no selective resource assigned to any single user [11].
- Rapid elasticity:-Consumers can increase or decrease capacity at will [11].
- Pay per use:-Consumers are charged fees based on their usage of a sequence of computing power, bandwidth use and/or storage [11].

Cloud computing models

- Private or Internet Cloud:-Cloud services are provided for any organizations are managed by the organization employee. These services exit off site [9].
- Public Cloud:-Cloud services are available to the public and owned by an organization selling cloud service, for example Amazon [9].
- Hybrid Cloud:-Hybrid Cloud the combination of Private and public cloud. E.g. data stored in private cloud or agency database is managed by a program running in the public cloud [9].

There are following type of model available for cloud computing.

### 1. Cloud Software as a Service (SAAS)

In earlier days software is purchased and install in client machine. In Software as a service software is deployed on internet by SAAS provider and subscriber can subscribe software and develop application using software. SAAS developer no need to purchased or install any software. SAAS developer only needs to subscribe software subscribing and use software for building, developing, deploying and running web application [2].

Advantage of SAAS

- Low cost
- Globally Accessible
- Automated update software

Disadvantage of SAAS

- Loss of control
- Limited applications
- Connectivity requirements

- Variable functions & features
- Slower speed

### 2. Cloud Platform as a Service (PAAS)

Cloud Platform as a service provide platform for creating, building, deployment and Running our web application on internet. Customers no need to download or install any software. PaaS Developers easily Develop application and easily deploy on Internet. So that application can easily accessible globally [2]. Example of PaaS is Google AppEngine service. Google AppEngine provides software to the user. PaaS Developer can easily develop application using Google AppEngine Software and Deployed on Google AppEngine server. Google AppEngine provides URL's of Application which PaaS Developer deploy on Google AppEngine Server. Using URL anyone can easily access application easily.

#### Advantage of PAAS

Easily Develop Application:-Developer no needs to download or install any software. Developers only need to develop application without worry about operating system because platform is provided by PaaS provider.

Easily Access:-Application deployed on PaaS can access easily and globally.

#### Disadvantage of PaaS

Platform Dependent:-PAAS Model is Platform Dependent. Application develop can be run on only those platform where there are develop. User cannot change platform.

Example user develop application on Google AppEngine can run only on AppEngine. User cannot run application in other platform.

### 3. Cloud Infrastructure as a Service (IAAS)

Infrastructure-as-a-Service (IaaS) is the delivery of computer infrastructure as a service [2].

#### Advantage of IAAS

- infrastructure scalability
  - native integrated management
- Performance, resource consumption/utilization, load
- economical cost
- Hardware, IT support

### 4. Cloud Communication as a Service (CAAS)

Cloud communication as a service is responsible managing hardware and software for communication technology. Communication technology likes voice over IP service, Video conferencing and instant messaging. Cloud communication as a Service is used in telecommunication industry.

### 5. Cloud Monitoring as a Service (MAAS)

Cloud Monitoring as a service is responsible for protecting a client from cyber threats. Cloud support as a service use for securing and maintaining the confidence, integrity, and availability of IT assets. Cloud monitoring as a service provide real-time, monitoring and protecting critical information assets of their customers.

### 6. Cloud Database as a Service (DAAS)

Cloud Database as a service provides different type of database service to the customer. For Example, Google AppEngine Database, Simple Database, Microsoft SQL Azure Database.

## II. SIMULATION AND PERFORMANCE ANALYSIS

The simulation and performance analysis will be done by using the cloud analyst tool [4].

Cloud Analyst:- Cloud analyst is a simulation tool developed by cloud computing and distributed system (CLOUDS) laboratory at Australia. Cloud analyst includes all functionality of Cloudsim. Cloudsim use for modeling and simulation of data centers [1]. Virtual machines with customized parameter.

Cloud Analyst is use for simulation of different web based application according to different configure simulation parameter such as User bases, application deployment, data center physical hardware detail of data center: DC1, advanced configure simulation [7].

#### Installation Step of cloud analyst

Step1:- Download Cloud Analyst software from following link.

<http://www.cloudbus.org/cloudsim/CloudAnalyst.zip>

Step2:- Copy file for any location in your system.

Step3:-Extract the download CloudAnalyst.zip to the particular drive.

Step 4:- User will find following folder structure.



Figure2:-Folder Structure

Step5:-Double click on run icon to run Cloud Analyst.

Step6:-Command prompt will open in Background.

#### A. Introduction to Load Balancing Framework

Region: -In the Cloud Analyst the world is divided in to 6 'Regions' that coincide with the 6 main continents in the World [7].

User Base: -User Base is considered as a single unit. In a single unit User Base may be one user or hundred user or thousand users is create for generating Traffic. User Base represents large number of User [7].

Data Center: -Cloud application service broker is responsible to decide which data center should accept and process request coming from each user base. A single data center controller is diagramed to a single Cloudsim [7].

VmLoadBalancer: -When the User Base generate request and send it. The Request first sent to the VmLoadBalancer. VmLoadBalancer is responsible to allocate the load to the available various data center. VmLoadBalancer allocate the load to the data center based on load balancing policy.



Figure3:- Cloud Analyst Tool

### III. LOAD BALANCING IN CLOUD COMPUTING

Load balancing is the process of divide the load among various resources in any system. Thus load need to be divide over the resources in cloud-based architecture, so that each resources does alternative the equal amount of task at any point of time [2]. Some technique is to provide i.e. is the basic needs of a balance requests to provide the solution of the application faster [2].

Cloud vendors are based on automatic load balancing services, which allow clients to access the number of CPUs or memories for their resources to range with increased demands [2]. This service is depends on the clients business needs. So load balancing serves two important needs, basically to promote possibility of Cloud resources and secondarily to promote performance [2]

1) *Load Balancing Technique in Cloud*

Round Robin Algorithm:-Round Robin Algorithm is the simplest scheduling algorithms that utilize the principle of time slices. The time is dividing into a multiple slices and each node is given a selective time sliced or time interval [3].

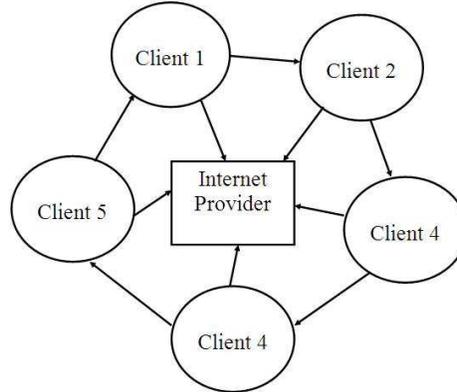


Figure4:- Round Robin Algorithm

Process of Round Robin Algorithm:-

Process	Burst Time
p1	8
p2	4
p3	9
p4	5

Find Out the waiting time.....? {Gives time Slice=4}

p1	p2	p3	p4	p1	p3	p4	p3	
0	4	8	10	16	20	24	25	26

Individual waiting time:-

For

$$P1=16-4 = 12 \text{ ms}$$

$$P2= 4 \text{ ms}$$

$$P3=25-(4+4) = 17 \text{ ms}$$

$$P4=24-4 = 20 \text{ ms}$$

$$\text{Average waiting time:-} 12+4+17+20/4= 53/4 = 13.23$$

Round Robin Scheduling

[Initialize] time quantum as  $tq = 10$

Repeat Steps till

$(\text{actual\_cloudlet\_list}).\text{Length} == \text{NULL}$

{

Execute [actual\_cloudlet] till  $tq$

Executed\_list [cloudlets] Execution [Actual\_cloudlet]

actual\_cloudlet cloudlet\_list [next\_cloudlet]

}

VMM [executed\_cloudlet\_list] Executed\_list [cloudlets]

Go to Step3

#### IV. METHODOLOGY

Cloud analyst is a simulation tool developed by the cloud computing and distributed system. Cloud analyst is use the Cloudsim. Cloudsim using a modeling and simulation of data center [1]. Cloudsim provide a graphics interface to the internet based on BRITE format. Cloudsim is a network simulation based on NS2 (Network Simulation2). Cloudsim would speed up the development of new resource allocation policies and scheduling algorithms for cloud computing [1]. Cloud analyst is use for simulation of different web based application according to different configure simulation parameter such as user bases, application deployment, data center physical hardware details of data center:DC1 [7].

**V. EXPERIMENT AND RESULTS**

Data center DC1 located at region 0 and after set all configuration and parameter perform simulation and calculate the overall response.

TABLE I  
Configuration Parameter

<b>Test1</b>	
<b>Test parameter</b>	<b>Values</b>
User base	ub1, ub2, ub3, ub4, ub5
Data center	dc1
Data center region	0
Service broker policy	closest data center
Load balancing algorithm	round robin

In this table we are using round robin algorithm for load balancing of data center (DC1) at region 0.

*A. Application Deployment Parameter*

Table 2  
Application Deployment Configuration Parameter

<b>Service Broker Policy</b>	<b>Data Center</b>	<b>#VMs</b>	<b>Image Size</b>	<b>Memory</b>	<b>BW</b>
Closest data center	Dc1	5	10000	512	1000

Application deployment parameter table denoted by the service broker policy set closest data center and the data center provide network bandwidth from a particular user base and send the request from the user base.

*B. Data Center Configuration Parameter*

Table 3  
Data Center Configuration Parameter

<b>Name</b>	<b>Region</b>	<b>Arch</b>	<b>OS</b>	<b>VMM</b>	<b>Cost per VM \$/Hr</b>	<b>Memory Cost \$/s</b>	<b>Storage Cost \$/s</b>	<b>Data Transfer Cost \$/GB</b>	<b>Physical Hw Units</b>
Dc1	0	X86	Linux	Xen	0.1	0.05	0.1	0.1	2

Data center configuration parameter table denoted by a one data center and located at region 0 and set all configurations for the data center.

Table 4  
Result Overall Response Time Summary

<b>Overall Response Time Summary</b>			
	<b>avg(ms)</b>	<b>min(ms)</b>	<b>max(ms)</b>
Overall response time	310.55	40.11	617.61
Data center processing time	0.32	0.02	0.86

Overall response time summary table calculate the overall response time and data center processing time by the region0

*C. Response Time by Region*

Table 5  
Result Response Time by Region

<b>User base</b>	<b>Avg(ms)</b>	<b>Min(ms)</b>	<b>Max(ms)</b>
Us1	50.02	40.11	60.61
Us2	200.79	161.11	247.11
Us3	299.22	241.61	369.12
Us4	500.83	390.11	617.61
Us5	499.95	382.60	610.12

Calculate the response time from the user base (UB1, UB2, UB3, UB4 and UB5) at region 0

*D. Data Center Request Servicing Time*

Table 6  
Result Data Center Request Servicing Times

Data center	Avg(ms)	Min(ms)	Max(ms)
Dc1	0.32	0.02	0.86

Calculate the data center request servicing time from the data center at region 0

*E. Cost*

Total Virtual Machine Cost (\$):-	0.50
Total Data Transfer Cost (\$):-	0.32
Grand Total (\$):-	0.82

Table 7  
Result Cost

Data center	Vm cost	Data transfer cost\$	Total \$
DC1	0.50	0.32	0.82

Calculate the cost from the data center and the total virtual machine cost and total data transfer cost calculate the grand total of data center. The bar chart shows the result of VM cost, data transfer cost and total cost of data center 1 in Figure 8.

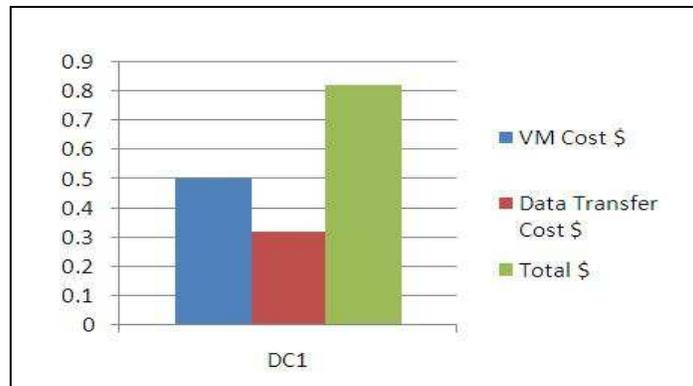


Figure5:-Test1 Cost

**VI. CONCLUSION**

The Cloud Computing requires efforts from the web development and server management. The overall performance of Cloud Computing depends on “How light the interface?” & “How is the availability of resources at the server?” This research paper discusses core application areas of Cloud Computing. This perception promotes us to work for performance analysis of Cloud Computing with Distributed Client. The Round Robin algorithm is used by different data center and different user base to design the working phase. Cloud Analyst tool sets the entire required configuration in data center & user base. The data center DC1 located at region 0 by setting entire configuration with parameter performs simulation and calculates the overall response time generates. This research concludes that performance to data center affects by distance and number of users, while hardware with software of the server has own affections.

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