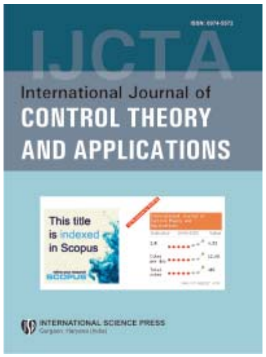


International Journal of Control Theory and Applications

ISSN : 0974–5572

© International Science Press

Volume 9 • Number 40 • 2016

# Load Balancing and Concave Pricing for Cloud Computing

**M.D. Abdul Irfan[a] M. Sangeetha[b] K. Sahith[a] and K.V.S. Yashwanth[a]**

*[a]B.Tech Information Technology, SRM University*

*E-mail: abdulirfan71@gmail.com, Corresponding Author*

*[b]Assistant Professor, Department Of Information Technology, SRM University*

***Abstract:*** Load balancing (LB) is defined as equal distribution of user requests among the virtual machines without server overloading. Load balancing is used for providing better performance by allocating the incoming requests equally among the existing nodes in the data center. The aim of our project is as follows: To increase the availability of services, To increase the user satisfaction, To maximize resource utilization, less execution time and completely reduce the waiting time of the user requests. To improvise the server performance, Maintain system stability, Build fault tolerance system, Accommodate future modification, Avoid overloading of virtual machine.

In this project, we are developing a load balancer for effective user request monitoring and file access. In existing research articles, no paper focus on experimental results and it deals with types of algorithms used for load balancing only. In our presented system, apache is used as a server for processing the user request and tomcat server is used as virtual machines. The status (idle, busy), session time, packet size, the name of the virtual machine, type, hostname and port address and bytes read in each virtual machines are been monitored by the apache server and based on the status the job is allocated to the respective virtual machines. Thus our presented project provides an efficient load balancer to avoid congestion and overloading of server in the data center.

With the increase demand in Cloud Computing industry, the cloud service providers attracts various customers with different demands. The diverse price scheme safeguards the discount pricing strategy from the market of Cloud brokers. The cloud service providers do not help every customer to utilize discount pricing strategy offered through online scheduling of data prices. In this project, we present a randomized online stack-centric scheduling algorithm (ROSA) and theoretically present and prove the lower bound of its competitive ratio. Finally the data owner files are encrypted using AES algorithm and migrated into cloud for data recovery or data storage. In data recovery, the files are migrated from the virtual machines to cloud named Cloud Me for data backup.

***Keywords:*** *Load Balancing, Pricing, Bulk Purchasing, Cloud Computing, Virtual machines.*

## 1. INTRODUCTION

Now a days there is lot of scope and demand for infrastructure-as-a-service (IaaS) cloud, because of the web applications and migration of customer to cloud computing. This is the reason why many virtual machine based servers are integrated to handle the user requests for better service. For instance, cloud providers usually use an hourly billing scheme, even if the customers do not actually make use of the allocated resources in the whole billing horizon. In the current cloud market, almost all cloud providers offer big discount for reserved and long-term requests. In addition, cloud providers usually give volume discount to customers with requests of large quantity, e.g., The Amazon EC2 cloud gives 10% discount for customers spending $25,000 or above on reserved instances and 20% discount for customers spending $200,000 or above. The different pricing schemes and various discount offers among different IaaS service providers or even within the same provider form a complex economic landscape which is not in the hands of end clients or customers. Thus this creates an opportunity for the cloud brokers to perform a huge business between the end users and cloud service providers.

Load balancing is defined as even distribution of user requests among various virtual machines without overloading the server. Workload of a machine means the total processing time it requires to execute a task assigned to a particular VM. LB is done so that every virtual machine in the cloud system does the same amount of work throughout therefore increasing the throughput and minimizing the response time. LB is one of the most important factor to be considered and used by the cloud service provider.

Balancing the load of virtual machines evenly means that none of the available machine is not idle or partially loaded while others are heavily loaded. One of the major issue of cloud computing is to divide the workload dynamically. Thus the benefits of Load Balancing is to gain customer satisfaction by providing results in less execution time and reducing fault tolerance.

## 2. OBJECTIVE

Our objective of the project is to design and develop an efficient load balancer to avoid congestion and over loading of server. Also to develop a user friendly and secure load balancer and also to keep track of the virtual machine`s status (idle, busy), session time, packet size, virtual machine name, type, hostname and port address and bytes read in each virtual machines. Also to provide a discountin the price for all cloud customers using ROSA technique. Also our objective is to create a real data center kind of environment and analyze the performance of the servers while processing or implementing the user requests.

## 3. EXISTING SYSTEM

In existing system, Load balancing is not efficient, that’s why most of the real time websites hangs or do not respond.

This is due to increase in number of requests which is beyond the servers’ capacity. Example: Anna University website at the time of results. Current research paper in load balancing deals with theoretical explanation only. No paper has experimental results. Many application use static or normal load balancing algorithms, which is not much efficient in the present scenario. Many applications use distributed load balancing technique. Regarding the pricing of the data or space by the cloud provider, the discounts are provided to large customers only i.e customers who buy large volumes of data from the cloud provider.

## 4. PROPOSED SYSTEM

We present a dynamic load balancing algorithm to implement the load balancing technique. Our presented Load Balancer involves both request monitoring and file access. The load balancer will keep track of the virtual machine`s status i.e, Busy or Ideal, it`s session time, it`s packet size, name of the virtual machine, type, the hostname and port address and bytes read in each virtual machines are being monitored in apache server. Based on the status of the virtual machine the job to be performed is allocated. Our proposed system will help usanalyze the HEAP memory of the server (maximum request load). Our proposed system uses hierarchical load balancing technique. In hierarchical load balancing technique every tree connecting the virtual machines are supervised by the parent nodes. In our project, the primary focus is to provide cloud infrastructure with a good pricing strategy for all the cloud users. For pricing strategy and allocation of discounts to the cloud users we have used randomized online stack-centric scheduling algorithm (ROSA). ROSA is superior to any other conventional online scheduling algorithms in terms of cost saving. Hierarchical load balancing involves different levels of the cloud in making a load balancing decision. Thus in the process of hierarchical load balancing each module in the applications are placed in a particular virtual machines for accessing. Thus the user requests is predominately monitored by the LoadBalancer to identify which virtual machine heap memory space needs to be increased or decreased.

## 5. ARCHITECTURE DIAGRAM

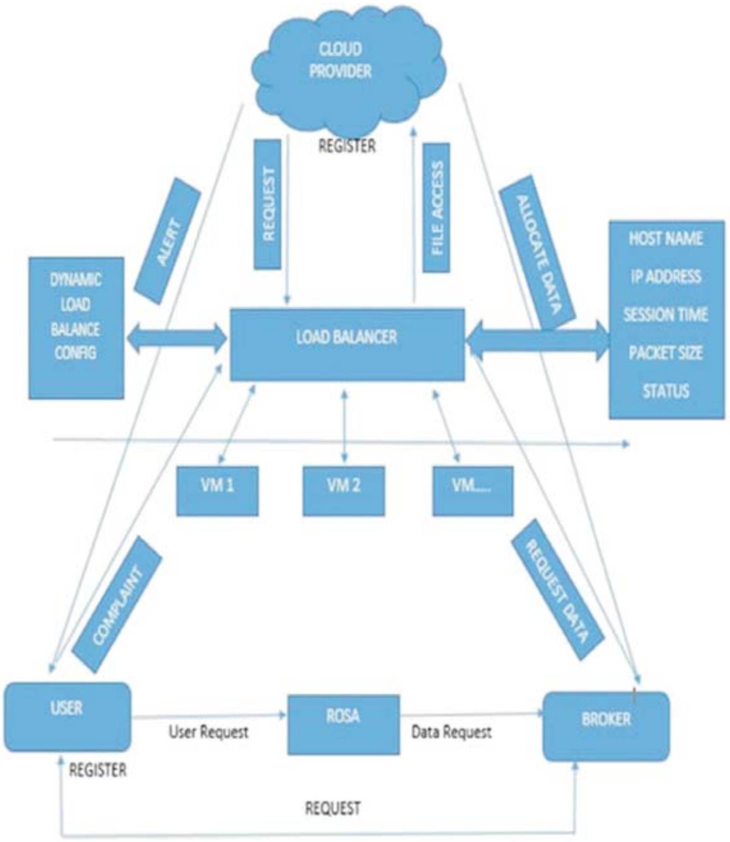


**Figure 1: Load Balancing and Request Flow**

## 6. WORKING METHODOLOGY

In this project, for pricing strategy and allocation of discounts to the cloud users we used ROSA algorithm. ROSA is superior to any other conventional online scheduling algorithms in terms of cost saving. Thus ROSA analyses the requests of the cloud users and provide efficient discount rates based on their volume of requests. In our project, user can login with username and password or create an account. If the user login is successfully registered means user send the request to ROSA then it will send the data request to the broker to respond to the user requests and get a discounted pricing for all the customers.In this module, the user have to buy the data with discount pricing with first preference with the help of ROSA technique .For example in existing the user gets the data without a

Proper discount with or without the help of broker. With the help of our application we make sure that each and every customer gets the discount for the amount of space he/she are buying in the cloud irrespective of the demands of the cloud in order to achieve the discount. If user1 buys 100MB of data and the user2 buys 500MB of data means ROSA technique have to choose the first priority of buying high data with pricing.so we have to able to buy a product with efficiency.

Also in this research project, we are developing a load balancer for effective user request monitoring and file access. In existing research articles, no papers focus on experimental results and it deals only with types of algorithms used for load balancing. In our proposed system, apache server is used as a server for processing the user request and tomcat is used as virtual machines. The status (idle, busy), its session time, packet size, thename of the virtual machine, type, the hostname and port address and bytes read in each virtual machines are monitored by the apache server and based on the status of the server the job is allocated to the virtual machines. Thus our proposed projectprovides an efficient load balancer to avoid congestion and overloading of server in the data center.Also in this project, the virtual machines adopts the structure of hierarchical load balancing technique.

Our proposed system uses hierarchical load balancing technique. In hierarchical load balancing technique all the tree connecting the virtual machines are supervised by the parent nodes. Hierarchical load balancing involves different levels of the cloud in making a load balancing decision. Thus in hierarchical load balancing each module present in the application are placed in a particular virtual machines for accessing. Thus the user requests is predominately monitored by the LB to identify which virtual machine heap memory space needs to be increased or decreased. Based upon the information gathered by the parent node a scheduling decision is made.

Finally the data owner encrypts his/her files using AES algorithm and the encrypted data is migrated into cloud for datarepositoryor data recovery. In data recovery, the files are migrated from the virtual machines to cloud named CloudMe for data backup. For Cloud storage we have configured public cloud named CloudMe cloud storage. CloudMe is a personal cloud storage service which is predominately used for file storage, sharing.

The service provides 6 gigabytes (GB) of storage for free and up to 100 GB on various for-fee plans. CloudMe is a cloud storage service that enables users to store files on remote cloud servers and gives us the ability to share files within a synchronized format. CloudMe provides an online storage solution using a service model of infrastructure as a service (IaaS).

## 7. DYNAMIC LOAD BALANCING ALGORITHM

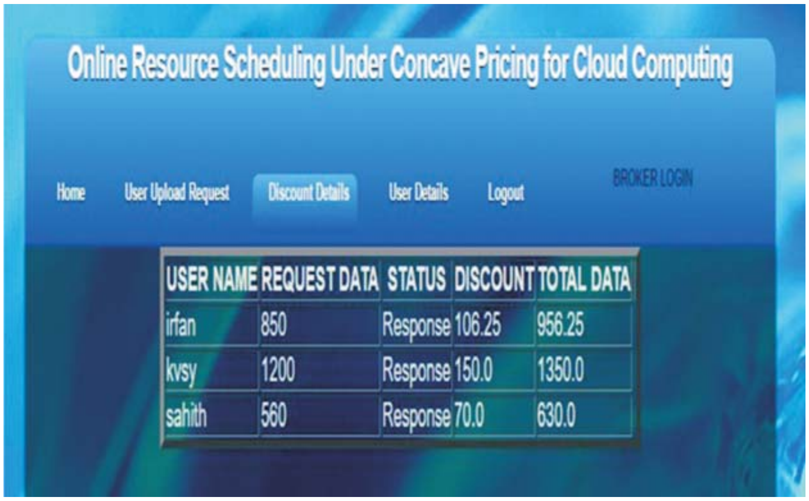
The configuration is made to the web server(apache), which takes up the requests of the clients and dynamically allocates to two or more servers, in our case tomcat servers by including the tomcat server installation and configuration such as port number and other server protocols so that the two servers bind to the web server which takes up the requests and guides to any of the two application servers (Tomcat) so that the load is distributed dynamically using the AJP protocol of the apache server. The two servers are made to run so that the load is distributed uniformly and also if any one of the server fails, hangs up or shut down the other server takes up the requests processing the client`s requirements without any service downfall.

## 8. AES ALGORITHM

The Advanced Encryption Standard (AES), also known as Rijndael, is the encryption of electronic data was created by the U.S. National Institute of Standards and Technology (NIST) on 2001. AES is implemented by Vincent Rijmen and Joan Daemen, who promoted a theory to the NIST. Rijndael is a group of ciphers with different key and block sizes.

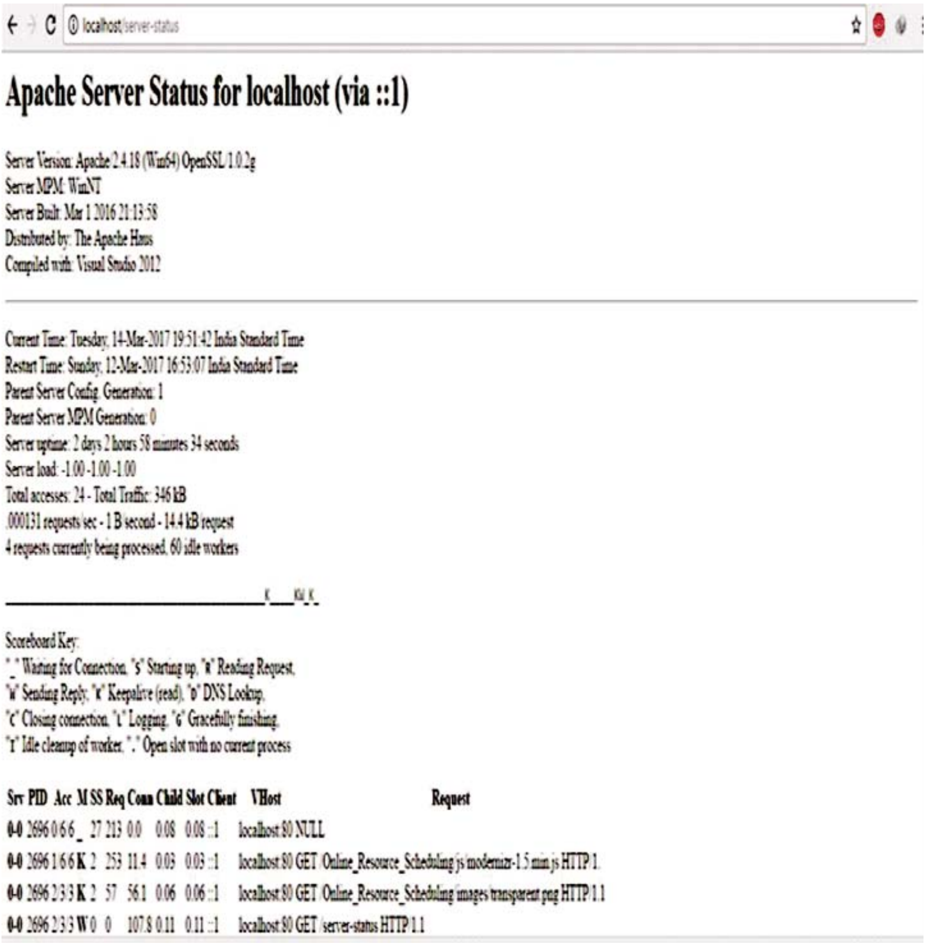
Advanced Encryption Standard is a 4 × 4 column order matrix of bytes, even though some versions of Rijndael have a larger block size and have additional columns in a state. Most AES formulations are done in different finite fields. Advanced Encryption Standard has rounds of several processing steps that such as substitution, transposition and integration of the input plaintext and change it into the final result of ciphertext.

## 9. EXPERIMENTAL RESULTS



| USER NAME | REQUEST DATA | STATUS | DISCOUNT | TOTAL DATA |
|---|---|---|---|---|
| irfan | 850 | Response | 106.25 | 956.25 |
| kvsy | 1200 | Response | 150.0 | 1350.0 |
| sahith | 560 | Response | 70.0 | 630.0 |

**Figure 2: Interface for cloud mediator to respond for the user request**



Apache Server Status for localhost (via ::1)

Server Version: Apache/2.4.18 (Win64) OpenSSL/1.0.2g
Server MPM: WinNT
Server Built: Mar 1 2016 21:13:58
Distributed by: The Apache Haus
Compiled with: Visual Studio 2012

Current Time: Tuesday, 14-Mar-2017 19:51:42 India Standard Time
Restart Time: Sunday, 12-Mar-2017 16:53:07 India Standard Time
Parent Server Config. Generation: 1
Parent Server MPM Generation: 0
Server uptime: 2 days 2 hours 58 minutes 34 seconds
Server load: -1.00 -1.00 -1.00
Total accesses: 24 - Total Traffic: 346 kB
.000131 requests/sec - 1 B/second - 14.4 kB/request
4 requests currently being processed, 60 idle workers

```
________________________________________________K___KW_K_

Scoreboard Key:
"_" Waiting for Connection, "S" Starting up, "R" Reading Request,
"W" Sending Reply, "K" Keepalive (read), "D" DNS Lookup,
"C" Closing connection, "L" Logging, "G" Gracefully finishing,
"I" Idle cleanup of worker, "." Open slot with no current process

Srv PID  Acc   M SS Req Conn  Child Slot Client  VHost              Request
0-0 2696 0/6/6 _ 27 213 0.0   0.08  0.08 ::1     localhost:80 NULL
0-0 2696 1/6/6 K 2  253 11.4  0.03  0.03 ::1     localhost:80 GET /Online_Resource_Scheduling/js/modernizr-1.5.min.js HTTP/1.
0-0 2696 2/3/3 K 2  57  56.1  0.06  0.06 ::1     localhost:80 GET /Online_Resource_Scheduling/images/transparent.png HTTP/1.1
0-0 2696 2/3/3 W 0  0   107.8 0.11  0.11 ::1     localhost:80 GET /server-status HTTP/1.1
```

**Figure 3: Server Status**

## 10. CONCLUSION

The major issues of file access through a server is Load Balancing. Overloading of a system may lead to poor performance which can make the technology unsuccessful, for the efficient utilization of resources, the efficient load balancing algorithm is required. Thus our project provides a complete solution for efficient load balancing along with discounted pricing of storage infrastructure resource in cloud.

## REFERENCE

[1] Rajesh George Rajan, V.Jeyakrishna (Dec 2013)," A Survey on Load Balancing in Cloud Computing Environment", Vol.2, Issue.12, pp.4726-4728.

[2] ZenonChaczko,VenkateshMadadevan, ShahrzadAslanzadehand, ChristopherMedermind (2011),"Availability and Load Balancing in Cloud Computing", Vol.14.pp.138-140.

[3] https://www.edgehosting.com/managed-solutions/managed-hosting-services/server-load-balancing/benefits.

[4] Dharmesh Kashyap, Jaydeep Viradiya(Nov 2014),"A Survey of Various Load Balancing Algorithms in Cloud Computing",Vol.3,Issue.11,pp.115-119.

[5] Shanti Swaroop Moharana, RajaDeepanD.Ramesh and Digamber Powar(May2013),"Analysis of Load Balancers in Cloud Computing",Vol.2,Issue.2,pp.101-108.

[6] Upendra Bhoi,Purvi N.Ramanuj(April 2013) "Enhanced Max-Min Task Scheduling Algorithm in Cloud Computing",Vol.2,Issue.4,

[7] J.Uma,V.Ramasamy, A.Kaleeswaran(Feb 2014),"Load Balancing Algorithms in Cloud Computing Environment-A Methodical Comparison",Vol.3,Issue.2,pp.272-274. [8] http://en.wikipedia.org/wiki/Cloud_computing.