

# Round Robin Approach for Better VM Load Balancing in Cloud computing

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**Abstract** – Cloud computing is known as digital service delivery over the Internet by several applications which are carried out by computer systems in distributed datacenters. . It is a fast growing area in computing research and industry today. With the advancement of the Cloud, there are new possibilities opening up on how applications can be built and how different services can be offered to the end user through Virtualization, on the internet. There are the cloud service providers who provide large scaled computing infrastructure defined on usage, and provide the infrastructure services in a very flexible manner which the users can scale up or down at will. The establishment of an effective load balancing algorithm and how to use Cloud computing resources efficiently for effective and efficient cloud computing is one of the Cloud computing service providers' ultimate goals. It supplies a high performance computing facilities which allow shared computation and storage over long distances. To properly manage the resources of the service provider we require balancing the load of the jobs that are submitted to the service provider. Load balancing is required as we don't want one centralized server's performance to be degraded. In available Virtual Machine Load balancing policies limitation of cloud is that they don't save the state of the previous allocation of virtual machine to a request from the user and the VM Load balancing algorithm requires execution each time a new request for VM allocation received from user. In this paper, we present Round Robin Algorithm for better load balancing in cloud Environment.

**Keywords** – Cloud Computing, Load Balancing, Virtual Machine, CloudSim, Data centre, Round Robin Algorithm.

## I. INTRODUCTION

Cloud computing is the most recent emerging epitome to turn the vision of “computing utilities” into a real world. Cloud computing is an emerging technology with advance feature that focuses on the way in which we design computing system, develop application and building software with advancement. It is based on dynamic provisioning concepts, which is applied on the services, also to compute capability, storage, networking & Information Technology (IT) infrastructure. In cloud computing resources are made available through the Internet and offered on a pay-per-use basis in anywhere from Cloud computing service broker. Cloud computing can help by providing massive computing power, unlimited storage capacity, less maintenance cost, availability of useful web-services etc.

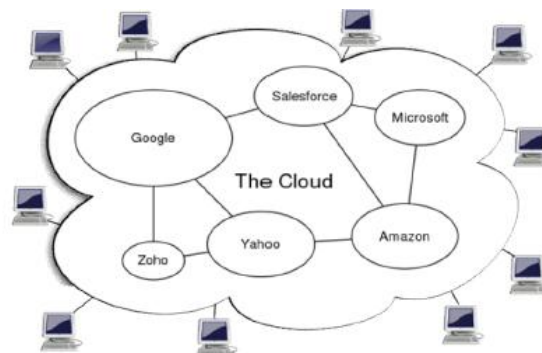


Fig.1. shows a simple cloud environment.

The virtualization forms the foundation of cloud technology where virtualization is an emerging technology that separate computing function and technology implementation from physical hardware. Cloud computing is the virtualization of computer program through the internet connection rather than installing application on everywhere. Using virtualization user can access server or storage without knowing specific storage detail. Virtualization can be applied to many types of computer resources: Infrastructure such as storage, network, computer (as CPU, memory), platform (such as Linux, windows OS), and software as a services.

Actually Cloud computing offers three layers of abstraction  
Infrastructure as a Service (IaaS),  
Platform as Services (PaaS),  
Software as Services (SaaS)

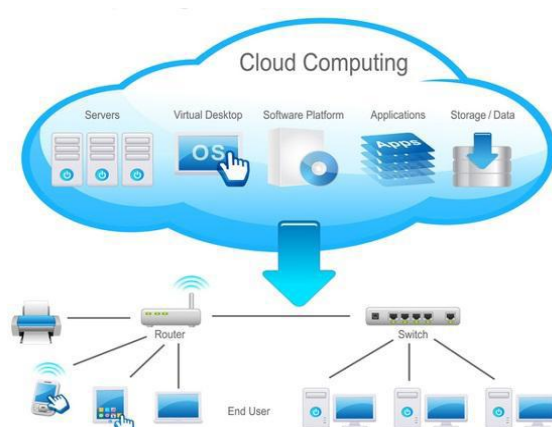


Fig 2: Virtualization of Cloud Computing

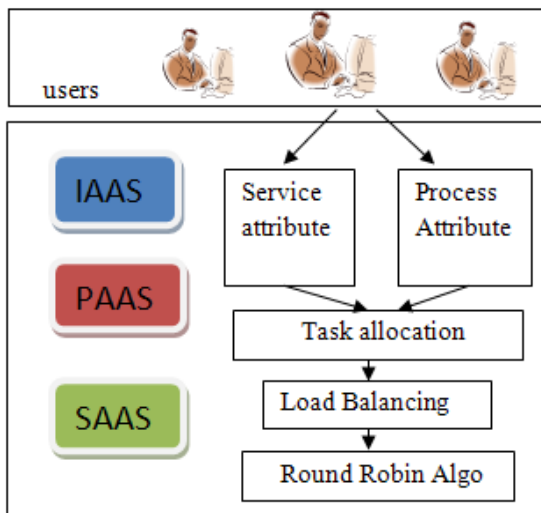


Fig.3. The framework of tasks allocation process

SaaS provides different types of applications as a Service for the end user. Middleware Services. Paas ) typically makes use of dedicated API's to control the behaviour of a server hosting engine which executes and replicates the execution according to user request eg. force.com, Google App Engine. IaaS provides the hardware infrastructure of cloud consisting of physical machines like clusters, datacenters etc to provide resources in order to meet the consumer's request on demand. To provide massive computing and storage resources in cloud environment here needs load balancing. Load balancing is the mechanism that decides which requesting nodes/client will use the virtual machine and which requesting machines will be put on hold (figure 4). Load balancing is also required to minimize the cost of machine and maximize the profit for the service being offered. Hence with these issues in mind we here in this paper propose an algorithm for rescheduling named round Robin algorithm.

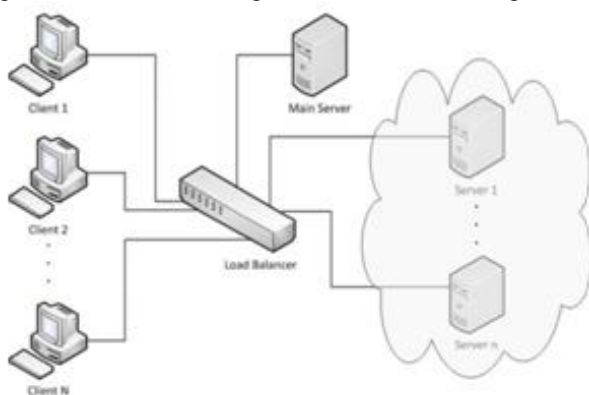


Fig.4. Load balancing in cloud environment

In IaaS, the physical resources can be split into a number of logical slices called Virtual Machine (VM's). All VM Load Balancing methods are designed to determine which Virtual Machine is assigned to the next cloudlet task units. These VM are modelled using different tools Cloudsim- Simulation framework for its allocation to the application.

## II. RELATED STUDY

Cardellini et al. [1] In this paper he has Considered different categories of web applications, and evaluate how static, dynamic and secure web service requests affect performance and quality of service at distributed web sites Levy et al[2] Presents an architecture and prototype implementation of performance management system for cluster based web service. H.Aydin et.al[3] have proposed minimizing the energy consumption and subsequently the cost for the static system. Buiya et. al.[4] Have proposed the architecture for market oriented allocation of resources within clouds. Xinhui et. A[5]have proposed total cost of ownership of cloud computing using a suite of metrics and formulas. K.Mukherjee and G. Sahoo[10] Have proposed a frame work for achieving better load balancing and job scheduling in Cloud environment. K. Mukherjee and G.Sahoo [6][7][8][9] Have conducted research on different issues of cloud computing regarding its security aspects, mathematical models and others.

## III. PROBLEM STATEMENT

With the ever increasing number of cloud service providers, rising competition, and the growing popularity of cloud, it is extremely important for cloud providers to improve their services by improving the operational cost (response time and the processing time of requests). Hence, to satisfy the service level objectives (SLOs) [11], it is very important to improve the low level requirements such as the CPU and memory requirements and the response time of the Userbase requests. One of the ways to improve this is by providing efficient VM load balancing policies. However, there are only a limited number of VM load balancing policies available at present. Also, in the existing VM load balancing strategies, an algorithm has to be run every time a new request for VM allocation is received from the Userbase. This is because the existing VM load balancing strategies do not save the previous allocation state of a VM to a request from a given User base. However, in case of the proposed strategy, a hashmap is used to store the entries for the last VM allocated to a request from a given Userbase. Thus, when a request is received from a Userbase, if an entry for the given Userbase exists in the hashmap and if the particular VM is available, then there is no need to run the VM allocation algorithm, which in turn saves a significant amount of time.

## IV. LOAD BALANCING

Load Balancing is a method to distribute workload on the multiple computers or a computer cluster through network links to achieve optimal resource utilization for maximizing throughput and minimizing overall response time. Load Balancing is used for avoiding too much overload on the resources and dividing the traffic between servers and data. Data can be sent and received without maximum delay. Load Balancing is used for minimizing

the total waiting time of the resources. In cloud computing load balancing are uses for balancing the load on virtual machine and cloud resources.

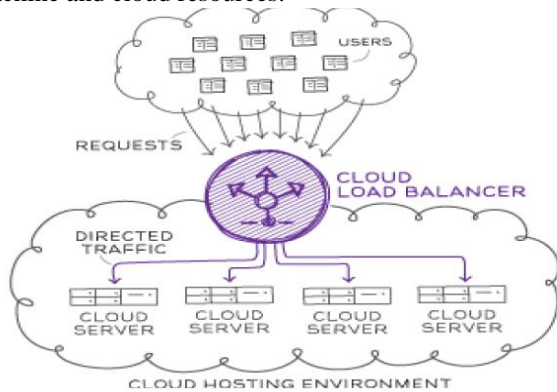


Fig.5. Cloud load balancer

### Existing Scheduling Algorithm in Cloud Computing

Virtual machine enables the abstraction of an OS and Application running on it from hardware there are three types of VM Load Balancer that is Round Robin, Throttled and active monitoring load balancing algorithms.

1. Round Robin Load Balancer – uses a simple Round Robin algorithm to allocate VMs.
2. Active Monitoring Load Balancer – this version load balances the tasks between available VMs in a way that evens out the number of active tasks on each VM at any given time.
3. Throttled Load Balancer – this ensures that only a pre-defined number of Internet Cloudlets are allocated to a single VM at any given time. If more request groups are present than the number of available VMs at a data center, some of the requests will be queued until the next VM becomes available.

One of the common problem with the above algorithms is that they do not save the state of the previous allocation of a VM to a request from given Userbase. As such, every time a request is received from the same Userbase the algorithm needs to be run again, which increases the total response of the requests. In this paper, we have addressed this problem for the Round Robin VM load balancer.

The Proposed Algorithm- Round Robin VM Load Balancing.

The proposed algorithm is an improvement over the Round Robin VM Load Balancing algorithm. The Round Robin algorithm does not save the state of previous allocation of a VM to a request from a given user base while the same state is saved in RR VM load balancer. The Round Robin VM Load balancer maintains two data structure which is discussed below.

- Hash Map- in which it stores the entry for the last VM allocated to a request from a given user base.
- VM State List- this stores the allocation status (i.e. busy available) of each VM.

ALGORITHM is-

Round\_Robin\_Load\_Balancing ()

```
{
    Initialize all the VM allocation status to
    AVAILABLE in the VM state list;
```

```
Initialize hash map with no entries;
```

```
While (new request are received by the Data Centre
Controller)
```

```
Do
```

```
{
```

```
Data Center Controller queue the requests;
```

```
Data Centre Controller removes a request from
the beginning of the queue;
```

```
If(hash map contain any entry of a VM corresponding to
the current requesting user base && VM allocation status
== AVAILABLE)
```

```
{
```

```
The VM is reallocated to the user base request;
```

```
}
```

```
Else
```

```
{
```

```
Allocate a VM to the user base request using Round Robin
Algorithm;
```

```
Update the entry of the user base and the VM in the hash
map and the VM state list;
```

```
}
```

```
}
```

```
}
```

## V. RESULT ANALYSIS

The proposed algorithm (i.e. the Round Robin Load Balancer Algorithm) implemented for simulation. Java language is used for implementing VM load balancing algorithm. Table 3 shows the result based on Round Robin VM Load Balancing algorithm for overall response time of the cloud. In this min(ms) time, max (ms) time to different number of virtual machines are analysed. Table 4 shows the result based on Round Robin VM Load Balancing algorithm for Data Centre processing time of the cloud. In this min (ms) time, max(ms) time to different number of virtual machines are analyzed.

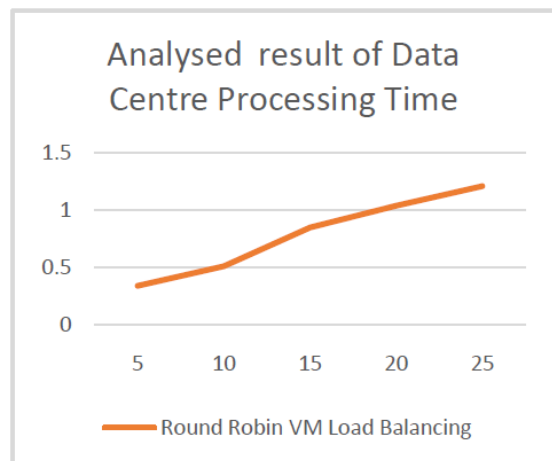
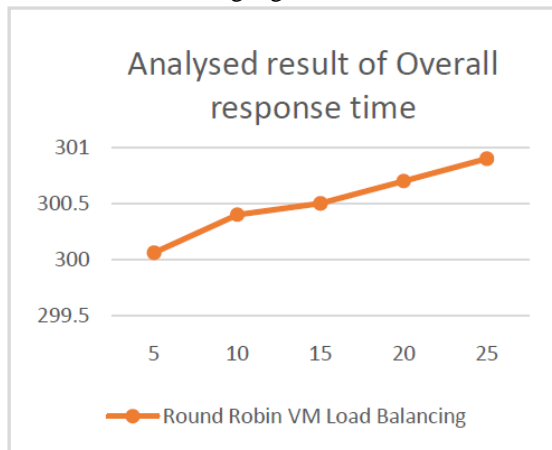
Table 1: For overall response time for Round Robin Load Balancing

No. of VM's	Avg(ms)	Min (ms)	Max (ms)
5	300.06	237.06	369.12
10	300.4	237.06	369.12
15	300.5	237.06	369.12
20	300.7	237.4	370.02
25	300.9	237.4	370.02

Table 2: For Data Centre processing time for Round Robin Load Balancing

No. of VM's	Avg (ms)	Min (ms)	Max (ms)
5	0.34	0.02	0.61
10	0.51	0.02	1.51
15	0.85	0.02	1.51
20	1.04	0.06	1.51
25	1.21	0.11	1.51

Analysed result shows that Round Robin Load Balancing consumes less time for overall response time and data centre processing time over Round Robin method. When number of virtual machine is increases then it takes more time for over all response time and data centre processing time. It decrease the problem of deadlock and server overflow in cloud environment by the new service broker policy in virtual machine that is Round Robin VM load balancing algorithm.



## VI. SUMMARY AND CONCLUSION

The total work of this thesis work is done for five servers. A virtual machine is a virtual form of computer hardware within software. Virtual machine is a software implementation that executes programs as if they were actual physical machines. We also gives the detailed review on existing scheduling algorithm. The proposed Round Robin VM Load Balancing and existing Round Robin algorithm implemented Java language for implementing VM scheduling algorithm in CloudSim toolkit. Assuming the application is deployed in one data centres having virtual machine (with 2048 Mb of memory in each VM running on physical processor capable of speed of 1000 MIPS). These experimental results show that Round Robin VM Load Balancing method improves the performance by consuming less time for scheduling virtual machine.

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