**IJCTA,** 9(21), 2016, pp. 31-37


# Implementation of Enhanced Load Balancing Algorithm in Cloud Computing using Virtualization

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***Abstract :*** Cloud computing demand is proliferating day-by-day. Expanding demand makes it complex and also many issues. Load balancing is one of the main barriers. To solve this problem we propose an algorithm discussed in this paper. With sprouting demand and advancement in cloud computing technology, there is a need to simulate large scale of applications on cloud before implementing them in real time environment. For simulating the cloud we use virtualization. As virtualization makes the setup cost feasible and it's easy to simulate the results.

***Keywords :*** Cloud computing; load balancing; virtualization; Enhanced Priority based Algorithm.

## 1. INTRODUCTION

A.Cloud computing the long held dream of computing as a utility has the potential to transform a large part of the IT industry, making software industry even more attractive as a service and shaping the way IT hardware is designed and is purchased .Developers with innovative ideas for more new internet services no longer requires the large capital outlays in hardware to deploy their services at the human expense to operate it. Cloud computing refers to both the application delivered as service over the internet and the hardware and the software in the data center that provides those services [1]. The cloud can offer consumers access to a number of different services, it's just the cloud provider's imagination and resources that put the limit. Service Providers today offer for example expensive software's, sophisticated platforms, unlimited file storage and high computing calculation power for research projects [2]. The beauty of cloud services is that all of the different services and resources are in the hands of the provider. The end customer no longer needs the technical knowledge or the money to set up a similar system on their own. Therefore, money can be saved as you are only being charged by what you use; a certain amount of gigabytes for file storage, license for a specific software or time using a service [3].

### A. Load Balancing in cloud computing

Load Balancing is a technique in which workload is distributed over a number of nodes to decrease the traffic and increase the efficiency and throughput of the cloud and also satisfying the condition that no node is overloaded and none is idle. Load balancing is used to make sure that none of your existing resources are idle while others are being utilized. There are various parameters( reliability, waiting time, adaptability, load rejection, stability, response time, resource utilization, turnaround time, throughput, execution time, fault tolerant, process migration, processor thrashing) which will improve the load balancing if we properly utilizing the resources[4,5]. Different algorithms have different criteria and environment to improve the performance. As while using website users

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could experience delays, possible long system responses and timeouts due to traffic and overloading. Load balancing resolve this problem [6]. It provides better distribution of the communication traffic so that website availability is conclusively settled.

A dynamic load balancing algorithm depends upon present state. It does not consider about previous state or behavior of the system. While balancing the load we should consider various parameters which will improve the load balancing if we properly utilizing the resources. Some of these parameters are reliability, waiting time, adaptability, load rejection, stability, response time, turnaround time, throughput, processor thrashing, execution time, resource utilization, fault tolerant, process migration, etc. [7].There is many algorithms that are used to distribute the load. Different algorithms have different criteria and environment to improve the performance.

### B. Virtualization

Virtualization is defined as a technology that provides abstraction between the computer hardware and the software running on them [12]. It is the process of creating a hypothetical version of something such as an operating system, a server, a storage device or network resources. This concept of virtualization has been around since 1960s *e.g.*, in IBM main frame systems. Since then, the concept has grown considerably and it has been applied to all aspects of computing –networks, memory, software, storage, and processors as well as services that IT offers. It is the fusion of the growing requirements and the recent advances in the IT architectures and solutions that is now bringing the virtualization to the true commodity level. Virtualization make the service very economic due to its ability to offer very advanced And complex IT services at a feasible cost, is poised to become, along with wireless and highly distributed and pervasive computing devices, such as sensors and personal cell-based access devices, the driving technology behind the next wave in IT growth. Figure 1 shows the logical diagram of full virtualization [13, 14].

### C. Advantages of Virtualization[14]

- Workload consolidation
- Create many virtual machines on a host
- Security and reliability of applications
- Create virtual machine for every application
- Test an application simultaneously with production Use of a host Use separate virtual machines
- Disaster management
- Port a virtual machine

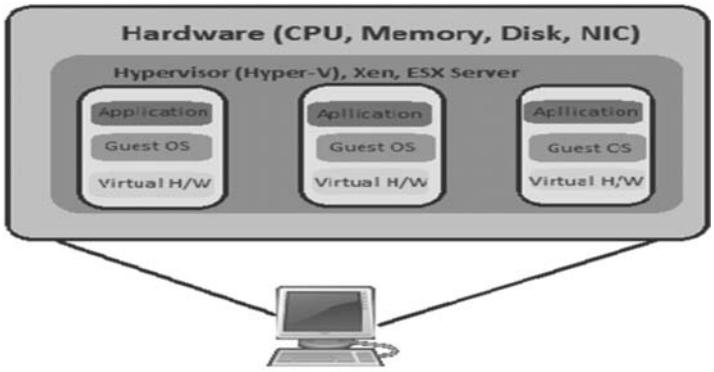


**Fig. 1. Logical diagram of Virtualization**

## 2. LITERATURE REVIEW

Load balancing in cloud computing is used to overcome from the problem of traffic and delay in service providing during the communication between cloud provider and client who is requesting for resources. In this thesis I have read various papers which try to solve this problem up to a great level. I have learnt my things like security issues, parameters which are improved to provide good quality of service. Still there is a need of further improvement. I have also tried to improve the problem by designing an algorithm and testing in cloud environment

with the help of virtualization. In this chapter I have compared various algorithms on the basis of parameters, merits and demerits. Distributed Load Balancing is used to distribute the work load over multiple networks. For this many distributed solution have been identified. There are different algorithms used for it. Some of them are as follows:

### A. Honey Bee algorithm

This algorithm achieves global load balancing through local serve actions. Its whole concept is based on the behavior of honey bee, how they search their food and then inform others for the same by waggle dance. The strength or power of waggle dance gives idea about the amount of food present. Similarly the load is managed on the cloud. The main server search for least loaded node and forward the client request to that node. When that machine is overloaded the user request is forwarded to next less loaded virtual machine [4, 6].

In case of load balancing, as the web servers demand increases or decreases, the resources are assigned dynamically to regulate the changing demands of the user. The servers are arranged under virtual servers (VS), each VS having its own logical service queues. Each server processed requests from its queue to calculate profit or reward, which is similar to the quality that the bees show in their waggle dance. One parameter of this reward can be the amount of time that the CPU required to process the request. The dance floor in case of honey bees is similar to an advert board here. This board is also used to communicate the profit of the entire colony. Each of the servers plays the role of either a forager or a scout. The server after executing a request can publish their profit on the advert boards with a probability of pz. A server can choose a queue of a VS by a probability of py showing forage/explore behavior, or it can check for advertisements (see dance) and serve it, thus showing scout behavior. A server executing a request simulates its profit and compares it with the colony profit and then sets its py. If this profit was high, then the server stays at the current virtual server; posting an advertisement for it by probability pz. If it was low, then the server returns to the forage or scout behavior. [4, 8].

### B. Active Clustering

Active Clustering is an iterative process which works on the principle of inter clustering(group similar nodes together) and working on these clusters. In this load balancing algorithm, process is triggered by a node and then selecting another node from its neighbor called matchmaker node which satisfy the condition that it should not similar to the initiator one[9]. Now the matchmaker node forms a connection between neighbors of it which is of the same type as the initial node. The matchmaker node then isolates the connection between itself and the initial node.

### C. Ant Colony Optimiation Algorithm

This technique take the idea from the ant behavior, how they gather information about the source of food and leave the liquid(pheromone) in the path to inform others the about the path of food. This algorithm maintains a pheromone table on the basis of resource utilization and node selection method. The ants searches for overloaded node *i.e*. the place where there is large amount of food and then traverse it and then go back to fill the under loaded node so as to make balance or evenly distribute the load[10].

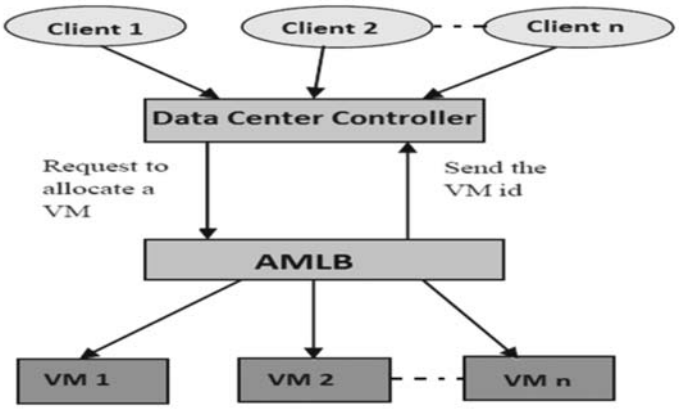


**Fig. 2. Active clustering ([9])**

## 3. PROPOSED WORK

In the proposed algorithm priority is assigned to each resource and on the basis of these priorities load is calculated by a formula that is defined in algorithm. On the basis of this load the request is sent to the cloud service provider in round robin way [16]. The cloud service provider decides to send the coming request to the machine which is least loaded. Thus all the request are executed without waiting for long time and neither go under starvation and all the resources are properly utilized. Thus no node is overloaded and requests are easily processed. Figure 3 shows the logical working of algorithm.

For creating cloud environment we use VMware tool to create virtual machines for simulating the output and XAMPP server as a server. After that the proposed algorithm is executed on the cloud to simulate it.

### A. Enhanced Priority based Algorithm

1. Initialize the load first assign priorities to the resources.
2. Now compute the load on each virtual machine(vm)by formula

$$\text{Load} = 4*c + 3*r + 2*d$$

   Where c is CPU utilization, r is ram utilization and d is disk utilization.
3. On the basis of this load sort the data centers and the coming request is forwarded to least loaded machine first in round robin manner on the basis of priority of coming load.

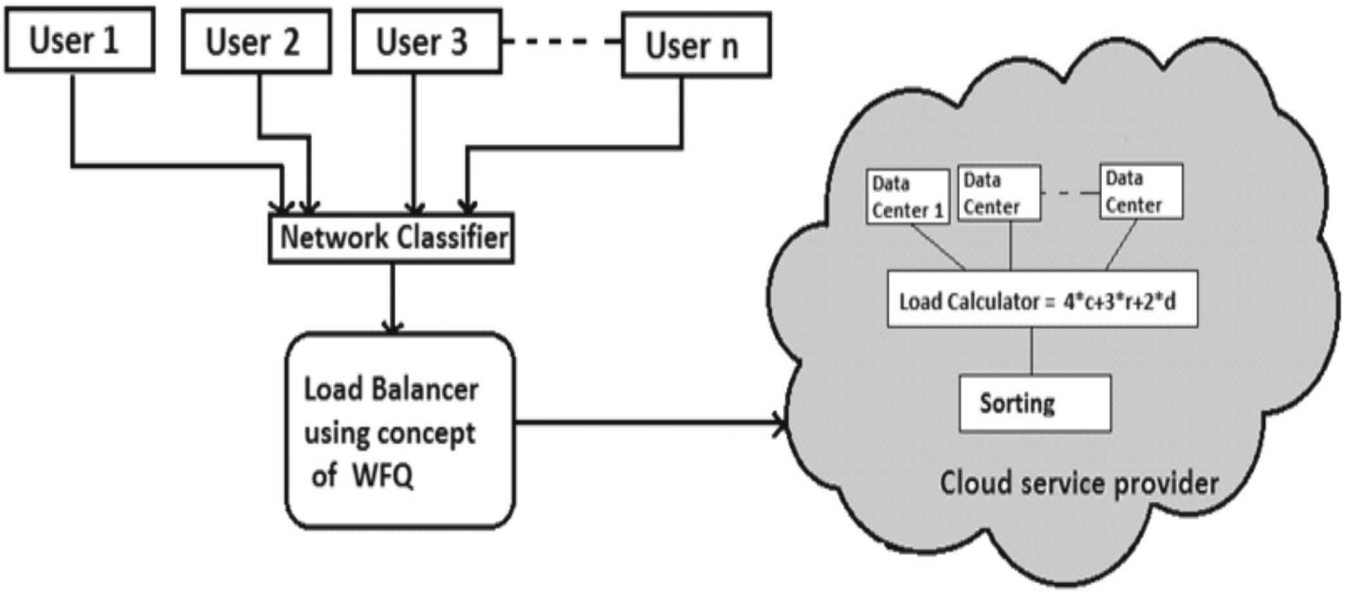


**Fig. 3. Diagram showing the working of algorithm**

## 4. RESULTS

**The Output of the execution of algorithm is given below .**

1. When the program is executed, the percentage of CPU, disk and memory utilization of each vm is calculated and output is shown on respective virtual machines. Also shown below in figure 4 and figure 5.
2. Calculation of load during different iteration during program execution shown in figure 6 with the help of table, which shows the total load and gives the least loaded virtual machine.
3. When client request for resource from cloud service provider and the node provided to it which is least loaded is shown in figure 7.

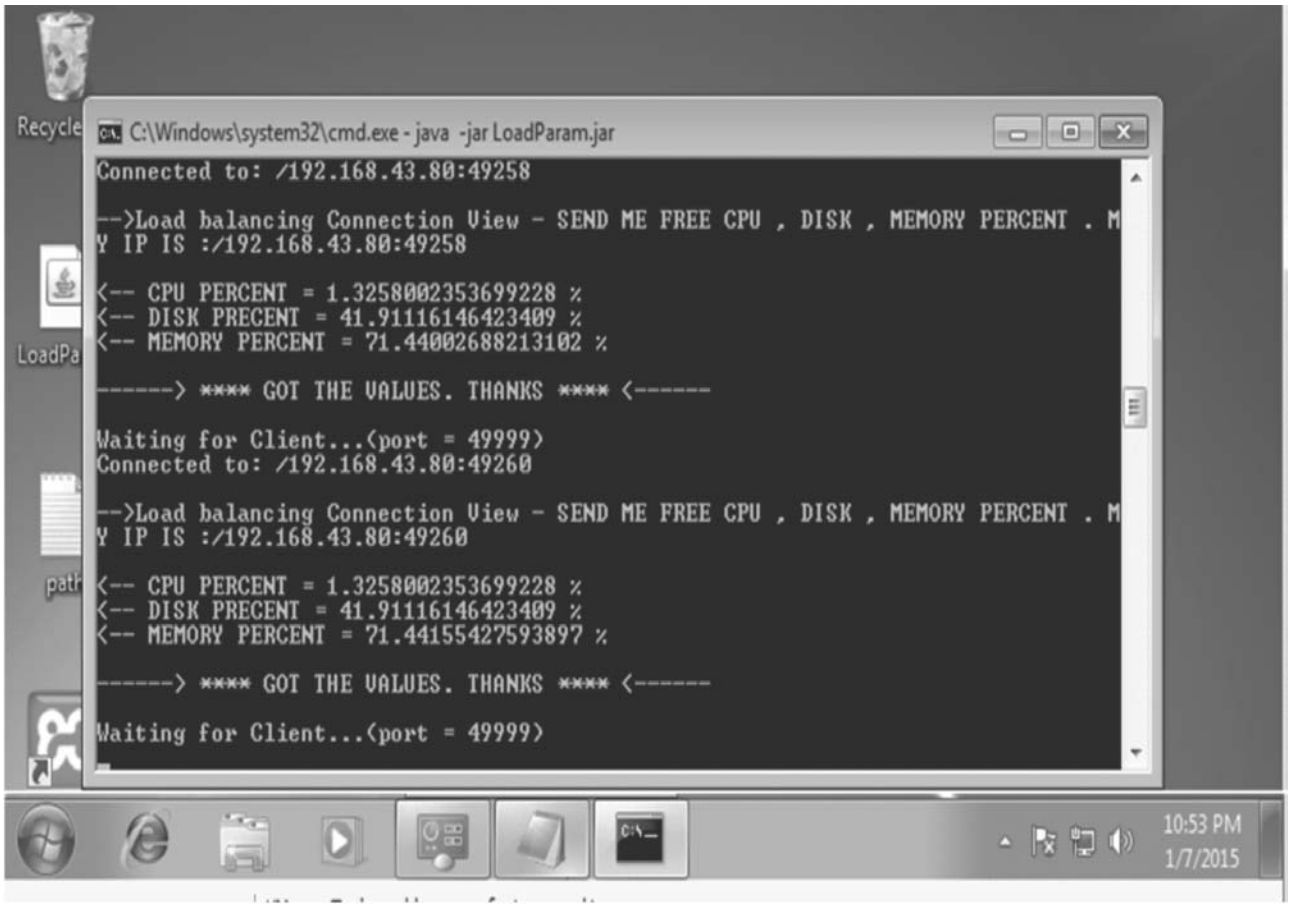


**Fig. 4. Output of Virtual Machine 1**

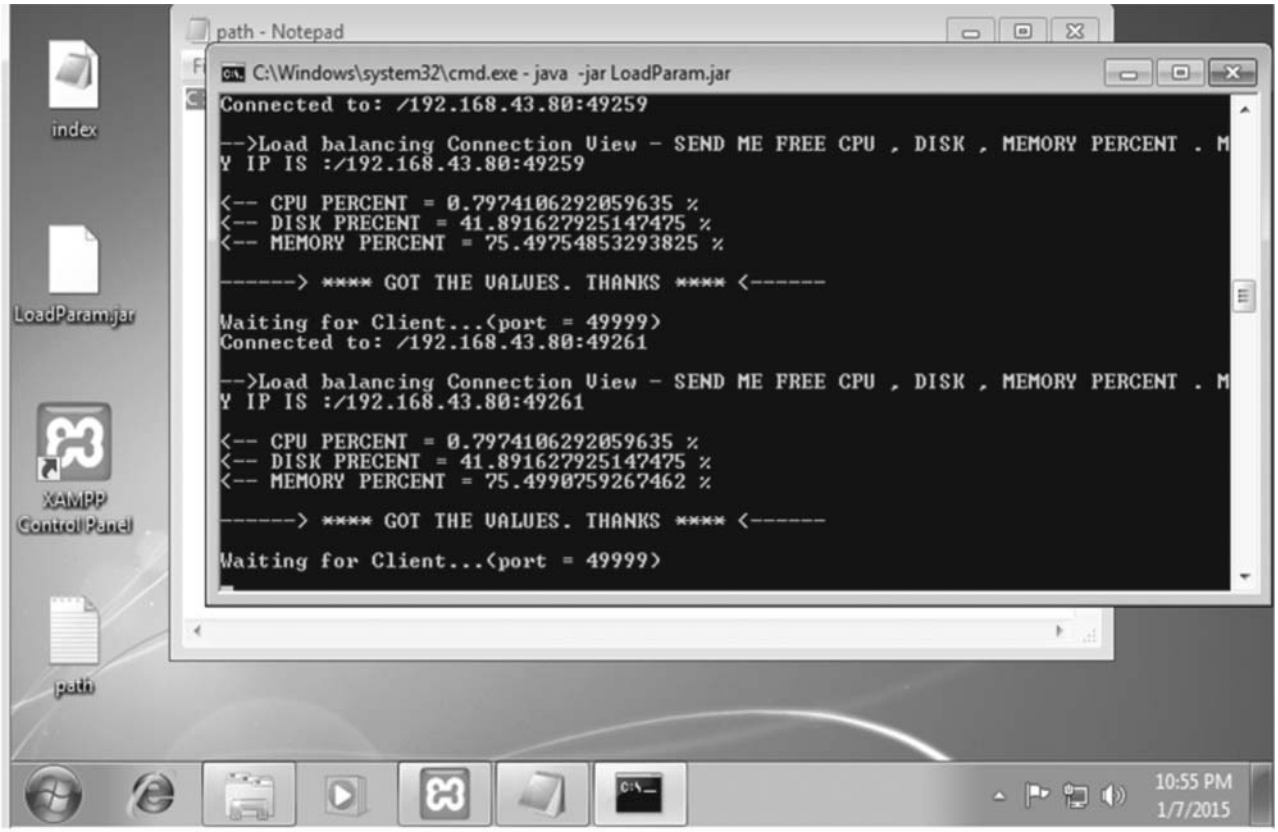


**Fig. 5. Output of Virtual Machine 2**

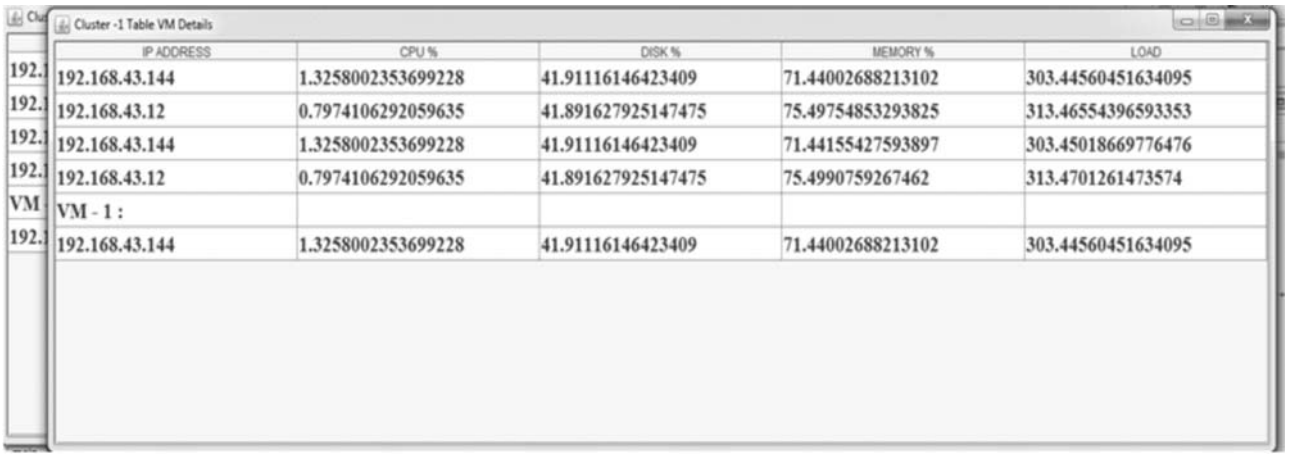


**Fig. 6. Total load on each virtual machine**


**Fig. 7. Allocated vm to client**

## 3. CONCLUSION

The overall goal of this research project is to equally distribute or balance the load on cloud. Load Balancing in cloud will hopefully improve the performance of cloud services by preventing overloading of servers which would otherwise degrade the performance. This project will help dynamically allocate jobs (data) to less loaded server which increases the overall performance of cloud. Using virtualization decreases the cost of the cloud and also increases the efficiency of the cloud. Client should not wait for executing its request due to overloading of server. There are provisions to accommodate future modifications in the system. Thus, we have successfully collected information of project and hopefully we will implement Load Balancing Model for better utilization and performance of cloud services using virtualization.

## 4. FUTURE WORK

The Cloud computing is an innovative techniques whose vision is to reduce the cost of computing, storage, increasing reliability and flexibility by transforming computers from something we buy and operate ourselves to something is operated by third party. It's a vast area and load balancing plays a major role in it and there is still need of improvement. I have discussed a solution using weighted fair queue concept using round robin scheduling that is used to balance the load on cloud. But there are still other approaches that can be applied to balance the load in clouds. The performance of the existing algorithm can also be enhanced by changing different parameters.

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