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Comparative Analysis of Load Distribution in Cloud using Cloud Analyst

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ABSTRACT

Cloud computing has become one of the trending field in IT, making it easier for users to access whatever they need on the Internet. Cloud Computing has benefited the users in many ways. In cloud environment, load balancing is an issue. It distributes the load among various nodes for better utilization of resources and improve response time. It also helps to avoid a situation where, there are nodes which are over loaded and other nodes are under loaded. The main purpose of this paper is to check the performance comparison in the service broker policy with optimizing response time. To face the challenge of load of data between servers, different algorithms are used. This paper discusses few of them andsimulation is performed using cloud analyst tool.

KEYWORDS: load balancing; cloud computing; cloud analyst

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INTRODUCTION

Cloud computing has become very popular these days for accessing online computing resources in a pay per use manner. It helps users to access the resources and also stores data according to their requirements. A cloud has many different elements such as client, distributed servers, datacenters.The cloud supports the concept of virtualization that displays virtualized data centers. When multiple nodes are connected in the cloud and random request are coming together, there is a possibility that some node may become overloaded and some under loaded. This situation gives rise to load balancing when work load are not properly distributed. Efficient resource allocation is necessary,so that the performance increases and the energy consumption and the carbon emission rate are reduced.

According to NIST definition, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."[1]

The architecture of cloud computing consists of two different models and essential characteristics.

Service model:-

IaaS: It offers infrastructure facilities for providing instances of Virtual Server and Storage.

PaaS: This service offers tools to create host on the infrastructure.

SaaS: It offers software applications.[2]

Deployment model:-

Public cloud: It is used by third-party providers to utilize cloud services.

Private cloud: This model was adopted by organizations to provide cloud service to the internal users.

Hybrid cloud: It is a model which consists of bothpublic and private cloud deployed to provide service for entire organizations. Sensitive and critical applications based organization adopts this delivery model.[3]

Load balancing in cloud[4] distributes the workload over multiple nodes so that no node is over loaded or sits idle. It is the basic issue in cloud computing. It makes sure that all the nodes in the system does almost same amount of work. Task scheduling and resource allocation is basic work of a load balancer. Cost and energy is reduced which provide high user satisfaction and improve overall performance.
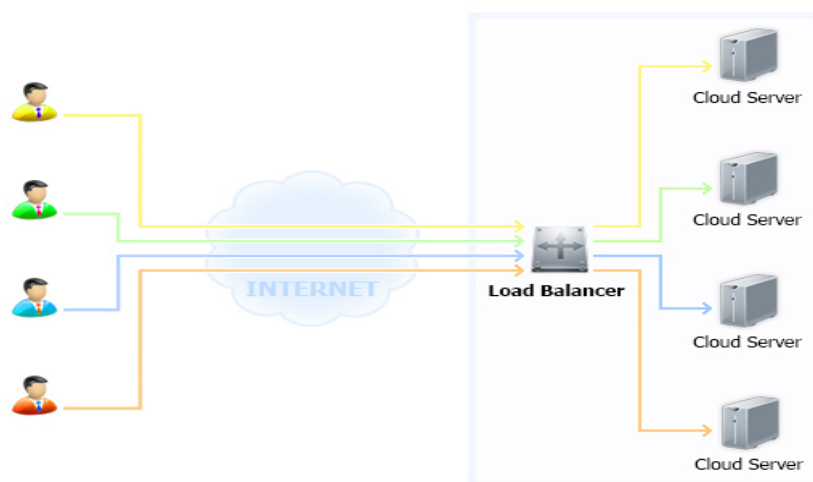
Fig1:- load balancing architecture

PROBLEM STATEMENT

When a request arrive to the Datacenter Controller, it has to be allocated to one of the nodes, but the requests have to be distributed equally within the system to avoid load of the work and system's performance degradation. From architecture of cloud we deduce that we need another componentcalled Load Balancer to balance the load of the system. The Load Balancer plays a major role in the cloud's total response time. In Cloud Computing the Load balancer selects the Data Center and virtual machines for upcoming request.

In the success ofcloud computing the load balancing and task scheduling plays an important role. Different factors affect cloud performance in terms of network data storage and resource sharing.[5]

LOAD BALANCING ALGORITHMS

Round robin algorithm:-

Jobs are allocated circularly. The assignment of processors takes place in a circular order.[6]when work is distributed equally in each node, the response if fast. The major drawback is that some nodes are overloaded in this algorithm, and others remain idle or underused.
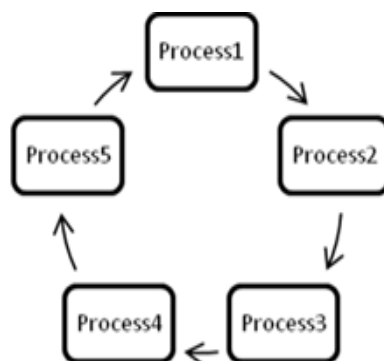

Fig2:-Round Robin

Honeybee foraging behavior load balancing algorithm:-

It is based on the real honey beebehavior and the way they find their food sources. Once, they find their food sources, they come back to their bee hive to inform the other bees about the food source. This is done by performing group movement, which is also known as "waggle Dance".[7] They perform waggle dance to give information to the other bees about the exact place the food source is located. It also tells about the quality of the food and the quantity.

Throttled load balancing algorithm:-

This algorithm is best suited for virtual machines. First of all the list of virtual machines is created. On the arrival of request the scanning of indexing table is done and available virtual machine is assigned. After the job is completed the indexing table is updated. [8]
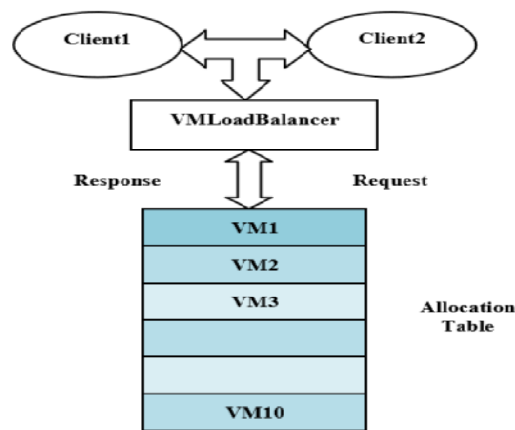

Fig3:- Throttled

ESCE(Equally Spread Current Execution) algorithm:-

In this algorithm, list of virtual machines and jobs are maintained. Whenever a requests arrives the list is scanned first and then it is allotted to the best suited virtual machine. Equal amount of load is distributed to all the virtual machines.[9]

Ant colony algorithm:-

It is based on the behavior of real ants. When they go for searching food they select the shortest path to reach there. Whenever request comes ant starts its movement. To gather information from the nodes, constant observations are made to find if the node is overloaded or under loaded. The ant turns back if they find any overloaded node and proceeds if the node is under loaded.

PROPOSED WORK

The cloud analyst simulator is used in this paper for experimental work.

Different algorithms of load balancing are compared in this and the parameters in which they were analyzed are total cost involved, overall data processing time and overall response time. The simulations are performed and results are compared using optimum response time in the service broker policy.

Cloud analyst:-

Cloud Analyst[10] is Constructed over existing Cloud Simtoolk it, which extends the CloudSim functionalities, and also helps in modeling, simulation and other experimentation [11]
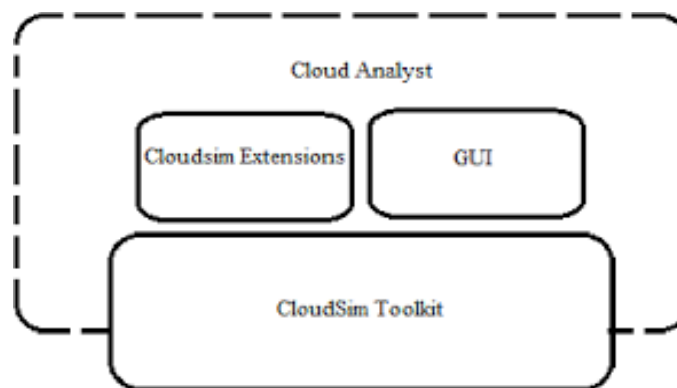

Fig4:- Cloud Analyst

Few elements of cloud analyst are:-

* GUI : It uses the Java GUI.

* Region: There are 6 regions on which Data centers can be created.

* User Base: It is the group of users which sends the requests to Data centers.

* Datacenter: Process the requests of User Bases and includes the different Virtual Machines.

* DC Controller: It is used to control the Datacenters and VMs.

* Internet Characteristics: It has the characteristics of Bandwidth and Latency.

* VM Load Balancer: It is used for balancing the load.

* Service Broker: It clears the web traffic of the requests.[12]

EXPERIMENTAL SETUP

In the cloud analyst simulator, the proposed algorithms are implemented. Different parameters such as user bases,advance configuration and data center configuration are set in this simulation.
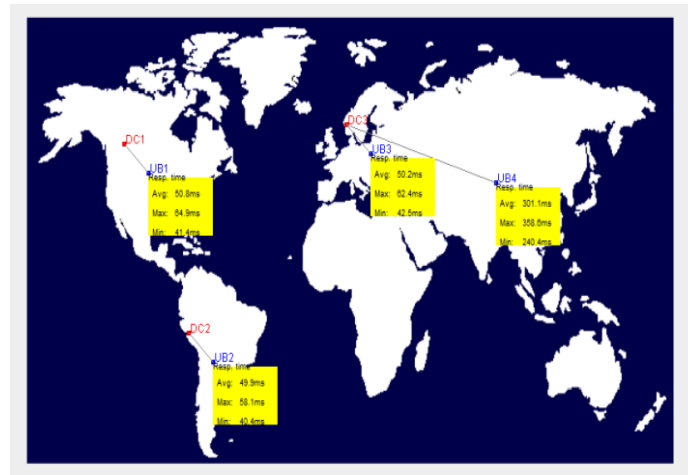
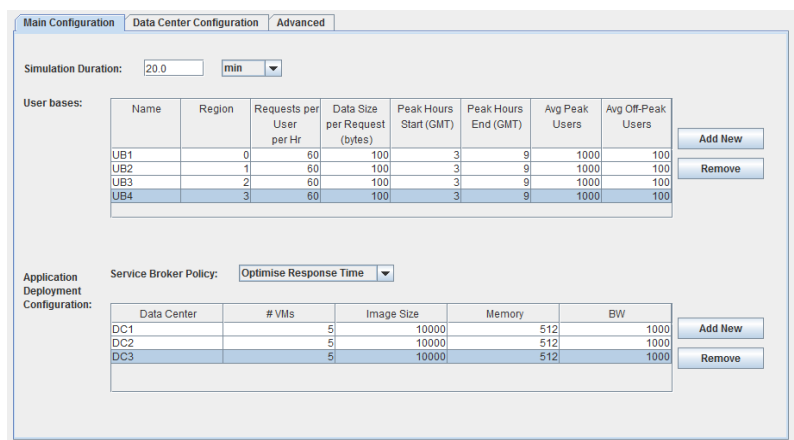**Fig5:- Datacenter by Region**

Fig6:- Main Configuration

This figure shows the main configuration setup where the different parameters are set. It consists of User bases, simulation duration where we can set the duration of the simulation and service broker policy. There are three service broker policies in cloud analyst and they are optimize response time, closest data center and dynamically configured. In this we also have data center configuration where we set the different data centers at different regions. The cloud analyst also consists of advance where we can set the number of users a single user base can have. There is also executable instructions length per request and there we can set our load balancing algorithms.

The simulation duration is set to 20 minutes, 4 user bases and 3 data centers are taken with 5 VMs each. Request per user is 60 and data size on every request is 100. The no. of user in single user base and request grouping factor is 10.

SIMULATION RESULT:-

The simulations are performed three times with the parameters. Every time the load balancing algorithms are changed and analyzed.Results are compared with the response time and cost criteria.

Table 1:- overall response time with respect to region

User Base	Round robin	Throttled	Honeybee
UB 1	50.69	50.59	50.77
UB 2	49.97	49.99	49.93
UB 3	49.98	50.10	50.16
UB 4	301.58	301.39	301.13
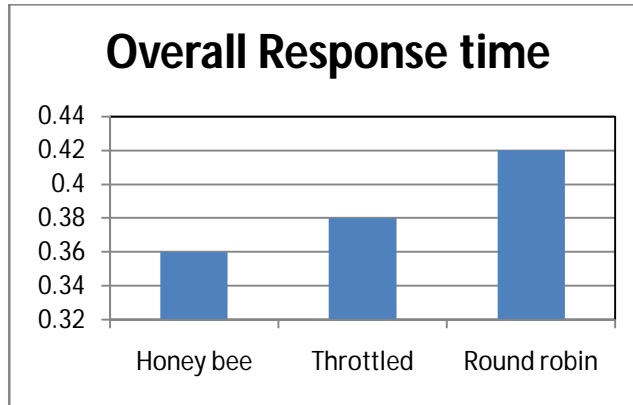
Fig7:- Total Response Time

Table 2:- Total Cost Involved

Cost involved	
Total virtual machine cost	0.50$
Total data transfer cost	0.09$
Grand Total	0.59$

The costs involved in all the three simulations are same.

Now, few more simulations are done with some parameters to get the result and they are total number of tasks, executable instruction length and average number of requests.[13]
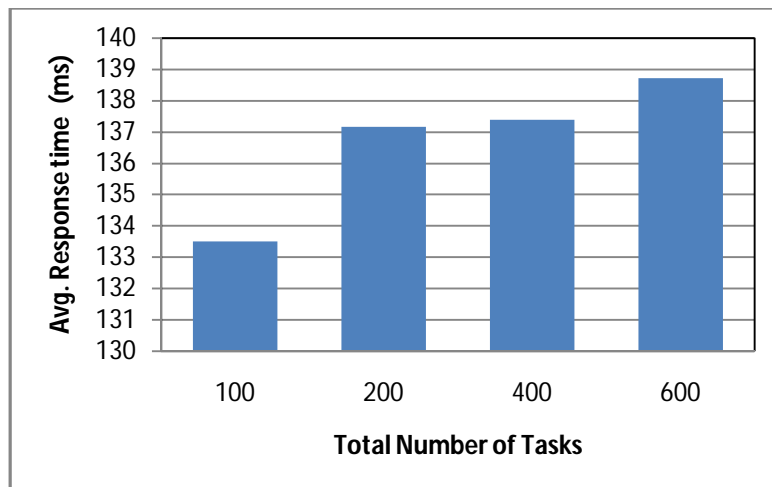

Fig 8:-Average Response Time Vs Numberof Tasks

This figurerepresents the average response time over total no. of tasks of Honeybee and the executable instruction length taken is 2000 byte. It is observed that with the increasing number of tasks the response time also increases.
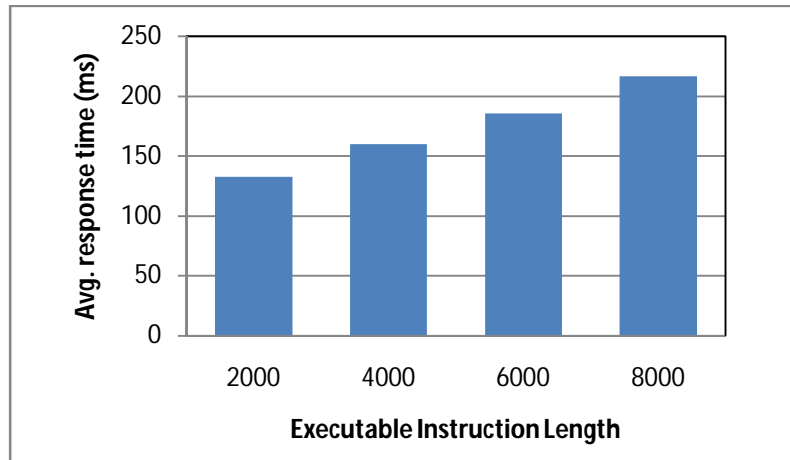

Fig 9. Average Response Time vs Executable InstructionLength

This figure presents average response time of Honey Bee with executable instruction length per request. It is observed that with the increasing number of executable instructions the response time also increases.

Comparison with the other algorithms:-

The comparison of proposed Honeybee is done with the, Round Robin and Throttled algorithm.
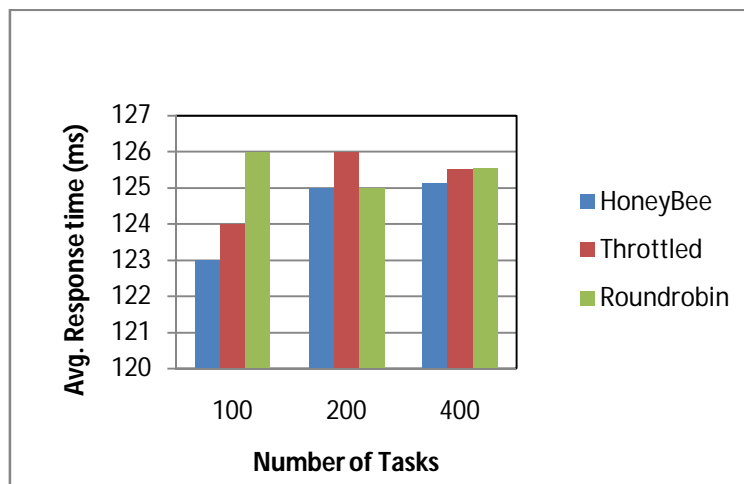

Fig 10: Average Response Time vs Numberof Tasks

This figure presents the average response time upon no. of tasks comparing Honeybee, throttled and roundrobin. Honeybee shows better performance in comparison to other algorithms.
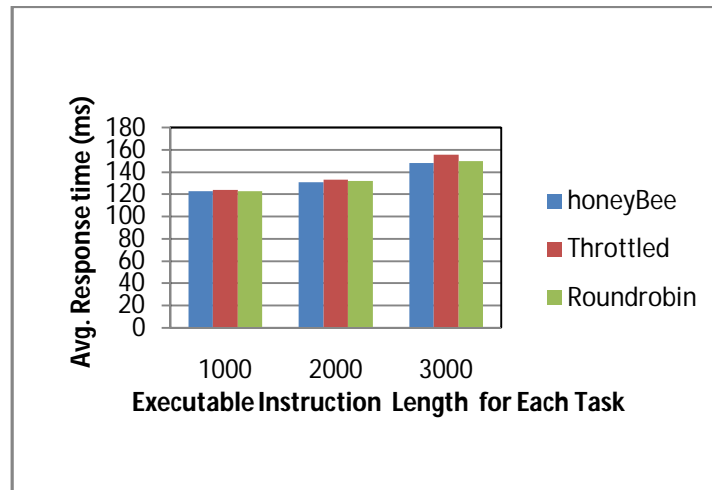
Fig 11. Average Response Time vs Executable InstructionLength

This figure presents the average response time of Honey bee, Round robin, and throttled algorithms versus executable instruction length. The number of executable instructions changes from 1000, 2000 and 3000. The average response time is almost similar in all cases.
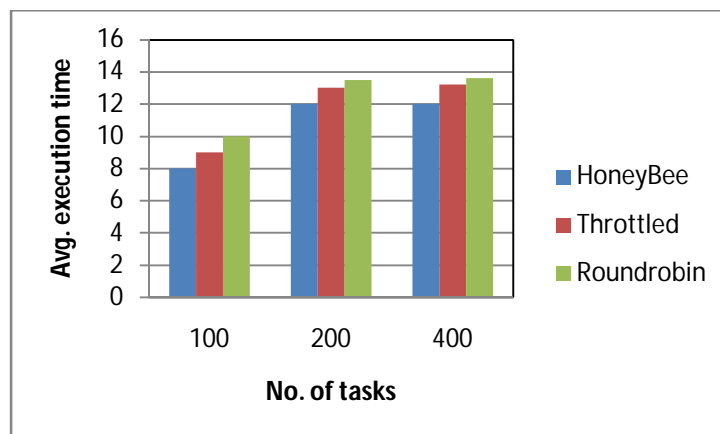

Fig 12. Average Execution Time vs Numberof Tasks

This figure shows the average execution time over no. of tasks and the comparison is done among Honeybee, round robin and throttled. The number of tasks is 100,200 and 400. It is seen that the average execution time for honey bee is better than the other algorithms

CONCLUSION

Cloud analyst is asimulator for balancing the load which design and analyze the cloud based issues. This paper shows how simulations are done in such environment with different parameters. The load balancing mainly focuses on response time and data transfer costs as it impacts the system performance[14].Three algorithms round robin, throttled and honeybee are taken into consideration and comparison are done with simulation metrics like overall response time, average execution time, data centerservice time and overall cost. According to the result and analysis of the experiment, the

proposed Honeybee hasthe best performance in the cloud environment when it comes to overall response time however, there no difference in the cost involved.

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