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Enhanced Load balancing Algorithm in Heterogeneous Cloud Environment

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Abstract: Cloud Computing is the rising area in the field of information technology (IT). It is growing very fast and provides an alternative to conventional computing. Cloud computing is a distributed computing where computing resources are made available to the users in a pay-as-you-go model. The three main types of services provided by cloud are Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). The main aim of cloud computing is to provide the satisfactory level of performance to the user. In cloud computing there are various technique to handle the large services and operations perform on it. To improve the performance of the user operations and storage utilization, it is important to research some areas in the cloud computing. One important issue associated with this field is load balancing. There are various algorithms for load balancing in cloud computing. In our proposed research work, Round Robin and Throttled algorithm has been modified. We have also tested our modified algorithm in heterogeneous cloud environment. Parameters considered for evaluating the performance of modified throttled algorithm are Response time and Data centre request processing time.

Keywords: Cloud computing, Throttled, Round Robin, Load balancing, Cloud analyst, Response time.

1. INTRODUCTION

In the last few years Cloud Computing became very popular. It provides a flexible and easy way to keep and receive the cloud services. It makes a large data sets and files available for the spreading number of users around the world. Cloud computing is an evolutionary outgrowth of prior computing approach, which builds upon existing and new technologies. Cloud Computing is an emerging computing technology that is rapidly consolidating itself as the next big step in the development and deployment of an increasing number of distributed applications. The cloud has created a new look to align IT and business visions. It is providing Software-as-Service (SaaS), Platform-as-Service (PaaS) and Infrastructure-as-Service (IaaS) in a virtualized cloud environment. The cloud computing power is made possible through distributed computing and the advanced communication networks. Cloud works on the principle of virtualization of resources with on-demand and pay-as-you go model policy. [1, 2]

2. LOAD BALANCING IN CLOUD COMPUTING

Load balancing is the major issue in Cloud Computing field. It is a technique which is used to distribute the load over different nodes. It is a method in which workload on nodes distribute to respective the other node in a network without disturbing the running task. The main aim of the load balancing algorithm is to efficiently assigning task to the cloud nodes such that the response time of the request is minimum and request processing is done efficiently [3]. The

load balancer determines which web server should serve the request. The load balancer uses a variety of scheduling algorithms to verify which server should handle and forwards the request on to the selected server. Load Balancing eliminates the situation of some servers very highly loaded while the other servers very lightly loaded in terms of CPU load percentage. [4]

3. LITERATURE REVIEW

Raza Abbas Haidri et. al. (2014) proposed heuristic based load balanced scheduling model for efficient execution of tasks. The proposed model balances the loads coming from several users among datacenters and hence it offers better resource utilization and high availability in the form of improved response time and turnaround time. [5]

Subasish Mohapatra et. al. (2014) discussed four different scheduling algorithms in cloud environment. Each algorithm is implemented and their scheduling parameters like average response time, data center service time and total cost of different data centers are observed. According to the simulation results analysis round robin algorithm has the best integrate performance. [8, 9]

Shridhar G.Damanal and G. Ram Mahana Reddy (2014) proposed an efficient algorithm which manages the load at the server by considering the current status of the all available VMs for assigning the incoming requests intelligently. The VM-assign load balancer mainly focuses on the efficient utilization of the resources NMs. Hence proposed algorithm solves the problem of inefficient

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utilization of the VMs / resources compared to existing algorithm. [6, 7]

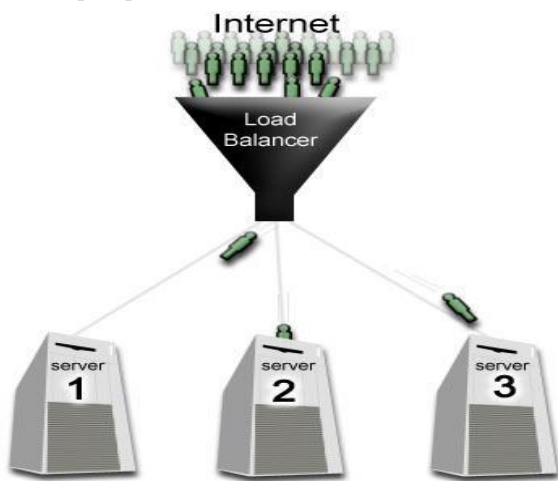


Figure 1: Load Balancer

Youssef Fahim et. al. (2014) discussed a new improvement of the load balancing algorithm by one hybrid algorithm that takes into account, the current load of the virtual machine of a data center and the status of its tasks during execution, in order to overcome the problems caused by the static algorithms. The hybrid algorithm allows cloud service providers, to improve the performance, availability and maximize the use of virtual machines in their data centers. [10, 11]

4. METHODOLOGY

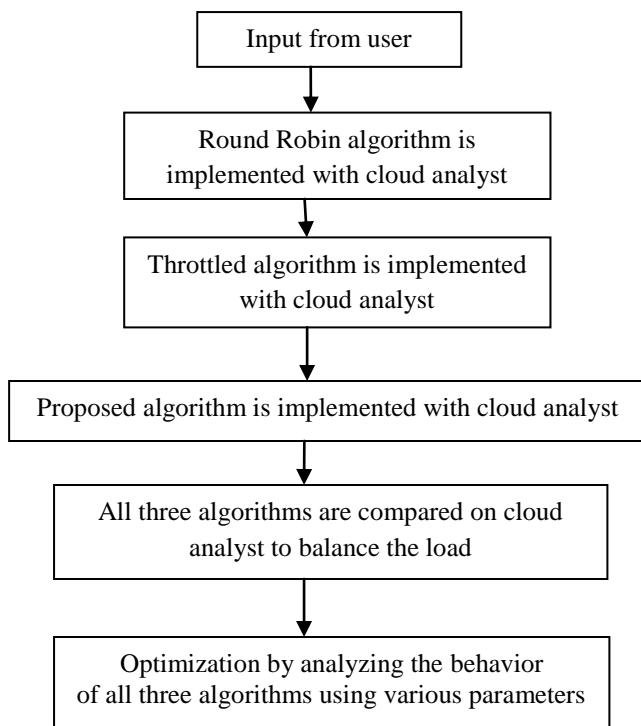


Figure 2: Algorithm steps

The performance of existing load balancing algorithms is analyzed using Cloud analyst which provides the simulated functionality of real cloud environment on low cost while allowing us to modify the existing architecture and check the results.

5. EXPERIMENTAL SETUP AND PERFORMANCE ANALYSIS

Experiment is carried out in the simulator. For the experimentation, Cloudsim based Cloud Analyst simulator has been used. Cloud Analyst simulator gives the real time scenario with six different geographical locations. i.e. depending on the specific application no of users from particular locations can be identified. The simulator is very flexible and it provides, virtual machines, data centers, band width and many more for experimentation. A snapshot of the Cloud Analyst architecture is shown below –

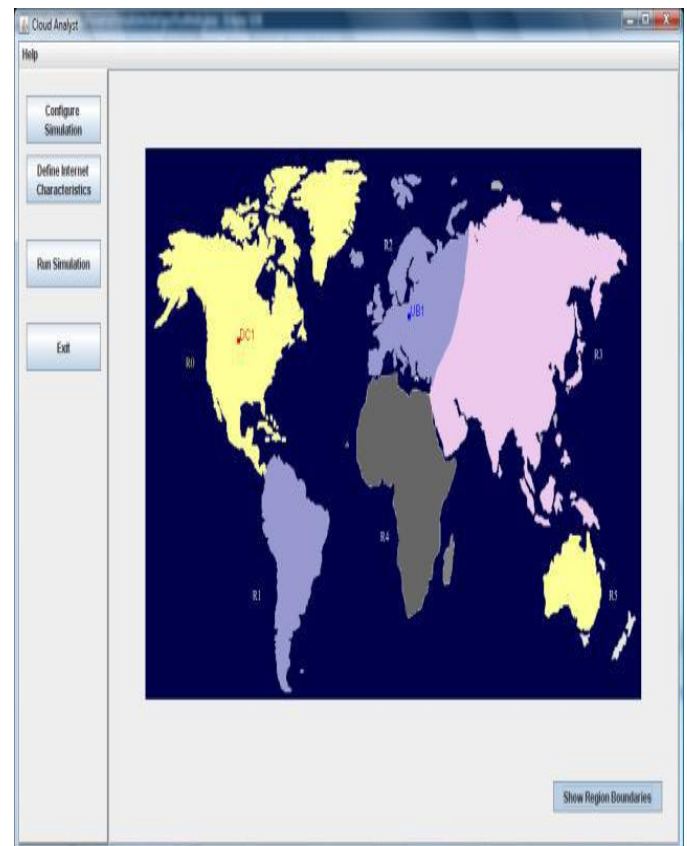


Figure 3: Cloud Analyst GUI

Results are obtained using Cloud analyst. Two parameters are considered for obtaining results namely Response time and Data center request processing time.

5.1 Response time

Average Response time for each user base calculated by the cloud analyst for each loading policy has been shown in Table 1.

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Table 1: Average response time

USER BASE	ROUND ROBIN	THROTTLED	PROPOSED ALGORITHM
UB1	1279.14	732.70	684.74
UB2	50.01	50.06	50.10
UB3	1298.07	743.53	711.39
UB4	1274.31	738.46	764.75
UB5	1251.48	669.44	678.39
UB6	1350.45	685.67	728.39
UB7	1235.01	762.74	777.52
UB8	1183.43	688.48	640.69
UB9	1298.20	733.05	665.83

Table 2: Average data center request servicing time

DATA CENTER	ROUND ROBIN	THROTTLED	PROPOSED
DC1	0.24	0.24	0.24
DC2	0.49	0.49	0.49
DC3	1571.38	859.78	819.57
DC4	0.36	0.36	0.36
DC5	0.36	0.35	0.36

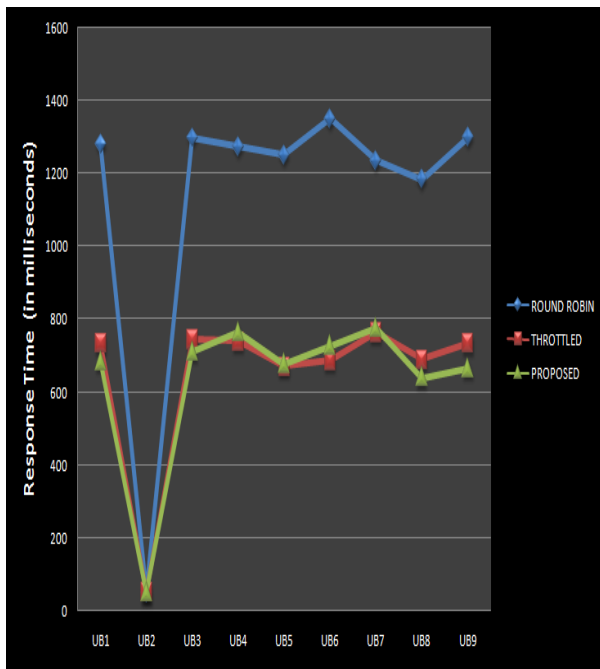


Figure 4: The Graphical analyses of Average response time.

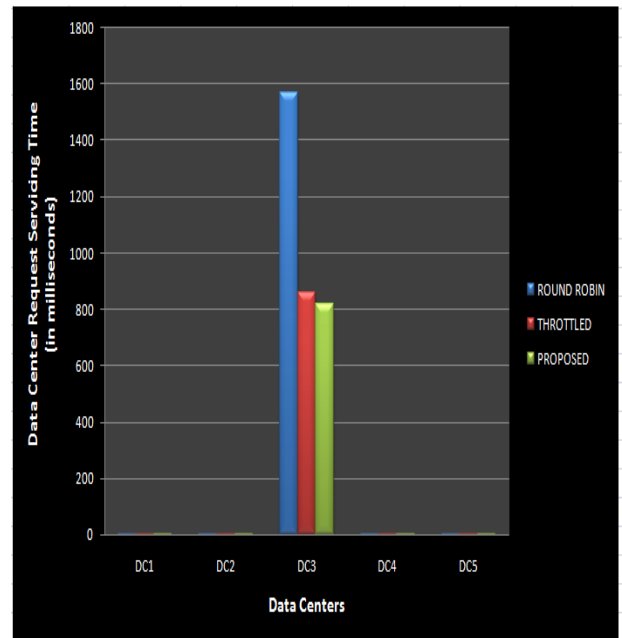


Figure 5: Average data center serving time and data centers

5.3 Overall Response Time and Data Center Processing Time

Overall response time and data center processing time of these three above discussed load balancing policies as discussed below:

Table 3: Comparison of load balancing policies

Parameter	Round Robin	Throttled	Proposed
Overall Response Time	1176.52	684.45	672.47
Data Center Processing Time	1007.26	514.71	502.43

5.2 Datacenter Request Servicing Times

Data Center Request Servicing Time for each data center calculated by the cloud analyst for each loading policy has been shown in Table 2.

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6. CONCLUSION

As cloud computing is a vast and emerging area, there are many issues related to it. Load balancing is one of them and it needs to be solved to provide better customer service. In our proposed work, a new enhanced load balancing algorithm is proposed and then implemented in heterogeneous cloud environment using Cloud Analyst tool. By considering the desired parameters in graphs and tables we can easily identify that the overall response time and data centre processing time is improved i.e. is reduced in comparison to the existing load balancing policies. Simulation result shows reduction up to 20-30% in the time. According to the experiment and analysis proposed enhanced algorithm has the best integrate performance.

7. FUTURE WORK

In future the work can be extended with different experiment setups having more datacenters spread around different locations, and trying to improve load balancing approaches on the basis of different parameters like cost. In the near future, this research will be extending for evaluating the performance in real time environment.

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