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An Improved Load Balancing Algorithm for public Cloud Environment

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Abstract: Cloud computing promises a new era of service delivery and deployment in such a way that every person can access any kind of services. It is a virtual pool of resources like storage, network, application, operating system and so on which are provided to users via internet. Cloud computing opens new possibilities approaching sustainable solutions to deploy and advance their services upon that platform. Cloud computing is an on demand service in which shared resources, information, software and other devices are provided to clients according to their requirements at specific time. The whole Internet can be viewed as a cloud. Capital and operational costs can be cut using cloud computing. One important issue associated with this field is load balancing in Cloud Computing. In our proposed research work, performance of optimal cost scheduling algorithm has been improved further. Parameters considered for evaluating the performance of enhanced cost scheduling algorithm are waiting time and turnaround time.

Keywords: Cloud computing,, Load balancing, Cloud simulator ,priority, Waiting time and Turnaround time.

1. INTRODUCTION

Cloud computing is a new generation of computing. It allows users to use computational resources and services of data centres (i.e., machines, network, storage, operating systems, servers, application development environments, application programs and services) over the network to deploy and develop their applications. The main feature of cloud computing is providing services on pay per use basis, which allows the users to organize their own sets of computing resources. The two main entities involved in cloud computing are the cloud user and the cloud service provider. Sometimes a cloud broker may also exist. Any resources required by the user are delivered by the cloud service provider. The main aim of cloud provider is to maximize his revenue and at the same time, optimize the usage of the datacenter. The user gets the Quality of Service from the provider on the pay as-you-use basis. This can be achieved by optimal datacenter utilization and proper load balancing. [7]

2. ALGORITHMS FOR LOAD BALANCING

Load balancing is a technique that is used to distribute the load over different nodes. It is done in such a way that it provides good resource utilization. When a particular node goes down or is overloaded with the data, then load is distributed to the other idle nodes. Load balancing algorithms are classified into two types: static algorithms and dynamic algorithms.

Static load balancing algorithms are mostly used for homogeneous and stable environment and these algorithms do not depend upon the current state of the system and have prior knowledge regarding system resources and details of all tasks

in an application. These kinds of algorithms face a major drawback in case of sudden failure of system resource and tasks. In these algorithms, prior knowledge of the node properties and capabilities consider for the assigning the tasks to the nodes based on the ability of the node to process new requests. Dynamic load balancing algorithms take decisions concerning load balancing based upon the current state of the system and don't need any prior knowledge about the system. This approach is an improvement over the static approach. The algorithms in this category are considered complex, but have better fault tolerance and overall performance.[6]

3. LITERATURE REVIEW

Nagamani et. al. proposed a optimal cost scheduling algorithm which helps us to reduce the cost and the processing power. Cloud resources that have been used are minimal. The proposed algorithm works fine when the VM in the data center are idle. It finds multiple slots in addition to finding single slot while load balancing and schedules a deadline sensitive request. It also works for cost optimization at the cloud service provider, while rescheduling already accommodates requests to make space for a newly arrived request. [1]

Raza Abbas et. al. proposed load balancer wisely binds the cloudlets to virtual machines to minimize the turnaround time and response time so that the desired objective is fulfilled. The model proposed is based on centralized load balancing strategy. [2]

J.srinivas et. al. looked at the basics of cloud. There are attention and relevance in the cloud. From a technology point of view, there are interesting technical problems to solve. From a consumer point of view, there are essential usability,

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stability and reliability problems to solve. On one hand, there are many stories of problems with clouds, from data loss, to service interruption, to compromised sensitive data. [3]

Mohsin Nazir et. al. concluded that Cloud Computing envisioned as the next generation architecture of IT Enterprise is a talk of the town these days. Cloud computing offers real benefits to companies looking for a competitive edge in today's economy. Many more providers are moving into this area, and the competition is driving prices even lower. [4]

Mayanka Katyal et. al. said that cloud computing is a new trend emerging in IT environment with huge requirements of infrastructure and resources. Load Balancing is an important aspect of cloud computing environment. Efficient load balancing scheme ensures efficient resource utilization by provisioning of resources to cloud user's on-demand basis in pay-as-you-say-manner. This paper presents various load balancing schemes in different cloud environment based on requirements specified in Service Level Agreement (SLA). [5]

4. METHODOLOGY

In the proposed research work three load balancing algorithms have been implemented namely: Round Robin algorithm, Optimal Cost scheduling algorithm and enhanced cost scheduling algorithm.

Round Robin algorithm: - It is one of the simplest scheduling techniques that utilize the principle of time slices/quantum and designed for time sharing system. Here the time is divided into multiple slots and each node is given a particular time slot or time interval i.e. it utilizes the principle of time scheduling and dealing with all process without any priority. Each node is given a quantum and its operation. The resources of the service provider are provided to the requesting client on the basis of time slot. The main drawback of this algorithm is that it has more waiting time which causes starvation.[8]

Optimal Cost scheduling algorithm: - In this algorithm the workload is distributed evenly across all the hosts in the cloud to avoid a situation where some nodes are heavily loaded while the others have hardly any work. It is one of the Resource Scheduling Algorithm that optimizes the cost and schedules the resources based on the cost. When the user requests for the resource the VM consisting of that package is executed. This technique brings down the execution cost of the service provider. The main drawback of this algorithm is that it does not work when all the VM in the data centers are busy and the new requests are in waiting state.

Enhanced Cost Scheduling algorithm: - In the proposed algorithm drawback of optimal cost scheduling algorithm has been removed. The busy state VM's in data centers have been controlled with the concept of time priority. The process which is smaller in size and requires minimum time for execution will be processed first and when new request arrived, least loaded VM is assigned to that request. The main advantage of this algorithm is its minimum average waiting

time. The entire research work has been simulated in Cloud Simulator. The step by step procedure has been explained below.

- Cloud users will first register themselves in cloud data center.
- Once they are registered, they can avail the desired services.
- The tasks will be assigned to cloud with the help of cloudlets in cloud-simulator and the proposed load balancing mechanism will be applied on varying load conditions.
- It will show that under what conditions or set of conditions our method outperforms the existing ones.

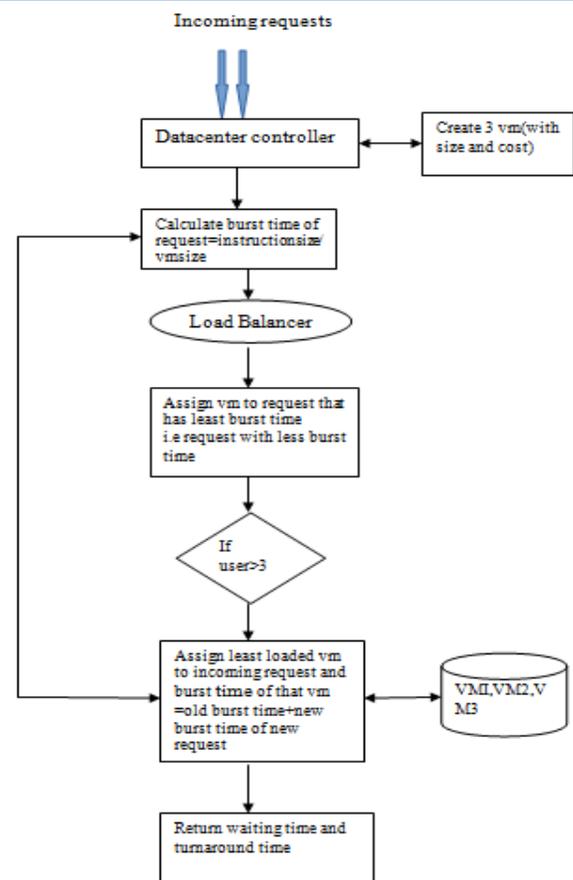


Figure 1: Enhanced Cost Scheduling algorithm

5. RESULTS AND EXPLANATION

It has been analyzed through the results that our algorithm performs best as compared to existing load balancing algorithms such as Round Robin and Optimal cost scheduling algorithm. Parameters considered for comparison are waiting time and Turnaround time.

Waiting time: - Waiting time is the amount of time a process has been waiting in ready queue. Table 1 gives a comparison of the average waiting time between the existing algorithms and the proposed algorithm.

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Table 1: Comparison of average waiting time

Parameter	Round Robin	Optimal cost scheduling	Enhanced load balancing
Waiting Time	36.66	34	22

Turnaround time: - Turnaround time is sum of periods spent waiting to get into memory, waiting in ready queue, executing and doing input output. It should be less. Table 2 gives the comparison between the average turnaround time between the existing algorithms and proposed algorithm.

Table 2: Comparison of average turnaround Time

Parameter	Round Robin	Optimal cost scheduling	Enhanced load balancing
Turnaround Time	68.66	62	50

Figure below shows the comparison of average waiting time and average turnaround time of round robin, optimal cost scheduling algorithm and the enhanced load balancing algorithm.

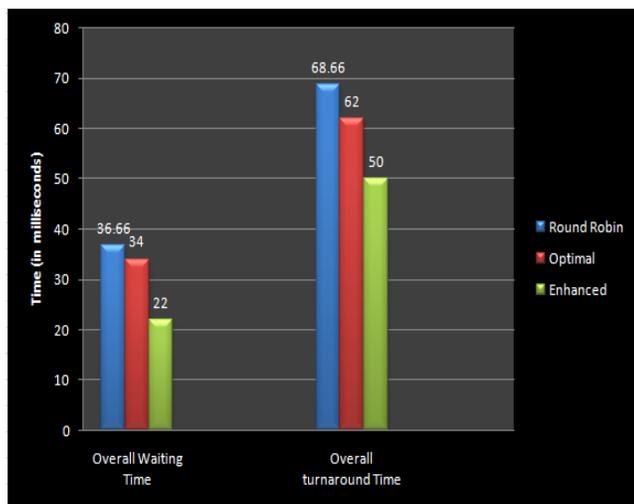


Figure 2: Comparison of average waiting time and turnaround time

6. CONCLUSION AND FUTURE WORK

It has been concluded that the proposed Cost scheduling algorithm outperforms as compared to round robin and optimal cost scheduling algorithm. Simulation results obtained using parameters such as waiting time and turnaround time is better than the previous algorithms. In future this work can be extended further by considering other parameters such as Throughput, service provider cost and security.

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