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Efficient Load Balancing of Resources for Different Cloud Service Providers in Cloud Computing

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ABSTRACT

In distributed computing cloud computing is an emerging technology which provides pay per model as per user demand or requirement. Cloud has a collection of virtual machines which facilities both computational and storage requirement. Scheduling and Load balancing are the main challenges in the cloud computing on which we are emphasizing. Scheduling is the process to control the order of work going to be performed by computer system. Load balancing has an important role in the performance in cloud computing. Better load balancing will make cloud computing more efficient and will also increase user satisfaction. It provides a way to handle several inquiries residing inside cloud computing environment set. Complete balancing acquires two tasks, one is resource provisioning/resource allocation and task scheduling throughout the system. In the proposed research paper, we are presenting a hybrid algorithm created by FCFS and Round Robin algorithms. As the Round Robin is the easiest algorithm that's why it is frequently used and the first preference for implementing easy schedulers. The Round Robin algorithm only requires a list of nodes. In the proposed solution we have eliminated the drawbacks of simple Round Robin algorithm by introducing assignment of time slices to different processes depending upon priorities.

Keywords: Cloud Computing, Load Balancing, Task Scheduling, Round Robin

I. INTRODUCTION

Cloud Computing is Information Technology Paradigm. In computer science cloud computing describes a type of outsourcing of computer services. Using internet services cloud computing delivers different type of services i.e. infrastructure as a service (Iaas), platform as a service (Paas) and software as a service (Saas). Iaas provides infrastructure as a service in the form of Virtual machine (VM) to the requester. Paas provides application development platform as a service to develop the web-based application to the requester. In Saas software application is provided to the requester by the cloud provider. Customers get the services because of subscription using pay as you use model.

As cloud computing is under in its development stage, many challenges and issues are being faced, one of them is to improve cloud scheduling process. Cloud

scheduling plays an important role in cloud computing to perform effective execution. Scheduling is a set of policies which controls the order of work going to be performed by the computer system. There are different types of scheduling algorithms are available in distributed computing system. We are emphasizing on
job scheduling algorithm in cloud computing. The job scheduling algorithm is proposed to achieve high performance computing and the best system throughput. Job scheduling is used to allocate the jobs as per the most efficient resources available corresponding to
the requirement in time with a view to satisfy the objective. The algorithm is designed in the way by which execution time can be minimized with maximizing the resource utilization. The job scheduling algorithm's efficiency straightaway affects the performance of the system as per the delivered Quality of Service [5]. In short, the efficiency of the system is directly proportional to the Quality of Service. In other words, we can say that as much as we increase the efficiency the QoS would be increased too. Job scheduling problems consists of three main things. They are [10]:

A. Machine Configuration

Machine configuration can be either of a single machine or a cluster of machines having a single or multiple processors in each machine.

B. Optimization Criterion

It is all about minimizing the overheads which affect in decreasing the overall throughput of the system. So, it consists of the parameters like reducing the response time, reducing the execution time, reducing the resource cost etc.

C. Set of Constraints and Characteristics

For the sake of allocating the tasks properly, the CPU must create a certain execution order and some set of constraints because the scheduling of the tasks can be either dependent on some other tasks or completely independent.
The main characteristics which come under the set of constraints which must be monitored are:

1) CPU utilization: - It is all about how much efficiently the CPU is being used by the system. The CPU must not come under idle condition with a view to utilize it completely.

2) Throughput: - It is the amount of number of processes completed per unit time.

3) Response time: It is the time of how long a process must wait for its first response after arriving at the system. In other words, we can say that the time span after arrival of the process till the CPU allotted to it for further processing for the very first time.

4) Waiting time: It is the amount of time which shows the total wait a process did after arrival to the complete execution.

5) Turnaround time: It is the overall time a process spent in a system.
6) Resource cost: It is the amount of cost which is required to use the resources. A cloud model using Cloud simulator consists of four elements namely Datacentres, Datacentre broker, host, Virtual machine, and cloudlet.

7) Datacentres: Datacentre is a huge group of networked computer servers which are mainly used by the organizations for facilitating the remote storage, processing, or distribution of ample amount of data.

8) Host: - Host is responsible to execute actions with respect to the virtual machine management which includes creation, deletion, and updating regarding the task processing. Cloud host is a server that provides all the hosting services. A cloud host is responsible to provide the transparency which allows various numbers of servers to act as a single system.

9) Virtual Machine: - The virtual machine (VM) gives the platform to deploy a software implementation of a machine, where the required platform is not present on the system, so we create a virtual world which shows the virtual interface as it is in the required platform which is known as a Virtual Machine.

10) Cloudlet:- A cloudlet is a datacentre which works on small scale or in another words we can say that it is a cluster of computers which are designed and created with a view to provide various cloud computing services to mobile devices, like smart phones, tablets, and many other wearable devices. It comes under the existence after the concept of mobile computing to
enhance the facilities.

II. LITERATURE REVIEW

Pooja Samal et al (2013) [4] load distribution problem on various nodes of a distribution system is solved. The work has been improved both resource utilization and job response time by analysing the various of Round Robin algorithm.

Kunal Mahurkar et al (2013) [7] presents OCRP (Optimal cloud resource provisioning) algorithm to solve the over provisioning and under provisioning problems in existing cloud mechanism. In the given solution they focused on optimal decisions in demand uncertainty and price uncertainty.

Raj Kumarsomani et al (2014) [2] proposed the hybrid method for VM level load balancing.

A. Round Robin Algorithm
B. Throttled Algorithm

It has also been implemented for IaaS framework in simulated cloud computing environment and the result obtained were analysed. These two algorithms have been proposed for virtual machine level load balancing that do not consider the current load state of VM
while allocating some new job to it.

The concept of circular way to allocate VMs has been taken from Round Robin algorithm and inspiration of checking availability on each step has been taken from throttled algorithm.

Soumen Santraet et al (2015) [1] propose an approach of Round Robin technique in a circular way and by this method author try to clarify the load balancing scenario of cloud server during its execution. According to author it will help to get an effective communication framework between broker and virtual machine to optimize the time and minimize the cost. The author implements it over Cloudsim 3.0 under VM scheduling i.e. space and time-sharing policies.

Ritu Kapur (2015) [3] present a new Cost-Effective Resource Scheduling algorithm, which when compared with the algorithm in outperforms it. The Simulations demonstrated prove the above fact. The CERS algorithm considers load balancing as an important
Quality of Service parameter performs a check for its necessity and if required does the load balancing and optimizes the performance as well as the overall resource cost.

Multi-Criteria Decision Making (MCDM) [7] methods are used for finding a solution and evaluating convicts. The application of MCDM methods is widely used in industrial, scientific, and engineering solutions since

last many decades. Service selection based on single or multiple criteria is a decision-making problem because in both cases it selects single service from various available services. We can use MCDM for cloud service selection because of properties of MCDM [8].

These criteria may be functional and non-functional types. User can demand these criteria in the form of QoS. It is a challenging task to fulfil all conflicting QoS demands and determine a Cloud Service. Therefore, a compromised and labelled solution is proposed to satisfy QoS requirements.

Rajat et al [12] presents a User Preference based Brokering (UPB) method designed using Ordered Weighted Averaging (OWA) [9] and VlseKriterijuska Optimizacija I Komoromisno Resenje (VIKOR) [10] methods to provide multi-criteria guided ranking and selection of services.

In this paper, we proposed Federated Cloud Service Broker and the modified VIKOR method is used in the next step to find the rank of services. The services get ranks as per preference given to QoS parameters. The service which gets the highest rank is selected and given to user. The method is tested using CloudSim.

The organization of this document is as follows. In Section 2, we will give detail of any modifications to equipment or equipment constructed specifically for the study and, if pertinent, provide illustrations of the modifications. In Section 3 (Result and Discussion), present your research findings and your analysis of those findings. Discussed in Section 4 (Conclusion) a conclusion is the last part of something, its end or result.

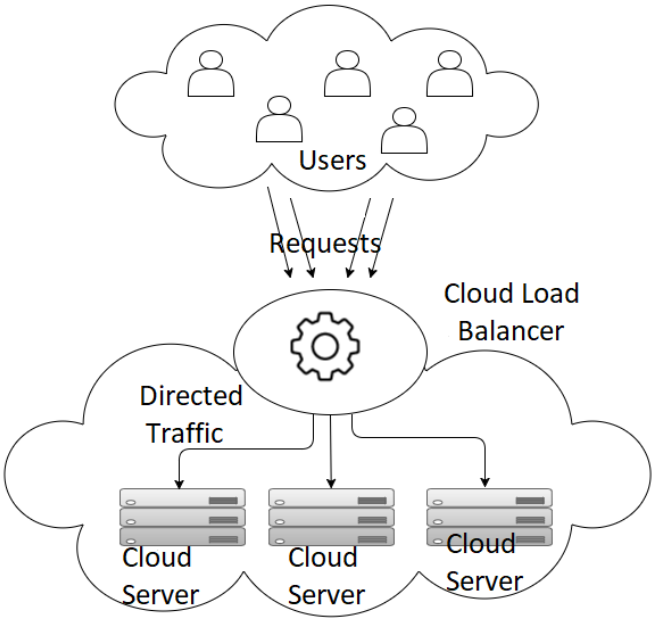

Figure 1. Proposed Model

III. Proposed Model

Cloud computing is efficient and scalable but maintaining the stability of processing so many jobs in the cloud computing environment is a very complex problem with load balancing receiving much attention for researchers.

A. The job arrival pattern is not predictable and the capacities of each node in the cloud differ, for load balancing problem, workload control is Crucial to improve system performance and maintain stability.

B. Load balancing schemes depending on whether the system dynamics are important can be either static or dynamic. [12]

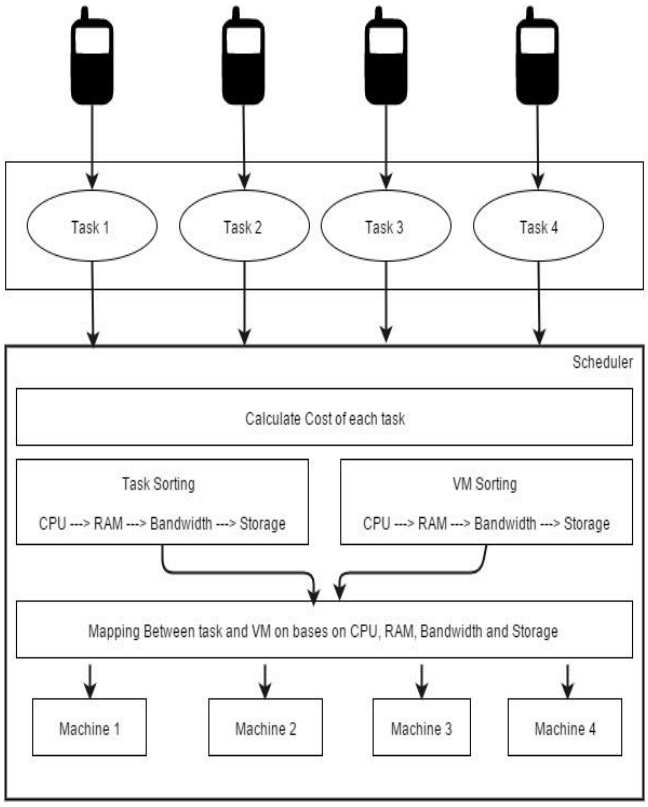

Figure 2 : Performance Evaluation

C. Static schemes do not use the system information and are less complex while dynamic schemes will bring additional costs for the system but can change as the system status changes. A dynamic scheme is used here for its flexibility [10].

IV. EXITING ALGORITHM

A. Round Robin

This is the simplest algorithm out of all available algorithms for load balancing and hence do not require complex algorithm implementations. It simply maintains a queue of incoming requests and allocates them VM in Time scheduling manner. Thus, each request is allowed to be executed for specific time quantum only then after if it is still incomplete, it must wait for its next round and if the request is complete, it allows other process to take charge of that VM based on the algorithm.

B. FCFS (First Come First Serve)

FCFS for parallel processing and is aiming at the resource with the smallest waiting queue time and is selected for the incoming task. The Cloud Sim toolkit supports First Come First Serve (FCFS) scheduling strategy for internal scheduling of jobs. Allocation of application-specific VMs to Hosts in a Cloud-based data center is the responsibility of the virtual machine provisioned component. The default policy implemented by the VM provisioned is a straightforward policy that allocates a VM to the Host in First-Come-First Serve(FCFS) basis. The disadvantages of FCFS are that it is non-pre-emptive. The shortest tasks which are at the back of the queue must wait for the long task at the front to finish. Its turnaround and response are quite low.

The proposed algorithm wills 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. Tree Set - 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.

A. Performance Evolution

Proposed System performs the following steps:

1) Calculate the cost of each task

2) Sort the task according to the following parameters

a) CPU

b) RAM

c) Bandwidth

d) Storage

3) Also arrange the VM according to the following parameters

a) CPU

b) RAM

c) Bandwidth
d) Storage

4) Check the status of Each VM.
5) Schedule the sorted VMs based on sorted task.
6) Calculate throughput, response time of each task.

V. RESULTS AND DISCUSSION

We implemented hybrid algorithm for load balancing algorithm on Net Beans using advanced JAVA. Cloud simulator is simulated for simulation with different configuration. Before simulation we configure many parameters like number of datacentres, number of cloudlets, VM configuration, bandwidth, and MIPS. We implemented three algorithm of load balancing are: 1). FCSF 2) Round Robin 3) Hybrid Algorithm.

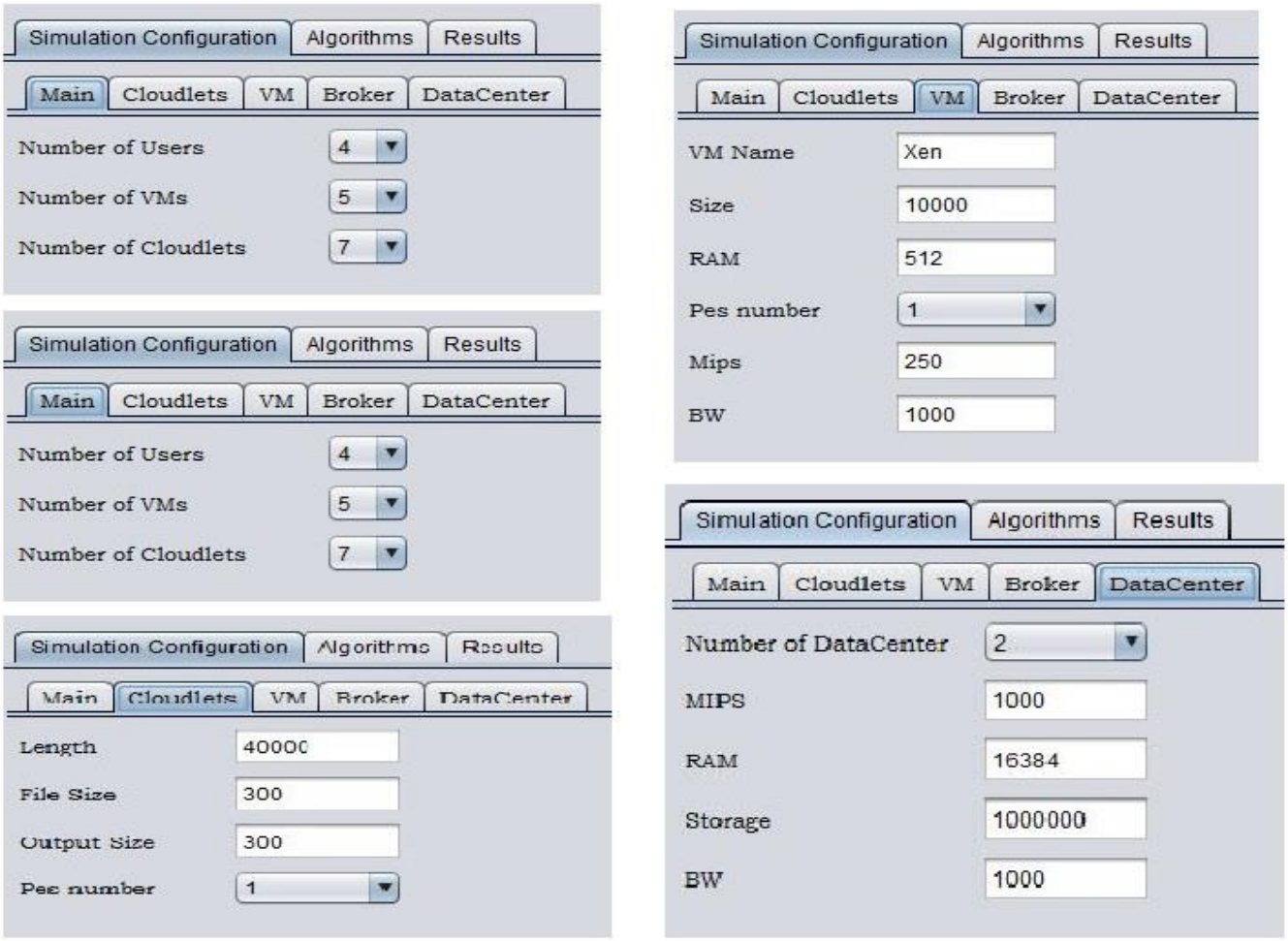

Figure 3 : Configuration Details of CloudSim Simulator

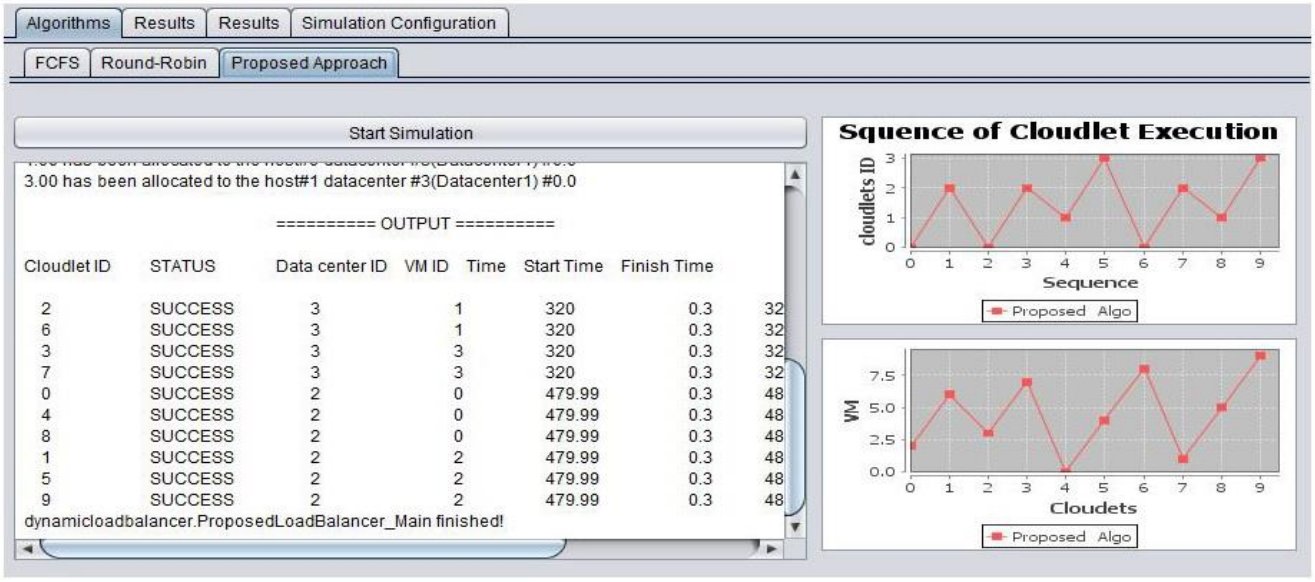

Figure 4: The VM allocation and Sequence of cloudlet Execution according to Proposed Hybrid algorithm

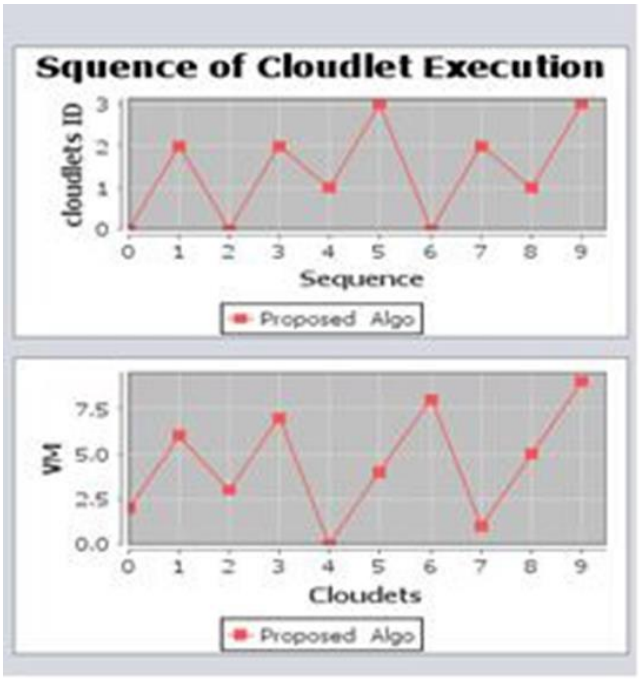

Figure 5 : VM and Cloudlet ID Allocation

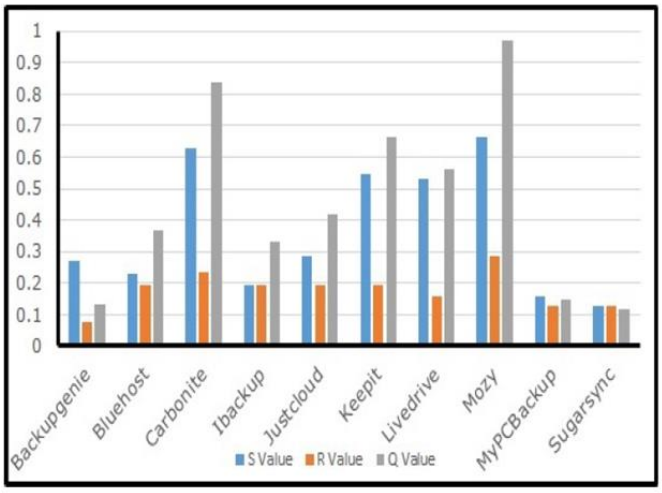

Figure 6 : S, R and Q for Minimum Values

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