Effective Virtual Machine Scheduling in Cloud Computing

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ABSTRACT

Cloud Computing provide the various services to the user on pay as you use mode as per requirement. The role of Virtual Machine's (VMs) has emerged as an important issue because, through virtualization technology, it makes cloud computing infrastructures to be scalable. Load Balancing is essential for effective operations in distributed environments hence in cloud it is very important research. There are various algorithms present for scheduling the clients request to appropriate available cloud node. In this paper an analysis of different existing Virtual Machine's (VM's) scheduling algorithms are done and proposed an Effective Load Balance algorithm over existing algorithm in Virtual Machine environment of cloud computing in order to achieve better overall response time and processing time.

Keywords - Cloud Computing, VM scheduling algorithms, Data center.

1. INTRODUCTION

Cloud computing is the delivery of computing services over the Internet. Cloud services allow individuals and businesses to use software and hardware that are managed by third parties at remote locations. In IT infrastructure cloud computing appears to be very important for the users to organize their applications in a distributed environment. This cloud computing enhances scalability, fault tolerance and availability. The Cloud computing is the delivery of computer resources through a Web service interface [1]. The term "cloud" refers to the organization of the underlying physical infrastructure remaining opaque (not visible) to the end user. In other words, cloud computing gives a user access to computer resources (i.e. machines, storage, operating systems, application development environments**,** application programs) Over a network through Web services, while the actual physical location and organization of the equipment hosting these resources be it in the next room or spread across the globe is not necessarily known to the user. Cloud computing delivers infrastructure, platform, and software (application) as services, which are made available as subscription-based services in a pay-as-you-go model to consumer. The services provided by cloud computing are:

1.1 Infrastructure as a Service (IaaS): Cloud Infrastructure as a Service (IaaS) consists of shared data-centers, virtual hardware and appearing as a single point of access for consumer's computing needs. IaaS can deliver software, data centre space, virtualization platforms and network instruments with advantages like flexibility, scalability and cost effectiveness [3].

1.2 Platform as a Service (PaaS): Cloud Platform as a Service (PaaS) facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers [2]. PaaS provider provides core cloud competences those are required to develop applications onto the Cloud like operating system, programming language execution environment, web server, database etc**.**

1.3 Software as a Service (SaaS): It provides the use of applications running on the Cloud Provider's infrastructure. These services can be accessible from any heterogeneous

systems or any interfaces [3]. These services may be defined with exception of limited user specific usage.

To gain the maximum benefit from cloud computing, developers must design mechanisms that optimize the use of architectural and deployment paradigms. The role of Virtual Machine's (VMs) has emerged as an important issue because, through virtualization technology, it makes cloud computing infrastructures to be scalable.

Cloud computing enjoys the many attractive attributes of virtualization technology, such as consolidation, isolation, migration and suspend/resume support [4]. A virtual machine (VM) is a software implementation of a computing environment in which an operating system (OS) or program can be installed and run. Important parameters related to virtual machines are Number of virtual machines used by applications, Time taken to create a new VM, Time taken to move an application from one VM to another, Time taken to allocate additional resources to VM Scheduling the basic processing units on a computing environment has always been an important issue. Like any other processing unit, VMs need to be scheduled on the cloud in order to minimize response time, Do the job faster, Consume less energy.

2. LITERATURE SURVEY

As Cloud Computing is growing rapidly and clients are demanding more services and better results, load balancing for the Cloud has become a very interesting and important research area. Many algorithms were suggested to provide efficient mechanisms and algorithms for assigning the client's requests to available Cloud nodes. The goal of scheduling algorithms in distributed systems is spreading the load on processors and maximizing their utilization while minimizing the total task execution time Job scheduling, The main purpose is to schedule jobs to the virtual machine with better resource utilization and faster job in minimum energy consumption

2.1 Round Robin Algorithm-The Round Robin algorithm mainly focuses on distributing the load equally to all the nodes. Using this algorithm, the scheduler allocates one VM to a node in a cyclic manner. The main advantage of this algorithm is that it utilizes all the resources in a balanced order. An equal number of VMs are allocated to all the nodes which ensure fairness

2.2 Weighted Round Robin- Shobha Biradar,[8] proposed algorithms weighted round robin, In order to improve the virtual machine's processing in cloud computing infrastructure In this a weighted round robin algorithm, which allocates all incoming requests to the available virtual machines in round robin fashion based on the weight's without considering the current load on each virtual machine.

2.3 Content-Based Virtual Machine Scheduling Algorithm - The content based VM scheduling algorithms were designed with the goal of lowering the amount of data transferred between racks in the data center when virtual machines disk image are being copied to the host node [12]. The algorithm returns the selected node and the VM on that node with the highest similar content. When deploying a VM, we search for potential hosts that have VMs that are similar in content to the VM being scheduled. Then, we select the host that has the VM with the highest number of disk blocks that are identical to ones in the VM being scheduled.

3. PROPOSED EFFECTIVE LOAD BALANCE (ELB) ALGORITHM

- ELB algorithms work in two stages in first stage it identified the VM with Least loaded and heavy loaded.
- In second stage it chooses the resources with heavy load and reassigns them to the resources with light load .i.e. if VM is overloaded then service manager distributes of its work to the VM having Least Loaded ,so that every VM is equally Loaded
- In current schedule the completion time for that task is calculated for all resources.
- Service manager count the VM capability i.e. CPU, Bandwidth, Memory, also calculate the remaining processing capability of Data center.
- Then the request assign to least loaded VM and the current allocation list updated, same process follow until all request are assign to the VM The process

stops if all resources and all VM assigned in them have been considered for rescheduling

Flowchart:

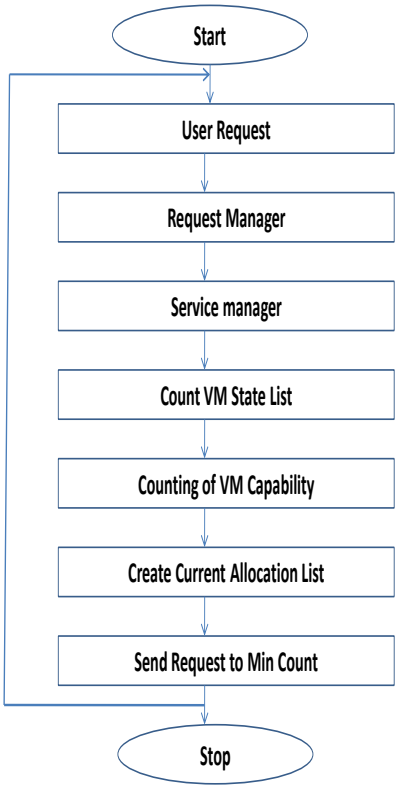

Figure 1: ELB

Algorithm:

Step-1) Request Manager i.e. DataCenterController receive a new request.

Step-2) Request Manager queries the Service manager i.e. ELB LoadBalancer for the request allocation.

Step-3) ELB LoadBalancer Maintain an index table of VM and Number of request currently allocated to them. At the start all VM have 0 allocations.

Step-4) ELB LoadBalancer Count the VM capability like Bandwidth, memory, CPU.

Step-5) Then Calculate the Remaining Processing capability of Data Center.

Step-6) Check available VM capacities is more or equal to the processing requirement of upcoming requests

Step-7) if it is reasonable then ELB LoadBalancer returns the VM id of selected VM to the DataCenterController.

Step-8) The DataCenterController sends the request to the VM identified by that id.

Step-9) DataCenterController notified the ELB LoadBalancer of the new allocation.

Step-10) ELB LoadBalancer updates the allocation table as per change.

Step-11) When the VM finish processing the request and the DataCenterController received response cloudlet, it notified ELB LoadBalncer of the VM De-allocation.

Step-12) The ELB LoadBalancer updates the allocation table

Step-13) Continue from the step-1

Step-14) Stop

4. IMPLEMENTATION DETAILS

The working environment for cloud computing where the proposed algorithm is implemented is done using cloud analyst [3] simulator which is built above “CloudSim”, toolkit.

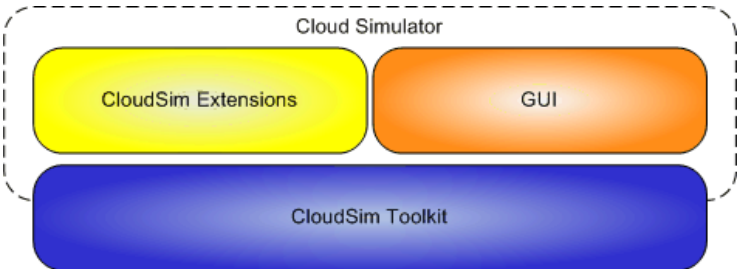

Figure 2: Cloud-Analyst built on top of Cloud-Sim toolkit

4.1 CloudSim

CloudSim is a framework developed by the GRIDS laboratory of University of Melbourne which enables seamless modelling, simulation and experimenting on designing Cloud computing infrastructures. CloudSim is a self-contained platform which can be used to model data centers, service brokers, scheduling and allocation policies of a large scaled Cloud platform. It provides a virtualization engine with extensive features for modeling the creation and life cycle management of virtual engines in a data center.

4.2 New Extensions

In addition to the Data Center operations provided by the CloudSim toolkit, following additional functionality is required for the CloudAnalyst and hence had to be built on top of CloudSim.

- **Application users** - There is the requirement of autonomous entities to act as traffic generators and behavior needs to be configurable.
- **Internet** - It is introduced to model the realistically data transmission across Internet with network delays and bandwidth restrictions.
- **Simulation defined by time period** - In Cloud-sim, the process takes place based on the pre-defined events. Here, in Cloud-Analyst, there is a need to generate events until the set time-period expires.
- **Service Brokers** - DataCeneterBroker in CloudSim performs VM management in multiple data centers and routing traffic to appropriate data centers. These two main responsibilities were segregated and assigned to DataCenterController and CloudAppServiceBroker in Cloud-Analyst.

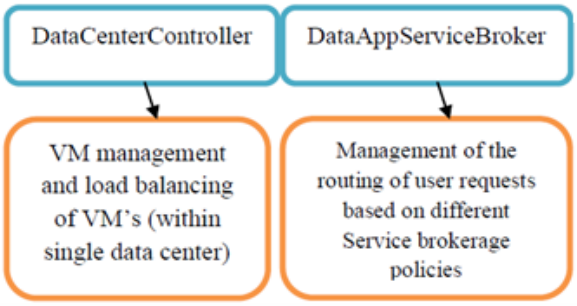

Figure 3: Responsibilities- Segregation

5. RESULT

The Proposed ELB algorithm is implemented using simulator Cloud-Analyst. We take different data center at different region with user bases. The requesting services from different regions or from same region the final result screen shown below as –

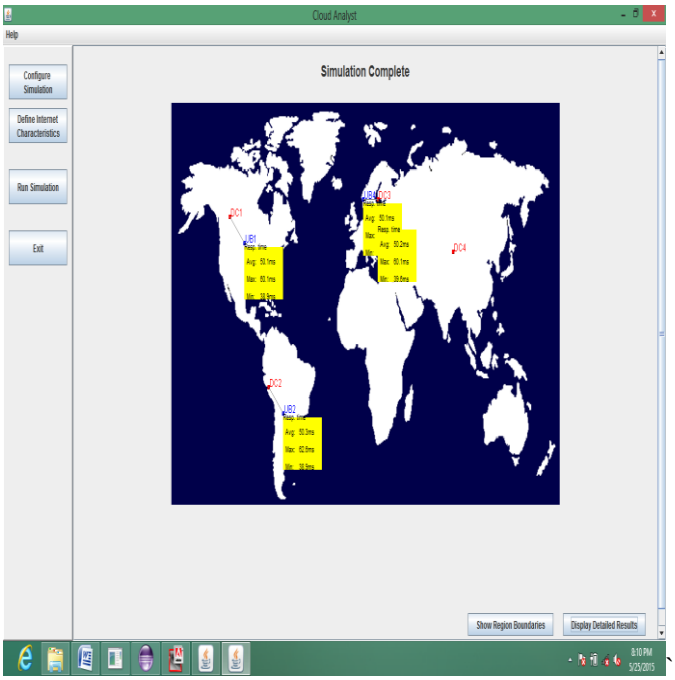

Figure 4: Cloudanalyst Main Result Screen

In above screen fig. 4 the lines show that the user base is requesting service from corresponding data center or server with the values shown at boxes at each user bases represents the response time observed by respected user base. The values are the minimum response time calculated at client side while requesting service from data center in the duration of simulation was running; similarly it shows the maximum response time and the average response time from above two calculated values.

The Results calculated as values of Response time observed at each client side, Data Center Service Request Times, Total VM and Data Transfer Cost. These are shown as below:

Overall Response Time Summary

	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	50.20	38.86	62.64
Data Center processing time:	0.53	0.00	4.50

Response Time by Region

Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.13	38.86	60.11
UB2	50.32	38.89	62.64
UB3	50.25	39.63	60.13
UB4	50.10	40.38	59.50

Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.52	0.02	1.16
DC2	0.53	0.04	1.01
DC3	0.53	0.02	4.50
DC4	0.00	0.00	0.00

Total Virtual Machine Cost ($):	1.91
Total Data Transfer Cost ($):	0.25
Grand Total: ($)	2.16

Data Center	VM Cost $	Data Transfer Cost $	Total $
DC4	0.40	0.00	0.40
DC3	0.50	0.13	0.63
DC2	0.50	0.07	0.57
DC1	0.50	0.06	0.57

6. CONCLUSION

The Proposed ELB algorithm is implemented using simulator Cloud-Analyst. We take different data center at different region with user bases. Data centers are located at different regions with user's bases requesting VM from different regions or from a same region. Here proposed ELB algorithm which drastically minimizes the response time and do job faster.

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