

# Profit Driven Approach with Guaranteed Quality of Service in Cloud

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**ABSTRACT:** Cloud computing is an emerging innovative IT-based business model which catches the attention of practitioners, for its potentiality of industry adoption, as well as of academicians, for research undertaking in different dimensions. From cloud service providers' perspective, profit is one in all the foremost necessary issues, and it's primarily determined by the configuration of a cloud service platform beneath given market demand. Increasing the profit of service provider includes service charge, business cost, amount of service; workload, Quality of Service and energy consumption are considered for profit maximization. Two main issues are discussed in this paper, (I) "the method of finding the well-organized virtual machine by using the idea of load balancing algorithm". (II) "Reallocation of the Virtual Machines" i.e. migration of the Virtual Machines when cloud provider is not available with the required Virtual Machines. A dynamic pricing scheme exploits an innovative method that estimates the cost of a cache structure and enhances the cloud revenue assure for customer satisfaction using price demand model premeditated for cloud cache. As a result, it endows with the most excellent and cost-efficiency solution for both users and cloud providers.

**KEYWORDS:** CloudSim, Efficient VMs Allocation, Dynamic pricing scheme, Load Balancing Algorithm.

## I. INTRODUCTION

An promising trend for delivering computing services over the internet is referred as cloud computing, which acts as a virtualization of resources that maintains and manages itself. There is no need to buy an infrastructure to run a service; instead it gives the option for pay as-you-go need basis. It is a platform where consumer can buy computing and storage power on a rental basis. It provides unlimited infrastructure to store and execute customer data and program. The benefits of cloud computing are: minimized capital expenditure, location and device independence, utilization and efficiency improvement, very high scalability, high computing power. Cloud suppliers buy and sell their services on cloud cache for capital. The building and maintenance cost of used resources is pay per usage.

There are different definitions for Cloud Computing, Foster et al. [1] defines Cloud Computing as "a large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet". Cloud Computing Providers offer numerous online services based on SLA (Service Level Agreement) between the provider and the customer. However an important role between providers and customers relationship has pricing model for which they must agree.

Each provider has his scheme for calculating the price (has an accounting system) for the cloud services offered for clients. The provider's goal is to have a greater benefit, while each client's goal is to have the maximum service for low price. Therefore, satisfying both parties requires an optimal pricing methodology. The price charged is one of the most important metrics that a service provider can control to encourage the usage of its services [2].

Price is an important factor for the company which provides cloud services because it affects the clients directly and organization profit. The price also has a major impact in economic aspect, where key concepts such as

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

fairness and competitive pricing in a multi-provider marketplace affect the actual pricing. Pricing for competition and fairness affects choices in the design of user applications and system infrastructures. In fact pricing fairness balances user cost and cloud service provider profit. Pricing model in Cloud Computing is more flexible than traditional models. Every cloud provider has its own pricing scheme. Main focus of Cloud Computing is to fulfill and guarantee quality of service (QoS) for customers. The price in Cloud Computing and value chain is based on business models and framework. The value chain from the traditional IT services is changing as a result of cloud computing.

## II. BACKGROUND THEORY

In this section, we review related work with regard to the pricing schemes in Cloud Computing. The issue of price in the cloud in terms of relationship between providers and customers is treated by many authors, which have analyzed different schemes and models in theoretical aspects and simulated through different software. To meet cloud computing requirements, CloudSim was developed for modelling and simulation of extensible Clouds [2]. There are various software based algorithms are proposed to improve the performance of cloud. Various factors are used to determine and evaluate cloud performance such as: latency, throughput, CPU usage, network error, and response time. These factors highly depend on geographical distribution of data centers, number of users, and number of data centers, service broker policy being used and load balancing algorithms. Many changes have been done in the existing algorithms and many new algorithms are proposed to improve the performance. For analysing performance of cloud environment in various ways, actual deployment of cloud is costly and difficult task, therefore not preferable. For this reason various simulation tools are used to model and analyse cloud computing environment and applications, graphically analyze the results before the actual deployment of clouds. The simulation tools available are Cloud Reports, Cloud Analyst, MR-CloudSim and Network CloudSim etc. The underlying platform for these simulators is CloudSim [3].

The frontrunner simulating Cloud environments is the CloudSim toolkit being developed at the GRIDS laboratory at the University of Melbourne. But some extensions are required to CloudSim to simulate a large scaled Internet application. It also became apparent that rather than just extending the CloudSim toolkit as a toolkit, it will be more beneficial to build a simulation tool using CloudSim, separating the simulation experimentation from a programming task. Such a tool will enable users to quickly set up simulations and summarize results in useful formats, and will appeal to a wider audience. Then the experiences and feedback from the users can be used to great effect to improve the framework as a tool as well as an approach.

Therefore the aims of the project can be summarized as below:

- Investigate in to existing simulation techniques for studying large scale distributed systems.
- Leverage suitable existing simulation techniques and tools and define an approach for effectively simulating large scaled Internet applications on Cloud environment.
- Develop the initial version of a tool required for such an approach with a sufficiently flexible design that leaves room for further refinement and extension.
- Perform initial experiments using the tools and approach.

### A. CLOUDSIM

CloudSim features for modelling data centers is used in CloudAnalyst. 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 modelling the creation and life cycle management of virtual engines in a data center. CloudSim framework is built on top of GridSim framework also developed by the GRIDS laboratory. The CloudAnalyst is built on top of CloudSim tool kit, by extending CloudSim functionality with the introduction of concepts that model Internet and Internet Application behaviours [9].

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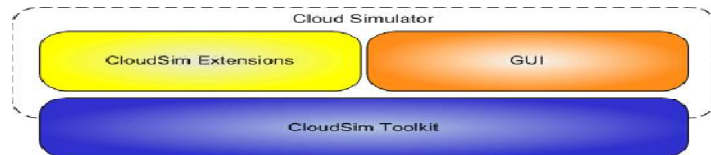


Fig.1 CloudAnalyst built on top of CloudSim toolkit

## B. USE OF CLOUDSIM TOOLKIT

### i. Functionality Leveraged as Is

CloudSim toolkit covers most of the activities taking place within a DataCenter in detail. This includes:

- Simulating DataCenter hardware definition in terms of physical machines composed of processors, storage devices, memory and internal bandwidth
- Simulating virtual machine specification, creation and destruction
- The management of virtual machines, allocation of physical hardware resources for the operation of virtual machines based on different policies (e.g. time-shared and space-shared)
- Simulating the execution of user programs or requests (Cloudlet/Gridlet) on the virtual machines .These features are directly used in the CloudAnalyst.

## III. RESEARCH PROBLEM

As the main aim of cloud computing is to provide resources as a service on demand to the user. In this paper we are going to carried out two main problems. 1. Reallocation of virtual machines. 2. Allocation of virtual machines.

### A. REALLOCATION OF VIRTUAL MACHINES

As we know the main aim of cloud computing is to fulfill the requirement of the user by providing resources as a service. Now suppose if we are having two physical machines and both the machines having one virtual machine with the processor of 1 GHz. If the request arrives for the virtual machine having processor of 2 GHz, at that time the concept of reallocation of virtual machine took place. For such situation we migrate one of the virtual machine from one physical machine to the other and combining configuration of both the virtual machine and make it available with the configuration of 2GHz and should provide a better service to the user. It is possible to have a number of cloud provider, if the situation took place that the request arrive at one of the cloud provider and somehow that cloud is not available with the resource required by the user, so in such case the other cloud provider, migrate their resources to that cloud and fulfill the requirement of the user.

### B. ALLOCATION OF VIRTUAL MACHINES

Now while allocating the virtual machines to the user as per the requirement, it is also need to be kept in mind that we should allocate them an efficient virtual machine. When the user request arrives for the virtual machine and if the cloud provider is available with the number of free virtual machines, then allocating an efficient virtual machine is the main goal of cloud provider. This problem contains the issue of allocating efficient virtual machines by using the concept of load balancing algorithm. For e.g. if the request arrives at the cloud provider for the VM and if more than 1 virtual machines are available, then the load balancing algorithm will find an efficient VM for the allocation. Moreover if arrived request does not match with the configuration of the available virtual machine then we disclose the suitable virtual machines configuration to the user so that they able to decide whether they need to remain in queue or get service from other cloud service provider.

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## IV. EXISTING SOLUTIONS

Quality of Service (QoS) denotes the level of performance, reliability, availability offered by an application and by the platform or infrastructure that hosts it. QoS is fundamental to cloud users, who expect providers to deliver the advertised characteristics, and for cloud providers, who need to find the right trade-off between QoS levels and operational cost. Finding out the optimal trade-off is not an easy decision problem because it involves Service Level Agreements (SLAs) which specifies QoS targets and economic penalties associated with SLA violations. Service providers need to comply with SLA contracts which determine the revenue and penalties on the basis of the achieved performance level. Service Level Agreements (SLA's) are signed between the service provider and the Customer where SLA violation acts as major constraints. SLA violation is reduced through mechanisms involving monitoring.

In general, a service provider rents a certain number of servers from the infrastructure providers and builds different multi-server systems for different application domains. Each multiserver system is to execute a special type of service requests and applications. Hence, the renting cost is proportional to the number of servers in a multiserver system. The power consumption of a multiserver system is linearly proportional to the number of servers and the server utilization, and to the square of execution speed. The revenue of a service provider is related to the amount of service and the quality of service. To summarize, the profit of a service provider is mainly determined by the configuration of its service platform.

To configure a cloud service platform, a service provider usually adopts a single renting scheme. That's to say, the servers in the service system are all long-term rented. Because of the limited number of servers, some of the incoming service requests cannot be processed immediately. So they are first inserted into a queue until they can handle by any available server.

To design an effective load balancing policy and to determine how to increase the cloud resource usage are the two main goals of a cloud service provider. The VM scheduling algorithms for load balancing helps in allotment of VMs efficiently on need. Basically, a VM load balancing algorithm decides which VM is to allocate when request is made by cloud consumer.

### Existing Load Balancing Algorithm

Load balancing policy determines which Virtual machine should be assigned to the current user request for processing to achieve optimal resource utilization, minimum response time and avoid overload [5].

### *RoundRobin VM Load Balancing Algorithm:*

It is a very simple load balancing algorithm that places the newly coming cloudlets on the available virtual machines in a circular manner. The major advantage of this algorithm is its simplicity and easy implementation. The main drawbacks are that it requires the prior knowledge of user tasks and system resources & it do not make use of current state of the system. Round Robin Algorithm is the simplest scheduling algorithms that utilize the principle of time slices. The time is dividing into a multiple slices and each node is given a selective time sliced or time interval [3].

## V. PROPOSED WORK

While doing some modification to the existing load balancing algorithm we achieve our goal. While displaying the available virtual machines with their configuration to the user, so that the user able to decide from which service provider they should take a service.

Below discussed are the steps followed by doing modification to the available load balancing algorithm. Steps followed by the proposed algorithm.

1. Efficient algorithms find expected efficient Virtual Machine for the allocation.
2. When a request to allocate a new VM from the Data Center Controller arrives, Algorithms find the most efficient VM for allocation from the bunch of available VMs.
3. Efficient algorithms return the id of the efficient VM to the Datacenter Controller.
4. Available virtual machine id will be disclosed to the end user.

5. If the required VM is not available, efficient algorithm will suggest some related VMs to the user.  
6. When the VM finishes processing the request and the Data Center Controller receives the Response. Data center controller notifies the efficient algorithm for the VM de-allocation .Continue From Step 2.  
Once the request arrives with the configuration of the virtual machine, algorithm will find out the matching configuration of the virtual machine with the available virtual machines. It will display the VM ID to the user if the configuration matches with the available VM and if the required VM is not available then the algorithm will disclose some relevant VMs with their configuration. For better understanding results are shown in below section.

## VI. METHODOLOGY

### A. SIMULATORS

The main aim of simulator is to test the implementation work in the absence of the required environment. Thus in the cloud environment two simulator are used CloudSim and Vcloud. CloudSim is the open source. Some simulators available for the distributed field such as SimGrid, GridSim, etc such simulators are not valid for the cloud computing as the cloud environment having multiple layers while SimGrid and GridSim are made for the single layer environment. Some comparison of simulator available for cloud computing are discussed below.

### B. ROUTING OF USER REQUESTS

Fig.2 including the use of service broker policy and the virtual machine load balancer [7].

- 1) User base generates an Internet Cloudlet, with application id for application and also includes name of the user base itself as *originator* for routing back the RESPONSE.
- 2) REQUEST is sent to the Internet with zero delay.
- 3) Internet consults the service broker for the datacenter selection. The service broker uses any one of the service broker policy based on the REQUEST.
- 4) Service broker sends information about selected datacenter controller to the Internet.
- 5) Internet adds appropriate network delay with the REQUEST and sends to the selected data center controller.
- 6) Selected datacenter controller uses any one of the virtual machines load balancing policy.
- 7) Virtual machines load balancer assign the virtual machine to the user request.
- 8) Selected datacenter sends the RESPONSE to the Internet after processing the REQUEST.
- 9) Internet uses the *originator* field of the Cloudlet information and adds appropriate network delay with RESPONSE and sends to the user base.

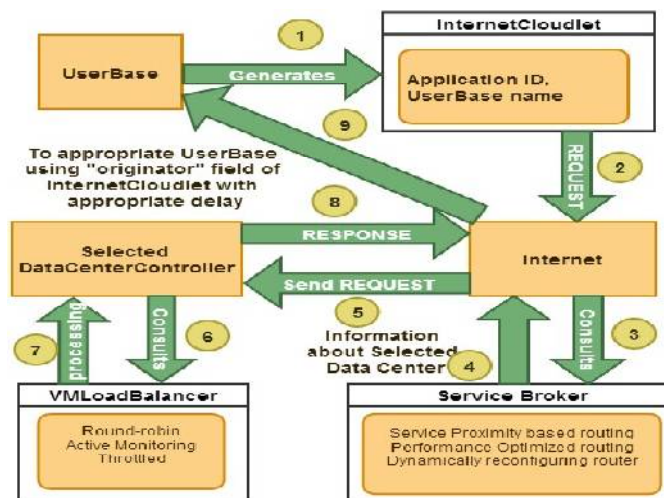


Fig.2 Routing of User Requests



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## C. WORKING OF SERVICE PROXIMITY ROUTING

This is based on closest datacenter strategy [7]. Working of service proximity based routing is shown in Fig.3.

- 1) ServiceProximityServiceBroker maintains an index table of all DataCenters indexed by their region.
- 2) When the Internet receives a message from a user base it queries the ServiceProximityServiceBroker for the destination DataCenterController.
- 3) The ServiceProximityServiceBroker retrieves the region of the sender of the request and queries for the region proximity list for that region from the Internet Characteristics. This list orders the remaining regions in the order of lowest network latency first when calculated from the given region.
- 4) The ServiceProximityServiceBroker picks the first datacenter located at the earliest/highest region in the proximity list. If more than one datacenter is located in a region, one is selected randomly.

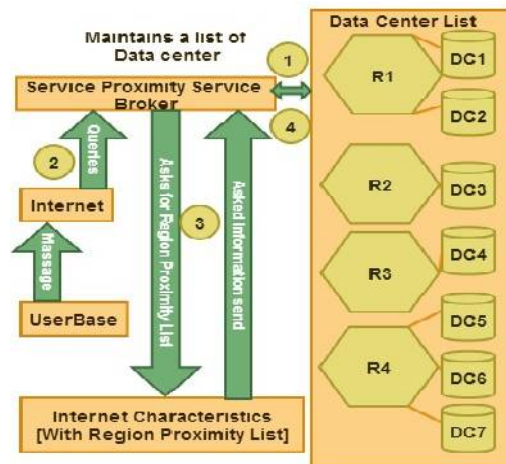


Fig.3 Service Proximity based Routing

## VII. EXPERIMENTAL RESULTS

### Results of Allocation of VMs

Users are going to decide VMs configurations as per their requirements. In our case user are going to decide VMs configuration on the bases of RAM, No. of CPUs and the Space required to the user. Below figure shows the basic image of input taken from the user.

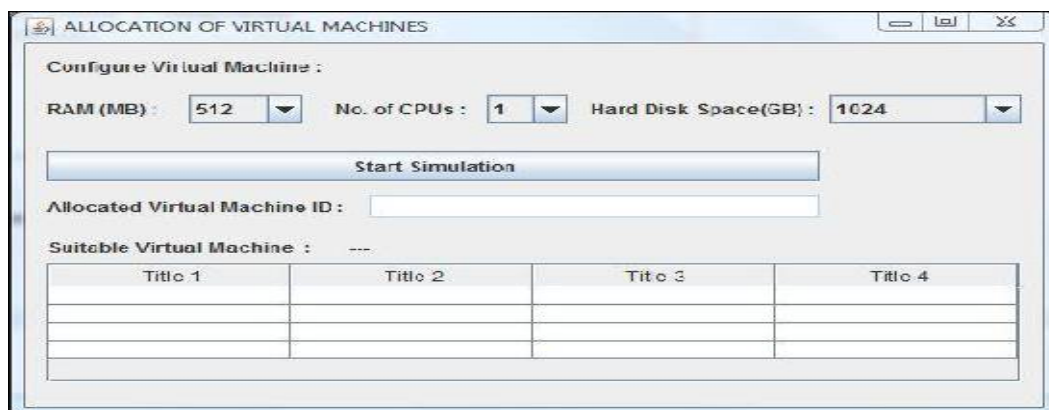


Fig.4 Input of required RAM, No. of CPUs and Hard Space are given by user.

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Case 1: -

Let us say if the user enters configuration of VM with the requirement of 512MB RAM, No. of CPUs = 1 and Space required = 1024GB. Output is as shown in below figure.

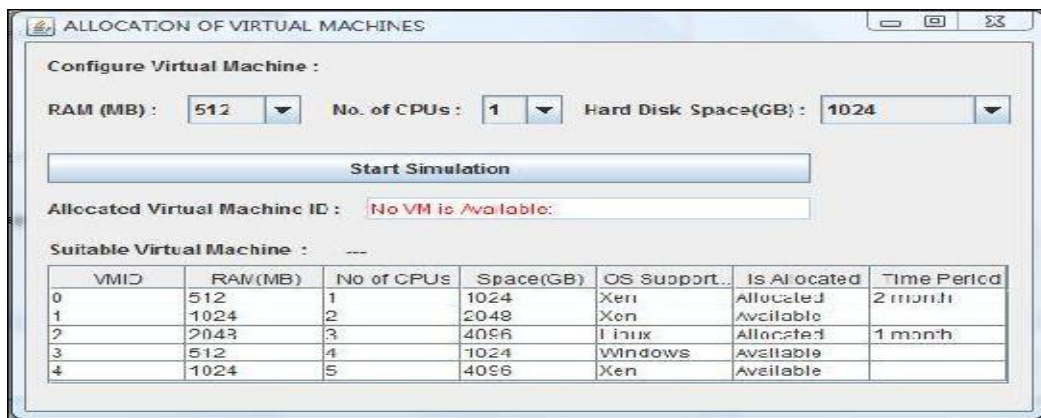


Fig.5 Result 1(required VM is not available)

Above mentioned output shows that the virtual machines with the configuration of 512 MB RAM, 1 CPU and 1024 GB Hard Disk Space is already allocated to the other user for 2 months so it will display that no VM is available as per the required configuration, but it shows some of the VMs to the user to decide as per their requirement.

Case 2: -Let us say if the user enters configuration of VM with the requirement of 812MB RAM, No. of CPUs = 1 and Space required = 1024GB.

Now suppose if we don't have the VM available with the required configuration of the user, so in that case we should display the suitable VM configuration available with us to the user. Output will be as shown in below figure.

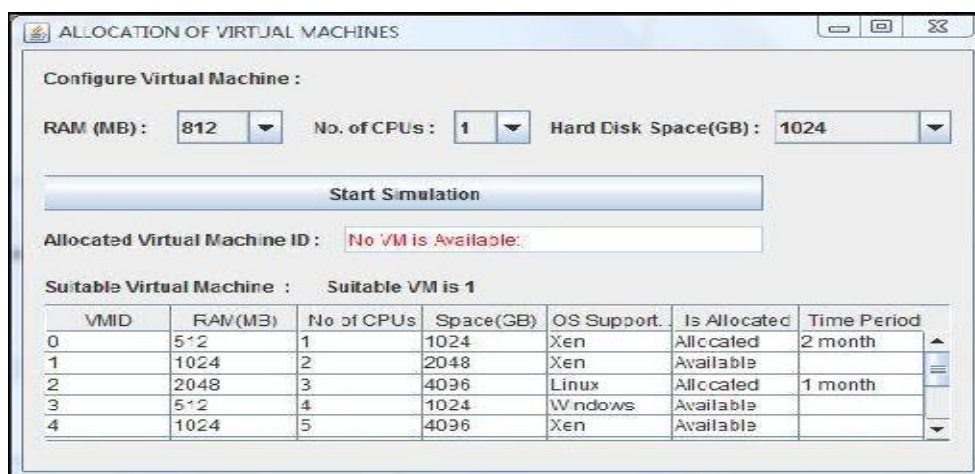


Fig.6 Result 2(Suggest Some VM if required configured VM is not available)

Case 3: - Let us say if the user enters configuration of VM with the requirement of 1024MB RAM, No. of CPUs = 5 and Space required = 4096GB. Output is as shown below.

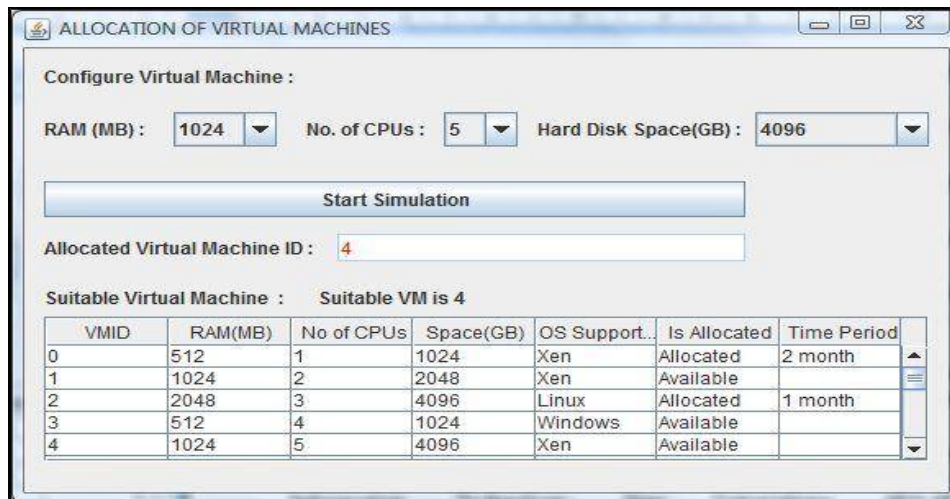


Fig.7 Result 4(Display Allocated VM ID)

## VIII. CONCLUSION

We proposed an algorithm for ruling out the well-organized VM for the allocation as per the user's demand. In this paper, we discussed about the some existing load balancing algorithms that area unit used for allocation of economical virtual machine. Our proposed algorithm is used for handling request, which arrives for the requirement of VMs. We suggest some of VMs with their configuration, if the required VM is not available. CloudSim is a simulator, which we used to test our algorithm. In future we wish to add new steps in our proposed algorithm which will able to provide better result for getting better service from the cloud provider.

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