

A User centric cost efficient resource management model for cloud computing

Harleen Kaur¹, Vandana Pushe²

^{1,2} Department of Computer Science, Desh Bhagat University
Amloh Road, Mandi Gobindgarh, Punjab, India

Abstract— Cloud computing is a model for enabling convenient and on-demand network access to a shared pool of configurable computing resources like networks, servers, storage, application and services that can be rapidly provisioned and released with minimal management effort or service provider interaction. These resources are pooled for the usage of customers to cater the elastic need of resources of customers due to varying workload. Clients need to pay only for the amount of resources they use. The need of the hour is to reduce the cost of cloud and increase its efficiency. Whenever there is change in requirements of the client, he/she need to contact service provider to change the configuration which may be time consuming and need extra effort i.e. the service provided is service provider centric. This new proposed model in User centric which gives more power to end user so that he/she can change the configurations by using a user interface which provide various options of configurations.

Keywords— Cloud, User centric, CloudSim, Cost efficient, Dynamic configuration.

I. INTRODUCTION

Cloud Computing refers to the software services delivered to end users over the internet as well as the backend and system software supporting them[1]. There are three cloud delivery models, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) deployed as public, private, community, and hybrid clouds.[2] All these services are provided over internet. There are four deployment models available in cloud computing namely public cloud, private cloud, community cloud and hybrid cloud. The reason behind vast spread of cloud technology is cost efficiency, easy scalability, good reliability, easy maintenance and mobile access. One of the main feature of cloud computing is service on demand. Most of the cloud services are Service Provider Centric. But this can be very time consuming and needs extra effort on both ends. Now a shift is needed to Client Centric services.

II. NEED OF CLIENT CENTRIC APPROACH

In cloud computing, two types of service approaches are available, Service provider centric approach and client centric approach. Following are the advantages of client centric approach:

A. Better Control in the Hands of Client

In this approach, the main control is in the hands of customer. He/she can select the required configuration at his own ease. An easy to use User interface is provided to user. Using that interface, client can select the configuration as per current requirement at his/her own ease. Client can change the configuration at any time.

B. Reduced Burden on Service Provider

There is an extra burden on cloud service provider to attend to all type of communication requests by customer. If the requirement of change in configuration is high, it can be extra burden on service provide to attend to these requests. By providing an interface to user on which he/she can change configuration on their own, time can be saved and also the burden on service provider can be reduced.

C. Efficient Cost Management

In this approach, depending upon the requirement of customer, three or more configuration options are provided to customer. These configuration options can be of three types such as:

- High Performance (High cost)
- Medium Performance (Medium cost)
- Low Performance (Low Cost)

Depending upon the requirement, user can select the required configuration. For example, in an e-ticket booking site, high performance is required on Fridays and weekends while medium performance is required for bookings for weekdays' night and low performance is needed on weekdays' mornings. Thus user can choose from predefined configurations and save on cost.

D. Better Resource Management

As the expected configurations are predefined based on high performance, medium performance and low performance requirements, it is easy to manage resources by service provider. Techniques such as migration, replication, shutdown etc can be applied to reduce latency. Thus better service can be provided to the user.

E. Ease of Use

As a Graphical User Interface will be provided to user, thus it is very easy for user to select configuration. He/she can change the configuration independent of time and location and any number of changes can be made. Also no direct communication is needed with service provider.

III. CLIENT CENTRIC MODEL

The main object of this model being approached is to give total control to client so that he/she can take his own decision. This will lead to a better satisfactory level of customer and reduced burden on service provider. Also cost can be reduced to a large extent as user can easily migrate from one configuration setup to other using the GUI.

A. Prerequisite

This model requires an early requirement analysis of the client organization so that a plan can be outlined regarding the configuration requirements of the customer. The nature of the organization and their performance and cost requirements are needed to be considered. Also the workload needs to be analyzed before developing the system. Workload consists of different type of tasks. After gathering all these information, three or more configuration options can be provided to user to select from. A full time internet connection is also required by client because these services will be provided over the internet. This model is developed using Eclipse 4.0 and CloudSim.

Things to be considered:

- Data traffic analysis is needed
- Configuration requirement during Peak hour and off hours
- Nature of organization
- Customer type
- Level of dynamic change in configuration requirements.
- Cost requirement of the
- Type of usage
- Technical level of customer, etc

Based on this information, configuration options are provided to user.

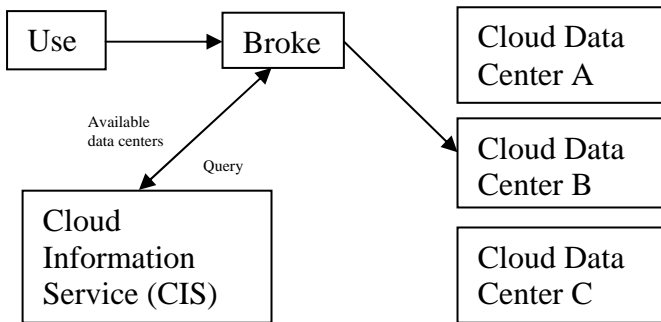


Fig. 1 CloudSim Architecture

CloudSim is used for this model because of following advantages:

- Time effectiveness: CloudSim can be used with Netbeans and/or Eclipse using Java it requires very less effort and time to implement cloud based application provisioning test environment.
- Flexibility and applicability: Developers can model and test the performance of their application services in heterogeneous cloud environments(Amazon EC2, Microsoft Azure) with little programming and deployment effort.[3]
- Very few pre-requisites: To use CloudSim, User only needs basic understanding of Java and OOP concept.

Many leading organizations and universities around the world are using CloudSim for [i] Cloud Resource Provisioning, [ii] Energy efficient management of data center, [iii] Optimization of cloud computing, and [iv] Research activity.

B. Working

A Graphical user interface is provided to the user over the internet which allow user to select configuration as per requirement. Here three types of configuration requirements are considered:

- High Performance(Low Cost)
- Medium Performance (Medium Cost)
- Low Performance (Low Cost)

Performance is directly proportional to cost. The number of cloudlets allocated depends upon the type selection of configuration. For higher performance, more number of cloudlets are allocated. Figure 2 shows the interface provided to user and also the predefined configurations available.

```
Cost_Aware_Migration_Models [Java Application] C:\Program Files\Java\jre8\bin\javaw.exe
Initialising...
Plz select cloud service Model :
Enter the 1 for High_performance(high_cost)
Enter the 2 for Normal_performance(normal_cost)
Enter the 3 for Low_performance(low_cost)
```

Fig. 2 Interface provided to user

As the user select his preference, the workload is executed using that configuration parameters.

C. Steps to Configure a Cloud in CloudSim

In CloudSim, following are the steps to create a cloud:

- Set number of users also known as Broker Count
- Initialize common variables on simulation.
- CIS object is created after initialization of common variables.
- Create Data center and configure host characteristics such as Processing elements (PE), RAM, MIPS, Bandwidth etc
- Create Data Center Broker Instance which is required for communication between Data center and Cloudlet.
- Create Virtual Machine instance and define its characteristics such as PE, RAM, MIPS and Bandwidth etc.
- This is very important task when detail about Virtual Machine is submitted to Broker.
- Specify Cloudlets (tasks) and specify their characteristics such as MIPS, file size, output size, length etc Submit this cloudlet to broker
- Start Simulation
- Stop Simulation

D. Results

The parameters used in this model are:

- For High performance, 600 cloudlets are allocated.
- For Medium performance, 400 cloudlets are allocated.
- For Low performance, 200 cloudlets are allocated.

Table 1 shows the results for particular parameters and workload, for all three types of configurations i.e. high performance, medium performance and low performance. From this table, it is observed that the cost of high performance model is high while

TABLE I
OBSERVATIONS FOR THREE TYPES OF CONFIGURATION USING A PREDEFINED SET OF PARAMETERS AND WORKLOAD

	High Performance	Medium Performance	Low Performance
Number of Hosts	800	800	800
Number of VMs	600	400	200
Total Simulation Time(sec)	86400	86400	86400
Energy consumption(kwh)	101.9073	67.5694	36.3772
Energy Consumption cost(Rs.)	10190.7322	6756.94251	3637.7241
Number of VM migrations	14310	9929	5846
Total cost of VMs	1491000	1032900	604600
SLA	0.00694%	0.00697%	0.00859%
SLA preferred degradation due to migration	0.10%	0.10%	0.12%
SLA time per active host	6.87%	7.11%	6.99%
Overall SLA violation	0.12%	0.11%	0.14%
Average SLA violation	9.97%	9.64%	9.57%
Number of hosts shutdown	3525	2655	1889
Mean time before a host shutdown(sec)	951.78	859.91	721.26
Mean time before a VM migration(sec)	19.32	20.07	20.21
VM selection mean(sec)	0.03218	0.02484	0.00912
Host selection mean(sec)	0.01723	0.01600	0.01552
VM reallocation mean(sec)	0.04356	0.02273	0.00905
Total mean(sec)	0.16989	0.10272	0.04953

- Total Cost of VMs in High performance configuration is approx. 247% more than low performance configuration

Service Level Agreement (SLA) is more achieved in High performance configuration as compared to other two configurations.

IV. CONCLUSIONS

This model is very helpful to reduce the overall cost taking into consideration different types of resource requirements in the cloud computing. By giving more control to users, burden on service provider can be reduced. The success of the system depends on how accurately the requirements of the client are studied and identified. In future, work can be done to reduce overall execution time of high performance model.

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