Allocating Resources in Cloud Using CloudAnalyst

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***Abstract* — Cloud Computing is a recent technology which is used to deliver the computing resources as a service over Internet inorder to facilitate the execution of tasks that involve in large-scale computation. A data center (DC) is a basis for the provision of cloud services which is composed of networked computers and storage that use to organize process, store and disseminate huge data. The cloud environment utilizes both computing and networking resources for the dynamic provisioning of resources, configuration and reconfiguration, and optimization of resources allocation. This helps to maximize the utilization of the data center and to minimize the cost for running user request in the cloud. In the proposed work, CloudAnalyst tool is used for creating Data Centers and userbase and inturn virtual machines (VM's) can be created for the data centers. In the proposed work, service broker's policies are analyzed for allocating resources efficiently.**

***Index Terms*—Cloud Computing, CloudAnalyst, Data Center, Resource allocation, Virtualization**

I. INTRODUCTION

Cloud computing is an on-demand computing technology which delivers services over Internet. The service models of Cloud computing includes Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS). The ultimate goal of cloud computing is to create a pool of resources across computers, servers, and data centers that enable users to access stored data and applications on demand basis. Cloud IaaS [3] acts as a service provider for the on demand access to computing resources with significant cost savings for the users.

II. RELATED WORKS

In Cloud computing, users can access applications & related data from anywhere, anytime over Internet. Using IaaS cloud model, it is possible for the users to rent resources for storage and other computations which significantly reduces infrastructure cost. One of the main drawback in cloud computing is optimizing the resources being allocated. The resource allocation is performed with the objective of minimizing the costs associated with it. The table 1 shows various resources allocation techniques.

A. Resource Allocation Scheme

The major goal of cloud is to provide efficient resource allocation mechanisms that offer an automated provisioning of resources. The purpose of any cloud service provider is to schedule applications inorder to obtain best utilization of available resources. The current status of each resource should be considered for better allocation of physical and/or virtual resources to applications with minimum the operational cost. In Cloud, the resource allocation scheme [3] should avoid the following criteria:

- Resource contention
- Scarcity of resources
- Resource fragmentation
- Over provisioning of resources
- Under provisioning of resources

A cloud service provider can offer the users with two provisioning plans such as reservation and/or on-demand plans. The main objective of this paper is to analyze that service broker policies could help the cloud users to maximize the utilization of the internal data center and to minimize the cost of running the tasks in the cloud.

B. System Framework

The key purpose of this paper is to avail resources on demand with reduced cost. There are four steps to generate the CPU time and VM creation time.

- Creating a Data Center and UserBase
- Configuring Data Center.
- Sending Cloudlets to VM's.
- Generating CPU and VM's load.

The figure 1 shows the system flow diagram in which client request is given and allocation of resource is done from the data center through cloud provider using optimized process at optimized cost.

The Cloud Service Brokers controls the routing of traffic between User Bases and Data Centers that decides which Data Center should service the requests from each user base. Cloud service provides resources efficiently based on demand.

Table.1 Resource Allocation Techniques

S. No.	Title	Techniques	Merits	Drawbacks
1	Vi NEYard: Virtual Network Embedding Algorithm with coordinated node and link mapping [7]	Network embedded	Increase the utilization of substrate network resources	Coordination of node and link
2	A Survey of Network Virtualization [8]	Virtual networks	Increased manageability	Complex design
3	Adaptive Virtual Network Provisioning [4]	Distributed fault tolerant embedding algorithm	Effectively repair resource failures	Only evaluated within a MSI
4	Efficient resource provisioning in compute clouds via VM multiplexing	Joint VM provisioning	High resource utilization	Estimates - size of VMs individually
5	Virtual network provisioning across multiple substrate networks	Virtual Network provisioning	To efficiently split virtual request	Complex optimization
6	Challenges in Resource Allocation in Network Virtualization [1]	Virtual network	Complex resource allocation	Dynamic assignment approach
7	Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering it Services as Computing Utilities [9]	Global Cloud exchange.	Provide feedback	Enterprises depends brokers for Cloud storage
8	Efficient Mapping of Virtual Network onto a Shared Substrate [6]	Back-bone mapping procedure	High quality mapping	Effort to find the best mapping

Steps for allocating the resources to the client:

1) Each UserBase has unique name and app ID with that a client request is made to the data centers via Internet.
2) Based on the client request, data center selection is done using service broker policies.
3) Then the Service brokers sends request to the selected DC Controller via Internet.
4) Now the selected DC Controller use VM Load Balancing policy to assign the VM to the client request.

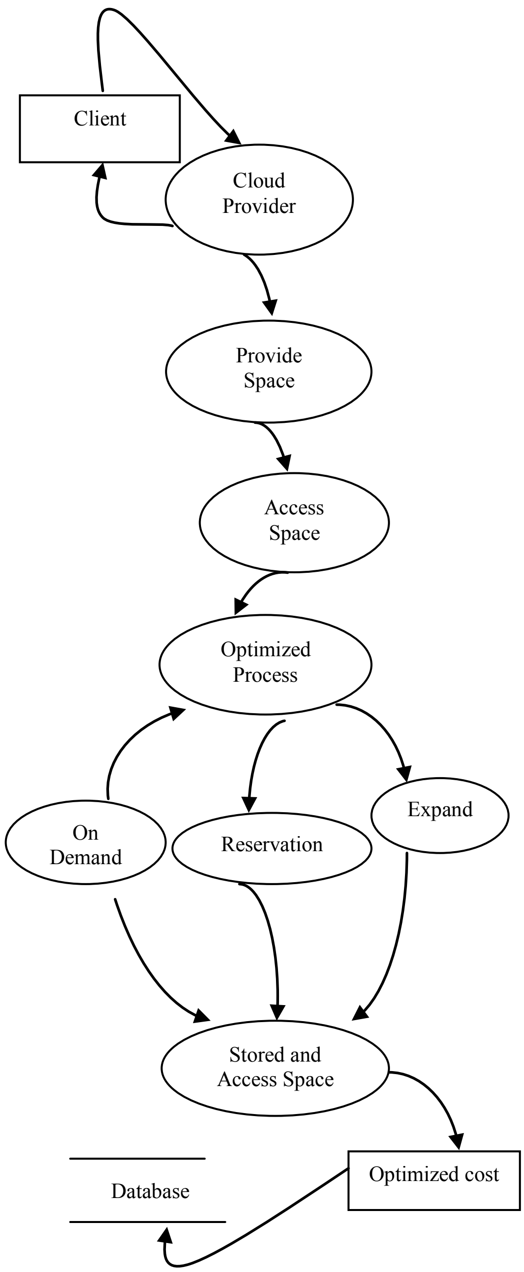

Fig. 1. System Flow Diagram

III. ANALYSIS OF RESOURCE ALLOCATION USING CLOUDANALYST

CloudAnalyst [2] is a cloud simulation tool in which number of Data Centers and UserBase can be created and any number of VMs can be created for the DCs. The architecture of CloudAnalyst is shown in the fig. 2. In the CloudAnalyst tool, the world is divided into 6 ‘Regions’ in which each of these regions consists of two main components that are User Bases and Data Centers.

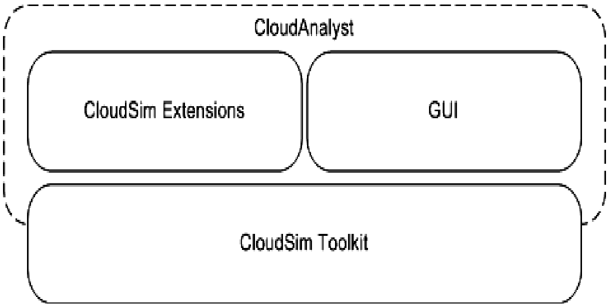

Fig. 2. Architecture of CloudAnalyst

A. Service Broker Policies

Inorder to provision the resources, balancing the load across Data centers is important. In CloudAnalyst[2], the load is balanced by using three service broker policies:

- Closest Data Center.
- Optimal Response Time.
- Reconfigure Dynamically with Load.

***a) Closest Data Center (CDC)* -** In this service brokers policy, UserBases are created and connected to the nearest Data Centers. This policy results in minimum response time.

***b) Optimal Response Time (ORT)* –** In this service brokers policy, number of Data centers created are connected to many number of Userbases. The optimal response time gives us a most favourable response time.

c) *Reconfigure Dynamically with Load (RDL)* – This service broker policy consume more time for running the simulation and it gives response time which is more than other two service broker policies.

In CloudAnalyst, simulation environment, next to the Main tab Data Center (DC) Configuration tab is there, using this, datacenters are created. Here we have chosen Round Robin algorithm for balancing the load in VM.

B. Simulation Results

In Main tab, we have created six UserBases in different regions and two Data centers in region 3 and 5 respectively.

After creating userbases and data centers, Service Broker Policy is selected as shown in the fig. 3.

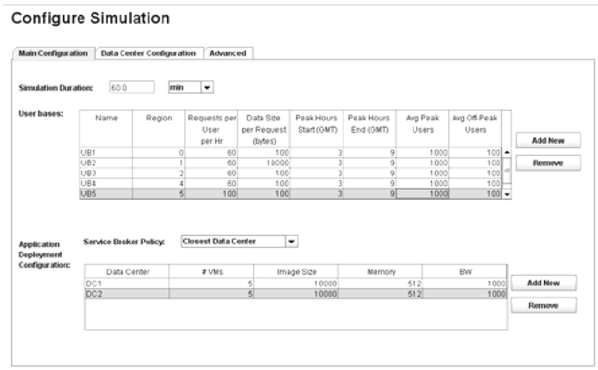

Fig. 3. Main Configuration Tab

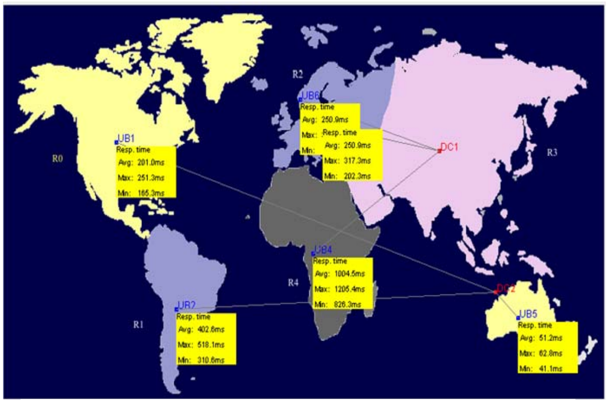

Fig. 4. Simulation Result – Closest Data Center

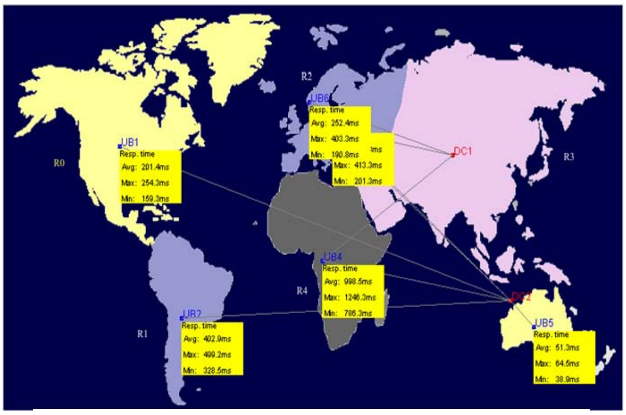

Fig. 5. Simulation Result – Optimized Response Time

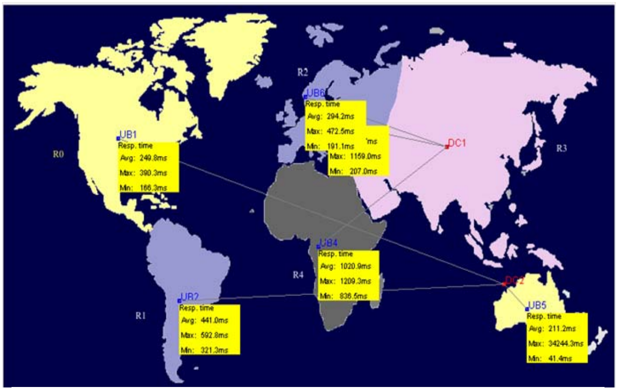

Fig. 6. Simulation Result – Reconfigure Dynamically with Load

Based on the main and datacenter configuration details, the simulation is executed and the Fig. 4, Fig. 5, Fig. 6 shows how the UserBase and Datacenter interact inorder to utilize the allocated resources based on the service broker policies. Here we have placed six user bases and 2 datacenters at different regions.

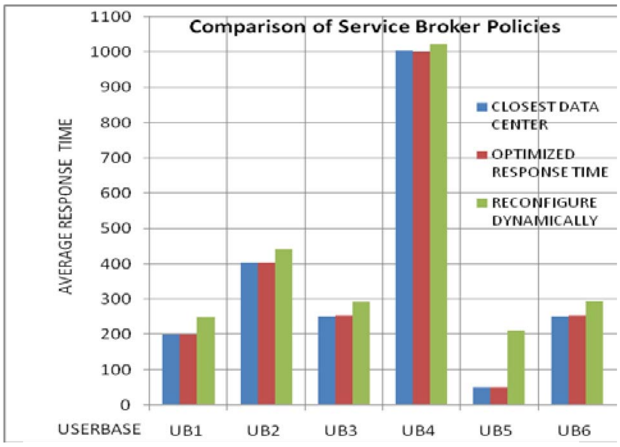

Fig. 7. Comparison of Service Broker Policies – Average Response Time

The fig 7. graph shows the average response time of three service broker policies from different UserBases. Here Closest Data Center shows less response time compared to other two service broker policies. The table 2 shows how much time taken for servicing the user request at the Data Centers.

Table 2. Data Center Request Servicing Times

Service Broker Policy	Data Centers	Avg (ms)	Min (ms)	Max (ms)
CDC	DC1	1.36	0.13	1.77
	DC2	1.53	0.13	3.25
ORT	DC1	1.39	0.13	1.77
	DC2	1.51	0.13	3.69
RDL	DC1	35.01	0.26	891.01
	DC2	98.73	0.23	34193

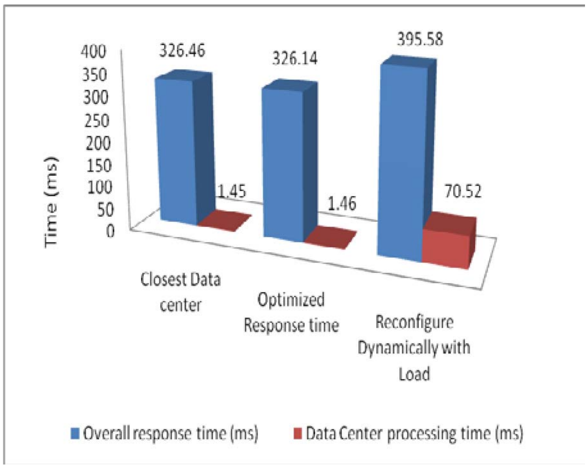

Fig. 8. Comparison of Service Broker Policies – Average Response Time

The figure 8 shows the overall response time and data processing time of service broker policies. In the simulation, we have taken two DCs one located at region 3 and other at region 5.

The graph fig. 9. represents the VM costs and Data transfer cost in the Data Centers based on the selected service broker policies

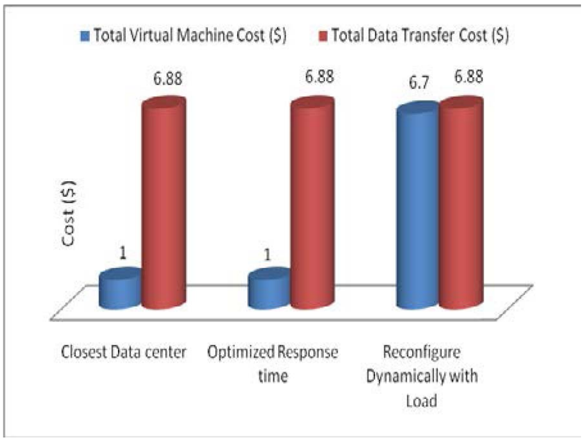

Fig. 9. VM Cost and Data Transfer Cost

Table 3. Cost Matrix of Data Center

Service Broker Policy	Data Centers	VM Cost $	Data Transfer Cost $	Total $
CDC	DC1	0.5	0.19	0.69
	DC2	0.5	6.69	7.19
ORT	DC1	0.5	0.17	0.67
	DC2	0.5	6.71	7.21
RDL	DC1	3.35	0.19	3.54
	DC2	3.35	6.69	10.04

The Table 3. represents the VM cost and Data Transfer cost at each Data Center based on the service broker policy. The simulation result shows that service broker policies CDC and ORT gives better performance in terms of response time and cost than the RDL broker policy.

IV. CONCLUSION

With the advancement of Cloud technologies rapidly, there is a need for simulation tools like CloudAnalyst to study and analyze the benefits of the technology in terms of resource provisioning and how best to apply the technology to large-scaled applications. We have chosen three services broker policies for simulating the allocation of resources from the data center in the cloud environment using CloudAnalyst. But there are still lots of service broker policies that can be applied to maximize the utilization of the data center and to minimize the cost of running the users requests in the cloud environment.

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