

Simulation and Analysis of Cloud Environment

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Abstract

Cloud computing has emerged as a popular solution to provide easy access to externalized IT resources. An increasing number of organizations benefit from Cloud computing to system their applications. One of its major advantages leading to its widespread application includes concepts of virtualization. There are different resources in cloud environment like Virtual Machine, CPU resource, Memory, Hard disk space of server machines located in datacenter. The server machines are consuming energy to provide services to users in cloud computing. For analyzing the resource allocation in cloud computing environment which is scalable to n servers then we will require Cloud simulation and modeling tool which will take create the cloud as per requirement. In this paper we have analyzed simulation of cloud on CloudSim and Cloud report for better analysis of cloud environment.

Keywords

Cloud computing, Simulation, CloudSim, Virtual Machine, Cloud Reports

I. Introduction

Cloud Computing is the practice of using a network of servers hosted on the Internet/Intranet to store, manage, and process data, rather than a local server or a personal computer. The cloud system is an on demand “just in time” provisioning involving a no upfront cost, pay-as-you-go system having infinite and elastic resource scalability.

Cloud computing is a concept used to describe a variety of computing concepts that involve large number of hosts connected through a communication network such as the Internet. Cloud computing is useful in distributed computing over a network, and means the ability to run a program or application on many connected computers at the same time. It is similarly referred to network-based services, which appear to be provided by real server hardware, and are in fact served up by virtual hardware, simulated by software running on one or more real machines.

II. Related Work

Different simulators have been proposed for modeling of Grid based environments. The toolkits are not capable of isolating the multilayer service abstractions (SaaS, PaaS, and IaaS) required by Cloud computing environments in other grid simulators. There is no support given for modeling virtualized environment. CloudSim toolkit is the perfect tool for modeling large scale virtualized cloud environment which has components for creating data centers, hosts, virtual machines, brokers and service requests[8].

CloudSim which is used for modeling and simulation of Cloud computing systems. Cloud model has been evaluated using CloudSim and performance gains as regards to response time and cost saving of using for various configurations [1]. It also allows simulation of multiple Data Centers to enable a study on federation and associated policies for migration of VMs for reliability and automatic scaling of applications [2]. Also CloudSim toolkit which supports both system and behaviour modeling of Cloud system components such as data centers, virtual machines (VMs) and resource provisioning policies. It implements generic application provisioning techniques that can be extended with ease and limited efforts. It supports modeling and simulation of Cloud computing environments consisting of both single and inter networked clouds[1,6].

Cloudsim is developed to simulate large scale Cloud environment for analyzing the cloud environment under various deployment configurations. Cloud Reports is a graphic tool that simulates

distributed computing environments based on the Cloud Computing. In other words, CloudReports is a graphical form of Cloud Sim with user friendly environment, repeatability and customizability [7].

III. Problem Statement

In cloud computing environment allocation of resource plays an important role. If resource are not properly allocated the high load on few servers and other servers with few load will lead to more energy consumption. As cloud is scalable from two servers to 1000s of servers or more than that it is not possible to deploy and test the cloud to analyze the resource allocation which is biggest problem. So the need of simulators arises to test the cloud as per our need which save time, cost, energy.

IV. Need of Cloud Simulation

For analyzing the resource allocation in cloud computing environment which is scalable to n servers then we will require Cloud simulation and modeling tool which will take create the cloud as per requirement. In this paper, we will be using Cloudsim, CloudReports for the resource allocation like Virtual machine.

1. Need for Cloudsim

As, cloud computing emerged as the leading technology for delivering reliable, secure, fault-tolerant, sustainable, and scalable computational services, which are presented as Software, Infrastructure, or Platform as services (SaaS, IaaS, PaaS).

Using simulation tools, which open the possibility of evaluating the hypothesis prior to software development in an environment where one can perform different tests. Specifically in the case of Cloud computing, where access to the infrastructure incurs payments in real currency, simulation-based approaches offer significant benefits, as it allows Cloud customers to test their services in repeatable and controllable environment free of cost, and to tune the performance bottlenecks before deploying on real Clouds[2].

At the cloud provider side, simulation environments allow evaluation of different kinds of resource leasing scenarios under different load and pricing distributions. This leads to the providers in optimizing the resource access cost with focus on improving profits. Without such simulation platforms, Cloud customers and providers have to depend either on theoretical and imprecise evaluations, or on try-and-error approaches that lead to less

service performance. By using CloudSim, developers can focus on specific system design issues that they want to test, without getting concerned about the low level details related to Cloud-based infrastructures and services[2][5].

V. Cloudsimulator

Cloudsim is simulation software which enables to work on cloud computing experiments. CloudSim is a simulation application which enables seamless modeling, simulation, and experimentation of cloud computing and application services. Due to the problem that existing distributed system simulators were not applicable to the cloud computing environment. Evaluating the performance of cloud provisioning policies, services, application workload, models and resources performance models under varying system, user configurations and requirements is difficult to achieve. To overcome this challenge, CloudSim can be used[4]. The CloudSim also supports system and behavior modeling of cloud system components such as data centers, virtual machines (VMs) and resource allocation policies[4].

Cloudsim implements generic application provisioning techniques that can be extended with ease and limited efforts. The cloudsim architecture is given below in figure 1. As shown in figure below the datacenter which is the backbone of the cloud which is having set of host(s), virtual machine(s).

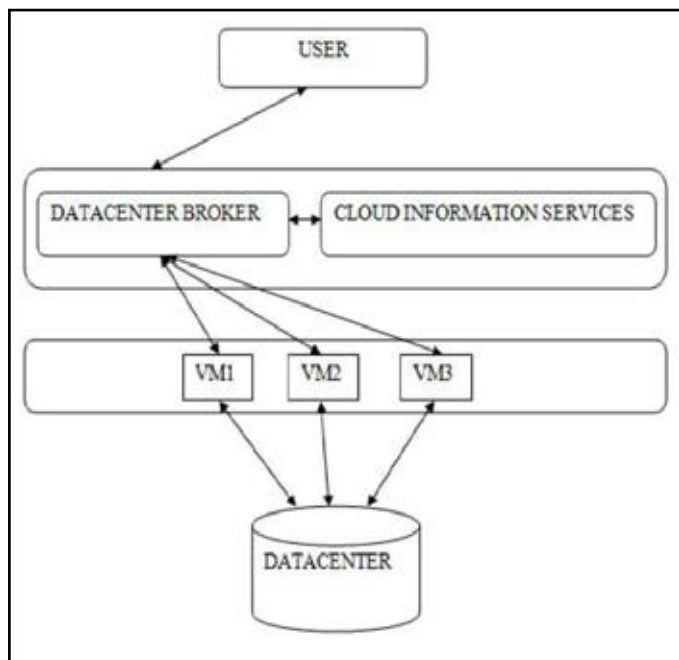


Fig.1: Cloudsim Architecture

1. Cloudsim Features

Following are the features of Cloudsim.

- Support for modeling and simulation of large scale Cloud computing data centers.
- Support for modeling and simulation of virtualized server hosts, with customizable policies for provisioning host resources to virtual machines
- Support for modeling and simulation of energy-aware computational resources
- Support for modeling and simulation of data center network topologies and message-passing applications
- Support for modeling and simulation of federated clouds
- Support for dynamic insertion of simulation elements, stop and resume of simulation

- Support for user-defined policies for allocation of hosts to virtual machines and policies for allocation of host resources to virtual machines results[9].

2. Cloudsim Components

There are main four basic components which are available in cloudsim.

- 1) Datacenter
- 2) Broker
- 3) Virtual Machine
- 4) Cloudlet

3. Cloudsim code

// The cloudsim code below gives the idea of how to create datacenter ,host ,virtual machine. User can specify customised requirement according to usage.

```
// Datacenters are the resource providers in CloudSim. We
//need at list one of them to run a CloudSim simulation
Datacenter datacenter0 = createDatacenter ("Datacenter_0");
// Create Broker
DatacenterBroker broker = createBroker();
int brokerId = broker.getId();
// Create one virtual machine vmList = new
ArrayList<Vm>();
// VM description
int vmid = 0;
int mips =1000;
long size = 100000; // image size (MB)
int ram = 1024; // vm memory (MB)
long bw = 1000;
int pesNumber = 1; // number of cpus String vmm = "vm1"; //
VMM name
// create VM
Vm vm = new Vm(vmid, brokerId, mips, pesNumber, ram, bw,
size, vmm, new CloudletSchedulerTimeShared());
// add the VM to the vmList vmList.add(vm);
// submit vm list to the broker broker.
submitVmList(vmList);
// Create one Cloudlet
cloudletList = new ArrayList<Cloudlet>();
```

e. CloudReports

CloudReports provide different views for researcher to play role of service providers and users in cloud computing. Capability of user are set the number of virtual machines each customer owns, a broker responsible for allocating these virtual machines and resource consumption algorithms, set the amount of computational nodes (hosts) and their resource configuration, which includes processing capacity, amount of RAM, available bandwidth, resource utilization and execution time. and its enable service providers to evaluate their cloud environment before leasing the services to the users[11].

For the Cloureports, CloudSim acts as its simulation engine and provides an easy interface, report generation features and creation of extensions. The application simulates an Infrastructure as a Service (IaaS) provider with an arbitrary number of datacenters. Each datacenter can be customized as per need. The user can easily set the amount of computational nodes (hosts) and their resource configuration, which includes processing capacity, amount of RAM, available bandwidth, power consumption and scheduling algorithms[10].

The user can set the number of virtual machines, a broker

responsible for allocating these virtual machines and resource allocation algorithms. Each virtual machine has its own configuration that consists of its hypervisor, image size, scheduling algorithms for tasks (cloudlets) and required processing capacity, RAM and bandwidth.

VI. Experimental Results

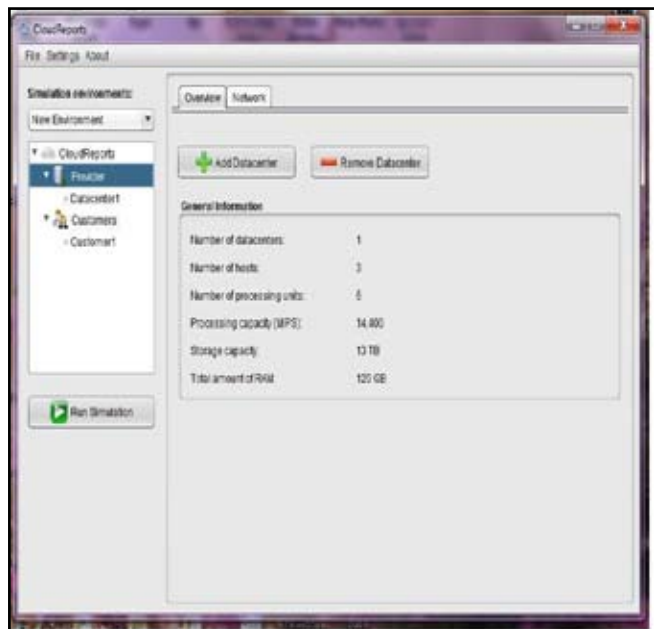


Fig. 2 : Cloudreports environment simulation

User can create datacenter ,no of hosts with capacity(MIPS), RAM in Cloud report as shown in figure 2. Additionally, CloudReports generates HTML reports of each simulation and raw data files that can be easily imported by third-party applications such as Octave[5].

User can create simulation environment which consists datacenter ,no of hosts with capacity(MIPS), RAM of desired configuration in Cloud report as shown in figure3.

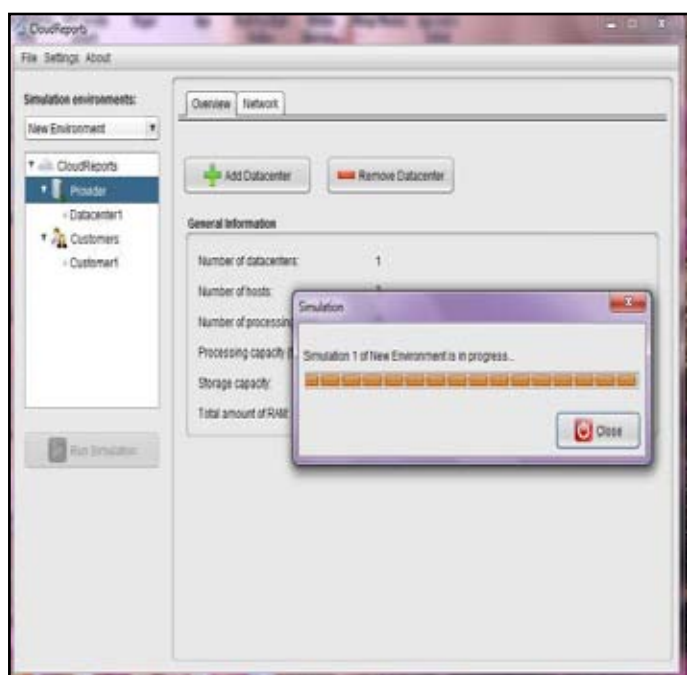


Fig. 3: Cloud reports Simulation

After simulation Cloud Reports will generate overview which consists of different resource statistics as shown in figure 4.

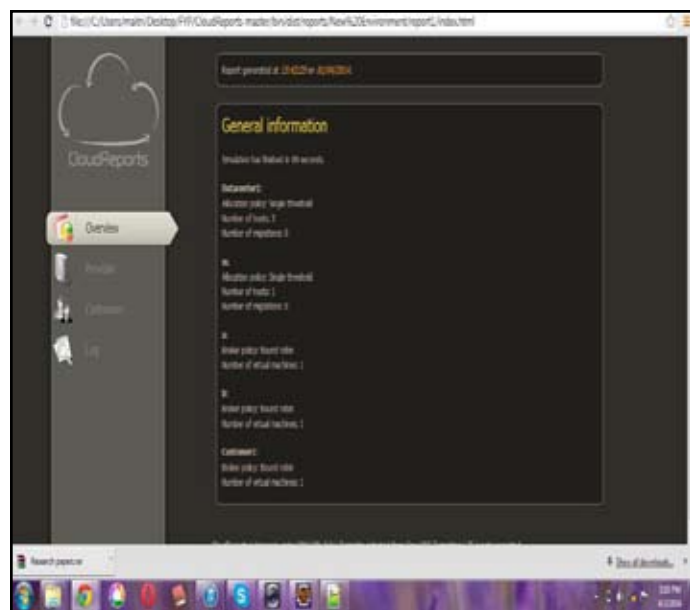


Fig. 4: Cloud Reports Simulation overview

For viewing different graphs resource , Energy utilization Cloud Reports can be used which is shown in figure 5 below.

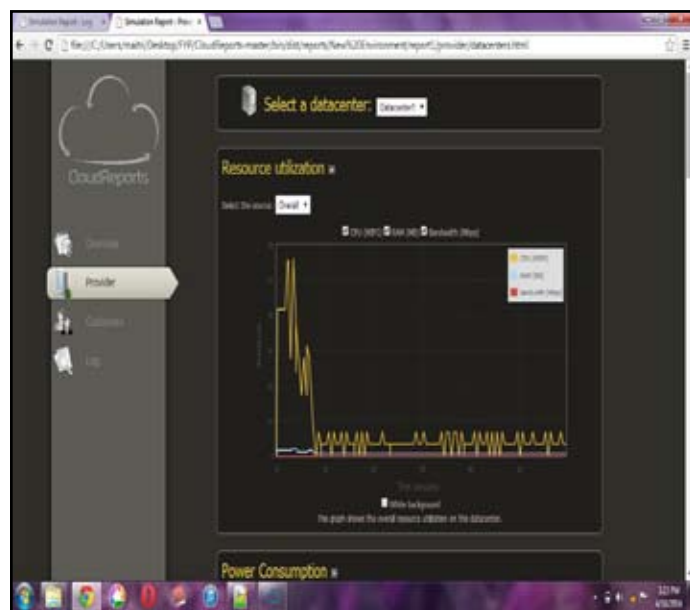


Fig. 5: Cloud reports resource utilization Graph

VII. Conclusion

Cloud computing involves a large number of computers connected through a real-time communication network such as the Internet or Intranet. As Cloud computing is scalable the need of simulation arises for allocation of resources on demand. The different resources such as Virtual Machine , Cpu, Memory ,Hard disk need to be allocated properly in order to reduce the energy consumption. As simulation of cloud is required to for As infrastructure requirement is scaling in and scaling out then it takes time ,cost , manpower utilization while doing actual deployment of cloud which is not advisable. Cloudsim is perfect solution for modelling the cloud against scaling in and scaling out of the infrastructure requirement. Cloud reports is the perfect solution for costing of

the infrastructure, resource utilization, power consumption of the customized environment.

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