An Overview and Survey of Various Cloud Simulation Tools

Parveen Kumar*, Anjandeep Kaur Rai

Assistant Professor, LPU M.Tech Student, LPU

Phagwara, Punjab, India

Parveen.it@gmail.com*, anjanrai@gmail.com

Abstract: Cloud computing is a distributed kind of internet based computing in which the resources like infrastructure, platform, software etc are provided by the cloud service providers to the customers on their request on a pay per usage basis. Today, everybody is moving towards traditional computing towards cloud computing   as it provides a number of advantages like on-demand access, broad network access, rapid elasticity etc. In spite of having so many advantages, consumer has to pay a good amount of money to the service provider depending upon the service provider as well as the amount in which the resource is used and also on the amount of time for which resource is used. To overcome this thing, cloud simulation tools can be used in place of using cloud services.

INTRODUCTION

Cloud computing, according to NIST, is a pay per usage, distributed model for enabling on demand network access to a wide variety of resources like hardware, software, network etc that is provided by the cloud service provider to the customer as per his request [1]. People, today, are shifting from traditional computing towards cloud as it provides higher reliability, fault tolerance, broad network access, on demand usage etc.But cloud suffers from some serious issues as well ,the major of which is monetary cost involved in using cloud resources and also cost involved in making sure that internet is always available, as cloud computing is purely an internet based technology .For ,this reason, the need of the hour is to have some less costly solution, and thus we are having an option of using simulation tools in cloud.

PROS OF RUNNING SIMULATION

Use of cloud computing is increasing at a very fast pace everywhere because it turns the capital expenditure cost into operational cost. In addition to that, use of simulation tools is considered a better option in spite of being on the real cloud as performing experiments in a controlled and dependent environment is difficult and costly to handle [2].Moreover, effective resource utilization is not possible in case of Cloud. So, we just shift towards cloud simulation tools. Following are the advantages of running simulation tools in cloud:

a. No capital cost involved: As we discussed earlier, that cloud computing makes a shift from capital expenditure cost to operational cost. Having a cloud simulation tool also involves having no installation cost or maintenance cost as well.

b. Leads to better results: Using such tools helps to change inputs and other parameters as well very easily which results in better and efficient output

c. Evaluation of risks at an early stage: Because simulation tools involve no cost while running as is in case of being on cloud, so user can identify and solve any risk that is associated with the design or with any parameter.

d. Easy to learn: While working with such simulation tools, user need to have only programming abilities and rest all depend on that. If the user is well versed with the language, then simulation tools offer no problem [3].

So, above are some of the advantages that are provided by the tools.

CLOUD SIMULATION TOOLS

There are various simulation tools for cloud ,some of which are as follows:

Cloud Sim:

Analysing the performance, policies in real cloud is difficult to achieve because of its altering nature, so in such a situation, we can opt for CloudSim. CloudSim is a famous tool that is actually a toolkit for simulation of cloud scenarios [4].CloudSim has been developed as a CloudBus project in Australia [4]. CloudSim actually enables the users to have a proper insight into cloud scenarios without worrying about the low level implementation details [5]. CloudSim Architecture

CloudSim has a layered architecture as shown in Figure 1; it is composed of several layers. Here, CloudSim 2.0 layered architecture has been discussed.
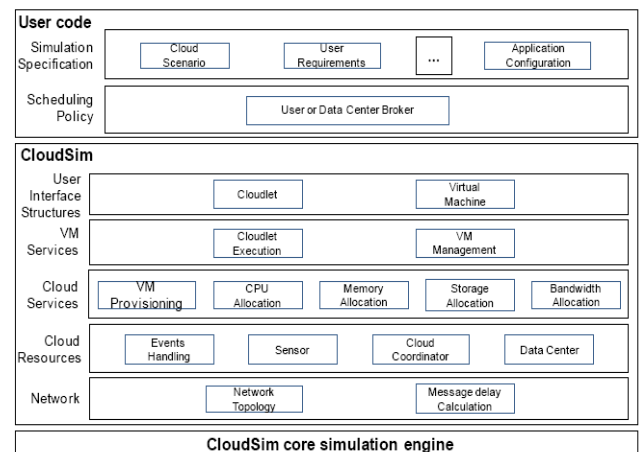

Figure 1: The CloudSim architecture

All components in CloudSim communicate through the process of message passing. The lowermost layer is responsible for managing the communication between various components. The second layer has all the sub layers in it that have the main cloud components [6].

In case of CloudSim, user can model the data center,virtual machines allocation, power consumption, network behaviour as well [7].

GDCSim:

The major problem associated with analyzing the parameters of data center is the lack of a well defined simulator. So we have GDCSim [8]. Here, GDC is Green Data Center Simulator. It actually combines both the modular and extensible entities [6]. GDCSim is used to iteratively design green data centers. It is developed at impact lab as a component of BlueTool infrastructure project [8].

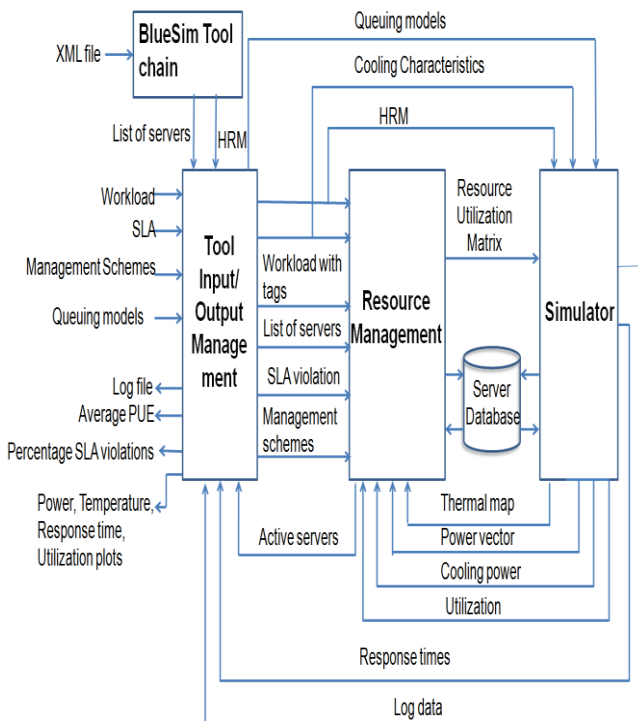Following Figure 2 shows the architecture of GDCSim:

Figure 2: GDCSim architecture

The GDCSim architecture as shown in Figure 2 consists of four main modules:
  a. BlueSim toolkit: BlueSim is a simulation package which consists of three modules: processing, pre-processing and post processing.
  b. Input/output management: It serves two purposes viz. It acts as a module for getting input and also it is responsible for showing the output.
  c. Resource Management: This module is responsible for power, cooling and workload management.
  d. Simulator: It is responsible for performing and management of simulation related activities occurring in the system.

Cloud Analyst:

The main problem that user comes across while working with CloudSim is that it is not at all graphical in nature, so to have better visualisation results, user can opt for CloudAnalyst. Such environment helps in separating the programming environment form the simulation environment [5]. This tool is very easy to use and has the ability to produce the output in graphical form.

Also, like CloudSim, it allows user to repeat experiments again and again with either same or different parameters.
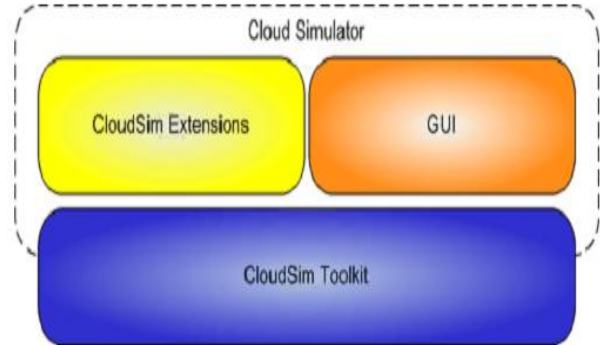

Figure 3: Relationship between CloudAnalyst and CloudSim

Above figure 3 shows that CloudAnalyst is purely derived from CloudSim but the difference between these two tools lies in the fact that CloudSim lacks of presentation capability but CloudAnalyst is able to display the output in graphical form [5].

Network Cloud

Network Cloud is an extension of CloudSim and is capable of implementing network layer in CloudSim, reads a BRITE file and generates a topological network. Here, we have topology file which contains the number of nodes along with the various entities involved in simulation [4].In this simulation tool, each entity is to be mapped to a single BRITE node so that network CloudSim can work properly. Network CloudSim can be used to stimulate network traffic in CloudSim.

MDCSim

MDCSim is a variant of CloudSim tools. It helps the user to analyze and predict the hardware related parameters of the data centers like those of servers, switches, routers etc. Also it is used predominantly because of its low overhead produced [4].

SPECI

SPECI, Simulation Program for Elastic Cloud Infrastructures, is responsible for analyzing the various scalability and performance aspects of future Data centers [9].It is assumed that when data centers are made to grow big, then they do so in a non linear fashion, so there is a need to analyze the behaviour of such data centers. Here what SPECI plays a role. So, these are all about some major cloud simulation tools being used today.

COMPARISON OF MAJOR CLOUD SIMULATION TOOLS

Here, we will mainly discuss the three major cloud simulation models viz. MDCSim, CloudSim and GreenCloud in terms of different parameters like availability, application models, time taken for simulation to complete etc.

Table 1: Comparison of MDC Sim, Cloud Sim and Green Cloud.

Parameters	MDCSim	CloudSim	GreenCloud
Communication Network	Limited	Limited	Full
Graphical Support	None	Limited(Cloud Analyst)	Limited(NetworkAnimator)
Availability	Commercial	OpenSource	OpenSource
Platform	CSIM	SimJava	NS2
Application Models	Computation	Computation and Data Transfer	Computation DataTransfer and Exec.deadline
Simulation Time	Seconds	Seconds	Tensof Minutes
Language/ Script	C++/Java	Java	C++oTcl
Physical Models	None	None	Available using plug in
Energy Models	Rough	None	Precise(servers + networks)
Support Of TCP/IP	None	None	Full
Power Saving Modes	None	None	DVFS, DNS And both

So, we can determine the tool depending upon our requirement.

CONCLUSION

In this review paper, we have discussed many cloud simulation tools. We can't say, some tool is better than another because every tool has some pros and cons over the other. So, it depends upon the requirements of users according to which he/she will choose the appropriate one.

ACKNOWLEDGMENT

The making of the paper needed co-operation and guidance of a number of people. I therefore consider it my prime duty to thank all those who had helped me through their venture. It is my immense pleasure to express my gratitude to Mr. Parveen Kumar as guide who provided me constructive and positive feedback during the preparation of this.

I express my sincere thank to all the staff members of CSE department for their kind co-operation. I am thankful to my friends whose encouragement and suggestion helped me to purpose my work.

I am also thankful to my parents for supporting me at each and every phase.

REFERENCES

[1]. Buyya Raj kumar, "Cloud Computing: Principles and Paradigms", Wiley, 2011

[2]. Calheiros Rodrigo N, Ranjan Rajiv, "CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments and Evaluation of Resource Provisioning Algorithms", Wiley Press, New York, USA, January, 2011,pp. 23-50.

[3]. http://blog.rescale.com/engineering-simulation-in-the-cloud/

[4]. Malhotra Rahul, Jain Prince, "Study and Comparison of CloudSim Simulators in the Cloud Computing", The SIJ Transactions on Computer Science Engineering & its Applications (CSEA), Vol. 1, No. 4, September-October 2013,pp.111-115.

[5]. B.Wickremasinghe (2009), "CloudAnalyst: A CloudSim based Tool for Modeling and Analysis of Large Scale Cloud Computing Environments", MEDC Project Report, 2009

[6]. Kaur Gaganjot, Kumar Pawan,"Study of Comparison of Various Cloud Computing Simulators", 2nd National Conference in Intelligent Computing & Communication.

[7]. Safi Faramarz, "CloudSim: A Toolkit for Modeling and Simulation of Cloud Computing Environments", Islamic Azad University, Najafabad Branch, Esfahan, Iran.

[8]. Gupta Sandeep K.S. and Gilbert Rose Robin, "GDCSim - An Integrated Tool Chain for Analyzing Green Data Center Physical Design and Resource Management Techniques", 2011 IEEE, pp.1-8.

[9]. Sriran Ilango,"SPECI, a simulation tool exploring cloud-scale data centres"

Short Bio data for the authors

Mr Parveen Kumar is currently Assistant Professor in Lovely professional University. He did his M.Tech from MNNIT, Allahabad. His area of interest is Cloud Computing.

Ms. Anjandeep Kaur Rai is currently pursuing M.Tech IT from Lovely Professional University and did Msc IT from DAV Jalandhar. Her area of research is Cloud Computing