International Journal of Engineering Research & Management Technology ISSN: 2348-4039
March-2017 Volume- 4, Issue-2
Email: editor@ijermt.org www.ijermt.org

COMPARATIVE STUDY OF OPEN SOURCE CLOUD SIMULATION TOOLS

Avneesh Vashistha
Assistant Professor
Department of IT
IMS, Ghaziabad

Shourabh Sholliya
Assistant Professor
Department of IT
IMS, Ghaziabad

ABSTRACT: Cloud computing in simple terms is internet-based computing or rental computing. Users can use applications from any computer through the internet on demand. This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth. Many cloud simulator tools and frameworks have been developed to aid the simulation of cloud environments in order to test any newly proposed algorithm, model or concept without having to incur the cost of deploying the same on an actual cloud infrastructure. It can be observed that although most of the cloud simulators and frameworks have similar architectures and functions, they considerably differ when comes to capability and extensibility. Several simulators have been developed for performance analysis of cloud computing environments. This paper explores various open source simulators available for cloud computing environment like CloudSim, CloudAnalyst, GreenCloud, iCanCloud, EMUSIM, GroudSim and DCSim. It is also observed that few Cloud Computing concepts cannot be satisfactorily simulated by any of these simulators.

KEYWORDS - Cloud Computing, Grid, Simulators, Virtual Machine, Hosts

1. INTRODUCTION

The basic idea of cloud computing had first been mentioned back in 1960s by John Macarathy, when he opined that computing may someday be organized as a public utility [1]. The internet is often represented as a cloud and the term "Cloud Computing" arises from that analogy. According to NIST [2], Cloud Computing is a model for enabling ubiquitous, Convenient, On-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud Computing is broadly categorized as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Cloud Computing or simply rental computing, is a new technology currently being studied in the academic world [3]. The definition of the cloud computing from the Gartner "A style of computing where massively scalable IT-related capabilities are provided as a service across the internet to multiple external customers using internet technologies" [4][5]. Many cloud simulator tools and frameworks have been developed to aid the simulation of cloud environments in order to test any newly proposed algorithm, model or concept without having to incur the cost of deploying the same on an actual cloud infrastructure. It can be observed that although most of the cloud simulators and frameworks have similar architectures and functions, they considerably differ when comes to capability and extensibility.

2. CLOUD SIMULATION TOOLS AND TECHNOLOGIES

Cloud simulation tools enable users to quickly set up simulations and summarize results in useful and desired formats, and will appeal to wider users or researchers. 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. These are the following simulators that support the cloud environment:

2.1 CloudSim

CloudSim, completely written in java, is a framework for modeling and simulation of cloud computing infrastructures and services. It provides a generalized and extensible simulation framework that enables modeling, simulation and experimentation of emerging cloud infrastructures and application

service. Using CloudSim, researchers and industry-based developers can focus on specific system design issues that they want to investigate, without getting concerned about the low-level details related to Cloud-based infrastructures and services. CloudSim is a development toolkit for simulation of Cloud scenarios and facilitates modeling and simulation of large scale cloud computing data centers; virtualized server hosts, with customizable policies for provisioning host resources to virtual machines; application containers; energy-aware computational resources; data center network topologies and message- passing applications; federated clouds. CloudSim supports dynamic insertion of simulation elements, stop and resume of simulation and also support user defined policies for allocation of hosts to virtual machines and policies for allocation of host resources to virtual machines [6][7].

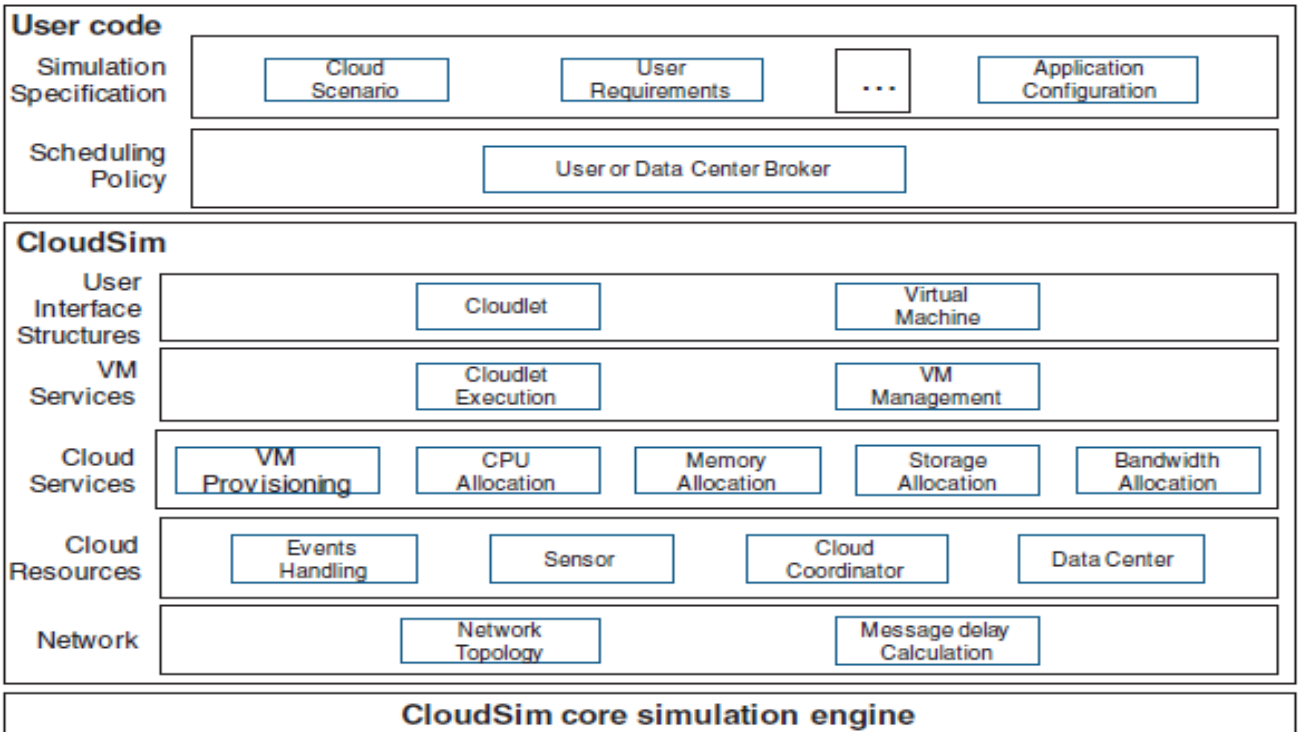

Fig.1- CloudSim Architecture

2.2 CloudAnalyst

CloudAnalyst was developed to simulate large-scale Cloud applications with the purpose of studying the behaviour of such applications under various deployment configurations. CloudAnalyst helps developers with insights in how to distribute applications among Cloud infrastructures and value added services such as optimization of applications performance and providers incoming with the use of Service Brokers [8].CloudSim is not graphical in nature, so to have better visualization results, researcher can opt for CloudAnalyst.

2.3 Greencloud

Greencloud is a sophisticated packet-level simulator for energy-aware cloud computing data centers with a focus on cloud communications**.** It offers a detailed fine-grained modeling of the energy consumed by the data center IT equipment, such as computing servers, network switches, and communication links. GreenCloud can be used to develop novel solutions in monitoring, resource allocation, workload scheduling as well as optimization of communication protocols and network infrastructures. Some basic features include networking and energy awareness; simulation of CPU, memory, storage and networking resources; independent energy models for each of resource; support of virtualization and VM migration; network-aware resource allocation; user friendly and open source[9][10].

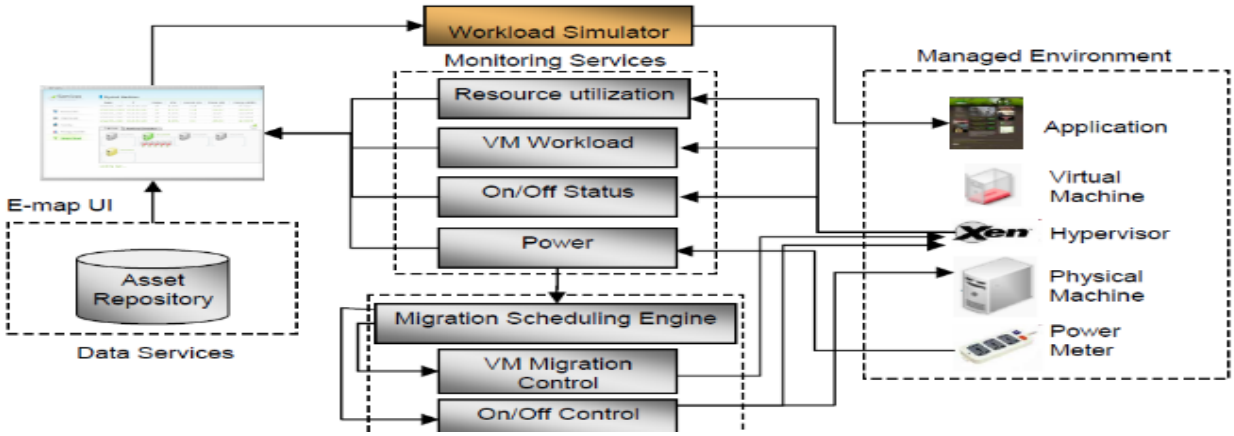

Fig.2- GreenCloud Architecture

2.4 iCanCloud

iCanCloudis a cloud simulator and developed to model and simulate cloud computing systems with an objective to predict the trade-off between cost and performance of a given set of applications executed in a specific hardware, and then provide to users useful information about such costs. Some basic features of iCanCloud simulation platform includes both existing and non-existing cloud computing architectures can be modeled and simulated; provides methods for integrating and testing new and existent cloud brokering policies as well as energy consumption of each hardware component in cloud computing environment. By using iCanCloud customizable virtual machines can be used to quickly simulate uni-core as well as multi core systems. This also provides a wide range of configurations for storage systems like local and remote storage systems. New components can be added to the repository of iCanCloud to increase the functionality of the simulation platform [11].

2.5 EMUSIM

EMUSIM, Integrated Emulation And Simulation For Evaluation Of Cloud Computing Applications, combines emulation (AEF) and simulation (CloudSim) to enable more accurate models of software artifacts (obtained via profiling during emulation) to be used during simulations. This is especially useful when the tester has no idea on the performance of the software under different levels of concurrency and parallelism, which impedes utilization of simulation. These can replace in situ experiments when such experiments would require a scale that is either unavailable for the tester or too expensive to run in a public Cloud [12].

2.6 GroudSim

GroudSim is a simulator able to simulate (Gr)id and Cl(oud) resources and application execution on them for the purpose of research in the areas of scheduling, resource management, provisioning and workflow execution [13].

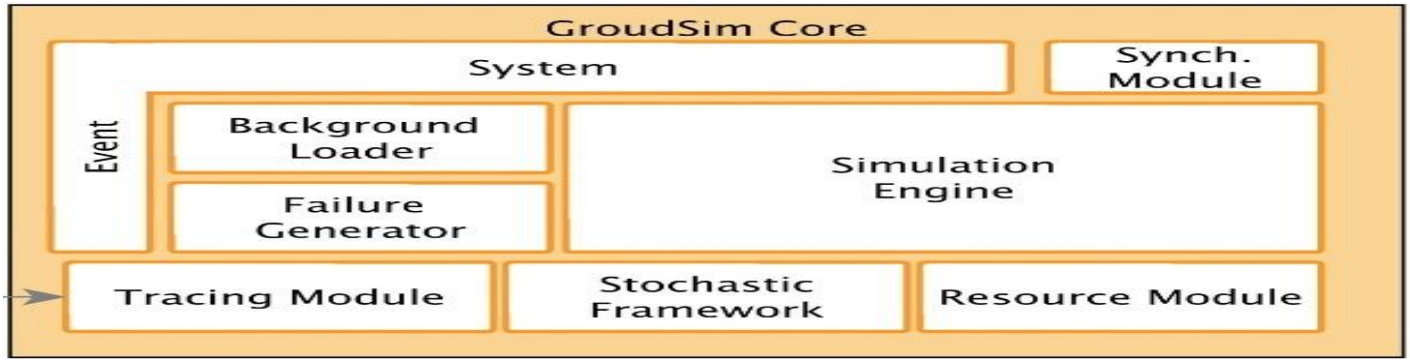

Fig.3- GroudSim Architecture

2.7 DCSim

DCSim (Data Centre Simulator) is an extensible data centre simulator implemented in Java, designed to provide an easy framework for developing and experimenting with data centre management techniques and algorithms. It is an event-driven simulator, simulating a data centre offering IaaS to multiple clients. It focuses on modelling transactional, continuous workloads (such as a web server), but can be extended to model other workloads as well. Main components of DCSim. The primary class is the DataCentre, which contains Hosts, VMs, and various management components and policies [14] [15].

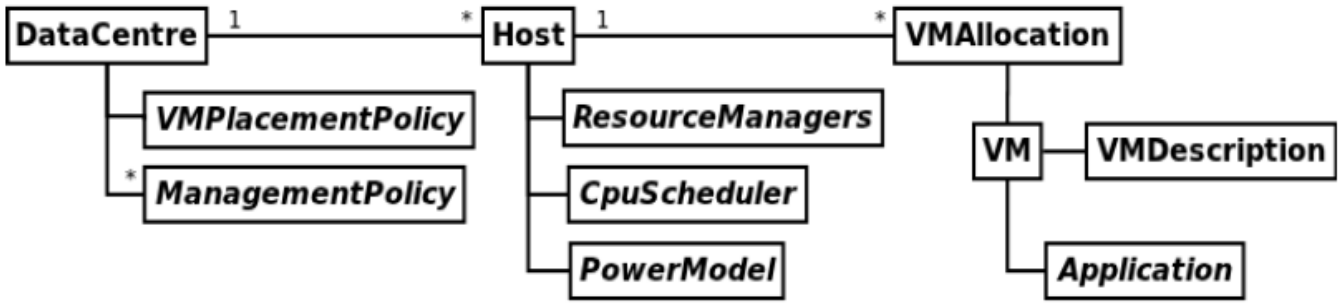

Fig.-4 -DCSim Architecture

3. COMPARISON

Figure-5[16] shows the comparison chart on the basis of some vital factors like platform, type, programming language, and cost, interface, model and simulation time. So, we can select the tool depending upon our specific requirements.

Comparing open source cloud computing simulators

Simulator	Platform	Type	Programming language	Cost modelling	GUI	Communication model	Simulation time
CloudSim	SimJava	Open source	Java	Yes	No	Limited	Second
CloudAnalyst	CloudSim	Open source	Java	Yes	Yes	Limited	Second
GreenCloud	NS-2	Open source	C++, oTCL	No	Limited	Full	Minute
iCanCloud	SIMCAN	Open source	C++	Yes	Yes	Full	Second
EMUSIM	CloudSim, AEF	Open source	Java	Yes	No	Limited	Second
GroudSim	-	Open source	Java	No	Limited	No	Second
DCSim		Open source	Java	No	Limited	No	Second

Fig.5- Comparison

4. CONCLUSION

This paper focuses on the architecture, platform, cost, communication model, and simulation time of fewer open source cloud simulation tools. Analyzing various open-source cloud computing frameworks, we find that there are differences between them regarding the overall scheme of their design. These tools may not emphasis on long-term support because of the version and OS dependency. Performance of cloud simulation tools depends on the efficiency of scheduling algorithm used in the tools.

REFERENCES

1. S. L. Garfinkel, Architects of the Information Society: Thirty- Five Years of the Laboratory for Computer Science at MIT, H. Abelson, Ed. The MIT Press, 1999
2. http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf
3. Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, Randy Katz, Andy Konwinski, Gunho Lee, David Ptterson, Ariel Rabkin, Ion Stoica, and MateiZaharia, "Above the clouds: A berkeley view of cloud computing," UCB/EECS-2009-28.

4. Cloud Computing Definition Gartner. http://www.gartner.com/newsroom/id/1035013
5. Avneesh Vashistha, Rabins Porwal, A.K Soni, "A Taxonomy of Scheduling Algorithms for Cloud Computing", IJCSI, pp67-71, 2015.
6. R.N. Calheiros, R. Ranjan, A. Beloglazov, C.A.F. De Rose, R. Buyya, "CloudSim: a toolkit for modeling and simulation of cloud computing environments and evaluation of resource provisioning algorithms, Softw.:Pract. Exper", 41 (1) (2011) 23–50 (ISSN: 0038-0644, Wiley Press, New York, USA).
7. http://www.cloudbus.org/cloudsim/
8. B.Wickremasinghe, R. N. Calheiros, R. Buyya "CloudAnalyst: A CloudSim-based Visual Modeller for Analysing Cloud Computing Environments and Applications", Advanced Information Networking and Applications (AINA), 24th IEEE International Conference on 20-23 April 2010.
9. https://greencloud.gforge.uni.lu/index.html
10. L. Liu, H. Wang1, X. Liu, X. Jin, W. He, Q. Wang, Y. Chen, "GreenCloud: A New Architecture for Green Data Center", *ICAC-INDST'09,* June 16, 2009.
11. https://www.arcos.inf.uc3m.es/old/icancloud/Home.html
12. http://www.cloudbus.org/cloudsim/emusim/
13. http://dps.uibk.ac.at/projects/groudsim/
14. M. Tighe, G. Keller, M. Bauer, and H. Lutfiyya, "DCSim: A data centre simulation tool for evaluating dynamic virtualized resource management," in SVM Proceedings, 6th Int. DMTF Academic Alliance Workshop on, Oct. 2012.
15. http://digs.csd.uwo.ca/
16. http://opensourceforu.com/2016/11/best-open-source-cloud-computing-simulators/

AUTHOR BIOGRAPHY

Avneesh Vashistha is a research scholar in Sharda Univeristy, Greater Noida and associated with IMS, Ghaziabad as Assistant Professor-IT department. His research area is Cloud Computing.

Shourabh Sholliya is associated with IMS Ghaziabad as Assistant Professor-IT department. His research area is optimization using genetics.