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A REVIEW ON CLOUD SIMULATORS

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ABSTRACT: ***Cloud computing is today's emerging technology, which offers computing resources as a service over the different network, through the web browser. As the adoption and rapid application development of cloud computing increases day by day, it is challenging to evaluate the security and performance problems that cloud computing confronts. Presently, modeling and simulation technology has become a useful and powerful tool in cloud computing research community to deal with these issues. In this paper, to the best of my knowledge, I have review existing cloud simulators and finally compare them base on various parameters like platform, language, graphical support etc.***

Keywords: Cloud Computing; Cloud Simulators; CloudSim; Cloud Analyst; Green Cloud; iCanCloud.

I. INTRODUCTION

To separate quality concerns and to decrease the complexity, Cloud simulators are required for cloud system. In Cloud simulator performance analysts can analyze the behavior of system under different scenarios behavior by focusing on quality issues of specific component. These tools are providing the facility of examine the hypothesis in a controlled environment where researcher can easily reproduce results. Today many IT companies are significantly benefited by these simulation-based approaches by allowing them to test their services in controllable and repeatable environment and experiment with different workload mix and resource performance scenarios on simulated infrastructures for developing and testing adaptive application provisioning techniques [1]. Presently the available distributed system simulator not having the environment that can model the Cloud computing environments. But in CloudSim emerging Cloud computing application services and infrastructures can be model and tested, due to its extensible and generalized simulation framework. In this paper, section II provides the background of various available simulators. Next in section III, different Cloud simulators define and explores, such as Cloud Analyst, CloudSim, Green Cloud, and icancloud. And in the last section IV, evaluation of all Cloud Simulators with respect to platform, language, availability, graphical support etc is given.

II. BACKGROUND

There have been many revisions of simulation methods to examine the behaviour of large scale distributed systems and tools to support such research. These simulators are GridSim [2], MicroGrid, GangSim, OptorSim, SimGrid [2] and CloudSim [3]. Whereas the first three prominences on Grid computing systems. CloudSim is the simulation framework for studying Cloud computing systems. However, to evaluate overheads of implementing distributed applications in Cloud organizations, grid simulators have been used. GridSim is an event driven simulation toolkit, which was developed in Java to address the difficulties of performance evaluation of heterogeneous Grid systems and real large scaled distributed environments in controlled and repeatable fashion. CloudSim enables simulation, seamless modelling and experimenting on Cloud computing infrastructures. CloudSim is a self-contained platform that can be used to model service brokers, data centres and allocation policies and scheduling of large scale Cloud platforms. For the simulation of distributed applications SimGrid is used, which is a generic framework applications in Grid platforms. And for demonstrating of Grid-based virtual resources and organizations, GangSim providing the support, is a Grid simulation toolkit. In specific, application management and modelling of on-demand virtualization enabled resource, is not possible as there is no support in existing Grid simulation toolkits. Further, Cloud infrastructure modelling and simulation toolkits must provide provision for cost-effective entities such as Cloud brokers and Cloud exchange for enabling real-time interchange of services.

III. CLOUD SIMULATORS

While grid computing simulators have good but they cannot sufficiently model the cloud infrastructure. There are still only a few choices for simulating cloud architecture, possibly because virtualization has provided the deployment of virtual private clouds on small scale physical test beds. However, for software simulation of clouds of very large scale, there have been some remarkable proposals. CloudSim simulation framework is based on the SimJava discrete event simulation engine at the lowermost layer, while the higher layers implement the GridSim toolkit for the modeling of the cluster, including traffic profiles, networks, resources, etc. CloudSim effectively extends the GridSim core functionalities by application services, modeling storage, resource provisioning betweendata center brokerage andvirtual machines, and can even simulate federated clouds [4, 5].

A. CloudSim

The existing distributed system simulators were not applicable to the cloud computing environment due to the application workload, services, evaluating the performance of cloud provisioning policies, resources and models under varying system, user requirements and configurations [6].To

overcome this challenge, CloudSim[10,11,12] can be used. In other words, CloudSim is a development toolkit for simulation of Cloud scenarios. CloudSim provides a generalized and extensible simulation framework that enables simulation, modeling, and experimentation of emerging Cloud computing infrastructures and application services. Main features of CloudSim are as follow:

- Virtual machines can be provided with host resources, using customizable policies by virtualize server host.
- Computational resources are manage in such manner that consume power only when they required.
- It support resume and stop of simulation process with dynamic insertion of simulation elements.
- Virtual machines with user-defined policies for sharing of host resources and also policies for allocation of hosts to virtual machines are also supported by CloudSim.

HP and many other leading organizations and also many universities around the world are using CloudSim for:

- Dynamic provisioning of Cloud resources.
- Differentdata center resources are manage in energy-efficient manner.
- Optimization of various cloud computingresearch activities.

But the restriction of CloudSim is that no Graphical User Interface (GUI) provided. Following Fig. 1 shows the layered architecture of CloudSim.

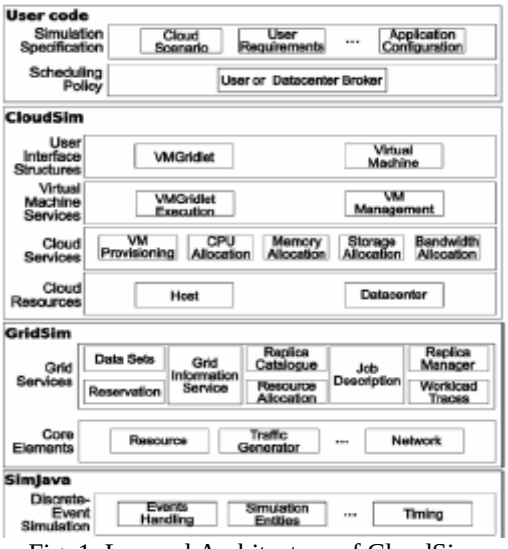

Fig. 1 Layered Architecture of CloudSim

B. CloudAnalyst

Due to lack of tools that enable developers to evaluate requirements of large-scale Cloud applications in terms of geographic distribution of both computing servers and user workloads.Based on CloudSim, CloudAnalyst [13, 14] was designed with extended capabilities of CloudSim. It simulate large-scale Cloud applications with the purpose of studying the behavior of such applications under various deployment configurations.

Main features of CloudAnalyst are as follow:

- Repeated execution of experiments can be possible
- Output is provided in graphically.
- Ease of Extension (Java Swing) anduse of associated technology

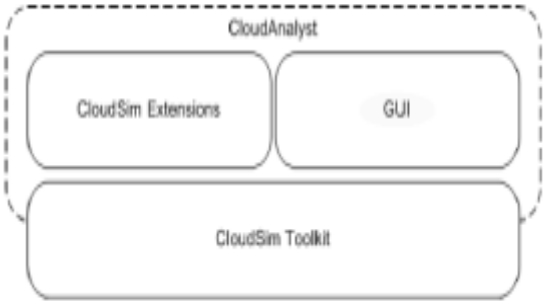

Fig. 2 Architecture of CloudAnalyst

C. GreenCloud

The lack of complete simulators on the market was the stimulus to develop GreenCloud [16, 17] that allows researchers to interact, observe and measure cloud performance. GreenCloud is a refined open source cloud computing simulator. Greencloud has been elaborated in the context of the GreenIT project.

Main features of GreenCloud are as follow:

- Facility for observing energy-efficiency of clouds not provided in it.
- Simulation base environment is provided for energy-aware cloud data centers.
- GreenCloud is an extension of the NS2 network simulator.
- All communication processes simulated on packet level are focused in it.

D. iCanCloud

Very recently, nunez et al. [7, 8] proposed a simulation platform iCanCloud. Following are the motivation for developing iCanCloud:

- To find out relation between cost and throughput of a given set of application on a particular hardware configuration and then cost information is provided to user.
- Various simulation instances are provided by Amazon, so the simulation framework is provided with model of such simulating instances.

Main features of iCanCloud are as follow:

- In it user can simulate and model both existing and non-existing cloud computing architectures.
- In it cloud hypervisor module is flexible one.
- It provide the facility to simulate uni-core/multi-core systems by customizable VMs.
- Large distributed models can be generated and customize easily using user-friendly GUI.
- For modeling and simulation of application it provides an adapted MPI and a POSIX-based API.

- It allow to add new components to the repository to increase the functionality of iCan Cloud.

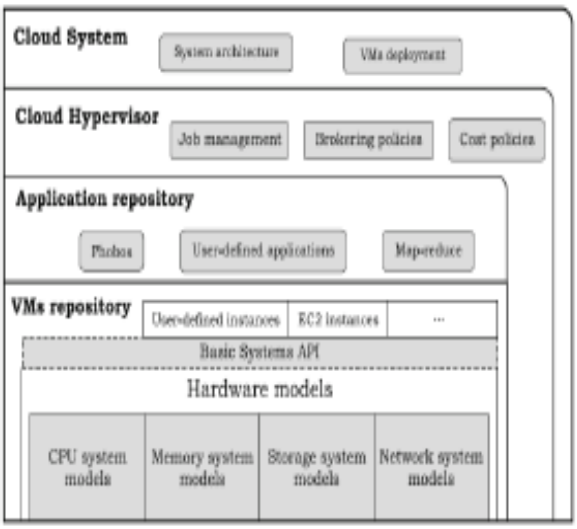

Fig. 3 Layered Architecture of iCanCloud

E. GDCSim

Many Cloud simulators are lack in analyzing the data centers parameters. So, the GDCSim was introduce,which is known as Green Data Center Simulator. It consist of both entities modular and extensible. By using GDCSim green data centers are design iteratively. It is developed as a component of Blue Tool Infrastructure Project at impact lab. Following Fig. 4 shows the architecture of GDCSim.

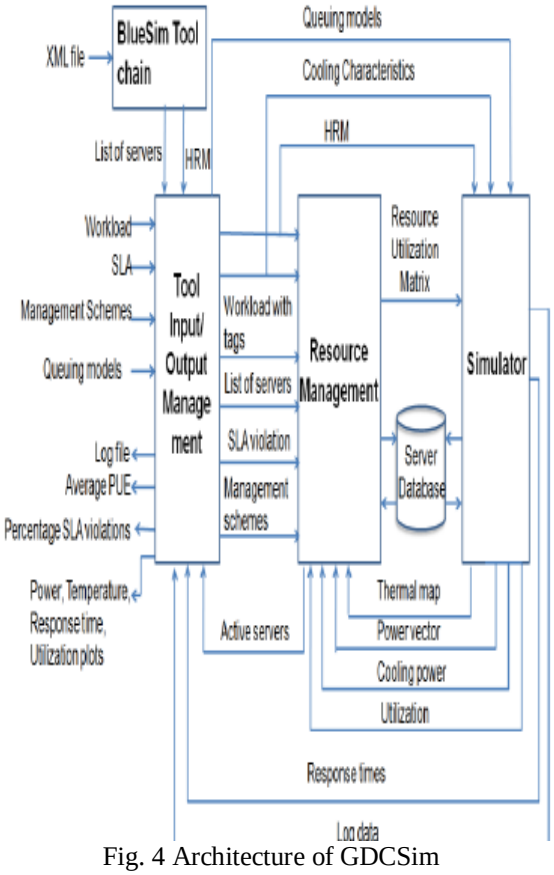

Fig. 4 Architecture of GDCSim

F. MDCSim

Data center related hardware parameters can analyze and predicted by MDCSim. It is mostly used due to its low overhead produced [9]. It is variant of CloudSim tool.

G. SPECI

SPECI [15] stands for Simulation Program for Elastic Cloud Infrastructure. Various aspects of scalability and performance of future data centers are analyze by SPECI. It is assumed that when size of data centers increases, then they do so in non-linear fashion, so it is required to analyze the behavior of such data centers.

H. NetworkCloudSim

It is an extended version of CloudSim, which is capable of implementing network layer in CloudSim, by reading BRITE file it can generate a topological network. It provide topology file which contains number of nodes with different entities required in simulation [9]. In NetwordCloudSim [18], network CloudSim work properly as every entity is mapped to single BRITE node.

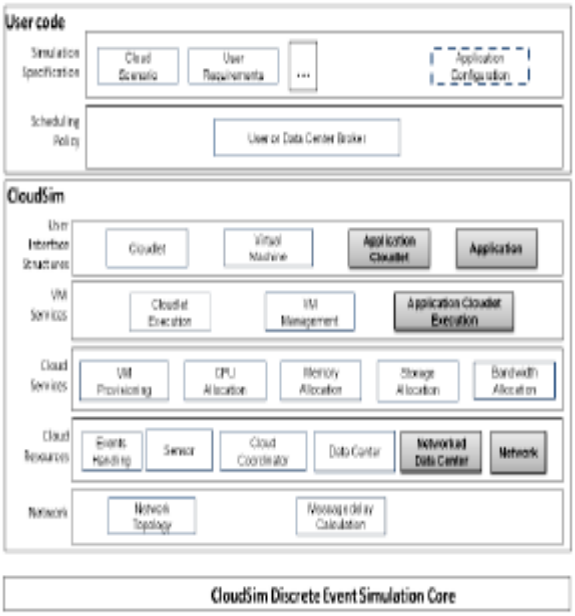

Fig. 5 Architecture of ClouSim based NetworkCloudSim

IV. COMPARISON OF CLOUD SIMULATORS

As described above in section III, many cloud computing simulation tools were proposed in the literature. In this section, we make analysis and comparison on the cloud computing simulators from various aspects, as shown in Table I.

TABLE I.Comparison of Cloud Simulators

Parameters	CloudSim	GreenCloud	MDCSim	iCanCloud
Platform		NS2	CSIM	OMNET , MPI
Language	Java	C++/Otcl	C++ / Java	C++

Availability	Open Source	Open Source	Comm-ercial	Open Source
Graphical Support	Limited (through Cloud Analyst)	Limited (through Nam)	None	Full
Communica-tion models	Limited	Full	Limited	Full
Physical models	None	Available using plugin	None	None
Models for public cloud providers	None	None	None	Amazon
Support for parallel experiments	No	No	No	WiP
Support for power consumption modelling	Limited	Yes	Yes	WiP

V. CONCLUSIONS

Nowadays, simulation-based approaches become popular in industry and academy to evaluate cloud computing systems, application behaviours and their security. In this paper, we review the existing cloud simulators for modelling and simulation of cloud computing scenario to the best of our knowledge, and analyse and compare them base on various parameters.

REFERENCES

[1] Xiaoying Bai et al., "Cloud Testing Tools," In proceedings of The 6th IEEE International Symposium on Service Oriented System Engineering, SOSE, 2011.

[2] I. Foster and C. Kesselman,"The Grid: Blueprint for a New Computing Infrastructure," Morgan Kaufmann, 1999.

[3] R. N. Calheiros et al., "CloudSim: a novel framework for modeling and simulation of cloud computing infrastructure and services," Technical Report of GRIDS Laboratory, The University of Melbourne, Australia, 2009.

[4] S. Ostermann, K. Plankensteiner, and D. Bodner, "Integration of an event based simulation-framework into a scientific workflow execution environment for grids and clouds,"Service Wave, LNCS 6994, pp.1-13, 2011.

[5] T. Fahringer, R. Prodan, R. Duan, et al., "ASKALON: a grid application development and computing environment," In 6th IEEE/ACM International Conference on Grid Computing, pp.122-131, 2005;

[6] Dr. Rahul Malhotra and Prince Jain, "An EMUSIM techniques and its components in a cloud computing environment." IJCTT, August 2013.

[7] A. Nunez, J. L. Vazquez-Poletti, A. C. Caminero, J. Carretero, and I. M. Llorente,"Design of a new cloud computing simulation platform,"In International Conference on Computational Science and Its Applications, LNCS 6784, pp.582-593, 2011.

[8] Nunez, J. L. Vazquez-Poletti, A. C. Caminero, G. G. Castane et al., "iCanCloud: a flexible and scalable cloud infrastructure simulator," Journal of Grid Computing, Vol.10, No.1, pp.185-209, 2012.

[9] 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.

[10] R. N. Calheiros, R. Ranjan, A. Beloglazov, C. A. F. De Rose, and R. Buyya, "CloudSim: a toolkit for modelsing and simulation of cloud computing environments and evaluation of resource provisioning algorithms," Software: Practice and Experience, Vol.41, No.1, pp.23-50, 2011.

[11] R. N. Calheiros, R. Ranjan, C. A. F. De Rose, and R. Buyya, "CloudSim: a novel framework for modeling and simulation of cloud computing infrastructure and services," Technical Report, GRIDS-TR-2009-1, Grid Computing and Distributed Systems Laboratory, The University of Melbourne, Australia, 2009.

[12] R. Buyya, R. Ranjan, and R. N. Calheiros, "Modeling and simulation of scalable cloud computing environments and the CloudSim toolkit: challenges and opportunities," The International Conference on Hign Performance Computing and Simulation, pp.1-11, 2009.

[13] Wickremasinghe, "CloudAnalyst: a cloudSim-based tool for modeling and analysis of large scale cloud computing environmens," MEDC Project Report, 2009.

[14] Wickremasinghe and R. N. Calheiros, "CloudAnalyst: a cloudSIm-based visual modeller for analysing cloud computing environments and applications," 24th International Conference on Advanced Information Networking and Application, pp.446- 452, 2010.

[15] I. Sriram, "SPECI, a Simulation Tool Exploring Cloud-Scale Data Centers," CloudCom'09, LNCS 5931, pp.381-392, 2009.

[16] Kliazovich, P. Bouvry, and S. U. Khan, "GreenCloud: a packet-level simulator of energy-aware cloud computing data canters," IEEE Global

Telecommunications Conference, pp.1-5, 2010.

[17] Kliazovich, P. Bouvry, and S. U. Khan, "GreenCloud: a packet-level simulator of energy-aware cloud computing data centers," Journal of Supercomputing, special issue on Green Networks, 2011.

[18] S. K. Garg and R. Buyya, "NetworkCloudSim: modelling parallel applications in cloud simulations," 4th IEEE International Conference on Utility and Cloud Computing, pp.105-113, 2011.

