Child Studies in Asia-Pacific Context (CSAC)
ISSN: 2288-601X
2022, 12 (1); 205-215
http://e-csac.org

A Study on Inside Views of Cloud Computing Tools

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Received 2022 March 10; **Revised** 2022 April 15; **Accepted** 2022 May 02

ABSTRACT

Distributed computing instruments can be isolated into different classifications as demonstrated by their features. Around here, we have made a broad examination with different classes based on the accompanying boundaries like expanding, connection and characterization. In this study, we compare and evaluate many notable open-source Cloud devices for greater efficiency. Particularly helpful would be the development of new calculations for all customers related with the various cycles and its design, which would allow for the improvement of codes in the finer details. Different test frameworks, such as the five open-source Cloud registration apparatuses (CloudSim, Cloud Analyst, Cloud Reports, , iCanCloud, EMUSIM, GroudSim, DCSim and Green Cloud), have different engineering configurations, showing components, reproduction processes, execution measures, and degrees of adaptability. The commercial vendors of these products often advertise them as having standard characteristics, notably with regards to layout, diagrams of components, and the method of multiplication. Some of the key characteristics that may be utilised to zero in on the benefits of these tools include a laser-like focus on a variety of layers and the ability to make accurate predictions about how well they will perform. A few gaming tools have been developed with distributed computing in mind. Simulation develops a virtual environment for testing and validating research trials in quest of effective and superior application-specific solutions. Making a model or real-time system is a scientific approach. As a result, it removes the requirement for and cost of computational facilities for performance assessment and modelling of the research solution. The Cloud Sim simulation is the primary emphasis of this guidebook instrument and its advantages for researchers.

Keywords: CloudAnalyst, CloudReports, CloudExp, GreenCloud, and iCanCloud, CloudSim.

1 INTRODUCTION

Because of its amazing advantages, distributed computing is firmly establishing itself. Expert companies providing distributed computing should regularly evaluate their services. Continuous and certifiable assessment can end up being expensive and unreasonable, so re-enactment offers a path of least resistance. In this piece, we take a look at the various distributed computing testing frameworks available as open source software.

The current value of the Indian server ranch reallocating market is estimated at near to $2billion, and by the end of the fiscal year 2023-24 [1], it is expected to have reached $5 billion, representing a CAGR of 25%. This is why the freshly termed "Cloud Computing strategy" is so important. There are several free and open-source Cloud Processing tools available now, such as CloudSim, Cloud Analyst, Cloud Reports, Cloudsched, and Green Cloud. Our investigation seeks to thoroughly examine the construction plan of every device, stage, programming model, accessibility, realistic support, genuine model, energy usage, reenactment time, memory space needed, etc. Comprehensive, real-world study on all fronts is certainly challenging since it necessitates writers to think about the global organised system as a whole,

which may be beyond their control. It is also impossible to predict or regulate the states of a framework. It's frustrating to try and evaluate consistently how well Cloud provisioning calculations and outstanding major task models are implemented. With this in mind, Cloud-based testing frameworks are designed to spot and use cutting-edge, enterprise-grade Cloud management tools. Here, we showcase five tools for simulating Cloud processing that are available under open source licences.

One of the most recent developments in data innovation is the advent of endlessly dispersed computing. End users are offered access to the company's IT infrastructure and applications as a service, with the accompanying typical cost-based payment model. Recent developments in fields like as virtualization, network processing, Web registration, utility figuring, and related advancements have contributed to distributed computing's rapid spread. Distributed computing via the Internet is useful if you require low-cost access to high-performance computing (HPC) and storage infrastructure. A portion of the vital qualities of distributed computing are: on-request access, flexibility, cost-viability, versatility, insignificant framework the board and area freedom. Trillions of dollars are being put resources into distributed computing today.

Real cloud infrastructure that allows for continuous testing and execution of new computations and strategies is inconceivable for frameworks chiefs, cloud subject matter experts, and even specialists. First-measure execution is crucial before continuous execution, and all potential security risks should be carefully considered. Reenacting and displaying technological advances is the saviour of these problems. The requirement for a distributed computing test system emerges to observe an execution situation progressively. When it comes to optimising the underlying infrastructure, executing new algorithms, detecting security issues, and measuring the system's overall quality and performance, testing environments on the cloud play a significant role.

It is important for researchers, framework administrators, cloud specialists, and board chairs to be able to accurately predict how distributed systems will perform, hence a number of test systems are being developed to aid with this. Finding the appropriate tool for the job at hand or learning about the features available on various gadgets may be a time-consuming and confusing process.

Some of the testing platforms are commercial, while others are open source and free to use. The trend is to explicitly deal with these test systems for a broad variety of complex and actual difficulties of distributed computing, since free and open source test systems foster in-depth learning and trial-and-error.

The critical benefits of utilizing a reenactment based structure in distributed computing are recorded underneath:

Test systems work with dynamic and adaptable arrangement and improvement conditions. They empower specialists cum framework overseers to learn and make the continuous cloud climate more adaptable and solid.

Test systems give simple to-utilize order/graphical points of interaction with loads of customisation choices that assist specialists with envisioning genuine situations, in this way keeping away from a wide range of ongoing issues.

Test systems are the most practical answer for true execution, as they are first planned, then grew, appropriately tried and whenever required, even overhauled, reconstructed and retested. Doing this in reality is very difficult regarding cost and time.

Through the use of test equipment, specialists may create their own display, security, and other provisioning calculations to replicate cloud settings.

This article provides an overview of some of the most useful open-source and free distributed computing testing frameworks currently available.

Our first efforts have focused on reducing response times [2], [4] on the Cloud in order to better serve the customer. The multiple quality limits of Cloud climate have also been studied, and their implementation is discussed in [3]. Next, we used Cloud Reports [5] [7] to analyse a number of different power models that save energy, and we used Green Cloud to study a number of different job schedulers that conserve energy. [6]. However, we have also invested much in the development of the Edge Cloud system [8]. Gridsim, developed by the authors in [9], is a Grid processing device

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primarily used for solving asset distribution challenges on the Grid. As shown in [10], developers have amassed a Cloudsim toolkit for doing Cloud-based asset provisioning calculations. Cloud Analyst was created by the author in [11] as a tool for use in a Distributed Computing Environment on a grand scale. Cloud Reports, developed by Thaigo Teixeira Sa et al. in [12], is a graphical user interface (GUI) based recreation tool designed to keep Cloud environments low-energy. FlexCloud is a system developed by Minxian Xu et al. [13].

2. ARCHITECTURE OF VARIOUS CLOUD SIMULATION TOOLS

2.1 Cloud Analyst

The GUI-based testing platform CloudAnalyst, acquired from CloudSim, has certain extended features and capabilities. At the University of Melbourne, Australia's Department of Computer Science and Software Engineering's CLOUDS Laboratory, Bhathiya Wickremasinghe and Rajkumar Buyya proposed CloudAnalyst. [18][15][11]. The test bed's setup lets us gauge the effectiveness of different server farms and user bases around the world. The modeller may generate circle-by-circle replicas and guide a series of reenactments with little modifications to the boundaries, which can be utilised to determine the behaviour of large-scale Internet applications housed in the cloud.

When it comes to providing always-on server farms, CloudAnalyst is a sophisticated replication framework for keeping tabs on load balancing, cloud group monitoring, and the consistent outflow of data. Users may now save their game configurations in XML files and export their live results to PDF format.

See below for a rundown of CloudAnalyst's best features.

Simple graphical user interface for configuring and reviewing the outcomes of various distributed computing experiments.

Reproduction definition through a serious level of setup and adaptability: CloudAnalyst is furnished with modelers that have a serious level of command over the examination by demonstrating elements, for example, server farms, virtual machines, memory, stockpiling and data transfer capacity.

Explore circling: CloudAnalyst can save recreation situations and circle them over and over by means of reenactment varieties. Both XML and PDF versions of the results may be stored.

In addition to a wealth of information, CloudAnalyst generates visual output like tables and graphs to show what went into the reproduction process.

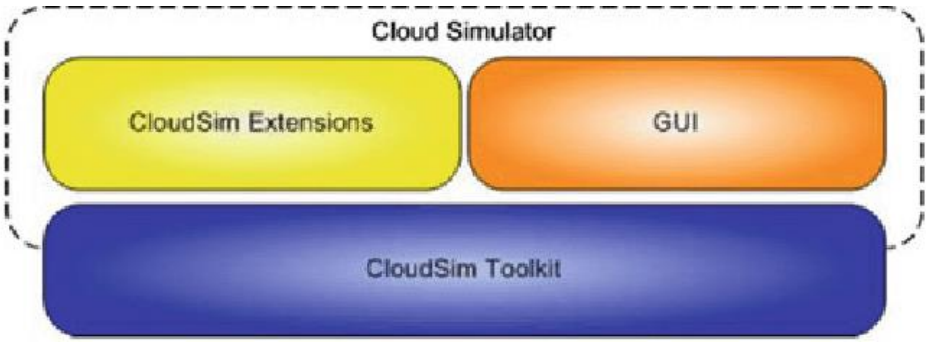

Figure 1. Architecture of Cloud Analyst Simulator

2.2 GreenCloud

GreenCloud gives a recreation climate to energy-mindful distributed computing server farms. For energy-efficient distributed computing server farms with an emphasis on cloud connections, this is the most advanced parcel-level test system currently available. It provides a detailed breakdown of how much power is used by the servers, switches, and other electronics in a data centre.

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University of Luxembourg scholar Dzmitry Kliazovich (Project Leader) and his colleagues created the GreenCloud assessment platform. This pilot programme is used to cultivate cutting-edge arrangements in areas such as accounting, asset allocation, responsibility booking, and even communication norms, product development, and organisational underpinnings.

To further develop the NS-2 parcel level organisation test system, GreenCloud was developed. It classifies energy use into three distinct types: those associated with data registration and transmission, data communication, and the physical infrastructure of a server farm. The most recent variant of GreenCloud is 2.1.2.

Many of the supplementary recreation scripts are invoked by the GreenCloud test system.

setup_params.tcl: Comprises the whole configuration of the server, including switches, commitments, checks, and motion.

toplogy.tcl: Produces the topology for a data center's server farm.

dc.tcl: Produces physical and virtual machines for a data center's server farm.

user.tcl: Sets the standards for how cloud users should behave.

record.tcl: Methods for notifying outcomes during execution are set up.

finish.tcl: Measures the reenactment and presents the results.

Here are the parts of the GreenCloud testing system:

The test system primarily centers around the cloud organization and, especially, energy utilization observing in distributed computing advances.

It upholds reproduction of CPU, memory, stockpiling and systems administration assets.

Upholds analysts in investigating techniques to limit power utilization by further developing power the board, as well as progressively overseeing and designing the power-mindful capacity of the framework's gadgets.

Has an easy to use GUI and is open source.

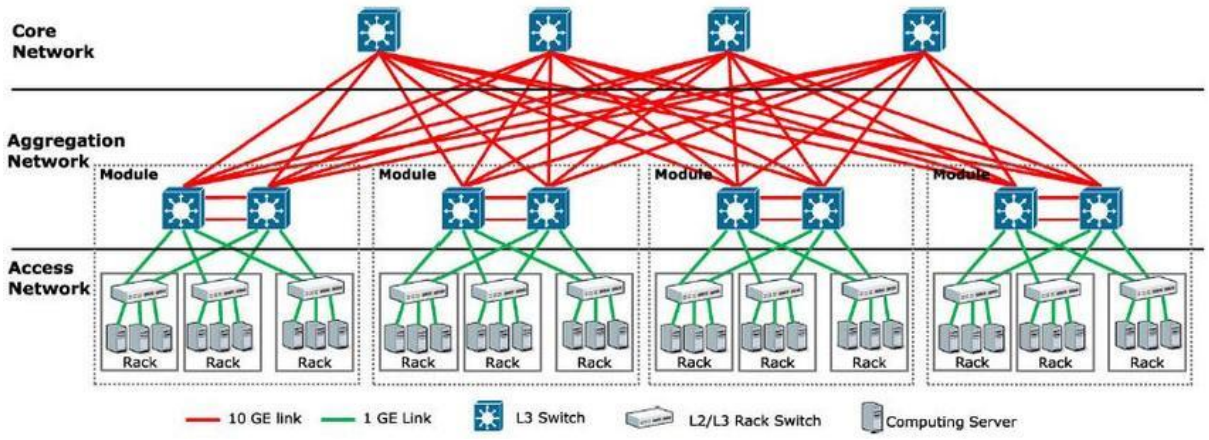

Figure 2. Architecture of GreenCloud Simulator (3Tier)

2.3 iCanCloud

Based on SIMCAN, iCanCloud is a distributed computing emulation platform that helps you play out scenarios involving massive storage facilities. Predicting the trade-offs between cost and execution of a certain arrangement of uses performed in unambiguous equipment is the goal of this study. A. Nunez and J.L. Vazquez-Poletti developed the

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iCanCloud reproduction structure. After that, the beta system will provide customers with information on those costs. Originally developed to enhance cloud services' flexibility, accuracy, execution, and diversity, iCanCloud is now a formidable test system for designing, implementing, and analysing a broad variety of cloud architectures.

The iCanCloud infrastructure is currently being built using the OMNeT++ platform. The newest release, 1.0, calls for OMNeT++ 4.6 and INET 2.5. It's possible to implement it on all flavours of Ubuntu and MAC OS.

Below is a list of iCanCloud's features:

Proof-of-concept and replication are possible for both proven and theoretical distributed computing architectures.

With an adjustable cloud hypervisor module, it's easy to try out new cloud facilitation methods while still using the ones you know and love.

Virtual machines that may be modified are useful for quickly simulating both single- and multi-center architectures.

iCanCloud gives many setups for capacity frameworks, which incorporate models for neighborhood capacity frameworks, distant capacity frameworks like NFS, and equal capacity frameworks (like equal document frameworks and RAID frameworks).

iCanCloud gives an easy to use GUI that makes it more straightforward to create and tweak enormous disseminated models. This graphical user interface (GUI) is helpful for managing a stockpile of preconfigured virtual machines (VMs), a granary of predetermined examinations, and a stockpile of preset cloud frameworks to start tests straight from the GUI and create visible results.

For presenting and simulating applications, iCanCloud provides a POSIX-based API and a take on the MPI library. Additionally, iCanCloud supports many approaches to showing apps, including creating new applications directly in the reproduction stage, using indications of real applications, and using a status chart.

In order to increase iCanCloud's utility, new components may be uploaded to the archive.

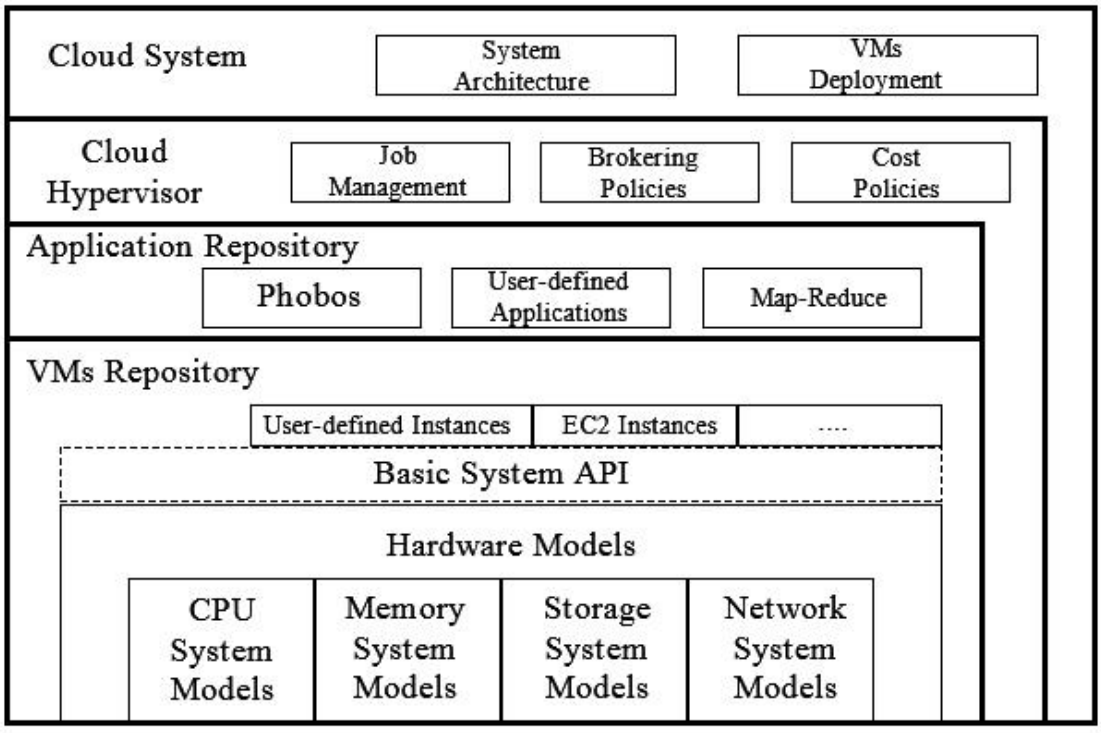

Figure 3. iCanCloud Architecture

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2.4 EMUSIM

The abbreviation EMUSIM refers to the practise of merging actual hardware with virtual environments for educational purposes. It combines copying (AEF-Automated Emulation Framework) and simulation to allow more realistic models of programming artefacts to be employed during reproductions (CloudSim). The Cloud Computing and Distributed Systems (CLOUDS) Laboratory at the University of Melbourne's Department of Computing and Information Systems is responsible for the creation of EMUSIM[17].

As a result, EMUSIM employs copying to learn about how applications behave, and then uses that knowledge to create a reproduction model. When the analyst has no idea how the product will be presented under the changed degrees of simultaneousness and parallelism that prevent reenactment, the EMUSIM test system is invaluable. Such alternatives may be used in place of in-person examinations if the latter need resources that are either out of reach of the analyst or too expensive to provide in the cloud. According to the GNU General Public License, EMUSIM is free software.

In August of 2010, version 1.3 of the Advanced Execution Format (AEF) was released.

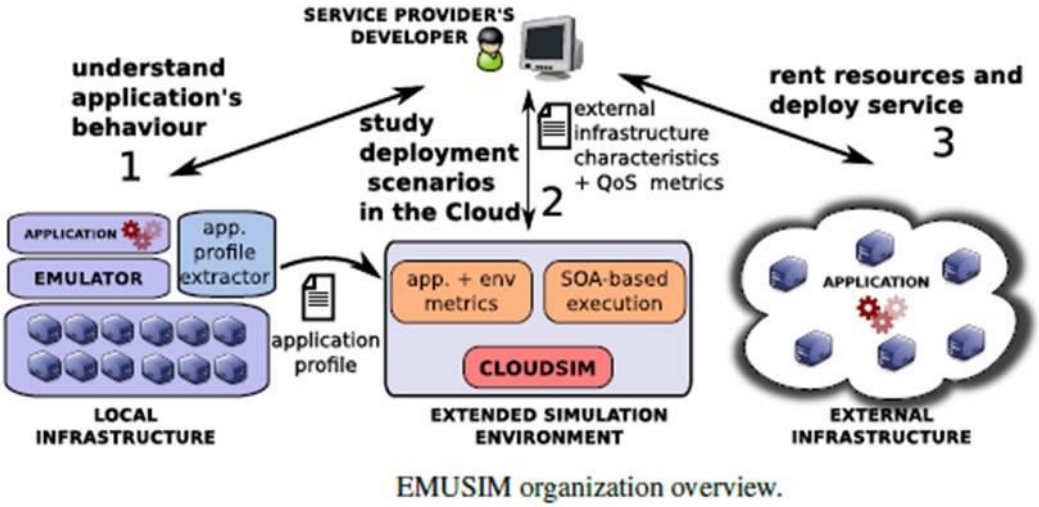
Below are some of EMUSIM's most notable features:

To assess the impact of asset migration, this article provides instances of request for cloud-based software as well as the means to create virtual copies of the original.

Accurately simulates application behaviour in order to provide information about runtime behaviour.

Decreases the expense of running cloud based reenactment, on the grounds that as opposed to nearby and restricted framework utilization, variable pricing based on actual expenses The evaluation makes use of the public cloud.

Allows for CPU-intensive programmes with loose coupling to be run.



EMUSIM organization overview.

Figure 4. ENUMSIM Architecture

2.5 GroudSim

For logical applications in the cloud or on a grid, we provide GroudSim (Gr-Grid oud-Cloud), an event-based testing solution. There is just one reenactment string needed. The work of S. Ostermann, K. Plankensteiner, and D. Bodner, GroudSim provides a framework and cloud recreation tool compartment for logical applications based on a flexible reproduction free discrete-occasion centre.

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GroudSim offers a full suite of tools for complex reenactment scenarios, from simple job executions on rented registered equipment to detailed calculations of expenses and foundation strain on assets. GroudSim is at its best when used to the IaaS subset of distributed computing. SaaS and PaaS models are examples of distributed computing that may benefit from this method of expansion.

The core GroudSim class, SimEngine, is responsible for keeping track of the chemicals that have been registered for use in following time, keeping a clock, and listing upcoming events. Many of the Groud bundle's typical utilities can be found in the framework and cloud assets classes, and these classes should be used instead of Groud's specialised behaviour.

Below are some of GroudSim's most notable features:

It is a robust collection of Java-based simulation tools for use in simulations of logical processes.

It incorporates both cloud and matrix architectures and is supported by a compartmentalised set of tools for occasional reproduction.

Contrast ad hoc execution to process-based methods across various testing environments.

May be successfully enlarged by using probability appropriation bundles.

GroundEntity, the most original part of GroudSim, defines error behaviour in its own unique way. The customer has the option to cancel the contract at any time.

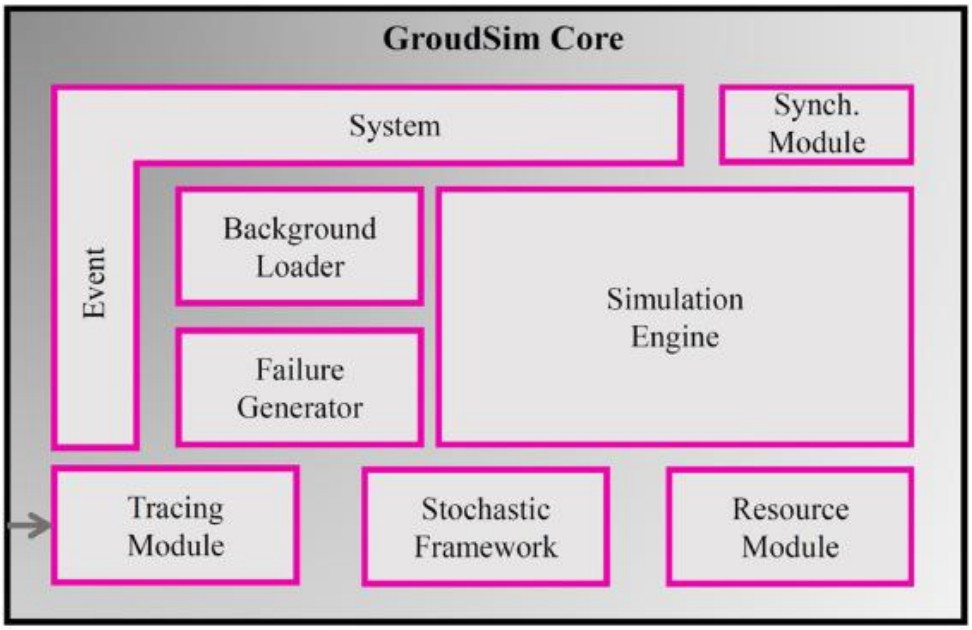

Figure 5. GroundSim core

2.6 DCSim (Data Center Simulation)

DCSim is a Java-based test system for server farms that can be easily expanded. It gives a steady and simple structure for creating and performing very good quality investigations on server farm the board strategies and calculations. DCSim, being an occasion driven test system, recreates a server farm IaaS proposing to various clients.

The ability to display replicated VMs is a new feature in DCSim, allowing the separation of activities and conditions across VMs that is essential for a multi-layered application.

The following are the components of DCSim:

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Integrated with a multi-tiered application approach that allows VMs to "play out" scenarios with one another.

Works with quick turn of events, assessment and criticism on server farm the executives approaches and calculations.

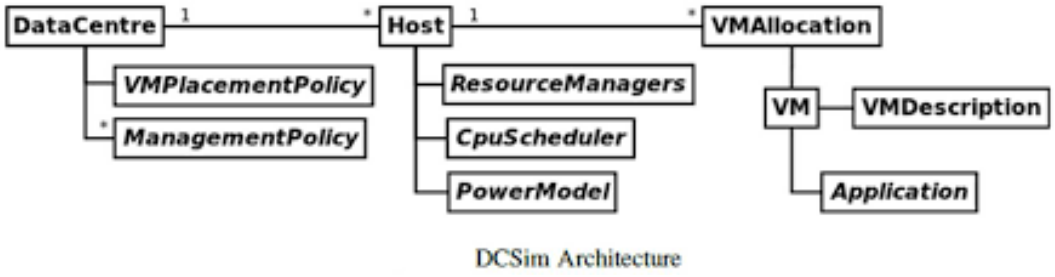

Figure 6. DCSim Architecture

2.7 CloudSim

CloudSim's [9] multidimensional design engineering is seen in Fig. 1. Users' needs for VMs and their dynamically constructed states are the primary emphasis of the client code layer. The Cloud provider may fairly weigh the merits of several approaches at this tier by developing the core VM to provide comfort. User Code monitors the top layer's focus substances for has and via expanding parts. Associating with the application allows planners to anticipate outcomes based on a cloud model's state at any one time, as well as the results of a mix of reasoning, configuration, and expected outcomes. User code, the CloudSim layer, and the CloudSim recreation motor layer make up the three tiers of the CloudSim's engineering.

CloudSim is an innovative, comprehensive, and modular set of Java-based simulation tools that may be used to simulate any real-world scenario. It maintains many essential features, including event lining and handling, the construction of CloudSim components, matching of parts and timekeeping administration in a game. It was developed by Professor (Dr.) Rajkumar Buyya of the University of Melbourne, Australia's Department of Computer Science and Software Engineering at their CLOUDS Laboratory to simulate cloud environments. In the realm of remote computing and application management, this toolbox enables consistent showing, reenactment, and trial and error. A possible label is "demonstrating an environment in which the apparatus is accepted as a starting point for creativity," with an emphasis on the need of paying close attention to the nuances of the new ideas being explored.

The main features of CloudSim are the basic classes for inferring server farms, Everything from virtual machines to apps to clients to computational resources to the policies and procedures used to book and furnish such resources. It uses strategies for application provisioning that are both scalable and resilient.

The CloudSim test system model is presented, which shows the birth of a single-host data centre, each of which operates a single cloudlet.The most recent variant of CloudSim is 4.0. Its highlights are recorded underneath:

Allows for the presentation and replication of massive, distributed computing server farms.

Supports a variety of techniques for feeding host resources to virtual machines, as well as the presentation and replication of virtual server components.

Allows for easy usage of regenerative features, breaks, and restarts.

Makes available client-defined procedures for VM host allocation (VMs).

Allows for the creation of distributed data centres with a wide range of possible network configurations, message-passing applications, and low-power servers.

Capable of simulating a hybrid cloud environment consisting of resources from both public and private networks. In-depth research on torrents and automated application scaling requires this fundamental piece of equipment.

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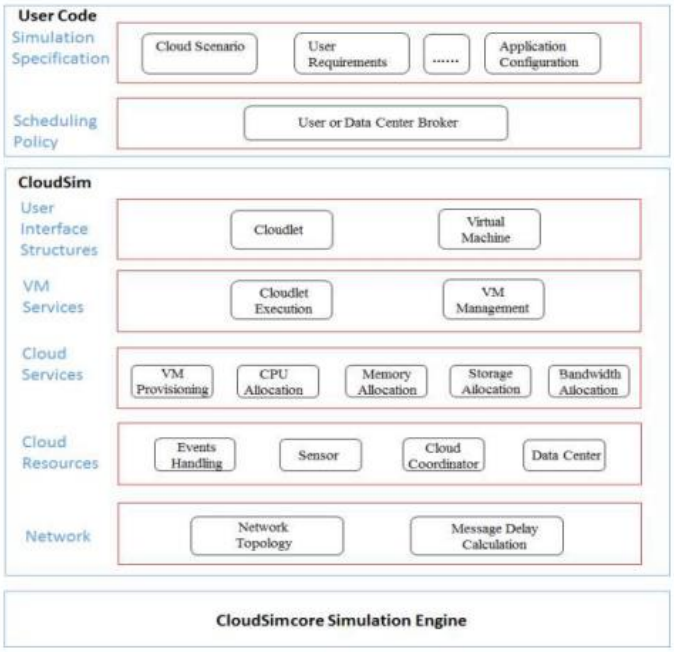

Figure 7. Architecture of CloudSim

2.8 Cloud Reports

Cloud Reports' architecture is seen in Fig. 4. The Cloud Reports coders want to implement a schedule like the one shown in Fig. 5. Presently, there are five mandatory modules and one extension module. The graphical user interface (GUI), report manager, simulation administrator, supplementary modules, and fundamental parts all belong to the business layer. Meanwhile, the Cloud Reports application is now being built on top of the CloudSim game engine and the Java virtual machine (JVM). The Cloud Reports service makes use of a SQLite database. The reports manager is responsible for compiling, analysing, and formatting restoration data gleaned from database archives to provide entertainment reports. The reports are constructed using HTML and raw data. The HTML files aggregate overall and per-user control use statistics from Cloud server farms and clients. Using all available game data, the report manager draws out charts that are included in the HTML report files. Raw data files have redundant information in a standardised format that can be fed into programmes like MATLAB and Octave.

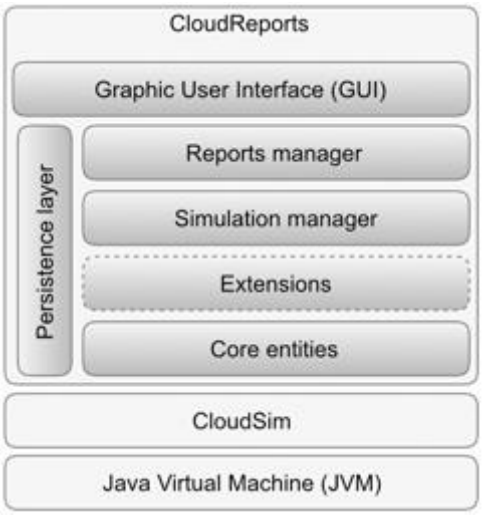

Figure 8. Architecture of Cloud Report

3. CONCLUSSION

This study explains the fundamental distinctions between five distinct Cloud-based simulators—CloudSim, Cloud Analyst, Cloud Reports, Cloudsched, and Green Cloud. These test environments may simulate real-world conditions encountered in a cloud server farm at many design levels. We provide comprehensive correlations based on the structures, component displays, recreation process, execution metrics, and outputs of these test systems. Research and analysis of the system's complexity and traffic demands simulators as vital instruments. It is obvious that none of them is ideal from every angle and configuration, as there is still much work to be done to demonstrate different Cloud layers, high extensibility that can enable new modules to be sent effectively in the devices, simplicity of use, and, finally, consideration of the client's need.

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