

Design of Infrastructure as a Service (IAAS) Framework with Report Generation Mechanism

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Abstract

Cloud computing in short can be defined as “internet based computing”, which makes users able to access software applications whenever they need without worrying about storage or power. In today’s modern era, cloud computing has become a very interesting technology, providing services to its users on demand over the internet. Cloud technology is an emerging topic after grid in the evolution of distributed computing. Due to its capability of storing data as well as its disseminated resources, security has become the main issue for deploying cloud environments. It gives the user an idea of using infrastructure without managing it. Some security issues include data leakage, data crash, resource sharing, multi-tenancy etc. This research paper discusses the design and implementation of IAAS framework which is one of the main models among PAAS (Platform as a Service) and SAAS (Software as a Service) with report generation mechanism also.

Keywords: Cloud Computing; cloud platforms, IAAS, authentication.

INTRODUCTION

Cloud computing is the cooperative term for a set of IT technologies which in association are changing the landscape of exactly how IT services are delivered, accessed and paid for. Some of the auxiliary technologies have by this time been available for quite some time, nevertheless it is the combination of several technologies which facilitates an unabridged way of using IT. Cloud computing is composed of two words 'cloud' and 'computing', where cloud refers to internet and cloud computing means internet-based computing. Cloud is present at the remote location. All the applications like E-mail run on the cloud. It provides appropriate, on-demand access to the network to share resources which can be applications, servers, networks, that are released with less effort [1]. It provides a way for accessing hardware and software resources remotely and also applications as utilities over the internet. Resources refer to platforms, any software services, virtual servers, etc. According to the definition [2], it provides the User with an idea of using infrastructure without managing it. Cloud computing is also accountable for providing computer processing power as well as user applications. It serves as a utility along with, electricity, vapour, aqua, and telephony. Cloud describes web as a space where computing exists as a

service. Through cloud computing, we can access IT resources with the help of internet. With the help of cloud computing, IT resources have increased and become more popular than other computing techniques.

BACKGROUND

Cloud Key Characteristics

- i. Measured Service: - It is observed by the performance escorted by pay-as-you-go pricing model.
- ii. Self-service on demand: - Any user can perform self-provision assess, storage without human cooperation [3].
- iii. Broad network access: - There is a preferment of network access with the use of many technology devices.
- iv. Rapid elasticity: - It is the ability to stuff and shrink based on policy, but there will be no impact on the users.
- v. Pooling of resources: - The resources get pooled so that the multiple consumers can have access to them by adopting a procedure called “virtualization” and some are assigned as well as reassigned according to the user’s choice or demand [4, 5].

Cloud Service Models

In general the cloud services can be divided into three main categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (Paas), Software-as-a-Service).

SaaS
<ul style="list-style-type: none">• Salesforce, youtube, facebook• Applications
Paas
<ul style="list-style-type: none">• Programming environment• Java/ Python
IaaS
<ul style="list-style-type: none">• Virtual Machines• Bandwidth, network and Memory

Figure 1: High Level View of Cloud Computing Architecture

- i. Infrastructure-as-a-Service (IaaS). It offers basic infrastructure on-demand services and using Application Programming Interface (API) for interactions with switches, hosts and routers. It also takes into account the major role of virtual machines along with the different parameters such as bandwidth and memory. In IaaS, Virtualization is used for integrating and decomposing resources in a noble manner so as to meet the request for shrinking resources from the cloud consumers. According to the author [6], with the help of virtual machines, the service provider of cloud supplies services to all users and storage for correcting the business adeptness [6].
- ii. Platform-as-a-Service (PaaS). Platform as a Service model provides the basic programming environment and possibly their configurations as well. Here the user controls deployed applications and thereby this model provides or offers the services as operation and development platforms to the consumer [7].
- iii. Software-as-a-Service (SaaS). In this model the consumer has the proficienc to utilize the applications of supplier that are running on cloud infrastructure. SaaS is on-demand software as applications are installed by the cloud providers and software is accessed by the users from the clients of the cloud. Hence there is no need for installing software applications on users own computer [8]. In SaaS cloud, different applications are arranged in a manner to achieve optimization in context with availability, security and speed. Some examples of SaaS include google docs etc.

Cloud Security Issues

- i. Data location: The precise location of the data in cloud is often unidentified. When storing data in the cloud, overlooking the physical location of cloud data is a major mistake. Once the data enters the cloud, it might pass through different data centres and geographic regions. There are numerous reasons why this can happen. Cloud services providers may passage data as a hedge against downtime (i.e., to alleviate localized outages), to decrease latency (by servicing requests closest to the point of origin) or to reduce costs.
- ii. Regulatory Compliance: Data owners are accountable for the integrity and confidentiality of their data, even when the data is not in their direct control, which in case with external service providers such as cloud providers. Hence forth some compliance cannot be obtained or achieved as on-site auditing is a requirement that cannot be satisfied [9].
- iii. Data Transmission: The various encryption techniques are used for data in transmission and SSL/TLS protocols are used here. To offer integrity and confidentiality of data in transmission to and

from the cloud provider by using various access controls resembling authentication and authorization and also guarantee the availability of the Internet resources at cloud provider side [10].

- iv. Network Security: Reusing the IP address has been a major network security concern. This perhaps sometimes risks the security of the new user as there is a firm time lag between the changes of an IP address in Domain Name Server.

RESEARCH METHODOLOGY

Orientation of CloudSim:

The main objective of this simulator is to provide or deliver a comprehensive and extensible framework that facilitates seamless simulation, modeling, and experimentation of incipient cloud computing infrastructures and different application services. With the efficient use of CloudSim, the scholars, researchers and industry-based developers can focus and rely on specific system design issues that they want to explore or investigate without getting concerned about the low level details related to the Cloud-based services and infrastructures. Figure 2 shows the general layout of CloudSim Architecture.

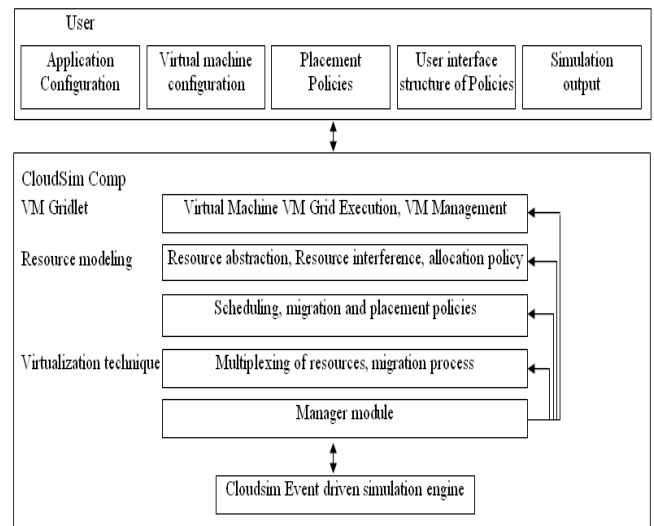


Figure 2: General layout of CloudSim Architecture

Design and Specification of the Framework

- i. The main infrastructure services related to the Cloud are demonstrated in the simulator by a DC (Datacenter Component) for managing various service requests. By VM processing, we mean set of operations related to VM life cycle which includes the following:-
 - a) provisioning of a host to a VM
 - b) VM Creation
 - c) VM Destruction
 - d) VM Migration.

To perform the above cycle the following steps are performed:-

The first step is to initialise the CloudSim package by initialising the CloudSim library, as follows:

```
CloudSim.init(num_user, calendar, trace_flag)
```

- ii. Datacenter is a set of hosts and are the resource providers in CloudSim; therefore the creation of data centres is a second step. To create a Datacenter, there is a need to define the Datacenter characteristics object that stores the properties of a data centre such as its architecture, list of machines, Operating System and an allocation policy that covers the time or space shared.

```
Datacenter datacenter8783 = new Datacenter (name, characteristic, new VmAllocationPolicySimple)
```

The Figure 3 shows

- iii. The next fundamental step is to create a Broker. A cloud broker is a third-party individual or business that acts as an intermediary between the buyer of a cloud computing service and the supplier of that service. The Datacenter Broker is created as follows:

```
DatacenterBroker(String broker);
```

- iv. Then we need to perform a VM allocation policy which will allocate one or more PE to a VM, and doesn't allow sharing of PEs [11]. If there is no free PEs then the allocation fails. In other words Spacesharing refers to sharing of memory space such as hard disk, RAM, Database. It shares the same queue and process one request at one computing as:-

```
public VmSchedulerSpaceShared(List<? Extends Pe>PeList)
//Creates a new vm scheduler space shared
public boolean allocatePesForVm(Vm vm, List<Double>ipsShare)
//This method allocates PEs for a VM. It returns true if this policy allows a new VM in the host.
Public void deallocatePesForVm(Vm vm)
//The method releases or deallocate the PEs allocated to a VM.
```

CLOUDSIM REPORT GENERATION

- i. CloudReports is a graphic tool that simulates the dispersed computing environments centred on the Cloud Computing prototype. It uses CloudSim as its simulation engine and gives an easy-to-use user interface, report generation features and creation of extensions in a plugin fashion.

- ii. The user also can set and establish the amount of computational nodes (hosts) and also their arbitrary resource alignment or configuration, which thereby includes processing capacity, amount of RAM, available bandwidth and scheduling algorithms.
- iii. The customers of the IaaS provider are also simulated and entirely customizable. The user can set the number of virtual machines each customer owns, a broker responsible for allocating these virtual machines and resource consumption algorithms.
- iv. Each VM has its own configuration which comprises of its image size, hypervisor, scheduling algorithms for tasks (here known as cloudlets) and the essential processing capacity, RAM and bandwidth. The general layout in netbeans to generate graphs in cloudsims is shown below in Figure3.

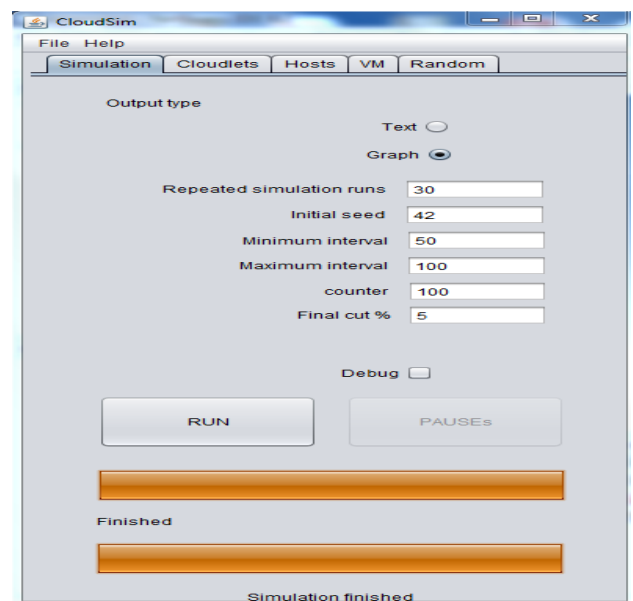


Figure 3: General layout of simulation running in Netbeans

RESULTS AND ANALYSIS OF REPORT GENERATION

- i. After the simulation is run in netbeans for a particular project, the reports are generated based on different parameters like Mips, RAM, bandwidth.
- ii. The steps that are followed to generate the reports from the provider side and the client side are as follows:-
- iii. Step 1: The overview and general information in Cloud Reports is shown in the figure below i.e. Fig4.
- iv. Step 2: The graph in Figure 5 shows the overall resource utilization on the datacenter by the provider. Cloud service providers (CSP) are companies that offer network services, infrastructure, or business applications in the cloud. The cloud services are hosted in a data center than can be accessed by companies or individuals using network

connectivity.

- v. Step 3: The Figure 6 shows a graph with the overall resource utilization on the datacenter by the customer side.



Figure 4: Overview of Cloud Reports



Figure 5: Overall resource utilization on the datacenter by the provider

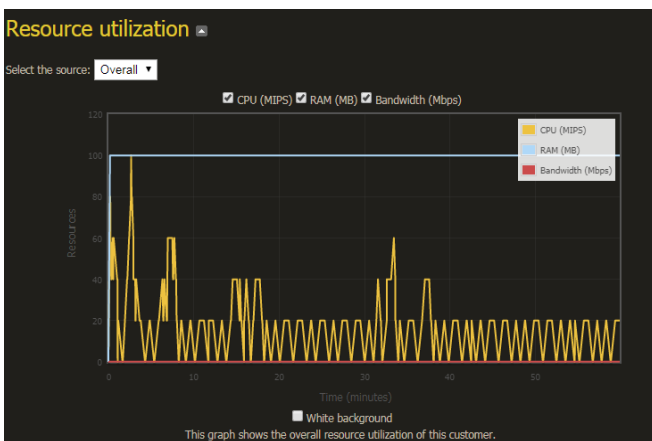


Figure 6: Overall resource utilization on the datacenter by the customer

CONCLUSION

This paper therefore describes and discusses the design and implementation of IAAS framework in cloud computing with the help of CloudSim simulator which involves the implementation of Virtual Machines, hosts and data centers also. Also the basic models like service models and deployment models which have made cloud computing more feasible and collaborative have also been discussed. This also focuses on the features as well as security issues of the cloud computing. Data security and multi-tenancy are the crucial issues in the cloud computing. It proves to be a successful revolutionary technology. It has become a highly attractive paradigm for large organizations. It increases the portability through the improvement of resource utilization.

DECLARATIONS

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- *Authors' information (optional)- Not Applicable
- *Acknowledgements- Not Applicable

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