	Install a C compiler in the virtual machine created using virtual box
Ex No.2	and execute Simple Programs

Steps in Installing C or C++ Compiler in Virtual machine and executing simple programs

Step 1 : Install the C or C++ compiler on Ubuntu-14.04 Virtual Machine by

#### \$ sudo apt install g++

Step 2: Create a file for writing C program.

## **\$ sudogedit add.c**

#### **Source Code:**

Sum of two numbers

#include<stdio.h>

int main()

#### {

int a,b,c; printf("Enter two nos:"); scanf("%d%d",&a,&b); c=0; c=a+b; printf("Sum of two nos is: %d",c); return 0;

}

Step 3: Compile the Program

\$sudo g++ add.c

Step 4: Run the Program

**\$**./a.out

**Expected Output:** 

Enter two nos : 2 3

Sum of two nos is: 5

#### **Output:**



#### **Result:**

The simple C programs are executed with C compiler in the Virtual Machine successfully and different programs are executed and verified.

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Ex No.	Install Google App Engine. Create hello world app and other simple web
3	applications using python/java. Use GAE launcher to launch the web
U	applications

#### Introduction

# **Google Cloud Platform (GCP)**

- **Google Cloud Platform** (**GCP**), offered by Google, is a suite of cloud computing services that runs on the same infrastructure that Google uses internally for its end-user products, such as Google Search, Gmail, file storage, and YouTube.
- Alongside a set of management tools, it provides a series of modular cloud services including computing, data storage, data analytics and machine learning.
- Google Cloud Platform provides infrastructure as a service, platform as a service, and serverless computing environments.



## Platform as a Service (PaaS)

- Cloud computing service which provides a computing platform and a solution stack as a service.
- Consumer creates the software using tools and/or libraries from the provider.
- Provider provides the networks, servers, storage, etc.



# **Google App Engine:**

- Google App Engine was first released as a beta version in April 2008.
- It is a is a Platform as a Service (PaaS) cloud computing platform for

developing and hosting web applications in Google-managed data centers.

- Google's App Engine opens Google's production to any person in the world at no charge.
- Google App Engine is software that facilitates the user to run his web applications on Google infrastructure.
- It is more reliable because failure of any server will not affect either the performance of the end user or the service of the Google.
- It virtualizes applications across multiple servers and data centers.
  - Other cloud-based platforms include offerings such as Amazon Web Services and Microsoft's Azure Services Platform.

#### > Introduction of Google App Engine

- Google App Engine lets you run your web applications on Google's infrastructure. App Engine applications are easy to build, easy to maintain, and easy to scale as your traffic and data storage needs grow. With App Engine, there are no servers to maintain: You just upload your application, and it's ready to serve your users.
- You can serve your app from your own domain name (such as https://www.example.com/) using Google Apps. Or, you can serve your app using a free name on the appspot.com domain. You can share your application with the world, or limit access to members of your organization.
- Google App Engine supports apps written in several programming languages. With App Engine's Java runtime environment, you can build your app using standard Java technologies, including the JVM, Java servlets, and the Java programming language—or any other language using a JVM-based interpreter or compiler, such as JavaScript or Ruby. App Engine also features a dedicated Python runtime environment, which includes a fast Python interpreter and the Python standard library. The Java and Python runtime environments are built to ensure that your application runs quickly, securely, and without interference from other apps on the system.
- With App Engine, you only pay for what you use. There are no set-up costs and no recurring fees. The resources your application uses, such as storage and bandwidth, are measured by the gigabyte, and billed at competitive rates. You control the maximum amounts of resources your app can consume, so it always stays within your budget. App Engine costs nothing to get started. All applications can use up to 500 MB of storage and enough CPU and bandwidth to support an efficient app serving around 5 million page views a month,

absolutely free. When you enable billing for your application, your free limits are raised, and you only pay for resources you use above the free levels.

## > Architecture of Google App Engine



# > Features of Google App Engine



# **GAE Application Environment:**

- Google App Engine makes it easy to build an application that runs reliably, even under heavy load and with large amounts of data. App Engine includes the following features:
- Persistent storage with queries, sorting and transactions
- Automatic scaling and load balancing
- APIs for authenticating users and sending email using Google Accounts
- Task queues for performing work outside of the scope of a web request
- Scheduled tasks for triggering events at specified times and regular intervals
- Dynamic web serving, with full support for common web technologies

# Java Runtime Environment

- You can develop your application for the Java runtime environment using common Java web development tools and API standards. Your app interacts with the environment using the Java Servlets standard, and can use common web application technologies such as Java Server Pages
- The Java runtime environment uses Java 6. The App Engine Java SDK supports developing apps using either Java 5 or 6. The environment includes the Java SE Runtime Environment (JRE) 6 platform and libraries. The restrictions of the sandbox environment are implemented in the JVM. An app can use any JVM byte code or library feature, as long as it does not exceed the sandbox restrictions. For instance, byte code that attempts to open a socket or write to a file will throw a runtime exception.
- Your app accesses most App Engine services using Java standard APIs. For the App Engine data store, the Java SDK includes implementations of the Java Data Objects (JDO) and Java Persistence API (JPA) interfaces. Your app can use the JavaMail API to send email messages with the App Engine Mail service. The java.net HTTP APIs accesses the App Engine URL fetch service.
- App Engine also includes low-level APIs for its services to implement additional adapters, or to use directly from the application. See the documentation for the data store, memcache, URL fetch, mail, images and Google Accounts APIs. Typically, Java developers use the Java programming language and APIs to implement web applications for the JVM. With the use

Page 86

of JVM-compatible compilers or interpreters, you can also use other languages to develop web applications, such as JavaScript, Ruby.



> Workflow of Google App Engine



#### Step1 : Login to <u>www.cloud.google.com</u>



## Step2 : Goto Console



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# Step 3 : Google Cloud Platform is shown

# Step 4 : Click Dashboard in the Google Cloud Plaform

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# Step 6 : Click New Project and give unique Project Name.

Example : kcet-cloud-project

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# Step 9 : Create app and Select Language Python

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Step 12 : Click Cloud Shell in the Kathir-Cloud-Project

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# Step 13 : Create a Directory PythonProject using mkdir command

# Syntax : mkdir PythonProject

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# Step 14 : Click Editor to create Python application

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# Step 15 : Click New File in the PythonProject Folder (Python file)

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# Step 16 : Create main.py file

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# main.py file

import &nbsplogging
from &nbspflask import &nbspFlask
app =&nbspFlask(\_name\_)
@ app.route('/')
def hello():
 return 'Hello&nbspWorld'

if\_\_\_name\_\_\_== '\_main\_':
 &nbspapp.run(host='127.0.0.1',port=8080, debug=True)

#### Step 17 : Create app.yaml file



#### app.yaml

runtime: python env: flex entrypoint: gunicorn -b :\$PORT&nbspmain:app

runtime\_config: python\_version: 3

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# Step 18 : Create requirements.txt file

# requirements.txt

Flask==0.11.1

gunicorn==19.6.0

# Step 19 : Move to Cloud Shell Environment to run the application

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Continue the application. It enable service on the given project



It started building the object and fetching the storage object for the created application



#### It is updating the service



# The application is successfully deployed and URL is

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# **Step 21 : Run your program in the broswer**

# Step 22 : Hello World Program is sucessfully run in the browser

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# **Result:**

Thus the Google App Engine is installed successfully and a web application to display hello world using python is developed and deployed in the GAE and used GAE Launcher to launch the web applications.

Ex No. 5 a	Simulate a cloud scenario using CloudSim

#### **Introduction:**

#### CloudSim

- A Framework for modeling and simulation of Cloud Computing Infrastructures and services
- Originally built at the Cloud Computing Distributed Systems (CLOUDS) Laboratory, The University of Melbourne, Australia
- It is completely written in JAVA

#### \* Main Features of CloudSiM

- Modeling and simulation
- Data centre network topologies and message-passing applications
- o Dynamic insertion of simulation elements
- Stop and resume of simulation
- o Policies for allocation of hosts and virtual machines

## Cloudsim – Essentials

- JDK 1.6 or above <u>http://tinyurl.com/JNU-JAVA</u>
- Eclipse 4.2 or above <u>http://tinyurl.com/JNU-Eclipse</u>
- Alternatively NetBeans<u>https://netbeans.org/downloads</u>
- Up & Running with cloudsim guide: https://goo.gl/TPL7Zh

#### Cloudsim-Directory structure

- cloudsim/ -- top level CloudSim directory
- docs/ -- CloudSim API Documentation
- examples/ -- CloudSim examples
- jars/ -- CloudSim jar archives
- sources/ -- CloudSim source code

#### Cloudsim - Layered Architecture

Cloud Scenario	B	User equirements		Application Configuration
	User	or Data Center Broke	r	
	Cloudlet		Virtual Machine	
	Cloudlet Execution		VM Management	
VM Provisioning	CPU Allocation	Memory Allocation	Storage Allocation	Bandwidth Allocation
Events Handling	Senso	Coc	Cloud Indinator	Data Center
[	Network Topology		Message delay Calculation	
	VM Provisioning Events Handling	Cloud Scenario Re User Cloudlet Cloudlet Execution VM CPU Provisioning Allocation Eventa Handling Sensor	Cloud Scenario User or Data Center Broke Cloudlet Cloudlet Execution VM Provisioning Events Handling Network Topology	Cloud     User       Scenario     Regulrements       User or Data Center Broker       User or Data Center Broker       Cloudlet     Virtual Machine       Cloudlet     VM Management       Cloudlet     VM Management       VM     CPU Allocation       Allocation     Allocation       Events     Sensor       Handling     Sensor       Network     Message delay Calculation

#### Cloudsim - Component model classes

- CloudInformationService.java
- o Datacenter.java,Host.java,Pe.java
- Vm.java,Cloudlet.java
- o DatacenterBroker.java
- o Storage.java,HarddriveStorage.java, SanStorage.java

#### Cloudsim - Major blocks/Modules

- o org.cloudbus.cloudsim
- $\circ$  org.cloudbus.cloudsim.core
- $\circ \quad org.cloudbus.cloudsim.core.predicates$
- o org.cloudbus.cloudsim.distributions
- o org.cloudbus.cloudsim.lists
- o org.cloudbus.cloudsim.network
- o org.cloudbus.cloudsim.network.datacenter
- o org.cloudbus.cloudsim.power
- o org.cloudbus.cloudsim.power.lists
- o org.cloudbus.cloudsim.power.models
- $\circ$  org.cloudbus.cloudsim.provisioners
- o org.cloudbus.cloudsim.util

## Cloudsim - key components

- o Datacenter
- DataCenterCharacteristics
- o Host
- DatacenterBroker
- o RamProvisioner
- o BwProvisioner
- Storage
- $\circ$  Vm
- VMAllocationpolicy
- o VmScheduler
- o Cloudlet
- CloudletScheduler
- CloudInformationService
- $\circ$  CloudSim
- CloudSimTags
- $\circ$  SimEvent
- o SimEntity
- $\circ$  CloudsimShutdown
- FutureQueue
- $\circ$  DefferedQueue
- Predicate and associative classes.

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**CloudSim Elements/Components** 

#### Procedure to import Eclipse, Cloudsim in your system

**Step 1:** Link to download Eclipse and download Eclipse for Windows 64bit into your Local machine

https://www.eclipse.org/downloads/packages/release/kepler/sr1/eclipse-ide-java-developers



Step 2: Download cloudsim-3.0.3 from git hub repository in your local machine

https://github.com/Cloudslab/cloudsim/releases/tag/cloudsim-3.0.	https://githul	o.com/Cloudsla	b/cloudsim/rel	leases/tag/clo	udsim-3.0.3
------------------------------------------------------------------	----------------	----------------	----------------	----------------	-------------

→ C → github.com/Cloud	lab/cloudsim/releasec/tag/doudsim-3.0.3	4	-1		
	WHAT'S NEW				
	This is a bug fix and refactoring release. The following updates have been made:				
	<ul> <li>Removed the dependency on the flanagan library. It is now replaced with Apache Math. The implementation and interface of t MathUtil has been changed accordingly.</li> </ul>	he			
	<ul> <li>The minimal time between events is now configurable.</li> </ul>				
	<ul> <li>Fixed Issue 44: UtilizationModelPlanetLabinMemory: use a global constant to define the size of the data field: a new construct the classes, allowing definition of data size, was added,</li> </ul>	or for			
	Fixed Issue 49 : Wrong calculation of debt during migrationL: all references to debt from Datacenter and its subclasses were re	moved			
	- Assets 4 Cloudsim-				
	Cloudsim-3.0.3.tar.gz	9.9 M			
	Ø cloudsim-3.0.3.zip	13:1 M			
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Step 3: Download commons-maths3-3.6.1 from git hub repository in your local machine

) 🚯 https://commons.apadhe.or	g/proper/commons-math/download_math.cgi	ଅଟ ୧.୨	earch (19	合自《	7	ŵ	₿
Downforad: Latest API docs (development) Jansdoc (J.6.1 release) Jansdoc (J.6.1 release) Jansdoc (J.6.1 release) Jansdoc (J.4.1 release) Jansdoc (J.4.1 release) Jansdoc (J.4.1 release) Jansdoc (J.4.1 release) Jansdoc (J.4.1 release) Jansdoc (J.4.1 release)	Using a Mirror We recommend you use a mirror to download our release but Recent releases (40 month your) yet be available from the You are commity using https://mirrors.astointermet.in/apache the end of the mirrors list() that should be available.	kis, but you must verify the integrity of the downk minrors . If you encounter a problem with this minror, ple none	oaded files using signatures downloaded f as a soled, another mirror. If all mirrors are	from our main failing, there	n distribut are back	ion direc up mirro	tories irs (al
Javadoc (3.1.1 release)		190					
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# https://commons.apache.org/proper/commons-math/download\_math.cgi

**Step 4:** Downloaded Eclipse, cloudsim-code-master and Apache Commons Math 3.6.1 in your local machine and extract cloudsim-3.0.3 and Apache Commons Math 3.6.1

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🕹 Downloads 🛛 🦸	Commons-math3-3.6.1-bin	07-11-2020-10:50	WinRAR ZIP archive	21,712 KB		
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**Step 5:** First of all, navigate to the folder where you have unzipped the eclipse folder and open Eclipse.exe

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Google Drive	<b>D</b> p2	2/16/2012 2:09 PM	File folder	
Li opoox	Jugins	1/8/2014 10:14 AM	File folder	
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Pictures	🖨 ecipse, exe	2/8/2012 9:15 AM	Application	52 KB
Videos	a ecipse.ini	1/8/2014 10:13 AM	Configuration settings	1KB
omeanain	ecipsec.exe	2/8/2012 9:15 AM	Application	24 KB
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iputer ical Disk (C:)	notice.html	2/8/2012.8:35 AM	Firefox HTML Docu	9 KB

**Step 6:** Now within Eclipse window navigate the menu: *File -> New -> Project*, to open the new project wizard

🚝 Debug - Eclipse				
File Edit Navigate Search Project	Run Window Help			
New	Alt+Shift+N ►	📑 Project	- 5	
Open File		E example		
Close	⊂trl+-₩			
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Rename	F2			
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Convert Line Delimiters To	•			
Print	Ctrl+P			
Switch Workspace	•			
Restart				
🚬 Import				
Export				
Export Diagram as Image				
Properties	Alt+Enter			
1 FutureQueue.java [CloudSimDemo/ 2 Datacenter.java [CloudSimDemo/ 3 CloudSimTags.java [CloudSimDemo, 4 LrMu.java [CloudSimDemo/example	] .] /] s/]			
Exit				

**Step 7:** A *\_New Project\_* wizard should open. There are a number of options displayed and you have to find & select the *\_Java Project\_* option, once done click *'Next\_* 

e <b>lect a wizard</b> Create a Java project		
<u>V</u> izards:		
UML Lab Java Project	t Project n Existing Ant Buildfile	

**Step 8:** Now a detailed new project window will open, here you will provide the project name and the path of CloudSim project source code, which will be done as follows:

**Project Name: CloudSim**.

Contra lava Project	
Create a Java project in the workspace or i	in an external location.
Project name: Cloudsim	
Vise default location	
Location: C:\Users\Anup\workspace\doi	udaim Browser
JRE	
Use an execution environment JRE:	JavaSE-1.7
C Uge a project specific JRE:	jre7 💌
C Use defgult JRE (currently 'jre7')	Configure JREs
Project layout	
C ⊔se project folder as root for source	es and class files
• <u>Create separate folders for sources</u>	and class files Configure default
Working sets	
Add project to working sets	
Wurking sets:	F Sector
The default compiler compliance leve	el for the current workspace is 1.6. The new project
will use a project specific compiler co	impliance level of 1.7.

**Step 9:** Unselect the 'Use default location' option and then click on 'Browse' to open the path where you have unzipped the Cloudsim project and finally click Next to set project settings.

 🗲 New Java Project	
Create a Java Project Enter a location for the project.	7
Project name:   cloudsim	
Location: Browse	
- JRE	-12
Use an execution environment JRE: JavaSE-1.7	
C Use a project spedific JRE:	
C Use default JRE (currently 'jre7) Configure JREs	
Project layout	
C         Use project folder as root for sources and class files           C         Create separate folders for sources and class files           C         Configure default	
Working sets	
Add project to working sets	
Working sets: Select	
The default complier compliance level for the current workspace is 1.6. The new project will use a project specific compliance level of 1.7.	

**Step 10:** Make sure you navigate the path till you can see the bin, docs, examplesetc folder in the navigation plane.

Project name: Cloue	dsim	
Use default locati	ion	
Location: D:\Projec	ts\cloudsim-3.0.3	Browse
JRE		
( ) Use an execution	n anvironment IDE: InvisCE 1.5	-
O Use a project s	Browse For Folder ×	~
O Use default JRE	Choose a directory for the project contents:	gure JREs
Project layout	✓ ■ Projects ^	
O Use project fol	✓ I cloudsim-3.0.3	
() Create separate	> docs	re default
	jars	
Working sets	> sources	11
Add project to	> OSB	New
Working sets:	Eolder: docs	elect
The wizard will source.	Make New Folder OK Cancel	the existing

**Step 11:** Once done finally, click \_Next' to go to the next step i.e. setting up of project settings

Create a Java Project		
Create a Java project in the workspace or	in an external location.	
Project name:   cloudsim		1
Use default location		
Location: F:',		Browse
1 JPAE		1
C Use an execution engronment JRE:	JavaSE-1.7	<u></u>
🗢 Uge a project specific JP(E)	jre7	<u></u>
C Use default JRE (currently '/re7')		Configure JREs
Project legical.		
C Use project folder as root for source	es and class files	
Create separate folders for sources	and classifiles 💿	onfigure default
Working sets		
Add project to working sets		
Working sets:		Select
<ul> <li>The wizard will automatically configue existing source.</li> </ul>	ire the JRE and the project layout	based on the

**Step 12:** Now open '*Libraries*' tab and if you do not find commons-math3-3.x.jar (*here* 'x' *means the minor version release of the library which could be 2 or greater*) in the list then simply click on *\_Add External Jar*' (commons-math3-3.x.jar will be included in the project from this step)

ava Settings	
Define the Java build settings.	
Source Projects Libraries % Order and Export ARs and class folders on the build path:	
> 👼 cloudsim-3.0.3-sources.jar - cloudcloud/jars	Add JARs
Interpretation in the second secon	Add External JARs
Cloudsim-examples-3.0.3.jar - cloudcloud/jars	Add Variable
> 🛋 JRE System Library [jre1.8.0_201]	Add Library
	Add Class Folder
	Add External Class Folder
	Edit
	Remove
	Migrate JAR File

**Step 13:** Once you have clicked on *\_Add External JAR's\_* Open the path where you have unzipped the commons-math binaries and select *\_Commons-math3-3.x.jar*<sup>•</sup> and click on open.

-New	aw Java Project			
Java :	JAR Selection		er 1	×
Dent	- 🚺 • Com	puter •	Search thesis	9
(m	🚇 Organize 👻 New folder 🛛 📰 👻 🗔 🚱		HI @	
JAR.	V Dropbox	Name -	Date modified	Type
	Libraries     Documents     Music     Music     Pictures     Videos     Computer     Local Disk (C:)     Study (D:)     Co Drive (H:)	CloudReports-master.zip	1/0/2014 1:29 PM 1/13/2014 2:29 PM 1/21/2014 2:59 PM 1/8/2014 11:46 AM 4/2/2013 9:28 PM	File folder File folder Compressed Executable :
	Network	▼ [ 4 ] File name: commons-math3-3.2.jar	Fjar,*.zip     Open C:	► ancel

**Step 14:** Ensure external jar that you opened in the previous step is displayed in the list and then click on *\_Finish*<sup>•</sup> (your system may take 2-3 minutes to configure the project)



**Step 15:** Once the project is configured you can open the *Project Explorer* and start exploring the Cloudsim project. Also for the first time eclipse automatically start building the workspace for newly configured Cloudsim project, which may take some time depending on the configuration of the computer system.

Following is the final screen which you will see after Cloudsim is configured.

Pa	ckage Explorer 🛛 🍃 Type Hierarchy 🛛 🗉 😫 🐨 😁 🗆 🗋	1
E	Cloudsim	
>	JRE System Library [jre1.8.0_201]	
>	进 examples	
2	🕮 sources	
>	Referenced Libraries	
>	😂 docs	
>	🗁 jars	
	业 build.xml	
	changelog.txt	
	i examples.txt	
	📄 license.txt	
	i pom.xml	
	eadme.txt	
	release_notes.txt	
		( ) · · · · · · · · · · · · · · · · · ·

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**Step 16:** Now just to check you within the **\_Project Explorer\_**, you should navigate to the **\_examples\_** folder, then expand the package *\_org.cloudbus.cloudsim.examples\_* and double click to open the *\_CloudsimExample1.java\_* 

Paci	kage Explorer 😂 🦹 Type Hierarchy 📧 🧐 🐨 🍸 🗖 🗌
- 100	Cloudsim
> 3	JRE System Library [/re1.8.0_201]
~ 0	🦔 examples
	H     org.cloudbus.cloudsim.examples
	> 🖸 CloudSimExample1.java
	> 🗵 CloudSimExample2.java
	> 🗵 CloudSimExample3.java
	> I CloudSimExample4.java
	> 🗵 CloudSimExample5.java
	O CloudSimExample6.java
	> ② CloudSimExample7.java
	> 2 CloudSimExample8.java
	III org.cloudbus.cloudsim.examples.network.datacenter
	> 🔠 org.cloudbus.cloudsim.examples.power
	> 🖶 org.cloudbus.cloudsim.examples.power.planetlab
	# org.cloudbus.cloudsim.examples.power.random
	> 色 workload.planetlab
> 6	😬 sources
P	🐘 Referenced Libraries
> 6	Docs
> 0	🗃 jars
-	韵 build.xml
1	🗟 changelog.txt
1	🖬 examples.txt
1	🗒 license.txt
1	M pom.xml
1	🖻 readme.txt
1	🗈 release_notes.txt

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III CoudSinExample2.java	36	
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CoudSinExample5.java	39 * cloudlet on it.	
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erg.cloudbas.cloudsim.examples.network	43 /** The cloudlet list. */	
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<ul> <li>B org.tioudbis.coudsim.examples.power/andom</li> </ul>	<pre>47 private static List<vm> vmlist;</vm></pre>	
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	b0 // First step: Initialize the Cloudsim package. It should be called (/ browned by the called b	
	bi // before creating any entities.	
	52 Int num user = 1; // number or cloud users	
	<pre>calendar calendar = calendar gecinstance();</pre>	
	ee boolean trace_riag = raise; // bean trace events	
	22 22 // Taitisling the Claudia library	
	co // initialize the trough index three flags	100
	<pre>bi crowsim.thtt(num_user, carendar, trace_riag);</pre>	~

#### IT8711 FOSS and Cloud Computing Lab



**Step 17:** Now navigate to the Eclipse menu <u>*Run ->Run*</u> or directly use a keyboard shortcut '*Ctrl + F11*' to execute the <u>*CloudsimExample1.java*</u>.

🗢 eclipse-workspace - Cloudsim/examples/org/cloudbus/cloudsim/examples/CloudSimExample1.java - Eclipse <u>File Edit Source Refactor Navigate Search Project Run Window Help</u> Ctrl+F11 + + + + + + + + b Debug 📲 Package Explorer 🖾 🁔 Type Hierarchy 🦔 Coverage Ctrl+Shift+F11 10 % oudsim.examples + 🤤 CloudSim Run History - 🤐 Cloudsim sim.examples; Run As à. > M JRE System Library [jre1.8.0\_201] 😬 examples Run Configurations... Toolkit et erg.cloudbus.cloudsim.examples Debug History CloudSimExample1.java Debug As > rmat: CloudSimExample2.java
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 un this example. > a docs 1091 All References 😂 jars All instances. Ctrl+Shift+N 24 象 build.xml Instance Count. 🖹 changelog.txt sed") Watch n(String[] args) { examples.txt Inspect Ctrl+Shift+1 license.txt 100 Display Ctrl+Shift+D Ctrl+U Imx.mog Execute rting CloudSimExample Readme.txt Force Return Alt+Shift+F release notes.txt 💁 External Tools First step: Initialize the Cloud 60 // before creating any entities.
int num user = 1: // number of closent 61 61 62

**Step 18:** If it is successfully executed it should be displaying the following type to output in the console window of the Eclipse IDE.



#### **Result:**

Thus the cloudsim is simulated using Eclipse Environment successfully.

# Ex No.5 b Simulate a cloud scenario using CloudSim and running a scheduling algorithm

#### Procedure to import Eclipse, running scheduling algorithms in your system

**Step 1:** Link to download Eclipse and download Eclipse for Windows 64bit into your Local machine

<u>https://www.eclipse.org/downloads/packages/release/kepler/sr1/eclipse-ide-java-developers</u>



**Step 2:** Download scheduling source code **cloudsim-code-master** from git hub repository in your local machine

#### https://github.com/shiro873/Cloudsim-Code

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Step 3: Download commons-maths3-3.6.1 from git hub repository in your local machine

https://commons.apache.org/proper/commons-math/download_math
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**Step 4:** Downloaded Eclipse, cloudsim-3.0.3 and Apache Commons Math 3.6.1 in your local machine and extract cloudsim-3.0.3 and Apache Commons Math 3.6.1

This	PC + Local Disk (D:)				◆ ⑤ Search Local Disk (D))	100
Ouide access	Name	Date modified	Туре	Size		
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**Step 5:** First of all, navigate to the folder where you have unzipped the eclipse folder and open Eclipse.exe

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**Step 6:** Now within Eclipse window navigate the menu: *File -> New -> Project*, to open the new project wizard

Debug - Eclipse			
le Edit Navigate Search Project	t Run Window Help		
New	Alt+Shift+N ►	📑 Project	
Open File		E S Example	
Close	⊂trl+W		
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Save	Ctrl+S		
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Save All	Ctrl+Shift+S		
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Exit			
		_	

**Step 7:** A *\_New Project\_* wizard should open. There are a number of options displayed and you have to find & select the *\_Java Project\_* option, once done click *'Next\_* 

Select a wizard			
Create a Java project			
<u>W</u> izards:			_
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1 Dava Project int	on Existing Ant buildhie		
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E CHLLab			
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**Step 8:** Now a detailed new project window will open, here you will provide the project name and the path of CloudSim-master-code project source code, which will be done as follows:

#### **Project Name: CloudSim**

🗕 🧲 New Java I	Project			<u>e</u> l
Create a Jav	a Project	or in an external location	Telr,	83
Create a save	project in the workspace	or an arr external location		
Project name	e: doudsim			
V Use defe	ult location;			
Location.	C:\Users\Anup\workspace\	Coudem	Browse	
JRE				
🕫 Use an	execution environment JR	Et Javase-1,7	•	
C Uge a p	project specific JRE:	jre7	~	
C Use de	fault JRE (currently 'jre7')		Configure JREs	
Project layo	out		1.	
⊂ <u>U</u> se pro	oject folder as root for sou	irces and class files		
	separate folders for source	ces and class files	Configure default	
-Working set	ts -		18	
T Add pr	oject to working sets			
Working se	ets:		T Selection	
(1) The de	fault compiler compliance le	evel for the current workspace	is 1.6. The new project	
will use	a project specific compiler	r compliance level of 1.7.		
				_

**Step 9:** Unselect the 'Use default location' option and then click on 'Browse' to open the path where you have unzipped the Cloudsim-code-master project and finally click Next to set project settings.

e New Java Project			
Create a Java Proje	ct		
Enter a location for the	project.		
Project name: cloud	sim		
Use default locati	on:		
Location:	1018 -		Browse
- JRE			
Use an execution	n environment JRE: Ja	vaSE-1.7	2
C Use a project sp	edific JRE:	17	<u>×</u>
C Use defoult JRE	(currently 'jre7')		Configure JREs
Project layout			
C Use project fold	er as root for sources an	nd class files	
Create separate	folders for sources and	class files	Configure default
Working sets			
Add project to v	orking sets		
Working sets:			- Sglect
The default com will use a project	piler compliance level for t specific compiler compli	the current workspace ance level of 1.7.	s is 1.6. The new project

**Step 10:** Make sure you navigate the path till you can see the bin, docs, examplesetc folder in the navigation plane.

0	New Java Project	- 🗆 🛸	- 6
File Edit Source Refactor Navigate Search Project Run Window	Create a Java Project Enter a project nome	<u>P</u>	Ourck Access
	Project name Use default location Location Use an e Use a	Browse	Find A + All + Activate. ()
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	Sock Next> Finish	Cancel	8
💷 🧈 🔞 😭 👩 🛷 💌		1 IM (2) \$\$ 4	9:37 

Step 11: Once done finally, click \_Next' to go to the next step i.e. setting up of project settings

Create a Java Project	
Create a Java project in the workspace or	in an external location.
Project name:   cloudsim	
Use default location	
Location: F:'	Browse
JRE .	
C Use an execution environment JRE:	JavaSE-1.7
C Use a project specific JP(C)	p=7
<ul> <li>Use default JRE (currently ')re7')</li> </ul>	Configure 3REs
Project legicial	1
C Use project folder as root for source	es and class files
Create separate folders for sources	ond closs files Configure default
Working sets	
Add project to working sets	
Working sets:	Select
<ul> <li>The wizard will automatically configuentiating source.</li> </ul>	ure the JRE and the project layout based on the

**Step 12:** Once the project is configured you can open the *\_Project Explorer\_* and start exploring the Cloudsim project. Also for the first time eclipse automatically start building the workspace for newly configured Cloudsim project, which may take some time depending on the configuration of the computer system.

Following is the final screen which you will see after Cloudsim is configured.

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**Step 13:** Now just to check you within the **\_Project Explorer\_**, you should navigate to the **\_src\_** folder, then expand the package *\_default package\_* and double click to open the *\_RoundRobin.java\_*.



**Step 14:** Now navigate to the Eclipse menu  $\_Run ->Run\_$  or directly use a keyboard shortcut '*Ctrl* + *F11*' to execute the '*RoundRobin*.java'. If it is successfully executed it should be displaying the following type to output in the console window of the Eclipse IDE.

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# **Result:**

Thus the scheduling algorithm is executed in cloudsim is simulated using Eclipse Environment successfully.

# Ex No. 6 Find a procedure to launch virtual machine using Openstack

## Introduction:

- OpenStack was introduced by Rackspace and NASA in July 2010.
- OpenStack is an Infrastructure as a Service known as Cloud Operating System, that take resources such as Compute, Storage, Network and Virtualization Technologies and control those resources at a data center level
- The project is building an open source community to share resources and technologies with the goal of creating a massively scalable and secure cloud infrastructure.
- ✤ The software is open source and limited to just open source APIs such as Amazon.



#### The following figure shows the OpenStack architecture

#### OpenStack architecture

- It is modular architecture
- Designed to easily scale out
- Based on (growing) set of core services

#### The major components are

- 1. Keystone
- 2. Nova
- 3. Glance
- 4. Swift
- 5. Quantum
- 6. Cinder

- **KEYSTONE** :
  - o Identity service
  - Common authorization framework
  - Manage users, tenants and roles
  - Pluggable backends (SQL,PAM,LDAP, IDM etc)

## • NOVA

- o Core compute service comprised of
  - Compute Nodes hypervisors that run virtual machines
    - Supports multiple hypervisors KVM,Xen,LXC,Hyper-V and ESX
  - Distributed controllers that handle scheduling, API calls, etc
    - Native OpenStack API and Amazon EC2 compatible
       API
- GLANCE
  - o Image service
  - Stores and retrieves disk images (Virtual machine templates)
  - Supports RAW, QCOW, VHD, ISO, OVF & AMI/AKI
  - o Backend Storage : File System, Swift, Gluster, Amazon S3

#### • SWIFT

- Object Storage service
- Modeled after Amazon's Service
- Provides simple service for storing and retrieving arbitrary data
- Native API and S3 compatible API

## • NEUTRON

- Network service
- Provides framework for Software Defined Network
- Plugin architecture
  - Allows intergration of hardware and software based network solutions
    - Open vSwitch, Cisco UCS,Standard Linux Bridge,NiCira NVP

## • CINDER

- Block Storage (Volume) service
- Provides block storage for Virtual machines(persistent disks)
- Similar to Amazon EBS service
- Plugin architecture for vendor extensions
  - NetApp driver for cinder

# • HORIZON

- Dashboard
- Provides simple self service UI for end-users
- Basic cloud administrator functions
  - Define users, tenants and quotas
  - No infrastructure management

# • HEAT OpenStack Orchestration

- Provides template driven cloud application orchestration
- Modeled after AWS Cloud Formation
- Targeted to provide advanced functionality such as high availability and auto scaling
- o Introduced by Redhat
- **CEILOMETER** OpenStack Monitoring and Metering
  - Goal: To Provide a single infrastructure to collect measurements from an entire OpenStack Infrastructure; Eliminate need for multiple agents attaching to multiple OpenStack Projects
  - Primary targets metering and monitoring: Provided extensibility

## Steps in Installing Openstack

Step 1:

- Download and Install Oracle Virtual Box latest version & Extension package
  - o <u>https://virtualbox.org/wiki/downloads</u>

# Step 2:

- Download CentOS 7 OVA(Open Virtual Appliance) from

   Link : https://linuxymimages.com/images/centos-7
- Import CentOS 7 OVA(Open Virtual Appliance) into Oracle Virtual Box

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Step 3:Login into CenOS 7

- Login Details
  - User name : centos
  - Password : centos
- To change into root user in Terminal

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[root@localhost edureka]# 📙		
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Step 4: Installation Steps for OpenStack

Step5: Command to disable and stop firewall

# systemctl disable firewalld

**#systemctl stop firewalld** 

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Step 6: Command to disable and stop Network Manager

#### # systemctl disable NetworkManager

#### # systemctl stop NetworkManager



Step 7: Enable and start Network

**#systemctl enable network** 

**#systemctl start network** 

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Step 8: OpenStack will be deployed on your Node with the help of PackStack package provided by rdo repository (**RPM Distribution of OpenStack**). In order to enable rdo repositories on Centos 7 run the below command.

# #yum install -y https://rdoproject.org/repos/rdo-release.rpm



Step 9: Update Current packages

#### **#yum update –y**



#### Step 10:Install OpenStack Release for CentOS

#### #yum install -y openstack-packstack



Step 11:Start packstack to install OpenStack Newton

#### **#packstak --allinone**

[root@localhost ~]# packstackallinone Welcome to the Packstack setup utility		
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Step 12:Note the user name and password from keystonerc\_admin

#### #cat keystonerc\_admin



**Step 13:** Click the URL and enter the user name and password to start OpenStack

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# OpenStack is successfully launched in your machine

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