Ex No.2	Install a C compiler in the virtual machine created using virtual box 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
```

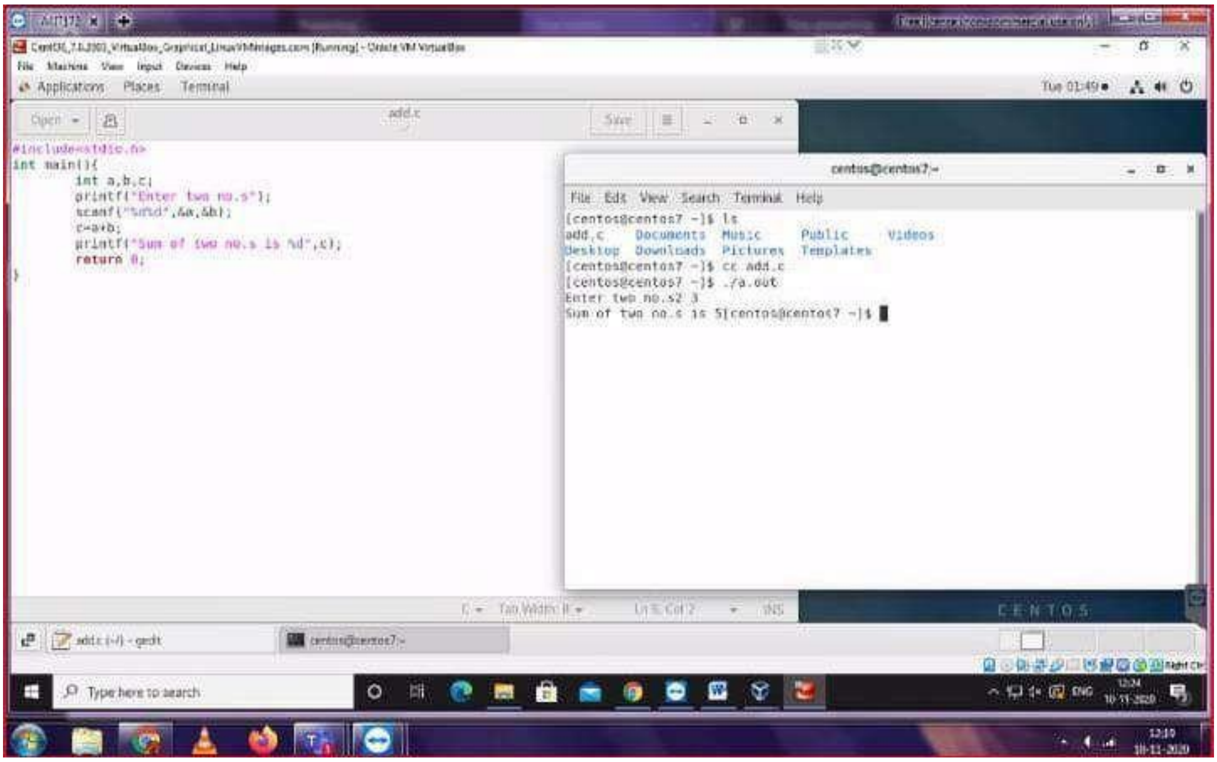
Step 4: Run the Program

```
$ ./a.out
```

Expected Output:

```
Enter two nos : 2 3
Sum of two nos is: 5
```

Output:



```
#include<stdio.h>
int main(){
        int a,b,c;
        printf("Enter two no.s");
        scanf("%d%d",&a,&b);
        c=a+b;
        printf("Sum of two no.s is %d",c);
        return 0;
}
```

```
[centos@centos7 ~]$ ls
add.c     Documents  Music     Public     Videos
Desktop   Downloads  Pictures  Templates
[centos@centos7 ~]$ cc add.c
[centos@centos7 ~]$ ./a.out
Enter two no.s2 3
Sum of two no.s is 5[centos@centos7 ~]$ 
```

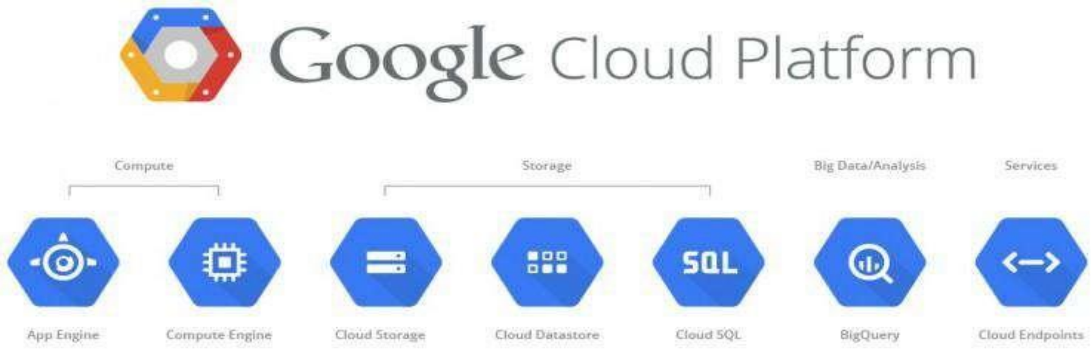
Result:

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

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

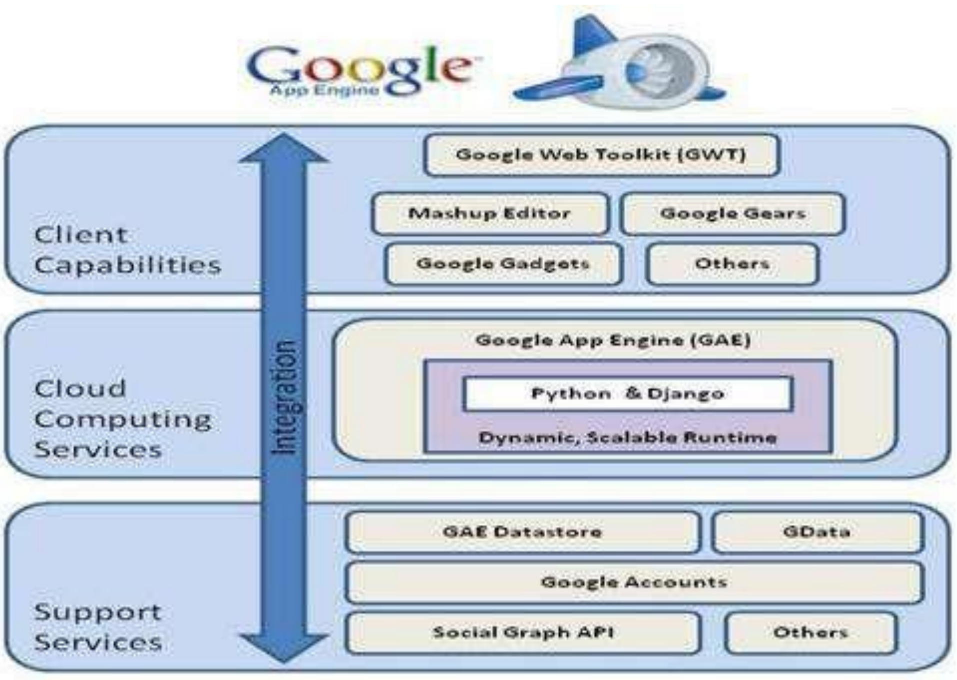
- Google‘s App Engine opens Google‘s production to any person in the world at no charge.
- Google App Engine is software that facilitates the user to run his web applications on Google infrastructure.
- It is more reliable because failure of any server will not affect either the performance of the end 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

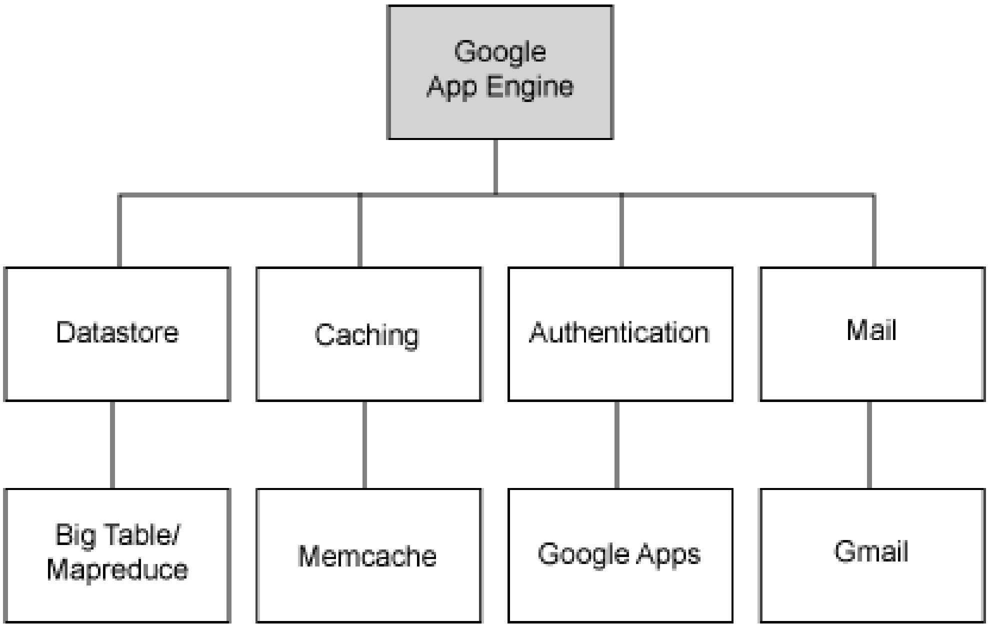
- Google App Engine lets you run your web applications on Google's infrastructure. App Engine applications are easy to build, easy to maintain, and easy to scale as your traffic and data storage needs grow. With App Engine, there are no servers to maintain: You just upload your application, and it's 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**



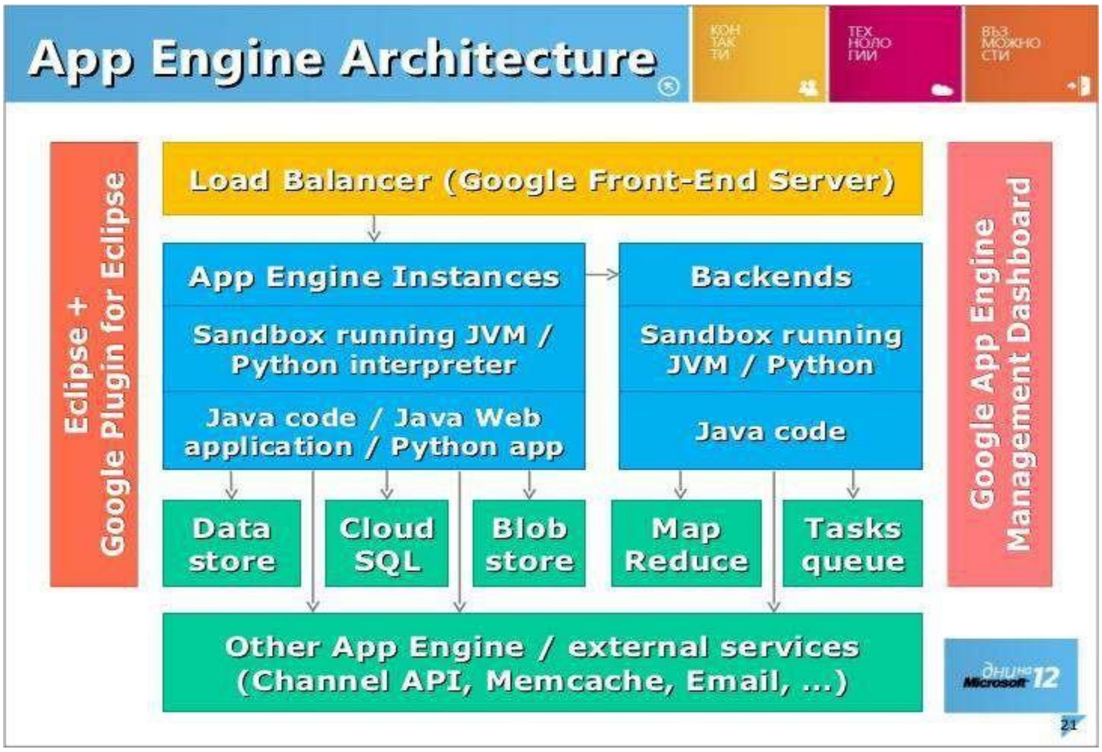
➢ GAE Application Environment:

- 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

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



App Engine Architecture

КОН ТАК ТИ

ТЕХ НОЛО ГИИ

ВЪЗ МОЖНО СТИ

Eclipse + Google Plugin for Eclipse

Load Balancer (Google Front-End Server)

App Engine Instances

Sandbox running JVM / Python interpreter

Java code / Java Web application / Python app

Backends

Sandbox running JVM / Python

Java code

Data store

Cloud SQL

Blob store

Map Reduce

Tasks queue

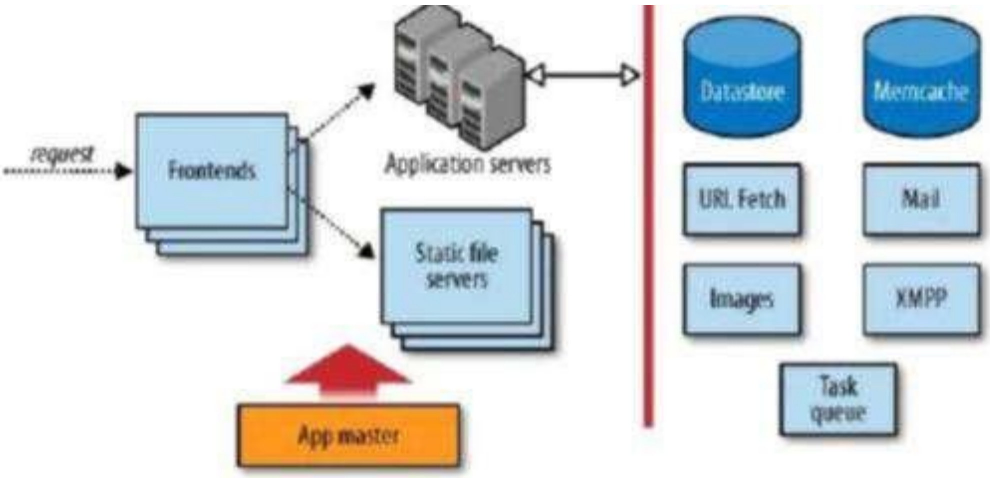
Other App Engine / external services (Channel API, Memcache, Email, ...)

Google App Engine Management Dashboard

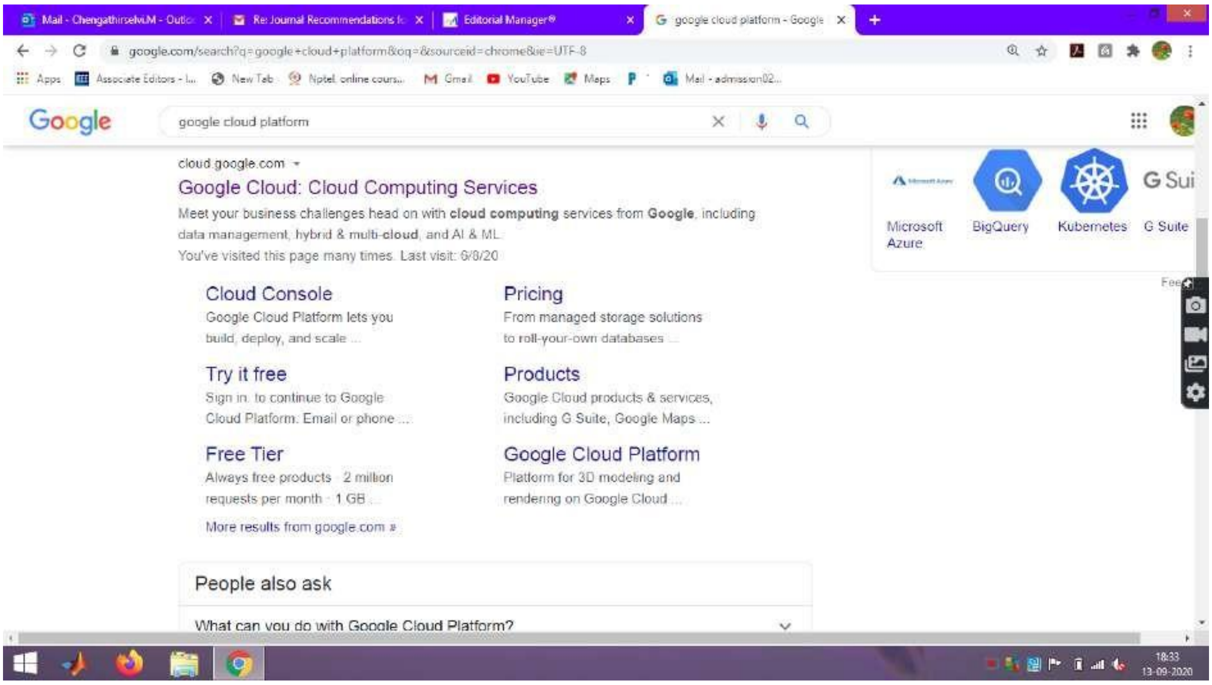
Microsoft дни 12

21

- **Workflow of Google App Engine**



Step1 : Login to www.cloud.google.com



cloud.google.com

Google Cloud: Cloud Computing Services

Meet your business challenges head on with cloud computing services from Google, including data management, hybrid & multi-cloud, and AI & ML.

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Google Cloud Platform lets you build, deploy, and scale ...

Pricing
From managed storage solutions to roll-your-own databases ...

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Always free products · 2 million requests per month · 1 GB ...

Google Cloud Platform
Platform for 3D modeling and rendering on Google Cloud ...

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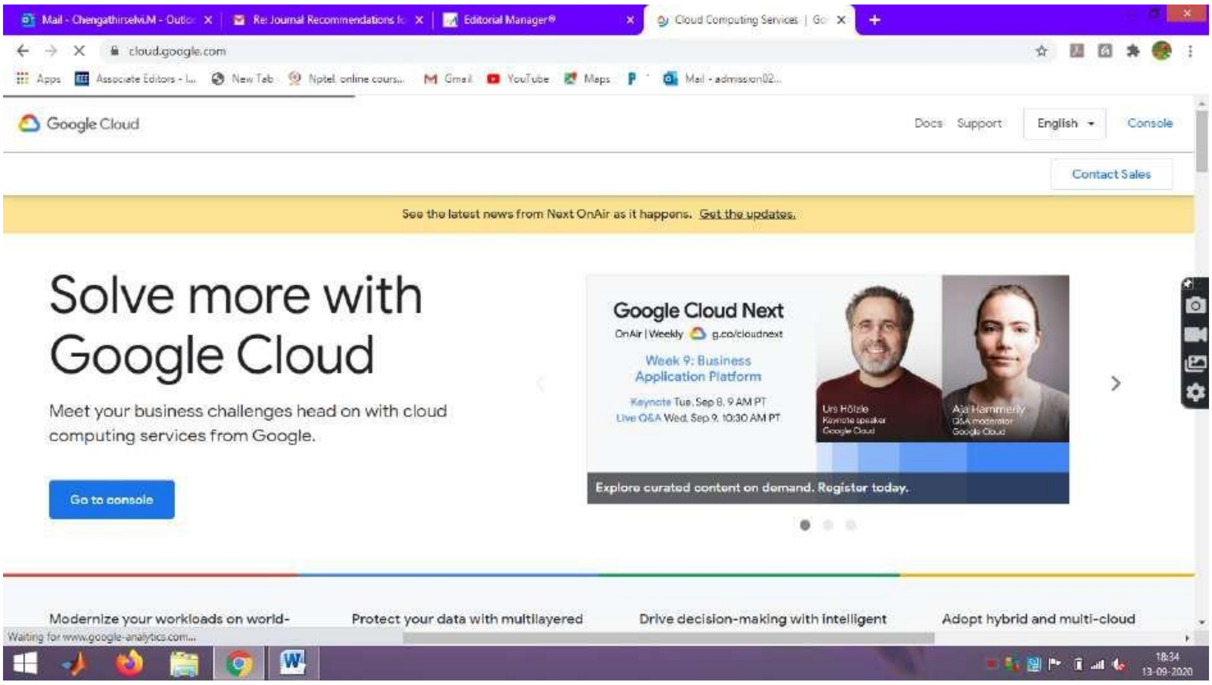
People also ask

What can you do with Google Cloud Platform?

Step2 : Goto Console



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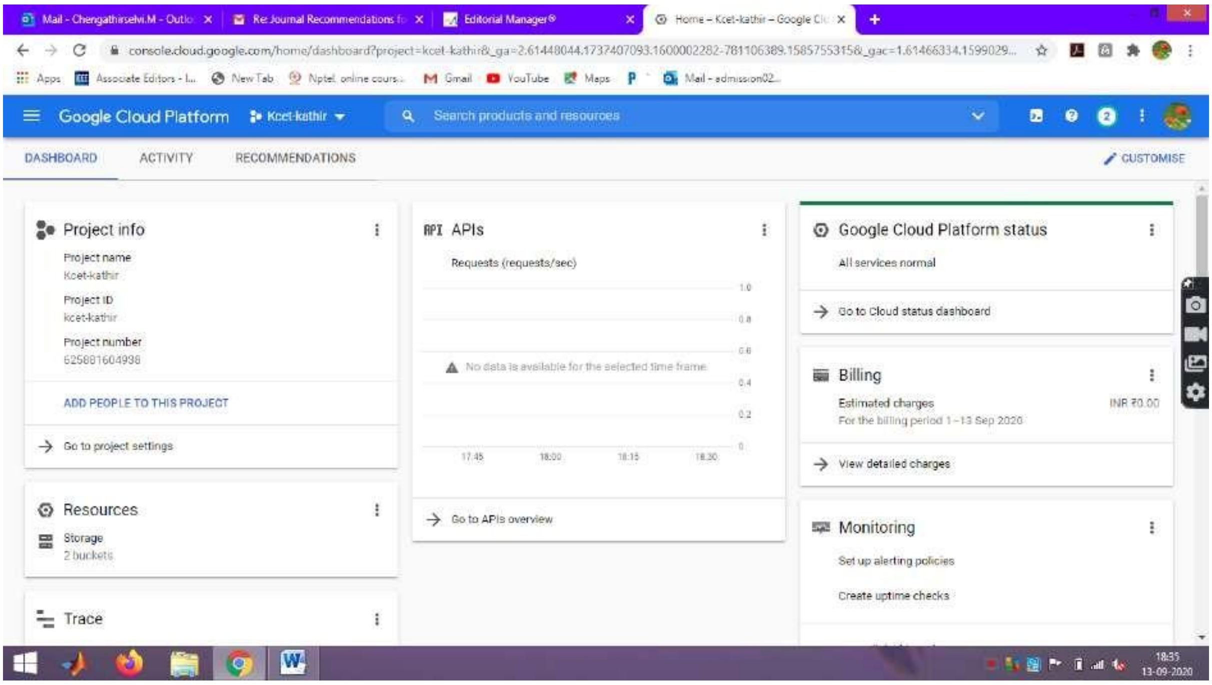
Adopt hybrid and multi-cloud

Step 3 : Google Cloud Platform is shown



console.cloud.google.com/home/dashboard?project=kcet-kathir&_ga=2.61448044.1737407093.1600002282-781106389.1585755315&_gac=1.61466334.1599029...

Project info

Project name
Kcet-kathir

Project ID
kcet-kathir

Project number
625881604998

APIs

Requests (requests/sec)

No data is available for the selected time frame

Google Cloud Platform status

All services normal

Billing

Estimated charges INR ₹0.00

For the billing period 1 – 13 Sep 2020

Monitoring

Set up alerting policies

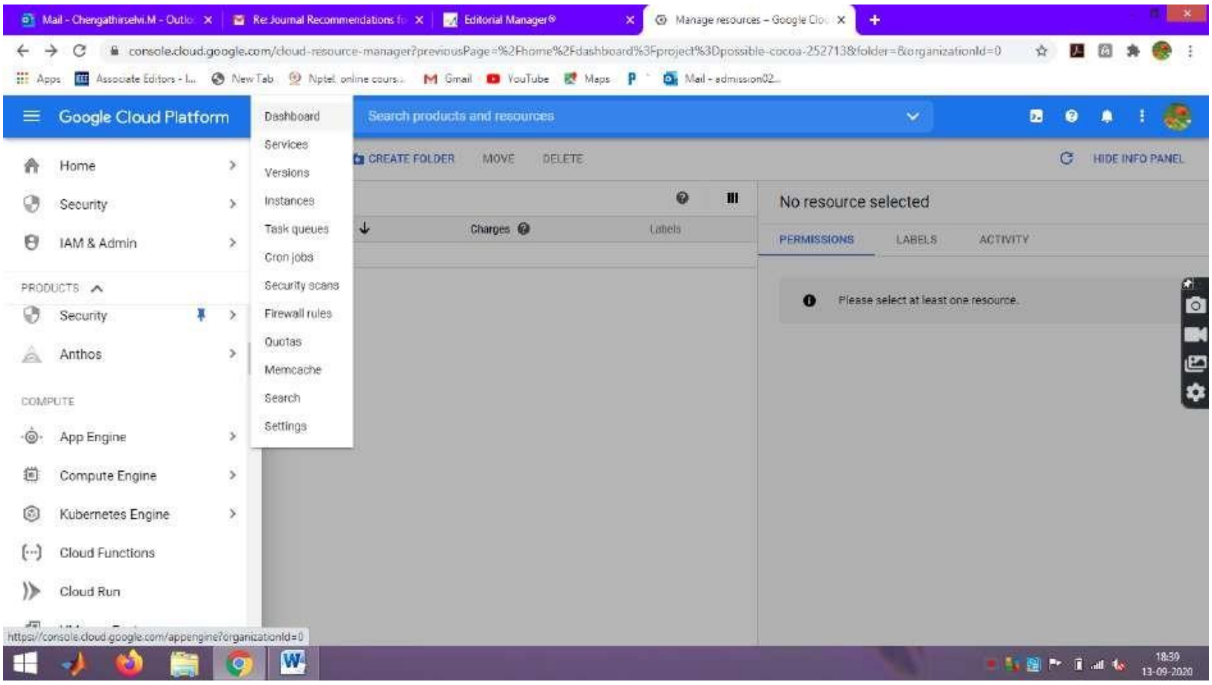
Create uptime checks

Resources

Storage
2 buckets

Trace

Step 4 : Click Dashboard in the Google Cloud Plaform

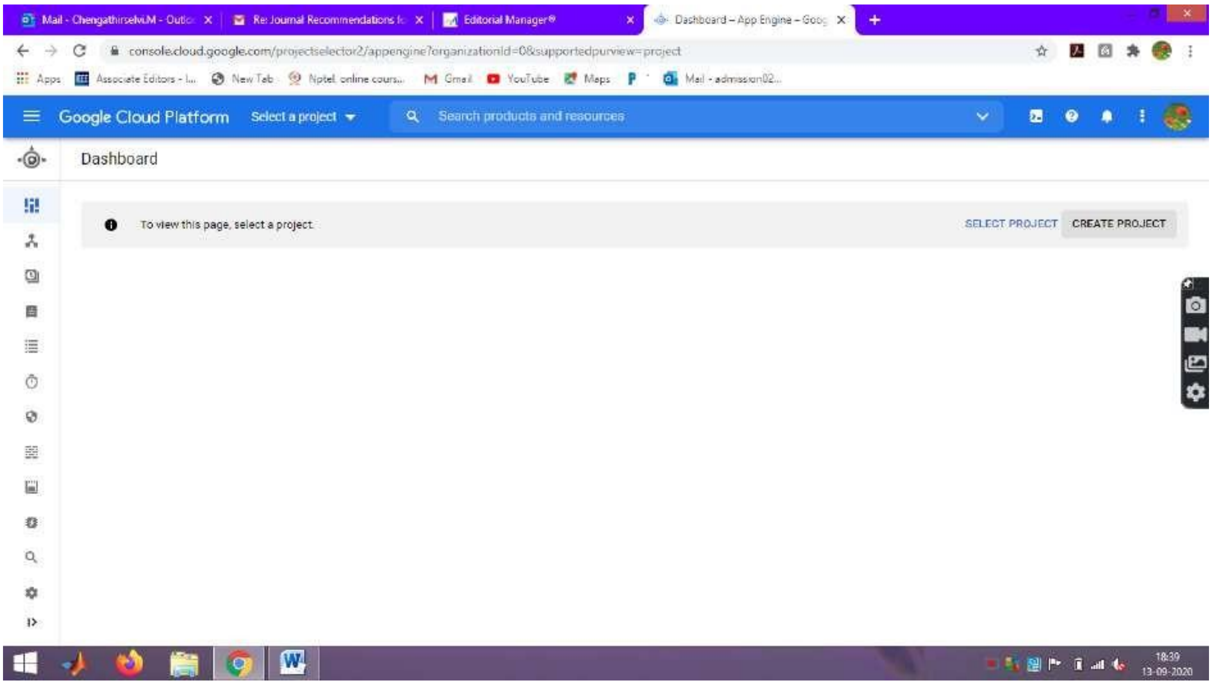


console.cloud.google.com/cloud-resource-manager?previousPage=%2Fhome%2Fdashboard%3Fproject%3Dpossible-cocoa-252713&folder=&organizationId=0

No resource selected

Please select at least one resource.

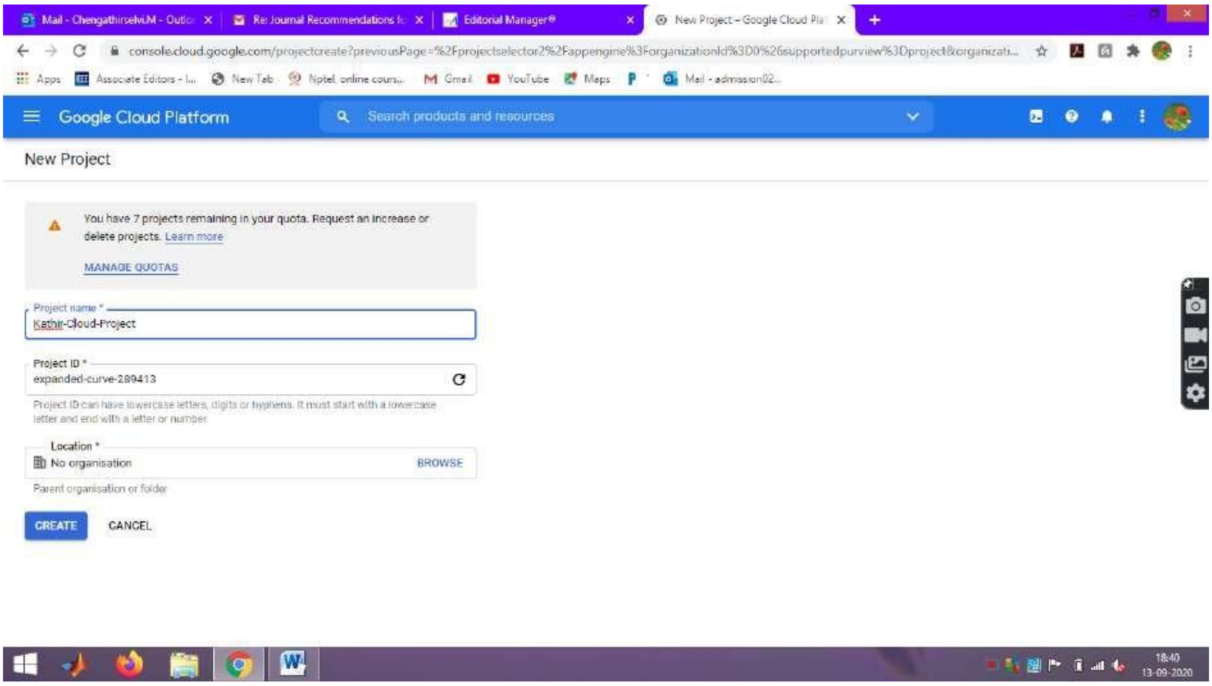
Step 5 : Dashboard in the Google Cloud Plaform



To view this page, select a project.

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

Example : kcet-cloud-project



You have 7 projects remaining in your quota. Request an increase or delete projects. Learn more

Project name * Kathir-Cloud-Project

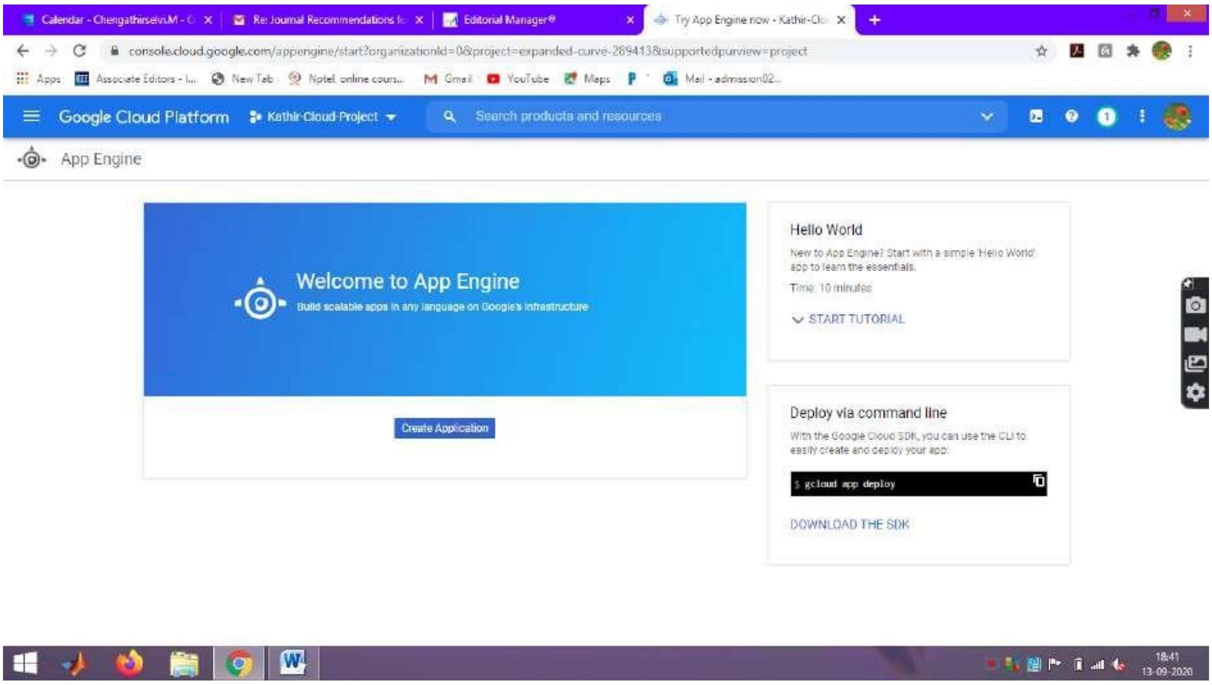
Project ID * expanded-curve-289413

Project ID can have lowercase letters, digits or hyphens. It must start with a lowercase letter and end with a letter or number.

Location * No organisation

Parent organisation or folder

Step 7 : Google App Engine is initated



console.cloud.google.com/appengine/start?organizationId=0&project=expanded-curve-289413&supportedpurview=project

Welcome to App Engine

Build scalable apps in any language on Google's infrastructure

Hello World

New to App Engine? Start with a simple 'Hello World' app to learn the essentials.

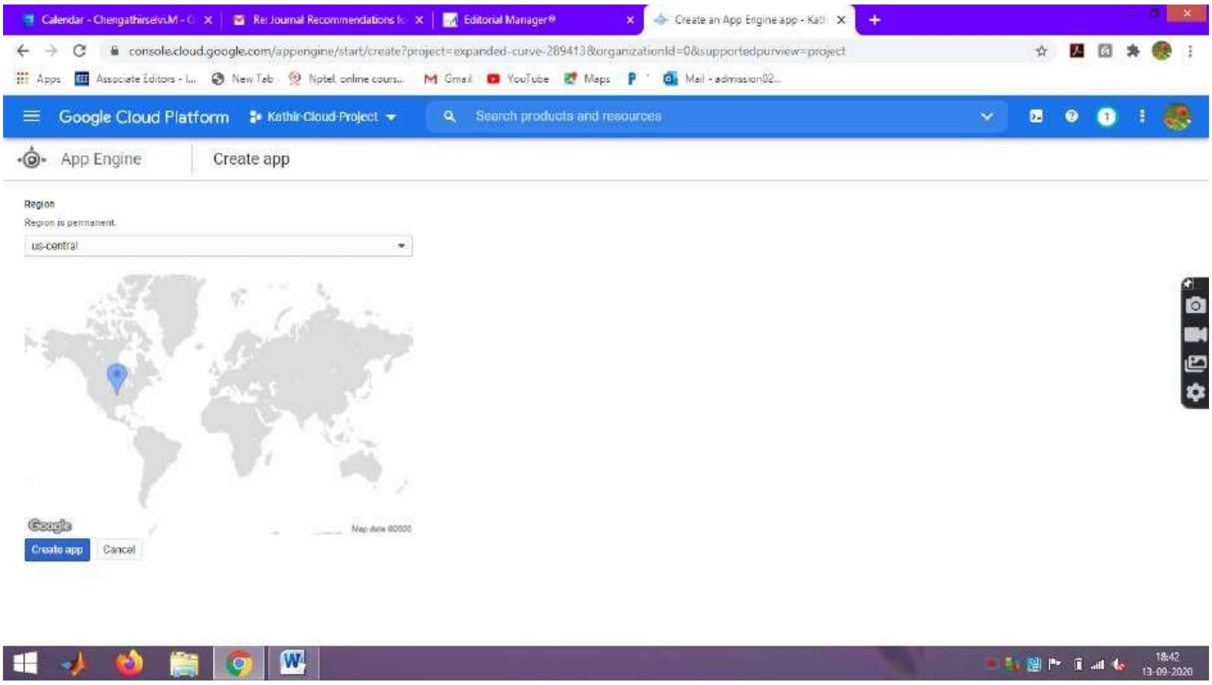
Time: 10 minutes

Deploy via command line

With the Google Cloud SDK, you can use the CLI to easily create and deploy your app:

```
$ gcloud app deploy
```

Step 8 : Click create Application



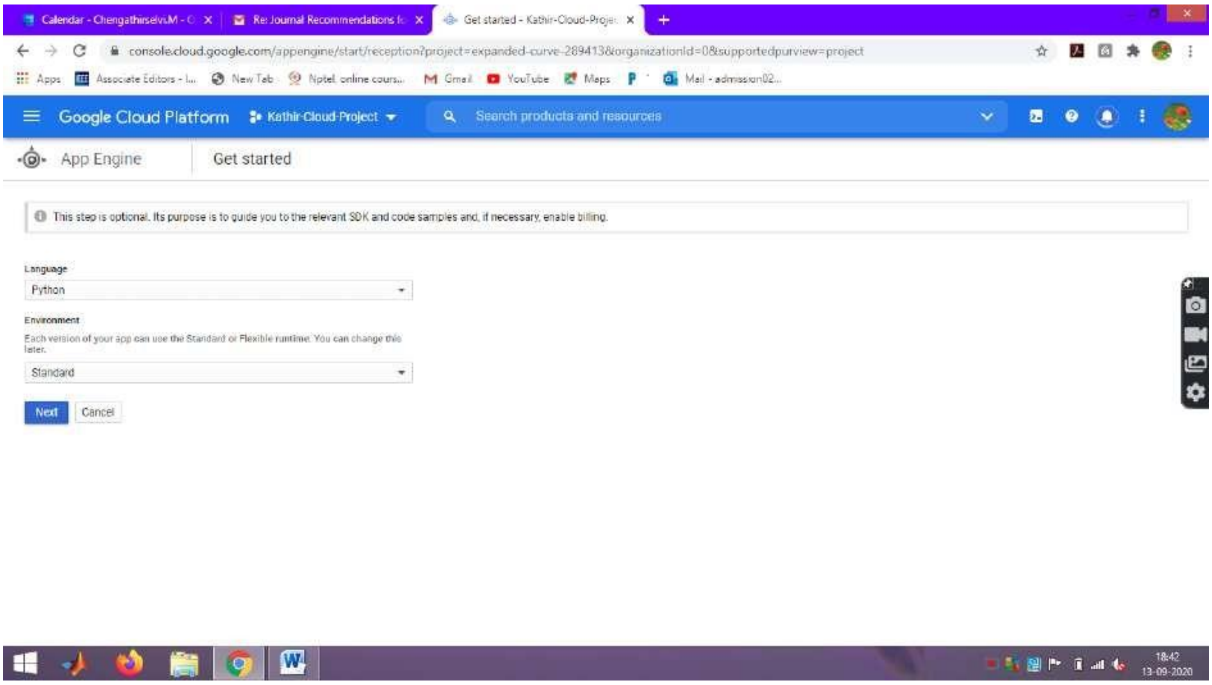
console.cloud.google.com/appengine/start/create?project=expanded-curve-289413&organizationId=0&supportedpurview=project

Region

Region is permanent.

us-central

Step 9 : Create app and Select Language Python



console.cloud.google.com/appengine/start/reception?project=expanded-curve-289413&organizationId=0&supportedpurview=project

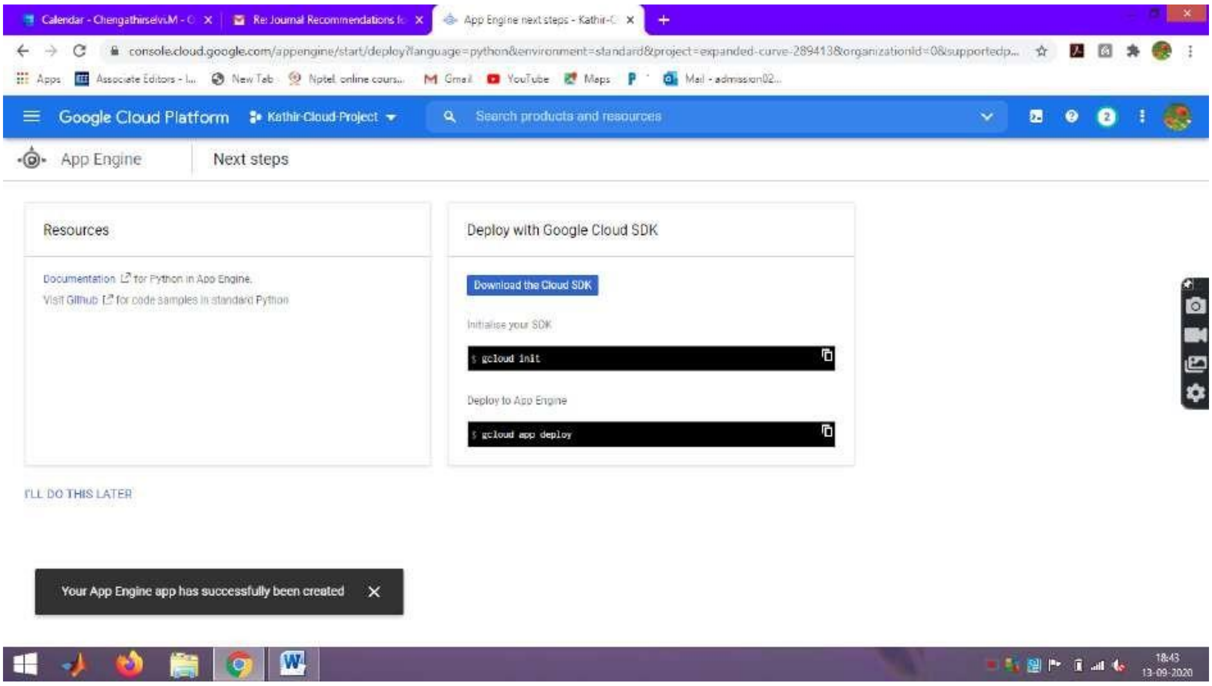
This step is optional. Its purpose is to guide you to the relevant SDK and code samples and, if necessary, enable billing.

Language: Python

Environment: Each version of your app can use the Standard or Flexible runtime. You can change this later.

Standard

Step 10 : Python app is created in Google App Engine



console.cloud.google.com/appengine/start/deploy?language=python&environment=standard&project=expanded-curve-289413&organizationId=0&supportedp...

Resources

Documentation for Python in App Engine.

Visit Github for code samples in standard Python

Deploy with Google Cloud SDK

Initialise your SDK

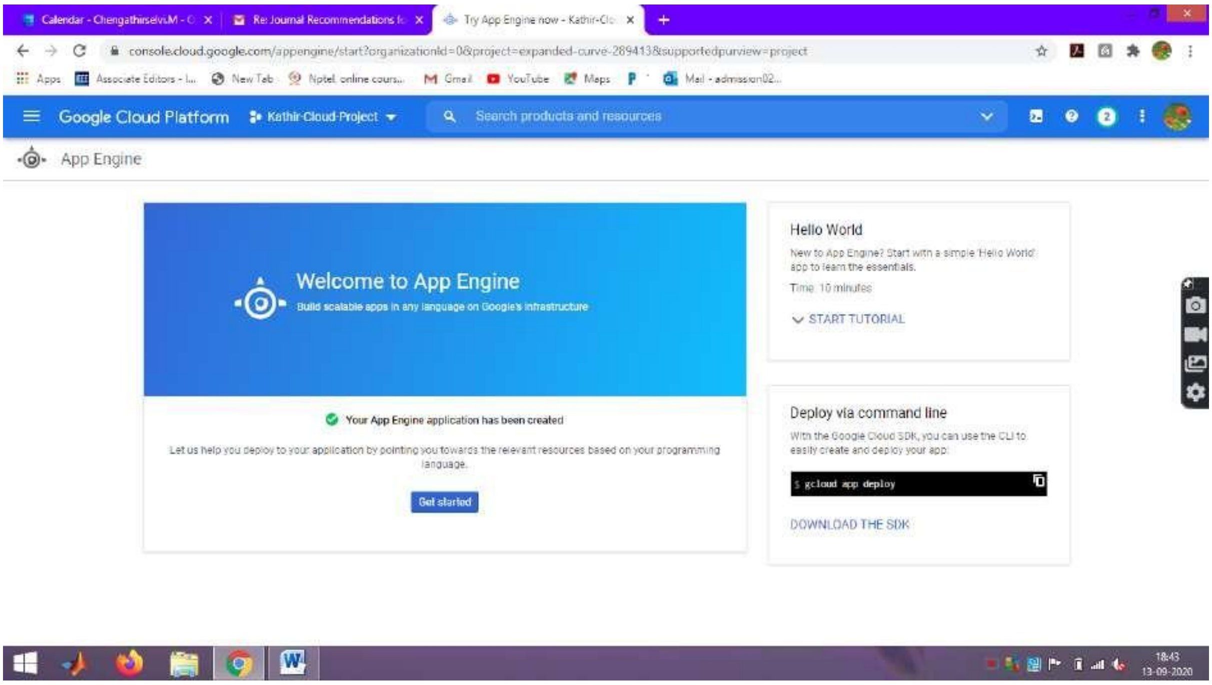
```
$ gcloud init
```

Deploy to App Engine

```
$ gcloud app deploy
```

Your App Engine app has successfully been created

Step 11 : Python app Engine application is created



Welcome to App Engine

Build scalable apps in any language on Google's infrastructure

Your App Engine application has been created

Let us help you deploy to your application by pointing you towards the relevant resources based on your programming language.

Hello World

New to App Engine? Start with a simple 'Hello World' app to learn the essentials.

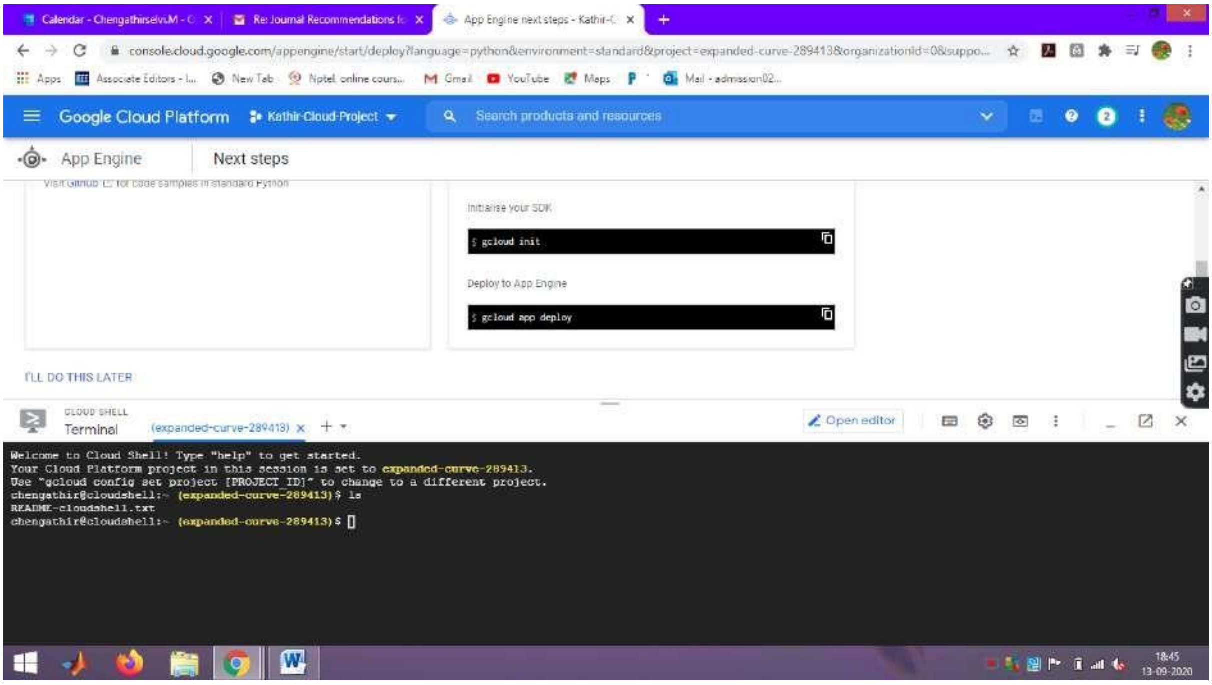
Time: 10 minutes

Deploy via command line

With the Google Cloud SDK, you can use the CLI to easily create and deploy your app:

```
$ gcloud app deploy
```

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



Initialise your SDK

```
$ gcloud init
```

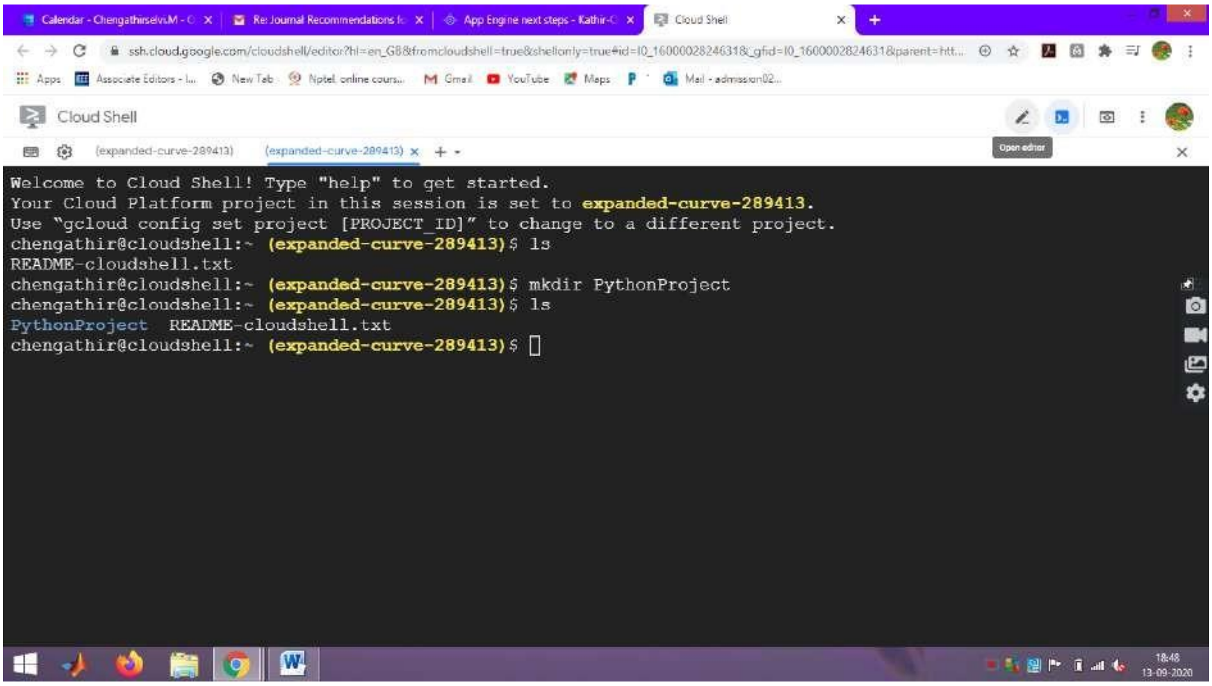
Deploy to App Engine

```
$ gcloud app deploy
```

```
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to expanded-curve-289413.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$
```

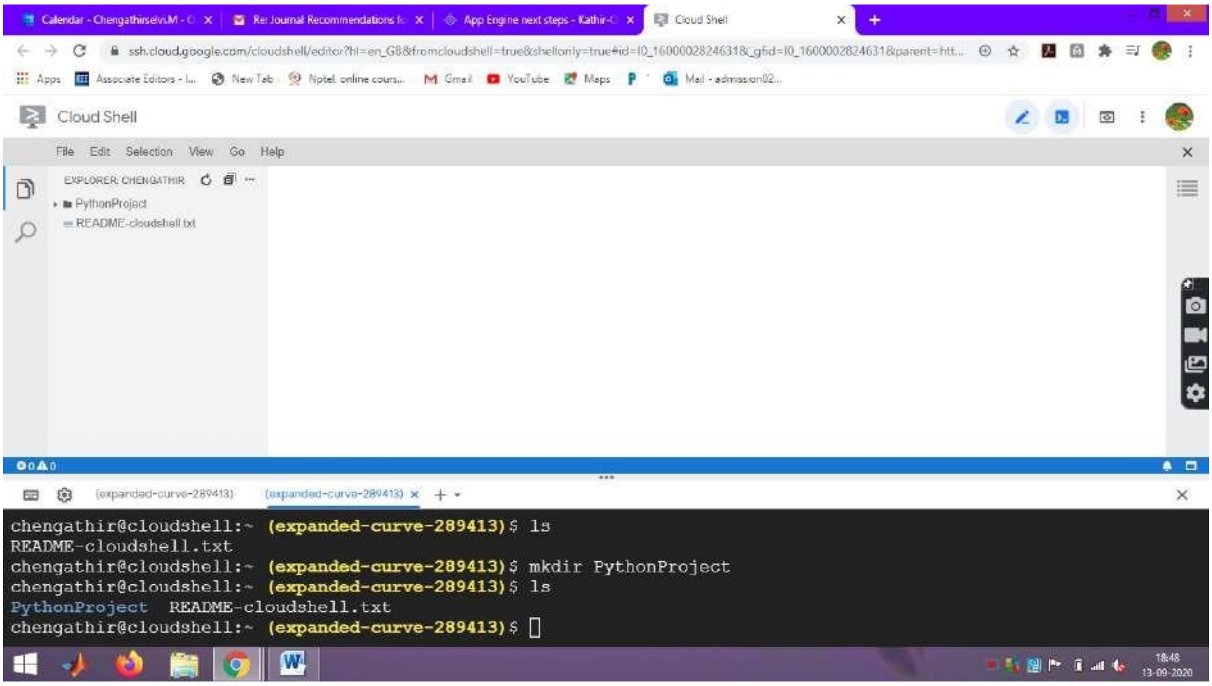
Step 13 : Create a Directory PythonProject using mkdir command

Syntax : mkdir PythonProject



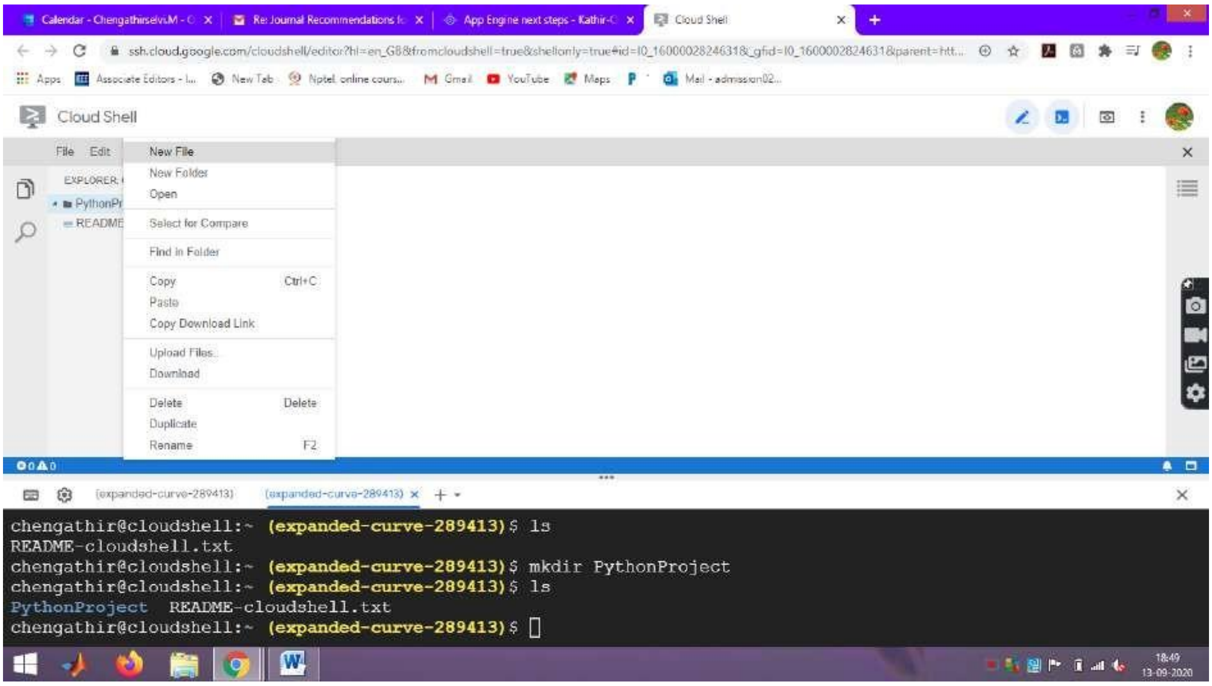
```
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to expanded-curve-289413.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$ mkdir PythonProject
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
PythonProject  README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$
```

Step 14 : Click Editor to create Python application



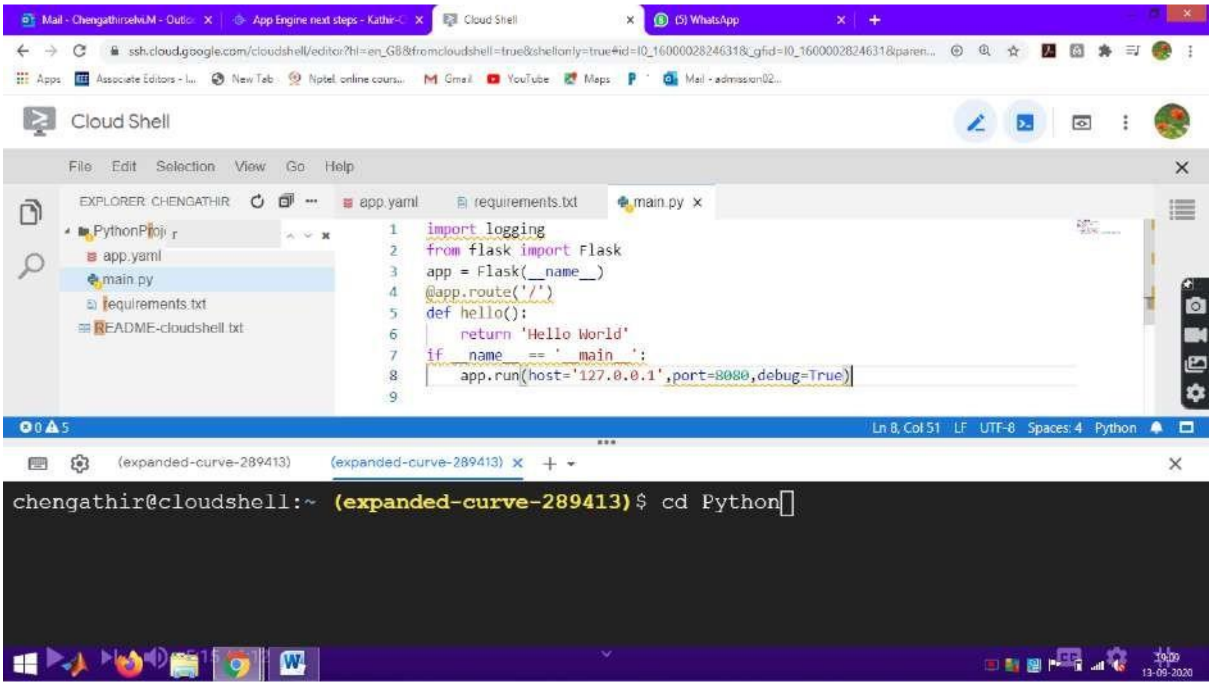
```
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$ mkdir PythonProject
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
PythonProject  README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$
```

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



```
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$ mkdir PythonProject
chengathir@cloudshell:~ (expanded-curve-289413)$ ls
PythonProject  README-cloudshell.txt
chengathir@cloudshell:~ (expanded-curve-289413)$
```

Step 16 : Create main.py file



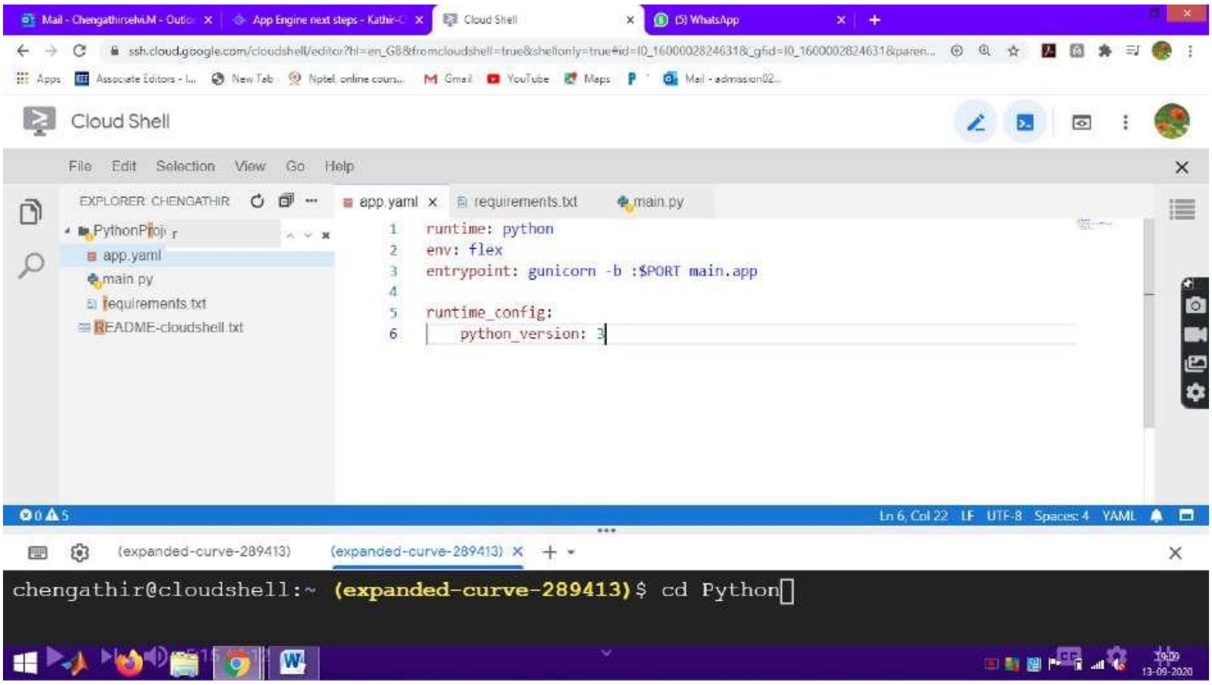
```python
import logging
from flask import Flask
app = Flask(__name__)
@app.route('/')
def hello():
    return 'Hello World'
if __name__ == '__main__':
    app.run(host='127.0.0.1',port=8080,debug=True)
```

```
chengathir@cloudshell:~ (expanded-curve-289413)$ cd Python
```

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



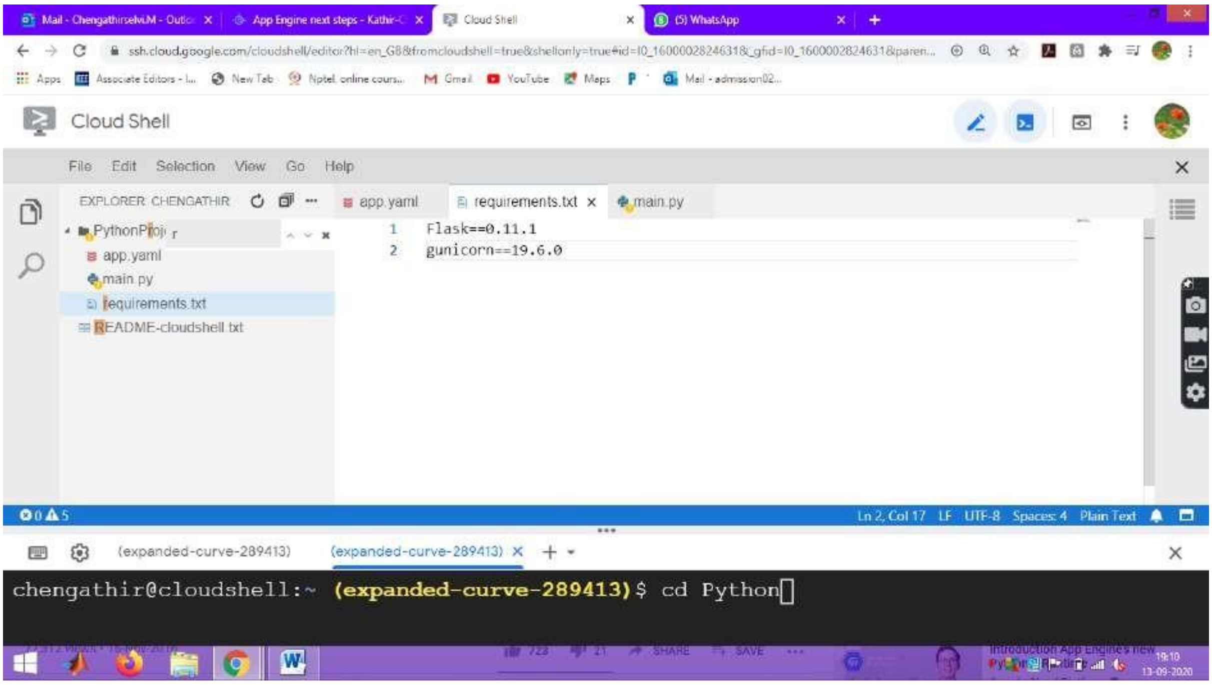
```
runtime: python
env: flex
entrypoint: gunicorn -b :$PORT main.app

runtime_config:
    python_version: 3
```

```
chengathir@cloudshell:~ (expanded-curve-289413)$ cd Python
```

app.yaml

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

runtime_config:
    python_version: 3
```

Step 18 : Create requirements.txt file



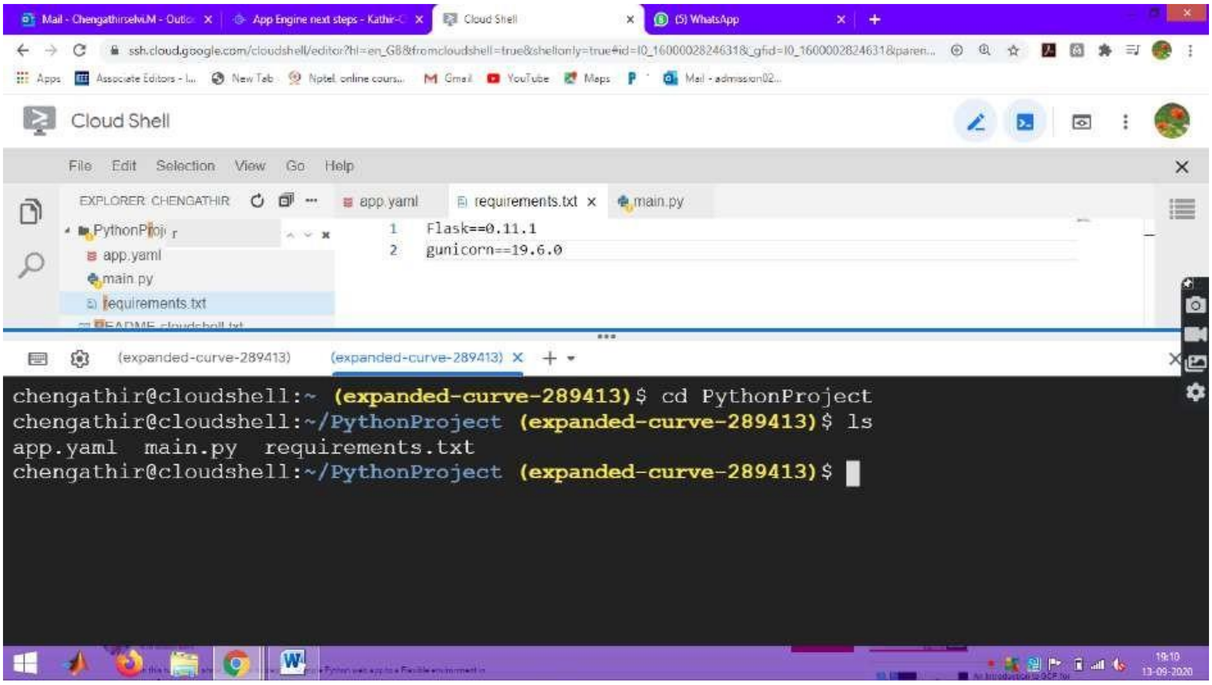
```
Flask==0.11.1
gunicorn==19.6.0
```

```
chengathir@cloudshell:~ (expanded-curve-289413)$ cd Python
```

requirements.txt

```
Flask==0.11.1
gunicorn==19.6.0
```

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

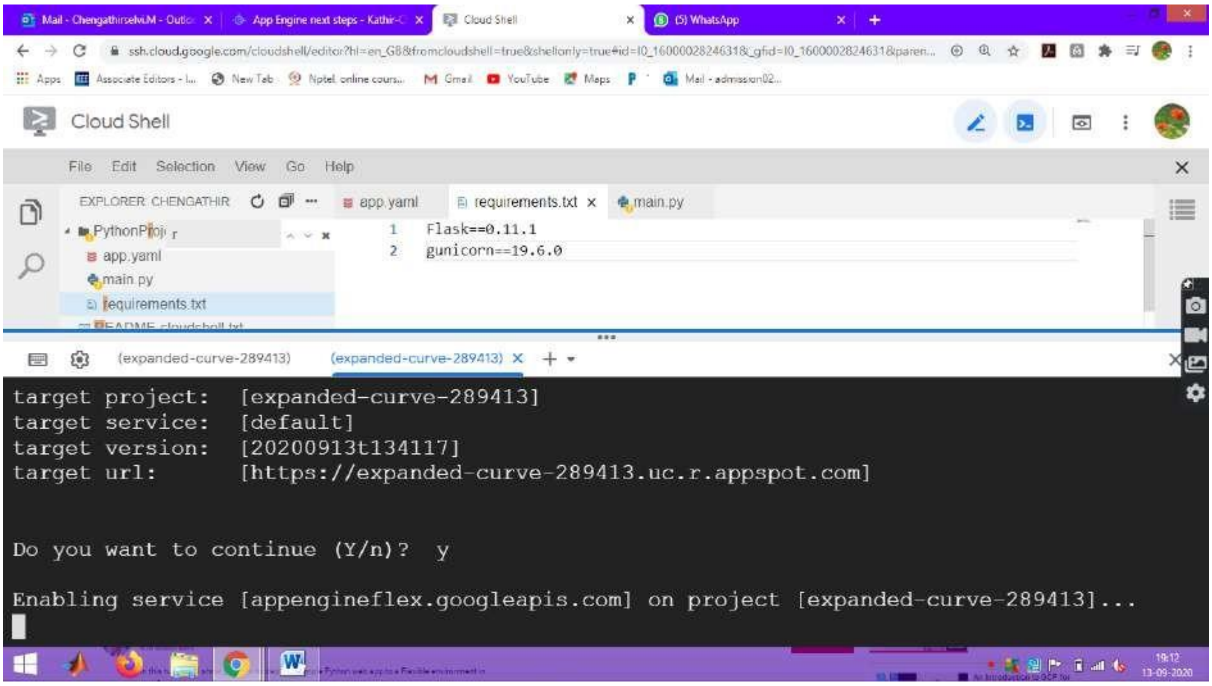


```
Flask==0.11.1
gunicorn==19.6.0
```

```
chengathir@cloudshell:~ (expanded-curve-289413)$ cd PythonProject
chengathir@cloudshell:~/PythonProject (expanded-curve-289413)$ ls
app.yaml  main.py  requirements.txt
chengathir@cloudshell:~/PythonProject (expanded-curve-289413)$
```

Step 20 : Move to Cloud Shell Environment to run the application

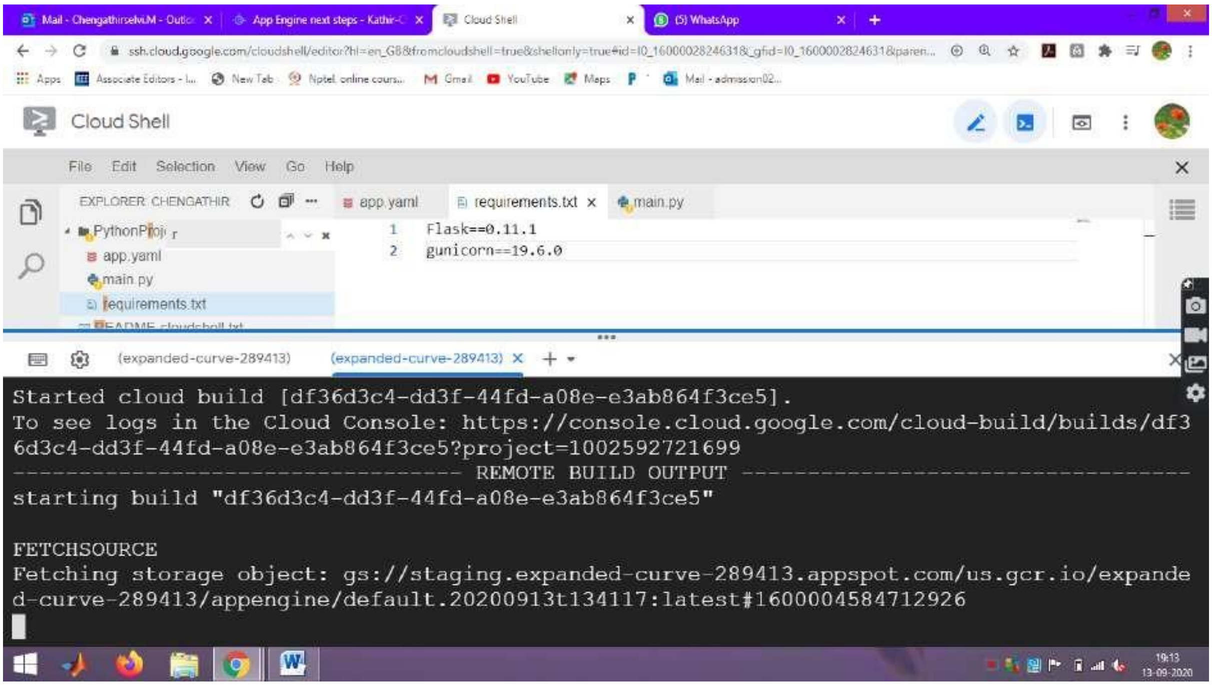
Syntax : gcloud app deploy



```
Flask==0.11.1
gunicorn==19.6.0
```

```
target project:   [expanded-curve-289413]
target service:   [default]
target version:   [20200913t134117]
target url:       [https://expanded-curve-289413.uc.r.appspot.com]


Do you want to continue (Y/n)?  y

Enabling service [appengineflex.googleapis.com] on project [expanded-curve-289413]...
```

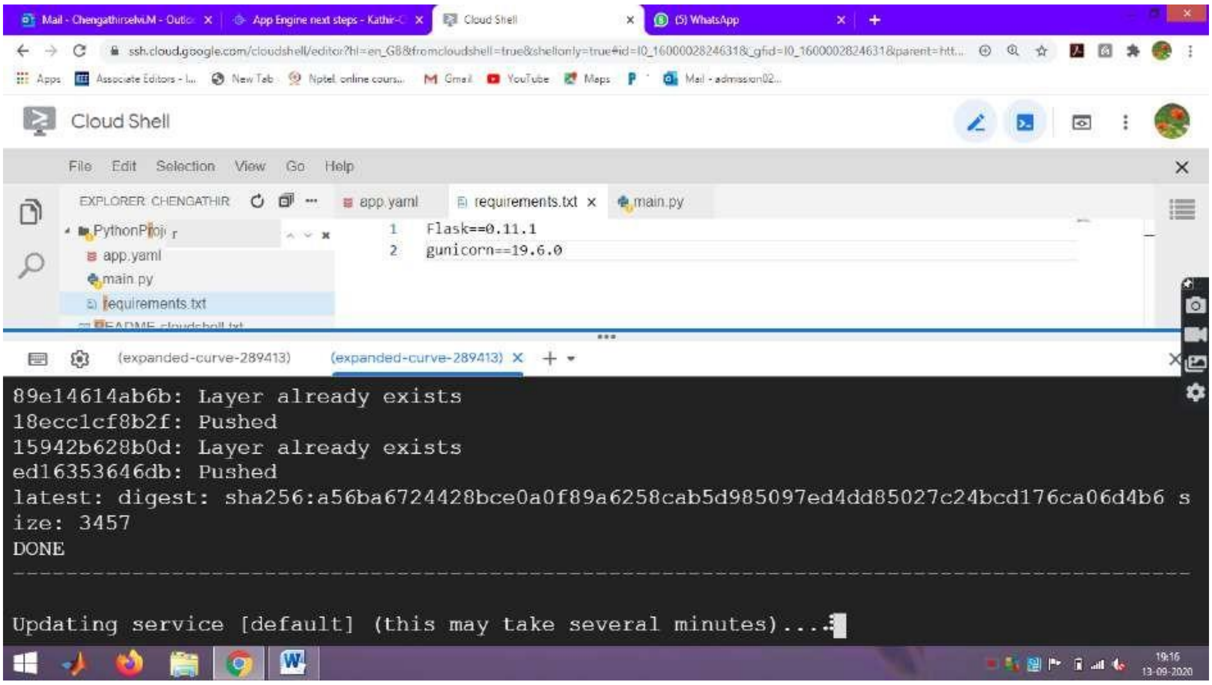
Continue the application. It enable service on the given project



```
Flask==0.11.1
gunicorn==19.6.0
```

```
Started cloud build [df36d3c4-dd3f-44fd-a08e-e3ab864f3ce5].
To see logs in the Cloud Console: https://console.cloud.google.com/cloud-build/builds/df3
6d3c4-dd3f-44fd-a08e-e3ab864f3ce5?project=1002592721699
---------------------------------- REMOTE BUILD OUTPUT ----------------------------------
starting build "df36d3c4-dd3f-44fd-a08e-e3ab864f3ce5"

FETCHSOURCE
Fetching storage object: gs://staging.expanded-curve-289413.appspot.com/us.gcr.io/expande
d-curve-289413/appengine/default.20200913t134117:latest#1600004584712926
```

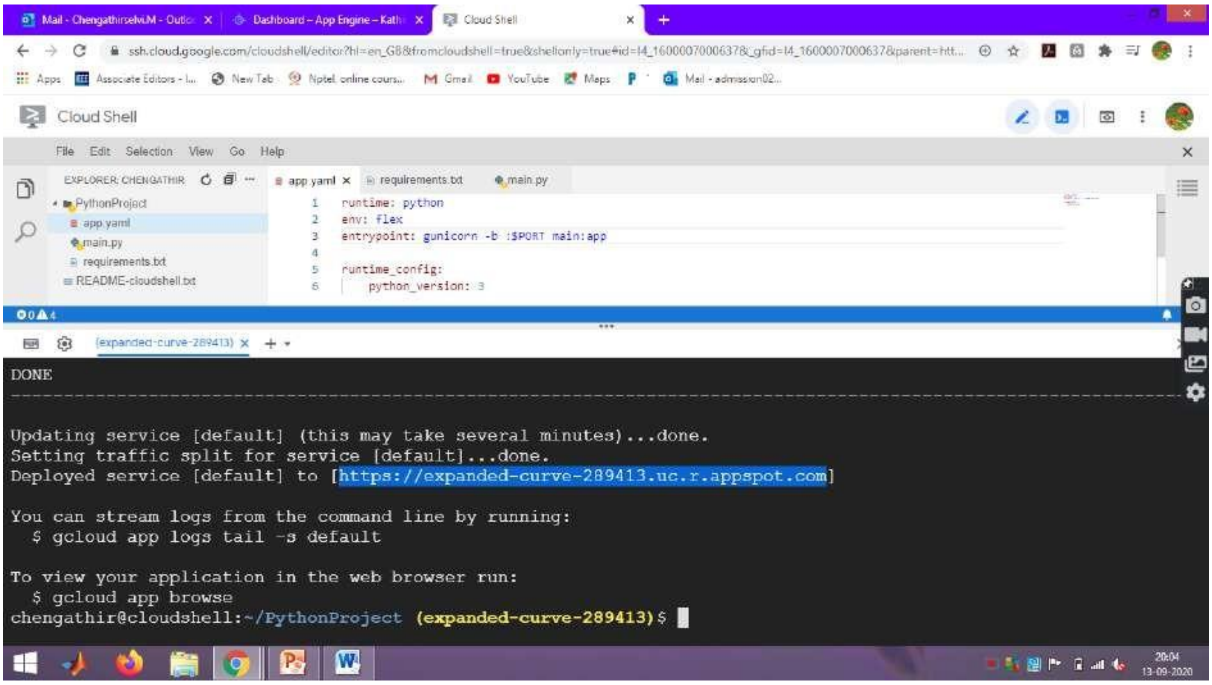
It started building the object and fetching the storage object for the created application



```
Flask==0.11.1
gunicorn==19.6.0
```

```
89e14614ab6b: Layer already exists
18ecc1cf8b2f: Pushed
15942b628b0d: Layer already exists
ed16353646db: Pushed
latest: digest: sha256:a56ba6724428bce0a0f89a6258cab5d985097ed4dd85027c24bcd176ca06d4b6 s
ize: 3457
DONE
--------------------------------------------------------------------------------------------

Updating service [default] (this may take several minutes)....
```

It is updating the service



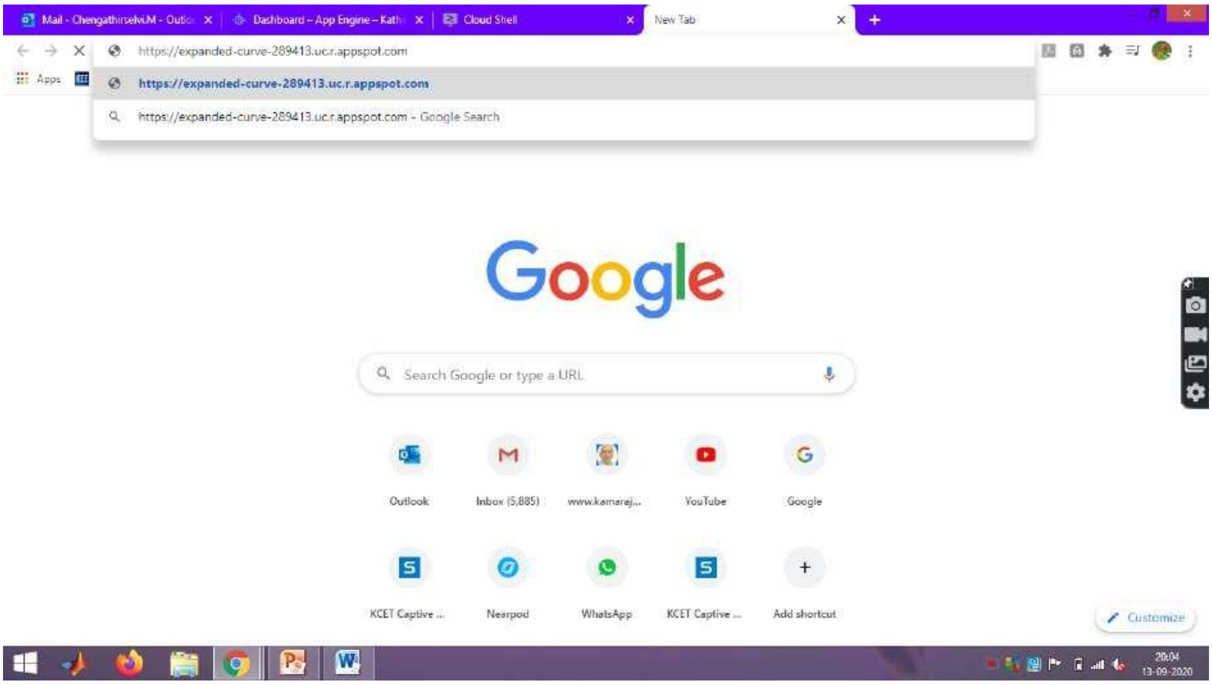
```
runtime: python
env: flex
entrypoint: gunicorn -b :$PORT main:app

runtime_config:
    python_version: 3
```

```
DONE
--------------------------------------------------------------------------------------------

Updating service [default] (this may take several minutes)...done.
Setting traffic split for service [default]...done.
Deployed service [default] to [https://expanded-curve-289413.uc.r.appspot.com]

You can stream logs from the command line by running:
  $ gcloud app logs tail -s default

To view your application in the web browser run:
  $ gcloud app browse
chengathir@cloudshell:~/PythonProject (expanded-curve-289413)$
```

The application is successfully deployed and URL is

https://expanded-curve-289413.uc.r.appspot.com

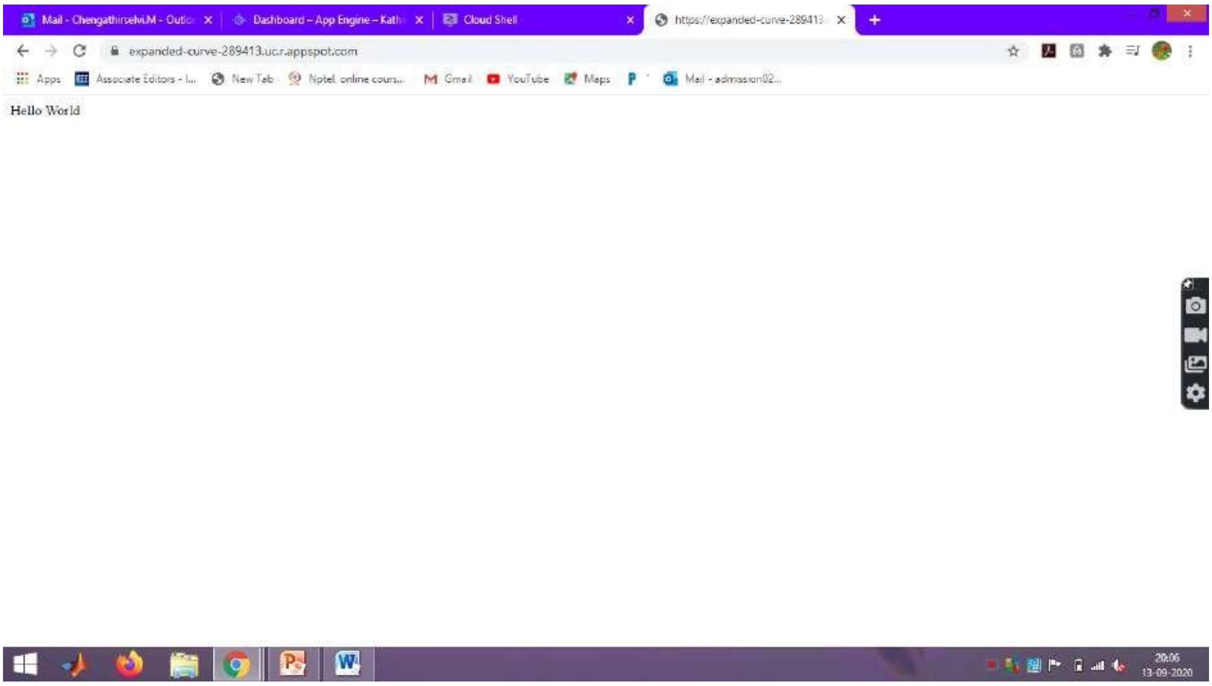
Step 21 : Run your program in the broswer



https://expanded-curve-289413.uc.r.appspot.com

https://expanded-curve-289413.uc.r.appspot.com - Google Search

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



expanded-curve-289413.uc.r.appspot.com

```
Hello World
```

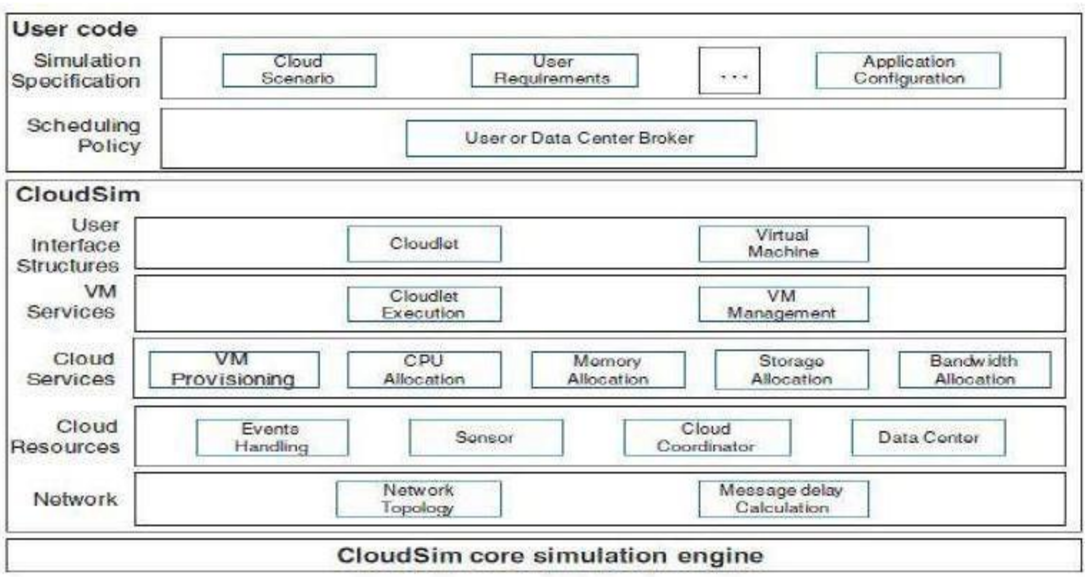
Result:

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:

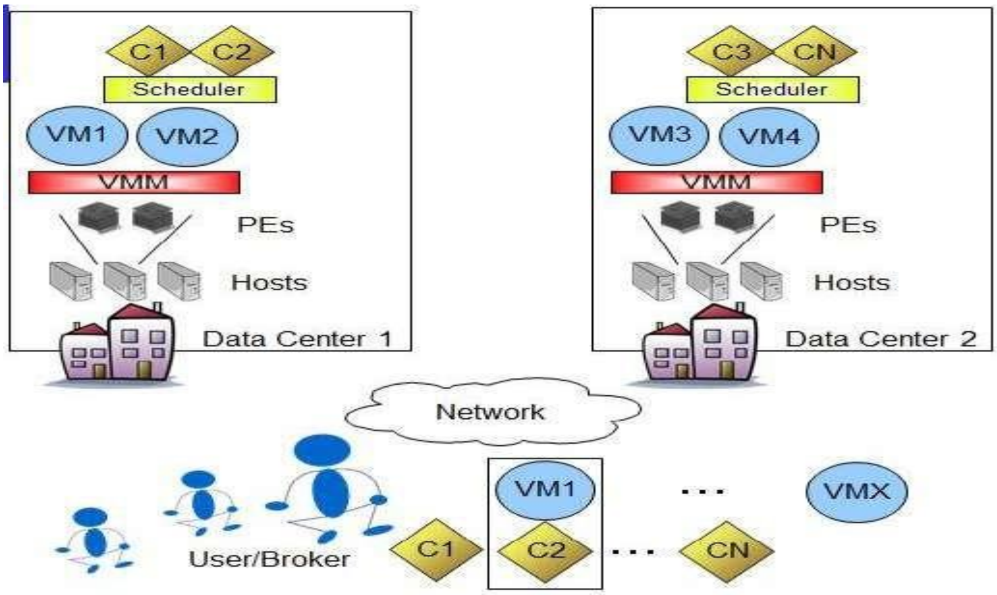
- **CloudSim**
  - A Framework for modeling and simulation of Cloud Computing Infrastructures and services
  - Originally built at the Cloud Computing Distributed Systems (CLOUDS) Laboratory, The University of Melbourne, Australia
  - It is completely written in JAVA
- **Main Features of CloudSiM**
  - Modeling and simulation
  - Data centre network topologies and message-passing applications
  - Dynamic insertion of simulation elements
  - Stop and resume of simulation
  - Policies for allocation of hosts and virtual machines
- **Cloudsim – Essentials**
  - JDK 1.6 or above http://tinyurl.com/JNU-JAVA
  - Eclipse 4.2 or above http://tinyurl.com/JNU-Eclipse
  - Alternatively NetBeanshttps://netbeans.org/downloads
  - 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**



- **Cloudsim - Component model classes**
  - CloudInformationService.java
  - Datacenter.java,Host.java,Pe.java
  - Vm.java,Cloudlet.java
  - DatacenterBroker.java
  - Storage.java,HarddriveStorage.java, SanStorage.java

- **Cloudsim - Major blocks/Modules**
  - org.cloudbus.cloudsim
  - org.cloudbus.cloudsim.core
  - org.cloudbus.cloudsim.core.predicates
  - org.cloudbus.cloudsim.distributions
  - org.cloudbus.cloudsim.lists
  - org.cloudbus.cloudsim.network
  - org.cloudbus.cloudsim.network.datacenter
  - org.cloudbus.cloudsim.power
  - org.cloudbus.cloudsim.power.lists
  - org.cloudbus.cloudsim.power.models
  - org.cloudbus.cloudsim.provisioners
  - org.cloudbus.cloudsim.util

- **Cloudsim - key components**
  - Datacenter
  - DataCenterCharacteristics
  - Host
  - DatacenterBroker
  - RamProvisioner
  - BwProvisioner
  - Storage
  - Vm
  - VMAllocationpolicy
  - VmScheduler
  - Cloudlet
  - CloudletScheduler
  - CloudInformationService
  - CloudSim
  - CloudSimTags
  - SimEvent
  - SimEntity
  - CloudsimShutdown
  - FutureQueue
  - DefferedQueue
  - Predicate and associative classes.

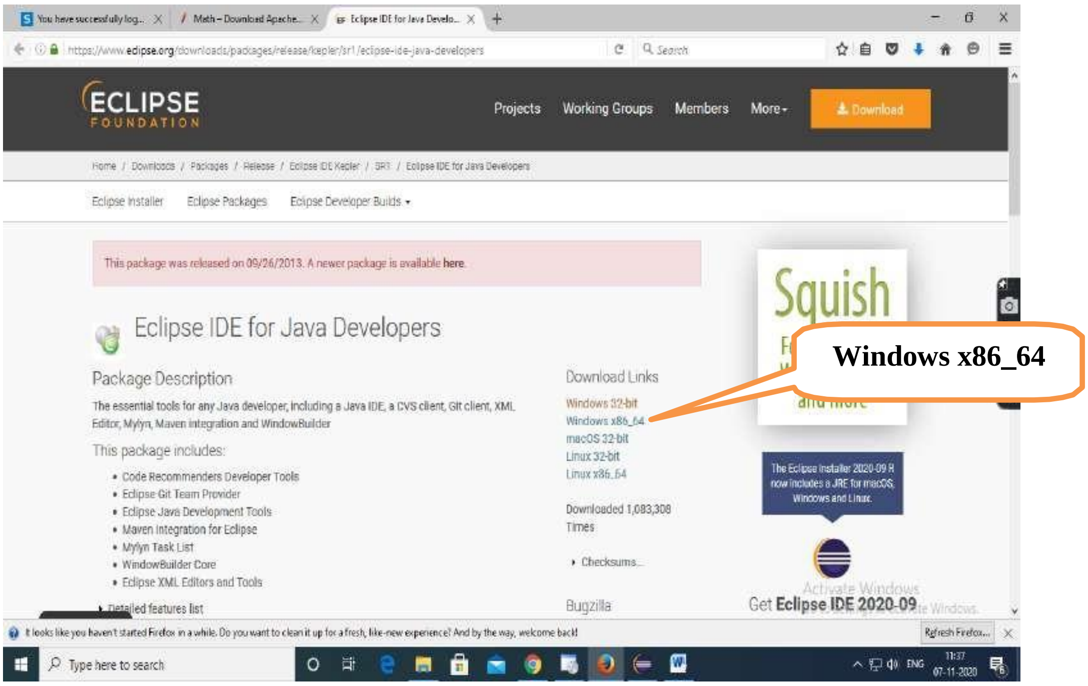


CloudSim Elements/Components

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


You have successfully log...
Math – Download Apache...
Eclipse IDE for Java Develo...
https://www.eclipse.org/downloads/packages/release/kepler/sr1/eclipse-ide-java-developers
Search
ECLIPSE FOUNDATION
Projects
Working Groups
Members
More
Download
Home / Downloads / Packages / Release / Eclipse IDE Kepler / SR1 / Eclipse IDE for Java Developers
Eclipse Installer
Eclipse Packages
Eclipse Developer Builds
Squish
Windows x86_64
Type here to search
ENG
11:37
07-11-2020

This package was released on 09/26/2013. A newer package is available here.

Eclipse IDE for Java Developers

Package Description

The essential tools for any Java developer, including a Java IDE, a CVS client, Git client, XML Editor, Mylyn, Maven integration and WindowBuilder

This package includes:

- Code Recommenders Developer Tools
- Eclipse Git Team Provider
- Eclipse Java Development Tools
- Maven Integration for Eclipse
- Mylyn Task List
- WindowBuilder Core
- Eclipse XML Editors and Tools

Detailed features list

Download Links

Windows 32-bit
Windows x86_64
macOS 32-bit
Linux 32-bit
Linux x86_64

Downloaded 1,083,308 Times

Checksums...

Bugzilla

The Eclipse Installer 2020-09 R now includes a JRE for macOS, Windows and Linux.

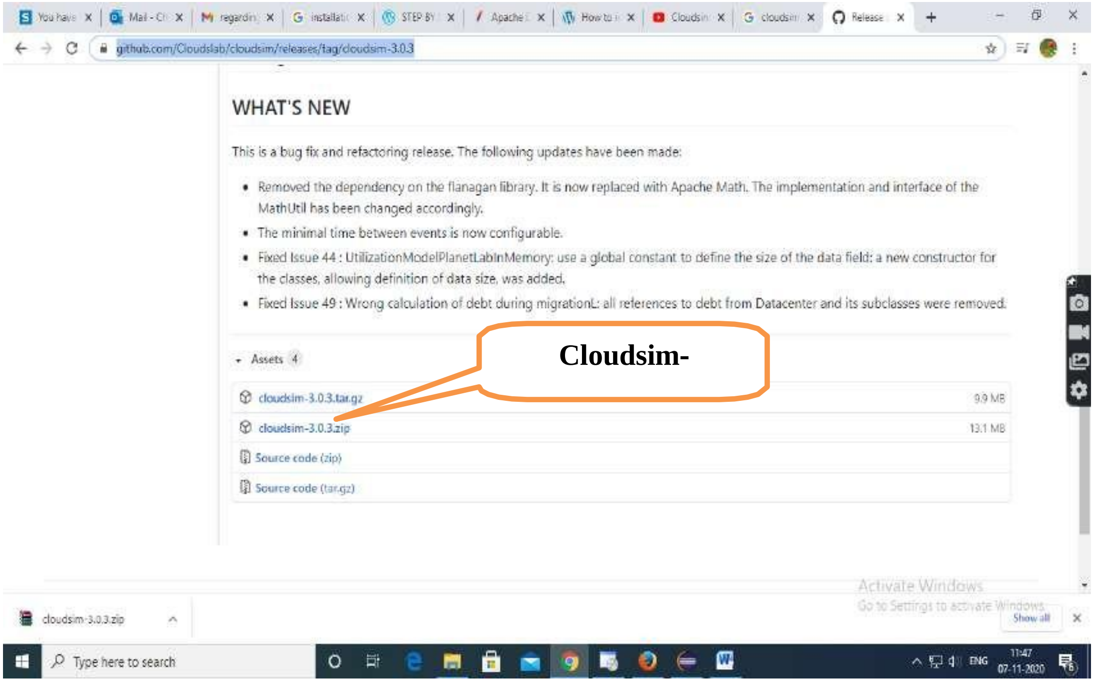
Get Eclipse IDE 2020-09

Activate Windows

It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back! Refresh Firefox...

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

https://github.com/Cloudslab/cloudsim/releases/tag/cloudsim-3.0.3



WHAT'S NEW

This is a bug fix and refactoring release. The following updates have been made:

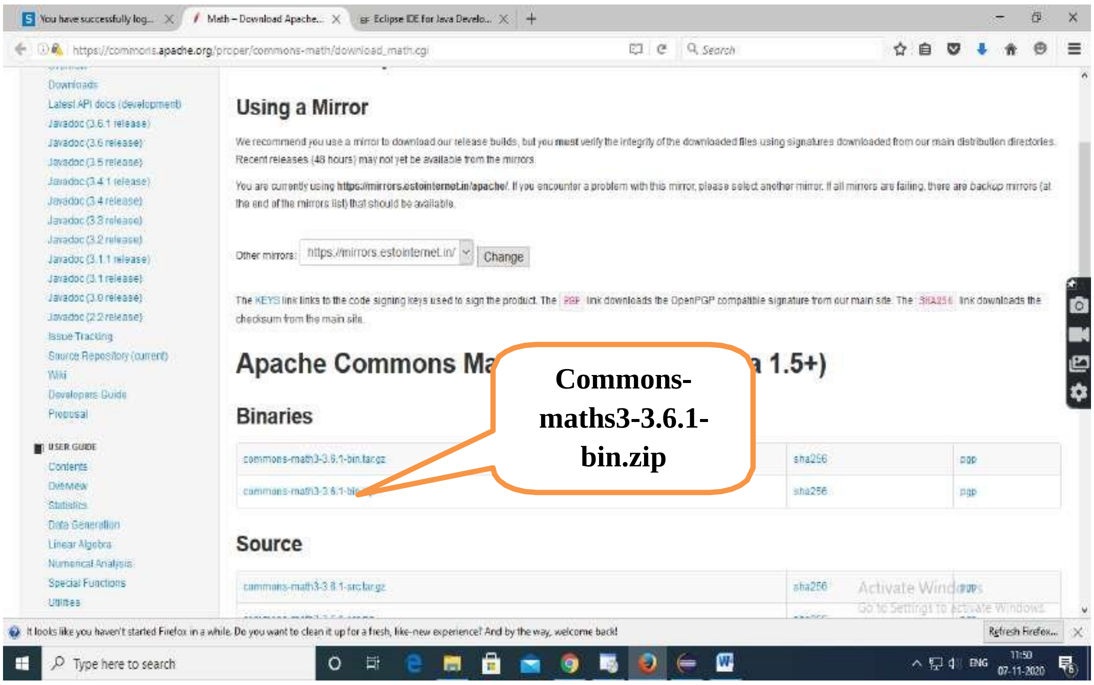
- Removed the dependency on the flanagan library. It is now replaced with Apache Math. The implementation and interface of the MathUtil has been changed accordingly.
- The minimal time between events is now configurable.
- Fixed Issue 44 : UtilizationModelPlanetLabInMemory: use a global constant to define the size of the data field: a new constructor for the classes, allowing definition of data size, was added.
- Fixed Issue 49 : Wrong calculation of debt during migrationL: all references to debt from Datacenter and its subclasses were removed.

Assets 4

cloudsim-3.0.3.tar.gz	9.9 MB
cloudsim-3.0.3.zip	13.1 MB
Source code (zip)	
Source code (tar.gz)	

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.cgi



Using a Mirror

We recommend you use a mirror to download our release builds, but you **must** verify the integrity of the downloaded files using signatures downloaded from our main distribution directories. Recent releases (48 hours) may not yet be available from the mirrors.

You are currently using **https://mirrors.estointernet.in/apache/**. If you encounter a problem with this mirror, please select another mirror. If all mirrors are failing, there are backup mirrors (at the end of the mirrors list) that should be available.

Other mirrors: https://mirrors.estointernet.in/ Change

The KEYS link links to the code signing keys used to sign the product. The PGP link downloads the OpenPGP compatible signature from our main site. The SHA256 link downloads the checksum from the main site.

Apache Commons Ma… 1.5+)

Binaries

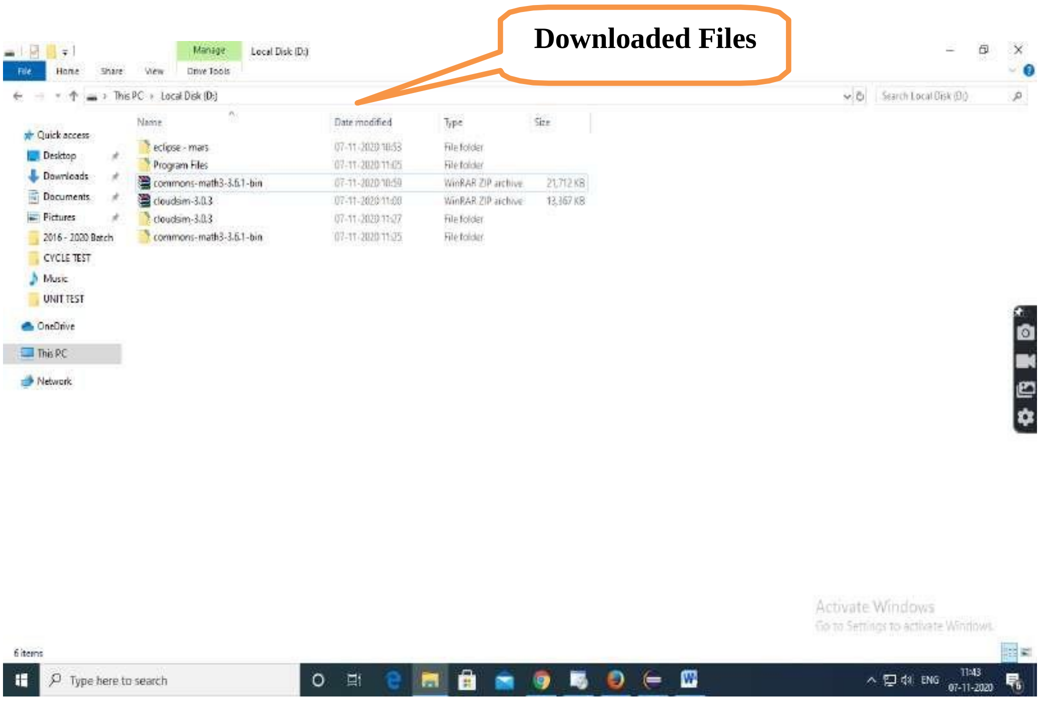
commons-math3-3.6.1-bin.tar.gz	sha256	pgp
commons-math3-3.6.1-bi…	sha256	pgp

Source

commons-math3-3.6.1-src.tar.gz	sha256	pgp

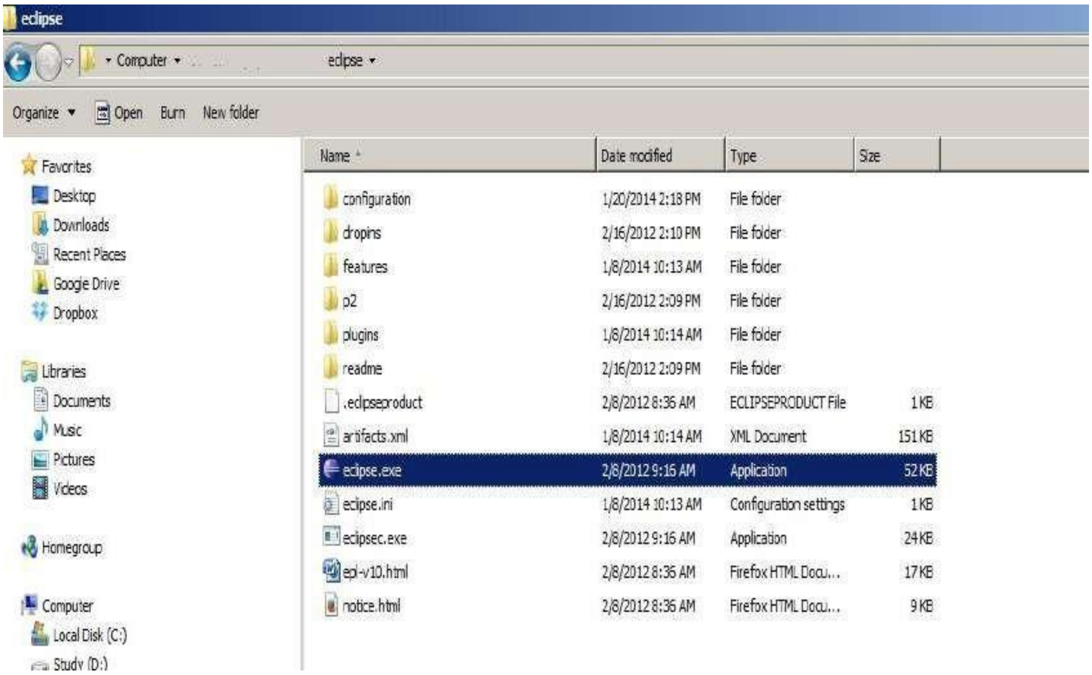
It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back! Refresh Firefox...

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



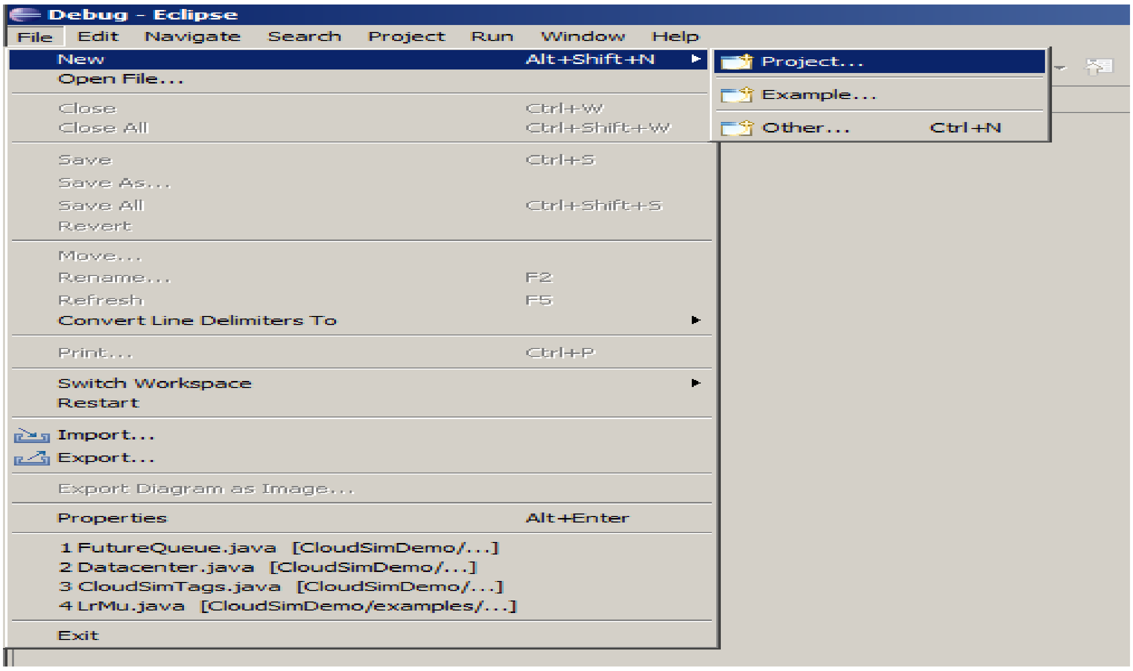
Name	Date modified	Type	Size
eclipse - mars	07-11-2020 10:53	File folder	
Program Files	07-11-2020 11:05	File folder	
commons-math3-3.6.1-bin	07-11-2020 10:59	WinRAR ZIP archive	21,712 KB
cloudsim-3.0.3	07-11-2020 11:00	WinRAR ZIP archive	13,367 KB
cloudsim-3.0.3	07-11-2020 11:27	File folder	
commons-math3-3.6.1-bin	07-11-2020 11:25	File folder	

Step 5: First of all, navigate to the folder where you have unzipped the eclipse folder and open Eclipse.exe

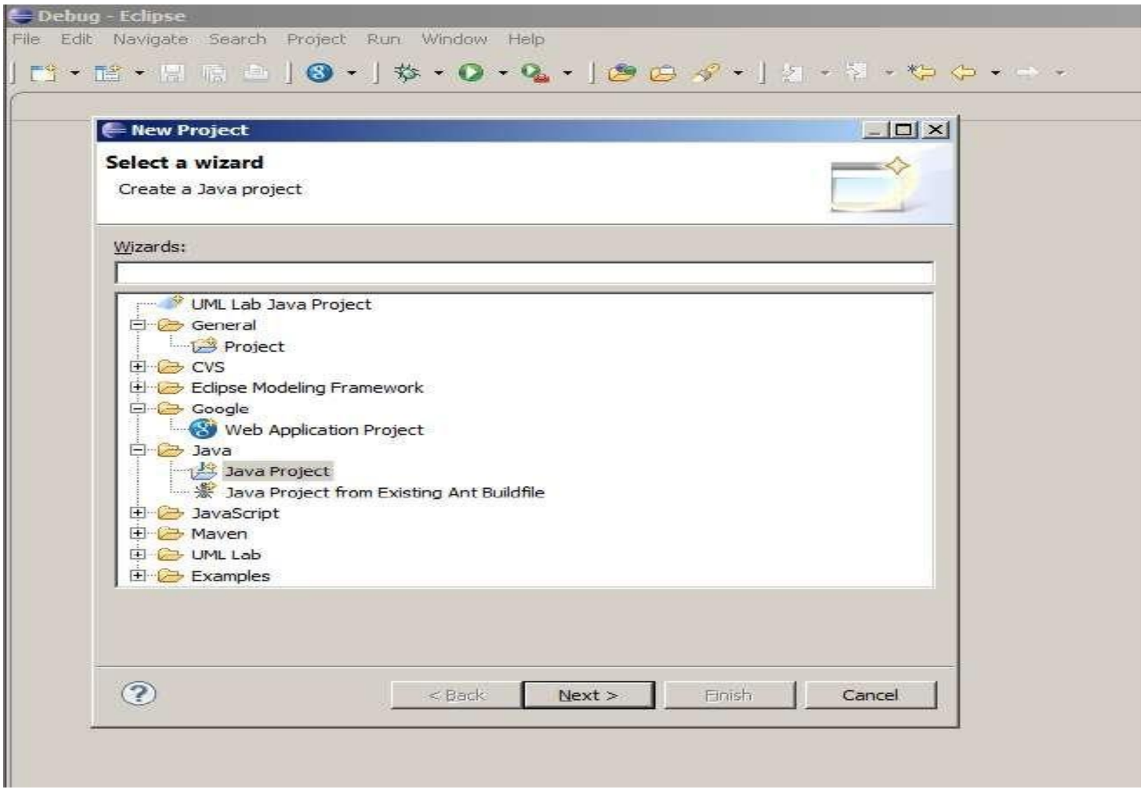


Name	Date modified	Type	Size
configuration	1/20/2014 2:18 PM	File folder	
dropins	2/16/2012 2:10 PM	File folder	
features	1/8/2014 10:13 AM	File folder	
p2	2/16/2012 2:09 PM	File folder	
plugins	1/8/2014 10:14 AM	File folder	
readme	2/16/2012 2:09 PM	File folder	
.eclipseproduct	2/8/2012 8:36 AM	ECLIPSEPRODUCT File	1 KB
artifacts.xml	1/8/2014 10:14 AM	XML Document	151 KB
eclipse.exe	2/8/2012 9:16 AM	Application	52 KB
eclipse.ini	1/8/2014 10:13 AM	Configuration settings	1 KB
eclipsec.exe	2/8/2012 9:16 AM	Application	24 KB
epl-v10.html	2/8/2012 8:36 AM	Firefox HTML Docu...	17 KB
notice.html	2/8/2012 8:36 AM	Firefox HTML Docu...	9 KB

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

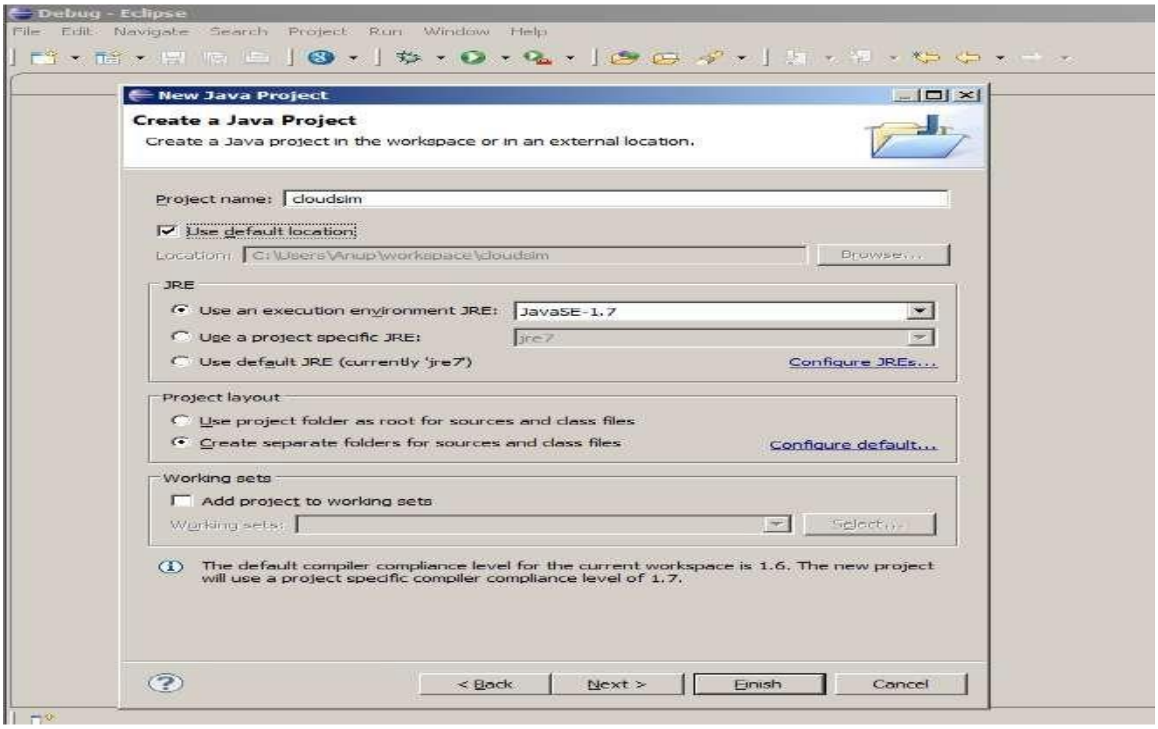


Step 7: A _*New Project*_ wizard should open. There are a number of options displayed and you have to find & select the _*Java Project*_ option, once done click ‘*Next*_



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.



Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: cloudsim

☑ Use default location

Location: C:\Users\Anup\workspace\cloudsim Browse...

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7') Configure JREs...

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files Configure default...

Working sets

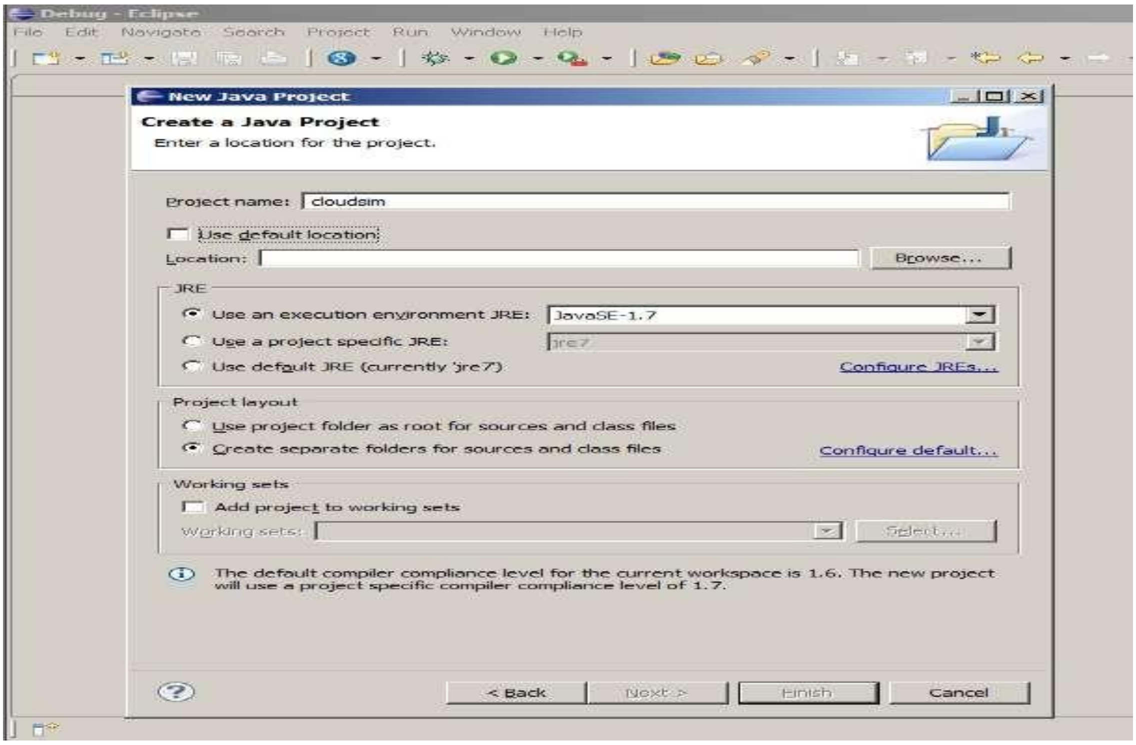
□ Add project to working sets

Working sets: Select...

The default compiler compliance level for the current workspace is 1.6. The new project will use a project specific compiler compliance level of 1.7.

< Back Next > Finish Cancel

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.



Create a Java Project

Enter a location for the project.

Project name: cloudsim

□ Use default location

Location: Browse...

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7') Configure JREs...

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files Configure default...

Working sets

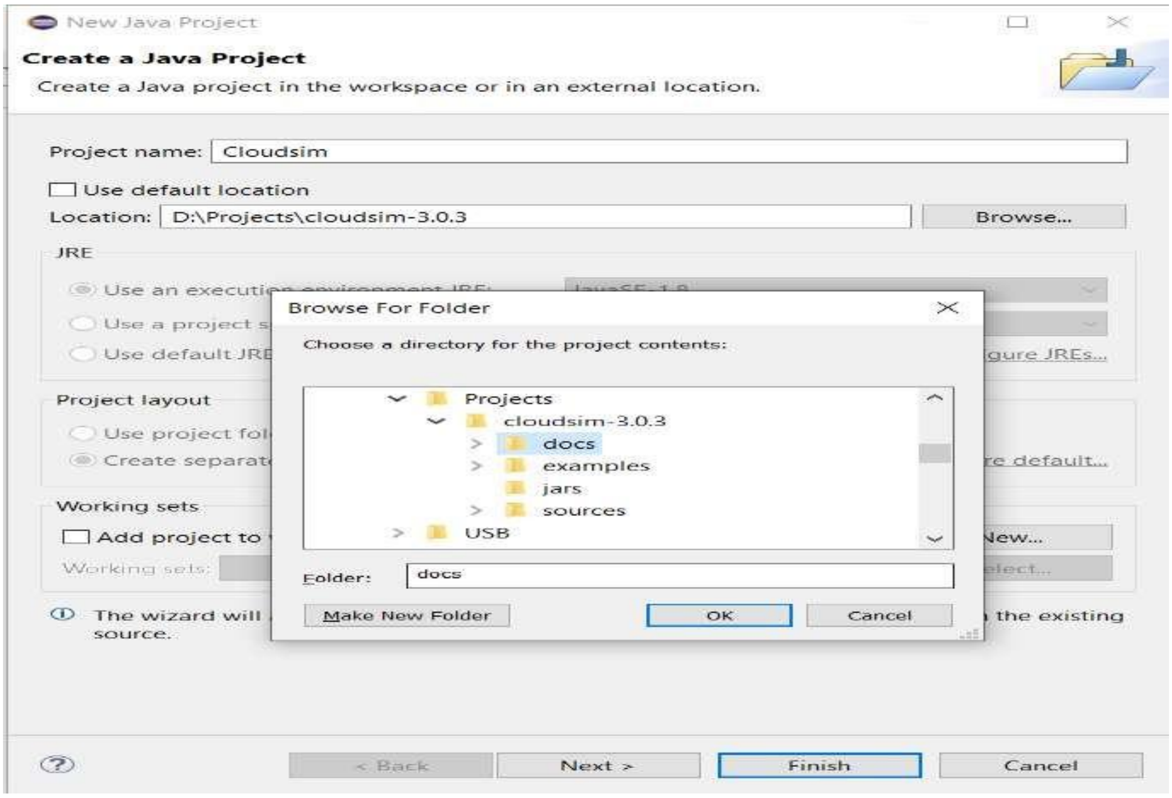
□ Add project to working sets

Working sets: Select...

The default compiler compliance level for the current workspace is 1.6. The new project will use a project specific compiler compliance level of 1.7.

< Back Next > Finish Cancel

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



New Java Project

Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: Cloudsim

□ Use default location

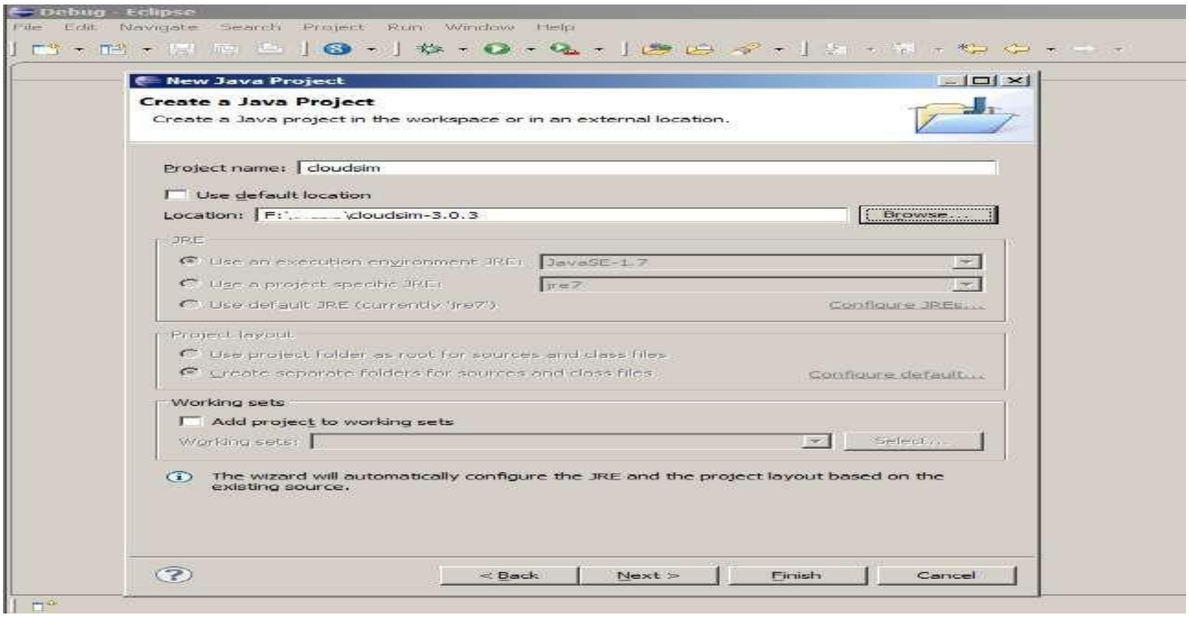
Location: D:\Projects\cloudsim-3.0.3

Browse For Folder

Choose a directory for the project contents:

Folder: docs

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



New Java Project

Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: cloudsim

□ Use default location

Location: F:\[illegible]\cloudsim-3.0.3

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7')

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files

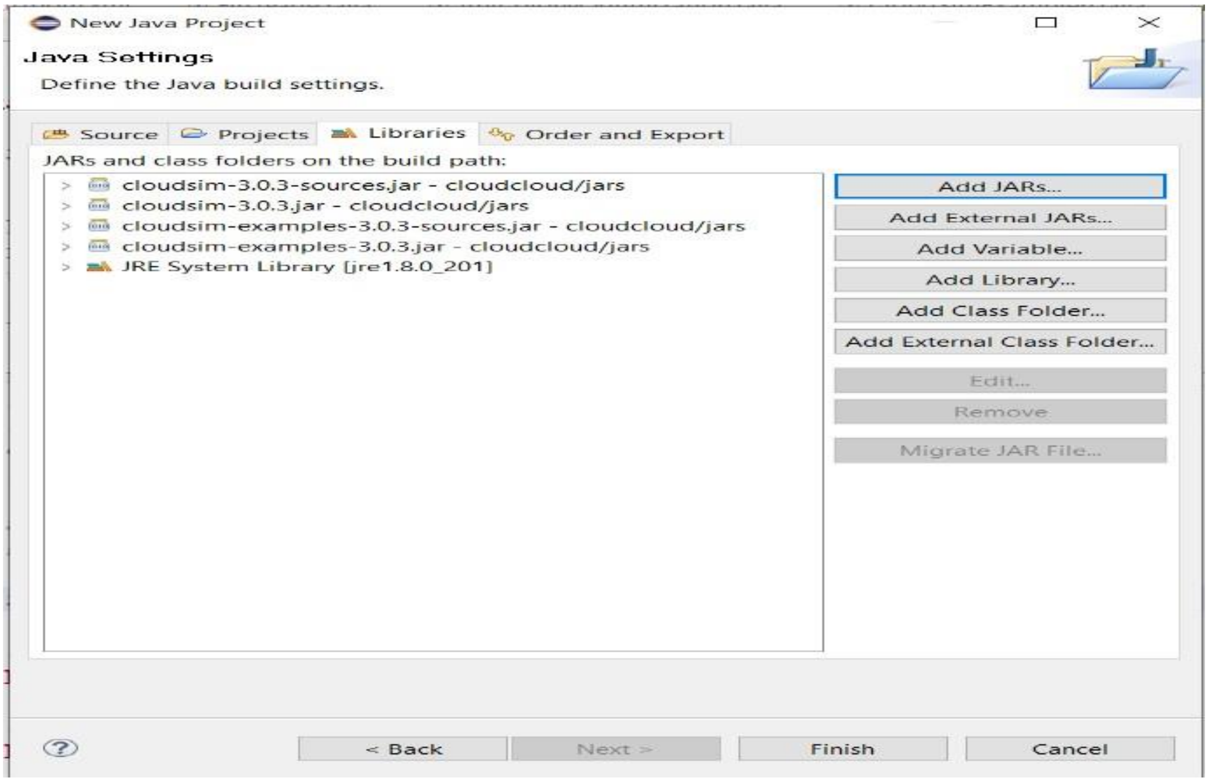
Working sets

□ Add project to working sets

Working sets:

The wizard will automatically configure the JRE and the project layout based on the existing source.

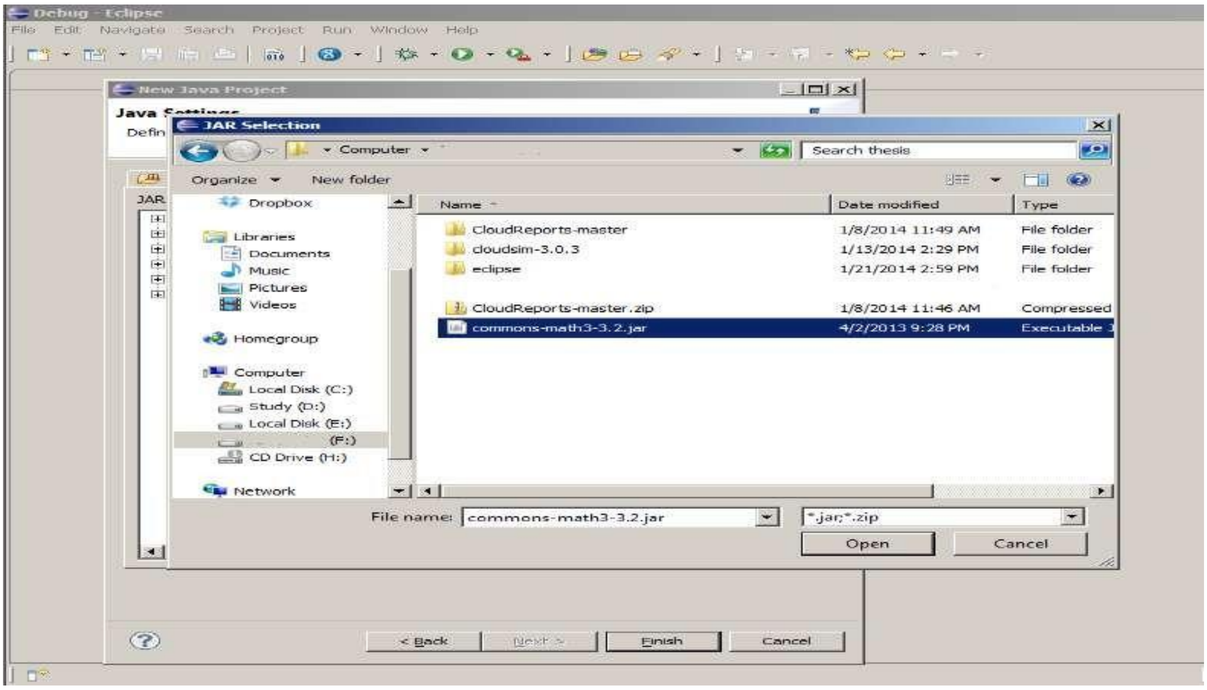
Step 12: Now open *'Libraries'* tab and if you do not find commons-math3-3.x.jar *(here 'x' means the minor version release of the library which could be 2 or greater*) in the list then simply click on *‗Add External Jar'* (commons-math3-3.x.jar will be included in the project from this step)



JARs and class folders on the build path:

- cloudsim-3.0.3-sources.jar - cloudcloud/jars
- cloudsim-3.0.3.jar - cloudcloud/jars
- cloudsim-examples-3.0.3-sources.jar - cloudcloud/jars
- cloudsim-examples-3.0.3.jar - cloudcloud/jars
- JRE System Library [jre1.8.0_201]

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*' and click on open.

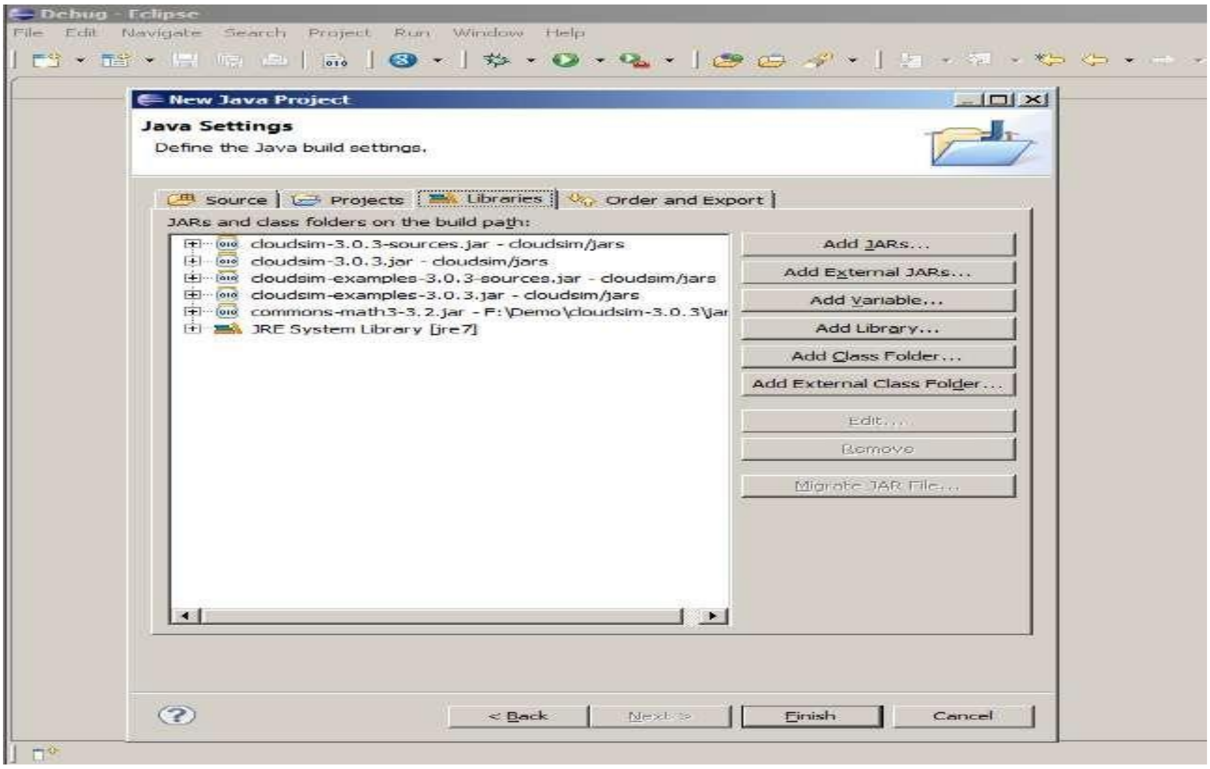


Name	Date modified	Type
CloudReports-master	1/8/2014 11:49 AM	File folder
cloudsim-3.0.3	1/13/2014 2:29 PM	File folder
eclipse	1/21/2014 2:59 PM	File folder
CloudReports-master.zip	1/8/2014 11:46 AM	Compressed
commons-math3-3.2.jar	4/2/2013 9:28 PM	Executable J

File name: commons-math3-3.2.jar

.jar;.zip

Step 14: Ensure external jar that you opened in the previous step is displayed in the list and then click on _*Finish*‘ (your system may take 2-3 minutes to configure the project)



New Java Project

Java Settings

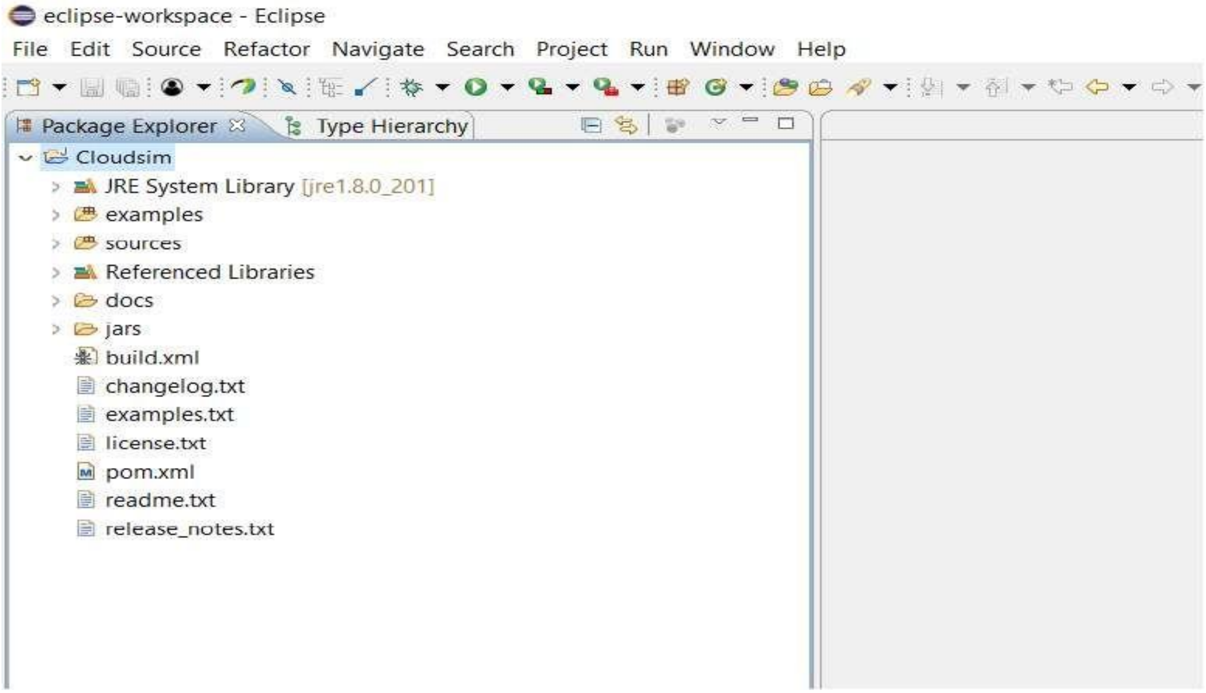
Define the Java build settings.

JARs and class folders on the build path:

- cloudsim-3.0.3-sources.jar - cloudsim/jars
- cloudsim-3.0.3.jar - cloudsim/jars
- cloudsim-examples-3.0.3-sources.jar - cloudsim/jars
- cloudsim-examples-3.0.3.jar - cloudsim/jars
- commons-math3-3.2.jar - F:\Demo\cloudsim-3.0.3\jar
- JRE System Library [jre7]

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.

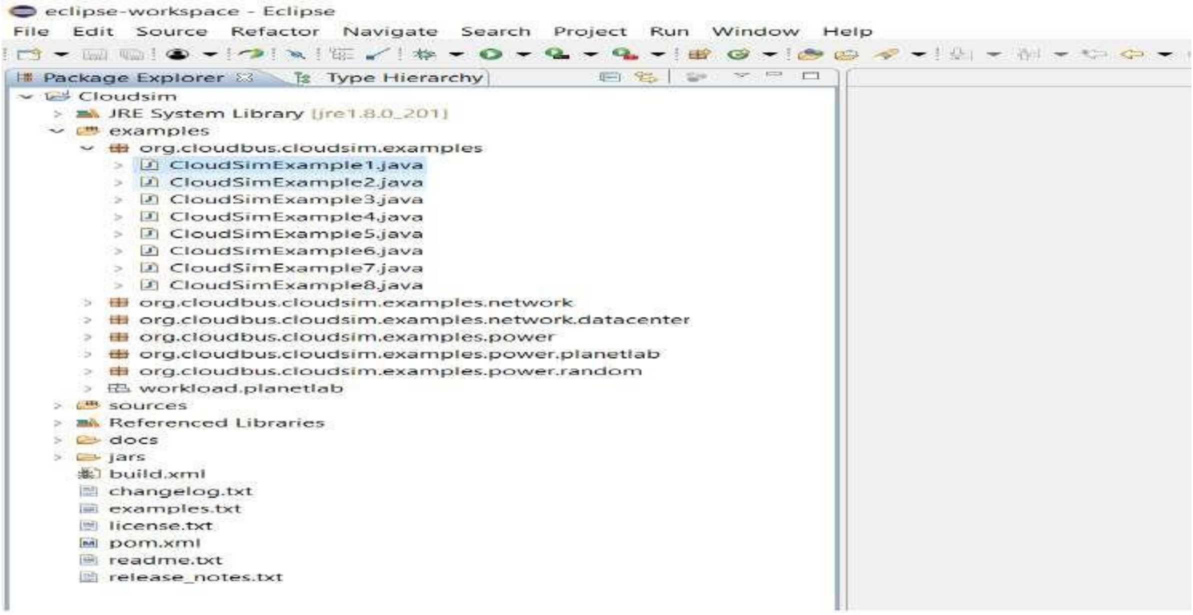
Following is the final screen which you will see after Cloudsim is configured.



eclipse-workspace - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
Type Hierarchy

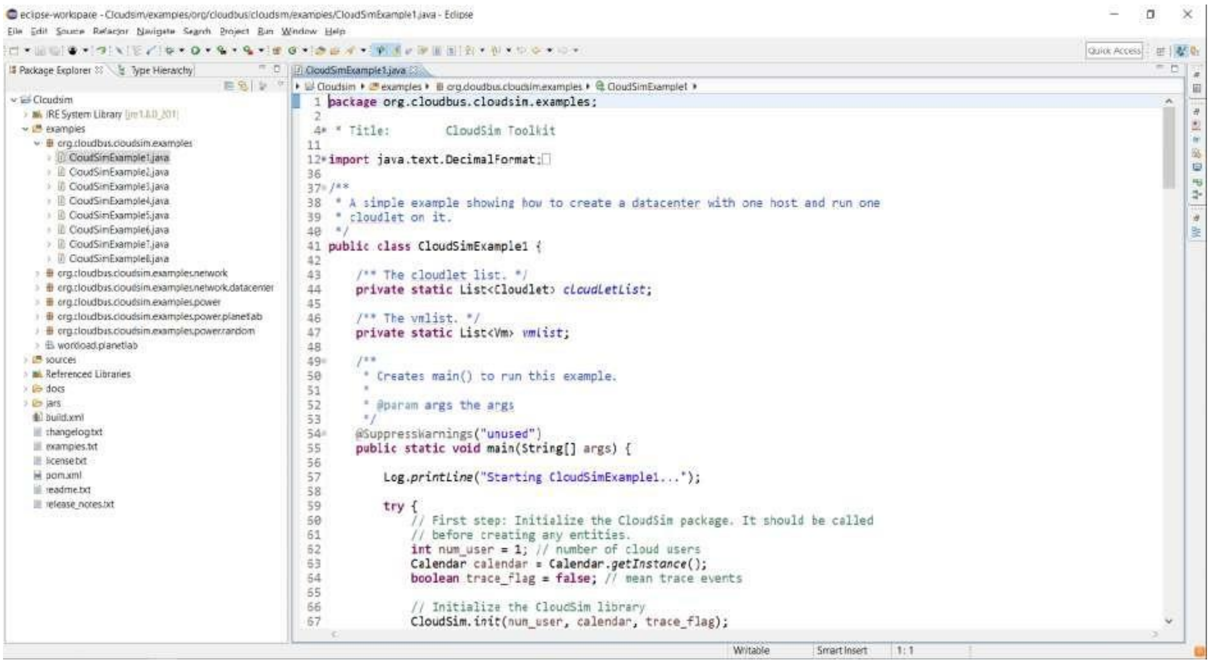
- Cloudsim
  - JRE System Library [jre1.8.0_201]
  - examples
  - sources
  - Referenced Libraries
  - docs
  - jars
  - build.xml
  - changelog.txt
  - examples.txt
  - license.txt
  - pom.xml
  - readme.txt
  - release_notes.txt

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*_

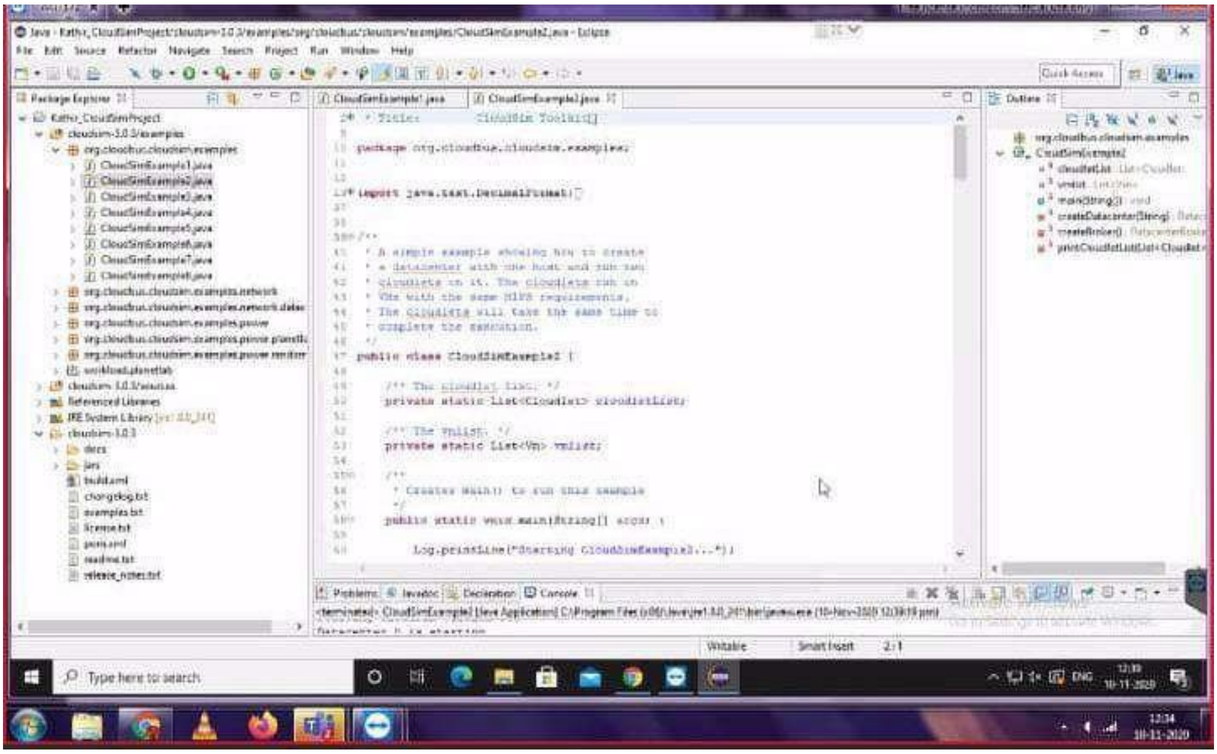

eclipse-workspace - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
Type Hierarchy

```
Cloudsim
  JRE System Library [jre1.8.0_201]
  examples
    org.cloudbus.cloudsim.examples
      CloudSimExample1.java
      CloudSimExample2.java
      CloudSimExample3.java
      CloudSimExample4.java
      CloudSimExample5.java
      CloudSimExample6.java
      CloudSimExample7.java
      CloudSimExample8.java
    org.cloudbus.cloudsim.examples.network
    org.cloudbus.cloudsim.examples.network.datacenter
    org.cloudbus.cloudsim.examples.power
    org.cloudbus.cloudsim.examples.power.planetlab
    org.cloudbus.cloudsim.examples.power.random
    workload.planetlab
  sources
  Referenced Libraries
  docs
  jars
  build.xml
  changelog.txt
  examples.txt
  license.txt
  pom.xml
  readme.txt
  release_notes.txt
```

.


eclipse-workspace - Cloudsim/examples/org/cloudbus/cloudsim/examples/CloudSimExample1.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access
Package Explorer
Type Hierarchy
CloudSimExample1.java
Cloudsim ▸ examples ▸ org.cloudbus.cloudsim.examples ▸ CloudSimExample1 ▸
Writable
Smart Insert
1 : 1

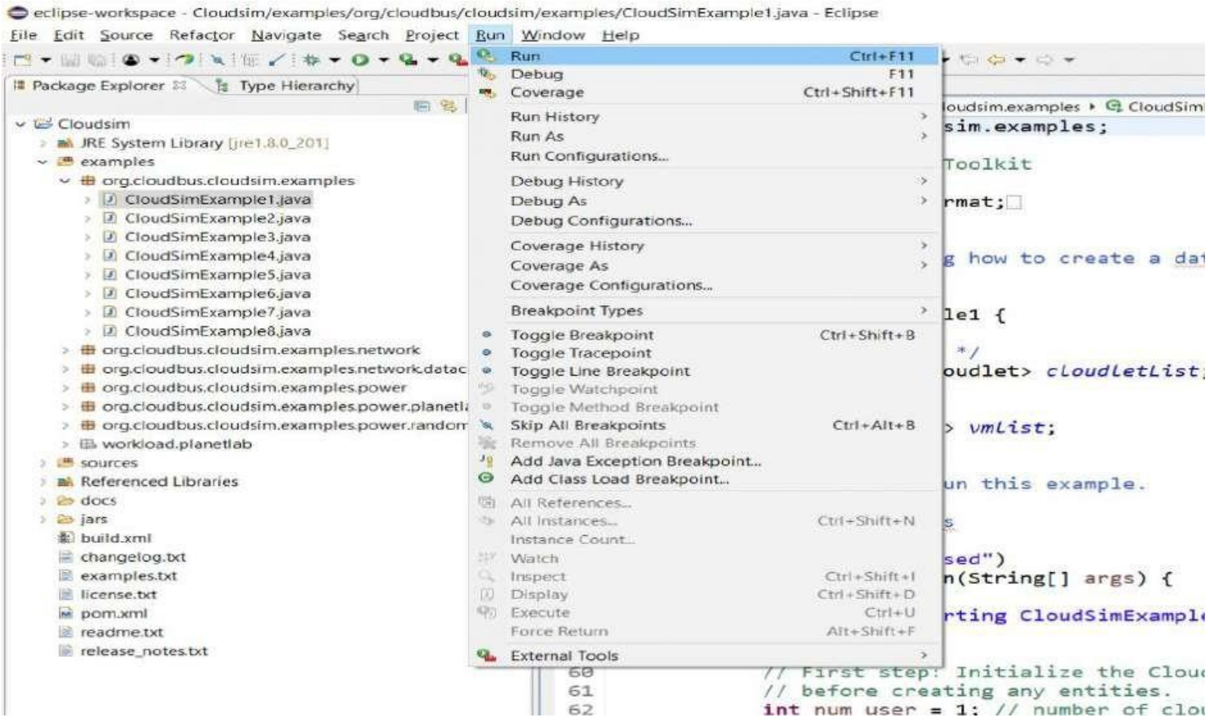
```
package org.cloudbus.cloudsim.examples;

 * Title:        CloudSim Toolkit

import java.text.DecimalFormat;

/**
 * A simple example showing how to create a datacenter with one host and run one
 * cloudlet on it.
 */
public class CloudSimExample1 {

    /** The cloudlet list. */
    private static List<Cloudlet> cloudletList;

    /** The vmlist. */
    private static List<Vm> vmlist;

    /**
     * Creates main() to run this example.
     *
     * @param args the args
     */
    @SuppressWarnings("unused")
    public static void main(String[] args) {

        Log.printLine("Starting CloudSimExample1...");

        try {
            // First step: Initialize the CloudSim package. It should be called
            // before creating any entities.
            int num_user = 1; // number of cloud users
            Calendar calendar = Calendar.getInstance();
            boolean trace_flag = false; // mean trace events

            // Initialize the CloudSim library
            CloudSim.init(num_user, calendar, trace_flag);
```


Java - Kathir_CloudSimProject/cloudsim-3.0.3/examples/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
CloudSimExample1.java
CloudSimExample2.java
Outline
Problems Javadoc Declaration Console
Writable Smart Insert 2:1
Type here to search

```
 * Title:        CloudSim Toolkit

package org.cloudbus.cloudsim.examples;

import java.text.DecimalFormat;

/**
 * A simple example showing how to create
 * a datacenter with one host and run two
 * cloudlets on it. The cloudlets run in
 * VMs with the same MIPS requirements.
 * The cloudlets will take the same time to
 * complete the execution.
 */
public class CloudSimExample2 {

	/** The cloudlet list. */
	private static List<Cloudlet> cloudletList;

	/** The vmlist. */
	private static List<Vm> vmlist;

	/**
	 * Creates main() to run this example
	 */
	public static void main(String[] args) {

		Log.printLine("Starting CloudSimExample2...");
```

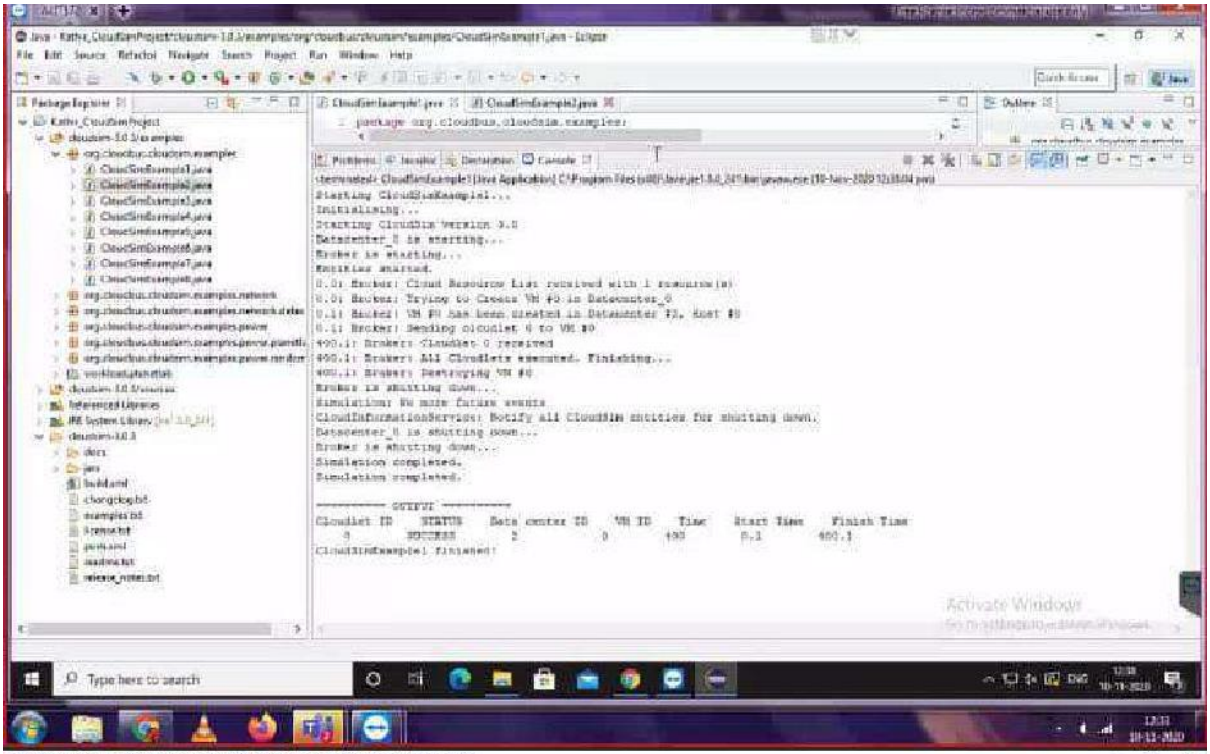
```
<terminated> CloudSimExample2 [Java Application] C:\Program Files (x86)\Java\jre1.8.0_201\bin\javaw.exe (10-Nov-2020 12:39:19 pm)
Datacenter_0 is starting...
```

Step 17: Now navigate to the Eclipse menu _*Run* ->*Run*_ or directly use a keyboard shortcut *‘Ctrl + F11’* to execute the _*CloudsimExample1.java*_.

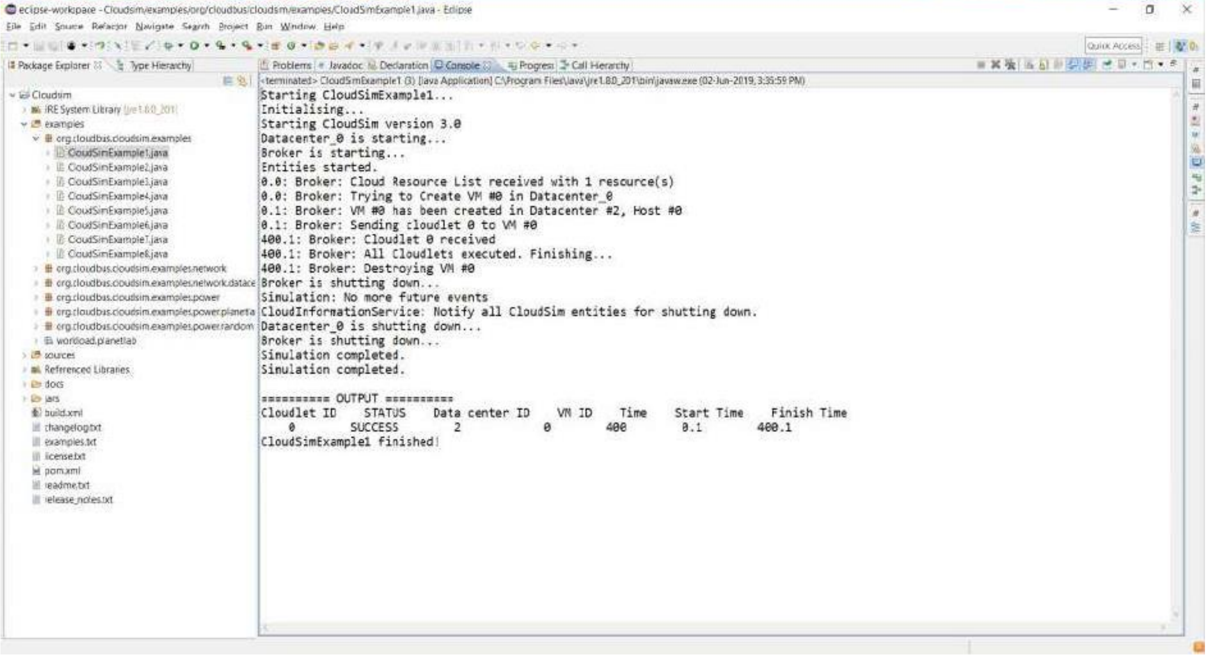


```
sim.examples;
Toolkit
rmat;
g how to create a dat
le1 {
 */
oudlet> cloudletList;
> vmList;
un this example.
s
sed")
n(String[] args) {
rting CloudSimExampl
// First step: Initialize the Clou
// before creating any entities.
int num_user = 1; // number of clo
```

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



```
Starting CloudSimExample1...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
400.1: Broker: Cloudlet 0 received
400.1: Broker: All Cloudlets executed. Finishing...
400.1: Broker: Destroying VM #0
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

========== OUTPUT ==========
Cloudlet ID    STATUS    Data center ID    VM ID    Time    Start Time    Finish Time
    0         SUCCESS        2              0        400        0.1          400.1
CloudSimExample1 finished!
```



```
Starting CloudSimExample1...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
400.1: Broker: Cloudlet 0 received
400.1: Broker: All Cloudlets executed. Finishing...
400.1: Broker: Destroying VM #0
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

========== OUTPUT ==========
Cloudlet ID    STATUS    Data center ID    VM ID    Time    Start Time    Finish Time
    0         SUCCESS        2              0        400        0.1          400.1
CloudSimExample1 finished!
```

Result:

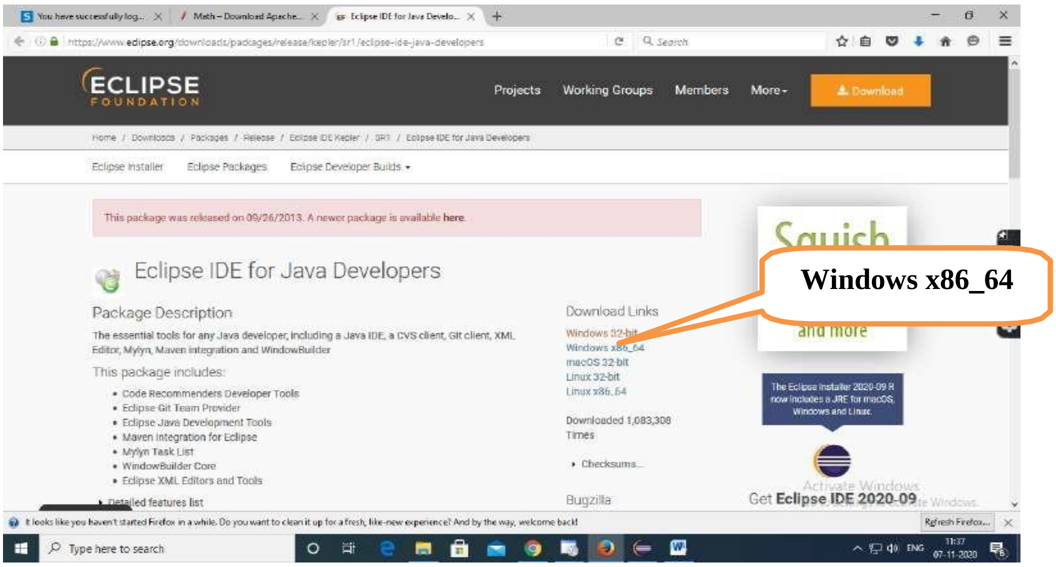
Thus the cloudsim is simulated using Eclipse Environment successfully.

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

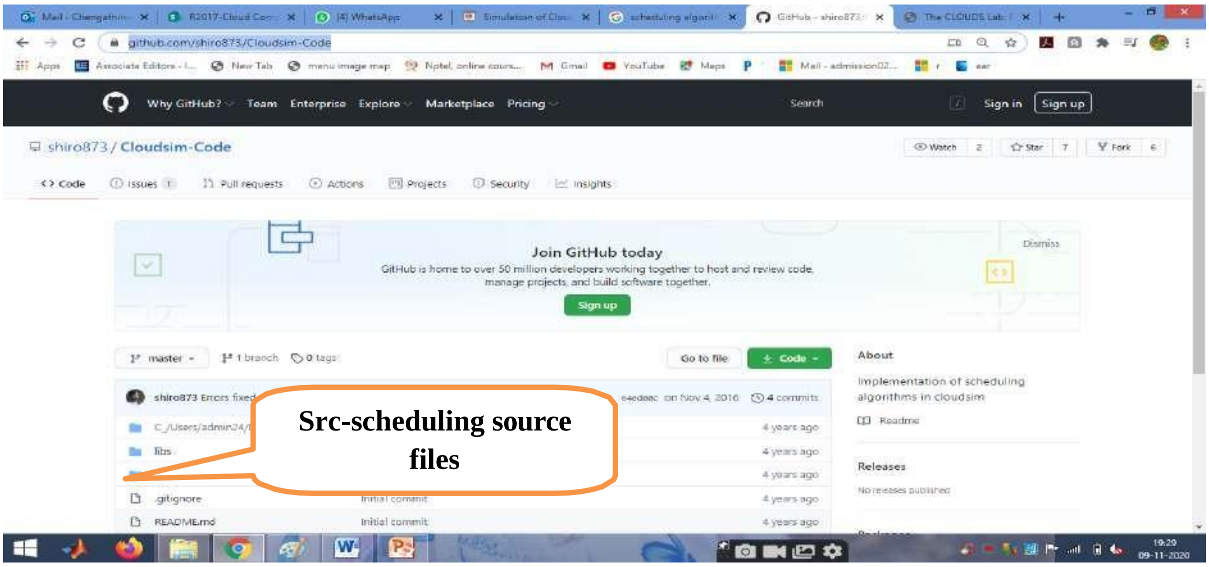
Step 1: Link to download Eclipse and download Eclipse for Windows 64bit into your Local machine

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



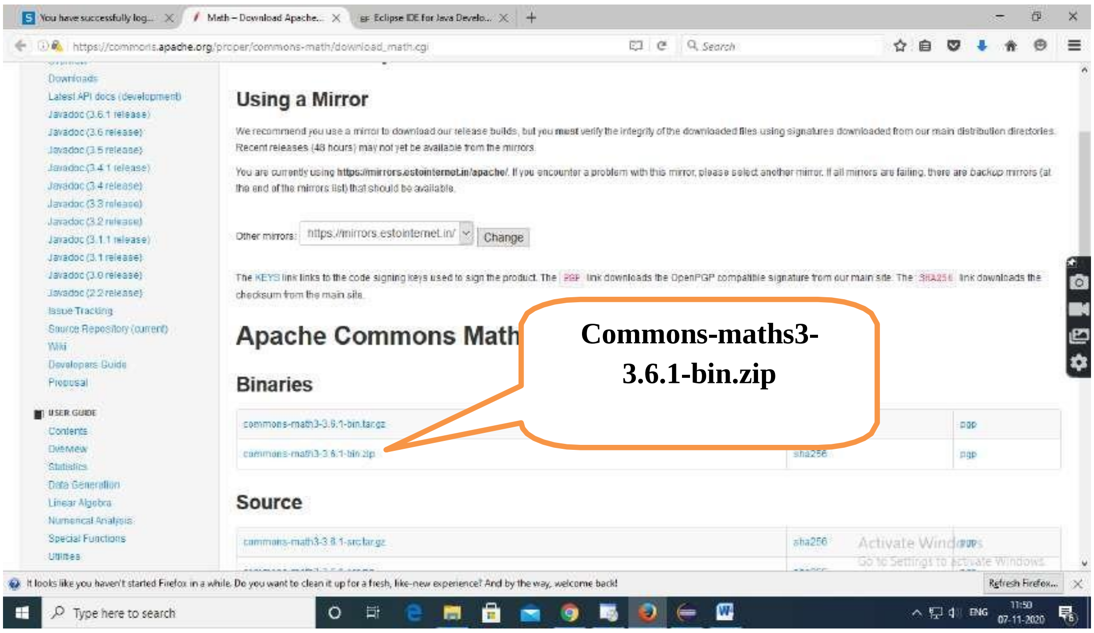
Step 2: Download scheduling source code **cloudsim-code-master** from git hub repository in your local machine

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



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.cgi



Using a Mirror

We recommend you use a mirror to download our release builds, but you **must** verify the integrity of the downloaded files using signatures downloaded from our main distribution directories. Recent releases (48 hours) may not yet be available from the mirrors.

You are currently using **https://mirrors.estointernet.in/apache/**. If you encounter a problem with this mirror, please select another mirror. If all mirrors are failing, there are backup mirrors (at the end of the mirrors list) that should be available.

Other mirrors: https://mirrors.estointernet.in/

The KEYS link links to the code signing keys used to sign the product. The PGP link downloads the OpenPGP compatible signature from our main site. The SHA256 link downloads the checksum from the main site.

Apache Commons Math

Binaries

commons-math3-3.6.1-bin.tar.gz		pgp
commons-math3-3.6.1-bin.zip	sha256	pgp

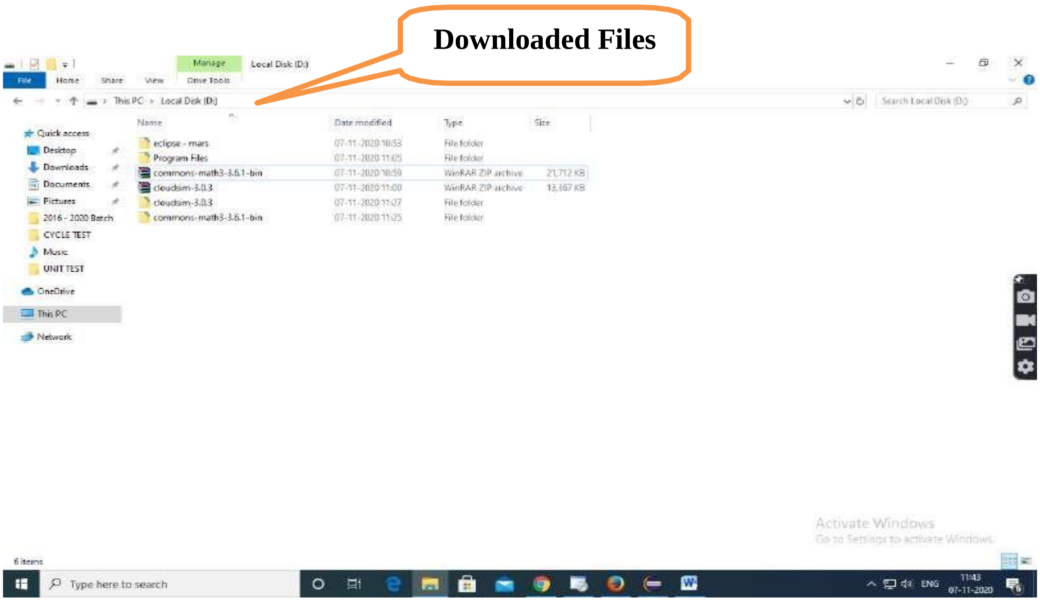
Source

commons-math3-3.6.1-src.tar.gz	sha256	pgp

It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back!

Commons-maths3-3.6.1-bin.zip

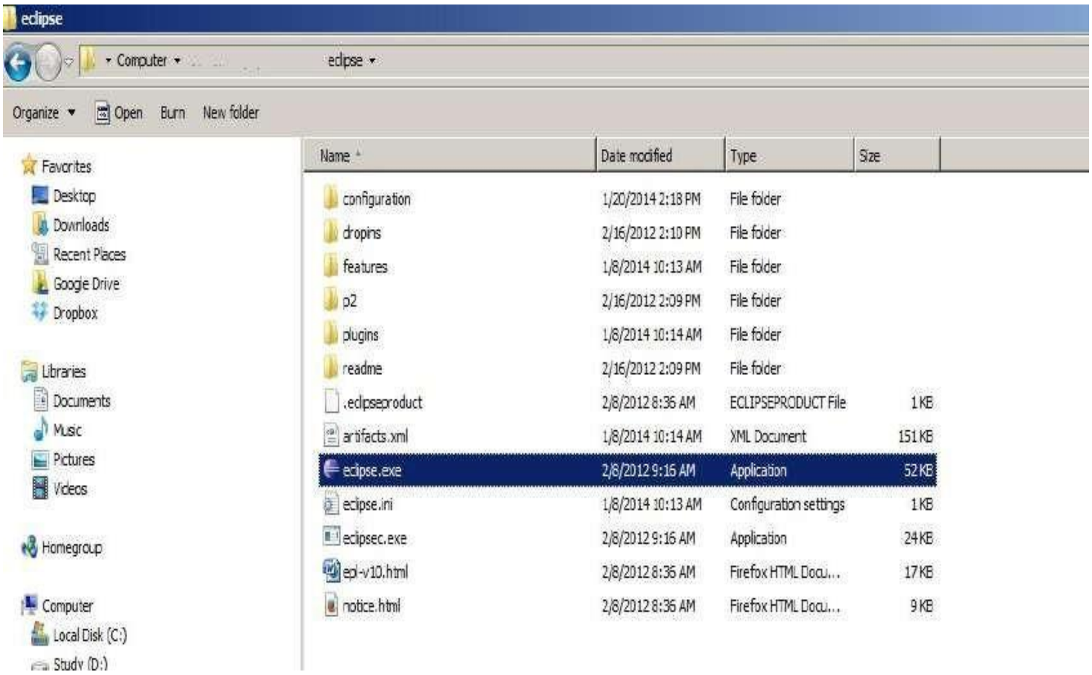
Step 4: Downloaded Eclipse, cloudsim-3.0.3 and Apache Commons Math 3.6.1 in your local machine and extract cloudsim-3.0.3 and Apache Commons Math 3.6.1



Downloaded Files

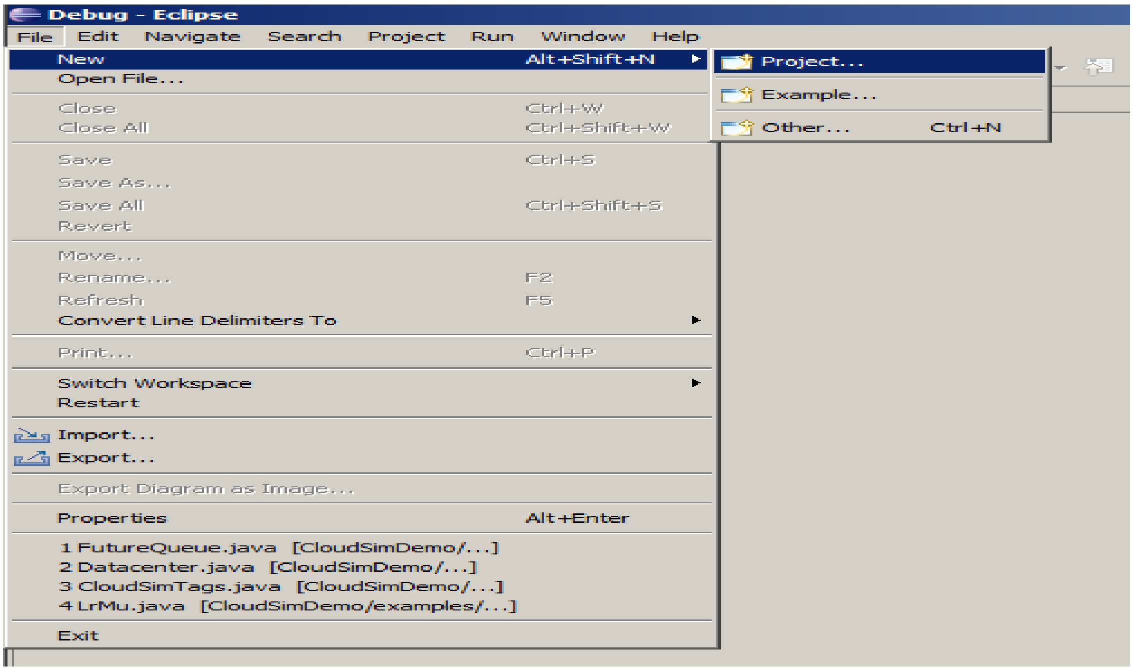
Name	Date modified	Type	Size
eclipse - mars	07-11-2020 10:53	File folder	
Program Files	07-11-2020 11:05	File folder	
commons-math3-3.6.1-bin	07-11-2020 10:59	WinRAR ZIP archive	21,712 KB
cloudsim-3.0.3	07-11-2020 11:00	WinRAR ZIP archive	13,367 KB
cloudsim-3.0.3	07-11-2020 11:27	File folder	
commons-math3-3.6.1-bin	07-11-2020 11:25	File folder	

Step 5: First of all, navigate to the folder where you have unzipped the eclipse folder and open Eclipse.exe

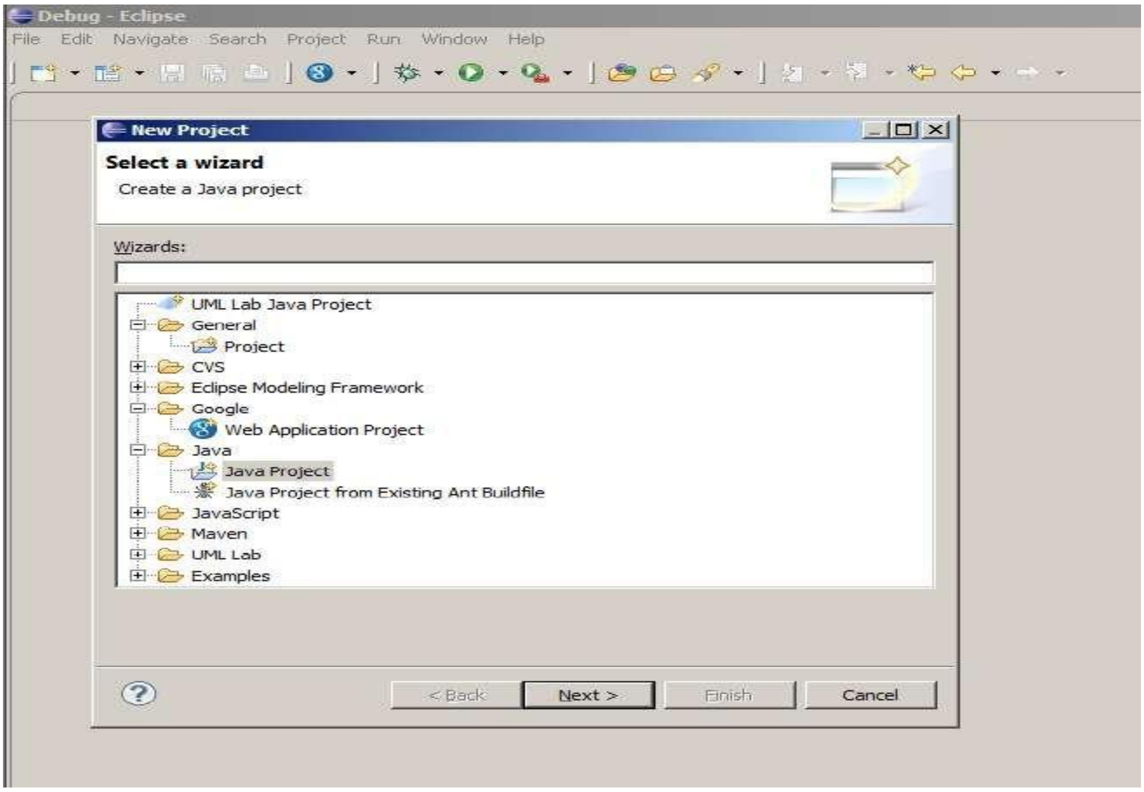


Name	Date modified	Type	Size
configuration	1/20/2014 2:18 PM	File folder	
dropins	2/16/2012 2:10 PM	File folder	
features	1/8/2014 10:13 AM	File folder	
p2	2/16/2012 2:09 PM	File folder	
plugins	1/8/2014 10:14 AM	File folder	
readme	2/16/2012 2:09 PM	File folder	
.eclipseproduct	2/8/2012 8:36 AM	ECLIPSEPRODUCT File	1 KB
artifacts.xml	1/8/2014 10:14 AM	XML Document	151 KB
eclipse.exe	2/8/2012 9:16 AM	Application	52 KB
eclipse.ini	1/8/2014 10:13 AM	Configuration settings	1 KB
eclipsec.exe	2/8/2012 9:16 AM	Application	24 KB
epl-v10.html	2/8/2012 8:36 AM	Firefox HTML Docu...	17 KB
notice.html	2/8/2012 8:36 AM	Firefox HTML Docu...	9 KB

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



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

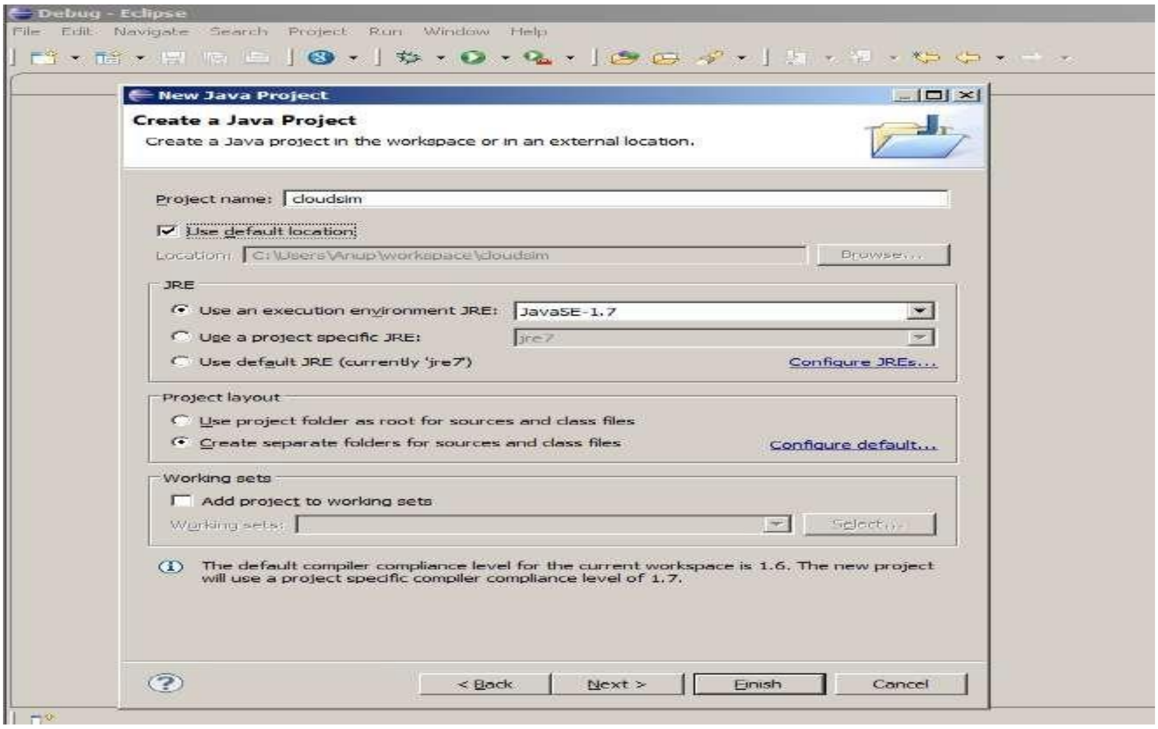
Create a Java project

Wizards:

- UML Lab Java Project
- General
  - Project
- CVS
- Eclipse Modeling Framework
- Google
  - Web Application Project
- Java
  - Java Project
  - Java Project from Existing Ant Buildfile
- JavaScript
- Maven
- UML Lab
- Examples

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



Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: cloudsim

☑ Use default location

Location: C:\Users\Anup\workspace\cloudsim

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently ‘jre7’)

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files

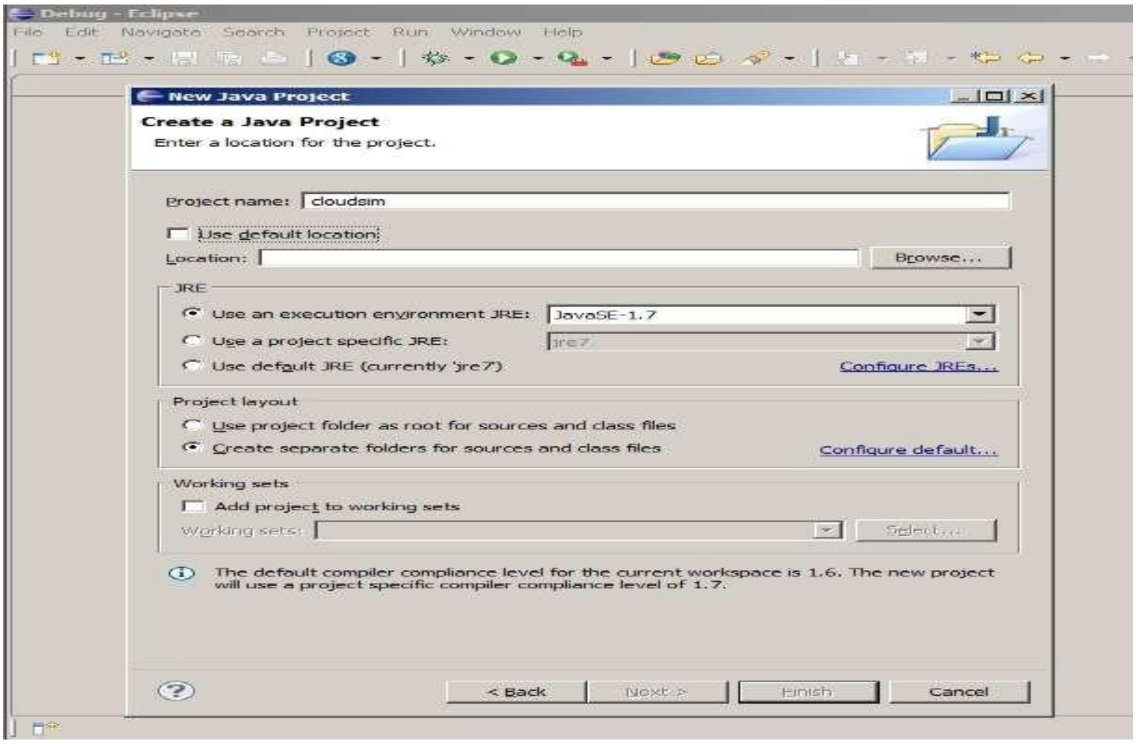
Working sets

□ Add project to working sets

Working sets:

The default compiler compliance level for the current workspace is 1.6. The new project will use a project specific compiler 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.



New Java Project

Create a Java Project

Enter a location for the project.

Project name: cloudsim

□ Use default location

Location: [Browse...]

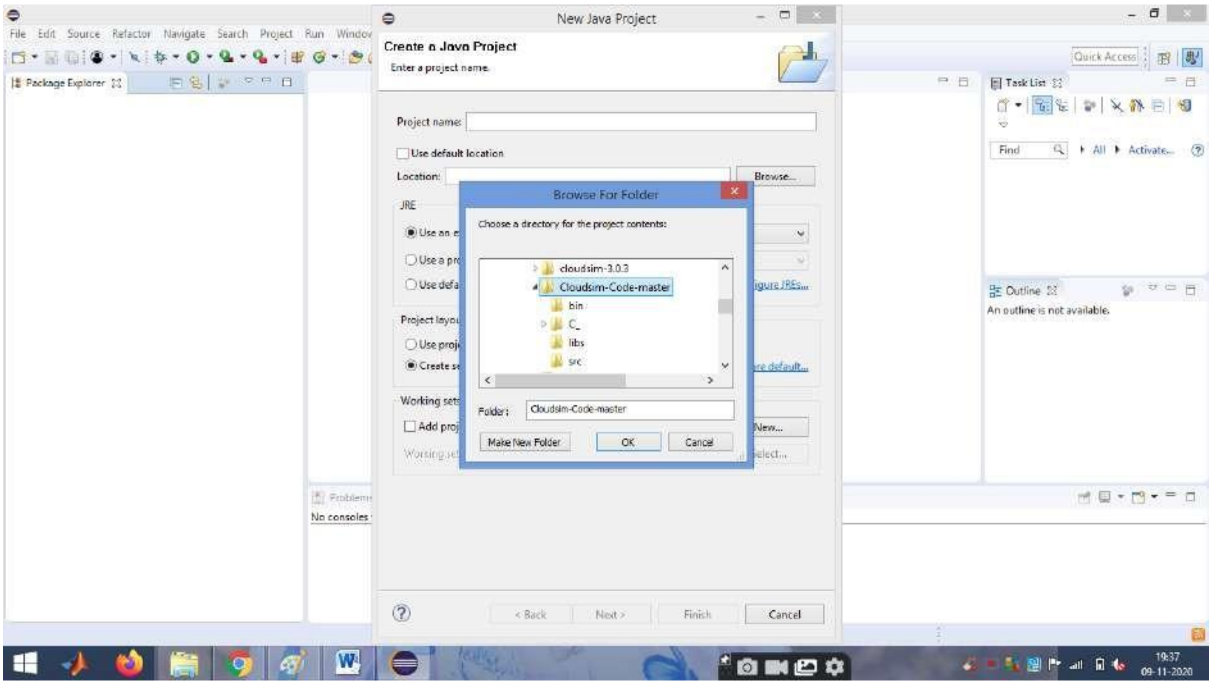
JRE
- ● Use an execution environment JRE: JavaSE-1.7
- ○ Use a project specific JRE: jre7
- ○ Use default JRE (currently 'jre7') — Configure JREs...

Project layout
- ○ Use project folder as root for sources and class files
- ● Create separate folders for sources and class files — Configure default...

Working sets
- □ Add project to working sets
- Working sets: [Select...]

The default compiler compliance level for the current workspace is 1.6. The new project will use a project specific compiler 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.



New Java Project

Create a Java Project

Enter a project name.

Project name:

□ Use default location

Location: [Browse...]

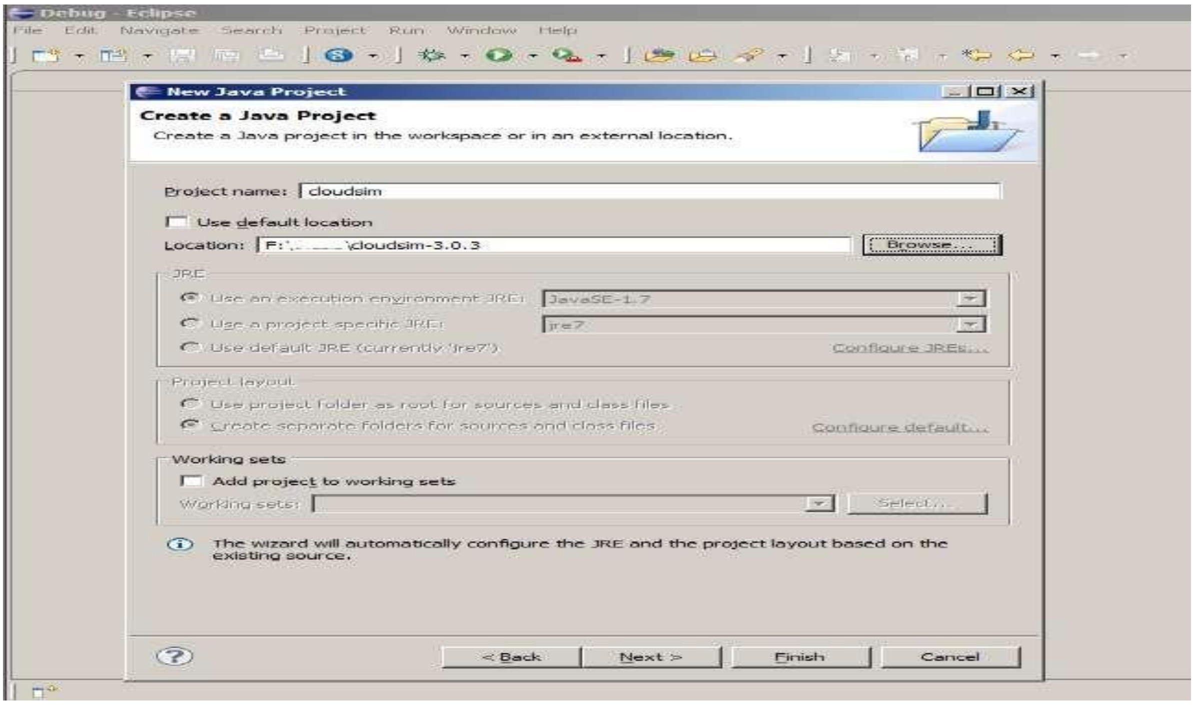
Browse For Folder

Choose a directory for the project contents:

- cloudsim-3.0.3
- Cloudsim-Code-master
  - bin
  - C_
  - libs
  - src

Folder: Cloudsim-Code-master

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



Project name: cloudsim

□ Use default location

Location: F:\...\cloudsim-3.0.3

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7')

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files

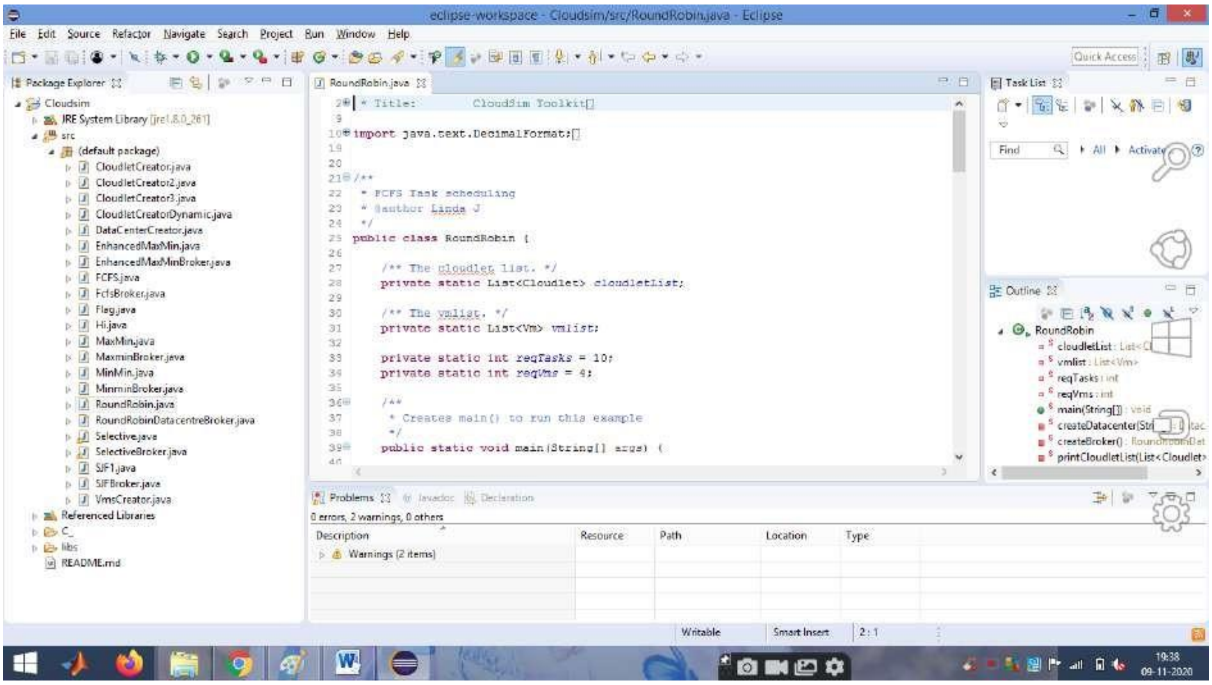
□ Add project to working sets

Working sets:

The wizard will automatically configure the JRE and the project layout based on the existing source.

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.

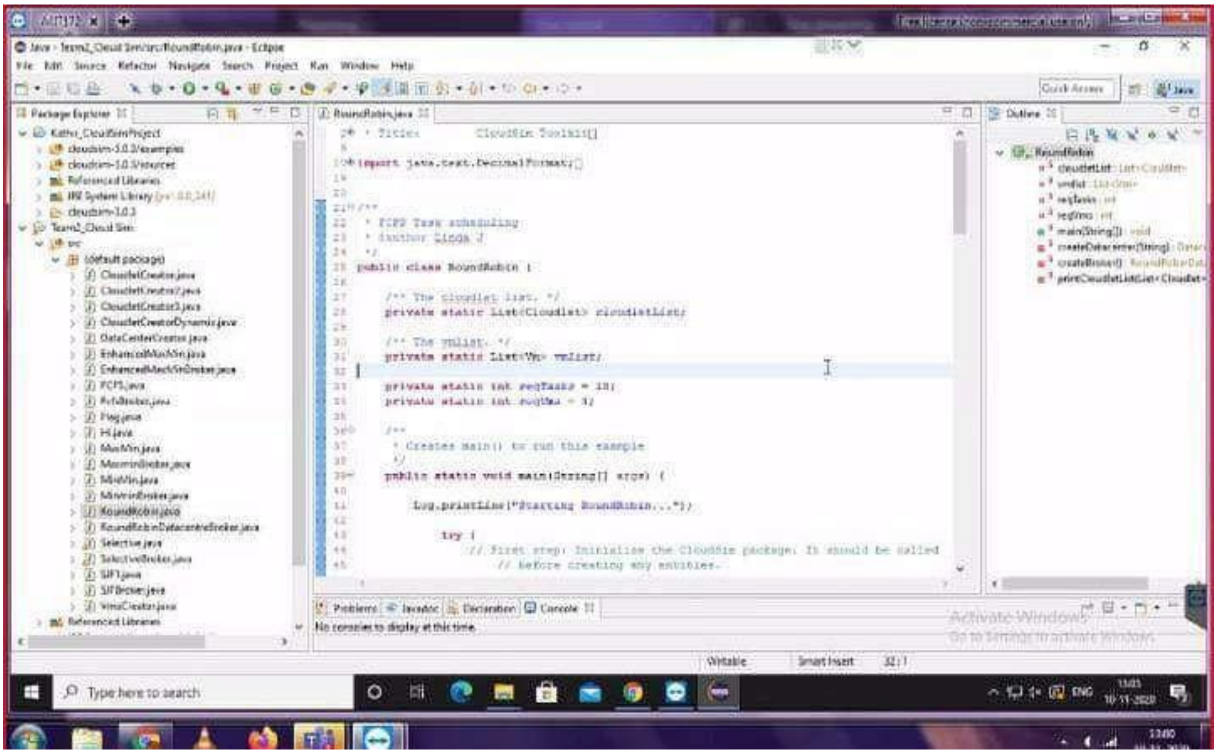
Following is the final screen which you will see after Cloudsim is configured.



```
 * Title:        CloudSim Toolkit
import java.text.DecimalFormat;


/**
 * FCFS Task scheduling
 * @author Linda J
 */
public class RoundRobin {

    /** The cloudlet list. */
    private static List<Cloudlet> cloudletList;

    /** The vmlist. */
    private static List<Vm> vmlist;

    private static int reqTasks = 10;
    private static int reqVms = 4;

    /**
     * Creates main() to run this example
     */
    public static void main(String[] args) {
```

0 errors, 2 warnings, 0 others

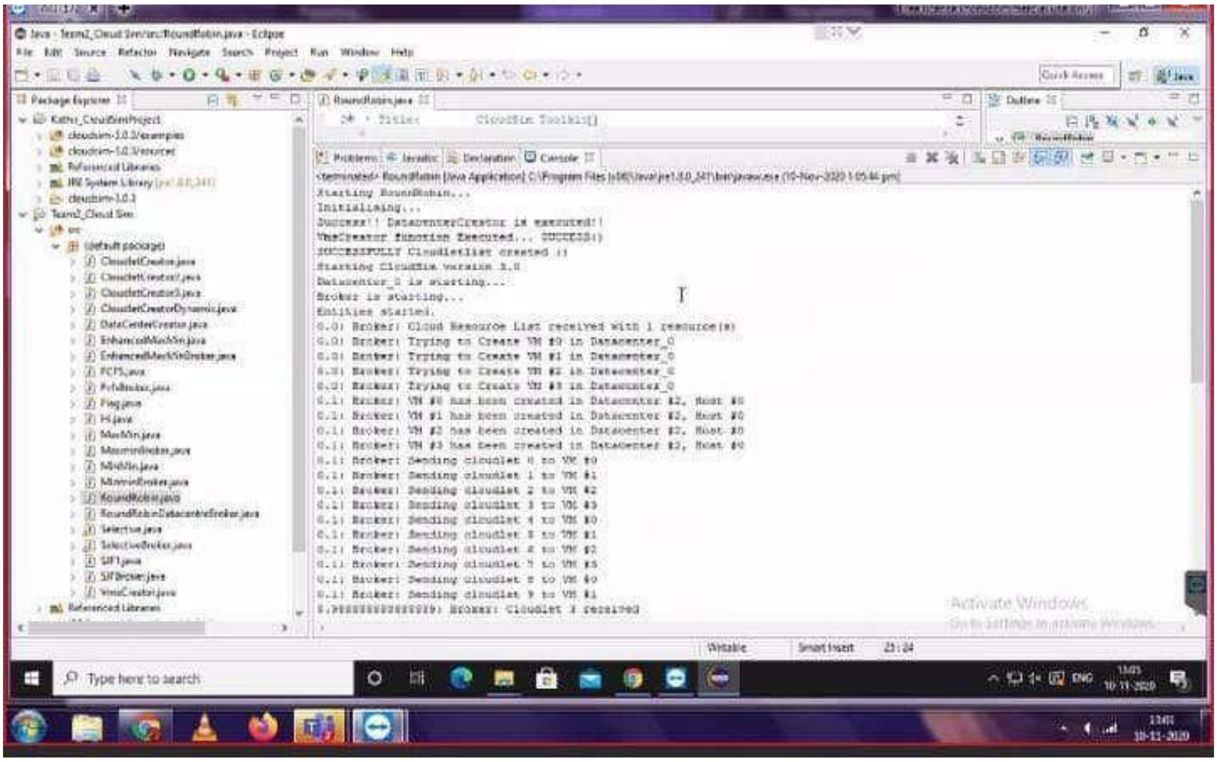
Step 13: Now just to check you within the _**Project Explorer**_, you should navigate to the _**src**_ folder, then expand the package _*default package*_ and double click to open the _R*oundRobin.java*_.



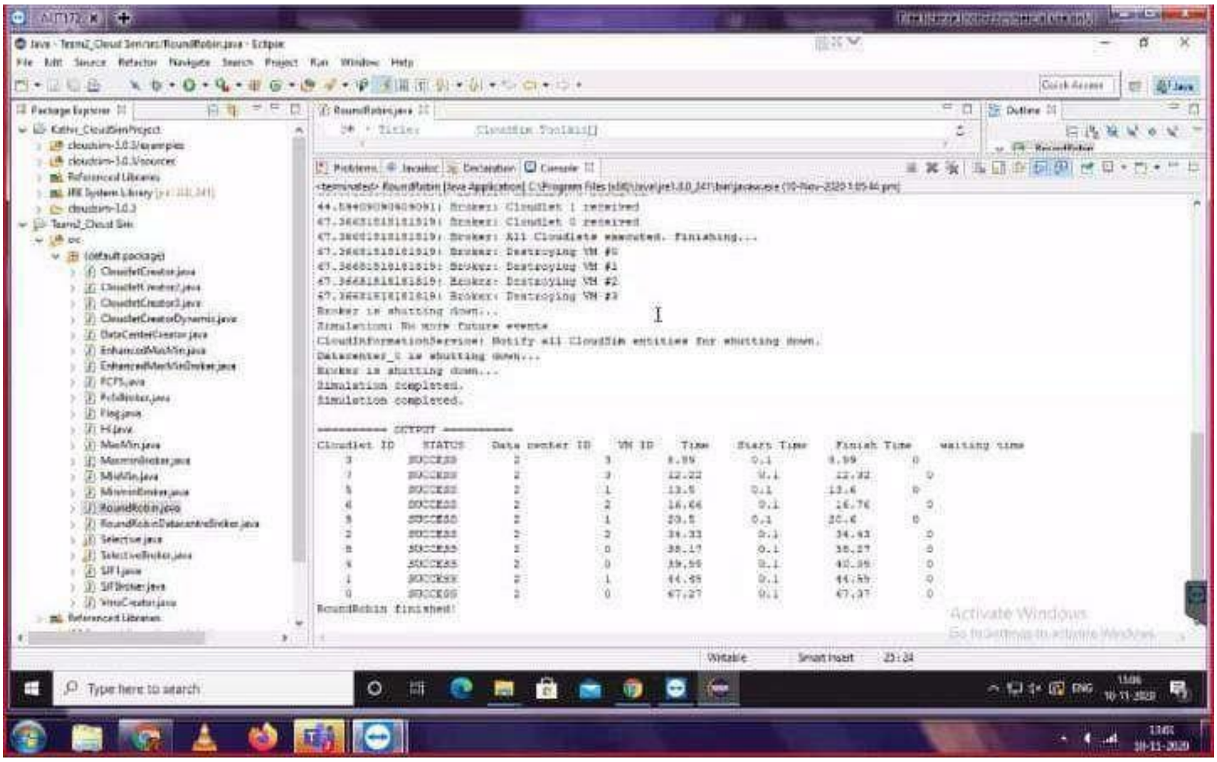
```
/* * Title:        CloudSim Toolkit[]

import java.text.DecimalFormat;[]


/**
 * FCFS Task scheduling
 * @author Linda J
 */
public class RoundRobin {

    /** The cloudlet list. */
    private static List<Cloudlet> cloudletList;

    /** The vmlist. */
    private static List<Vm> vmlist;

    private static int reqTasks = 10;
    private static int reqVms = 4;

    /**
     * Creates main() to run this example
     */
    public static void main(String[] args) {

        Log.printLine("Starting RoundRobin...");

            try {
                // First step: Initialize the CloudSim package. It should be called
                    // before creating any entities.
```

No consoles to display at this time.

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.



```
<terminated> RoundRobin [Java Application] C:\Program Files (x86)\Java\jre1.8.0_241\bin\javaw.exe (10-Nov-2020 1:05:46 pm)
Starting RoundRobin...
Initialising...
Success!! DatacenterCreator is executed!!
VmsCreator function Executed... SUCCESS:)
SUCCESSFULLY Cloudletlist created !!
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.0: Broker: Trying to Create VM #1 in Datacenter_0
0.0: Broker: Trying to Create VM #2 in Datacenter_0
0.0: Broker: Trying to Create VM #3 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: VM #1 has been created in Datacenter #2, Host #0
0.1: Broker: VM #2 has been created in Datacenter #2, Host #0
0.1: Broker: VM #3 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
0.1: Broker: Sending cloudlet 1 to VM #1
0.1: Broker: Sending cloudlet 2 to VM #2
0.1: Broker: Sending cloudlet 3 to VM #3
0.1: Broker: Sending cloudlet 4 to VM #0
0.1: Broker: Sending cloudlet 5 to VM #1
0.1: Broker: Sending cloudlet 6 to VM #2
0.1: Broker: Sending cloudlet 7 to VM #3
0.1: Broker: Sending cloudlet 8 to VM #0
0.1: Broker: Sending cloudlet 9 to VM #1
8.399999999999999: Broker: Cloudlet 3 received
```



```
<terminated> RoundRobin [Java Application] C:\Program Files (x86)\Java\jre1.8.0_241\bin\javaw.exe (10-Nov-2020 1:05:46 pm)
44.54090909090901: Broker: Cloudlet 1 received
47.36681818181819: Broker: Cloudlet 0 received
47.36681818181819: Broker: All Cloudlets executed. Finishing...
47.36681818181819: Broker: Destroying VM #0
47.36681818181819: Broker: Destroying VM #1
47.36681818181819: Broker: Destroying VM #2
47.36681818181819: Broker: Destroying VM #3
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

========== OUTPUT ==========
Cloudlet ID    STATUS    Data center ID    VM ID    Time    Start Time    Finish Time    waiting time
    3          SUCCESS        2              3       8.89       0.1          8.99         0
    7          SUCCESS        2              3       12.22       0.1          12.32         0
    5          SUCCESS        2              1       13.5       0.1          13.6         0
    6          SUCCESS        2              2       16.66       0.1          16.76         0
    9          SUCCESS        2              1       20.5       0.1          20.6         0
    2          SUCCESS        2              2       34.33       0.1          34.43         0
    8          SUCCESS        2              0       38.17       0.1          38.27         0
    4          SUCCESS        2              0       39.95       0.1          40.05         0
    1          SUCCESS        2              1       44.45       0.1          44.55         0
    0          SUCCESS        2              0       47.27       0.1          47.37         0
RoundRobin finished!
```

Result:

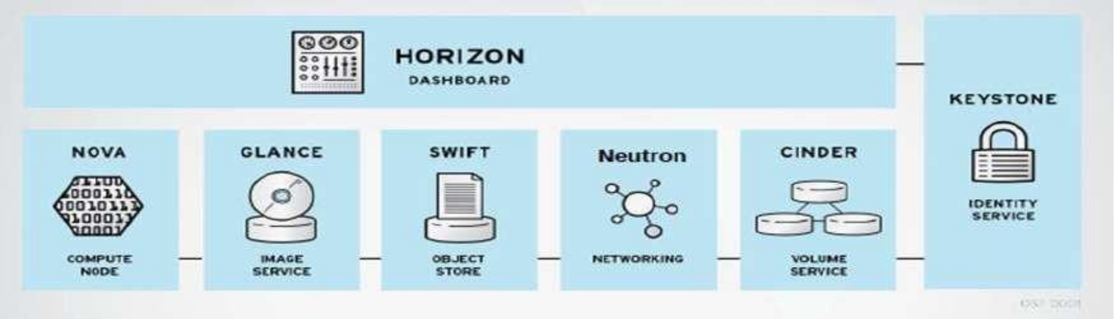
Thus the scheduling algorithm is executed in cloudsim is simulated using Eclipse Environment successfully.

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

- **NOVA**
  - 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**
  - Image service
  - Stores and retrieves disk images (Virtual machine templates)
  - Supports RAW,QCOW,VHD,ISO,OVF & AMI/AKI
  - 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
    - 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

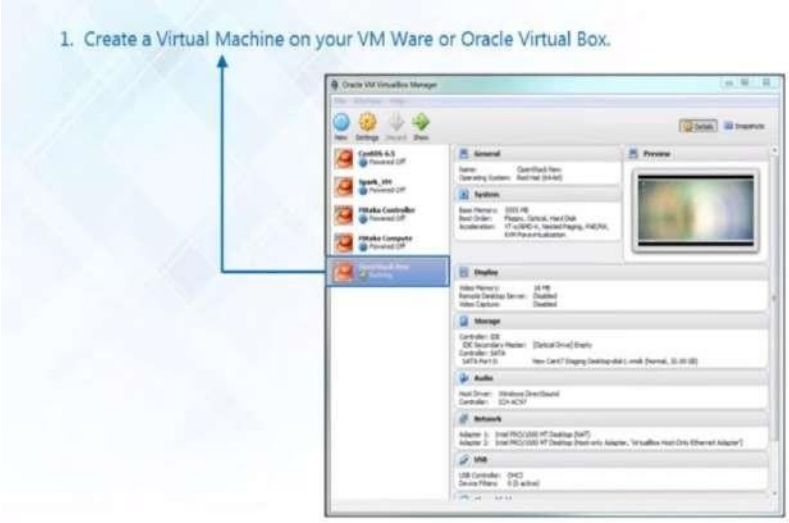
❖ **Steps in Installing Openstack**

Step 1:

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

Step 2:

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

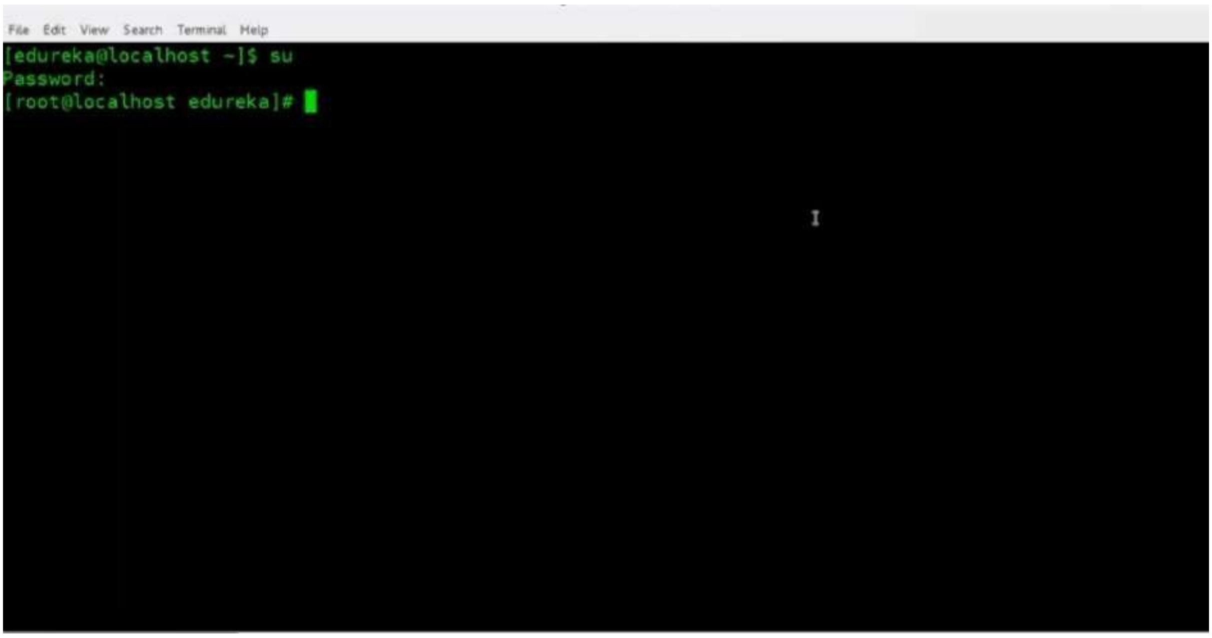


1. Create a Virtual Machine on your VM Ware or Oracle Virtual Box.

Step 3: Login into CenOS 7

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

#sudosu–



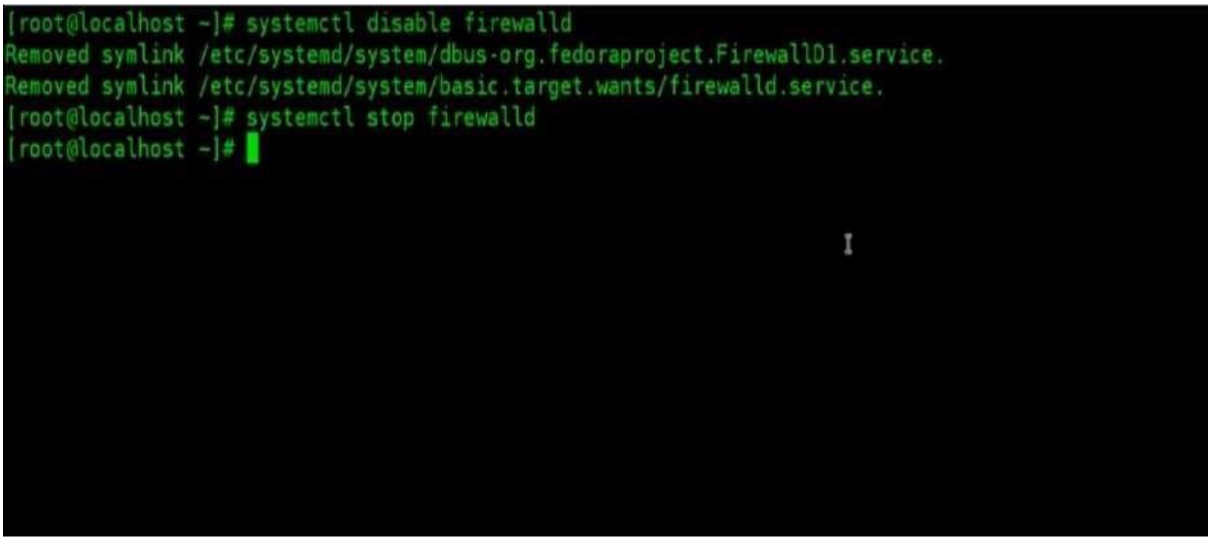
```
[edureka@localhost ~]$ su
Password:
[root@localhost edureka]# 
```

Step 4: Installation Steps for OpenStack

Step5: Command to disable and stop firewall

# systemctl disable firewalld

#systemctl stop firewalld

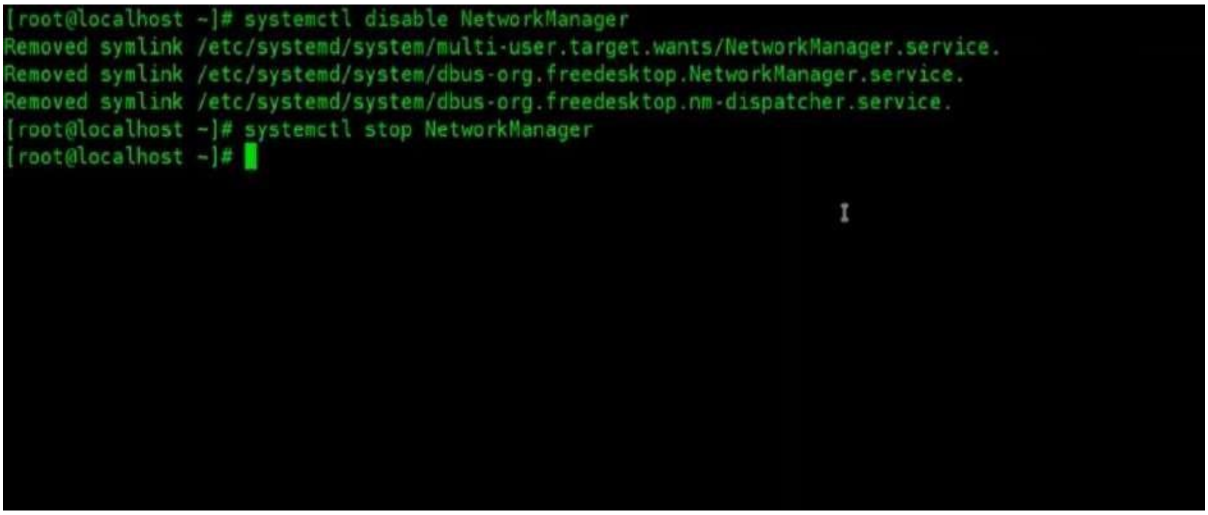


```
[root@localhost ~]# systemctl disable firewalld
Removed symlink /etc/systemd/system/dbus-org.fedoraproject.FirewallD1.service.
Removed symlink /etc/systemd/system/basic.target.wants/firewalld.service.
[root@localhost ~]# systemctl stop firewalld
[root@localhost ~]#
```

Step 6: Command to disable and stop Network Manager

# systemctl disable NetworkManager

# systemctl stop NetworkManager

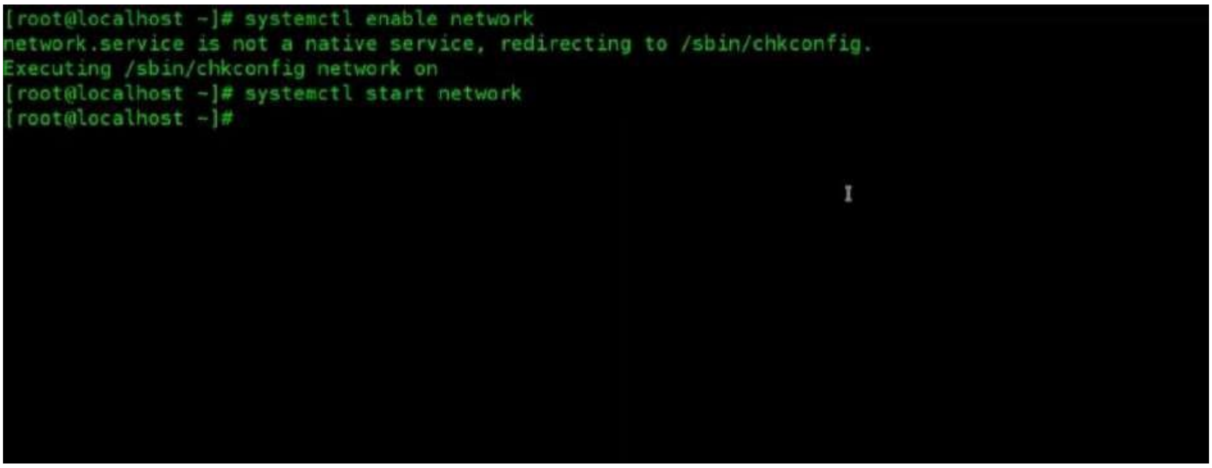


```
[root@localhost ~]# systemctl disable NetworkManager
Removed symlink /etc/systemd/system/multi-user.target.wants/NetworkManager.service.
Removed symlink /etc/systemd/system/dbus-org.freedesktop.NetworkManager.service.
Removed symlink /etc/systemd/system/dbus-org.freedesktop.nm-dispatcher.service.
[root@localhost ~]# systemctl stop NetworkManager
[root@localhost ~]#
```

Step 7: Enable and start Network

#systemctl enable network

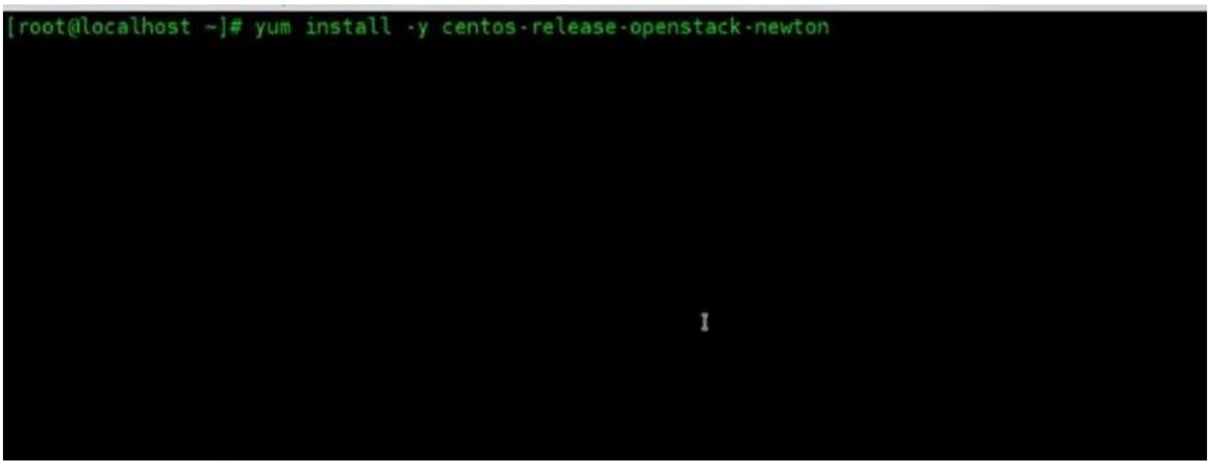
#systemctl start network



```
[root@localhost ~]# systemctl enable network
network.service is not a native service, redirecting to /sbin/chkconfig.
Executing /sbin/chkconfig network on
[root@localhost ~]# systemctl start network
[root@localhost ~]#
```

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.

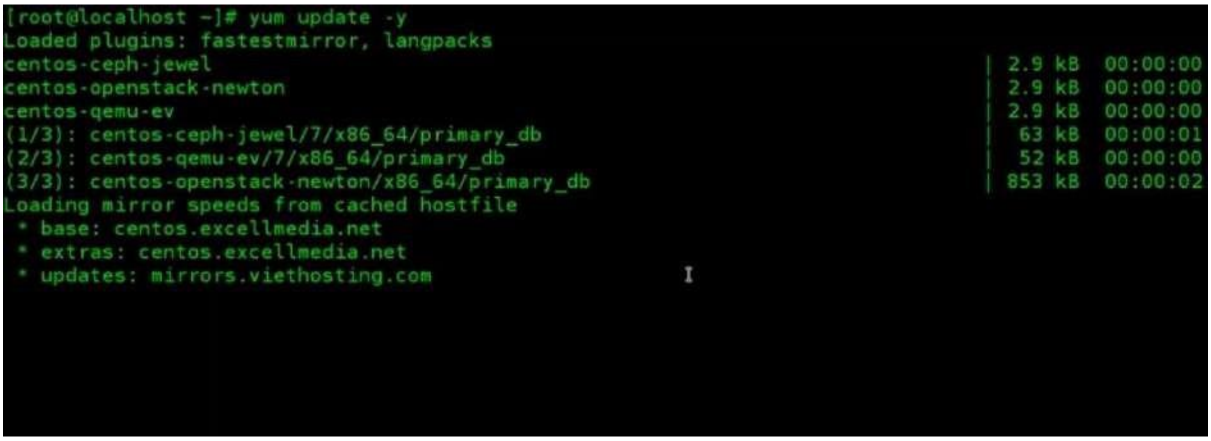
#yum install -y https://rdoproject.org/repos/rdo-release.rpm



```
[root@localhost ~]# yum install -y centos-release-openstack-newton
```

Step 9: Update Current packages

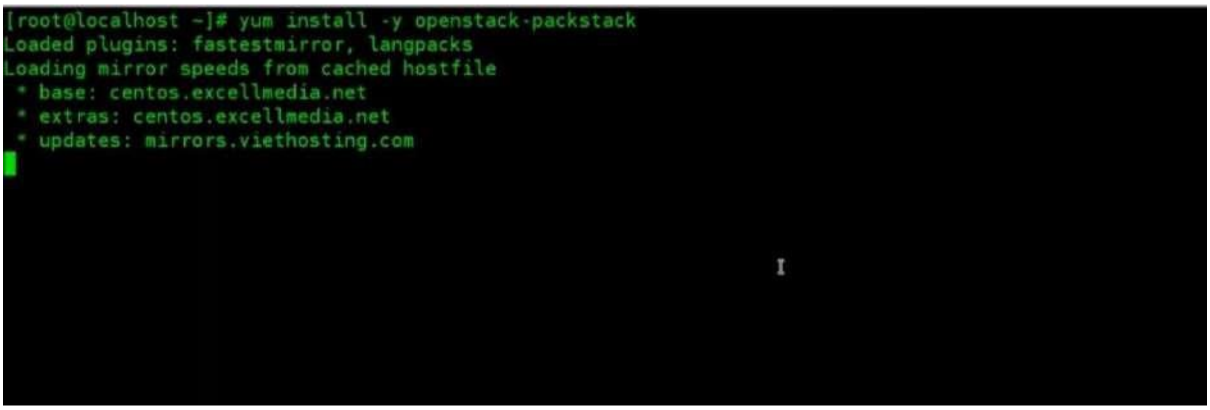
#yum update –y



```
[root@localhost ~]# yum update -y
Loaded plugins: fastestmirror, langpacks
centos-ceph-jewel                                                  | 2.9 kB  00:00:00
centos-openstack-newton                                            | 2.9 kB  00:00:00
centos-qemu-ev                                                     | 2.9 kB  00:00:00
(1/3): centos-ceph-jewel/7/x86_64/primary_db                       |  63 kB  00:00:01
(2/3): centos-qemu-ev/7/x86_64/primary_db                          |  52 kB  00:00:00
(3/3): centos-openstack-newton/x86_64/primary_db                   | 853 kB  00:00:02
Loading mirror speeds from cached hostfile
 * base: centos.excellmedia.net
 * extras: centos.excellmedia.net
 * updates: mirrors.viethosting.com
```

Step 10: Install OpenStack Release for CentOS

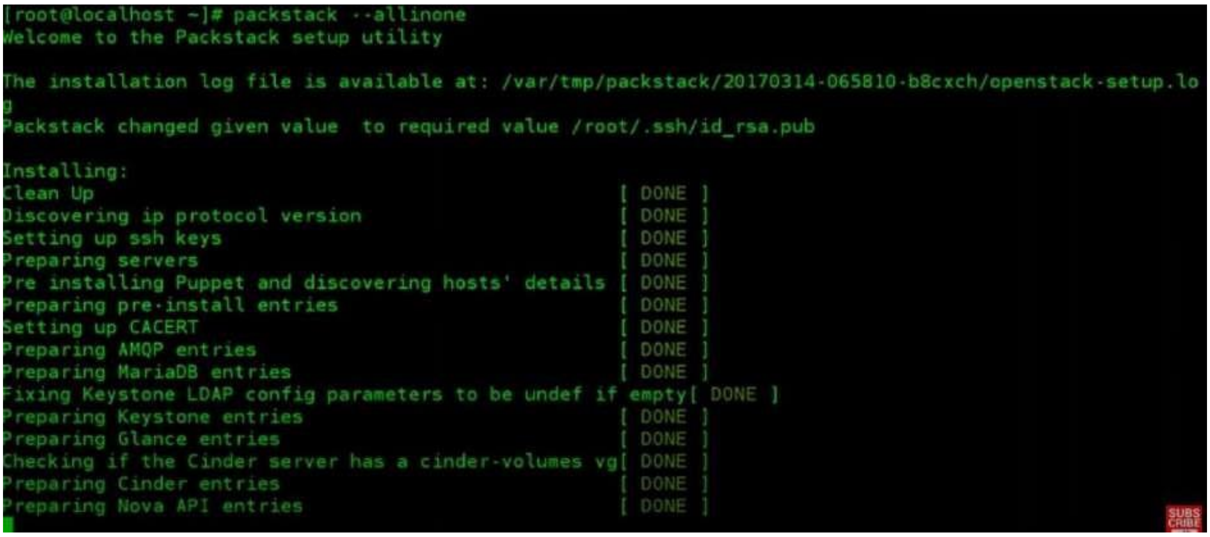
#yum install –y openstack-packstack



```
[root@localhost ~]# yum install -y openstack-packstack
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: centos.excellmedia.net
 * extras: centos.excellmedia.net
 * updates: mirrors.viethosting.com
```

Step 11: Start packstack to install OpenStack Newton

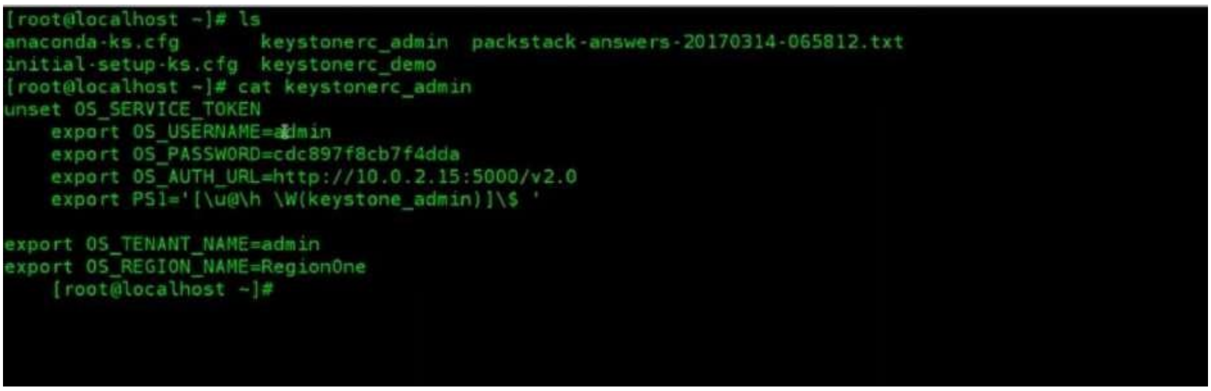
#packstak --allinone



```
[root@localhost ~]# packstack --allinone
Welcome to the Packstack setup utility

The installation log file is available at: /var/tmp/packstack/20170314-065810-b8cxch/openstack-setup.lo
g
Packstack changed given value  to required value /root/.ssh/id_rsa.pub

Installing:
Clean Up                                             [ DONE ]
Discovering ip protocol version                      [ DONE ]
Setting up ssh keys                                  [ DONE ]
Preparing servers                                    [ DONE ]
Pre installing Puppet and discovering hosts' details [ DONE ]
Preparing pre-install entries                        [ DONE ]
Setting up CACERT                                    [ DONE ]
Preparing AMQP entries                               [ DONE ]
Preparing MariaDB entries                            [ DONE ]
Fixing Keystone LDAP config parameters to be undef if empty[ DONE ]
Preparing Keystone entries                           [ DONE ]
Preparing Glance entries                             [ DONE ]
Checking if the Cinder server has a cinder-volumes vg[ DONE ]
Preparing Cinder entries                             [ DONE ]
Preparing Nova API entries                           [ DONE ]
```

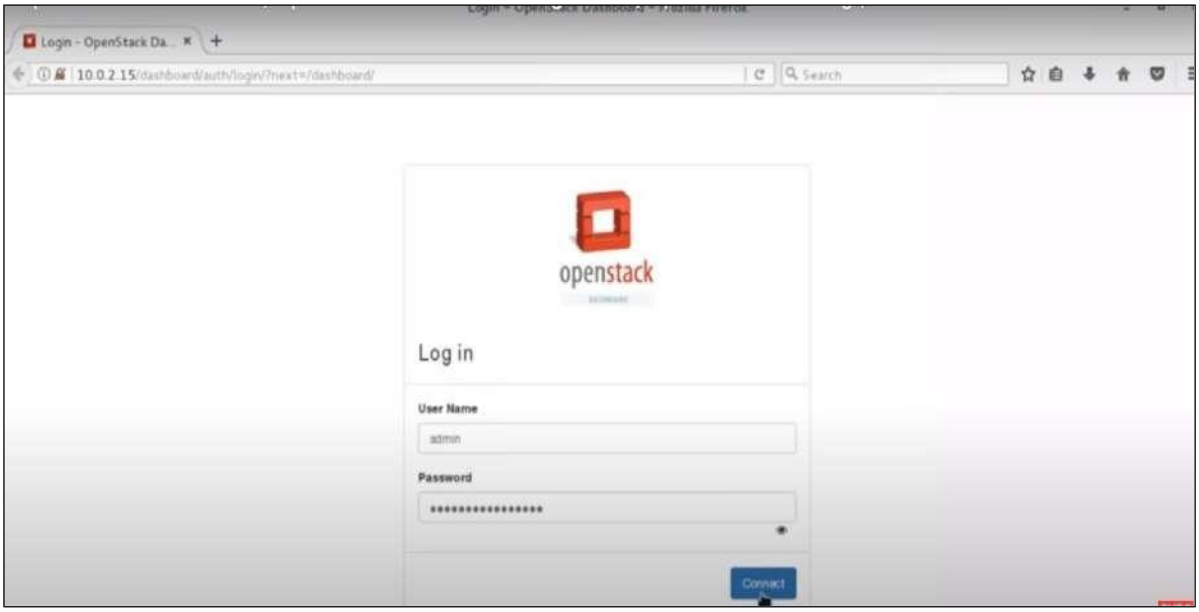
Step 12: Note the user name and password from keystonerc_admin

#cat keystonerc_admin



```
[root@localhost ~]# ls
anaconda-ks.cfg       keystonerc_admin  packstack-answers-20170314-065812.txt
initial-setup-ks.cfg  keystonerc_demo
[root@localhost ~]# cat keystonerc_admin
unset OS_SERVICE_TOKEN
    export OS_USERNAME=admin
    export OS_PASSWORD=cdc897f8cb7f4dda
    export OS_AUTH_URL=http://10.0.2.15:5000/v2.0
    export PS1='[\u@\h \W(keystone_admin)]\$ '

export OS_TENANT_NAME=admin
export OS_REGION_NAME=RegionOne
    [root@localhost ~]#
```

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



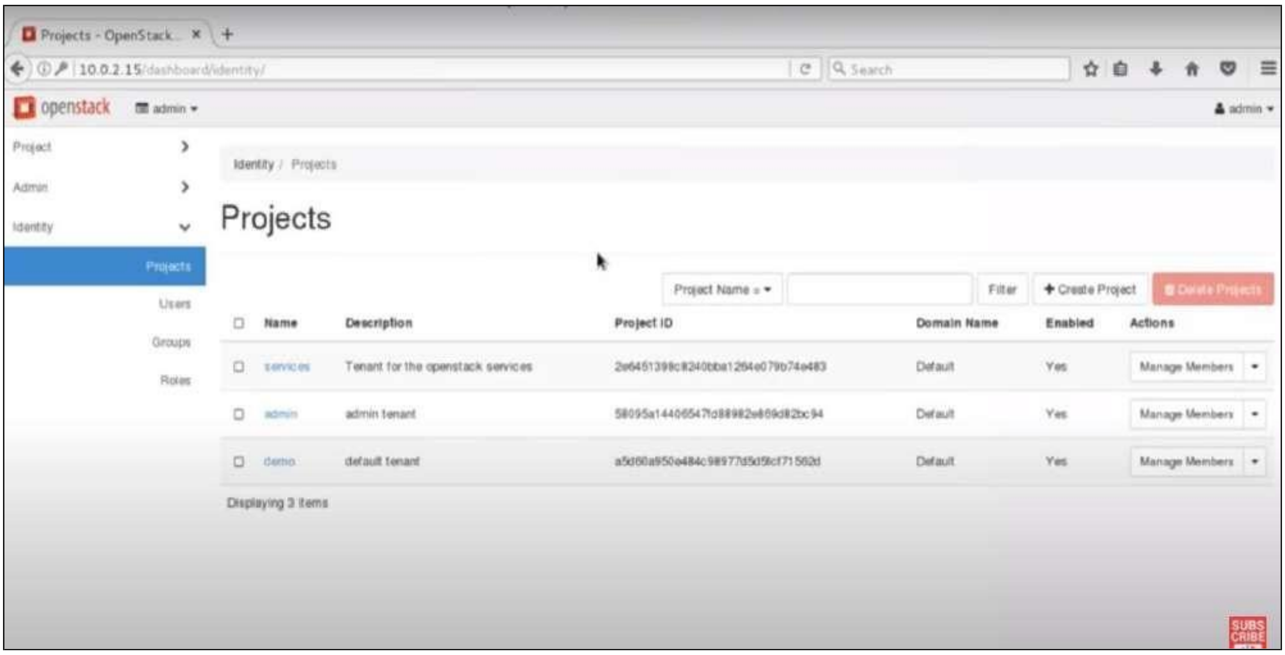
10.0.2.15/dashboard/auth/login/?next=/dashboard/

Log in

User Name: admin

Password: ••••••••••••••••

OpenStack is successfully launched in your machine



10.0.2.15/dashboard/identity/

Identity / Projects

Projects

☐	Name	Description	Project ID	Domain Name	Enabled	Actions
☐	services	Tenant for the openstack services	2e6451398c8240bba1264e079b74e483	Default	Yes	Manage Members ▾
☐	admin	admin tenant	58095a14406547fd88982e869d82bc94	Default	Yes	Manage Members ▾
☐	demo	default tenant	a5d60a950e484c98977d5d5fcf71562d	Default	Yes	Manage Members ▾

Displaying 3 items