Ex.No: 01 **Install Virtual box/VMware Workstation**
Date:

Aim:

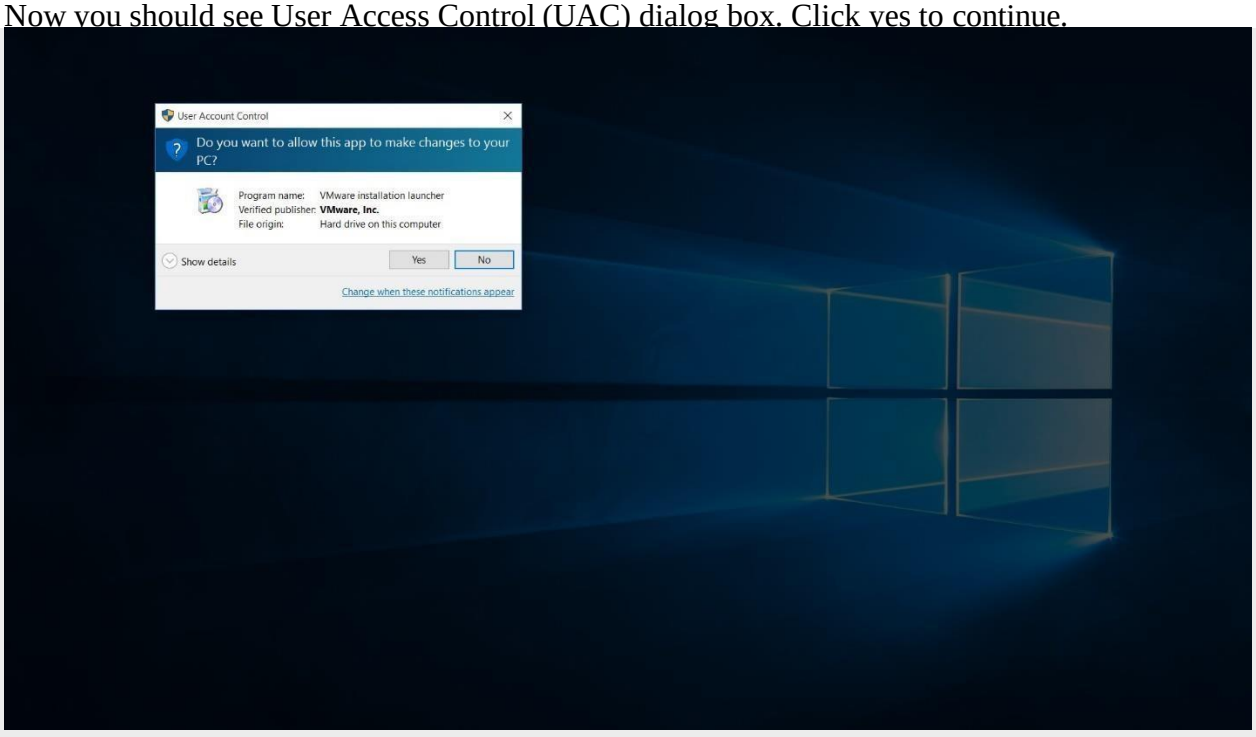
Find procedure to Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

PROCEDURE TO INSTALL

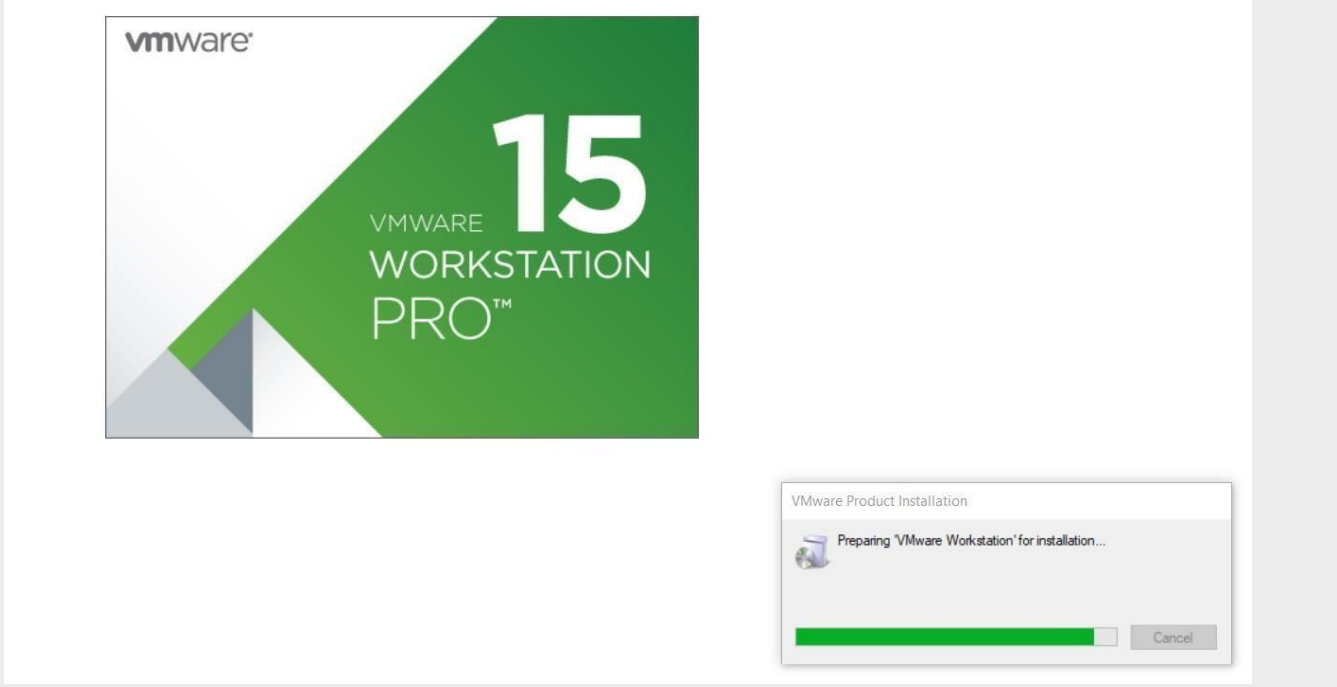
Step 1- Download Link
Link for downloading the software is https://www.vmware.com/products/workstation-pro/workstation-pro-evaluation.html. Download the software for windows. Good thing is that there is no signup process. Click and download begins. Software is around 541 MB.

Step 2- Download the installer file
It should probably be in the download folder by default, if you have not changed the settings in your browser. File name should be something like VMware-workstation-full-15.5.1-15018445.exe. This file name can change depending on the version of the software currently available for download. But for now, till the next version is available, they will all be VMware Workstation 15 Pro.

Step 3- Locate the downloaded installer file
For demonstration purpose, I have placed the downloaded installer on my desktop. Find the installer on your system and double click to launch the application.
Step 4- User Access Control (UAC) Warning
Now you should see User Access Control (UAC) dialog box. Click yes to continue.



VMware Workstation 12 Pro installer windows 10 UAC screenshot
Initial Splash screen will appear. Wait for the process to complete.



VMware Workstation 15 Installation Splash Screen

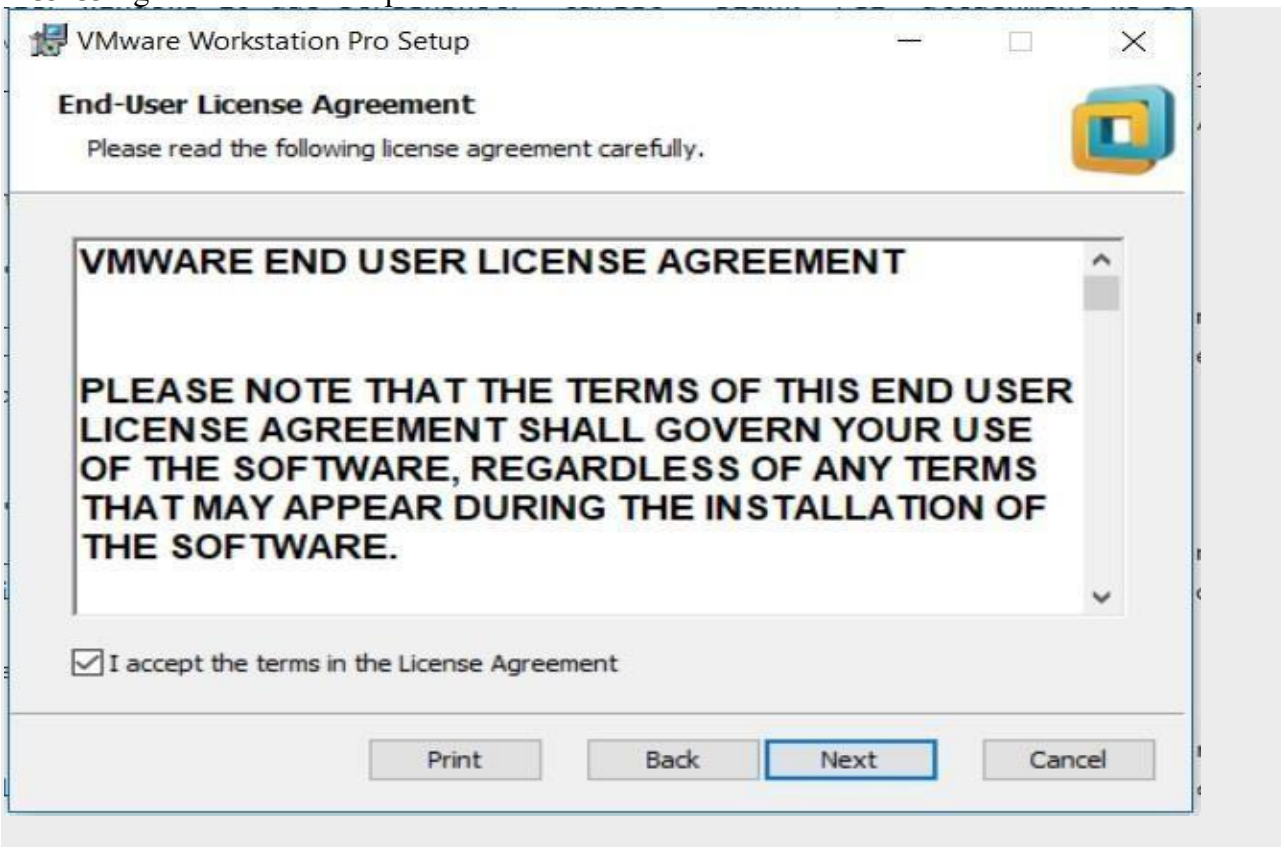
Step 5- VMware Workstation Setup wizard

Now you will see VMware Workstation setup wizard dialog box. Click next to continue.

VMware Workstation 15 Installation – Setup Wizard

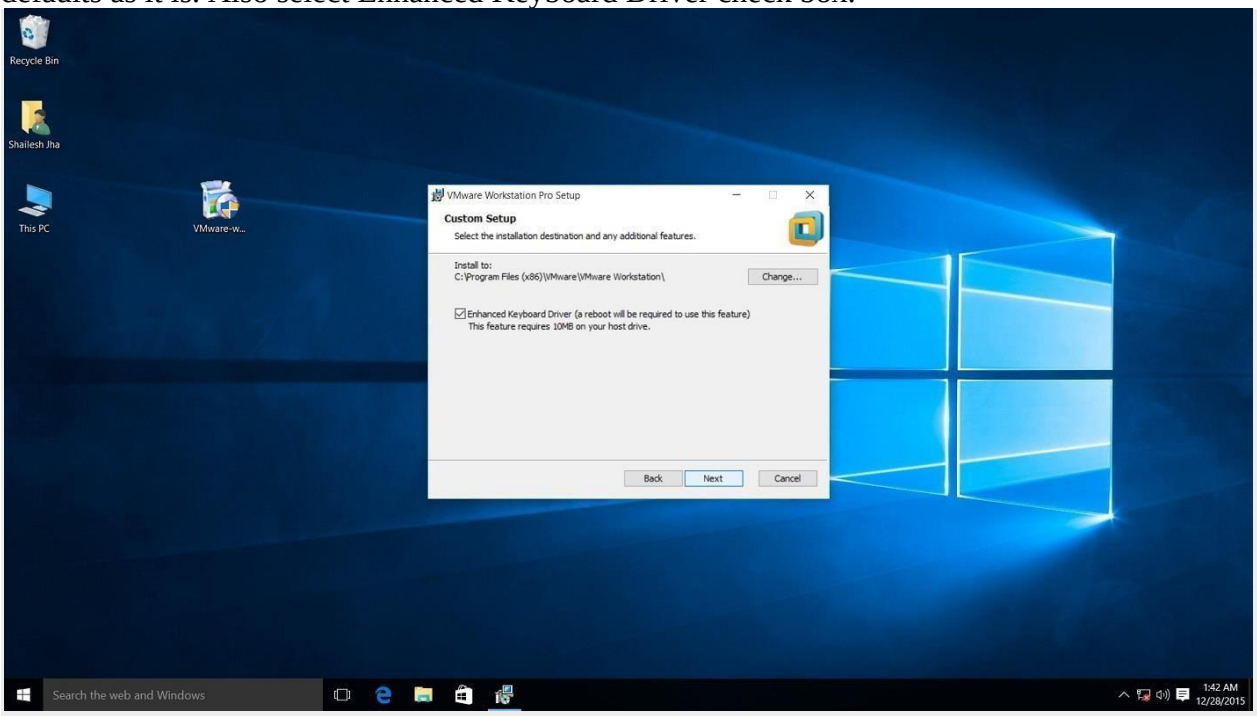
Step 6- End User Licence Agreement

This time you should see End User Licence Agreement dialog box. Check “I accept the terms in the Licence Agreement” box and press next to continue.



Step 7- Custom Setup options

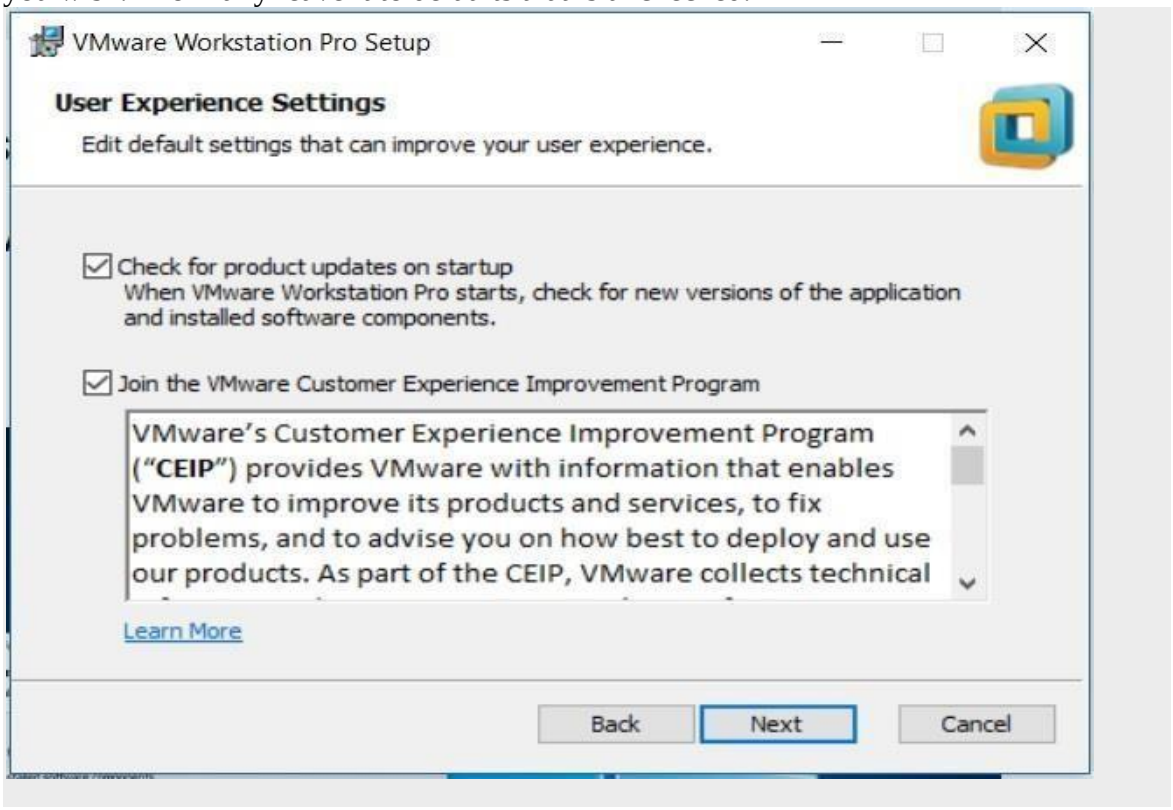
Select the folder in which you would like to install the application. There is no harm in leaving the defaults as it is. Also select Enhanced Keyboard Driver check box.



VMware Workstation 15 Pro installation – select installation folder

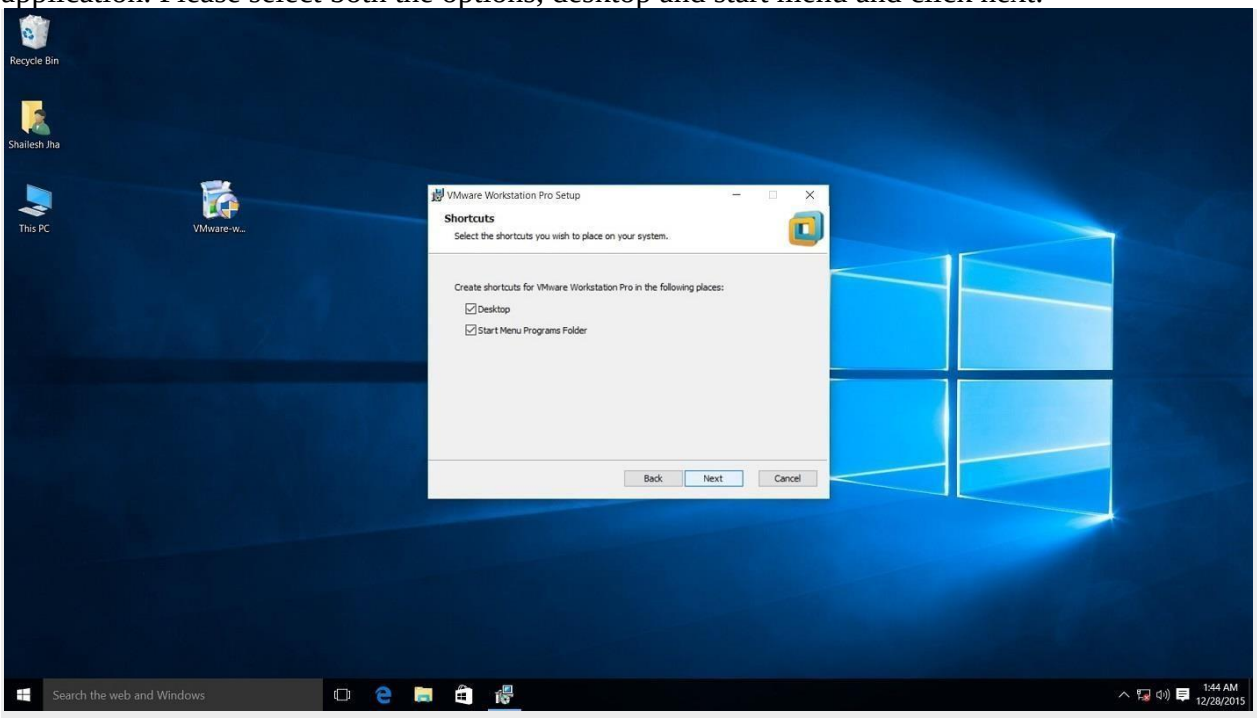
Step 8- User Experience Settings

Next you are asked to select “Check for Updates” and “Help improve VMware Workstation Pro”. Do as you wish. I normally leave it to defaults that is unchecked.



Step 9- Application Shortcuts preference

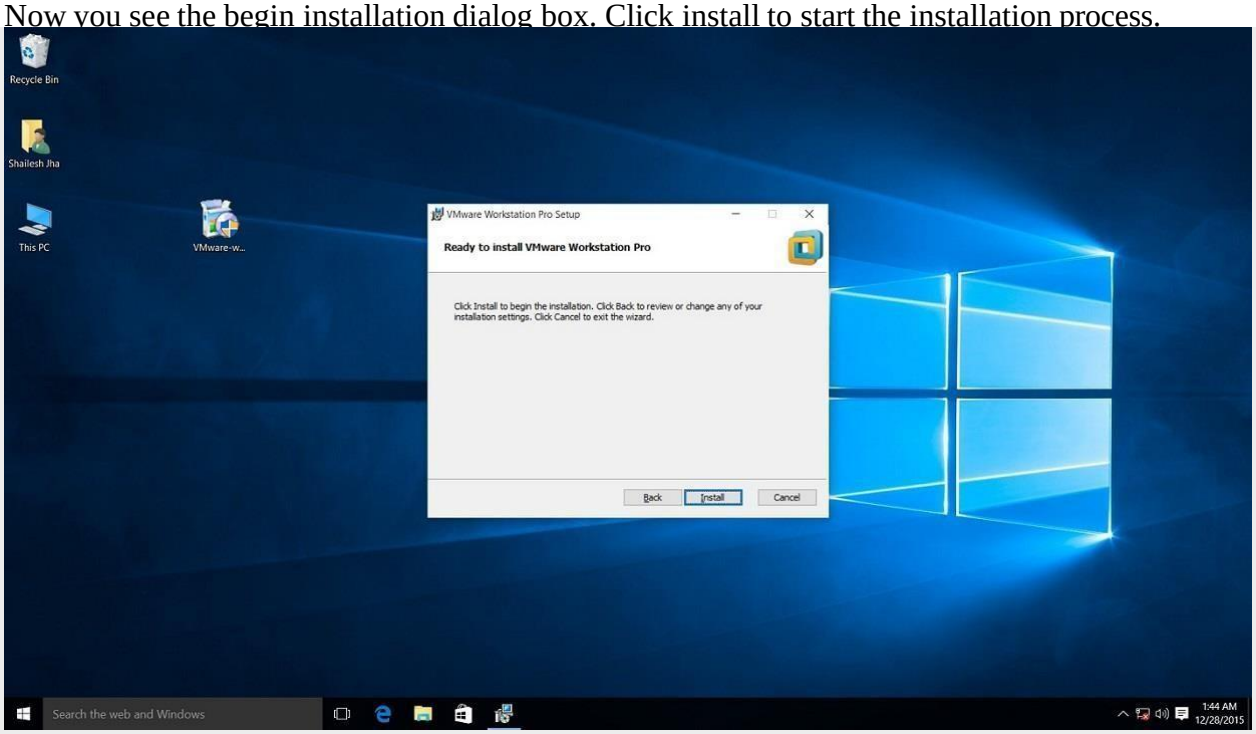
Next step is to select the place you want the shortcut icons to be placed on your system to launch the application. Please select both the options, desktop and start menu and click next.



VMware workstation 15 pro installation shortcut selection checkbox screenshot.

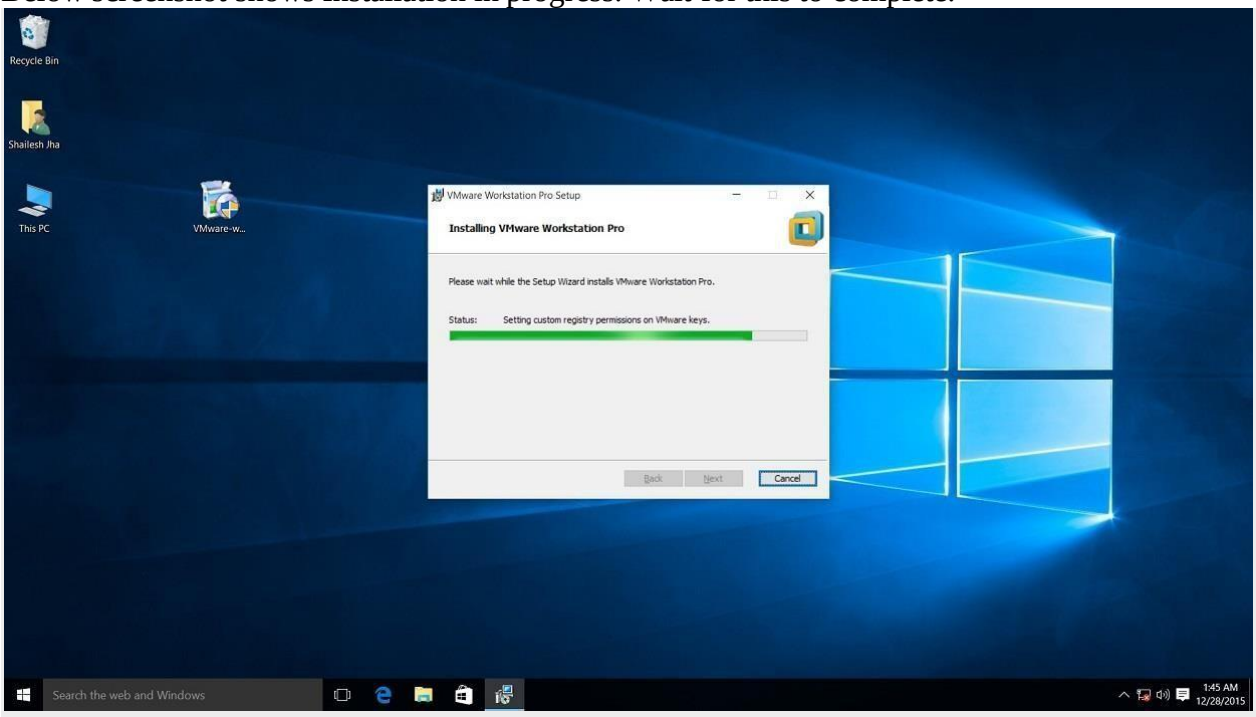
Step 10- Installation begins

Now you see the begin installation dialog box. Click install to start the installation process.



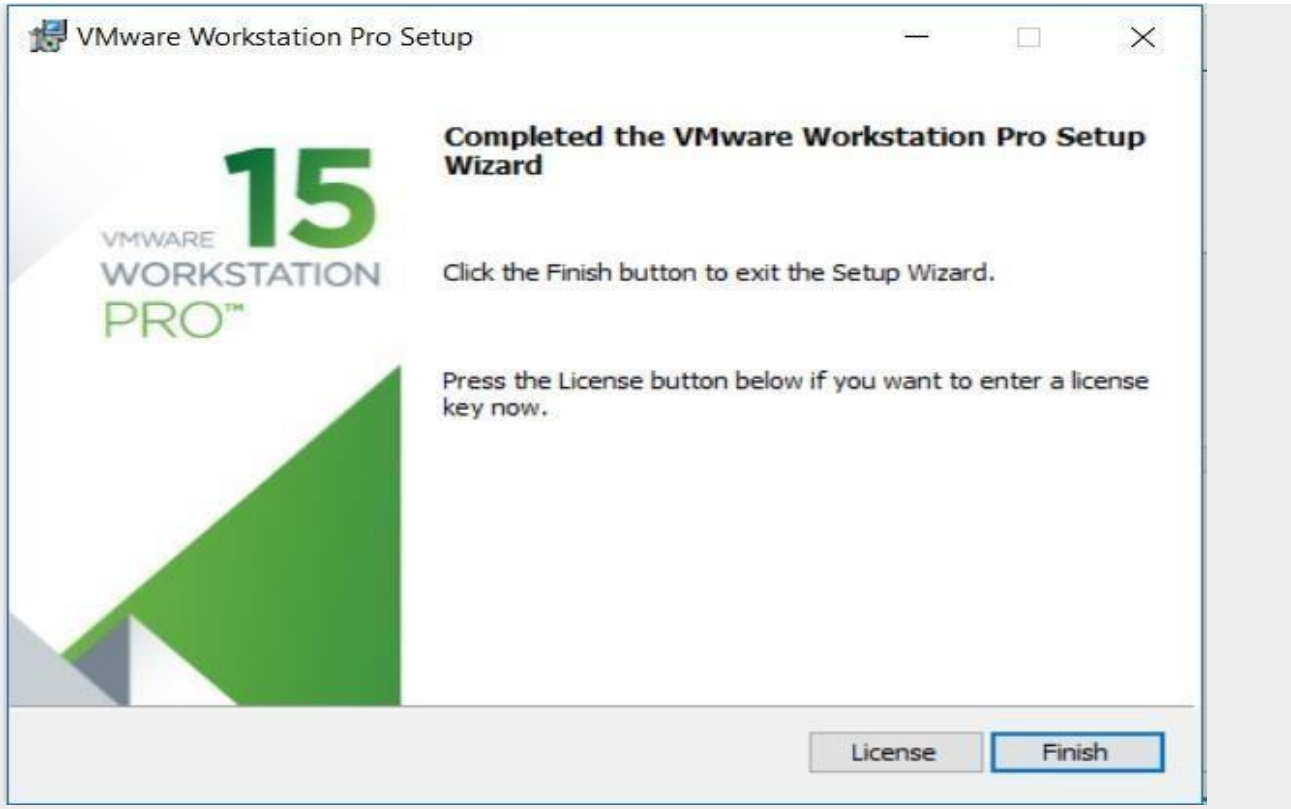
Screenshot for VMware Workstation 15 pro installation begin confirmation dialog box on windows 10.

Below screenshot shows Installation in progress. Wait for this to complete.



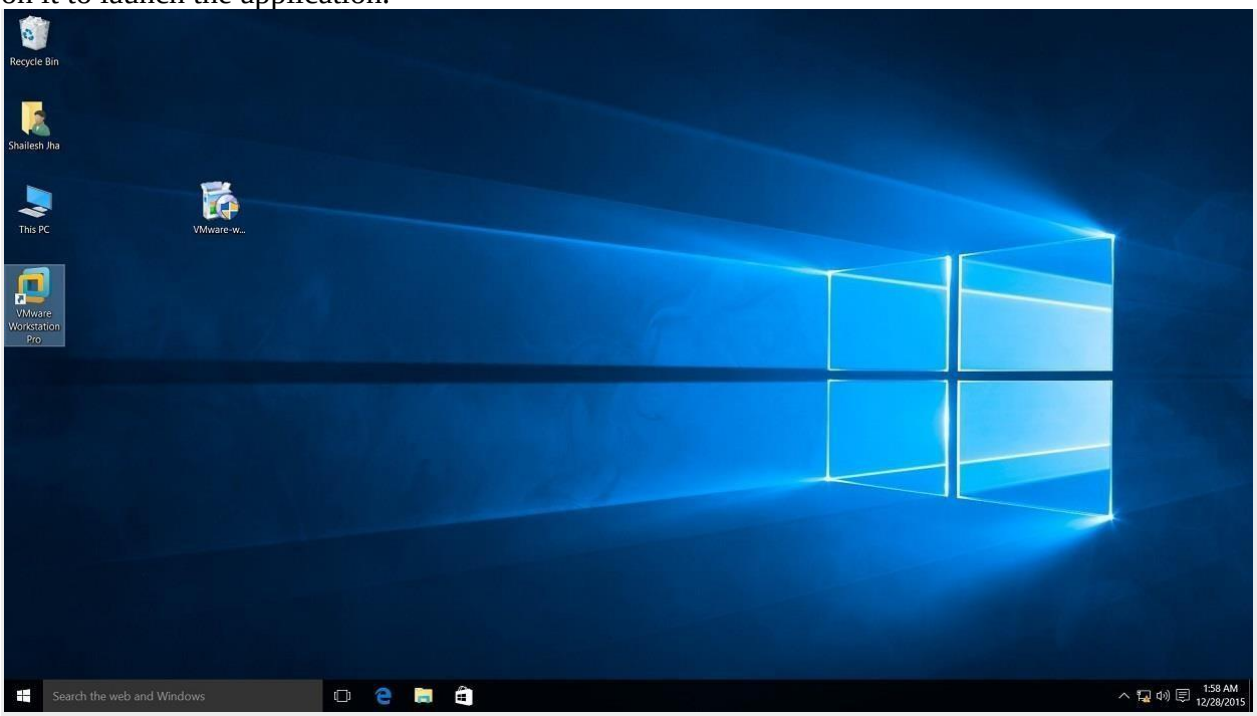
Screenshot for VMware Workstation 15 pro installation process.

At the end you will see installation complete dialog box. Click finish and you are done with the installation process. You may be asked to restart your computer. Click on Yes to restart.



Step 11- Launch VMware Workstation

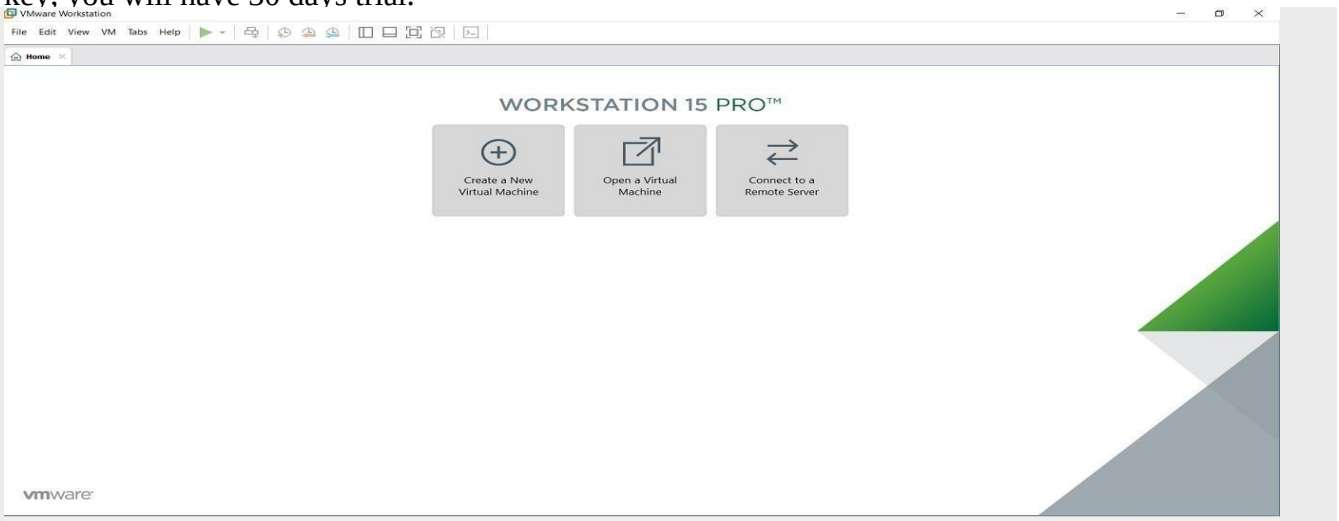
After the installation completes, you should see VMware Workstation icon on the desktop. Double click on it to launch the application.



Screenshot for VMware Workstation 15 Pro icon on windows 10 desktop.

Step 12- Licence Key

If you see the dialog box asking for licence key, click on trial or enter the licence key. Then what you have is the VMware Workstation 15 Pro running on your windows 10 desktop. If don't have the licence key, you will have 30 days trial.



VMware Workstation 15 Pro home screen

Step 13- At some point if you decide to buy

At some point of time if you decide to buy the Licence key, you can enter the Licence key by going to **Help->Enter a Licence Key** You can enter the 25 character licence key in the dialog box shown below and click OK. Now you have the licence version of the software.

RESULT:

Thus, the VMware installed successfully in the system.

Ex.No: 02 **Install a C compiler in the virtual machine created using virtual box and**
Date: **execute simple programs.**

Aim:

Find procedure to install a C compiler in the virtual machine created using virtual box and execute simple programs in windows7 or 8.

PROCEDURE TO INSTALL

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;
}
```

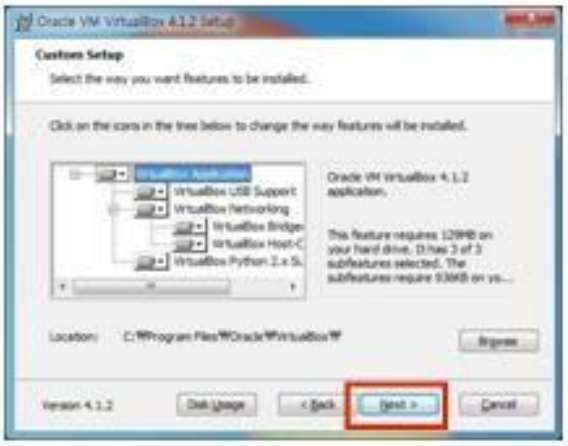
Step 3: Compile the Program
$sudo g++ add.c
Step 4: Run the Program
$ ./a.out
Expected Output:
Enter two nos : 2 3 Sum of two nos is: 5

Install VirtualBox

Step 1: Visit http://www.virtualbox.org/wiki/downloads
Step 2: Download VirtualBox platform packages for your OS
Step 3: Open the Installation Package by double clicking

MAC

PC



Step 4: Click continue and finish installing VirtualBox

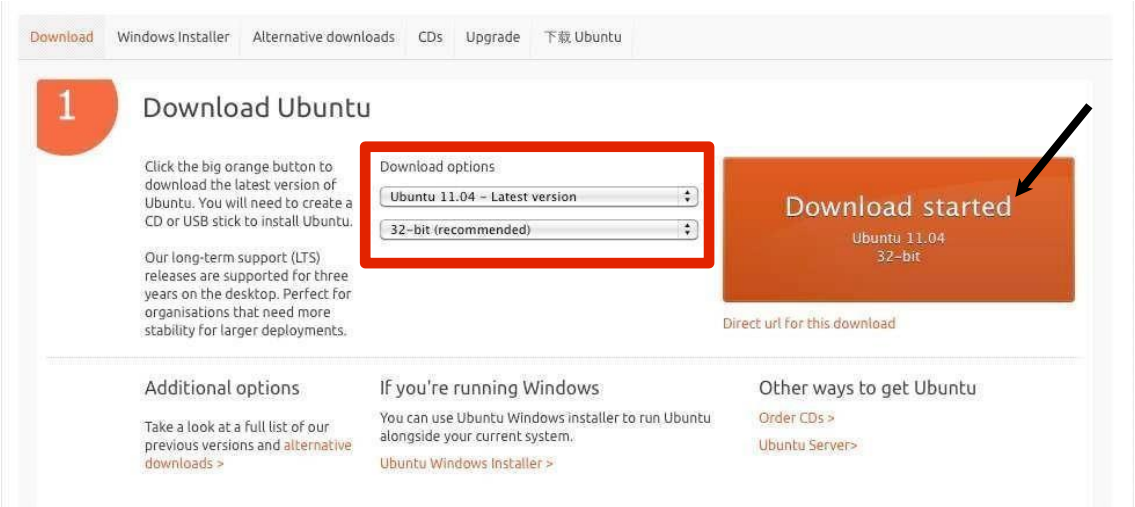
MAC

PC

Step 5: When finished installation, close the window.

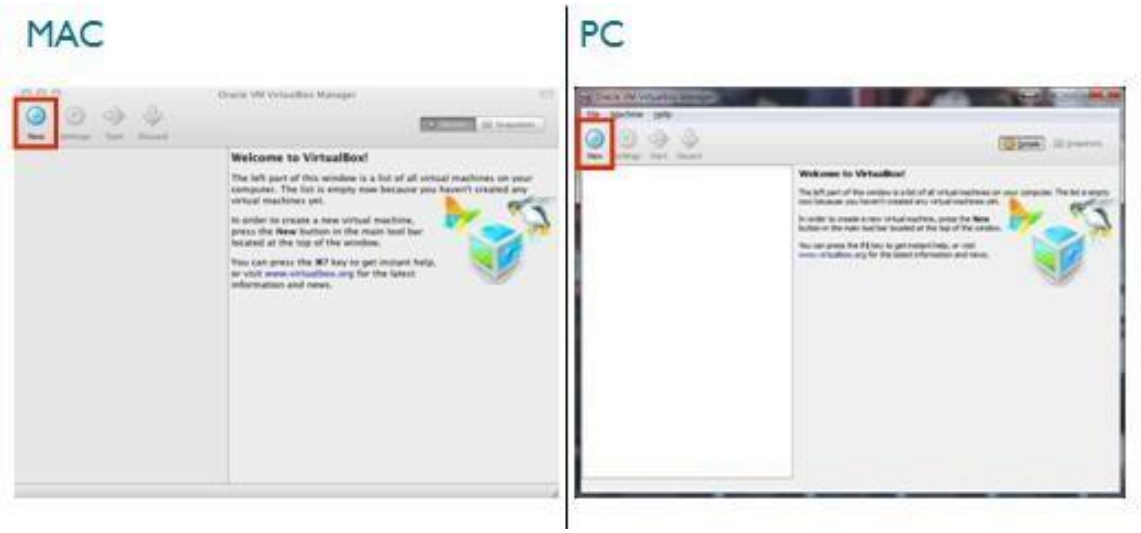
Download Linux

Step 1: Visit the page http://www.ubuntu.com/download/ubuntu/download
Step 2: Choose the Latest version of Ubuntu and 32-bit and click “Start Download”



Install Linux using Virtual Box

Step1: Run VirtualBox by double-clicking the icon
Step 2:Click “New” button on the top left corner

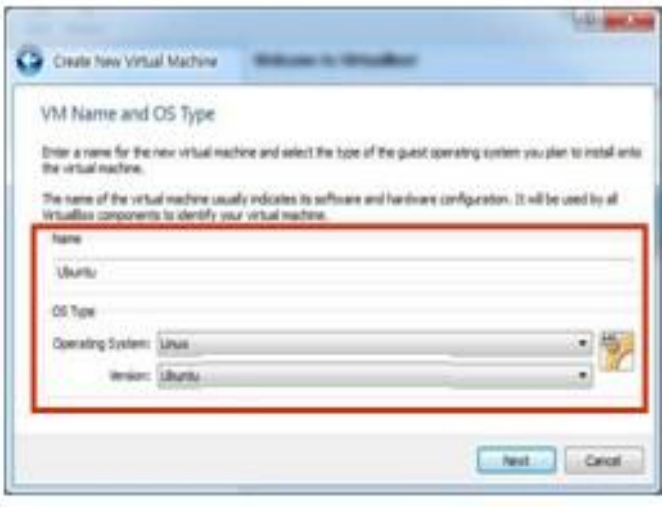


Install Linux using Virtual Box

Step 3; Click “Continue” on the pop-up window
Step 4:Type VN name, select “Linux” for the OS and choose “Ubuntu” for the version.

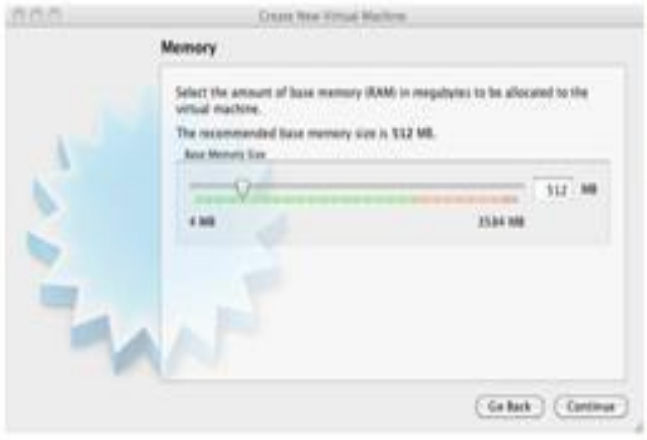
MAC

PC

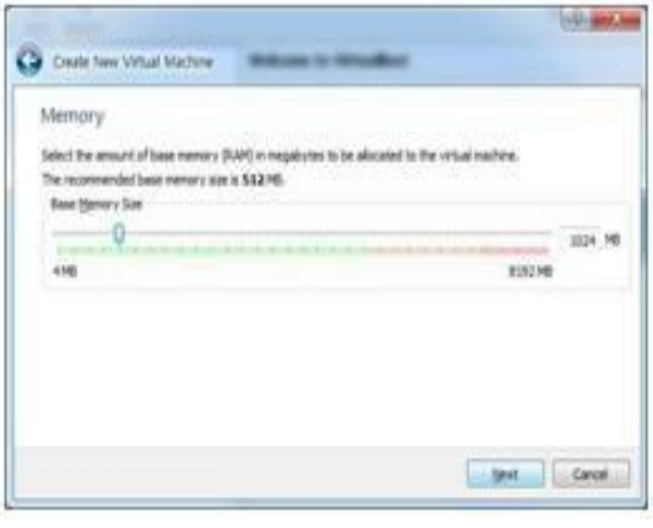


Step 5: Choose the amount of memory to allocate (I suggest choosing between 5I2 NB to I024 NB)
Step 6:Click Continue or Next

MAC



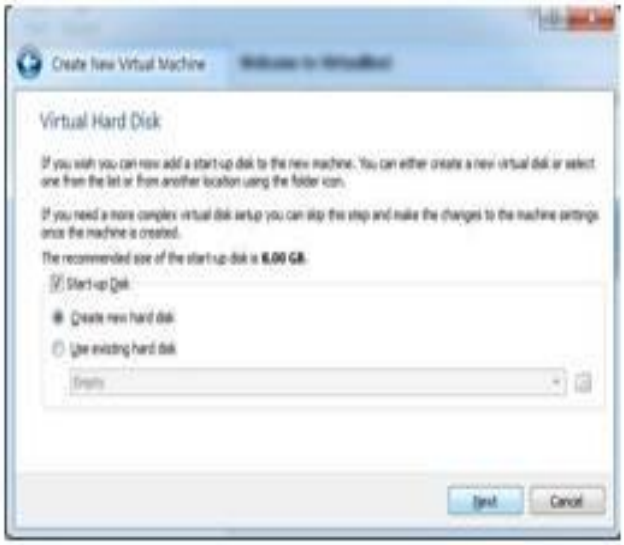
PC



Step 7: Choose create a new virtual hard disk
Step 8:Click Continue or Next

MAC

PC

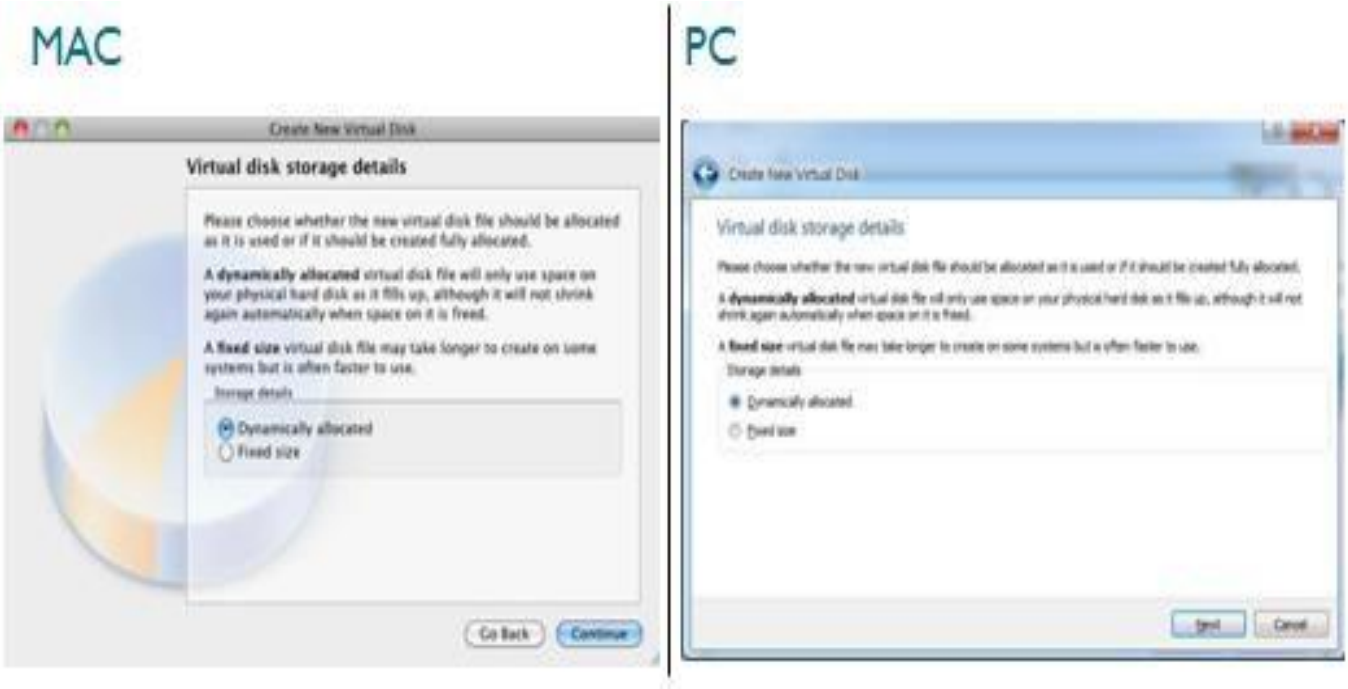


Step 9: Choose VDI (VirtualBox Disk Image)
Step 10: Click Continue or Next

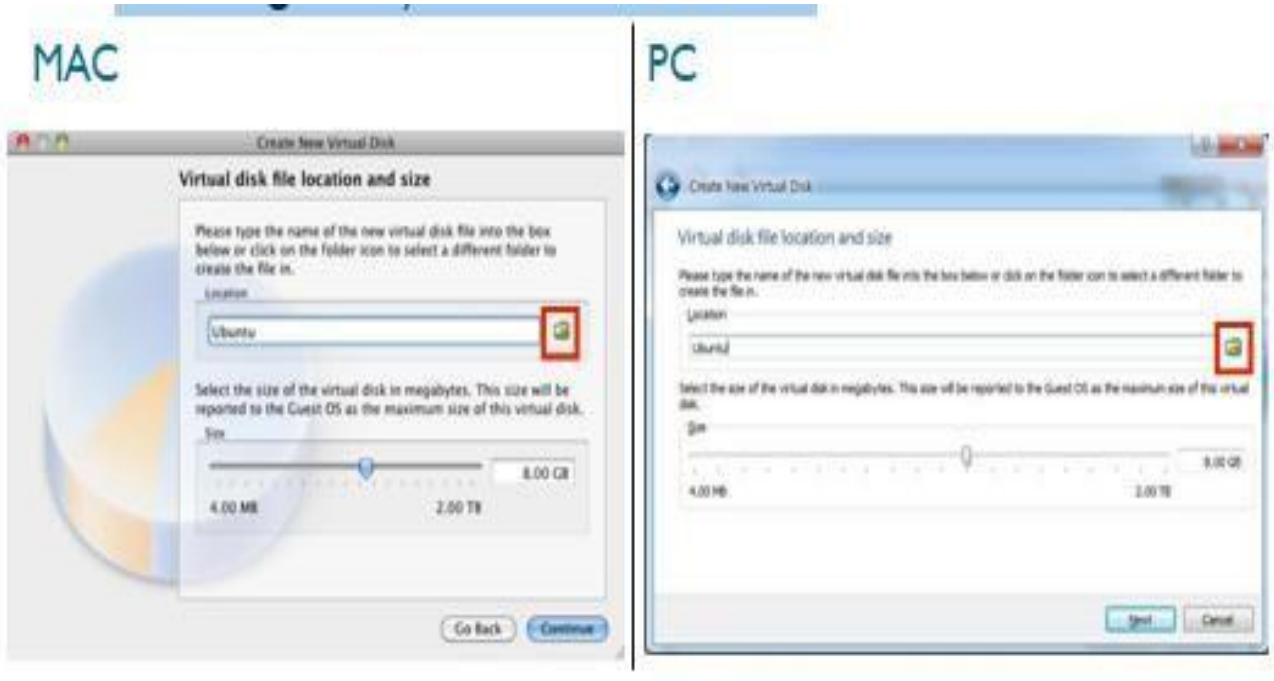
MAC

PC

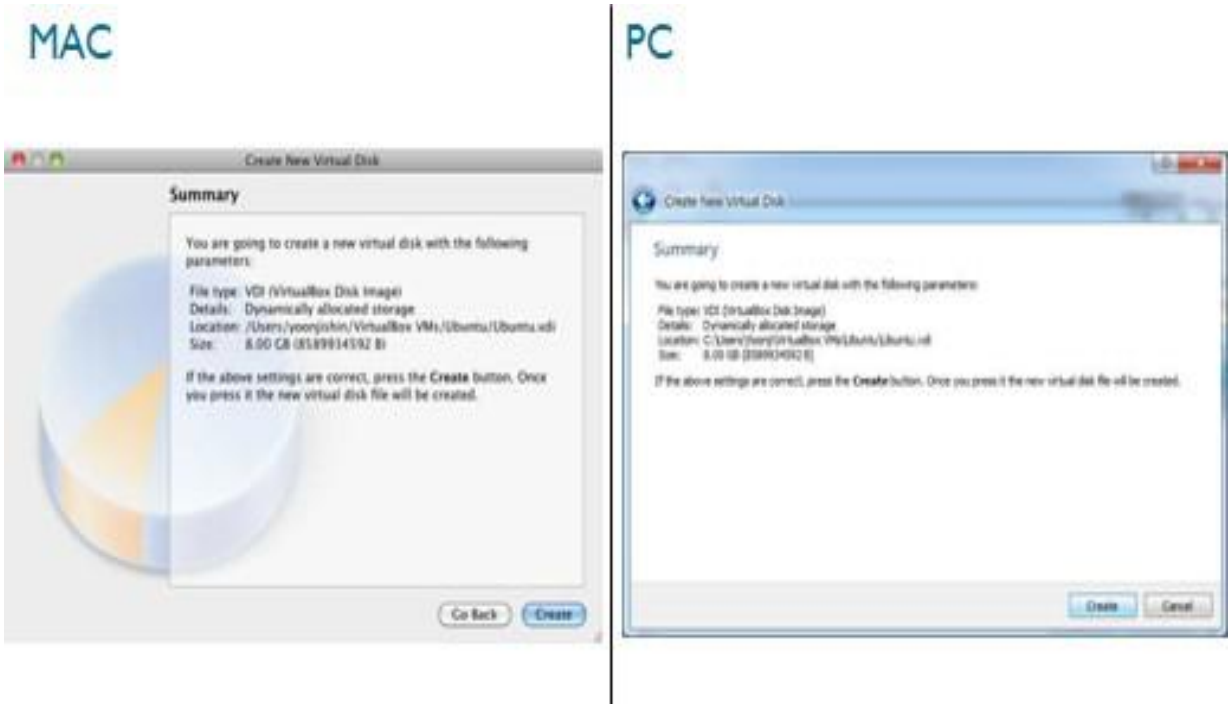
Step 11: Choose “Dynamically Allocated” click continue.
This way, the size of your Virtual Hard Disk will grow as you use.



Step 12; Click the folder icon and choose the ubuntu iso file you downloaded.
Step I3. Select the size of the Virtual Disk (I recommend choosing 8 GB) and click continue

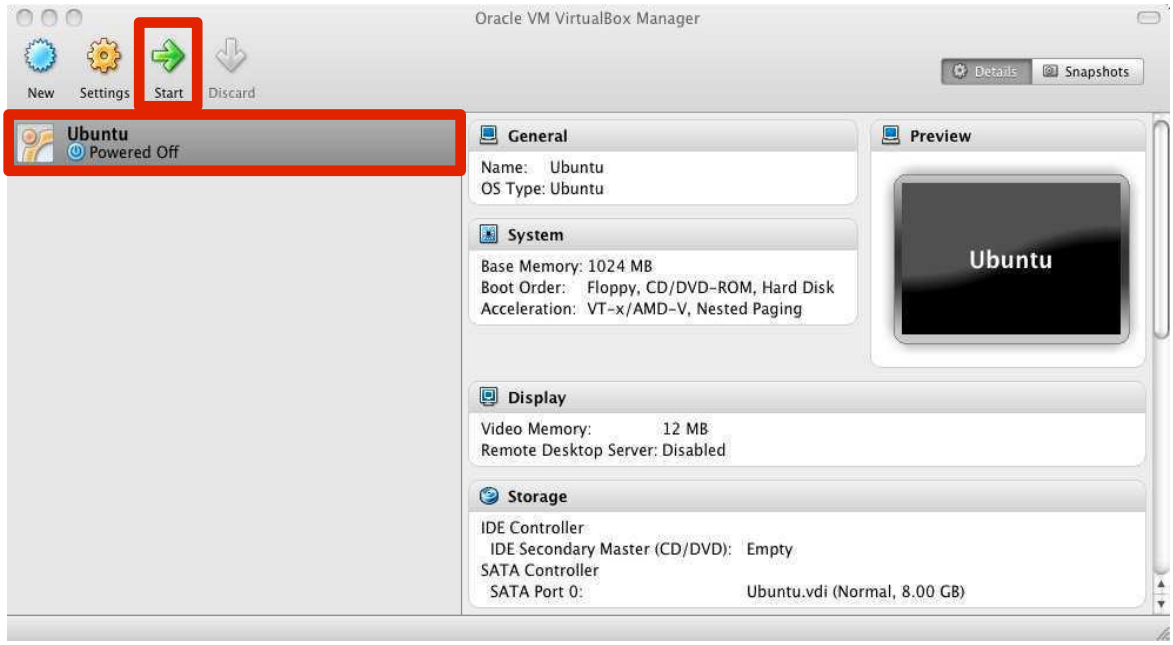


Step 14: Click Create



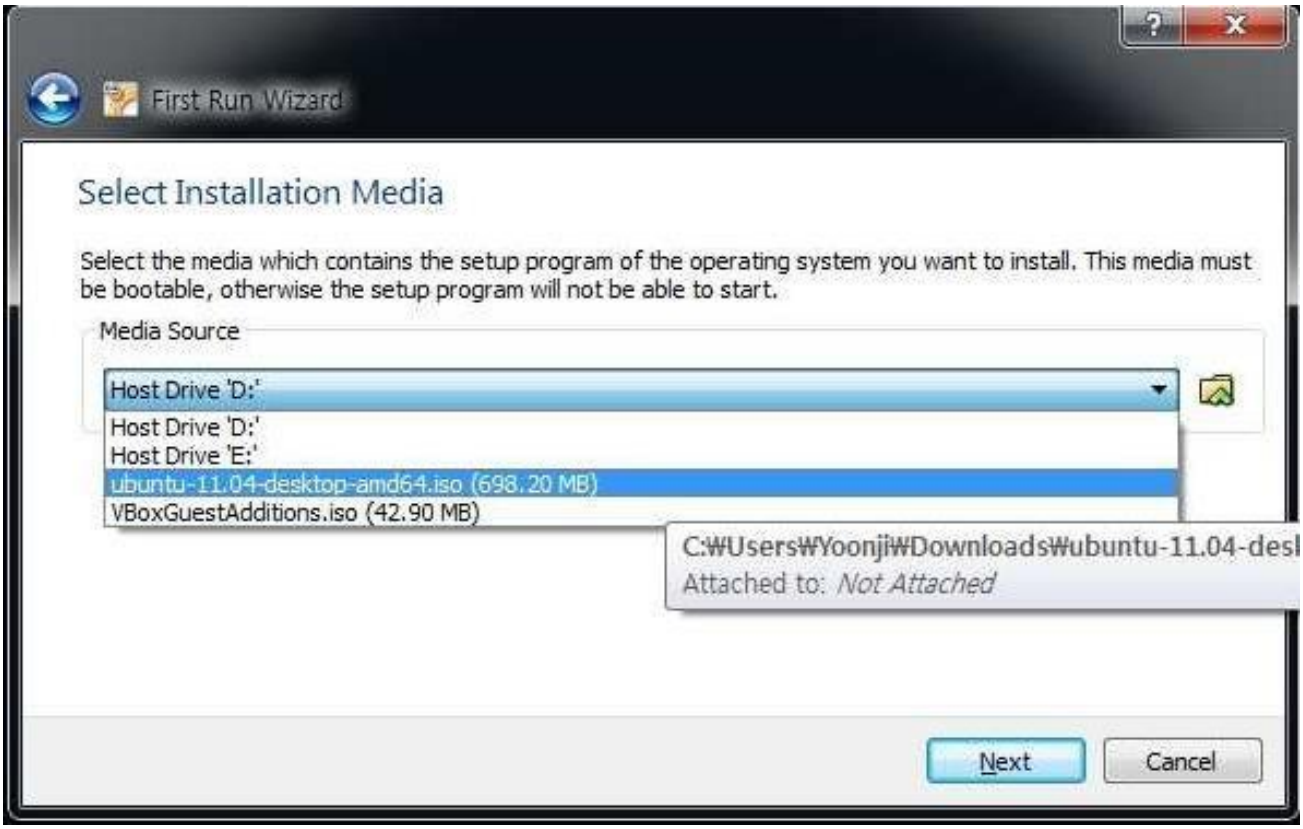
Running Linux

Step 1: Choose Ubuntu from left column and click Start

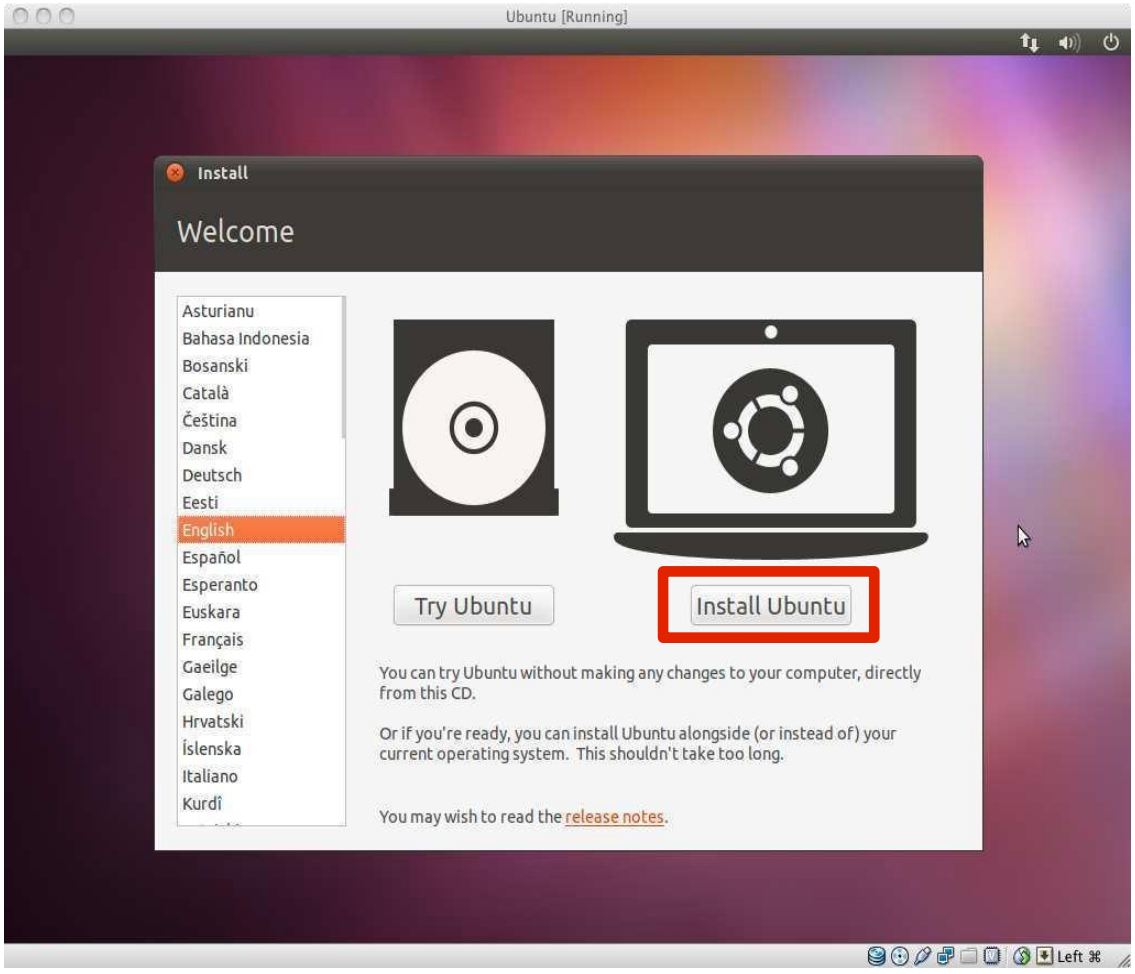


Step 2: Click continue on pop-up window

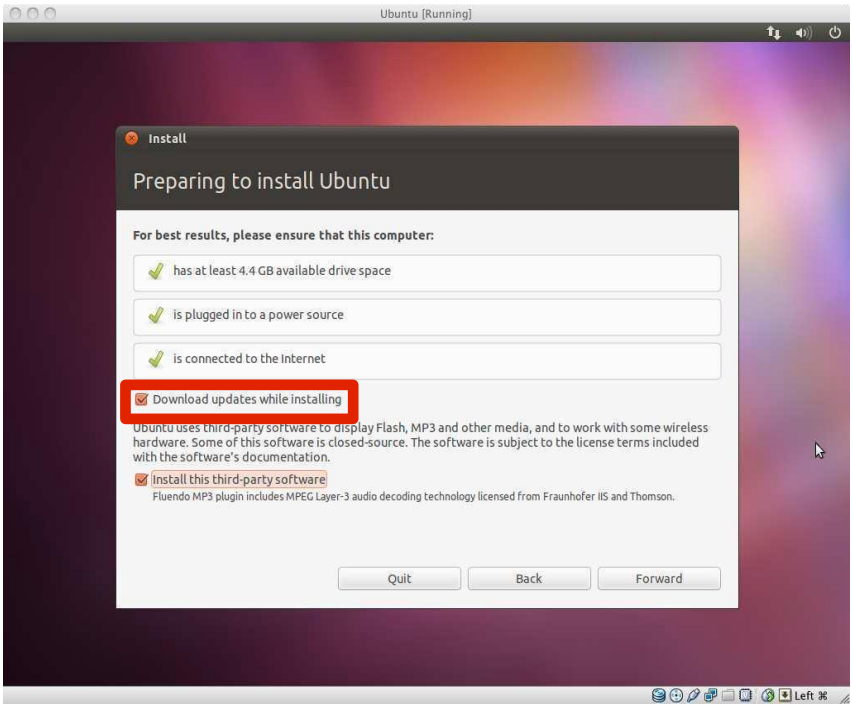
Step 3: Click the folder icon and choose the ubuntu iso file you downloaded and click continue and start



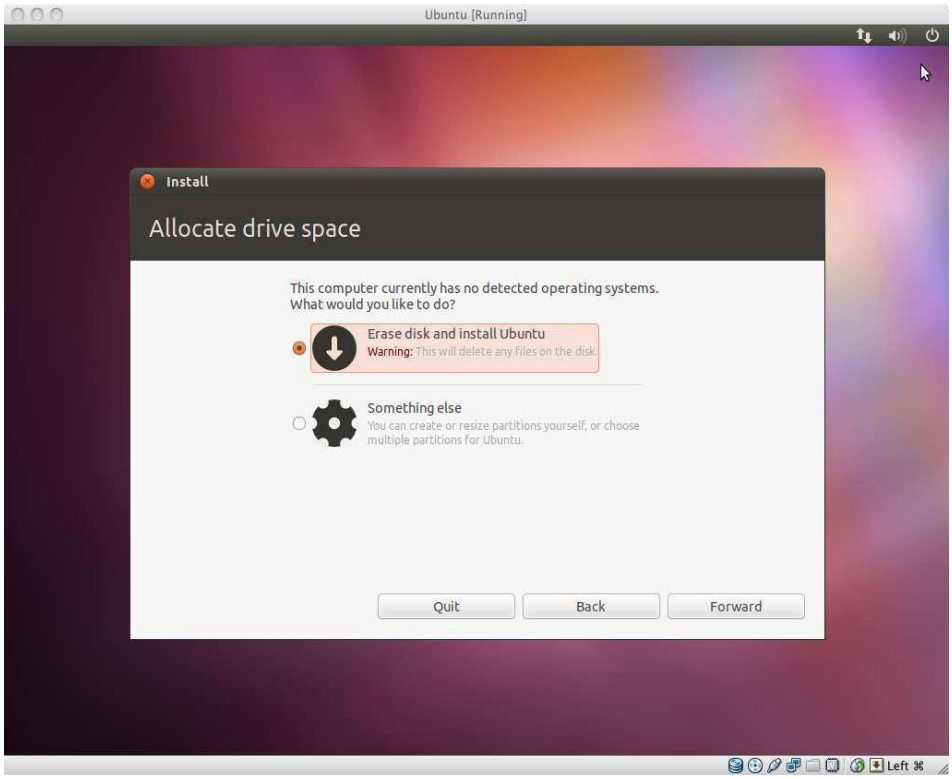
Step 4: Click Install Ubuntu



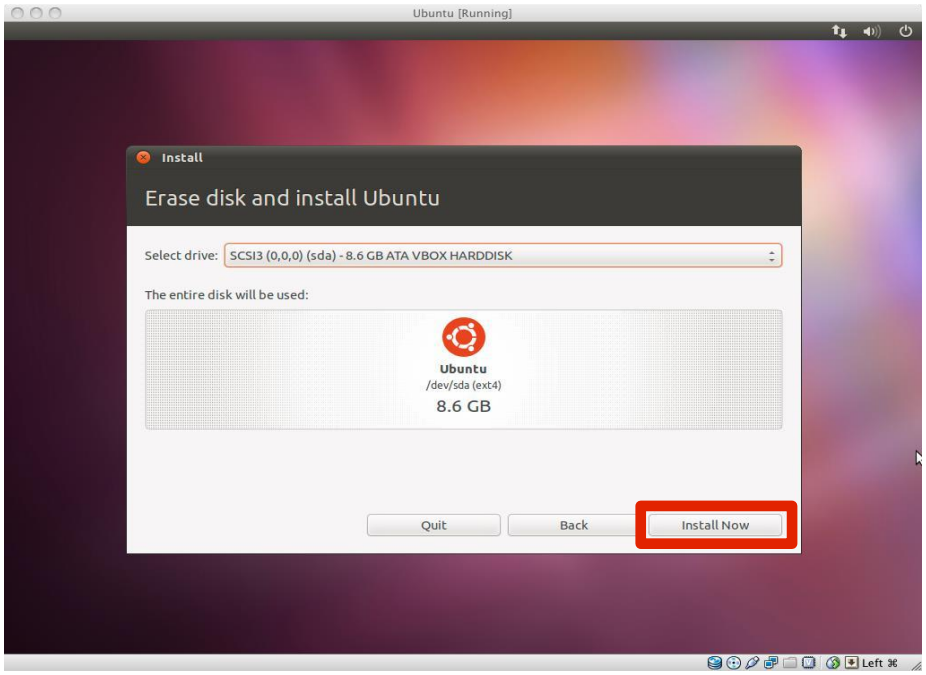
Step 5; Check “Download updates” and clickForward



Step 6; Choose “Erase disk and install Ubuntu” and click Forward (Don’t worry, it won’t wipe yourcomputer)

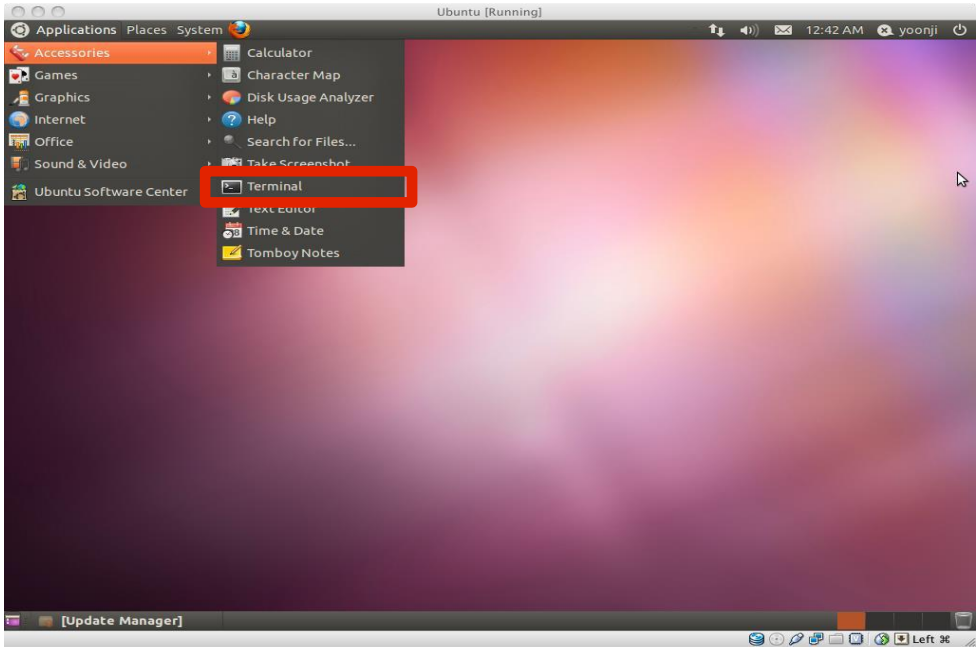


Step 6: Click “Install Now” and wait. Naybe grab a snack.
Step 7:When finished, click Restart and press Enter.

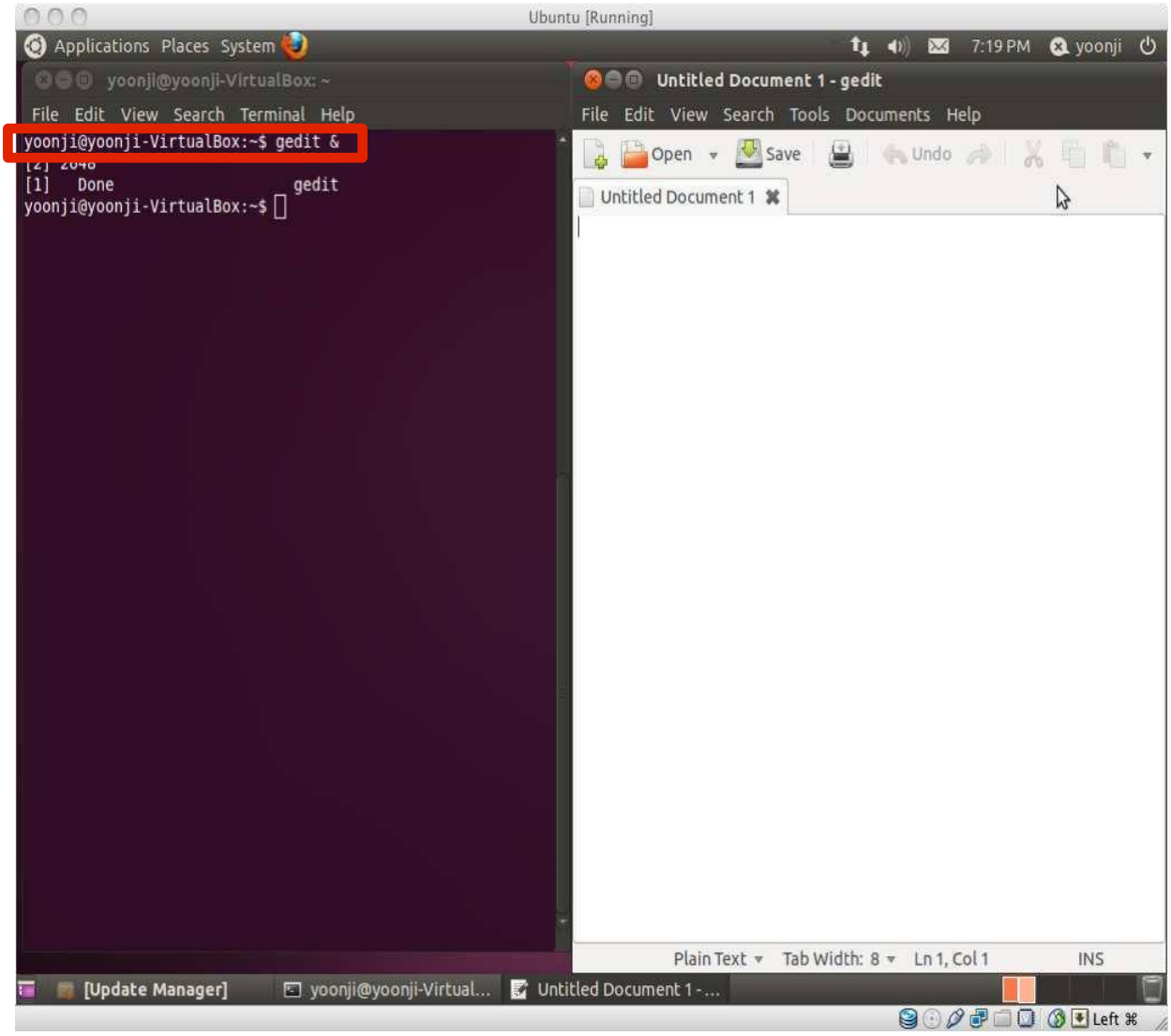


C Programming on Linux

Step 1: Open Terminal (Applications-Accessories-Terminal)



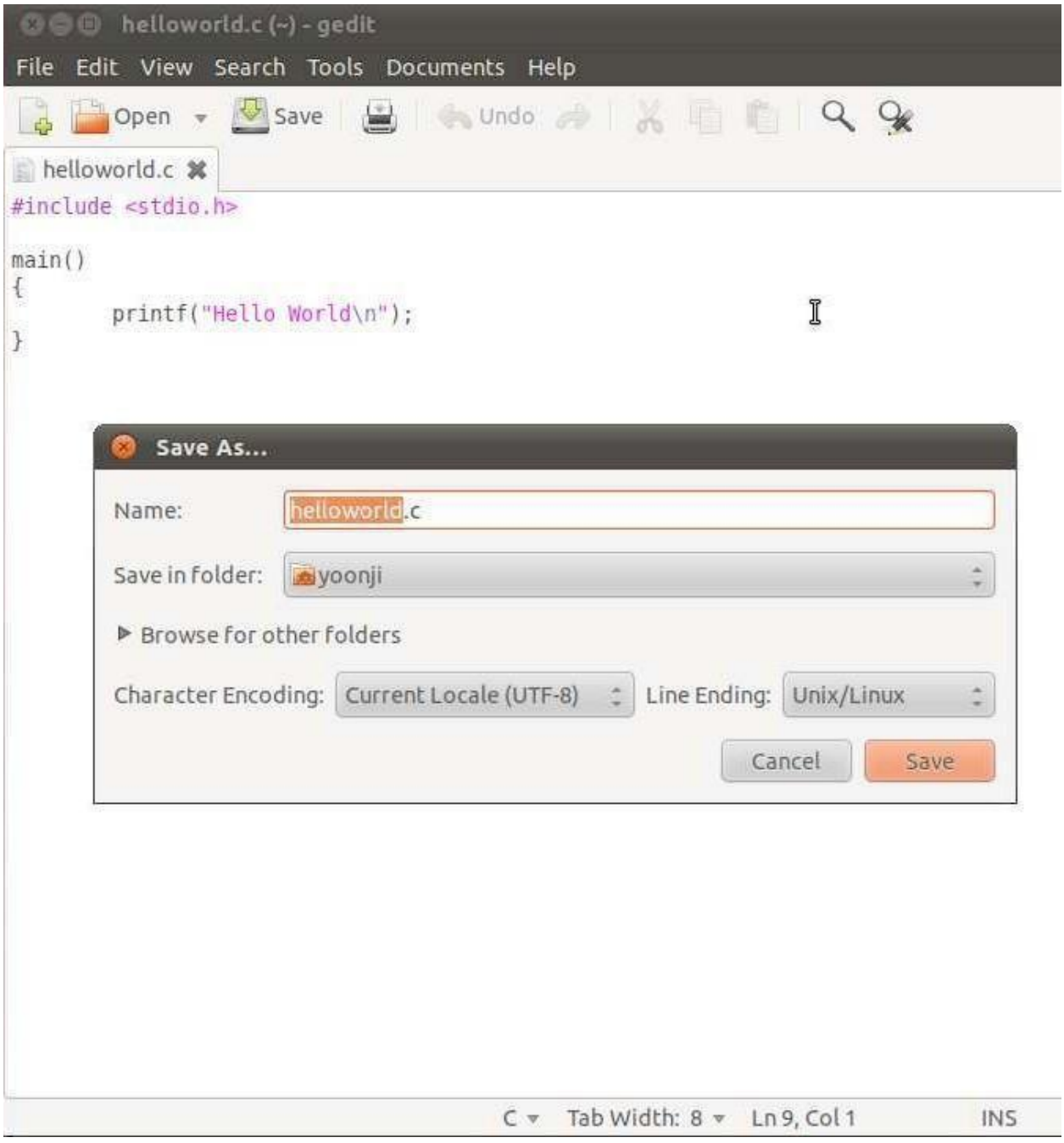
Step 2: Open gedit by typing “gedit &” on terminal (You can also use any other Text Editor application



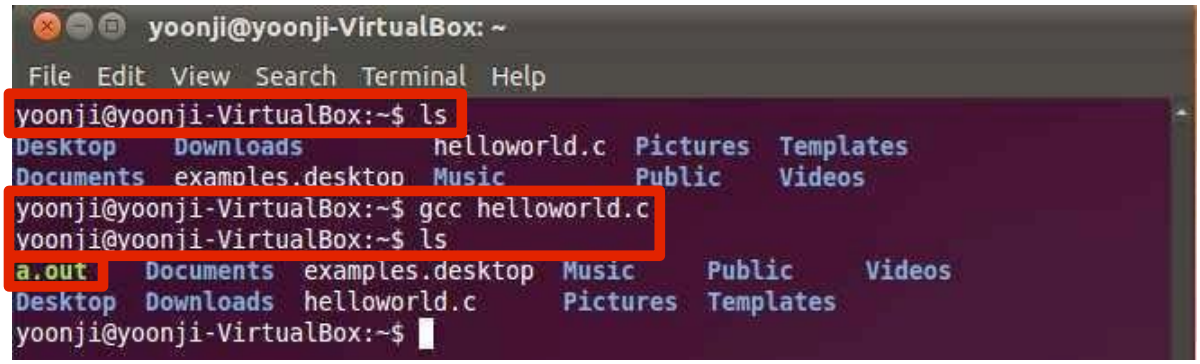
Step 3: Type the following on gedit (or any other text editor)

```
#include<stdio.h> main()
{
printf("Hello  World\n");
}
```

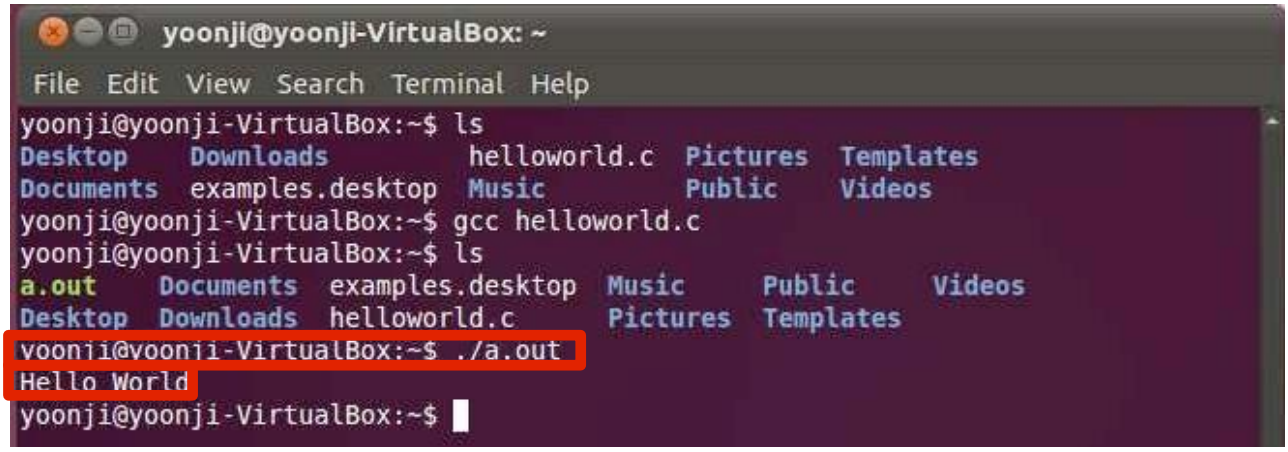
Step 4:Save this file as “helloworld.c”



Step 4: Type “ls” on Terminal to see all files under current folder
Step 5: Confirm that “helloworld.c” is in the current directory. If not, type cd DIRECTORY_PATH to go to the directory that has “helloworld.c”
Step 6:Type “gcc helloworld.c” to compile, and type “ls” to confirm that a new executable file “a.out” is created



Step 8:Type “./a.out” on Terminal to run the program
Step 9:If you see “Hello World” on the next line,you just successfully ran your first C program!
Step I0: Try other codes from “A Shotgun Introduction to C” on professor Edwards’s webpage.



RESULT:

Thus, C compiler is installed using virtual box and a program is executed successfully and output is verified.

Ex.No: 03 Installing and Running the Google App Engine On Windows
Date:

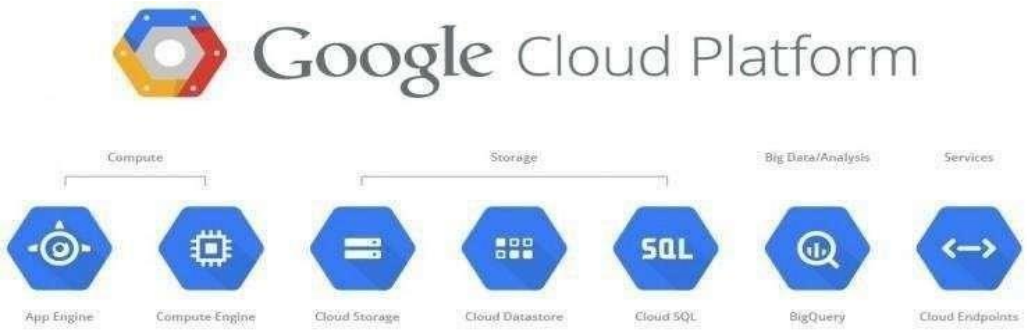
Aim

To install Google App Engine. Create hello world app and other simple web applications using python/java and to Use GAE launcher to launch the web applications

Procedure

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 solutionstack 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.

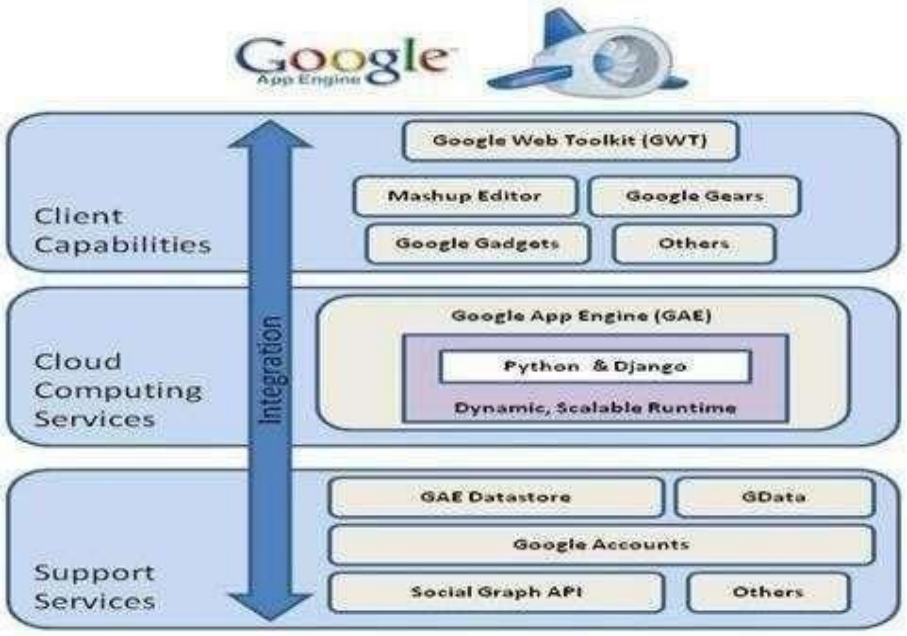
- Google‘s App Engine opens Google‘s production to any person in the world atno charge.
- Google App Engine is software that facilitates the user to run his webapplications on Google infrastructure.
- It is more reliable because failure of any server will not affect either theperformance of the end user or the service of the Google.
- It virtualizes applications across multiple servers and data centers.
  - Other cloud-based platforms include offerings such as Amazon WebServices and Microsoft's Azure Services Platform.

Introduction of Google App Engine

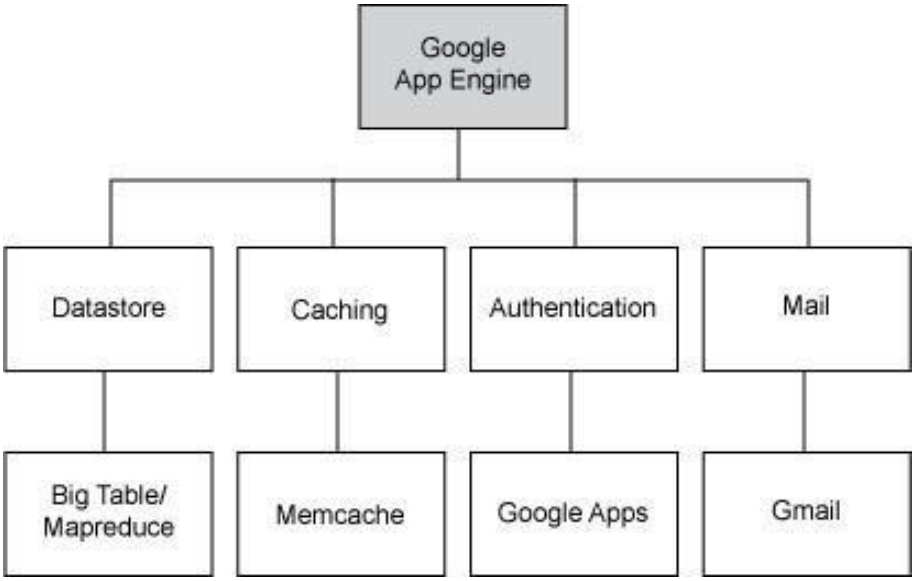
- Google App Engine lets you run your web applications on Google's infrastructure. App Engine applications are easy to build, easy to maintain,and easy to scale as your traffic and data storage needs grow. With App Engine, there are no servers to maintain: You just upload your application, and it's ready 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 Javaprogramming language—or any other language using a JVM-based interpreteror 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 limitsare raised, and you only pay for resources you use above the free levels.

- **Architecture of Google App Engine**



- **Features of Google App Engine**



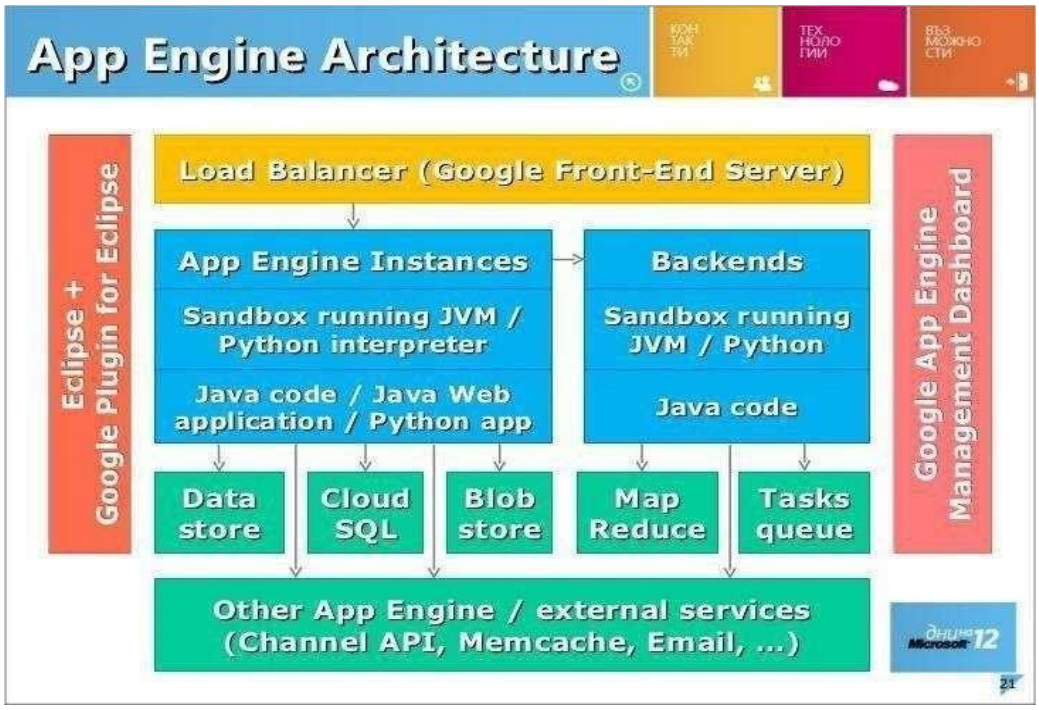
GAE Application Environment:

- 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

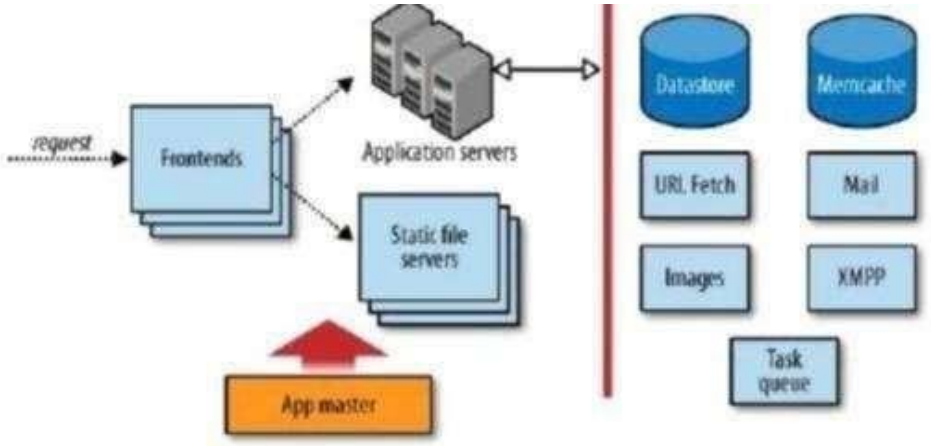
Java Runtime Environment

- 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 languagesto develop web applications, such as JavaScript, Ruby.



 Workflow of Google App Engine



This document describes the installation of the Google App Engine Software Development Kit (SDK) on a Microsoft Windows and running a simple “hello world” application.The App Engine SDK allows you to run Google App Engine Applications on your local computer. It simulates the run---time environment of the Google App Engine infrastructure.

Pre--Requisites: Python 2.5.4

If you don't already have Python 2.5.4 installed in your computer, download and Install Python 2.5.4 from:

http://www.python.org/download/releases/2.5.4/

Download and Install
You can download the Google App Engine SDK by going to:
http://code.google.com/appengine/downloads.html
and download the appropriate install package.

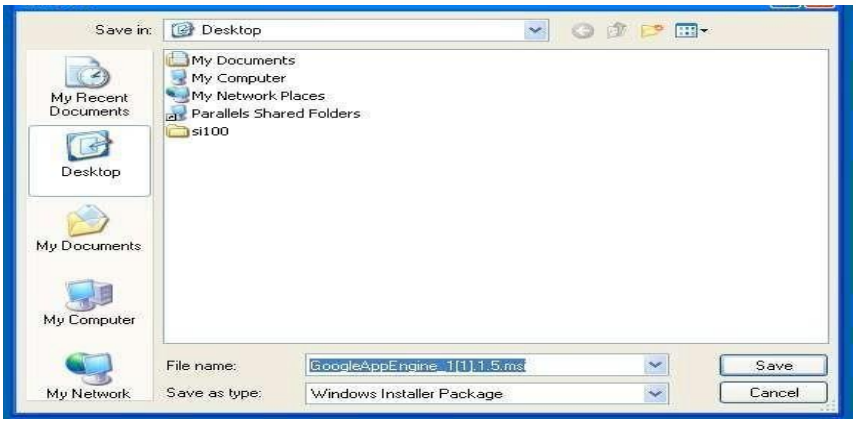
Download the Google App Engine SDK

Before downloading, please read the Terms that govern your use of the App Engine SDK.

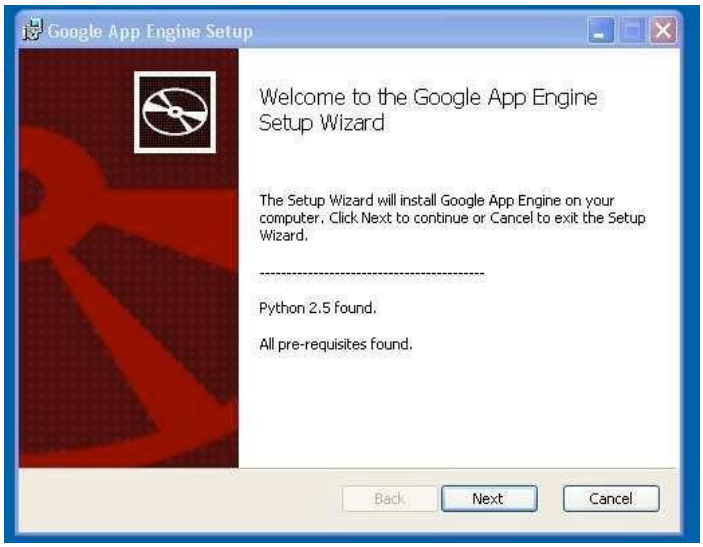
Please note: The App Engine SDK is under **active development**, please keep this in mind as you explore its capabilities. See the SDK Release Notes for the information on the most recent changes to the App Engine SDK. If you discover any issues, please feel free to notify us via our Issue Tracker.

Platform	Version	Package	Size	SHA1 Checksum
Windows	1.1.5 - 10/03/08	GoogleAppEngine_1.1.5.msi	2.5 MB	e974312b4aefc0b3873ff0d93eb4c525d5e88c30
Mac OS X	1.1.5 - 10/03/08	GoogleAppEngineLauncher-1.1.5.dmg	3.6 MB	f62208ac01c1b3e39796e58100d5f1b2f052d3e7
Linux/Other Platforms	1.1.5 - 10/03/08	google_appengine_1.1.5.zip	2.6 MB	cbb9ce817bdabf1c4f181d9544864e55ee253de1

or



Double Click on the **GoogleApplicationEngine** installer.



Click through the installation wizard, and it should install the App Engine. If you do not have Python 2.5, it will install Python 2.5 as well.

Once the install is complete you can discard the downloaded installer

Making your First Application

Now you need to create a simple application. We could use the "+" option to have the launcher make us an application – but instead we will do it by hand to get a better sense of what is going on.

Make a folder for your Google App Engine applications. I am going to make the Folder on my Desktop called "**apps**" – the path to this folder is:

C:\Documents and Settings\csev\Desktop\apps

And then make a sub---folder in within **apps** called "**ae--01--trivial**" – the path to this folder would be:

C:\ Documents and Settings \csev\Desktop\apps\ae--01--trivial

Using a text editor such as JEdit (www.jedit.org), create a file called **app.yaml** in the **ae--01--trivial** folder with the following contents:

```
application: ae-
01-trivial
```

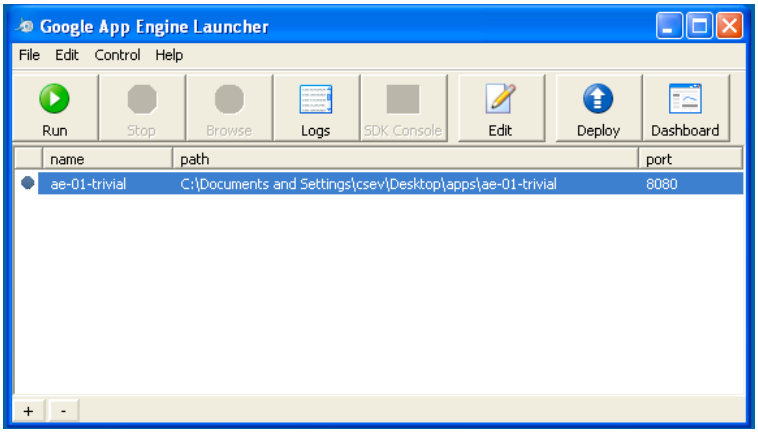
```
version: 1
runtime: python
api_version: 1

handlers:
- url: /.*
  script: index.py
```

Note: Please do not copy and paste these lines into your text editor – you might end up with strange characters – simply type them into your editor. Then create a file in the **ae--01--trivial** folder called **index.py** with three lines in it:

```
print 'Content-Type:
text/plain' print ' '
print 'Hello there Chuck'
```

Then start the **GoogleAppEngineLauncher** program that can be found under **Applications**. Use the **File --> Add Existing Application** command and navigate into the **apps** directory and select the **ae--01--trivial** folder. Once you have added the application, select it so that you can control the application using the launcher.



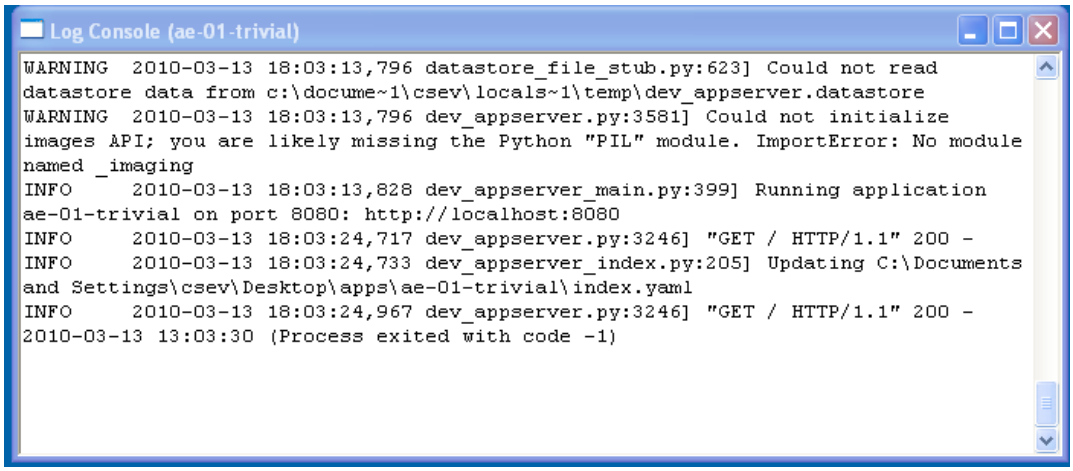
Once you have selected your application and press **Run**. After a few moments your application will start and the launcher will show a little green icon next to your application. Then press **Browse** to open a browser pointing at your application which is running at **http://localhost:8080/**

Paste **http://localhost:8080** into your browser and you should see your application as follows:

Just for fun, edit the **index.py** to change the name "Chuck" to your own name and press Refresh in the browser to verify your updates.

Watching the Log

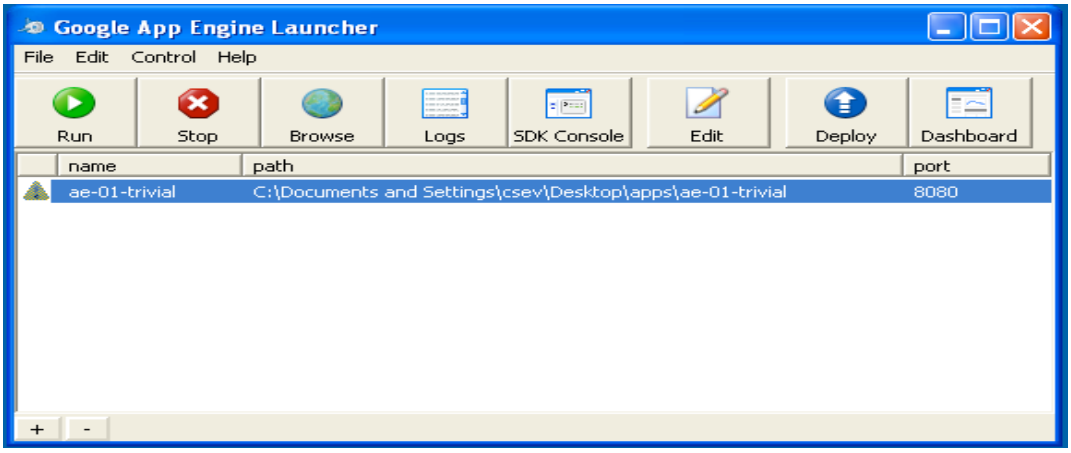
You can watch the internal log of the actions that the web server is performing when you are interacting with your application in the browser. Select your application in the Launcher and press the **Logs** button to bring up a log window:



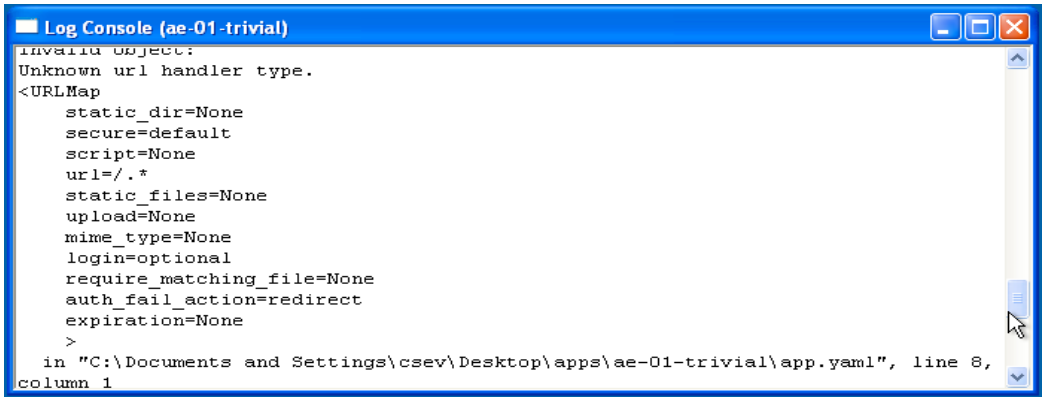
Each time you press **Refresh** in your browser – you can see it retrieving the output with a **GET** request.

Dealing With Errors

With two files to edit, there are two general categories of errors that you may encounter. If you make a mistake on the app.yaml file, the App Engine will not start and your launcher will show a yellow icon near your application:

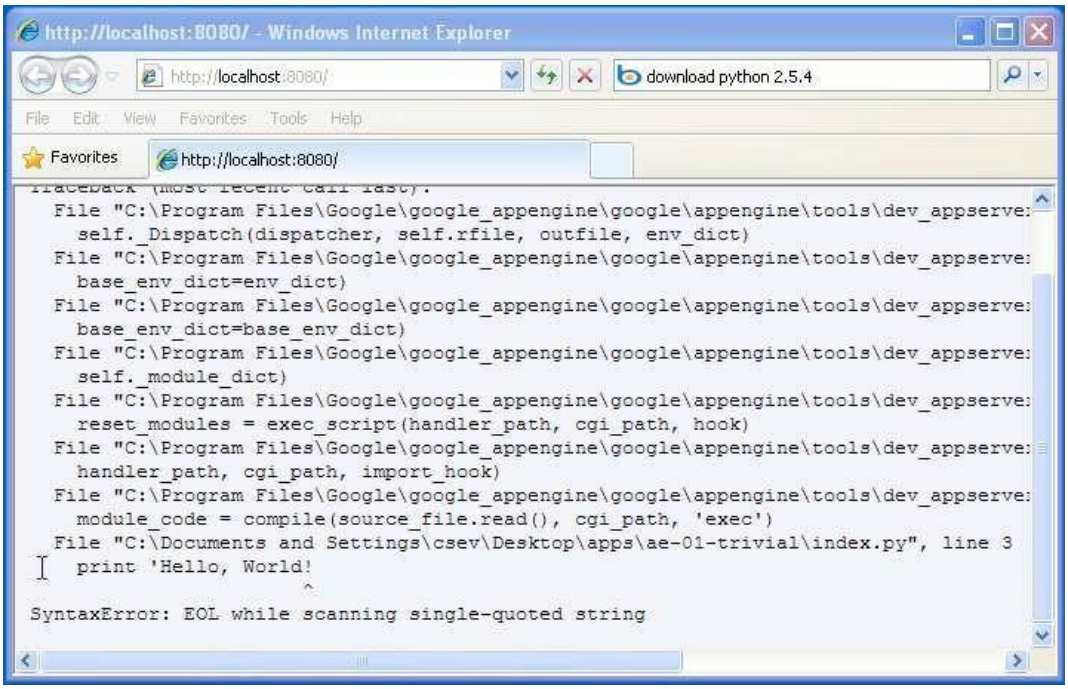


To get more detail on what is going wrong, take a look at the log for the application:



In this instance – the mistake is mis---indenting the last line in the **app.yaml** (line 8).

If you make a syntax error in the **index.py** file, a Python trace back error will appear in your browser.



The error you need to see is likely to be the last few lines of the output – in this case I made a Python syntax error on line one of our one---line application.

Reference: http://en.wikipedia.org/wiki/Stack_trace

When you make a mistake in the **app.yaml** file – you must the fix the mistake and attempt to start the application again.

If you make a mistake in a file like i**ndex.py**, you can simply fix the file and press refresh in your browser – there is no need to restart the server.

Shutting Down the Server

To shut down the server, use the Launcher, select your application and press the **Stop** button.

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: 04.A **Simulate a cloud scenario using CloudSim**

Date:

Aim

To simulate a cloud scenario using CloudSim

Procedure

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**

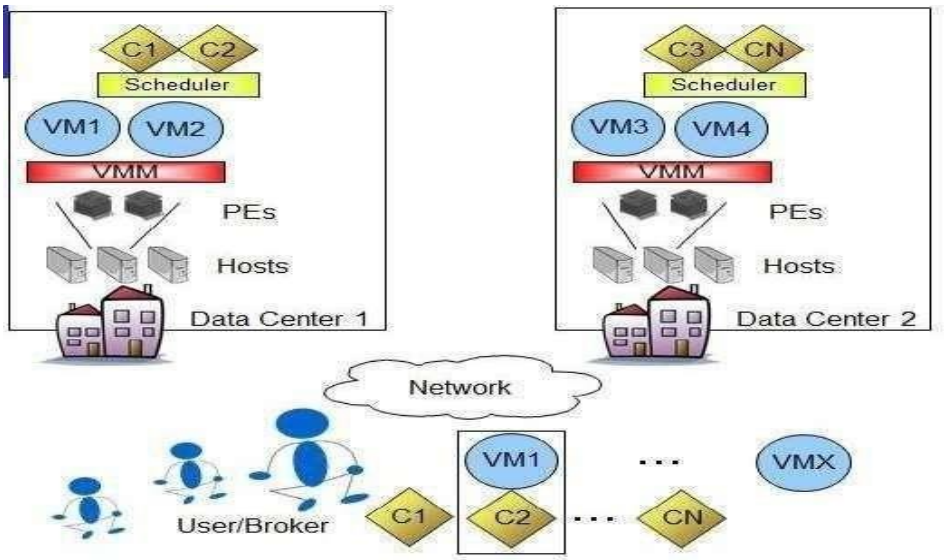
- **Cloudsim - Component model classes**
  - CloudInformationService.java
  - Datacenter.java,Host.java,Pe.java
  - Vm.java,Cloudlet.java
  - DatacenterBroker.java
  - Storage.java,HarddriveStorage.java, SanStorage.java

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.

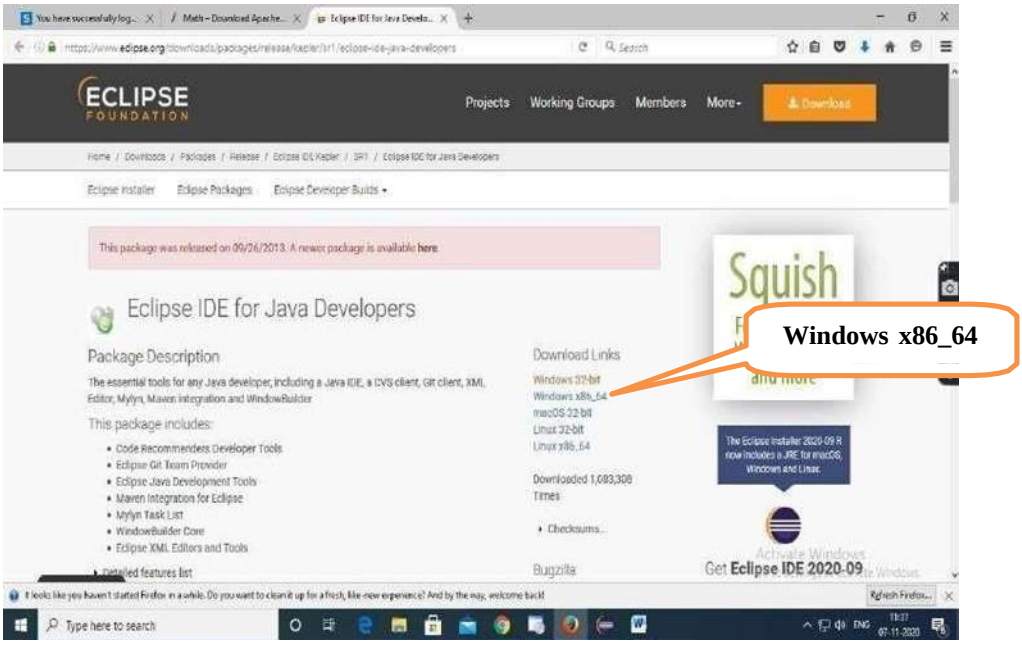


CloudSim Elements/Components

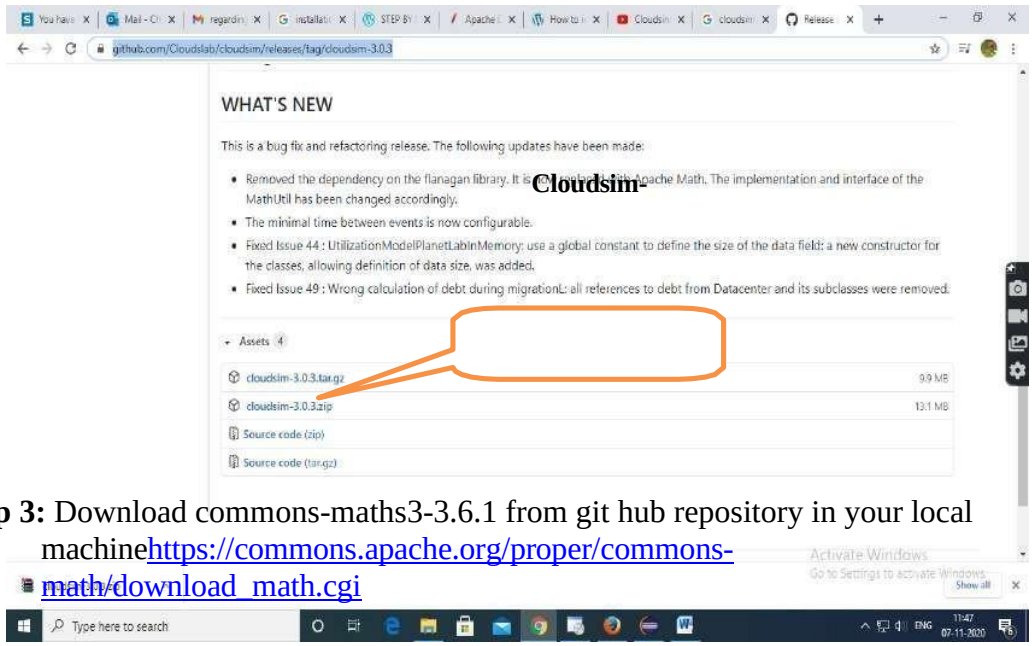
Procedure to import Eclipse, Cloudsim in your system

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

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

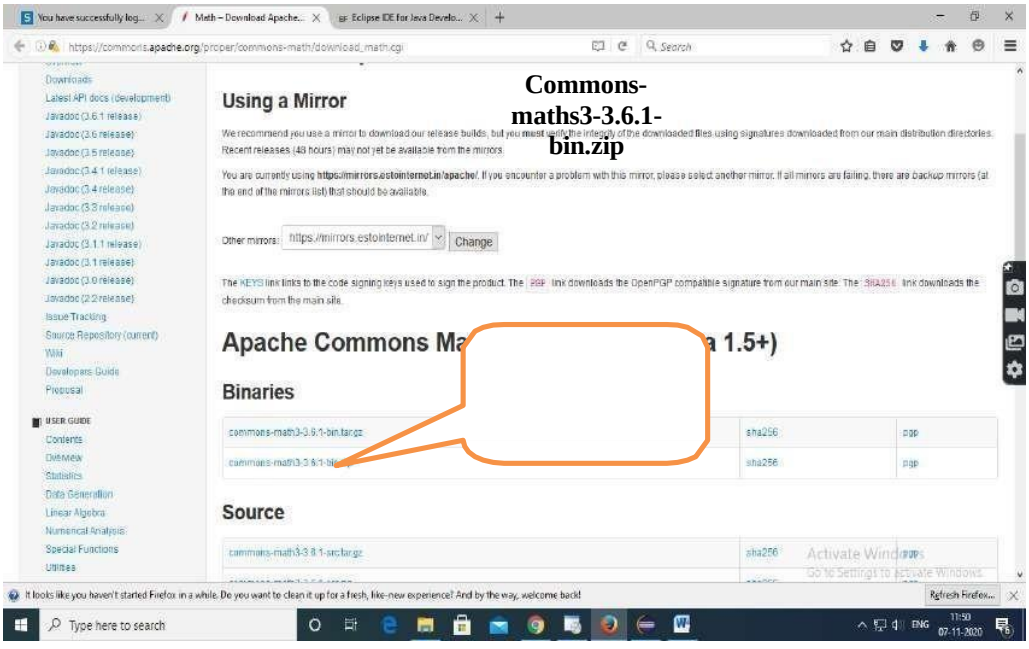


Step 2: Download cloudsim-3.0.3 from git hub repository in your local machine
https://github.com/Cloudslab/cloudsim/releases/tag/cloudsim-3.0.3



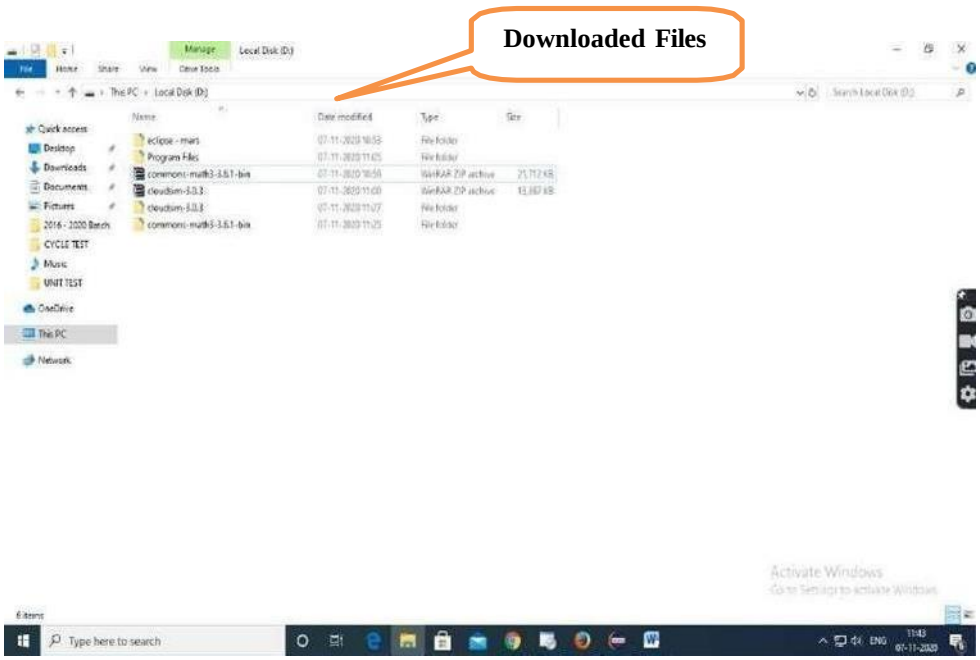
Cloudsim-

Step 3: Download commons-maths3-3.6.1 from git hub repository in your local machinehttps://commons.apache.org/proper/commons-math/download_math.cgi

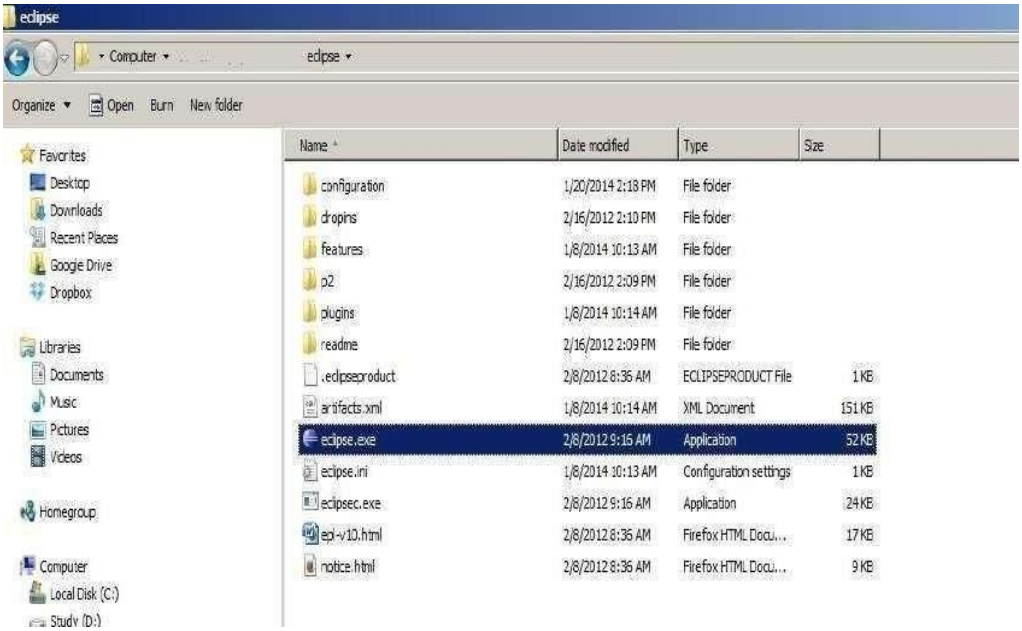


Commons-maths3-3.6.1-bin.zip

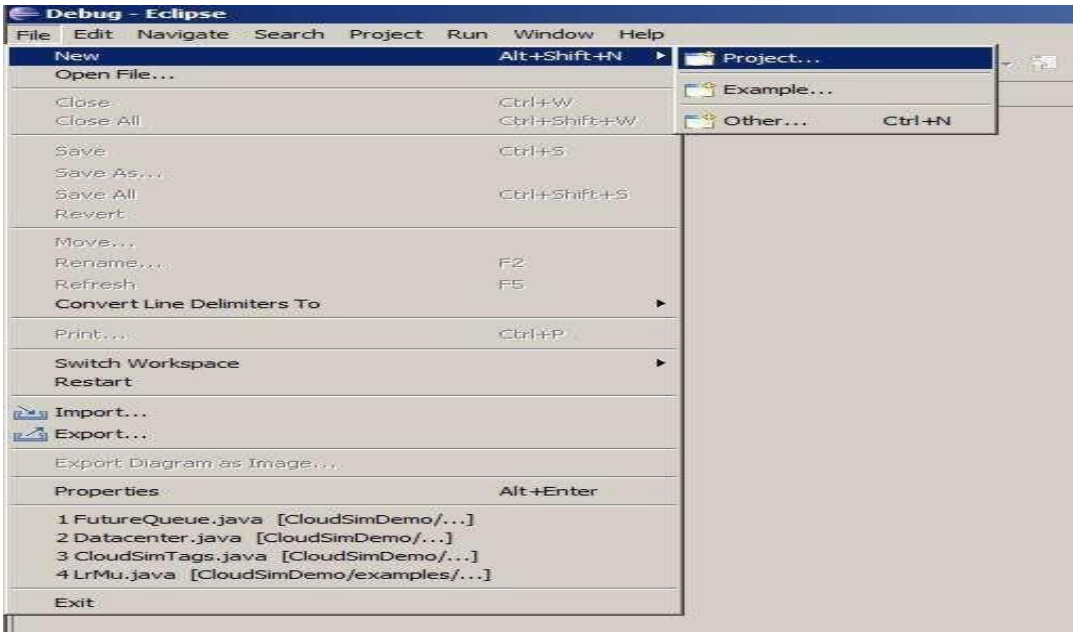
Step 4: Downloaded Eclipse, cloudsim-code-master and Apache Commons Math 3.6.1 inyour local machine and extract cloudsim-3.0.3 and Apache Commons Math 3.6.1



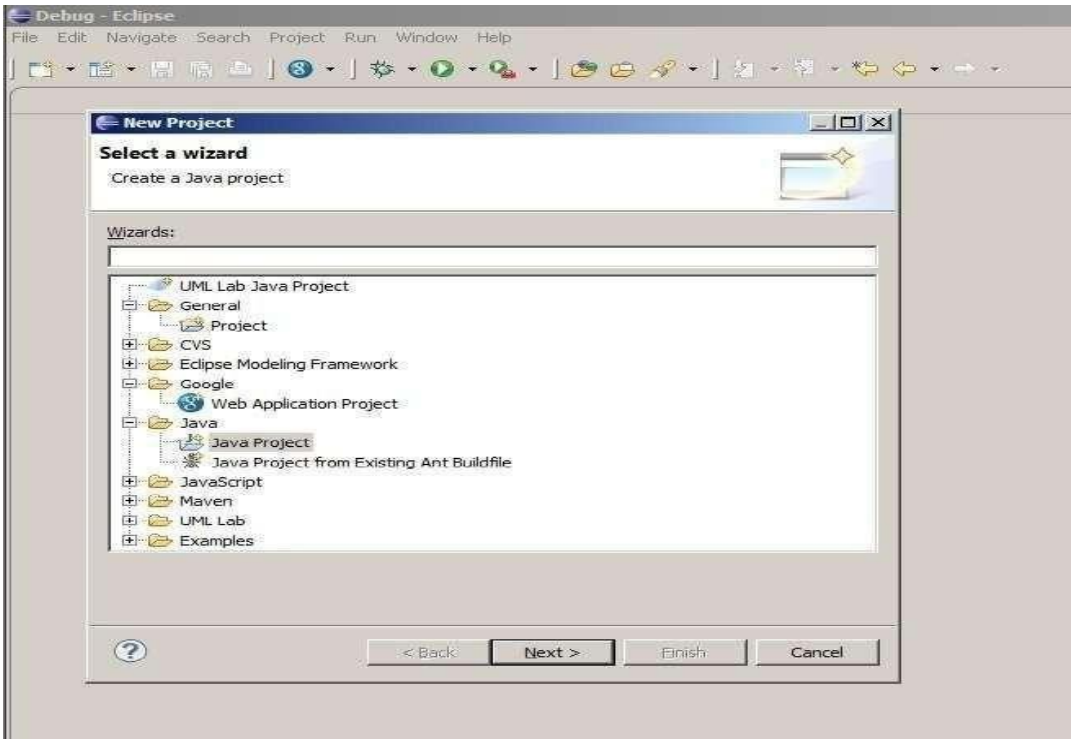
Step 5: First of all, navigate to the folder where you have unzipped the eclipse folder andopen Eclipse.exe



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

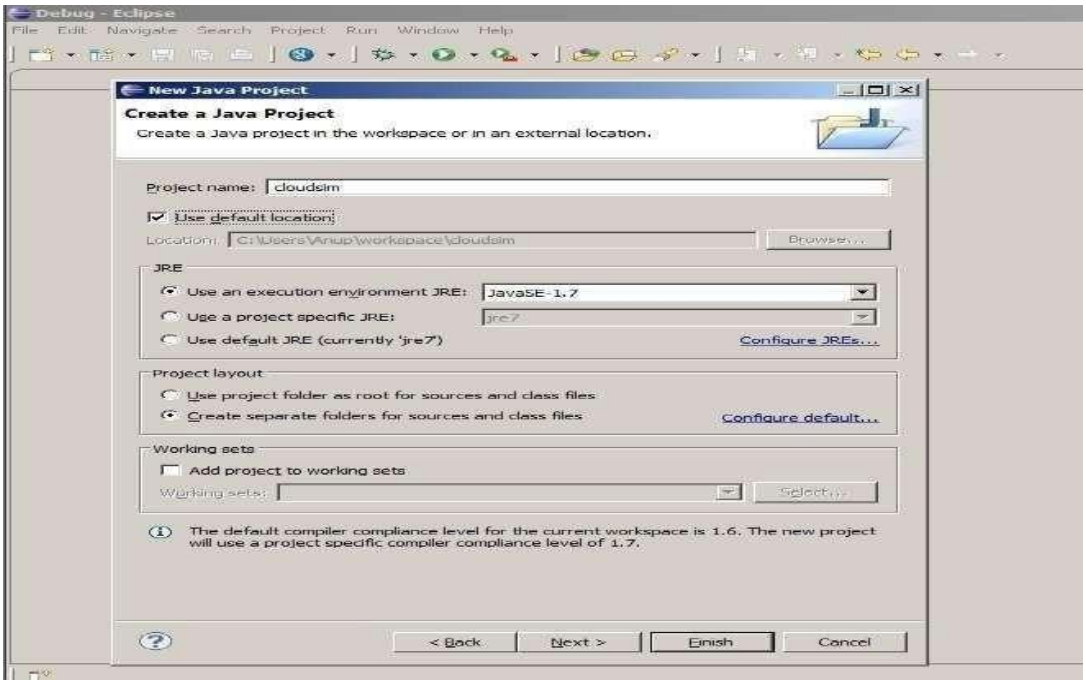


Step 7: A *_New Project_* wizard should open. There are a number of options displayed and you have to find & select the *_Java Project_* option, once done click *'Next_*

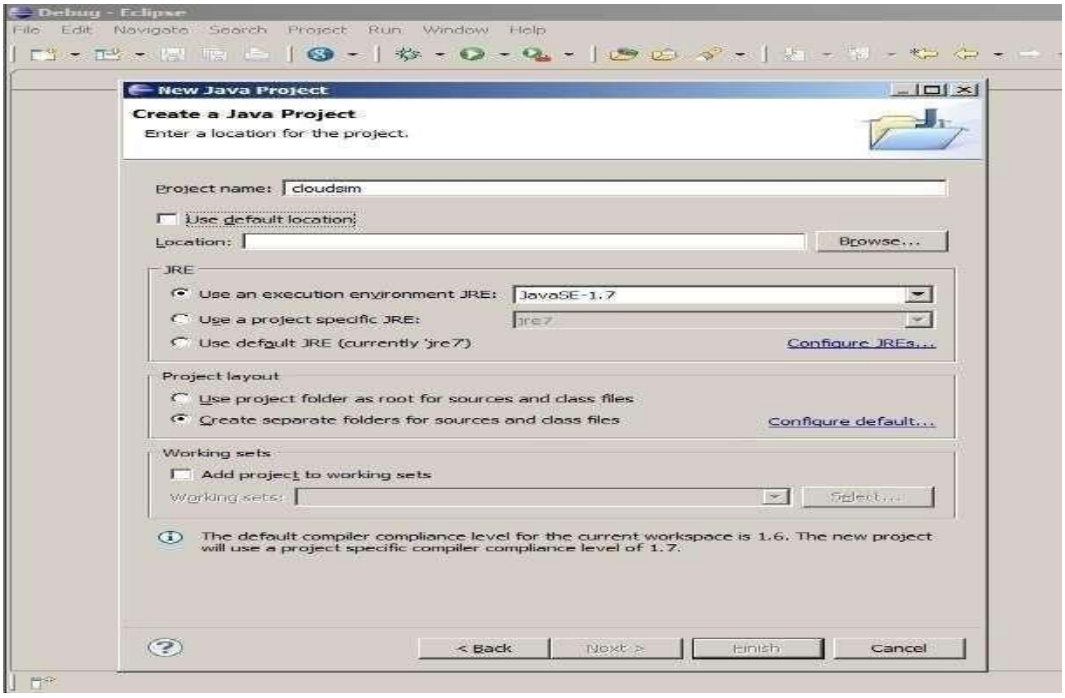


Step 8: Now a detailed new project window will open, here you will provide the project name andthe path of CloudSim project source code, which will be done as follows:

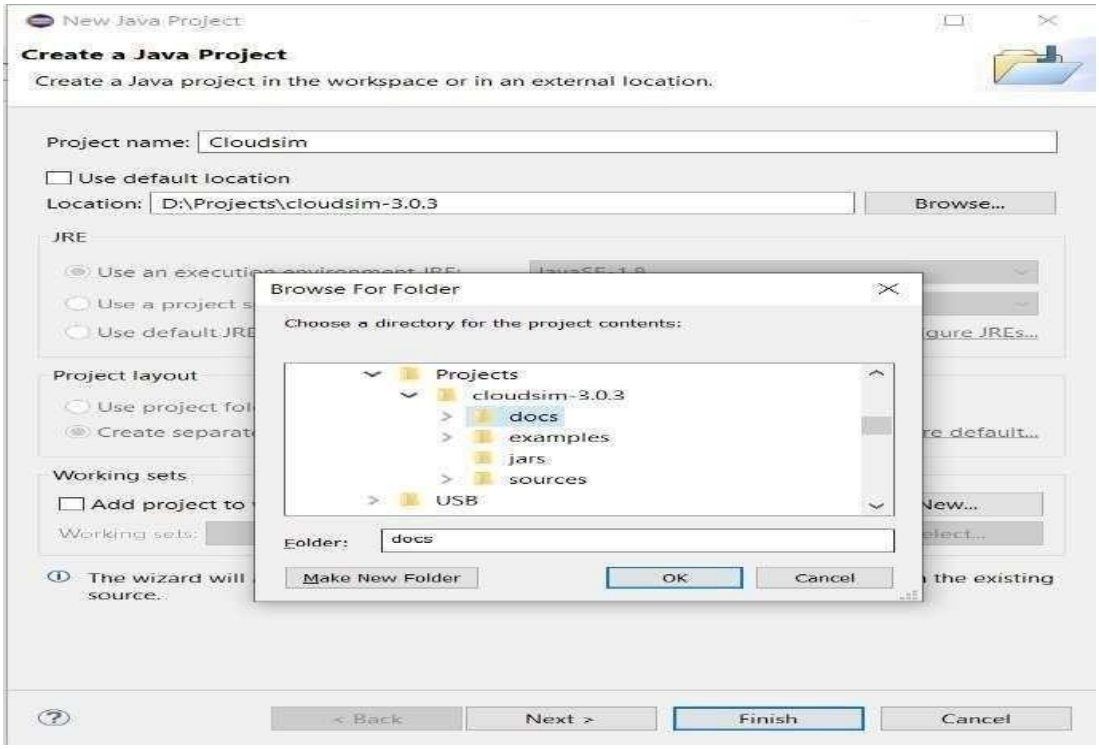
Project Name: CloudSim.



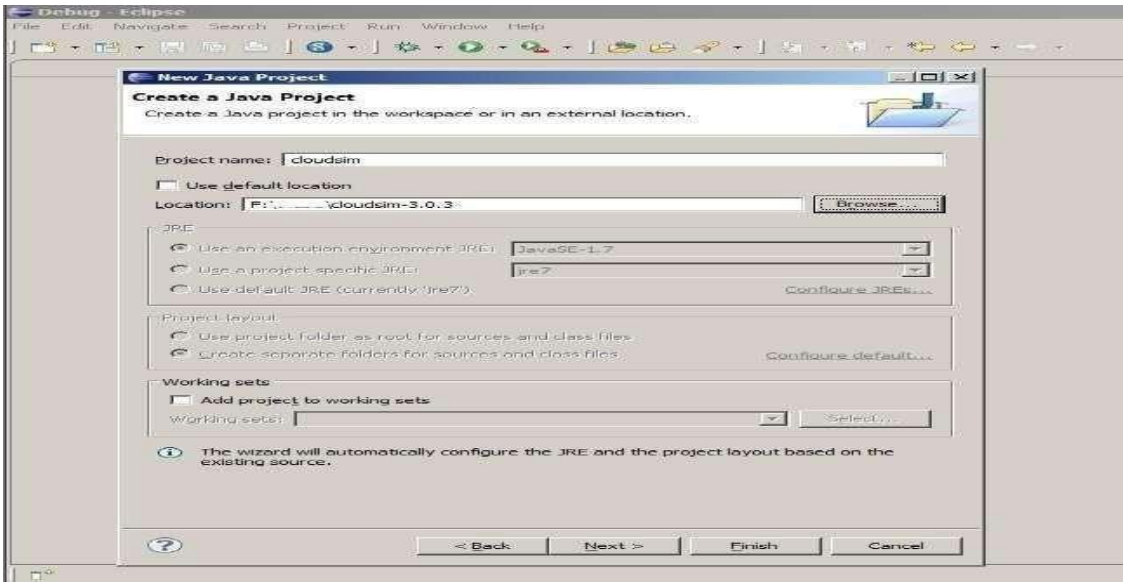
Step 9: Unselect the *'Use default location'* option and then click on *'Browse'* to open the path where you have unzipped the Cloudsim project and finally click Next to set project settings.



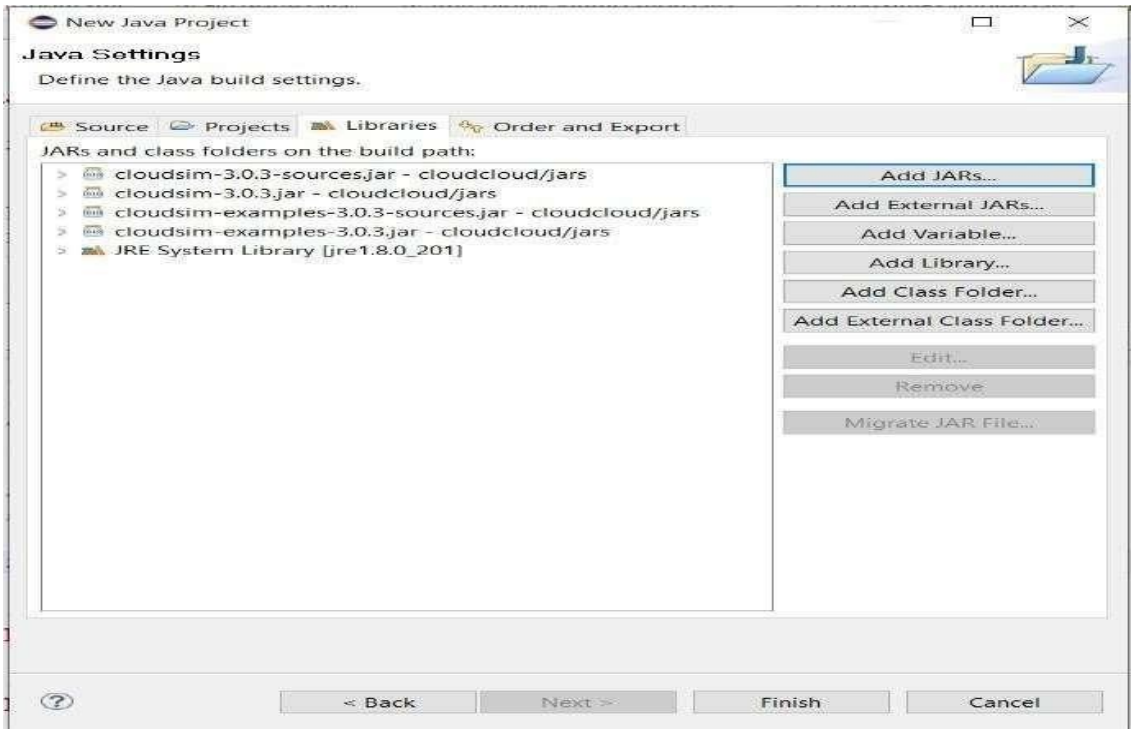
Step 10: Make sure you navigate the path till you can see the bin, docs, examplesetc folder inthe navigation plane.



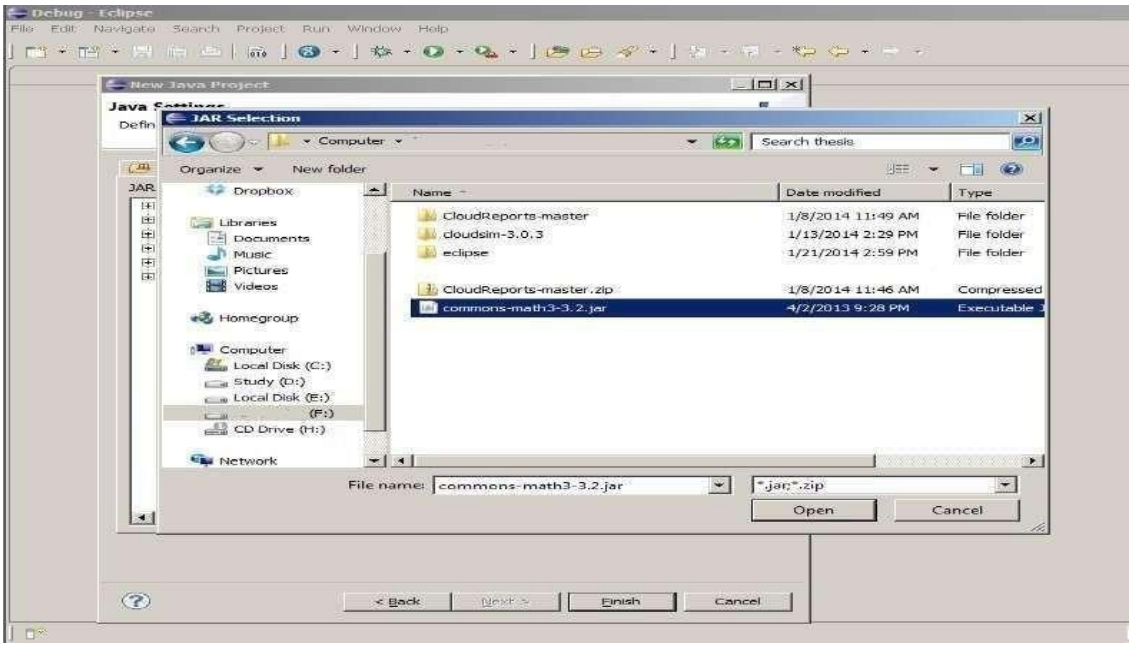
Step 11: Once done finally, click _Next‘ to go to the next step i.e. setting up of projectsettings



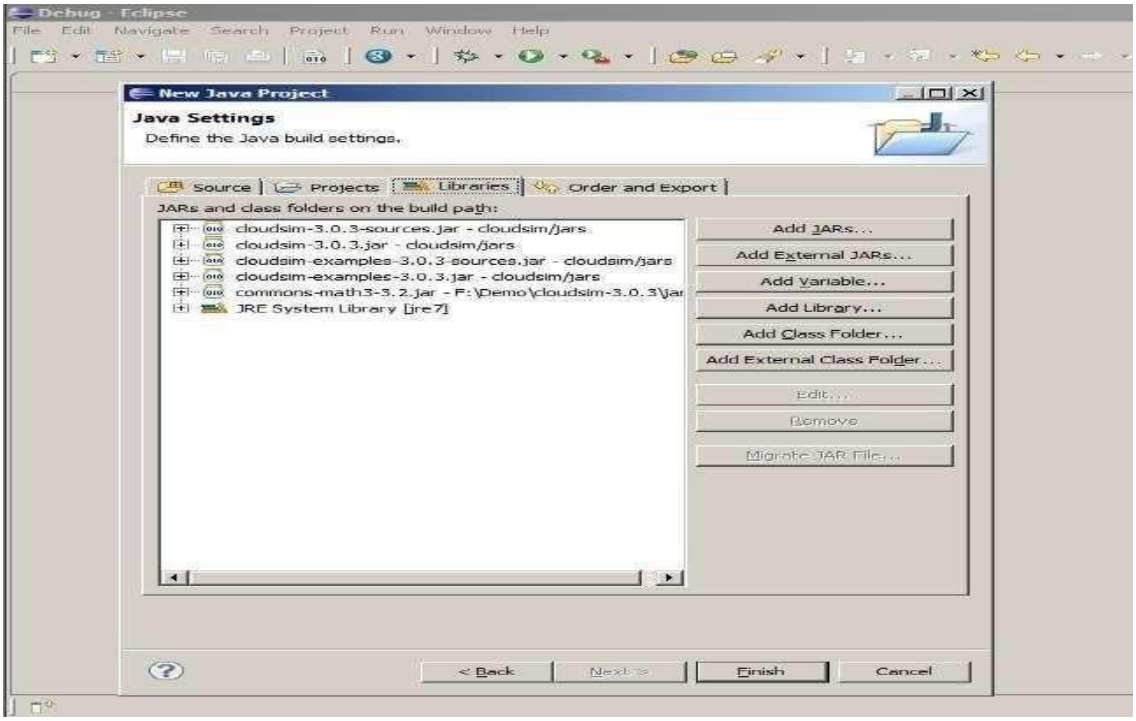
Step 12: Now open *‘Libraries’* tab and if you do not find commons-math3-3.x.jar *(here ‘x’ means the minor version release of the library which could be 2 or greater*) in the list then simply click on *_Add External Jar’* (commons-math3-3.x.jar will be included in the project from this step)



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.

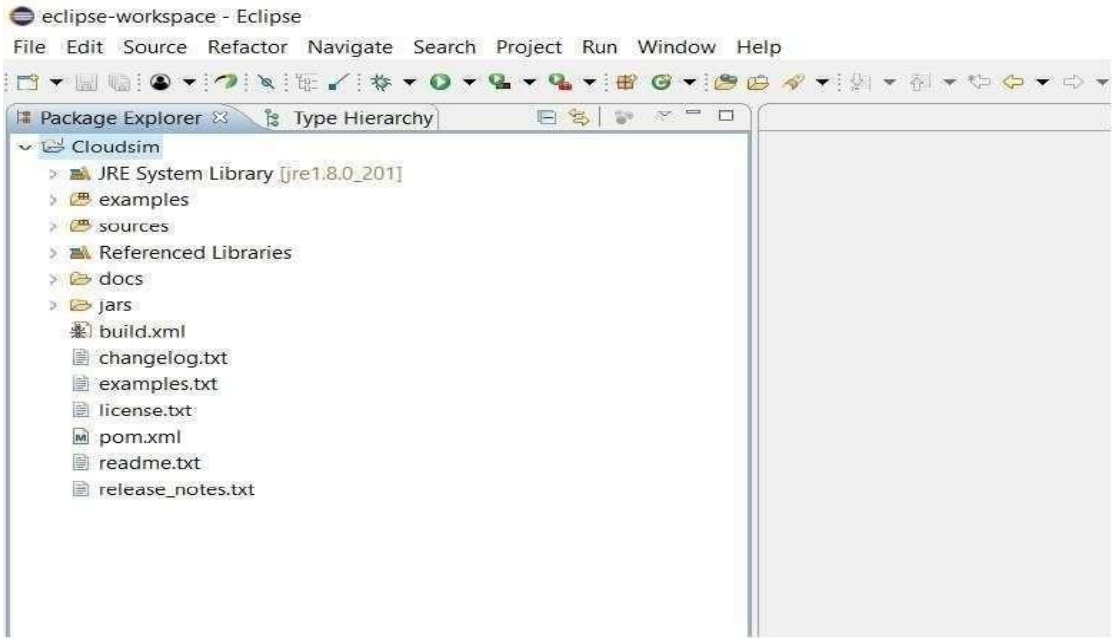


Step 14: Ensure external jar that you opened in the previous step is displayed in the list andthen click on *_Finish*' (your system may take 2-3 minutes to configure the project)

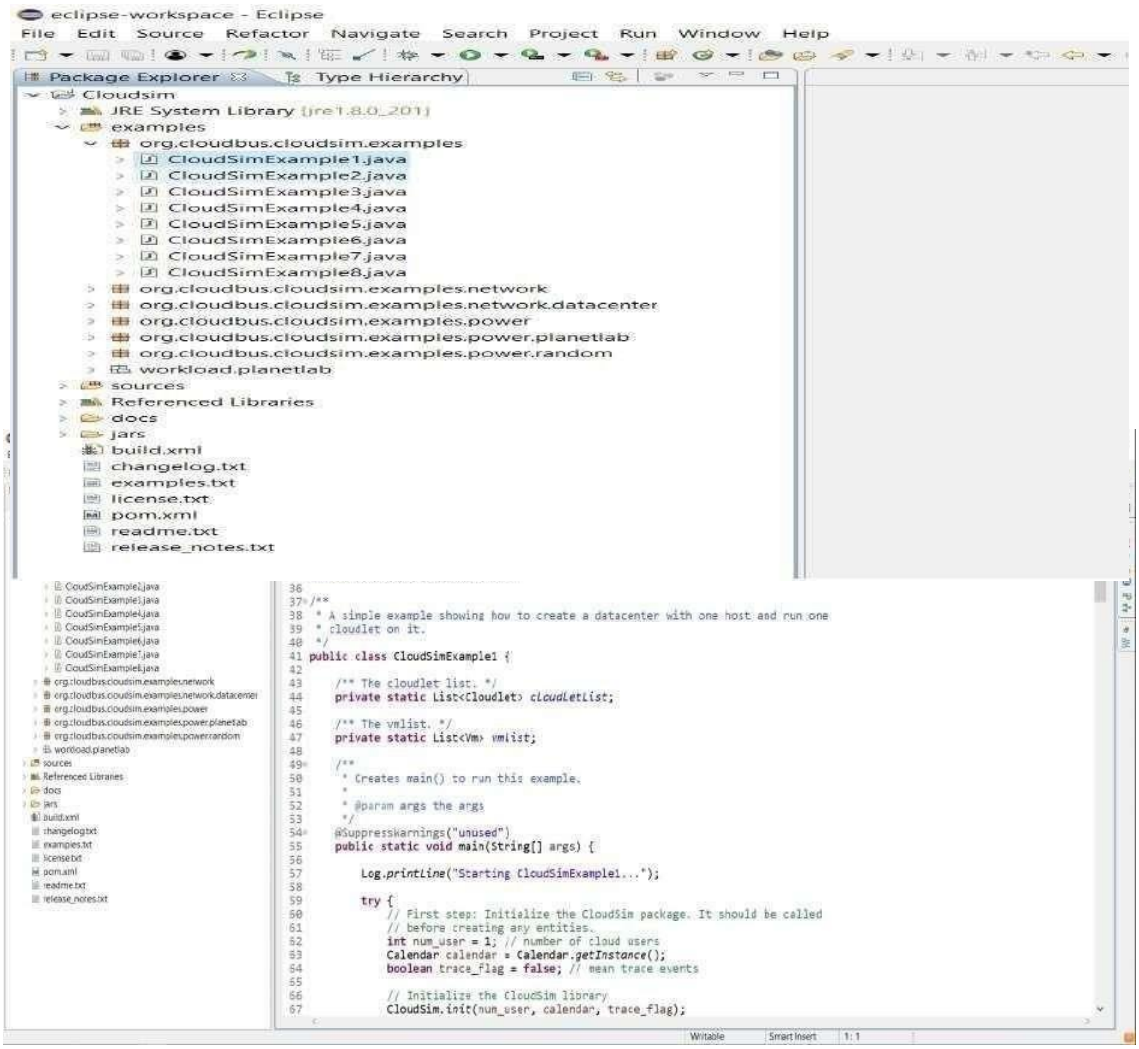


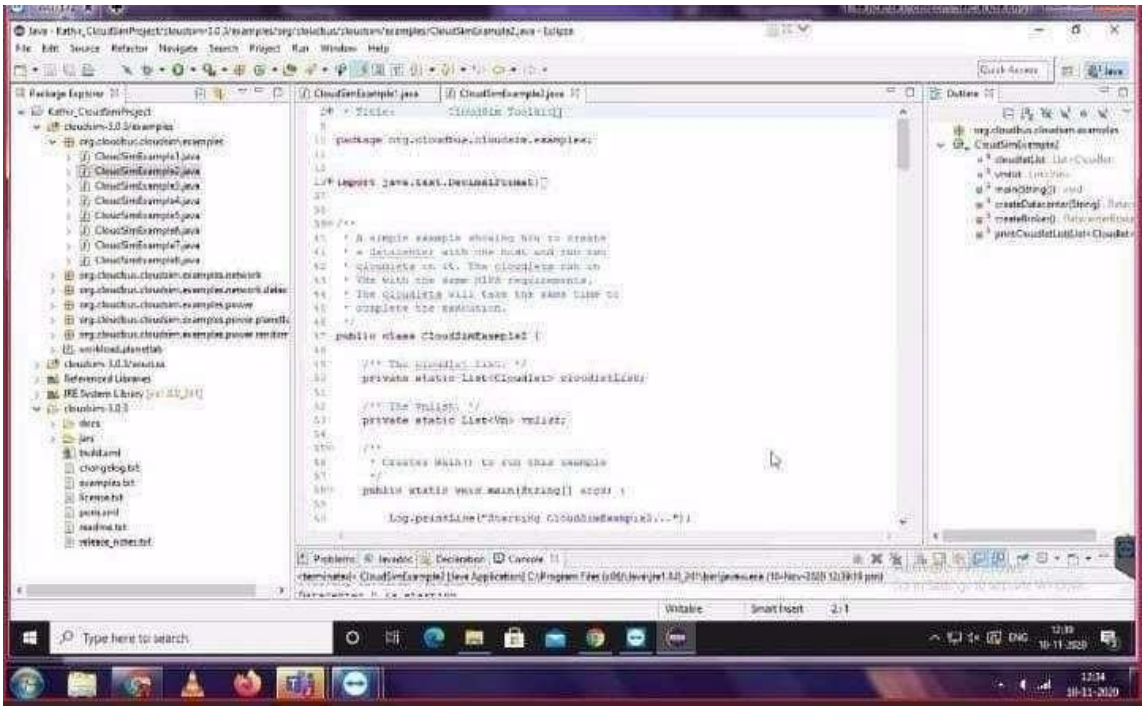
Step 15: Once the project is configured you can open the *Project Explorer* and start exploring the Cloudsim project. Also for the first time eclipse automatically start building the workspace for newly configured Cloudsim project, which may take some time depending on the configuration of the computer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

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

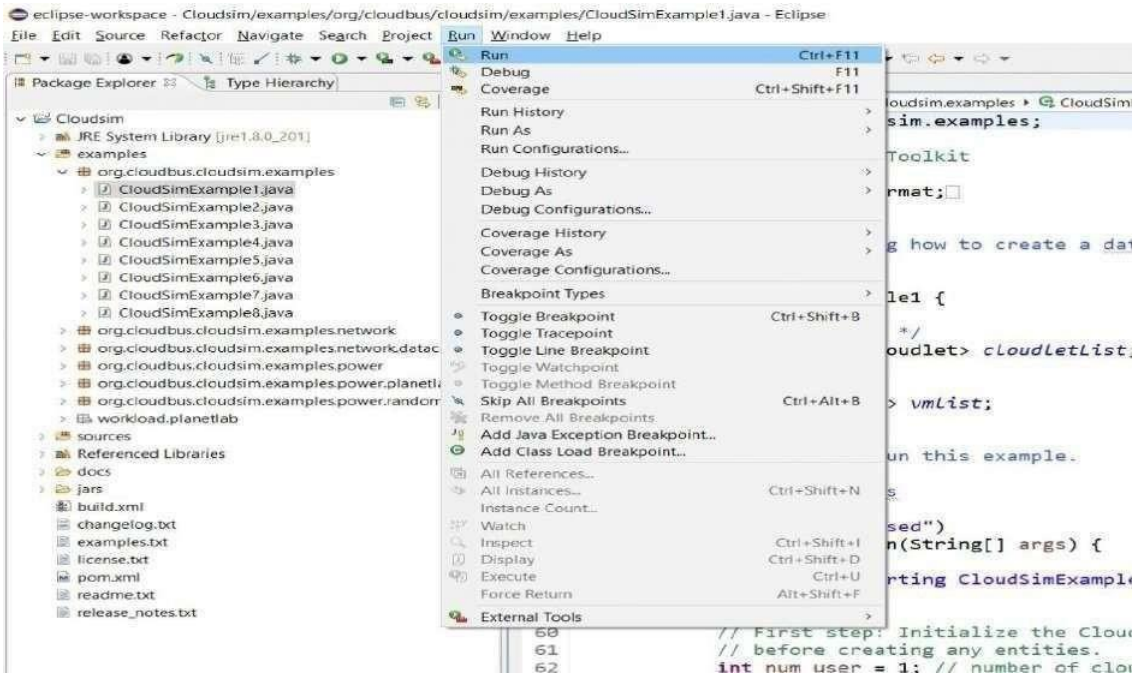


Step 16: Now just to check you within the _**Project Explorer**_, you should navigate to the _**examples**_ folder, then expand the package _*org.cloudbus.cloudsim.examples*_ and double click to open the _*CloudsimExample1.java*_

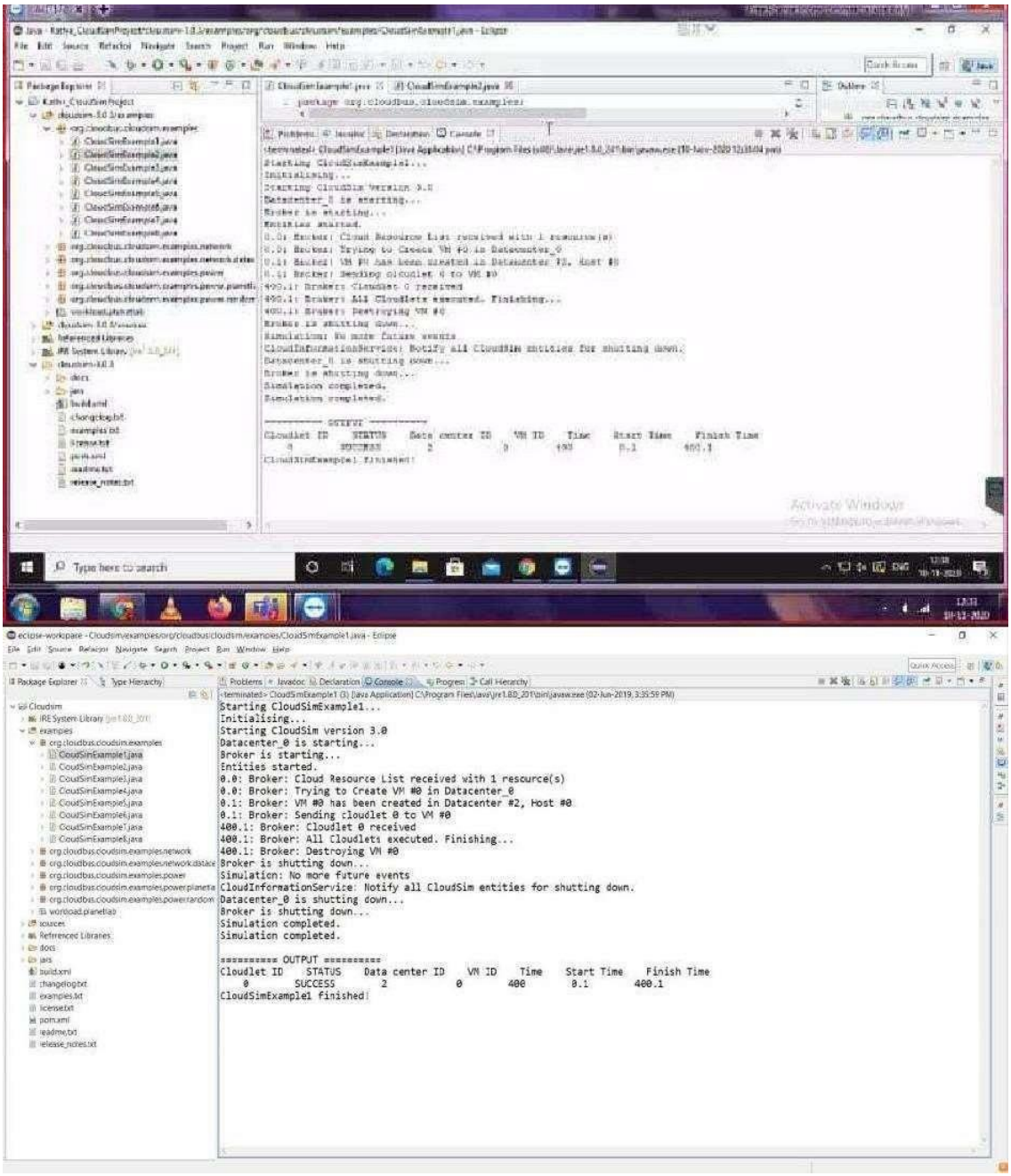




Step 17: Now navigate to the Eclipse menu *_Run ->Run_* or directly use a keyboard shortcut *'Ctrl + F11'* to execute the *_CloudsimExample1.java_*.



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



Result:

Thus the cloudsim is simulated using Eclipse Environment successfully.

Ex.No: 04.B **Simulate a cloud scenario using CloudSim and running a scheduling algorithm**
Date:

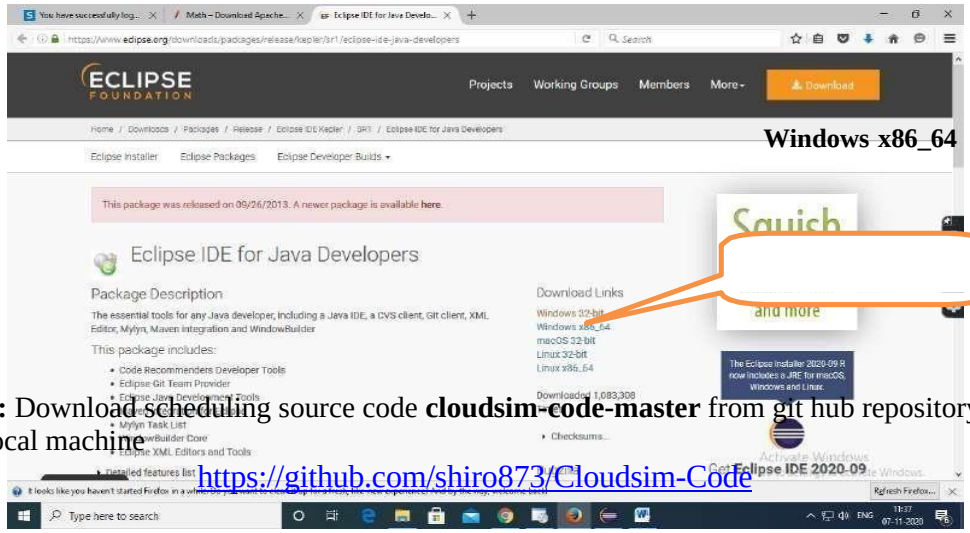
Aim

To simulate a cloud scenario using CloudSim and running a scheduling algorithm

Procedure to import Eclipse, running scheduling algorithms in your system

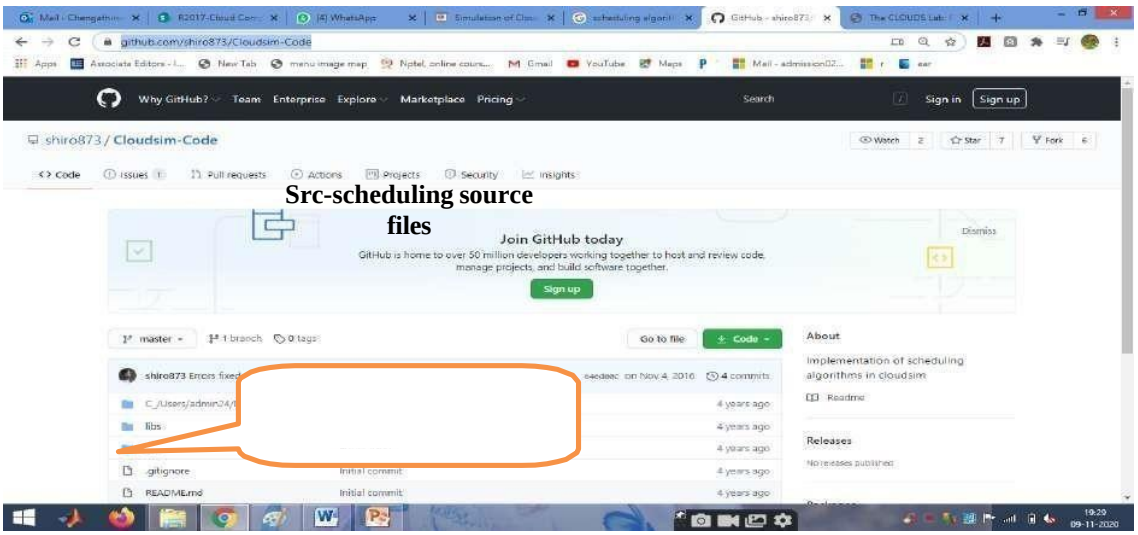
Step 1: Link to download Eclipse and download Eclipse for Windows 64bit into your Localmachine

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



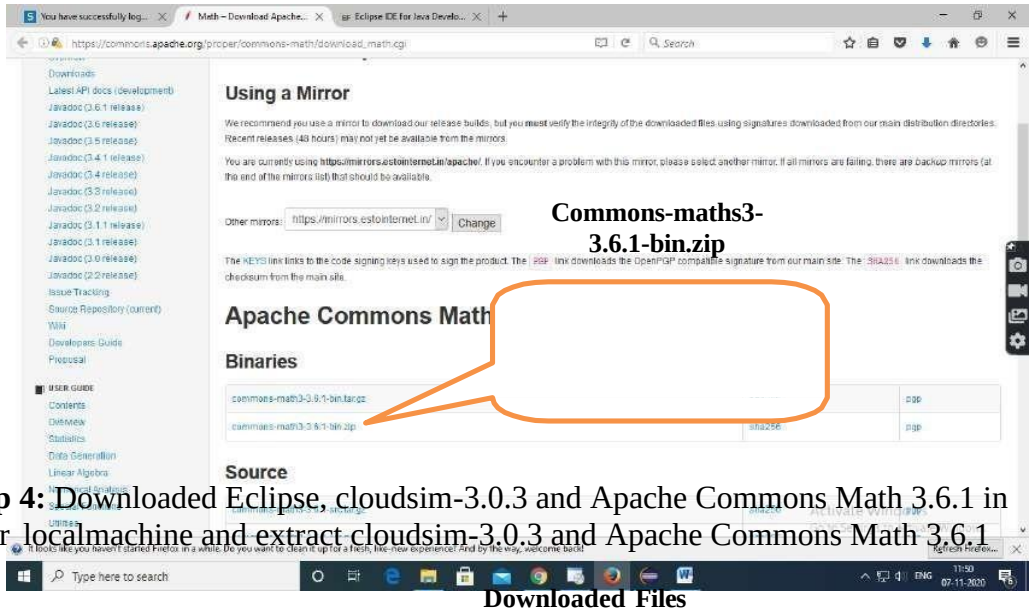
Windows x86_64

Step 2: Download scheduling source code **cloudsim-code-master** from git hub repository in your local machine https://github.com/shiro873/Cloudsim-Code



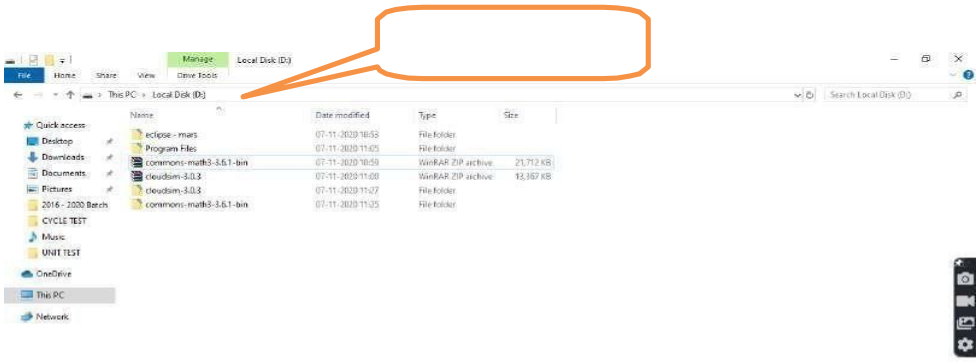
Src-scheduling source files

Step 3: Download commons-maths3-3.6.1 from git hub repository in your local machinehttps://commons.apache.org/proper/commons-math/download_math.cgi

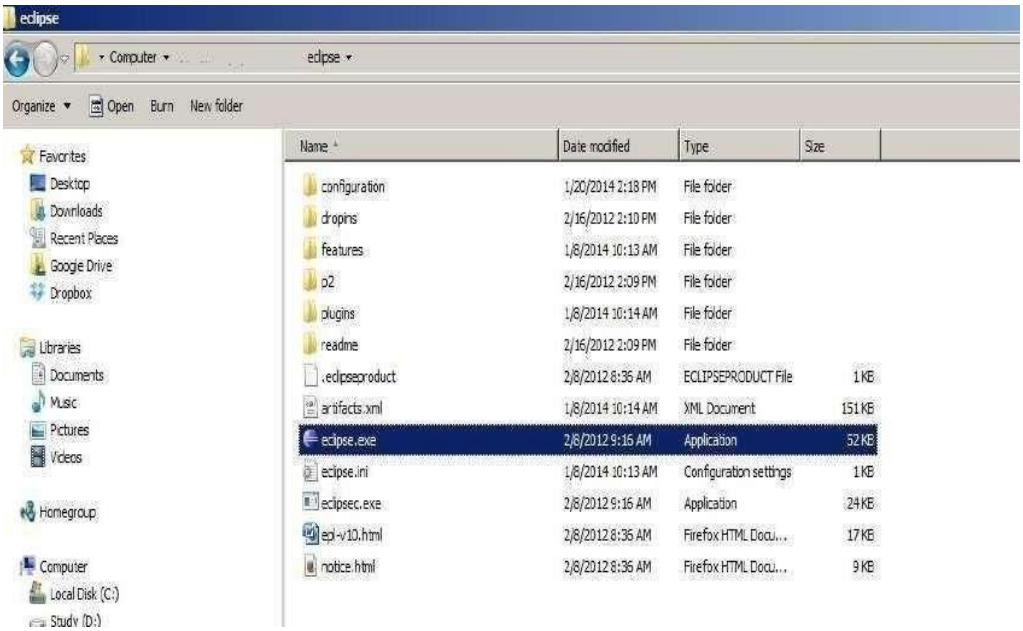


Downloaded Files

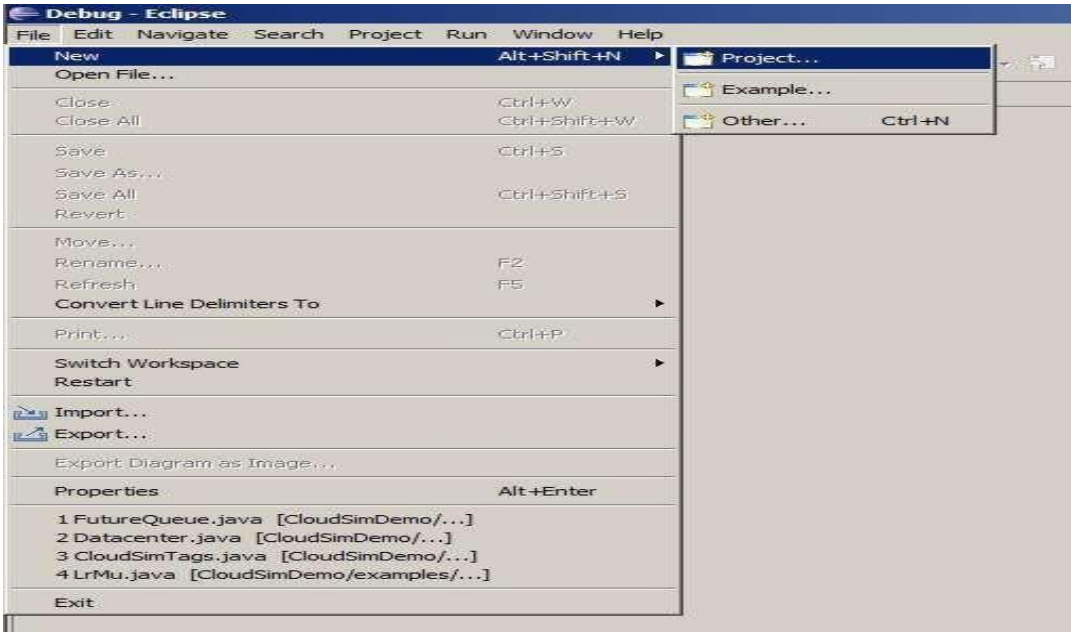
Step 4: Downloaded Eclipse, cloudsim-3.0.3 and Apache Commons Math 3.6.1 in your localmachine and extract cloudsim-3.0.3 and Apache Commons Math 3.6.1



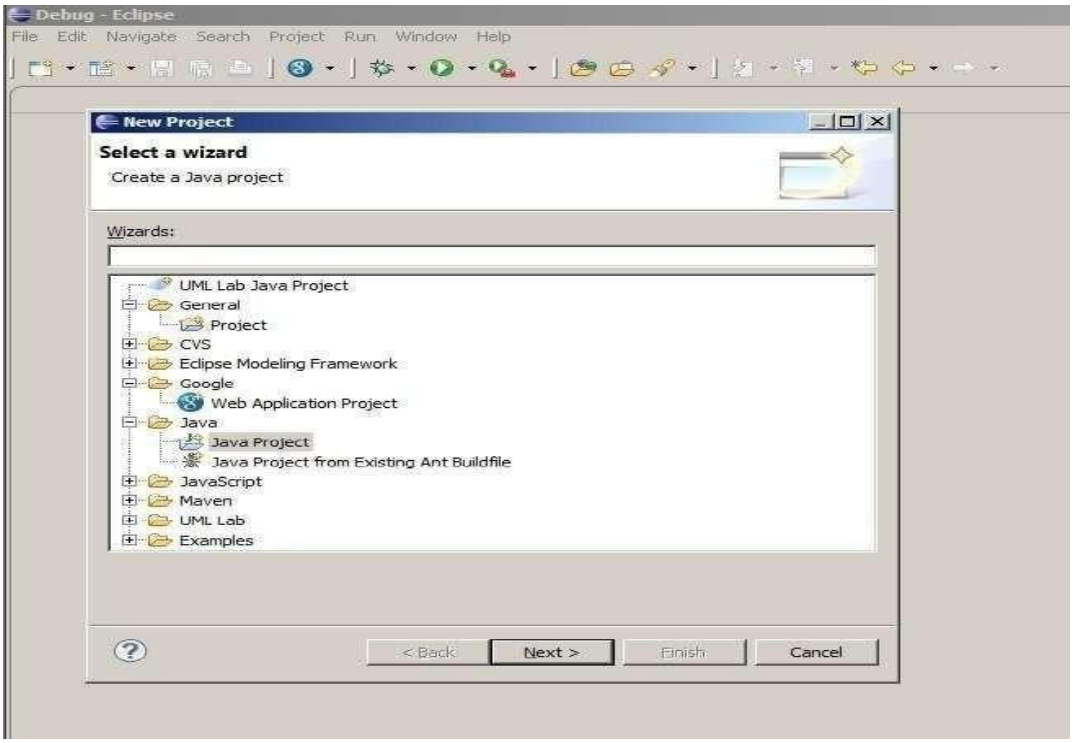
Step 5: First of all, navigate to the folder where you have unzipped the eclipse folder andopen Eclipse.exe



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

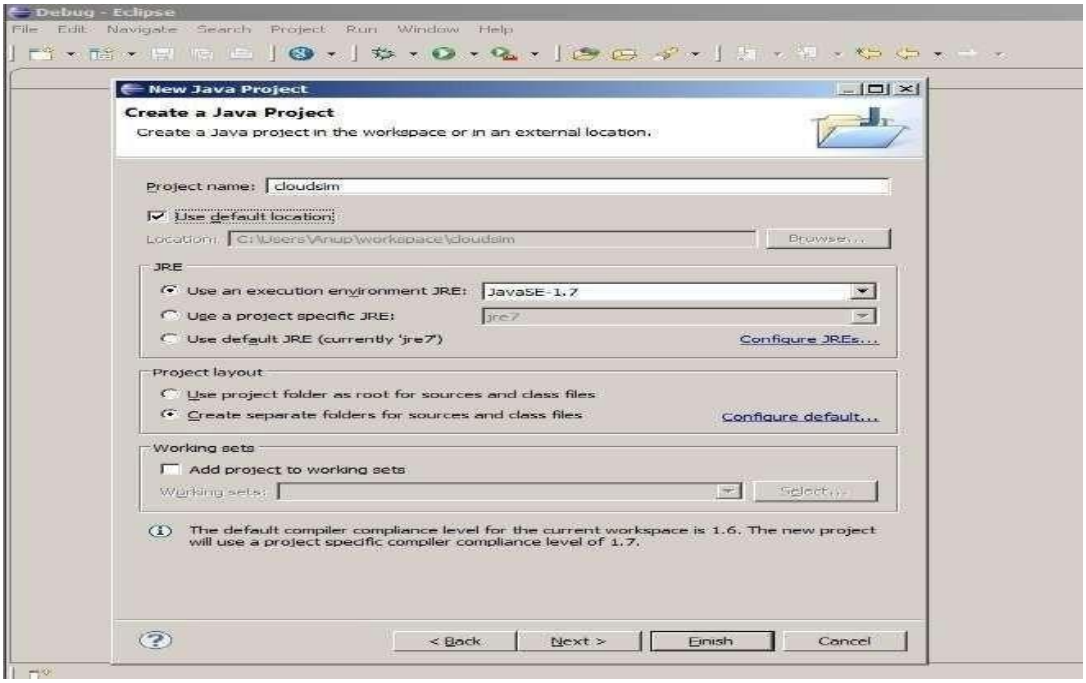


Step 7: A _*New Project*_ wizard should open. There are a number of options displayed and you have to find & select the _*Java Project*_ option, once done click *'Next*_

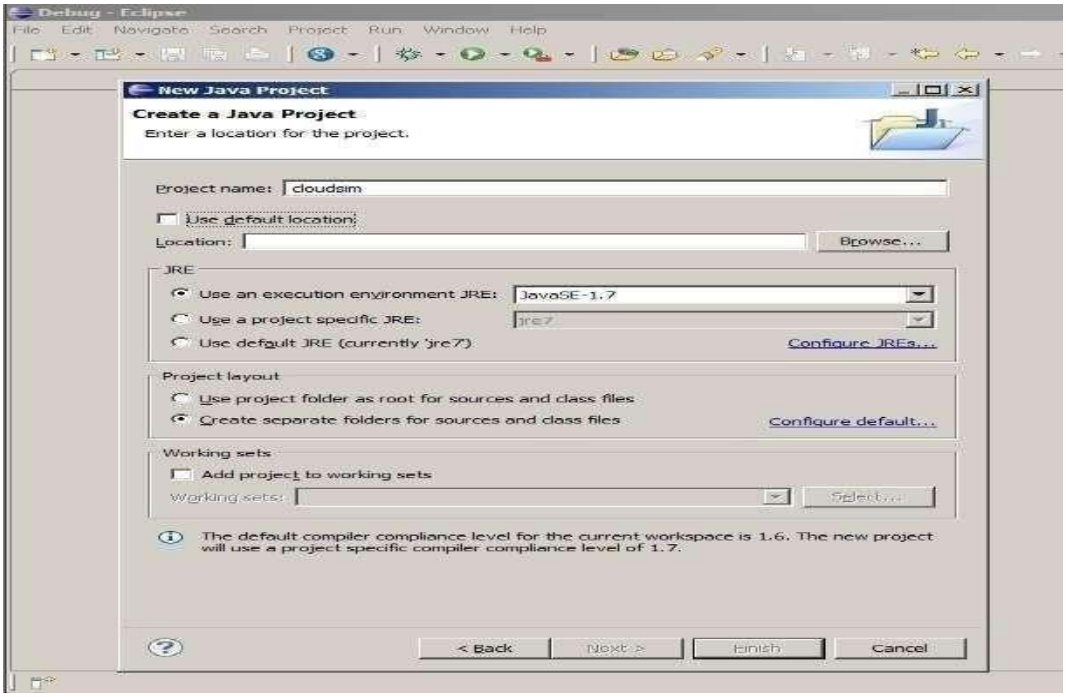


Step 8: Now a detailed new project window will open, here you will provide the project nameand the path of CloudSim-master-code project source code, which will be done as follows:

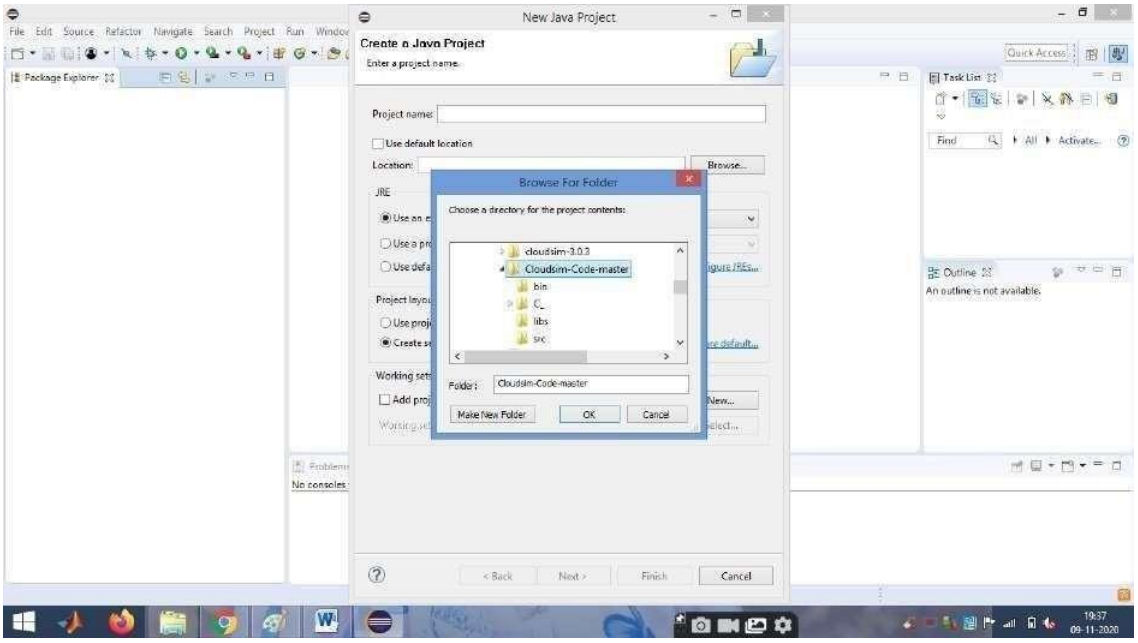
Project Name: CloudSim



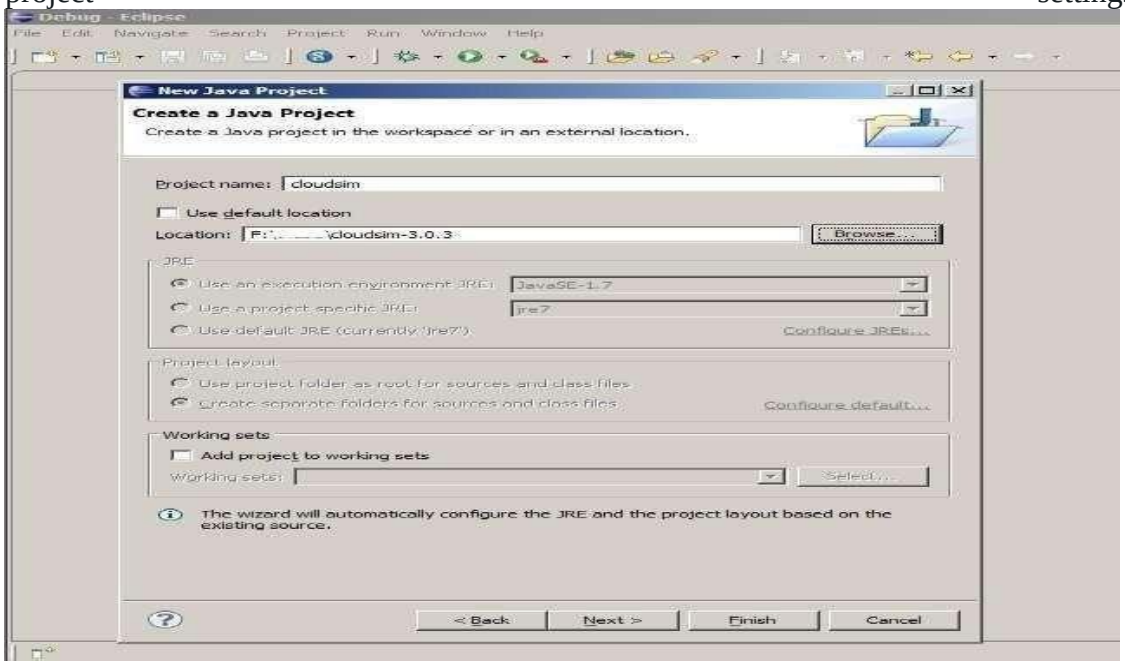
Step 9: Unselect the *'Use default location'* option and then click on *'Browse'* to open the path where you have unzipped the Cloudsim-code-master project and finally click Next to set project settings.



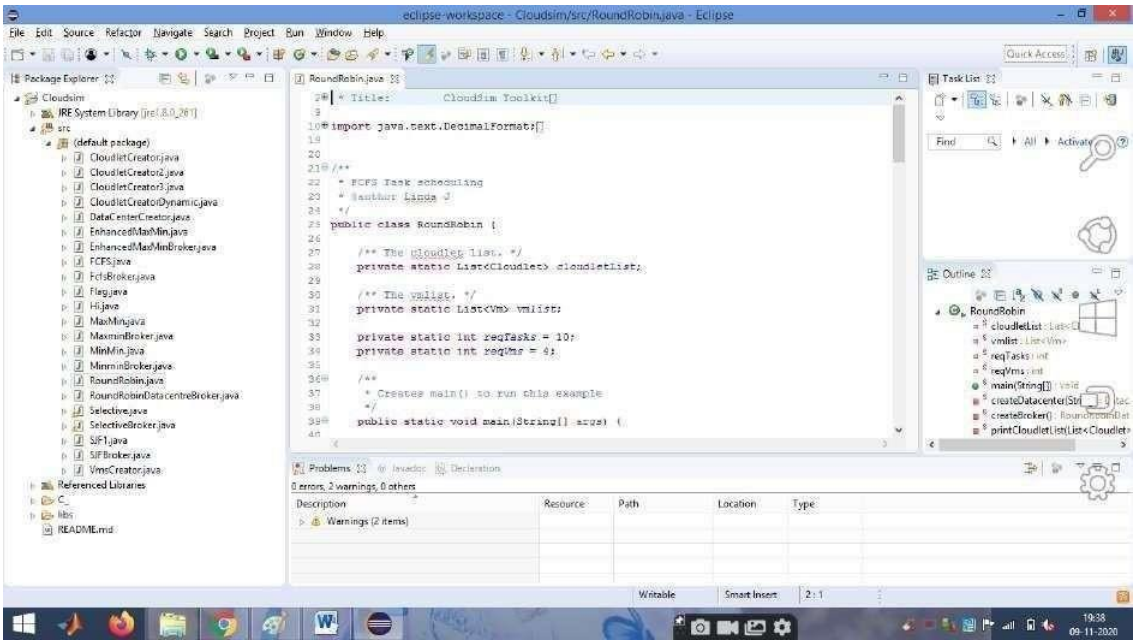
Step 10: Make sure you navigate the path till you can see the bin, docs, examplesetc folder in the navigation plane.



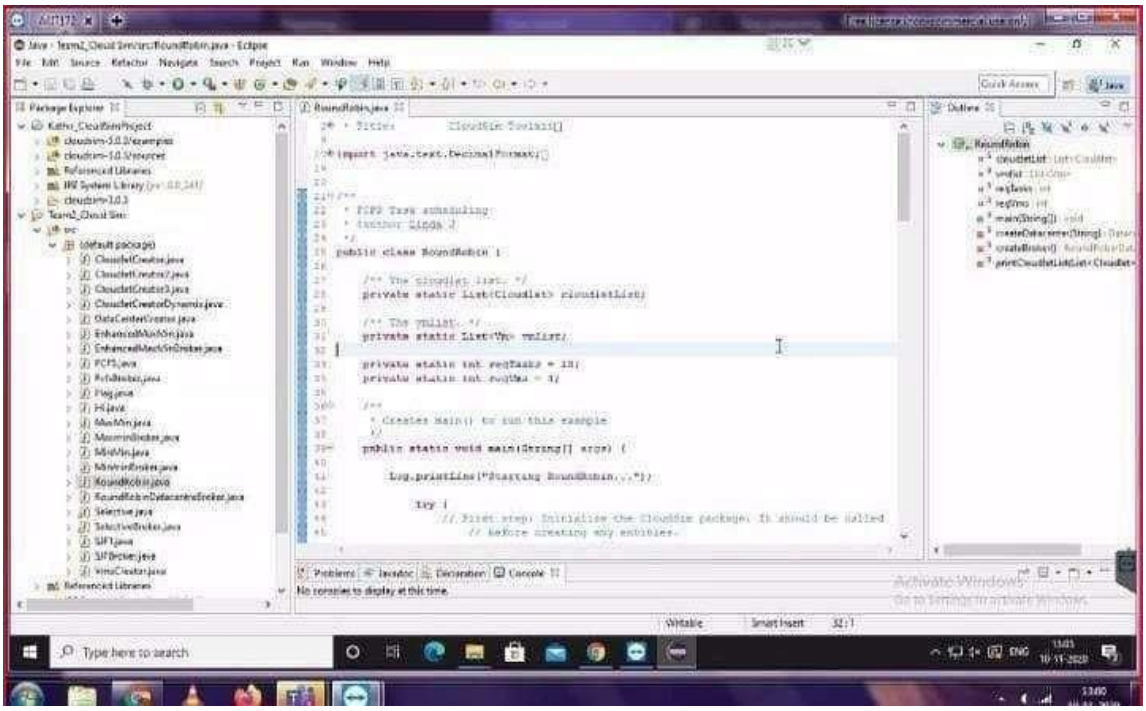
Step 11: Once done finally, click _Next‘ to go to the next step i.e. setting up of project settings



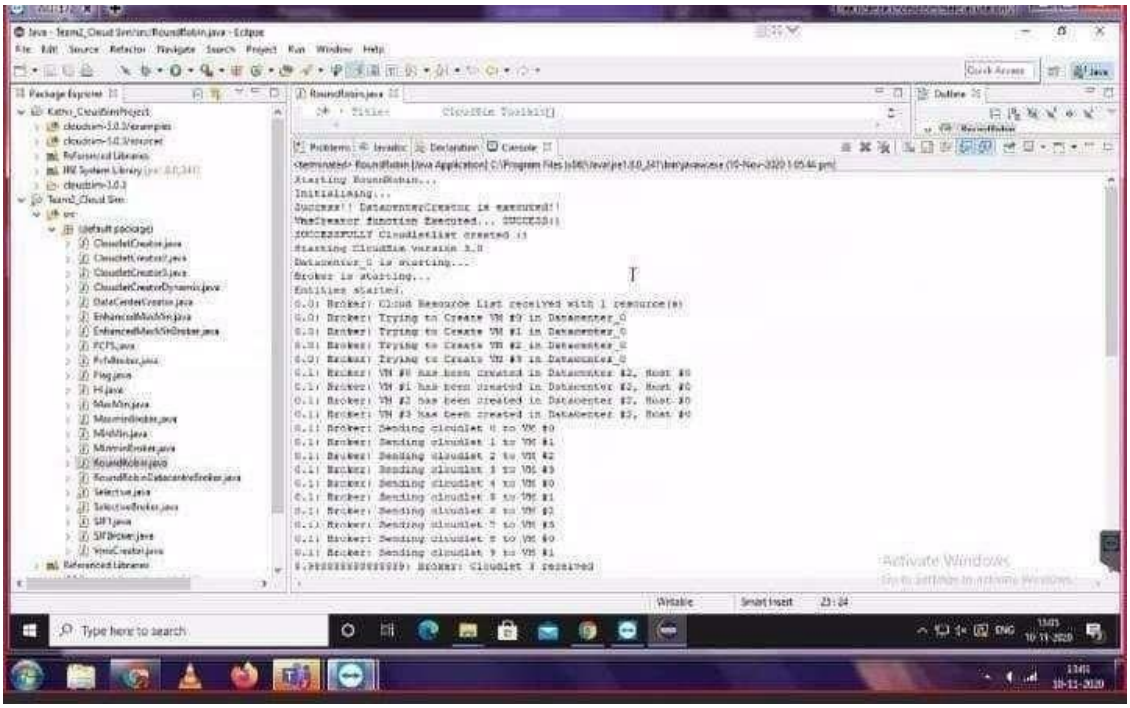
Step 12: Once the project is configured you can open the _*Project Explorer*_ and start exploring the Cloudsim project. Also for the first time eclipse automatically start building the workspace for newly configured Cloudsim project, which may take some time depending on the configuration of the computer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

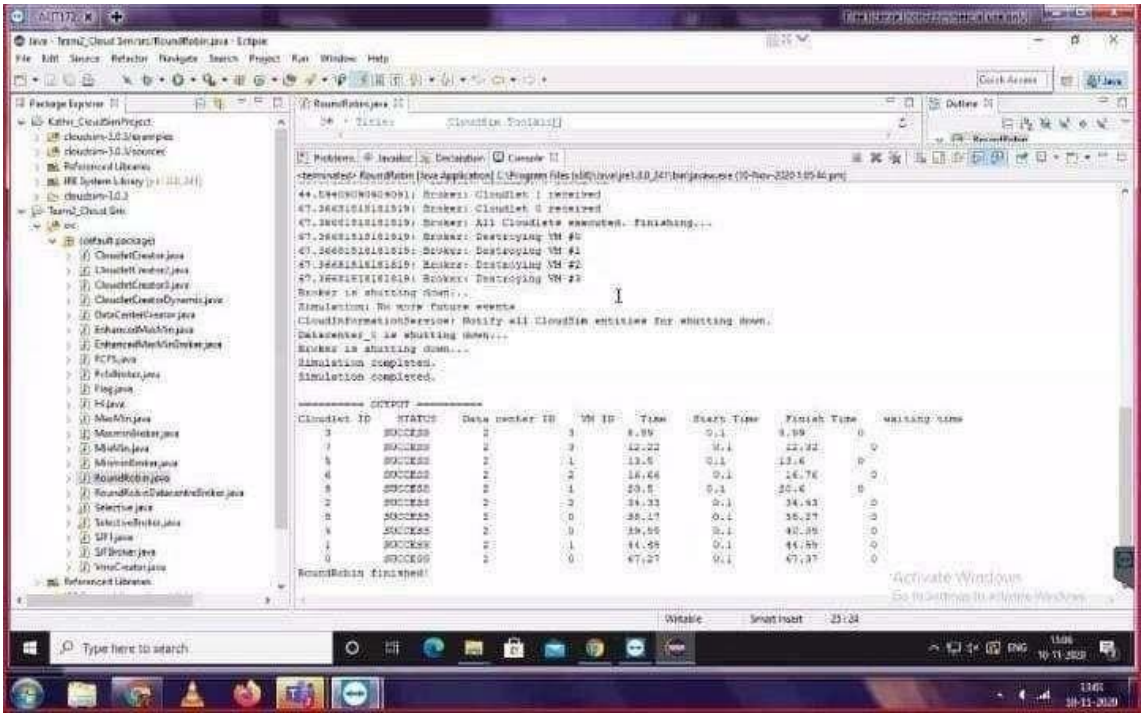


Step 13: Now just to check you within the **_Project Explorer_**, you should navigate to the **_src_** folder, then expand the package _*default package*_ and double click to open the _*RoundRobin.java*_.



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.





Result:

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

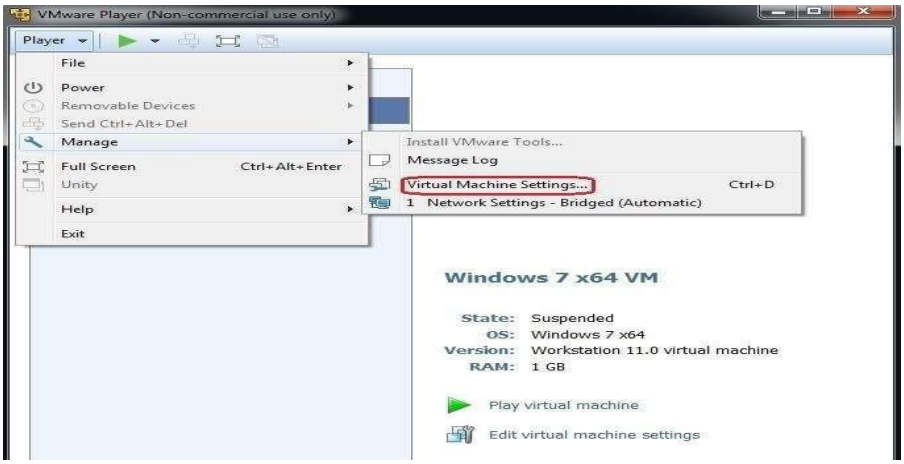
Ex.No: 05 **<u>Procedure to File Sharing from Host to Guest VM</u>**

Date:

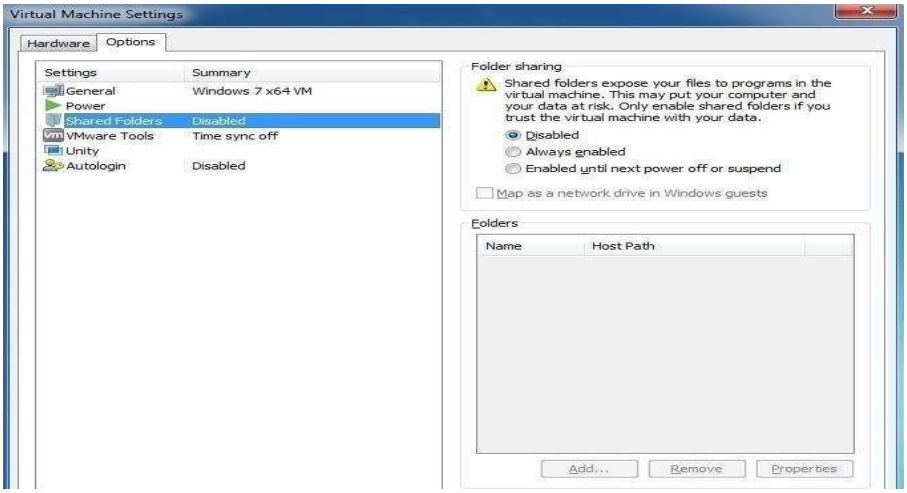
Aim

To transfer a file Host to Guest Virtual Machine

Procedure: 1. Choose the virtual machine and select **Player > Manage > Virtual Machine Settings**

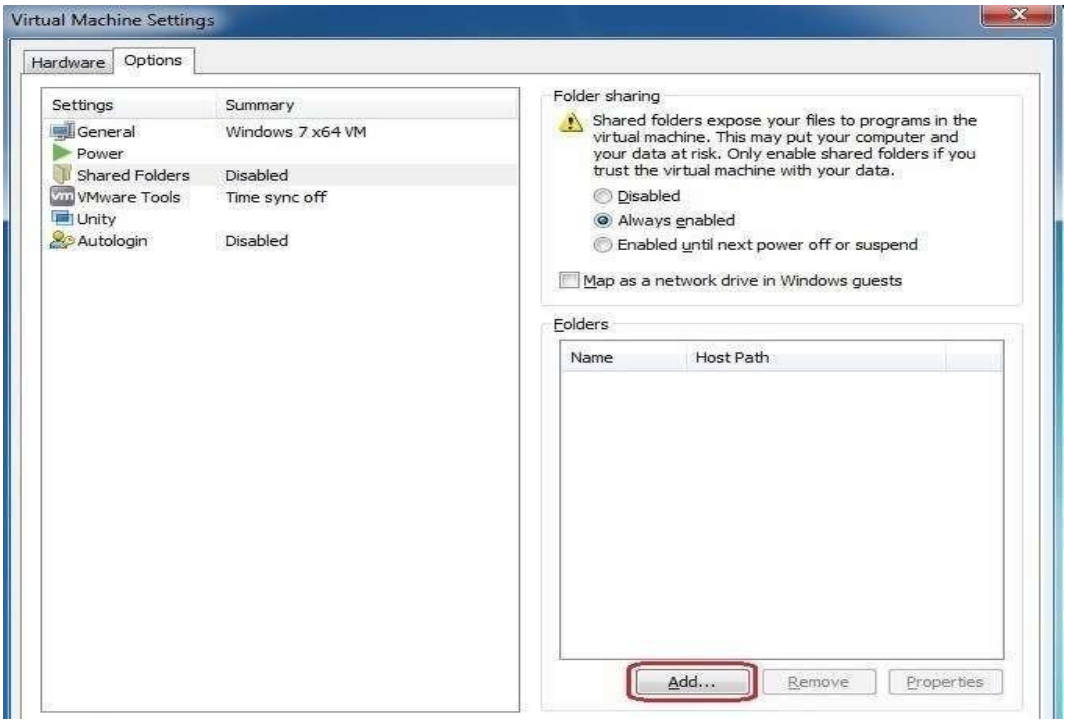


2. Go to the **Options** tab and select the **Shared Folders** option

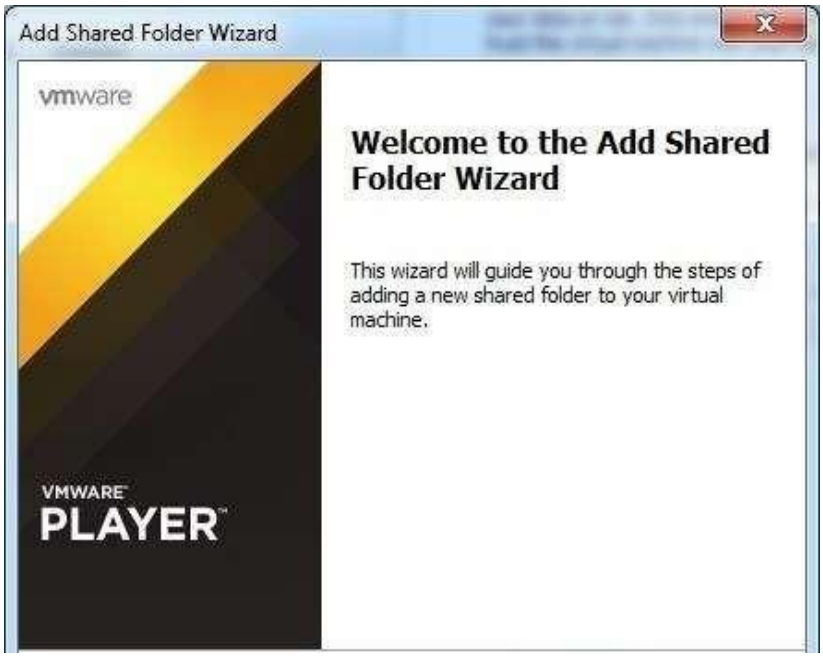


3. Under **Folder sharing**, choose a sharing option. Two options are available:
   - **Always enabled** – keeps folder sharing enabled, even when the virtual machine is shut down, suspended, or powered off.
   - **Enabled until next power off or suspend** – enable folder sharing temporarily, until the virtual machine is shut down, suspended, or powered off. Note that if the virtual machine is restarted, shared folders will remain enabled.
4. (Optional) You can also map the drive to the Shared Folders directory that contains all shared folders. To do that, select the **Map as a network drive in Windows guests** option.

2. Click **Add** to add a share folder



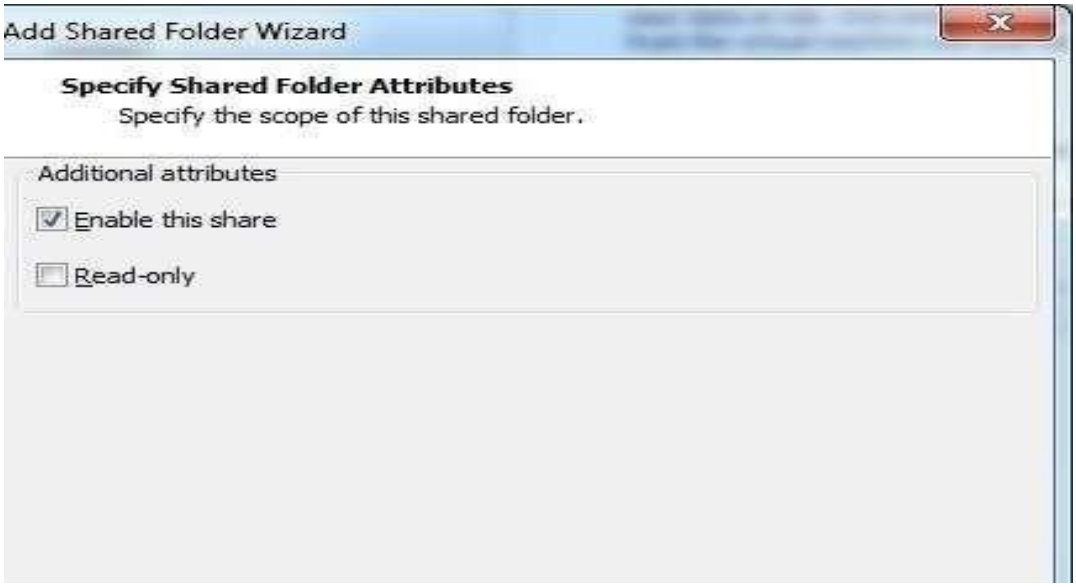
6. The **Add Shared Folder Wizard** opens. Click **Next** to Continue:



7. Type the path on the host system to the directory you want to share and specify its name:

8. Select shared folder options:

- **Enable this share** – enables the shared folder. Deselect this option when you want to disable the shared folder without deleting it from the virtual machine configuration.
- **Read-only** – makes the shared folder read-only. The virtual machine can view and copy files from the shared folder, but it cannot add, change, or remove files.



View a shared folder

A shared folder appears differently, depending on the guest operating system type and version.

To view a shared folder in a Windows guest OS, go to **Windows**

Browser > Network. You should see a list of computer available on the network, including a computer named **vmware-host**:

Double click **vmware-host** and browse to the shared folder:

Procedure to share the files among the host and guest VM

1. You can copy few (or more) lines with ***copy & paste*** mechanism.
   For this you need to share clipboard between host OS and guest OS, installing **Guest Addition** on both the virtual machines (probably setting *bidirectional* and restarting them).
   You *copy* from *guest OS* in the clipboard that is shared with the *host OS*.
   Then you *paste* from the *host OS* to the second *guest OS.*
2. You can enable **drag and drop** too with the same method (Click on the machine, settings, general, advanced, drag and drop: set to *bidirectional*)
3. You can have **common *Shared Folders*** on both virtual machines and use one of the directory shared as buffer to copy.
   Installing **Guest Additions** you have the possibility to set Shared Folders too. As you put a file in a shared folder from *host OS* or from *guest OS*, is immediately visible to the other. (Keep in mind that can arise some problems for date/time of the files when there are different clock settings on the different virtual machines).
   If you use the same folder shared on more machines you can exchange files directly copying them in this folder.
4. You can use **usual method to copy files between 2 different computer** with client-server application. (e.g. scp with sshd active for linux, winscp... you can get some info about SSH servers e.g. here)
   You need an active server (sshd) on the receiving machine and a client on the sending machine. Of course you need to have the authorization setted (via password or, better, via an automatic authentication method).
   Note: many Linux/Ubuntu distribution install sshd by default: you can see if it is running with pgrep sshd from a shell. You can install with sudo apt-get install openssh-server.
5. You can **mount part of the file system** of a virtual machine via NFS or SSHFS on the other, or you can **share file and directory** with Samba.
   You may find interesting the article Sharing files between guest and host without VirtualBox shared folders with detailed step by step instructions.

You should remember that you are dialling with a little network of machines with different operative systems, and in particular:

- Each virtual machine has its own operative system running on and acts as a physical machine.
- Each virtual machine is an instance of a program *owned* by an *user* in the hosting operative system and should undergo the restrictions of the *user* in the *hosting OS*.
  E.g Let we say that Hastur and Meow are users of the hosting machine, but they did not allow each other to see their directories (no read/write/execute authorization). When each of them run a virtual machine, for the hosting OS those virtual machine are two normal programs owned by Hastur and Meow and cannot see the private directory of the other user. This is a restriction due to the *hosting OS*. It's easy to overcame it: it's enough to give authorization to read/write/execute to a directory or to chose a different directory in which both users can read/write/execute.
- Windows likes mouse and Linux fingers. :-)
  I mean I suggest you to enable *Drag & drop* to be cosy with the Windows machines and the *Shared folders* or to be cosy with Linux.
  When you will need to be fast with Linux **you will feel the need** of ssh-keygen and to Generate once SSH Keys to copy files on/from a remote machine without writing password anymore. In this way it functions bash auto-completion remotely too!

Result:

Thus the procedure to share the files among the host and guest VM is done and verified.

Ex.No: 06 **To Launch Virtual Machine using trystack**
Date:

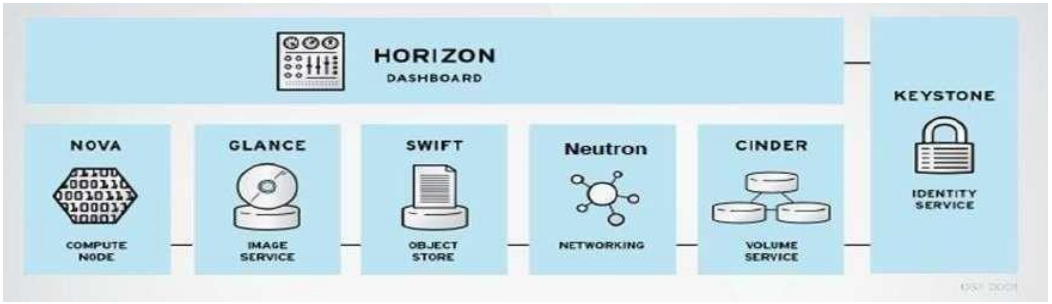
Aim

To 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-Vand ESX
    - Distributed controllers that handle scheduling, API calls, etc
      - Native OpenStack API and Amazon EC2 compatibleAPI
- **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 networksolutions
      - Open vSwitch, Cisco UCS,Standard LinuxBridge,NiCira NVP

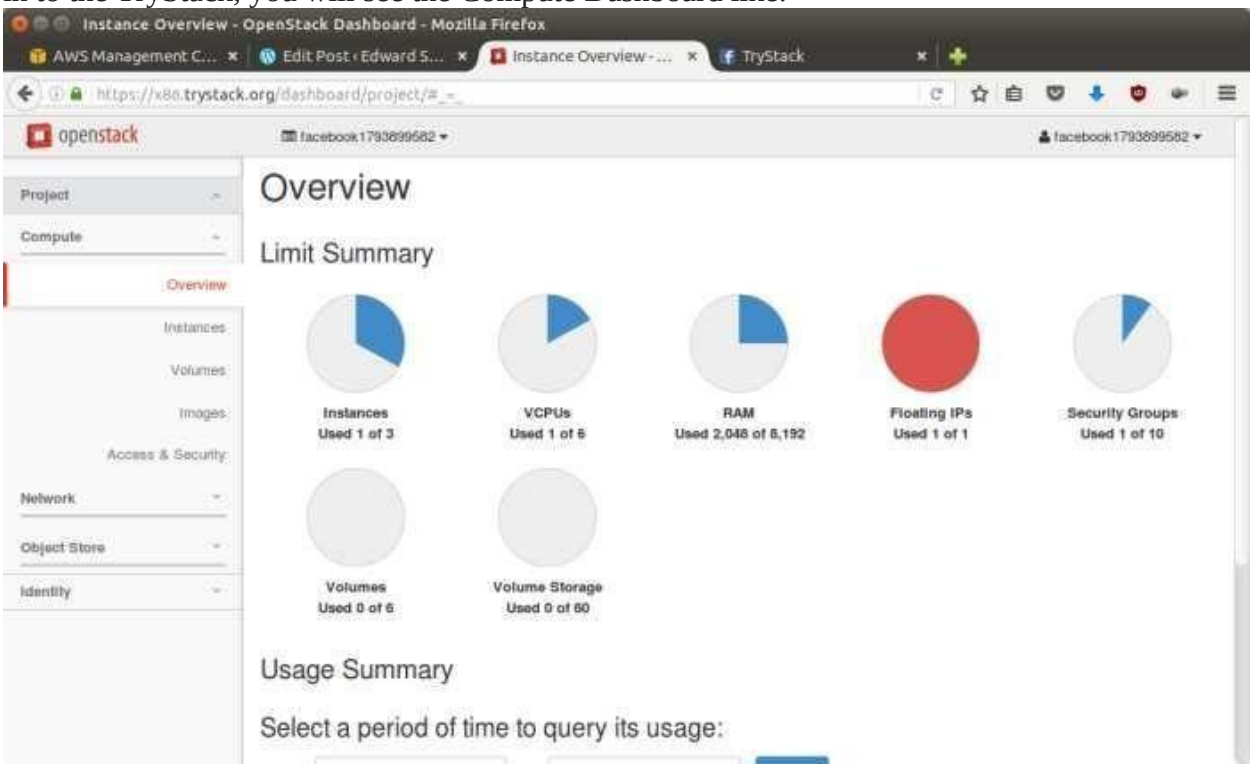
- **CINDER**
  - Block Storage (Volume) service
  - Provides block storage for Virtual machines(persistent disks)
  - Similar to Amazon EBS service
  - Plugin architecture for vendor extensions
    - NetApp driver for cinder
- **HORIZON**
  - Dashboard
  - Provides simple self service UI for end-users
  - 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 availabilityand 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

OpenStack is an open-source software cloud computing platform. OpenStack is primarily used for deploying an infrastructure as a service (IaaS) solution like Amazon Web Service (AWS). In other words, you can *make your own AWS* by using OpenStack. If you want to try out OpenStack, **TryStack** is the easiest and free way to do it.

In order to try OpenStack in TryStack, you must register yourself by joining TryStack Facebook Group. The acceptance of group needs a couple days because it's approved manually. After you have been accepted in the TryStack Group, you can log in TryStack.

TryStack.org Homepage

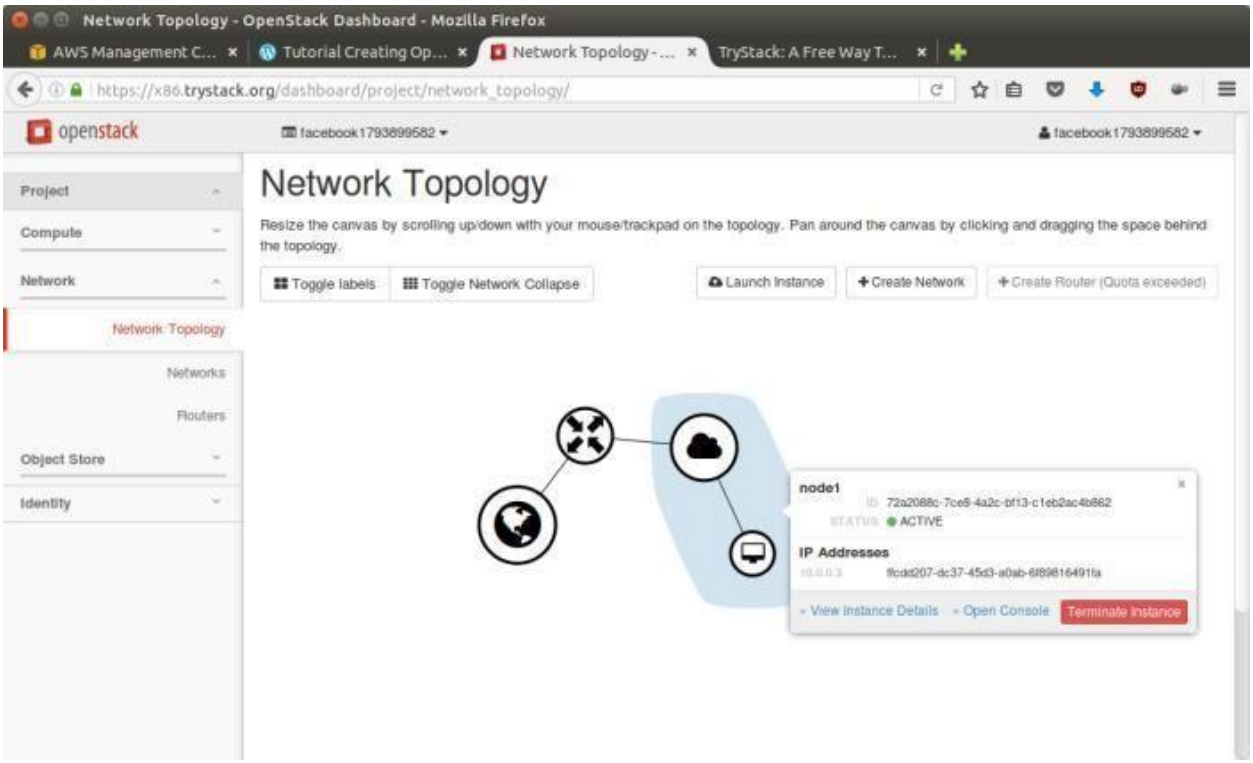
I assume that you already join to the Facebook Group and login to the dashboard. After you log in to the TryStack, you will see the Compute Dashboard like:



OpenStack Compute Dashboard

Overview: What we will do?

In this post, I will show you how to run an OpenStack instance. The instance will be accessible through the internet (have a public IP address). The final topology will like:



Network topology

As you see from the image above, the instance will be connected to a local network and the local network will be connected to internet.

Step 1: Create Network

Network? Yes, the network in here is our own local network. So, your instances will be not mixed up with the others. You can imagine this as your own LAN (Local Area Network) in the cloud.

1. Go to **Network > Networks** and then click **Create Network**.
2. In **Network** tab, fill **Network Name** for example internal and then click **Next**.
3. In **Subnet** tab,
    1. Fill **Network Address** with appropriate CIDR, for example 192.168.1.0/24. Use private network CIDR block as the best practice.
    2. Select **IP Version** with appropriate IP version, in this case IPv4.
    3. Click **Next**.
4. In **Subnet Details** tab, fill **DNS Name Servers** with 8.8.8.8 (Google DNS) and then click **Create**.

Step 2: Create Instance

Now, we will create an instance. The instance is a virtual machine in the cloud, like AWS EC2. You need the instance to connect to the network that we just created in the previous step.

1. Go to **Compute > Instances** and then click **Launch Instance**.
2. In **Details** tab,
    1. Fill **Instance Name**, for example Ubuntu 1.
    2. Select **Flavor**, for example m1.medium.
    3. Fill **Instance Count** with **1**.
    4. Select **Instance Boot Source** with **Boot from Image**.
    5. Select **Image Name** with **Ubuntu 14.04 amd64 (243.7 MB)** if you want install Ubuntu 14.04 in your virtual machine.
3. In **Access & Security** tab,
    1. Click [+] button of **Key Pair** to import key pair. This key pair is a public and private key that we will use to connect to the instance from our machine.
    2. In **Import Key Pair** dialog,
        1. Fill **Key Pair Name** with your machine name (for example Edward-Key).
        2. Fill **Public Key** with your **SSH public key** (usually is in ~/.ssh/id_rsa.pub). See description in Import Key Pair dialog box for more information. If you are using Windows, you can use **Puttygen** to generate key pair.
        3. Click **Import key pair**.
    3. In **Security Groups**, mark/check **default**.
4. In **Networking** tab,
    1. In **Selected Networks**, select network that have been created in Step 1, for example internal.
5. Click **Launch**.
6. If you want to create multiple instances, you can repeat step 1-5. I created one more instance with instance name Ubuntu 2.

Step 3: Create Router

I guess you already know what router is. In the step 1, we created our network, but it is isolated. It doesn't connect to the internet. To make our network has an internet connection, we need a router that running as the gateway to the internet.

1. Go to **Network > Routers** and then click **Create Router**.
2. Fill **Router Name** for example router1 and then click **Create router**.
3. Click on your **router name link**, for example router1, **Router Details** page.
4. Click **Set Gateway** button in upper right:
    1. Select **External networks** with **external**.
    2. Then **OK**.
5. Click **Add Interface** button.
    1. Select **Subnet** with the network that you have been created in Step 1.
    2. Click **Add interface**.
6. Go to **Network > Network Topology**. You will see the network topology. In the example, there are two network, i.e. external and internal, those are bridged by a

router. There are
instances those are joined to internal network.

Step 4: Configure Floating IP Address

Floating IP address is public IP address. It makes your instance is accessible from the internet. When you launch your instance, the instance will have a private network IP, but no public IP. In OpenStack, the public IPs is collected in a pool and managed by admin (in our case is TryStack). You need to request a public (floating) IP address to be assigned to your instance.

1. Go to **Compute > Instance**.
2. In one of your instances, click **More > Associate Floating IP**.
3. In **IP Address**, click Plus [+].
4. Select **Pool** to **external** and then click **Allocate IP**.
5. Click **Associate**.
6. Now you will get a public IP, e.g. 8.21.28.120, for your instance.

Step 5: Configure Access & Security

OpenStack has a feature like a firewall. It can whitelist/blacklist your in/out connection. It is called *Security Group*.

1. Go to **Compute > Access & Security** and then open **Security Groups** tab.
2. In **default** row, click **Manage Rules**.
3. Click **Add Rule**, choose **ALL ICMP** rule to enable ping into your instance, and then click **Add**.
4. Click **Add Rule**, choose **HTTP** rule to open HTTP port (port 80), and then click **Add**.
5. Click **Add Rule**, choose **SSH** rule to open SSH port (port 22), and then click **Add**.
6. You can open other ports by creating new rules.

Step 6: SSH to Your Instance

Now, you can SSH your instances to the floating IP address that you got in the step 4. If you are using Ubuntu image, the SSH user will be ubuntu.

- **Steps in Installing Openstack**

Step 1:

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

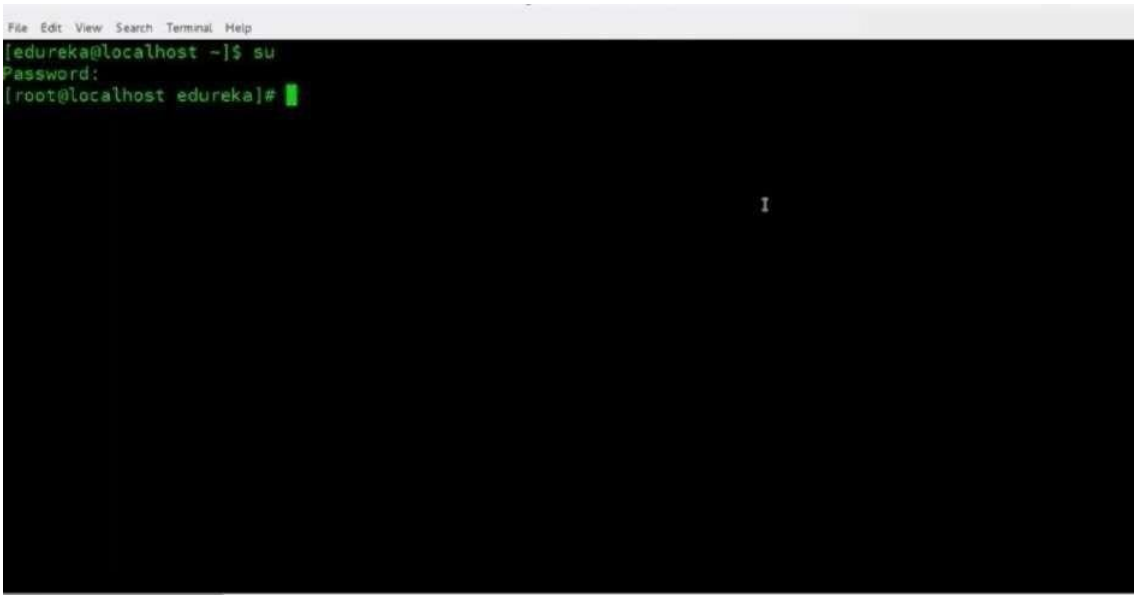
Step 2:

- 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

Step 3: Login into CenOS 7

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

  #sudosu–



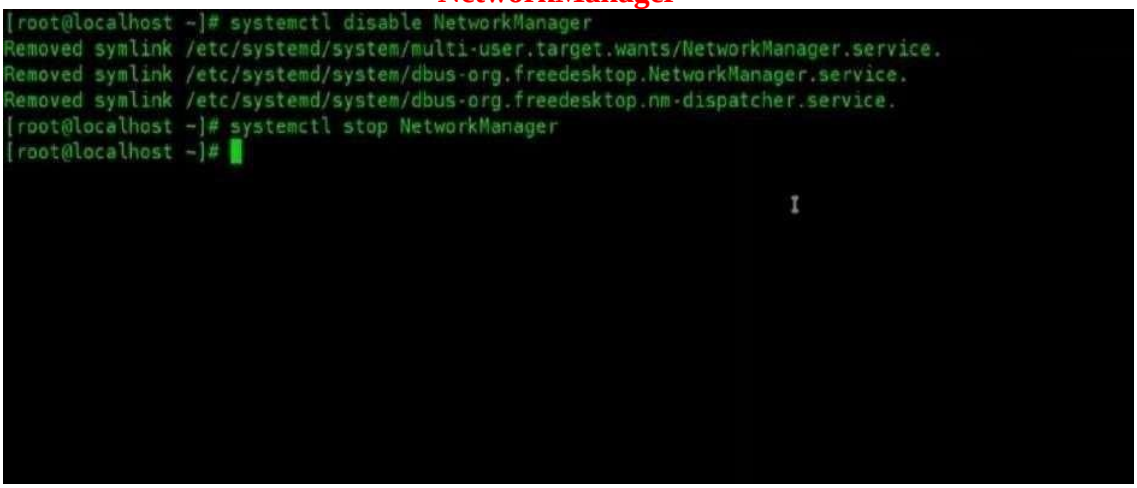
Step 4: Installation Steps for OpenStack

Step5: Command to disable and stop firewall

 # systemctl disable firewalld#systemctl stop firewalld

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

```
[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

Step 11: Start packstack to install OpenStack Newton

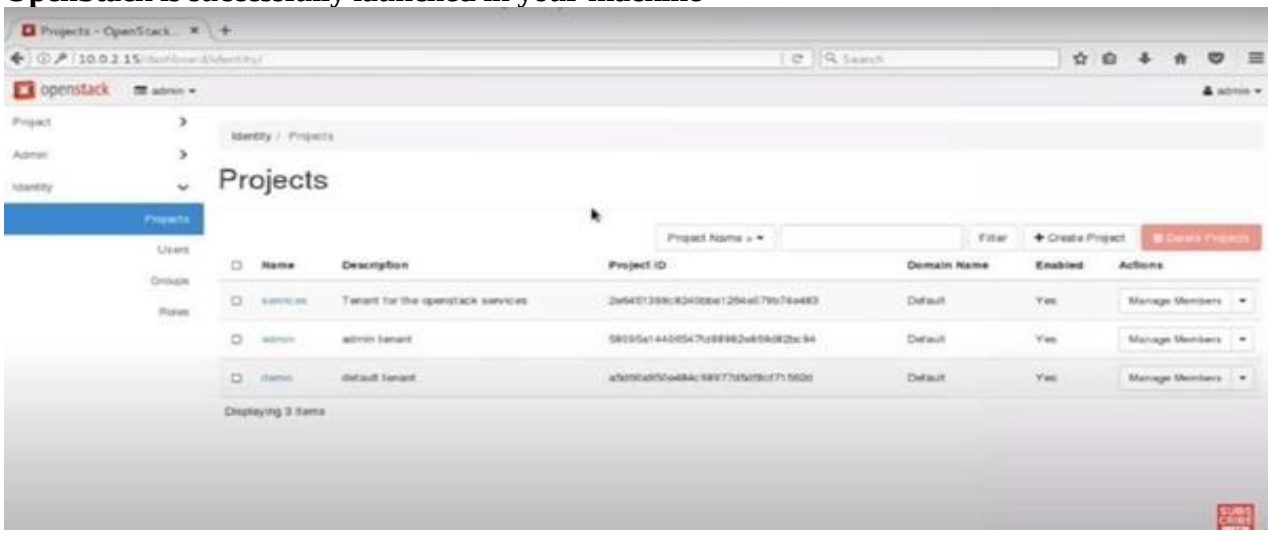
#packstak --allinone

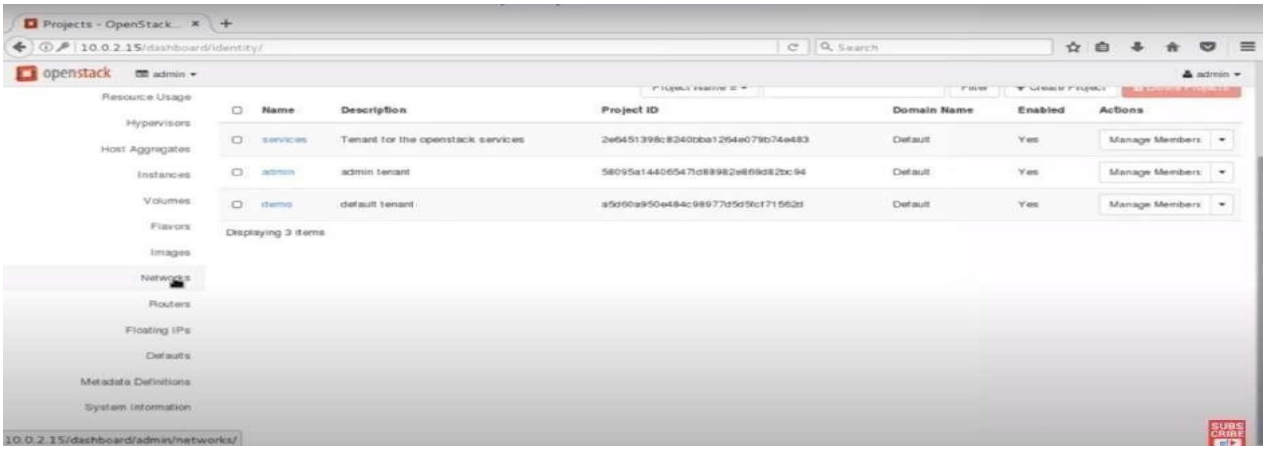
Step 12: Note the user name and password from keystonerc_admin

#cat keystonerc_admin

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

OpenStack is successfully launched in your machine





Result:

Thus the OpenStack Installation is executed successfully.

Ex.No: 07 **Installation of Hadoop Single Node Cluster**
Date:

Aim:
To find procedure to set up the one node Hadoop cluster.

Install Hadoop

Step 1: Download the Java 8 Package. Save this file in your home directory.

Step 2: Extract the Java Tar File.

***Command*:** tar -xvf jdk-8u101-linux-i586.tar.gz

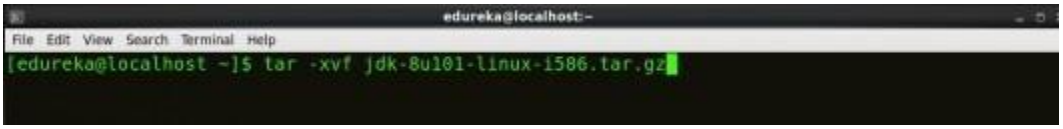


Fig: Hadoop Installation – Extracting Java Files

Step 3: Download the Hadoop 2.7.3 Package.

***Command*:** wget https://archive.apache.org/dist/hadoop/core/hadoop-2.7.3/hadoop-2.7.3.tar.gz

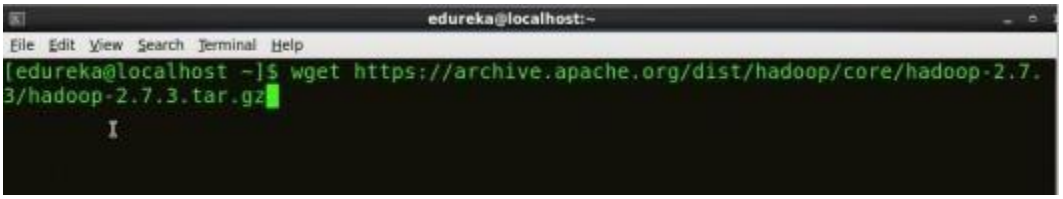


Fig: Hadoop Installation – Downloading Hadoop

Step 4: Extract the Hadoop tar File.

Command: tar -xvf hadoop-2.7.3.tar.gz

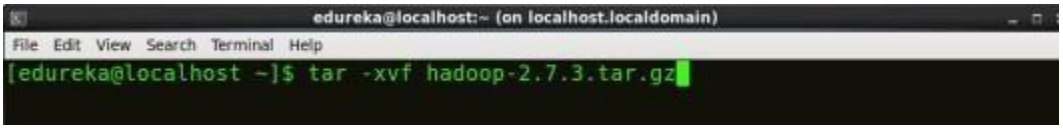


Fig: Hadoop Installation – Extracting Hadoop Files **Step 5:** Add the Hadoop and Java paths in the bash file (.bashrc). Open**. bashrc** file. Now, add Hadoop and Java Path as shown below.

***Command*:** vi .bashrc

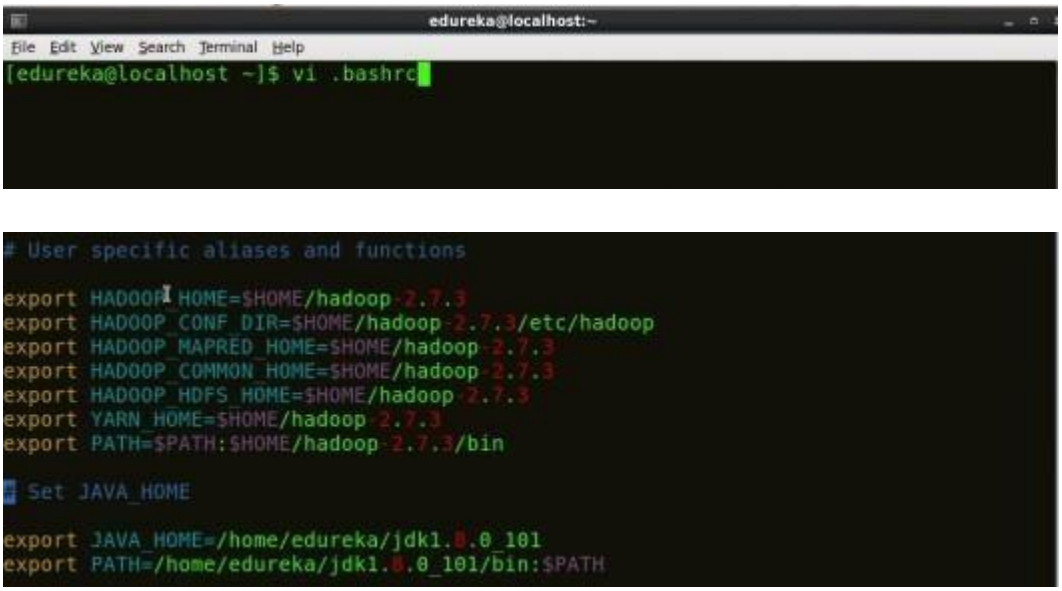


Fig: Hadoop Installation – Setting Environment Variable

Then, save the bash file and close it.

For applying all these changes to the current Terminal, execute the source command.

***Command*:** source .bashrc

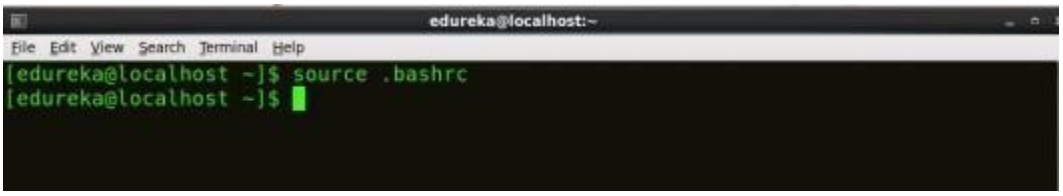


Fig: Hadoop Installation – Refreshing environment variables

To make sure that Java and Hadoop have been properly installed on your system and can be accessed through the Terminal, execute the java -version and hadoop version commands.

***Command*:** java -version

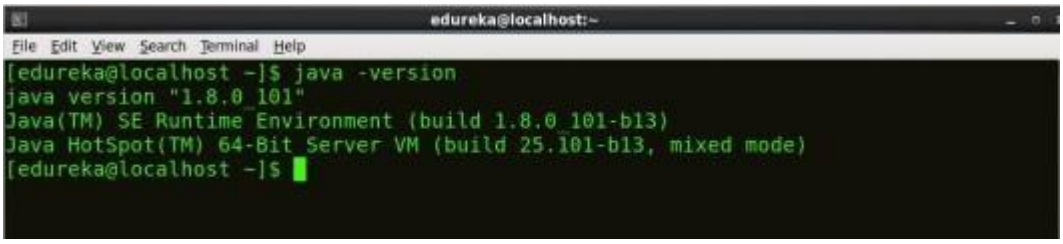


Fig: Hadoop Installation – Checking Java Version

***Command*:** hadoop version

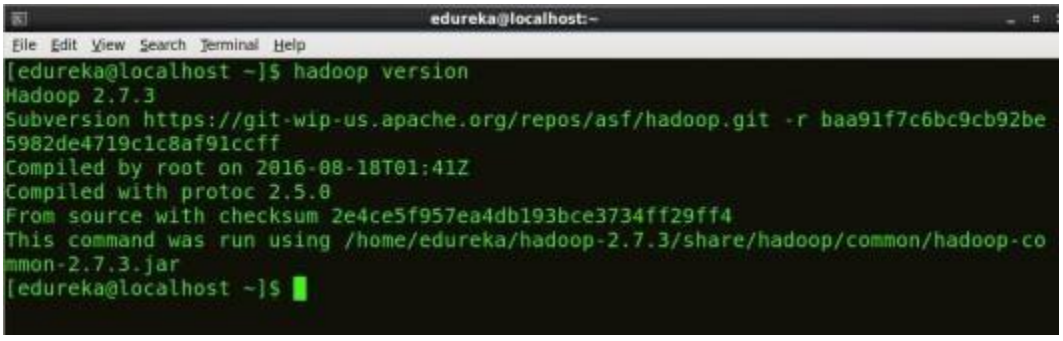


Fig: Hadoop Installation – Checking Hadoop Version

Step 6: Edit the **Hadoop Configuration files**.

Command: cd hadoop-2.7.3/etc/hadoop/

Command: ls

All the Hadoop configuration files are located in **hadoop-2.7.3/etc/hadoop** directory as you can see in the snapshot below:

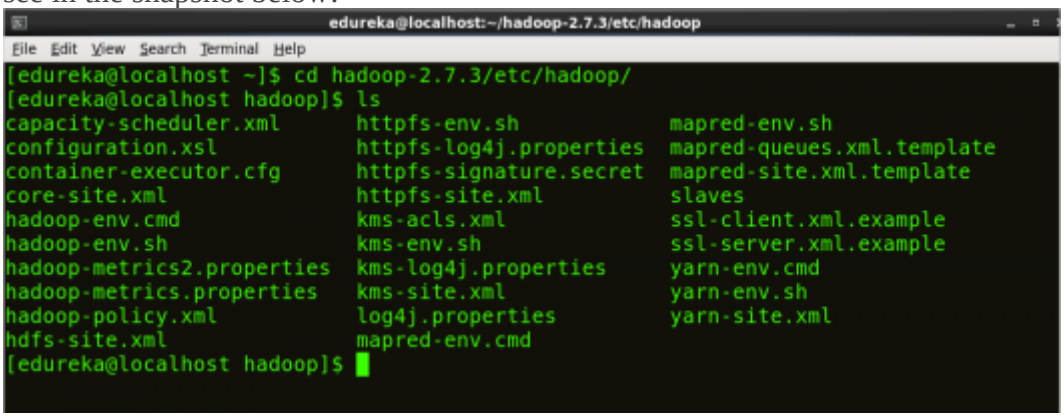
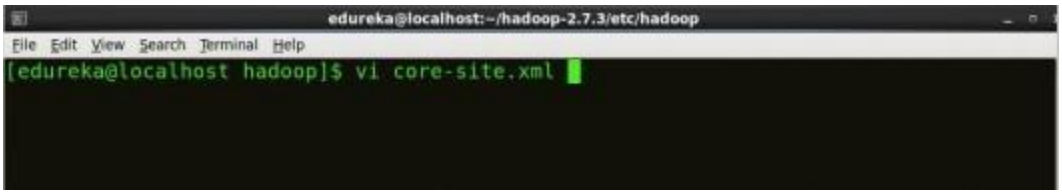


Fig: Hadoop Installation – Hadoop Configuration Files

Step 7: Open *core-site.xml* and edit the property mentioned below inside configuration tag:

core-site.xml informs Hadoop daemon where NameNode runs in the cluster. It contains configuration settings of Hadoop core such as I/O settings that are common to HDFS & MapReduce.

***Command*:** vi core-site.xml




```
1
2                <?xml version="1.0" encoding="UTF-8"?>
3      <?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
4                              <configuration>
5                                <property>
6                           <name>fs.default.name</name>
7                         <value>hdfs://localhost:9000</value>
8                                </property>
                               </configuration>
```

Fig: Hadoop Installation – Configuring core-site.xml

Step 8: Edit *hdfs-site.xml* and edit the property mentioned below inside configuration tag:

hdfs-site.xml contains configuration settings of HDFS daemons (i.e. NameNode, DataNode, Secondary NameNode). It also includes the replication factor and block size of HDFS.

***Command*:** vi hdfs-site.xml

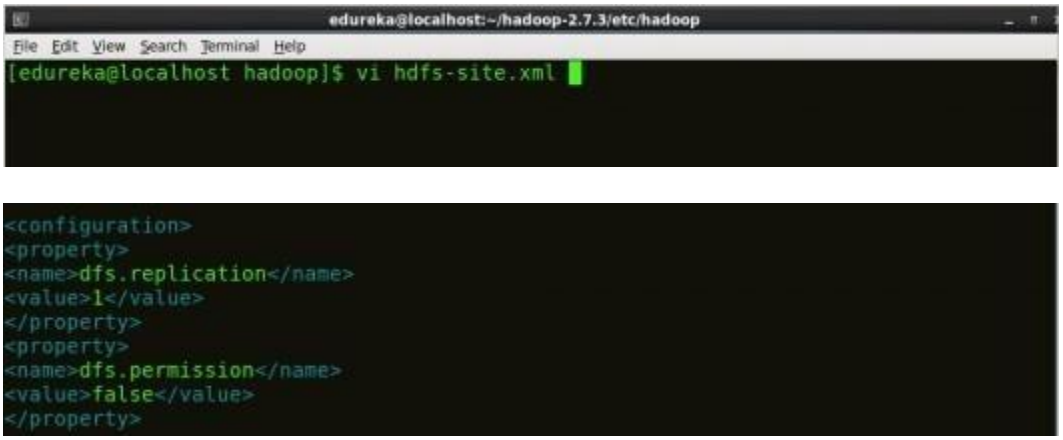


Fig: Hadoop Installation – Configuring hdfs-site.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<configuration>
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
<property>
<name>dfs.permission</name>
<value>false</value>
</property>
</configuration>
```

Step 9: Edit the *mapred-site.xml* file and edit the property mentioned below inside configuration tag:

mapred-site.xml contains configuration settings of MapReduce application like number of JVM that can run in parallel, the size of the mapper and the reducer process, CPU cores available for a process, etc.

In some cases, mapred-site.xml file is not available. So, we have to create the mapred- site.xml file using mapred-site.xml template.

***Command*:** cp mapred-site.xml.template mapred-site.xml

***Command*:** vi mapred-site.xml.

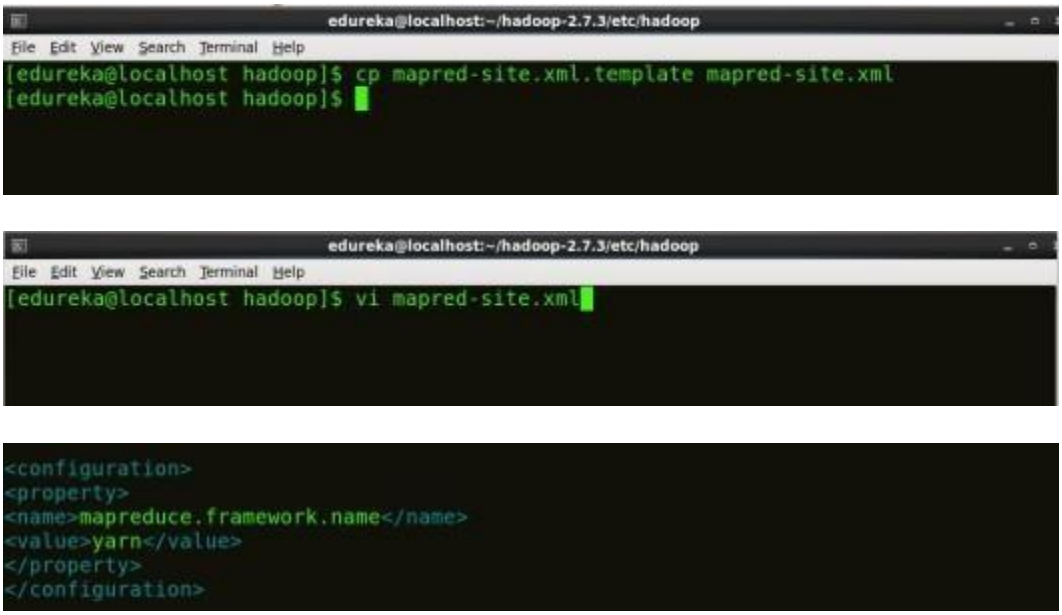


Fig: Hadoop Installation – Configuring mapred-site.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<configuration>
<property>
<name>mapreduce.framework.name</name>
<value>yarn</value>
</property>
</configuration>
```

Step 10: Edit *yarn-site.xml* and edit the property mentioned below inside configuration tag:

yarn-site.xml contains configuration settings of ResourceManager and NodeManager like application memory management size, the operation needed on program & algorithm, etc.

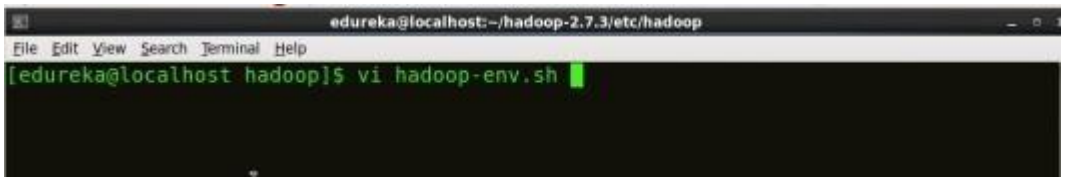
***Command*:** vi yarn-site.xml

Fig: Hadoop Installation – Configuring yarn-site.xml

Step 11: Edit *hadoop-env.sh* and add the Java Path as mentioned below:

```
<?xml version="1.0">
  <configuration>
    <property>
<name>yarn.nodemanager.aux-services</name>
  <value>mapreduce_shuffle</value>
    </property>
    <property>
<name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</
                        name>
  <value>org.apache.hadoop.mapred.ShuffleHandler</value>
    </property>
  </configuration>
```

hadoop-env.sh contains the environment variables that are used in the script to run Hadoop like Java home path, etc.



***Command*:** vi hadoop–env.sh

Fig: Hadoop Installation – Configuring hadoop-env.sh **Step 12:**
Go to Hadoop home directory and format the NameNode. ***Command*:** cd
***Command*:** cd hadoop-2.7.3

***Command*:** bin/hadoop namenode -format

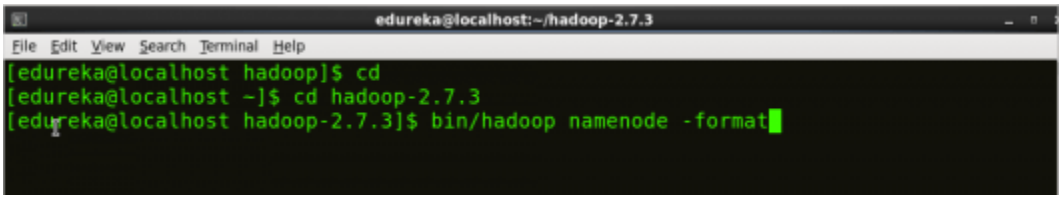


Fig: Hadoop Installation – Formatting NameNode

This formats the HDFS via NameNode. This command is only executed for the first time. Formatting the file system means initializing the directory specified by the dfs.name.dir variable.

Never format, up and running Hadoop filesystem. You will lose all your data stored in the HDFS.

Step 13: Once the NameNode is formatted, go to hadoop-2.7.3/sbin directory and start all the daemons.

Command: cd hadoop-2.7.3/sbin

Either you can start all daemons with a single command or do it individually.

Command: ./start-all.sh

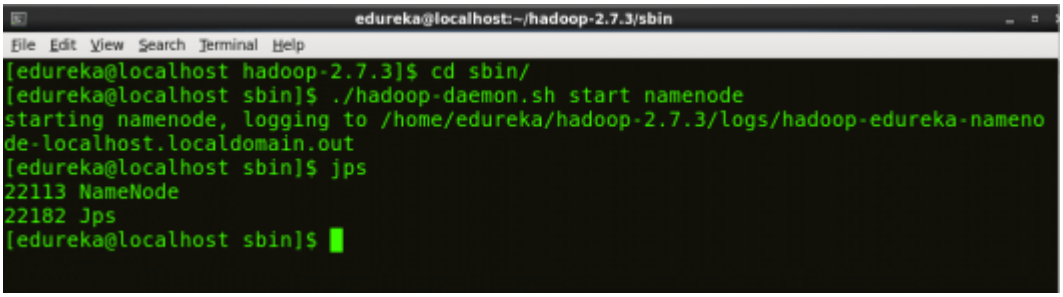
The above command is a combination of ***start-dfs.sh, start-yarn.sh*** & ***mr-jobhistory-daemon.sh***

Or you can run all the services individually as below:

Start NameNode:

The NameNode is the centerpiece of an HDFS file system. It keeps the directory tree of all files stored in the HDFS and tracks all the file stored across the cluster.

Command: ./hadoop-daemon.sh start namenode



Start DataNode:

Fig: Hadoop installation– Starting NameNode

On startup, a DataNode connects to the Namenode and it responds to the requests from the Namenode for different operations.

Command: ./hadoop-daemon.sh start datanode

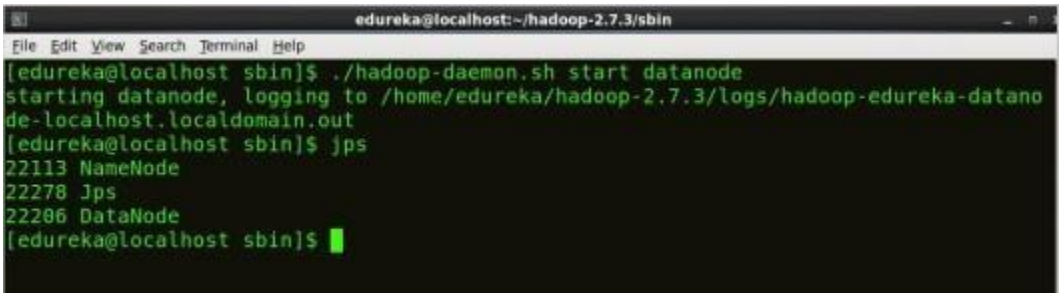


Fig: Hadoop Installation – Starting DataNode

Start ResourceManager:

ResourceManager is the master that arbitrates all the available cluster resources and thus helps in managing the distributed applications running on the YARN system. Its work is to manage each NodeManagers and the each application's ApplicationMaster.

Command: ./yarn-daemon.sh start resourcemanager

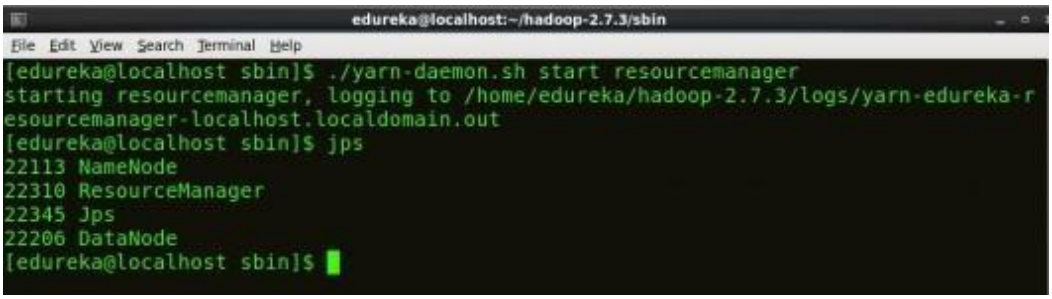


Fig: Hadoop Installation – Starting ResourceManager

Start NodeManager:

The NodeManager in each machine framework is the agent which is responsible for managing containers, monitoring their resource usage and reporting the same to the ResourceManager.

Command: ./yarn-daemon.sh start nodemanager

Fig: Hadoop Installation – Starting NodeManager

Start JobHistoryServer:

JobHistoryServer is responsible for servicing all job history related requests from client.

***Command*:** ./mr-jobhistory-daemon.sh start historyserver

Step 14: To check that all the Hadoop services are up and running, run the below command.
Command: jps

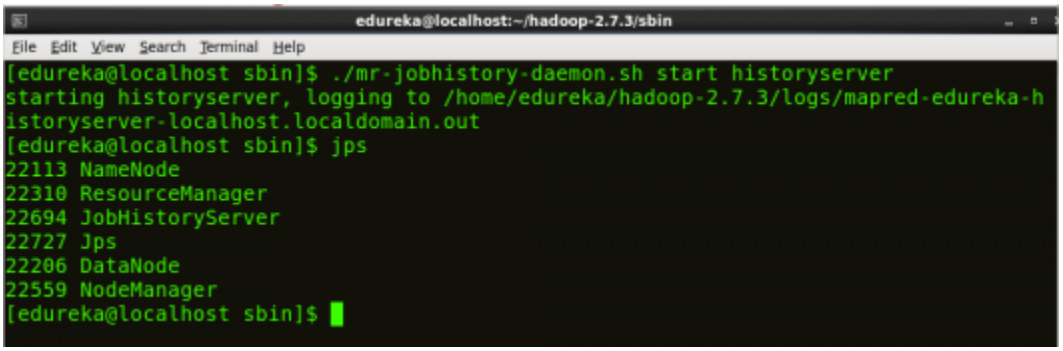


Fig: Hadoop Installation – Checking Daemons

Step 15: Now open the Mozilla browser and go to **localhost**:**50070/dfshealth.html** to check the NameNode interface.

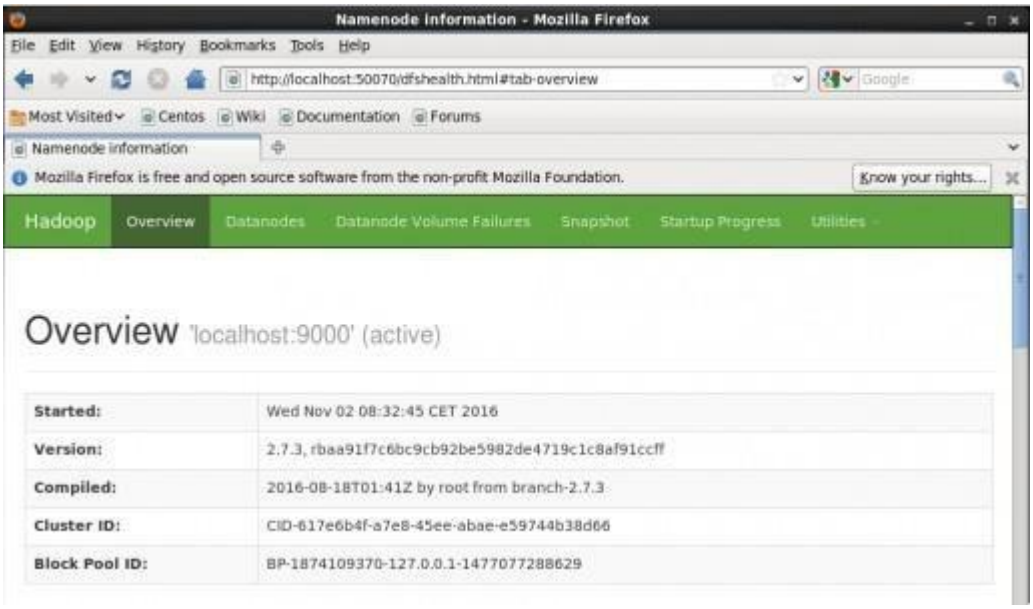


Fig: Hadoop Installation – Starting WebUI

Congratulations, you have successfully installed a single node Hadoop cluster

Result:
Thus the procedure to set up the one node Hadoop cluster was successfully done and verified.

Ex.No: 08 **Word Count Program Using Map and Reduce**
Date:
Aim:

To Count the number of words using JAVA for demonstrating the use of Map and Reduce

Procedure:

1. Analyze the input file content
2. Develop the code
    a. Writing a map function
    b. Writing a reduce function
    c. Writing the Driver class
3. Compiling the source
4. Building the JAR file
5. Starting the DFS
6. Creating Input path in HDFS and moving the data into Input path
7. Executing the program

Program: WordCount.java

```
import java.io.IOException;
import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;

import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;

import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class WordCount {

   public static class TokenizerMapper extends Mapper<Object, Text, Text, IntWritable> {
      private final static IntWritable one = new IntWritable(1);
      private Text word = new Text();

      public void map(Object key, Text value, Context context) throws IOException,
InterruptedException {
         StringTokenizer itr = new StringTokenizer(value.toString());
         while (itr.hasMoreTokens()) {
            word.set(itr.nextToken());
            context.write(word, one);

   }
```

```
    }
  }

  public static class IntSumReducer extends Reducer<Text, IntWritable, Text, IntWritable> {
    private IntWritable result = new IntWritable();

    public void reduce(Text key, Iterable<IntWritable> values, Context context)
        throws IOException, InterruptedException {
      int sum = 0;
      for (IntWritable val : values) {
        sum += val.get();
      }
      result.set(sum);
      context.write(key, result);
    }
  }

  public static void main(String[] args) throws Exception {
    Configuration conf = new Configuration();
    Job job = Job.getInstance(conf, "word count");

    job.setJarByClass(WordCount.class);
    job.setMapperClass(TokenizerMapper.class);
    job.setCombinerClass(IntSumReducer.class);
    job.setReducerClass(IntSumReducer.class);

    job.setOutputKeyClass(Text.class);
    job.setOutputValueClass(IntWritable.class);

    FileInputFormat.addInputPath(job, new Path(args[0]));
    FileOutputFormat.setOutputPath(job, new Path(args[1]));

    System.exit(job.waitForCompletion(true) ? 0 : 1);
  }
}
```

Save the program as **WordCount.java**

Step 1: Compile the java program

For compilation we need this hadoop-core-1.2.1.jar file to compile the mapreduce program.

https://mvnrepository.com/artifact/org.apache.hadoop/hadoop-core/1.2.1

Assuming both jar and java files in same directory run the following command to compile
root@a4cseh160:/#javac -classpath hadoop-core-1.2.1.jar WordCount.java
Step 2: Create a jar file

Syntax:jar cf jarfilename.jar MainClassName*.class

Output:

root@a4cseh160:/#jar cf wc.jar WordCount*.class**Step**

3: Make directory in hadoop file system **Syntax:**
hdfs dfs -mkdir directoryname
Output:

root@a4cseh160:/# hdfs dfs -mkdir /user

Step 4: Copy the input file into hdfs
Syntax:

hdfs dfs -put sourcefile destpath

Output:

root@a4cseh160:/#hdfs dfs -put /input.txt /user
Step 5: To a run a programSyntax:
hadoop jar jarfilename main_class_name inputfile outputpath
Output:

root@a4cseh160:/#hadoop jar wc.jar WordCount /user/input.txt /user/out

Input File: (input.txt)

Cloud and Grid Lab. Cloud and Grid Lab. Cloud Lab.

Output:
18
3 Cloud

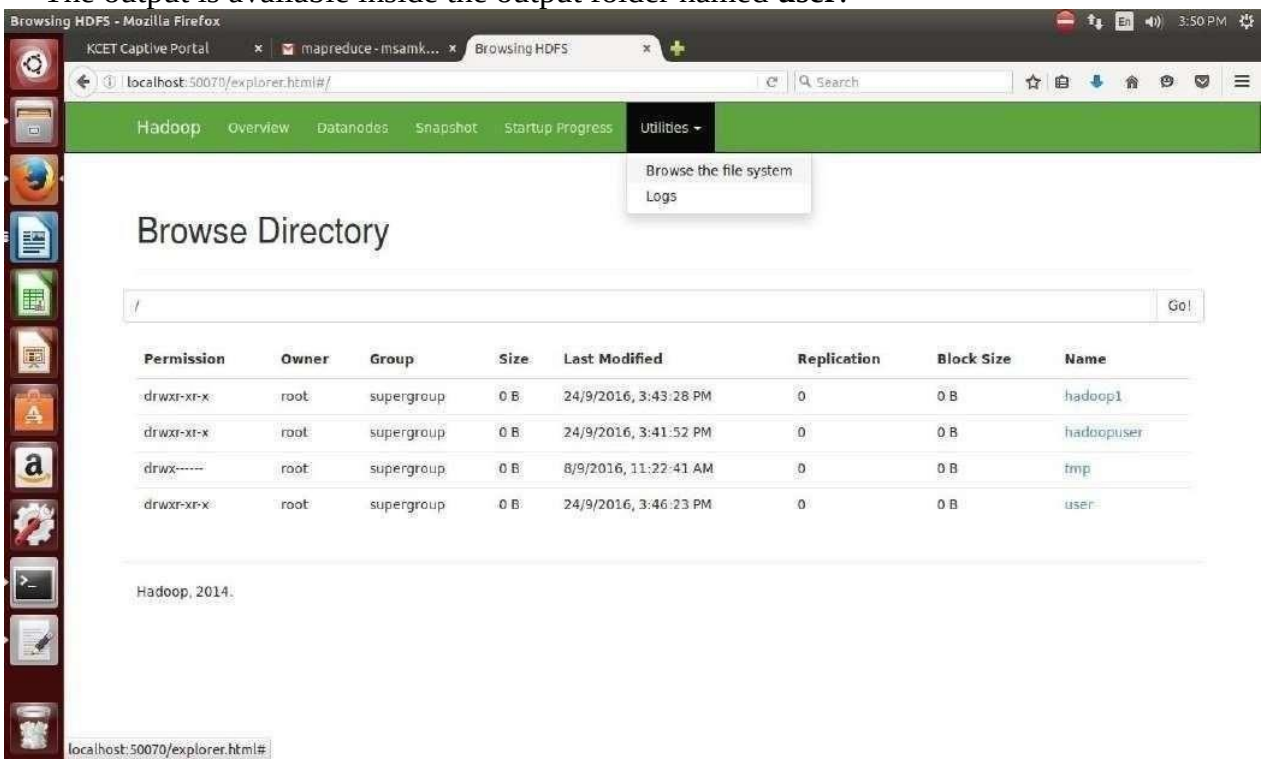
3 Lab.

2 Grid

2 and

Step 6: Check the output in the Web UI at **http://localhost:50070.**

In the Utilities tab select browse file system and select the correct user.
The output is available inside the output folder named **user**.



Step 7: To Delete an output folder

Syntax:

hdfs dfs -rm -R outputpath

Output:

root@a4cseh160:/#hdfs dfs -rm -R /user/out.txt

Result:

Thus the numbers of words were counted successfully by the use of Map and Reduce tasks.

20 ITPL602 CLOUD COMPUTING & VIRTUALIZATION LABORATORY

CONTENT BEYOND SYLLABUS

LIST OF EXPERIMENTS:

1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.
3. Using Apache Axis develop a Grid Service.
4. Develop applications using Java or C/C++ Grid APIs

1. Develop a new Web Service for Calculator.

OBJECTIVE:
To develop a new Web service for Calculator applications.

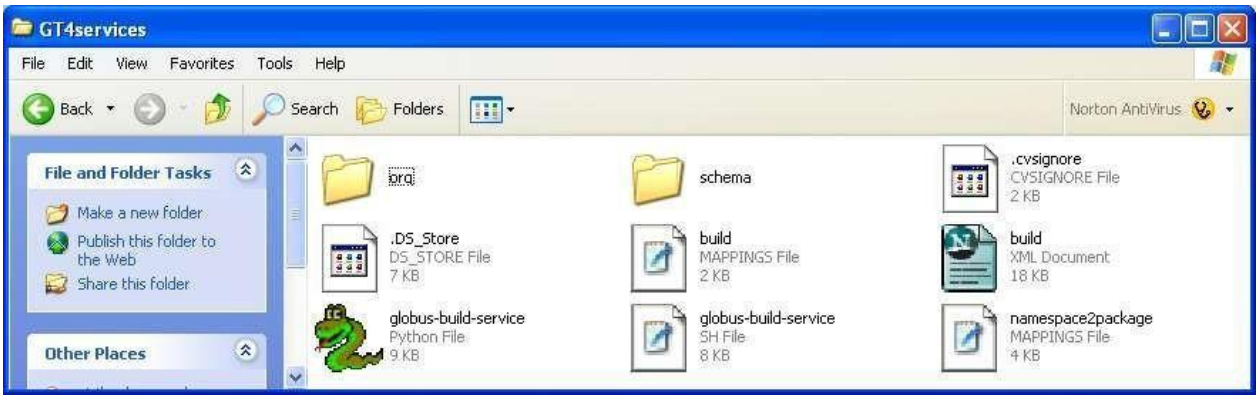
PROCEDURE:
When you start Globus toolkit container, there will be number of services starts up. The service for this task will be a simple Math service that can perform basic arithmetic for a client.
The Math service will access a resource with two properties:
1. An integer value that can be operated upon by the service
2. A string values that holds string describing the last operation

The service itself will have three remotely accessible operations that operate upon *value*:
(a) add, that adds *a* to the resource property *value*.
(b) subtract that subtracts *a* from the resource property *value*.
(c) getValueRP that returns the current value of *value.*
Usually, the best way for any programming task is to begin with an overall description of what you want the code to do, which in this case is the service interface. The service interface describes how what the service provides in terms of names of operations, their arguments and return values. A Java interface for our service is:

```
public interface Math {
public void add(int a);
public void subtract(int a);
public int getValueRP();
}
```

It is possible to start with this interface and create the necessary WSDL file using the standard Web service tool called Java2WSDL. However, the WSDL file for GT 4 has to include details of resource properties that are not given explicitly in the interface above. Hence, we will provide the WSDL file.

Step 1 Getting the Files
All the required files are provided and comes directly from [1]. The MathService source code files can be found from http://www.gt4book.com (http://www.gt4book.com/downloads/gt4book-examples.tar.gz)
A Windows zip compressed version can be found at http://www.cs.uncc.edu/~abw/ITCS4146S07/gt4book-examples.zip. Download and uncompress the file into a directory called **GT4services**. Everything is included (the java source WSDL and deployment files, etc.):



WSDL service interface description file -- ***The WSDL service interface description file is provided within the GT4services folder at:***
GT4Services\schema\examples\MathService_instance\Math.wsdl
This file, and discussion of its contents, can be found in Appendix A. Later on we will need to modify this file, but first we will use the existing contents that describe the Math service above.
Service code in Java -- For this assignment, both the code for service operations and for the resource properties are put in the same class for convenience. More complex services and resources would be defined in separate classes. The Java code for the service and its resource properties is located within the GT4services folder at:
GT4services\org\globus\examples\services\core\first\impl\MathService.java.
Deployment Descriptor -- The deployment descriptor gives several different important sets of information about the service once it is deployed. It is located within the **GT4services** folder at:
GT4services\org\globus\examples\services\core\first\deploy-server.wsdd.

Step 2 – Building the Math Service
It is now necessary to package all the required files into a GAR (Grid Archive) file. The build tool ant from the Apache Software Foundation is used to achieve this as shown overleaf:
Generating a GAR file with Ant (from http://gdp.globus.org/gt4-tutorial/multiplehtml/ch03s04.html)
Ant is similar in concept to the Unix make tool but a java tool and XML based.
Build scripts are provided by Globus 4 to use the ant build file. The windows version of the build script for MathService is the Python file called **globus-build-service.py**, which held in the **GT4services** directory. The build script takes one argument, the name of your service that you want to deploy. To keep with the naming convention in [1], this service will be called **first**.
In the *Client Window*, run the build script from the **GT4services** directory with:
globus-build-service.py first
The output should look similar to the following:
Buildfile: build.xml
BUILD SUCCESSFUL
Total time: 8 seconds
During the build process, a new directory is created in your **GT4Services** directory that is named **build**. All of your stubs and class files that were generated will be in that directory and

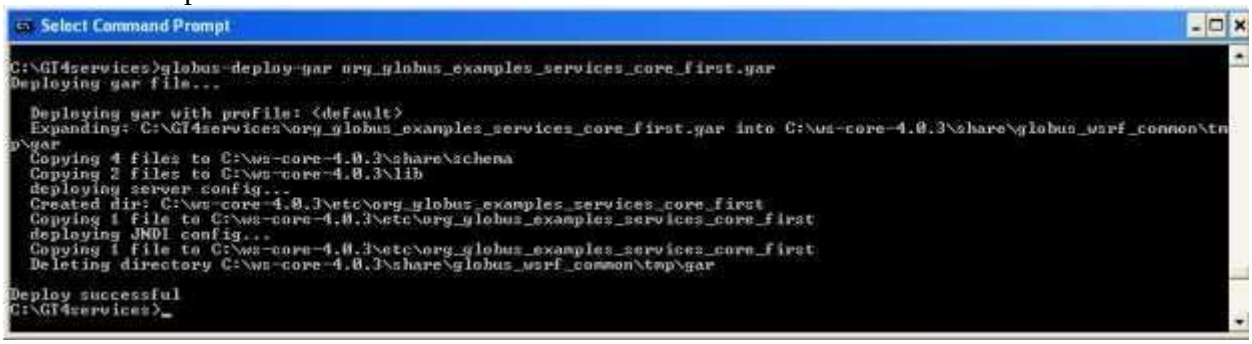
its subdirectories. More importantly, there is a GAR (Grid Archive) file called **org_globus_examples_services_core_first.gar**. The GAR file is the package that contains every file that is needed to successfully deploy your Math Service into the Globus container. The files contained in the GAR file are the Java class files, WSDL, compiled stubs, and the deployment descriptor.

Step 3 – Deploying the Math Service

If the container is still running in the Container Window, then stop it using Control-C. To deploy the Math Service, you will use a tool provided by the Globus Toolkit called **globus-deploy-gar**. In the *Container Window*, issue the command:

globus-deploy-gar org_globus_examples_services_core_first.gar

Successful output of the command is :



The service has now been deployed.

Check service is deployed by starting container from the *Container Window*:

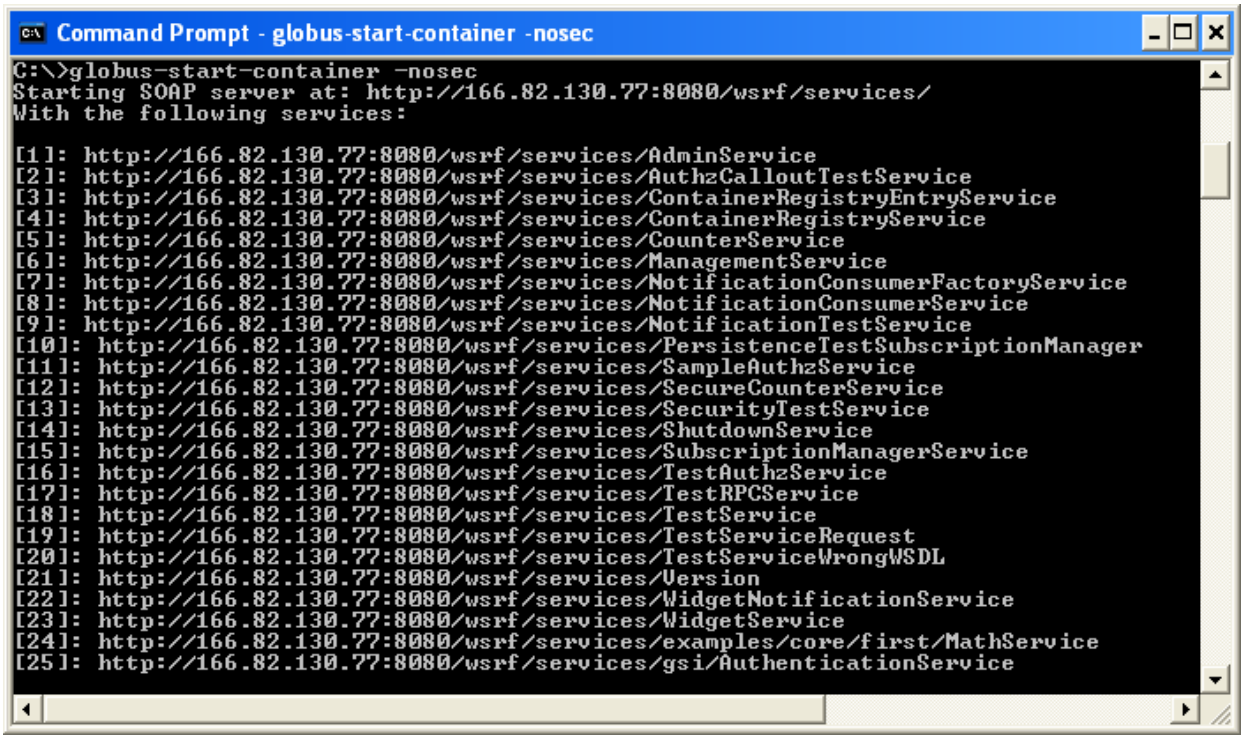
You should see the service called **MathService**.

Step 4 – Compiling the Client

A client has already been provided to test the Math Service and is located in the **GT4Services** directory at:

GT4Services\org\globus\examples\clients\MathService_instance\Client.java

and contains



You should see the service called **MathService**.

Step 4 – Compiling the Client

A client has already been provided to test the Math Service and is located in the **GT4Services** directory at:

GT4Services\org\globus\examples\clients\MathService_instance\Client.java

and contains the following code:

```
package org.globus.examples.clients.MathService_instance;
import org.apache.axis.message.addressing.Address;
import org.apache.axis.message.addressing.EndpointReferenceType;
import org.globus.examples.stubs.MathService_instance.MathPortType;
import org.globus.examples.stubs.MathService_instance.GetValueRP;
import
org.globus.examples.stubs.MathService_instance.service.MathServiceAddressingL
ocator;
public class Client {
public static void main(String[] args) {
MathServiceAddressingLocator locator = new
MathServiceAddressingLocator()
try {
String serviceURI = args[0];
// Create endpoint reference to service
EndpointReferenceType endpoint = new
EndpointReferenceType();
endpoint.setAddress(new Address(serviceURI));
MathPortType math;
// Get PortType
math = locator.getMathPortTypePort(endpoint);
// Perform an addition
math.add(10);
// Perform another addition
math.add(5);
// Access value
System.out.println("Current value: "
+ math.getValueRP(new GetValueRP()));
// Perform a subtraction
math.subtract(5);
// Access value
System.out.println("Current value: "
+ math.getValueRP(new GetValueRP()));
} catch (Exception e) {
e.printStackTrace();
}
}
}
```

When the client is run from the command line, you pass it one argument. The argument is the URL that specifies where the service resides. The client will create the end point rerference and incorporate this URL as the address. The end point reference is then used with the **getMathPortTypePort** method of a **MathServiceAdressingLocator** object to obtain a reference to the Math interface (portType). Then, we can apply the methods available in the

service as though they were local methods Notice that the call to the service (add and subtract method calls) must be in a "**try {} catch(){}**" block because a "RemoteException" may be thrown. The code for the "**MathServiceAddressingLocator**" is created during the build process. (Thus you don't have to write it!)

(a) Settting the Classpath

To compile the new client, you will need the JAR files from the Globus toolkit in your CLASSPATH. Do this by executing the following command in the Client Window:

%GLOBUS_LOCATION%\etc\globus-devel-env.bat

You can verify that this sets your CLASSPATH, by executing the command:

echo %CLASSPATH%

You should see a long list of JAR files.

Running **\gt4\etc\globus-devel-env.bat** only needs to be done *once* for each *Client Window* that you open. It does *not* need to be done each time you compile.

(b) Compiling Client

Once your CLASSPATH has been set, then you can compile the Client code by typing in the following command:

javac -classpath
build\classes\org\globus\examples\services\core\first\impl\:%CLASSPATH%
org\globus\examples\clients\MathService_instance\Client.java

Step 5 – Start the Container for your Service

Restart the Globus container from the *Container Window* with:

globus-start-container -nosec

if the container is not running.

Step 6 – Run the Client

To start the client from your **GT4Services** directory, do the following in the *Client Window*, which passes the GSH of the service as an argument:

java -classpath
build\classes\org\globus\examples\services\core\first\impl\:%CLASSPATH%
org.globus.examples.clients.MathService_instance.Client
http://localhost:8080/wsrf/services/examples/core/first/MathService

which should give the output:

Current value: 15
Current value: 10

Step 7 – Undeploy the Math Service and Kill a Container

Before we can add functionality to the Math Service (Section 5), we must undeploy the service. In the *Container Window*, kill the container with a Control-C. Then to undeploy the service, type in the following command:

globus-undeploy-gar org_globus_examples_services_core_first

which should result with the following output:

Undeploying gar...
Deleting /.
.
.
Undeploy successful

6 Adding Functionality to the Math Service

In this final task, you are asked to modify the Math service and associated files so the srvice supports the multiplication operation. To do this task, you will need to modify:

- Service code (**MathService.java**)
- WSDL file (**Math.wsdl)**

The exact changes that are necessary are not given. You are to work them out yourself. You will need to fully understand the contents of service code and WSDL files and then modify them accordingly. Appendix A gives an explanation of the important parts of these files. Keep all file names the same and simply redeploy the service afterwards. You will also need to add a code to the client code (**Client.java**) to test the modified service to include multiplication.

Result:

Thus the Develop a new Web Service for Calculator was executed successfully.

2. Develop new OGSA-compliant Web Service

OBJECTIVE:

To develop a new OGSA-compliant web service.

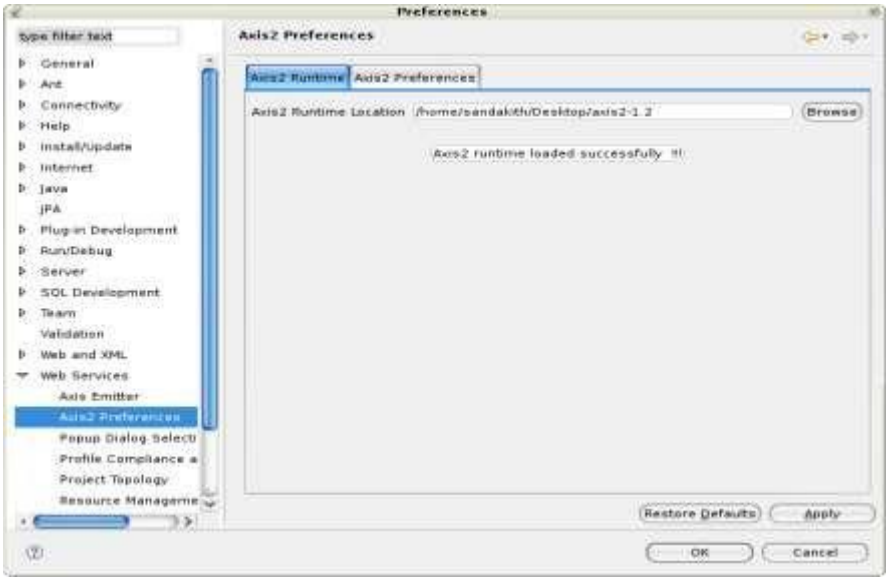
PROCEDURE:

Writing and deploying a WSRF Web Service is easier than you might think. You just have to follow five simple steps

1. Define the service's interface. This is done with *WSDL*
2. Implement the service. This is done with *Java*.
3. Define the deployment parameters. This is done with *WSDD* and *JNDI*
4. Compile everything and generate a GAR file. This is done with *Ant*
5. Deploy service. This is also done with *a GT4 tool*

To run this program, as a minimum you will be required to have installed the following prerequisite software

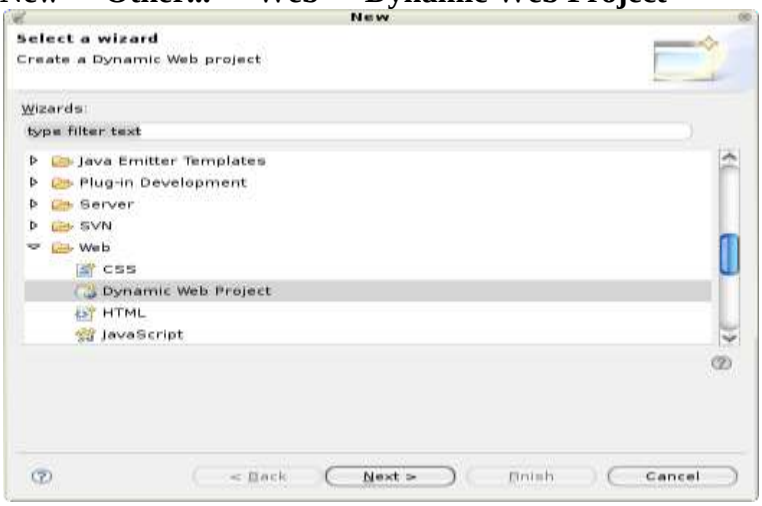
a. Download the latest Axis2 runtime from the above link and extract it. Now we point Eclipse WTP to downloaded Axis2 Runtime. Open **Window -> Preferences -> Web Services -> Axis2 Emitter**



Select the Axis2 Runtime tab and point to the correct Axis2 runtime location. Alternatively at the Axis2 Preference tab, you can set the default setting that will come up on the Web Services Creation wizards. For the moment we will accept the default settings.

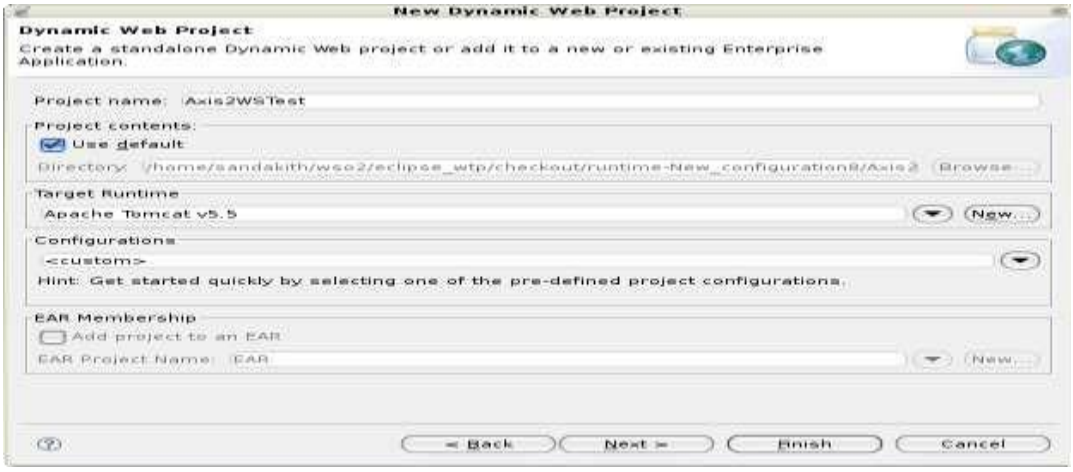
b. Click OK.

c. Next we need to create a project with the support of Axis2 features. Open **File -> New -> Other... -> Web -> Dynamic Web Project**



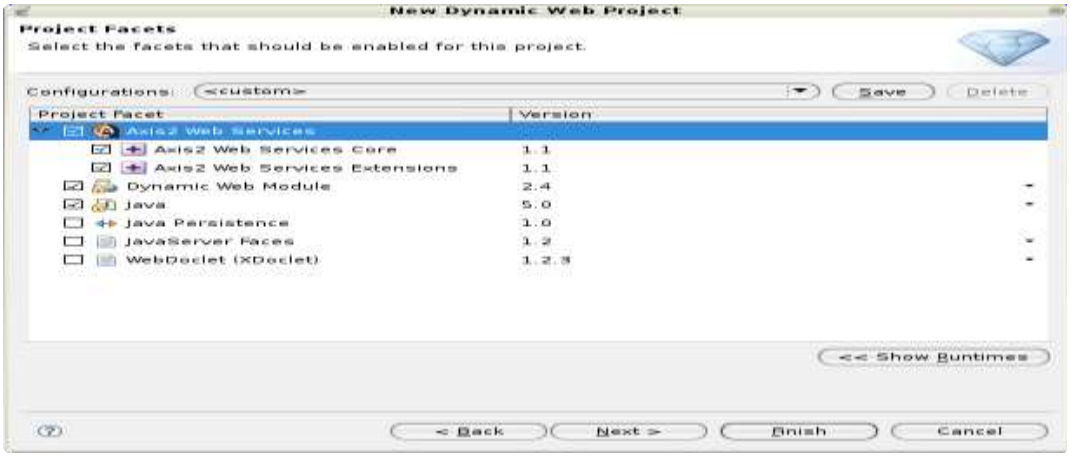
Click next

d. Select the name **Axis2WSTest** as the Dynamic Web project name (you can specify any name you prefer), and select the configured Tomcat runtime as the target runtime.



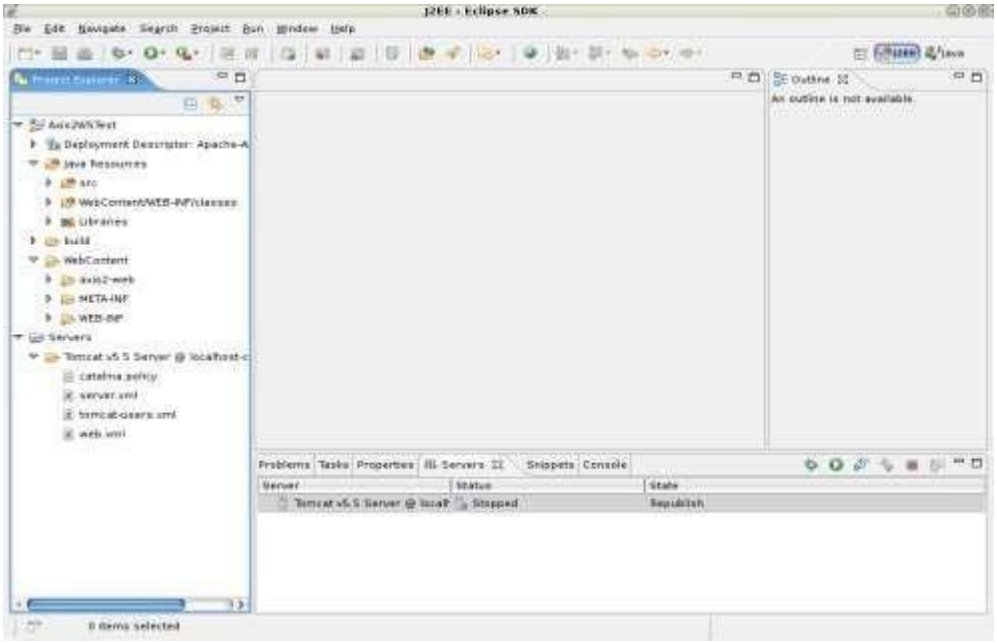
Click next.

e. Select the Axis2 Web service facet

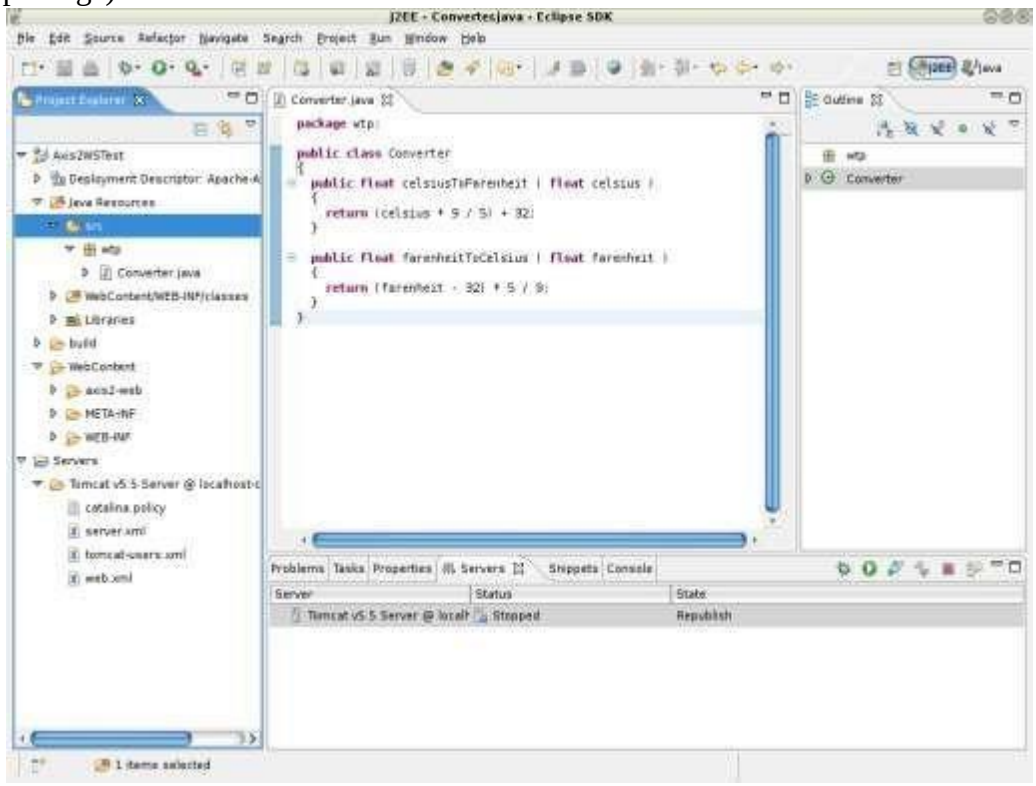


Click Finish.

f. This will create a dynamic Web project in the workbench

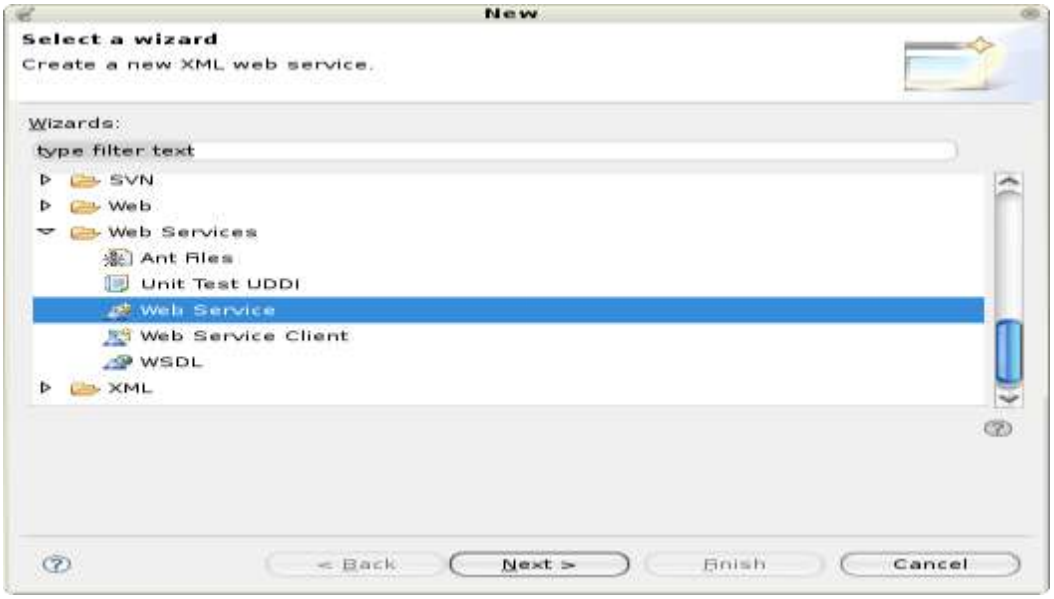


g. Import the wtp/Converter.java class into Axis2WSTest/src (be sure to preserve the package).



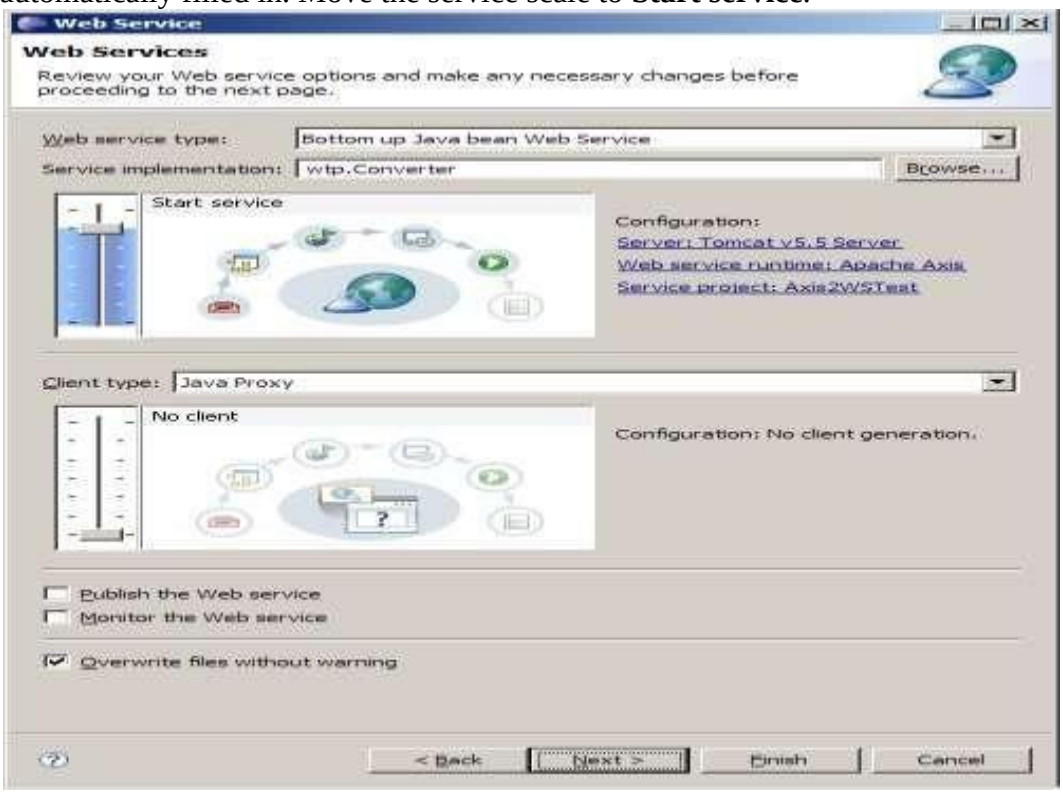
Build the Project, if its not auto build.

h. Select Converter.java, open File -> New -> Other... -> Web Services -> Web Service

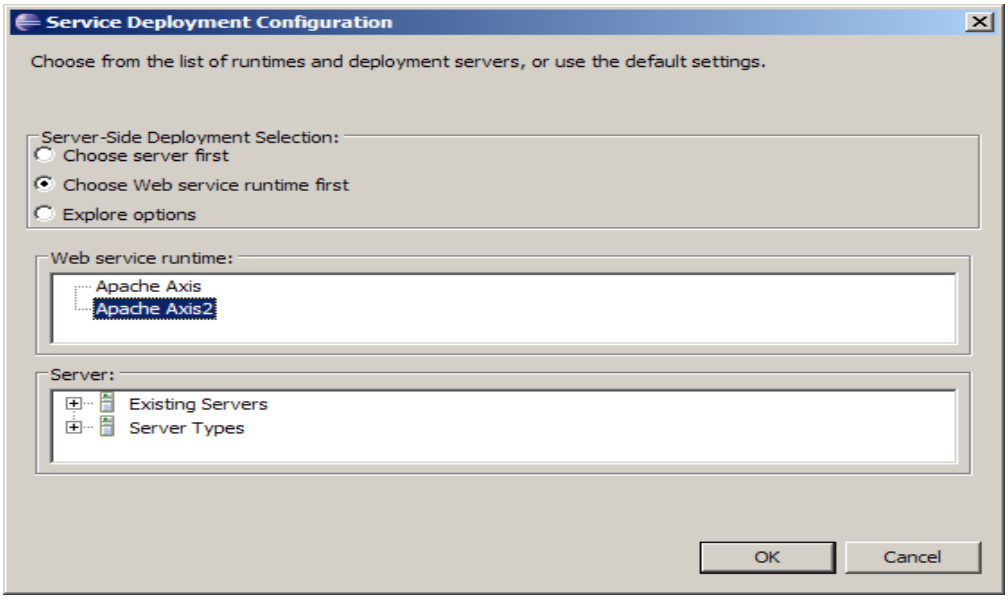


Click next.

i. The Web service wizard would be brought up with Web service type set to **Bottom up Java bean Web Service** with the service implementation automatically filled in. Move the service scale to **Start service**.

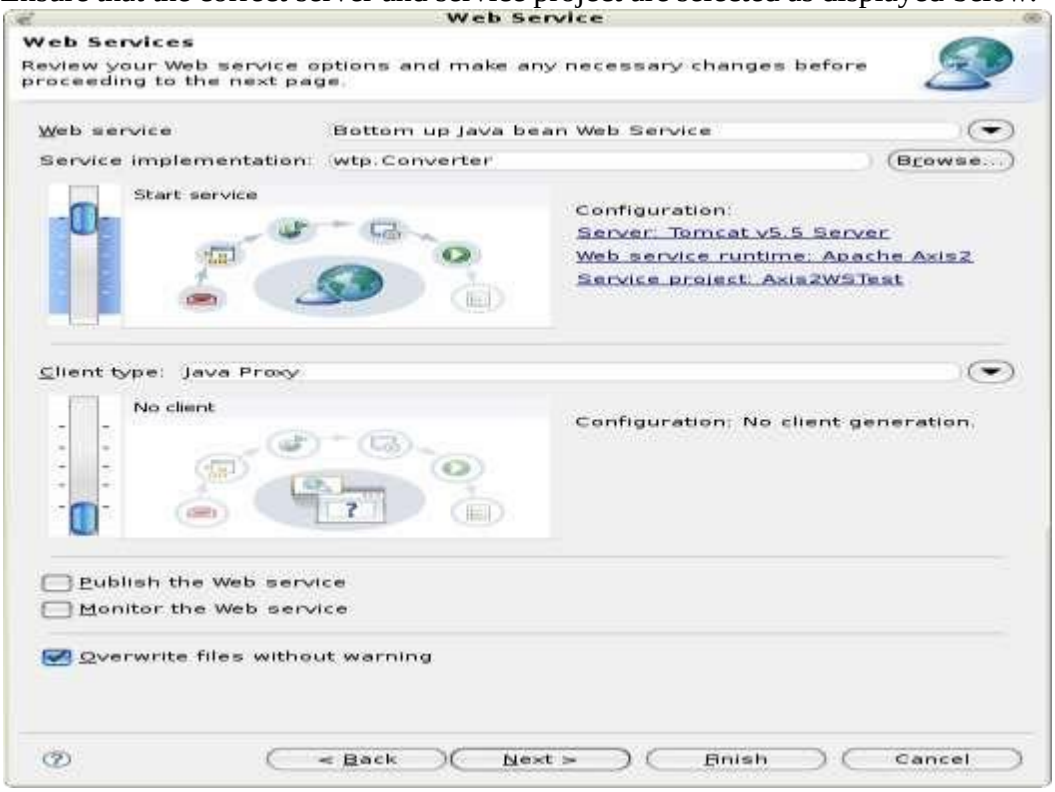


j. Click on the **Web Service runtime** link to select the Axis2 runtime.



Click OK.

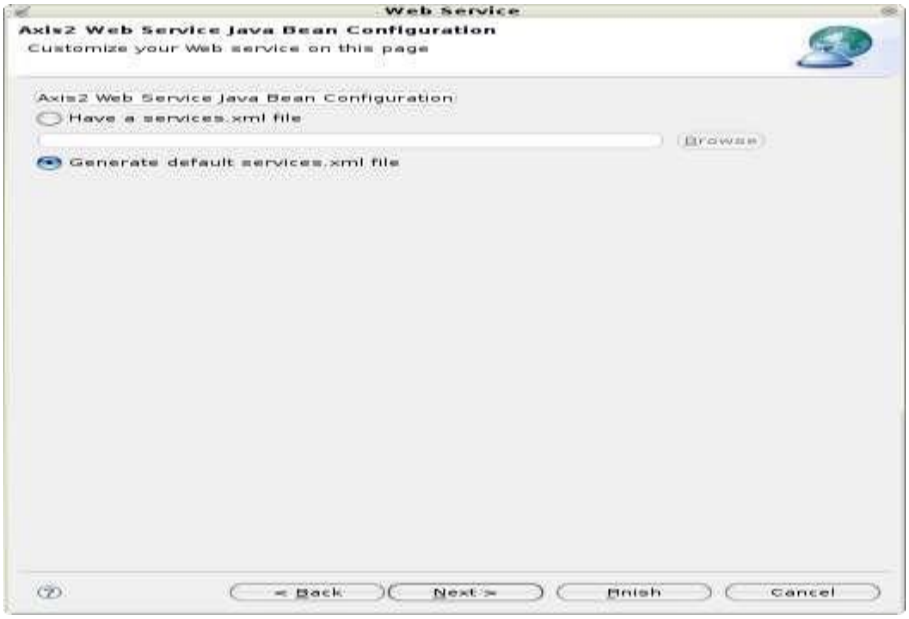
k. Ensure that the correct server and service project are selected as displayed below.



Click next.

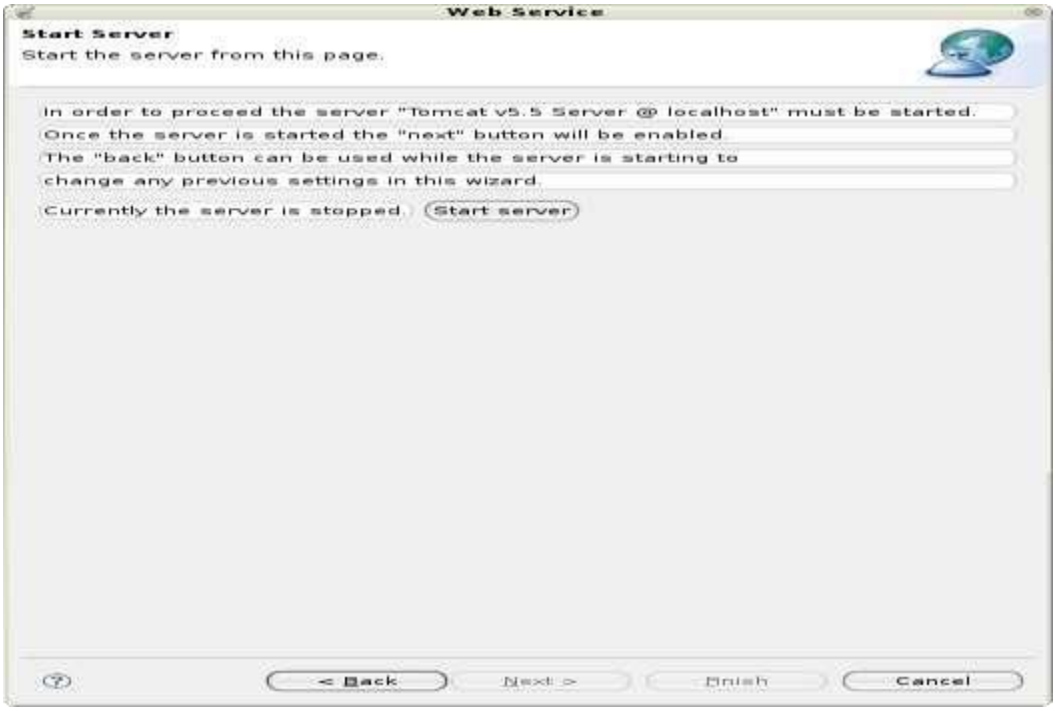
l. This page is the service.xml selection page. if you have a custom services.xml, you can include that by clicking the **Browse** button. For the moment, just leave it

at the default.



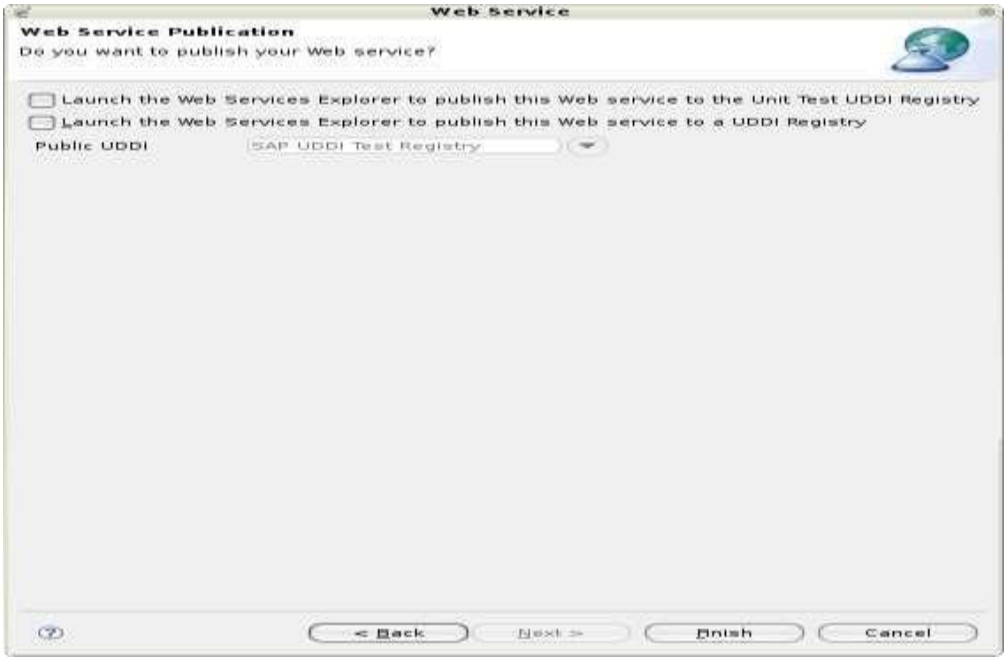
Click next.

m. This page is the Start Server page. It will be displayed if the server has not been started. Click on the **Start Server** button. This will start the server runtime.



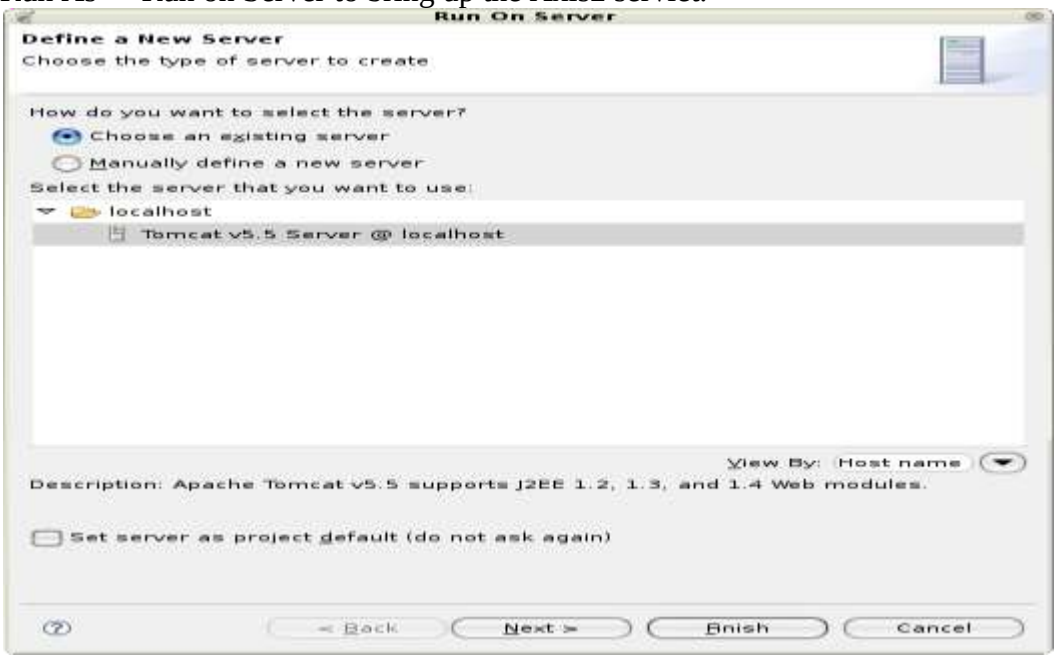
Click next.

n. This page is the Web services publication page, accept the defaults.



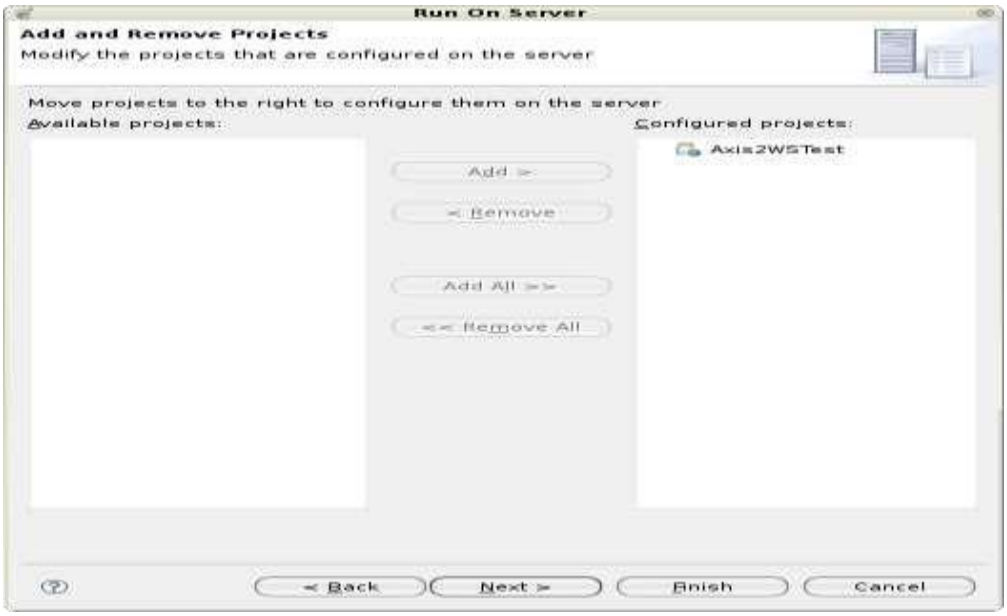
Click Finish.

o. Now, select the **Axis2WSTest** dynamic Web project, right-click and select Run -> Run As -> Run on Server to bring up the Axis2 servlet.



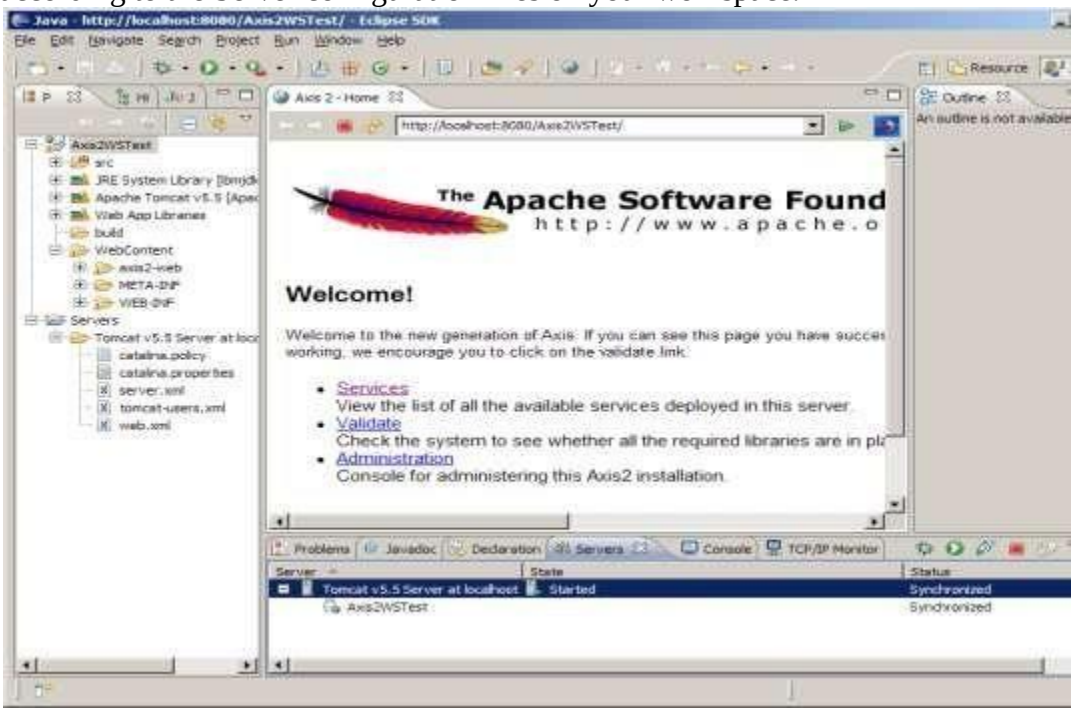
Click Next.

p. Make sure you have the **Axis2WSTest** dynamic Web project on the right-hand side under the Configured project.

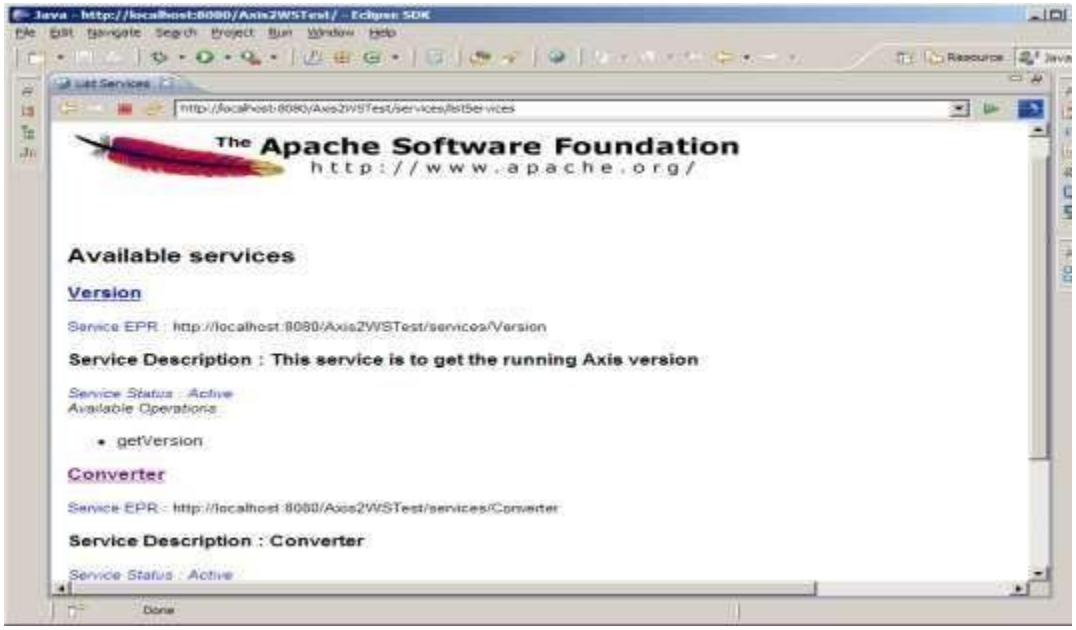


Click Finish.

q. This will deploy the Axis2 server webapp on the configured servlet container and will display the Axis2 home page. Note that the servlet container will start up according to the Server configuration files on your workspace.

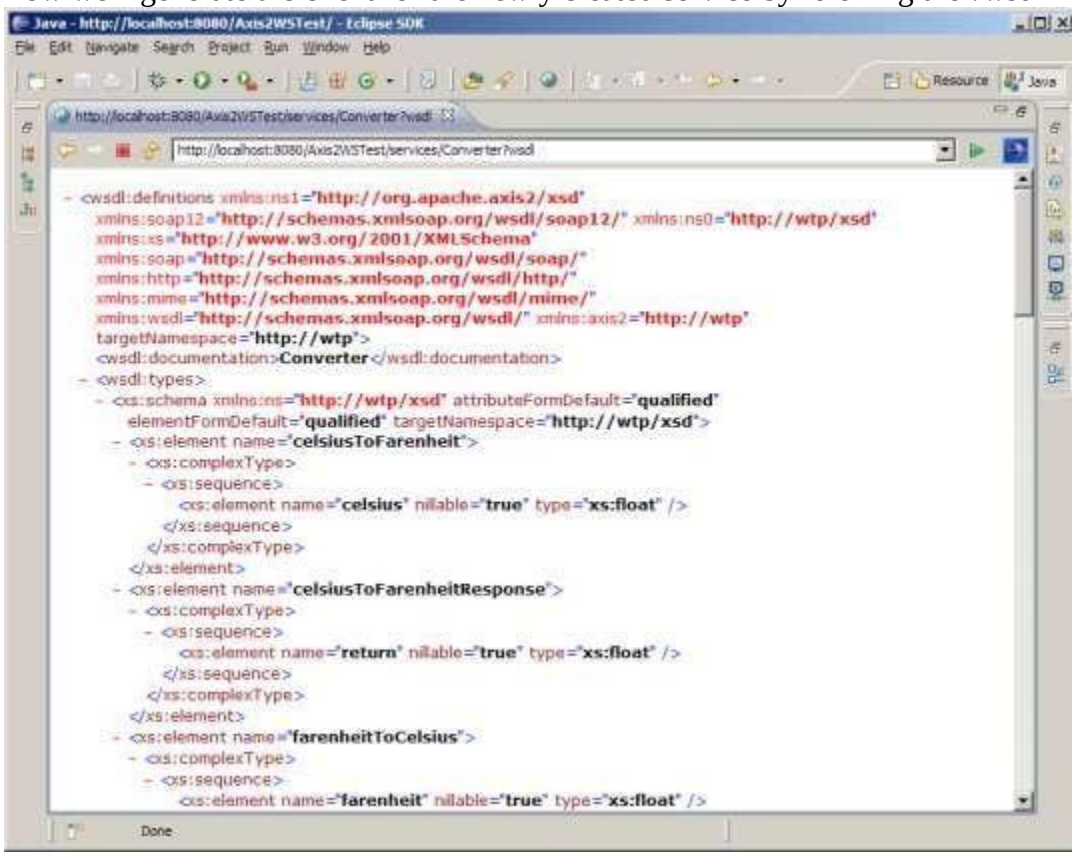


r. Click on the **Services** link to view the available services. The newly created converter Web service will be shown there.

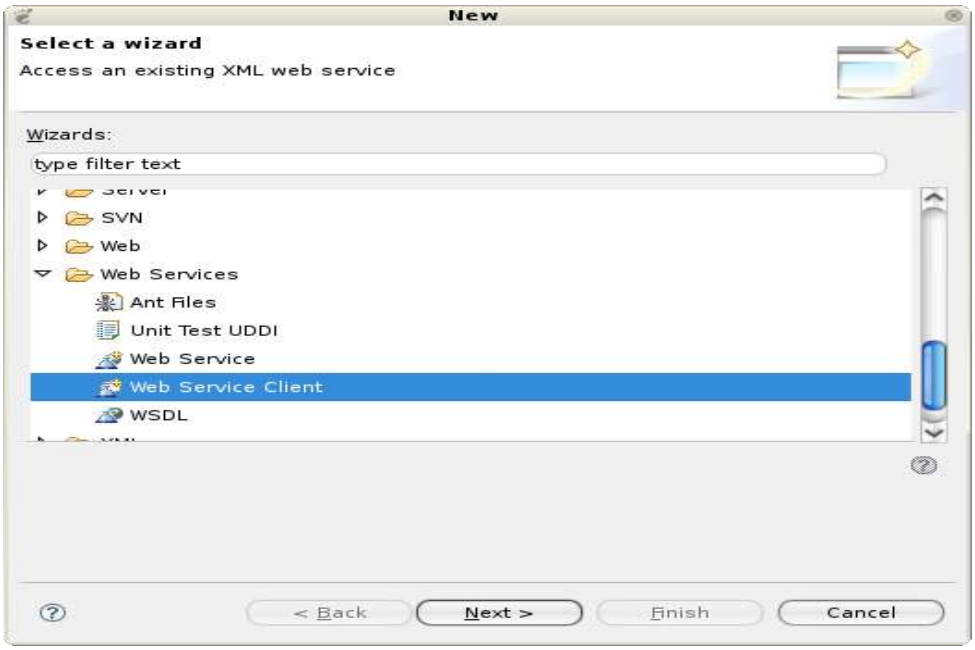


s. Click on the **Converter Service** link to display the wsdl URL of the newly created Web service. Copy the URL.

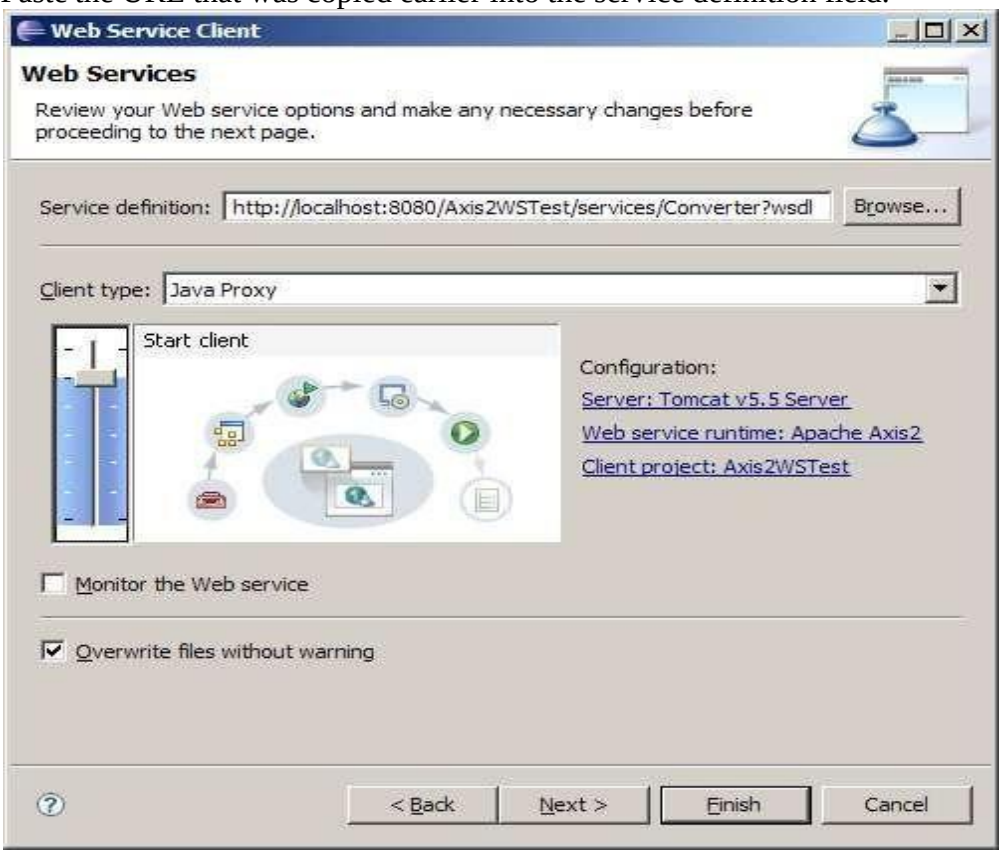
t. Now we'll generate the client for the newly created service by referring the ?wsdl



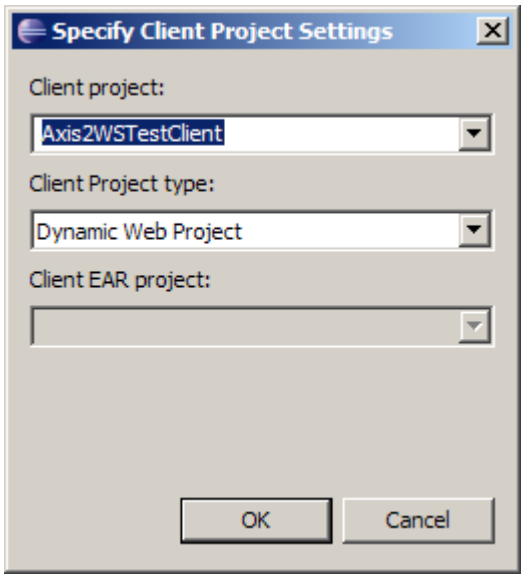
generated by the Axis2 Server. Open File -> New -> Other... -> Web Services -> Web ServiceClient



u. Paste the URL that was copied earlier into the service definition field.



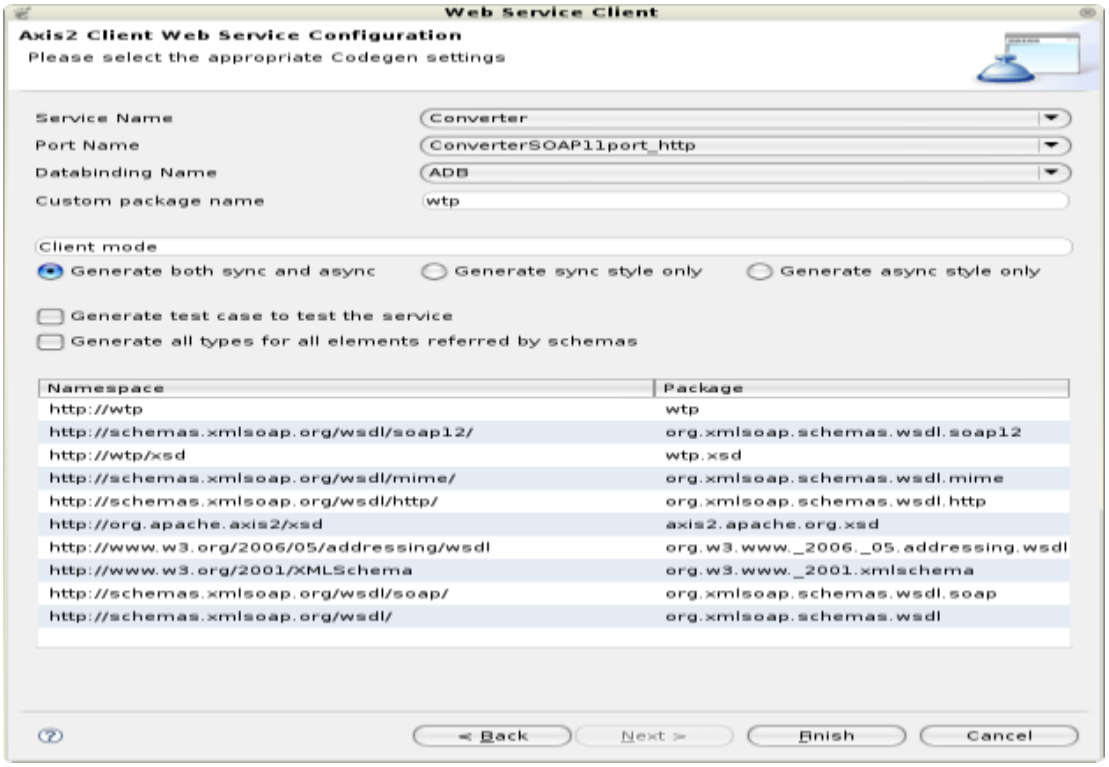
v. Click on the **Client project** hyperlink and enter **Axis2WSTestClient** as the name of the client project. Click OK.



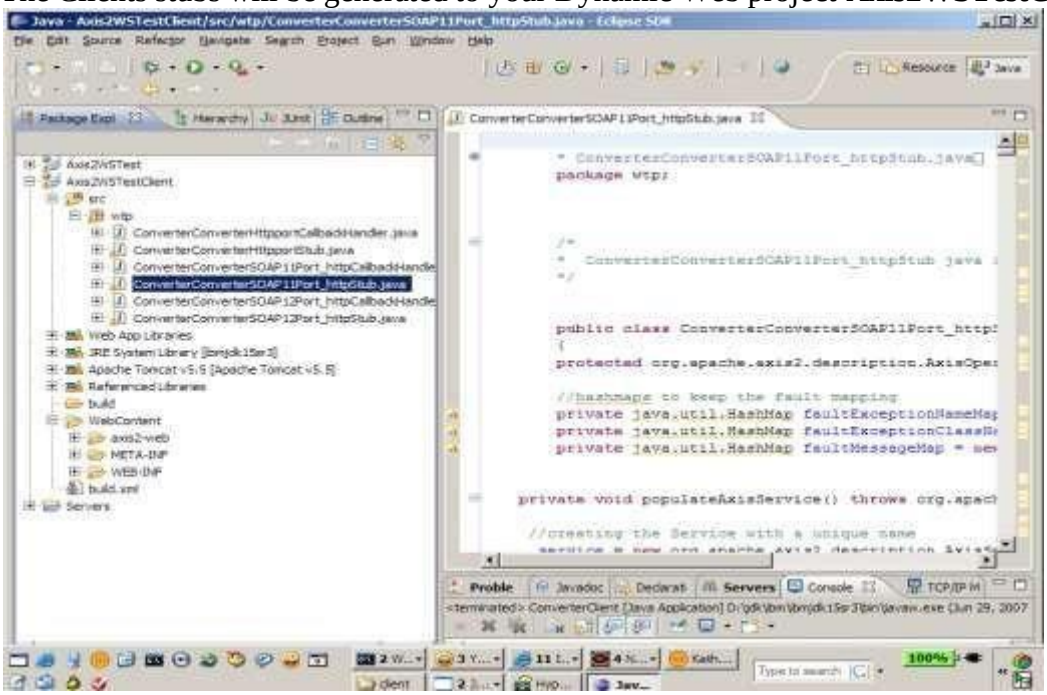
Back on the Web Services Client wizard, make sure the Web service runtime is set

to Axis2 and the server is set correctly. Click Next.

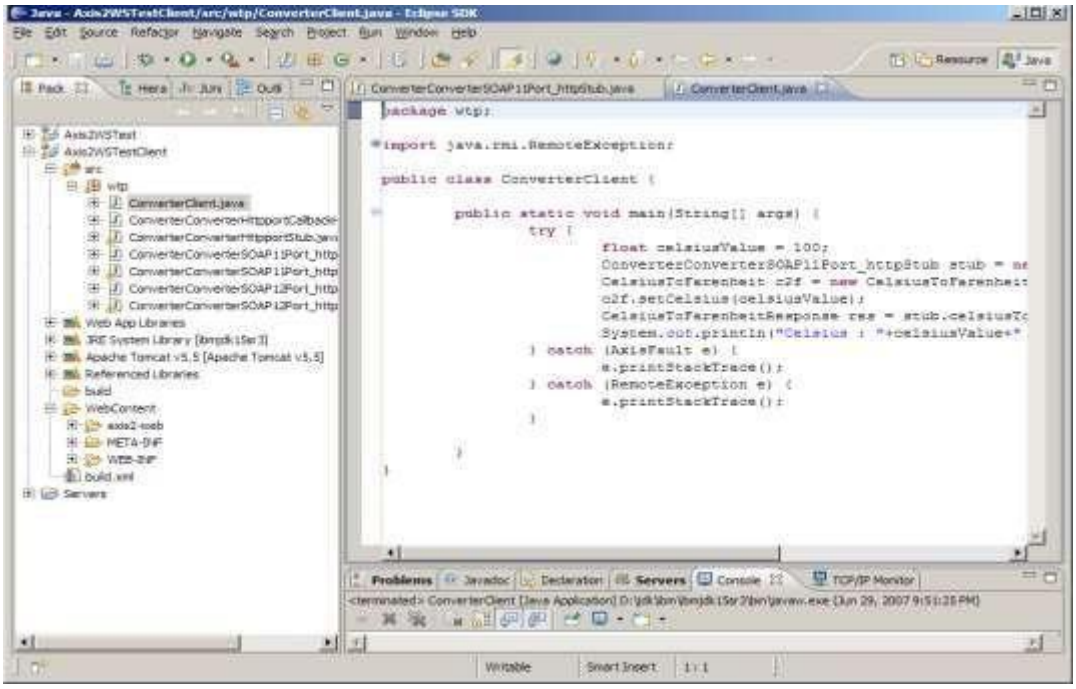
Next page is the Client Configuration Page. Accept the defaults and click Finish.



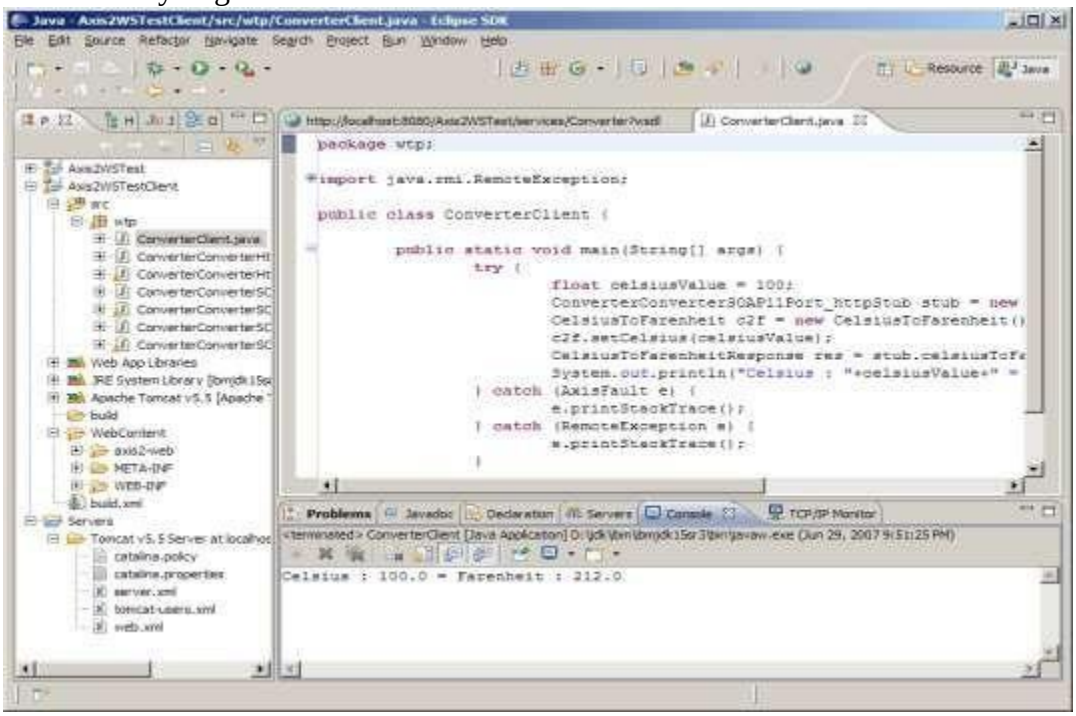
The Clients stubs will be generated to your Dynamic Web project **Axis2WSTestClient**.



Now we are going to write Java main program to invoke the client stub. Import the ConverterClient.java file to the workspace into the wtp package in the src folder of **Axis2WSTestClient**.

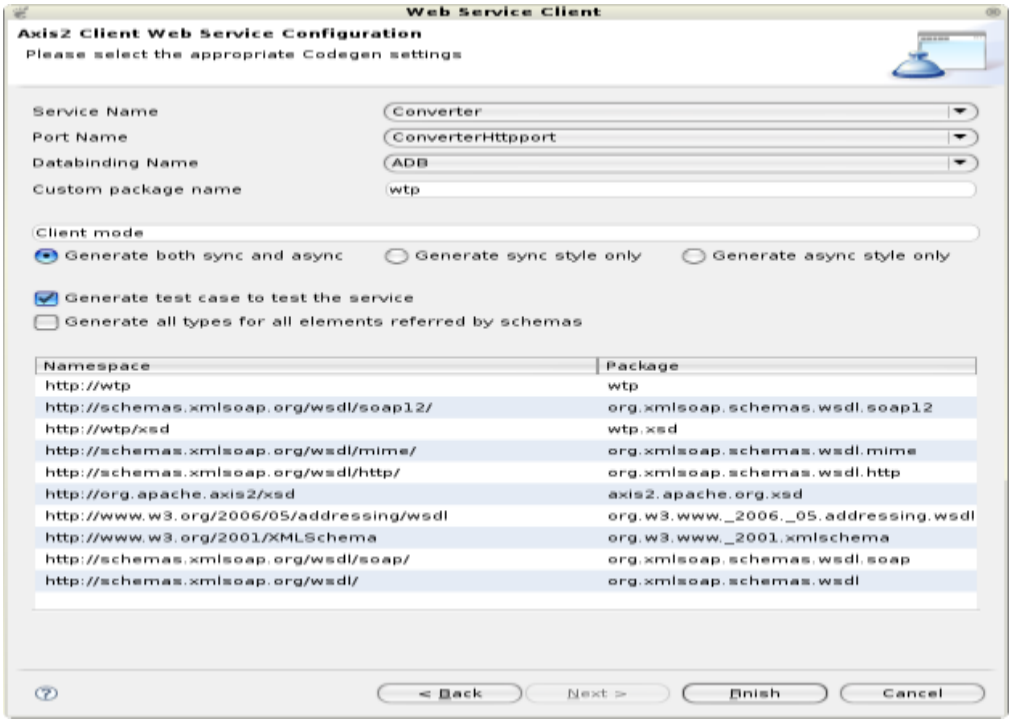


Then select the ConverterClient file, right-click and select Run As -> Java Application. Here's what you get on the server console:

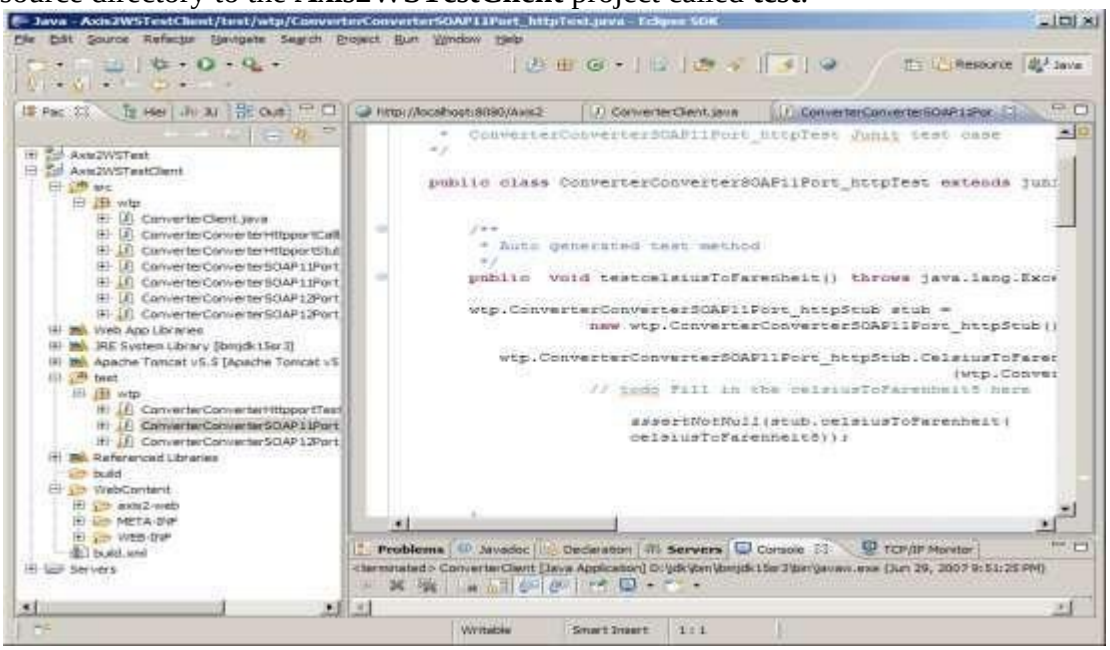


Another way to test and invoke the service is to select **Generate test case to test the service** check box on the Axis2 Client Web Service Configuration Page when going

through the Web Service Client wizard.



If that option is selected, the Axis2 emitter will generate JUnit testcases matching the WSDL we provide to the client. These JUnit testcases will be generated to a newly added source directory to the **Axis2WSTestClient** project called **test**.



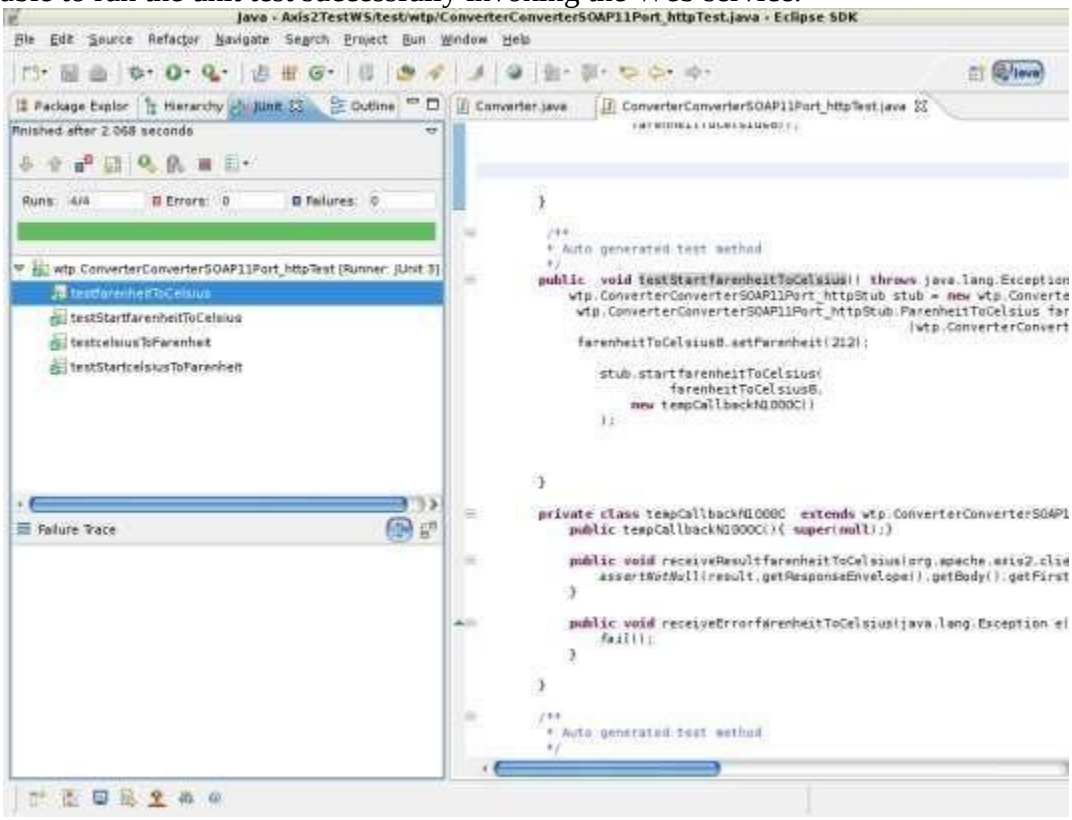
Next thing we need to do is to insert the test case with the valid inputs as the Web service method arguments. In this case, let's test the ConverterConverterSOAP11Port_httpTest.java by provide values for Celsius and Farenheit for the temperature conversion. As an example, replace the generated TODO statement in each test method to fill in the data with values as:

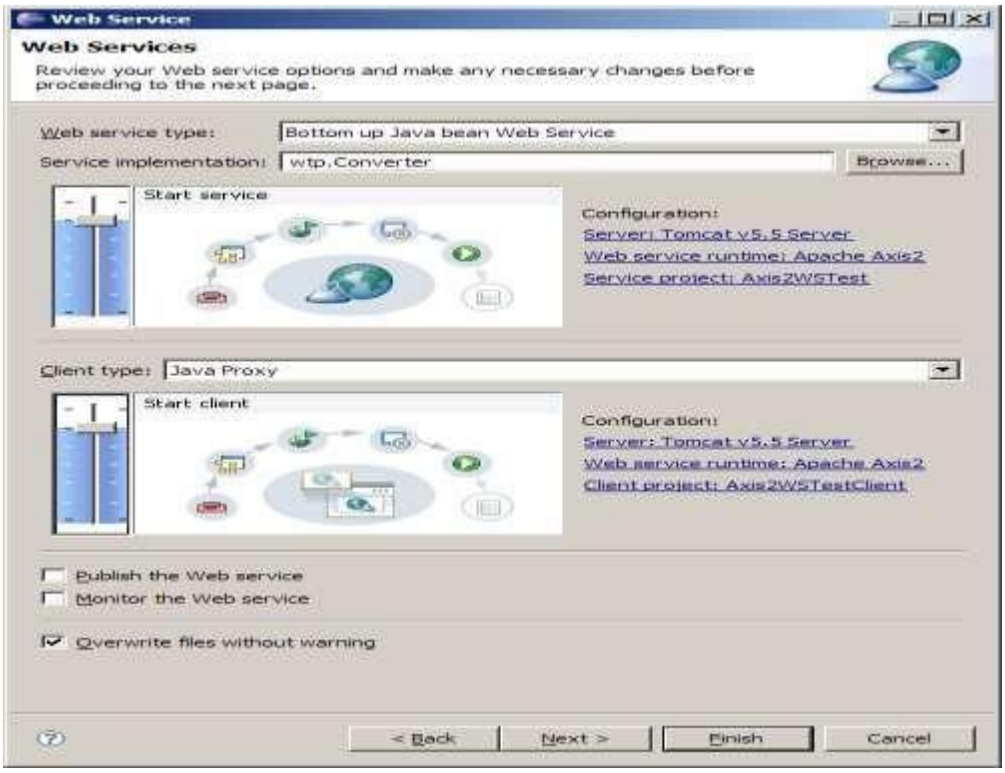
```
testfarenheitToCelsius() -> farenheitToCelsius8.setFarenheit(212);
```

```
     testStartfarenheitToCelsius() -
>farenheitToCelsius8.setFarenheit(212);
     testcelsiusToFarenheit() -> celsiusToFarenheit10.setCelsius(100);
     testStartcelsiusToFarenheit() ->
celsiusToFarenheit10.setCelsius(100);
```

Here the testcases were generated to test both the synchronous and asynchronous clients.

w. After that, select the testcase, right-click, select Run As -> JUnit Test. You will be able to run the unit test successfully invoking the Web service.





The Web Service wizard orchestrates the end-to-end generation, assembly, deployment, installation and execution of the Web service and Web service client. Now that your Web service is running, there are a few interesting things you can do with this WSDL file. Examples:

- You can choose Web Services -> Test with Web Services Explorer to test the service.
- You can choose Web Services -> Publish WSDL file to publish the service to a public UDDI registry.

RESULT:

Thus the development of a new OGSA-compliant web service was executed successfully.

3. Using Apache Axis develop a Grid Service

OBJECTIVE:

To develop a Grid Service using Apache Axis.

PROCEDURE:

You will need to download and install the following software:

1. Java 2 SDK v1.4.1, http://java.sun.com/j2se/1.4.1/download.html
2. Apache Tomcat v4.124
   http://jakarta.apache.org/builds/jakarta-tomcat-4.0/release/v4.1.24/bin/jakarta tomcat4.1.24.exe.
3. XML Security v1.0.4,
   http://www.apache.org/dist/xml/security/java-library/xmlsecurity_bin1.0.4.zip
4. Axis v1.1, http://ws.apache.org/axis/dist/1_1/axis-1_1.zip

1. Java 2 SDK

- Run the downloaded executable (j2sdk-1_4_1-windows-i586.exe) which will install the
- SDK in C:\j2sdk1.4.1. Set the JAVA_HOME environment variable to point to this directory as follows:
- Click on START->CONTROL PANEL->SYSTEM
- Click on the Advanced tab
- Click on the Environment Variables button
- Click on the New… button in the user variable section and enter the details
- Add the Java binaries to your PATH variable in the same way by setting a user variable called PATH with the value "%PATH%;C:\j2sdk1.4.1\bin"

2. Apache Tomcat

- Run the downloaded executable (jakarta-tomcat-4.1.24.exe), and assume the installation directory is C:\jakarta-tomcat-4.1.24.
- Edit C:\ jakarta-tomcat-4.1.24\conf\tomcat-users.xml and create an "admin" and "manager" role as well as a user with both roles. The contents of the file should be similar to:

```
<?xml version='1.0' encoding='utf8'?>
<tomcat-users>
<role rolename="manager"/>
<role rolename="admin"/>
<user username="myuser" password="mypass" roles="admin,manager"/>
</tomcat-users>
```

- Start Tomcat by running C:\ jakarta-tomcat-4.1.24\bin\startup.bat and test it by browsing http://localhost:8080/
- Stop Tomcat by running C:\ jakarta-tomcat-4.1.24\bin\shutdown.bat.

3. XML Security

- Download and unzip http://www.apache.org/dist/xml/security/javalibrary/xmlsecurity-bin 1_0_4.zip
- Copy xml-sec.jar to C:\axis-1_1\lib\

- Set-up your CLASSPATH environment variable to including the following: C:\axis1_1\lib\xml-sec.jar;

4. Apache Axis

- Unzip the downloaded Axis archive to C: (this will create a directory C:\axis-1_1).
- Extract the file xmlsec.jar from the downloaded security archive to C:\axis1_1\webapps\axis\WEB-INF\lib.
- Set-up your CLASSPATH environment variable to including the following:
  - o The current working directory
  - o All the AXIS jar files as found in C:\axis-1_1\lib
    C:\jakarta-tomcat-4.1.24\common\lib\servlet.jar
- Your CLASSPATH should therefore look something like:
  C:\axis-1_1\lib\axis.jar;
  C:\axis 1_1\lib\axis-ant.jar;
  C:\axis-1_1\lib\commons-discovery.jar;
  C:\axis-1_1\lib\commons-logging.jar;
  C:\axis-1_1\lib\jaxrpc.jar;
  C:\axis-1_1\lib\log4j-1.2.8.jar;
  C:\axis-1_1\lib\saaj.jar;
  C:\axis-1_1\lib\wsdl4j.jar;
  C:\axis-1_1\lib\xercesImpl.jar
  C:\axis-1_1\lib\xmlParserAPIs.jar;
  C:\jakarta-tomcat-4.1.24\common\lib\servlet.jar
  C:\axis-1_1\lib\xml-sec.jar;
- Now tell Tomcat about your Axis web application by creating the file C:\jakarta- tomcat-4.1.24\webapps\axis.xml with the following content:

```
<Context path="/axis" docBase="C:\axis-1_1\webapps\axis" debug="0"
 privileged="true">

<LoggerclassName="org.apache.catalina.logger.FileLogger"prefix="axis_log."
 suffix=".txt" timestamp="false"/>
```

5. Deploy a Sample Web service packaged within Axis installations

Deploy one of the sample Web Services to test the system and to create the C:\axis-1_1\webapps\axis\WEB-INF\server-config.wsdd file. From C:\axis-1_1 issue the command (on one line):

java org.apache.axis.client.AdminClient
http://localhost:8080/axis/services/AdminService/samples/stock/deploy.wsdd

This should return the following:

.-Processing file samples/stock/deploy.wsdd
.- <Admin>Done processing</Admin>

RESULT:

Thus the development of a Grid Service using Apache Axis is executed successfully.

4. Develop applications using Java or C/C++ Grid APIs

OBJECTIVE:

To develop an applications using Java or C/C++ Grid APIs.

SAMPLE CODE:

```
import AgentTeamwork.Ateam.*;
import MPJ.*;
public class UserProgAteam extends AteamProg {
private int phase;
public UserProgAteam( Ateam o )
{ }
public UserProgAteam( )
{ }
// real const
public UserProgAteam( String[] args ) {
phase = 0;
}
// phase recovery
private void userRecovery( ) {
phase = ateam.getSnapshotId( );
}
private void compute( ) {
for ( phase = 0; phase < 10; phase++ ) {
try {
Thread.currentThread( ).sleep( 1000 );
}
catch(InterruptedException e ) {
}
ateam.takeSnapshot( phase );
System.out.println( "UserProgAteam at rank " + MPJ.COMM_WORLD.Rank( ) + " : took a
snapshot " + phase );
}
}
public static void main( String[] args ) {
System.out.println( "UserProgAteam: got started" );
MPJ.Init( args, ateam);
UserProgAteam program = null;
// Timer timer = new Timer( );
if ( ateam.isResumed( ) ) {
program = ( UserProgAteam )
ateam.retrieveLocalVar( "program" );
program.userRecovery( );
}
else
{
program = new UserProgAteam( args );
ateam.registerLocalVar( "program", program );
}
program.compute( );
MPJ.Finalize( );
}
```

```
public class UserProgAteam extends AteamProg {
// application body private void compute( ) {
for ( phase = 0; phase < 10; phase++ ) {
try {
Thread.currentThread( ).sleep( 1000 );
}
catch(InterruptedException e ) {
}
ateam.takeSnapshot( phase );
System.out.println ( "UserProgAteam at rank " + MPJ.COMM_WORLD.Rank() + " : took a snapshot
" + phase );
}}
```

Socket sample code – within some function body

```
import AgentTeamwork.Ateam.GridTcp.*;
private final int port = 2000;
private GridSocket socket; private
GridServerSocket server; private InputStream
input; private OutputStream output;
for ( int i = start; i < start + trans; i++ ) {
try {
output.write( i % 128 );
} catch ( IOException e ) {
}
System.out.println ( "Sockets with " + myRank + ": " + " output[" + i + "]=" + i % 128 );
}
for ( int i = start; i < start + trans; i++ ) {
try {
System.out.println ( "Sockets with " + myRank + ": " + " input[" + i + "]=" + input.read( ) ); }
catch ( IOException e ) {
}}
```

MPI sample code

```
import AgentTeamwork.Ateam.*;
import MPI.*;
public class UserProgAteam extends AteamProg {
// application body private void compute( ) {
}
public static void main( String[] args ) {
MPJ.Init( args, ateam );
program.compute( ); MPJ.Finalize( );
}
}
```

C/C++ compile.sh – Helloworld.cpp

```
#!/bin/sh
rm -f *.class
javac -classpath MPJ.jar:Ateam.jar:. *.java
# jar cvf GridJNI.jar *.class jar -cvf
GridJNI.jar *.class javah -jni JavaToCpp
g++ -rdynamic JavaToCpp.cpp -o _libJavaToCpp.so_ -shared -ldl g++ -shared -o
```

libHelloWorld.so GridJNI_library.cpp
HelloWorld.cpp

C/C++ MPI sample code – Helloworld.cpp

```
#include <iostream.h>
using namespace std;
typedef int MPI_Request, MPI_Status, MPI_Comm;
extern void takeSnapshot(int argc);
extern int MPI_Init(int* argc, char*** argv);
extern void MPI_Finalize();
extern int MPI_Comm_rank(MPI_Comm comm, int *rank);
extern int MPI_Comm_size(MPI_Comm comm, int *size);
int main(int argc, char** argv) {
cerr << "main" << endl;
cerr << "argc = " << argc << endl;
cerr << "argv[0] = " << argv[0] << endl; cerr << "argv[1] = " <<
argv[1] << endl; MPI_Init(&argc, &argv);
cout << "MPI Init Successful!" << endl;
cout << "[HelloWorld.cpp]Calling Rank() and Size()" << endl;
int rank, size;
MPI_Comm_rank(0,&rank);
MPI_Comm_size(0,&size);
cout << "[HelloWorld.cpp]Rank = " << rank << endl;
cout << "[HelloWorld.cpp]Size = " << size << endl; cerr << "Calling
MPI_Finalize()" << endl; MPI_Finalize();
cerr << "finished" << endl;
}
```

RESULT:

Thus the development of applications using Java or C/C++ Grid APIs is executed successfully