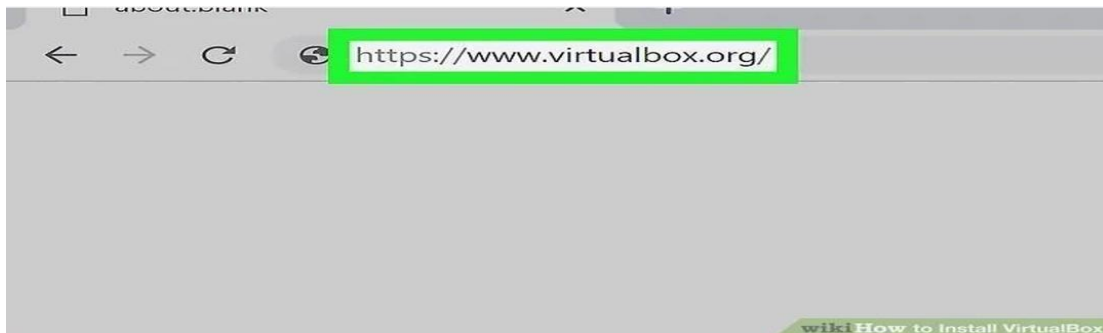


## Experiment No. 1(a)

**Aim:** Install VirtualBox/VMware Workstation on different OS.

### 1. Installation of Virtual Box on Windows.

**Step 1: Open the VirtualBox website.** Go to <https://www.virtualbox.org/> in your computer's Internet browser. This is the website from which you'll download the VirtualBox setup file.



**Step 2: Click Download VirtualBox.** It's a blue button in the middle of the page. Doing so will open the downloads page.

**Step 3: Click Windows hosts.** You'll see this link below the "VirtualBox 71.4 platform packages" heading. The VirtualBox EXE file will begin downloading onto your computer.



**Step 4: Open the VirtualBox EXE file.** Go to the location to which the EXE file downloaded and double- click the file. Doing so will open the VirtualBox installation window.

**Step 5: Navigate through the installation prompts.** Do the following:

- Click Next on the first three pages.

- Click Yes when

prompted.

Click Install

- Click Yes when prompted.

**Step 6: Click install when prompted.** Doing so will allow VirtualBox to begin installing on your computer.



**Step 7: Click finish when prompted.** Doing so will allow VirtualBox to begin installing on your when prompted. It's on the lower-right side of the window. Doing so will close the installation window and open VirtualBox. Now that you've installed and opened VirtualBox, you can create a virtual machine to run any operating system on your Pacemaker, sure that you don't uncheck the "Start" box before doing this.

## 2. Installation of VirtualBox on MAC

**Step 1: Open the VirtualBox website.** Go to <https://www.virtualbox.org/> in your Mac's Internet browser. This is the website from which you'll download the VirtualBox DMG file.



**Step 2: Click Download VirtualBox.** It's a blue button in the middle of the page. Doing so will open the downloads page.



**Step 3: Click the link.** You'll find this option in the middle of the downloads page. The VirtualBox DMG file will begin downloading onto your Mac.

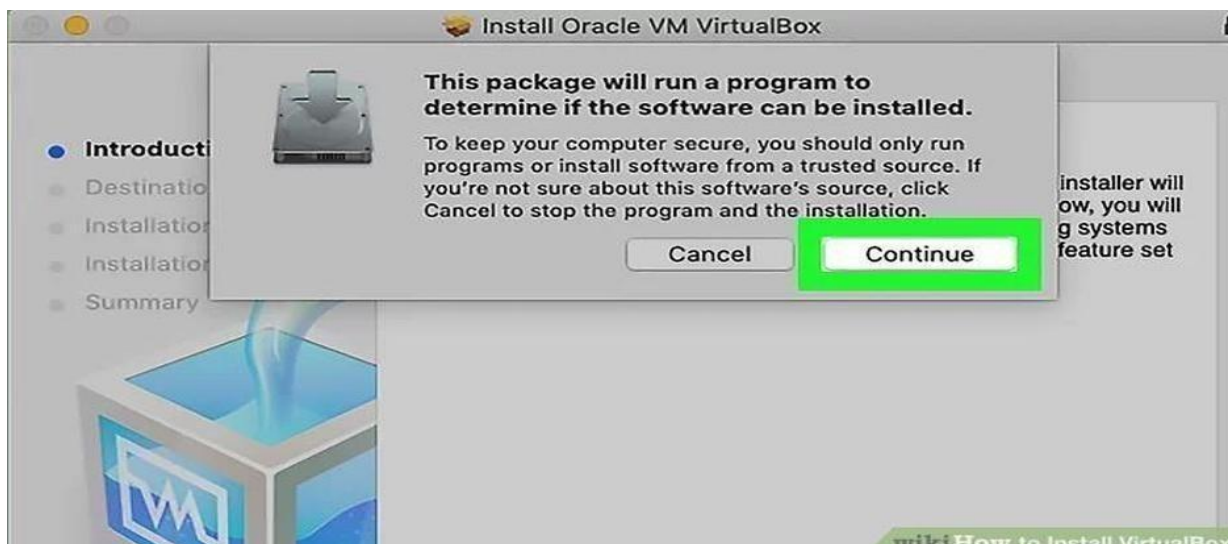
**Step 4: Open the "VirtualBox" DMG file.** Once the VirtualBox DMG finishes downloading, double-click the file to open it.



**Step 5: Double-click the "VirtualBox" icon.** It's a brown box-shaped icon in the upper-left corner of the window. Doing so will prompt VirtualBox's installation window open.

**Step 6: Navigate through the installation prompts.** Click Continue when prompted, then do the following:

- Click Continue in the bottom-right corner of the window.
- Click Install in the bottom-right corner of the window.
- Enter your Mac user password when prompted.
- Click Install Software.



**Step 7: Wait for the installation to be completed.**



**Step 8: Open VirtualBox.** Click Spotlight, type in VirtualBox, and double-click VirtualBox in the resulting drop-down menu. Now that you've installed and opened VirtualBox, you can create a virtual machine to run any operating system on your Mac.





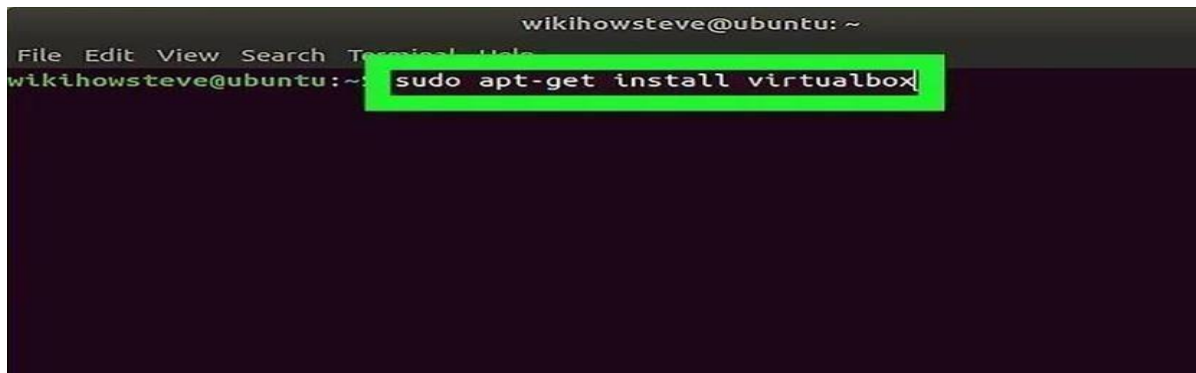
### 3. Installation of VirtualBox on Linux.

**Step 1: Open Terminal.** This step will vary depending on your version of Linux, but you can usually open Terminal by selecting Terminal from the Menu. The Terminal window will pop up.

- You can also press **Alt + Ctrl + T** to open Terminal.



**Step 2: Enter the installation command.** Type in `sudo apt-get install virtual box - qt` and press.



**Step 3: Enter your password when prompted.** Type in the password that you use to log into your computer, then press Enter.



**Step 4: Confirm the installation.** Type y when prompted, then press Enter.

**Step 5: Wait for VirtualBox to finish installing.** This will take a few minutes. When you see your computer account's username appear to the left of the command line, Terminal has successfully installed VirtualBox and is awaiting further commands.

```
1 amd64 2.0.1-4ubuntu1 [33.0 kB]
Get:2 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libqt5core5a a
.9.5+dfsg-0ubuntu1 [2,035 kB]
Get:3 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libqt5dbus5 am
9.5+dfsg-0ubuntu1 [196 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libqt5network5
5.9.5+dfsg-0ubuntu1 [634 kB]
Get:5 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libxcb-xineram
64 1.13-1 [5,256 B]
Get:6 http://us.archive.ubuntu.com/ubuntu bionic/main amd64 libqt5gui5 amd
9% [6 libqt5gui5 2,416 kB/2,566 kB 94%] 475 kB/s 2
```

**Step 6: Open VirtualBox.** Type in VirtualBox and press to do so. This will prompt the VirtualBox main window open. Now that you've installed and opened VirtualBox, you can proceed with creating a virtual machine to run any operating system on your computer.

```
depmod.....
DKMS: install completed.
Setting up virtualbox (5.2.10-dfsg-6ubuntu18.04.1) ...
vboxweb.service is a disabled or a static unit, not starting it
Setting up virtualbox-qt (5.2.10-dfsg-6ubuntu18.04.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for systemd (237-3ubuntu10.9) ...
Processing triggers for ... (0.100.0-20) ...
wikihowsteve@ubuntu:~$ virtualbox
```

## Conclusion:

Thus, We have learned how to Install VirtualBox/VMware Workstation on different OS.

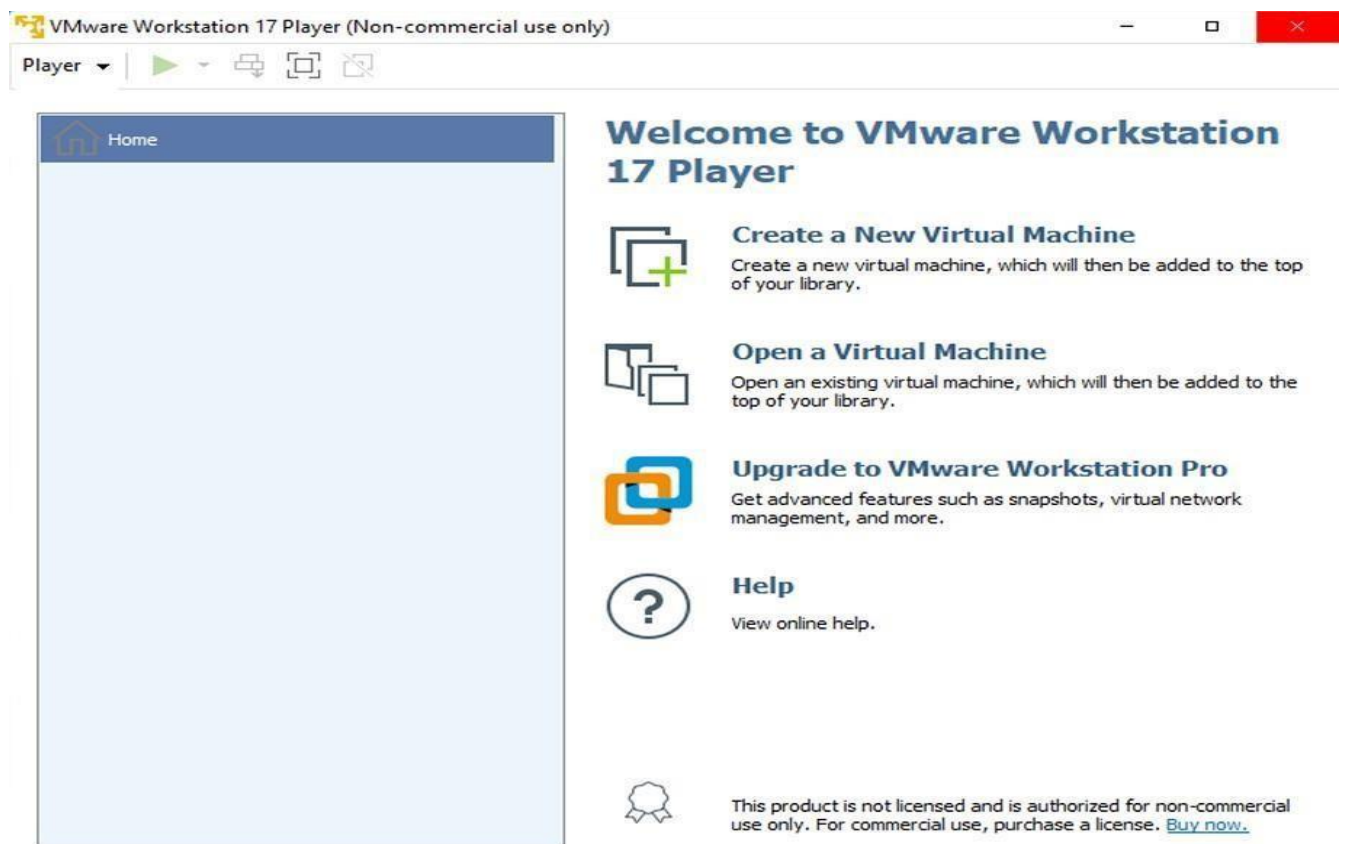
## Experiment No. 1(b)

### **Aim: Install different operating systems in VMware.**

Install New OS in VMware Workstation

The process to install a new operating system in VMware Workstation is straightforward because the setup wizard makes things super easy. Below are step-by-step screenshots showing everything you need to know, from the initial setup screen all the way to booting into the new operating system.

#### **Step 1: Go to File > New Virtual Machine.**



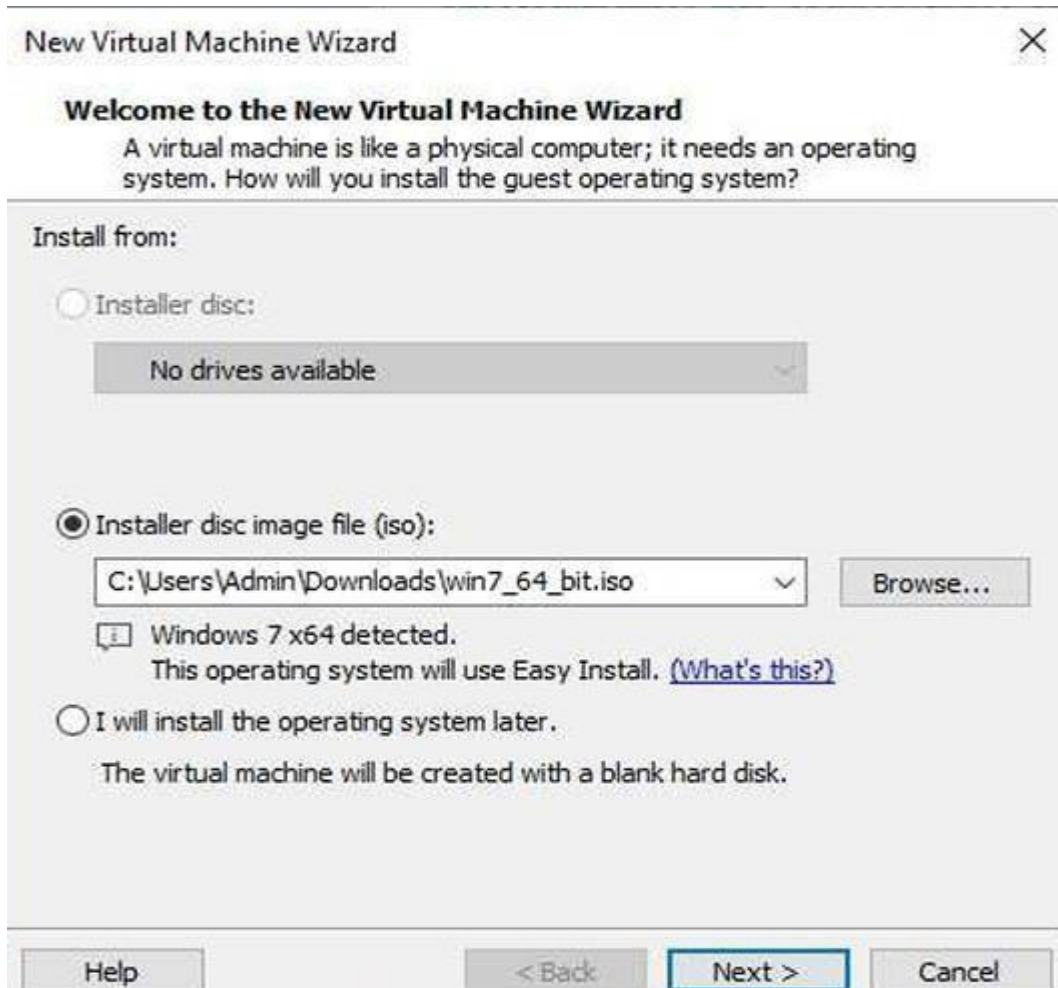
#### **Step 2: Select Typical (recommended), and then press Next.**

#### **Step 3: Pick on how to install the operating system**

Select Installer disc if the operating system is in the disc drive. Otherwise, choose Installer disc image file (iso) if you have a file that contains the OS, like a Windows 10 ISO or an ISO for macOS.



**Step 4: Choose precisely where the OS files are located.**



If you select to install the operating system from a disc, choose the correct disc drive from the drop-down menu. For an ISO installation, select Browse and locate the ISO image.

**Step 5: Press Next to proceed** to the screen where you name the new virtual machine and pick where its files should be stored. Fill out that information and then select Next again.

Important: Be sure to pick a location that can handle the possibly ultra-large files created by the operating system as you use it. You might end up needing hundreds of gigabytes if you use this VM heavily. Storing it on an external hard drive is a good idea if your local hard drive doesn't have the space.

Note: For some operating system setups, you'll be asked to enter the product key used to activate it. You should be able to skip that step if you want to enter the key later.

**Step 6: Define how storage should take place with this virtual machine, and then press Next.**

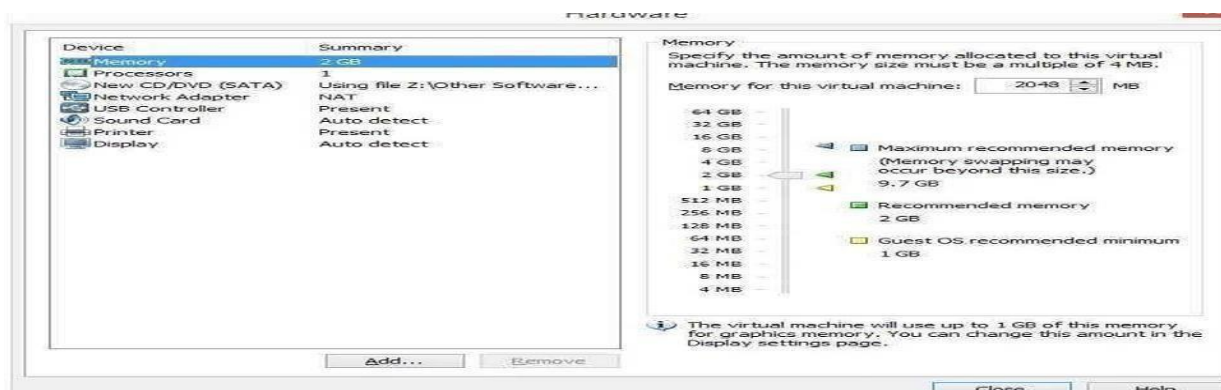


You can change the maximum size of the virtual hard drive from the small box. From the bottom of this window there are two options: Store virtual disk as a single file and Store virtual disk into multiple files.

Pick the second option if you think you might one day move the VMware hard drive to a different computer but take note of the text on that screen that mentions a possible performance reduction of using multiple files with a large hard drive.

In other words, if you plan to store lots of data in this VM, select the “single file” option, otherwise go with “multiple files.”

**Step 7: Select Customize Hardware** and make any necessary changes. You can change details about the memory, processors, disc drive, network adapter, USB controller, sound card, printer, and display.



For example, the Memory section is how you specify how much physical RAM the virtual machine is allotted. If you later decide that you’ve given too little memory to the VM, it might perform slowly.

Similarly, if you give too much, your host computer will perform sluggishly and will have a

difficult time even using the VM.

VMware Workstation recommends a specific amount based on how much you have installed, but you can adjust the memory to anything you like (though it's best to stick to the recommended level). Different operating systems require different amounts of memory (e.g., Windows 10 needs more than Windows 2000).

Network Adapter is an important component here that you might end up having to adjust later if your

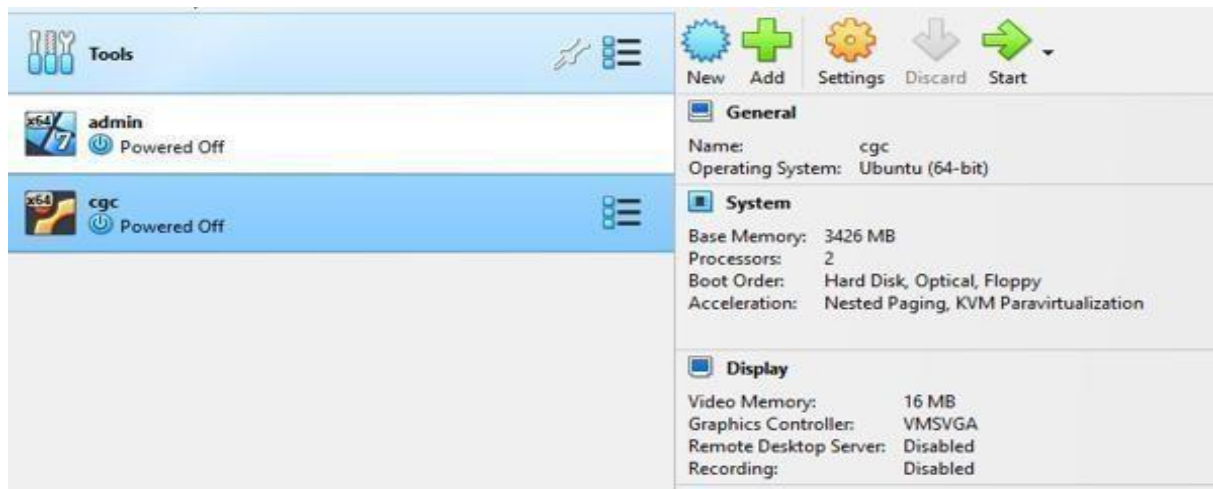
virtual machines don't have internet access. There are multiple options, and some may or may not work properly depending on how your host computer is set up and how the guest OS (the VM) works. You can skip this for now to have the default option chosen for you.

**Step 8: Choose Close to exit the Hardware screen, and then press Finish.**

VMware Workstation will create the virtual disk you specified in Step 6 and then turn on the virtual machine automatically. This process might take a while, but you can watch the progress bar for an estimation of when it will finish.

**Step 9: Follow any on-screen prompts to begin the OS installation.** For example, if you see Press key to boot from CD or DVD, do that to start the OS setup.

**Step 10: Follow the directions** for your specific operating system install to add the OS to VMware Workstation.



**Conclusion:**

Thus, We have learned how to Install different operating systems in VMware.

## Experiment No. 2

### **AIM:- Simulate a cloud scenario using simulator. (CloudSim)**

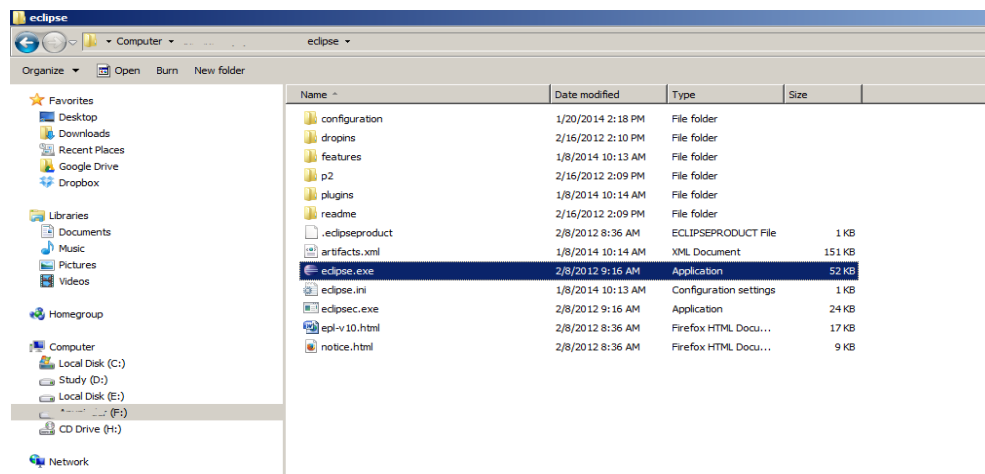
Now before you start to setup CloudSim, following resources must be Installed/downloaded on the local system.

**Cloudsim** simulation toolkit setup is easy. Before you start to setup CloudSim, following resources must be Installed/downloaded on the local system:

- **Java Development Kit(JDK):** As the Cloudsim simulation toolkit is a class library written in the Java programming language, therefore, the latest version of Java(JDK) should be installed on your machine, which can be downloaded from [Oracles Java portal](#).
- **Eclipse IDE for Java developers:** As per your current installed operating system(Linux/Windows). Before you download to make sure to check if 32-bit or 64- bit version is applicable to your Computer machine.
- **Download CloudSim source code:** To date, various versions of CloudSim are released the latest version is 5.0, which is based on a container-based engine. Whereas to **keep the setup simple for beginners we will be setting up the mostused version i.e. 3.0.3.**
- **One external requirement of Cloudsim** i.e. common jar package of math-related functions is to be downloaded from the [Apache website](#)
- Unzip **Eclipse, Cloudsim and Common Math libraries** to some common folder.

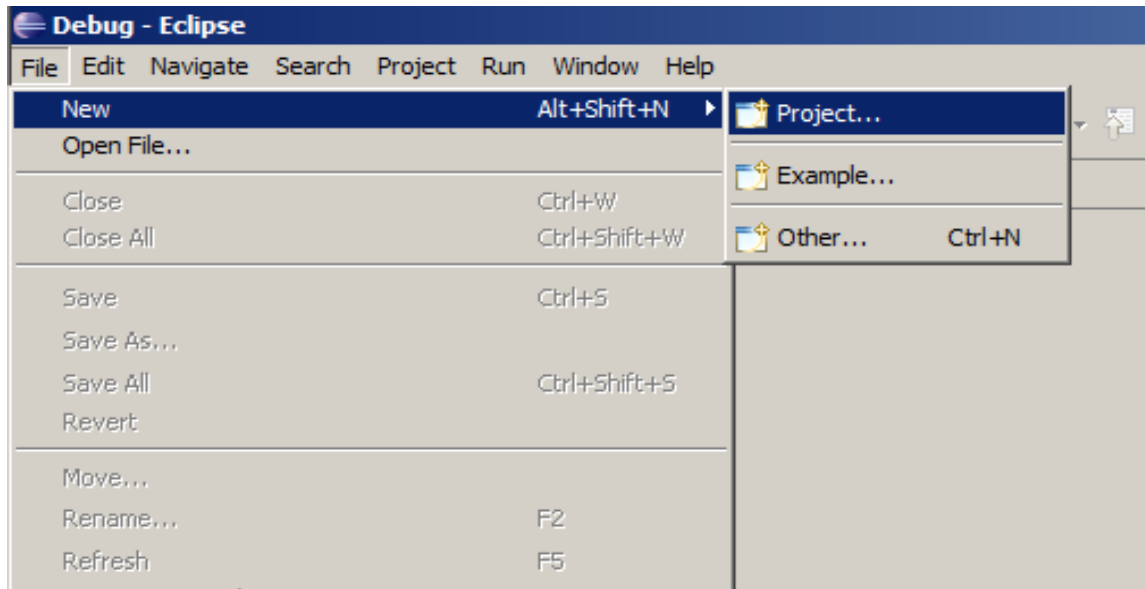
### **Let's Get Started to answer "How to install Cloudsim?"**

First of all, navigate to the folder where you have unzipped the eclipse folder and openEclipse.exe

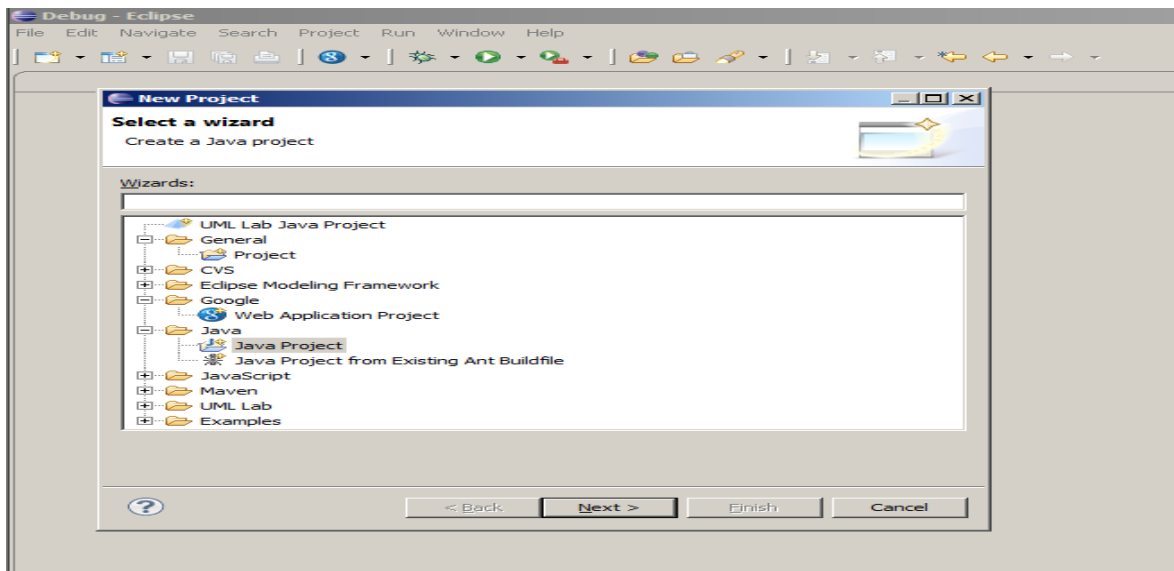




Now within Eclipse window navigate the menu: *File -> New -> Project*, to open the new project wizard

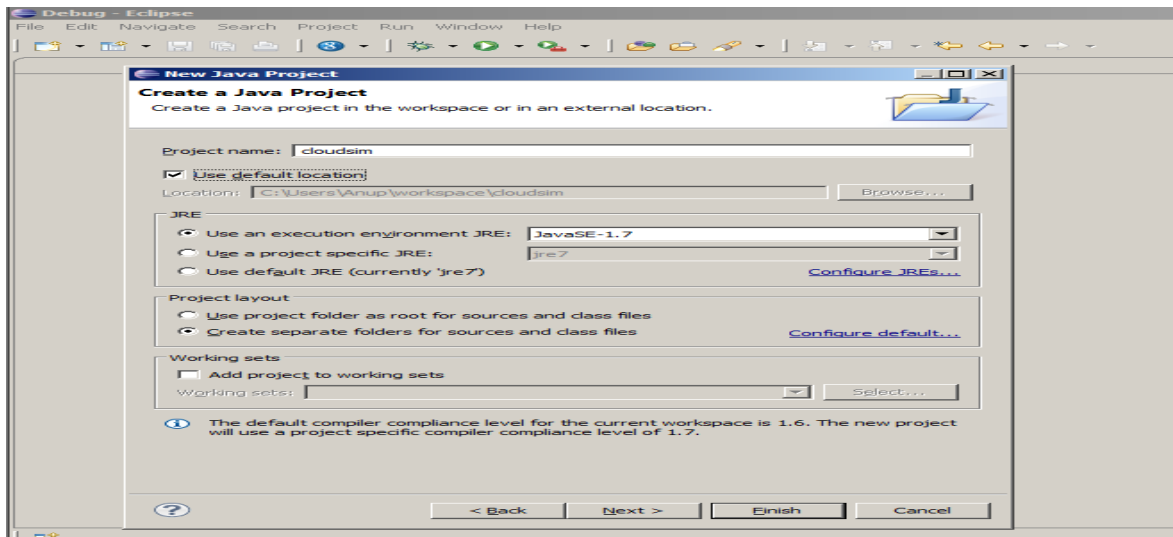


*Project* wizard should open. There are a number of options displayed and you have to find & select the *Java Project* option, once done click *Next*

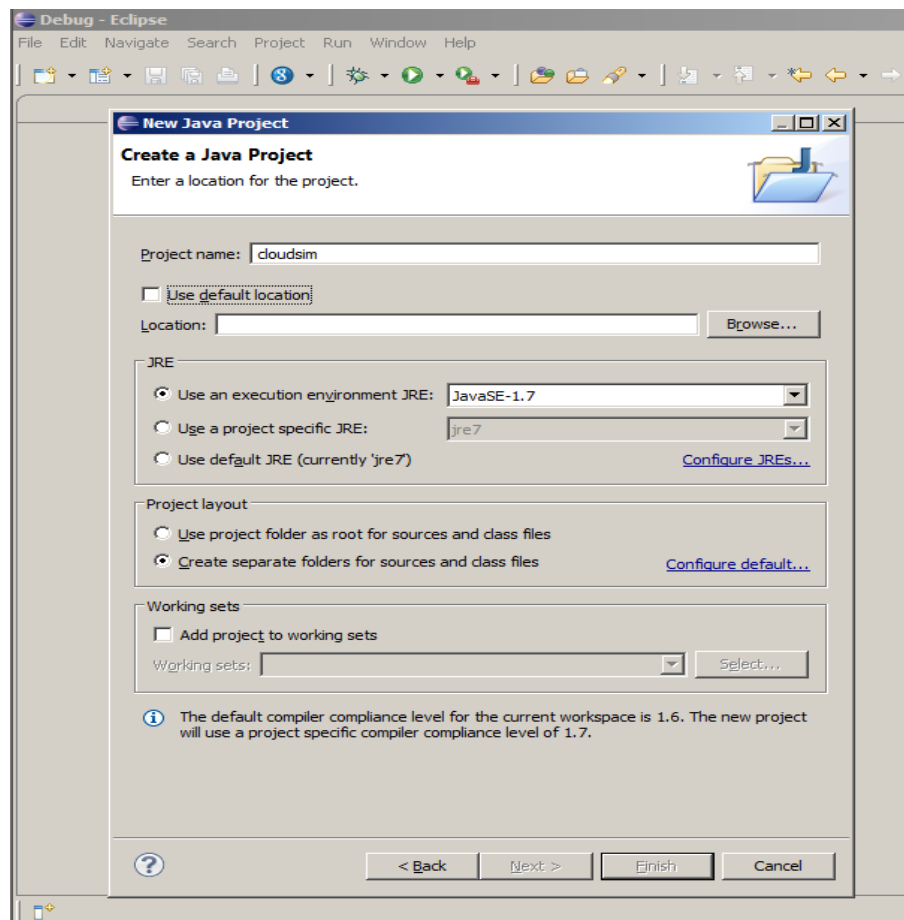


will provide the project name and the path of CloudSim project source code, which will be done as follows:

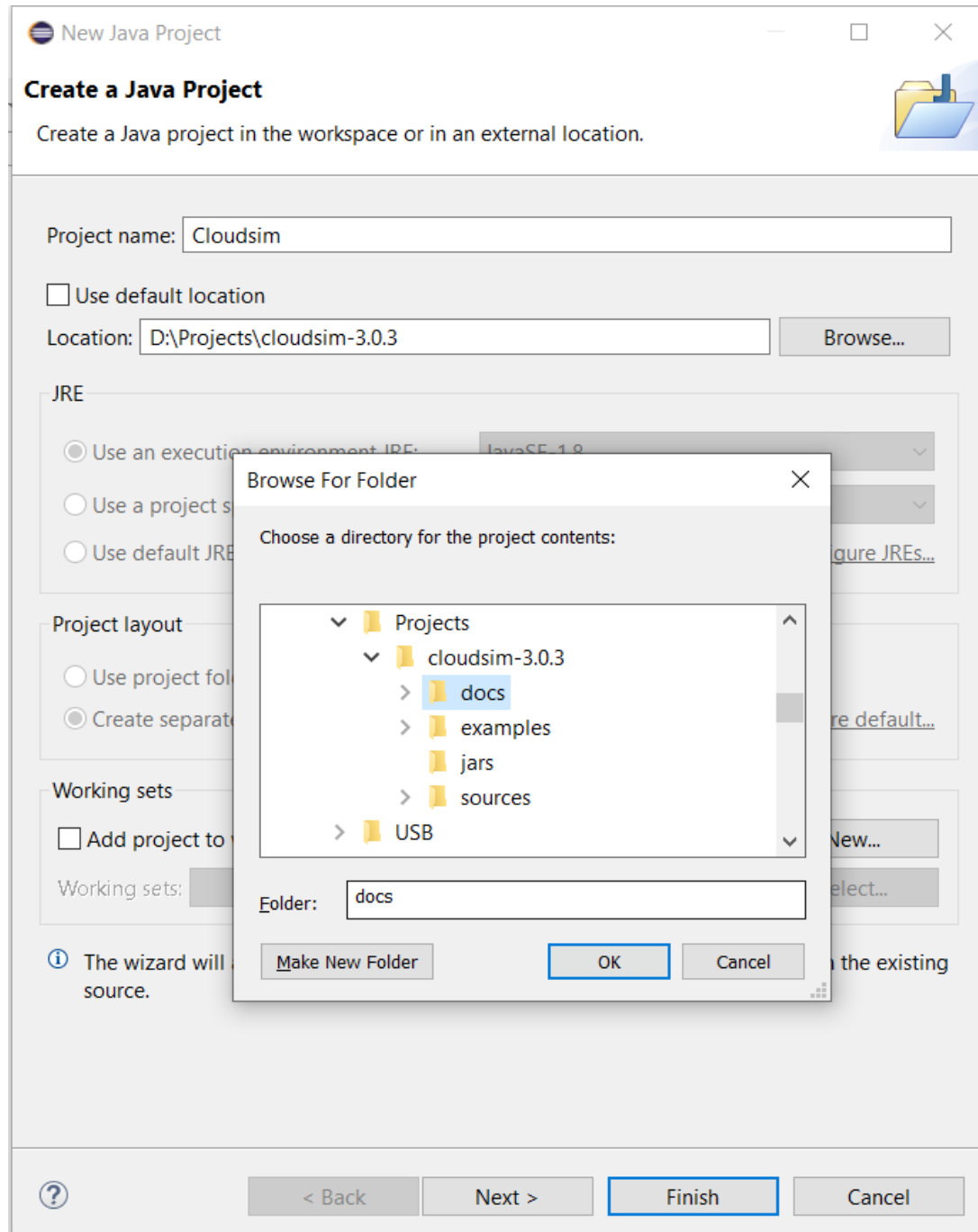
- Project Name: CloudSim.



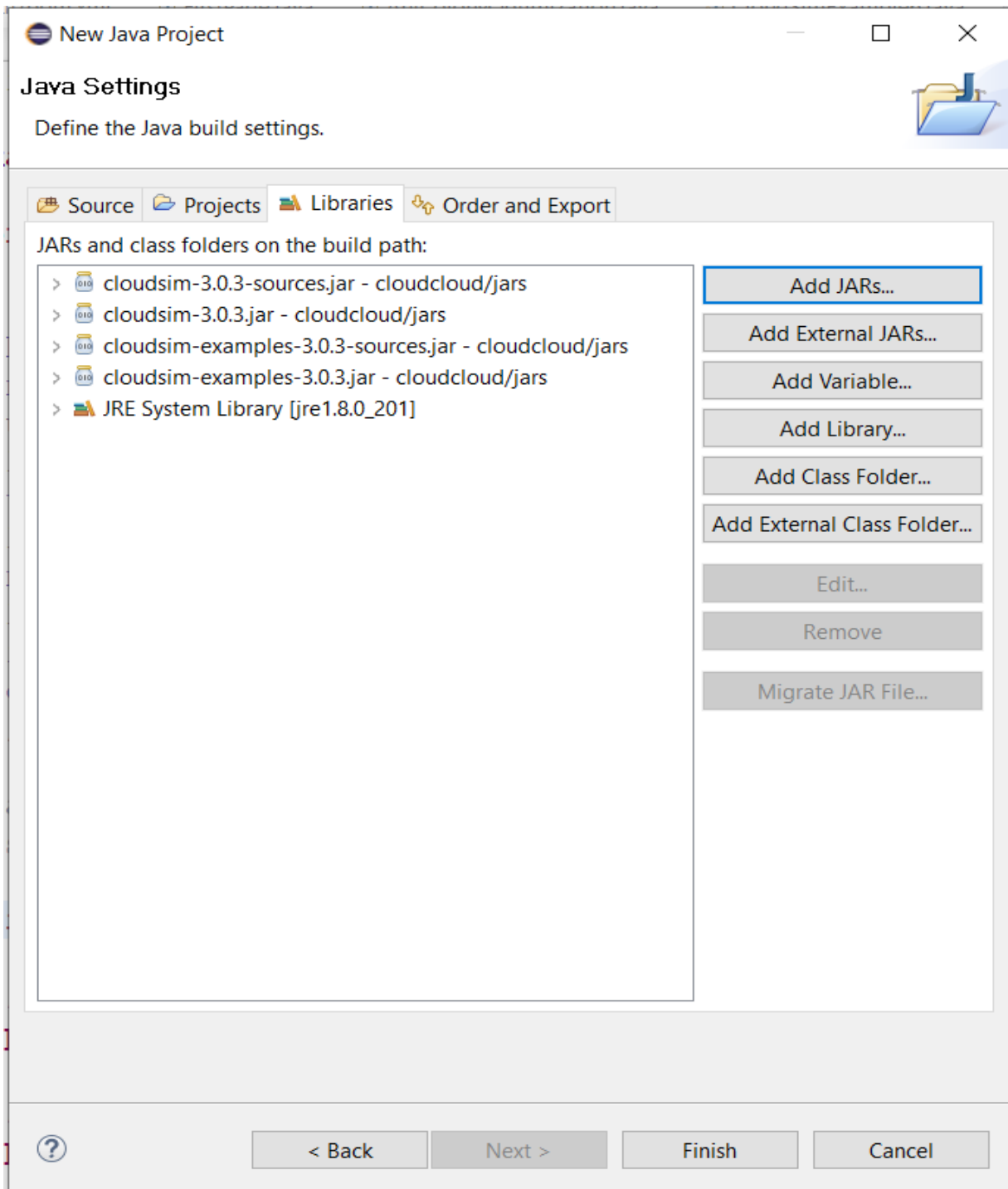
- Unselect the 'Use default location' option and then click on 'Browse' to open the path where you have unzipped the Cloudsim project and finally click Next to set project settings.



Make sure you navigate the path till you can see the bin, docs, examples etc folder in the navigation plane.

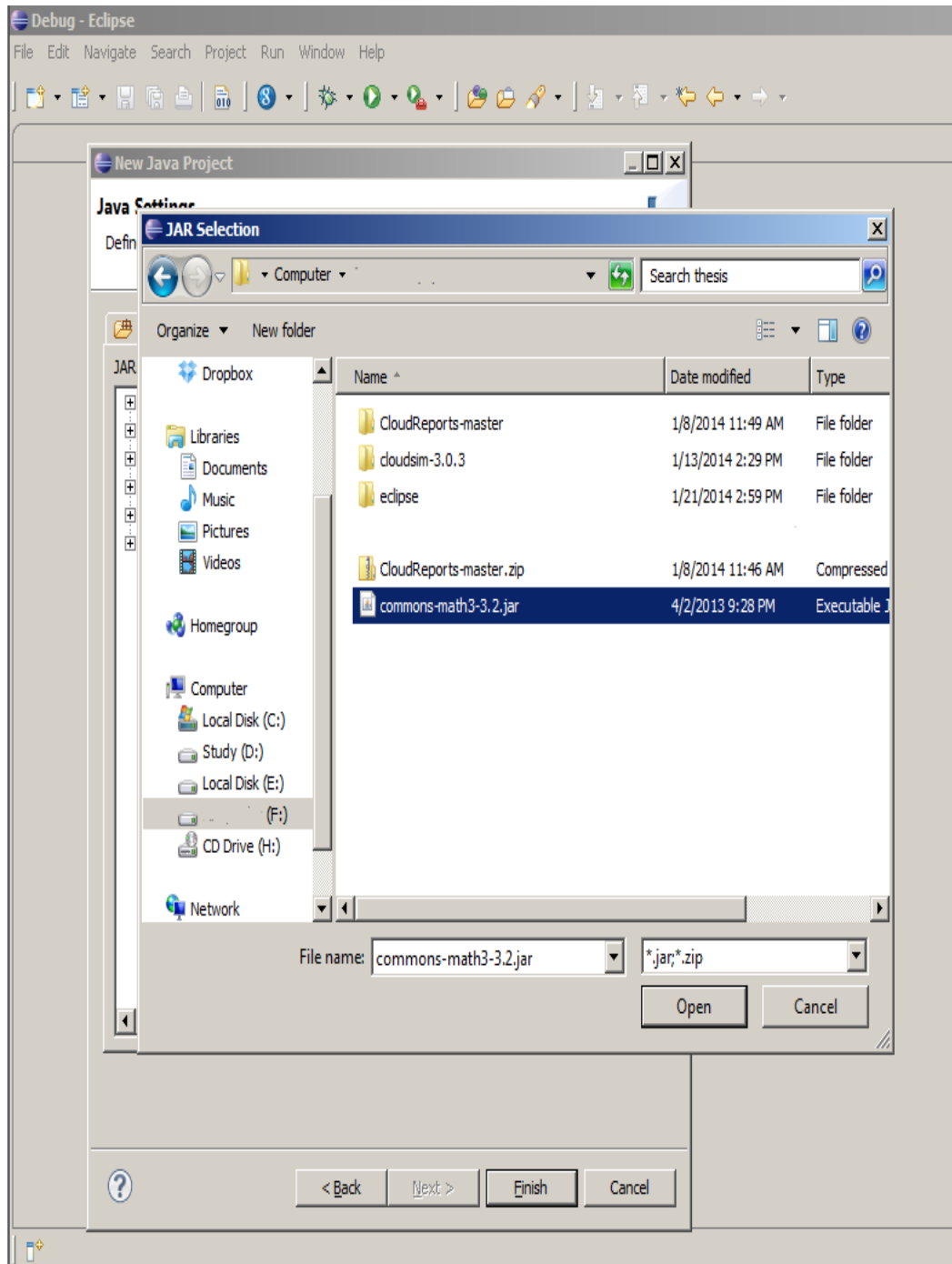


Now open 'Libraries' tab and if you do not find commons-math3-3.x.jar (*here 'x' means the minor version release of the library which could be 2 or greater*) in the list then simply click on 'Add External Jar' (commons-math3-3.x.jar will be included in the project from this step)

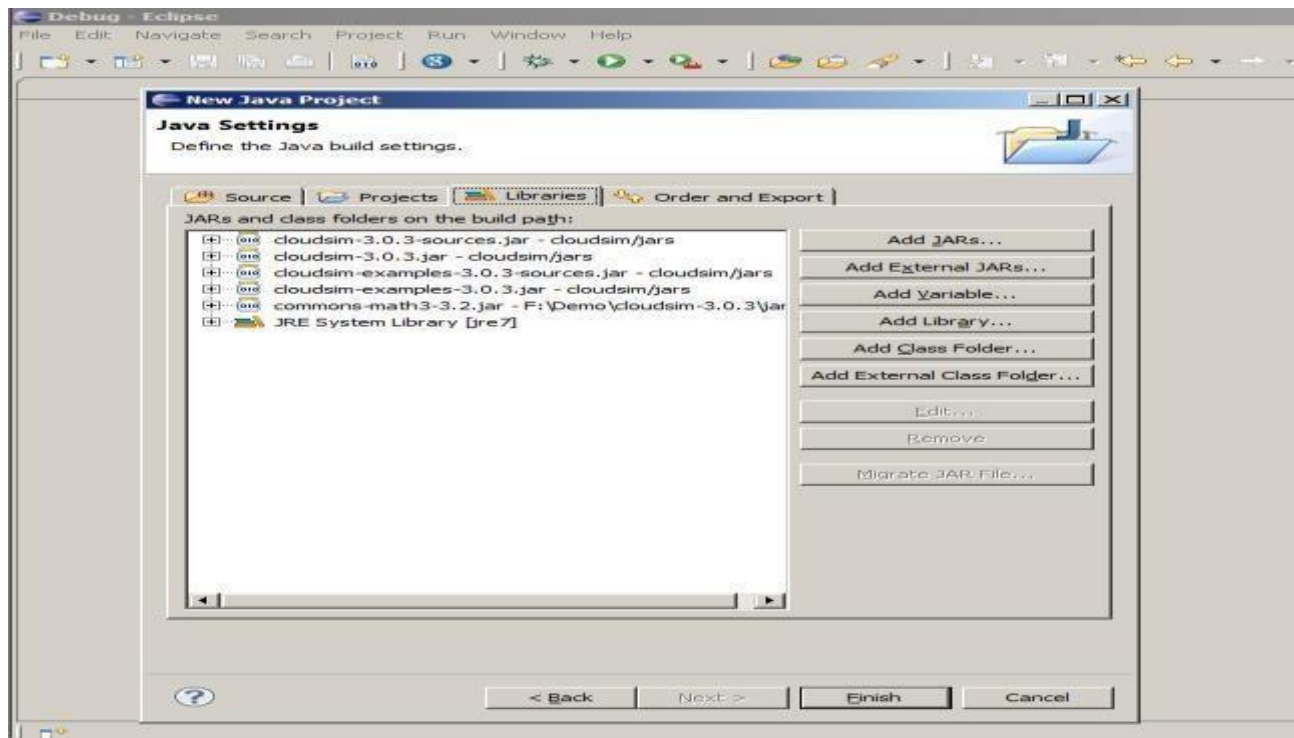
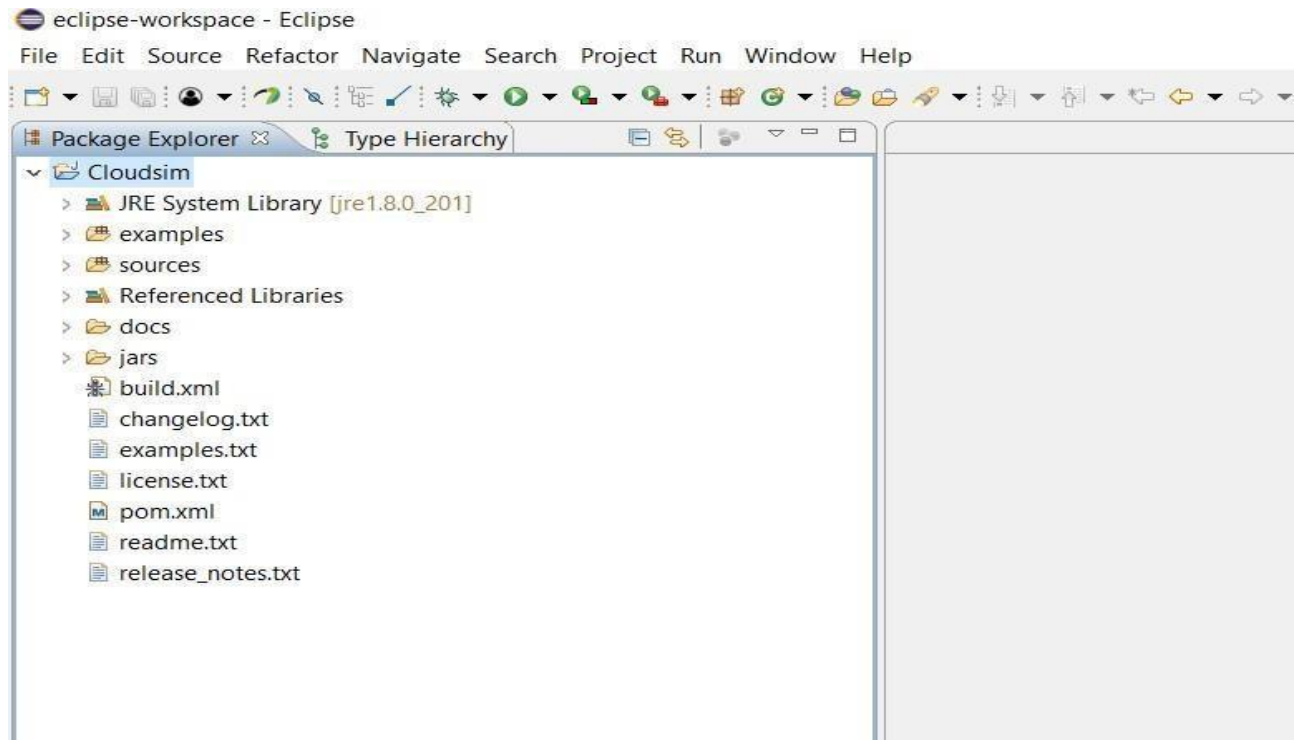




Once you have clicked on 'Add External JAR's' Open the path where you have unzipped the commons-math binaries and select '*Commons-math3-3.x.jar*' and click on open.



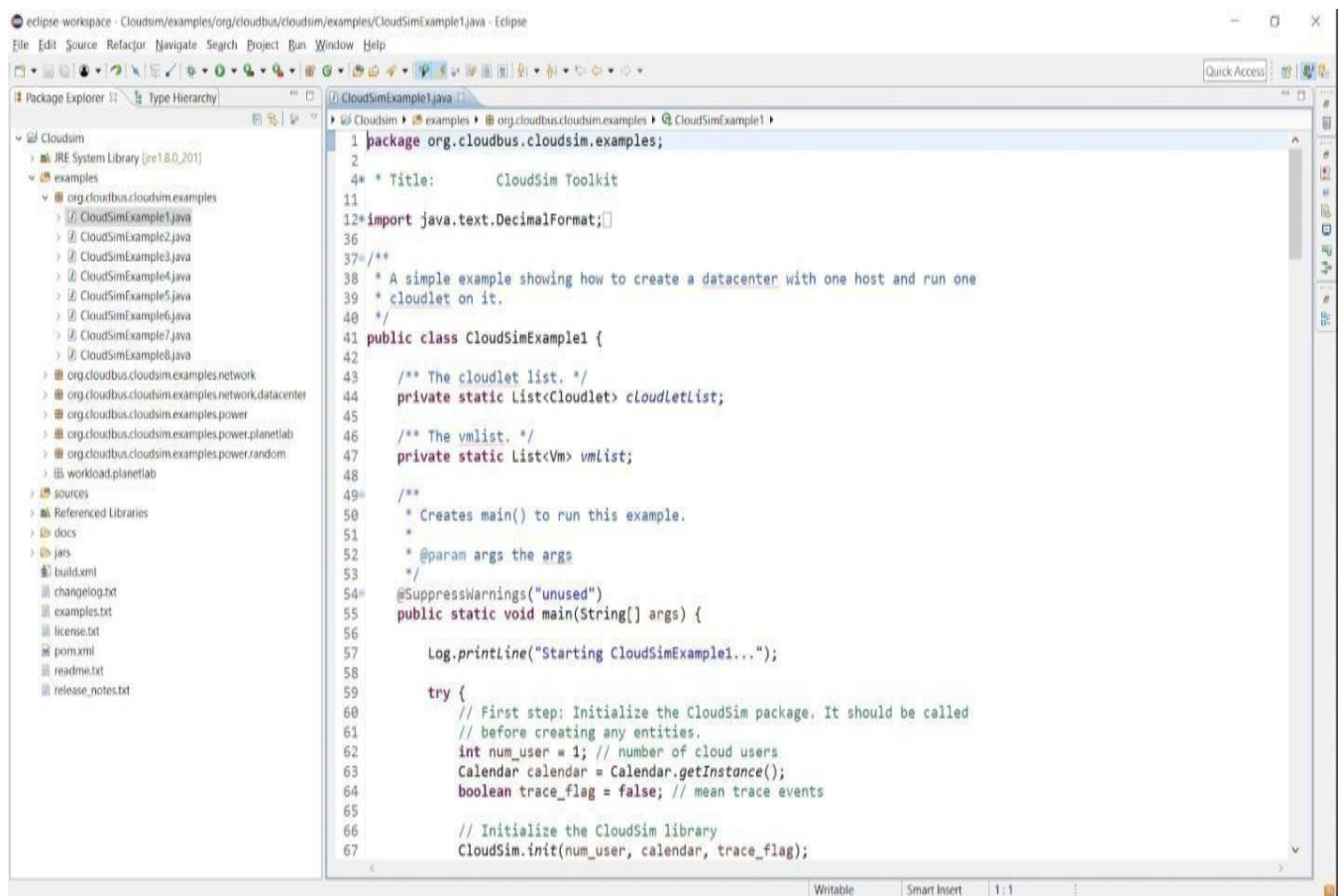
Ensure external jar that you opened in the previous step is displayed in the list and then click on 'Finish' (your system may take 2-3 minutes to configure the project)



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.

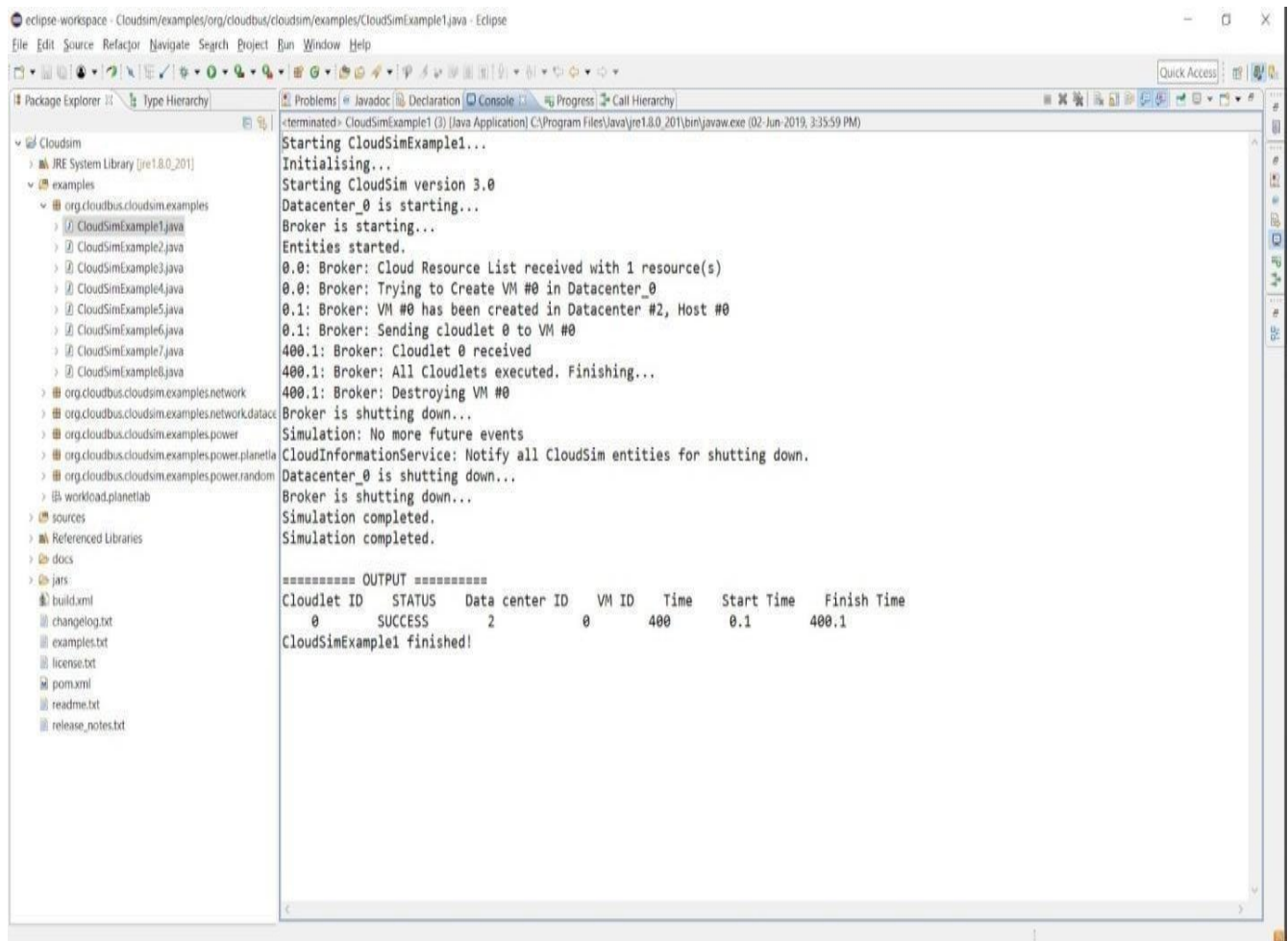
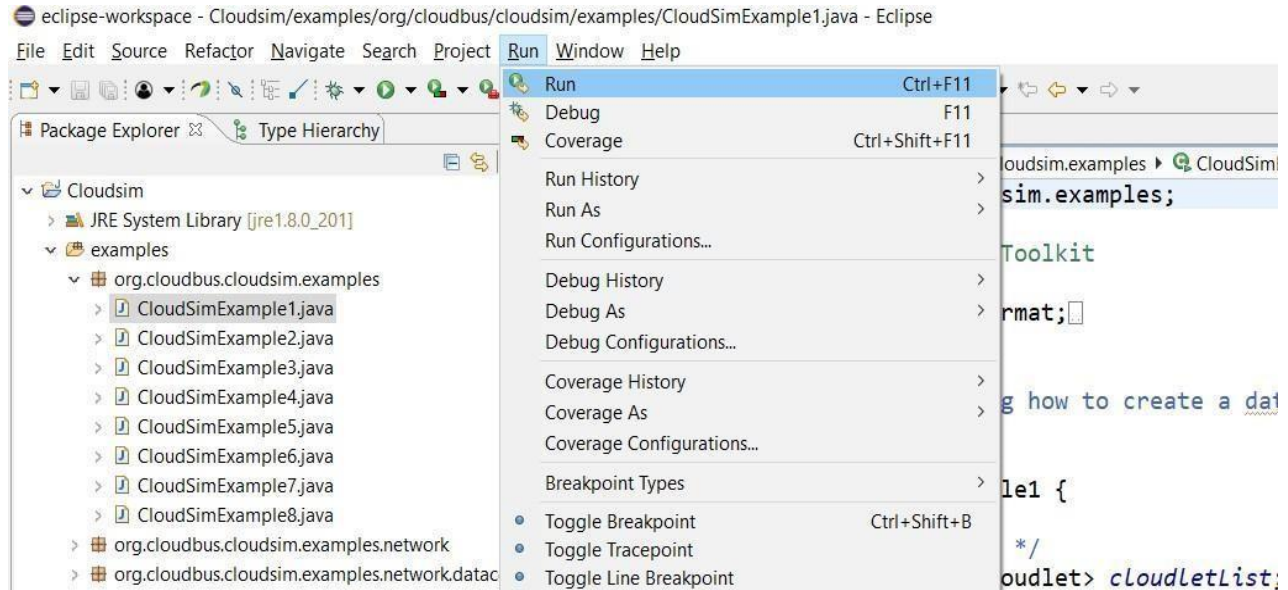
Following is the final screen which you will see after Cloudsim is configured.

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*’



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

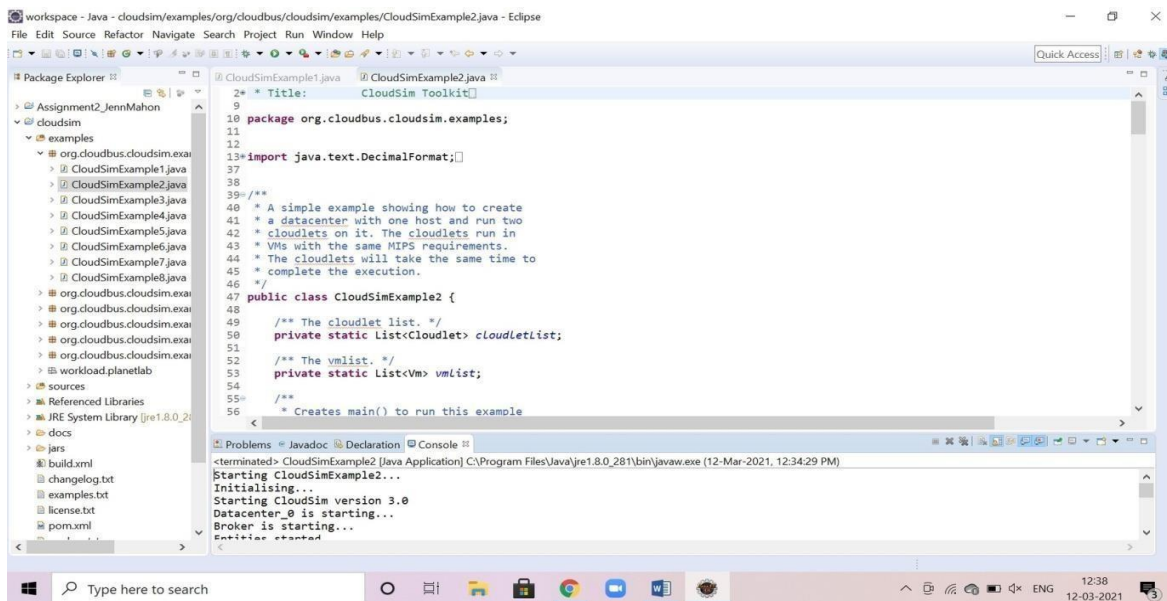
If it is successfully executed it should be displaying the following type to output in the console window of the Eclipse IDE.



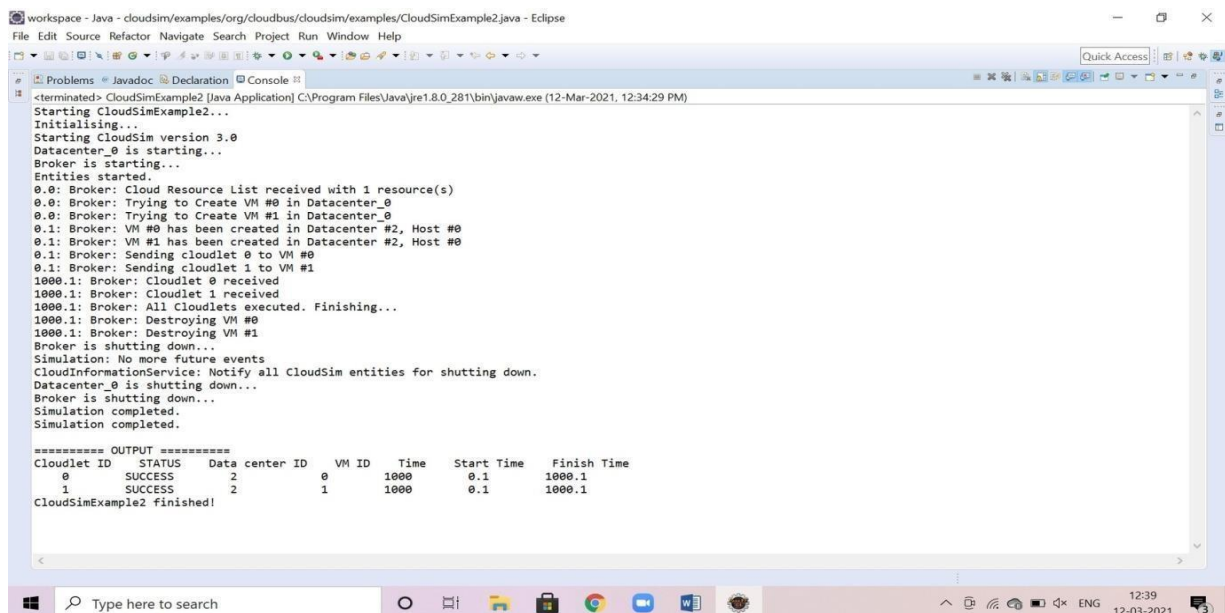


## Now for Example 2

double click to open the '*CloudsimExample2.java*'



if it is successfully executed it should be displaying the following type to output in the console window of the Eclipse IDE.



## Conclusion:

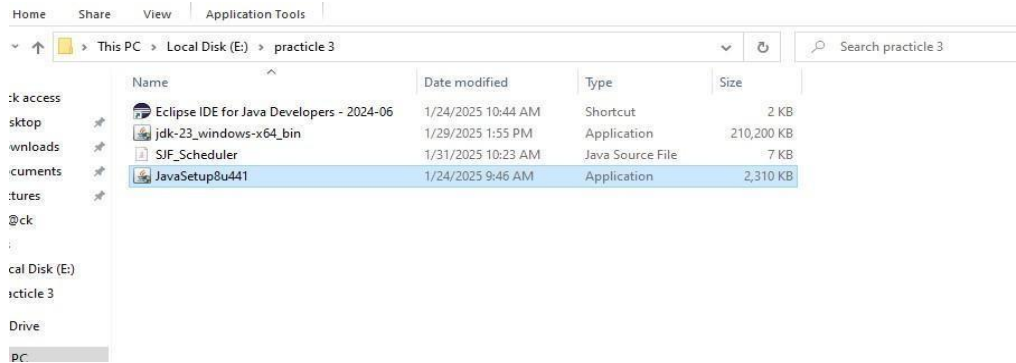
Thus, we have learned how to Simulate a cloud scenario using simulator.

## Experiment No. 3

**AIM: Implement scheduling algorithms.**

**Steps:**

1. Install any of the IDE for running JAVA applications (eclipse recommended)
2. Install JDK and JRE for the same



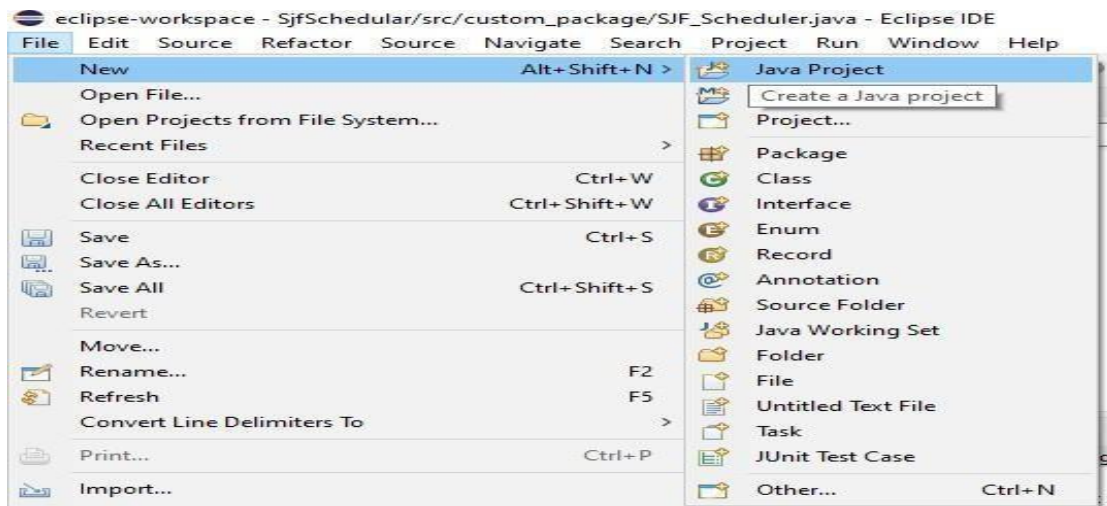
3. Add the jdk\bin path to the environment variables Open environment variables window, add the following to the path variable

Do include your bin path wherever you have

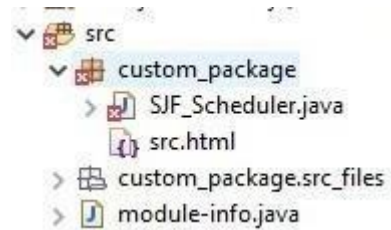
installed JDK Mine is as following :

> C:\Program Files\Java\jdk-14.0.1\bin

4. Open eclipse in your confined workspace
5. Click on new and open a new JAVA Project, give it a name

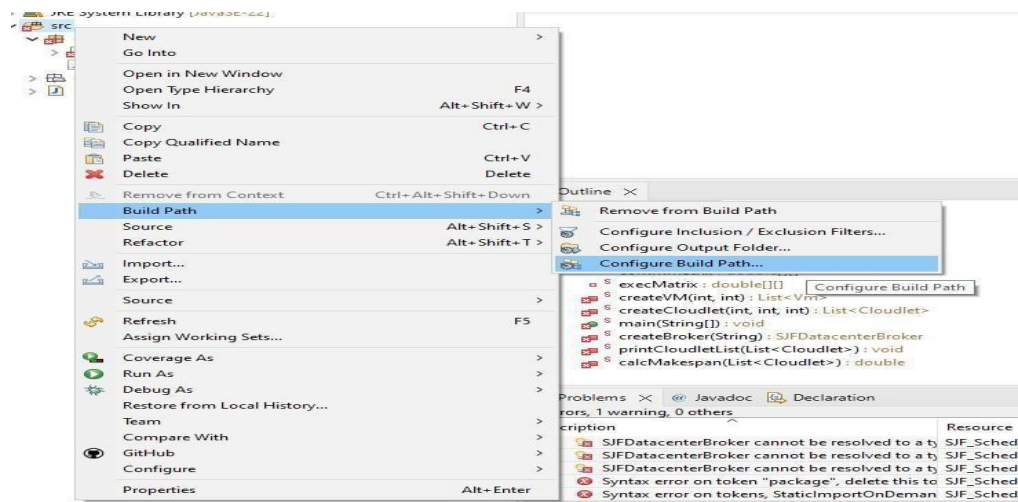


6. Create a package inside the src folder.



7. Now right click on the project and choose configure build path.

8. Click on the libraries section and add external jars



9. Now right click on the project and run the project as **JAVA Application**.

10. Select the SJF\_Scheduler.java file present in the list.

### Code:

```
package <package_name>;

import org.cloudbus.cloudsim.*;

import org.cloudbus.cloudsim.core.CloudSim;

import org.cloudbus.cloudsim.provisioners.BwProvi
sionerSimple; import java.text.DecimalFormat;

import java.util.ArrayList; import java.util.Calendar;

import java.util.LinkedList;

import java.util.List; public class SJF_Scheduler {

private static List<Cloudlet> cloudletList;
```

```

private static List<Vm> vmList;

private static Datacenter[] datacenter;
private static double[][] commMatrix;

private static double[][] execMatrix;
private static List<Vm> createVM(int userId, int
vms) { LinkedList<Vm> list = new LinkedList<>();

long size = 10000;

int ram = 512;

int mips = 250;

long bw = 1000; int pesNumber = 1;

String vmm = "Xen"; Vm[] vm = new Vm[vms];

for (int I = 0; I < vms; i++) {

vm[i] = new Vm(datacenter[i].getId(), userId, mips,
pesNumber, ram, bw, size, vmm, new
CloudletSchedulerSpaceShared());

list.add(vm[i]);

}
return list;}

UtilizationModel utilizationModel = new
UtilizationModelFull(); Cloudlet[] cloudlet = new
Cloudlet[cloudlets];

for (int I = 0; I < cloudlets; i++) {

int dcId = (int) (Math.random() *
Constants.NO_OF_DATA_CENTERS);

cloudlet[i] = new Cloudlet(idShift + I, length,
pesNumber, fileSize, outputSize, utilizationModel,
utilizationModel, utilizationModel);

}
return list;}

public static void main(String[] args) {

execMatrix = GenerateMatrices.getExecMatrix();

commMatrix = GenerateMatrices.getCommMatrix();

```



```

try {
int num_user = 1;

Calendar calendar = Calendar.getInstance();
boolean
trace_flag = false; CloudSim.init(num_user, calendar,
trace_flag);

datacenter = new Datacenter[Constants.NO_OF_DATA_CENTERS];

for (int i = 0; i < Constants.NO_OF_DATA_CENTERS; i++) {

datacenter[i] = DatacenterCreator.createDatacenter("Datacenter_" + i);}
SJFDatacenterBroker broker = createBroker("Broker_0");

int brokerId = broker.getId();

vmList = createVM(brokerId, Constants.NO_OF_DATA_CENTERS);
cloudletList = createCloudlet(brokerId, Constants.NO_OF_TASKS, 0);
broker.submitVmList(vmList);

broker.submitCloudletList(cloudletList);

CloudSim.startSimulation();

List<Cloudlet> newList =
broker.getCloudletReceivedList();

CloudSim.stopSimulation(); printCloudletList(newList)

} catch (Exception e) {

e.printStackTrace();

Log.println("The simulation has been terminated due to an unexpected error");} } private static
SJFDatacenterBroker createBroker(String name) throws Exception {

return new SJFDatacenterBroker(name);}

private static void printCloudletList(List<Cloudlet> list)

{ String indent = "          ";

DecimalFormat dft = new DecimalFormat("###.##");

dft.setMinimumIntegerDigits(2);

Log.println("===== OUTPUT =====");

```

```

Log.println("Cloudlet ID" + indent + "STATUS" + indent + "Data center ID" + indent + "VM
ID" + indent + "Time" + indent + "Start Time" + indent + "Finish Time" + indent + "Waiting
Time");
for (Cloudlet cloudlet : list) {
Log.print(indent + dft.format(cloudlet.getCloudletId()) + indent + indent);
if (cloudlet.getCloudletStatus() == Cloudlet.SUCCESS)

{ Log.print("SUCCESS");

Log.println(indent + indent + dft.format(cloudlet.getResourceId()) + indent + indent + indent +
dft.format(cloudlet.getVmId()) + indent + indent + dft.format(cloudlet.getActualCPUTime())
+ indent + indent + dft.format(cloudlet.getExecStartTime()) + indent + indent + indent +
dft.format(cloudlet.getFinishTime()) + indent + indent + indent +
dft.format(cloudlet.getWaitingTime()));

}}
double makespan = calcMakespan(list);

Log.println("Makespan using SJF: " + makespan);
}

private static double calcMakespan(List<Cloudlet> list) {
double makespan = 0;
double[] dcWorkingTime = new double[Constants.NO_OF_DATA_CENTERS];
for (int I = 0; I < Constants.NO_OF_TASKS; i++) {
int dcId = list.get(i).getVmId() % Constants.NO_OF_DATA_CENTERS;
if (dcWorkingTime[dcId] != 0) -dcWorkingTime[dcId];
dcWorkingTime[dcId] += execMatrix[i][dcId] +
commMatrix[i][dcId]; makespan = Math.max(makespan,
dcWorkingTime[dcId]) }
return makespan}
}

```

**OUTPUT:**

Cloudlet ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time	Waiting Time
1	SUCCESS	1	1	4000	0	4000	0
4	SUCCESS	1	1	7000	4000	11000	4000
0	SUCCESS	1	1	8000	11000	19000	11000
2	SUCCESS	2	2	10000	0	10000	0
3	SUCCESS	2	2	10000	10000	20000	10000
Makespan using SJF: 20000							

## **Experiment No. 4**

### **Aim: To study cloud security management**

Cloud security, also known as cloud computing security, consists of a set of policies, controls, procedures and technologies that work together to protect cloud-based systems, data, and infrastructure. These security measures are configured to protect cloud data, support regulatory compliance and protect customers' privacy as well as setting authentication rules for individual users and devices. From authenticating access to filtering traffic, cloud security can be configured to the exact needs of the business. And because these rules can be configured and managed in one place, administration overheads are reduced and IT teams empowered to focus on other areas of the business.

Cloud computing offers organizations many benefits, but these benefits are unlikely to be realized if there are not appropriate IT security and privacy protection strategies in place when using the cloud. When migrating to the cloud, organizations must have a clear understanding of potential security risks associated with cloud computing, and set realistic expectations with providers. The following 8 steps will help enterprise IT and business decision makers analyze the information security and privacy implications of cloud computing and cloud security management on their business.

Following are the Steps to follow:

#### **1. Ensure effective governance and compliance**

Most organizations have security, privacy and compliance policies and procedures to protect their IP and assets. In addition to this, organizations should establish a formal governance framework that outlines chains of responsibility, authority and communication. This describes the roles and responsibilities of those involved, how they interact and communicate, and general rules and policies.

#### **2. Audit operation and business process**

It is important to audit the compliance of IT system vendors that host the applications and data in the cloud. There are three important areas that need to be audited by cloud service customers: internal control environment of a cloud service provider, access to the corporate audit trail, and the cloud service facility's security.

#### **3. Manage people, roles and identities**

Using the cloud means there will be employees from the cloud service provider that can access the data and applications, as well as employees of the organization that perform operations on the providers system. Organizations must ensure that the provider has processes that govern who has access to customer data and application. The provider must allow the customer to assign and manage roles and authorization for each of their users. The provide must also have a secure system in place to managing the unique identifies for users and services.

#### **4. Proper protection of data**

Data is the core of all IT security concerns for any organization. Cloud computing does not change this concern but brings new challenges because of the nature of cloud computing. The security and protection of data both at rest and in transit needs to be ensured.

#### **5. Enforce privacy policies**

Privacy and protection of personal information and data is crucial, especially as many major companies and financial institutions are suffering data breaches. Privacy of personal information is related to personal data that is held by an organization, which could be compromised by negligence or bugs. It is critical that privacy requirements be addresses by the cloud service provider. If not, the organization should consider seeking a different provider or not placing sensitive data in the cloud.

#### **6. Assess security considerations for cloud applications**

Organizations are constantly protecting their business applications from internal and external threats. Application security poses challenges to both the provider and organization, and depending on the type of cloud deployment model (IaaS, PaaS, or SaaS), there are different security policy considerations.

#### **7. Cloud networks and connections are secure**

Cloud service providers must allow legitimate network traffic and block malicious traffic. Unfortunately, cloud service providers will not know what network traffic its customer plan to send and receive. Therefore, organizations and providers must work together to set safety measures, and provide the tools necessary to protect the system.

#### **8. Evaluate security controls and physical infrastructure**

The security of an IT system is also based on the security of the physical infrastructure and facility. Organizations must have assurance from the provider that the appropriate controls are in place. Infrastructure and facilities should be held in secure areas, and protected against external and environmental threats. For example, physical printers should be locked down or moved into a controlled access area. Further protect access by using a network print security appliance to require user authentication for access to the printer to help eliminate security breaches and reduce printing costs. As organizations migrate their applications and data to the cloud computing, it is critical to maintain the security and privacy protection they had in their traditional IT environment.

### **Conclusion:**

Thus, we have learned how to study cloud security management.



## Experiment No. 5

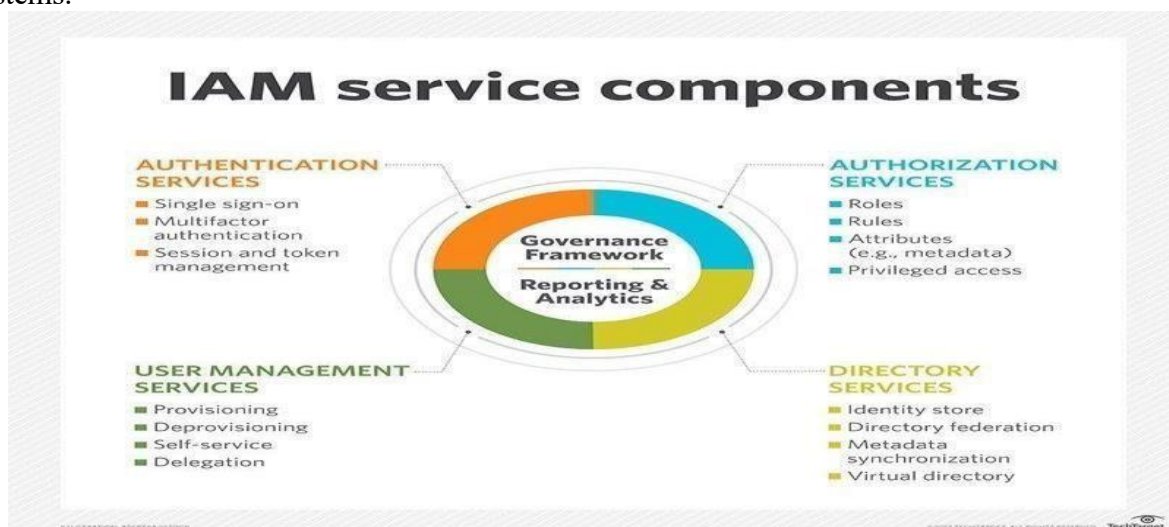
### **Aim: To study and implementation of Identity and Access Management**

Identity and Access Management (ID management) is the organizational process for ensuring that individuals have the appropriate access to technology resources. More specifically, this includes the identifying, authentication and authorization of a person, or persons, to have access to applications, systems or networks. This is done by associating user rights and restrictions with established identities. Managed identities can also refer to software processes that need access to organizational systems. Identity and access management can be considered an essential component for security. Identity and access management includes authenticating users and determining whether they're allowed access to particular systems. ID management works hand-in-hand with identity access management systems. Identity and access management is focused on authentication, while access management is aimed at authorization.

The main goal of identity and access management is to ensure that only authenticated users are granted access to the specific applications, systems or IT environments for which they are authorized. This includes control over user provisioning and the process of onboarding new users such as employees, partners, clients and other stakeholders. Identity and access management also includes control over the process of authorizing system or network permissions for existing users and the offboarding of users who are no longer authorized to access organization systems.

ID management determines whether a user has access to systems and also sets the level of access and permissions a user has on a particular system. For instance, a user may be authorized to access a system but be restricted from some of its components.

Identity governance, the policies and processes that guide how roles and user access should be administered across a business environment, is also an important aspect of identity and access management. Identity governance is key to successfully managing role-based access management systems.



### **Importance of identity and access management**

Identity and access management is an important part of the enterprise security plan, as it is linked to both the security and productivity of the organization.

In many organizations, users are granted more access privileges than they need to perform their functions. Attackers can take advantage of compromised user credentials to gain access to organizations' network and data. Using identity and access management, organizations can safeguard their corporate assets against many threats including hacking, ransomware, phishing and other malware attacks.

Identity and access management systems can add an additional layer of protection by ensuring user access policies and rules are applied consistently across an organization.

An identity and access management (IAM) system can provide a framework with the policies and technology needed to support the management of identities. Many of today's IAM systems use federated identity, which allows a single digital identity to be authenticated and stored across multiple different systems. An IAM system can also be used to deploy single sign-on (SSO) technologies.

This can significantly decrease the number of passwords users need. SSO incorporates a federated-identity approach by using a single login and password to create an authentication token, which can then be accepted by various enterprise systems and applications. Combined with multifactor authentication as well as enforceable security policies, enterprises can lower the risk of security breaches. An example of such policies includes the principle of least privilege, which gives users only the access they require to fulfill their roles.

### **Challenges of implementing identity and access management**

To implement identity and access management, an enterprise must be able to plan and collaborate across business units. Successful organizations will more likely be ones that establish identity and access management strategies with clear objectives, defined business processes and buy-in from stakeholders at the outset. Identity and access management works best when IT, security, human resources and other departments are involved.

Identity and access management systems must allow companies to automatically manage multiple users in different situations and computing environments in real time. It's much more time-consuming to manually adjust access privileges and access controls for hundreds or thousands of users. Additionally, authentication must be simple for users to perform and easy for IT to deploy and secure.

One of the top challenges in implementing identity and access management is password management. IT professionals should investigate techniques that can reduce the impact of these password issues in their companies.

For security, tools for managing identity and access management should run as an application on a dedicated network appliance or server. At the core of an identity and access management system are policies defining which devices and users are allowed on the network and what a user can accomplish, depending on device type, location and other factors. All of this also depends on appropriate

management console functionality. This includes policy definition, reporting, alerts, alarms and other common management and operations requirements. An alarm might be triggered, for example, when a specific user tries to access a resource for which they do not have permission. Reporting produces an audit log documenting what specific activities were initiated.

Many identity and access management systems offer directory integration, support for both wired and wireless users and the flexibility to meet almost any security and operational policy requirement. Because bring your own device (BYOD) is so strategic today, time-saving features support for a variety of mobile operating systems and automated device status verification is becoming common. Time-saving features may include automated device onboarding and provisioning.

### **Business benefits of identity and access management**

In addition to managing employees, the use of identity and access management along with access management enables a business to manage customer, partner, supplier and device access to its systems while ensuring security is the top priority.

This goal can be accomplished on several fronts, starting with allowing authorized access from anywhere. As people increasingly use their social media identities to access services and resources, organizations must be able to reach their users through any platform. Additionally, they can allow their users access to corporate systems through their existing digital identities.

Identity and access management can also be used to improve employee productivity. This is especially important when onboarding new employees, or changing authorizations for accessing different systems when an employee's function changes. When companies hire new employees, they have to be given access to specific parts of their systems, given new devices and provisioned into the business. Done manually, this process can be time-consuming and reduces the ability of the employees to get right to work. However, automated provisioning can enable companies to accelerate the process of allowing new employees to access the required parts of their systems.

Finally, identity and access management can be an important tool for enhancing employees' user experience, especially for reducing the impact of identity chaos -- the state of having multiple sets of user IDs and passwords for disparate systems. Typically, people can't remember numerous usernames and passwords and would prefer to use a single identity to log in to different systems at work.

### **Conclusion:**

Thus, we have learned how to do Identity and Access Management.