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Subject:- CSE427

Test:- CA4 Lab Evaluation

Task:- 2 (Create 2 Data Centre, 3 VM, 3 Cloudlets with 2 Hosts)

Date:- 24 Apr 2023

Question). Task 2 - Create 2 Data centres, 3 VM, and 3 Cloudlets with 2 Hosts.

Answer:-

So, to achieve this result as given in the task, there are some steps which I followed. These are as below ---

Step 1). Initialize the Cloud Sim package. It should be called before creating any entities.

E.g.:-

```
int num_user = 1; // number of cloud users  
  
Calendar calendar = Calendar.getInstance();  
  
boolean trace_flag = false; // mean trace events
```

Step 2). Create Data centre.

E.g.:-

```
Datacenter datacenter0 = createDatacenter("Datacenter_0");
```

Step 3). Create Broker (In Cloudsim Data Centre are the resource provider).

E.g.-

```
DatacenterBroker broker = createBroker();  
int brokerId = broker.getId();
```

Step 4). Create one virtual machine.

E.g.-

```
vmlist = new ArrayList<Vm>();
```

Step 5). Create one Cloudlet.

E.g.:-

```
cloudletList = new ArrayList<Cloudlet>();
```

Step 6). Start simulation.

E.g.:-

```
CloudSim.startSimulation();  
CloudSim.stopSimulation();
```

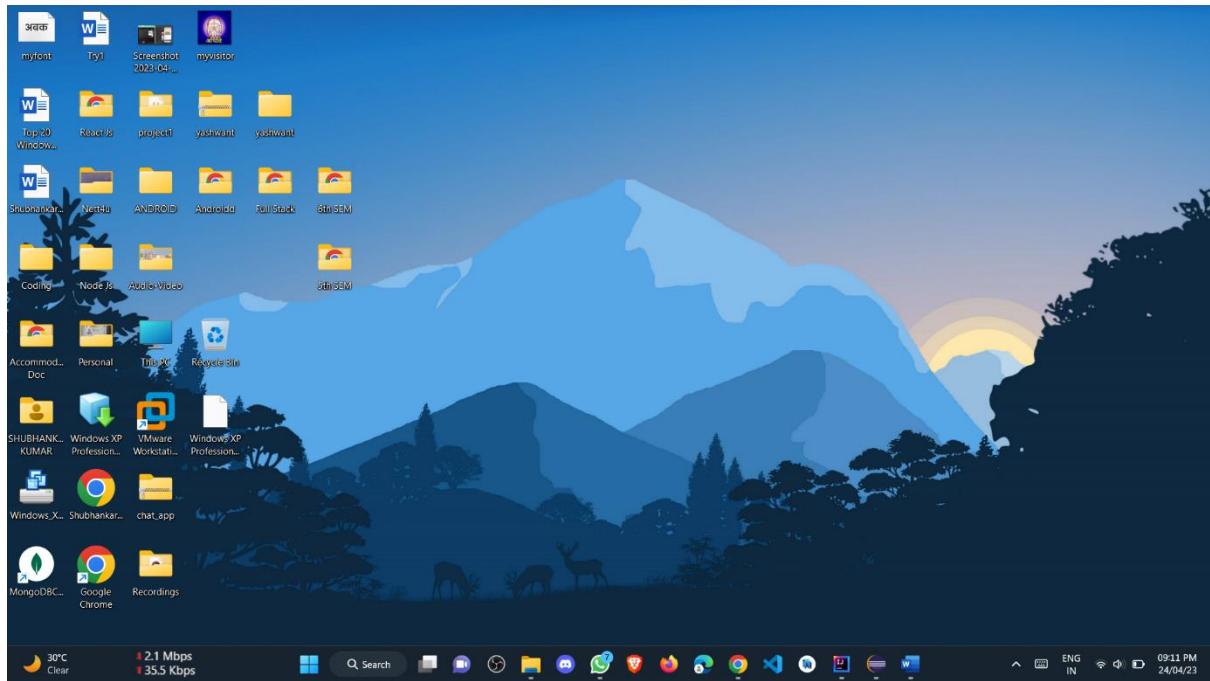
Step 7). This step is used to print the result when the simulation is over.

E.g.:-

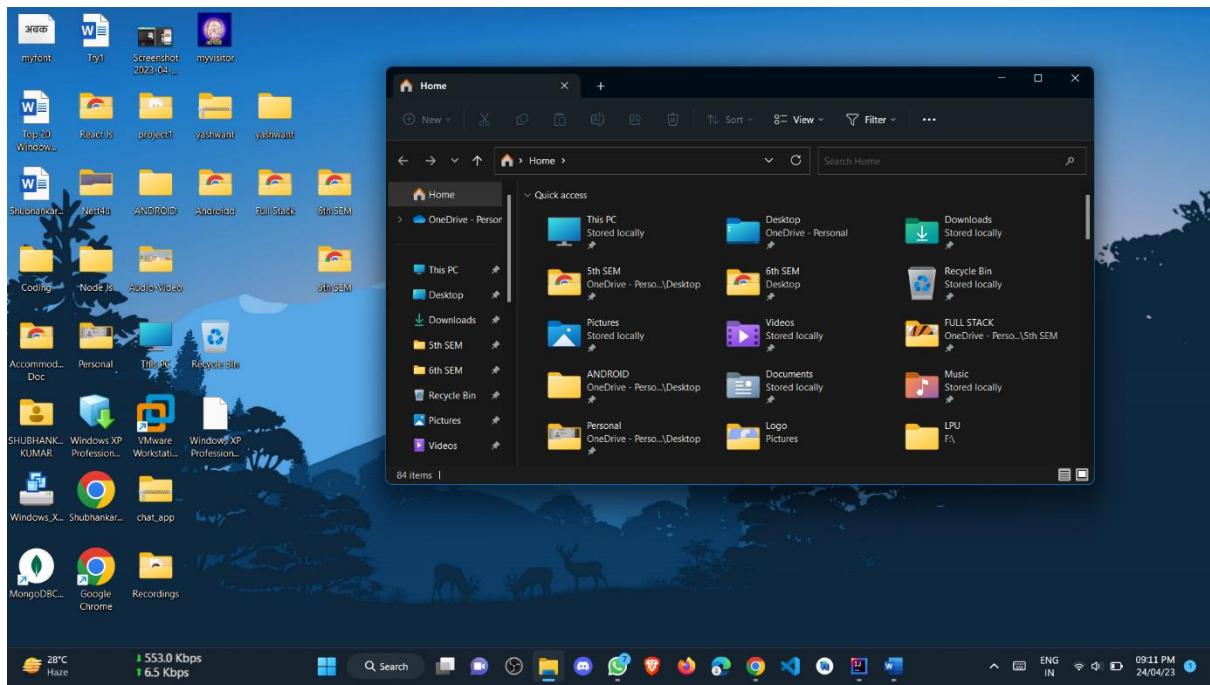
```
List<Cloudlet> newList = broker.getCloudletReceivedList();  
printCloudletList(newList);
```

Below are all Screenshot:-

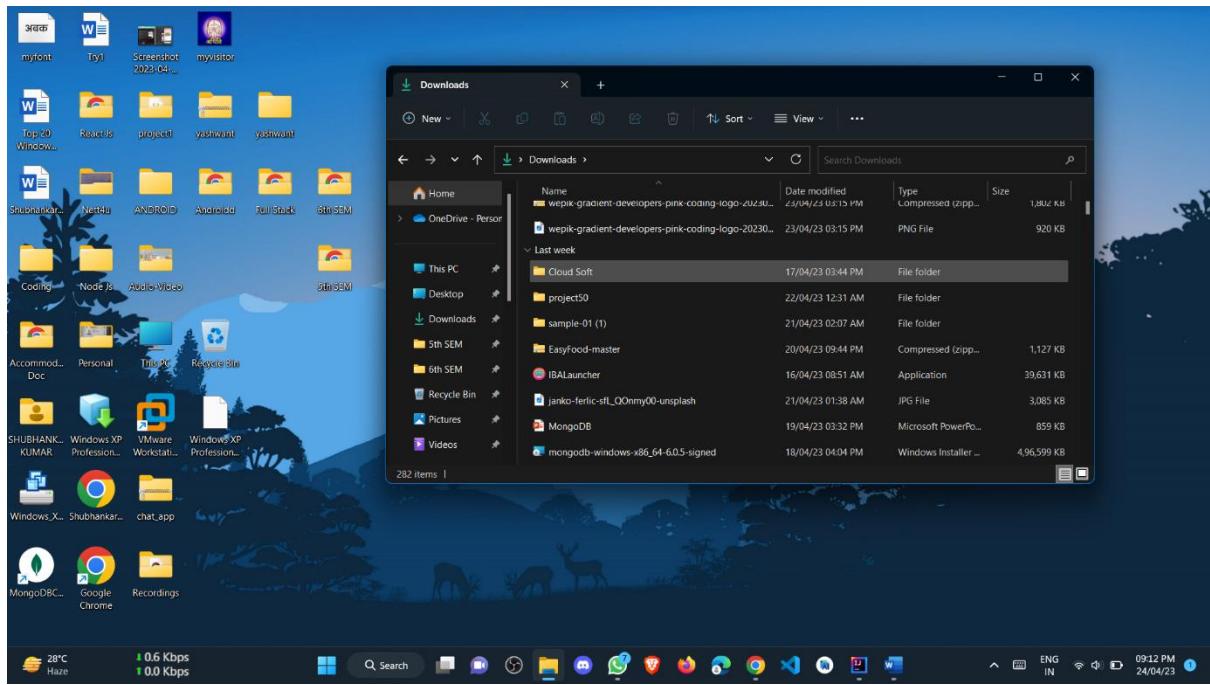
1- This is my home screen.



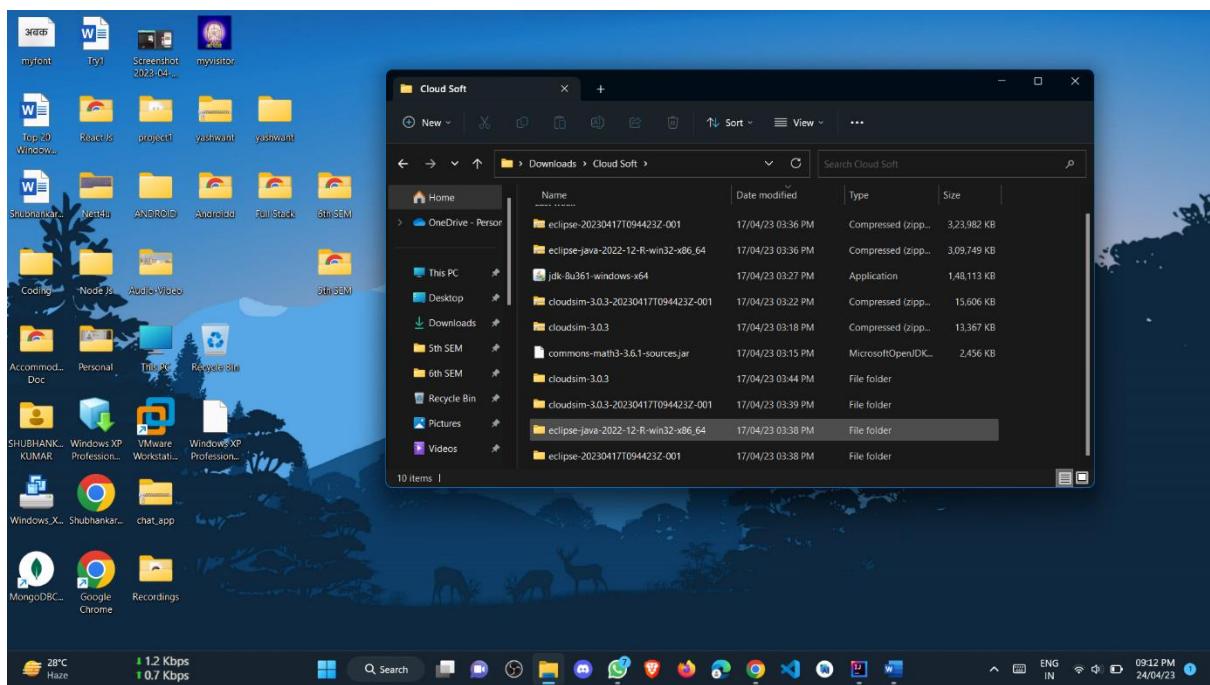
2- I have opened my file explorer where I have saved the eclipse and another file whatever I need



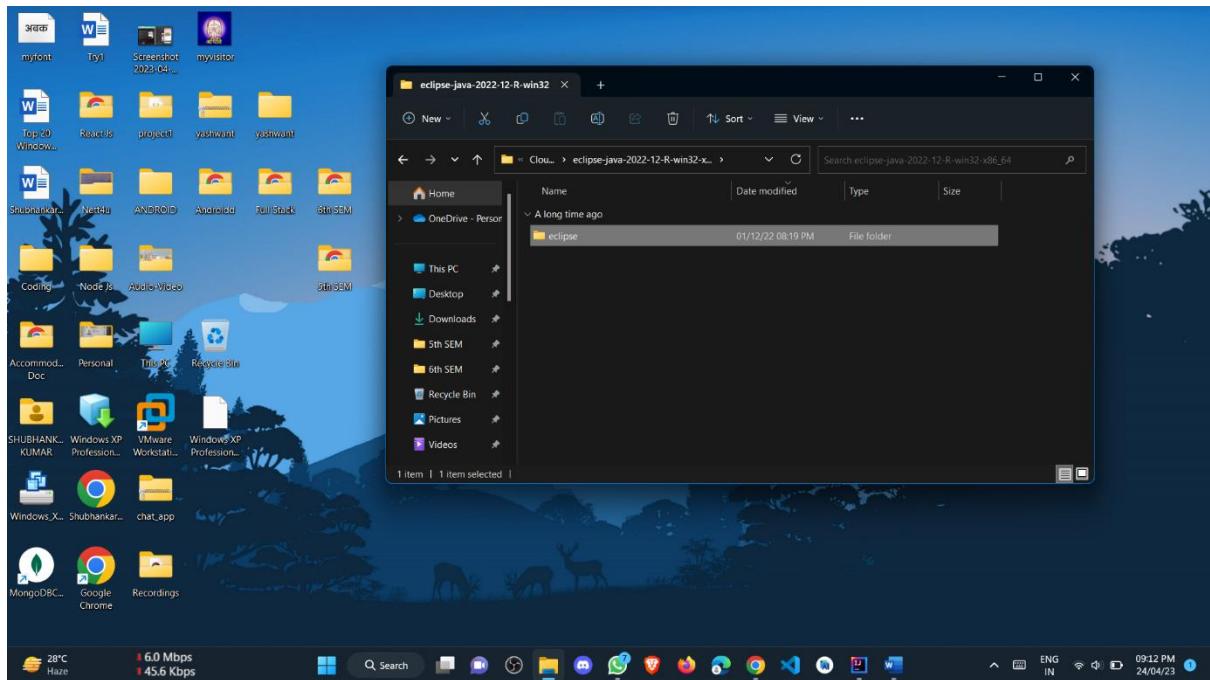
3- Open the Download file section where I have downloaded



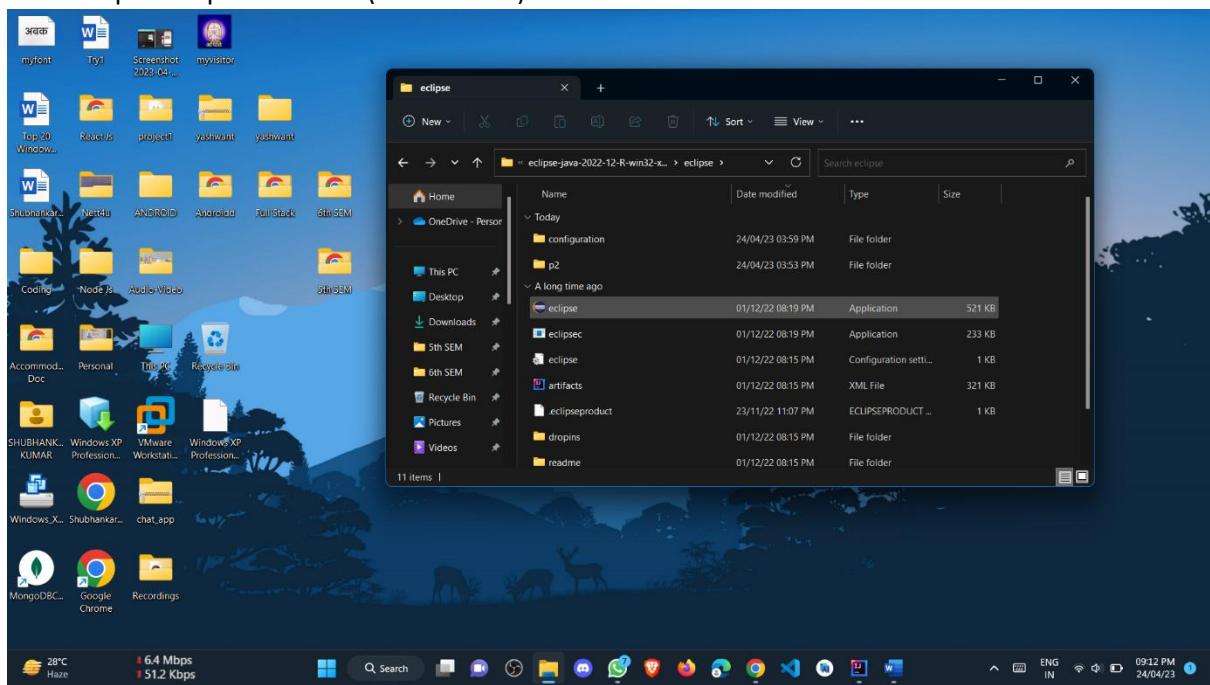
4- Open “eclipse-java-2022-12-R-win32-x86_64” .



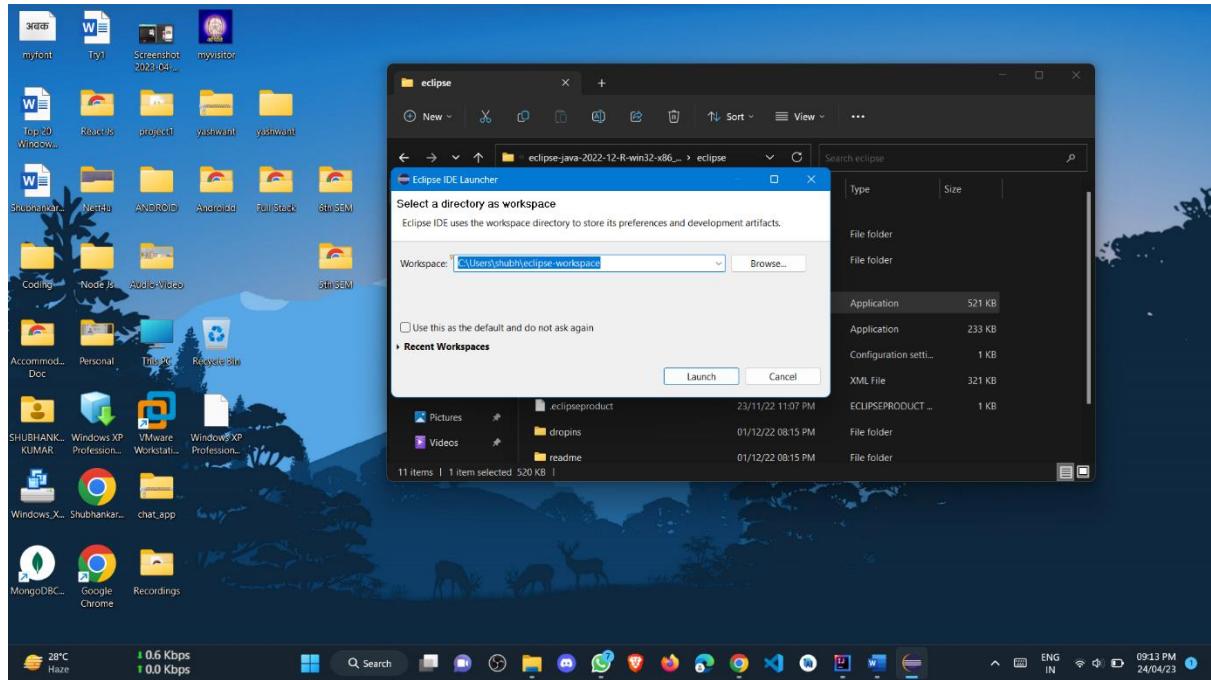
5- Open Eclipse folder



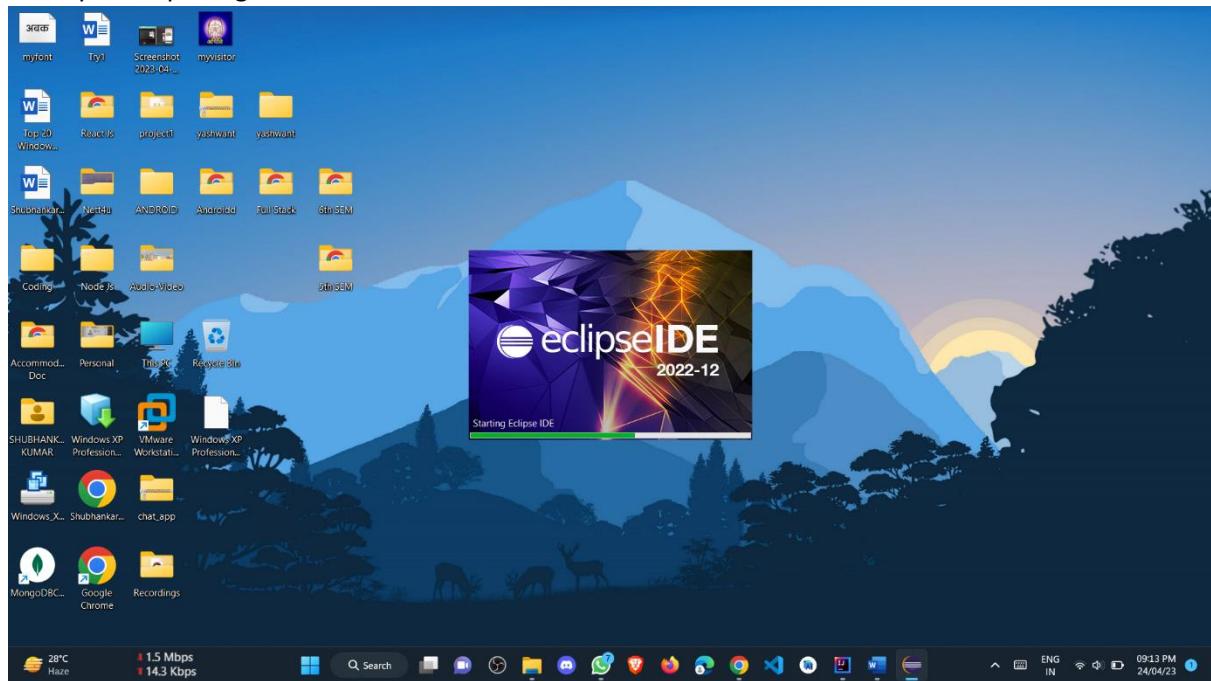
6- Now open Eclipse Software (double click)



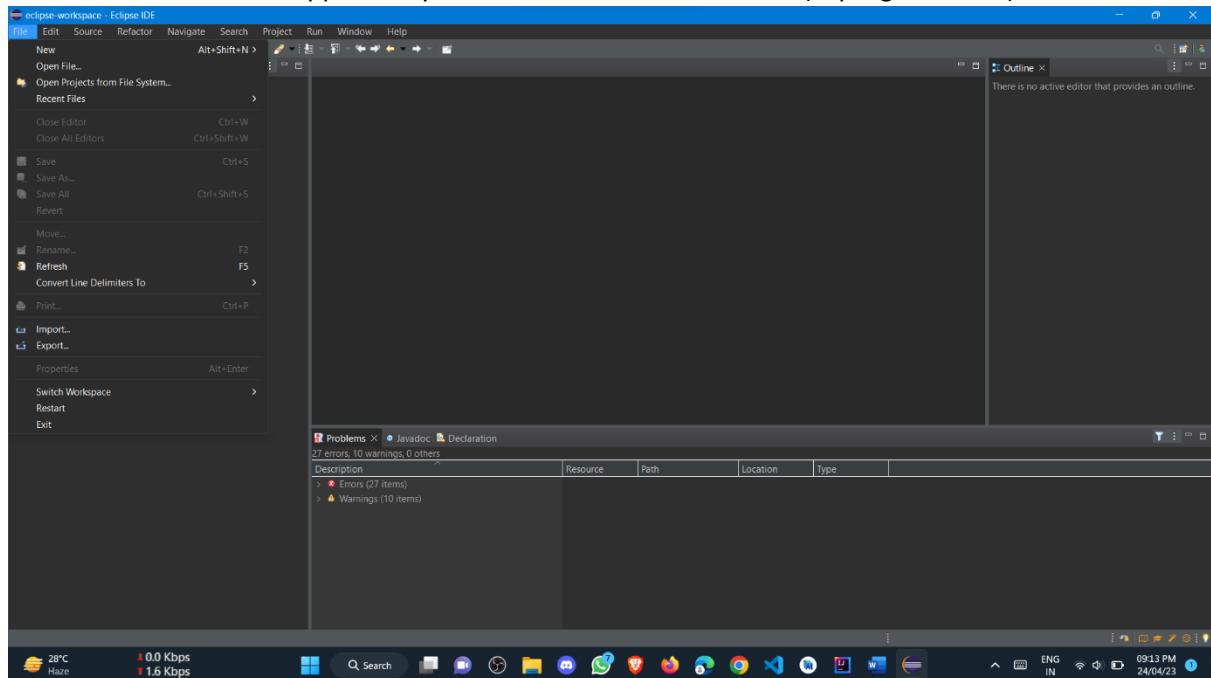
7- It will ask you where you want to save/launch the software. So, it depends on you. You can Browse according to your choice. Here I leave it by default. Now Click on Launch Button.



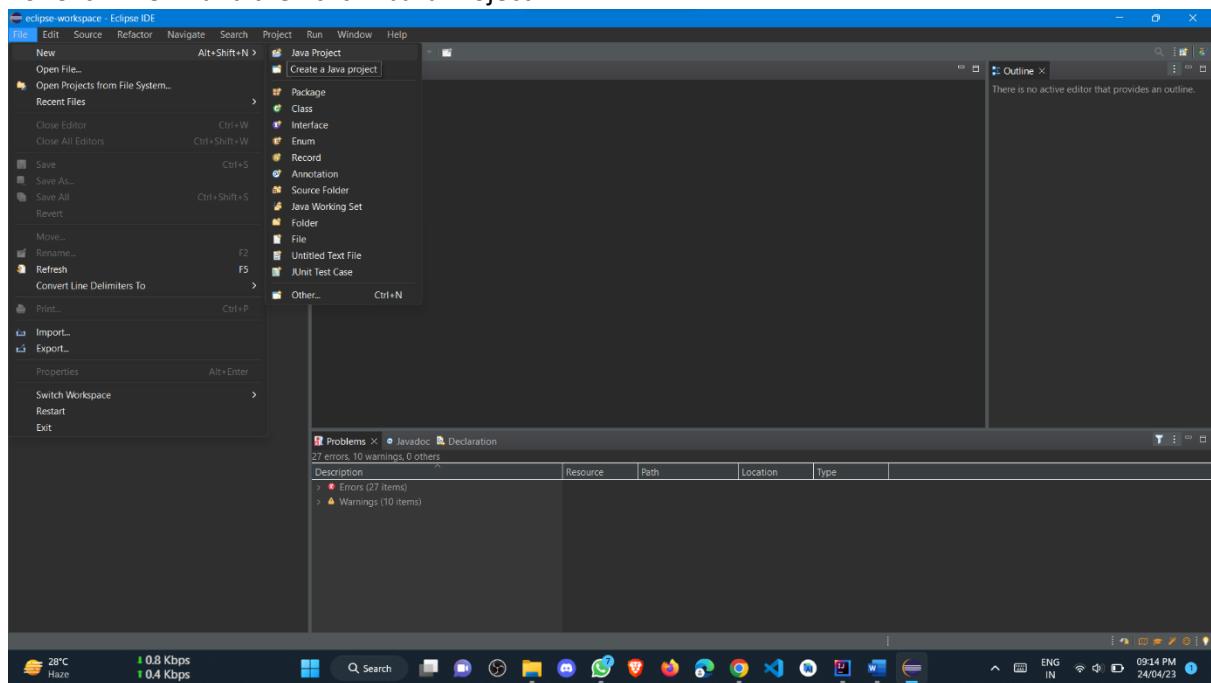
8- Eclipse is opening.



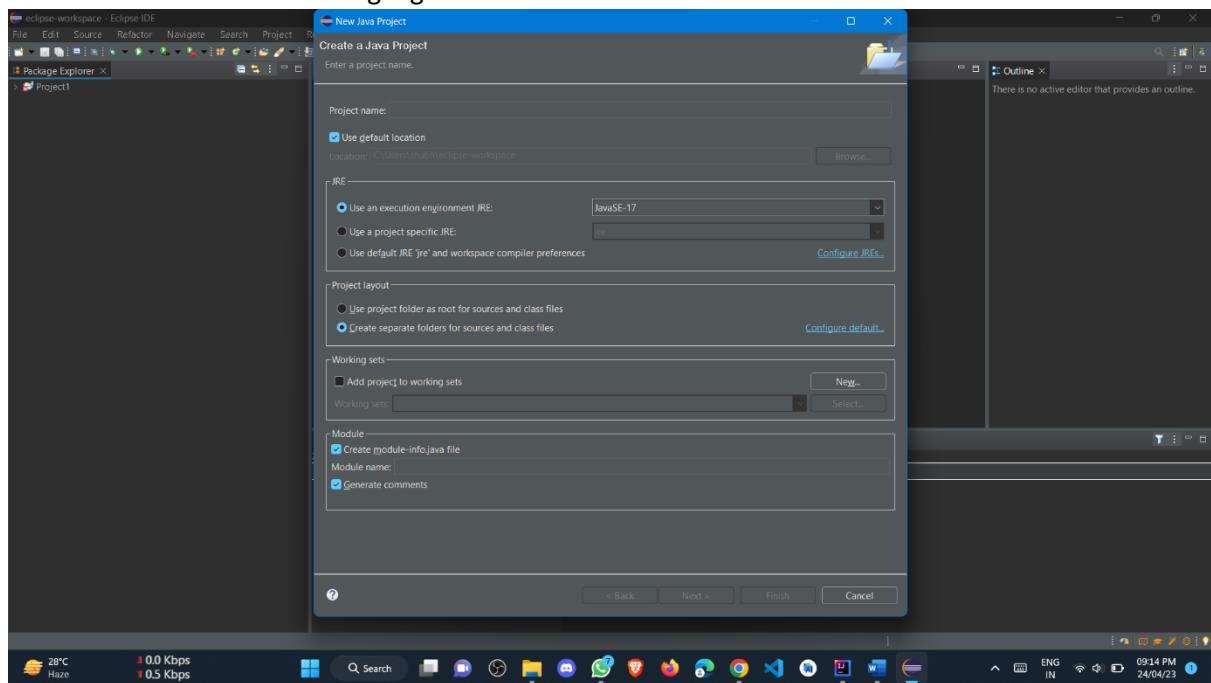
9- The same screen will appear on your device. Now click on “File” (Top-right Corner).



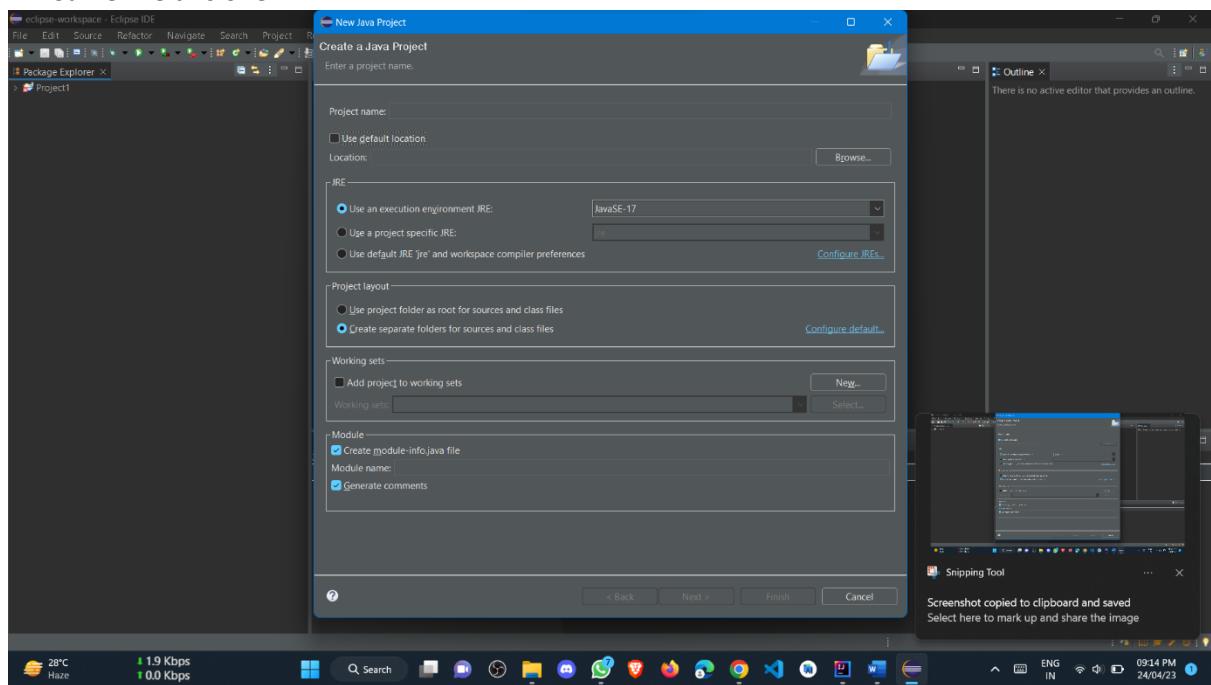
10- Click “New” and then click “ Java Project”.



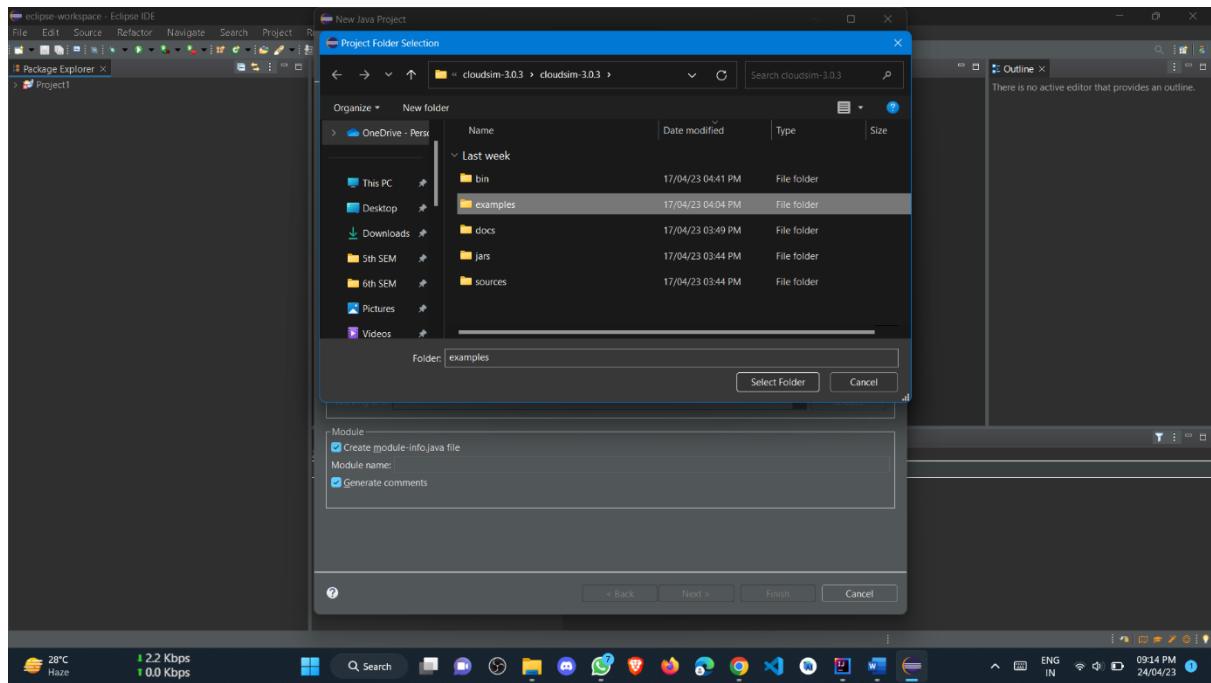
11- Now name the project according to you and untick the “Use default location”. When you untick, the “Browse” button will be highlighted and click on the “Browse” button.



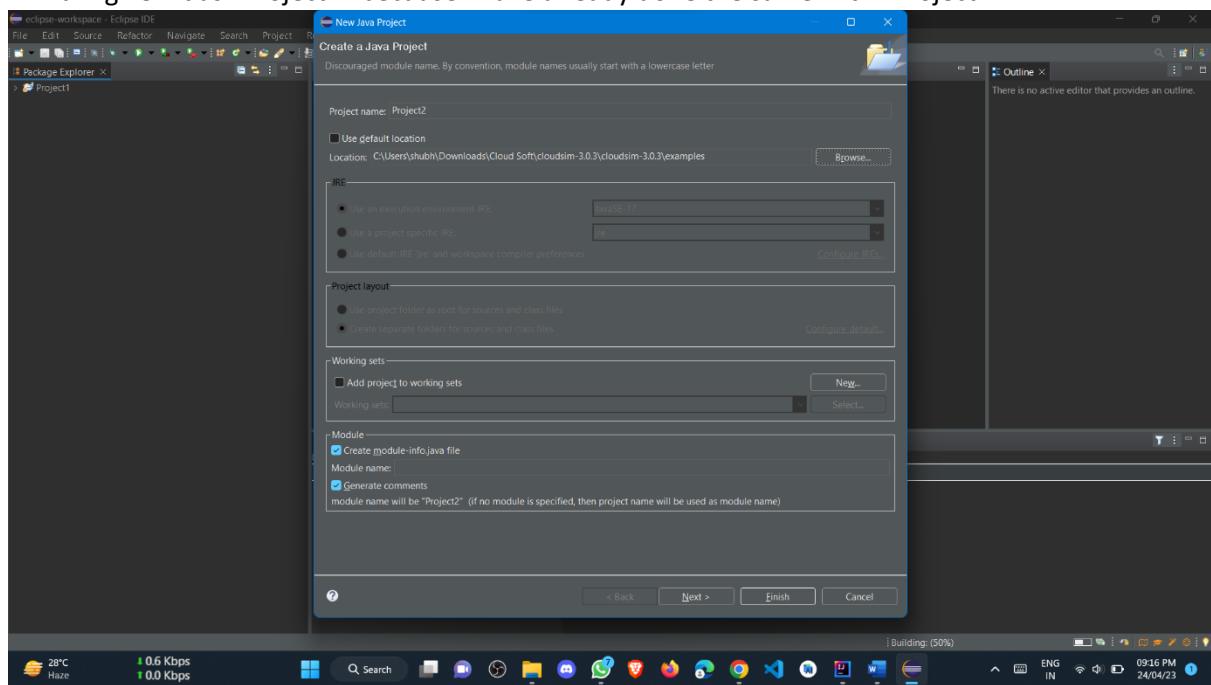
12- Same like this one



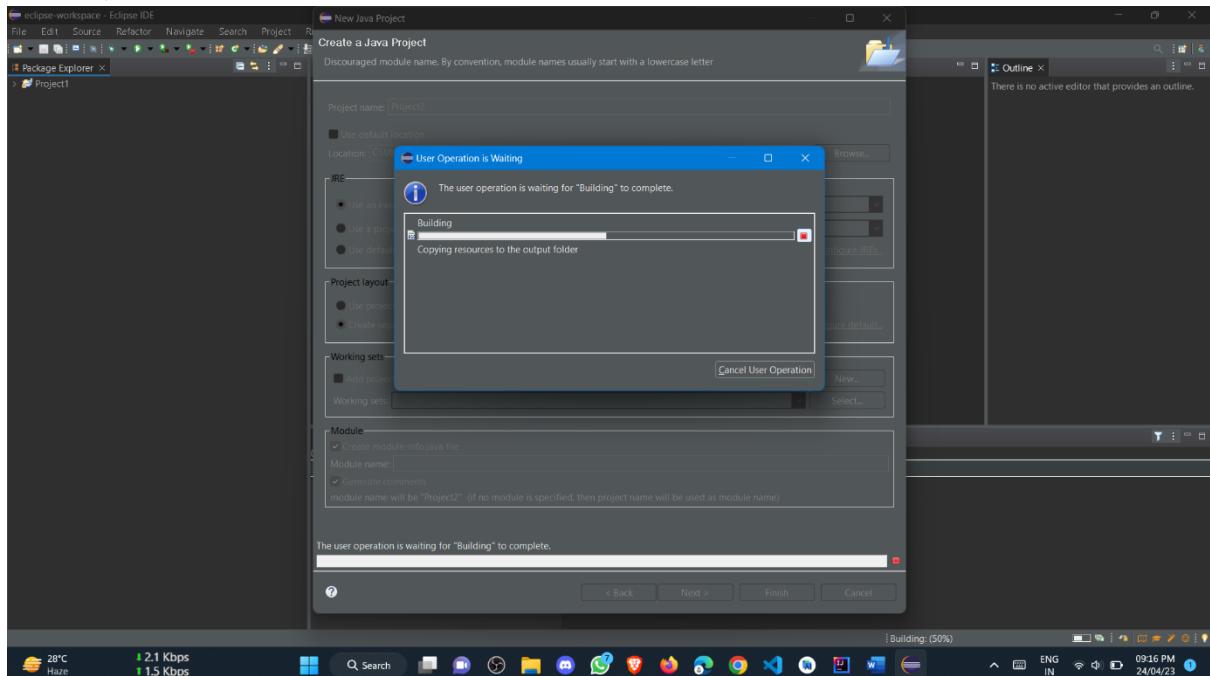
13- When you click on the “Browse” Button, you must give the location where the “Example” folder is available.



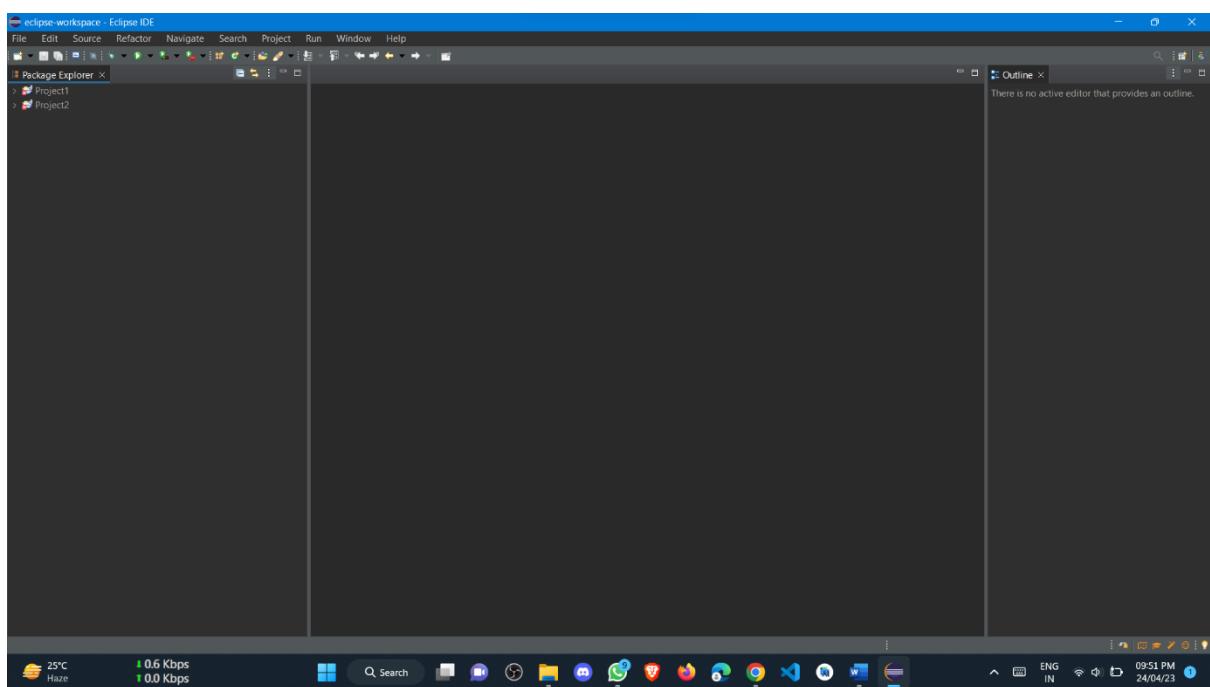
14-I am given it as “Project2” because I have already done the same with “Project1”.



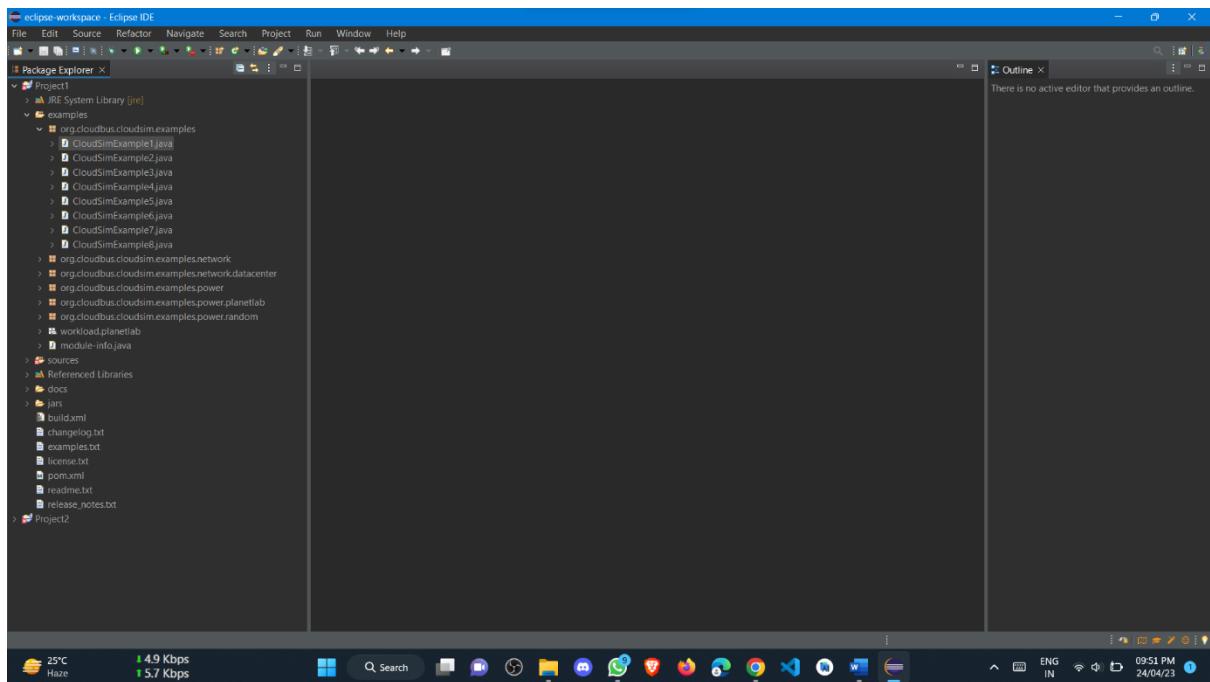
15- Now, it will show.



16- Open Project 1



17- Open the “Example” folder. Then open “org.cloudbus.cloudsim.example” folder



18- Double click on any file. Let's I Clicked on “Example1”

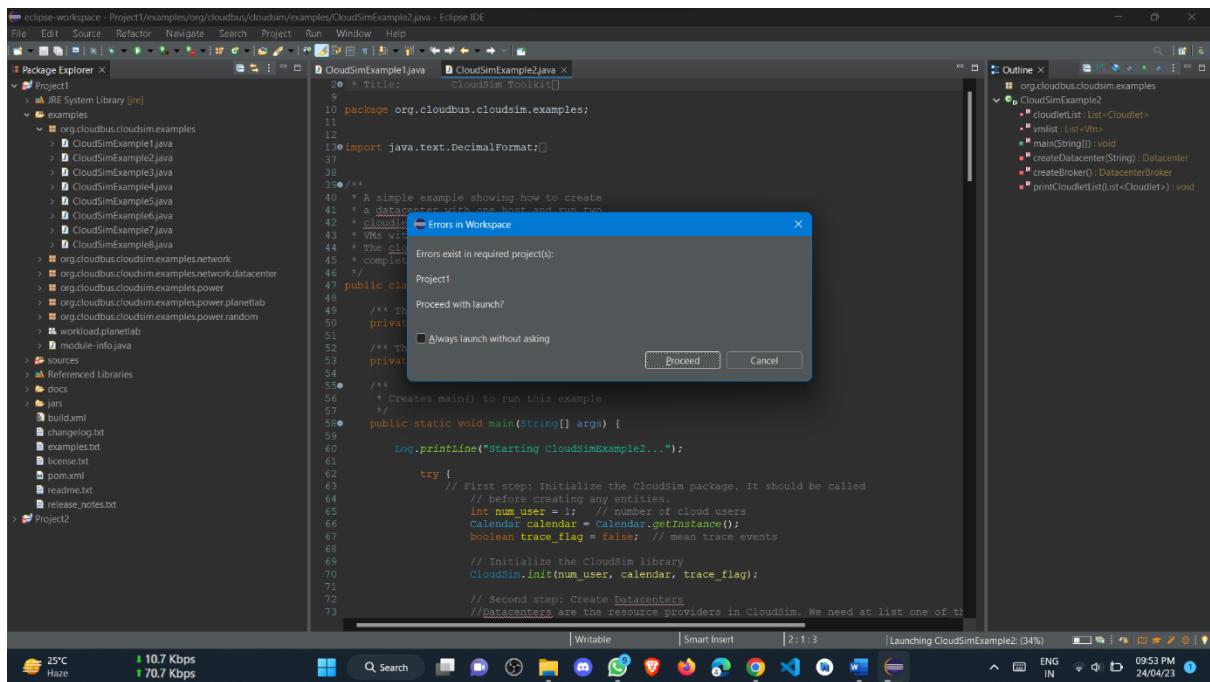
eclipse-workspace - Project1/examples/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse IDE

```

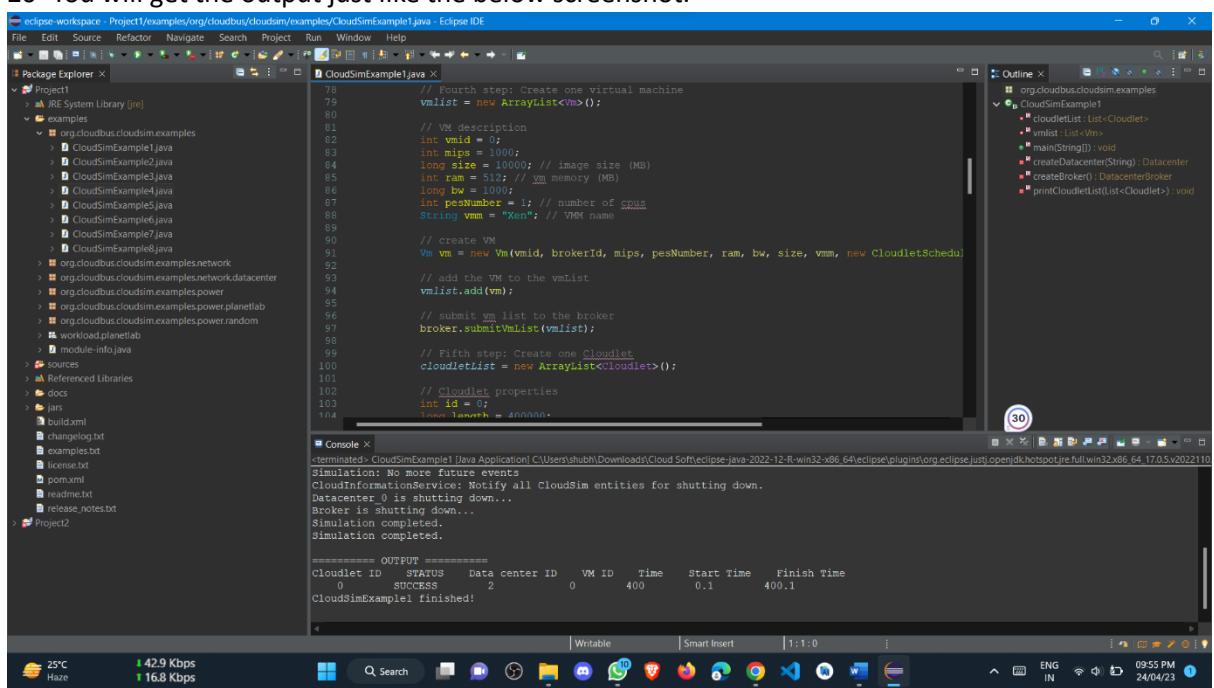
File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer Run CloudSimExample2.java CloudSimExample2.java
2 | * Title: CloudSim Toolkit[]
3 |
4 package org.cloudbus.cloudsim.examples;
5
6 import java.text.DecimalFormat;
7
8 /**
9  * A simple example showing how to create
10 * a datacenter with one host and run two
11 * cloudlets on it. The cloudlets run in
12 * two VMs with the same CPU requirements.
13 * The cloudlets will take the same time to
14 * complete the execution.
15 */
16 public class CloudSimExample2 {
17
18     /**
19      * The cloudlet list.
20     */
21     private static List<Cloudlet> cloudletList;
22
23     /**
24      * The vmList.
25     */
26     private static List<Vm> vmList;
27
28     /**
29      * Creates main() to run this example
30     */
31     public static void main(String[] args) {
32
33         Log.printLine("Starting CloudSimExample2...");
34
35         try {
36             // First step: Initialize the CloudSim package. It should be called
37             // before creating any entities.
38             numUser = 1; // number of cloud users
39             Calendar calendar = Calendar.getInstance();
40             boolean traceFlag = false; // mean trace events
41
42             // Initialize the CloudSim library
43             CloudSim.init(numUser, calendar, traceFlag);
44
45             // Second step: Create Datacenters
46             // Datacenters are the resource providers in CloudSim. We need at least one of them.
47         } catch (Exception e) {
48             e.printStackTrace();
49         }
50     }
51 }

```

19- Run the File and click “Proceed” button.



20- You will get the output just like the below screenshot.



21- Now I am adding 2 Data centres, 3 VM, and 3 Cloudlets with 2 Hosts.

eclipse-workspace - Project1/example/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse IDE

```

File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  IRE System Library [jre]
  examples
    org.cloudbus.cloudsim.examples
      CloudSimExample1.java
      CloudSimExample2.java
      CloudSimExample3.java
      CloudSimExample4.java
      CloudSimExample5.java
      CloudSimExample6.java
      CloudSimExample7.java
      CloudSimExample8.java
    org.cloudbus.cloudsim.examples.network
    org.cloudbus.cloudsim.examples.power
    org.cloudbus.cloudsim.examples.power.plan
    org.cloudbus.cloudsim.examples.power.rand
    workload.planetab
    module-info.java
sources
Referenced Libraries
docs
Jars
  build.xml
  changeelog.txt
  examples.txt
  license.txt
  pom.xml
  readme.txt
  release.notes.txt
project2

```

```

1 * Title:      CloudSim Toolkit
2 * Description: Cloudsim (Cloud Simulation) Toolkit for Modeling and Simulation
3 * License:    GPL - http://www.gnu.org/copyleft/gpl.html
4 *
5 * Copyright (c) 2009, The University of Melbourne, Australia
6 *
7 * package org.cloudbus.cloudsim.examples;
8 *
9 /**
10  * A simple example showing how to create
11  * a datacenter with one host and run two
12  * cloudlets on it. The cloudlets run in
13  * VMs with the same MIFs requirements.
14  * The cloudlets will take the same time to
15  * complete the execution.
16 */
17 public class CloudSimExample2 {
18
19 // ** The cloudlet list. */
20 private static List<Cloudlet> cloudletList;
21 /** The cloudlet lists. */
22 private static List<Cloudlet> cloudletList1;
23 private static List<Cloudlet> cloudletList2;
24 private static List<Cloudlet> cloudletList3;
25
26
27 /** The vmlist. */
28 private static List<Vm> vmlist;
29 private static List<Vm> vmlist1;
30 private static List<Vm> vmlist2;
31 private static List<Vm> vmlist3;
32
33
34 /**
35  * @param args
36  */
37 public static void main(String[] args) {
38
39 /**
40  * First step: Initialize the CloudSim package. It should be called
41  * before creating any entities.
42  * int num_user = 1; // number of cloud users
43  * Calendar calendar = Calendar.getInstance();
44  * boolean trace_flag = false; // mean trace events
45
46  * Initialize the CloudSim library
47  * CloudSim.init(num_user, calendar, trace_flag);
48
49  * Second step: Create Datacenters
50  * Datacenters are the resource providers in CloudSim. We need at least one of them to run a CloudSim simulation
51  * @SuppressWarnings("unused")
52  * Datacenter datacenter0 = createDatacenter("Datacenter_0");
53  * @SuppressWarnings("unused")
54  * Datacenter datacenter1 = createDatacenter("Datacenter_1");
55
56
57  * Third step: Create Broker
58  * DatacenterBroker broker = createBroker();
59  * int brokerId = broker.getId();
60
61  * DatacenterBroker broker1 = createBroker();
62  * int brokerId1 = broker1.getId();
63
64
65  * Fourth step: Create one virtual machine
66  * VmList1 = new ArrayList<Vm>();
67  * VmList2 = new ArrayList<Vm>();
68  * VmList3 = new ArrayList<Vm>();
69
70  * //VM description
71
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```

Console

```

terminated - CloudSimExample2 [Java Application] C:\Users\shubh\Downloads\Cloud Soft\eclipse\java-2022-12-R-win32-x86_64\eclipse\plugins\org.eclipse.jst\openjdk\hotspot\jre\full\win32\x86_64_17.0.5.v20221102-0933\re\bin
Starting CloudSimExample2...

```

26°C Clear 6.1 Kbps 1.0 Kbps

Writable Smart Insert 38:1: 1311

11:35 PM ENG IN 24/04/23

Three VM---

eclipse-workspace - Project1/example/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse IDE

```

File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  IRE System Library [jre]
  examples
    org.cloudbus.cloudsim.examples
      CloudSimExample1.java
      CloudSimExample2.java
      CloudSimExample3.java
      CloudSimExample4.java
      CloudSimExample5.java
      CloudSimExample6.java
      CloudSimExample7.java
      CloudSimExample8.java
    org.cloudbus.cloudsim.examples.network
    org.cloudbus.cloudsim.examples.power
    org.cloudbus.cloudsim.examples.power.plan
    org.cloudbus.cloudsim.examples.power.rand
    workload.planetab
    module-info.java
sources
Referenced Libraries
docs
Jars
  build.xml
  changeelog.txt
  examples.txt
  license.txt
  pom.xml
  readme.txt
  release.notes.txt
project2

```

```

1 /**
2  * @param args
3  */
4 public static void main(String[] args) {
5
6   Log.printLine("Starting CloudSimExample2...");
7
8   try {
9     // First step: Initialize the CloudSim package. It should be called
10    // before creating any entities.
11    int num_user = 1; // number of cloud users
12    Calendar calendar = Calendar.getInstance();
13    boolean trace_flag = false; // mean trace events
14
15    // Initialize the CloudSim library
16    CloudSim.init(num_user, calendar, trace_flag);
17
18    // Second step: Create Datacenters
19    // Datacenters are the resource providers in CloudSim. We need at least one of them to run a CloudSim simulation
20    // @SuppressWarnings("unused")
21    Datacenter datacenter0 = createDatacenter("Datacenter_0");
22    // @SuppressWarnings("unused")
23    Datacenter datacenter1 = createDatacenter("Datacenter_1");
24
25
26    // Third step: Create Broker
27    DatacenterBroker broker = createBroker();
28    int brokerId = broker.getId();
29
30    DatacenterBroker broker1 = createBroker();
31    int brokerId1 = broker1.getId();
32
33
34    // Fourth step: Create one virtual machine
35    VmList1 = new ArrayList<Vm>();
36    VmList2 = new ArrayList<Vm>();
37    VmList3 = new ArrayList<Vm>();
38
39    // VM description
40
41
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```

Console

```

terminated - CloudSimExample2 [Java Application] C:\Users\shubh\Downloads\Cloud Soft\eclipse\java-2022-12-R-win32-x86_64\eclipse\plugins\org.eclipse.jst\openjdk\hotspot\jre\full\win32\x86_64_17.0.5.v20221102-0933\re\bin
Starting CloudSimExample2...

```

26°C Clear 55 Kbps 13.8 Kbps

Writable Smart Insert 39:4: 1315

11:35 PM ENG IN 24/04/23

The screenshot shows the Eclipse IDE interface with the project 'CloudSimExample2' open. The 'CloudSimExample2.java' file is the active editor, displaying Java code for creating virtual machines (VMs) and cloudlets. The code includes imports for ArrayList, CloudletSchedulerTimeShared, and VM. It defines three VMs (vm1, vm2, vm3) with specific configurations like mips, ram, bw, and size. The broker then submits these VMs to a list. The code then moves to creating two cloudlets (cloudlet1, cloudlet2, cloudlet3) with properties like id, length, pesNumber, fileSize, and outputSize. These cloudlets are added to a list and submitted to the broker. The final step involves starting the simulation.

```
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer X CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  > IRE System Library [jre]
  > examples
    > org.cloudbus.cloudsim.examples
      : CloudSimExample1.java
      : CloudSimExample2.java
      : CloudSimExample3.java
      : CloudSimExample4.java
      : CloudSimExample5.java
      : CloudSimExample6.java
      : CloudSimExample7.java
      : CloudSimExample8.java
    > org.cloudbus.cloudsim.examples.network
    > org.cloudbus.cloudsim.examples.power
    > org.cloudbus.cloudsim.examples.power.plan
    > org.cloudbus.cloudsim.examples.power.rand
    > workload.planetlab
    > module-info.java
  > sources
  > Referenced Libraries
  > docs
  > jars
    build.xml
    changelog.txt
    examples.txt
    license.txt
    pom.xml
    README.txt
    release.notes.txt
  > project2
CloudSimExample2.java
1. //Fourth step: Create one virtual machine
2. vmlist1 = new ArrayList<Vm>();
3. vmlist2 = new ArrayList<Vm>();
4. vmlist3 = new ArrayList<Vm>();
5. 
6. //VM description
7. int vmid = 1;
8. int mips = 250;
9. long size = 10000; //image size (MB)
10. int ram = 512; //VM memory (MB)
11. long bw = 1000;
12. int pesNumber = 1; //number of CPU
13. String vmm = "xen"; //VM name
14. 
15. //create two Vms
16. Vm vm1 = new Vm(vmid, brokerId, mips, pesNumber, ram, bw, size, vmm, new CloudletSchedulerTimeShared());
17. 
18. vmid++;
19. Vm vm2 = new Vm(vmid, brokerId, mips, pesNumber, ram, bw, size, vmm, new CloudletSchedulerTimeShared());
20. 
21. vmid++;
22. Vm vm3 = new Vm(vmid, brokerId, mips, pesNumber, ram, bw, size, vmm, new CloudletSchedulerTimeShared());
23. 
24. 
25. //add the Vms to the vmlist
26. vmlist1.add(vm1);
27. vmlist2.add(vm2);
28. vmlist3.add(vm3);
29. 
30. 
31. //submit vm list to the broker
32. broker.submitVmList(vmlist1);
33. broker.submitVmList(vmlist2);
34. broker.submitVmList(vmlist3);
35. 
36. 
37. //Fifth step: Create two Cloudlets
38. 
39. terminated> CloudSimExample2 [Java Application] C:\Users\shubh\Downloads\Cloud Soft\eclipse\java-2022-12-R-win32-x86_64\eclipse\plugins\org.eclipse.jdt\openjdk\hotspot\jre\full\win32\x86_64_17.05.v20221102-0933\re\bim
Starting CloudSimExample2...
4.

```

Three Cloudlets----

This screenshot shows the same Eclipse IDE environment as the previous one, but the code in 'CloudSimExample2.java' has been modified to create three cloudlets instead of two. The code follows a similar structure: it creates three VMs (vm1, vm2, vm3), adds them to lists, and submits them to the broker. Then, it creates three cloudlets (cloudlet1, cloudlet2, cloudlet3) with specific properties and adds them to lists before submitting them to the broker. The final command to start the simulation is present at the bottom.

```
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer X CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  > IRE System Library [jre]
  > examples
    > org.cloudbus.cloudsim.examples
      : CloudSimExample1.java
      : CloudSimExample2.java
      : CloudSimExample3.java
      : CloudSimExample4.java
      : CloudSimExample5.java
      : CloudSimExample6.java
      : CloudSimExample7.java
      : CloudSimExample8.java
    > org.cloudbus.cloudsim.examples.network
    > org.cloudbus.cloudsim.examples.power
    > org.cloudbus.cloudsim.examples.power.plan
    > org.cloudbus.cloudsim.examples.power.rand
    > workload.planetlab
    > module-info.java
  > sources
  > Referenced Libraries
  > docs
  > jars
    build.xml
    changelog.txt
    examples.txt
    license.txt
    pom.xml
    README.txt
    release.notes.txt
  > project2
CloudSimExample2.java
1. //Fifth step: Create two Cloudlets
2. cloudletList1 = new ArrayList<Cloudlet>();
3. cloudletList2 = new ArrayList<Cloudlet>();
4. cloudletList3 = new ArrayList<Cloudlet>();
5. 
6. 
7. //Cloudlet properties
8. int id = 0;
9. pesNumber = 1;
10. long length = 250000;
11. long fileSize = 300;
12. long outputSize = 300;
13. UtilizationModel utilizationModel = new UtilizationModelFull();
14. 
15. Cloudlet cloudlet1 = new Cloudlet(id, length, pesNumber, fileSize, outputSize, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel);
16. 
17. cloudlet1.setUserid(brokerId);
18. 
19. id++;
20. Cloudlet cloudlet2 = new Cloudlet(id, length, pesNumber, fileSize, outputSize, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel);
21. 
22. cloudlet2.setUserid(brokerId);
23. 
24. id++;
25. Cloudlet cloudlet3 = new Cloudlet(id, length, pesNumber, fileSize, outputSize, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel, utilizationModel);
26. 
27. cloudlet3.setUserid(brokerId);
28. 
29. 
30. //add the cloudlets to the list
31. cloudletList1.add(cloudlet1);
32. cloudletList2.add(cloudlet2);
33. cloudletList3.add(cloudlet3);
34. 
35. 
36. //submit cloudlet list to the broker
37. broker.submitCloudletList(cloudletList1);
38. broker.submitCloudletList(cloudletList2);
39. broker.submitCloudletList(cloudletList3);
39. 
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```

eclipse-workspace - Project1/example/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse IDE

```

File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  IRE System Library [jre]
  examples
    org.cloudbus.cloudsim.examples
      CloudSimExample1.java
      CloudSimExample2.java
      CloudSimExample3.java
      CloudSimExample4.java
      CloudSimExample5.java
      CloudSimExample6.java
      CloudSimExample7.java
      CloudSimExample8.java
    org.cloudbus.cloudsim.examples.network
    org.cloudbus.cloudsim.examples.power
    org.cloudbus.cloudsim.examples.power.plan
    org.cloudbus.cloudsim.examples.power.rand
    workload.planetab
    module-info.java
sources
Referenced Libraries
docs
jars
build.xml
changeLog.txt
examples.txt
license.txt
pom.xml
readme.txt
release.notes.txt
Project2

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```

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166
167   //submit cloudlet list to the broker
168   broker.submitCloudletList(cloudletList1);
169   broker.submitCloudletList(cloudletList3);
170   //submit cloudlet list to the brokers
171   // broker1.submitCloudletList(cloudletList1);
172   // broker2.submitCloudletList(cloudletList2);
173
174
175   //bind the cloudlets to the vms. This way, the broker
176   // will submit the bound cloudlets only to the specific VM
177   broker.bindCloudletToVm(cloudlet1.getId(),vm1.getId());
178   broker.bindCloudletToVm(cloudlet2.getId(),vm2.getId());
179   broker.bindCloudletToVm(cloudlet3.getId(),vm3.getId());
180
181
182   // Sixth step: Starts the simulation
183   CloudSim.startSimulation();
184
185
186   // Final step: Print results when simulation is over
187   List<Cloudlet> newList = broker.getCloudletReceivedList();
188
189   CloudSim.stopSimulation();
190
191   printCloudletList(newList);
192
193   Log.println("CloudSimExample2 finished!");
194 }
195 catch (Exception e) {
196   e.printStackTrace();
197   Log.println("The simulation has been terminated due to an unexpected error");
198 }
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Console

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terminated: CloudSimExample2 [Java Application] C:\Users\shubh\Downloads\Cloud Soft\eclipse-java-2022-12-R-win32-x86_64\eclipse\plugins\org.eclipse.jdt\openjdk.hotspot.jre.full.win32\x86_64_17.0.5.v20221102-0933\re\bim
Starting CloudSimExample2...

```

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Search

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The required output is -----

eclipse-workspace - Project1/example/org/cloudbus/cloudsim/examples/CloudSimExample2.java - Eclipse IDE

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File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer CloudSimExample1.java CloudSimExample2.java CloudSimExample5.java
Project1
  IRE System Library [jre]
  examples
    org.cloudbus.cloudsim.examples
      CloudSimExample1.java
      CloudSimExample2.java
      CloudSimExample3.java
      CloudSimExample4.java
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177   //bind the cloudlets to the vms. This way, the broker
178   // will submit the bound cloudlets only to the specific VM
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180   broker.bindCloudletToVm(cloudlet2.getId(),vm2.getId());
181   broker.bindCloudletToVm(cloudlet3.getId(),vm3.getId());
182
183   // Sixth step: Starts the simulation
184   CloudSim.startSimulation();
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Console

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terminated: CloudSimExample2 [Java Application] C:\Users\shubh\Downloads\Cloud Soft\eclipse-java-2022-12-R-win32-x86_64\eclipse\plugins\org.eclipse.jdt\openjdk.hotspot.jre.full.win32\x86_64_17.0.5.v20221102-0933\re\bim
0.1: Broker0: VM #2 has been created in Datacenter #2, Host #0
0.1: Broker0: Sending cloudlet 1 to VM #0
0.1: Broker0: Sending cloudlet 1 to VM #1
0.1: Broker0: Sending cloudlet 2 to VM #2
1000.1: Broker0: Cloudlet 0 received
1000.1: Broker0: Cloudlet 1 received
1000.1: Broker0: Cloudlet 2 received
1000.1: Broker0: All cloudlets executed. Finishing...
1000.1: Broker0: Destroying VM #0
1000.1: Broker0: Destroying VM #1
1000.1: Broker0: Destroying VM #2
Broker0 is shutting down...
Broker1 is shutting down...
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker0 is shutting down...
Broker1 is shutting down...
Simulation completed.
Simulation completed.

CloudInformationServices: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker0 is shutting down...
Broker1 is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID STATUS Data center ID VM ID Time Start Time Finish Time
0 SUCCESS 2 0 1000 0.1 1000.1
1 SUCCESS 2 1 1000 0.1 1000.1
2 SUCCESS 2 2 1000 0.1 1000.1

CloudSimExample2 finished!

```

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Thank You!. 