

**Practical 8**  
**Cloud Computing**  
2CSDE67

**Mistry Unnat**  
20BCE515

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Department of Computer Science and Engineering  
Institute of Technology  
Nirma University  
Ahmedabad

**AIM:** Understanding the architecture and workflow of the cloud sim and workflow sim and analysing its results to understand load balancing, scheduling and failure handling techniques.

**Steps:**

1. From the zip folder extracts cloudsims-3.0.3 into a folder. Also, extract the commons-math3-3.6.1 jar into the same folder.
2. Open Eclipse IDE and go to File -> New -> Java Project. Enter any name for your project and then uncheck the Use default location box just under it and click on Browse and then Browse to the folder where you extracted your files and select the cloudsims-3.0.3 folder.
3. Go to Libraries -> Add External JARs. Now browse to the same folder where you extracted your commons-math3 jar file and open it.

**Examples:**

**1. CloudSimExample1.java:**

```

package org.cloudbus.cloudsim.examples;

import org.cloudbus.cloudsim.*;
import org.cloudbus.cloudsim.examples.*;

public class CloudSimExample1 {

    public static void main(String[] args) {
        // ... (code for creating Datacenter, Broker, and Cloudlet) ...
    }
}

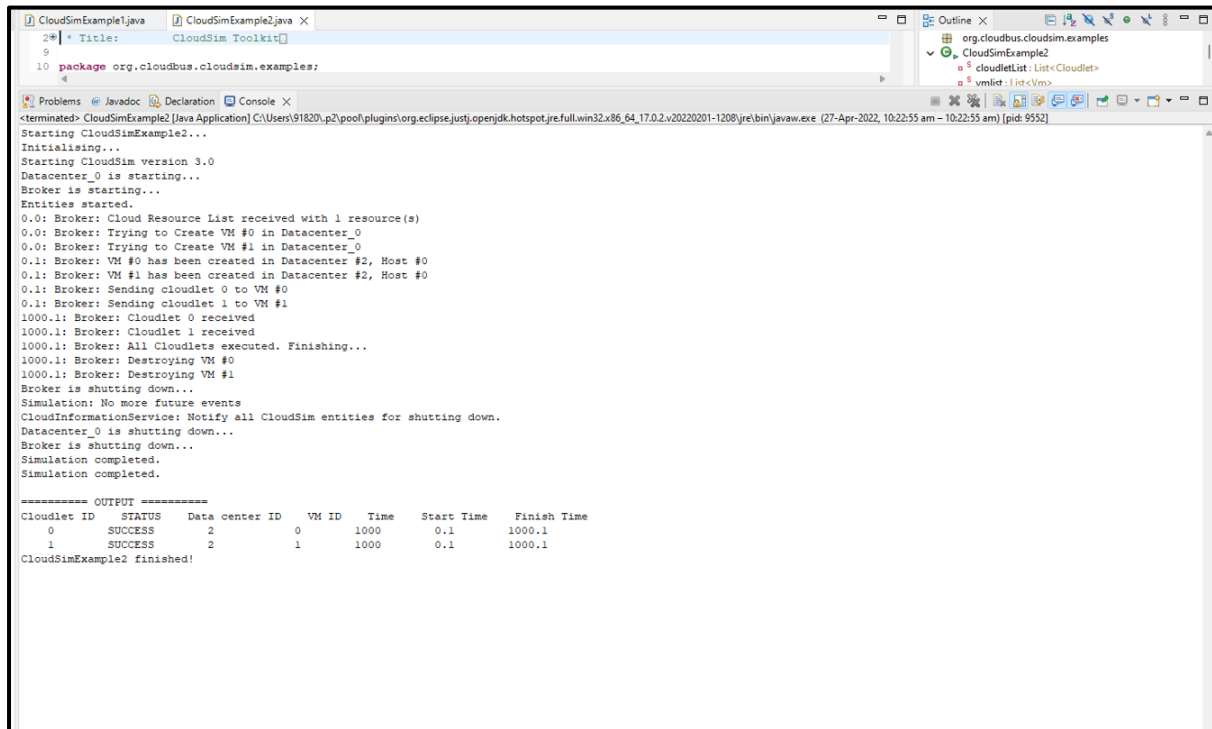
```

----- OUTPUT -----

Cloudlet ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time
0	SUCCESS	2	400	400.1	0.1	400.1

CloudSimExample1 finished!

## 2. CloudSimExample2.java:



```

CloudSimExample2.java
2 * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples;
4

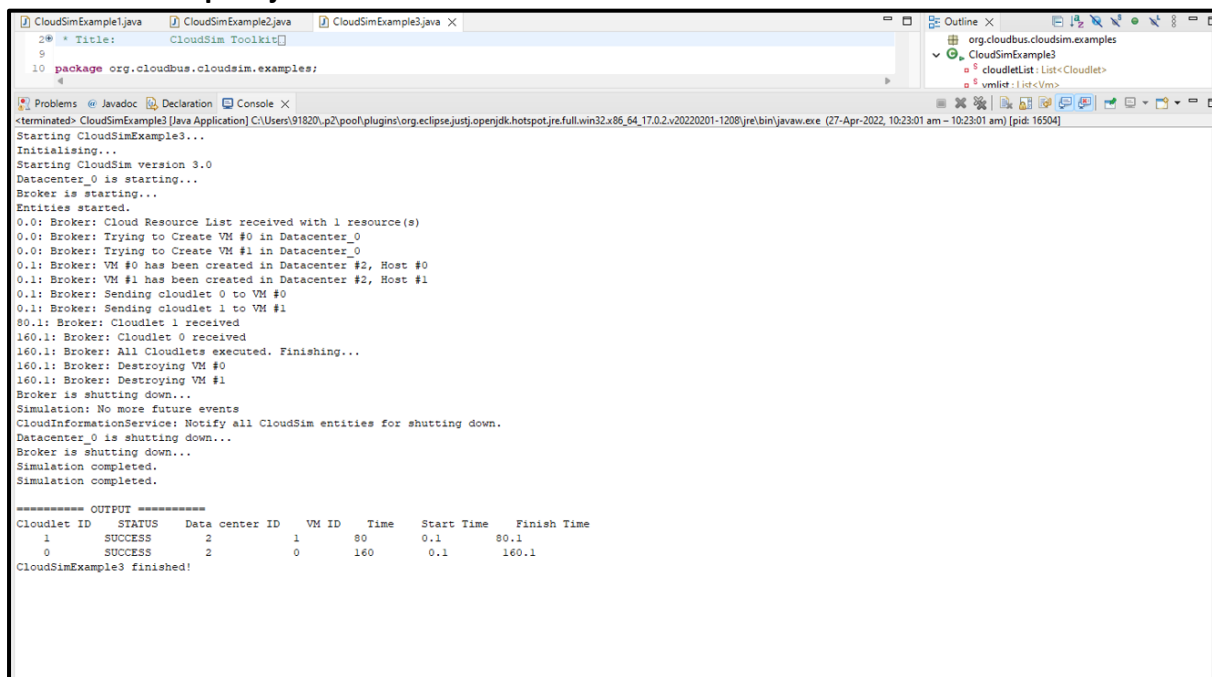
Problems Javadoc Declaration Console X
<terminated> CloudSimExample2 [Java Application] C:\Users\91820\p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64.17.0.2.v20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:22:55 am - 10:22:55 am) [pid: 9552]

Starting CloudSimExample2...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.0: Broker: Trying to Create VM #1 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: VM #1 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
0.1: Broker: Sending cloudlet 1 to VM #1
1000.1: Broker: Cloudlet 0 received
1000.1: Broker: Cloudlet 1 received
1000.1: Broker: All Cloudlets executed. Finishing...
1000.1: Broker: Destroying VM #0
1000.1: Broker: Destroying VM #1
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS   2                0       1000   0.1          1000.1
1            SUCCESS   2                1       1000   0.1          1000.1
CloudSimExample2 finished!

```

## 3. CloudSimExample3.java:



```

CloudSimExample3.java
2 * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples;
4

Problems Javadoc Declaration Console X
<terminated> CloudSimExample3 [Java Application] C:\Users\91820\p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64.17.0.2.v20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:01 am - 10:23:01 am) [pid: 16504]

Starting CloudSimExample3...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.0: Broker: Trying to Create VM #1 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: VM #1 has been created in Datacenter #2, Host #1
0.1: Broker: Sending cloudlet 0 to VM #0
0.1: Broker: Sending cloudlet 1 to VM #1
80.1: Broker: Cloudlet 1 received
160.1: Broker: Cloudlet 0 received
160.1: Broker: All Cloudlets executed. Finishing...
160.1: Broker: Destroying VM #0
160.1: Broker: Destroying VM #1
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
1            SUCCESS   2                1       80     0.1          80.1
0            SUCCESS   2                0       160    0.1          160.1
CloudSimExample3 finished!

```

#### 4. CloudSimExample4.java:

```

2 * Title: CloudSim Toolkit
5
10 package org.cloudbus.cloudsim.examples;

<terminated> CloudSimExample4 [Java Application] C:\Users\91820\p2\poo\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.2.v20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:05 am - 10:23:05 am) [pid: 1564]
Starting CloudSimExample4...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Datacenter_1 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 2 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.0: Broker: Trying to Create VM #1 in Datacenter_0
[VmScheduler.vmCreate] Allocation of VM #1 to Host #0 failed by MIPS
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: Creation of VM #1 failed in Datacenter #2
0.1: Broker: Trying to Create VM #1 in Datacenter_1
0.2: Broker: VM #1 has been created in Datacenter #3, Host #0
0.2: Broker: Sending cloudlet 0 to VM #0
0.2: Broker: Sending cloudlet 1 to VM #1
160.2: Broker: Cloudlet 0 received
160.2: Broker: Cloudlet 1 received
160.2: Broker: All Cloudlets executed. Finishing...
160.2: Broker: Destroying VM #0
160.2: Broker: Destroying VM #1
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

***** OUTPUT *****
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS    2                0       160     0.2          160.2
1            SUCCESS    3                1       160     0.2          160.2
CloudSimExample4 finished!

```

#### 5. CloudSimExample5.java:

```

2 * Title: CloudSim Toolkit
5
10 package org.cloudbus.cloudsim.examples;

<terminated> CloudSimExample5 [Java Application] C:\Users\91820\p2\poo\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.2.v20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:10 am - 10:23:10 am) [pid: 1912]
Starting CloudSimExample5...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Datacenter_1 is starting...
Broker1 is starting...
Broker2 is starting...
Entities started.
0.0: Broker1: Cloud Resource List received with 2 resource(s)
0.0: Broker2: Cloud Resource List received with 2 resource(s)
0.0: Broker1: Trying to Create VM #0 in Datacenter_0
0.0: Broker2: Trying to Create VM #0 in Datacenter_0
[VmScheduler.vmCreate] Allocation of VM #0 to Host #0 failed by MIPS
0.1: Broker1: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker1: Sending cloudlet 0 to VM #0
0.1: Broker2: Creation of VM #0 failed in Datacenter #2
0.1: Broker2: Trying to Create VM #0 in Datacenter_1
0.2: Broker2: VM #0 has been created in Datacenter #3, Host #0
0.2: Broker2: Sending cloudlet 0 to VM #0
160.1: Broker1: Cloudlet 0 received
160.1: Broker1: All Cloudlets executed. Finishing...
160.1: Broker1: Destroying VM #0
Broker1 is shutting down...
160.2: Broker2: Cloudlet 0 received
160.2: Broker2: All Cloudlets executed. Finishing...
160.2: Broker2: Destroying VM #0
Broker2 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker1 is shutting down...
Broker2 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       160     0.1          160.1
*****> User 4
***** OUTPUT *****
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS    3                0       160     0.2          160.2
*****> User 5
CloudSimExample5 finished!

```

## 6. CloudSimExample6.java:

```

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
4            SUCCESS   2                4       3       0.2          3.2
16           SUCCESS   2                4       3       0.2          3.2
28           SUCCESS   2                4       3       0.2          3.2
5            SUCCESS   2                5       3       0.2          3.2
17           SUCCESS   2                5       3       0.2          3.2
29           SUCCESS   2                5       3       0.2          3.2
6            SUCCESS   3                6       3       0.2          3.2
18           SUCCESS   3                6       3       0.2          3.2
30           SUCCESS   3                6       3       0.2          3.2
7            SUCCESS   3                7       3       0.2          3.2
19           SUCCESS   3                7       3       0.2          3.2
31           SUCCESS   3                7       3       0.2          3.2
8            SUCCESS   3                8       3       0.2          3.2
20           SUCCESS   3                8       3       0.2          3.2
32           SUCCESS   3                8       3       0.2          3.2
10           SUCCESS   3                10       3       0.2          3.2
22           SUCCESS   3                10       3       0.2          3.2
34           SUCCESS   3                10       3       0.2          3.2
9            SUCCESS   3                9       3       0.2          3.2
21           SUCCESS   3                9       3       0.2          3.2
33           SUCCESS   3                9       3       0.2          3.2
11           SUCCESS   3                11       3       0.2          3.2
23           SUCCESS   3                11       3       0.2          3.2
35           SUCCESS   3                11       3       0.2          3.2
0            SUCCESS   2                0       4       0.2          4.2
12           SUCCESS   2                0       4       0.2          4.2
24           SUCCESS   2                0       4       0.2          4.2
36           SUCCESS   2                0       4       0.2          4.2
1            SUCCESS   2                1       4       0.2          4.2
13           SUCCESS   2                1       4       0.2          4.2
25           SUCCESS   2                1       4       0.2          4.2
37           SUCCESS   2                1       4       0.2          4.2
2            SUCCESS   2                2       4       0.2          4.2
14           SUCCESS   2                2       4       0.2          4.2
26           SUCCESS   2                2       4       0.2          4.2
38           SUCCESS   2                2       4       0.2          4.2
3            SUCCESS   2                3       4       0.2          4.2
15           SUCCESS   2                3       4       0.2          4.2
27           SUCCESS   2                3       4       0.2          4.2
39           SUCCESS   2                3       4       0.2          4.2
CloudSimExample6 finished!

```

## 7. CloudSimExample7.java:

```

320.096: Broker_0: Destroying VM #1
320.096: Broker_0: Destroying VM #2
320.096: Broker_0: Destroying VM #3
320.096: Broker_0: Destroying VM #4
Broker_0 is shutting down...
519.996: Broker_1: Cloudlet 101 received
519.996: Broker_1: Cloudlet 106 received
519.996: Broker_1: Cloudlet 103 received
519.996: Broker_1: Cloudlet 108 received
519.996: Broker_1: Cloudlet 100 received
519.996: Broker_1: Cloudlet 105 received
519.996: Broker_1: Cloudlet 102 received
519.996: Broker_1: Cloudlet 107 received
519.996: Broker_1: Cloudlet 104 received
519.996: Broker_1: Cloudlet 109 received
519.996: Broker_1: All Cloudlets executed. Finishing...
519.996: Broker_1: Destroying VM #100
519.996: Broker_1: Destroying VM #101
519.996: Broker_1: Destroying VM #102
519.996: Broker_1: Destroying VM #103
519.996: Broker_1: Destroying VM #104
Broker_1 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker_0 is shutting down...
Broker_1 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       320      0.1          320.1
5            SUCCESS   2                0       320      0.1          320.1
1            SUCCESS   2                1       320      0.1          320.1
6            SUCCESS   2                1       320      0.1          320.1
2            SUCCESS   2                2       320      0.1          320.1
7            SUCCESS   2                2       320      0.1          320.1
4            SUCCESS   2                4       320      0.1          320.1
9            SUCCESS   2                4       320      0.1          320.1
3            SUCCESS   2                3       320      0.1          320.1
8            SUCCESS   2                3       320      0.1          320.1
CloudSimExample7 finished!

```

## 8. CloudSimExample8.java:

```

<terminated> CloudSimExample8 [Java Application] C:\Users\91820\p2\pool\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.2_20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:38 am - 10:23:39 am) [pid: 21584]
820.1: GlobalBroker_1: Cloudlet 105 received
820.1: GlobalBroker_1: Cloudlet 102 received
820.1: GlobalBroker_1: Cloudlet 107 received
820.1: GlobalBroker_1: Cloudlet 104 received
820.1: GlobalBroker_1: Cloudlet 109 received
820.1: GlobalBroker_1: All Cloudlets executed. Finishing...
820.1: GlobalBroker_1: Destroying VM #100
820.1: GlobalBroker_1: Destroying VM #101
820.1: GlobalBroker_1: Destroying VM #102
820.1: GlobalBroker_1: Destroying VM #103
820.1: GlobalBroker_1: Destroying VM #104
GlobalBroker_1 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker_0 is shutting down...
GlobalBroker_1 is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS   3                0       320    0.1          320.1
5            SUCCESS   3                0       320    0.1          320.1
1            SUCCESS   3                1       320    0.1          320.1
6            SUCCESS   3                1       320    0.1          320.1
2            SUCCESS   3                2       320    0.1          320.1
7            SUCCESS   3                2       320    0.1          320.1
4            SUCCESS   3                4       320    0.1          320.1
9            SUCCESS   3                4       320    0.1          320.1
3            SUCCESS   3                3       320    0.1          320.1
8            SUCCESS   3                3       320    0.1          320.1
101         SUCCESS   3                101     320    200.1        520.1
106         SUCCESS   3                101     320    200.1        520.1
103         SUCCESS   3                103     320    200.1        520.1
108         SUCCESS   3                103     320    200.1        520.1
100         SUCCESS   3                100     320    200.1        520.1
105         SUCCESS   3                100     320    200.1        520.1
102         SUCCESS   3                102     320    200.1        520.1
107         SUCCESS   3                102     320    200.1        520.1
104         SUCCESS   3                104     320    200.1        520.1
109         SUCCESS   3                104     320    200.1        520.1
CloudSimExample8 finished!

```

## 9. NetworkExample1.java:

```

2* * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples.network;
11
12*import java.text.DecimalFormat;
37
38/**
39 * A simple example showing how to create
40 * a datacenter with one host and a network
41 * topology and run one cloudlet on it.
42 */
43 public class NetworkExample1 {
44     /** The cloudlet list. */
45     private static List<Cloudlet> cloudletList;
46
47     /** The vmList. */
48     private static List<Vm> vmList;
49
50     /**
51      * Creates main() to run this example
52      */
53     public static void main(String[] args) {
54
55         Log.println(Log.INFO, "Starting NetworkExample1...");
56
57         try {
58             // First step: Initialize the CloudSim package. It should be called
59             // before creating any entities.
60             int num_user = 1; // number of cloud users
61             Calendar calendar = Calendar.getInstance();
62             boolean trace_flag = false; // mean trace events
63
64

```

```

<terminated> NetworkExample1 [Java Application] C:\Users\91820\p2\pool\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.2_20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:38 am - 10:23:39 am) [pid: 21584]
Starting NetworkExample1...
Initializing...
Topology file: topology.brite
Problem in processing BRITE file. Network simulation is disabled. Error: topology.brite
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
160.1: Broker: Cloudlet 0 received
160.1: Broker: All Cloudlets executed. Finishing...
160.1: Broker: Destroying VM #0
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS   2                0       160    0.1          160.1
NetworkExample1 finished!

```

## 10. NetworkExample2.java:

```

2* * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples.network;
11
12*import java.text.DecimalFormat;
13*import java.text.DecimalFormat;
37
38/**
39 * A simple example showing how to create
40 * two datacenters with one host and a
41 * network topology each and run two cloudlets
42 * on them.
43 */
44 public class NetworkExample2 {
45     /** The cloudlet list. */
46     private static List<Cloudlet> cloudletList;
47
48     /** The vmList. */
49     private static List<Vm> vmList;
50
51     /**
52      * Creates main() to run this example
53      */
54     public static void main(String[] args) {
55
56         Log.println(Log.INFO, "Starting NetworkExample2...");
57
58         try {
59             // First step: Initialize the CloudSim package. It should be called
60             // before creating any entities.
61             int num_user = 1; // number of cloud users
62             Calendar calendar = Calendar.getInstance();
63             boolean trace_flag = false; // mean trace events
64
65             // Initialize the CloudSim library
66             CloudSim.init(num_user, calendar, trace_flag);
67
68             // Second step: Create Datacenters
69             // Datacenters are the resource providers in CloudSim. We need at 1:
70             Datacenter dc1 = new Datacenter("Datacenter_0");
71

```

```

<terminated> NetworkExample2 [Java Application] C:\Users\91820\p2\pool\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64_17.0.2_20220201-1208\jre\bin\javaw.exe (27-Apr-2022, 10:23:38 am - 10:23:39 am) [pid: 21584]
Starting NetworkExample2...
Initializing...
Topology file: topology.brite
Problem in processing BRITE file. Network simulation is disabled. Error: topology.brite
Starting CloudSim version 3.0
Datacenter_0 is starting...
Datacenter_1 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 2 resource(s)
0.0: Broker: Trying to Create VM #0 in Datacenter_0
0.0: Broker: Trying to Create VM #1 in Datacenter_0
0.1: Broker: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker: VM #1 has been created in Datacenter #2, Host #0
0.1: Broker: Sending cloudlet 0 to VM #0
0.1: Broker: Sending cloudlet 1 to VM #1
160.1: Broker: Cloudlet 0 received
160.1: Broker: Cloudlet 1 received
160.1: Broker: All Cloudlets executed. Finishing...
160.1: Broker: Destroying VM #0
160.1: Broker: Destroying VM #1
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====
Cloudlet ID   STATUS   Data center ID   VM ID   Time   Start Time   Finish Time
0            SUCCESS   2                0       160    0.1          160.1
1            SUCCESS   2                1       160    0.1          160.1
NetworkExample2 finished!

```



## 11. NetworkExample3.java:

```

28 * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples.network;
11
12 import java.text.DecimalFormat;
13
14 /**
15  * A simple example showing how to create
16  * two datacenters with one host each and
17  * run cloudlets of two users with network
18  * topology on them.
19  */
20 public class NetworkExample3 {
21
22     /** The cloudlet list. */
23     private static List<Cloudlet> cloudletList1;
24     private static List<Cloudlet> cloudletList2;
25
26     /** The vm list. */
27     private static List<Vm> vmList1;
28     private static List<Vm> vmList2;
29
30     /**
31      * Creates main() to run this example
32      */
33     public static void main(String[] args) {
34
35         Log.println("Starting NetworkExample3...");
36
37         try {
38             // First step: Initialize the CloudSim package. It should be called
39             // before creating any entities.
40             int num_user = 2; // number of cloud users
41             Calendar calendar = Calendar.getInstance();
42             boolean trace_flag = false; // mean trace events
43
44             // Initialize the CloudSim library
45             CloudSim.init(num_user, calendar, trace_flag);
46
47             // Second step: Create Datacenters
48             // Datacenters are the resource providers in CloudSim. We need at 1:
49             Datacenter datacenter0 = createDatacenter("Datacenter_0");
50             Datacenter datacenter1 = createDatacenter("Datacenter_1");
51
52             //Third step: Create Brokers
53             DatacenterBroker broker1 = createBroker(1);
54             int brokerId1 = broker1.getId();
55
56         }
57     }
58 }

```

```

<terminated> NetworkExample3 [Java Application] C:\Users\91820...p2\poo\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64.jre\bin\java.exe
Starting NetworkExample3...
Initialising...
Topology file: topology.brite
Problem in processing BRITE file. Network simulation is disabled. Error: topology.brite
Starting CloudSim version 3.0
Datacenter_0 is starting...
Datacenter_1 is starting...
Broker1 is starting...
Broker2 is starting...
Entities started.
0.0: Broker1: Cloud Resource List received with 2 resource(s)
0.0: Broker2: Cloud Resource List received with 2 resource(s)
0.0: Broker1: Trying to Create VM #0 in Datacenter_0
0.0: Broker1: Trying to Create VM #0 in Datacenter_0
[VmScheduler.vmmCreate] Allocation of VM #0 to Host #0 failed by MIPS
0.1: Broker1: VM #0 has been created in Datacenter #2, Host #0
0.1: Broker1: Sending cloudlet 0 to VM #0
0.1: Broker2: Creation of VM #0 failed in Datacenter #2
0.1: Broker2: Trying to Create VM #0 in Datacenter_1
0.2: Broker2: VM #0 has been created in Datacenter #3, Host #0
0.2: Broker2: Sending cloudlet 0 to VM #0
160.1: Broker1: Cloudlet 0 received
160.1: Broker1: All Cloudlets executed. Finishing...
160.1: Broker1: Destroying VM #0
Broker1 is shutting down...
160.2: Broker2: Cloudlet 0 received
160.2: Broker2: All Cloudlets executed. Finishing...
160.2: Broker2: Destroying VM #0
Broker2 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Datacenter_1 is shutting down...
Broker1 is shutting down...
Broker2 is shutting down...
Simulation completed.
Simulation completed.
===== OUTPUT =====
Cloudlet ID STATUS Data center ID VM ID Time Start Time Finish Time
0 SUCCESS 2 0 160 0.1 160.1
===== OUTPUT =====
Cloudlet ID STATUS Data center ID VM ID Time Start Time Finish Time
0 SUCCESS 3 0 160 0.2 160.2
NetworkExample3 finished!

```

## 12. NetworkExample4.java:

```

28 * Title: CloudSim Toolkit
9
10 package org.cloudbus.cloudsim.examples.network;
11
12 import java.text.DecimalFormat;
13
14 /**
15  * A simple example showing how to create
16  * a datacenter with one host and a network
17  * topology and run one cloudlet on it.
18  * Here, instead of using a BRITE file describing
19  * the links, links are inserted in the code.
20  */
21 public class NetworkExample4 {
22
23     /** The cloudlet list. */
24     private static List<Cloudlet> cloudletList;
25
26     /** The vm list. */
27     private static List<Vm> vmList;
28
29     /**
30      * Creates main() to run this example
31      */
32     public static void main(String[] args) {
33
34         Log.println("Starting NetworkExample4...");
35
36         try {
37             // First step: Initialize the CloudSim package. It should be called
38             // before creating any entities.
39             int num_user = 1; // number of cloud users
40             Calendar calendar = Calendar.getInstance();
41             boolean trace_flag = false; // mean trace events
42
43             // Initialize the CloudSim library
44
45         }
46     }
47 }

```

```

<terminated> NetworkExample4 [Java Application] C:\Users\91820...p2\poo\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64.jre\bin\java.exe
Starting NetworkExample4...
Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Broker is starting...
Entities started.
0.0: Broker: Cloud Resource List received with 1 resource(s)
20.0: Broker: Trying to Create VM #0 in Datacenter_0
40.1: Broker: VM #0 has been created in Datacenter #2, Host #0
40.1: Broker: Sending cloudlet 0 to VM #0
220.1: Broker: Cloudlet 0 received
220.1: Broker: All Cloudlets executed. Finishing...
220.1: Broker: Destroying VM #0
Broker is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.
===== OUTPUT =====
Cloudlet ID STATUS Data center ID VM ID Time Start Time Finish Time
0 SUCCESS 2 0 160 50.1 210.1
NetworkExample4 finished!

```

```

1 package org.cloudbus.cloudsim.examples.network.datacenter;
2
3 *import java.io.IOException;
4
5 public class TestExample {
6
7     /** The vmlist. */
8     private static List<NetworkVm> vmlist;
9
10    /**
11     * Creates main() to run this example.
12     *
13     * @param args the args
14     */
15    public static void main(String[] args) {
16
17        Log.println("Starting CloudSimExample1...");
18
19        try {
20            int num_user = 1; // number of cloud users
21            Calendar calendar = Calendar.getInstance();
22            boolean trace_flag = false; // mean trace events
23
24            // Initialize the CloudSim library
25            CloudSim.init(num_user, calendar, trace_flag);
26
27            // Second step: Create Datacenters
28            // Datacenters are the resource providers in CloudSim. We need at
29            // least one of them to run a CloudSim simulation
30            NetworkDatacenter datacenter0 = createDatacenter("Datacenter_0");
31
32            // Third step: Create Broker
33            NetDatacenterBroker broker = createBroker();
34            broker.setLinkKDC(datacenter0);
35            // broker.setLinkKDC(datacenter0);
36            // Fifth step: Create one Cloudlet
37
38            vmlist = new ArrayList<NetworkVm>();
39
40            // submit vm list to the broker
41
42            broker.submitVmList(vmlist);
43
44            // Sixth step: Starts the simulation
45            CloudSim.startSimulation();
46
47            CloudSim.stopSimulation();
48
49            // Final step: Print results when simulation is over
50            List<Cloudlet> newList = broker.getCloudletReceivedList();
51            printCloudletList(newList);
52
53        } catch (IOException e) {
54            e.printStackTrace();
55        }
56    }
57
58    // Create a new datacenter with one host
59    private static NetworkDatacenter createDatacenter(String name) {
60
61        // First step: Create Hosts
62        // We need three hosts for each datacenter
63        int numHosts = 3;
64        int mips = 1000; // MIPS
65        double p = 0.001; // power (watts)
66        double ic = 1.0; // initial cost
67        double rc = 1.0; // rental cost
68        double cc = 1.0; // creation cost
69        double dc = 1.0; // deletion cost
70        double sc = 1.0; // storage cost
71        double tc = 1.0; // transmission cost
72        double bc = 1.0; // bandwidth cost
73        double lc = 1.0; // latency cost
74        double pc = 1.0; // packet cost
75        double ccost = 1.0; // cost per cloudlet
76        double dcost = 1.0; // cost per data
77        double scost = 1.0; // cost per storage
78        double lcost = 1.0; // cost per latency
79        double pcost = 1.0; // cost per packet
80        double bcost = 1.0; // cost per bandwidth
81        double lcost2 = 1.0; // cost per latency
82        double pcost2 = 1.0; // cost per packet
83        double bcost2 = 1.0; // cost per bandwidth
84        double lcost3 = 1.0; // cost per latency
85        double pcost3 = 1.0; // cost per packet
86        double bcost3 = 1.0; // cost per bandwidth
87        double lcost4 = 1.0; // cost per latency
88        double pcost4 = 1.0; // cost per packet
89        double bcost4 = 1.0; // cost per bandwidth
90        double lcost5 = 1.0; // cost per latency
91        double pcost5 = 1.0; // cost per packet
92        double bcost5 = 1.0; // cost per bandwidth
93        double lcost6 = 1.0; // cost per latency
94        double pcost6 = 1.0; // cost per packet
95        double bcost6 = 1.0; // cost per bandwidth
96        double lcost7 = 1.0; // cost per latency
97        double pcost7 = 1.0; // cost per packet
98        double bcost7 = 1.0; // cost per bandwidth
99        double lcost8 = 1.0; // cost per latency
100       double pcost8 = 1.0; // cost per packet
101       double bcost8 = 1.0; // cost per bandwidth
102       double lcost9 = 1.0; // cost per latency
103       double pcost9 = 1.0; // cost per packet
104       double bcost9 = 1.0; // cost per bandwidth
105       double lcost10 = 1.0; // cost per latency
106       double pcost10 = 1.0; // cost per packet
107       double bcost10 = 1.0; // cost per bandwidth
108       double lcost11 = 1.0; // cost per latency
109       double pcost11 = 1.0; // cost per packet
110       double bcost11 = 1.0; // cost per bandwidth
111       double lcost12 = 1.0; // cost per latency
112       double pcost12 = 1.0; // cost per packet
113       double bcost12 = 1.0; // cost per bandwidth
114       double lcost13 = 1.0; // cost per latency
115       double pcost13 = 1.0; // cost per packet
116       double bcost13 = 1.0; // cost per bandwidth
117       double lcost14 = 1.0; // cost per latency
118       double pcost14 = 1.0; // cost per packet
119       double bcost14 = 1.0; // cost per bandwidth
120       double lcost15 = 1.0; // cost per latency
121       double pcost15 = 1.0; // cost per packet
122       double bcost15 = 1.0; // cost per bandwidth
123       double lcost16 = 1.0; // cost per latency
124       double pcost16 = 1.0; // cost per packet
125       double bcost16 = 1.0; // cost per bandwidth
126       double lcost17 = 1.0; // cost per latency
127       double pcost17 = 1.0; // cost per packet
128       double bcost17 = 1.0; // cost per bandwidth
129       double lcost18 = 1.0; // cost per latency
130       double pcost18 = 1.0; // cost per packet
131       double bcost18 = 1.0; // cost per bandwidth
132       double lcost19 = 1.0; // cost per latency
133       double pcost19 = 1.0; // cost per packet
134       double bcost19 = 1.0; // cost per bandwidth
135       double lcost20 = 1.0; // cost per latency
136       double pcost20 = 1.0; // cost per packet
137       double bcost20 = 1.0; // cost per bandwidth
138       double lcost21 = 1.0; // cost per latency
139       double pcost21 = 1.0; // cost per packet
140       double bcost21 = 1.0; // cost per bandwidth
141       double lcost22 = 1.0; // cost per latency
142       double pcost22 = 1.0; // cost per packet
143       double bcost22 = 1.0; // cost per bandwidth
144       double lcost23 = 1.0; // cost per latency
145       double pcost23 = 1.0; // cost per packet
146       double bcost23 = 1.0; // cost per bandwidth
147       double lcost24 = 1.0; // cost per latency
148       double pcost24 = 1.0; // cost per packet
149       double bcost24 = 1.0; // cost per bandwidth
150       double lcost25 = 1.0; // cost per latency
151       double pcost25 = 1.0; // cost per packet
152       double bcost25 = 1.0; // cost per bandwidth
153       double lcost26 = 1.0; // cost per latency
154       double pcost26 = 1.0; // cost per packet
155       double bcost26 = 1.0; // cost per bandwidth
156       double lcost27 = 1.0; // cost per latency
157       double pcost27 = 1.0; // cost per packet
158       double bcost27 = 1.0; // cost per bandwidth
159       double lcost28 = 1.0; // cost per latency
160       double pcost28 = 1.0; // cost per packet
161       double bcost28 = 1.0; // cost per bandwidth
162       double lcost29 = 1.0; // cost per latency
163       double pcost29 = 1.0; // cost per packet
164       double bcost29 = 1.0; // cost per bandwidth
165       double lcost30 = 1.0; // cost per latency
166       double pcost30 = 1.0; // cost per packet
167       double bcost30 = 1.0; // cost per bandwidth
168       double lcost31 = 1.0; // cost per latency
169       double pcost31 = 1.0; // cost per packet
170       double bcost31 = 1.0; // cost per bandwidth
171       double lcost32 = 1.0; // cost per latency
172       double pcost32 = 1.0; // cost per packet
173       double bcost32 = 1.0; // cost per bandwidth
174       double lcost33 = 1.0; // cost per latency
175       double pcost33 = 1.0; // cost per packet
176       double bcost33 = 1.0; // cost per bandwidth
177       double lcost34 = 1.0; // cost per latency
178       double pcost34 = 1.0; // cost per packet
179       double bcost34 = 1.0; // cost per bandwidth
180       double lcost35 = 1.0; // cost per latency
181       double pcost35 = 1.0; // cost per packet
182       double bcost35 = 1.0; // cost per bandwidth
183       double lcost36 = 1.0; // cost per latency
184       double pcost36 = 1.0; // cost per packet
185       double bcost36 = 1.0; // cost per bandwidth
186       double lcost37 = 1.0; // cost per latency
187       double pcost37 = 1.0; // cost per packet
188       double bcost37 = 1.0; // cost per bandwidth
189       double lcost38 = 1.0; // cost per latency
190       double pcost38 = 1.0; // cost per packet
191       double bcost38 = 1.0; // cost per bandwidth
192       double lcost39 = 1.0; // cost per latency
193       double pcost39 = 1.0; // cost per packet
194       double bcost39 = 1.0; // cost per bandwidth
195       double lcost40 = 1.0; // cost per latency
196       double pcost40 = 1.0; // cost per packet
197       double bcost40 = 1.0; // cost per bandwidth
198       double lcost41 = 1.0; // cost per latency
199       double pcost41 = 1.0; // cost per packet
200       double bcost41 = 1.0; // cost per bandwidth
201       double lcost42 = 1.0; // cost per latency
202       double pcost42 = 1.0; // cost per packet
203       double bcost42 = 1.0; // cost per bandwidth
204       double lcost43 = 1.0; // cost per latency
205       double pcost43 = 1.0; // cost per packet
206       double bcost43 = 1.0; // cost per bandwidth
207       double lcost44 = 1.0; // cost per latency
208       double pcost44 = 1.0; // cost per packet
209       double bcost44 = 1.0; // cost per bandwidth
210       double lcost45 = 1.0; // cost per latency
211       double pcost45 = 1.0; // cost per packet
212       double bcost45 = 1.0; // cost per bandwidth
213       double lcost46 = 1.0; // cost per latency
214       double pcost46 = 1.0; // cost per packet
215       double bcost46 = 1.0; // cost per bandwidth
216       double lcost47 = 1.0; // cost per latency
217       double pcost47 = 1.0; // cost per packet
218       double bcost47 = 1.0; // cost per bandwidth
219       double lcost48 = 1.0; // cost per latency
220       double pcost48 = 1.0; // cost per packet
221       double bcost48 = 1.0; // cost per bandwidth
222       double lcost49 = 1.0; // cost per latency
223       double pcost49 = 1.0; // cost per packet
224       double bcost49 = 1.0; // cost per bandwidth
225       double lcost50 = 1.0; // cost per latency
226       double pcost50 = 1.0; // cost per packet
227       double bcost50 = 1.0; // cost per bandwidth
228       double lcost51 = 1.0; // cost per latency
229       double pcost51 = 1.0; // cost per packet
230       double bcost51 = 1.0; // cost per bandwidth
231       double lcost52 = 1.0; // cost per latency
232       double pcost52 = 1.0; // cost per packet
233       double bcost52 = 1.0; // cost per bandwidth
234       double lcost53 = 1.0; // cost per latency
235       double pcost53 = 1.0; // cost per packet
236       double bcost53 = 1.0; // cost per bandwidth
237       double lcost54 = 1.0; // cost per latency
238       double pcost54 = 1.0; // cost per packet
239       double bcost54 = 1.0; // cost per bandwidth
240       double lcost55 = 1.0; // cost per latency
241       double pcost55 = 1.0; // cost per packet
242       double bcost55 = 1.0;
```

### Montage 25:

```

Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Starting WorkflowSim 1.1.0
planner_0 is starting...
planner_0_Merger_ is starting...
planner_0_Merger_Engine_0 is starting...
planner_0_Merger_Engine_0_Scheduler_0 is starting...
Entities started.
0.0: planner_0_Merger_Engine_0_Scheduler_0: Cloud Resource List received with 1 resource(s)
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #0 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #1 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #2 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #3 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #4 in Datacenter_0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #0 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #1 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #2 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #3 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #4 has been created in Datacenter #2, Host #0
144.2136082106829: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #0
144.2136082106829: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #1
144.2136082106829: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #2
144.2136082106829: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #3
144.2136082106829: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #4
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
planner_0 is shutting down...
planner_0_Merger_ is shutting down...
planner_0_Merger_Engine_0 is shutting down...
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation completed.
Simulation completed.

```



***** OUTPUT *****									
Job ID	Task ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time	Depth	
25	Stage-in	SUCCESS	2	0	0.38	0.1	0.48	0	
1	2,	SUCCESS	2	1	18.13	0.48	18.61	1	
4	5,	SUCCESS	2	4	19.73	0.48	20.21	1	
3	4,	SUCCESS	2	3	22.27	0.48	22.75	1	
2	3,	SUCCESS	2	2	27.59	0.48	28.07	1	
12	13,	SUCCESS	2	1	13.93	20.21	34.14	2	
11	12,	SUCCESS	2	4	15.07	22.75	37.81	2	
7	8,	SUCCESS	2	3	17.82	22.75	40.57	2	
0	1,	SUCCESS	2	0	46.07	0.48	46.55	1	
9	10,	SUCCESS	2	1	13.77	34.14	47.91	2	
13	14,	SUCCESS	2	2	21.44	28.07	49.51	2	
10	11,	SUCCESS	2	4	15.05	37.81	52.87	2	
8	9,	SUCCESS	2	1	14.18	47.91	62.09	2	
5	6,	SUCCESS	2	3	17.36	46.55	63.91	2	
6	7,	SUCCESS	2	0	36.46	46.55	83.01	2	
14	15,	SUCCESS	2	0	2.48	83.01	85.49	3	
15	16,	SUCCESS	2	0	4.89	85.49	90.37	4	
17	18,	SUCCESS	2	1	13.95	90.37	104.32	5	
20	21,	SUCCESS	2	4	15.4	90.37	105.77	5	
19	20,	SUCCESS	2	3	17.89	90.37	108.26	5	
18	19,	SUCCESS	2	2	22.36	90.37	112.73	5	
16	17,	SUCCESS	2	0	35.74	90.37	126.11	5	
21	22,	SUCCESS	2	2	2.95	126.11	129.06	6	
22	23,	SUCCESS	2	2	6.26	129.06	135.32	7	
23	24,	SUCCESS	2	2	7.97	135.32	143.28	8	
24	25,	SUCCESS	2	2	0.93	143.28	144.21	9	

### Montage\_50:

```

Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Starting WorkflowSim 1.1.0
planner_0 is starting...
planner_0_Merger_ is starting...
planner_0_Merger_Engine_0 is starting...
planner_0_Merger_Engine_0_Scheduler_0 is starting...
Entities started.
0.0: planner_0_Merger_Engine_0_Scheduler_0: Cloud Resource List received with 1 resource(s)
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #0 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #1 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #2 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #3 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #4 in Datacenter_0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #0 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #1 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #2 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #3 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #4 has been created in Datacenter #2, Host #0
220.5124474759226: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #0
220.5124474759226: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #1
220.5124474759226: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #2
220.5124474759226: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #3
220.5124474759226: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #4
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
planner_0 is shutting down...
planner_0_Merger_ is shutting down...
planner_0_Merger_Engine_0 is shutting down...
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation completed.
Simulation completed.

```

***** OUTPUT *****										
Job ID	Task ID	STATUS	Data center	ID	VM ID	Time	Start Time	Finish Time	Depth	
50	Stage-in	SUCCESS	2	2	0	0.15	0.1	0.25	0	
3	4,	SUCCESS	2		3	15.27	0.25	15.52	1	
0	1,	SUCCESS	2		0	17.84	0.25	18.09	1	
1	2,	SUCCESS	2		1	22.04	0.25	22.29	1	
5	6,	SUCCESS	2		3	15.6	15.52	31.12	1	
4	5,	SUCCESS	2		4	35.88	0.25	36.13	1	
6	7,	SUCCESS	2		0	18.55	18.09	36.63	1	
21	22,	SUCCESS	2		3	11.88	31.12	43	2	
7	8,	SUCCESS	2		1	21.53	22.29	43.82	1	
2	3,	SUCCESS	2		2	45.77	0.25	46.02	1	
11	12,	SUCCESS	2		0	14.71	36.63	51.34	2	
9	10,	SUCCESS	2		3	12.27	43	55.27	2	
13	14,	SUCCESS	2		1	17.32	43.82	61.14	2	
8	9,	SUCCESS	2		4	28.47	36.13	64.6	2	
20	21,	SUCCESS	2		0	14.5	51.34	65.85	2	
12	13,	SUCCESS	2		3	12.11	55.27	67.38	2	
23	24,	SUCCESS	2		1	17.28	61.14	78.42	2	
29	30,	SUCCESS	2		3	12.18	67.38	79.56	2	
28	29,	SUCCESS	2		0	14.52	65.85	80.36	2	
14	15,	SUCCESS	2		2	36.16	46.02	82.18	2	
22	23,	SUCCESS	2		3	12.17	79.56	91.73	2	
27	28,	SUCCESS	2		4	28.18	64.6	92.78	2	
24	25,	SUCCESS	2		0	14.03	80.36	94.39	2	
16	17,	SUCCESS	2		1	17.2	78.42	95.62	2	
26	27,	SUCCESS	2		3	11.94	91.73	103.67	2	
31	32,	SUCCESS	2		0	14.56	94.39	108.95	2	
17	18,	SUCCESS	2		1	17.5	95.62	113.12	2	
33	34,	SUCCESS	2		3	12.17	103.67	115.84	2	
25	26,	SUCCESS	2		2	35.54	82.18	117.72	2	
30	31,	SUCCESS	2		4	28.47	92.78	121.25	2	
34	35,	SUCCESS	2		0	14.41	108.95	123.36	2	
10	11,	SUCCESS	2		3	12.29	115.84	128.12	2	
35	36,	SUCCESS	2		1	17.26	113.12	130.38	2	
19	20,	SUCCESS	2		0	14.07	123.36	137.42	2	
32	33,	SUCCESS	2		3	12.26	128.12	140.38	2	
18	19,	SUCCESS	2		4	28.02	121.25	149.26	2	
15	16,	SUCCESS	2		2	35.59	117.72	153.31	2	
36	37,	SUCCESS	2		0	3.05	153.31	156.36	3	
37	38,	SUCCESS	2		0	5.73	156.36	162.09	4	
41	42,	SUCCESS	2		3	12.08	162.09	174.17	5	
38	39,	SUCCESS	2		0	14.98	162.09	177.07	5	
39	40,	SUCCESS	2		1	17.42	162.09	179.51	5	
43	44,	SUCCESS	2		3	12.03	174.17	186.2	5	
42	43,	SUCCESS	2		4	28.69	162.09	190.78	5	
44	45,	SUCCESS	2		0	14.37	177.07	191.44	5	
45	46,	SUCCESS	2		1	17.03	179.51	196.54	5	
40	41,	SUCCESS	2		2	35.36	162.09	197.45	5	
46	47,	SUCCESS	2		1	5.33	197.45	202.78	6	
47	48,	SUCCESS	2		1	7.76	202.78	210.54	7	
48	49,	SUCCESS	2		1	7.98	210.54	218.52	8	
49	50,	SUCCESS	2		1	1.99	218.52	220.51	9	

## 2. FCFSS Algorithm: Montage\_25:

```

Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Starting WorkflowSim 1.1.0
planner_0 is starting...
planner_0_Merger_ is starting...
planner_0_Merger_Engine_0 is starting...
planner_0_Merger_Engine_0_Scheduler_0 is starting...
Entities started.
0.0: planner_0_Merger_Engine_0_Scheduler_0: Cloud Resource List received with 1 resource(s)
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #0 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #1 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #2 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #3 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #4 in Datacenter_0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #0 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #1 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #2 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #3 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #4 has been created in Datacenter #2, Host #0
138.1735197303085: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #0
138.1735197303085: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #1
138.1735197303085: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #2
138.1735197303085: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #3
138.1735197303085: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #4
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
planner_0 is shutting down...
planner_0_Merger_ is shutting down...
planner_0_Merger_Engine_0 is shutting down...
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation completed.

```

Job ID	Task ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time	Depth
25	Stage-in	SUCCESS	2	0	0.19	0.1	0.29	0
4	5,	SUCCESS	2	4	15.02	0.29	15.31	1
1	2,	SUCCESS	2	1	22.02	0.29	22.31	1
3	4,	SUCCESS	2	3	22.85	0.29	23.13	1
0	1,	SUCCESS	2	0	22.98	0.29	23.26	1
11	12,	SUCCESS	2	4	11.48	23.13	34.62	2
12	13,	SUCCESS	2	1	16.92	22.31	39.22	2
13	14,	SUCCESS	2	0	17.82	23.26	41.08	2
7	8,	SUCCESS	2	3	18.28	23.13	41.42	2
5	6,	SUCCESS	2	4	11.56	34.62	46.17	2
2	3,	SUCCESS	2	2	45.91	0.29	46.2	1
6	7,	SUCCESS	2	1	16.87	39.22	56.09	2
10	11,	SUCCESS	2	3	17.66	46.2	63.86	2
8	9,	SUCCESS	2	0	18.57	46.2	64.77	2
9	10,	SUCCESS	2	2	36.06	46.2	82.26	2
14	15,	SUCCESS	2	0	1.24	82.26	83.49	3
15	16,	SUCCESS	2	0	2.44	83.49	85.93	4
20	21,	SUCCESS	2	4	11.73	85.93	97.66	5
17	18,	SUCCESS	2	1	16.94	85.93	102.86	5
16	17,	SUCCESS	2	0	17.82	85.93	103.75	5
19	20,	SUCCESS	2	3	18.35	85.93	104.28	5
18	19,	SUCCESS	2	2	37.2	85.93	123.13	5
21	22,	SUCCESS	2	0	2.45	123.13	125.58	6
22	23,	SUCCESS	2	0	5.2	125.58	130.78	7
23	24,	SUCCESS	2	0	6.62	130.78	137.4	8
24	25,	SUCCESS	2	0	0.77	137.4	138.17	9

**Montage\_50:**

```

Initialising...
Starting CloudSim version 3.0
Datacenter_0 is starting...
Starting WorkflowSim 1.1.0
planner_0 is starting...
planner_0_Merger_ is starting...
planner_0_Merger_Engine_0 is starting...
planner_0_Merger_Engine_0_Scheduler_0 is starting...
Entities started.
0.0: planner_0_Merger_Engine_0_Scheduler_0: Cloud Resource List received with 1 resource(s)
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #0 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #1 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #2 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #3 in Datacenter_0
0.0: planner_0_Merger_Engine_0_Scheduler_0: Trying to Create VM #4 in Datacenter_0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #0 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #1 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #2 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #3 has been created in Datacenter #2, Host #0
0.1: planner_0_Merger_Engine_0_Scheduler_0: VM #4 has been created in Datacenter #2, Host #0
910.9988003750717: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #0
910.9988003750717: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #1
910.9988003750717: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #2
910.9988003750717: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #3
910.9988003750717: planner_0_Merger_Engine_0_Scheduler_0: Destroying VM #4
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
planner_0 is shutting down...
planner_0_Merger_ is shutting down...
planner_0_Merger_Engine_0 is shutting down...
planner_0_Merger_Engine_0_Scheduler_0 is shutting down...
Simulation completed.
Simulation completed.

```

===== OUTPUT =====									
Job ID	Task ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time	Depth	0
50	4,	Stage-in	SUCCESS	2	2	0			
3	4,	SUCCESS	2	3	17.29	1.91	19.2	1	0
4	5,	SUCCESS	2	4	18.26	1.91	20.17	1	
1	2,	SUCCESS	2	1	19.2	1.91	21.11	1	
5	6,	SUCCESS	2	3	17.66	19.2	36.86	1	
2	3,	SUCCESS	2	2	36.58	1.91	38.49	1	
6	7,	SUCCESS	2	4	18.49	20.17	38.67	1	
7	8,	SUCCESS	2	1	18.76	21.11	39.88	1	
21	22,	SUCCESS	2	3	13.45	36.86	50.31	2	
25	26,	SUCCESS	2	4	14.3	38.67	52.97	2	
26	27,	SUCCESS	2	1	14.84	39.88	54.71	2	
14	15,	SUCCESS	2	3	13.9	50.31	64.22	2	
22	23,	SUCCESS	2	2	28.66	38.49	67.15	2	
16	17,	SUCCESS	2	4	14.3	52.97	67.27	2	
20	21,	SUCCESS	2	1	15.15	54.71	69.86	2	
23	24,	SUCCESS	2	3	13.71	64.22	77.93	2	
29	30,	SUCCESS	2	4	14.45	67.27	81.72	2	
15	16,	SUCCESS	2	1	15.03	69.86	84.9	2	
18	19,	SUCCESS	2	3	13.62	77.93	91.55	2	
19	20,	SUCCESS	2	4	14.03	81.72	95.74	2	
28	29,	SUCCESS	2	2	28.76	67.15	95.91	2	
30	31,	SUCCESS	2	1	15.19	84.9	100.09	2	
31	32,	SUCCESS	2	3	13.89	91.55	105.44	2	
17	18,	SUCCESS	2	4	14.57	95.74	110.31	2	
33	34,	SUCCESS	2	1	15.1	100.09	115.18	2	
34	35,	SUCCESS	2	3	13.72	105.44	119.16	2	
35	36,	SUCCESS	2	4	14.36	110.31	124.67	2	
32	33,	SUCCESS	2	2	28.88	95.91	124.79	2	
0	1,	SUCCESS	2	0	215.2	1.91	217.11	1	
11	12,	SUCCESS	2	3	14.01	217.11	231.12	2	
12	13,	SUCCESS	2	4	14.37	217.11	231.48	2	
9	10,	SUCCESS	2	1	15.35	217.11	232.46	2	
13	14,	SUCCESS	2	3	13.75	231.12	244.87	2	
24	25,	SUCCESS	2	4	13.98	231.48	245.45	2	
10	11,	SUCCESS	2	2	28.88	217.11	245.99	2	
27	28,	SUCCESS	2	1	15.01	232.46	247.47	2	
8	9,	SUCCESS	2	0	175.17	217.11	392.28	2	
36	37,	SUCCESS	2	0	36.84	392.28	429.12	3	
37	38,	SUCCESS	2	0	69.08	429.12	498.2	4	
41	42,	SUCCESS	2	3	13.67	498.2	511.88	5	
42	43,	SUCCESS	2	4	14.6	498.2	512.8	5	
39	40,	SUCCESS	2	1	15.18	498.2	513.39	5	
43	44,	SUCCESS	2	3	13.62	511.88	525.5	5	
40	41,	SUCCESS	2	2	28.26	498.2	526.46	5	
44	45,	SUCCESS	2	4	14.33	512.8	527.13	5	
45	46,	SUCCESS	2	1	14.84	513.39	528.23	5	
38	39,	SUCCESS	2	0	188.75	498.2	678.96	5	
46	47,	SUCCESS	2	0	53.58	678.96	732.54	6	
47	48,	SUCCESS	2	0	78.13	732.54	810.67	7	
48	49,	SUCCESS	2	0	80.27	810.67	890.93	8	
49	50,	SUCCESS	2	0	20.07	890.93	911	9	

**Conclusion:**

From this practical, we understood the architecture and workflow of the cloud sim and workflow sim and analysing its results to understand load balancing, scheduling and failure handling techniques.