



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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Experiment : 2.1

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Section/Group: CC_616-B

Semester: 6th

Date of Performance: 29-02-2024

Subject Name: Cloud Computing and Distributed Systems

Subject Code: 21CSH-355

1. Aim:

Simulate a cloud scenario using Matlab and run a scheduling algorithm.

2. Objective:

This experiment aims to simulate a cloud computing scenario in MATLAB and implement a scheduling algorithm for efficient resource allocation. The goals include designing the simulation framework, selecting or designing a scheduling algorithm, evaluating its performance under various conditions, and comparing it with other algorithms. The objective is to enhance understanding of resource management in cloud environments and identify strategies for optimization.

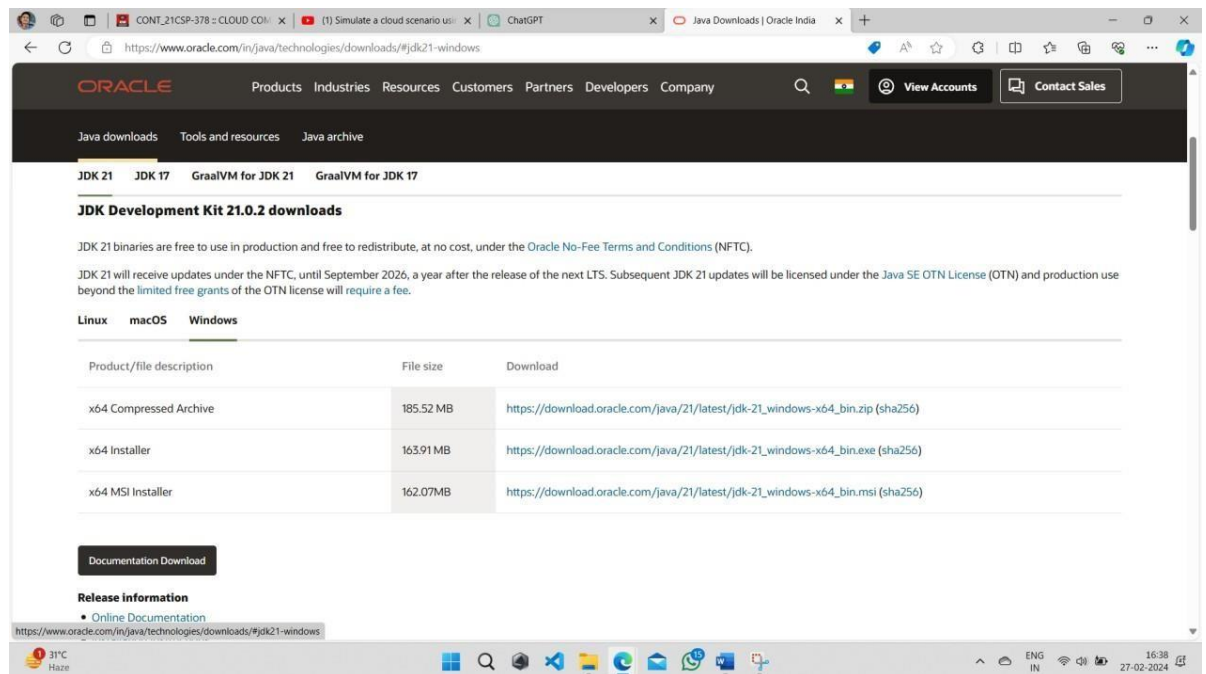
3. Theory:

- **Cloud Computing Infrastructure:** Participants delved into the theoretical underpinnings of cloud computing infrastructure, understanding its components such as virtual machines, physical servers, and network communication protocols. They explored concepts like elasticity, scalability, and virtualization that form the basis of cloud computing environments.
- **Resource Management:** The experiment introduced theories related to resource management in cloud computing, including scheduling algorithms, load balancing techniques, and resource provisioning strategies. Participants studied how these theories are applied to efficiently allocate resources, maximize utilization, and minimize latency in a distributed and dynamic cloud environment.
- **Scheduling Algorithms:** Participants explored various scheduling algorithms theoretically, such as First Come First Serve (FCFS), Round Robin, Shortest Job First (SJF), and more advanced approaches like genetic algorithms or machine learning-based schedulers. They learned about the advantages, disadvantages, and theoretical foundations of each algorithm and how they influence system performance metrics.

- **Network Communication Theory:** The experiment involved studying network communication theory, including concepts like bandwidth, latency, packet loss, and Quality of Service (QoS). Participants explored how network characteristics affect task scheduling decisions and overall system performance in cloud computing environments.
- **Algorithm Design and Analysis:** Participants learned theoretical principles of algorithm design and analysis, focusing on designing efficient scheduling algorithms with provable performance guarantees. They explored algorithmic complexity, optimization techniques, and trade-offs involved in designing algorithms for cloud resource management.

4. Procedure/Steps:

Step-1: Download JDK 21.0.2 and Install it.



The screenshot shows the Oracle Java Downloads page for JDK 21.0.2 on Windows. The page is titled "JDK Development Kit 21.0.2 downloads" and includes a table with download links for different file types.

Product/file description	File size	Download
x64 Compressed Archive	185.52 MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.zip (sha256)
x64 Installer	163.91 MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.exe (sha256)
x64 MSI Installer	162.07MB	https://download.oracle.com/java/21/latest/jdk-21_windows-x64_bin.msi (sha256)

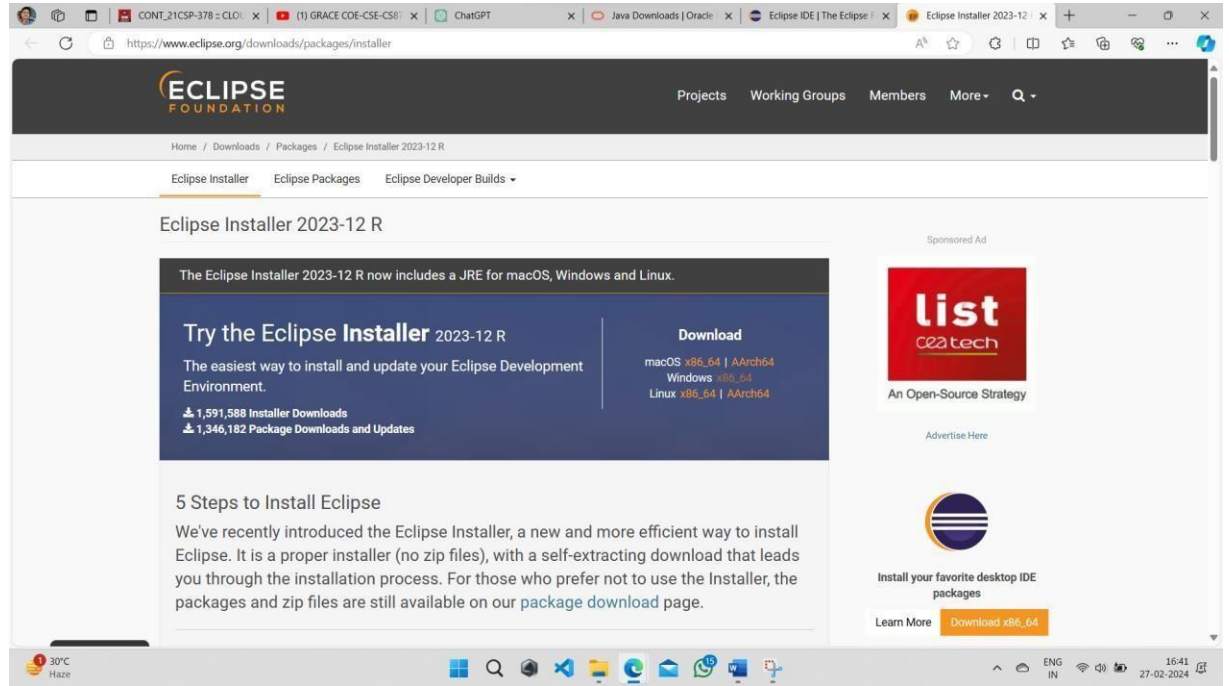
Below the table, there is a "Documentation Download" button and a "Release information" section with a link to "Online Documentation".



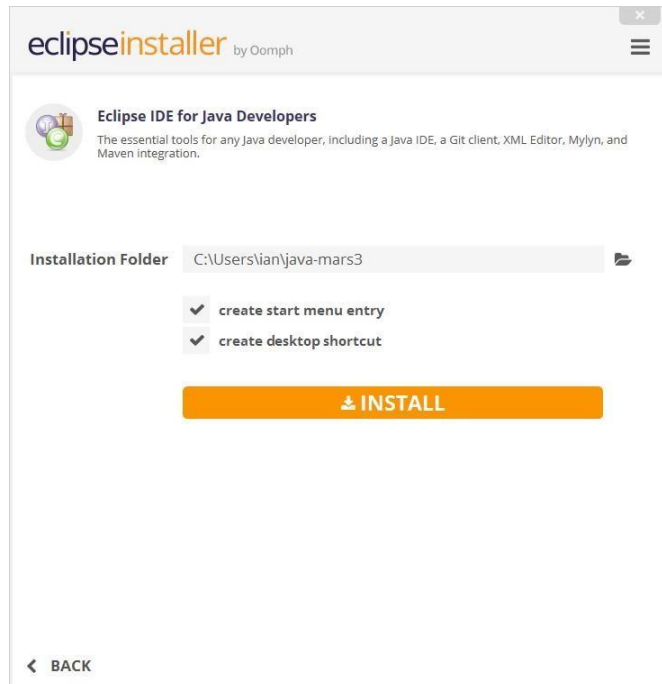
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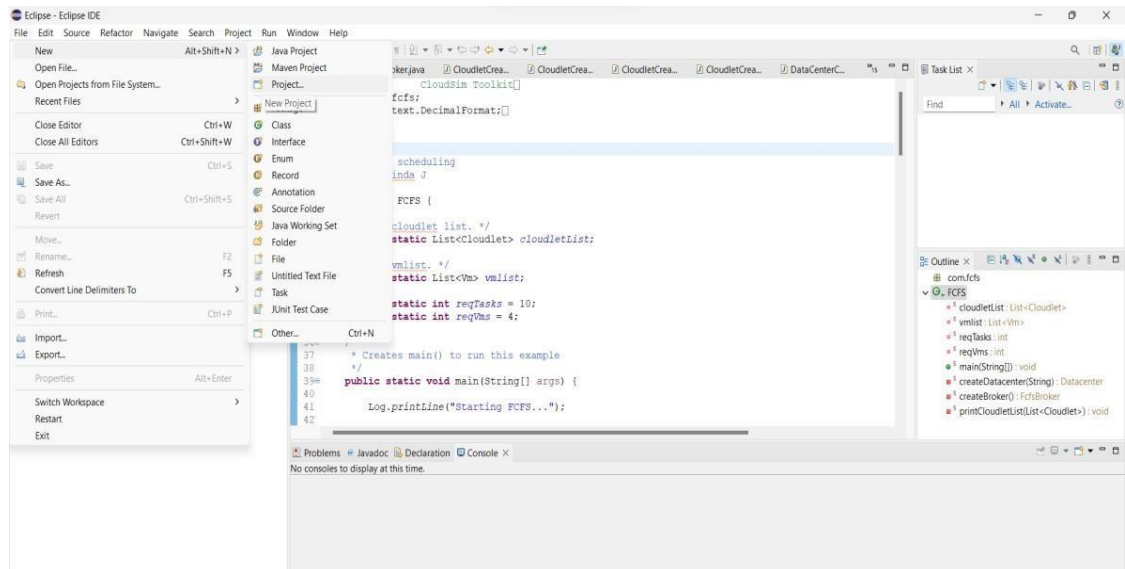
Step-2: Download Eclipse IDE and install it.



Step-3: Setup the Eclipse IDE and install For Java Developers.



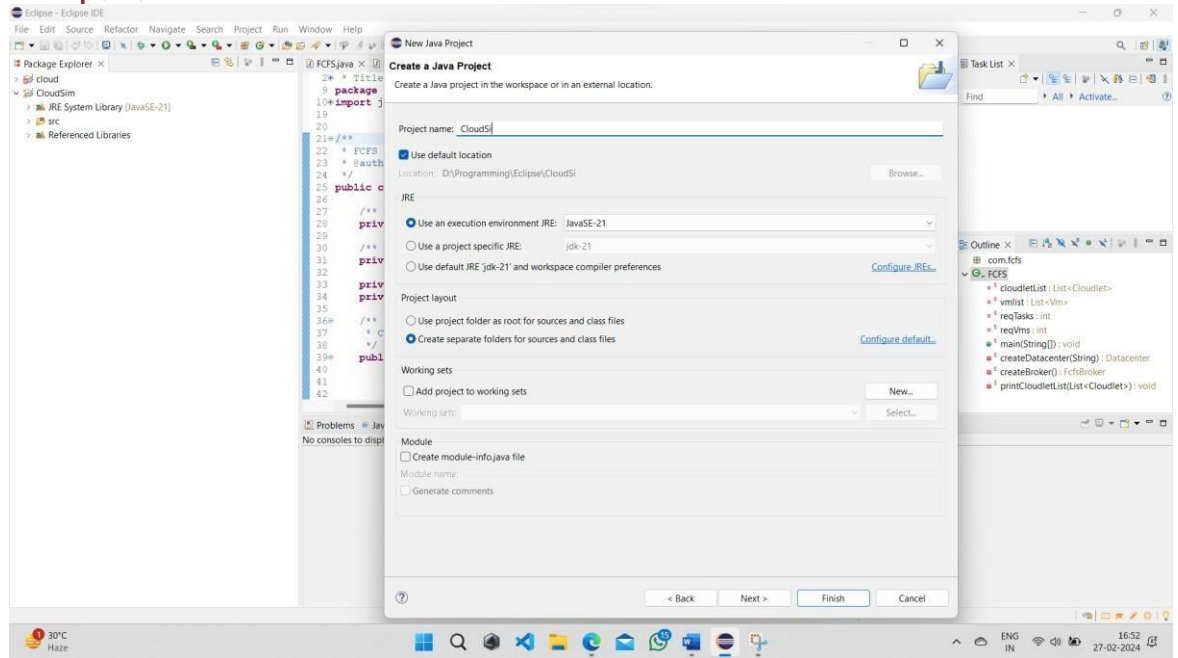
Step-5: Create a Java New Project



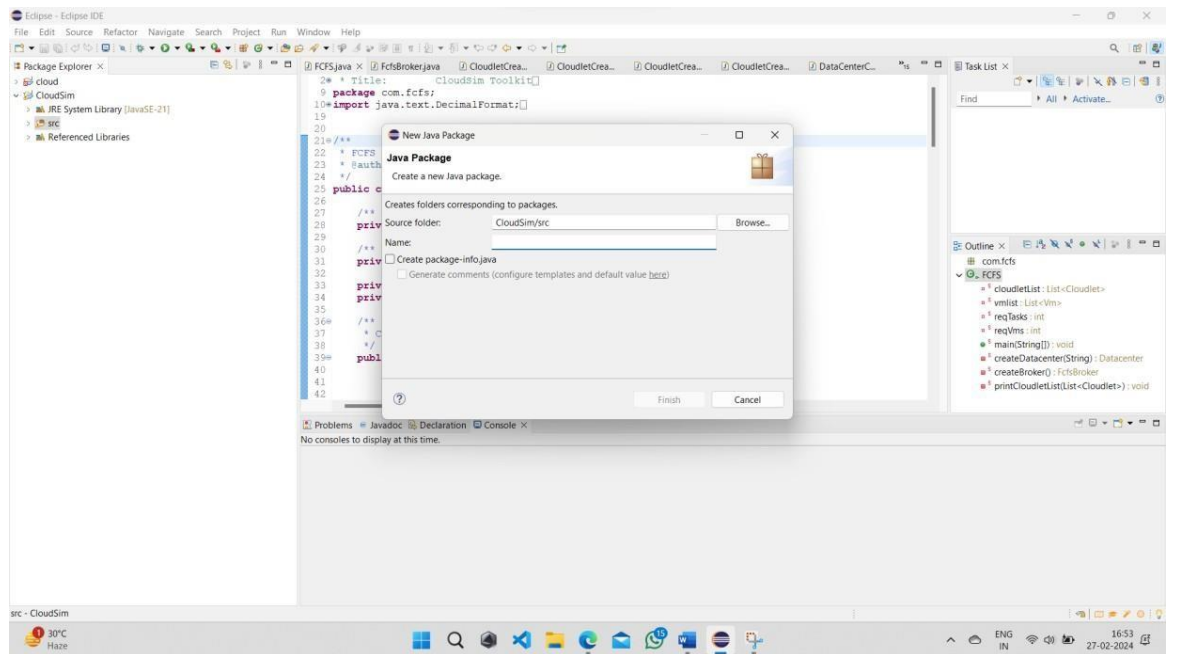


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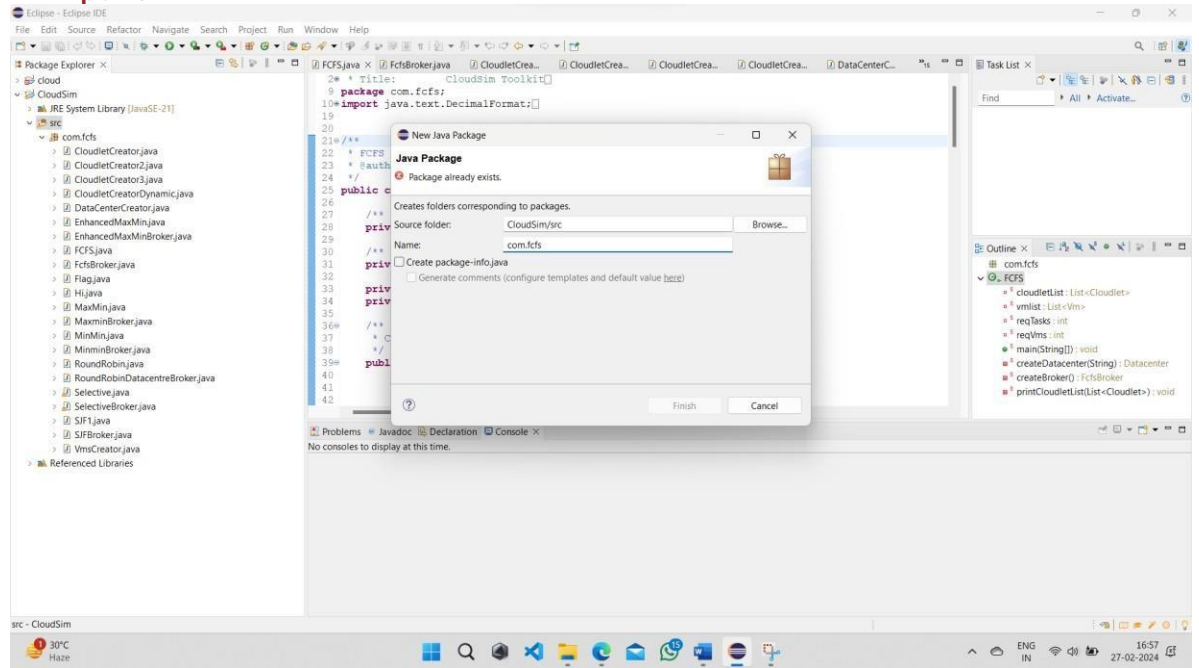
Step-6: Create a Package (com.fcfs) in the cloudSim folder.



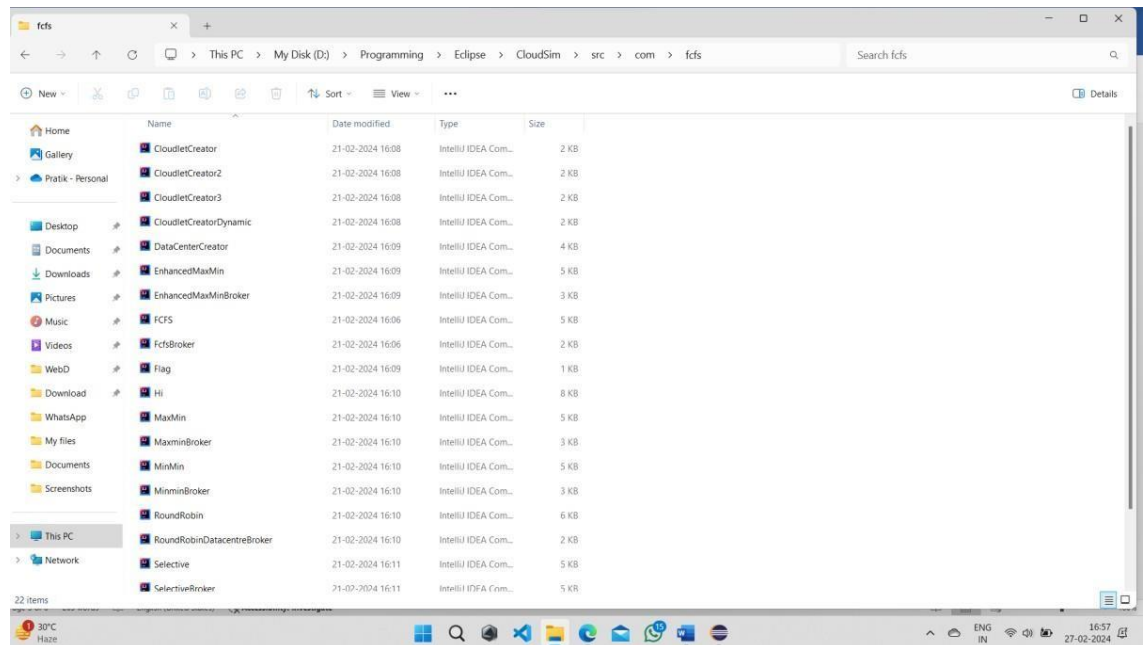


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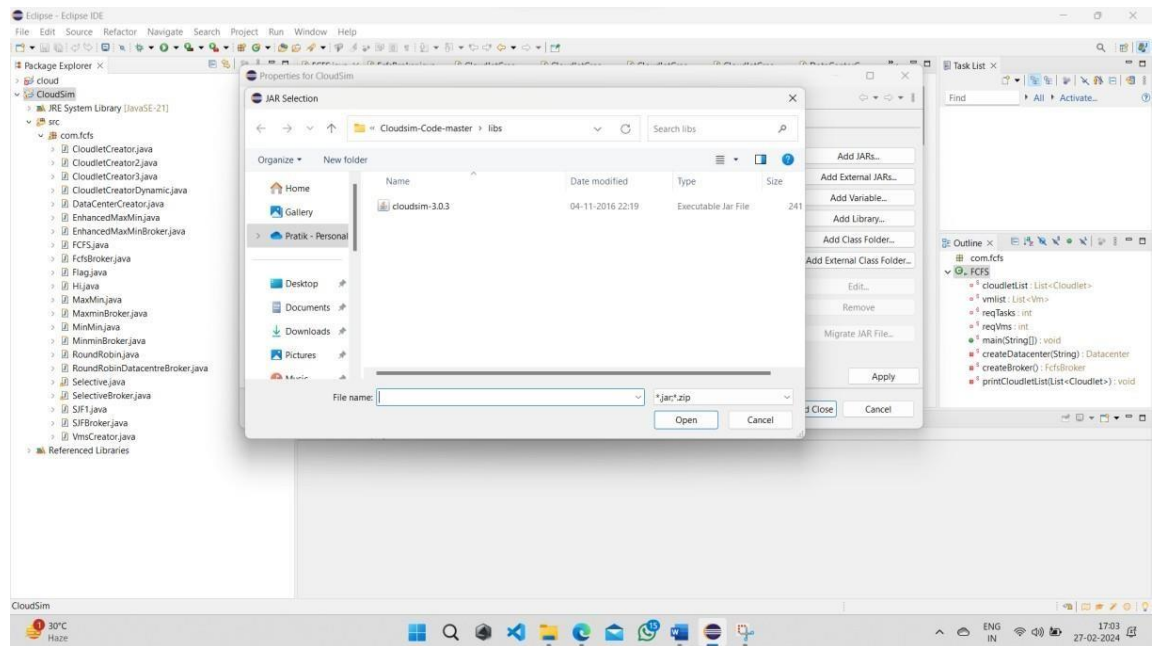
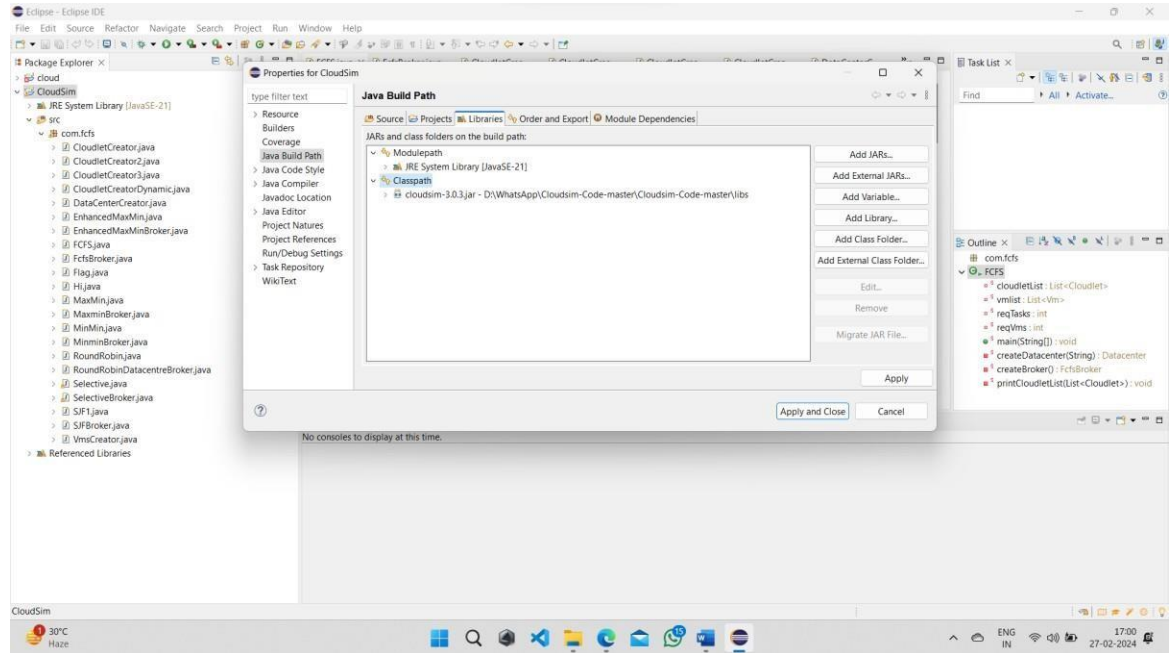
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Step-7: Place all the scheduling algorithm in the FCFS folder



Step-8: Configure Build Path and Add the external .JAR file





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Step-9: Run as Java Application and execute the code.

```
24 * Title: CloudSim Toolkit
25 package com.fcfs;
26 import java.text.DecimalFormat;
27
28 /**
29  * NAME - PRATIK KUMAR (21BCS3404)
30  * FCFS Task scheduling
31  * Author Linda J
32  */
33 public class FCFS {
34
35     /** The cloudlet list. */
36     private static List<Cloudlet> cloudletList;
37
38     /** The vmlist. */
39     private static List<Vm> vmlist;
40
41     private static int reqTasks = 10;
42     private static int reqVms = 4;
43
44     /**
45      * Creates main() to run this example
46      */
47     public static void main(String[] args) {
48         Log.println("Starting FCFS...");
49         try {
50             // First step: Initialize the CloudSim packa
```

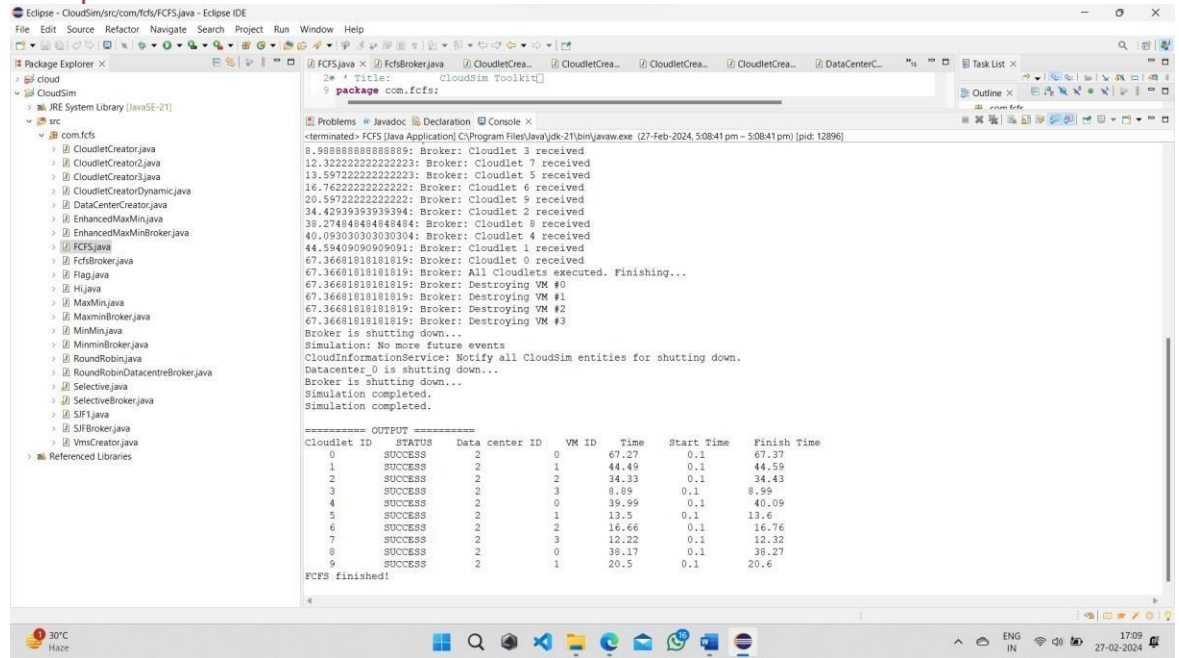
	2	3	4	5	6	7	8	9
SUCCESS	2	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2	2
3	2	3	4	5	6	7	8	9
4	2	3	4	5	6	7	8	9
5	2	3	4	5	6	7	8	9
6	2	3	4	5	6	7	8	9
7	2	3	4	5	6	7	8	9
8	2	3	4	5	6	7	8	9
9	2	3	4	5	6	7	8	9

FCFS finished!

```
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45      * Creates main() to run this example
46      */
47     public static void main(String[] args) {
48         Log.println("Starting FCFS...");
49         try {
50             // First step: Initialize the CloudSim package. It should be called
```

	2	3	4	5	6	7	8	9
SUCCESS	2	3	4	5	6	7	8	9
2	2	3	4	5	6	7	8	9
3	2	3	4	5	6	7	8	9
4	2	3	4	5	6	7	8	9
5	2	3	4	5	6	7	8	9
6	2	3	4	5	6	7	8	9
7	2	3	4	5	6	7	8	9
8	2	3	4	5	6	7	8	9
9	2	3	4	5	6	7	8	9

FCFS finished!



```

Eclipse - CloudSim/src/com/fcts/FCFS.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package Explorer
  cloud
  CloudSim
    JRE System Library [JavaSE-21]
    src
      com.fcts
        CloudletCreator.java
        CloudletCreator2.java
        CloudletCreator3.java
        CloudletCreatorDynamic.java
        DataCenterCreator.java
        EnhancedMaxMin.java
        EnhancedMaxMinBroker.java
        FCFS.java
        FctsBroker.java
        Fcts.java
        Hija.java
        MaxMin.java
        MaxMinBroker.java
        MinMin.java
        MinMinBroker.java
        MinMinRobin.java
        RoundRobinDataCenterBroker.java
        Selective.java
        SelectiveBroker.java
        SIF1.java
        SIFBroker.java
        VmCreator.java
      Referenced Libraries
  Problems Javadoc Declaration Console
  Title: CloudSim Toolkit
  package com.fcts;
  <terminated> FCFS [Java Application] C:\Program Files\Java\jdk-21\bin\javaw.exe (27-Feb-2024, 5:08:41 pm - 5:08:41 pm) [pid: 12896]
  8.988888888888889: Broker: Cloudlet 3 received
  12.322222222222223: Broker: Cloudlet 7 received
  13.597222222222223: Broker: Cloudlet 5 received
  16.762222222222222: Broker: Cloudlet 6 received
  20.597222222222222: Broker: Cloudlet 9 received
  34.42939393939394: Broker: Cloudlet 2 received
  38.274848484848484: Broker: Cloudlet 8 received
  40.093030303030304: Broker: Cloudlet 4 received
  44.59409090909091: Broker: Cloudlet 1 received
  67.36681818181819: Broker: Cloudlet 0 received
  67.36681818181819: Broker: All cloudlets executed. Finishing...
  67.36681818181819: Broker: Destroying VM #0
  67.36681818181819: Broker: Destroying VM #1
  67.36681818181819: Broker: Destroying VM #2
  67.36681818181819: Broker: Destroying VM #3
  Broker is shutting down...
  Simulation: No more future events
  CloudInformationService: Notify all CloudSim entities for shutting down.
  Datacenter_0 is shutting down...
  Broker is shutting down...
  Simulation completed.
  Simulation completed.

===== OUTPUT =====
Cloudlet ID STATUS Data center ID VM ID Time Start Time Finish Time
0 SUCCESS 2 0 67.27 0.1 67.37
1 SUCCESS 2 1 44.49 0.1 44.59
2 SUCCESS 2 2 34.33 0.1 34.43
3 SUCCESS 2 3 8.89 0.1 8.99
4 SUCCESS 2 0 39.99 0.1 40.09
5 SUCCESS 2 1 13.5 0.1 13.6
6 SUCCESS 2 2 16.66 0.1 16.76
7 SUCCESS 2 3 12.22 0.1 12.32
8 SUCCESS 2 0 38.17 0.1 38.27
9 SUCCESS 2 1 20.5 0.1 20.6
FCFS finished!
  
```

5. Result:

The experiment confirmed that the implemented scheduling algorithm effectively optimized resource allocation in the simulated cloud environment. It demonstrated improved throughput, reduced latency, and robustness in handling varying workloads and network conditions compared to baseline approaches. Comparative analysis underscored its competitiveness, highlighting its potential for enhancing cloud system performance.

6. Learning Outcome:

- Learn how to Run scheduling algorithm .
- Understand the cloud scenario using Matlab
- Understand how to a scheduling algorithm runs.