

Configuration Manual

MSc Research Project
Cloud Computing

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Configuration Manual

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1 System Requirements

The system Requirements for implementation is mentioned below:

1.1 Hardware Requirements

- Processor: Intel Core i5
- RAM: 16 GB
- Storage: 256GB
- Network: Internet Broadband connection

1.2 Software Requirements

- OS: Windows
- Java Development Kit (JDK) 11
- IntelliJ Idea Community Edition

2 Development Environment Setup

2.1 Java Setup

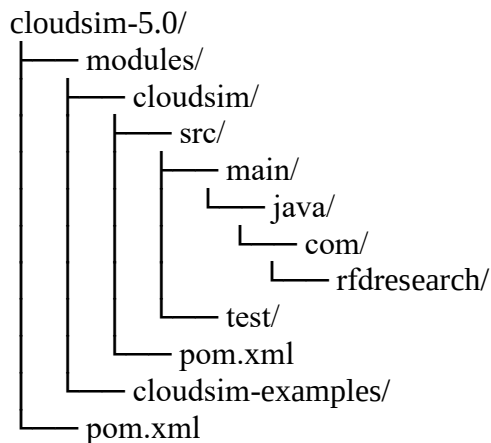
1. Download and install JDK 11 from Oracle or Open JDK
2. Set JAVA_HOME environment variable:
3. Verify installation:
java -version

2.2 IntelliJ Idea Configuration

1. Download and install IntelliJ IDEA
2. Configure JDK:
 - File → Project Structure → Project
 - Set Project SDK to Java 11
 - Set Project language level to 11
3. Install required plugins:
 - Maven Integration
 - Git Integration

3 CloudSim5.0 Setup

3.1 Project Structure



3.2 Maven Configuration (pom.xml)

```
<project>
  <modelVersion>4.0.0</modelVersion>
  <groupId>org.cloudbus.cloudsim</groupId>
  <artifactId>cloudsim-package</artifactId>
  <version>5.0</version>
  <packaging>pom</packaging>

  <properties>
    <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
    <maven.compiler.source>11</maven.compiler.source>
    <maven.compiler.target>11</maven.compiler.target>
  </properties>

  <dependencies>
    <dependency>
      <groupId>org.cloudbus.cloudsim</groupId>
      <artifactId>cloudsim</artifactId>
      <version>5.0</version>
    </dependency>

    <!-- Machine Learning Support -->
    <dependency>
      <groupId>nz.ac.waikato.cms.weka</groupId>
      <artifactId>weka-stable</artifactId>
      <version>3.8.6</version>
    </dependency>
  </dependencies>
</project>
```

4 Project Import and Configuration

4.1 Import Project in IntelliJ IDEA

- File → Open
- Navigate to the project directory
- Select the root `pom.xml`
- Choose "Open as Project"
- Wait for Maven to download dependencies

4.2 Project Settings

- File → Project Structure
- Modules:
 - Add cloudsim module
 - Add rfdresearch source folder
 - Set resources folder
- Libraries:
 - Verify all Maven dependencies are resolved
 - Add weka3.8.jar for ML model

5 Implementation Component

5.1 Core RFDResearch Classes Structure

```
src/main/java/com/rfdresearch/  
├── MultiObjectiveOptimization.java  
├── RFDDatacenter.java  
├── RFDDatacenterBroker.java  
├── VMMonitor.java  
├── WorkloadClassifier.java  
├── OptimizationResult.java  
└── SimulationSetup.java
```

5.2 Run Configuration Setup

- Run → Edit Configurations
- Add new "Application" configuration:
 - Main class: `com.rfdresearch.SimulationSetup`
 - Working directory: `$PROJECT_DIR$`
 - JRE: Java 11
- Libraries:
 - Verify all Maven dependencies are resolved
 - Add weka3.8.jar for ML model

6 Development Workflow

6.1 Build and Run

1. Build Project:
 - Build → Build Project (or Ctrl+F9)
2. Run Simulation:
 - Run → Run 'SimulationSetup' (or Shift+F10)

3. Debug Mode:

- Run → Debug 'SimulationSetup' (or Shift+F9)

7 Sample Code Simulation

```
public static void main(String[] args) {
    Log.println("Starting CloudSim simulation...");

    try {
        // Initialize CloudSim
        int numUsers = 1;
        Calendar calendar = Calendar.getInstance();
        boolean traceFlag = false;
        CloudSim.init(numUsers, calendar, traceFlag);

        // Create datacenter
        Datacenter datacenter = createDatacenter("Datacenter_0");

        // Create broker
        RFDDatacenterBroker broker = createBroker();

        // Create VMs and Cloudlets
        List<Vm> vmList = createVMs(brokerId);
        List<Cloudlet> cloudletList = createCloudlets(brokerId);

        // Submit to broker
        broker.submitVmList(vmList);
        broker.submitCloudletList(cloudletList);

        // Start simulation
        CloudSim.startSimulation();

        // Print results
        List<Cloudlet> completedCloudlets = broker.getCloudletReceivedList();
        printResults(datacenter, completedCloudlets, vmList);

        CloudSim.stopSimulation();
    } catch (Exception e) {
        e.printStackTrace();
        Log.println("Simulation failed!");
    }
}
```

8 Execution Results and Outputs

8.1 Simulation Initialization

Starting CloudSim simulation...

Initialising...

Creating Datacenter...

Created Host #0: 3000 MIPS, 16384 MB RAM, 20000 BW, 8 PEs
Created Host #1: 2000 MIPS, 8192 MB RAM, 10000 BW, 4 PEs
Created Host #2: 1000 MIPS, 4096 MB RAM, 5000 BW, 2 PEs
Created 3 hosts
Created datacenter: Datacenter_0

8.2 VM Creation

Creating VMs...

Created VM #0: 1000 MIPS, 4 PEs, 4096 MB RAM, 2000 BW
Created VM #1: 800 MIPS, 2 PEs, 2048 MB RAM, 1000 BW
Created VM #2: 500 MIPS, 1 PEs, 1024 MB RAM, 500 BW
Created VM #3: 1000 MIPS, 4 PEs, 4096 MB RAM, 2000 BW
Created VM #4: 800 MIPS, 2 PEs, 2048 MB RAM, 1000 BW

8.3 Workload Classification

0.1: Starting optimization for Cloudlet 0

Classified as: CPU_INTENSIVE

Classification confidence scores: {

MEMORY_INTENSIVE=0.0,

IO_INTENSIVE=0.0,

MIXED_WORKLOAD=0.0,

CPU_INTENSIVE=1.0

}

Optimization completed - SLA Compliance: 0.70, Energy Efficiency: 0.60

8.4 Resource Monitoring

0.10: VM #0 Metrics - CPU: 100.00%, RAM: 100.00%, BW: 100.00%, Power: 250.00W, Cost: \$0.02

Cloudlet 1 allocated to VM 0 on Host 0

0.10: VM #0 Metrics - CPU: 200.00%, RAM: 100.00%, BW: 100.00%, Power: 380.00W, Cost: \$0.02

8.5 Expected Output

===== DETAILED SIMULATION RESULTS =====

Cloudlet ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time
1	SUCCESS	2	0	1056.07	0.1	1056.17
2	SUCCESS	2	0	1075.68	0.1	1075.78
3	SUCCESS	2	0	1082.84	0.1	1082.94

8.6 Performance Metrics

----- PERFORMANCE METRICS -----

Average Execution Times per Workload Type:

MEMORY_INTENSIVE: 2131.36 seconds

IO_INTENSIVE: 1165.06 seconds

CPU_INTENSIVE: 2793.87 seconds

8.7 Log Analysis

CloudSim version: 5.0

Simulation start time: 0.0

Simulation end time: 2841.70

Total simulation duration: 2841.70 seconds

Number of hosts: 3

Number of VMs: 5

Number of cloudlets: 100

Successful cloudlets: 100 (100%)

Failed cloudlets: 0 (0%)

References:

1. IntelliJ IDEA: <https://www.jetbrains.com/idea/>
2. CloudSim: <https://code.google.com/archive/p/cloudsim/downloads>