

St. Francis Institute of Technology, Mumbai-400 103
Department Of Information Technology

A.Y. 2024-2025
Class: TE-ITA/B, Semester: V

Subject: **DevOps Lab**

Experiment – 6: To understand master-slave architecture and scale your Jenkins standalone implementation by implementing slave nodes.

1. **Aim:** To understand master-slave architecture and scale your Jenkins standalone implementation by implementing slave nodes
2. **Objectives:** Aim of this experiment is that, the students will be able to do
 - Jenkins management
 - Adding a slave node to Jenkins
3. **Outcomes:** After study of this experiment, the students will be able
 - To understand the importance of Jenkins to Build and deploy Software Applications on server environment.
4. **Prerequisite:** Knowledge of Computer Networks concept of Master-slave architecture
5. **Requirements:** Jenkins, JDK, python, Personal Computer, Windows operating system, browser, Internet Connection, Microsoft Word.
6. **Pre-Experiment Exercise:**
Brief Theory: Refer shared material
7. **Laboratory Exercise**
 - A. **Procedure:**
 - a. **Answer the following:**
 - Explain the architecture of Jenkins with diagram.
 - Explain the distributed architecture of Jenkins with diagram
 - b. **Execute following (Refer the shared material) and attach screenshots:**
 - Create a slave node and connect it to master
 - Use an existing project or a new project to run in the slave node
 - Apply cron command on a project

8. Post-Experiments Exercise

A. Extended Theory:

Nil

B. Questions:

- What are the ways to configure Jenkins node agent to communicate with Jenkins master?
- Which architecture is recommended for a scalable Jenkins environment?

C. Conclusion:

- Write what was performed in the experiment.
- Write the significance of the topic studied in the experiment.

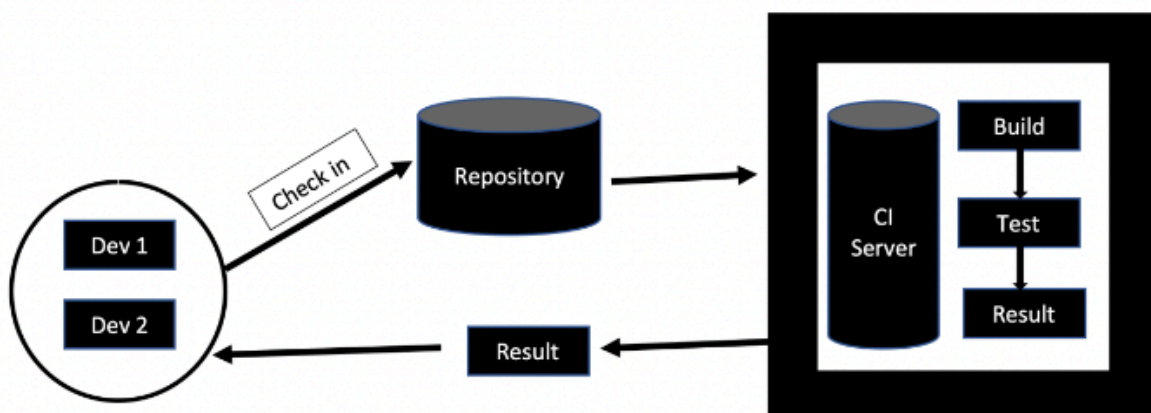
D. References:

<https://jenkins.io/doc/>
<https://www.slideshare.net/abediaz/introduction-to-jenkins>
<https://www.studytonight.com/jenkins/jenkins-master-slave-configuration>
<https://www.edureka.co/blog/jenkins-master-and-slave-architecture-a-complete-guide/>

a. Answer the following:

- **Explain the architecture of Jenkins with a diagram.**

Jenkins is an open-source automation server used for continuous integration and continuous delivery (CI/CD). In the standalone setup, Jenkins runs on a single server where the build jobs are executed. Developers commit their code to a version control system (VCS), and Jenkins detects these changes, triggers build jobs, and provides feedback through notifications or emails. This architecture works well for small to medium-sized projects but can become a bottleneck for larger projects requiring multiple environments for testing.



In the standalone setup, the Jenkins server alone handles all the build tasks. Developers commit code to the VCS, Jenkins detects changes, triggers builds, and runs tests. This setup is simpler but less scalable

(Answer and Image reference:

<https://thenucleargeeks.com/2020/01/23/jenkins-architecture/>)

- **Explain the distributed architecture of Jenkins with diagram**

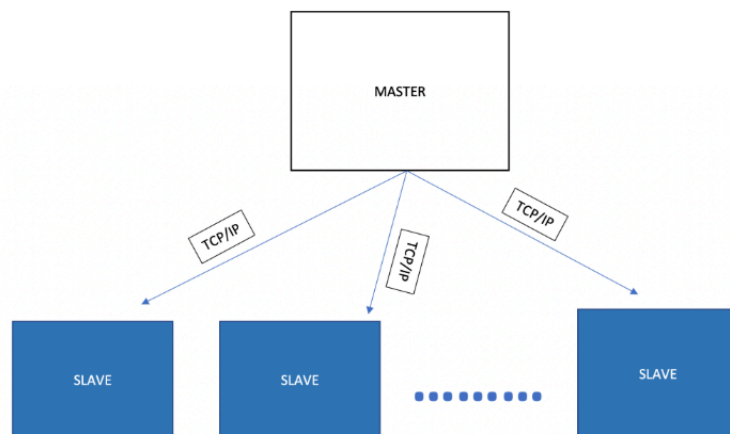
In a distributed architecture, Jenkins employs a master-slave setup to manage distributed builds. This architecture helps in handling larger projects and improves the efficiency of the build process. Here's how it works:

1. Jenkins Master:

- Schedules Build Jobs: The master node schedules build jobs to be executed by the slaves.
- Dispatches Builds: It dispatches these build jobs to various slave nodes.
- Monitors Slaves: Continuously monitors the slave nodes and records the build results.
- Executes Jobs: Can also execute build jobs directly if needed.

2. Jenkins Slave:

- Runs on Remote Machine: A slave node runs on a separate machine and listens for instructions from the master.
- Executes Build Jobs: Executes the build jobs dispatched by the master.
- OS Independent: Slaves can run on different operating systems like Windows, Linux, or macOS.
- Specific Configuration: Jobs can be configured to run on specific slave nodes or any available slave.

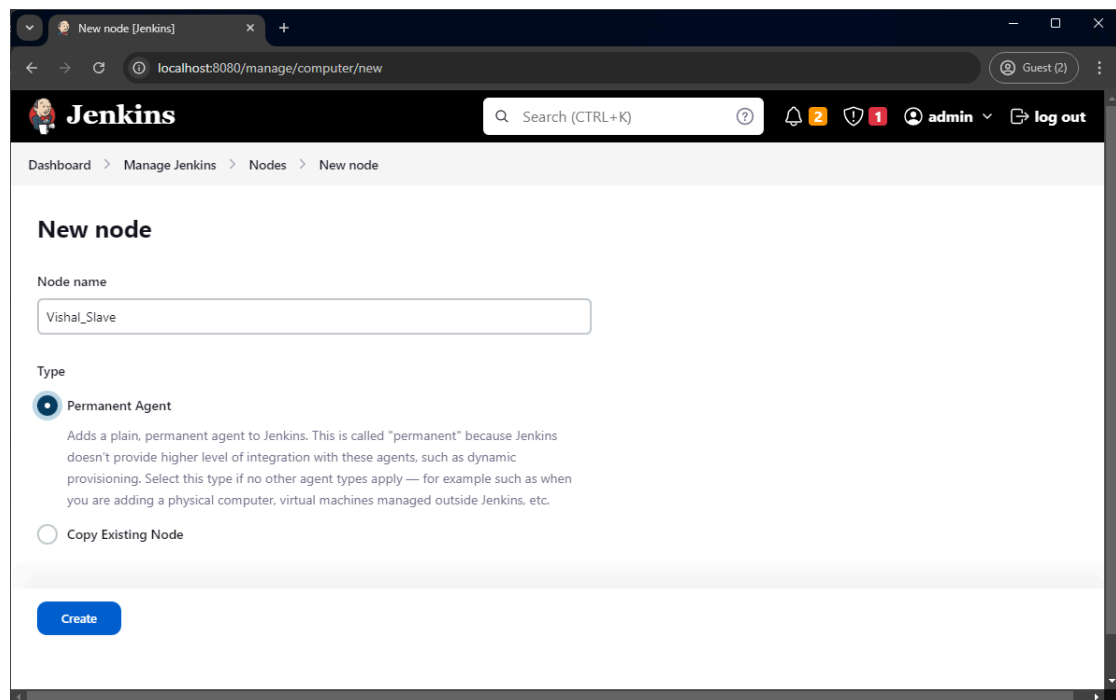
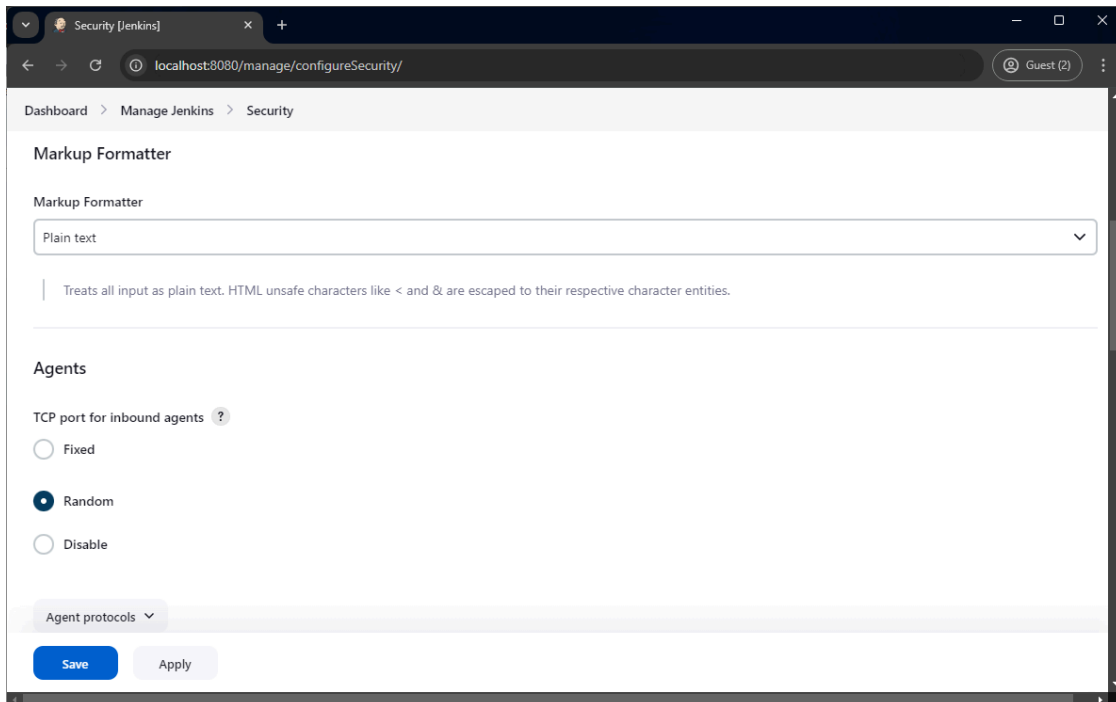


(Answer and Image reference:

<https://thenucleargeeks.com/2020/01/23/jenkins-architecture/>)

b. Execute following (Refer the shared material) and attach screenshots:

- Create a slave node and connect it to master



Jenkins

localhost:8080/manage/computer/createItem

Search (CTRL+K)

admin log out

Dashboard > Manage Jenkins > Nodes

Name ?

Vishal_Slave

Description ?

TEIT-A Roll no 62
This is my first slave. This slave is used to run Java.

Plain text Preview

Number of executors ?

2

Remote root directory ?

C:\VishalRMahajan

Labels ?

VishalRMahajan_Slave

Save

Jenkins

localhost:8080/manage/computer/createItem

Search (CTRL+K)

Guest (2)

Dashboard > Manage Jenkins > Nodes

Labels ?

VishalRMahajan_Slave

Usage ?

Use this node as much as possible

Launch method ?

Launch agent by connecting it to the controller

☐ Disable WorkDir ?

Custom WorkDir path ?

C:\VishalRMahajan

Internal data directory ?

remoting

☐ Fail if workspace is missing ?

☐ Use WebSocket ?

Save

Vishal_Slave Configuration [Jenkins]

localhost:8080/computer/Vishal_Slave/configure

Dashboard > Nodes > Vishal_Slave > Configure

Custom WorkDir path ?
C:\VishalRMahajan

Internal data directory ?
remoting

☐ Fail if workspace is missing ?

☐ Use WebSocket ?

Advanced ▾

Availability ?
Keep this agent online as much as possible ▾ ?

Node Properties

☐ Disable deferred wipeout on this node ?

☐ Environment variables

☐ ShiningPanda workspace directory ?

☐ Tool Locations

Save

```

C:\Users\Student>curl.exe -sO http://localhost:8080/jnlpJars/agent.jar & java -jar agent.jar -jnlpUrl http://localhost:8080/computer/Vishal%5FSlave/jenkins-agent.jnlp -secret 47f2880ac80055433cee42c2fa54285262c79353e31d6d82b21232f9a7e274b6 -workDir "C:\VishalRMahajan"
Oct 01, 2024 10:44:57 AM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using C:\VishalRMahajan\remoting as a remoting work directory
Oct 01, 2024 10:44:57 AM org.jenkinsci.remoting.engine.WorkDirManager setupLogging
INFO: Both error and output logs will be printed to C:\VishalRMahajan\remoting
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main createEngine
INFO: Setting up agent: Vishal_Slave
Oct 01, 2024 10:44:58 AM hudson.remoting.Engine startEngine
INFO: Using Remoting version: 3131.vf2b_b_798b_ce99
Oct 01, 2024 10:44:58 AM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using C:\VishalRMahajan\remoting as a remoting work directory
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Locating server among [http://localhost:8080/]
Oct 01, 2024 10:44:58 AM org.jenkinsci.remoting.engine.JnlpAgentEndpointResolver resolve
INFO: Remoting server accepts the following protocols: [JNLP4-connect, Ping]
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Agent discovery successful
    Agent address: localhost
    Agent port: 64456
    Identity: 50:47:a5:34:87:22:b0:82:72:6a:94:b8:c2:5c:39:2f
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Handshaking
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connecting to localhost:64456
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Trying protocol: JNLP4-connect
Oct 01, 2024 10:44:58 AM org.jenkinsci.remoting.protocol.impl.BIONetworkLayer$Reader run
INFO: Waiting for ProtocolStack to start.
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Remote identity confirmed: 50:47:a5:34:87:22:b0:82:72:6a:94:b8:c2:5c:39:2f
Oct 01, 2024 10:44:58 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connected
  
```

- Use an existing project or a new project to run in the slave node

Vishal_EXP06 Config [Jenkins]

localhost:8080/view/VishalRMahajan/job/Vishal_EXP06/configure

Guest (2)

Dashboard > VishalRMahajan > Vishal_EXP06 > Configuration

Configure

- General
- Source Code Management
- Build Triggers
- Build Environment
- Build Steps
- Post-build Actions

Description

This is EXP06 of DevOps lab. VishalRMahajan Roll no 62 TEITA4

Plain text [Preview](#)

- ☐ Commit agent's Docker container ?
- ☐ Define a Docker template
- ☐ Discard old builds ?
- ☐ GitHub project
- ☐ This project is parameterized ?
- ☐ Throttle builds ?
- ☐ Execute concurrent builds if necessary ?
- ☒ Restrict where this project can be run ?

Label Expression ?

Vishal_Slave

Label Vishal_Slave matches 1 node. Permissions or other restrictions provided by plugins may further reduce that

[Save](#) [Apply](#)

Vishal_EXP06 Config [Jenkins]

localhost:8080/view/VishalRMahajan/job/Vishal_EXP06/configure

Dashboard > VishalRMahajan > Vishal_EXP06 > Configuration

Configure

- General
- Source Code Management
- Build Triggers
- Build Environment
- Build Steps**
- Post-build Actions

Build Steps

Execute Windows batch command ?

Command

See [the list of available environment variables](#)

```
echo "Hello"
```

Advanced ▾

Add build step ▾

Post-build Actions

Add post-build action ▾

Save Apply

REST API Jenkins 2.414.1


✓ Console Output


```
Started by user admin
Running as SYSTEM
Building remotely on Vishal_Slave (VishalRMahajan_Slave) in workspace C:\VishalRMahajan\workspace\Vishal_EXP06
[Vishal_EXP06] $ cmd /c call C:\Users\Student\AppData\Local\Temp\jenkins17922091170549478472.bat


C:\VishalRMahajan\workspace\Vishal_EXP06>echo "Hello"
"Hello"


C:\VishalRMahajan\workspace\Vishal_EXP06>exit 0
Finished: SUCCESS
```



- Apply cron command on a project

**Jenkins**


2


1


admin


log out


Dashboard > Nodes > Vishal_Slave


Status


Delete Agent


Configure


Build History


Load Statistics

Script Console

Log

System Information

Disconnect

Selenium node Management

Agent Vishal_Slave

Mark this node temporarily offline

TEIT-A Roll no 62
This is my first slave.This slave is used to run Java.



Edit description

Agent is connected.

Labels

VishalRMahajan_Slave

Projects tied to Vishal_Slave

S	W	Name ↓	Last Success	Last Failure	Last Duration
		Vishal_EXP06	42 sec #1	N/A	77 ms

Build Executor Status

1 Idle

2 Idle

Icon: S M L

Icon legend

Atom feed for all

Atom feed for failures

Atom feed for just latest build

Build Triggers

☐ Trigger builds remotely (e.g., from scripts) ?

☐ Build after other projects are built ?

☒ Build periodically ?

Schedule ?

H/5 * * * *

☐ GitHub hook trigger for GITScm polling ?

☐ Poll SCM ?

The screenshot shows the Jenkins web interface for a project named "Vishal_EXP06". The interface is divided into a sidebar on the left and a main content area. The sidebar contains navigation links: Status, Changes, Workspace, Build Now, Configure, Delete Project, and Rename. The main content area displays the project name "Project Vishal_EXP06" and a description: "This is EXP06 of DevOps lab. VishalRMahajan Roll no 62 TEITA4". Below the description, there are buttons for "Edit description" and "Disable Project". A section titled "Permalinks" lists four links: "Last build (#4), 2.8 sec ago", "Last stable build (#4), 2.8 sec ago", "Last successful build (#4), 2.8 sec ago", and "Last completed build (#4), 2.8 sec ago". The "Build History" section shows a list of builds: #4 (Oct 1, 2024, 11:02 AM), #3 (Oct 1, 2024, 10:58 AM), #2 (Oct 1, 2024, 10:52 AM), and #1 (Oct 1, 2024, 10:50 AM). At the bottom, there are links for "Atom feed for all" and "Atom feed for failures". The top navigation bar includes a search bar, a user profile (admin), and a "log out" button.

✓ Console Output

```
Started by timer
Running as SYSTEM
Building remotely on Vishal_Slave (VishalRMahajan_Slave) in workspace C:\VishalRMahajan\workspace\Vishal_EXP06
[Vishal_EXP06] $ cmd /c call C:\Users\Student\AppData\Local\Temp\jenkins2515507745348901987.bat

C:\VishalRMahajan\workspace\Vishal_EXP06>echo "Hello"
"Hello"

C:\VishalRMahajan\workspace\Vishal_EXP06>exit 0
Finished: SUCCESS
```