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

A.Y. 2023-2024
Class: TE-ITA/B, Semester: V

Subject: **DevOps Lab**

Experiment – 7: 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.

Jenkins is an open-source automation server used for continuous integration and continuous delivery (CI/CD). Its architecture includes:

Master Node: The central server that manages job scheduling, monitoring, and distributing tasks to worker nodes.

Worker Nodes (Agents): These are slave machines that perform the actual build and deployment tasks. They receive instructions from the master node.

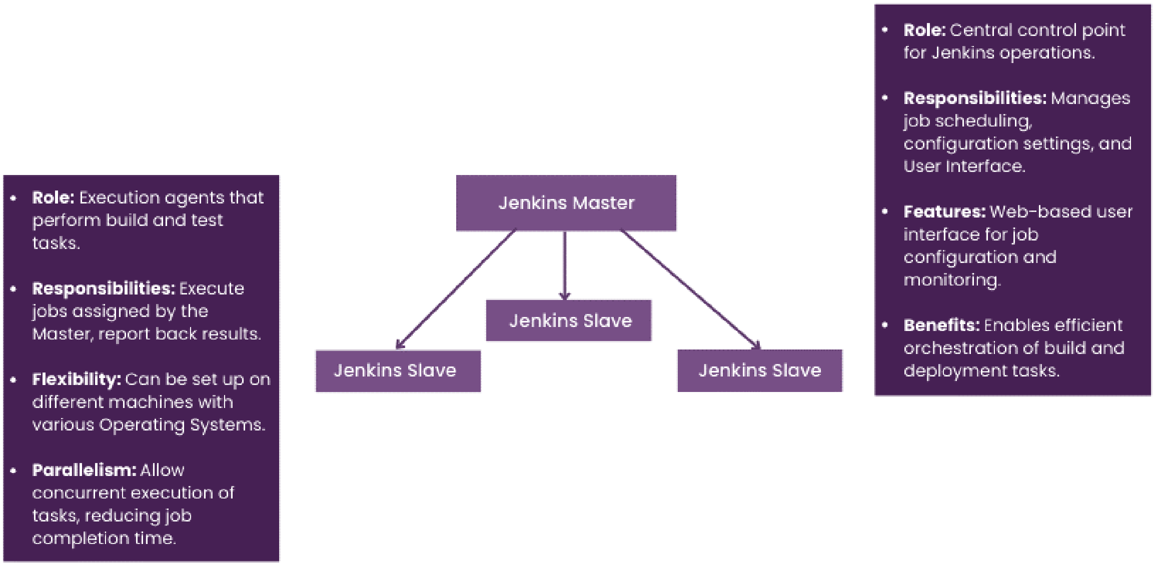
Plugins: Jenkins has a vast ecosystem of plugins that extend its functionality, allowing integration with various tools, version control systems, and other services.

Job/Project Configuration: Users define build and deployment tasks through job/project configurations. These tasks can include source code compilation, testing, and deployment.

Distributed Builds: Jenkins supports distributed builds, where different worker nodes can execute tasks concurrently, improving scalability and performance.

Job Queue: Jobs are placed in a queue and executed in the order they were triggered. The master node manages the queue and assigns jobs to available workers.
Web Interface: Jenkins provides a web-based dashboard for configuring jobs, viewing build histories, and monitoring the CI/CD pipeline.

SCM Integration: Jenkins can integrate with various source code management (SCM) systems like Git, SVN, and others to automatically trigger builds when code changes occur.
Overall, Jenkins' architecture is designed to automate and streamline the software development and deployment process, making it a popular choice for CI/CD in various development environments.

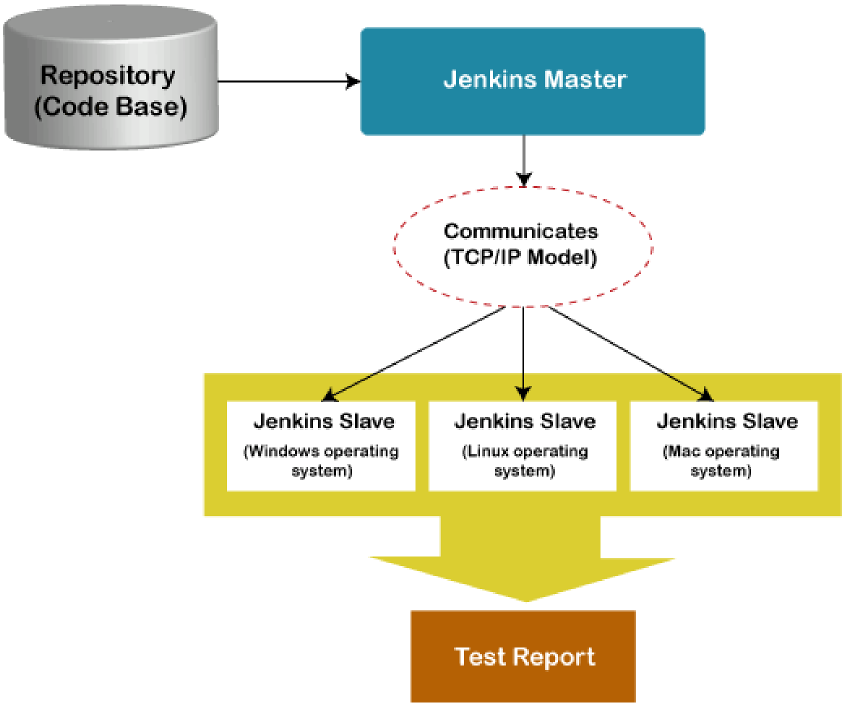


- **Role:** Execution agents that perform build and test tasks.
- **Responsibilities:** Execute jobs assigned by the Master, report back results.
- **Flexibility:** Can be set up on different machines with various Operating Systems.
- **Parallelism:** Allow concurrent execution of tasks, reducing job completion time.

- **Role:** Central control point for Jenkins operations.
- **Responsibilities:** Manages job scheduling, configuration settings, and User Interface.
- **Features:** Web-based user interface for job configuration and monitoring.
- **Benefits:** Enables efficient orchestration of build and deployment tasks.

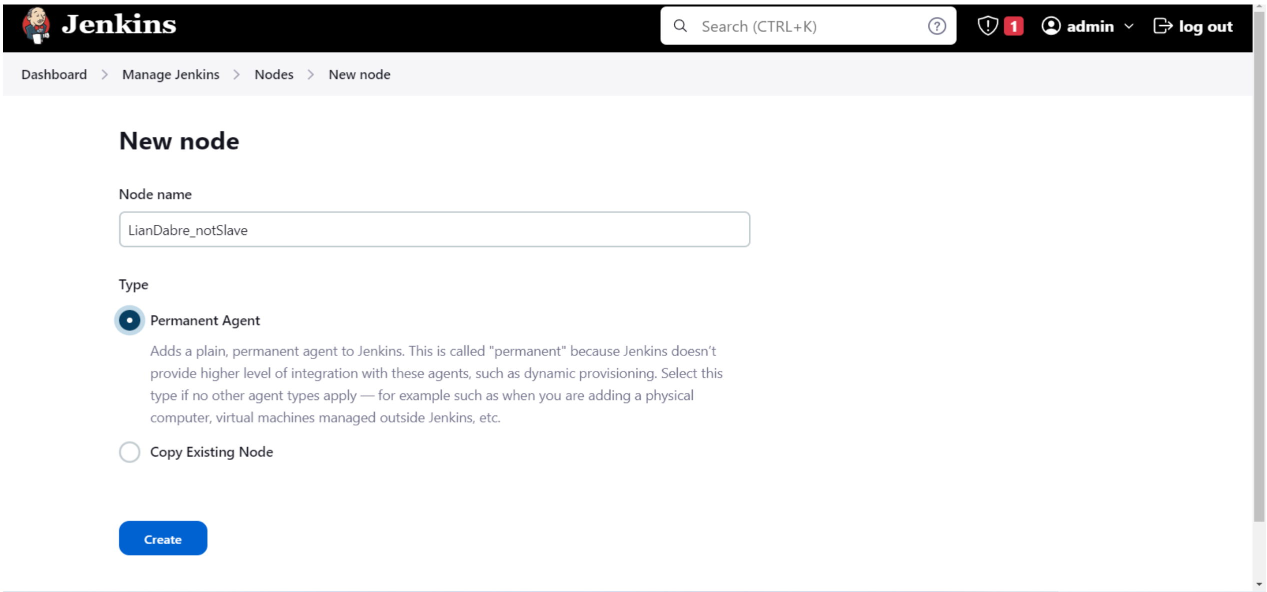
- Explain the distributed architecture of Jenkins with diagram

Jenkins' distributed architecture involves a central master node that manages multiple worker nodes (agents). The master schedules and delegates tasks to agents, which perform build and deployment jobs. This distributed setup enables parallel and scalable job execution, improving performance and resource utilization in continuous integration and continuous delivery (CI/CD) pipelines.



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

- Create a slave node and connect it to master



New node

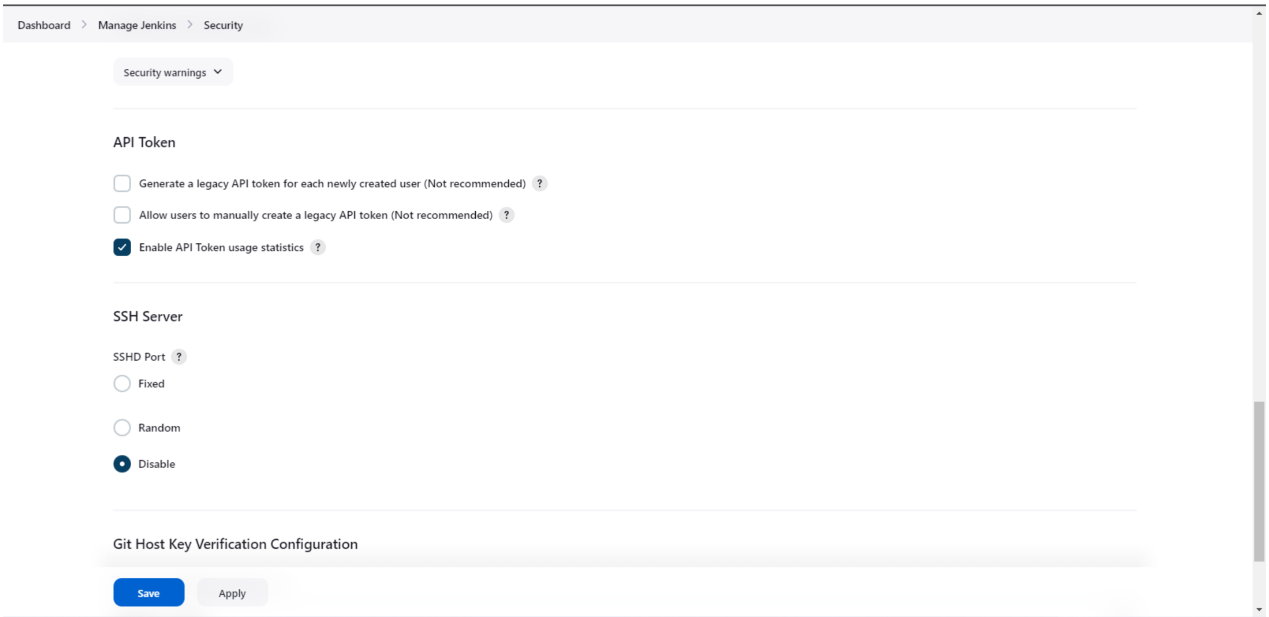
Node name: LianDabre_notSlave

Type

● Permanent Agent

Adds a plain, permanent agent to Jenkins. This is called "permanent" because Jenkins doesn't provide higher level of integration with these agents, such as dynamic provisioning. Select this type if no other agent types apply — for example such as when you are adding a physical computer, virtual machines managed outside Jenkins, etc.

○ Copy Existing Node



API Token

□ Generate a legacy API token for each newly created user (Not recommended)

□ Allow users to manually create a legacy API token (Not recommended)

☑ Enable API Token usage statistics

SSH Server

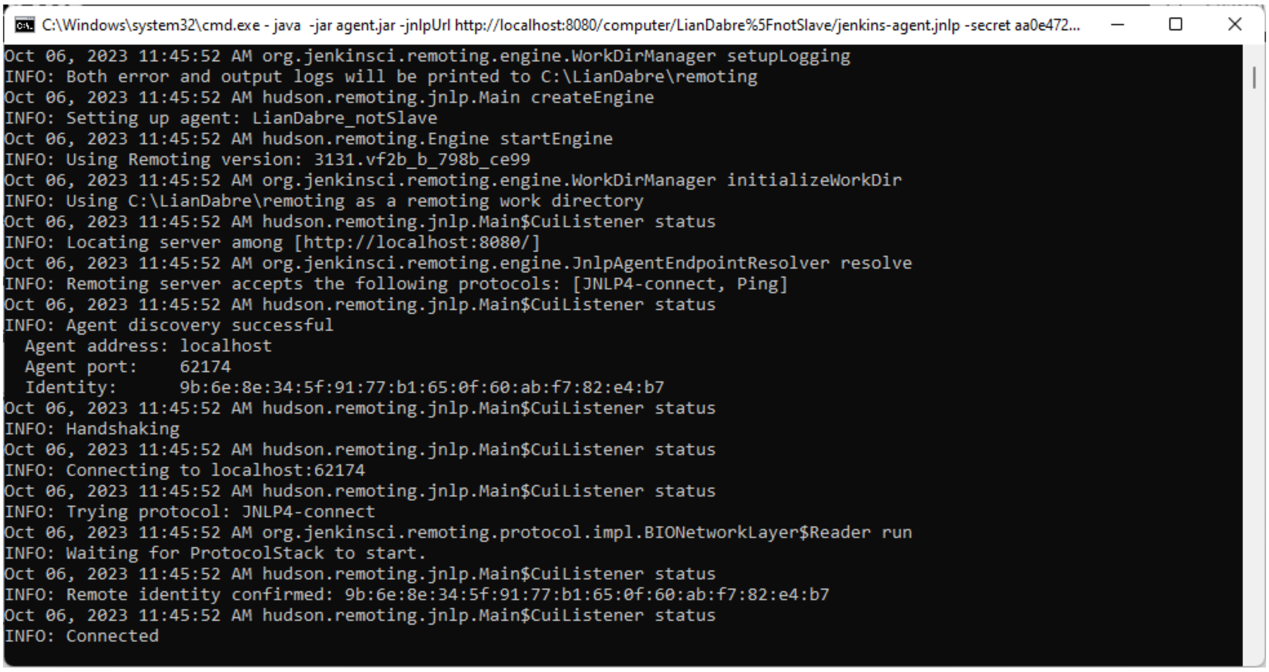
SSHD Port

○ Fixed

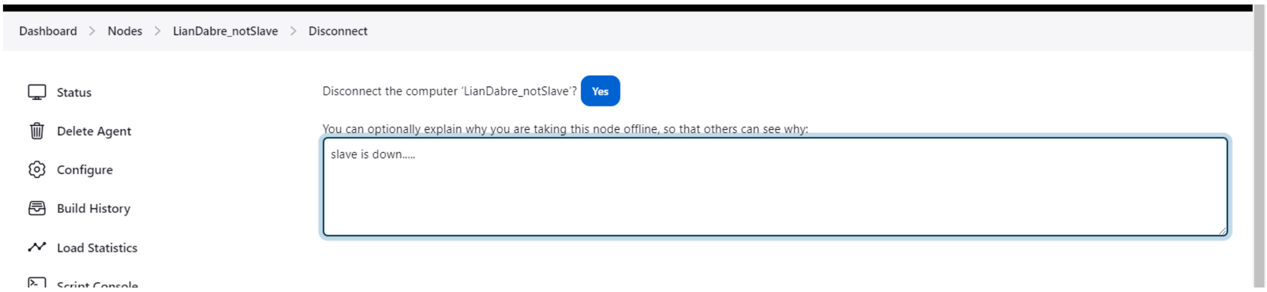
○ Random

● Disable

Git Host Key Verification Configuration


C:\Windows\system32\cmd.exe - java -jar agent.jar -jnlpUrl http://localhost:8080/computer/LianDabre%5FnotSlave/jenkins-agent.jnlp -secret aa0e472...

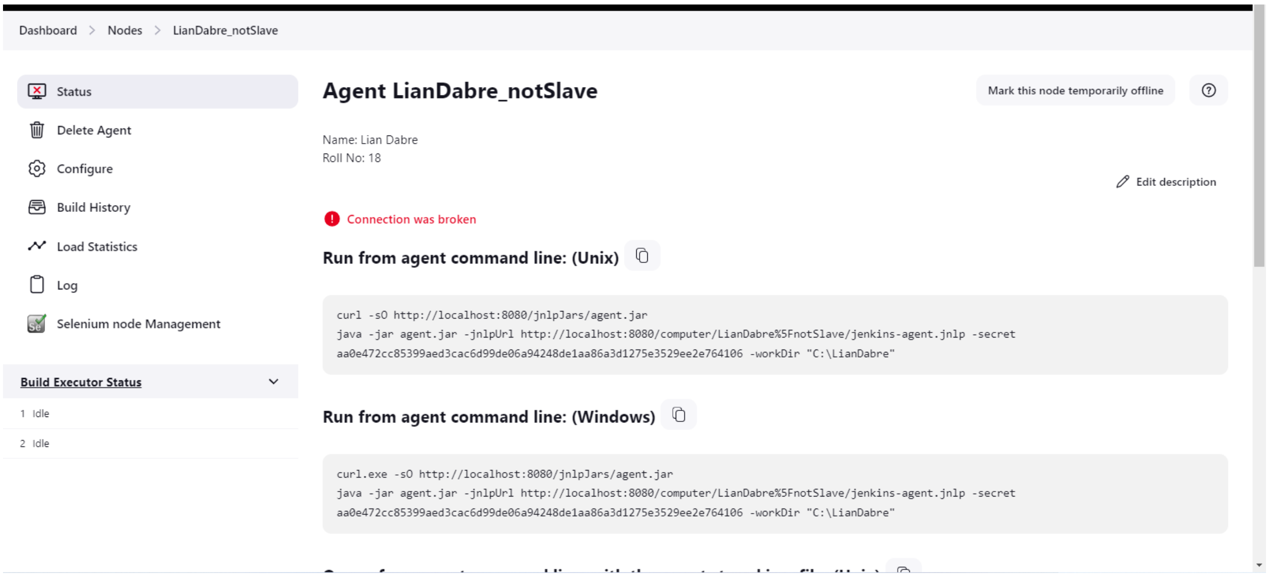
```
Oct 06, 2023 11:45:52 AM org.jenkinsci.remoting.engine.WorkDirManager setupLogging
INFO: Both error and output logs will be printed to C:\LianDabre\remoting
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main createEngine
INFO: Setting up agent: LianDabre_notSlave
Oct 06, 2023 11:45:52 AM hudson.remoting.Engine startEngine
INFO: Using Remoting version: 3131.vf2b_b_798b_ce99
Oct 06, 2023 11:45:52 AM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using C:\LianDabre\remoting as a remoting work directory
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Locating server among [http://localhost:8080/]
Oct 06, 2023 11:45:52 AM org.jenkinsci.remoting.engine.JnlpAgentEndpointResolver resolve
INFO: Remoting server accepts the following protocols: [JNLP4-connect, Ping]
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Agent discovery successful
  Agent address: localhost
  Agent port:    62174
  Identity:      9b:6e:8e:34:5f:91:77:b1:65:0f:60:ab:f7:82:e4:b7
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Handshaking
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connecting to localhost:62174
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Trying protocol: JNLP4-connect
Oct 06, 2023 11:45:52 AM org.jenkinsci.remoting.protocol.impl.BIONetworkLayer$Reader run
INFO: Waiting for ProtocolStack to start.
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Remote identity confirmed: 9b:6e:8e:34:5f:91:77:b1:65:0f:60:ab:f7:82:e4:b7
Oct 06, 2023 11:45:52 AM hudson.remoting.jnlp.Main$CuiListener status
INFO: Connected
```



Disconnect the computer 'LianDabre_notSlave'? Yes

You can optionally explain why you are taking this node offline, so that others can see why:

slave is down.....



Agent LianDabre_notSlave

Name: Lian Dabre
Roll No: 18

Connection was broken

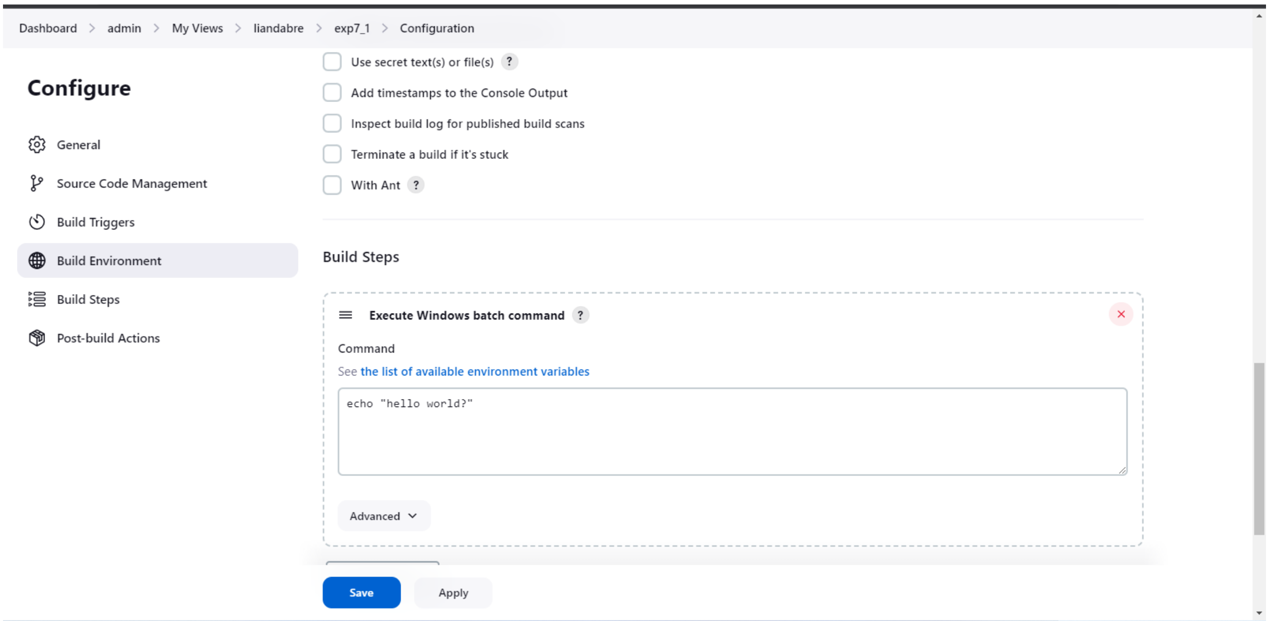
Run from agent command line: (Unix)

```
curl -sO http://localhost:8080/jnlpJars/agent.jar
java -jar agent.jar -jnlpUrl http://localhost:8080/computer/LianDabre%5FnotSlave/jenkins-agent.jnlp -secret
aa0e472cc85399aed3cac6d99de06a94248de1aa86a3d1275e3529ee2e764106 -workDir "C:\LianDabre"
```

Run from agent command line: (Windows)

```
curl.exe -sO http://localhost:8080/jnlpJars/agent.jar
java -jar agent.jar -jnlpUrl http://localhost:8080/computer/LianDabre%5FnotSlave/jenkins-agent.jnlp -secret
aa0e472cc85399aed3cac6d99de06a94248de1aa86a3d1275e3529ee2e764106 -workDir "C:\LianDabre"
```

Build Executor Status	
1	Idle
2	Idle



☐ Use secret text(s) or file(s)
☐ Add timestamps to the Console Output
☐ Inspect build log for published build scans
☐ Terminate a build if it's stuck
☐ With Ant

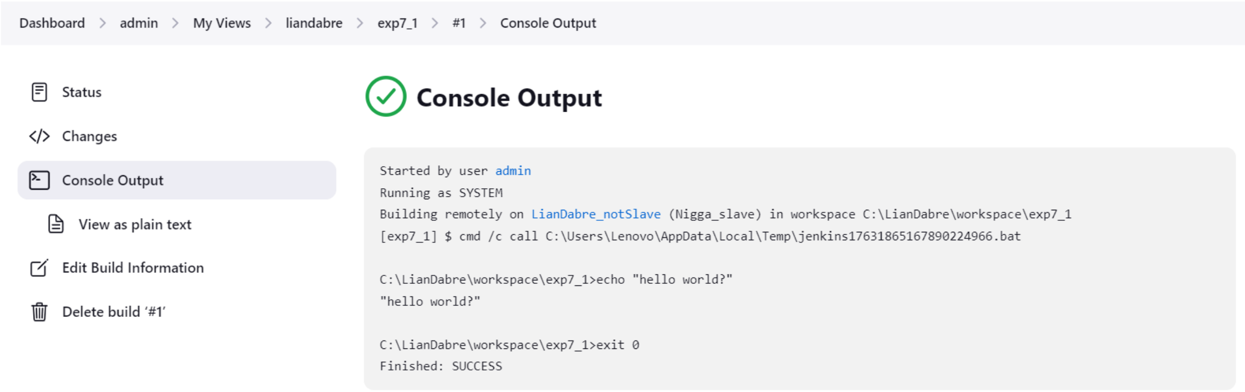
Build Steps

Execute Windows batch command

Command

See the list of available environment variables

```
echo "hello world?"
```



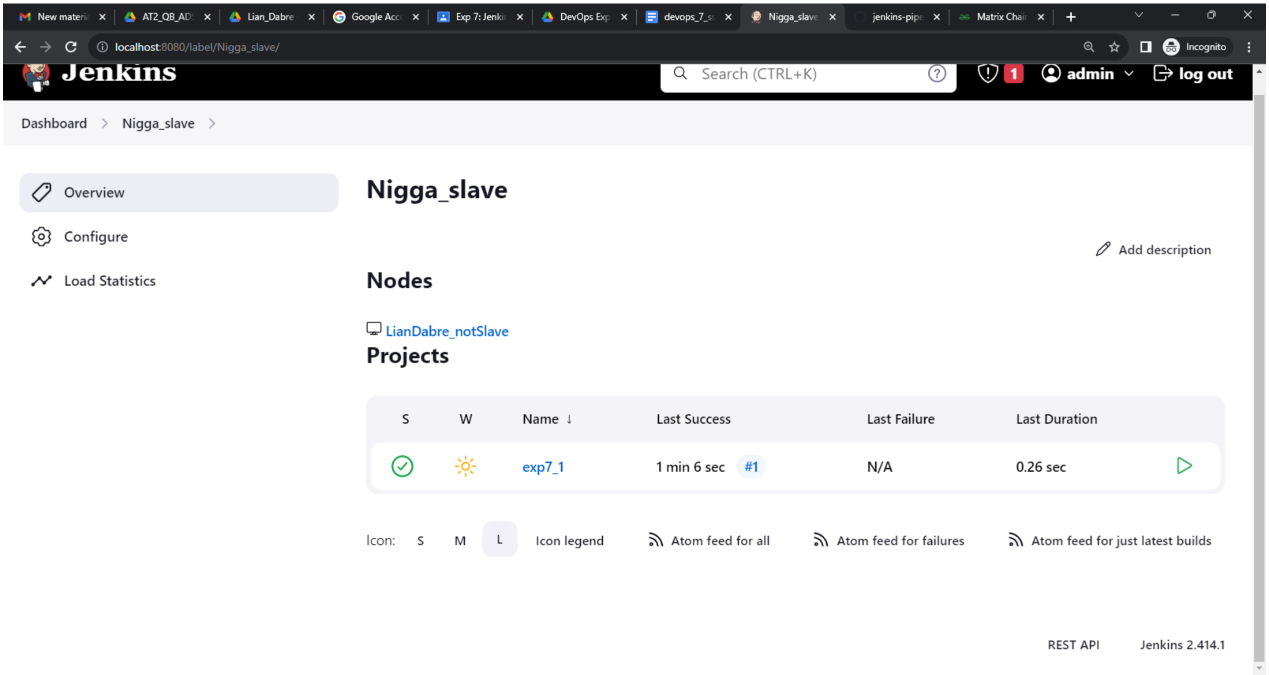
Console Output

```
Started by user admin
Running as SYSTEM
Building remotely on LianDabre_notSlave (Nigga_slave) in workspace C:\LianDabre\workspace\exp7_1
[exp7_1] $ cmd /c call C:\Users\Lenovo\AppData\Local\Temp\jenkins17631865167890224966.bat

C:\LianDabre\workspace\exp7_1>echo "hello world?"
"hello world?"

C:\LianDabre\workspace\exp7_1>exit 0
Finished: SUCCESS
```

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



Dashboard > Nigga_slave >

Overview

Configure

Load Statistics

Nigga_slave

Add description

Nodes

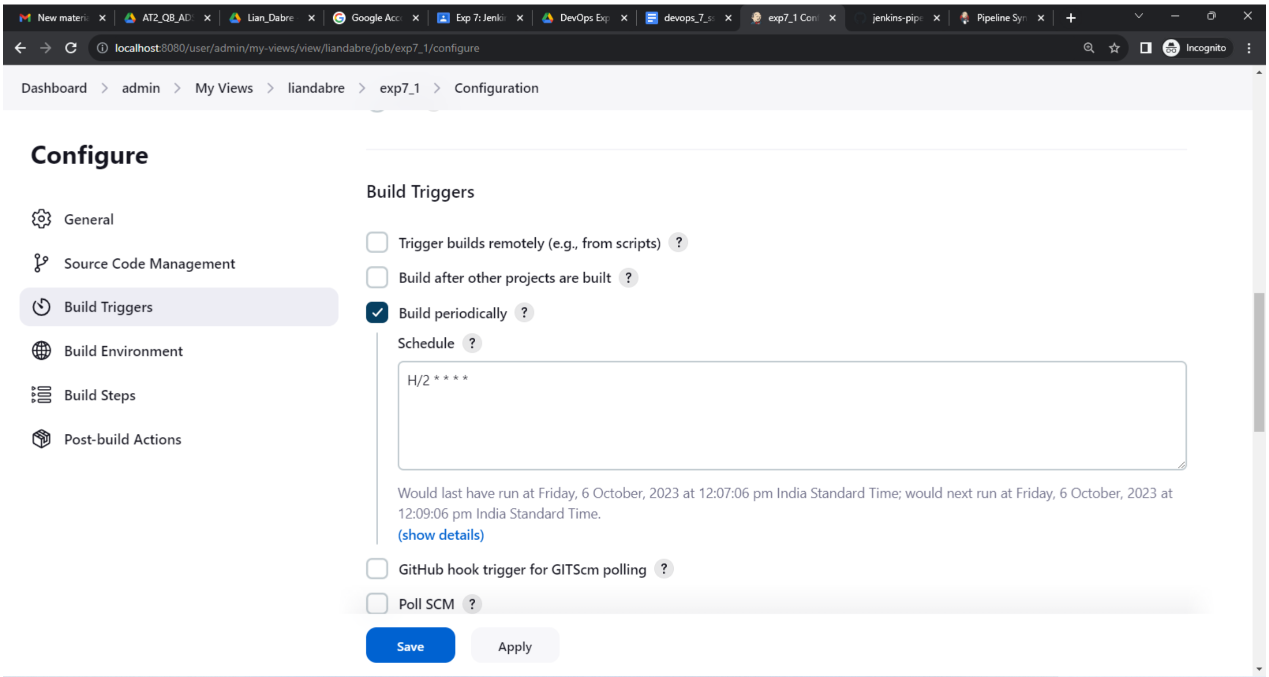
LianDabre_notSlave

Projects

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	☀	exp7_1	1 min 6 sec #1	N/A	0.26 sec

Icon: S M L Icon legend Atom feed for all Atom feed for failures Atom feed for just latest builds

REST API Jenkins 2.414.1



Dashboard > admin > My Views > liandabre > exp7_1 > Configuration

Configure

General

Source Code Management

Build Triggers

Build Environment

Build Steps

Post-build Actions

Build Triggers

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

☐ Build after other projects are built ?

☑ Build periodically ?

Schedule ?

```
H/2 * * * *
```

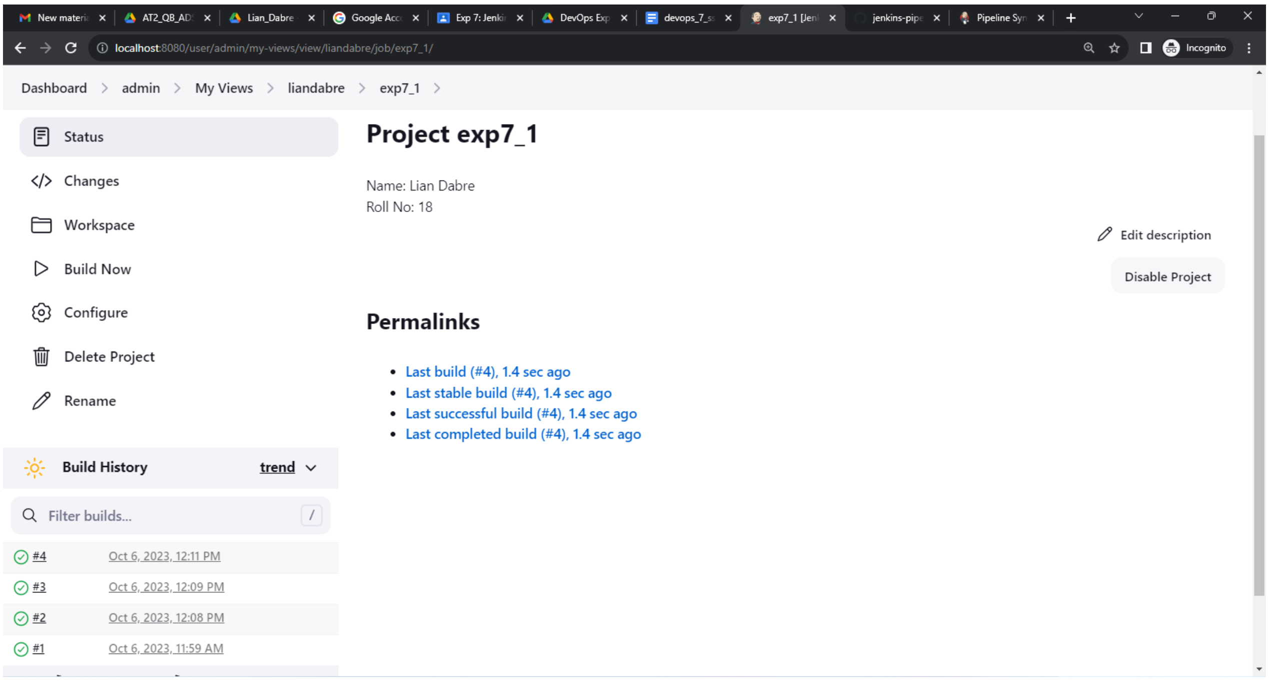
Would last have run at Friday, 6 October, 2023 at 12:07:06 pm India Standard Time; would next run at Friday, 6 October, 2023 at 12:09:06 pm India Standard Time.

(show details)

☐ GitHub hook trigger for GITScm polling ?

☐ Poll SCM ?

Save Apply



Dashboard > admin > My Views > liandabre > exp7_1 >

Status

Changes

Workspace

Build Now

Configure

Delete Project

Rename

Project exp7_1

Name: Lian Dabre
Roll No: 18

Edit description

Disable Project

Permalinks

- Last build (#4), 1.4 sec ago
- Last stable build (#4), 1.4 sec ago
- Last successful build (#4), 1.4 sec ago
- Last completed build (#4), 1.4 sec ago

Build History trend

Filter builds... /

✓ #4	Oct 6, 2023, 12:11 PM
✓ #3	Oct 6, 2023, 12:09 PM
✓ #2	Oct 6, 2023, 12:08 PM
✓ #1	Oct 6, 2023, 11:59 AM

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/