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.

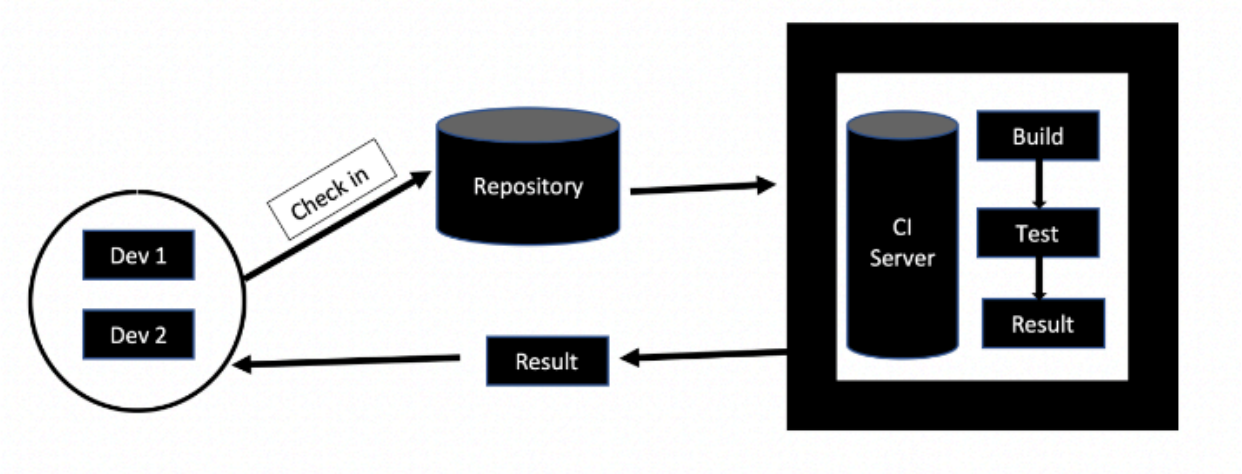
1. **Aim:** To understand master-slave architecture and scale your Jenkins standalone implementation by implementing slave nodes
2. **Objectives:** Aim of this experiment is that, the students will be able to do
   - Jenkins management
   - Adding a slave node to Jenkins
3. **Outcomes:** After study 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.



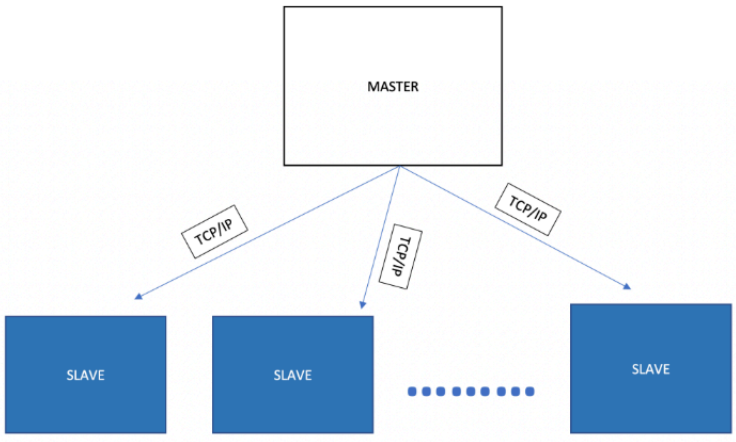
In the standalone setup, the Jenkins server alone handles all the build tasks. Developers commit code to the VCS, Jenkins detects changes, triggers builds, and runs tests. This setup is simpler but less scalable

(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:

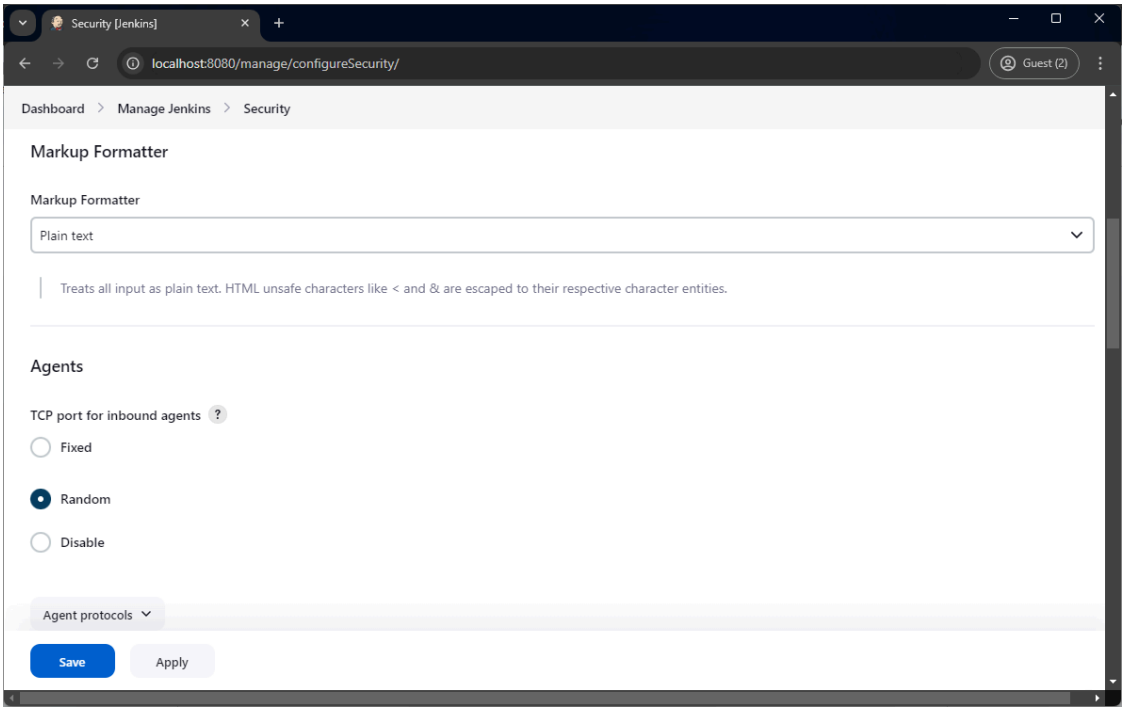
1. **Jenkins Master:**
    - Schedules Build Jobs: The master node schedules build jobs to be executed by the slaves.
    - Dispatches Builds: It dispatches these build jobs to various slave nodes.
    - Monitors Slaves: Continuously monitors the slave nodes and records the build results.
    - Executes 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.

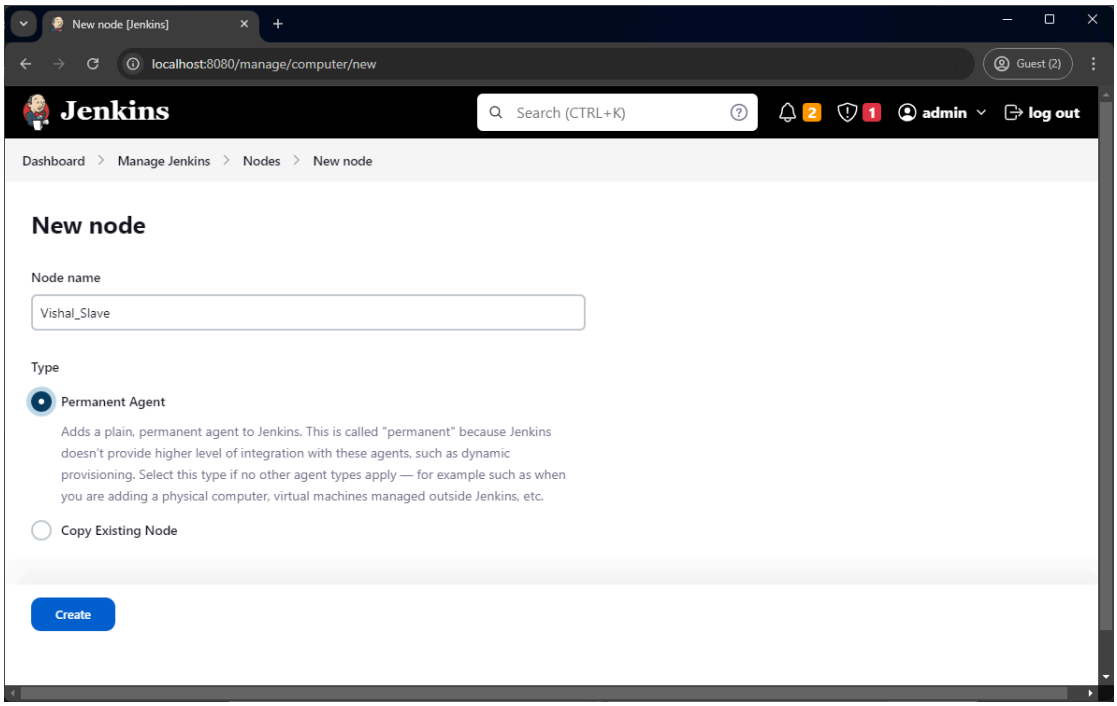


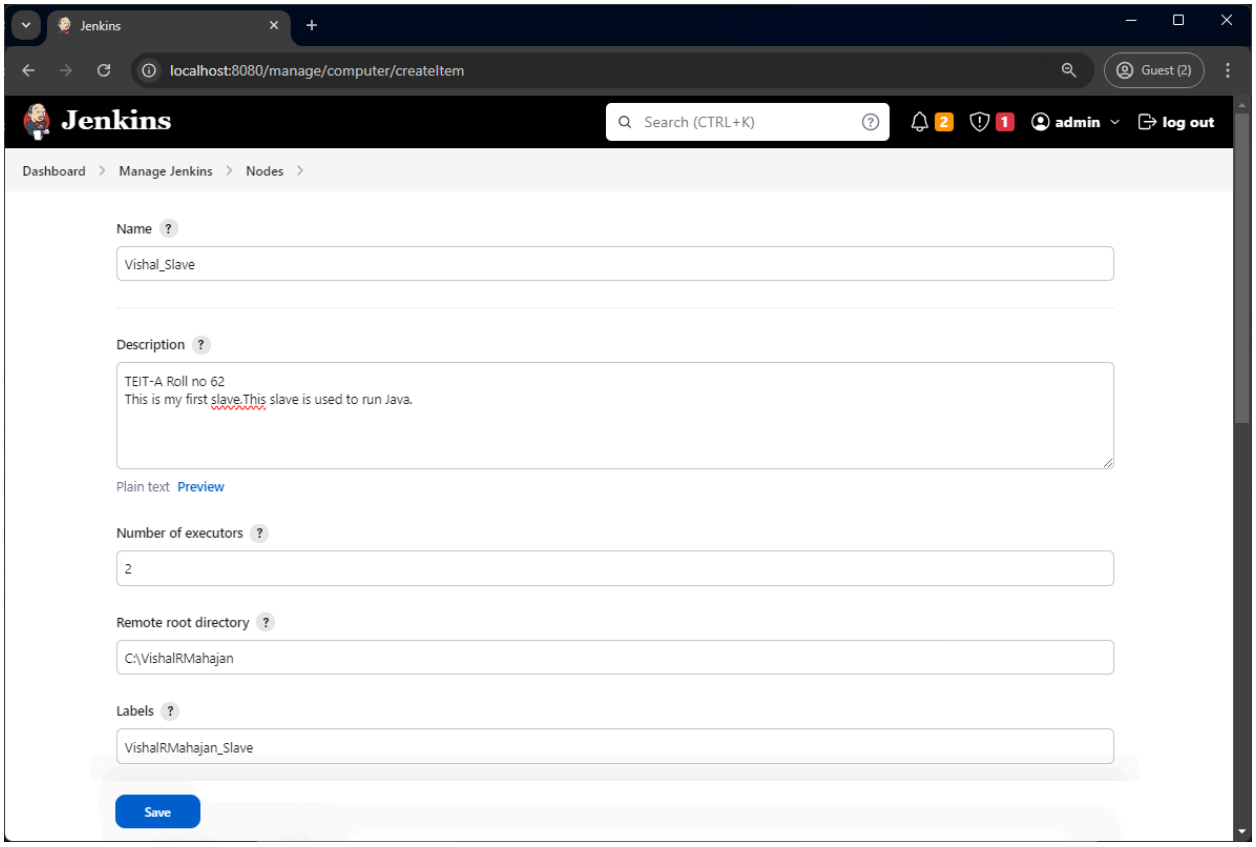
(Answer and Image reference: https://thenucleargeeks.com/2020/01/23/jenkins-architecture/)

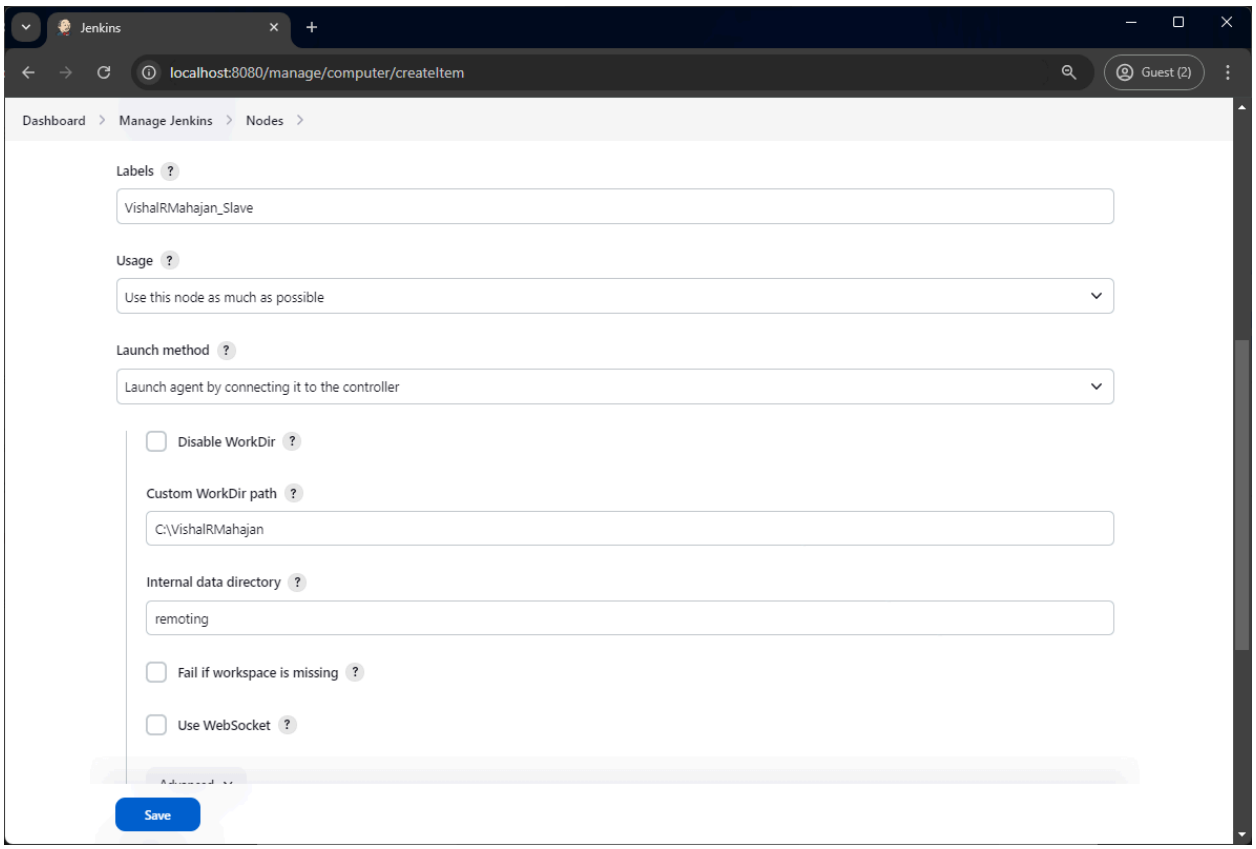
b. Execute following (Refer the shared material) and attach screenshots:

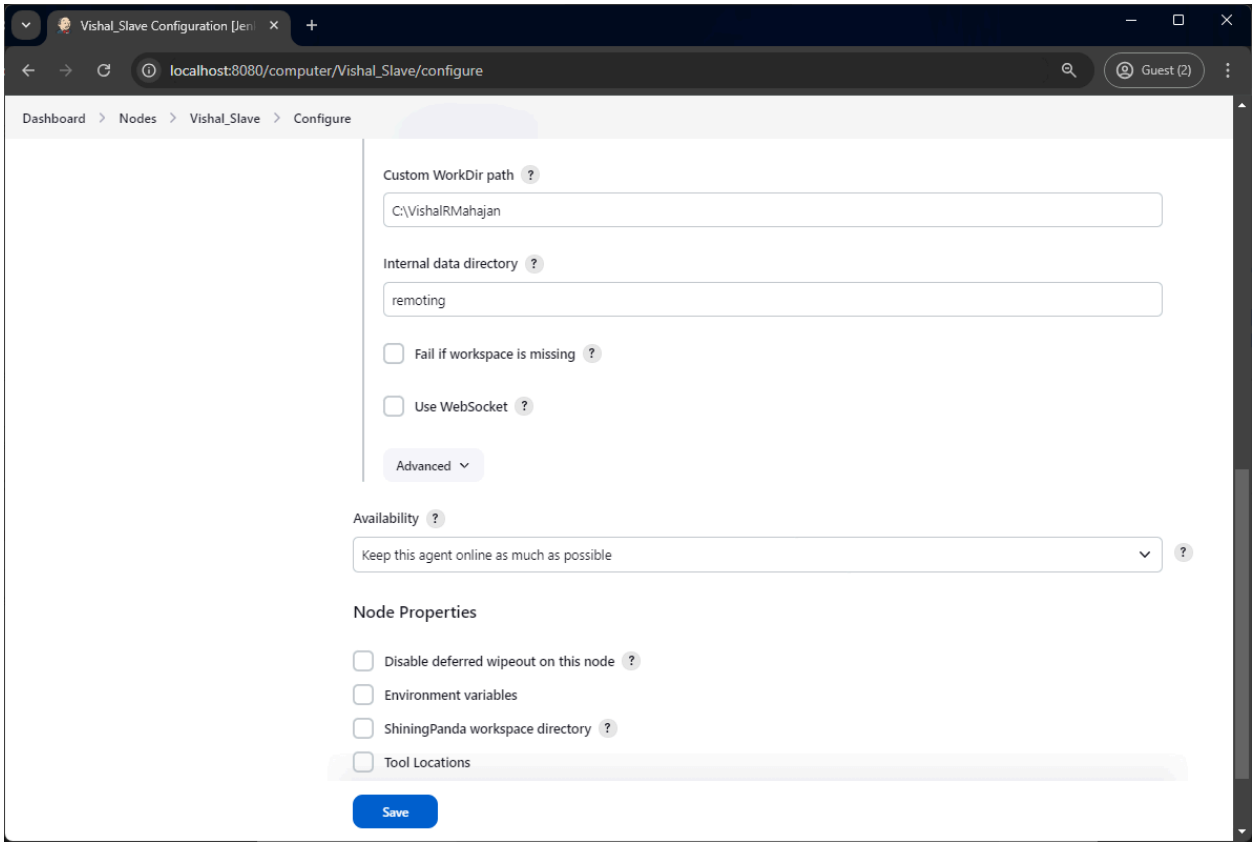
- **Create a slave node and connect it to master**

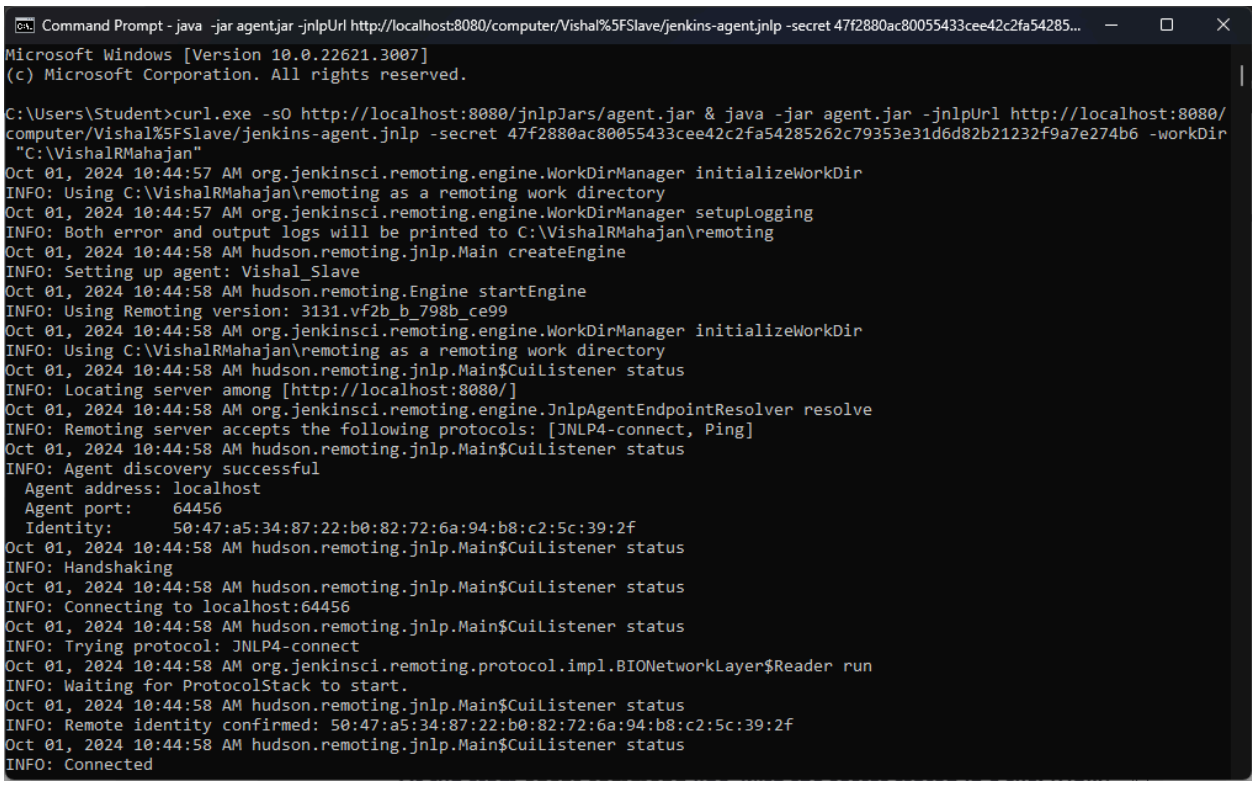




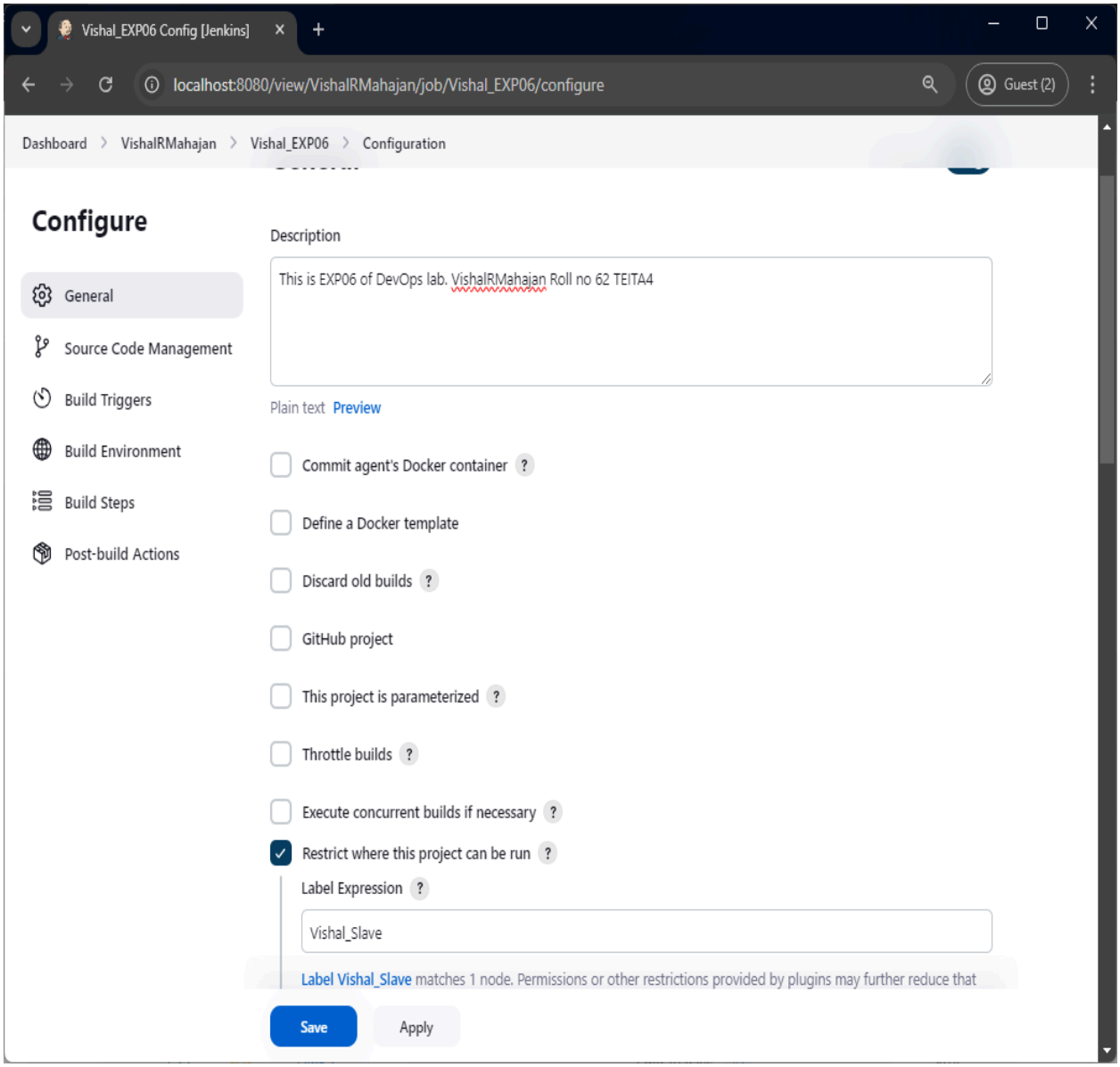

Jenkins
localhost:8080/manage/computer/createItem
Guest (2)
Jenkins
Search (CTRL+K)
2
1
admin
log out
Dashboard
Manage Jenkins
Nodes
Name
Vishal_Slave
Description
TEIT-A Roll no 62
This is my first slave.This slave is used to run Java.
Plain text
Preview
Number of executors
2
Remote root directory
C:\VishalRMahajan
Labels
VishalRMahajan_Slave
Save

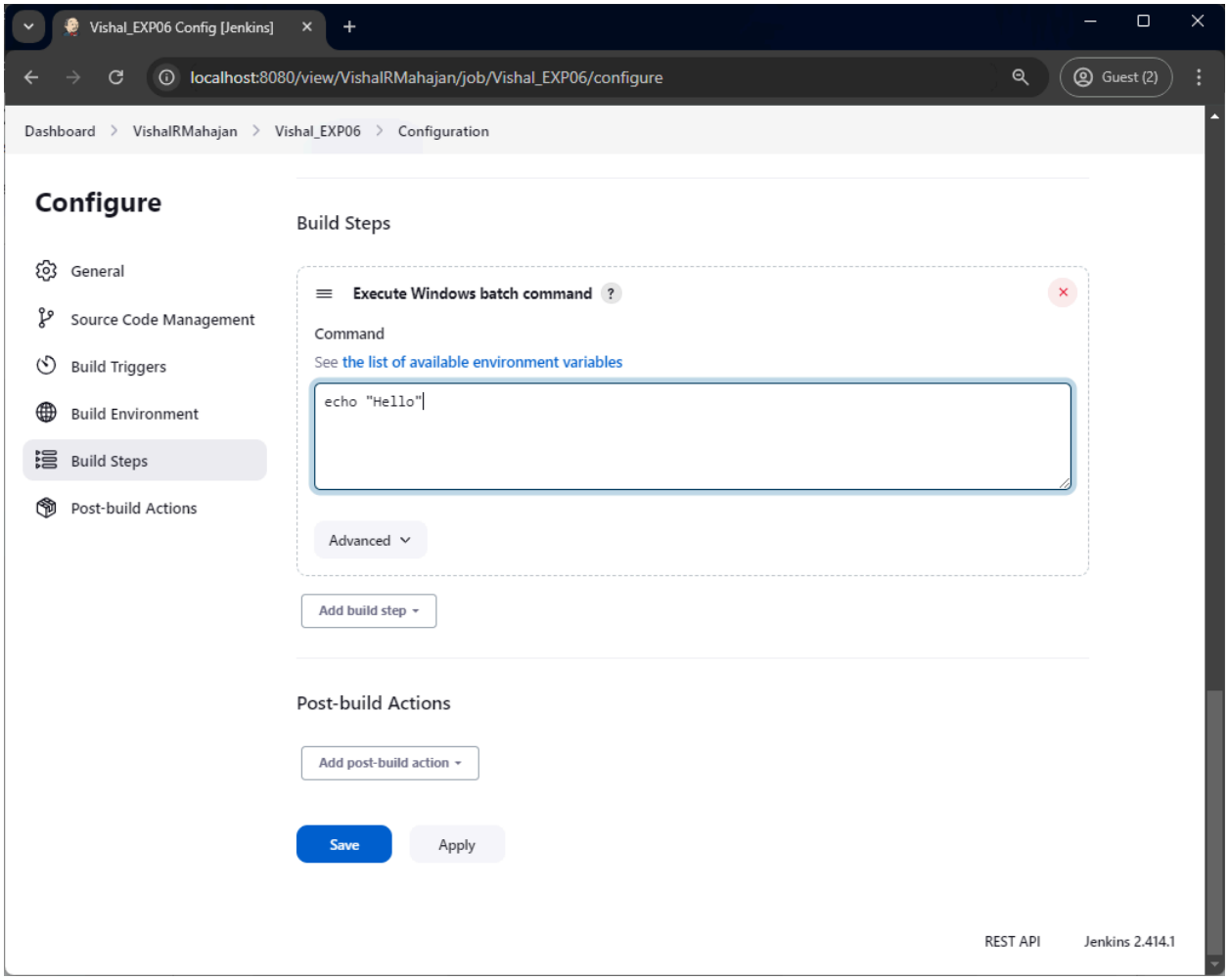

Jenkins
localhost:8080/manage/computer/createItem
Guest (2)
Dashboard
Manage Jenkins
Nodes
Labels
VishalRMahajan_Slave
Usage
Use this node as much as possible
Launch method
Launch agent by connecting it to the controller
Disable WorkDir
Custom WorkDir path
C:\VishalRMahajan
Internal data directory
remoting
Fail if workspace is missing
Use WebSocket
Save


Vishal_Slave Configuration [Jen
localhost:8080/computer/Vishal_Slave/configure
Guest (2)
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


Command Prompt - java -jar agent.jar -jnlpUrl http://localhost:8080/computer/Vishal%5FSlave/jenkins-agent.jnlp -secret 47f2880ac80055433cee42c2fa54285...
Microsoft Windows [Version 10.0.22621.3007]
(c) Microsoft Corporation. All rights reserved.
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**





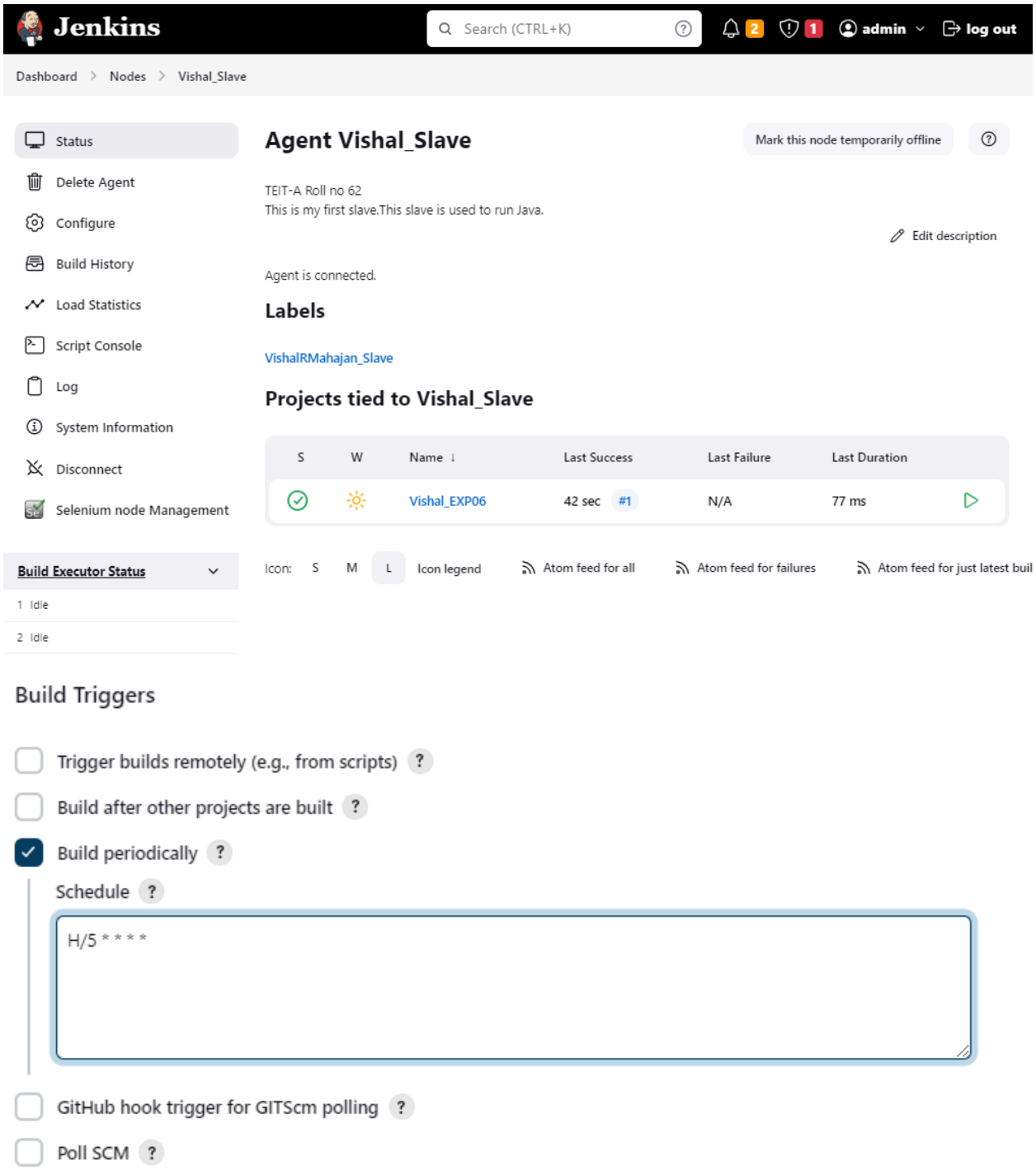
Console Output

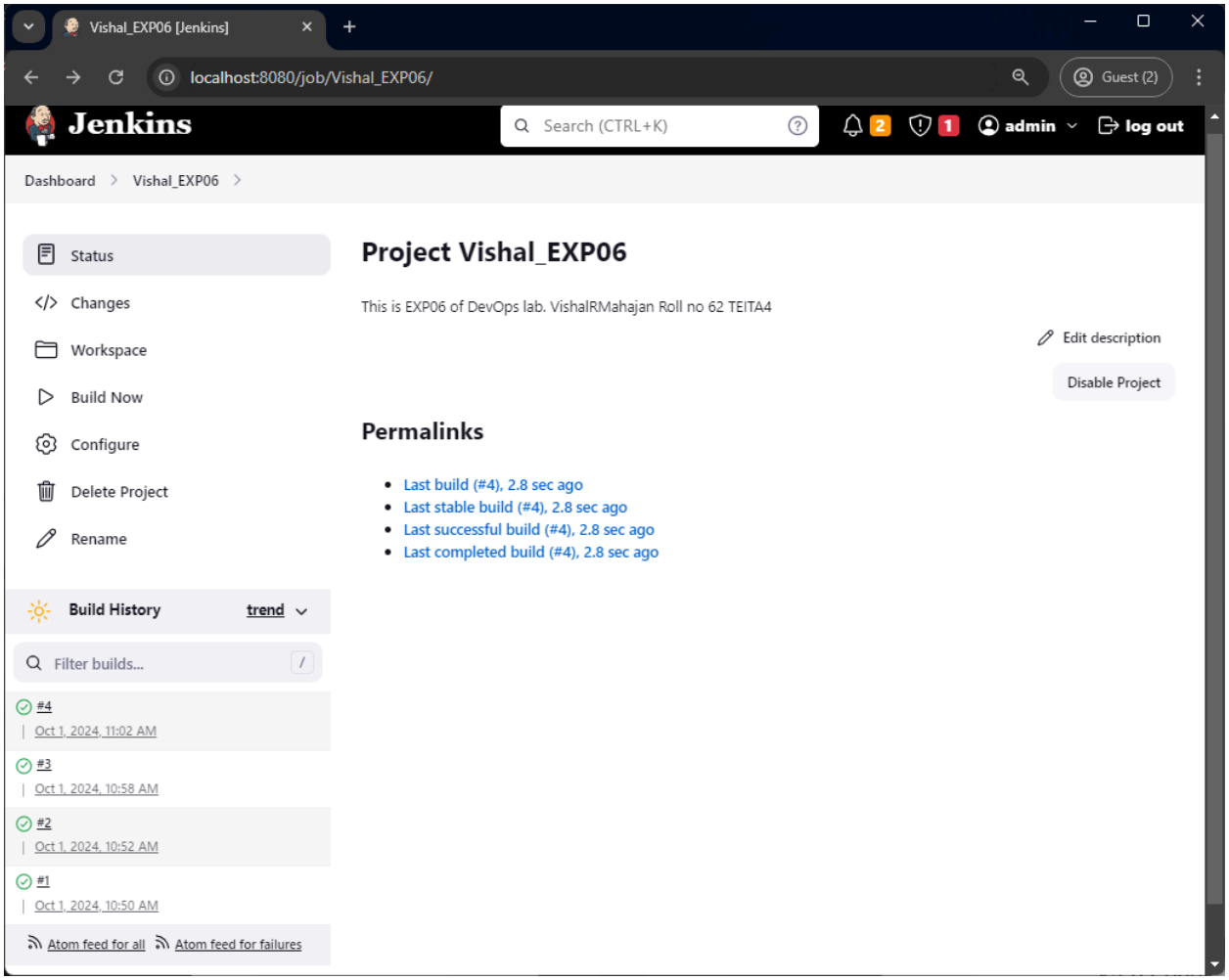
```
Started by user admin
Running as SYSTEM
Building remotely on Vishal_Slave (VishalRMahajan_Slave) in workspace C:\VishalRMahajan\workspace\Vishal_EXP06
[Vishal_EXP06] $ cmd /c call C:\Users\Student\AppData\Local\Temp\jenkins17922091170549478472.bat

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

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

- **Apply cron command on a project**





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
```