Academic Year: 2025-26 **Semester: V**

Class / Branch: TEIT

Subject: DevOps Lab

Name of Instructor: Prof. Seema Jadhav

Experiment No. 6

Aim: To implement Jenkins Master-Slave Architecture with Scaling.

Theory:

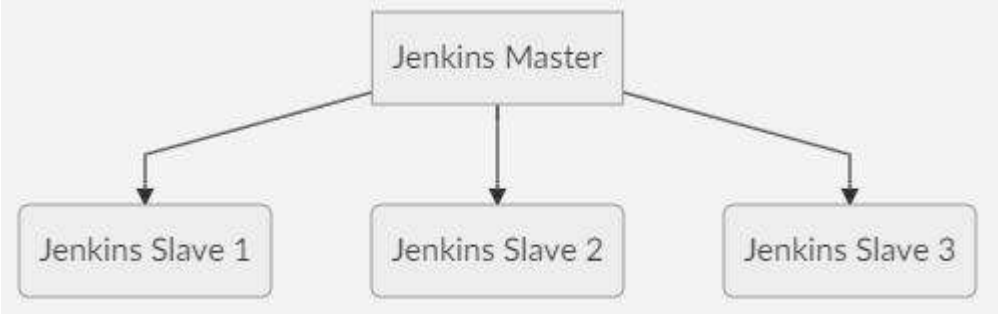
Need of Jenkins Mater-[Agent-slave] Architecture:

When we build the Jenkins job in a single Jenkins master node then Jenkins uses the resource of the base machine and if no executor is available then the jobs are queued in the Jenkins server. Sometimes you might need several different environments to test your builds. This cannot be done by a single Jenkins server. It is recommended not to run different jobs in the same system that required a different environment. In such scenarios where we need a different machine with a different environment that takes the specific job from the master to build.

On the same Jenkins setup, multiple teams are working with their jobs. All jobs are running on the same base operating system and the base operating system has limited resources. Also, we don't want to put our personal data on the same system where other teams can read.

Jenkins Distributed Architecture:

Jenkins uses A Master-Slave architecture to manage distributed builds. The machine where we install Jenkins software will be Jenkins master and that run's on port 8080 by default. On the slave machine, we install a program called Agent. This agent requires JVM. This agent executes the tasks provided by Jenkins master. We can launch n numbers of agents and we can configure whichtask will be run on which agent server from Jenkins master by assigning the agent to the task.

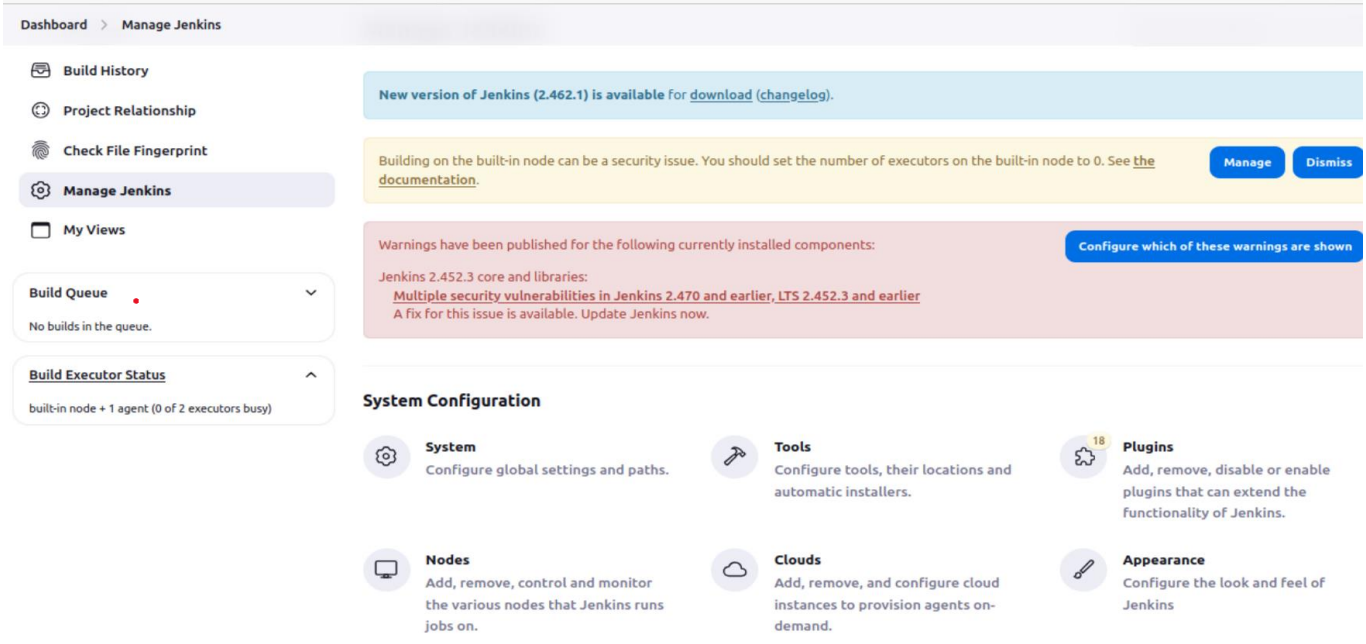


Jenkins Master and Slave Concept
A Jenkins master comes with the basic installation of Jenkins, and in this configuration, the master handles all the tasks for our build system.
If we are working on multiple projects, we may run multiple jobs on each project. Some projects need to run on some nodes, and in this process, we need to configure slaves. Jenkins slaves connect to the Jenkins master using the Java Network Launch Protocol(JNLP).

The Jenkins master acts to schedule the jobs, assign slaves, and send builds to slaves to execute the jobs.
It will also monitor the slave state (offline or online) and get back the build result responses from slaves and the display build results on the console output. The workload of building jobs is delegated to multiple **slaves**.

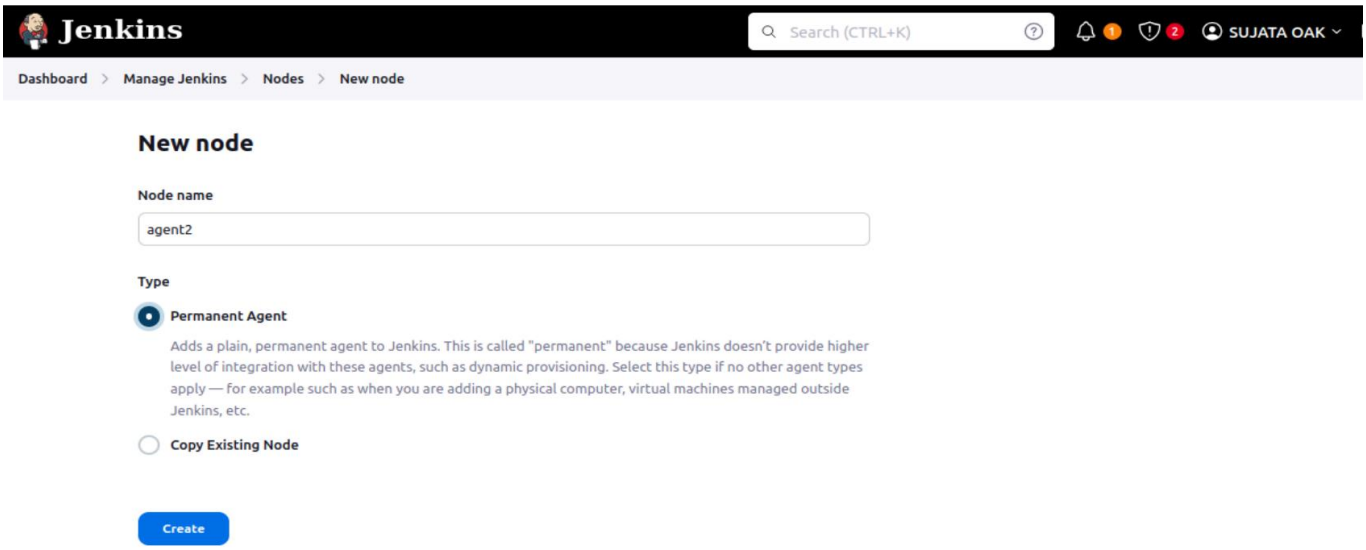
Steps to Configure Jenkins Master and Slave Nodes

STEP1: In Jenkins Dashboard Click on Manage Jenkins -> Manage Nodes

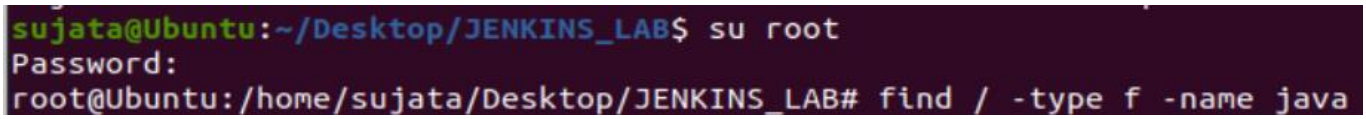


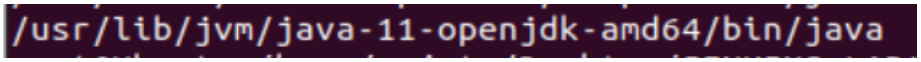
STEP 2: Select New Node and enter the name of the node in the Node Name field.

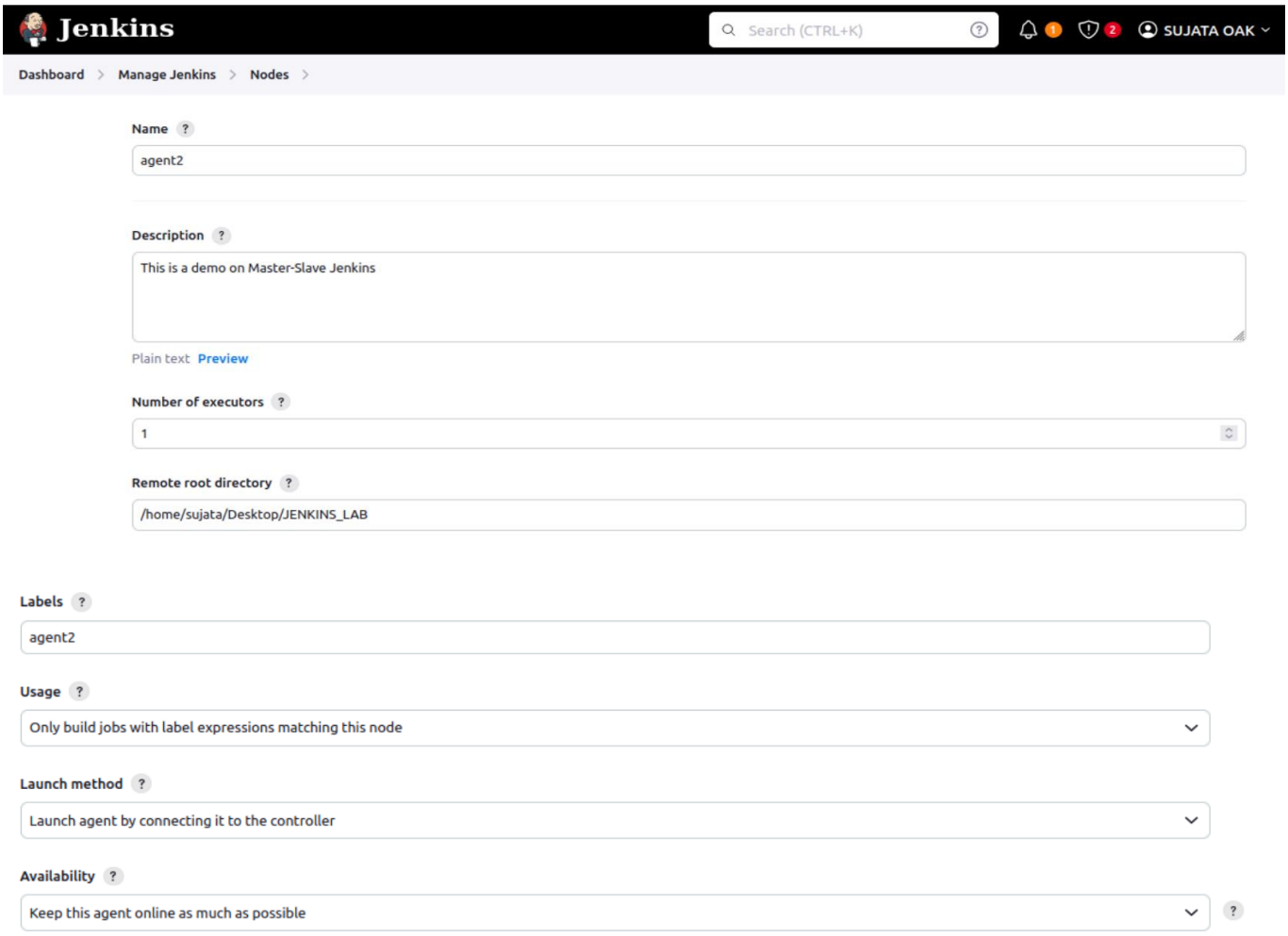
Select Permanent Agent and click the OK button. Initially, you will get only one option, "Permanent Agent." Once we have one or more slaves you will get the "Copy Existing Node" option. Click Create



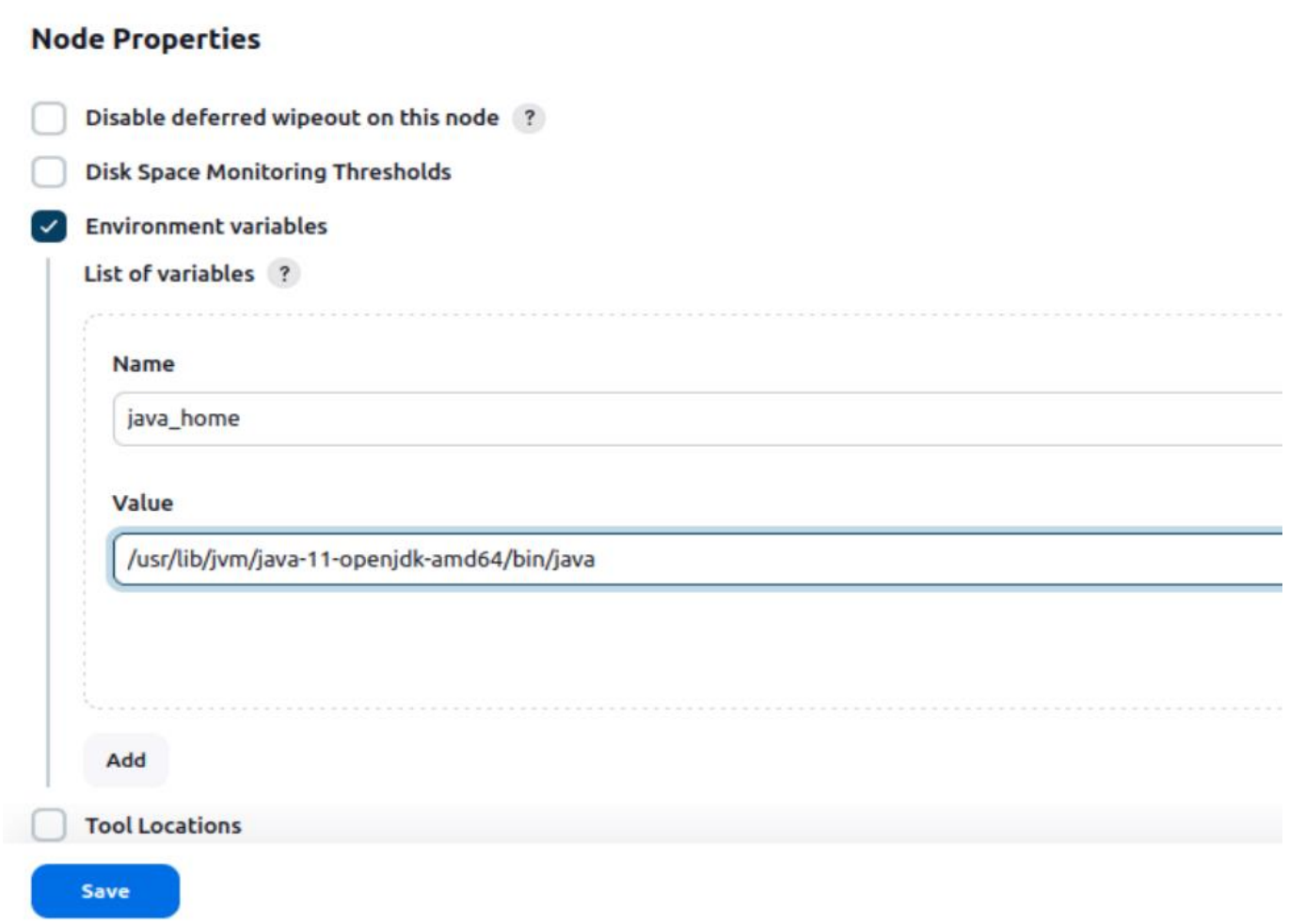
STEP3: Configure node with below details:

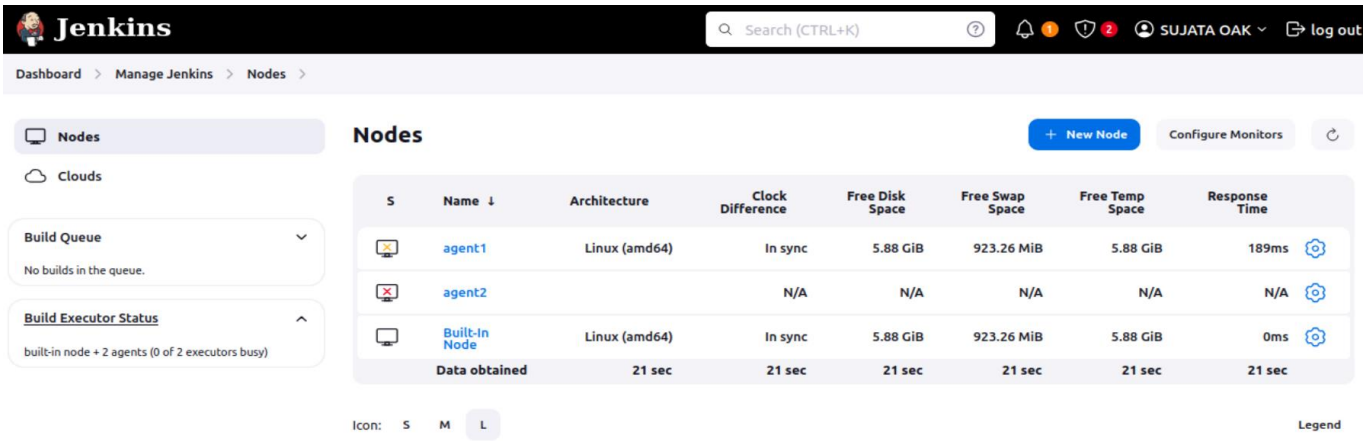






Under 'Node Properties', provide jdk path.


Node Properties
Disable deferred wipeout on this node
Disk Space Monitoring Thresholds
Environment variables
List of variables
Name
java_home
Value
/usr/lib/jvm/java-11-openjdk-amd64/bin/java
Add
Tool Locations
Save


Jenkins
Search (CTRL+K)
SUJATA OAK
log out
Dashboard
Manage Jenkins
Nodes
Nodes
Clouds
Build Queue
No builds in the queue.
Build Executor Status
built-in node + 2 agents (0 of 2 executors busy)
New Node
Configure Monitors
S
Name
Architecture
Clock Difference
Free Disk Space
Free Swap Space
Free Temp Space
Response Time
agent1
Linux (amd64)
In sync
5.88 GiB
923.26 MiB
5.88 GiB
189ms
agent2
N/A
N/A
N/A
N/A
N/A
Built-In Node
Linux (amd64)
In sync
5.88 GiB
923.26 MiB
5.88 GiB
0ms
Data obtained
21 sec
21 sec
21 sec
21 sec
21 sec
21 sec
Icon: S M L
Legend

STEP4: On click of 'Save' will display the below page with error message. Here Jenkins connect with Slave node using Java Web Start and it needs a port to establish the connection.

To configure JNLP port in global security. Now goto Manage Jenkins -> Security

This port has to be allowed to access across firewall, so from Master terminal run the below command,

sudo ufw allow 50000/tcp

This command will allow port 50000 to listen for request.

```
root@Ubuntu:/home/sujata/Desktop/JENKINS_LAB# sudo ufw allow 50000/tcp
Rule added
Rule added (v6)
```

STEP5: Again coming back to Jenkins and navigate to Nodes -> agent2 which will display two ways to connect with Agent node.

To establish connection, run the below command

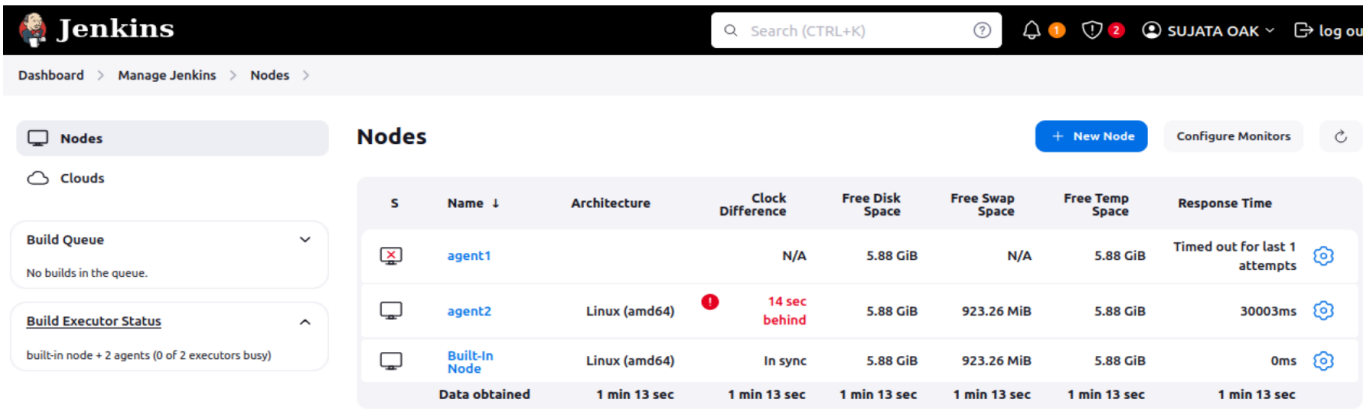
```
root@Ubuntu:/home/sujata/Desktop/JENKINS_LAB# curl -sO http://127.0.0.1:8080/jnlpJars/agent.jar
```

```
root@Ubuntu:/home/sujata/Desktop/JENKINS_LAB# java -jar agent.jar -url http://127.0.0.1:8080/ -secret cacd8d769874ea4f1a2a28392
ffe62d08addd0eeb0ea463cced99fa1f707fad0 -name agent2 -workDir "/home/sujata/Desktop/JENKINS_LAB"
```

OUTPUT:

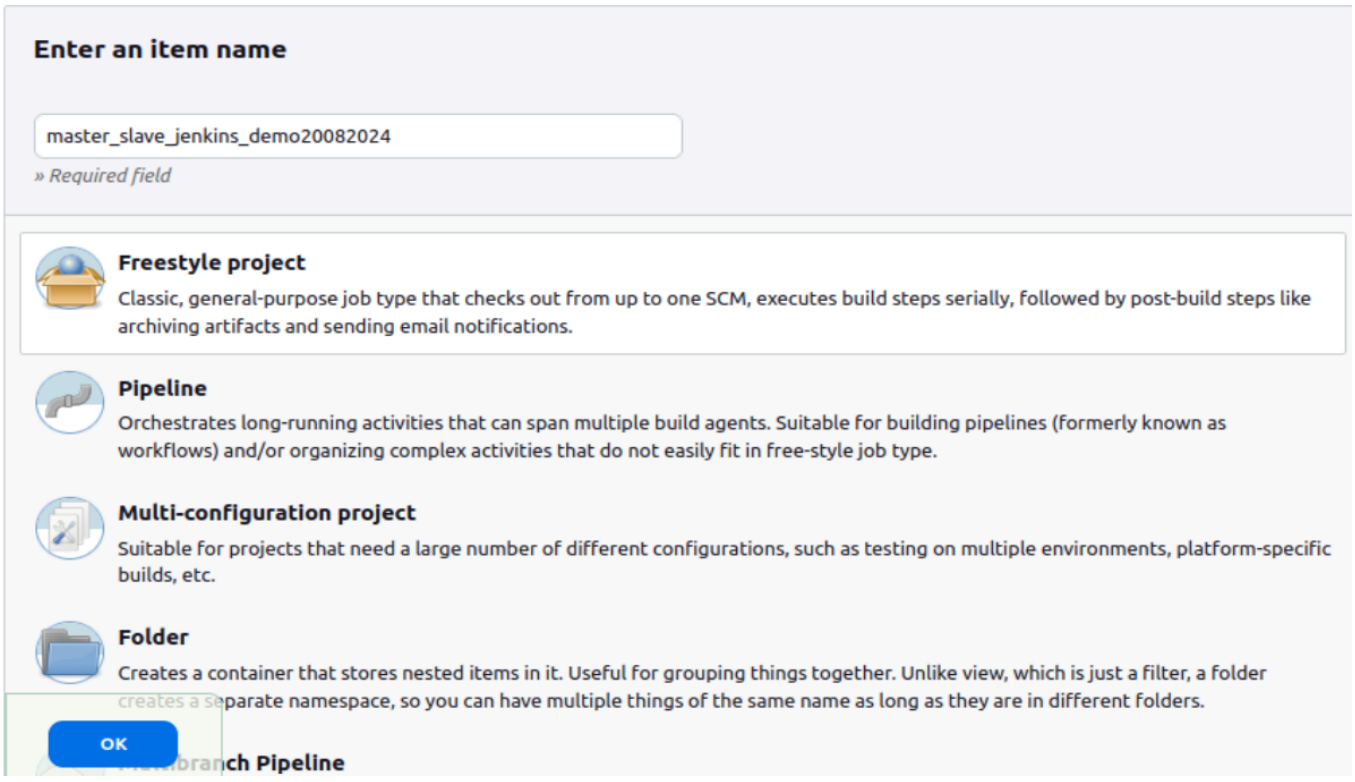
```
INFO: Both error and output logs will be printed to /home/sujata/Desktop/JENKINS_LAB/remoting
Aug 20, 2024 10:24:53 AM hudson.remoting.Launcher createEngine
INFO: Setting up agent: agent2
Aug 20, 2024 10:24:53 AM hudson.remoting.Engine startEngine
INFO: Using Remoting version: 3206.vb_15dcf73f6a_9
Aug 20, 2024 10:24:53 AM org.jenkinsci.remoting.engine.WorkDirManager initializeWorkDir
INFO: Using /home/sujata/Desktop/JENKINS_LAB/remoting as a remoting work directory
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Locating server among [http://127.0.0.1:8080/]
Aug 20, 2024 10:24:54 AM org.jenkinsci.remoting.engine.JnlpAgentEndpointResolver resolve
INFO: Remoting server accepts the following protocols: [JNLP4-connect, Ping]
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Agent discovery successful
  Agent address: 127.0.0.1
  Agent port:    50000
  Identity:      80:21:52:35:ca:60:ed:97:f1:2a:65:7a:50:b9:27:77
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Handshaking
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Connecting to 127.0.0.1:50000
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Server reports protocol JNLP4-connect-proxy not supported, skipping
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Trying protocol: JNLP4-connect
Aug 20, 2024 10:24:54 AM org.jenkinsci.remoting.protocol.impl.BIONetworkLayer$Reader run
INFO: Waiting for ProtocolStack to start.
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Remote identity confirmed: 80:21:52:35:ca:60:ed:97:f1:2a:65:7a:50:b9:27:77
Aug 20, 2024 10:24:54 AM hudson.remoting.Launcher$CuiListener status
INFO: Connected
```

This will establish connection with the configured Slave node.

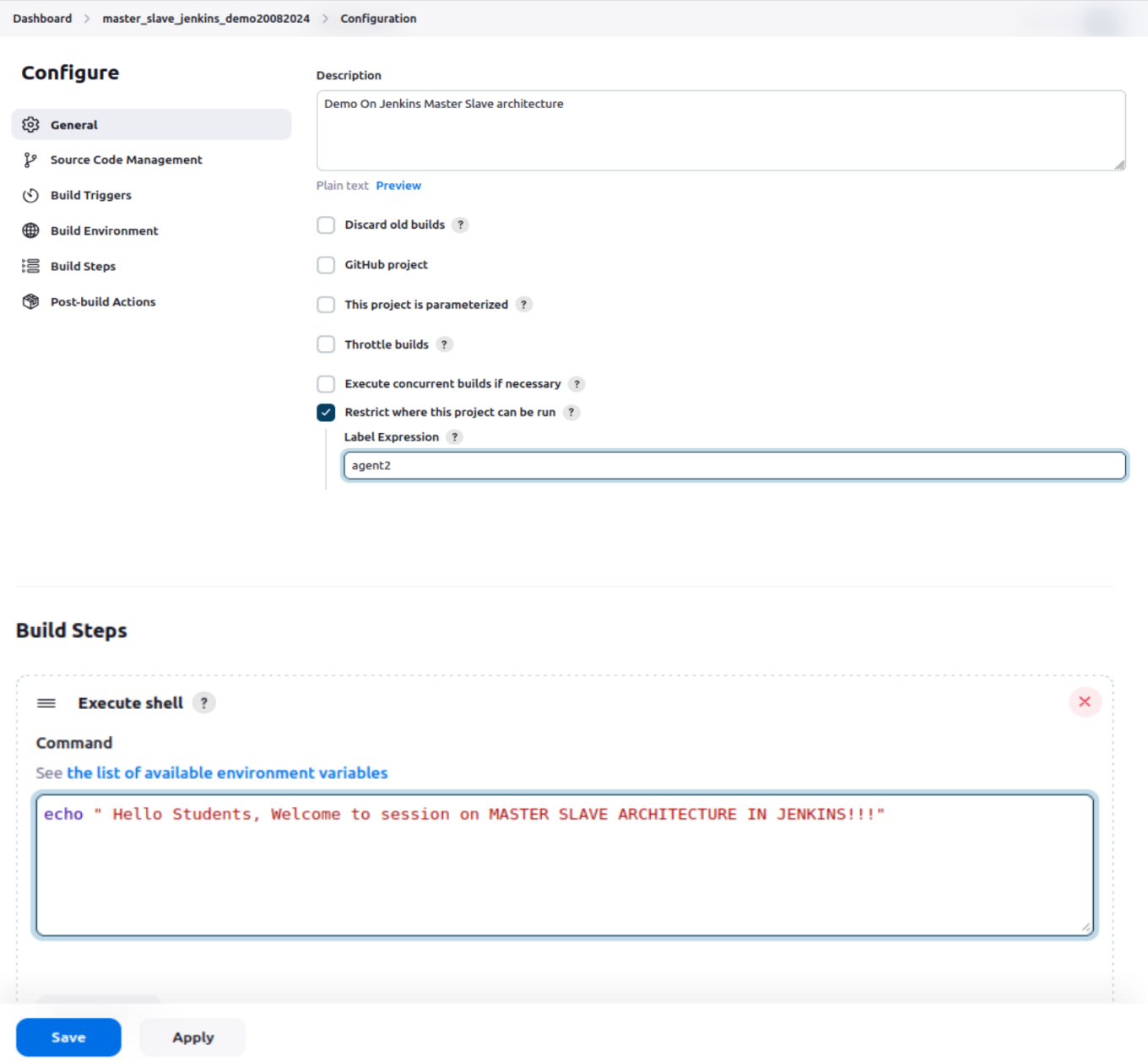


Now Jenkins Slave node is ready to run any job. This node's label name should be mentioned in the corresponding Job configuration as below:

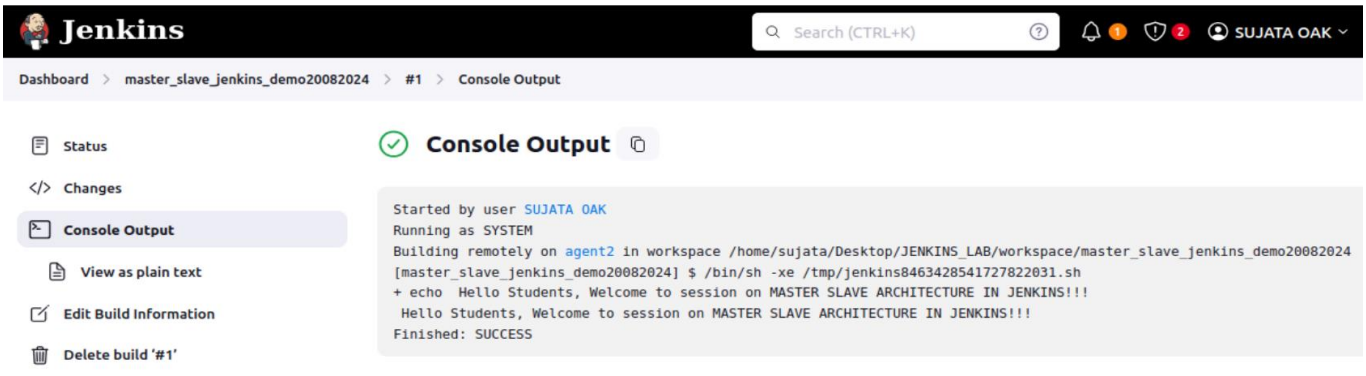
STEP 6: Create a New Job in Jenkins dashboard



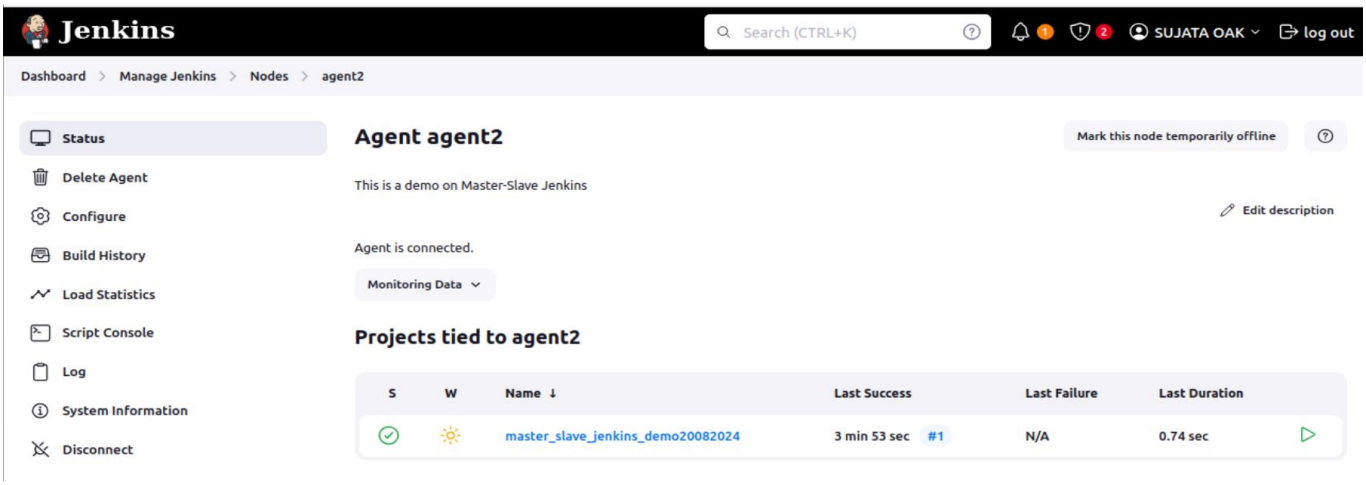
STEP 7: Configure the page with following:



Click on Build-Now, Console Output



STEP 8: Goto Jenkins Dashboard->Manage Jenkins->Nodes->agent2



Conclusion: This way we could connect with many machines as Slave nodes with different environment and execute our Jenkins jobs.