



# Vidyavardhini's College of Engineering and Technology

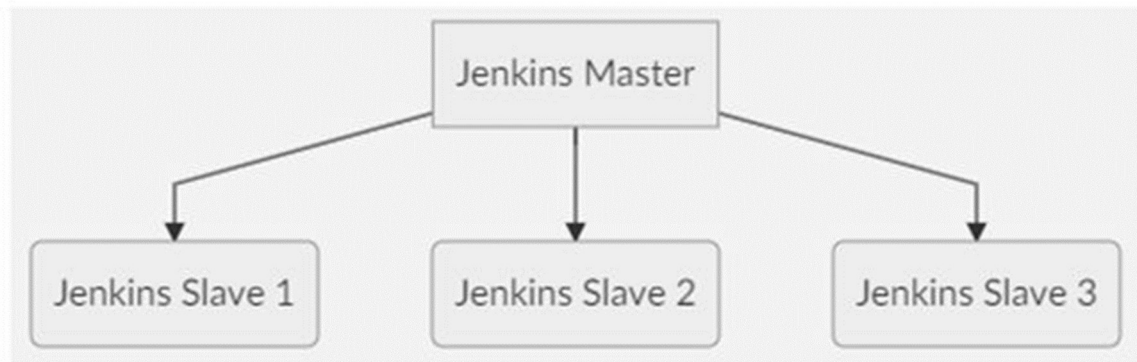
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**Aim: To understand Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.**

### Theory:

A Jenkins master comes with the basic installation of Jenkins, and in this configuration, the master handles all the tasks for your build system. You are working on multiple projects, you 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.

Jenkins Master and Slave Architecture



The Jenkins master acts to schedule the jobs, assign slaves, and send builds 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:

- Click on Manage Jenkins in the left corner on the Jenkins dashboard.
- Scroll down, Click on Manage Nodes and clouds.



- Select New Node and enter the name of the node in the Node Name field.



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Select **New Node** and enter the name of the node in the Node Name field.

The screenshot shows the Jenkins 'Nodes' page. On the left sidebar, 'New Node' is highlighted. The main area shows a form for adding a new node. The 'Node name' field is empty. Below it, the 'Permanent Agent' option is selected. A description for 'Permanent Agent' is provided: '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.'

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

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

S	Name	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time
	master	Windows 10 (amd64)	In sync	132.81 GB	5.12 GB	132.81 GB	
	Parallel_Agent_01		N/A	N/A	N/A	N/A	
Data obtained		6 min 4 sec	6 min 4 sec	6 min 4 sec	6 min 4 sec	6 min 4 sec	6 min 4

Refresh status

In the above screen shot, Parallel\_Agent\_01 was Created and currently it is in offline mode.

- Click on configure, Provide the details.
  - Name -Parallel\_Agent\_01.
  - Number of executors- 5.
  - Remote root directory-We have to provide a Jenkins path.
  - Labels-Parallel\_Agent.
  - Launch method-Launch agent by connecting it to the master.

	Parallel_Agent_01		N/A	N/A	N/A	N/A	
17 min		17 min	17 min	17 min	17 min	17 min	17

Refresh status

- Node Properties Tab:
  - Check Environment variables
  - Provide the Java path



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- Check Tool Locations

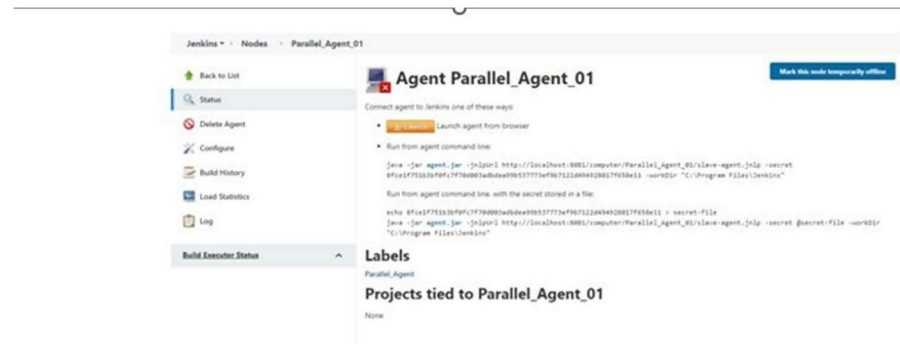
Provide the Git path and click on save button.

The screenshot shows the Jenkins Node Configuration page for 'Parallel\_Agent\_01'. The left sidebar contains links: Back to List, Status, Delete Agent, Configure (selected), Build History, Load Statistics, and Log. The main content area has fields for Name (Parallel\_Agent\_01), Description, # of executors (5), Remote root directory (C:\Program Files\Jenkins), Labels (Parallel\_Agent), Usage (Use this node as much as possible), Launch method (Launch agent by connecting it to the master), and checkboxes for Disable WorkDir, Custom WorkDir path, Internal data directory (remoting), and Fail if workspace is missing. Below these is the Availability dropdown set to 'Keep this agent online as much as possible'. The 'Node Properties' section has two checked options: 'Environment variables' and 'Tool Locations'. Under 'Environment variables', there is a list of variables with one entry: Name 'Java\_Home' and Value 'C:\Program Files\Java\jdk1.8.0\_171'. Under 'Tool Locations', there is a list of tool locations with one entry: Name '(Git) GIT\_HOME' and Home 'C:\Program Files\Git\bin\git.exe'. There are 'Add', 'Delete', and 'Save' buttons.

- Click on Go to the security configuration screen and change it. It will redirect to Configure Global Security → Agents > click on Fixed radio button port: 49187 and click on save Button. Go back to Nodes settings.



- We can see the screen,





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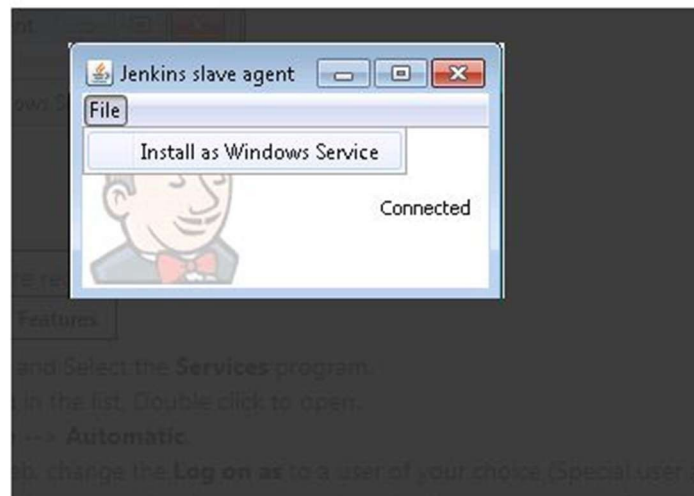
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- Click on Launch button, it will download the launch agent in your system.
- Jenkins-slave.exe file should copy in the Jenkins folder which you installed in your system.
- Double Click on jenkins - slave.exe.

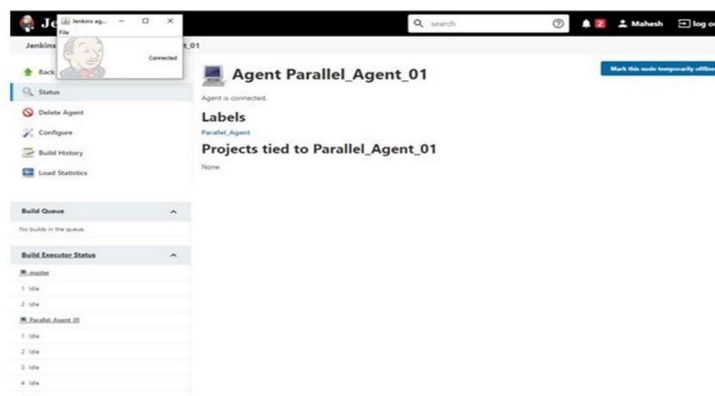
I Disk (C:) > Program Files > Jenkins

Name	Date modified	Type	Size
jenkins-slave.wrapper.log	08-02-2021 11:21	Text Document	2 KB
jenkins_agent.pid	08-02-2021 11:21	PID File	1 KB
jenkins-slave.err.log	08-02-2021 11:21	Text Document	0 KB
jenkins-slave.out.log	08-02-2021 11:21	Text Document	0 KB
jenkins-slave.exe	08-02-2021 11:20	Application	606 KB
jenkins-slave.xml	08-02-2021 11:20	XML Document	4 KB
slave.jar	08-02-2021 11:20	Executable Jar File	1,486 KB
slave-agent.jnlp	08-02-2021 11:19	JNLP File	1 KB
jenkins.err.log	08-02-2021 11:17	Text Document	8 KB
jenkins.out.log	08-02-2021 11:15	Text Document	1 KB
jenkins.wrapper.log	08-02-2021 11:15	Text Document	3 KB
jenkins.xml	08-02-2021 11:13	XML Document	3 KB
jenkins.exe.config	25-01-2021 17:08	XML Configuration...	1 KB
Jenkins.war	25-01-2021 17:06	WAR File	65,711 KB
jenkins.exe	25-01-2021 14:58	Application	606 KB
remoting	08-02-2021 11:20	File folder	

- Run the launch agent, click on the run button and it will show connected.



- In the screenshot below, we can see the connected popup, click on the file menu, select the install as service and click yes button. Once it is done, refresh the page.





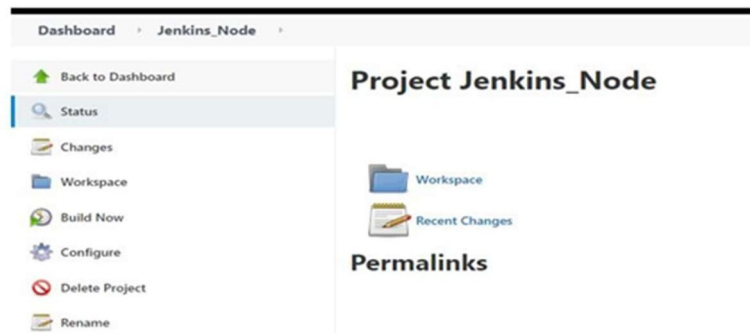
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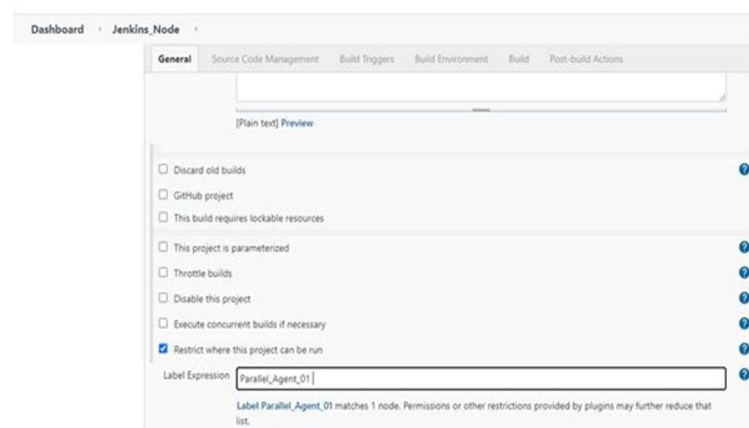
- we can see the Build executors. One is master and other is Parallel\_agent\_01

In Master node, we can see the number of executors as 2.

1. In Parallel\_agent\_01, we can see the number of executors as 5.
2. Go to build job -> configure.



3. In the General tab, check on Restrict where this project can be run.
4. In Label Expression, we have to select the node name where we need to execute the build job.



5. We can create more nodes as well.

### Conclusion:

#### Q1. How does Jenkins communicate between master and slave?

Jenkins communicates with slave nodes using the Java Network Launch Protocol (JNLP). The master initiates the connection and sends build tasks to the slaves, which then execute the tasks and report back the results to the master.

#### Q2. How many slaves can be connected to Jenkins master?

Jenkins can handle a large number of slave nodes connected to a single master. The exact limit depends on various factors such as system resources, network configuration, and workload. In practice, Jenkins can support hundreds or even thousands of slave nodes in large-scale distributed build environments.