



BHARATIYA VIDYA BHAVAN'S
SARDAR PATEL INSTITUTE OF TECHNOLOGY
MUNSHI NAGAR, ANDHERI (WEST), MUMBAI – 400 058.
(Autonomous College Affiliated to University of Mumbai)
MASTER OF COMPUTER APPLICATIONS

Class: F.Y.MCA

Semester: I AY2425

Subject: Software Engineering Lab

Subject In charge: Nikhita Mangaonkar

Course Code: MC503

ROLL NO.: 2024510001

BATCH: A

NAME: Atharva Vasant Angre

EXPERIMENT NO: 10

EXPERIMENT TITLE: Study of continuous Integration and development tools.

Objective:

1.To understand the use of CI/CD tools

Concepts:

Software Configuration Management- SCM is like a system that helps developers keep track of all the changes in their software, such as new features, bug fixes, or updates. It ensures everyone works on the correct version, avoids conflicts, and keeps a history of what changed and why. SCM also automates tasks like building and releasing software, making the development process smoother and more reliable.

A CI/CD pipeline is like an automated assembly line for software development. It helps developers build, test, and deliver software updates quickly and efficiently.

Continuous Integration (CI) - CI is a practice where developers frequently upload their code to a shared space, usually a repository like GitHub. Each time new code is added, automated tests and checks run to ensure everything works together correctly. This way, problems are caught early, making it faster and easier to fix them. It also encourages teamwork and avoids big integration issues later.

Continuous Deployment (CD) - CD takes CI one step further by automatically delivering tested changes directly to the live system (like a website or app). If the automated tests pass, the updates go live without manual intervention. This means users always get the latest features or fixes quickly, and developers can focus on creating new things instead of managing updates.

Jenkin and its Features - Jenkins is a popular tool that helps automate the process of building, testing, and deploying software.



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Environment Setup for Jenkins

Prerequisites

- **Java Installation:** Jenkins requires Java to run. Install Java Development Kit (JDK) version 8 or later.
- **System Requirements:** Jenkins can run on Windows, macOS, or Linux. Ensure the system meets basic memory and disk space requirements.

Features:

- **Pipeline Automation:** You can create a step-by-step process (pipeline) for your software, from testing to deployment.
- **Plugins:** Jenkins works with other tools like Git for version control or Docker for containerization.
- **Distributed Builds:** It can use multiple computers to speed up tasks like testing or building large software.
- **Notifications:** Alerts are sent when something goes wrong, so you can fix it quickly.
- **Web Interface:** Jenkins provides a user-friendly dashboard to manage tasks easily.
- **Cross-Platform:** Works on any system, including Windows, macOS, and Linux.



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Now update the OS. Command: `sudo apt-get update`

```
System load:  0.0          Processes:      97
Usage of /:   21.0% of 7.57GB    Users logged in: 0
Memory usage: 21%          IPv4 address for eth0: 172.31.34.8
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-34-8:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal InRelease
```

Add jenkins repository for ubuntu.

Command: `sudo wget -O /usr/share/keyrings/jenkins-keyring.asc \ https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key`

```
ubuntu@ip-172-31-34-8:~$ sudo wget -O /usr/share/keyrings/jenkins-keyring.asc \
> https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key
--2023-11-21 20:56:55-- https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key
Resolving pkg.jenkins.io (pkg.jenkins.io)... 146.75.38.133, 2a04:4e42:78::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|146.75.38.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3175 (3.1K) [application/pgp-keys]
Saving to: '/usr/share/keyrings/jenkins-keyring.asc'

/usr/share/keyrings/jenkins-k 100%[=====] 3.10K --.-KB/s
2023-11-21 20:56:55 (49.4 MB/s) - '/usr/share/keyrings/jenkins-keyring.asc' saved [3175/3175]
```



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Command: echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \

https://pkg.jenkins.io/debian-stable binary/ | sudo tee \

/etc/apt/sources.list.d/jenkins.list > /dev/null

```
ubuntu@ip-172-31-34-8:~$ echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \  
> https://pkg.jenkins.io/debian-stable binary/ | sudo tee \  
> /etc/apt/sources.list.d/jenkins.list > /dev/null  
ubuntu@ip-172-31-34-8:~$
```

Now run 'sudo apt-get update' to update the Jenkins repository

```
ubuntu@ip-172-31-34-8:~$ sudo apt-get update  
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal InRelease  
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease  
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease  
Ign:4 https://pkg.jenkins.io/debian-stable binary/ InRelease  
Get:5 https://pkg.jenkins.io/debian-stable binary/ Release [2044 B]  
Get:6 https://pkg.jenkins.io/debian-stable binary/ Release.gpg [833 B]  
Get:7 https://pkg.jenkins.io/debian-stable binary/ Packages [25.9 kB]  
Hit:8 http://security.ubuntu.com/ubuntu focal-security InRelease  
Fetched 28.8 kB in 4s (6840 B/s)  
Reading package lists... Done
```

Install JDK.

Command: sudo apt install fontconfig openjdk-17-jre

```
ubuntu@ip-172-31-34-8:~$ sudo apt install fontconfig openjdk-17-jre  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
fontconfig is already the newest version (2.13.1-2ubuntu3).  
openjdk-17-jre is already the newest version (17.0.8.1+1~us1-0ubuntu1~20.04).  
0 upgraded, 0 newly installed, 0 to remove and 21 not upgraded.  
1 not fully installed or removed.  
After this operation, 0 B of additional disk space will be used.  
Do you want to continue? [Y/n] y  
Setting up jenkins (2.426.1)
```




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Now install jenkins.

Command: sudo apt-get install jenkins -y

```
ubuntu@ip-172-31-34-8:~$ sudo apt-get install jenkins -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
jenkins is already the newest version (2.426.1).
0 upgraded, 0 newly installed, 0 to remove and 21 not upgraded.
ubuntu@ip-172-31-34-8:~$ |
```

Command:

Sudo systemctl enable jenkins && sudo systemctl start jenkins && sudo systemctl status jenkins

```
ubuntu@ip-172-31-34-8:~$ sudo systemctl enable jenkins
Synchronizing state of jenkins.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable jenkins
ubuntu@ip-172-31-34-8:~$ |

ubuntu@ip-172-31-34-8:~$ sudo systemctl start jenkins
ubuntu@ip-172-31-34-8:~$ sudo systemctl status jenkins
Unit jenkins.service could not be found.
ubuntu@ip-172-31-34-8:~$ sudo systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/lib/systemd/system/jenkins.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2023-11-21 21:11:10 UTC; 8min ago
     Main PID: 18372 (java)
        Tasks: 41 (limit: 1126)
      Memory: 316.4M
     CGroup: /system.slice/jenkins.service
             └─18372 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080

Nov 21 21:10:43 ip-172-31-34-8 jenkins[18372]: 89ad5fd159954738a8c5e911932adb4
Nov 21 21:10:43 ip-172-31-34-8 jenkins[18372]: This may also be found at: /var/lib/jenkins/secrets/initialAdminPassword
Nov 21 21:10:43 ip-172-31-34-8 jenkins[18372]: *****
Nov 21 21:10:43 ip-172-31-34-8 jenkins[18372]: *****
Nov 21 21:10:43 ip-172-31-34-8 jenkins[18372]: *****
Nov 21 21:11:10 ip-172-31-34-8 jenkins[18372]: 2023-11-21 21:11:10.772+0000 [id=31] INFO jenkins.InitReactorRunner$1#onAttained: Comp
Nov 21 21:11:10 ip-172-31-34-8 jenkins[18372]: 2023-11-21 21:11:10.803+0000 [id=24] INFO hudson.lifecycle.Lifecycle#onReady: Jenkins
Nov 21 21:11:10 ip-172-31-34-8 systemd[1]: Started Jenkins Continuous Integration Server.
Nov 21 21:11:10 ip-172-31-34-8 jenkins[18372]: 2023-11-21 21:11:10.957+0000 [id=47] INFO h.m.DownloadService$Downloadable#load: Obtai
Nov 21 21:11:10 ip-172-31-34-8 jenkins[18372]: 2023-11-21 21:11:10.958+0000 [id=47] INFO hudson.util.Retrier#start: Performed the act
lines 1-19/19 (END)
```



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Now set the java environment variable.

Command:

Update-alternatives --config java

Export JAVA_HOME=<your java path>

Echo \$JAVA_HOME

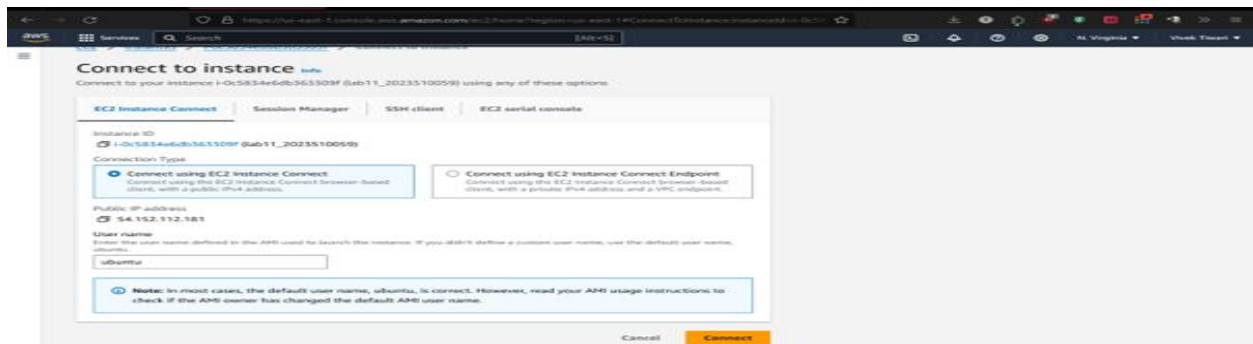
Copy the java path.

```
ubuntu@ip-172-31-35-202:~$ update-alternatives --config java
There are 2 choices for the alternative java (providing /usr/bin/java).

  Selection    Path                                          Priority  Status
  ----
*  0            /usr/lib/jvm/java-21-openjdk-amd64/bin/java  2111     auto mode
    1            /usr/lib/jvm/java-17-openjdk-amd64/bin/java  1711     manual mode
    2            /usr/lib/jvm/java-21-openjdk-amd64/bin/java  2111     manual mode

Press <enter> to keep the current choice[*], or type selection number:
ubuntu@ip-172-31-35-202:~$ export JAVA_HOME=/usr/lib/jvm/java-21-openjdk-amd64
ubuntu@ip-172-31-35-202:~$ echo $JAVA_HOME
/usr/lib/jvm/java-21-openjdk-amd64
```

Now copy the IP address mentioned under the ec2 connect tab





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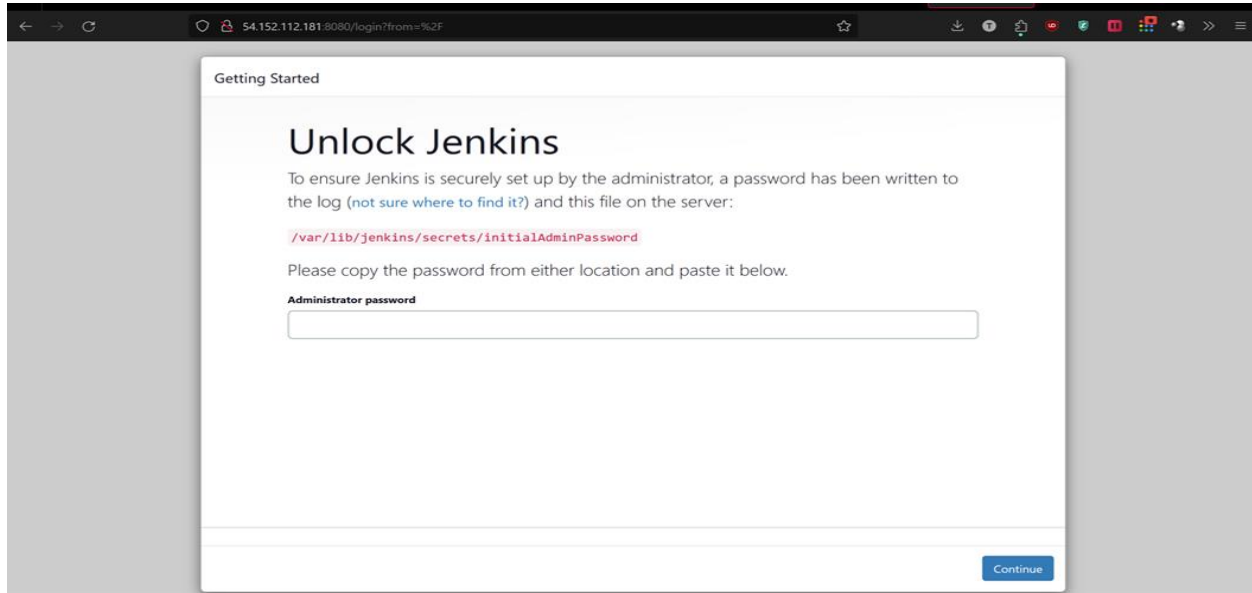
Semester: I AY2425

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Ip address:8080 to open the jenkins dashboard



Command: sudo cat <jenkins path>

To obtain the password

```
ubuntu@ip-172-31-34-8:~$ sudo cat /var/lib/jenkins/secrets/initialAdminPassword
88247564150657758a8c5f0118224d1d4
ubuntu@ip-172-31-34-8:~$
```



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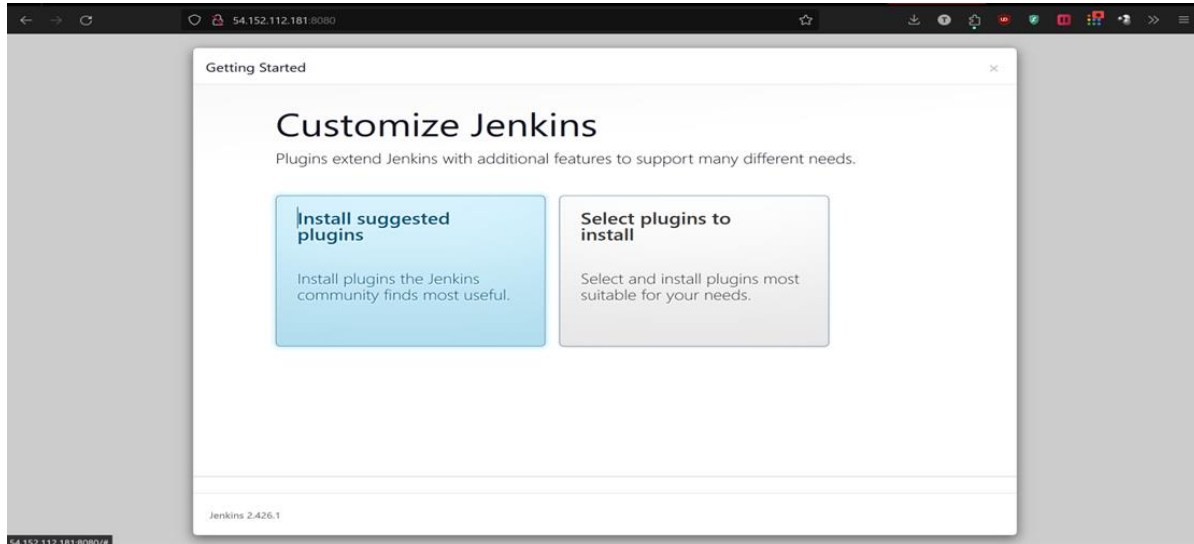
Semester: I AY2425

Subject: Software Engineering Lab

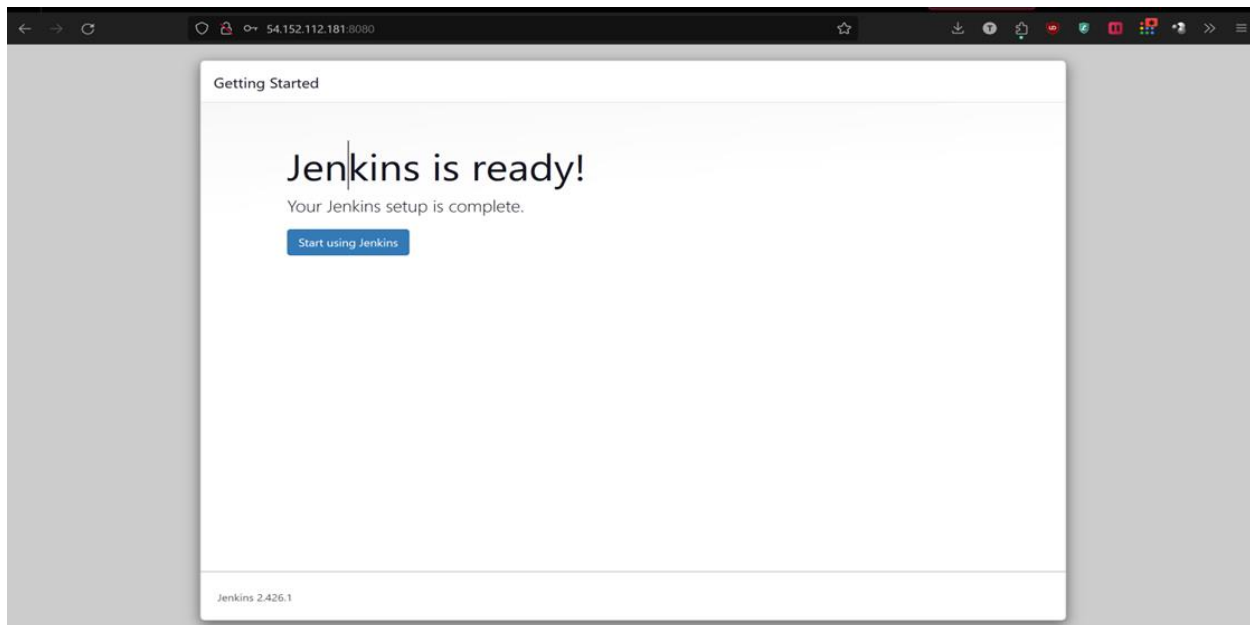
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Now install all the suggested plugins



Now create a user, this will be used to login to jenkins dashboard





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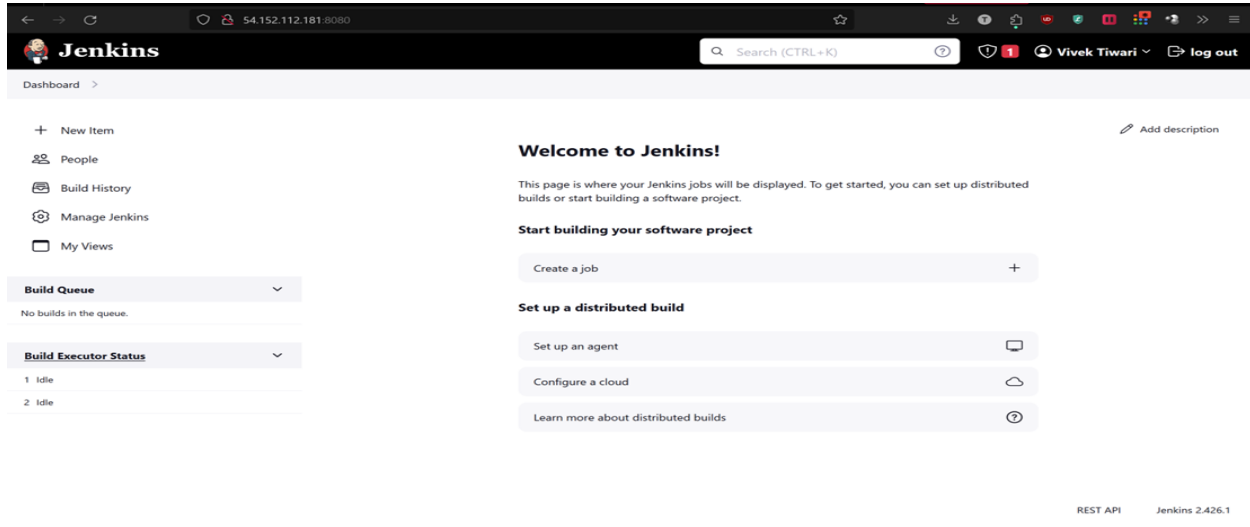
Semester: I AY2425

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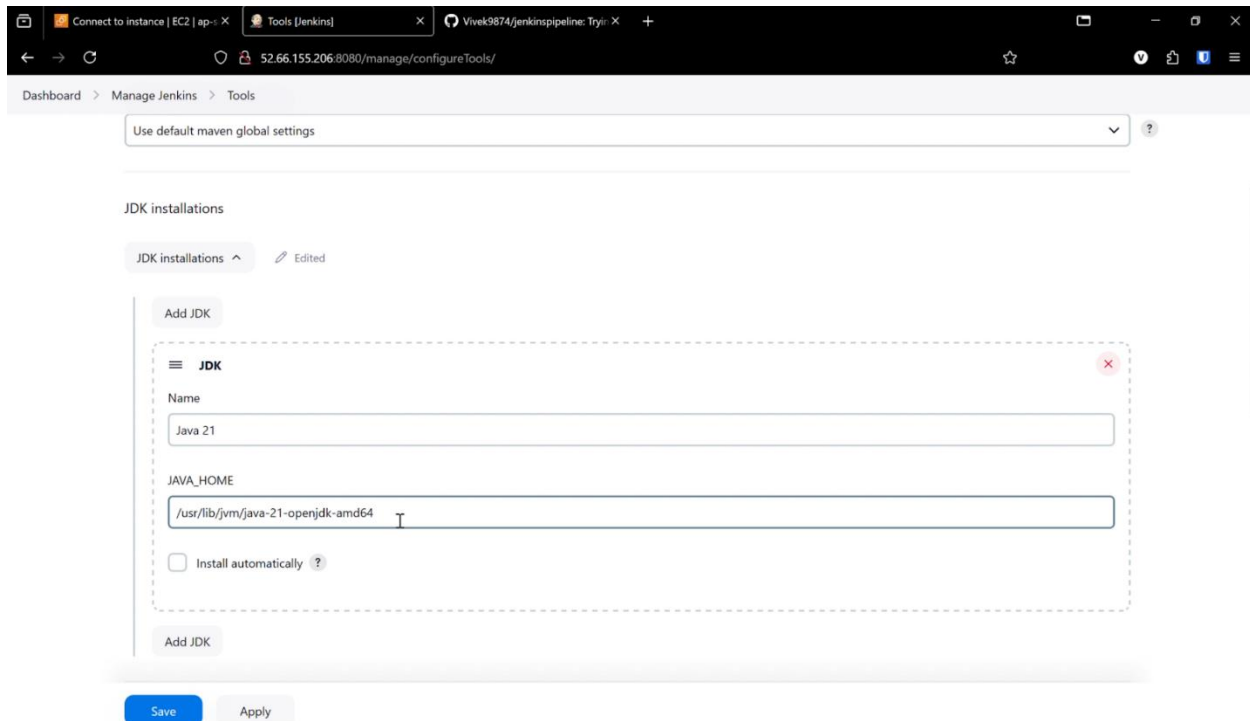
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Log in using the credentials



Now go to manage jenkins and paste the java environment variable path in jdk.





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Now create a freestyle project & Enter a description

The image shows two screenshots of the Jenkins web interface. The top screenshot is the 'New Item' page. It has a header with the Jenkins logo, a search bar, and user information. Below the header, there's a breadcrumb trail: Dashboard > All > New Item. The main section is titled 'New Item'. It asks to 'Enter an item name' with a text box containing 'JavaPipeline'. Below that, it says 'Select an item type' and lists four options: 'Freestyle project' (selected), 'Maven project', 'Pipeline', and 'Multi-configuration project'. Each option has a brief description. At the bottom, there's a 'Folder' option and an 'OK' button. The bottom screenshot is the 'Configuration' page for the 'JavaPipeline' item. It has a similar header and breadcrumb trail: Dashboard > JavaPipeline > Configuration. The left sidebar shows a list of configuration sections: General (selected), Source Code Management, Build Triggers, Build Environment, Build Steps, and Post-build Actions. The main section is titled 'General' and has a toggle switch for 'Enabled' which is turned on. Below this, there's a 'Description' text area. At the bottom, there are checkboxes for 'Discard old builds', 'GitHub project', 'This project is parameterized', 'Throttle builds', and 'Execute concurrent builds if necessary'. There's also an 'Advanced' dropdown menu and 'Save' and 'Apply' buttons.



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Under source code management, select git. Provide the URL of your **public** repository. Specify the branch name too

Dashboard > JavaPipeline > Configuration

Configure

General

Source Code Management

Build Triggers

Build Environment

Build Steps

Post-build Actions

☐ Execute concurrent builds if necessary ?

Advanced ▾

Source Code Management

☐ None

☒ Git ?

Repositories ?

Repository URL ?

https://github.com/Vivek9874/jenkinspipeline.git

Please enter Git repository.

Credentials ?

- none - ▾

+ Add ▾

Connect to instance | EC2 | ap-... x

JavaPipeline Config [Jenkins] x

Vivek9874/jenkinspipeline: Try... x

+

← → ↻

🔒 52.66.155.206:8080/job/JavaPipeline/configure

☆ 🔔 ⓘ 🌐 ☰

Dashboard > JavaPipeline > Configuration

Configure

General

Source Code Management

Build Triggers

Build Environment

Build Steps

Post-build Actions

- none - ▾

+ Add ▾

Advanced ▾

Add Repository

Branches to build ?

Branch Specifier (blank for 'any') ?

*/main

Add Branch



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Dashboard > JavaPipeline > Configuration

Configure

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

Repository browser ?
(Auto) v

Additional Behaviours
Add v

Build Triggers

- ☐ Trigger builds remotely (e.g., from scripts) ?
- ☐ Build after other projects are built ?
- ☐ Build periodically ?
- ☐ GitHub Branches
- ☐ GitHub Pull Requests ?
- ☒ GitHub hook trigger for GITScm polling ?
- ☐ Poll SCM ?

Under Build environment, select execute shell

Dashboard > JavaPipeline > Configuration

Configure

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

☐ Poll SCM ?

Build Environment

- ☐ Delete workspace before build starts
- Filter
- Execute Windows batch command
- Execute shell**
- GitHub PR: set 'pending' status
- Invoke Ant
- Invoke Gradle script
- Invoke top-level Maven targets
- Run with timeout
- Set build status to "pending" on GitHub commit
- Add build step ^

Post-build Actions

Add post-build action v

Save Apply



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Enter shell commands to execute your java code.

Dashboard > JavaPipeline > Configuration

Configure

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

Execute shell ?
Command
[See the list of available environment variables](#)

```
javac hello.java  
java hello.java
```

Advanced ▾

Add build step ▾

Post-build Actions

Add post-build action ▾

Save Apply

Now save and build the project.

Dashboard >

+ New Item

- Build History
- Manage Jenkins
- My Views

Build Queue

No builds in the queue.

Build Executor Status

- JavaPipeline #1
- Idle

S	W	Name	Last Success	Last Failure	Last Duration
✓	☁	getJava	11 hr #7	12 hr #3	3.6 sec
✓	☀	getPipe	12 hr #1	N/A	4.4 sec
☹	☀	JavaPipeline	N/A	N/A	N/A

Icon: S M L



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You'll be able to see the output of your java code in the console output

The screenshot shows the Jenkins web interface. The browser address bar displays the URL `52.66.155.206:8080/job/JavaPipeline/1/console`. The page title is "Vivek9874/jenkinspipeline: Tr". The left sidebar contains a "Console Output" tab, which is selected. The main content area shows the console output for the build. The output text is as follows:

```
> started by user vivek iwar1
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/JavaPipeline
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://github.com/Vivek9874/jenkinspipeline.git
> git init /var/lib/jenkins/workspace/JavaPipeline # timeout=10
Fetching upstream changes from https://github.com/Vivek9874/jenkinspipeline.git
> git --version # timeout=10
> git --version # 'git version 2.43.0'
> git fetch --tags --force --progress -- https://github.com/Vivek9874/jenkinspipeline.git +refs/heads/*:refs/remotes/origin/* #
timeout=10
> git config remote.origin.url https://github.com/Vivek9874/jenkinspipeline.git # timeout=10
> git config --add remote.origin.fetch +refs/heads/*:refs/remotes/origin/* # timeout=10
Avoid second fetch
> git rev-parse refs/remotes/origin/main^{commit} # timeout=10
Checking out Revision 07256f7e27936212c66636ae6c1213335da1b24c (refs/remotes/origin/main)
> git config core.sparsecheckout # timeout=10
> git checkout -f 07256f7e27936212c66636ae6c1213335da1b24c # timeout=10
Commit message: "Update hello.java"
First time build. Skipping changelog.
[JavaPipeline] $ /bin/sh -xe /tmp/jenkins1925291252347522312.sh
+ javac hello.java
+ java hello.java
Hello Jenkins. Vivek here. Webhooks are enabled!
Finished: SUCCESS
```