Project Report

on

Deployment Of CI/CD Pipeline on Cloud

Submitted in partial fulfilment for the award of

Post Graduate Diploma in High Performance Computing System Administration from **C-DAC ACTS (Pune)**

Under the Guidance of

Mr. Ashutosh Das

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Shivshankar Gadeodhe	**PRN: 230340127034**
Akshay Gaikwad	**PRN: 230340127035**
Trupti Kokane	**PRN: 230340127052**

CERTIFICATE

TO WHOMSOEVER IT MAY CONCERN

This is to certify that

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have successfully completed their project on

Deployment of CI/CD pipeline on cloud.

Under the Guidance of Mr. Ashutosh Das

Project Guide **Project Supervisor**

HOD ACTS

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1. ABSTRACT

Continuous Integration and Continuous Delivery (CI CD) pipeline approach has increased the efficiency of projects. In this project, the CI/CD pipeline is used to automate the deployment process, to ensure faster delivery, higher quality, and increased productivity. The pipeline typically involves four stages: source, build, test, and deployment. The deployment stage involves deploying the built application to the target environment, such as a cloud server or container, and include infrastructure provisioning, configuration, and containerization using technologies like Docker.

Jenkins is used to build and deploy applications in the CI/CD pipeline. A CI/CD pipeline supports continuous deployment, reducing the risk of integration issues and enabling faster bug detection. Docker xCAT image deployment can be used to deploy HPC applications in future enhancement.

2. OVERVIEW OF THE PROJECT

Project Scope and Objectives: The primary objective of the project is to implement a robust CI/CD pipeline that automates the software deployment process. This automation aims to expedite delivery, maintain high software quality, and boost efficiency. The pipeline comprises source code management, build automation, testing, and deployment stages.

CI/CD Pipeline Stages:

1. **Source Stage:** This is where the source code is stored in a version control system (e.g., Git). Changes made to the codebase trigger the pipeline to start.
2. **Build Stage:** The CI server (in your case, Jenkins) pulls the code from the repository and compiles it. This stage also includes any necessary pre-processing, such as compiling assets or bundling dependencies.
3. **Test Stage:** Automated tests are executed to ensure the code is functioning as expected. This stage includes unit tests, integration tests, and potentially other testing types like security or performance testing.
4. **Deployment Stage:** The built and tested application is deployed to the target environment, which could be a cloud server or a container. This step involves infrastructure provisioning, configuration, and containerization using Docker.

Benefits of CI/CD Pipeline:

- **Faster Delivery:** Automation streamlines the deployment process, reducing manual intervention and speeding up delivery times.
- **Higher Quality:** Automated tests catch bugs and issues early, enhancing software quality and stability.
- **Increased Productivity:** Developers spend less time on manual deployment tasks, allowing them to focus on coding.
- **Reduced Integration Issues:** Continuous integration minimizes integration issues by frequently merging changes into the main codebase.
- **Continuous Deployment Support:** The pipeline facilitates continuous deployment, allowing rapid, automated releases when code changes are ready.

Future Enhancements': Docker xCAT Image Deployment: In future iterations, enhancing the project to deploy HPC (High-Performance Computing) applications using Docker xCAT images could significantly benefit scientific and computational workload.

3. Deployment of CI/CD pipeline on cloud

A Jenkins CI/CD pipeline is a set of automated processes within the Jenkins continuous integration server that helps developers build, test, and deploy their code efficiently. Here is a simplified breakdown of how it works:

1. Code Push: When a developer pushes code to a version control repository (e.g., Git), Jenkins is triggered to start the pipeline.

2. Build: Jenkins pulls the latest code from the repository and compiles/builds the codebase. This step ensures that the code is syntactically correct and can be executed.

3. Automated Testing: After the build, the pipeline runs automated tests, such as unit tests, integration tests, and regression tests. These tests verify that the code functions as expected and has not introduced any regressions.

4. Code Analysis: Jenkins may perform static code analysis to identify coding issues, vulnerabilities, or coding style violations.

5. Deployment: If all tests pass and the code analysis are satisfactory, Jenkins deploys the code to a specified environment, such as a cloud server.

6. Additional Testing: More thorough testing may be performed in the staging environment to simulate real-world usage and identify any issues that weren't caught during earlier stages.

7. Final Deployment: Once the code has successfully passed through the various stages and received approval, Jenkins deploys it to the production environment.

The beauty of Jenkins pipelines lies in their configurability and automation. Developers can define the exact steps, tests, and environments their code goes through, reducing manual intervention and ensuring a consistent and reliable deployment process.

Jenkins declarative CI/CD pipeline using following tools:

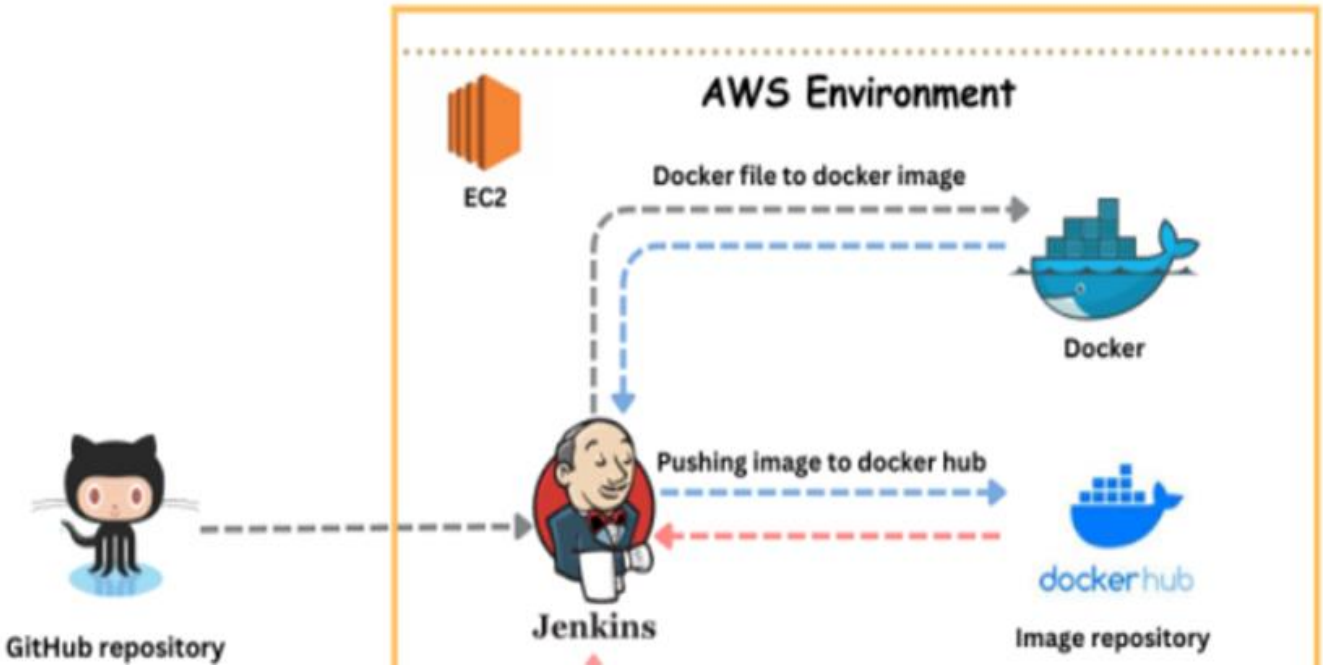
1. GitHub - Code repository
2. Docker - Build tool

3. Docker HUB- Build/image repository

4. AWS EC2 instance

5. Jenkins - to automate the entire pipeline

6.Tomcat server



Containerized Web-based Application created using CI/CD declarative pipeline through Jenkins.
Implemented an automated CI/CD pipeline for web application by developing a Git Workflow that seamlessly triggers code built for every commit made to the master branch.
Leveraged GitHub, EC2, Docker, Jenkins, Docker Hub to successfully build and automate the deployment process

4. System Requirement

Cloud Provider Account: We need an account with a chosen cloud provider (AWS, Azure, GCP, etc.) to access their services and resources.

Version Control System: Version control system (e.g., Git) and a repository to manage the codebase.

CI/CD Tool: The CI/CD tool meets the project's needs and is compatible with the chosen cloud provider. Checked the system requirements of the tool and ensured it’s properly configured.

Source Code: The source code should be organized and stored in a way that's compatible with CI/CD tool's requirements.

Build Environment: Depending on application's technology stack, might need specific tools and dependencies to build applications. This could include compilers, libraries, and other software components.

Virtual Machines or Containers: This CI/CD pipeline requires virtual machines and containers to run build and test processes. Make sure you have the appropriate resources available for this.

Network Connectivity: A stable and reliable internet connection is essential for interacting with cloud services and for enabling CI/CD pipeline to access code repositories and external resources.

Tomcat server: Ensure Tomcat server configuration to display web pages.

Backup and Recovery Plan: Can have a plan in place for backing up CI/CD pipeline configurations and code repositories. This helps in case of accidental data loss or system failures.

Scaling Considerations: If the project grows, there are future enhancements considered while implementing this project.

Documentation: Documentation is done w.r.to the setup and configuration of your CI/CD pipeline, including any environment variables, dependencies, and configuration settings.

Budget and Cost Management: This project is developed considering the costs associated with cloud services.

4.1. Software Requirement

Version Control System:

Git: A distributed version control system used to manage your source code.

CI/CD Tools:

Jenkins: An open-source automation server that orchestrates the entire CI/CD process.

GitHub CI/CD: Built-in CI/CD functionality provided by GitHub, covering the entire software development lifecycle.

Build Tools:

Docker: A platform for developing, shipping, and running applications in containers.

EC2 instance: Instances for execution on AWS Cloud Formation.

Scripting Languages: Python is used for scripting automation tasks within your CI/CD pipeline.

AWS CLI: Command-line interface for managing AWS resources.

PyCharm: PyCharm provides smart code completion, code inspections, on-the-fly error highlighting and quick-fixes, along with automated code refactoring's and rich navigation capabilities.

4.2 Hardware Requirement

Compute Resources:

Virtual Machines: Choose the appropriate instance types based on the workload requirements of your CI/CD pipeline. These might include factors like CPU, memory, and storage capacity.

Networking:

Network Bandwidth: Make sure your cloud instances or containers have adequate network bandwidth for fetching code from repositories, pushing build artifacts, and communicating with external services.

Storage:

Disk Space: Allocate sufficient disk space to store code repositories, build artifacts, logs, and other data generated during the CI/CD process

4.3 User Interface

Jenkins:

Jenkins is a widely used open-source automation server. Its UI can be accessed through a web browser. Allows to configure and manage jobs (pipelines) through this interface. The UI allows to create new jobs, specify source code repositories, define build steps, configure triggers, set up integrations, and monitor job execution and logs.

GitHub CI/CD:

GitHub is used for version control to include its CI/CD functionality into the platform. The UI allows to configure CI/CD pipelines directly within GitHub repository. The UI shows pipeline status, logs, and artifacts.

AWS:

AWS provides a comprehensive suite of services for CI/CD. Its UI allows to set up pipelines by configuring build and release definitions. We can define triggers, configure source repositories, specify build steps, set up testing, and manage deployment stages. The UI also provides insights into builds, tests, and deployments.

The general process of configuring a CI/CD pipeline through these interfaces involves:

Defining a pipeline or job.

Connecting to version control repository.

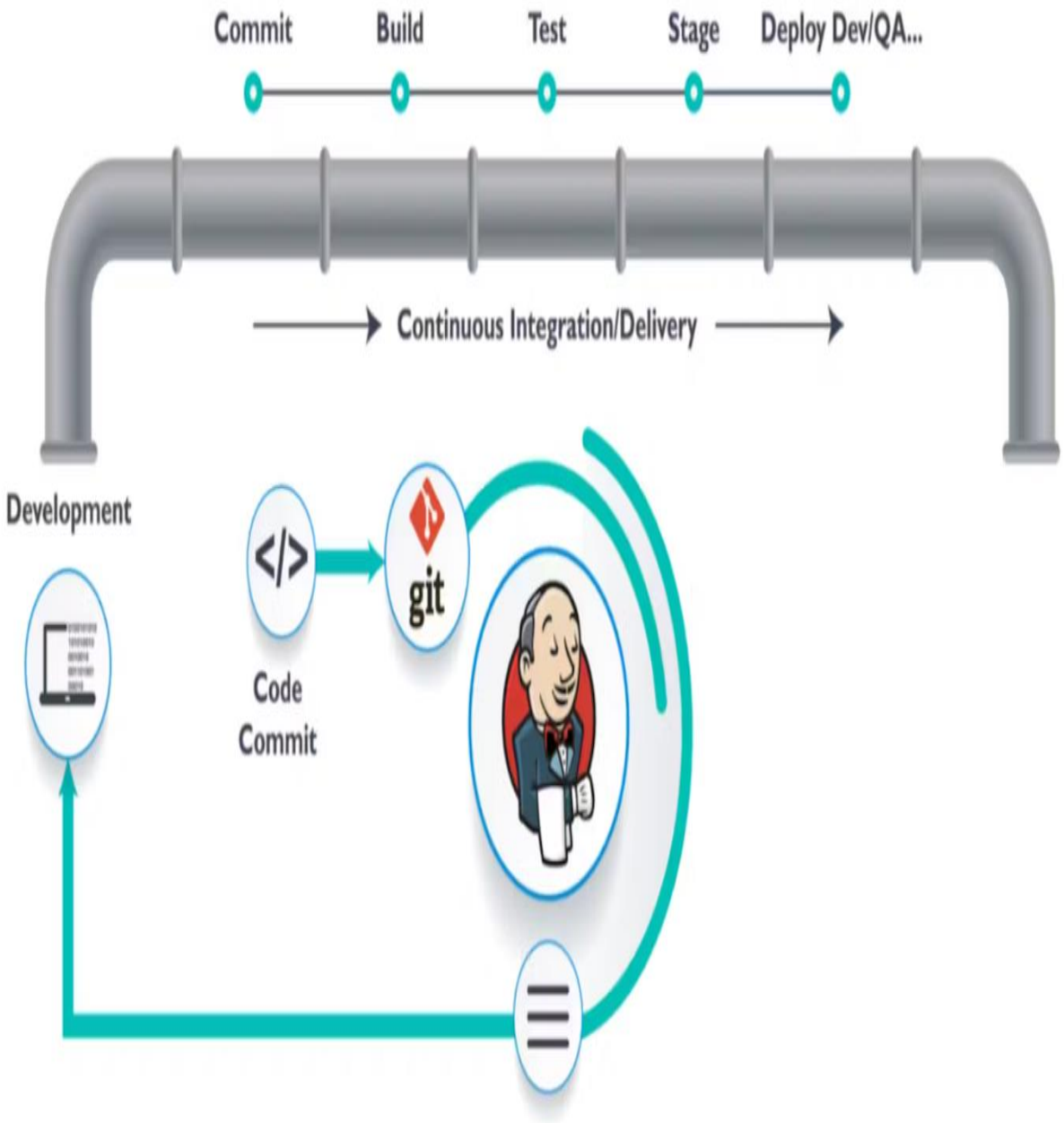
Specifying build and deployment steps.

Configuring triggers (manual, or scheduled).

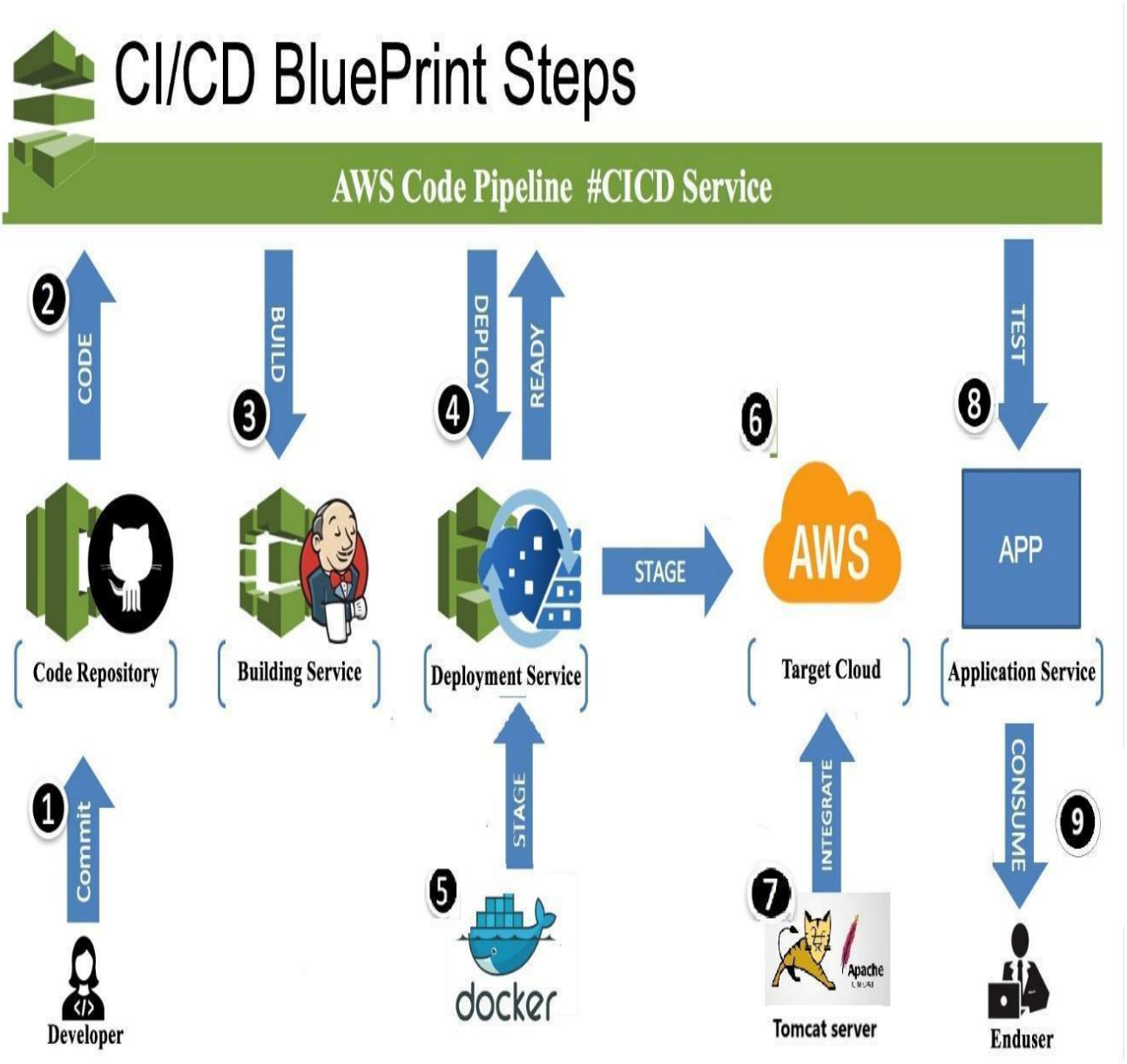
Setting environment variables and configurations.

5. System Architecture

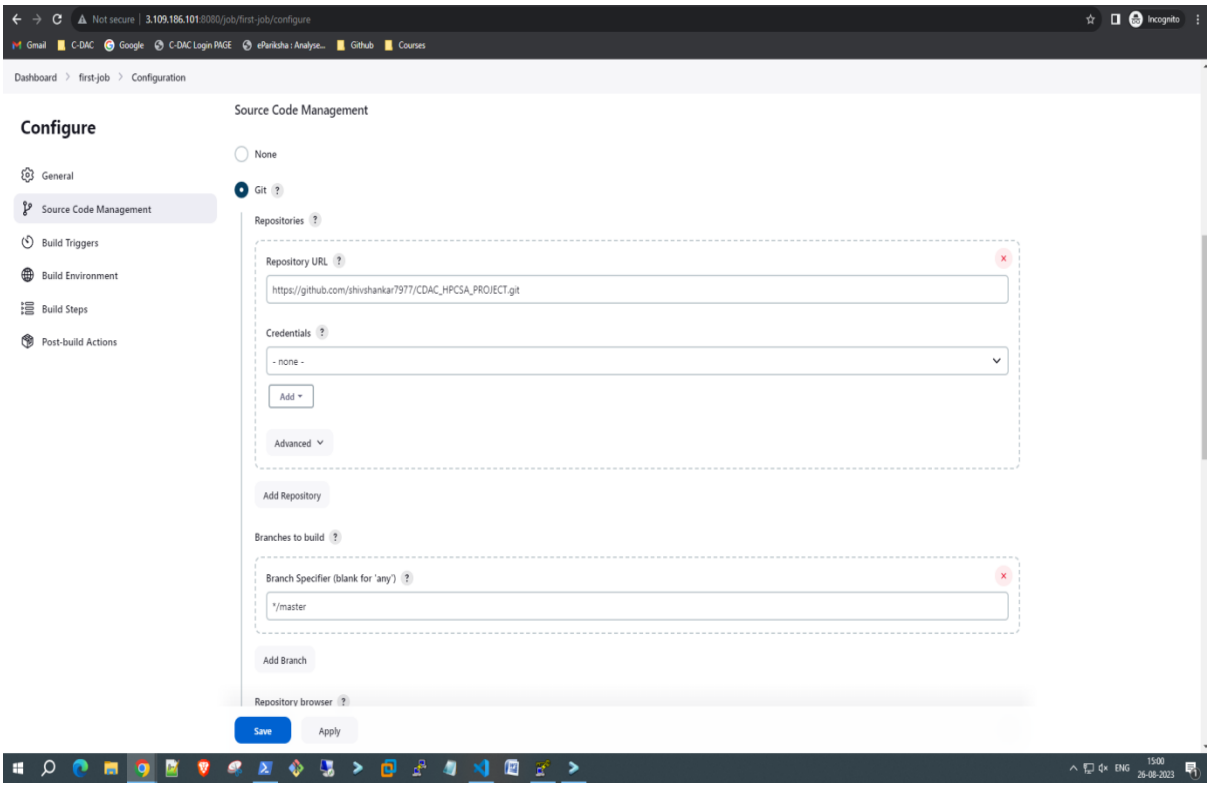
5.1 Data Flow Diagram

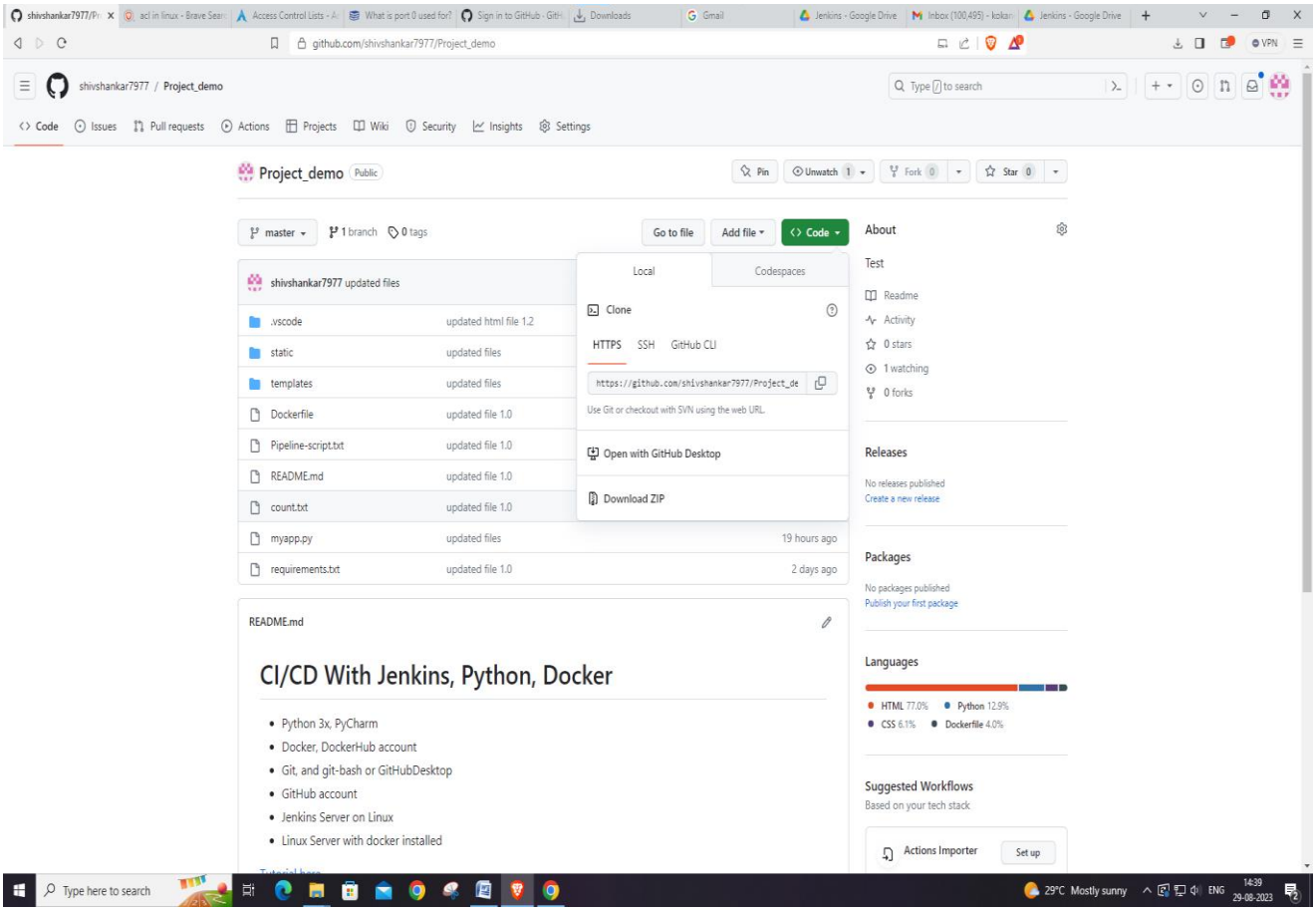


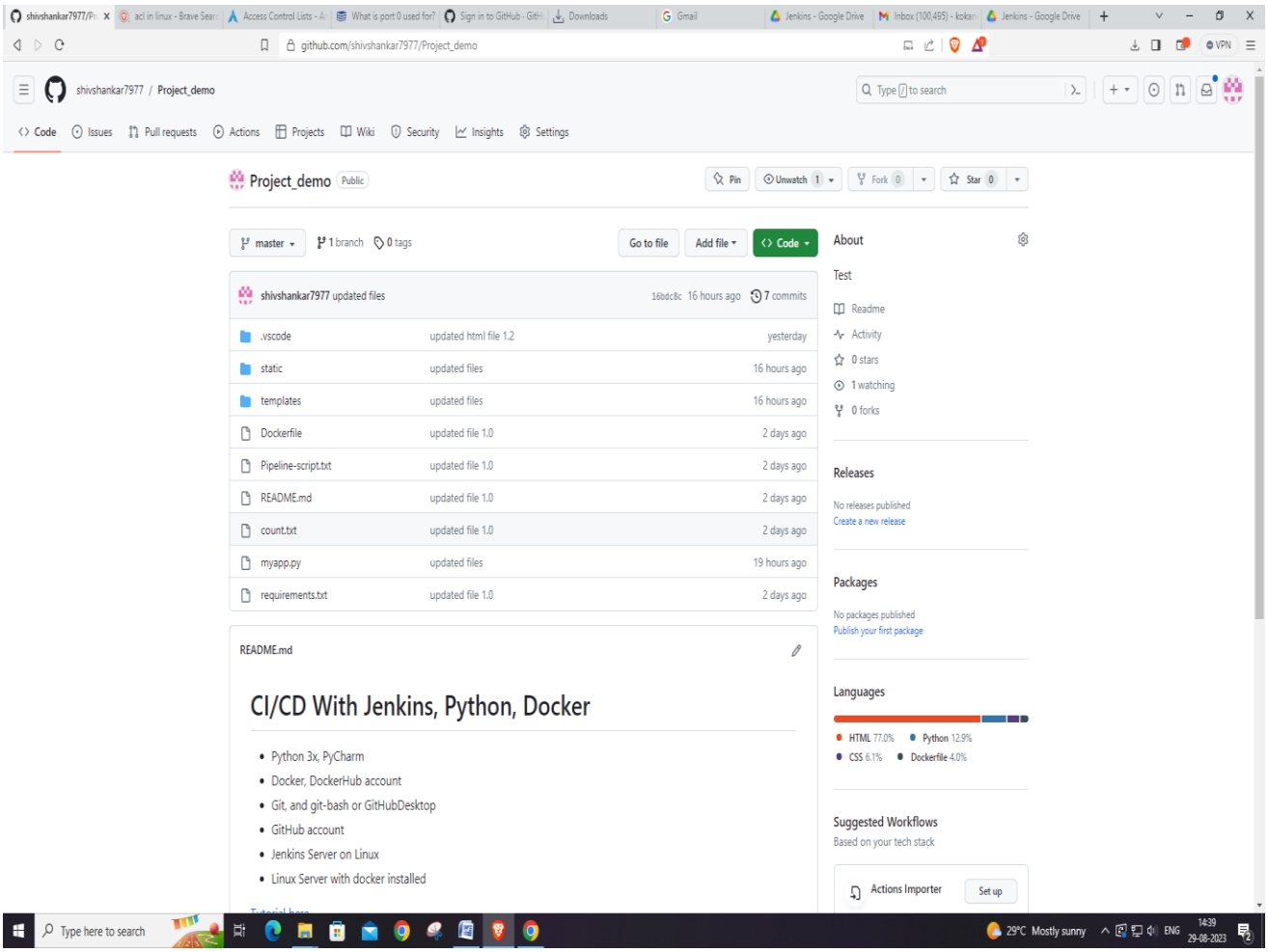
5.2 Activity Diagram



6. Introduction to Repository






github.com/shivshankar7977/Project_demo
shivshankar7977 / Project_demo
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
Project_demo
Public
Pin
Unwatch 1
Fork 0
Star 0
master
1 branch
0 tags
Go to file
Add file
Code
About
Test
Readme
Activity
0 stars
1 watching
0 forks
shivshankar7977 updated files
16bdc8c 16 hours ago
7 commits
.vscode updated html file 1.2 yesterday
static updated files 16 hours ago
templates updated files 16 hours ago
Dockerfile updated file 1.0 2 days ago
Pipeline-script.txt updated file 1.0 2 days ago
README.md updated file 1.0 2 days ago
count.txt updated file 1.0 2 days ago
myapp.py updated files 19 hours ago
requirements.txt updated file 1.0 2 days ago
README.md
CI/CD With Jenkins, Python, Docker
Python 3x, PyCharm
Docker, DockerHub account
Git, and git-bash or GitHubDesktop
GitHub account
Jenkins Server on Linux
Linux Server with docker installed
Releases
No releases published
Create a new release
Packages
No packages published
Publish your first package
Languages
HTML 77.0%
Python 12.9%
CSS 6.1%
Dockerfile 4.0%
Suggested Workflows
Based on your tech stack
Actions Importer
Set up
Type here to search
29°C Mostly sunny
ENG
14:39
29-08-2023

7. Git Concepts

Git is a version control system that is used to manage and track changes made to source code and other files. It was created by Linus Torvalds in 2005 to manage the development of the Linux operating system. With Git, developers can track changes to their code, collaborate with others on a project, and maintain multiple versions of their codebase. Git uses a distributed model, which means that every developer has a complete copy of the codebase on their local machine. This allows developers to work offline and independently, and then synchronize their changes with others when they're ready.

Git also provides features like branching and merging, which allow developers to create parallel versions of their codebase and merge changes made by multiple developers back into the main codebase. These features make it easier to manage complex development workflows and collaborate on large projects. Overall, Git is a powerful and widely used tool for managing software development projects.

Git clone git is a command used to create a copy of a Git repository on your local machine. To use git clone, you need to specify the URL of the remote repository you want to clone, as well as the location on your local machine where you want to create the copy.

Git push is a command used to upload local repository content to a remote repository. When you make changes to your local repository, you can use git push to send those changes to a remote repository that you have previously cloned or created. The basic syntax of the command is: git push File pushed

8. Jenkins server configuration

JENKINS

Jenkins is a popular open-source automation server that can be used to implement Continuous Integration/Continuous Deployment (CI/CD) pipelines in software development projects. It provides a wide range of plugins and integrations with various tools and technologies, making it a flexible and powerful tool for implementing a CI/CD pipeline.

In a typical CI/CD pipeline, Jenkins can be used to automate the build, test, and deployment processes. It can integrate with source code repositories, such as Git, to automatically trigger a build when new code is pushed to the repository. Jenkins can then compile the code, run unit tests, and generate reports on the test results.

One of the key advantages of using Jenkins in a CI/CD pipeline is its ability to provide visibility and control over the entire pipeline. Jenkins can provide real-time feedback on the status of each stage in the pipeline, making it easier to identify and address any issues that arise. It can also be configured to send notifications and alerts to team members when a build fails or when an issue is detected. Overall, Jenkins is a valuable tool for implementing a robust and efficient CI/CD pipeline in software development projects. Its flexibility and extensive plugin library make it an ideal choice for teams looking to automate their build, test, and deployment processes while maintaining control and visibility over the pipeline.

Fig 3.1 Jenkins Logo

9. Docker Configuration

Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly. With Docker, you can manage your infrastructure in the same ways you manage your applications. By taking advantage of Docker's methodologies for shipping, testing, and deploying code, you can significantly reduce the delay between writing code and running it in production.

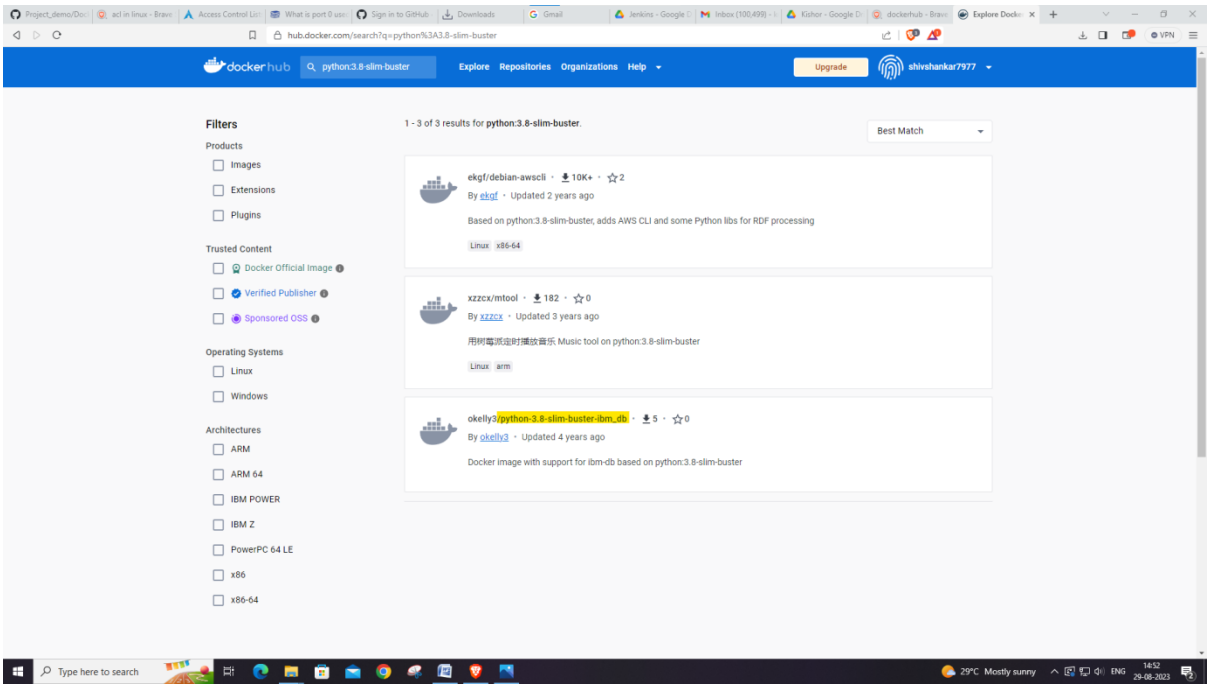
Docker file:

```
#Dockerfile, image, container

FROM python:3.8-slim-buster
ADD . /python-flask
WORKDIR /python-flask
RUN pip install -r requirements.txt
CMD [ "python", "./myapp.py" ]
```

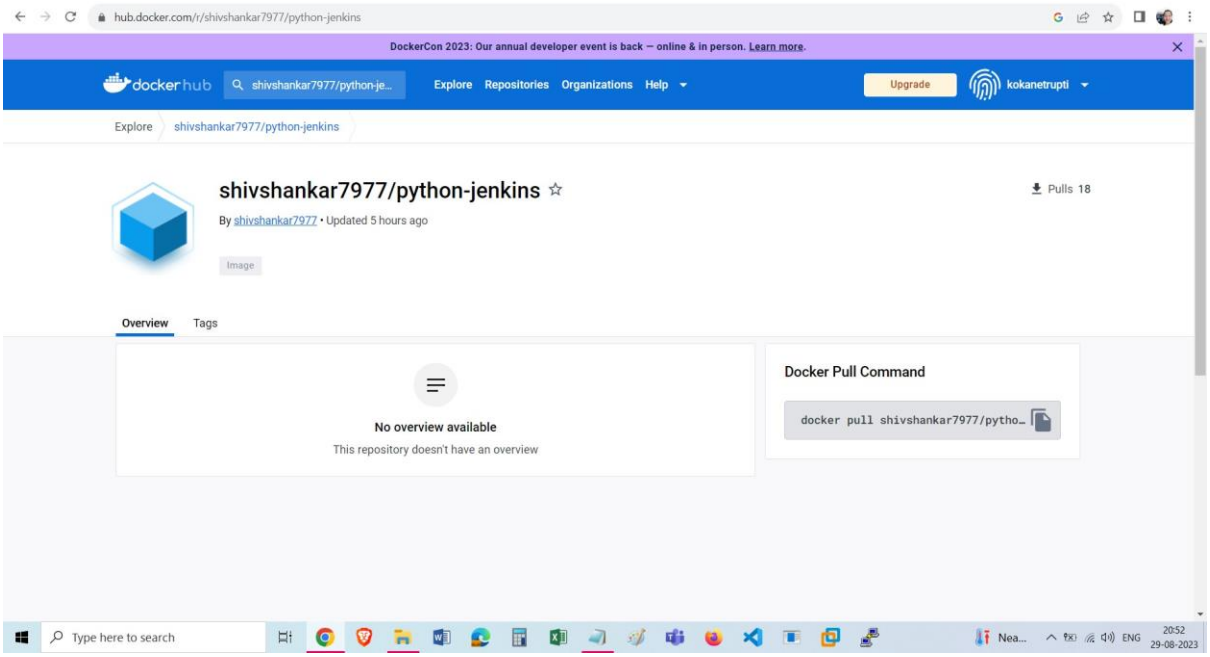
requirements.txt

```
click==8.0.3
colorama==0.4.4
Flask==2.0.2
itsdangerous==2.0.1
Jinja2==3.0.3
MarkupSafe==2.0.1
Werkzeug==2.0.2
```

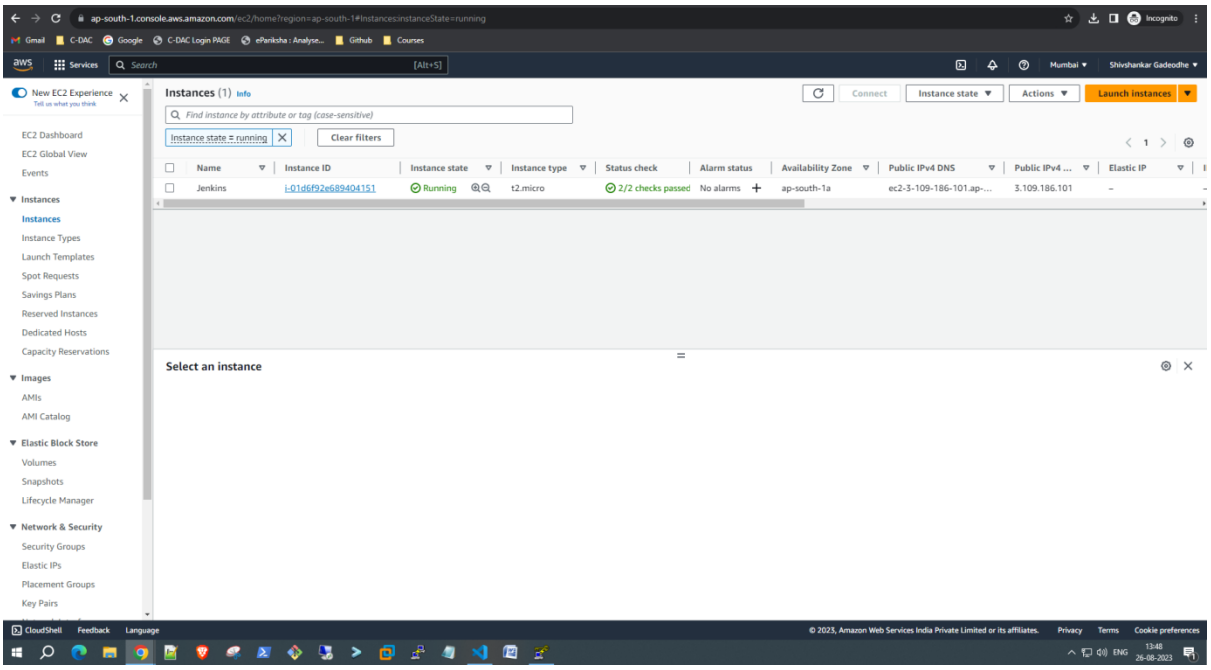
10. Pulling docker image

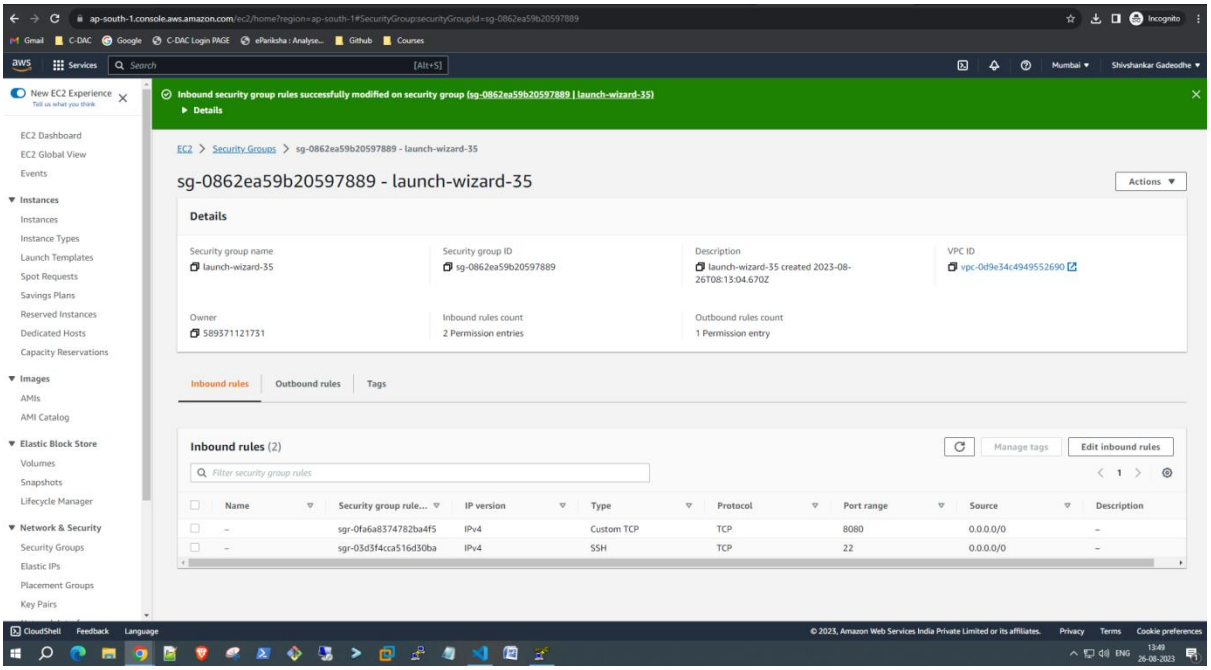


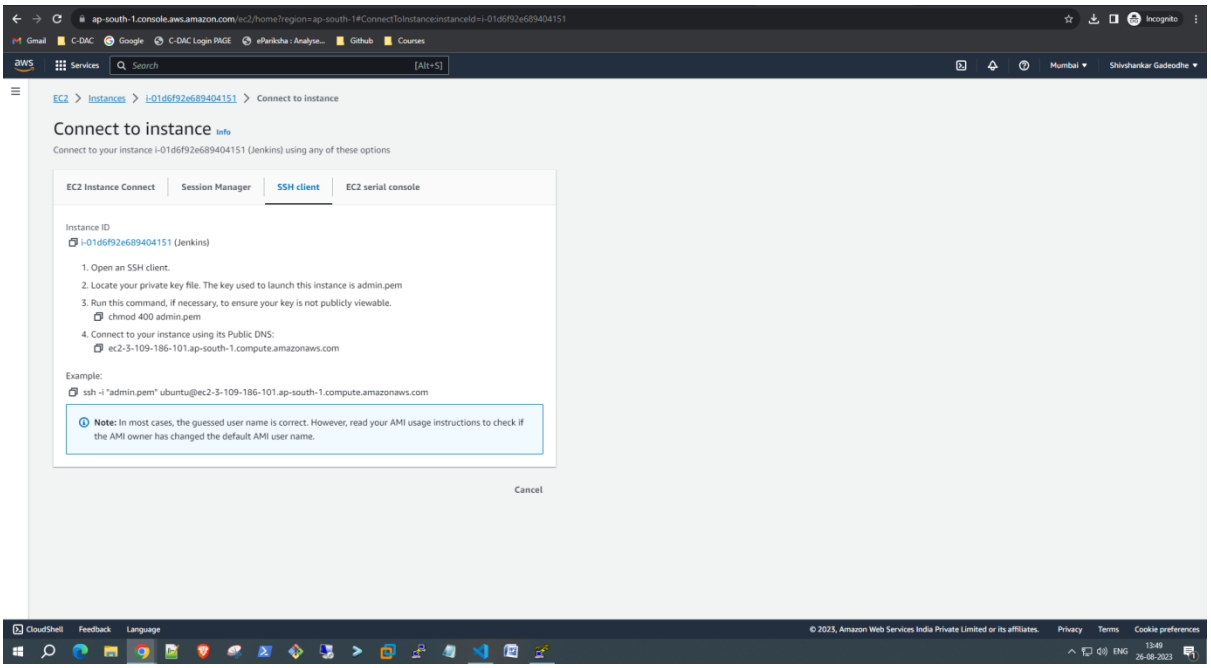

```
deployer@tomcat-virtual-machine:~$ docker ps
CONTAINER ID   IMAGE                              COMMAND              CREATED         STATUS         PORTS                                       NAMES
bbc0522ce128   shivshankar7977/python-jenkins     "python ./myapp.py"  10 hours ago    Up 10 hours    0.0.0.0:5001->5000/tcp, :::5001->5000/tcp   Python-CI-CD-Pipeline
deployer@tomcat-virtual-machine:~$
```



11.Launching EC2 instance







sudo apt update -y

```
ubuntu@ip-172-31-1-37:~$ sudo apt update -y
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
112 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

sudo apt upgrade -y

```
ubuntu@ip-172-31-1-37:~$ sudo apt upgrade -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
#
# You can verify the status of security fixes using the `pro fix` command.
# E.g., a recent Ruby vulnerability can be checked with: `pro fix USN-6219-1`
# For more detail see: https://ubuntu.com/security/notices/USN-6219-1
#
The following NEW packages will be installed:
  linux-aws-6.2-headers-6.2.0-1009 linux-headers-6.2.0-1009-aws linux-image-6.2.0-1009-aws linux-modules-6.2.0-1009-aws
The following packages will be upgraded:
```

java --version

```
ubuntu@ip-172-31-1-37:~$ java --version
Command 'java' not found, but can be installed with:
sudo apt install openjdk-11-jre-headless  # version 11.0.20+8-1ubuntu1~22.04, or
sudo apt install default-jre              # version 2:1.11-72build2
sudo apt install openjdk-17-jre-headless  # version 17.0.8+7-1~22.04
sudo apt install openjdk-18-jre-headless  # version 18.0.2+9-2~22.04
sudo apt install openjdk-19-jre-headless  # version 19.0.2+7-0ubuntu3~22.04
sudo apt install openjdk-8-jre-headless   # version 8u382-ga-1~22.04.1
ubuntu@ip-172-31-1-37:~$
```

sudo apt install openjdk-11-jre -y

```
ubuntu@ip-172-31-1-37:~$ sudo apt install openjdk-11-jre -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  alsa-topology-conf alsa-ucm-conf at-spi2-core ca-certificates-java dconf-gsettings-backend dconf-service fontconfig-config fonts-dejavu-core
  fonts-dejavu-extra gsettings-desktop-schemas java-common libasound2 libasound2-data libatk-bridge2.0-0 libatk-wrapper-java
  libatk-wrapper-java-jni libatk1.0-0 libatk1.0-data libatspi2.0-0 libavahi-client3 libavahi-common-data libavahi-common3 libcups2 libdconf1
  libdrm-amdgpu1 libdrm-intel1 libdrm-nouveau2 libdrm-radeon1 libfontconfig1 libfontenc1 libgif7 libgl1 libgl1-amber-dri libgl1-mesa-dri
  libglapi-mesa libglvnd0 libglx-mesa0 libglx0 libgraphite2-3 libharfbuzz0b libice6 libjpeg-turbo8 libjpeg8 liblcms2-2 libllvm15 libpciaccess0
  libpcsclite1 libsensors-config libsensors5 libsm6 libx11-xcb1 libxaw7 libxcb-dri2-0 libxcb-dri3-0 libxcb-glx0 libxcb-present0 libxcb-randr0
  libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0 libxcomposite1 libxfixes3 libxft2 libxi6 libxinerama1 libxkbfile1 libxmu6 libxpm4
  libxrandr2 libxrender1 libxshmfence1 libxt6 libxtst6 libxv1 libxxf86dga1 libxxf86vm1 openjdk-11-jre-headless session-migration x11-common
  x11-utils
Suggested packages:
```

sudo apt install openjdk-17-jre -y

```
ubuntu@ip-172-31-1-37:~$ sudo apt install openjdk-17-jre
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adwaita-icon-theme fontconfig gtk-update-icon-cache hicolor-icon-theme humanity-icon-theme libcairo-gobject2 libcairo2 libdatrie1 libdeflate0
  libgail-common libgail18 libgdk-pixbuf-2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common libjbig0
  libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0 libpixman-1-0 librsvg2-2 librsvg2-common libthai-data libthai0 libtiff5 libwebp7
  libxcb-render0 libxcursor1 libxdamage1 openjdk-17-jre-headless ubuntu-mono
Suggested packages:
  gvfs librsvg2-bin libnss-mdns fonts-ipafont-gothic fonts-ipafont-mincho fonts-wqy-microhei | fonts-wqy-zenhei fonts-indic
The following NEW packages will be installed:
  adwaita-icon-theme fontconfig gtk-update-icon-cache hicolor-icon-theme humanity-icon-theme libcairo-gobject2 libcairo2 libdatrie1 libdeflate0
  libgail-common libgail18 libgdk-pixbuf-2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libgtk2.0-0 libgtk2.0-bin libgtk2.0-common libjbig0
  libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0 libpixman-1-0 librsvg2-2 librsvg2-common libthai-data libthai0 libtiff5 libwebp7
  libxcb-render0 libxcursor1 libxdamage1 openjdk-17-jre openjdk-17-jre-headless ubuntu-mono
0 upgraded, 34 newly installed, 0 to remove and 0 not upgraded.
Need to get 61.1 MB of archives.
After this operation, 251 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

12. Jenkins Installation

curl -fsSL https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key | sudo tee /usr/share/keyrings/jenkins-keyring.asc > /dev/null

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-172-31-1-37:~$ curl -fsSL https://pkg.jenkins.io/debian-stable/jenkins.io-2023
.key | sudo tee   /usr/share/keyrings/jenkins-keyring.asc > /dev/null
ubuntu@ip-172-31-1-37:~$ echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc]
https://pkg.jenkins.io/debian-stable binary/ | sudo tee   /etc/apt/sources.list.d/jenkin
s.list > /dev/null
ubuntu@ip-172-31-1-37:~$
```

sudo apt-get install jenkins -y

```
ubuntu@ip-172-31-1-37:~$ sudo apt-get install jenkins -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  net-tools
The following NEW packages will be installed:
  jenkins net-tools
0 upgraded, 2 newly installed, 0 to remove and 0 not upgraded.
Need to get 89.1 MB of archives.
After this operation, 90.4 MB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 net-tools amd64 1.60+git20181103.0eebece-1ubuntu5 [204 kB]
Get:2 https://pkg.jenkins.io/debian-stable binary/ jenkins 2.414.1 [88.9 MB]
Fetched 89.1 MB in 6s (15.5 MB/s)
Selecting previously unselected package net-tools.
(Reading database ... 110026 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20181103.0eebece-1ubuntu5_amd64.deb ...
Unpacking net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Selecting previously unselected package jenkins.
```

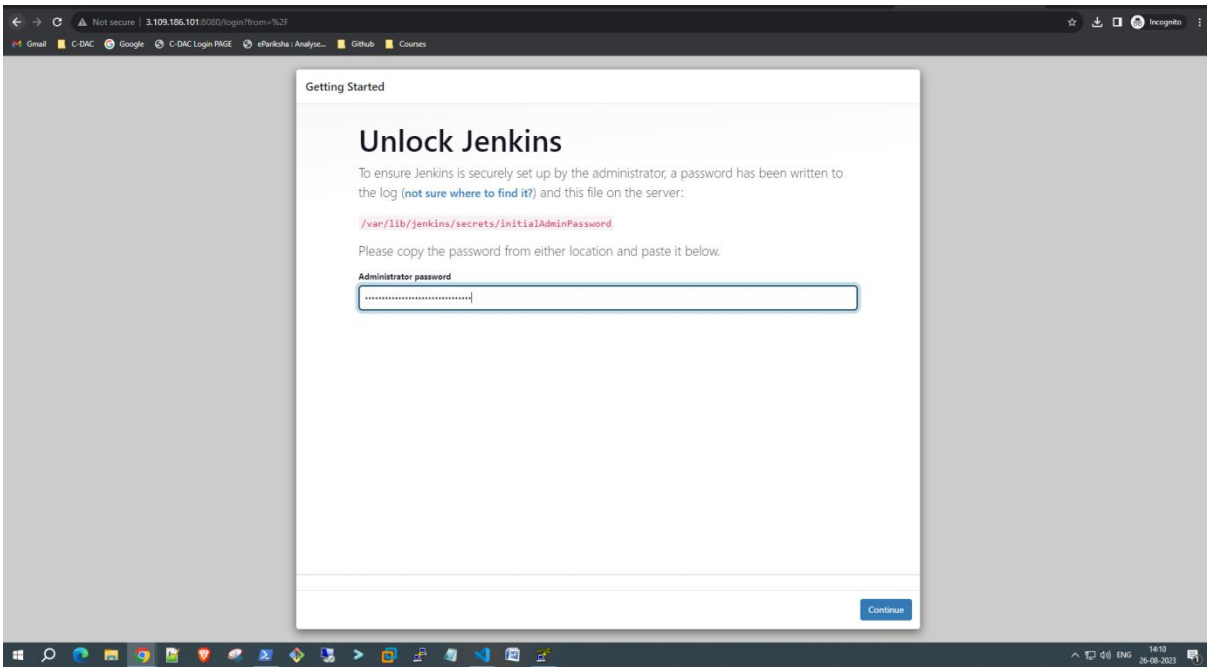
sudo systemctl status jenkins

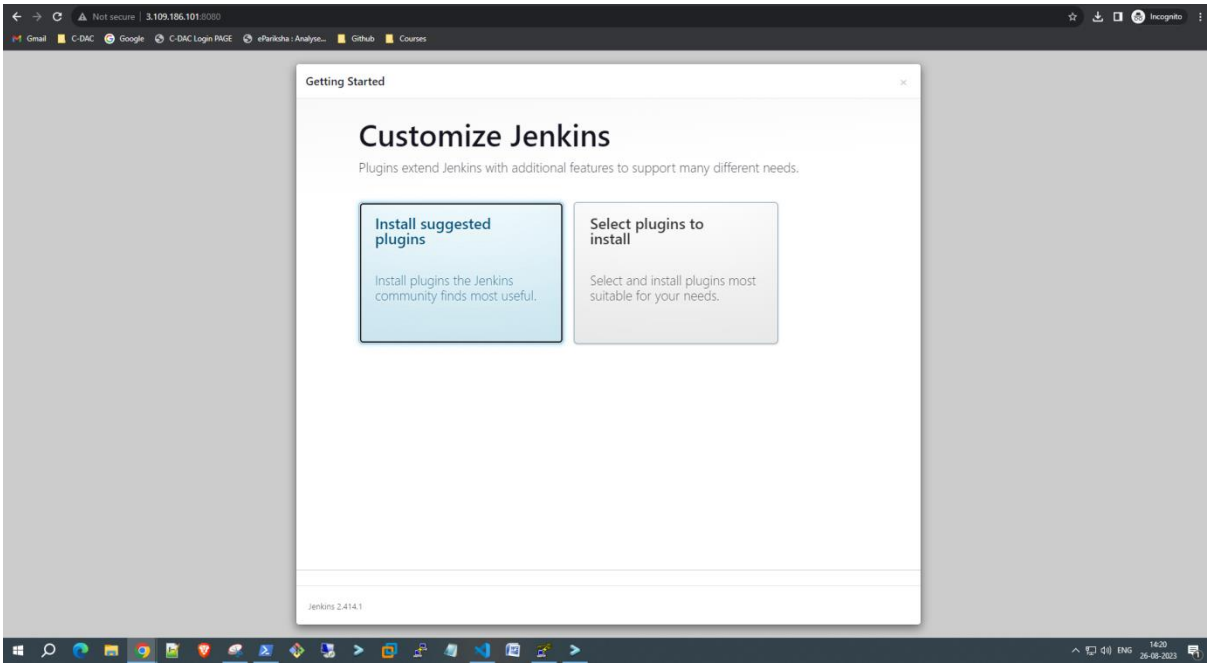
```
ubuntu@ip-172-31-1-37:~$ sudo systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
     Loaded: loaded (/lib/systemd/system/jenkins.service; enabled; vendor preset: enabled)
     Active: active (running) since Sat 2023-08-26 08:47:48 UTC; 14s ago
   Main PID: 26812 (java)
      Tasks: 45 (limit: 1141)
     Memory: 305.1M
        CPU: 37.389s
     CGroup: /system.slice/jenkins.service
             └─26812 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080
```

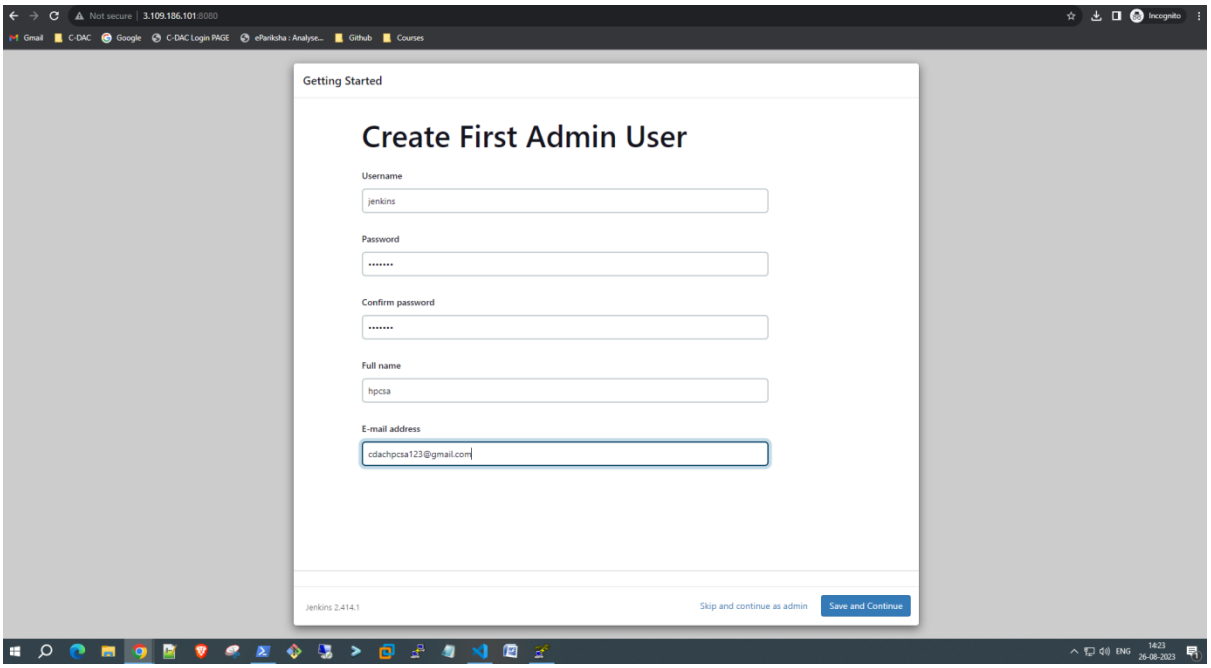
sudo cat /var/lib/jenkins/secrets/initialAdminPassword

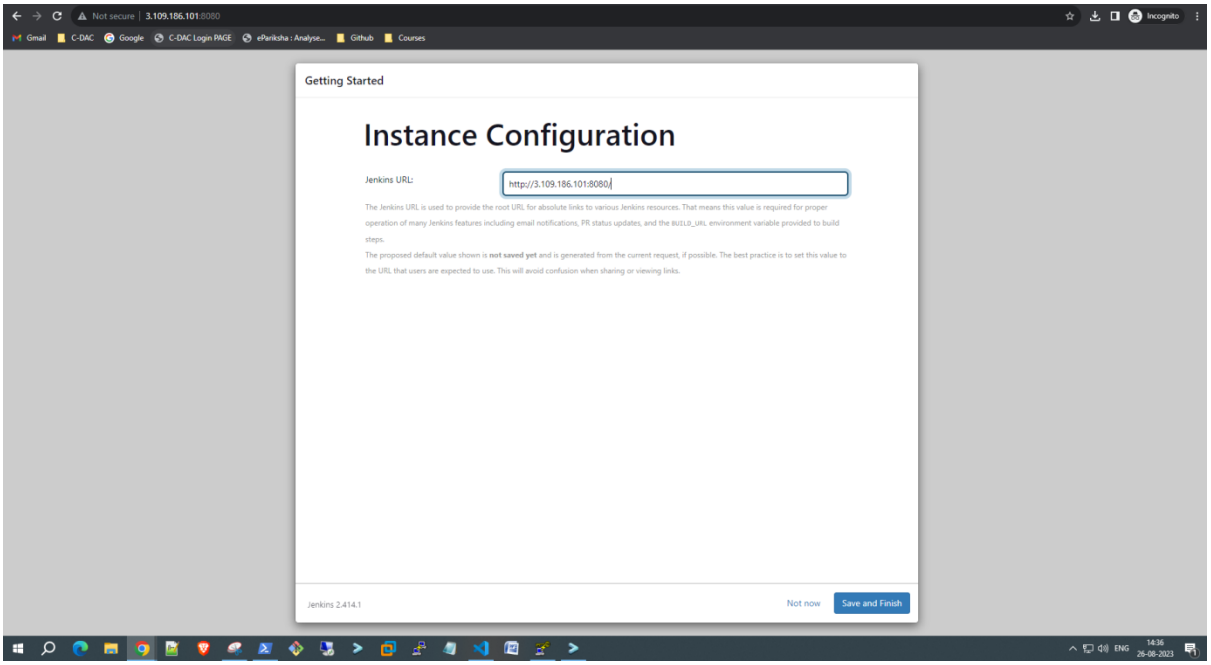
sudo vim /etc/sudoers

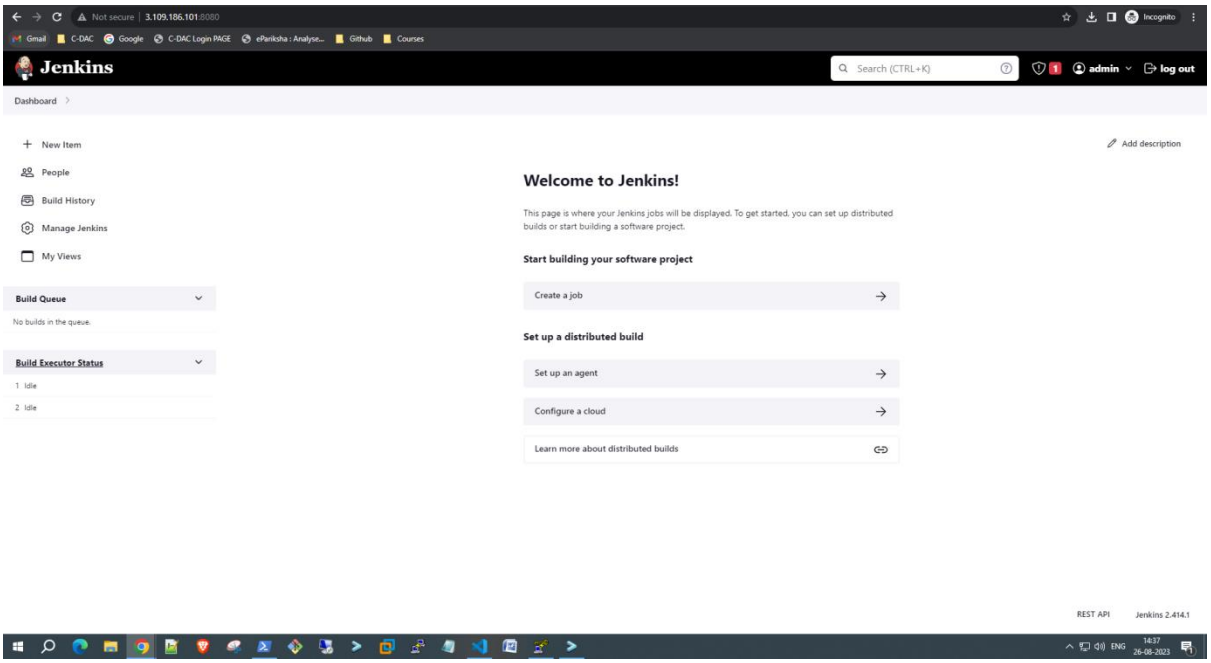
```
ubuntu@ip-172-31-1-37:~$ sudo cat /var/lib/jenkins/secrets/initialAdminPassword
3fd41bd974d84cddbaf444ba1f12fb53
ubuntu@ip-172-31-1-37:~$
```

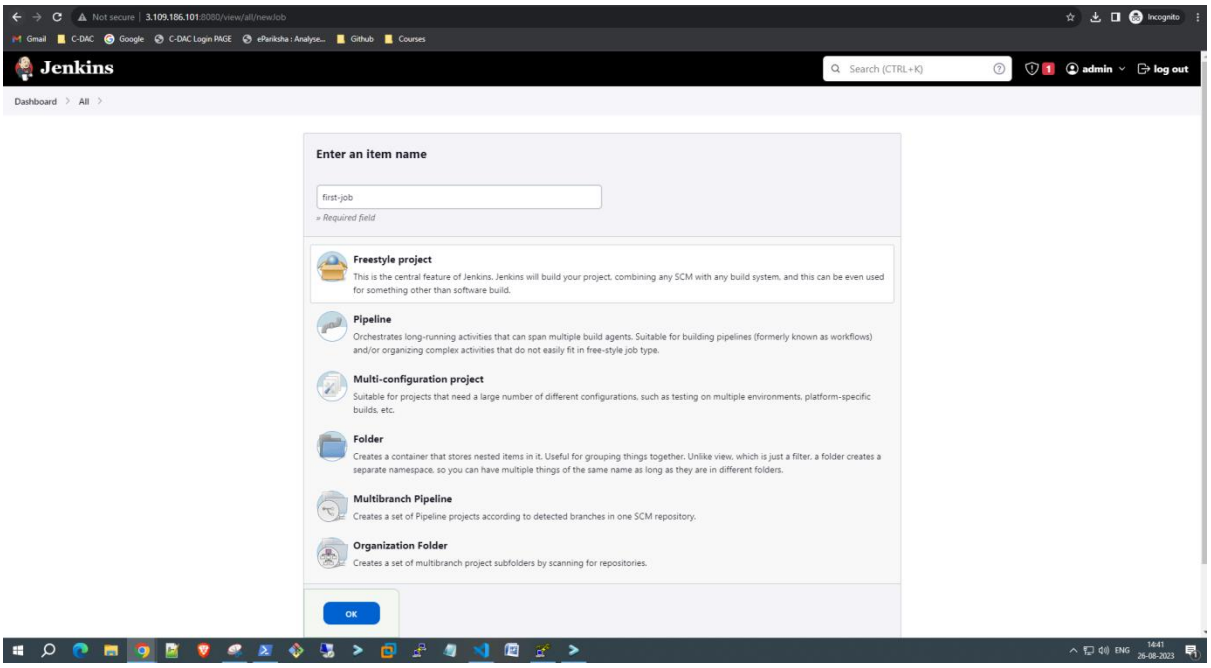

Not secure | 3.109.186.101:8080/login?from=%2F
Incognito
Gmail
C-DAC
Google
C-DAC Login PAGE
ePariksha : Analyse...
Github
Courses
Getting Started
Unlock Jenkins
To ensure Jenkins is securely set up by the administrator, a password has been written to the log (not sure where to find it?) and this file on the server:
/var/lib/jenkins/secrets/initialAdminPassword
Please copy the password from either location and paste it below.
Administrator password
Continue
ENG
14:10
26-08-2023

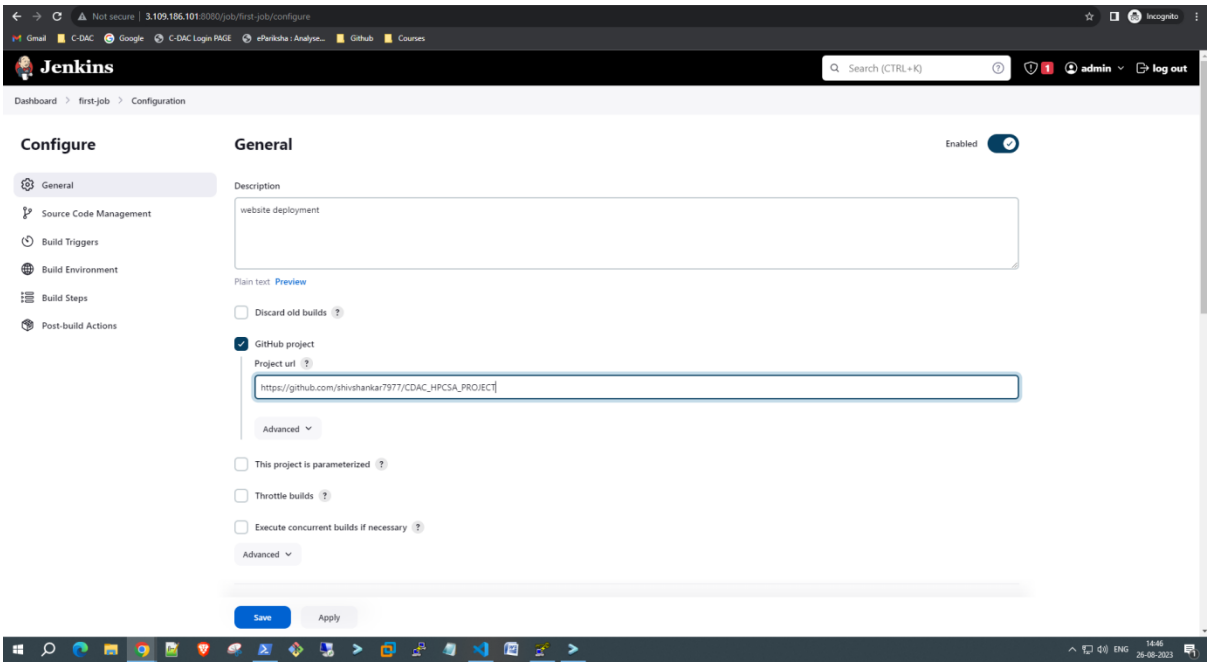

Not secure | 3.109.186.101:8080
Incognito
Gmail
C-DAC
Google
C-DAC Login PAGE
ePariksha : Analyse...
Github
Courses
Getting Started
Customize Jenkins
Plugins extend Jenkins with additional features to support many different needs.
Install suggested plugins
Install plugins the Jenkins community finds most useful.
Select plugins to install
Select and install plugins most suitable for your needs.
Jenkins 2.414.1
ENG
14:20
26-08-2023

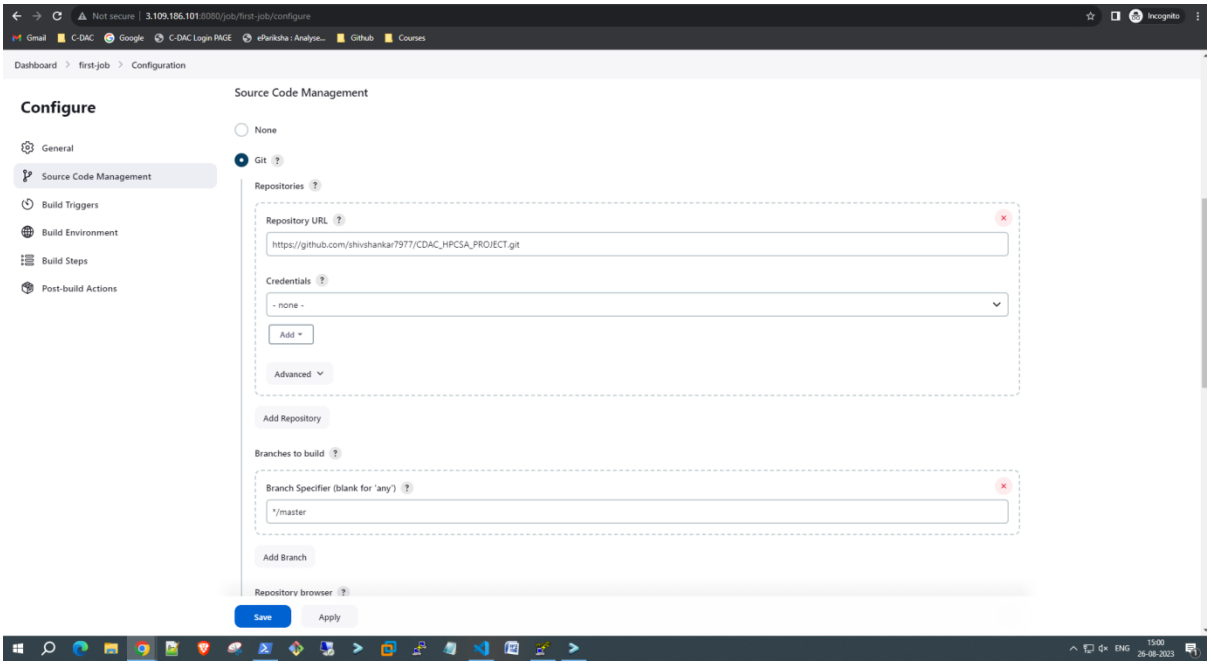

Not secure | 3.109.186.101:8080
Incognito
Gmail
C-DAC
Google
C-DAC Login PAGE
ePariksha : Analyse...
Github
Courses
Getting Started
Create First Admin User
Username
jenkins
Password
Confirm password
Full name
hpcsa
E-mail address
cdachpcsa123@gmail.com
Jenkins 2.414.1
Skip and continue as admin
Save and Continue
ENG
14:23
26-08-2023

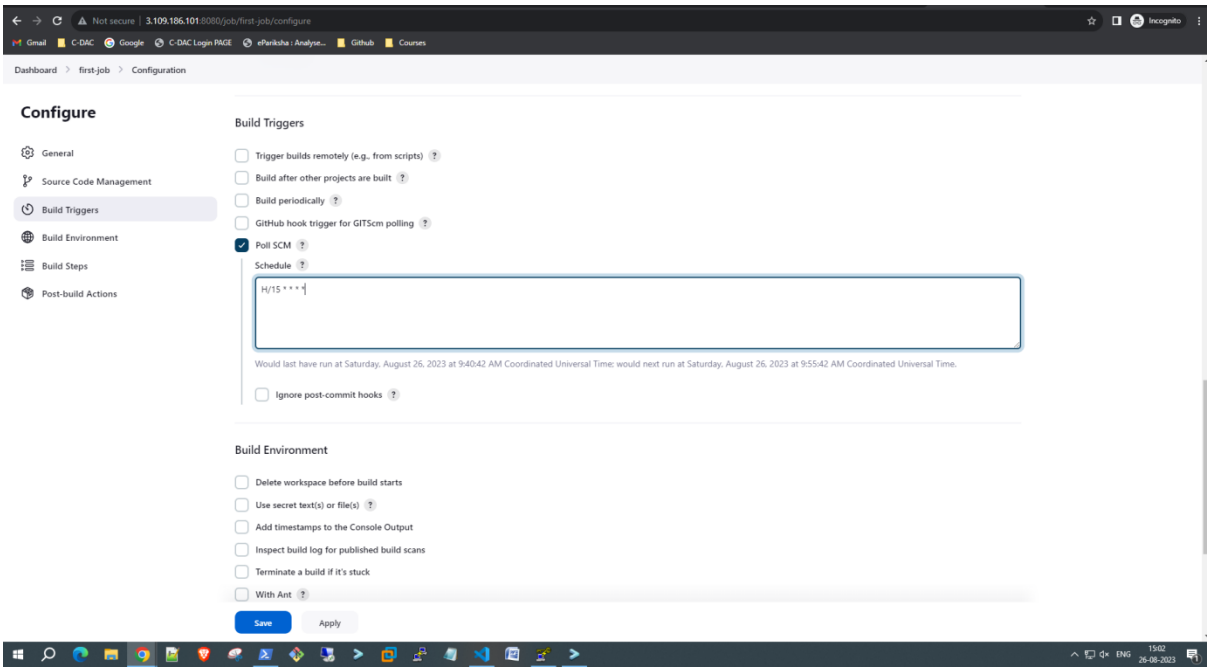

Not secure | 3.109.186.101:8080
Incognito
Gmail
C-DAC
Google
C-DAC Login PAGE
ePariksha : Analyse...
Github
Courses
Getting Started
Instance Configuration
Jenkins URL:
http://3.109.186.101:8080/
The Jenkins URL is used to provide the root URL for absolute links to various Jenkins resources. That means this value is required for proper operation of many Jenkins features including email notifications, PR status updates, and the BUILD_URL environment variable provided to build steps.
The proposed default value shown is not saved yet and is generated from the current request, if possible. The best practice is to set this value to the URL that users are expected to use. This will avoid confusion when sharing or viewing links.
Jenkins 2.414.1
Not now
Save and Finish
ENG
14:36
26-08-2023

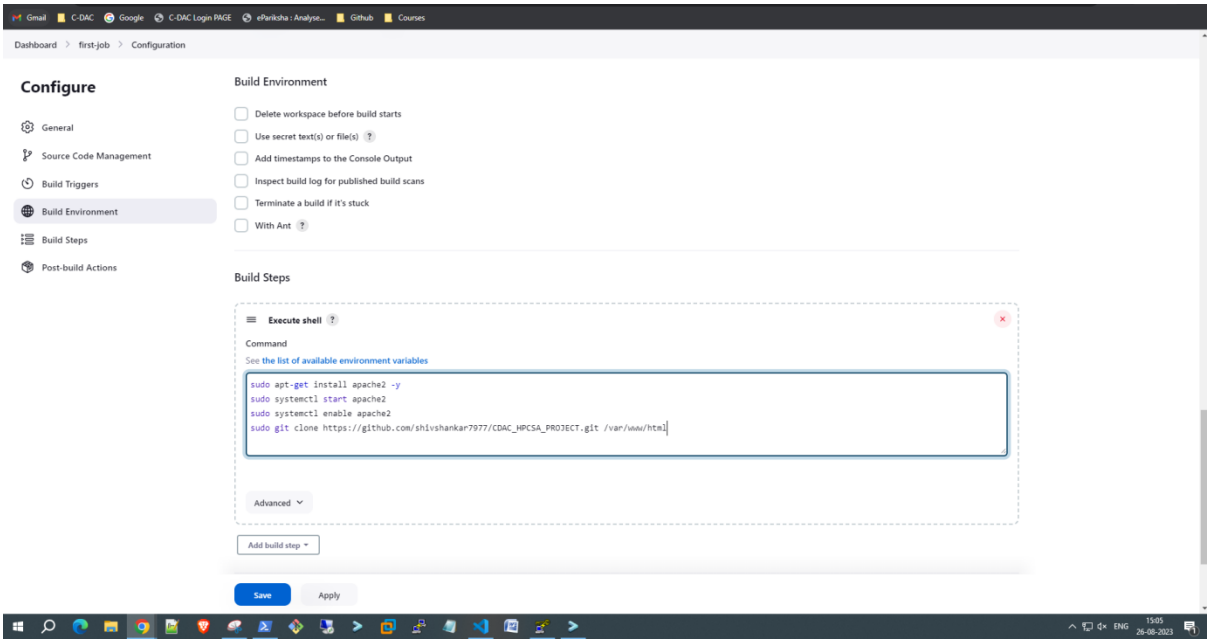

Not secure | 3.109.186.101:8080
Jenkins
Search (CTRL+K)
admin
log out
Dashboard
New Item
People
Build History
Manage Jenkins
My Views
Add description
Welcome to Jenkins!
This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.
Start building your software project
Create a job
Set up a distributed build
Set up an agent
Configure a cloud
Learn more about distributed builds
Build Queue
No builds in the queue.
Build Executor Status
1 Idle
2 Idle
REST API
Jenkins 2.414.1

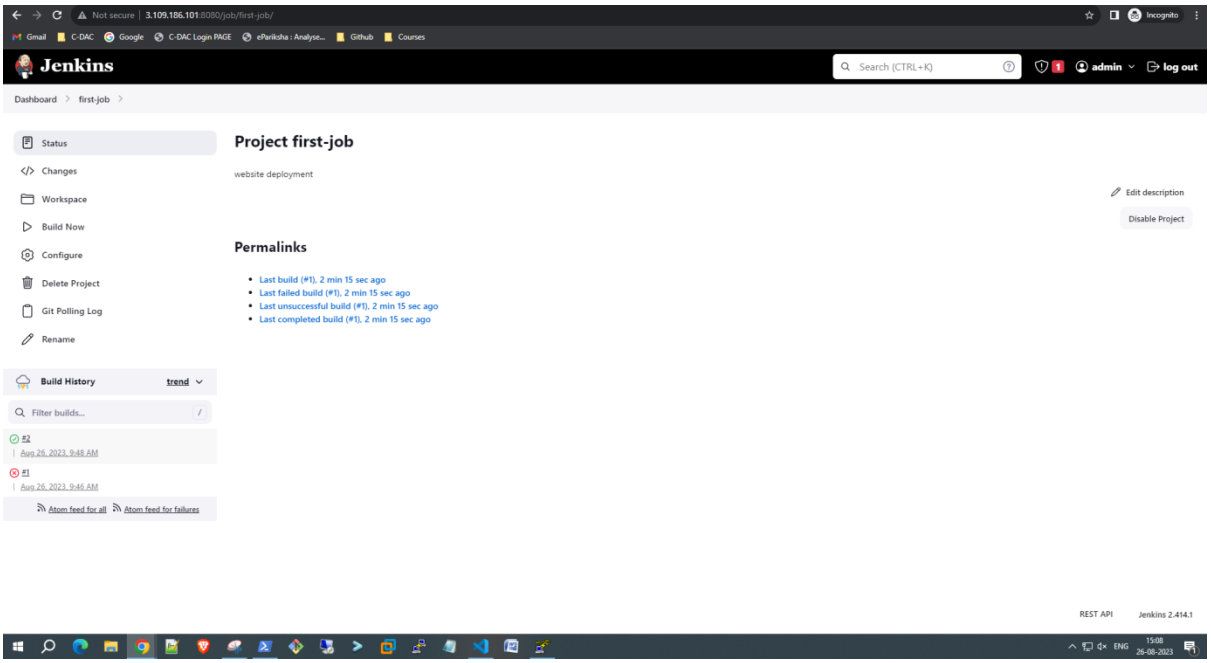

Not secure | 3.109.186.101:8080/view/all/newJob
Jenkins
Search (CTRL+K)
admin
log out
Dashboard
All
Enter an item name
first-job
» Required field
Freestyle project
This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.
Pipeline
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.
Multi-configuration project
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.
Folder
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different folders.
Multibranch Pipeline
Creates a set of Pipeline projects according to detected branches in one SCM repository.
Organization Folder
Creates a set of multibranch project subfolders by scanning for repositories.
OK

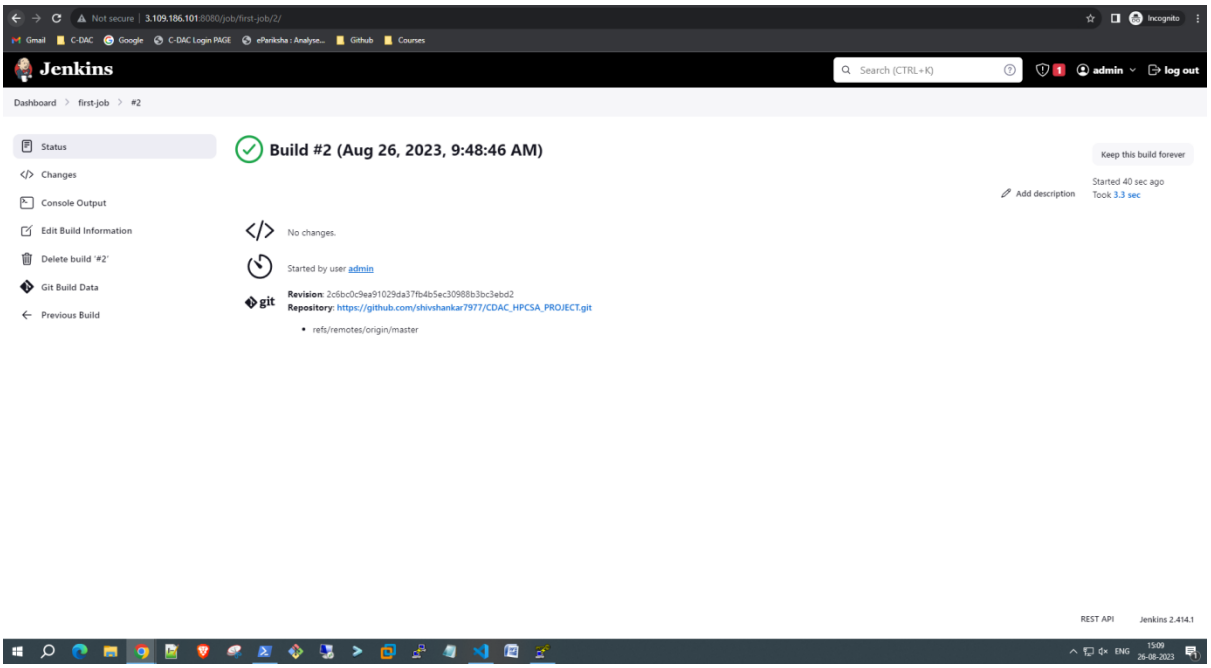

Not secure | 3.109.186.101:8080/job/first-job/configure
Jenkins
Search (CTRL+K)
admin
log out
Dashboard > first-job > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
General
Enabled
Description
website deployment
Plain text Preview
Discard old builds
GitHub project
Project url
https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT
Advanced
This project is parameterized
Throttle builds
Execute concurrent builds if necessary
Advanced
Save
Apply

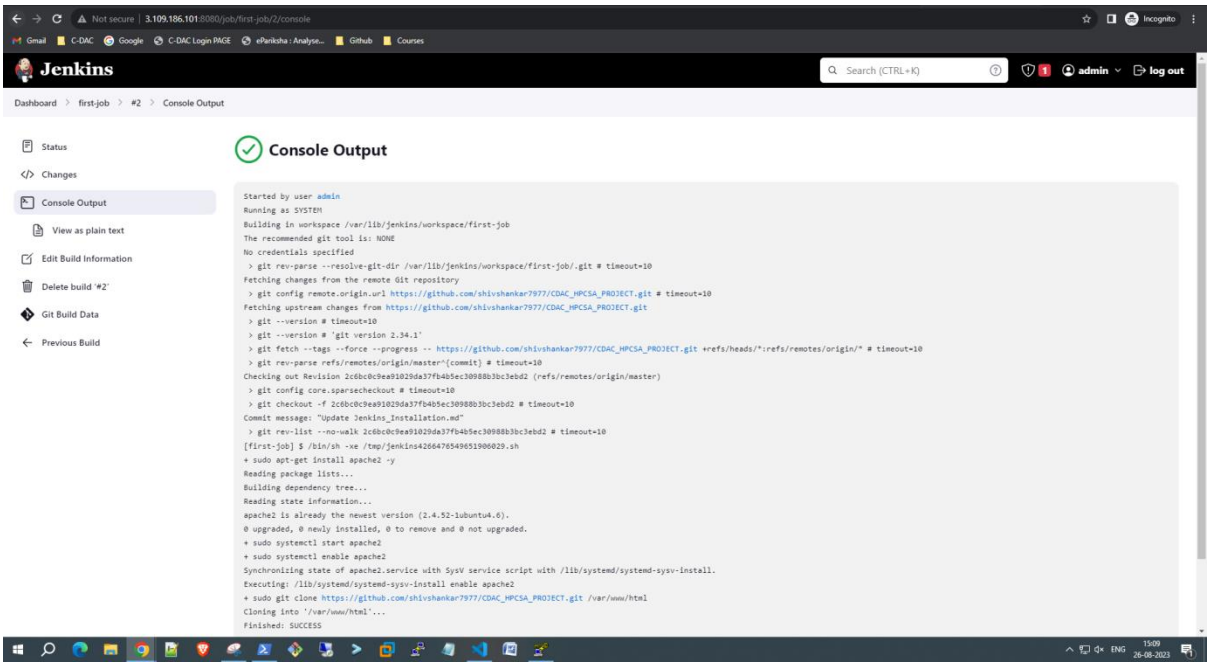

Not secure | 3.109.186.101:8080/job/first-job/configure
Dashboard > first-job > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
Source Code Management
None
Git
Repositories
Repository URL
https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git
Credentials
- none -
Add
Advanced
Add Repository
Branches to build
Branch Specifier (blank for 'any')
*/master
Add Branch
Repository browser
Save
Apply

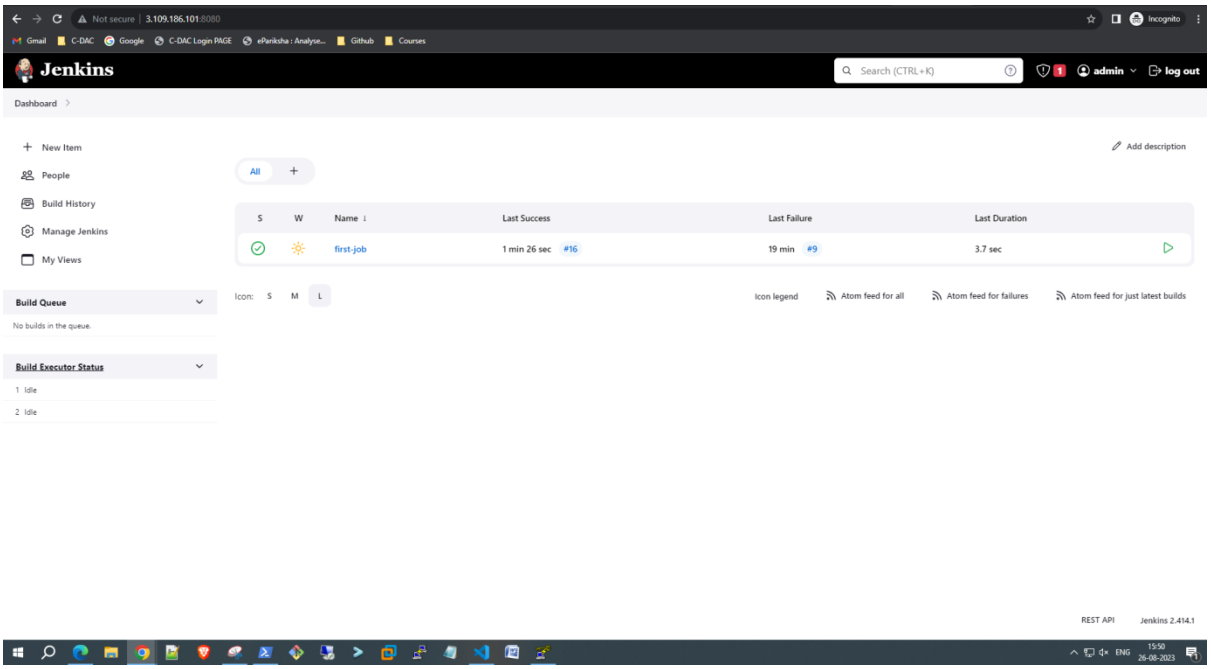

Not secure | 3.109.186.101:8080/job/first-job/configure
Dashboard > first-job > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
Build Triggers
Trigger builds remotely (e.g., from scripts)
Build after other projects are built
Build periodically
GitHub hook trigger for GITScm polling
Poll SCM
Schedule
H/15 * * * *
Would last have run at Saturday, August 26, 2023 at 9:40:42 AM Coordinated Universal Time; would next run at Saturday, August 26, 2023 at 9:55:42 AM Coordinated Universal Time.
Ignore post-commit hooks
Build Environment
Delete workspace before build starts
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
Save
Apply


Dashboard > first-job > Configuration
Configure
General
Source Code Management
Build Triggers
Build Environment
Build Steps
Post-build Actions
Build Environment
Delete workspace before build starts
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 shell
Command
See the list of available environment variables
sudo apt-get install apache2 -y
sudo systemctl start apache2
sudo systemctl enable apache2
sudo git clone https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git /var/www/html
Advanced
Add build step
Save
Apply


Not secure | 3.109.186.101:8080/job/first-job/
Jenkins
Search (CTRL+K)
admin
log out
Dashboard > first-job >
Status
Changes
Workspace
Build Now
Configure
Delete Project
Git Polling Log
Rename
Build History
trend
Filter builds...
#2
Aug 26, 2023, 9:48 AM
#1
Aug 26, 2023, 9:46 AM
Atom feed for all
Atom feed for failures
Project first-job
website deployment
Edit description
Disable Project
Permalinks
Last build (#1), 2 min 15 sec ago
Last failed build (#1), 2 min 15 sec ago
Last unsuccessful build (#1), 2 min 15 sec ago
Last completed build (#1), 2 min 15 sec ago
REST API
Jenkins 2.414.1


Not secure | 3.109.186.101:8080/job/first-job/2/
Jenkins
Search (CTRL+K)
admin
log out
Dashboard > first-job > #2
Status
Changes
Console Output
Edit Build Information
Delete build '#2'
Git Build Data
Previous Build
Build #2 (Aug 26, 2023, 9:48:46 AM)
Keep this build forever
Add description
Started 40 sec ago
Took 3.3 sec
No changes.
Started by user admin
Revision: 2c6bc0c9ea91029da37fb4b5ec30988b3bc3ebd2
Repository: https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git
refs/remotes/origin/master
REST API
Jenkins 2.414.1


Not secure | 3.109.186.101:8080/job/first-job/2/console
Jenkins
Search (CTRL+K)
admin
log out
Dashboard > first-job > #2 > Console Output
Status
Changes
Console Output
View as plain text
Edit Build Information
Delete build '#2'
Git Build Data
Previous Build
Console Output
Started by user admin
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/first-job
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/first-job/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git # timeout=10
Fetching upstream changes from https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git
> git --version # timeout=10
> git --version # 'git version 2.34.1'
> git fetch --tags --force --progress -- https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 2c6bc0c9ea91029da37fb4b5ec30988b3bc3ebd2 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 2c6bc0c9ea91029da37fb4b5ec30988b3bc3ebd2 # timeout=10
Commit message: "Update Jenkins_Installation.md"
> git rev-list --no-walk 2c6bc0c9ea91029da37fb4b5ec30988b3bc3ebd2 # timeout=10
[first-job] $ /bin/sh -xe /tmp/jenkins4266476549651906029.sh
+ sudo apt-get install apache2 -y
Reading package lists...
Building dependency tree...
Reading state information...
apache2 is already the newest version (2.4.52-1ubuntu4.6).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
+ sudo systemctl start apache2
+ sudo systemctl enable apache2
Synchronizing state of apache2.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable apache2
+ sudo git clone https://github.com/shivshankar7977/CDAC_HPCSA_PROJECT.git /var/www/html
Cloning into '/var/www/html'...
Finished: SUCCESS


Not secure | 3.109.186.101:8080
Jenkins
Search (CTRL+K)
admin
log out
Dashboard
New Item
People
Build History
Manage Jenkins
My Views
Add description
All
S
W
Name
Last Success
Last Failure
Last Duration
first-job
1 min 26 sec #16
19 min #9
3.7 sec
Build Queue
No builds in the queue.
Build Executor Status
1 Idle
2 Idle
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

13. Docker Installation

On Jenkins server:

```
master@master:~$ sudo apt-get install docker* -y
[sudo] password for master:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'docker-compose' for glob 'docker*'
Note, selecting 'docker.io-doc' for glob 'docker*'
Note, selecting 'docker2aci' for glob 'docker*'
Note, selecting 'docker-doc' for glob 'docker*'
Note, selecting 'docker-ce' for glob 'docker*'
Note, selecting 'docker.io' for glob 'docker*'
Note, selecting 'docker' for glob 'docker*'
Note, selecting 'docker-clean' for glob 'docker*'
Note, selecting 'docker-registry' for glob 'docker*'
Note, selecting 'docker-doc' instead of 'docker.io-doc'
docker is already the newest version (1.5-2).
docker-clean is already the newest version (2.0.4-4).
docker-compose is already the newest version (1.29.2-1).
docker-registry is already the newest version (2.8.0+ds1-4).
docker2aci is already the newest version (0.17.2+dfsg-2.1).
Suggested packages:
  aufs-tools btrfs-progs cgroupfs-mount | cgroup-lite debootstrap rinse zfs-fuse | zfsutils
The following packages will be upgraded:
  docker-doc docker.io
```

On Tomcat server:

```
tomcat@tomcat-virtual-machine:~$ sudo apt-get install docker* -y
[sudo] password for tomcat:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'docker-compose' for glob 'docker*'
Note, selecting 'docker.io-doc' for glob 'docker*'
Note, selecting 'docker2aci' for glob 'docker*'
Note, selecting 'docker-doc' for glob 'docker*'
Note, selecting 'docker-ce' for glob 'docker*'
Note, selecting 'docker.io' for glob 'docker*'
Note, selecting 'docker' for glob 'docker*'
Note, selecting 'docker-clean' for glob 'docker*'
Note, selecting 'docker-registry' for glob 'docker*'
Note, selecting 'docker-doc' instead of 'docker.io-doc'
docker is already the newest version (1.5-2).
docker-clean is already the newest version (2.0.4-4).
docker-compose is already the newest version (1.29.2-1).
docker-registry is already the newest version (2.8.0+ds1-4).
docker2aci is already the newest version (0.17.2+dfsg-2.1).
docker-doc is already the newest version (20.10.25-0ubuntu1~22.04.2).
docker.io is already the newest version (20.10.25-0ubuntu1~22.04.2).
0 upgraded, 0 newly installed, 0 to remove and 15 not upgraded.
tomcat@tomcat-virtual-machine:~$
```

14. Scripts

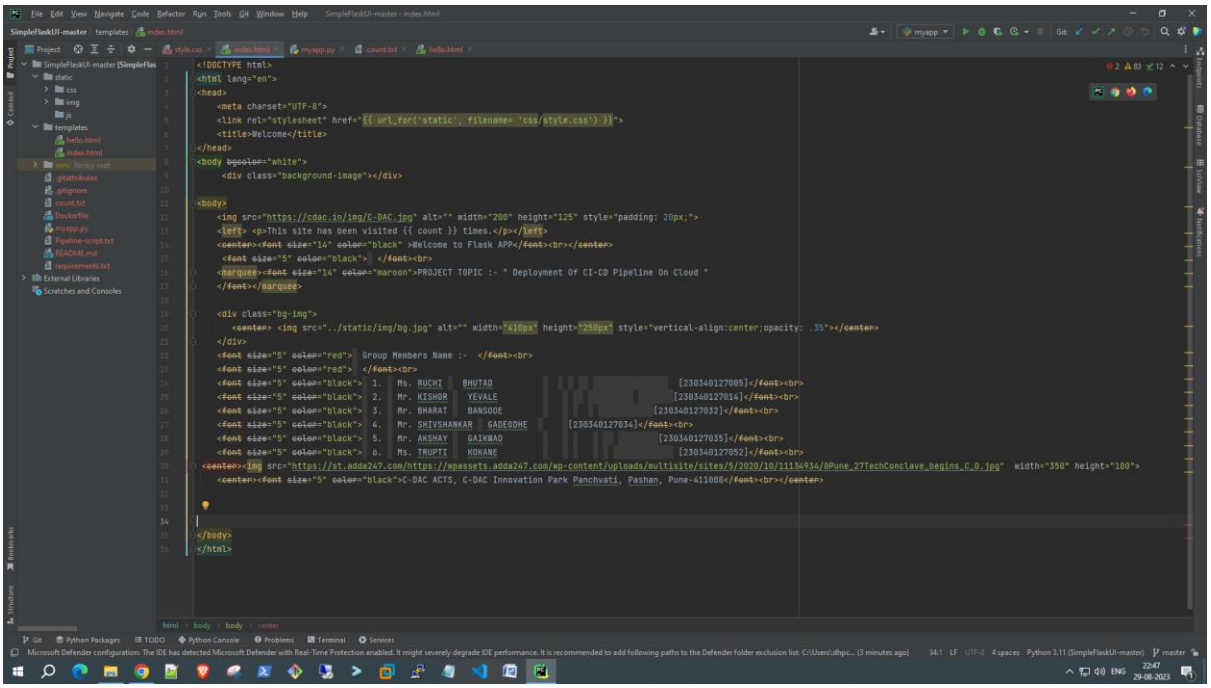
14.1 Python-Flask Script on PyCharm.

Flask script

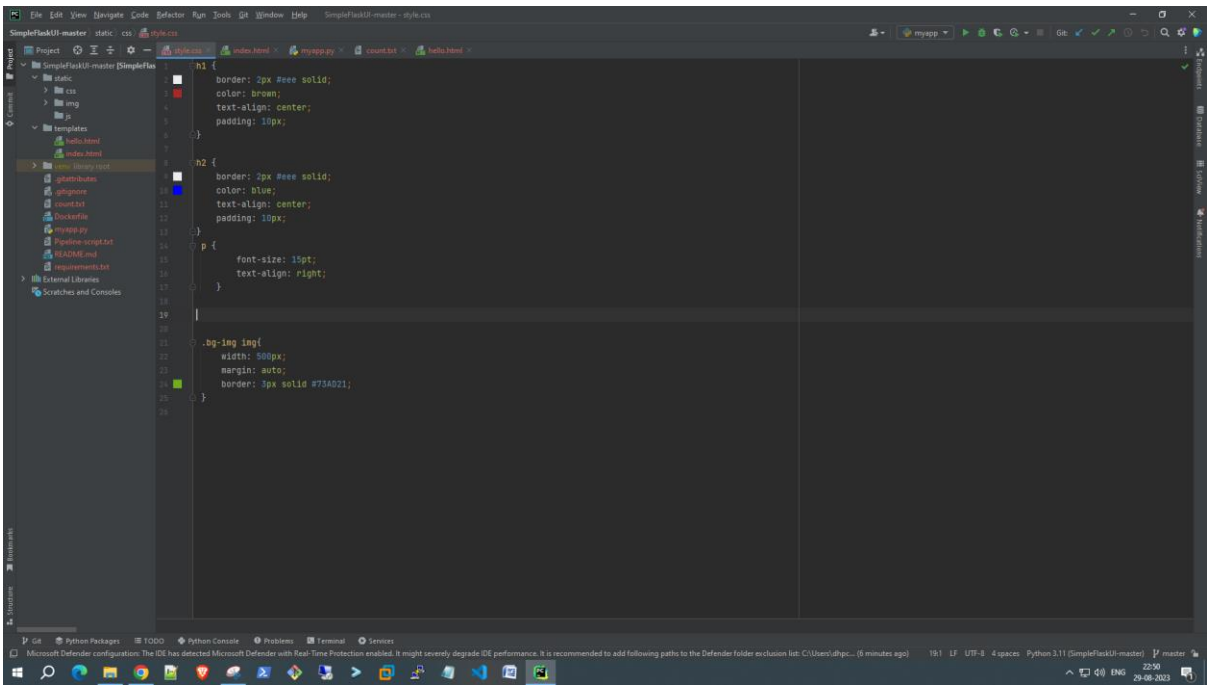
myapp.py

```
from flask import Flask, render_template
app = Flask(__name__)

@app.route('/')
def hello():
   return render_template('index.html')

@app.route('/hello/<name>')
def hello_name(name):
   # Load current count
   f = open("count.txt", "r")
   count = int(f.read())
   f.close()
   # Increment the count
   count += 1
   # Overwrite the count
   f = open("count.txt", "w")
   f.write(str(count))
   f.close()

   return render_template('index.html', name=name, count=count)

if __name__ == '__main__':
   app.run(host ='0.0.0.0', debug = True)
```

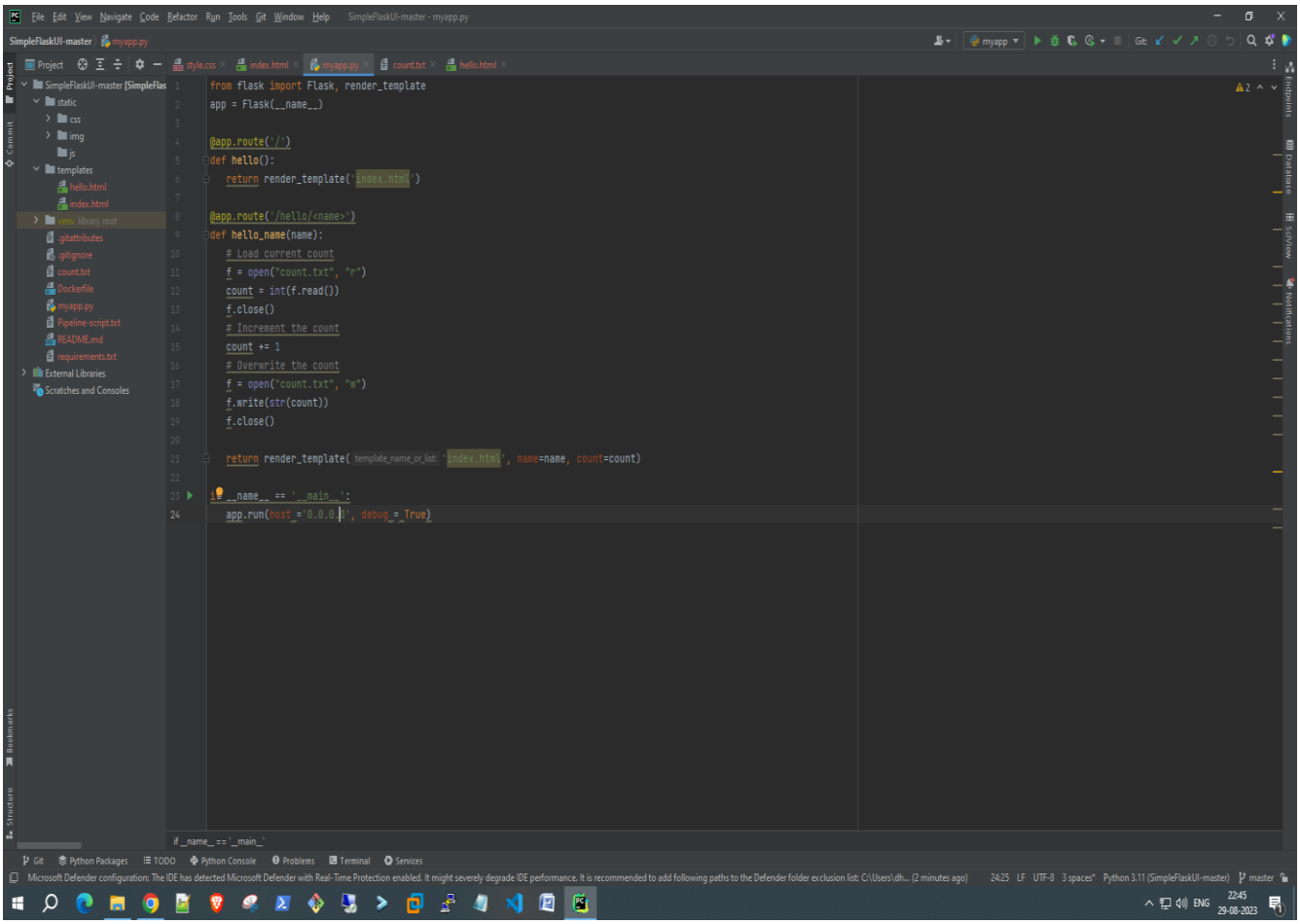
14.2 HTML Script



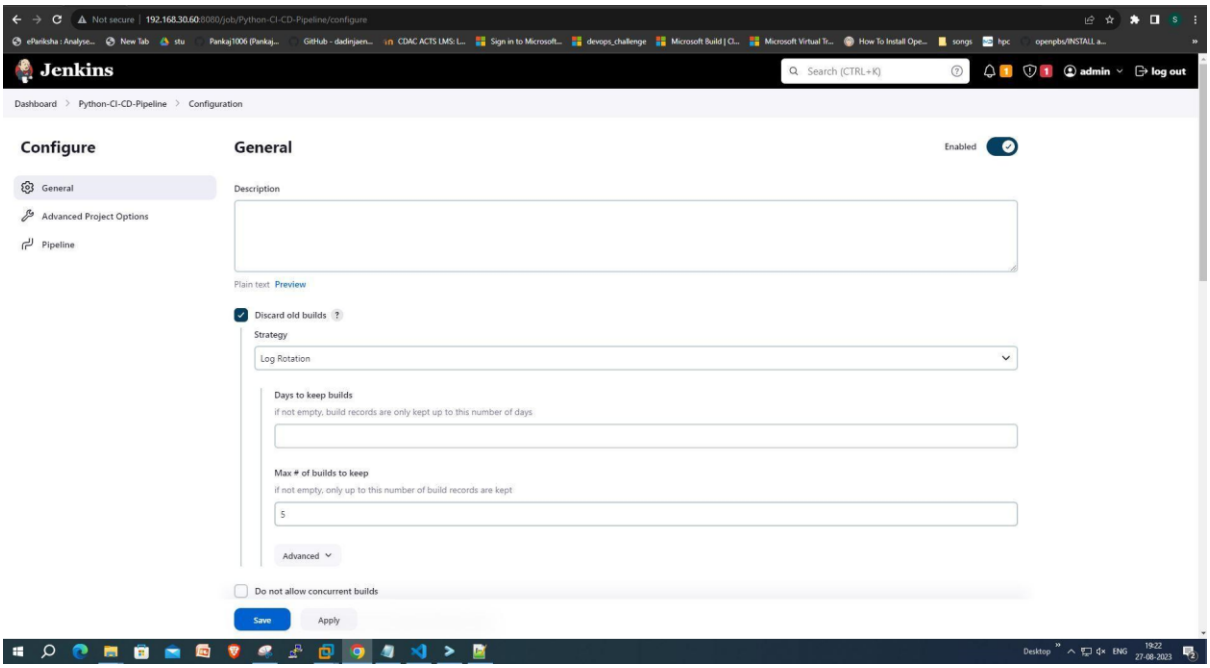
14.3 CSS Script

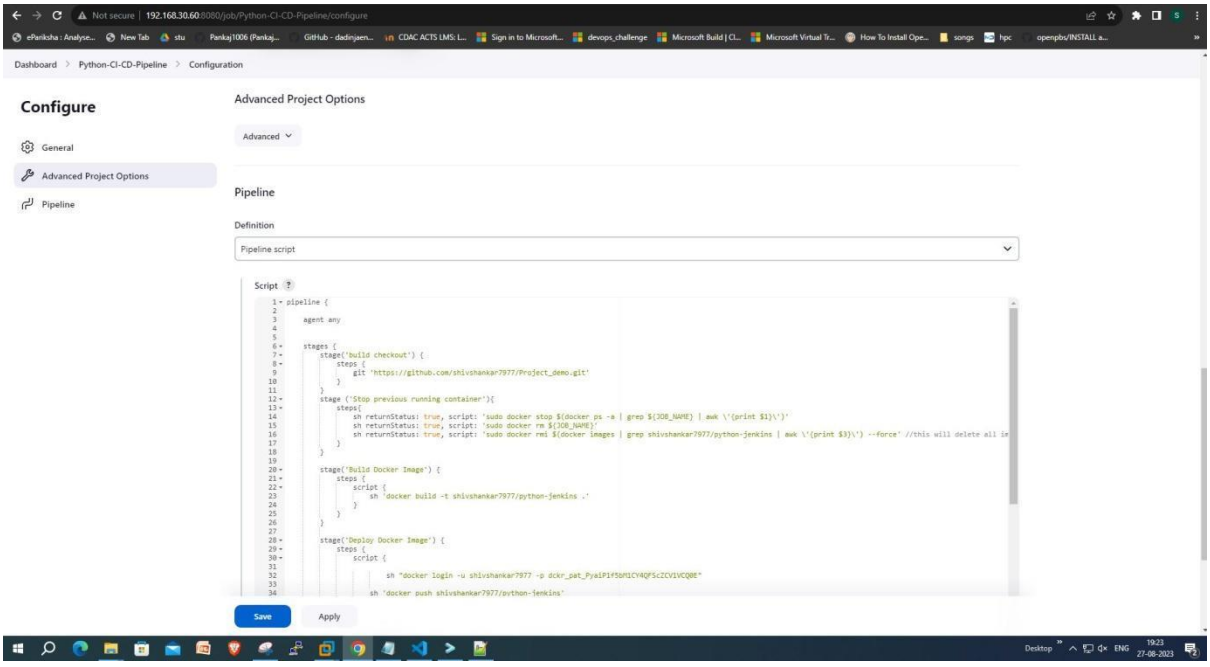


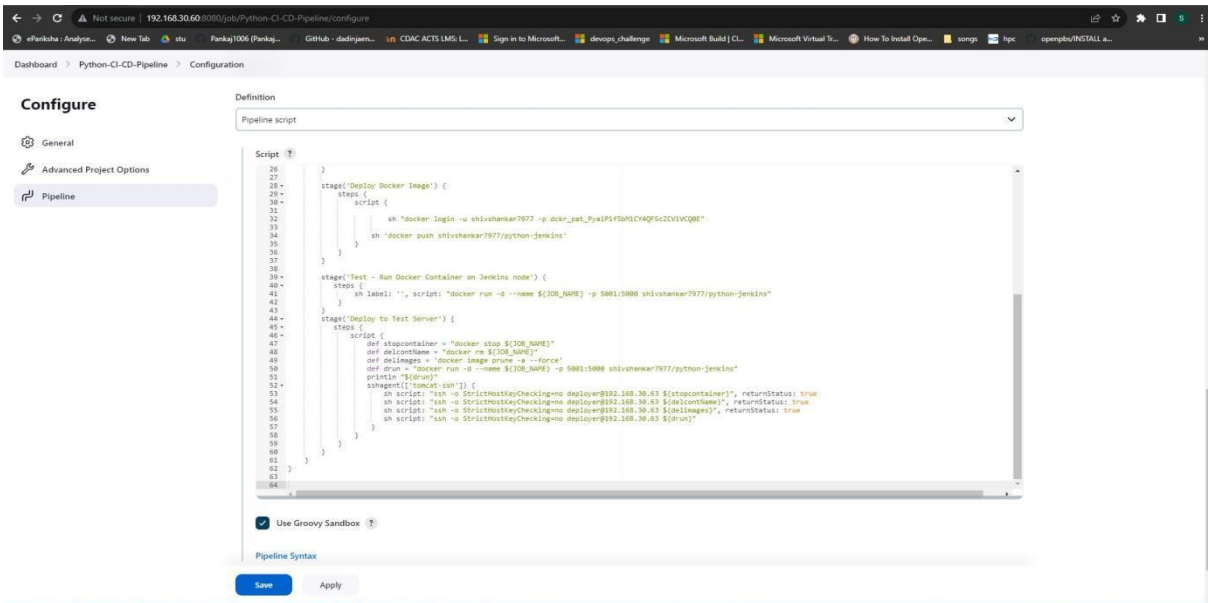
14.4 myapp.py (Flask App Code)

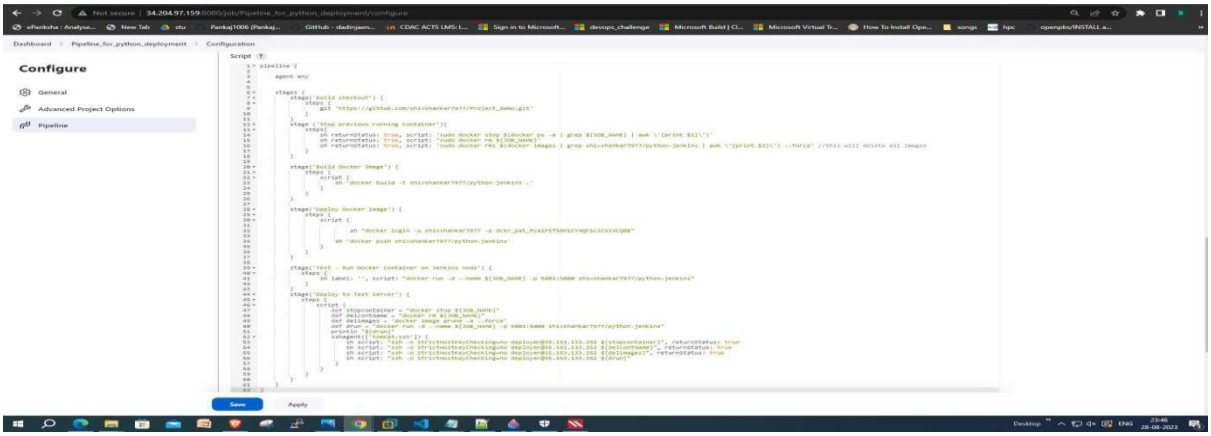


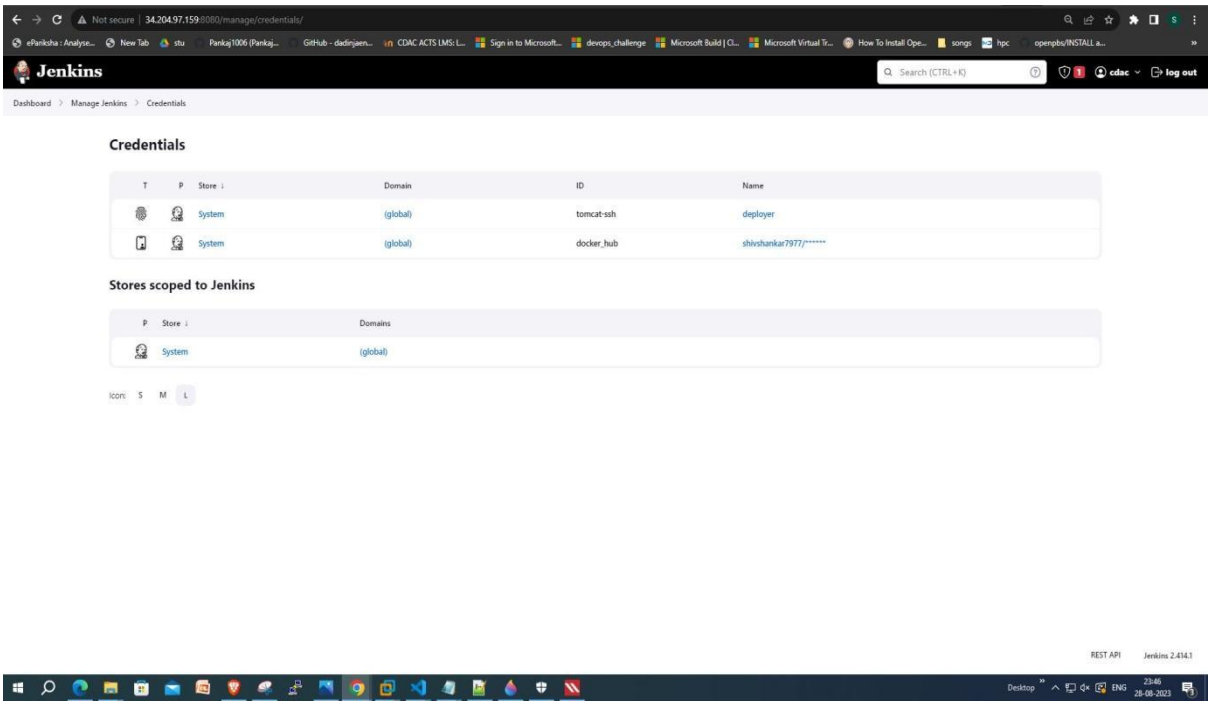
15. Jenkins files configuration





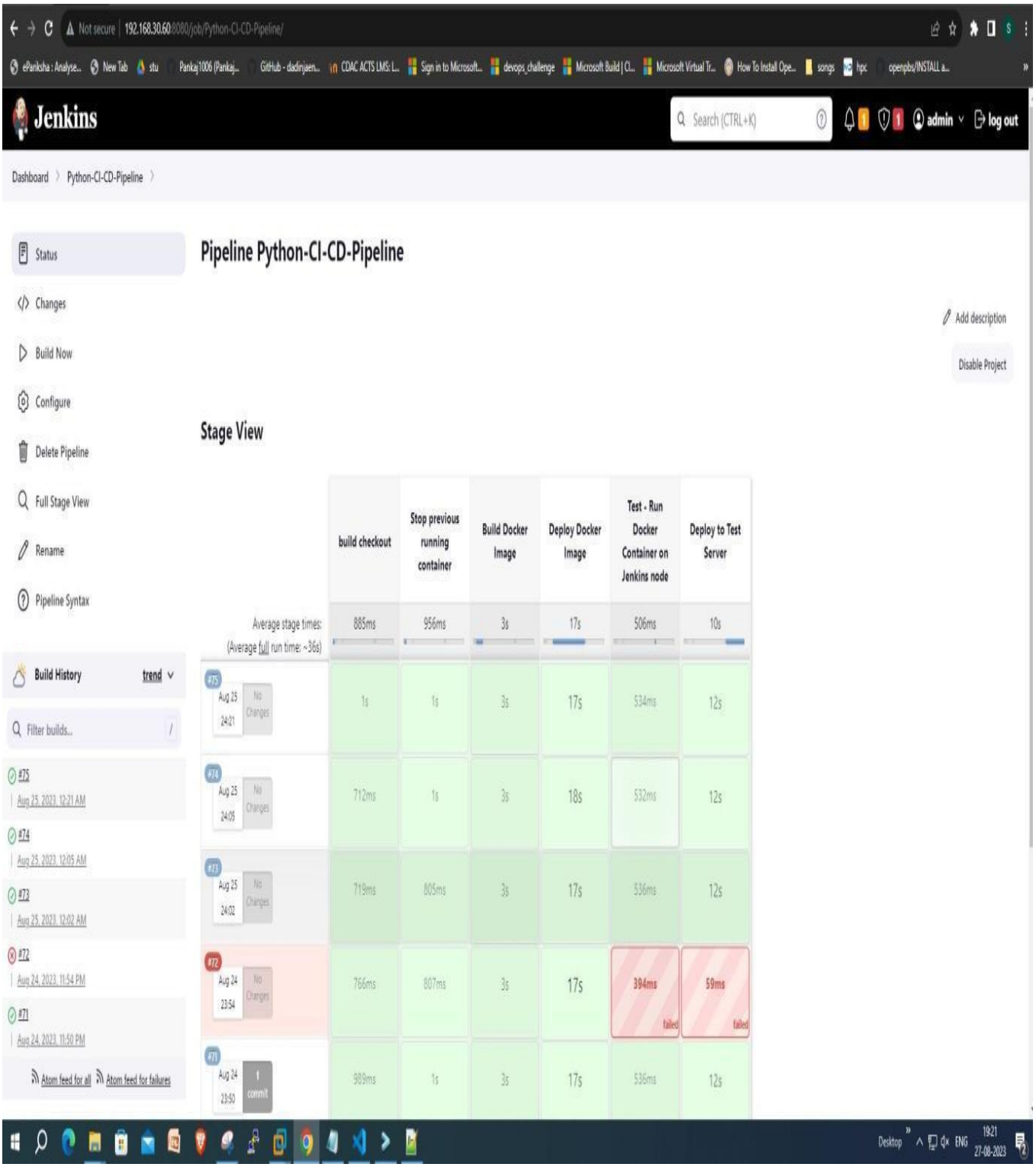

Not secure | 192.168.30.60:8080/job/Python-CI-CD-Pipeline/configure
Dashboard > Python-CI-CD-Pipeline > Configuration
Configure
General
Advanced Project Options
Pipeline
Definition
Pipeline script
Script
stage('Deploy Docker Image') {
stage('Test - Run Docker Container on Jenkins node') {
stage('Deploy to Test Server') {
Use Groovy Sandbox
Pipeline Syntax
Save
Apply


Not secure | 34.204.97.159:8080/job/Pipeline_for_python_deployment/configure
Dashboard > Pipeline_for_python_deployment > Configuration
Configure
General
Advanced Project Options
Pipeline
Script
pipeline {
stages {
stage('Build checkout') {
stage ('Stop previous running container'){
stage('Build Docker Image') {
stage('Deploy Docker Image') {
stage('Test - Run Docker Container on Jenkins node') {
stage('Deploy to Test Server') {
Save
Apply


Not secure | 34.204.97.159:8080/manage/credentials/
Jenkins
Search (CTRL+K)
cdac
log out
Dashboard > Manage Jenkins > Credentials
Credentials
T
P
Store ↓
Domain
ID
Name
System
(global)
tomcat-ssh
deployer
System
(global)
docker_hub
shivshankar7977/******
Stores scoped to Jenkins
P
Store ↓
Domains
System
(global)
Icon: S M L
REST API
Jenkins 2.414.1

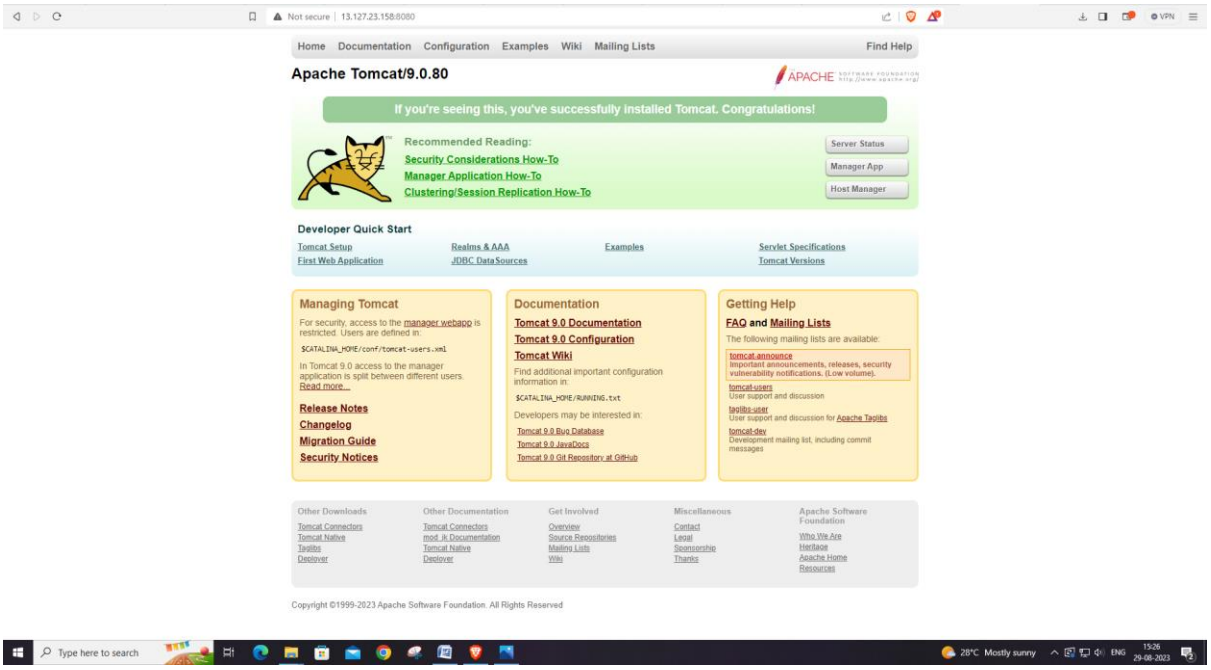
16. Test Plan

Project execution on physical machine.

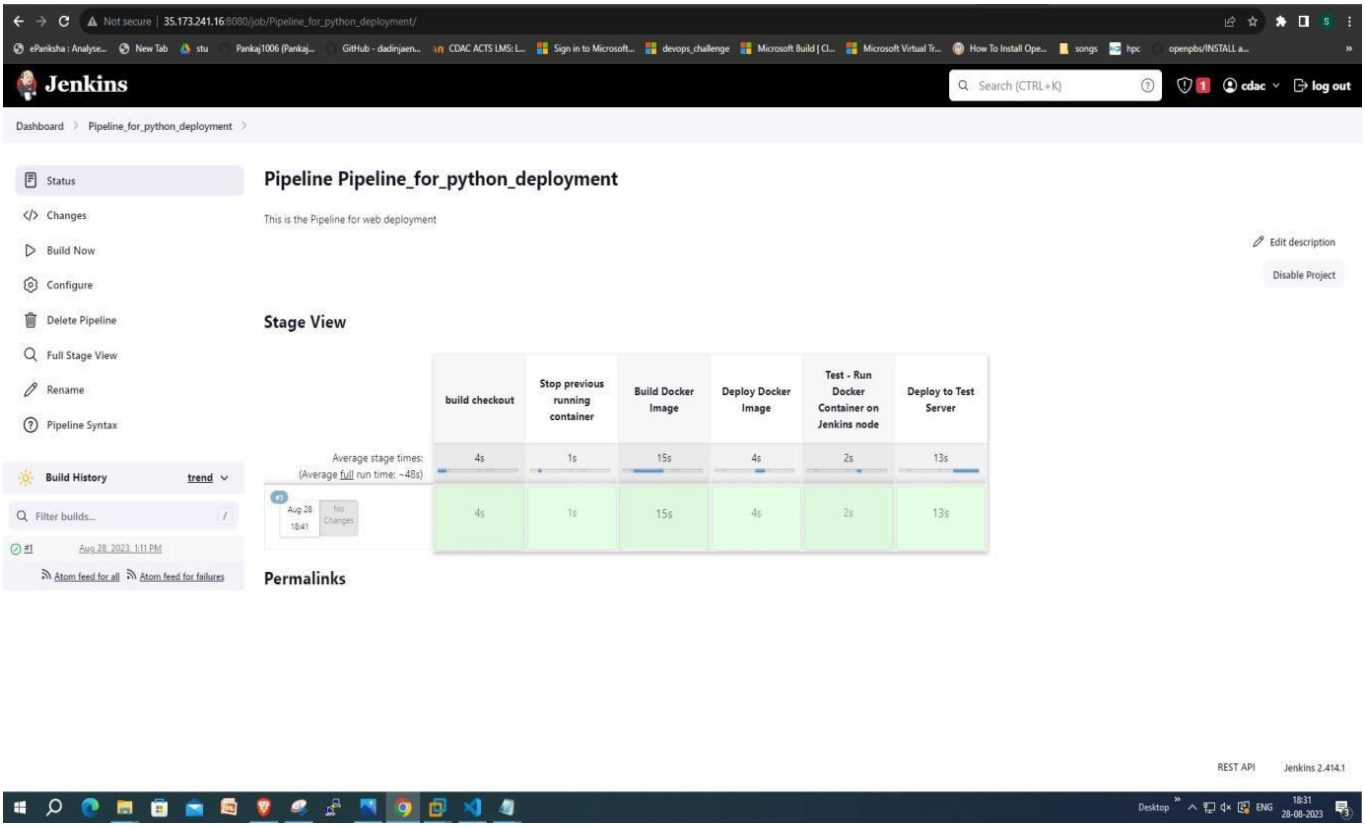


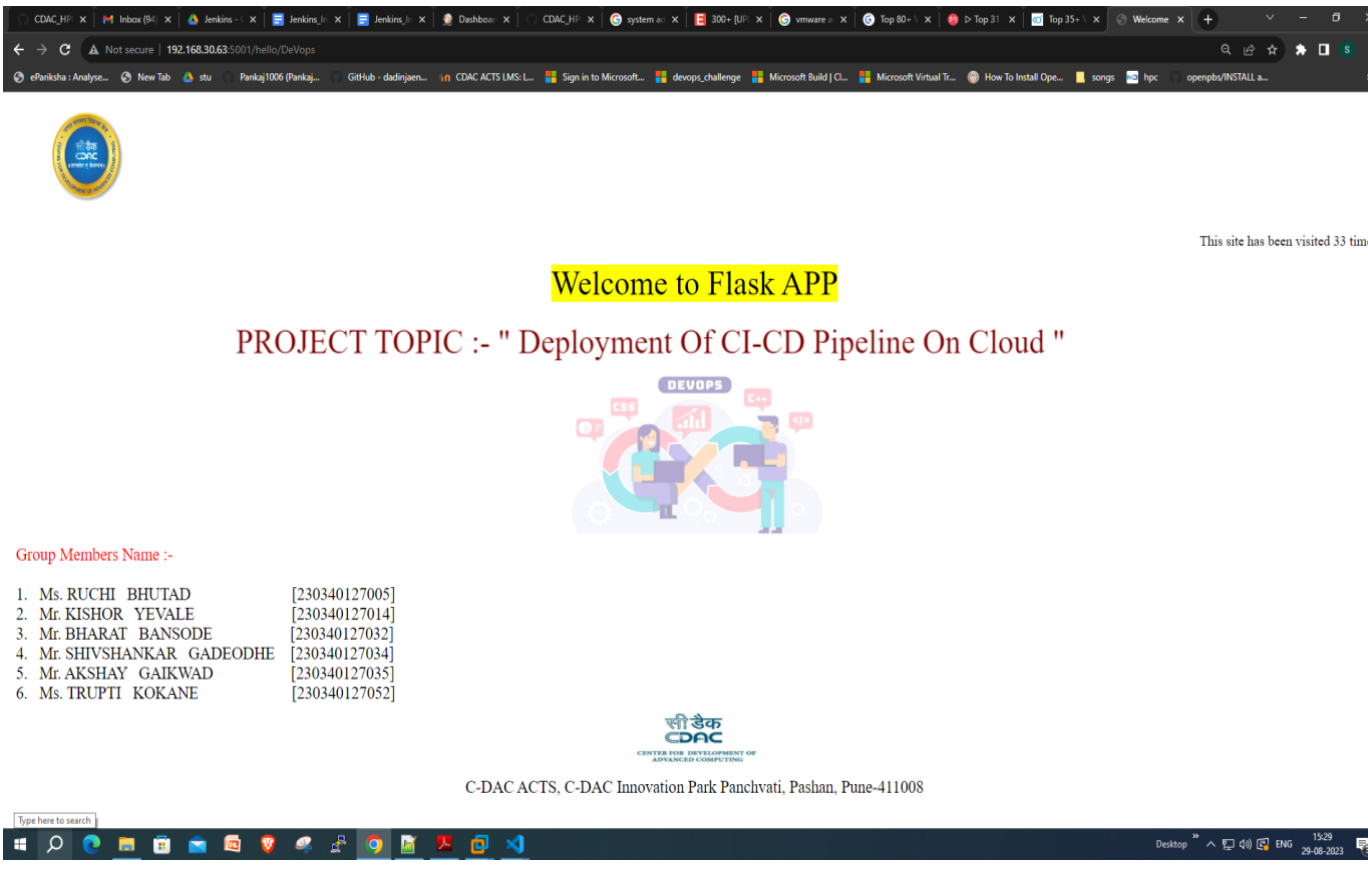
17. Application server

Tomcat server:



18. Results


Not secure | 35.173.241.16:8080/job/Pipeline_for_python_deployment/
Jenkins
Search (CTRL+K)
cdac
log out
Dashboard
Pipeline_for_python_deployment
Status
Changes
Build Now
Configure
Delete Pipeline
Full Stage View
Rename
Pipeline Syntax
Build History
trend
Filter builds...
Atom feed for all
Atom feed for failures
Pipeline Pipeline_for_python_deployment
This is the Pipeline for web deployment
Edit description
Disable Project
Stage View
build checkout
Stop previous running container
Build Docker Image
Deploy Docker Image
Test - Run Docker Container on Jenkins node
Deploy to Test Server
Average stage times:
(Average full run time: ~48s)
4s
1s
15s
4s
2s
13s
Aug 28
18:41
No Changes
Permalinks
REST API
Jenkins 2.414.1


Not secure | 192.168.30.63:5001/hello/DeVops
This site has been visited 33 times.
Welcome to Flask APP
PROJECT TOPIC :- " Deployment Of CI-CD Pipeline On Cloud "
DEVOPS
Group Members Name :-
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19. Conclusion

In conclusion, the deployment of a CI/CD pipeline on the cloud represents a transformative approach to software development and deployment. Through this project, we have successfully designed, implemented, and harnessed the power of cloud infrastructure to create a seamless and automated pipeline that has revolutionized our development processes.

By leveraging cloud resources, we have established a dynamic and scalable environment that caters to the entire software development lifecycle. The CI/CD pipeline has enabled us to continuously integrate code changes, rigorously test applications, and deploy them with utmost efficiency. This has resulted in accelerated delivery times, heightened software quality, and enhanced productivity across our development teams.

The multi-stage pipeline, encompassing source code management, build automation, testing, and deployment, has provided a comprehensive framework for orchestrating complex workflows.

In summary, the deployment of a CI/CD pipeline on the cloud has ushered in a new era of agility, reliability, and security in our software development endeavors. This project serves as a testament to the possibilities that emerge when cutting-edge cloud technology converges with modern software delivery practices. As we move forward, we are well-equipped to rapidly deploy new features, adapt to evolving requirements, and continuously innovate, all while upholding the highest standards of security and quality.

20. References

1. Reference for Docker
   https://docs.docker.com/build/guide/
2. Jenkins Documentation for pipeline https://www.jenkins.io/doc/tutorials/#pipeline
3. References from GitHub
   https://docs.github.com/
4. AWS Documentation
   https://docs.aws.amazon.com/
5. PyCharm Documentation
   https://www.jetbrains.com/help/pycharm/getting-started.html
6. python flask documentation
   https://flask.palletsprojects.com/