Day-2 DevOps-Training

step-by-step guide to setting up a simple Python "Hello, Docker!" Flask application using Docker and Docker Compose.

---

1. Install Docker

First, install Docker to get the Docker engine running on your system:

```
sudo apt install -y docker.io
```

- **Explanation:** Installs Docker on your system using the apt package manager. The -y flag auto-confirms any prompts.

---

2. Start and Enable Docker Service

Start the Docker service and enable it to start automatically at boot time:

```
sudo systemctl start docker
```

```
sudo systemctl enable docker
```

- **Explanation:** The start command starts the Docker daemon, and enable ensures Docker runs on startup.

---

3. Verify Docker Installation

Verify that Docker was installed correctly by checking its version:

```
docker --version
```

- **Explanation:** Displays the installed Docker version to confirm the installation.

---

4. Install Docker Compose

Now, install Docker Compose, a tool to define and manage multi-container Docker applications:

```
sudo curl -L "https://github.com/docker/compose/releases/latest/download/docker-compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
```

```
sudo chmod +x /usr/local/bin/docker-compose
```

- **Explanation:** The first command downloads the latest Docker Compose binary, and the second command makes it executable.

---

5. Verify Docker Compose Installation

Check the installed version of Docker Compose:

```
docker-compose --version
```

- **Explanation:** Displays the installed Docker Compose version to verify the installation.

---

6. Create Project Directory

Create a directory for your project and navigate into it:

```
mkdir ~/docker-python-app
```

```
cd ~/docker-python-app
```

- **Explanation:** Creates a directory for your project and navigates into it.

---

7. Create the app.py file

Create a Python file app.py for the Flask application:

```
nano app.py
```

Paste the following Flask application code:

```
from flask import Flask

app = Flask(__name__)

@app.route('/')
def hello_world():
    return 'Hello, world Running inside the docker!'

if __name__ == '__main__':
    app.run(host='0.0.0.0', port=5000)
```

- **Explanation:** A simple Flask app with one route (/) that returns a greeting message. The Flask server listens on all interfaces (0.0.0.0) and port 5000.

---

8. Create requirements.txt

Create a requirements.txt file to list Python dependencies:

```
nano requirements.txt
```

Add the following content:

```
flask
```

- **Explanation:** Lists the Flask library as the required dependency for your project.

---

9. Install pip (if not already installed)

Ensure pip is installed to handle Python package installations:

```
sudo apt update
```

```
sudo apt install python3-pip
```

- **Explanation:** Updates the package list and installs pip to handle Python packages.

---

10. Create Dockerfile

Create a Dockerfile that defines how the Docker image should be built:

```
nano Dockerfile
```

Add the following content:

```
# Use the official Python image from Docker Hub
FROM python:3.9-slim

# Set the working directory inside the container
WORKDIR /app

# Copy the current directory contents into the container at /app
COPY . /app

# Install any needed packages specified in requirements.txt
RUN pip install --no-cache-dir -r requirements.txt

# Make port 5000 available to the world outside the container
EXPOSE 5000

# Define the environment variable for Flask to run in production mode
ENV FLASK_ENV=production
```

```
# Run app.py when the container launches
CMD ["python", "app.py"]
```

- **Explanation:** This Dockerfile defines the Python environment, installs dependencies, exposes port 5000, and starts the Flask app inside the container.

---

11. Create docker-compose.yml

Create a docker-compose.yml file to manage the application's services:

```
nano docker-compose.yml
```

Add the following content:

```
version: '3.8'
services:
  web:
    build: .
    ports:
      - "5000:5000"
    environment:
      - FLASK_ENV=development
    volumes:
      - .:/app
    restart: always
```

- **Explanation:** This Compose file:
  - Defines the web service.
  - Builds the image from the current directory.
  - Maps port 5000 from the host to the container.
  - Mounts the current directory (.) into the container to enable live code reloading.
  - Restarts the container if it crashes.

---

12. Add User to Docker Group (if needed)

To avoid using sudo with Docker commands, add your user to the Docker group:

```
sudo usermod -aG docker $USER
```

```
newgrp docker
```

- **Explanation:** The first command adds your user to the Docker group, and the second command applies the changes to your current session.

---

13. Build and Run the Application

Now, you can build and start the Flask app container using Docker Compose:

```
docker-compose up --build
```

- **Explanation:** This command builds the Docker image and starts the container based on the docker-compose.yml configuration. The --build flag forces a rebuild of the Docker image.

---

14. Access the Application

Once the container is running, open your browser and navigate to:

```
http://localhost:5000
```

You should see the message: **"Hello, Docker Python App!"**

Summary of Commands

1. Install Docker:
2. `sudo apt install -y docker.io`
3. Start and enable Docker service:
4. `sudo systemctl start docker`
5. `sudo systemctl enable docker`
6. Install Docker Compose:
7. `sudo curl -L "https://github.com/docker/compose/releases/latest/download/docker-compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose`
8. `sudo chmod +x /usr/local/bin/docker-compose`
9. Create project directory:
10. `mkdir ~/docker-python-app`
11. `cd ~/docker-python-app`
12. Create app.py with Flask code.
13. Create requirements.txt with flask.

14. Install pip (if needed):

15. sudo apt update

16. sudo apt install python3-pip

17. Create Dockerfile with the configuration.

18. Create docker-compose.yml with service definition.

19. Add your user to the Docker group (if necessary):

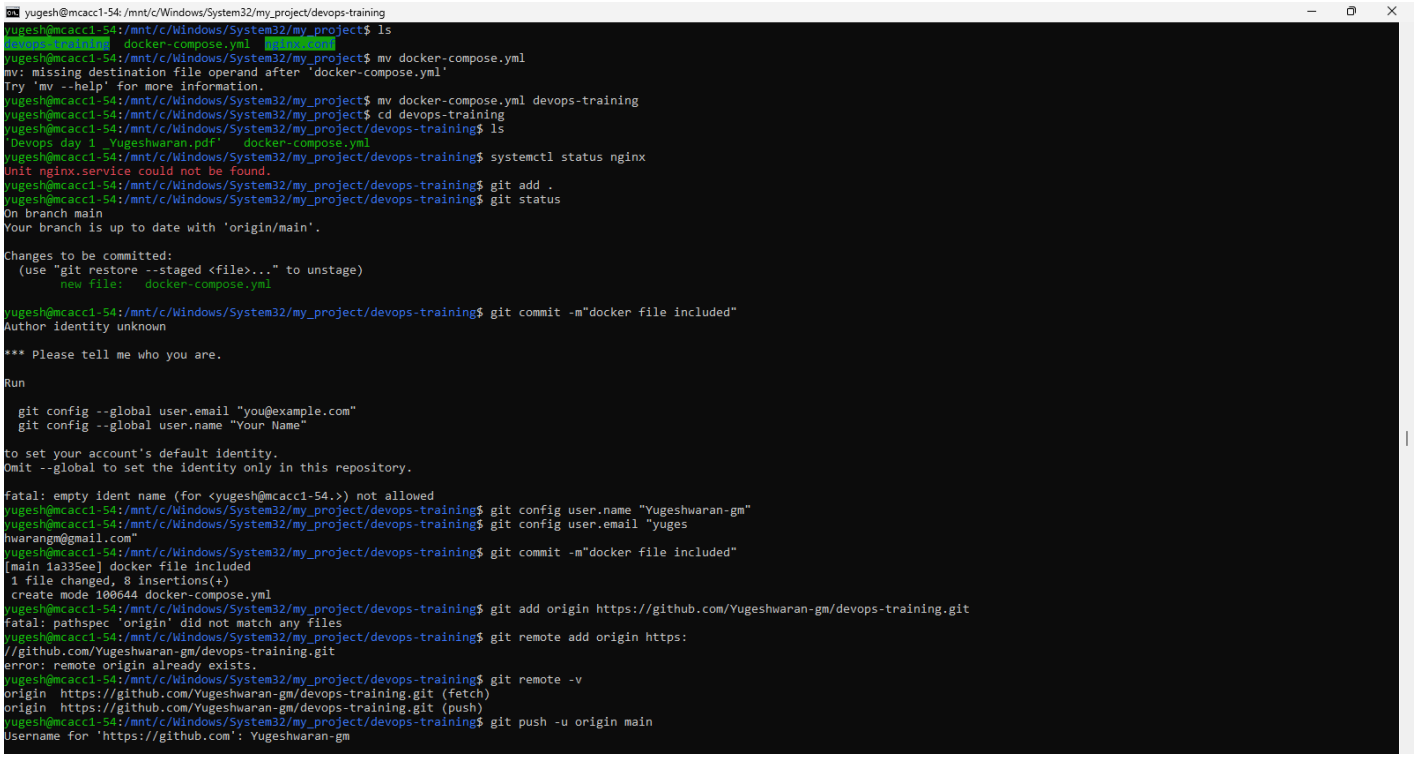
20. sudo usermod -aG docker $USER

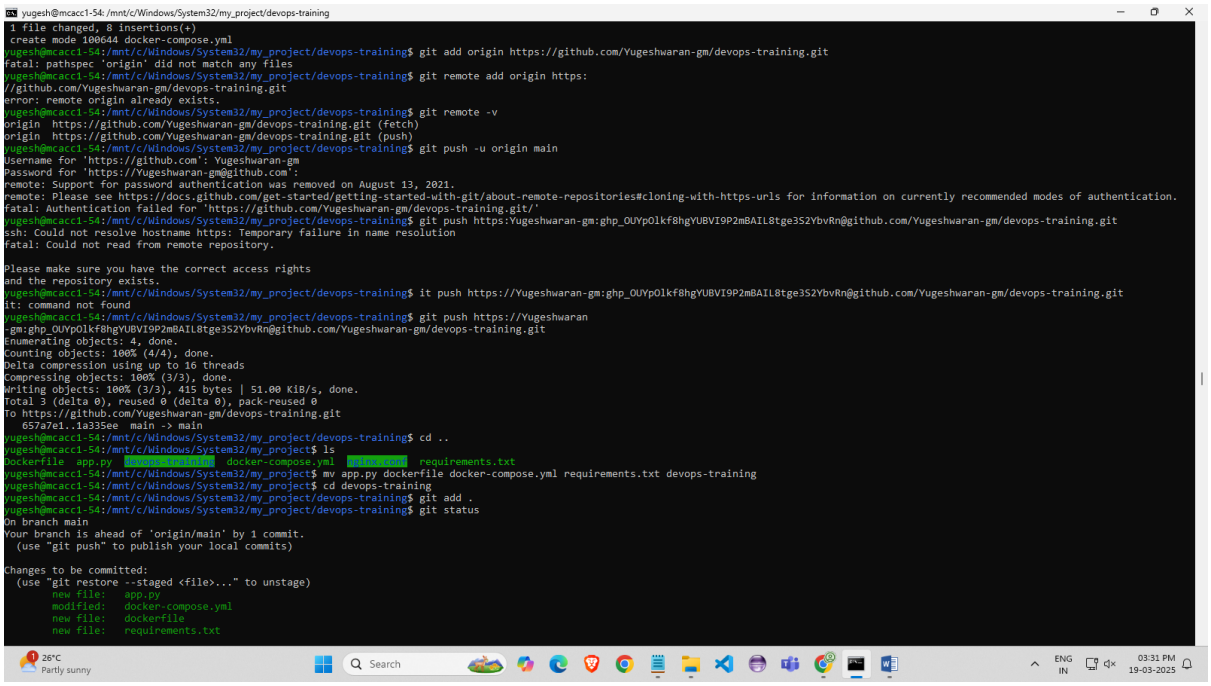
21. newgrp docker

22. Build and run the app:

23. docker-compose up --build

Now your "Hello, Docker!" Flask app should be running inside a Docker container, accessible at http://localhost:5000.




yugesh@mcacc1-54: /mnt/c/Windows/System32/my_project/devops-training
1 file changed, 8 insertions(+)
create mode 100644 docker-compose.yml
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git add origin https://github.com/Yugeshwaran-gm/devops-training.git
fatal: pathspec 'origin' did not match any files
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git remote add origin https:
//github.com/Yugeshwaran-gm/devops-training.git
error: remote origin already exists.
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git remote -v
origin https://github.com/Yugeshwaran-gm/devops-training.git (fetch)
origin https://github.com/Yugeshwaran-gm/devops-training.git (push)
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-tralning$ git push -u origin main
Username for 'https://github.com': Yugeshwaran-gm
Password for 'https://Yugeshwaran-gm@github.com':
remote: Support for password authentication was removed on August 13, 2021.
remote: Please see https://docs.github.com/get-started/getting-started-with-git/about-remote-repositories#cloning-with-https-urls for information on currently recommended modes of authentication.
fatal: Authentication failed for 'https://github.com/Yugeshwaran-gm/devops-training.git/'
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git push https:Yugeshwaran-gm: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@github.com/Yugeshwaran-gm/devops-training.git
ssh: Could not resolve hostname https: Temporary failure in name resolution
fatal: Could not read from remote repository.
Please make sure you have the correct access rights
and the repository exists.
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ it push https://Yugeshwaran-gm: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@github.com/Yugeshwaran-gm/devops-training.git
it: command not found
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git push https://Yugeshwaran
gm: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@github.com/Yugeshwaran-gm/devops-training.git
Enumerating objects: 4, done.
Counting objects: 100% (4/4), done.
Delta compression using up to 16 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 415 bytes | 51.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/Yugeshwaran-gm/devops-training.git
657a7e1..1a335ee main -> main
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ cd ..
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project$ ls
Dockerfile app.py devops-training docker-compose.yml dockerfile requirements.txt
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project$ mv app.py dockerfile docker-compose.yml requirements.txt devops-training
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project$ cd devops-training
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git add .
yugesh@mcacc1-54:/mnt/c/Windows/System32/my_project/devops-training$ git status
On branch main
Your branch is ahead of 'origin/main' by 1 commit.
(use "git push" to publish your local commits)
Changes to be committed:
(use "git restore --staged <file>..." to unstage)
new file: app.py
modified: docker-compose.yml
new file: dockerfile
new file: requirements.txt
26°C
Partly sunny
Search
ENG
IN
03:31 PM
19-03-2025

```
nisanth@LAPTOP-G3U57BJM:~/docker-app$ sudo docker ps
CONTAINER ID   IMAGE                COMMAND           CREATED        STATUS          PORTS                                       NAMES
a9a9d9673cb3   docker-python-app-web   "python app.py"   14 hours ago   Up 26 minutes   0.0.0.0:5000->5000/tcp, :::5000->5000/tcp   docker-python-app-web-1
```

Hello, Docker Python App!

Jenkins Pipeline Through Git Token - Setup Procedure

Step 1: Generate a Git Personal Access Token

Before configuring the Jenkins pipeline, you need to generate a **Personal Access Token (PAT)** from your Git service.

GitHub (Example)

1. **Log in to GitHub** and navigate to your profile.
2. Go to **Settings** > **Developer Settings** > **Personal Access Tokens**.
3. Click **Generate New Token**.
4. Select the necessary permissions for the token. For example, to clone repositories, select:
    - repo (full control of private repositories)
    - read:org (for organization repository access)
5. Generate the token and **copy it**. This token will act as the password when Jenkins connects to GitHub.

GitLab (Example)

1. **Log in to GitLab** and go to **Profile Settings** > **Access Tokens**.
2. Generate a new token with appropriate scopes (e.g., read_repository).
3. **Save the token** to use in Jenkins.

Bitbucket (Example)

1. **Log in to Bitbucket** and go to **Personal Settings** > **App Passwords**.
2. Create an app password with necessary permissions (like repository read).
3. **Save the password** to use in Jenkins.

Step 2: Store Git Token in Jenkins Credentials

Once you've generated the Git token, the next step is to store it securely in Jenkins.

1. **Log in to Jenkins** and navigate to the Jenkins dashboard.

2. In the left menu, click on **Manage Jenkins**.
3. Click on **Manage Credentials**.
4. Select the appropriate **scope** (e.g., (Global)).
5. Click on **Add Credentials**.
6. In the **Kind** dropdown, select **Username with password**.
7. In the **Username** field, enter your Git username (e.g., your-username for GitHub).
8. In the **Password** field, paste the **Git token** you generated.
9. Optionally, give it an ID (e.g., git-token-jenkins).
10. Click **OK** to save the credentials.

Step 3: Configure Jenkins Pipeline

Now that the Git token is securely stored in Jenkins, you can configure a Jenkins pipeline to use it for Git interactions.

Example Pipeline Script (Declarative Pipeline)

You'll now set up a pipeline that uses Git for the source code. Here's an example using a declarative pipeline.

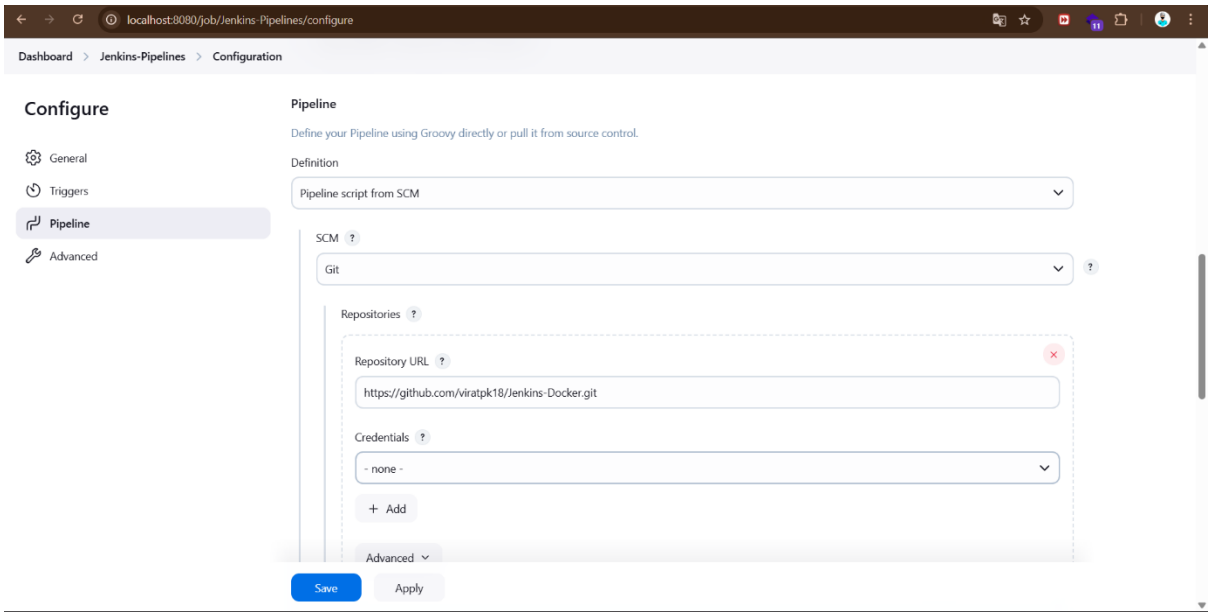
1. **Create a New Pipeline Job**:
    - Go to Jenkins Dashboard.
    - Click **New Item**, select **Pipeline**, and name your pipeline (e.g., Git-Pipeline).
    - Click **OK**.
2. **Configure the Pipeline**:
    - In the pipeline configuration, scroll to the **Pipeline** section.
    - Choose **Pipeline script from SCM**.
    - Set the **SCM** dropdown to **Git**.
    - In the **Repository URL** field, enter your repository URL (e.g., https://github.com/yourusername/your-repository.git).
    - Select **Credentials**. Choose the credentials you created earlier (e.g., git-token-jenkins).

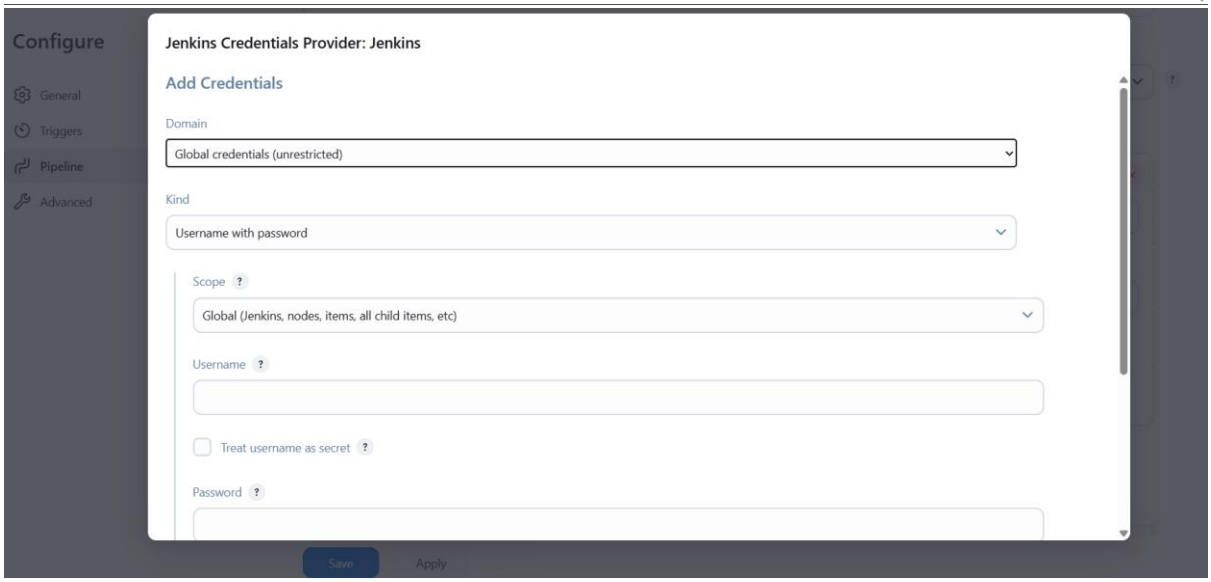
Step 4: Run the Jenkins Pipeline

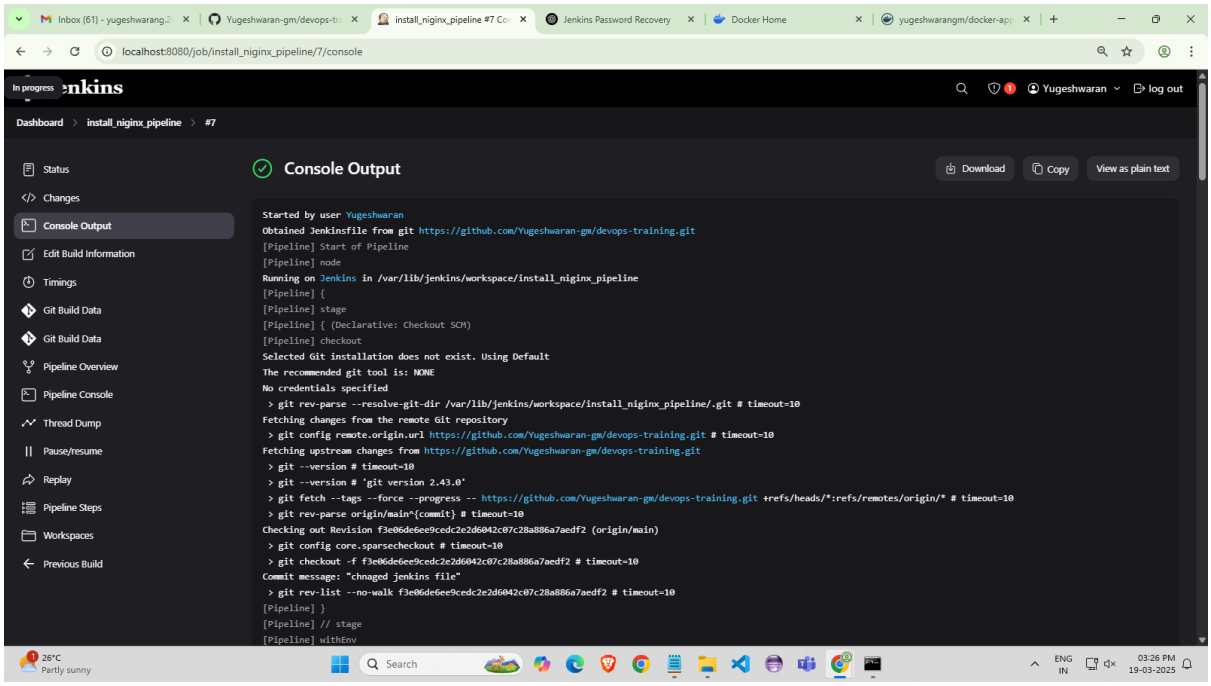
- After configuring the pipeline, click **Save** and then **Build Now** to run the pipeline.
- Jenkins will use the credentials you provided to authenticate with Git, clone the repository, and run the pipeline steps.

Step 5: Monitor and Troubleshoot

- If the pipeline fails, check the Jenkins job's **Console Output** for debugging information. Common issues can be due to incorrect credentials, Git URL, or permission issues.







Jenkins Pipeline for Dockerized Application Deployment

This document provides a step-by-step guide on how the Jenkins pipeline automates the process of fetching the code from GitHub, building a Docker image, pushing it to a container registry, and deploying the application in a running Docker container.

Pipeline Overview

The pipeline follows these key steps:

1. **Checkout Code** - Fetch the latest code from the GitHub repository.
2. **Build Docker Image** - Create a Docker image for the application.
3. **Login to Docker Registry** - Authenticate to the container registry.
4. **Push to Container Registry** - Upload the built image to a Docker registry.
5. **Stop & Remove Existing Container** - Stop and remove any existing container with the same name.
6. **Run Docker Container** - Deploy a new container with the updated image.
7. **Post Actions** - Handle success or failure messages.

Step-by-Step Execution

1. Checkout Code

- Uses Jenkins credentials to authenticate and fetch the latest code from GitHub.
- Ensures secure access using stored credentials instead of exposing raw tokens.

Implementation:

```
stage('Checkout Code') {
    steps {
        withCredentials([usernamePassword(credentialsId: 'github-yugesh', usernameVariable: 'GIT_USER', passwordVariable: 'GIT_TOKEN')]) {
            git url: "https://$GIT_USER:$GIT_TOKEN@github.com/Yugeshwaran-gm/devops-training.git", branch: 'main'
        }
    }
}
```

2. Build Docker Image

- Builds the Docker image using the Dockerfile present in the repository.
- Tags the image with the latest version.

Implementation:

```
stage('Build Docker Image') {
    steps {
        sh 'docker build -t $DOCKER_IMAGE .'
    }
}
```

3. Login to Docker Registry

- Uses stored Jenkins credentials to log in securely to the Docker registry.
- Prevents exposing login credentials in the script.

Implementation:

```
stage('Login to Docker Registry') {
    steps {
        withCredentials([usernamePassword(credentialsId: 'docker-yugesh', usernameVariable: 'DOCKER_USER', passwordVariable: 'DOCKER_PASS')]) {
```

```
            sh 'echo $DOCKER_PASS | docker login -u $DOCKER_USER --password-stdin'
        }
    }
}
```

4. Push to Container Registry

- Pushes the newly built Docker image to the specified container registry.
- Ensures the latest version of the application is stored and accessible.

Implementation:

```
stage('Push to Container Registry') {
    steps {
        sh 'docker push $DOCKER_IMAGE'
    }
}
```

5. Stop & Remove Existing Container

- Stops and removes the running container if it exists.
- Prevents conflicts when deploying the new version.

Implementation:

```
stage('Stop & Remove Existing Container') {
    steps {
        script {
            sh '''
            if [ "$(docker ps -aq -f name=$CONTAINER_NAME)" ]; then
                docker stop $CONTAINER_NAME || true
                docker rm $CONTAINER_NAME || true
            fi
            '''
        }
    }
}
```

6. Run Docker Container

- Starts a new Docker container with the updated image.
- Maps the internal application port 5000 to 5001 on the host machine.

Implementation:

```
stage('Run Docker Container') {
    steps {
        sh 'docker run -d -p 5001:5000 --name $CONTAINER_NAME $DOCKER_IMAGE'
    }
}
```

7. Post Actions

- If successful, displays a success message.
- If failed, displays an error message.

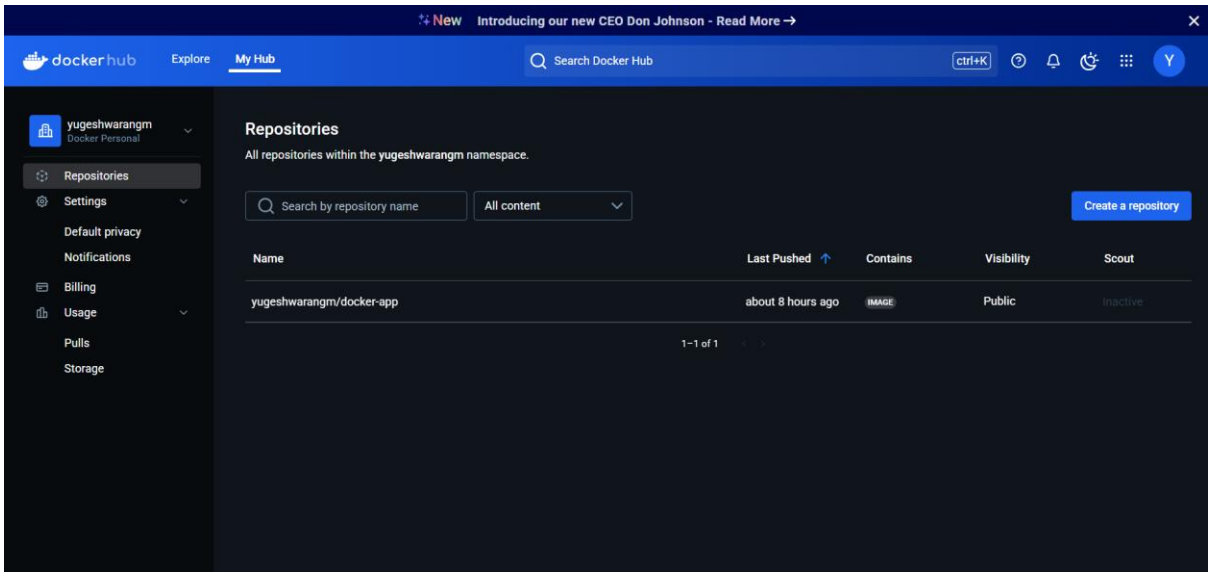
Implementation:

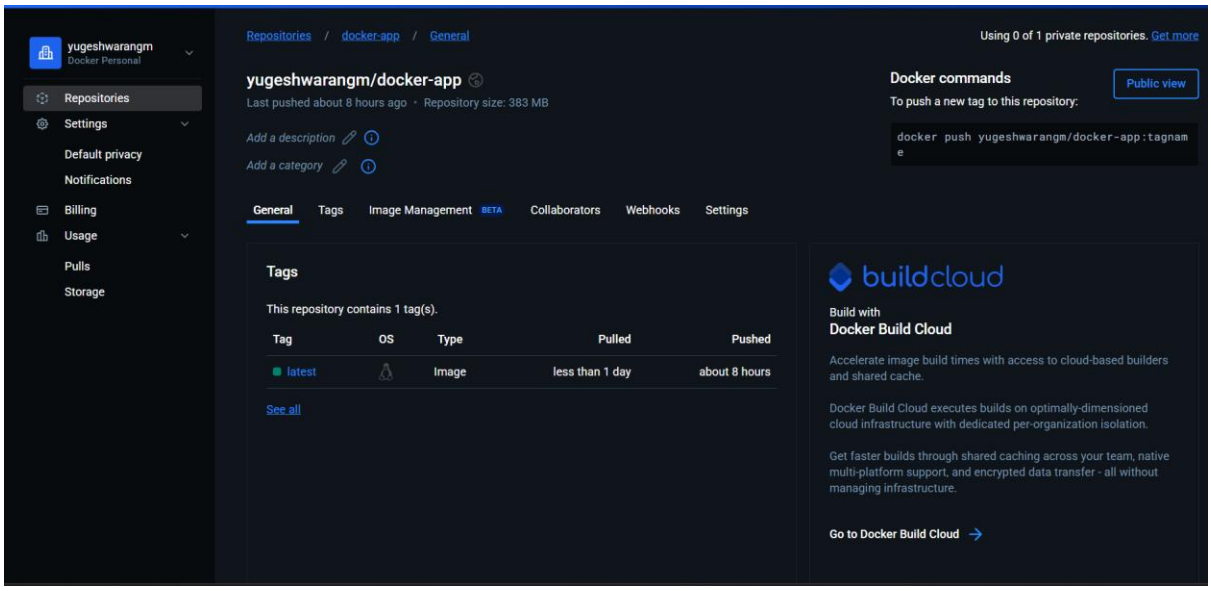
```
post {
    success {
        echo "Build, push, and container execution successful!"
    }
    failure {
        echo "Build or container execution failed."
    }
}
```

Conclusion

This Jenkins pipeline automates the entire process of fetching the code, building a Docker image, pushing it to a registry, and deploying the container. It ensures a seamless CI/CD workflow, making application updates smooth and efficient. 🚀

Hello, Docker Python App!


New Introducing our new CEO Don Johnson - Read More →
dockerhub
Explore
My Hub
Search Docker Hub
ctrl+K
yugeshwarangm
Docker Personal
Repositories
Settings
Default privacy
Notifications
Billing
Usage
Pulls
Storage
Repositories
All repositories within the yugeshwarangm namespace.
Search by repository name
All content
Create a repository
Name
Last Pushed
Contains
Visibility
Scout
yugeshwarangm/docker-app
about 8 hours ago
IMAGE
Public
Inactive
1–1 of 1


yugeshwarangm
Docker Personal
Repositories
Settings
Default privacy
Notifications
Billing
Usage
Pulls
Storage
Repositories / docker-app / General
Using 0 of 1 private repositories. Get more
yugeshwarangm/docker-app
Last pushed about 8 hours ago • Repository size: 383 MB
Add a description
Add a category
Docker commands
Public view
To push a new tag to this repository:
docker push yugeshwarangm/docker-app:tagnam
e
General
Tags
Image Management BETA
Collaborators
Webhooks
Settings
Tags
This repository contains 1 tag(s).
Tag
OS
Type
Pulled
Pushed
latest
Image
less than 1 day
about 8 hours
See all
buildcloud
Build with
Docker Build Cloud
Accelerate image build times with access to cloud-based builders and shared cache.
Docker Build Cloud executes builds on optimally-dimensioned cloud infrastructure with dedicated per-organization isolation.
Get faster builds through shared caching across your team, native multi-platform support, and encrypted data transfer - all without managing infrastructure.
Go to Docker Build Cloud