Continuous Deployment Pipeline with GitLab on Ubuntu

Introduction:

Continuous Integration (CI) and Continuous Deployment (CD) are essential practices in modern software development. The primary goal of a CI/CD pipeline is to automatically build, test, and deploy your application whenever changes are made to your repository.

Why We Need CI/CD:

A CI/CD pipeline offers significant benefits for software development and deployment:

- Automated Deployments: When you push changes to any branch, the CI/CD pipeline will automatically build, test, and deploy your application to your server. This reduces manual intervention and ensures consistency.
- Faster Development Cycles: Automation speeds up the feedback loop, allowing for quicker iterations and faster delivery of features and fixes.

Prerequisites:

Before setting up the CI/CD pipeline, ensure your application runs via a Dockerfile. Docker allows you to package your application with all its dependencies, ensuring consistency across different environments. Please follow this for .Net application.

> Documentation/Dockerizing.NET_Applications.pdf at main · talukderroni13039/Documentation (github.com)

Step-by-Step Guide to Setting Up CI/CD Pipeline with GitLab on Ubuntu Server

Step 1 - DockerFile in your project

Firstly make sure your application has been containerized via Dockerfile.

Then push your project into your specific Gitlab Repository.

Step 2 - Install GitLab Runner on Your Ubuntu Server

Start by logging in to your server:

ssh your_user_name@your_server_IP

Check Gitlab runner is exists or not in the server

systemctl status gitlab-runner

You will have active (running) in the output:

Output • gitlab-runner.service - GitLab Runner Loaded: loaded (/etc/systemd/system/gitlab-runner.service; enabled; vendor preset: Active: active (running) since Mon 2020-06-01 09:01:49 UTC; 4s ago Main PID: 16653 (gitlab-runner) Tasks: 6 (limit: 1152) CGroup: /system.slice/gitlab-runner.service —16653 /usr/lib/gitlab-runner/gitlab-runner run --working-directory /home

In order to install the gitlab-runner service, you'll add the official GitLab repository. Download and inspect the install script:

curl -L "https://packages.gitlab.com/install/repositories/runner/gitlab-runner/script.deb.sh" | sudo bash

On successful execution, this returns the following message:

The repository is setup! You can now install packages.

To install the gitlab-runner package, run the following command in terminal:

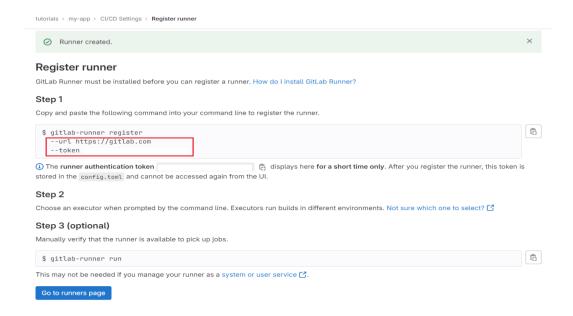
sudo apt-get install gitlab-runner

When you execute the previous command, the output will be like:

```
Output
[sudo] password for sammy: % Total % Received % Xferd Average Speed Time
Dload Upload Total Spent Left Speed
100 5945 100 5945 0 0 8742 0 --:--:-- 8729
```

Step 3 - Register Gitlab Runner

- 1. In your GitLab project, navigate to **Settings** > **CI/CD** > **Runners** > **Expand**.
- 2. In the **Project runners** section, click on **New project runner** and follow the form to create a new runner for your project.
- 3. Once a runner is in place, you'll find the **registration token** and the **GitLab URL**. Copy both to a text editor; you'll need them for the next command. They will be referred to as https://your gitlab.com and project token.



Back to your terminal in the server and register the runner for your project:

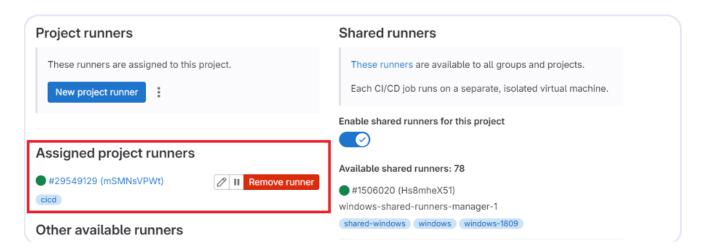
sudo gitlab-runner register -n --url https://your_gitlab.com --registration-token project_token --executor docker --description "Deployment Runner" --docker-image "docker:stable" --tag-list deployment --docker-privileged

https://your_gitlab.com project_token

Just replace two things with your gitlab runner what you have created via gitlab runner in gitlab Output:



Verify the registration process by going to **Settings** > **CI/CD** > **Runners** in GitLab, where the registered runner will show up.



Step 4- Setting Up an SSH Key

Make sure the user has sudo access and the user is in the Docker group. This permits **deployer** to execute the **docker** command, which is required to perform the deployment.

Creta ssh key pair one is public and another one is private key: ssh-keygen -b 4096

To authorize the SSH key for the server user, you need to append the public key to the authorized keys file:

```
cat ~/.ssh/id rsa.pub >> ~/.ssh/authorized keys
```

Start by showing the SSH private key:

```
cat ~/.ssh/id rsa
```

Copy the output to your clipboard. Make sure to add a line break after

```
----END RSA PRIVATE KEY----:
```

Now navigate to **Settings** > **CI** / **CD** > **Variables** in your GitLab project and click **Add Variable**.

Key: ID RSA

• Value: Paste your SSH private key from your clipboard (including a line break at the end).

• Type: File

Environment Scope: All (default)
 Protect variable: Unchecked
 Mask variable: Unchecked

Key: SERVER IP

Value: your server IP

• Type: Variable

Environment scope: All (default)
 Protect variable: Unchecked
 Mask variable: Unchecked

Key: SERVER USER

Value: your_user_name

• Type: Variable

Environment scope: All (default)
 Protect variable: Unchecked
 Mask variable: Unchecked

Step 5 - Configuring the .gitlab-ci.yml File

In GitLab, go to the **Project overview** page, click the **+** button and select **New file**. Then set the **File name** to .gitlab-ci.yml.

Alternatively you can clone the repository and make all following changes to .gitlab-ci.yml on your local machine, then commit and push to the remote repository.

Next, add the following to your .gitlab-ci.yml file:

stages:

- build

variables:

TAG_LATEST: \$CI_REGISTRY_IMAGE/\$CI_COMMIT_REF_NAME:latest

TAG COMMIT: \$CI REGISTRY IMAGE/\$CI COMMIT REF NAME: \$CI COMMIT SHORT SHA

DOCKER_TLS_CERTDIR: ""
DOCKER_DRIVER: overlay2

build:

image: docker:latest

stage: build services:

- docker:dind

only:

- deployment

tags:

- deployment

script:

- echo \$SERVER USER
- echo \$TAG LATEST
- echo \$TAG COMMIT
- docker build -t \$TAG COMMIT -t \$TAG LATEST.
- echo "docker push startted"
- docker login -u gitlab-ci-token -p \$CI JOB TOKEN \$CI REGISTRY
- docker push \$TAG COMMIT
- docker push \$TAG LATEST
- echo "server login started"
- echo "\$ID RSA" > /tmp/id rsa.pem
- Is /tmp
- chmod 600 /tmp/id rsa.pem
- cat /tmp/id_rsa.pem
- ssh -i /tmp/id rsa.pem -o StrictHostKeyChecking=no \$SERVER USER@\$SERVER IP
- echo "login sucess"
- ssh -i /tmp/id_rsa.pem -o StrictHostKeyChecking=no \$SERVER_USER@\$SERVER_IP "docker login -u gitlab-ci-token -p \$CI JOB TOKEN \$CI REGISTRY"
 - echo "login to the server"
- ssh -i /tmp/id_rsa.pem -o StrictHostKeyChecking=no \$SERVER_USER@\$SERVER_IP "docker pull \$TAG_COMMIT"
- ssh -i /tmp/id_rsa.pem -o StrictHostKeyChecking=no \$SERVER_USER@\$SERVER_IP "docker container rm f message-processor || true"
- ssh -i /tmp/id_rsa.pem -o StrictHostKeyChecking=no \$SERVER_USER@\$SERVER_IP "docker run -d --name message-processor \$TAG COMMIT"

Explanation:

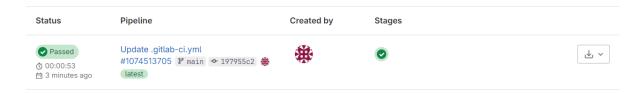
- docker build ...: Builds the Docker image based on the Dockerfile and tags it with the latest commit tag defined in the variables section.
- docker login ...: Logs Docker in to the project's container registry. You use the predefined
 variable \$CI_JOB_TOKEN as an authentication token. GitLab will generate the token and stay valid for
 the job's lifetime.
- docker push ...: Pushes both image tags to the container registry.
- tags:
 - deployment
- The deployment tag ensures that the job will be executed on runners that are tagged deployment, When create runner give them specific tag like deployment
- only:
 - deployment

This is the branch name where job will be executed

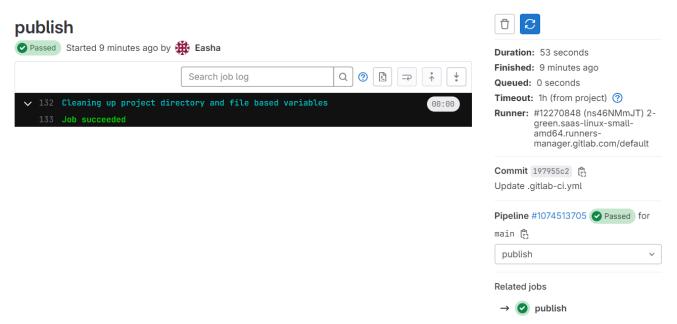
- -i stands for identity file and \$ID_RSA is the GitLab variable containing the path to the private key file.
- -o StrictHostKeyChecking=no makes sure to bypass the question, whether or not you trust the remote host. This question can not be answered in a non-interactive context such as the pipeline.
- \$SERVER_USER and \$SERVER_IP are the GitLab variables. They specify the remote host and login user for the SSH connection.
- command will be executed on the remote host.

Step 6 - Validating the Deployment

When a <code>.gitlab-ci.yml</code> file is pushed to the repository, GitLab will automatically detect it and start a CI/CD pipeline. At the time you created the <code>.gitlab-ci.yml</code> file, GitLab started the first pipeline. Go to <code>Build > Pipelines</code> in your GitLab project to see the pipeline's status. If the jobs are still running/pending, wait until they are complete. You will see a <code>Passed</code> pipeline with two green checkmarks, denoting that the publish and deploy job ran successfully.



Next click the **publish** button to open the result page of the deploy job.



Inally we want to check the deployed container on our server. Head over to your terminal and make sure to log in again,

ssh sammy@your_server_IP

docker container Is



Conclusion:

Then you configured the .gitlab-ci.yml pipeline configuration to:

- 1. Build the Docker image.
- 2. Push the Docker image to the container registry.
- 3. Log in to the server, pull the latest image, stop the current container, and start a new one.

GitLab will now deploy the application to your server for each push to the repository.

Reference:

https://docs.gitlab.com/ee/topics/build your application.html