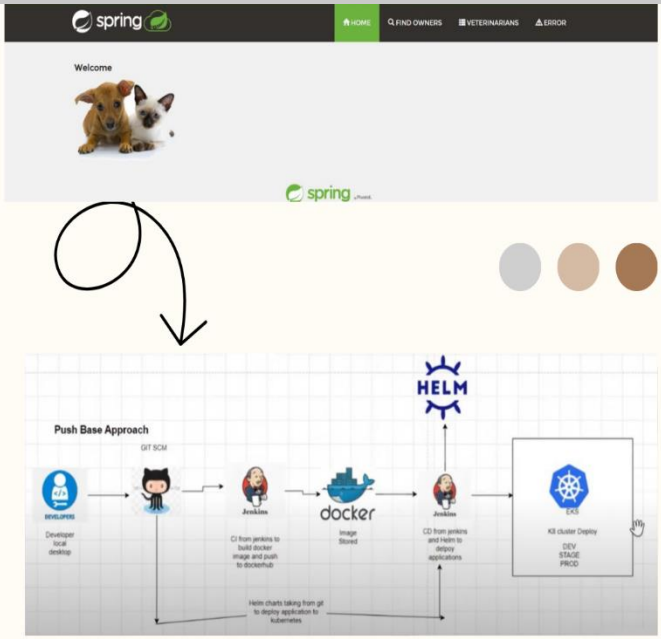
PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Project

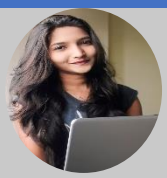
Deployment of Pet-clinic APP



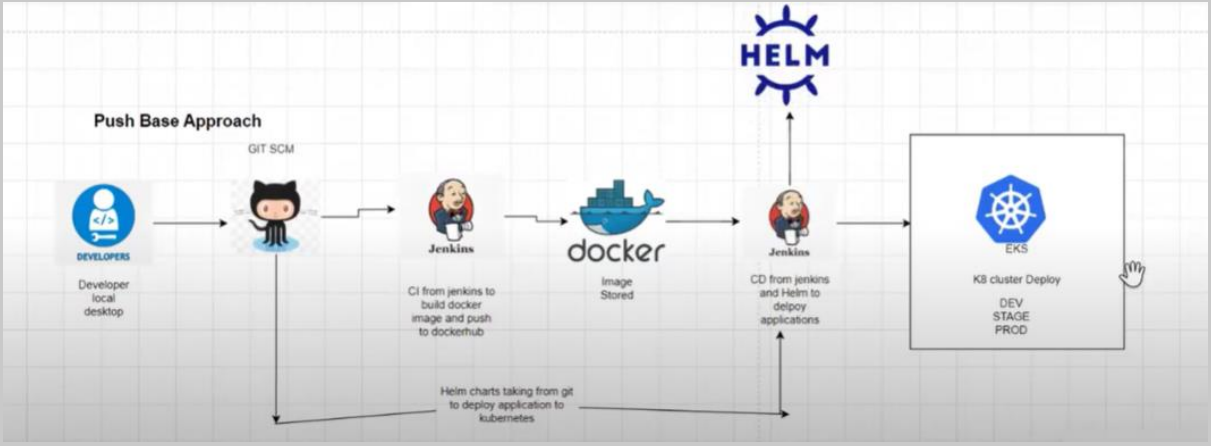
SPRING-BOOT APPLICATION DEPLOYMENT PROJECT "PET-CLINIC"

Divya Satpute

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP



Jenkins on Server Push Based Approach CICD



Project content

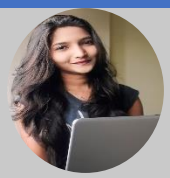
1. **Create Cluster using kubeadm script**
   (step1)
2. **How to deploy Jenkins with Our custom domain and SSL**
   (step 2)
3. **Step-by-step guide to configure SSL on Jenkins using Let's Encrypt and NGINX reverse proxy**
   (step 3)
4. **create webhook on Git-hub**
   (step 4)
   Referral GIT-REPO = git clone https://github.com/divyasatpute/Jenkins.git

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Introduction

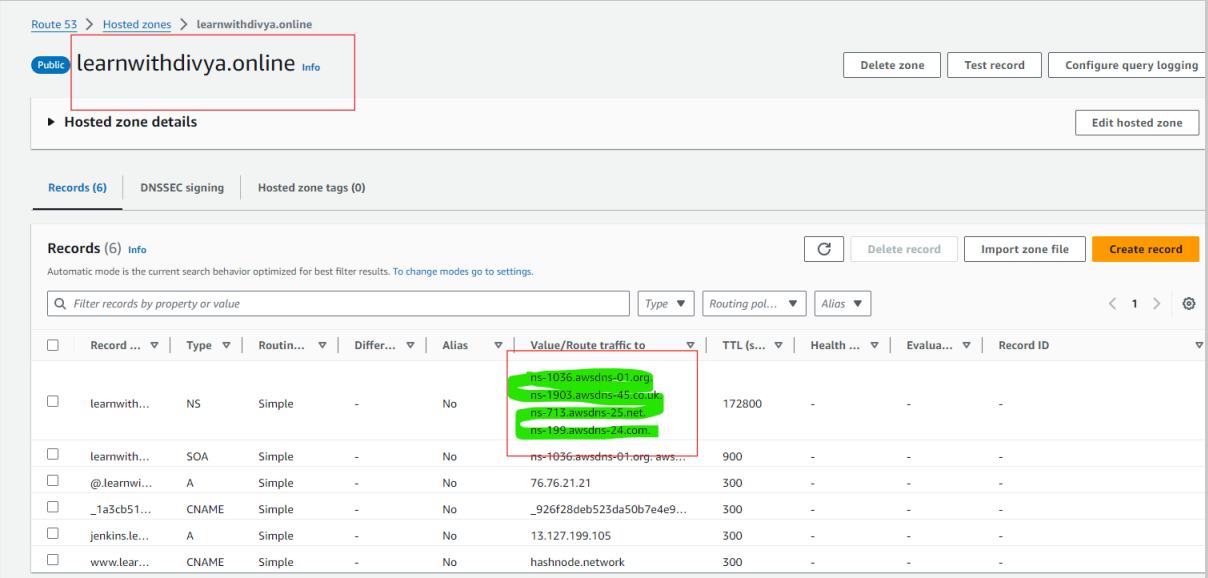
- **What is CI/CD?** 🛠️
  - Continuous Integration (CI) + Continuous Deployment (CD).
  - Automates software delivery process.
- **Server Push Based Approach** 🔄
  - Code changes are automatically pushed to the server.
  - Reduces manual intervention and accelerates deployment.
- **Jenkins Overview** 🥷
  - Popular open-source automation server.
  - Supports building, deploying, and automating projects.
- **How It Works** 🖥️
  - **Code Push**: Developers push code to a version control system (e.g., Git) 🌐.
  - **Webhook Trigger**: A webhook notifies Jenkins of changes 🔔.
  - **Build Process**: Jenkins pulls the latest code and runs builds/tests 📊.
  - **Deployment**: Successful builds are automatically deployed to the server 🚢.
- **Benefits** ✅
  - **Automated Testing**: Ensures code quality through automated tests 🧪.
  - **Consistent Releases**: Reduces human error in deployments.
  - **Scalability**: Easily integrates with other tools and systems 🔗.
- **Common Tools Used** 🔧
  - **Version Control**: Git
  - **Notification Services**: Slack, email alerts.

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP



Prerequisites

you must have your purchase domain and create hosted zone in Route 53 and replace this namespaces with your domain



Git clone

$git clone https://github.com/divyasatpute/Jenkins.git

push this repo on your github

$git push <your github repo URL >

.

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Step by Step guide

For that you need to create 4 machine cluster

(step1)

Create Cluster using kubeadm script

In this POC we need 1 master and 2 worker machine and Jenkins machine separately

On AWS Console

- 4 EC2 machine
- ubuntu 20.04 AMI
- volume 40GB (storage)
- c5.xlarge Machine Type

after you have to connect all on gitbash

And update all cluster using following command:

$sudo apt update -y

And set hostname for each node

$sudo hostname Master

$sudo hostname Worker1

$sudo hostname Worker2

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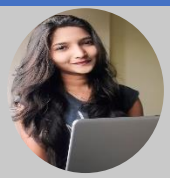

Come on root user

$sudo -i

now on master node paste the following command (EKS Script) Controlplane script

$bash <(curl -s
https://raw.githubusercontent.com/isakibshaikh1/Kubeadm/main/kubeadm/master.sh)

And on another on both Worker node paste following command (worker script)

$bash <(curl -s
https://raw.githubusercontent.com/isakibshaikh1/Kubeadm/main/kubeadm/worker.sh)

```
--2024-07-18 14:07:56--  https://objects.githubusercontent.com/github-production-release-asset-2e65be/11225014/c2055a8
3-495f-4439-87ad-16e8764054ec?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=releaseassetproduction%2F20240718%2Fus
-east-1%2Fs3%2Faws4_request&X-Amz-Date=20240718T140756Z&X-Amz-Expires=300&X-Amz-Signature=bffe274ed8b3c50b65147d867007
ff88e0a1f8f53b2da3598c7be3ae42a6f817&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=11225014&response-content-di
sposition=attachment%3B%20filename%3Detcd-v3.5.1-linux-amd64.tar.gz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.108.133, 185.199.111.133, 185.199.1
10.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 19399491 (18M) [application/octet-stream]
Saving to: 'etcd-v3.5.1-linux-amd64.tar.gz'

etcd-v3.5.1-linux-amd64.tar.g 100%[===============================================>]  18.50M  --.-KB/s    in 0.05s

2024-07-18 14:07:56 (386 MB/s) - 'etcd-v3.5.1-linux-amd64.tar.gz' saved [19399491/19399491]


### COMMAND TO ADD A WORKER NODE ###
kubeadm join 172.31.46.89:6443 --token qanxgm.tmberexbyo3n0dpr --discovery-token-ca-cert-hash sha256:c2b6ac5e46556ed69
c940fa8725eb37e6ccbeaa3f39117fc71a481a1798eac3c
root@master:~#
```

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Note: now your master node is ready take this token from master node and paste on worker node for join worker node to master

as you can see node will be ready but worker node yet not ready state

Note that both nodes are NotReady. This is OK because we have not yet installed networking.

```
root@master:~# kubectl get nodes
NAME      STATUS     ROLES           AGE   VERSION
master    Ready      control-plane   21m   v1.29.2
worker1   Ready      <none>          28s   v1.29.2
worker2   NotReady   <none>          14s   v1.29.2
```

for that we have use some plugins Install a Network Plugin

Doc Ref : [Installing Network Plugin Addons]

Install Weave Net [: Weave Net]

$kubectl apply -f https://github.com/weaveworks/weave/releases/download/v2.8.1/weave-daemonset-k8s.yaml

```
root@master:~# kubectl get nodes
NAME      STATUS   ROLES           AGE   VERSION
master    Ready    control-plane   22m   v1.29.2
worker1   Ready    <none>          96s   v1.29.2
worker2   Ready    <none>          82s   v1.29.2
```

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Installation of Jenkins (step 2)

How to deploy Jenkins with Our custom domain and SSL

For install Jenkins we need to follow below shell script, i am using ubuntu 20.04 this script also work for ubuntu 22.04

$vi jenkins.sh

Paste this script in Jenkins.sh

```
#! /bin/bash


sudo apt update
sudo apt install openjdk-11-jre -y
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


sudo apt-get update
sudo apt install -y maven
sudo apt-get install jenkins -y
sudo systemctl enable jenkins
sudo systemctl start jenkins
sudo systemctl status Jenkins
```

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Run script using this command

$sh jenkins.sh

After that we need to check using Jenkins using ec2 instance id for example:- 34.203.34.186:8080 for checking purpose but our end goal its should not be run on this after configuring nginx reverse proxy will be remove port 8080 from ec2 instance security group and check , Here you can see our Jenkins up and running

```
     Active: active (running) since Wed 2024-08-07 16:39:17 UTC; 4s ago
   Main PID: 4354 (java)
      Tasks: 44 (limit: 4676)
     Memory: 479.0M (peak: 485.5M)
        CPU: 20.444s
     CGroup: /system.slice/jenkins.service
             └─4354 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cach

Aug 07 16:39:10 jenkins jenkins[4354]: a9071988ca2741eeab6b57e5acdb177f
Aug 07 16:39:10 jenkins jenkins[4354]: This may also be found at: /var/lib/jenkins/secrets/initialAdminPassword
Aug 07 16:39:10 jenkins jenkins[4354]: *************************************************************
Aug 07 16:39:10 jenkins jenkins[4354]: *************************************************************
Aug 07 16:39:10 jenkins jenkins[4354]: *************************************************************
Aug 07 16:39:17 jenkins jenkins[4354]: 2024-08-07 16:39:17.760+0000 [id=32]        INFO        jenkins.InitReac
Aug 07 16:39:17 jenkins jenkins[4354]: 2024-08-07 16:39:17.859+0000 [id=22]        INFO        hudson.lifecycle
Aug 07 16:39:17 jenkins systemd[1]: Started jenkins.service - Jenkins Continuous Integration Server.
Aug 07 16:39:18 jenkins jenkins[4354]: 2024-08-07 16:39:18.600+0000 [id=47]        INFO        h.m.DownloadServ
root@jenkins:~# cat /var/lib/jenkins/secrets/initialAdminPassword
a9071988ca2741eeab6b57e5acdb177f
root@jenkins:~#
```

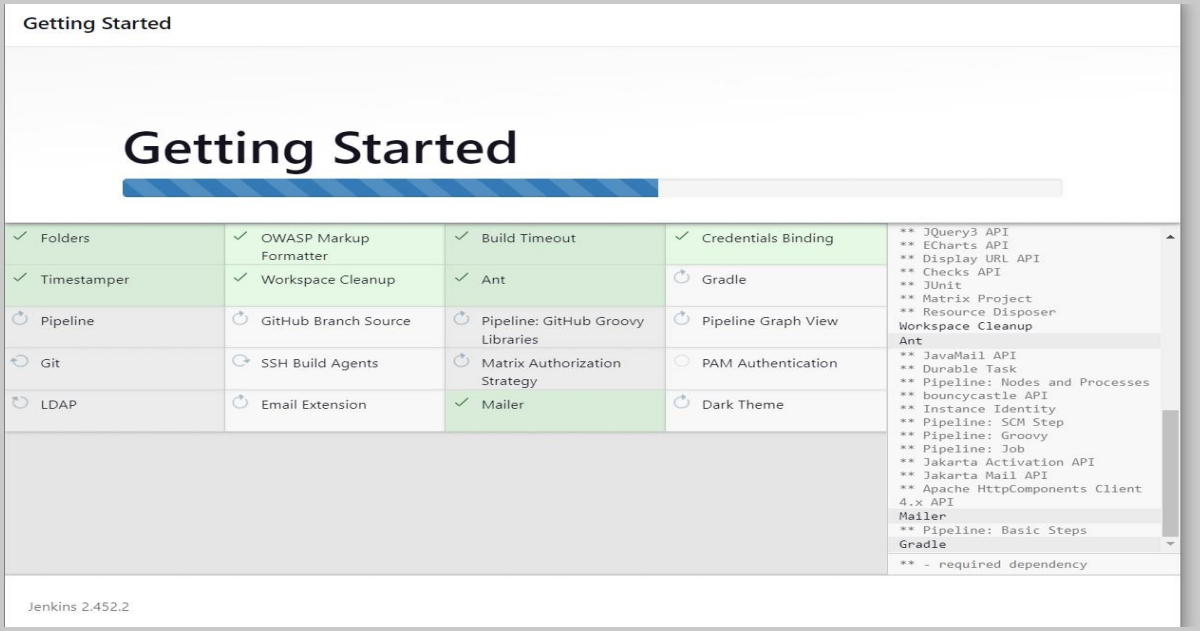
Access your Jenkins Dashboard on browser now

Note: Make sure you enable 8080 port in Security Group Inbound Rules.

Get the initial administration password

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

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



Now your Jenkins started: Create Admin user

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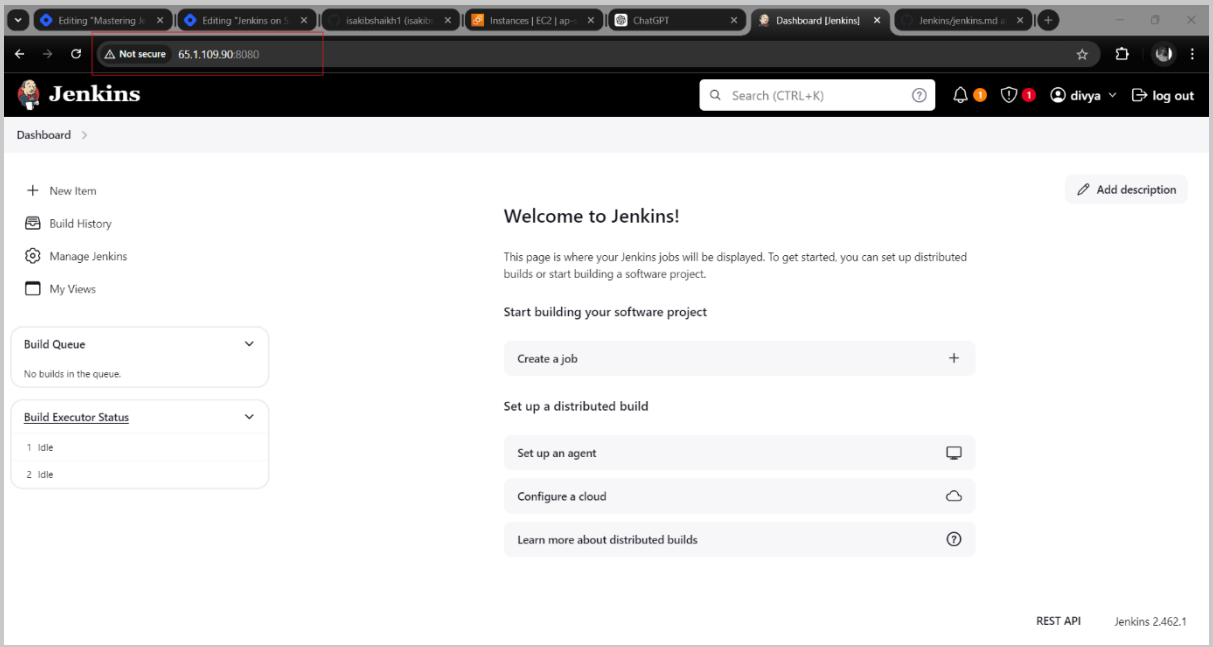
🎉 Now, appreciate yourself you successfully deploy Jenkins on your machine 🎉

It is Look like this: **Jenkins up and Running but this is not yet secured we have to add SSL for secure connection**



Step-by-step guide to configure SSL on Jenkins using Let's Encrypt and NGINX reverse proxy (step 3)

Install NGINX on your server if it's not already installed. You can do this by running the following command:

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#update repository first

$sudo apt-get update -y

#install nginx by following commad

$sudo apt-get install nginx -y

#check nginx status

$sudo systemctl status nginx

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
root@jenkins:~# sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
     Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset: enabled)
     Active: active (running) since Wed 2024-08-07 17:03:44 UTC; 55s ago
       Docs: man:nginx(8)
    Process: 5869 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_process on; (code=exited, status=0/SU>
    Process: 5871 ExecStart=/usr/sbin/nginx -g daemon on; master_process on; (code=exited, status=0/SUCCESS)
   Main PID: 5872 (nginx)
      Tasks: 3 (limit: 4676)
     Memory: 2.4M (peak: 2.5M)
        CPU: 15ms
     CGroup: /system.slice/nginx.service
             ├─5872 "nginx: master process /usr/sbin/nginx -g daemon on; master_process on;"
             ├─5873 "nginx: worker process"
             └─5875 "nginx: worker process"

Aug 07 17:03:44 jenkins systemd[1]: Starting nginx.service - A high performance web server and a reverse proxy >
Aug 07 17:03:44 jenkins systemd[1]: Started nginx.service - A high performance web server and a reverse proxy s>
lines 1-17/17 (END)
```

Create a new server block configuration file for Jenkins. You can do this by creating a new file in the /etc/nginx/sites-available/ directory. For example:

$vi /etc/nginx/sites-available/jenkins

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Add the following content to the file: Note: Replace jenkins.example.com with your Jenkins domain name.

```
server {
    listen 80;
    server_name jenkins.learnwithdivya.online;

    location / {
        proxy_pass http://localhost:8080;
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_set_header X-Forwarded-Proto $scheme;
    }
}
```

Create a symbolic link to the server block configuration file in the /etc/nginx/sites-enabled/ directory:

$sudo ln -s /etc/nginx/sites-available/jenkins /etc/nginx/sites-enabled/

Note: you can see /etc/nginx/sites-available/jenkins on this path the file - represented simple file ($sudo ls -lrt /etc/nginx/sites-available/jenkins)

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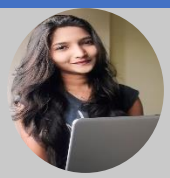

```
root@jenkins:~# ls -lrt /etc/nginx/sites-available/jenkins
-rw-r--r-- 1 root root 354 Aug  7 17:25 /etc/nginx/sites-available/jenkins
```

after running above command its create shortcut because by default Jenkins look this file on /etc/nginx/sites-enabled location (ls -lrt /etc/nginx/sites-enabled)

```
root@jenkins:~# ls -lrt /etc/nginx/sites-enabled/
total 0
lrwxrwxrwx 1 root root 34 Aug  7 17:03 default -> /etc/nginx/sites-available/default
lrwxrwxrwx 1 root root 34 Aug  7 17:28 jenkins -> /etc/nginx/sites-available/jenkins
```

Test the NGINX configuration and restart the NGINX service:

$sudo nginx -t

```
ubuntu@jenkins:~$ sudo nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
```

Restart the nginx server

$sudo systemctl restart nginx

Install Certbot, the Let's Encrypt client, by running the following commands:

$sudo apt-get update -y

$sudo apt-get install certbot python3-certbot-nginx -y

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Obtain an SSL certificate for your Jenkins domain name using Certbot:

$sudo certbot --nginx -d jenkins.learnwithdivya.online

#Note: Replace jenkins.example.com with your Jenkins domain name.

After running above you can found error like this:

```
Certbot failed to authenticate some domains (authenticator: nginx). The Certificate Authority reported these pro
blems:
  Domain: jenkins.learnwithdivya.online
  Type:   dns
  Detail: DNS problem: NXDOMAIN looking up A for jenkins.learnwithdivya.online - check that a DNS record exists
for this domain; DNS problem: NXDOMAIN looking up AAAA for jenkins.learnwithdivya.online - check that a DNS reco
rd exists for this domain

Hint: The Certificate Authority failed to verify the temporary nginx configuration changes made by Certbot. Ensu
re the listed domains point to this nginx server and that it is accessible from the internet.

Some challenges have failed.
Ask for help or search for solutions at https://community.letsencrypt.org. See the logfile /var/log/letsencrypt/
letsencrypt.log or re-run Certbot with -v for more details.
ubuntu@jenkins:~$
```

For resolve this issue you need to create A name record on your Route53 service

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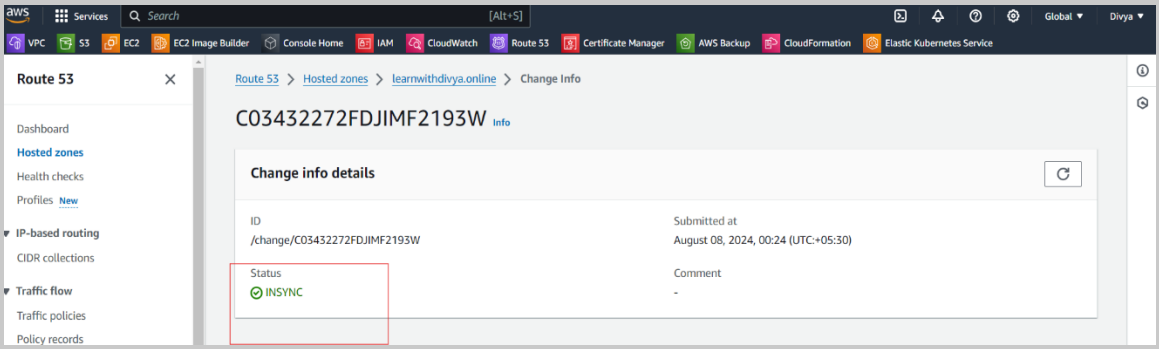
Go to route53 --> click on hosted zone --> click on your domain name ---> create on record, once it will be insync then you can try again above command

Then run the command

$sudo certbot --nginx -d jenkins.learnwithdivya.online




```
ubuntu@jenkins:~$ sudo certbot --nginx -d jenkins.learnwithdivya.online
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Requesting a certificate for jenkins.learnwithdivya.online

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/jenkins.learnwithdivya.online/fullchain.pem
Key is saved at:         /etc/letsencrypt/live/jenkins.learnwithdivya.online/privkey.pem
This certificate expires on 2024-11-05.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for jenkins.learnwithdivya.online to /etc/nginx/sites-enabled/jenkins
Congratulations! You have successfully enabled HTTPS on https://jenkins.learnwithdivya.online

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
If you like Certbot, please consider supporting our work by:
 * Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
 * Donating to EFF:                    https://eff.org/donate-le
```

🎉 Congratulations! 🎉

Divya Satpute Notes

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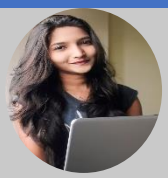
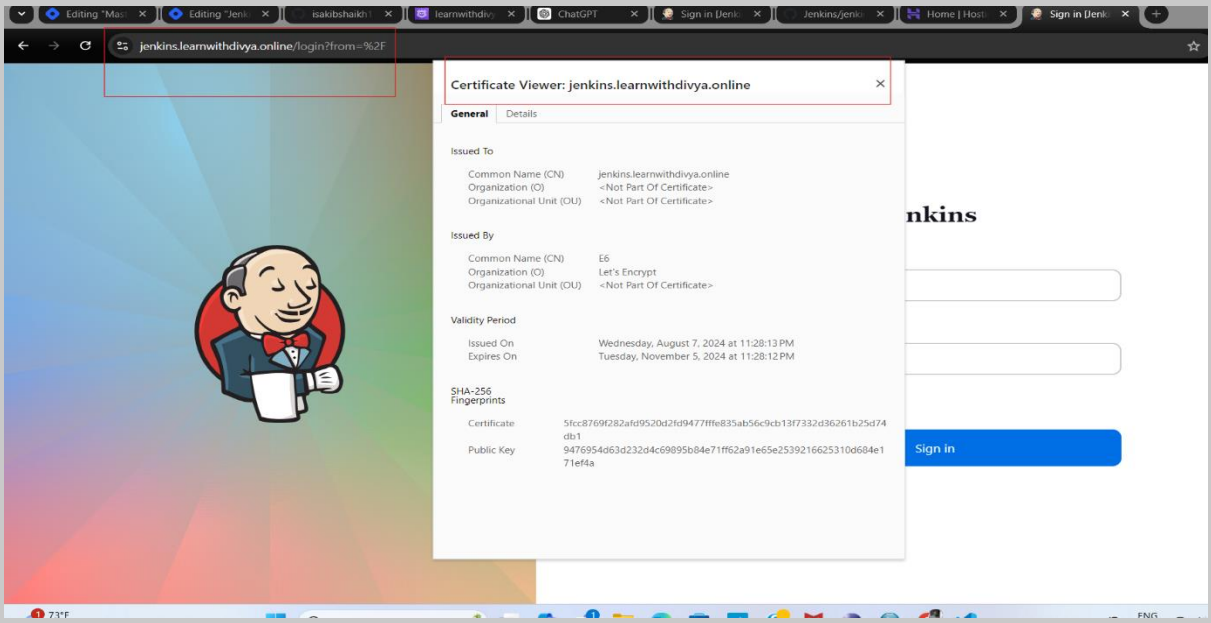


You've put in hard work, dedication, and perseverance to reach this milestone!

Now your Jenkins runs in secure with SSL certificate in secure site



It means without using LLB we are use nginx as a reverse proxy : if you are trying to click http:// still it will be redirect to https://

Sounds interesting, right?

Now move to next

create webhook on Github(step 4)

- Click on repo settings --->

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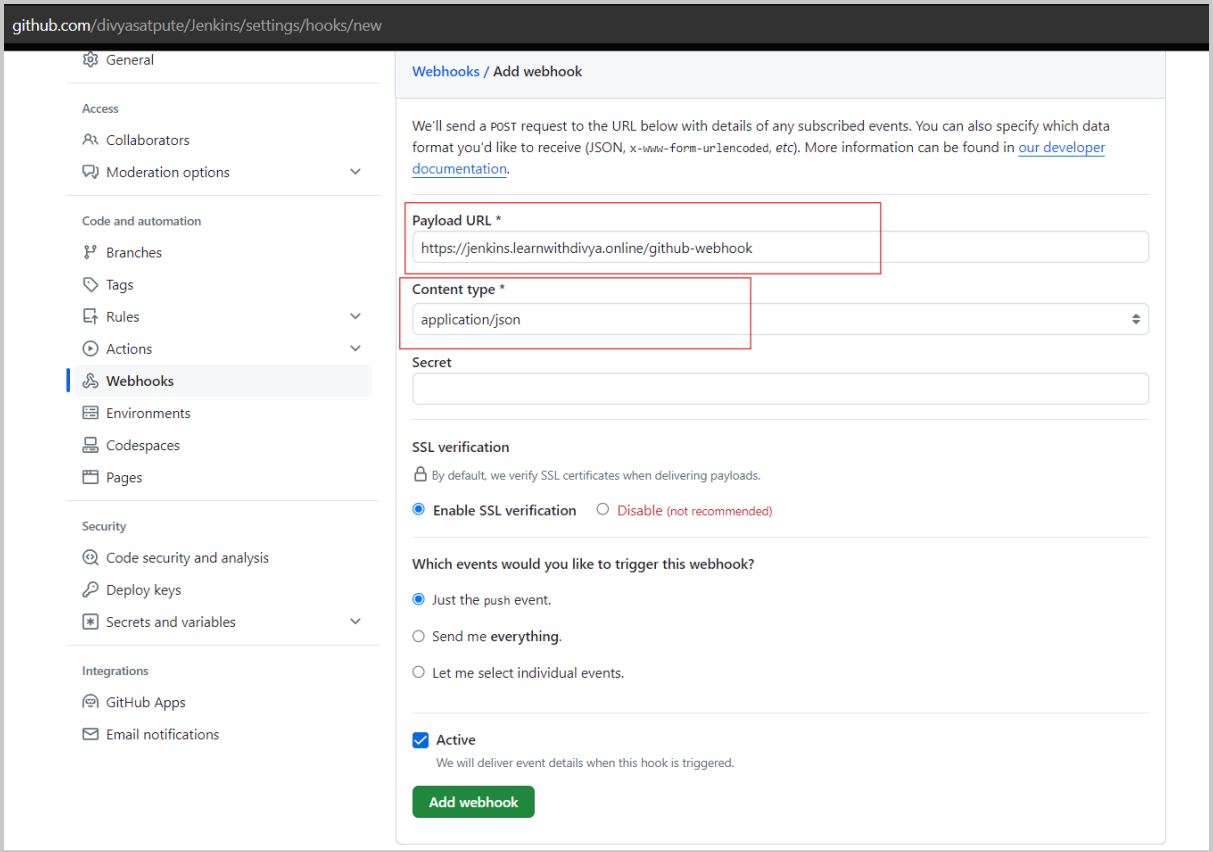
- click on webhook ---->
- Add new Webhook --->
- in Playload URL configure your Jenkins URL followed by github-webhook and content type json
- click on ADD webhook



Our Webhooks are ready

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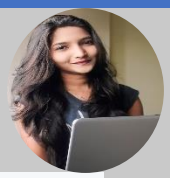

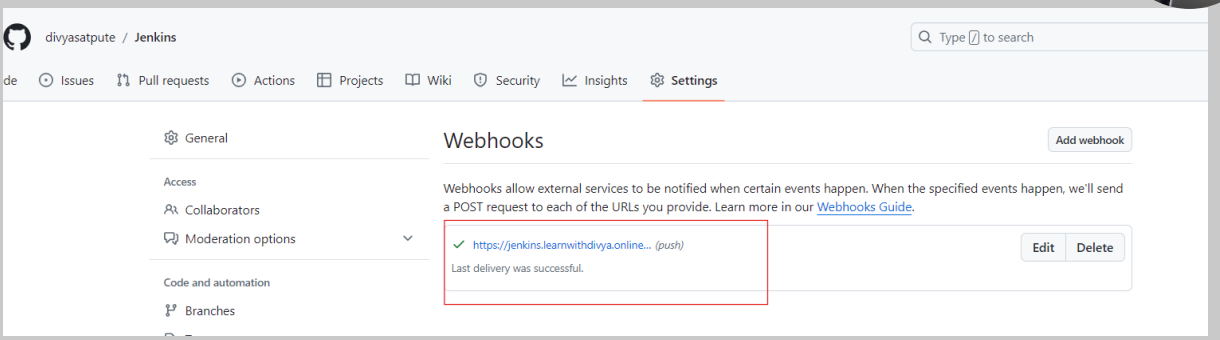

Docker Install on Jenkins machine

$sudo apt install docker.io -y

Give permission to socket

$sudo usermod -aG docker $USER

$sudo chown $USER:docker /var/run/docker.sock

change ownership

$sudo chown jenkins:docker /var/run/docker.sock

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Go to docker hub account generate token

now on your jenkins machine click on manage jenkins --> click on Credentials --->

system ---> global Credentials

ADD your docker token as a password

ADD (ID) which is you given in your pipeline

```
        stage('Build Docker Image'){
            steps{
                script {
                    def customImage = docker.build("divyasatpute/petclinic:${env.BUILD_NUMBER}", "./docker")
                    docker.withRegistry('https://registry.hub.docker.com', 'dockerhub') {
                    customImage.push()
                }
            }
        }
    }
```

Plugins Installation

Go TO Jenkins Dashboard →Manage jenkins ->plugins ---> available plugins ---->

1. docker
2. docker pipelline
3. docker commons
4. docker -build-steps
5. docker slave

install it

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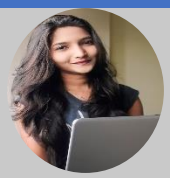


Installation of Helm

Helm Install on Jenkins Machine and Master Node

Run this command on both machine

$curl -fsSL -o get_helm.sh https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3

chmod 700 get_helm.sh

./get_helm.sh

configuration on master node

change directory

$ cd .kube/

copy config file in /home/ubuntu

$cp config /home/ubuntu/

change directory

$cd /home/ubuntu/

change ownership

$sudo chown ubuntu:ubuntu config

break connection come into your local machine download folder

$exit

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

```
total 8
-rw------- 1 ubuntu ubuntu 5652 Aug 10 14:12 config
root@master:/home/ubuntu# exit
logout
ubuntu@master:~$ exit
logout
Connection to ec2-43-204-109-240.ap-south-1.compute.amazonaws.com closed.

Rinku@Rinku MINGW64 ~/downloads (master)
$
```

Now fire this command on local **(copy file from remote to local)**

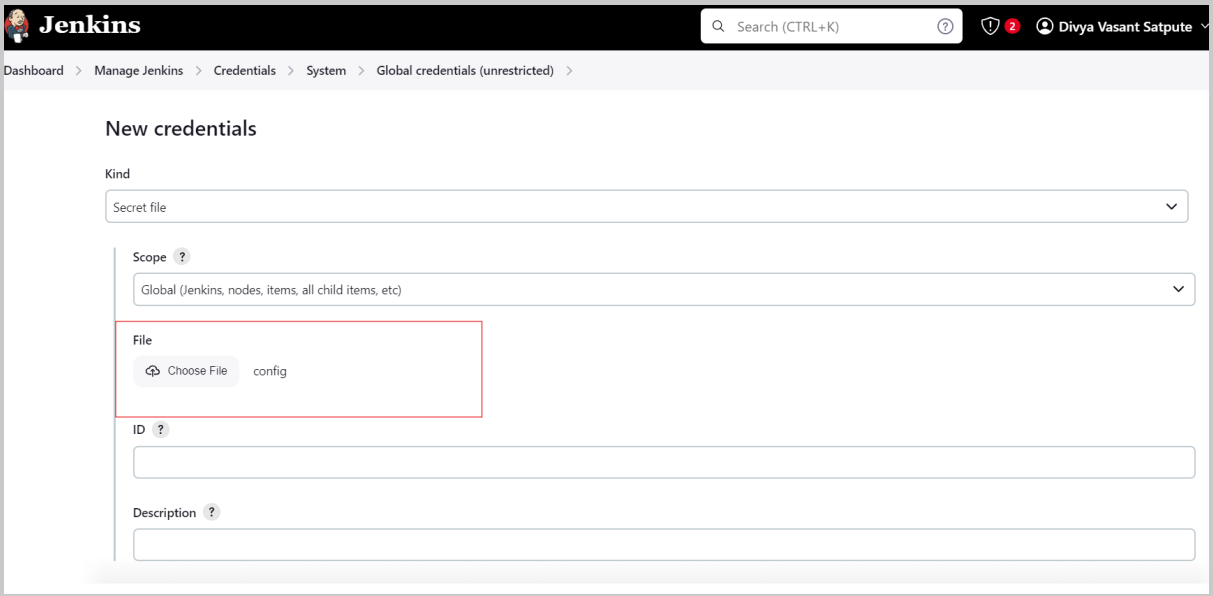
$scp -i divya.pem ubuntu@43.204.109.240:/home/ubuntu/config .

```
config                                                    100% 5652   204.7KB/s   00:00

Rinku@Rinku MINGW64 ~/downloads (master)
-rw-r--r-- 1 Rinku 197121       5652 Aug 10 19:53  config
```

Now to go to Jenkins dashboard

1. **click on manage Jenkins**
2. **click on Credencials**
3. **select as a secrete file**
4. **and upload config file which is we downloaded in our local machine**

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP



- **Go to Jenkins dashboard**
- **click on manage Jenkins**
- **click on available plugins**

1. **Kubernetes Client API**
2. **Kubernetes Credentials**
3. **Kubernetes**
4. **Kubernetes CLI**
5. **Kubernetes Credentials Provider**

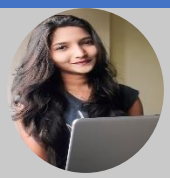
- **install it**

How to Set Up the Jenkins + GitHub Integration

NOW LAST STEP TO ACHIEVE THE THINGS

Divya Satpute Notes

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP



create Jenkins pipeline

```
pipeline {
  agent any
  stages {
    stage('Build Maven') {
      steps {
        sh 'pwd'
        sh 'mvn clean install package'
      }
    }

    stage ('Copy Artifacts') {
      steps {
        sh 'pwd'
        sh 'cp -r target/*.jar docker'
      }
    }

    stage('Unit Tests') {
      steps {
        sh 'mvn test'
      }
    }

    stage('Build Docker Image'){
```

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

```
        steps{
            script {
                def customImage = docker.build("iamsakib/petclinic:${env.BUILD_NUMBER}",
"./docker")
                docker.withRegistry('https://registry.hub.docker.com', 'dockerhub') {
                customImage.push()
            }
        }
    }
  }

    stage('Build on kubernetes'){
    steps {
        withKubeConfig([credentialsId: 'kubeconfig']) {
            sh 'pwd'
            sh 'cp -R helm/* .'
            sh 'ls -ltrh'
            sh 'pwd'
            sh '/usr/local/bin/helm upgrade --install petclinic-app petclinic --set
image.repository=iamsakib/petclinic --set image.tag=${BUILD_NUMBER}'
    }
  }
}

}
```

```
}

#replace yours id
```

Deployment of Application

- Go to Jenkins dashboard
- click on new item

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

- give name to your project
- select pipeline
- select GitHub hook trigger for GITScm polling
- select pipeline script with SCM
- SCM =git and configure GIT URL and branch
- script path should be jenkinsfile (**jenkinsfile should be available on your git repo)**
- save and apply
- Access your application **<worker_node_Pliblic_IP:32740>**

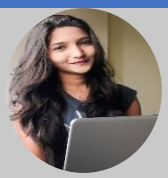
And boommmmmmmmmmmmm

🌟 Way to Go! 🌟

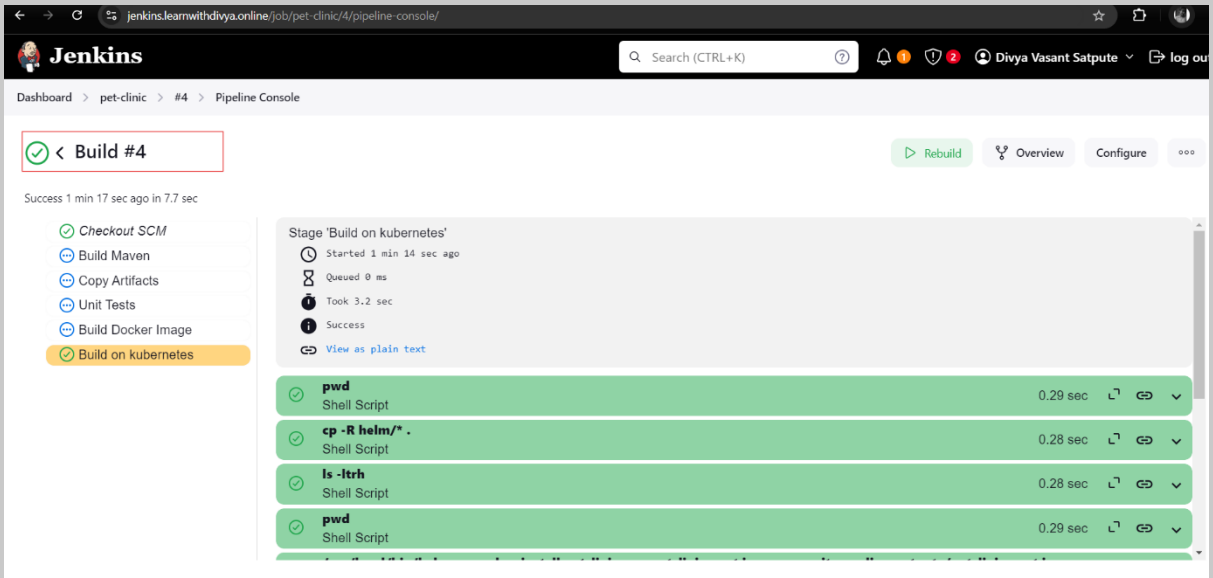
You've done it—what an incredible achievement! This moment is a testament to your effort, resilience, and talent. You faced the challenge head-on and came out on top, and now it's time to celebrate that success.

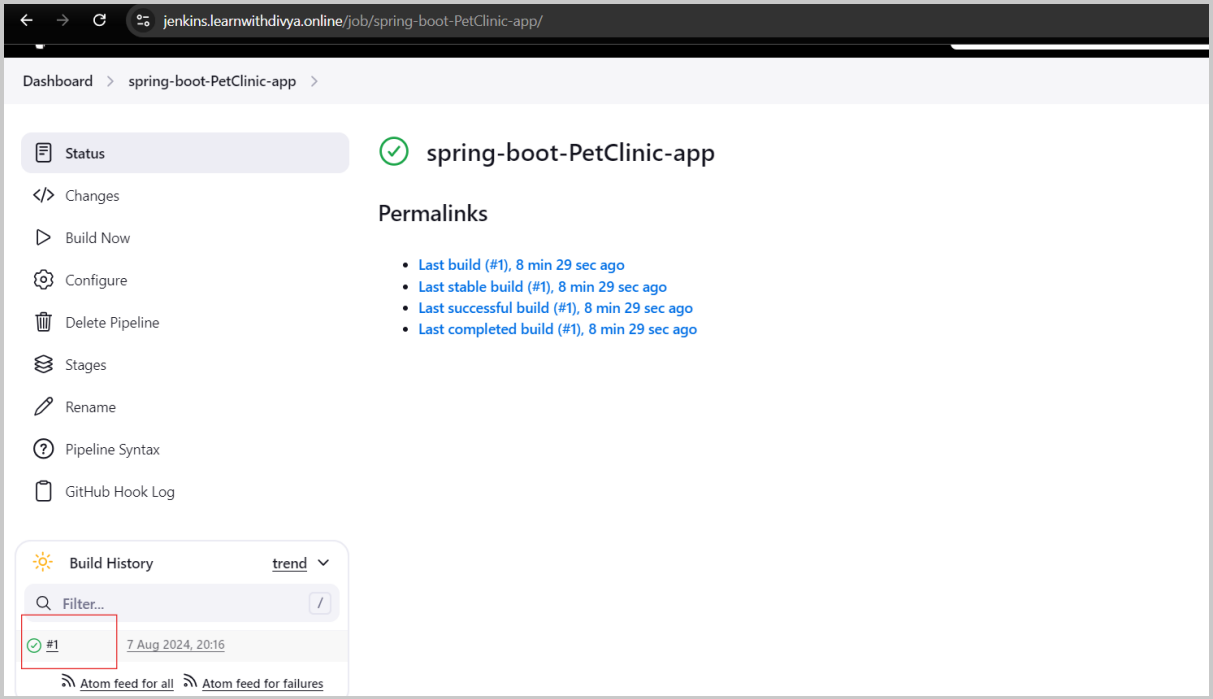
Remember, this is proof of what you're capable of. Keep pushing forward, and don't forget to enjoy every victory along the way. You've earned it—**congratulations!**

PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP



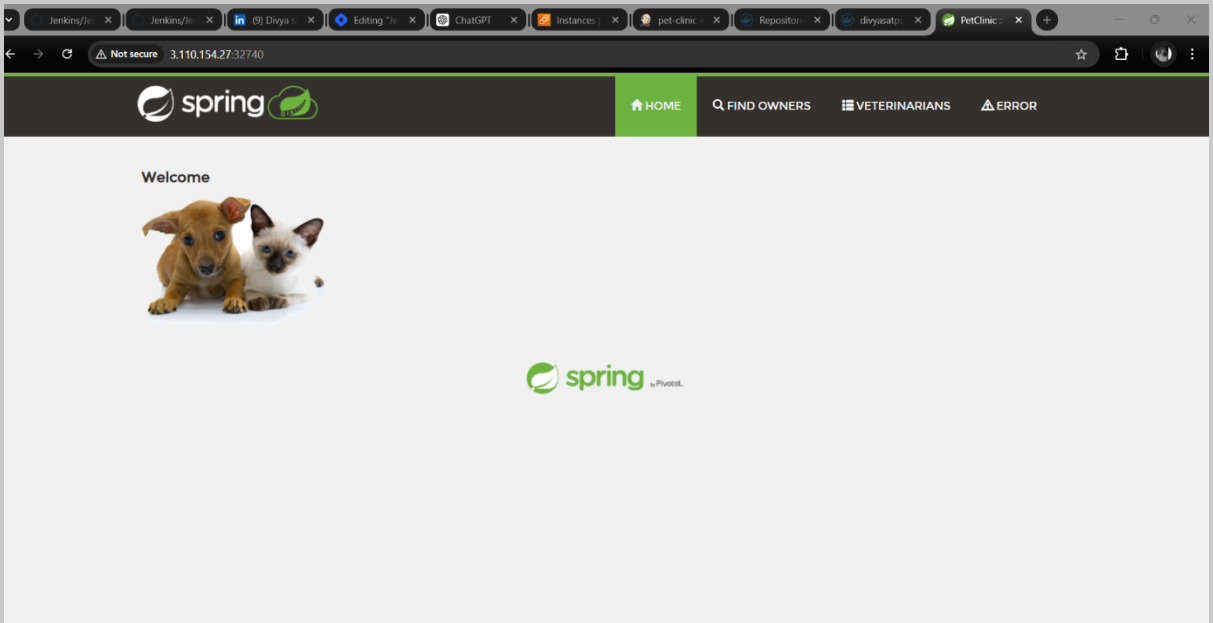
✅ Test Results ✅

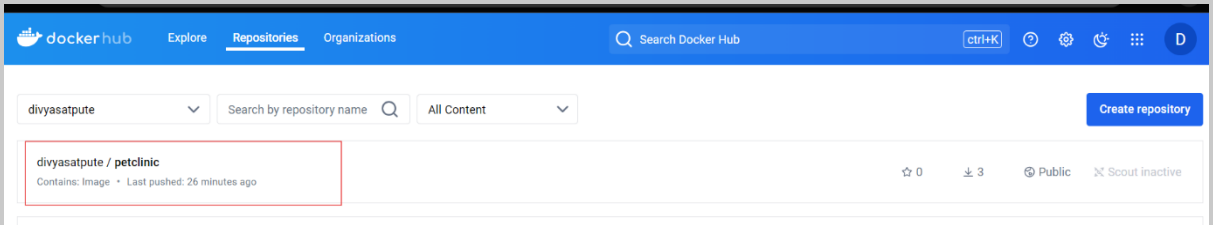




PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

```
root@master:~# k get all
NAME                                     READY   STATUS         RESTARTS   AGE
pod/petclinic-deployment-6b5d5d5bbc-hb662   0/1     ErrImagePull   0          3m18s
pod/petclinic-deployment-6b5d5d5bbc-n7n7h   0/1     ErrImagePull   0          3m18s

NAME                      TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
service/kubernetes        ClusterIP   10.96.0.1       <none>        443/TCP          162m
service/petclinic-service NodePort    10.103.157.81   <none>        8080:32740/TCP   3m18s

NAME                                 READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/petclinic-deployment 0/2     2            0           3m18s

NAME                                            DESIRED   CURRENT   READY   AGE
replicaset.apps/petclinic-deployment-6b5d5d5bbc 2         2         0       3m18s

NAME                                                    REFERENCE                        TARGETS         MINPODS
MAXPODS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/petclinic-deployment   Deployment/petclinic-deployment   <unknown>/50%   1
5         2          3m18s
```





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PROJECT ON PUSHBASED APPROACH ON JENKINS DEPLOYMENT OF SPRING BOOT PET-CLINIC APP

Thank you so much for referring my Notes I hope it will be helpful for you!

🌟 really appreciate your support! If you found them helpful, feel free to like, share, or leave a comment! Your feedback means a lot to me and helps me create even better content.

😊 Thanks again! 🙌