

Felix Gokmen

Built and Created a CI/CD pipeline to Deploy Applications on Kubernetes Cluster by using helm and Jenkinsfile.

Used AWS and created 4 instances.

Two instance for worknodes

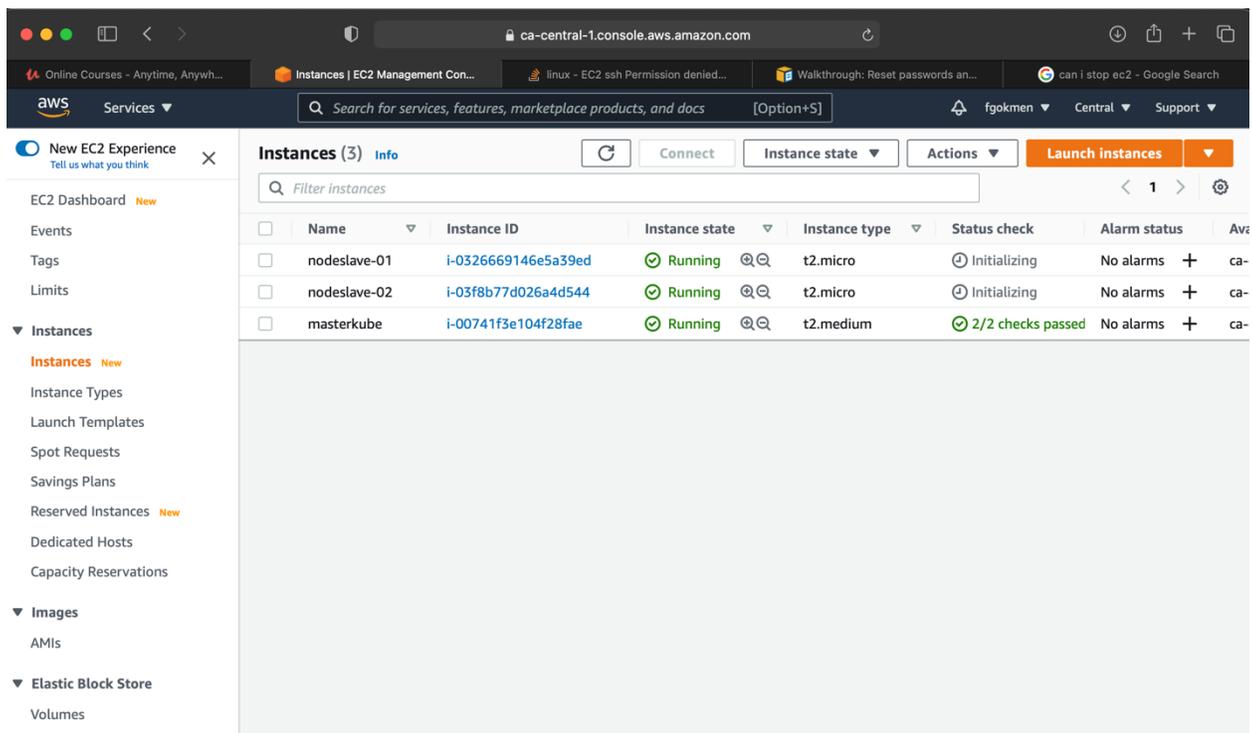
One instance for master nodes

One instance for Jenkins and Kubernetes – helm to test and run

1-First create ec2 virtual machine. I have chosen AWS as centos

Created one for master node

Created for nodeslave with two instances



2- Change the host name for each VM

```
Last login: Sat May 22 06:50:07 2021 from cpe688f2e0fdbb3-cm688f2e0fdbb0.cpe.net.cable.rogers.com
[centos@nodeslave-01 ~]$ _
```

```
Last login: Sat May 22 06:52:12 2021 from cpe688f2e0fdbb3-cm688f2e0fdbb0.cpe.net.cable.rogers.com
[centos@nodeslave-02 ~]$
```

```
Last login: Sat May 22 06:37:38 2021 from cpe688f2e0fdbb3-cm688f2e0fdbb0.cpe.net.cable.rogers.com
[centos@masterkube ~]$ sudo yum install -y yum-utils_
```

3- Master VM updated with apt and created docker installation

👉. <https://docs.docker.com/engine/install/centos/>

3-The cluster nodes joined to master nodes.

```
devops-project — fgokmen@masterkube:~ — ssh -i devops.pem centos@15.222.233.152 — 125x28
...e:~ — ssh -i devops.pem centos@15.222.233.152
...-120-67.ca-central-1.compute.amazonaws.com
...-71-1.ca-central-1.compute.amazonaws.com

[fgokmen@masterkube ~]$ kubectl get nodes
NAME           STATUS    ROLES    AGE   VERSION
masterkube     Ready    master   21m   v1.15.6
nodeslave-01   Ready    <none>   25s   v1.15.6
nodeslave-02   Ready    <none>   54s   v1.15.6
[fgokmen@masterkube ~]$
```

✓ Pods are running

NAME	READY	STATUS	RESTARTS	AGE
calico-kube-controllers-75dbcbbf8b-94qzm	1/1	Running	0	6m18s
calico-node-5flmm	1/1	Running	0	3m9s
calico-node-95wvz	1/1	Running	0	3m38s
calico-node-zvhcr	1/1	Running	0	6m18s
coredns-5c98db65d4-nl464	1/1	Running	0	23m
coredns-5c98db65d4-ptjcp	1/1	Running	0	23m
etcd-masterkube	1/1	Running	0	22m
kube-apiserver-masterkube	1/1	Running	0	22m
kube-controller-manager-masterkube	1/1	Running	0	22m
kube-proxy-kg4df	1/1	Running	0	23m
kube-proxy-m92dp	1/1	Running	0	3m9s
kube-proxy-xxvd8	1/1	Running	0	3m38s
kube-scheduler-masterkube	1/1	Running	0	22m

4- Created server linux AWS and made the installation properly for Jenkins

Instances (4) [Info](#)

🔍 Filter instances

<input type="checkbox"/>	Name ▾	Instance ID	Instance state ▾	Instance type ▾	Status check
<input type="checkbox"/>	nodeslave-01	i-0326669146e5a39ed	🟢 Running 📄🔍	t2.micro	🟢 2/2 checks passed
<input type="checkbox"/>	nodeslave-02	i-03f8b77d026a4d544	🟢 Running 📄🔍	t2.micro	🟢 2/2 checks passed
<input type="checkbox"/>	masterkube	i-00741f3e104f28fae	🟢 Running 📄🔍	t2.medium	🟢 2/2 checks passed
<input type="checkbox"/>	server	i-0a9c750cff1a4c5c8	🟢 Running 📄🔍	t2.medium	🟢 2/2 checks passed

5- Helm created inside the Jenkins.

```
Creating /var/lib/jenkins/.helm
Creating /var/lib/jenkins/.helm/repository
Creating /var/lib/jenkins/.helm/repository/cache
Creating /var/lib/jenkins/.helm/repository/local
Creating /var/lib/jenkins/.helm/plugins
Creating /var/lib/jenkins/.helm/starters
Creating /var/lib/jenkins/.helm/cache/archive
Creating /var/lib/jenkins/.helm/repository/repositories.yaml
Adding stable repo with URL: https://kubernetes-charts.storage.googleapis.com

Error: error initializing: Looks like "https://kubernetes-charts.storage.googleapis.com" is not a valid chart repository or cannot be reached: Failed to fetch https://kubernetes-charts.storage.googleapis.com/index.yaml : 403 Forbidden
-bash-4.2$
-bash-4.2$
```

6- Communication successful from Jenkins server and Pods are running on master nodes where I create in Jenkins servers

NAME	READY	STATUS	RESTARTS	AGE
calico-kube-controllers-75dbcbbf8b-94qzm	1/1	Running	1	21h
calico-node-5flmm	1/1	Running	1	21h
calico-node-95wvz	1/1	Running	1	21h
calico-node-zvhcr	1/1	Running	1	21h
coredns-5c98db65d4-nl464	1/1	Running	1	21h
coredns-5c98db65d4-ptjcp	1/1	Running	1	21h
etcd-masterkube	1/1	Running	1	21h
kube-apiserver-masterkube	1/1	Running	1	21h
kube-controller-manager-masterkube	1/1	Running	1	21h
kube-proxy-kg4df	1/1	Running	1	21h
kube-proxy-m92dp	1/1	Running	1	21h
kube-proxy-xxvd8	1/1	Running	1	21h
kube-scheduler-masterkube	1/1	Running	1	21h
tiller-deploy-7bf78cdbf7-gvz77	1/1	Running	0	46s

7- Here is my instance on AWS console.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
nodeslave-01	i-0326669146e5a39ed	Running	t2.micro	2/2 checks passed	No alarms	ca-central-1a
nodeslave-02	i-03f8b77d026a4d544	Running	t2.micro	2/2 checks passed	No alarms	ca-central-1a
masterkube	i-00741f3e104f28fae	Running	t2.medium	2/2 checks passed	No alarms	ca-central-1b
server	i-0a9c750cff1a4c5c8	Running	t2.medium	2/2 checks passed	No alarms	ca-central-1b

8-Helm version on Jenkins Client and Server

- Client is Jenkins's server
- Server is for Master server

```
[-bash-4.2$ helm version
Client: &version.Version{SemVer:"v2.14.1", GitCommit:"5270352a09c7e8b6e8c9593002a73535276507c0", GitTreeState:"clean"}
Server: &version.Version{SemVer:"v2.14.1", GitCommit:"5270352a09c7e8b6e8c9593002a73535276507c0", GitTreeState:"clean"}
```

9- Created Jenkinfile for continuous Integration of my existing portfolio web site.

- Docker credential entered and pushed by Jenkins pipeline
- Git repository cloned to Jenkins pipeline.

General Build Triggers Advanced Project Options **Pipeline**

Pipeline

Definition

Pipeline script from SCM

SCM

Git

Repositories

Repository URL

https://github.com/fatihkgm/MyPortfolia.git

Credentials

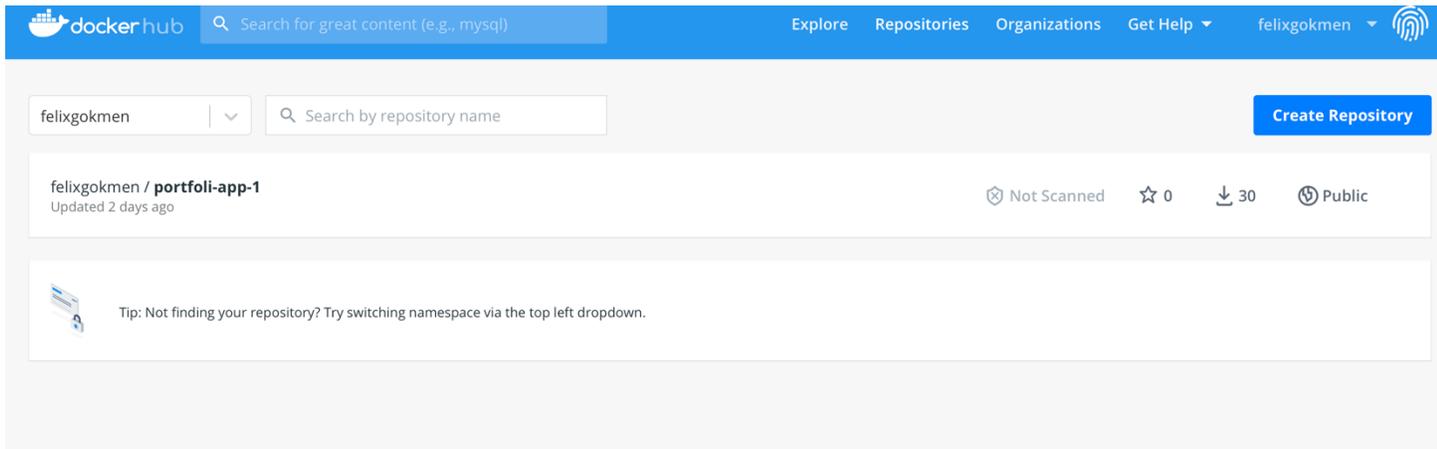
fatihkgm/***** Add

Advanced...

Add Repository

```
> git config remote.origin.url https://github.com/fatihkgm/MyPortfolia.git # timeout=10
Fetching upstream changes from https://github.com/fatihkgm/MyPortfolia.git
> git --version # timeout=10
> git --version # 'git version 2.23.4'
using GIT_ASKPASS to set credentials
> git fetch --tags --force --progress -- https://github.com/fatihkgm/MyPortfolia.git # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Unable to auto-install JDK until the license is accepted.
Checking out Revision afac7abb34a18fe0070b3314937d0c4c5f4b831 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f afac7abb34a18fe0070b3314937d0c4c5f4b831 # timeout=10
Commit message: "Update Jenkinsfile"
> git rev-list --no-walk afac7abb34a18fe0070b3314937d0c4c5f4b831 # timeout=10
Finished: SUCCESS
```

```
You, 18 minutes ago · Update Jenkinsfile
stage('Build docker image') {
  steps {
    script {
      def customImage = docker.build('felixgokmen/felix-portfolio', ".")
      docker.withRegistry('https://registry.hub.docker.com', 'dockerhub') {
        customImage.push("${env.BUILD_NUMBER}")
      }
    }
  }
}
```



10-Mater server – created imagePullSecret which I created docker image as private to pull.

- `kubectl create secret docker-registry regcred --docker-server=hub.docker.com --docker-username=felixgokmen --docker-password=`

```
[fgokmen@masterkube ~]$ kubectl create secret docker-registry regcred --docker-server=hub.docker.com --docker-username=felixgokmen --docker-password=56?
secret/regcred created
[fgokmen@masterkube ~]$
```

```
[fgokmen@masterkube ~]$ kubectl get secret
NAME                                TYPE                                DATA  AGE
default-token-759fk                 kubernetes.io/service-account-token 3      24h
regcred                             kubernetes.io/dockerconfigjson      1      50s
[fgokmen@masterkube ~]$
```

11-Deploying my website -NodejsAPP- on Kubernetes Cluster with Jenkinsfile by using HELM.

gm / MyPortfolia Private

Issues Pull requests Actions Projects Wiki Security Insights Settings

master 1 branch 0 tags Go to file Add file Code

fatihkgm Update README.md 759d843 now 8 commits

helm/website	helm file created	2 minutes ago
public	file created	2 days ago
views	file created	2 days ago
.dockerignore	dockerignore file created	2 days ago
Dockerfile	Docker file created	2 days ago
Jenkinsfile	Update Jenkinsfile	42 minutes ago
Procfile	file created	2 days ago
README.md	Update README.md	now
app.js	file created	2 days ago
package-lock.json	file created	2 days ago
package.json	Docker file created	2 days ago

README.md

felix.gokmen

master MyPortfolia / helm / website /

fatihkgm helm file created

..

templates	helm file created
Chart.yaml	helm file created
README.md	helm file created
values.yaml	helm file created

■ Deployment screenshots

```
template:
  metadata:
    labels:
      app: website
  spec:
    containers:
      - name: website-container
        image: "{{ .Values.image.repository }}:{{ .Values.image.tag }}"
        imagePullPolicy: Always
        resources:
          limits:
            cpu: '1'
            memory: '1Gi'
          requests:
            cpu: '1'
            memory: '1Gi'
        ports:
          - containerPort: 8080
    imagePullSecrets:
      - name: regcred
```

12- There is now pods available now on master service and server instance

```
regcred Kubernetes.io/dockerconfigjson 1
[[fgokmen@masterkube ~]$ kubectl get pods
No resources found.
[[fgokmen@masterkube ~]$

[[root@ip-172-31-5-148 ~]# su - jenkins
Last login: Sun May 23 07:27:35 UTC 2021 on pts/0
[-bash-4.2$ helm list
-bash-4.2$ _
```

13- Pipeline created for pulling docker image and using helm chart in gitgub.

master mywebsite / Jenkinsfile

fatihkgm jenkins updated Latest commit 618ef37 6 minutes ago

1 contributor

14 lines (14 sloc) | 366 Bytes

```
1 pipeline {
2   agent any
3   stages {
4     stage('Build on k8 ') {
5       steps {
6         sh 'pwd'
7         sh 'cp -R helm/* .'
8         sh 'ls -ltr'
9         sh 'pwd'
10        sh '/usr/local/bin/helm upgrade --install mywebsite website'
11      }
12    }
13  }
14 }
```

■ Screenshots value.yaml in github

master mywebsite / helm / website / values.yaml

fatihkgm update Latest commit f4acd01 1

1 contributor

64 lines (52 sloc) | 1.38 KB

```
1 replicaCount: 1
2
3 image:
4   repository: felixgokmen/portfoli-app-1
5   tag: latest
6   pullPolicy: IfNotPresent
7
8 imagePullSecrets: []
9 nameOverride: ""
10 fullnameOverride: ""
11
12 serviceAccount:
13   # Specifies whether a service account should be created
14   create: true
15   # The name of the service account to use.
16   # If not set and create is true, a name is generated using the fullname template
17   name:
18
19 podSecurityContext: {}
20 # fsGroup: 2000
21
22 securityContext: {}
23 # capabilities:
24 #   drop:
25 #     - ALL
26 # readOnlyRootFilesystem: true
27 # runAsNonRoot: true
```

■ Deployment file with using value.yaml

```
spec:
  containers:
  - name: website-container
    image: "{{ .Values.image.repository }}:{{ .Values.image.tag }}"
    imagePullPolicy: Always
  resources:
```

■ Jenkins server helm list now shows

NAME	REVISION	UPDATED	STATUS	CHART	APP VERSION
mywebsite	2	Sun May 23 09:34:02 2021	DEPLOYED	website-0.1.0	1.0

-bash-4.2\$

■ Master server

NAME	READY	STATUS	RESTARTS	AGE
website-69c5968dfd-vh7zc	0/1	Pending	0	12m

[fgokmen@masterkube ~]\$

13- After all configuration done - run it on Jenkins server

The screenshot shows the Jenkins web interface. The top navigation bar includes 'Dashboard', 'website-helm', and 'Pipeline website-helm'. The left sidebar contains various actions like 'Back to Dashboard', 'Status', 'Changes', 'Build Now', 'Configure', 'Delete Pipeline', 'Full Stage View', 'Rename', 'Pipeline Syntax', and 'Build History'. The main content area displays the 'Stage View' for the pipeline. It shows two stages: 'Declarative: Checkout SCM' and 'Build on k8'. The 'Average stage times' are 434ms for Checkout SCM and 1s for Build on k8. The 'Average full run time' is approximately 2s. The build history shows two recent builds: #23 (May 23 05:33) and #22 (May 23 05:26), both with 'No Changes'.

■ Console Output is ;

LAST DEPLOYED: Sun May 23 09:34:02 2021

NAMESPACE: default

STATUS: DEPLOYED

RESOURCES:

==> v1/Pod(related)

NAME	READY	STATUS	RESTARTS	AGE
website-69c5968dfd-vh7zc	0/1	Pending	0	7m17s

==> v1/Service

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
website	LoadBalancer	10.98.124.8	<pending>	3000:30100/TCP	7m18s

==> v1/ServiceAccount

NAME	SECRETS	AGE
mywebsite	1	7m18s

==> v1beta1/Deployment

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
website	0/1	1	0	7m18s

==> v2beta1/HorizontalPodAutoscaler

NAME	REFERENCE	TARGETS	MINPODS	MAXPODS	REPLICAS	AGE
website-mem-hpa	Deployment/website-deployment	<unknown>/50%	1	5	0	7m18s

NOTES:

1. Get the application URL by running these commands:

```
export POD_NAME=$(kubectl get pods --namespace default -l "app.kubernetes.io/name=website,app.kubernetes.io/version=v1" -o jsonpath="{.items[0].metadata.name}")
echo "Visit http://127.0.0.1:8080 to use your application"
kubectl port-forward $POD_NAME 8080:80
```

```
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

■ Helm list in Jenkins server

NAME	REVISION	UPDATED	STATUS	CHART
mywebsite	5	Mon May 24 01:07:28 2021	DEPLOYED	website-0.1.0

■ Pods in master server

NAME	READY	STATUS	RESTARTS	AGE
website-7bdc5cb495-wt244	1/1	Running	0	18m

■ Pods information

```

memory: 528Mi
Requests:
  cpu: 300m
  memory: 428Mi
Environment: <none>
Mounts:
  /var/run/secrets/kubernetes.io/serviceaccount from default-token-759fk (ro)
Conditions:
  Type           Status
  Initialized     True
  Ready           True
  ContainersReady True
  PodScheduled    True
Volumes:
  default-token-759fk:
    Type:          Secret (a volume populated by a Secret)
    SecretName:    default-token-759fk
    Optional:      false
QoS Class:       Burstable
Node-Selectors:  <none>
Tolerations:     node.kubernetes.io/not-ready:NoExecute for 300s
                 node.kubernetes.io/unreachable:NoExecute for 300s
Events:
  Type    Reason      Age   From              Message
  ----    -
  Normal  Scheduled   19m   default-scheduler Successfully assigned default/website-7bdcbc495-wt244 to nodeslave-01
  Normal  Pulling     19m   kubelet, nodeslave-01 Pulling image "felixgokmen/portfoli-app-1:latest"
  Normal  Pulled      18m   kubelet, nodeslave-01 Successfully pulled image "felixgokmen/portfoli-app-1:latest"
  Normal  Created     18m   kubelet, nodeslave-01 Created container website-container
  Normal  Started     18m   kubelet, nodeslave-01 Started container website-container

```

■ Loadbalancer created

```

Normal Started 18m kubelet, nodeslave-01 Started container website-con
[fgokmen@masterkube ~]$ kubectl get svc
NAME          TYPE          CLUSTER-IP    EXTERNAL-IP    PORT(S)          AGE
kubernetes   ClusterIP     10.96.0.1     <none>         443/TCP          42h
website       LoadBalancer 10.98.124.8   <pending>      3000:30100/TCP  16h
[fgokmen@masterkube ~]$

```

■ Checking with my nodeslave server public ip that created webapp with port number I assigned.
<http://35.183.198.151:30100>

<input type="checkbox"/>	Name	Instance ID	Instance state	Instance type	Status check	Ala
<input checked="" type="checkbox"/>	nodeslave-01	i-0326669146e5a39ed	Running	t2.micro	2/2 checks passed	No
<input type="checkbox"/>	nodeslave-02	i-03f8b77d026a4d544	Running	t2.micro	2/2 checks passed	No
<input type="checkbox"/>	masterkube	i-00741f3e104f28fae	Running	t2.medium	2/2 checks passed	No
<input type="checkbox"/>	server	i-0a9c750cff1a4c5c8	Running	t2.medium	2/2 checks passed	No

14- 😊 The website is reachable now.

Not Secure — 35.182.211.67

Instances | website-he... | Directory: / | (1) Integrati... | kubernetes... | mywebsite/... | fatihkgmjN... | invalid valu... | Kubernete... | TheKGM

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Hello, My name is
Felix Gokmen.
And I'm a Developer & Design

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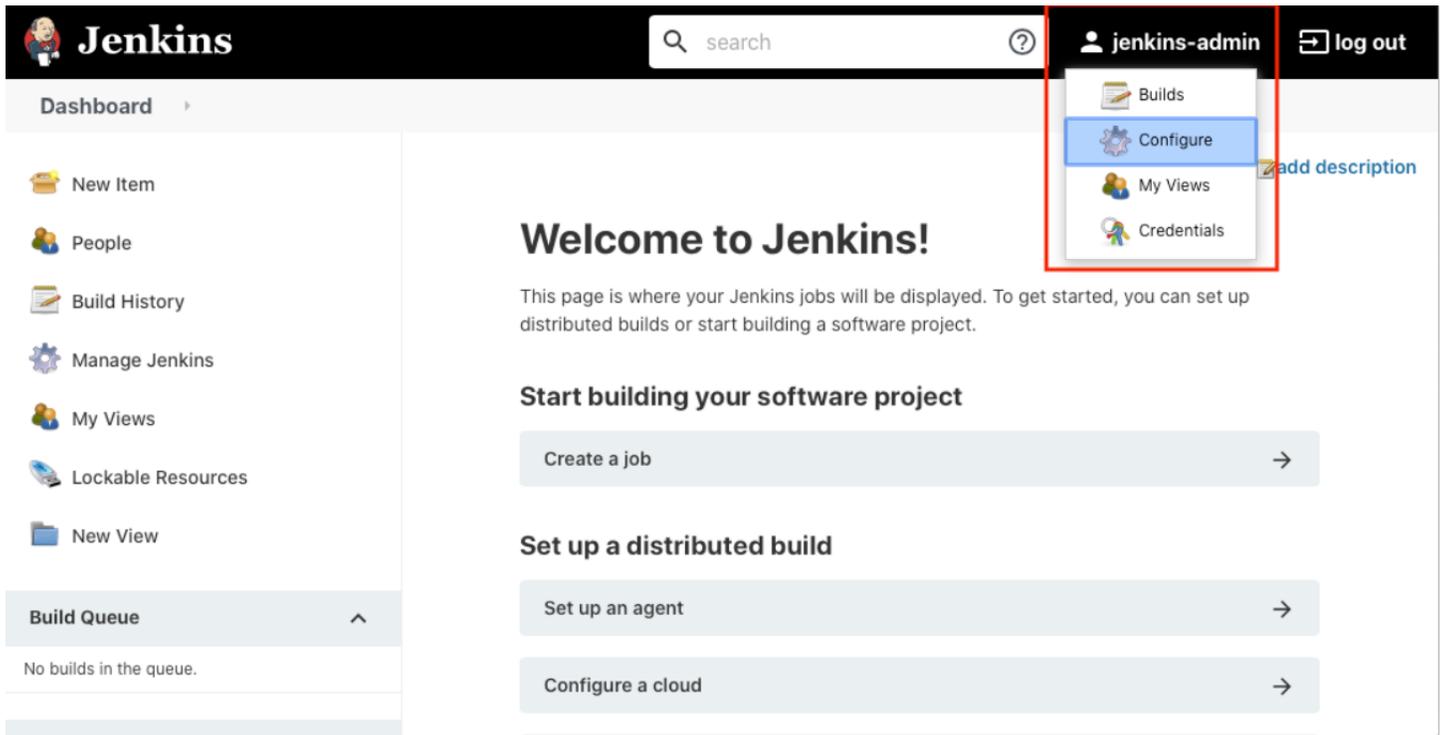
```
kubernetes ClusterIP 10.96.0.1 <none> 443/TCP 42h
website LoadBalancer 10.98.124.8 <pending> 3000:30100/TCP 16h
[f gokmen@masterkube ~]$
```

15- Cheking my Jenkins server for files

```
[root@ip-172-31-5-148 ~]# cd /var/lib/jenkins/workspace/website-helm
[root@ip-172-31-5-148 website-helm]# ls -lart
total 80
-rw-r--r--  1 jenkins jenkins   111 May 23 08:31 README.md
-rw-r--r--  1 jenkins jenkins    17 May 23 08:31 Procfile
drwxr-xr-x  3 jenkins jenkins    21 May 23 08:31 helm
-rw-r--r--  1 jenkins jenkins    26 May 23 08:31 .dockerignore
-rw-r--r--  1 jenkins jenkins   123 May 23 08:31 Dockerfile
-rw-r--r--  1 jenkins jenkins  3411 May 23 08:31 app.js
-rw-r--r--  1 jenkins jenkins 51993 May 23 08:31 package-lock.json
-rw-r--r--  1 jenkins jenkins   845 May 23 08:31 package.json
drwxr-xr-x  5 jenkins jenkins   100 May 23 08:31 public
drwxr-xr-x  3 jenkins jenkins   216 May 23 08:31 views
drwxr-xr-x  3 jenkins jenkins    77 May 23 08:31 website
drwxr-xr-x 10 jenkins jenkins   186 May 23 09:10 ..
-rw-r--r--  1 jenkins jenkins   366 May 23 09:23 Jenkinsfile
drwxr-xr-x  7 jenkins jenkins   222 May 23 09:23 .
drwxr-xr-x  8 jenkins jenkins   162 May 24 01:07 .git
```

👉 Lets build Integrating GitHub Webhooks with Jenkins to automate unit and integration test after GitHub events for CI/CD

👉 To connect my Jenkins server with my Webhook, i will first need to create an API Token to authenticate from the version control provider (Github in this case). To do so, we need to click on our account and then on the configure option.



👉 Click on Add new Token, write a name for it and then press Generate. You need to store this Token in a safe place because there is no way to recover it in the future unless creating a new one.

Full Name

Description

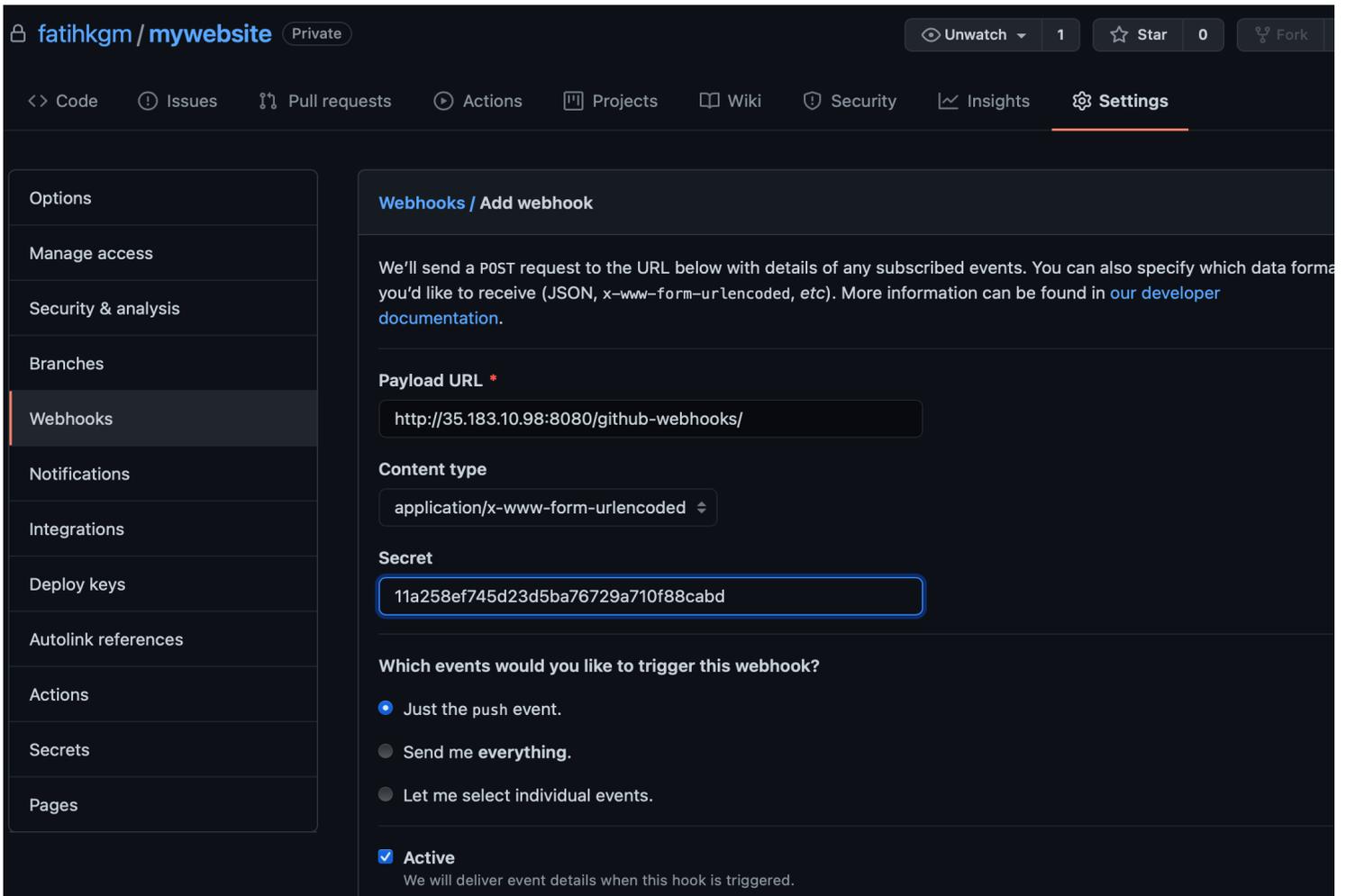
API Token

Current token(s)

Token created on 2021-05-23T21:33:24 11a258ef745d23d5ba76729a710f88cabd 📄 ✖

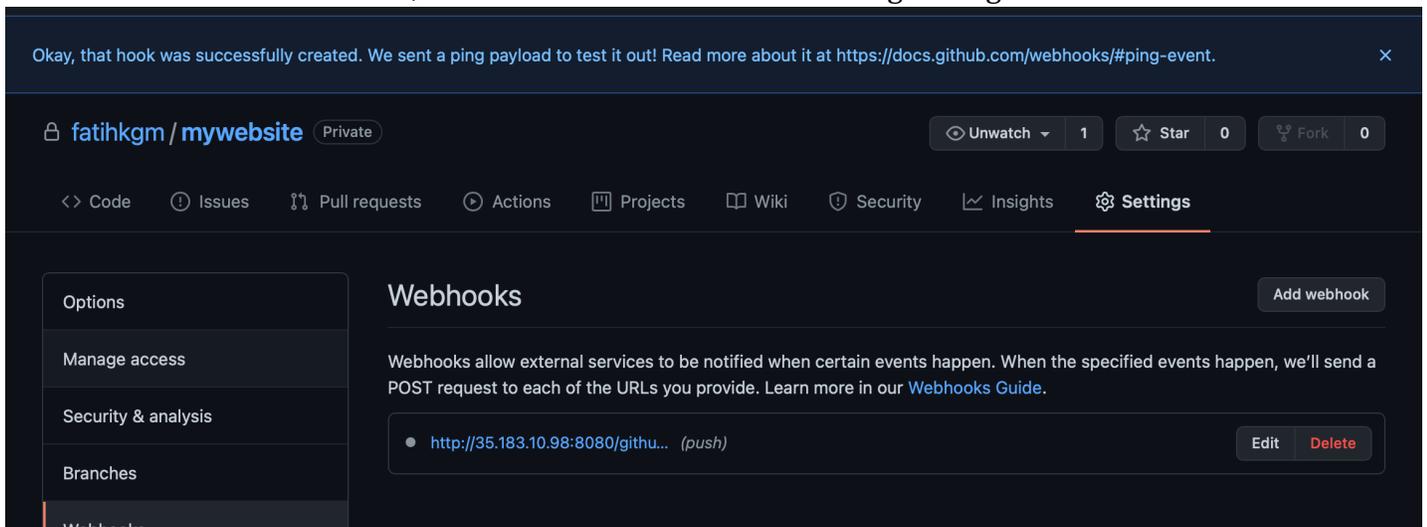
⚠ Copy this token now, because it cannot be recovered in the future.

👉 To create GitHub Webhook, i need to open our repository and click on settings. Go to github repository and click setting > webhooks > add webhoks .Here is the configuration below picture.



👉 Inside the Payload URL text box, you need to write the direction to you Jenkins Server, plus: /github-webhook/. If you created a ngrok account, it'd be obtained at the end of section one. The payload must have both / to work, otherwise it'll throw some error. Inside the Secret box, i'll paste the Jenkins API Token which you can see above picture. Finally, click on: Let me select individual elements to choose the desired webhook events for our needs to trigger Jenkins.

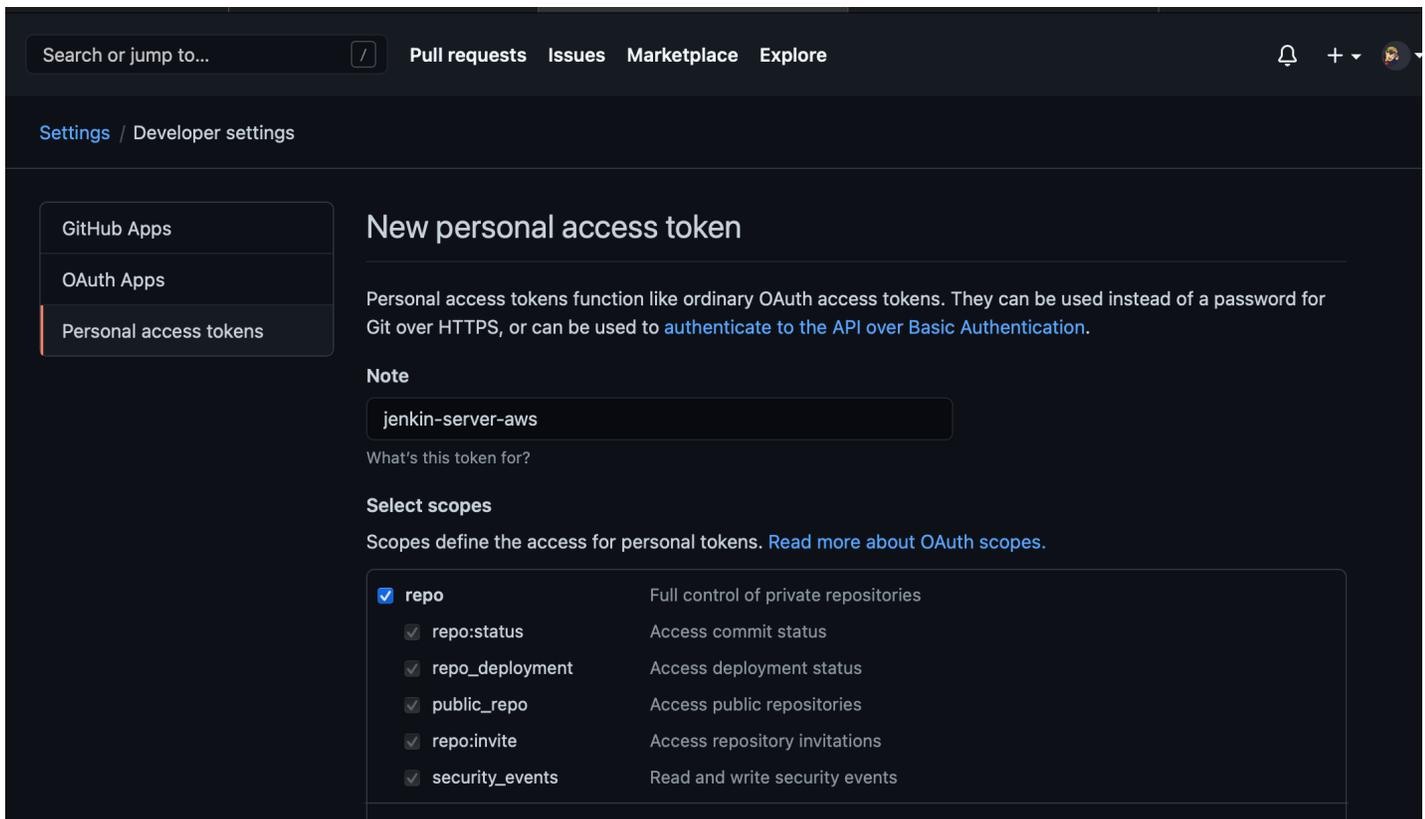
✅ Once created the webhook, it'll look like the following image.



👉 Since early 2021 GitHub restricts API user authentication to work only with a token or private ssh key. There is no longer possible to authenticate using you user and password, and such is the case working with Jenkins.

To create a token to be authenticated from Jenkins, go to your GitHub profile, then click on Settings, Developer Settings, Personal access tokens -- see picture below.

🟡 I give it a name ("Jenkin-server-aws") plus checking the two boxes: repo and user, finally click on Generate Token.



👉 Once the token has been generated, it'll look like the following. Again, these tokens are meant to be kept in a safe place, there is no way to recover them once lost unless creating a new one.

Pull requests Issues Marketplace Explore

ected are included in other scopes. Only the minimum set of necessary scopes has been saved. X

Personal access tokens

Generate new token Revoke all

Tokens you have generated that can be used to access the [GitHub API](#).

Make sure to copy your new personal access token now. You won't be able to see it again!

✓ ghp_FpbPDvL4840IdJhX84gMVqdEDFvrgS2v26XX  Delete

- 👉 You need first to have the GitHub plugin installed on Jenkins; if you installed all the recommended plugins at Jenkins installation, it should be there) click on Add GitHub Server, GitHub Server
 - ✔ Inside the credentials section click on add, Jenkins.

Jenkins Credentials Provider: Jenkins

Add Credentials

Domain

Global credentials (unrestricted)

Kind

Secret text

Scope

Global (Jenkins, nodes, items, all child items, etc)

Secret

.....

ID

secret-github-portfolia

Description

secret-github-portfolia

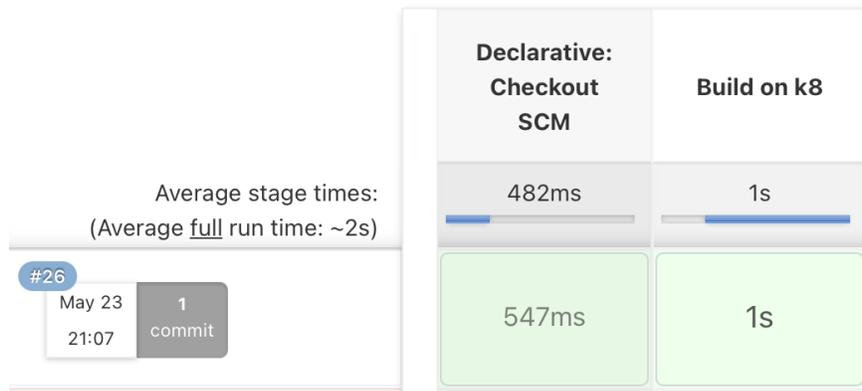
Add Cancel

👉 Pushing any commit to our GitHub repository and triggering the build on Jenkins 😊 easy-peasy

Pipeline website-helm



Stage View



👉 Next step is shot down your EC2 instances. 🤪

Stop instances?



Instance IDs

- 📄 i-00741f3e104f28fae (masterkube)
- 📄 i-0326669146e5a39ed (nodeslave-01)
- 📄 i-03f8b77d026a4d544 (nodeslave-02)
- 📄 i-0a9c750cff1a4c5c8 (server)

To confirm that you want to stop the instances, choose the *Stop* button below.

Cancel

Stop

Note: The AWS Free Tier provides to explore and try out AWS services free of charge up to specified limits for each service for 1 year. Since I use free tier ,it charged me almost 5\$.It depends of what service you are using
✓I used my instance almost 2days.