

Assignment 4: Container Orchestration with Jenkins on Kubernetes

Team Members

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1. Overview

This assignment demonstrates the complete setup, configuration, and teardown of a Jenkins environment deployed on a Kubernetes cluster. The project components include:

- Deployment of Jenkins in Kubernetes using `up.yaml`
- Configuration of Jenkins pipeline jobs connected to both GitHub and Gitea repositories
- Webhook configuration for triggering builds
- Teardown of the Jenkins deployment using `down.yaml` to clean up resources

Screenshots have been captured at key stages and are included below.

2. Jenkins Deployment on Kubernetes

Deployment Configuration (`up.yaml`)

The `up.yaml` file defines the following Kubernetes objects:

- **Deployment:** Configures the Jenkins pod using the `jenkins/jenkins:lts` image with one replica.
 - **Service:** Exposes the Jenkins pod internally via a ClusterIP service on port 8080.
 - **PersistentVolumeClaim (PVC):** Allocates 8Gi of storage for Jenkins home.
 - **Ingress:** Routes external traffic to Jenkins using an ngrok-based host.
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3. Jenkins Pipeline Jobs

GitHub Jenkins Job

A Jenkins pipeline job was created to monitor a GitHub repository containing the Jenkinsfile. The pipeline includes the following stages:

- **Build:** Outputs “Building...”
- **Test:** Outputs “Testing...”
- **Deploy:** Outputs “Deploying...”

The job was successfully triggered by a GitHub webhook configured to the Jenkins URL via ngrok.

Gitea Jenkins Job

A similar Jenkins pipeline job was created for the Gitea repository (<https://gitea.com/ShironKurian/jenkinsfile-repo.git>). This job uses the same Jenkinsfile and a webhook from Gitea to the ngrok Jenkins URL.

4. Repository Setup

GitHub Repository

The GitHub repository contains the Jenkinsfile used by the pipeline job. It is correctly configured with a webhook to trigger builds on push events.

Gitea Repository

The Gitea repository mirrors the GitHub repository and also contains the Jenkinsfile.

5. Webhook Configuration

GitHub Webhook

The GitHub webhook is set to trigger a Jenkins build on push events. It is configured to send notifications to the Jenkins server via the ngrok URL:

```
https://8278-172-191-151-53.ngrok-free.app/github-webhook/
```

Gitea Webhook

The Gitea webhook is similarly configured to notify Jenkins of changes.

6. Resource Teardown with `down.yaml`

Due to partner permission issues, the deletion of Kubernetes resources was executed from Shiron Kurian's end. The `down.yaml` file (shown below) deletes the Jenkins-related resources in reverse order:

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: jenkins-ingress
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: jenkins-home
---
apiVersion: v1
kind: Service
metadata:
  name: jenkins
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: jenkins
```

Verification

After running the deletion command, the following commands verified that all resources were removed:

```
kubectl get all
kubectl get pvc
```

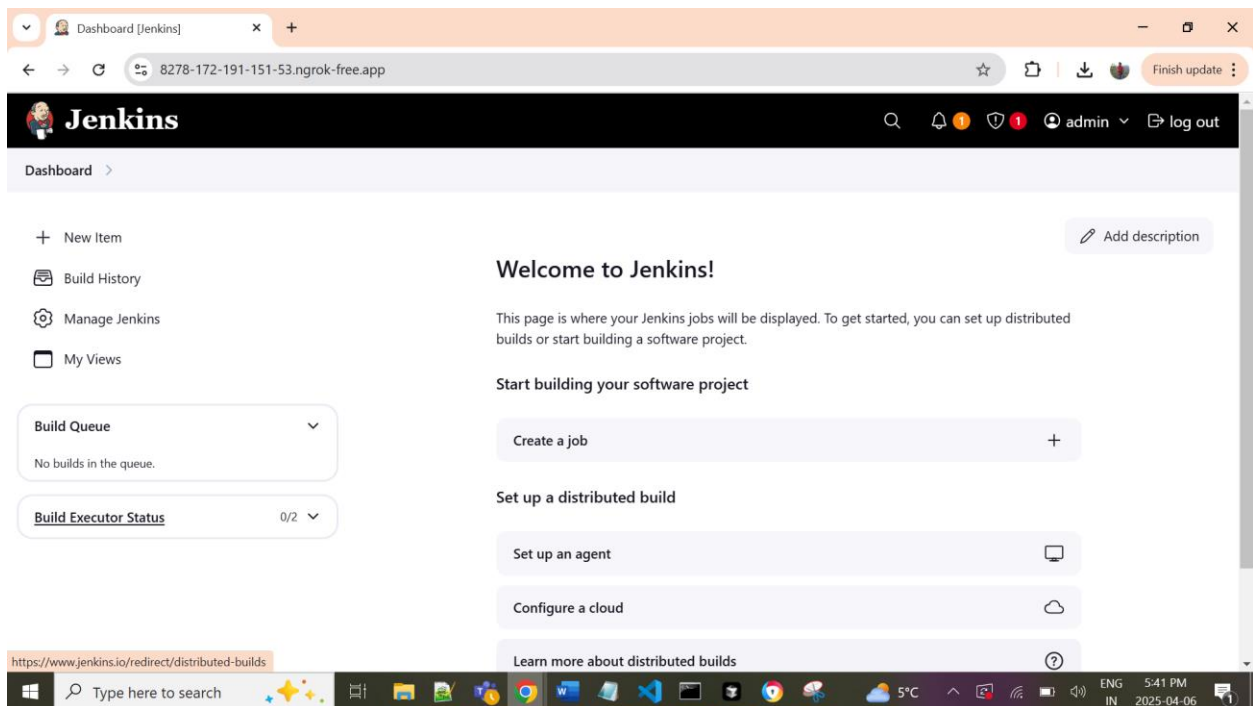
The outputs showed only the default Kubernetes service and no PVCs.

7. Conclusion

This project demonstrates the successful orchestration of a Jenkins environment on Kubernetes with integrations to both GitHub and Gitea. The assignment covers the deployment of Jenkins, configuration of pipeline jobs with webhooks, and proper resource cleanup. Despite some challenges with partner permissions, the team collaborated effectively to complete all required tasks. All steps have been thoroughly documented with screenshots.

ScreenShots:

Jenkins:



Dashboard [Jenkins] x +

8278-172-191-151-53.ngrok-free.app

Jenkins

Dashboard >

+ New Item

Build History

Manage Jenkins

My Views

Build Queue

No builds in the queue.

Build Executor Status

0/2

All +

S	W	Name	Last Success	Last Failure	Last Duration
✓	☀	gitea-pipeline	4 min 56 sec #1	N/A	2.2 sec
✓	☀	github-pipeline-job	36 min #1	N/A	8.2 sec

Icon: S M L

REST API Jenkins 2.492.3

Github Jenkins job:

github-pipeline-job [Jenkins] x +

8278-172-191-151-53.ngrok-free.app/job/github-pipeline-job/

Jenkins

Dashboard > github-pipeline-job >

Status

Changes

Build Now

Configure

Delete Pipeline

Stages

Rename

Pipeline Syntax

GitHub Hook Log

github-pipeline-job

Add description

Permalinks

- Last build (#1), 37 min ago
- Last stable build (#1), 37 min ago
- Last successful build (#1), 37 min ago
- Last completed build (#1), 37 min ago

Builds

Type here to search

4°C

ENG US 6:40 PM 2025-04-06

github-pipeline-job #1 (Jenkins) x +

8278-172-191-151-53.ngrok-free.app/job/github-pipeline-job/1/

Jenkins

Dashboard > github-pipeline-job > #1

Status #1 (Apr 6, 2025, 10:03:28 PM) Add description Keep this build forever

Changes

Console Output

Edit Build Information

Delete build '#1'

Polling Log

Timings

Git Build Data

Pipeline Overview

Pipeline Console

Restart from Stage

Started by GitHub push by ShironKurian

Started 39 min ago
Took 8.2 sec

This run spent:

- 6.3 sec waiting;
- 8.2 sec build duration;
- 14 sec total from scheduled to completion.

git Revision: d1b34ca6085d70c63c1070a891e7131271c51c77
Repository: <https://github.com/ShironKurian/Assignment-4---Jenkins-on-K8s.git>

- refs/remotes/origin/main

No changes.

Type here to search

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github-pipeline-job #1 Console x +

8278-172-191-151-53.ngrok-free.app/job/github-pipeline-job/1/console

Jenkins

Dashboard > github-pipeline-job > #1

Status Console Output Download Copy View as plain text

Changes

Console Output

Edit Build Information

Delete build '#1'

Polling Log

Timings

Git Build Data

Pipeline Overview

Pipeline Console

Restart from Stage

Started by GitHub push by ShironKurian

Obtained Jenkinsfile from git <https://github.com/ShironKurian/Assignment-4---Jenkins-on-K8s.git>

[Pipeline] Start of Pipeline

[Pipeline] node

Running on Jenkins in /var/jenkins_home/workspace/github-pipeline-job

[Pipeline] {

[Pipeline] stage

[Pipeline] { (Declarative: Checkout SCM)

[Pipeline] checkout

Selected Git installation does not exist. Using Default

The recommended git tool is: NONE

No credentials specified

Cloning the remote Git repository

Cloning repository <https://github.com/ShironKurian/Assignment-4---Jenkins-on-K8s.git>

> git init /var/jenkins_home/workspace/github-pipeline-job # timeout=10

Fetching upstream changes from <https://github.com/ShironKurian/Assignment-4---Jenkins-on-K8s.git>

> git --version # timeout=10

Type here to search

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ENG US 6:42 PM 2025-04-06

github-pipeline-job #1 Console

8278-172-191-151-53.ngrok-free.app/job/github-pipeline-job/1/console

Dashboard > github-pipeline-job > #1

```
[Pipeline] stage
[Pipeline] { (Test)
[Pipeline] echo
Testing...
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Deploy)
[Pipeline] echo
Deploying...
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

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Gitea Jenkins job:

gitea-pipeline [Jenkins]

8278-172-191-151-53.ngrok-free.app/job/gitea-pipeline/

Dashboard > gitea-pipeline

Status

gitea-pipeline

Edit description

Changes

Build Now

Configure

Delete Pipeline

Stages

Rename

Pipeline Syntax

GitHub Hook Log

Permalinks

- Last build (#1), 6 min 10 sec ago
- Last stable build (#1), 6 min 10 sec ago
- Last successful build (#1), 6 min 10 sec ago
- Last completed build (#1), 6 min 10 sec ago

Builds

gitea-pipeline #1 Console [Jenk] x +

8278-172-191-151-53.ngrok-free.app/job/gitea-pipeline/1/console

Finish update

Jenkins

Dashboard > gitea-pipeline > #1

- Status
- Changes
- Console Output**
- Edit Build Information
- Delete build '#1'
- Polling Log
- Timings
- Git Build Data
- Pipeline Overview
- Pipeline Console
- Restart from Stage

Download Copy View as plain text

Started by GitHub push by
Obtained Jenkinsfile from git <https://gitea.com/ShironKurian/jenkinsfile-repo.git>

```
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/jenkins_home/workspace/gitea-pipeline
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
Selected Git installation does not exist. Using Default
The recommended git tool is: NONE
No credentials specified
Cloning the remote Git repository
Cloning repository https://gitea.com/ShironKurian/jenkinsfile-repo.git
> git init /var/jenkins_home/workspace/gitea-pipeline # timeout=10
Fetching upstream changes from https://gitea.com/ShironKurian/jenkinsfile-repo.git
> git --version # timeout=10
```

Type here to search

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ENG US 6:41 PM 2025-04-06

gitea-pipeline #1 Console [Jenk] x +

8278-172-191-151-53.ngrok-free.app/job/gitea-pipeline/1/console

Finish update

Dashboard > gitea-pipeline > #1

```
[Pipeline] stage
[Pipeline] { (Test)
[Pipeline] echo
Testing...
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Deploy)
[Pipeline] echo
Deploying...
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

REST API Jenkins 2.492.3

Type here to search

4°C

ENG US 6:42 PM 2025-04-06

gitea repository:

The screenshot shows the Gitea web interface for the repository 'ShironKurian/jenkinsfile-repo'. The browser address bar shows 'gitea.com/ShironKurian/jenkinsfile-repo'. The repository page includes a navigation bar with links for Code, Issues, Pull Requests, Actions, Projects, Releases, Wiki, and Activity. Below the navigation bar, there are statistics: 4 Commits, 1 Branch, and 0 Tags. A search bar is present. The main content area shows a list of files: 'jenkinsfile' (21 minutes ago) and 'README.md' (8 minutes ago). The 'README.md' file is expanded, showing the title 'jenkinsfile-repo' and the content 'test1 test2'. On the right side, there is a 'Description' section with the text 'No description provided' and a 'Readme' section with the text '30 KiB'.

Github repository:

The screenshot shows the Github web interface for the repository 'ShironKurian/Assignment-4---Jenkins-on-K8s'. The browser address bar shows 'github.com/ShironKurian/Assignment-4---Jenkins-on-K8s'. The repository page includes a navigation bar with links for Code, Issues, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings. Below the navigation bar, there are statistics: 1 Branch and 0 Tags. A search bar is present. The main content area shows a list of files: '.devcontainer' (3 days ago), '.gitignore' (3 days ago), 'Jenkinsfile' (1 hour ago), 'LICENSE' (3 days ago), 'README.md' (42 minutes ago), 'down.yaml' (3 days ago), and 'up.yaml' (1 hour ago). The 'README.md' file is expanded, showing the title 'Assignment 4 - Jenkins on K8s' and the content 'test1 test2'. On the right side, there is an 'About' section with the text 'Assignment 4 - Jenkins on K8s' and a 'Releases' section with the text 'No releases published'.

webhook Github:

The screenshot shows the GitHub repository settings page for 'Assignment-4---Jenkins-on-K8s'. The 'Webhooks' section is active, displaying a list of configured webhooks. One webhook is listed with the URL 'https://8278-172-191-151-53.ngrok-... (push)' and a status of 'Last delivery was successful'. The left sidebar shows the repository structure, including 'General', 'Access', 'Moderation options', 'Code and automation', 'Security', and 'Webhooks'.

Webhook Gitea:

The screenshot shows the Gitea repository settings page for 'ShironKurian /jenkinsfile-repo'. The 'Webhooks' section is active, displaying a list of configured webhooks. One webhook is listed with the URL 'https://8278-172-191-151-53.ngrok-free.app/github-webhook/'. The left sidebar shows the repository structure, including 'Settings', 'Repository', 'Collaborators', 'Webhooks', 'Branches', 'Tags', 'Deploy Keys', 'LFS', and 'Actions'.

```
@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $ kubectl get all
NAME                                READY    STATUS    RESTARTS   AGE
pod/jenkins-b75d99854-jdg4r        1/1      Running   4 (78m ago) 2d23h

NAME                                TYPE          CLUSTER-IP    EXTERNAL-IP  PORT(S)    AGE
service/jenkins                    ClusterIP     10.43.103.42  <none>       8080/TCP   2d23h
service/kubernetes                  ClusterIP     10.43.0.1     <none>       443/TCP    3d

NAME                                READY    UP-TO-DATE  AVAILABLE   AGE
deployment.apps/jenkins            1/1      1            1            2d23h

NAME                                DESIRED    CURRENT    READY    AGE
replicaset.apps/jenkins-b75d99854  1          1          1        2d23h
@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $ kubectl get pvc
NAME                                STATUS    VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS
jenkins-home                        Bound     pvc-918962df-26ec-4cc1-a295-f2fe2bc8afed  8Gi        RWO             local-path
<unset>                             2d23h

@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $
```

Output after down.yaml execution:

The screenshot shows the VS Code interface for a workspace named 'Assignment-4---Jenkins-on-K8s'. The Explorer panel on the left lists files including '.devcontainer', '.gitignore', 'down.yaml', 'Jenkinsfile', 'LICENSE', 'README.md', and 'up.yaml'. The main editor displays the 'down.yaml' file with the following content:

```
1  apiVersion: networking.k8s.io/v1
2
3  kind: Ingress
4
5  metadata:
6    name: jenkins-ingress
7
8  ---
9
10
11 apiVersion: v1
12
13 kind: PersistentVolumeClaim
14
15 metadata:
```

The TERMINAL panel at the bottom shows the output of the 'down' command, which successfully deleted the 'jenkins-home' persistent volume claim, the 'jenkins' service, and the 'jenkins' deployment. The terminal also shows the user's subsequent 'kubectl get all' and 'kubectl get pvc' commands, which confirm that no resources are found in the default namespace.

```
@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $ kubectl get all
NAME                                TYPE          CLUSTER-IP    EXTERNAL-IP  PORT(S)    AGE
service/kubernetes                  ClusterIP     10.43.0.1     <none>       443/TCP    3d1h

@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $ kubectl get pvc
No resources found in default namespace.

@ShironKurian →/workspaces/Assignment-4---Jenkins-on-K8s (main) $
```