

Stage 1: Setting Up the Kubernetes Cluster and Static Web App

1. Set Up Minikube:

- Ensure Minikube is installed and running on the local Ubuntu machine.
- Verify the Kubernetes cluster is functioning correctly
- Start Minikube (minikube start)
- Create a directory named static-web-api in the current working directory (mkdir static-web-api)

```
einfochips@AHMLPT2581:~$ minikube start
minikube v1.33.1 on Ubuntu 22.04
Using the docker driver based on existing profile
Starting "minikube" primary control-plane node in "minikube" cluster
Pulling base image v0.0.44 ...
Updating the running docker "minikube" container ...
Preparing Kubernetes v1.30.0 on Docker 26.1.1 ...
Verifying Kubernetes components...
  ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
  ■ Using image registry.k8s.io/ingress-nginx/controller:v1.10.1
  ■ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.1
  ■ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.1
Verifying ingress addon...
Enabled addons: storage-provisioner, default-storageclass, ingress
Done! kubectrl is now configured to use "minikube" cluster and "default" namespace by default
einfochips@AHMLPT2581:~$ minikube status
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured

einfochips@AHMLPT2581:~$ mkdir day9_task
einfochips@AHMLPT2581:~$ cd day9_task/
einfochips@AHMLPT2581:~/day9_task$ nano index.html
einfochips@AHMLPT2581:~/day9_task$ nano Dockerfile
einfochips@AHMLPT2581:~/day9_task$ docker build -t day9_task_image .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
Install the buildx component to build images with BuildKit:
https://docs.docker.com/go/buildx/
```

Create a file deployment.yaml

Create a file service.yaml

Apply the Deployment and Service Manifests

Minikube IP address

```
einfochips@AHMLPT2581:~/day9_task$ docker run --name day9_task_image -d -p 8082:80 day9_task_image
4130f1d252274184758cde8ef3d1ad7ed89f962243583214d531e75d05b99eb1
einfochips@AHMLPT2581:~/day9_task$ nano deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano service.yaml
einfochips@AHMLPT2581:~/day9_task$ nano index.html
einfochips@AHMLPT2581:~/day9_task$ nano service.yaml
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f deployment.yaml
The Deployment "day9_task_image-deployment" is invalid:
* metadata.name: Invalid value: "day9_task_image-deployment": a lowercase RFC 1123 subdomain must consist of lower case alphanumeric characters, '-' or '.', and must start and end with an alphanumeric character (e.g. 'example.com', regex used for validation is '[a-z0-9]([-a-z0-9]*[a-z0-9])?(\.[a-z0-9]([-a-z0-9]*[a-z0-9])?)*')
* spec.template.spec.containers[0].name: Invalid value: "day9_task_image": a lowercase RFC 1123 label must consist of lower case alphanumeric characters or '-', and must start and end with an alphanumeric character (e.g. 'my-name', or '123-abc', regex used for validation is '[a-z0-9]([-a-z0-9]*[a-z0-9])?')
pynon          3.8-slim      aas04e100zcy   10 days ago    145MB
wordpress      latest        d2a2d7e671fd   3 weeks ago    685MB
nginx          latest        fffffc90d343   3 weeks ago    188MB
<none>         <none>       f23dc7cd74bd   2 months ago   432MB
gcr.io/k8s-minikube/kicbase v0.0.44      5a6e59a9bdc0   2 months ago   1.26GB
mysql          5.7          5107333e08a8   7 months ago   501MB
node           14           1d12470fa662   15 months ago  912MB
einfochips@AHMLPT2581:~/day9_task$ docker tag day9_task_image:latest utsavshah0305/day9_task_image:latest
einfochips@AHMLPT2581:~/day9_task$ docker push utsavshah0305/day9_task_image:latest
The push refers to repository [docker.io/utsavshah0305/day9_task_image]
1b2648bc451b: Pushed
56b6d3be75f9: Mounted from library/nginx
0c6c257920c8: Mounted from library/nginx
92d0d4e97019: Mounted from library/nginx
7190c87a0e8a: Mounted from library/nginx
```

2. Deploy Static Web App:

- Create a Dockerfile for a simple static web application (e.g., an HTML page served by Nginx).
- Build a Docker image for the static web application.
- Push the Docker image to Docker Hub or a local registry.

```
einfochips@AHMLPT2581:~/day9_task$ nano deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano Dockerfile
einfochips@AHMLPT2581:~/day9_task$ docker build -t day9-image .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
Install the buildx component to build images with BuildKit:
https://docs.docker.com/go/buildx/
```

```
Sending build context to Docker daemon 5.12kB
Step 1/3 : FROM nginx:latest
----> fffffc90d343
Step 2/3 : COPY index.html /usr/share/nginx/html/
----> 8d61ec92d28c
Step 3/3 : EXPOSE 80
----> Running in a871531bc77f
Removing intermediate container a871531bc77f
----> 8ab66351c200
Successfully built 8ab66351c200
Successfully tagged day9-image:latest
einfochips@AHMLPT2581:~/day9_task$ docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
day9-image	latest	8ab66351c200	18 seconds ago	188MB
day9_task_image	latest	7eba63789053	About an hour ago	188MB
utsavshah0305/day9_task_image	latest	7eba63789053	About an hour ago	188MB
utsavshah0305/nodejs-advanced-app	latest	435b5694857a	25 hours ago	1.09GB
nodejs-app	latest	da39e8c18a6c	30 hours ago	1.09GB
utsavshah0305/nodejs-app	latest	da39e8c18a6c	30 hours ago	1.09GB
your-dockerhub-username/nodejs-app	latest	da39e8c18a6c	30 hours ago	1.09GB
Flask-k8s-app	latest	11cd70cf6e16	2 days ago	156MB
nodejs-k8s-app	v2	78c17a872e0d	2 days ago	917MB
utsavshah0305/nodejs-k8s-app	latest	1d0760cc5cbe	2 days ago	917MB
nodejs-k8s-app	latest	e97ab4033ddc	2 days ago	917MB

```
einfochips@AHMLPT2581:~/day9_task$ docker tag day9-image:latest utsavshah0305/day9-image:latest
einfochips@AHMLPT2581:~/day9_task$ docker push utsavshah0305/day9-image:latest
The push refers to repository [docker.io/utsavshah0305/day9-image]
71d1f5fb551f: Pushed
56b6d3be75f9: Mounted from utsavshah0305/day9_task_image
0c6c257920c8: Mounted from utsavshah0305/day9_task_image
92d0d4e97019: Mounted from utsavshah0305/day9_task_image
7190c87a0e8a: Mounted from utsavshah0305/day9_task_image
933a3ce2c78a: Mounted from utsavshah0305/day9_task_image
32cfaf91376f: Mounted from utsavshah0305/day9_task_image
32148f9f6c5a: Mounted from utsavshah0305/day9_task_image
latest: digest: sha256:d341e924ec84d81676a50de920ce83f019ff11c83909f042528d24d82bd51b37 size: 1985
```

```
einfochips@AHMLPT2581:~/day9_task$ docker rm -f day9-image
day9-image
einfochips@AHMLPT2581:~/day9_task$ docker run --name day9-image -d -p 8088:80 day9-image
9dbec75924611f3c709c3b8270ef2ef819fb7984e82cd7c307d496fc0a02f303
einfochips@AHMLPT2581:~/day9_task$ nano deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano service.yaml
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f deployment.yaml
deployment.apps/day9-image-deployment created
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f service.yaml
service/day9-image-service created
einfochips@AHMLPT2581:~/day9_task$ minikube start --addons=ingress
🌟 minikube v1.33.1 on Ubuntu 22.04
👉 Using the docker driver based on existing profile
👉 Starting "minikube" primary control-plane node in "minikube" cluster
🔗 Pulling base image v0.0.44 ...
🔄 Updating the running docker "minikube" container ...
🔧 Preparing Kubernetes v1.30.0 on Docker 26.1.1 ...
🔍 Verifying Kubernetes components...
  ▪ Using image gcr.io/k8s-minikube/storage-provisioner:v5
  ▪ Using image registry.k8s.io/ingress-nginx/controller:v1.10.1
  ▪ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.1
  ▪ Using image registry.k8s.io/ingress-nginx/kube-webhook-certgen:v1.4.1
🔍 Verifying ingress addon...
🌟 Enabled addons: storage-provisioner, default-storageclass, ingress
👉 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
einfochips@AHMLPT2581:~/day9_task$ nano ingress-resource.yaml
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/day9-image-ingress created
```

3. Kubernetes Deployment:

- Write a Kubernetes deployment manifest to deploy the static web application.
- Write a Kubernetes service manifest to expose the static web application within the cluster.
- Apply the deployment and service manifests to the Kubernetes cluster.

General
Tags
Builds
Collaborators
Webhooks
Settings

utsavshah0305/day9-image

Updated 5 minutes ago

This repository does not have a description

This repository does not have a category

Docker commands

To push a new tag to this repository:

docker push utsavshah0305/day9-image:tagname

Tags

This repository contains 1 tag(s).

Tag	OS	Type	Pulled	Pushed
latest		Image	5 minutes ago	5 minutes ago

See all

Automated Builds

Manually pushing images to Hub? Connect your account to GitHub or Bitbucket to automatically build and tag new images whenever your code is updated, so you can focus your time on creating.

Available with Pro, Team and Business subscriptions. [Read more about automated builds](#)

Upgrade

```
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/day9-image-ingress created
einfochips@AHMLPT2581:~/day9_task$ sudo nano /etc/hosts
[sudo] password for einfochips:
einfochips@AHMLPT2581:~/day9_task$ minikube ip
192.168.58.2
einfochips@AHMLPT2581:~/day9_task$ sudo nano /etc/hosts
einfochips@AHMLPT2581:~/day9_task$ curl http://myapp.local/
<!DOCTYPE html>
<html>
<head>
<title>Day 9</title>
</head>
<body>
  <h1>Hello There</h1>
  <p>Day 9 Task</p>
</body>
</html>
einfochips@AHMLPT2581:~/day9_task$ nano frontend-deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano frontend-deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano frontend-deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ nano backend-deployment.yaml
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f frontend-deployment.yaml
deployment.apps/frontend created
service/frontend-service created
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f backend-deployment.yaml
deployment.apps/backend created
service/backend-service created
einfochips@AHMLPT2581:~/day9_task$ nano ingress-resource.yaml
einfochips@AHMLPT2581:~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/day9-image-ingress configured
```

```
einfochips@AHMLPT2581:~/day9_task$ curl http://myapp.local/backend
Hello from backend
```

4. Create Ingress Resource:

- Write an ingress resource manifest to route external traffic to the static web application.
- Configure advanced ingress rules for path-based routing and host-based routing (use at least two different hostnames and paths).
- Implement TLS termination for secure connections.
- Configure URL rewriting in the ingress resource to modify incoming URLs before they reach the backend services.
- Enable sticky sessions to ensure that requests from the same client are directed to the same backend pod.
- minikube addons enable ingress
- Create a Kubernetes Secret to store the TLS certificate
- kubectl create secret tls tls-secret --cert=tls.crt --key=tls.key
- nano ingress-rewriting.yaml

- kubectl apply -f ingressrewring.yaml
- Create a ingress-resource.yaml
- Apply the Ingress-resource.yaml
- Create a deployment.yaml
- Create a service.yaml

[illegible]

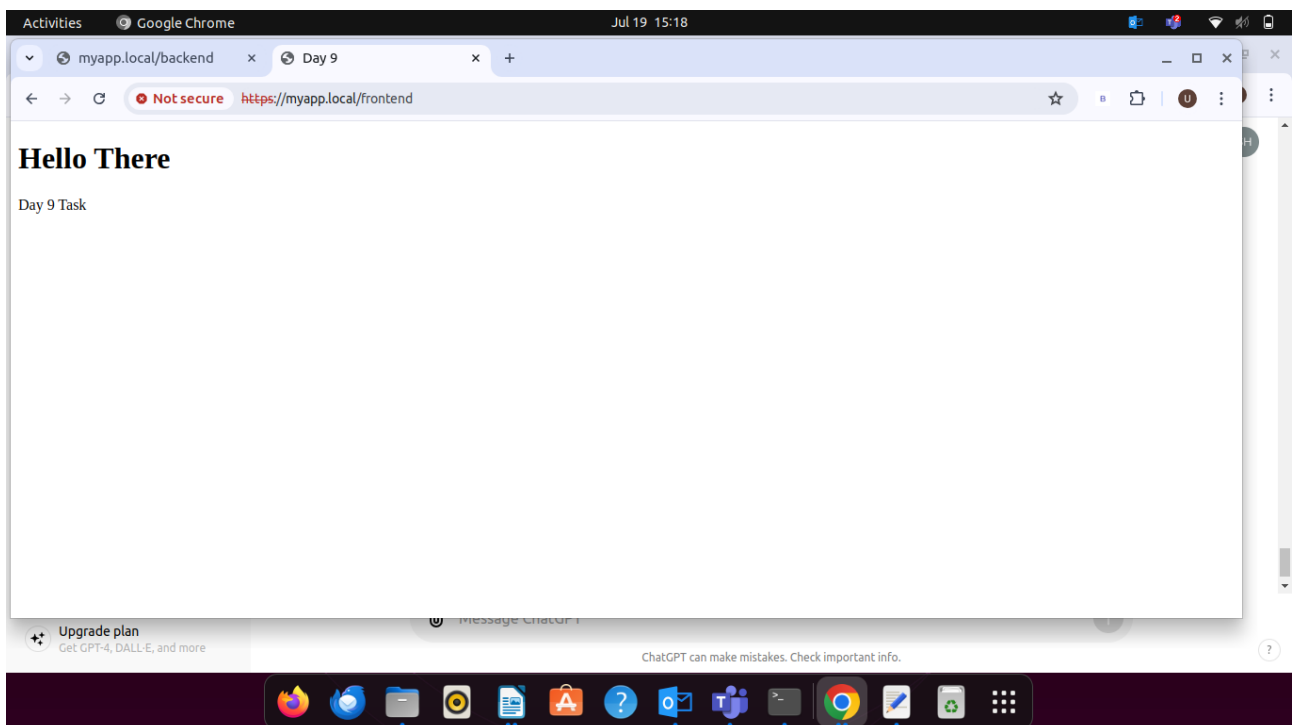
```
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl create secret tls tls-secret --cert=tls.crt --key=tls.key
secret/tls-secret created
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano ingress-resource.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano ingress-rewriting.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano sticky-ingress.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ rm -f sticky-ingress.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ ls
backend-deployment.yaml  Dockerfile  index.html  ingress-rewriting.yaml  tls.crt
deployment.yaml          frontend-deployment.yaml  ingress-resource.yaml  service.yaml  tls.key
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano sticky-ingress.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl apply -f sticky-ingress.yaml
ingress.networking.k8s.io/sticky-ingress created
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl apply -f ingress-rewriting.yaml
Warning: path /oldpath/(.*) cannot be used with pathType Prefix
ingress.networking.k8s.io/rewrite-ingress created
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano hpa.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl apply -f hpa.yaml
error: resource mapping not found for name: "day9-image-hpa" namespace: "" from "hpa.yaml": no matches for kind "HorizontalPodAutoscaler" in version "
autoscaling/v2beta2"
ensure CRDs are installed first
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano hpa.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl apply -f hpa.yaml
horizontalpodautoscaler.autoscaling/day9-image-hpa created
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano hpa.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano hpa.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ nano load-generator.yaml
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl apply -f load-generator.yaml
pod/load-generator created
e1nf0ch1ps@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME          REFERENCE          TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa  Deployment/day9-image  cpu: <unknown>/50%    2         5         2         3m24s
```

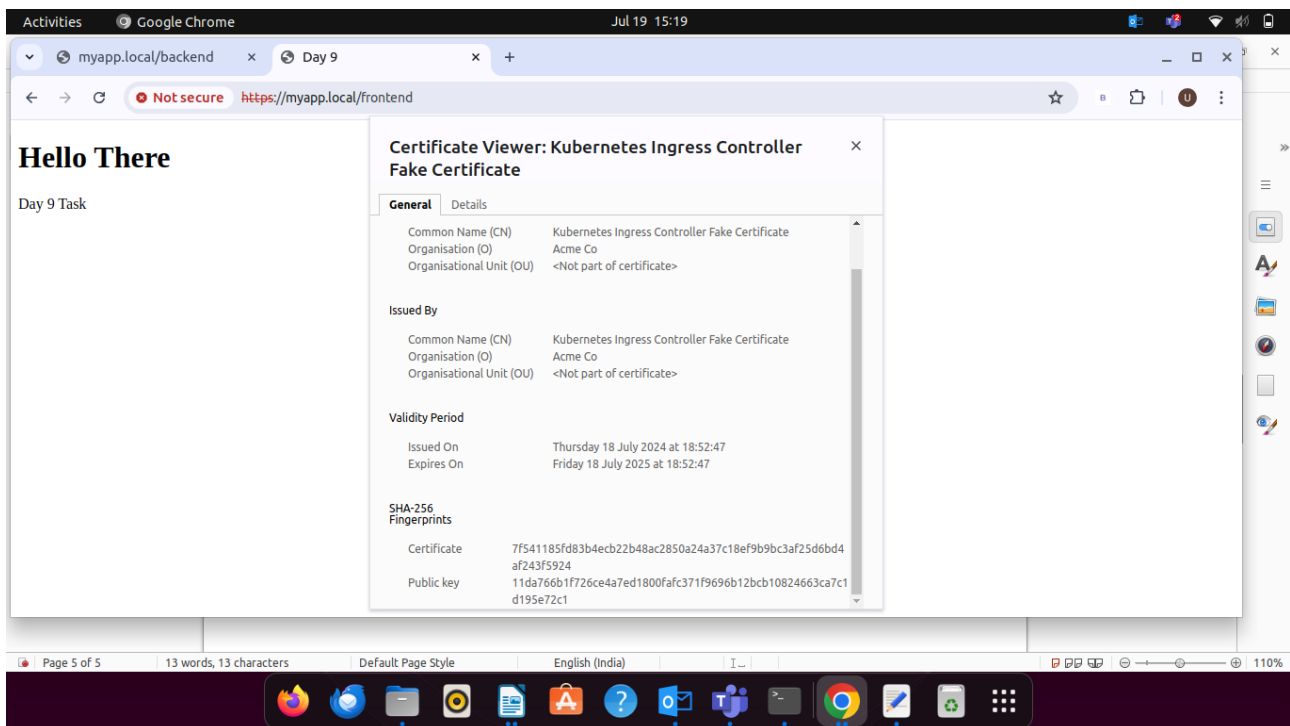
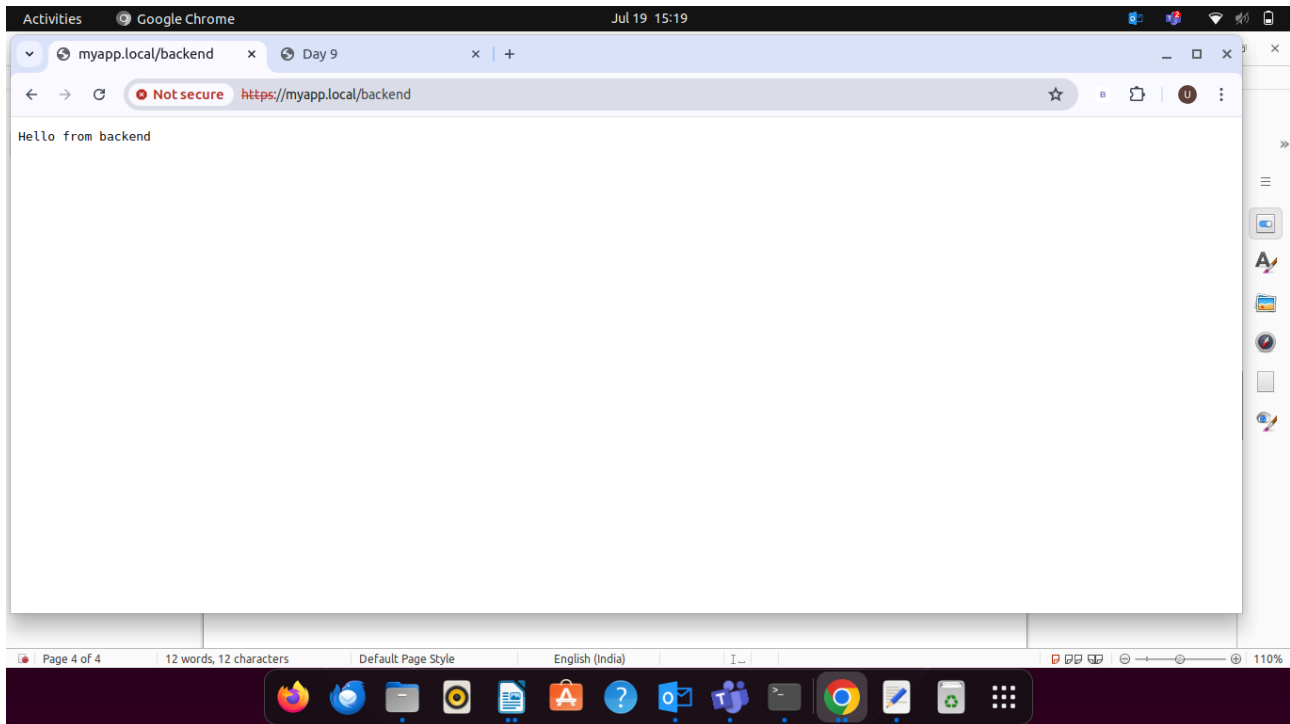
6. Configure Horizontal Pod Autoscaler:

- Write a horizontal pod autoscaler (HPA) manifest to automatically scale the static web application pods based on CPU utilization.
- Set thresholds for minimum and maximum pod replicas.

```
Activities Terminal Jul 19 12:43
einfochips@AHMLPT2581: ~/day9_task
einfochips@AHMLPT2581: ~/day9_task$ ls
backend-deployment.yaml  Dockerfile  hpa.yaml  ingress-resource.yaml  load-generator.yaml  sticky-ingress.yaml  tls.key
deployment.yaml          frontend-deployment.yaml  index.html  ingress-rewriting.yaml  service.yaml  tls.crt
einfochips@AHMLPT2581: ~/day9_task$ kubectl delete -f .
deployment.apps "backend" deleted
service "backend-service" deleted
deployment.apps "day9-image-deployment" deleted
deployment.apps "frontend" deleted
service "frontend-service" deleted
horizontalpodautoscaler.autoscaling "day9-image-hpa" deleted
ingress.networking.k8s.io "example-ingress" deleted
ingress.networking.k8s.io "rewrite-ingress" deleted
pod "load-generator" deleted
service "day9-image-service" deleted
ingress.networking.k8s.io "sticky-ingress" deleted
einfochips@AHMLPT2581: ~/day9_task$ nano ingress-resource.yaml
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f deployment.yaml
deployment.apps/day9-image-deployment created
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f service.yaml
service/day9-image-service created
einfochips@AHMLPT2581: ~/day9_task$ nano frontend-deployment.yaml
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f frontend-deployment.yaml
deployment.apps/frontend created
service/frontend-service created
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f backend-deployment.yaml
deployment.apps/backend created
service/backend-service created
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/example-ingress created
einfochips@AHMLPT2581: ~/day9_task$ curl http://myapp.local/frontend
<!DOCTYPE html>
<html>
<head>
<title>Day 9</title>
</head>
<body>
<h1>Hello There</h1>
<p>Day 9 Task</p>
</body>
</html>
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/example-ingress created
einfochips@AHMLPT2581: ~/day9_task$ curl http://myapp.local/frontend
<!DOCTYPE html>
<html>
<head>
<title>Day 9</title>
</head>
<body>
<h1>Hello There</h1>
<p>Day 9 Task</p>
</body>
</html>
einfochips@AHMLPT2581: ~/day9_task$ curl http://myapp.local/backend
Hello from backend
einfochips@AHMLPT2581: ~/day9_task$ kubectl get secret
NAME      TYPE      DATA  AGE
tls-secret  kubernetes.io/tls  2      13h
```

```
einfochips@AHMLPT2581: ~/day9_task$ kubectl apply -f ingress-resource.yaml
ingress.networking.k8s.io/example-ingress created
einfochips@AHMLPT2581: ~/day9_task$ curl http://myapp.local/frontend
<!DOCTYPE html>
<html>
<head>
<title>Day 9</title>
</head>
<body>
<h1>Hello There</h1>
<p>Day 9 Task</p>
</body>
</html>
einfochips@AHMLPT2581: ~/day9_task$ curl http://myapp.local/backend
Hello from backend
einfochips@AHMLPT2581: ~/day9_task$ kubectl get secret
NAME      TYPE      DATA  AGE
tls-secret  kubernetes.io/tls  2      13h
```





Stress Testing:

- Perform stress testing to simulate traffic and validate the HPA configuration.
- Monitor the scaling behavior and ensure the application scales up and down based on the load.

```
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/day9-image-deployment  cpu: <unknown>/2%  1         10        1          100m
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/day9-image-deployment  cpu: <unknown>/2%  1         10        1          101m
```

```
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/day9-image-deployment  cpu: 0%/2%       1         10        1          147m
einfochips@AHMLPT2581:~/day9_task$
```

```
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/day9-image-hpa  Deployment/frontend  cpu: <unknown>/2%  1         10        2          3h34m
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/frontend  cpu: <unknown>/2%  1         10        2          3h34m
einfochips@AHMLPT2581:~/day9_task$
```

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einfochips@AHMLPT2581: ~/day9_task

```
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/day9-image  cpu: 95%/50%    2         10        4          22m
einfochips@AHMLPT2581:~/day9_task$ kubectl get hpa
NAME                REFERENCE                TARGETS          MINPODS   MAXPODS   REPLICAS   AGE
day9-image-hpa      Deployment/day9-image  cpu: 95%/50%    2         10        4          22m
einfochips@AHMLPT2581:~/day9_task$
```