National University of Sciences and Technology (NUST)
School of Electrical Engineering and Computer Science

Department of Computing

SE-315: Cloud Computing

Lab 10: App Dev: Deploying the Application into Kubernetes Engine - Python

CLO4: Display skills to effectively use cloud centric solutions such as serverless application development.

Date: 27.11.24

Lab 10: App Dev: Deploying the Application into Kubernetes Engine - Python

Introduction:

Google Kubernetes Engine provides a managed environment for deploying, managing, and scaling your containerized applications using Google infrastructure. The environment Kubernetes Engine provides consists of multiple machines (specifically, Compute Engine instances) grouped together to form a cluster.

Kubernetes provides the mechanisms through which you interact with your cluster. You use Kubernetes commands and resources to deploy and manage your applications, perform administration tasks and set policies, and monitor the health of your deployed workloads.

In this lab, you deploy the Quiz application into Kubernetes Engine, leveraging Google Cloud resources, including Container Builder and Container Registry, and Kubernetes resources, such as Deployments, Pods, and Services.

Lab Tasks

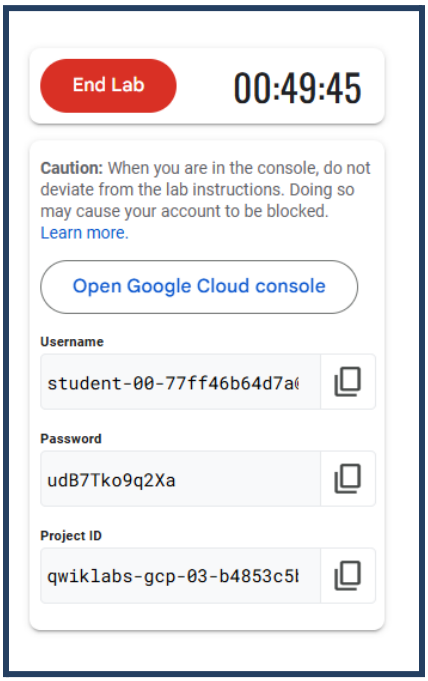
Go through the following link:

https://www.cloudskillsboost.google/focuses/1073?parent=catalog

which will take you to the 'App Dev: Deploying the Application into Kubernetes Engine – Python' page. The list of tasks is given below. Make sure to take screenshots of each task as you will need to add them in the solution section given below.

1. Setup and requirements

creating a qwiklabs account:



Activating cloud shell:

`gcloud auth list`

```
student_00_77ff46b64d7a@cloudshell:~ (qwiklabs-gcp-03-b4853c5b98d7)$ gcloud auth list
Credentialed Accounts

ACTIVE: *
ACCOUNT: student-00-77ff46b64d7a@qwiklabs.net

To set the active account, run:
    $ gcloud config set account `ACCOUNT`
```

`gcloud config list project`

```
student_00_77ff46b64d7a@cloudshell:~ (qwiklabs-gcp-03-b4853c5b98d7)$ gcloud config list project
[core]
project = qwiklabs-gcp-03-b4853c5b98d7

Your active configuration is: [cloudshell-13874]
```

2. Prepare the Quiz application.

Clone source code in Cloud Shell

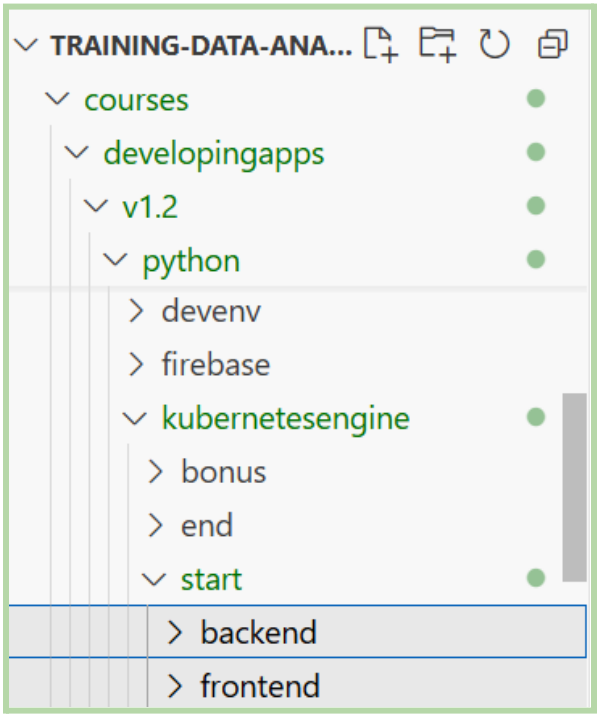
```
student_00_77ff46b64d7a@cloudshell:~ (qwiklabs-gcp-03-b4853c5b98d7)$ git clone https://github.com/GoogleCloudPlatform/training-data-analyst
Cloning into 'training-data-analyst'...
remote: Enumerating objects: 65494, done.
remote: Counting objects: 100% (61/61), done.
remote: Compressing objects: 100% (50/50), done.
Receiving objects:  48% (31438/65494), 544.25 MiB | 20.68 MiB/s
```

Configure the Quiz application

```
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ . prepare_environment.sh
Creating quiz-account Service Account
Created service account [quiz-account].
created key [57e48db1c04e26e48a1ad4307e1f34576a1337fc] of type [json] as [key.json] for [quiz-account@qwiklabs-gcp-03-b4853c5b98d7.iam.gse
Setting quiz-account IAM Role
Updated IAM policy for project [qwiklabs-gcp-03-b4853c5b98d7].
bindings:
- members:
  - serviceAccount:qwiklabs-gcp-03-b4853c5b98d7@qwiklabs-gcp-03-b4853c5b98d7.iam.gserviceaccount.com
  role: roles/bigquery.admin
- members:
```

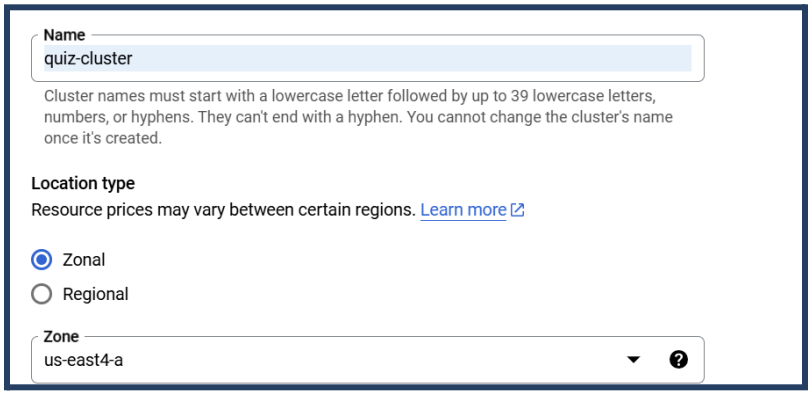
3. Review the code.

Examining the code at;
training-data-analyst/courses/developingapps/v1.2/python/kubernetesengine/start

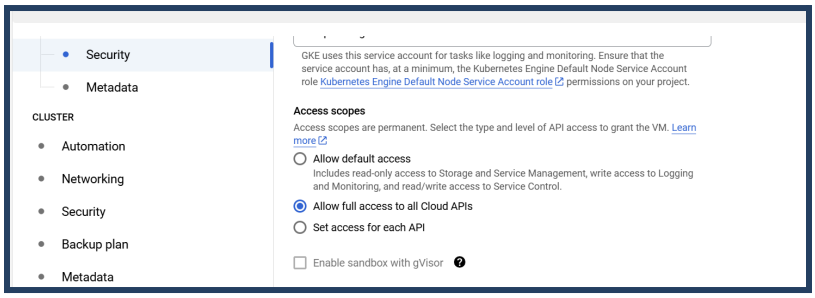


4. Create and connect to a Kubernetes Engine Cluster

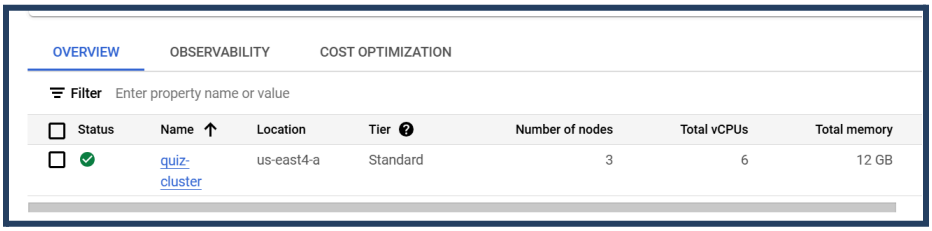
Create a Kubernetes Engine cluster



Granting full access through default Pool > Security > Access scopes



Created cluster:



Connect to the cluster:

```
Project ID: qwiklabs-gcp-03-b4853c5b98d7
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ gcloud container clusters get-credentials quiz-cluster --zone us-e
ast4-a --project qwiklabs-gcp-03-b4853c5b98d7
Fetching cluster endpoint and auth data.
kubeconfig entry generated for quiz-cluster.
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ kubectl get pods
No resources found in default namespace.
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$
```

5. Build Docker images using Container Builder

frontend docker file:

Dockerfile M ×

courses > developingapps > v1.2 > python > kubernetesengine > start > frontend > Dockerfile

```
5   ENV VIRTUAL_ENV /env
6   ENV PATH /env/bin:$PATH
7
8   ADD requirements.txt /app/requirements.txt
9   RUN pip install -r /app/requirements.txt
10
11  ADD . /app
12
13  CMD gunicorn -b 0.0.0.0:$PORT quiz:app
14
```

backend dockerfile:

Dockerfile M ×

courses > developingapps > v1.2 > python > kubernetesengine > start > backend > Dockerfile

```
5   ENV VIRTUAL_ENV /env
6   ENV PATH /env/bin:$PATH
7
8   ADD requirements.txt /app/requirements.txt
9   RUN pip install -r /app/requirements.txt
10
11  ADD . /app
12
13  CMD python -m quiz.console.worker
```

building the Docker images:

frontend:

```
gcloud builds submit -t gcr.io/$DEVSHELL_PROJECT_ID/quiz-frontend ./frontend/
```

```
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ gcloud builds submit -t gcr.io/$DEVSHELL_PROJECT_ID/quiz-frontend ./
frontend/
Creating temporary archive of 29 file(s) totalling 40.1 KiB before compression.
Uploading tarball of [./frontend/] to [gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697565.280599-5e8725eb4da54e789d3bb93db45d887f.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/qwiklabs-gcp-03-b4853c5b98d7/locations/global/builds/619aab97-1e9d-47f9-8f57-11edcfc0bded].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/619aab97-1e9d-47f9-8f57-11edcfc0bded?project=756262782430 ].
Waiting for build to complete. Polling interval: 1 second(s).
------------------------------------------------------------------------ REMOTE BUILD OUTPUT ------------------------------------------------------------------------
starting build "619aab97-1e9d-47f9-8f57-11edcfc0bded"

FETCHSOURCE
Fetching storage object: gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697565.280599-5e8725eb4da54e789d3bb93db45d887f.tgz#1732697566912840
Copying gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697565.280599-5e8725eb4da54e789d3bb93db45d887f.tgz#1732697566912840...
/ [1 files][  8.8 KiB/  8.8 KiB]
Operation completed over 1 objects/8.8 KiB.
BUILD
Already have image (with digest): gcr.io/cloud-builders/docker
Sending build context to Docker daemon  69.12kB
```

backend:

```
gcloud builds submit -t gcr.io/$DEVSHELL_PROJECT_ID/quiz-backend ./backend/
```

```
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ gcloud builds submit -t gcr.io/$DEVSHELL_PROJECT_ID/quiz-backend ./b
ackend/
Creating temporary archive of 9 file(s) totalling 8.4 KiB before compression.
Uploading tarball of [./backend/] to [gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697639.030633-f399ba10694240cca295a9725ef53a1c.tgz]
Created [https://cloudbuild.googleapis.com/v1/projects/qwiklabs-gcp-03-b4853c5b98d7/locations/global/builds/f7ebcd51-df29-4f5b-993d-e4cab562667e].
Logs are available at [ https://console.cloud.google.com/cloud-build/builds/f7ebcd51-df29-4f5b-993d-e4cab562667e?project=756262782430 ].
Waiting for build to complete. Polling interval: 1 second(s).
------------------------------------------------------------------------ REMOTE BUILD OUTPUT ------------------------------------------------------------------------
starting build "f7ebcd51-df29-4f5b-993d-e4cab562667e"

FETCHSOURCE
Fetching storage object: gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697639.030633-f399ba10694240cca295a9725ef53a1c.tgz#1732697639861558
```

Message that the backend Docker image is ready:

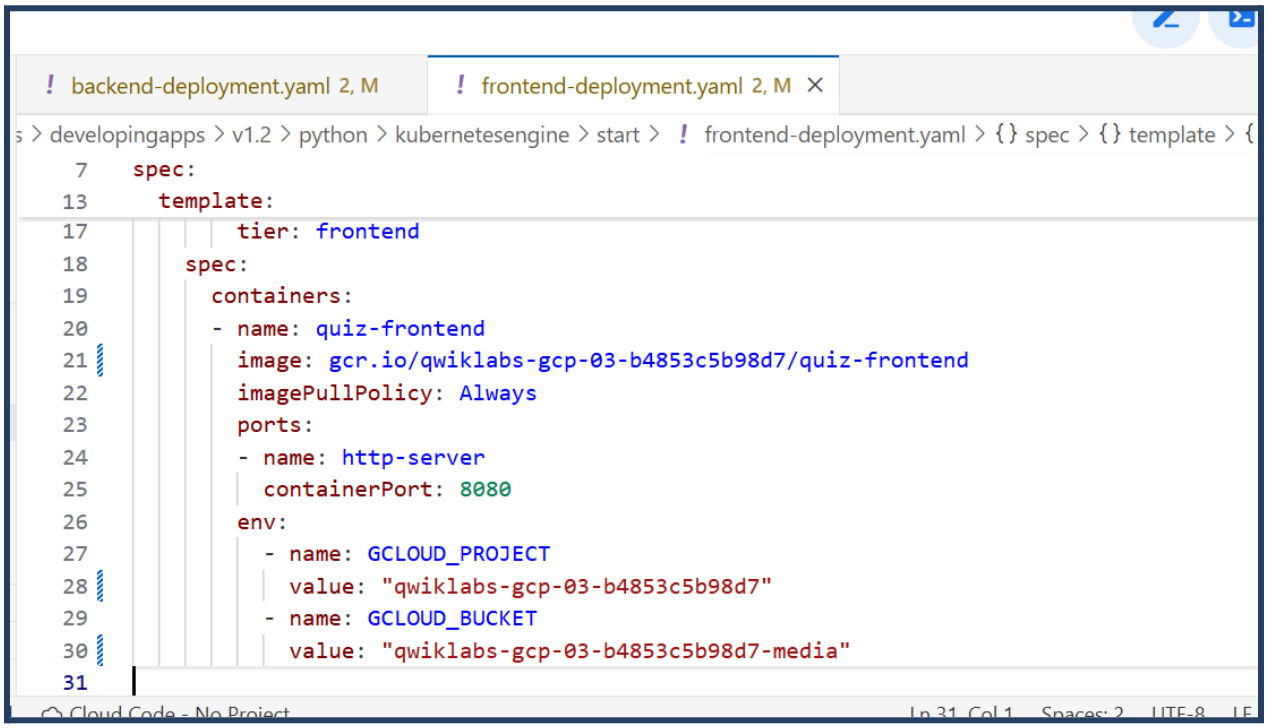
```
DONE
------------------------------------------------------------------------------------------
ID: f7ebcd51-df29-4f5b-993d-e4cab562667e
CREATE_TIME: 2024-11-27T08:54:00+00:00
DURATION: 39S
SOURCE: gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697639.030633-f399
IMAGES: gcr.io/qwiklabs-gcp-03-b4853c5b98d7/quiz-backend (+1 more)
STATUS: SUCCESS
```

6. Create Kubernetes deployment and service resources.

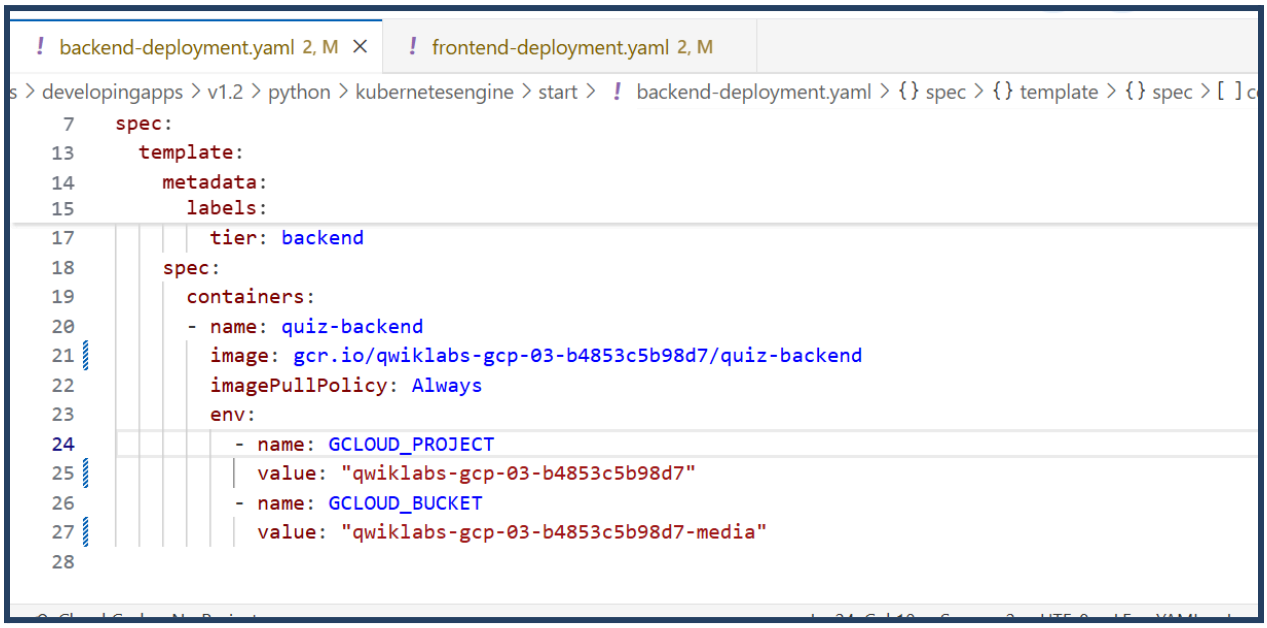
finding Gcloud projectID, Bucket and image name

```
CREATE_TIME: 2024-11-27T08:54:00+00:00
DURATION: 39S
SOURCE: gs://qwiklabs-gcp-03-b4853c5b98d7_cloudbuild/source/1732697639.030633-f399ba10694240cca295a9725ef53a1c.tgz
IMAGES: gcr.io/qwiklabs-gcp-03-b4853c5b98d7/quiz-backend (+1 more)
STATUS: SUCCESS
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ echo $GCLOUD_PROJECT
qwiklabs-gcp-03-b4853c5b98d7
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ ^C
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ echo $GCLOUD_BUCKET
qwiklabs-gcp-03-b4853c5b98d7-media
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$ ^C
student_00_77ff46b64d7a@cloudshell:~/kubernetesengine/start (qwiklabs-gcp-03-b4853c5b98d7)$
```

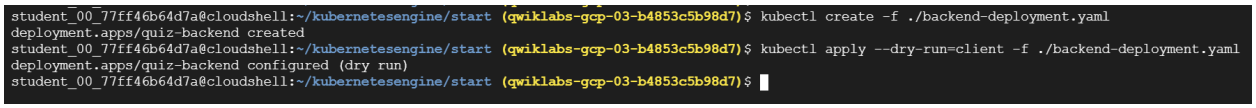
Replace the placeholders in the **frontend-deployment.yaml:**

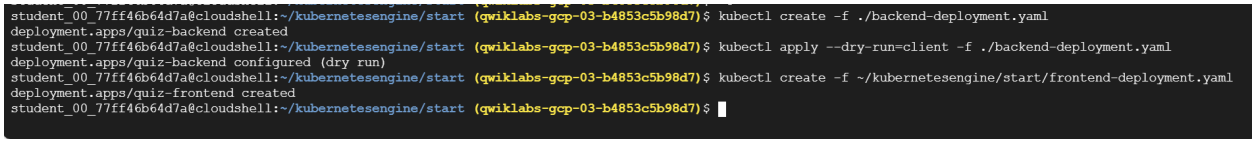


Replace the placeholders in the **backend-deployment.yaml:**



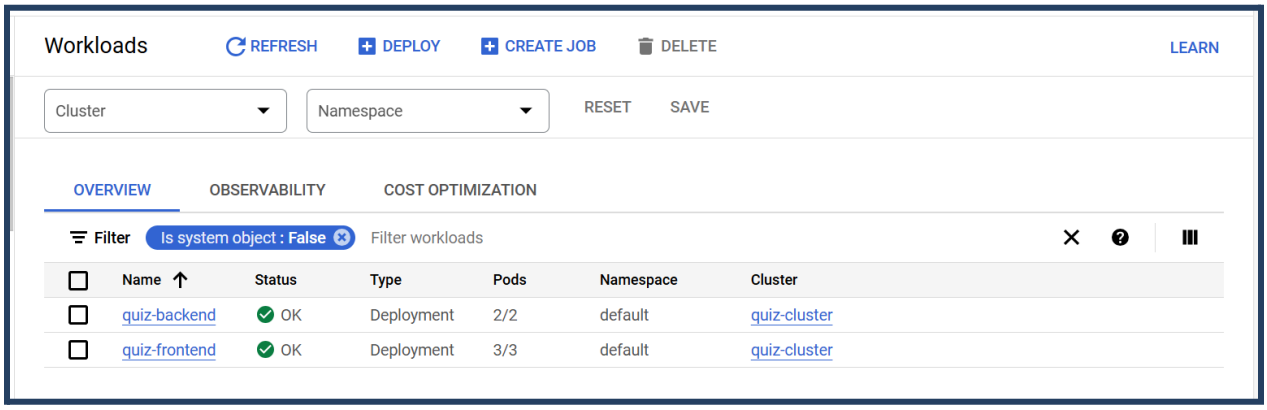
Execute the deployment and service Files:





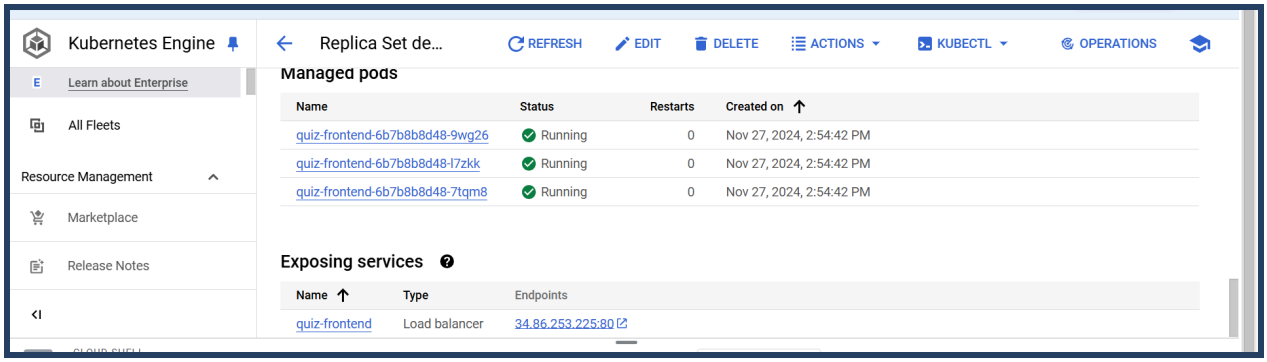
7. Test the Quiz Application

Review the deployed resources:

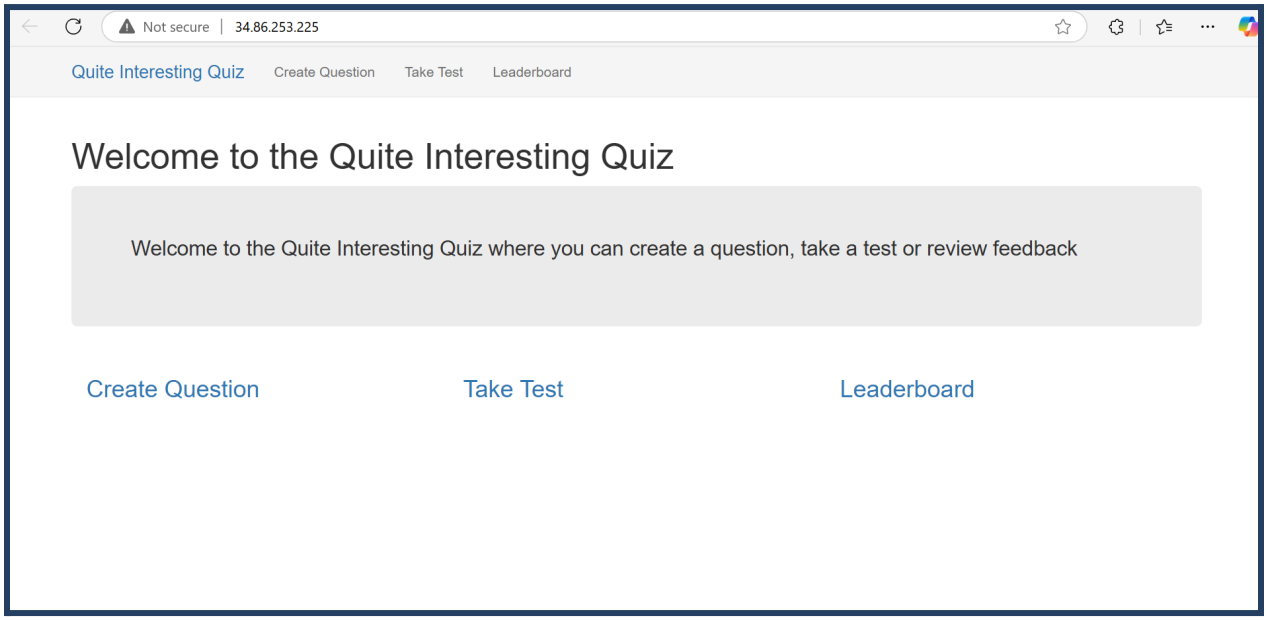
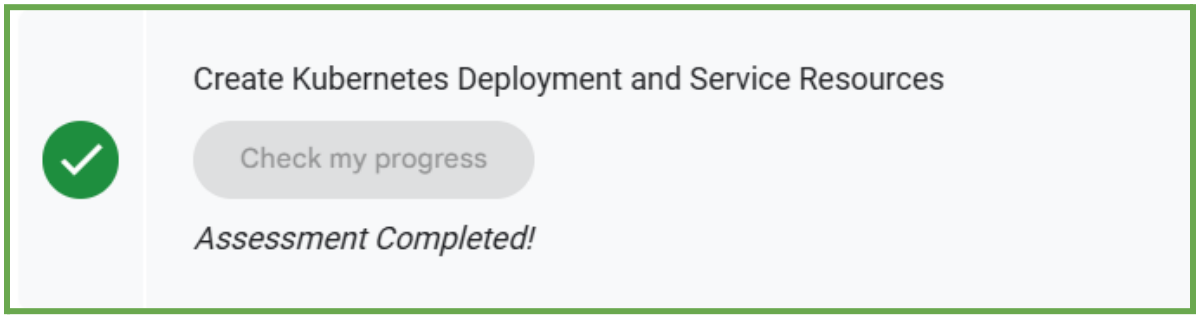


Managed pods within quiz-frontend:

the Endpoints IP Address for the quiz application is **34.86.253.225:80**



Opening in browser:



Lab Completion: