PES University

Cloud Computing

Subject Code: UE21CS351

Problem Statement-5

Back Up service using docker and Kubernetes

Deliverables Document

<===Team Details===>

Anirudh Sai Lanka (PES2UG21CS073)

Armaan Mittal (PES2UG21CS092)

Atif Shaik (PES2UG21C105)

B Karthik (PES2UG21CS111)

TAs: Phanindra and Nytik

=> Week-1: Containerized Google Drive client

- **Basic Startup and Setup Google Drive AI:**

```
C:\Users\l1972\OneDrive\Desktop\cc_project1>minikube start
W0423 14:38:45.790018   26896 main.go:291] Unable to resolve the current Docker CLI con
text "default": context "default": context not found: open C:\Users\l1972\.docker\conte
xts\meta\37a8eec1ce19687d132fe29051dca629d164e2c4958ba141d5f4133a33f0688f\meta.json: Th
e system cannot find the path specified.
* minikube v1.32.0 on Microsoft Windows 11 Home Single Language 10.0.22631.3447 Build 2
2631.3447
* minikube 1.33.0 is available! Download it: https://github.com/kubernetes/minikube/rel
eases/tag/v1.33.0
* To disable this notice, run: 'minikube config set WantUpdateNotification false'

* Using the docker driver based on existing profile
* Starting control plane node minikube in cluster minikube
* Pulling base image ...
* Restarting existing docker container for "minikube" ...
* Preparing Kubernetes v1.28.3 on Docker 24.0.7 ...
* Configuring bridge CNI (Container Networking Interface) ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by
default
```

backup_script.py {} credentials.json ×

Week-1 > {} credentials.json > ...

```
{
    "installed": {
        "client_id": "897308618510-qml199e22kvomvij45e33773a5n0r5cv.apps.googleusercontent.com",
        "project_id": "animated-canyon-420317",
        "auth_uri": "https://accounts.google.com/o/oauth2/auth",
        "token_uri": "https://oauth2.googleapis.com/token",
        "auth_provider_x509_cert_url": "https://www.googleapis.com/oauth2/v1/certs",
        "client_secret": "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",
        "redirect_uris": ["http://localhost"]
    }
}
```

- **Create A Docker Container:**

backup_script.py | Dockerfile

Week-1 > Dockerfile

```
1   # Use a base image
2   FROM python:3.9
3
4   # Set the working directory in the container
5   WORKDIR /app
6
7   # Copy the Python script and dependencies
8   COPY backup_script.py /app/
9   COPY requirements.txt /app/
10
11  # Install dependencies
12  RUN pip install --no-cache-dir -r requirements.txt
13
14  # Run the Python script when the container starts
15  CMD ["python", "./backup_script.py"]
16
```

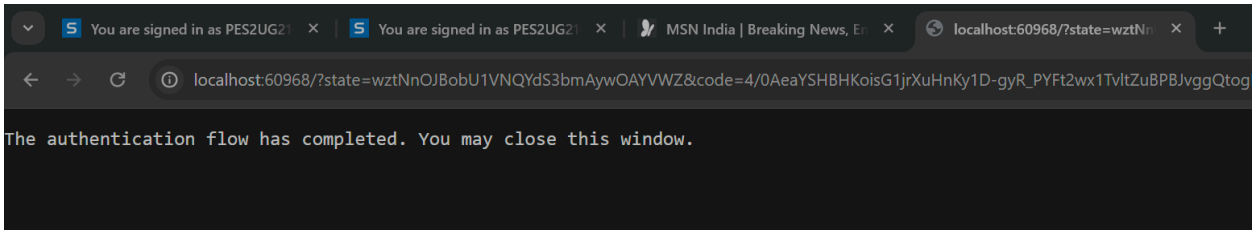
```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-1>docker build -t my-backup-service .
[+] Building 21.4s (11/11) FINISHED                                    docker:default
 => [internal] load build definition from Dockerfile                           0.0s
 => => transferring dockerfile: 410B                                           0.0s
 => [internal] load metadata for docker.io/library/python:3.9                  2.7s
 => [auth] library/python:pull token for registry-1.docker.io                  0.0s
 => [internal] load .dockerignore                                              0.0s
 => => transferring context: 2B                                                0.0s
 => [1/5] FROM docker.io/library/python:3.9@sha256:4e98ebe9359684d858cf40c98b77d  0.0s
 => [internal] load build context                                              0.1s
 => => transferring context: 2.00kB                                            0.0s
 => CACHED [2/5] WORKDIR /app                                                  0.0s
 => [3/5] COPY backup_script.py /app/                                          0.0s
 => [4/5] COPY requirements.txt /app/                                          0.0s
 => [5/5] RUN pip install --no-cache-dir -r requirements.txt                  17.4s
 => exporting to image                                                         0.9s
 => => exporting layers                                                        0.9s
 => => writing image sha256:b1583a691576534718a735c0802a0cf1ac66c6760c747ed39944  0.0s
 => => naming to docker.io/library/my-backup-service                           0.0s

View build details: docker-desktop://dashboard/build/default/default/okjd92xhtkuoss375d
mk9aa0m

What's Next?
  View a summary of image vulnerabilities and recommendations → docker scout quickview
```

- **Write the Backup Script:**

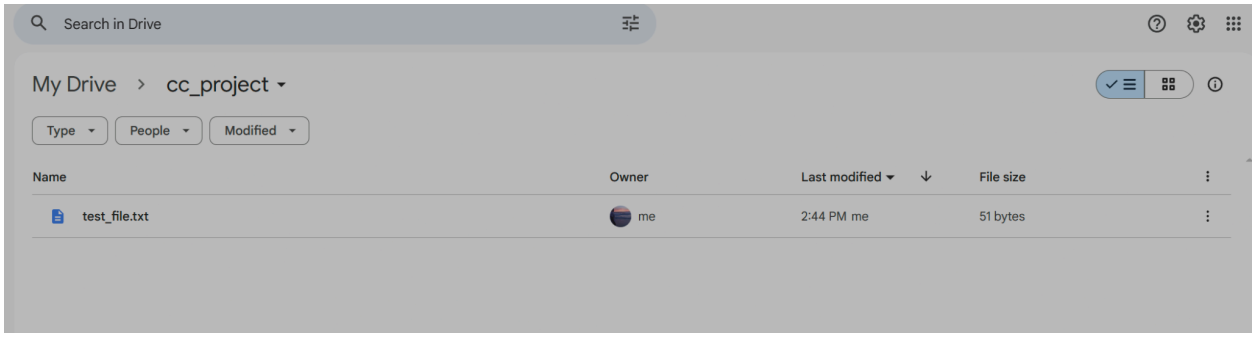
backup_script.py

Week-1 > backup_script.py > ...

```python
from google.oauth2.credentials import Credentials
from google.auth.transport.requests import Request
from google_auth_oauthlib.flow import InstalledAppFlow
from googleapiclient.discovery import build
from googleapiclient.http import MediaFileUpload
import os

import logging
from google.oauth2 import service_account
from googleapiclient.discovery import build

# Define scope
SCOPES = ['https://www.googleapis.com/auth/drive']

def authenticate():
    creds = None
    # Load credentials from credentials.json file
    if os.path.exists('credentials.json'):
        flow = InstalledAppFlow.from_client_secrets_file(
            'credentials.json', SCOPES)
        creds = flow.run_local_server(port=0)
    else:
        print("Error: 'credentials.json' file not found.")
    return creds

def upload_file_to_drive(file_path, drive_folder_id):
    # Authenticate and create a Drive service
    creds = authenticate()
    if creds:
        service = build('drive', 'v3', credentials=creds)

        # Set the file metadata
        file_metadata = {
            'name': os.path.basename(file_path),
            'parents': [drive_folder_id]  # ID of the folder where you want to upload the file
        }

        # Upload the file
        media = MediaFileUpload(file_path, resumable=True)
        try:
            file = service.files().create(body=file_metadata, media_body=media, fields='id').execute()
            print('File uploaded successfully. File ID: %s' % file.get('id'))
        except Exception as e:
            print(f"An error occurred: {e}")

if __name__ == "__main__":
    # Example usage
    file_path = 'C:\\Users\\11972\\OneDrive\\Desktop\\cc_project1\\Week-1\\test_file.txt'
    drive_folder_id = '1eGAf7GuXJbSLdj4mvhXB7a5XBsrB5nw3'
    upload_file_to_drive(file_path, drive_folder_id)
```




```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-1>python backup_script.py
Please visit this URL to authorize this application: https://accounts.google.com/o/oaut
h2/auth?response_type=code&client_id=897308618510-qmll99e22kvomvij45e33773a5n0r5cv.apps
.googleusercontent.com&redirect_uri=http%3A%2F%2Flocalhost%3A60968%2F&scope=https%3A%2F
%2Fwww.googleapis.com%2Fauth%2Fdrive&state=wztNnOJBobU1VNQYdS3bmAywOAYVWZ&access_type=o
ffline
File uploaded successfully. File ID: 1ypkzJB5287tgAPJyfCtVIFYLOK4IWc7q
```



=> Week-2: Kubernetes Deployment & Orchestration

- ## Kubernetes CronJob:

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl apply -f backup-cronjob1.yaml
cronjob.batch/my-backup-cronjob created

C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl get cronjob backup-cronjob
NAME             SCHEDULE       SUSPEND   ACTIVE   LAST SCHEDULE   AGE
backup-cronjob   0 */12 * * *   False     5        5h41m           9d
```

backup-cronjob.yaml

Week-2 > backup-cronjob.yaml > apiVersion

```yaml
apiVersion: batch/v1
kind: CronJob
metadata:
  name: backup-cronjob
spec:
  schedule: "0 0 * * *"  # Run every hour
  jobTemplate:
    spec:
      template:
        spec:
          containers:
          - name: backup-container
            image: backup-service:tag  # Set your image name and tag here
            command: ["python","backup_script.py"]
            env:
            - name: CLIENT_ID
              valueFrom:
                secretKeyRef:
                  name: api-credentials
                  key: CLIENT_ID
            - name: CLIENT_SECRET
              valueFrom:
                secretKeyRef:
                  name: api-credentials
                  key: CLIENT_SECRET
            - name: REFRESH_TOKEN
              valueFrom:
                secretKeyRef:
                  name: api-credentials
                  key: REFRESH_TOKEN
            volumeMounts:
            - name: data-volume
              mountPath: /data
          restartPolicy: OnFailure
          volumes:
          - name: data-volume
            persistentVolumeClaim:
              claimName: my-pvc
```

backup-cronjob1.yaml

Week-2 > backup-cronjob1.yaml > apiVersion

```yaml
apiVersion: batch/v1
kind: CronJob
metadata:
  name: my-backup-cronjob
spec:
  schedule: "*/5 * * * *"  # Run every hour
  jobTemplate:
    spec:
      template:
        spec:
          containers:
          - name: my-backup-container
            image: my-google-drive-backup:latest
          restartPolicy: OnFailure


```

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl get cronjob
NAME                SCHEDULE       SUSPEND   ACTIVE   LAST SCHEDULE   AGE
backup-cronjob      0 */12 * * *   False     5        5h44m           9d
my-backup-cronjob   */5 * * * *    False     0        <none>          3m15s
```

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl apply -f deployment.yaml
deployment.apps/backup-service configured

C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl apply -f service.yaml
service/cc-backup-image-service unchanged
```

- **Persistent Volume Claims (PVC):**

PVC.yaml

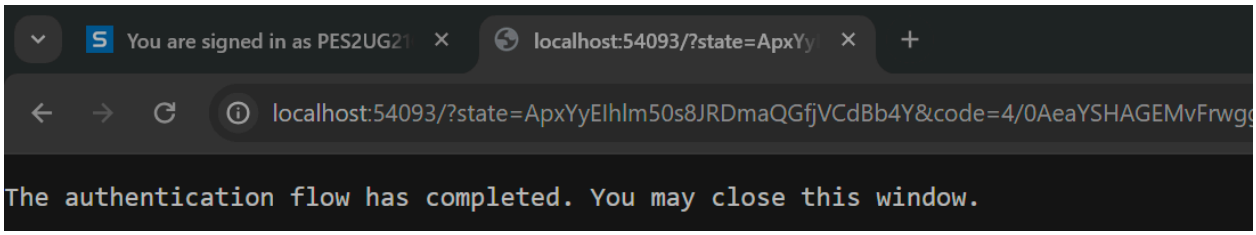
C: > Users > l1972 > OneDrive > Desktop > cc_project1 > Week-2 > PVC.yaml

```yaml
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: backup-data-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi
```

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-2>kubectl apply -f PVC.yaml
persistentvolumeclaim/backup-data-pvc unchanged
```

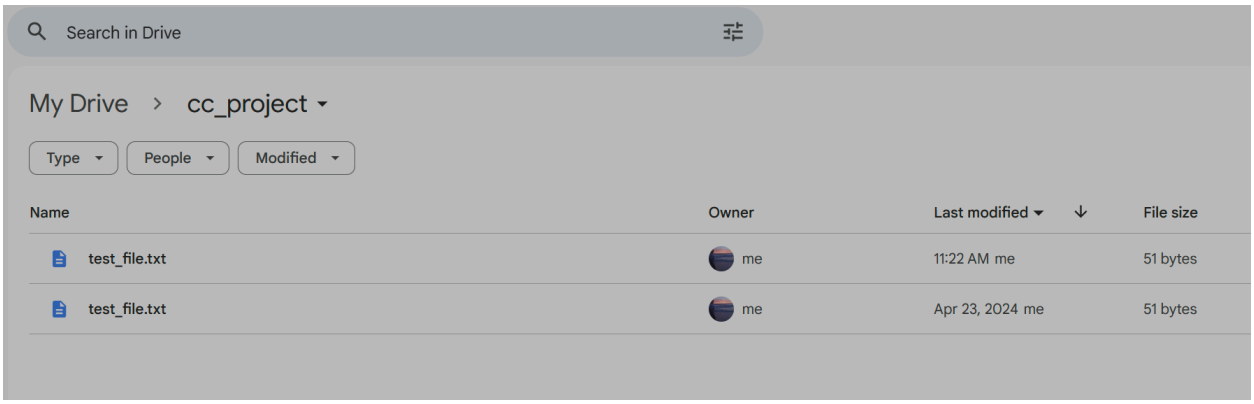
- **Monitoring And Logging:**

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-1>python backup_script.py
Please visit this URL to authorize this application: https://accounts.google.com/o/oauth2/auth?resp
onse_type=code&client_id=897308618510-qmll99e22kvomvij45e33773a5n0r5cv.apps.googleusercontent.com&r
edirect_uri=http%3A%2F%2Flocalhost%3A54093%2F&scope=https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fdrive
&state=ApxYyEIhlm50s8JRDmaQGfjVCdBb4Y&access_type=offline
File uploaded successfully. File ID: 1H4kWDYtPSIHdWuyDcf0DAfbN-NA6U72p
```

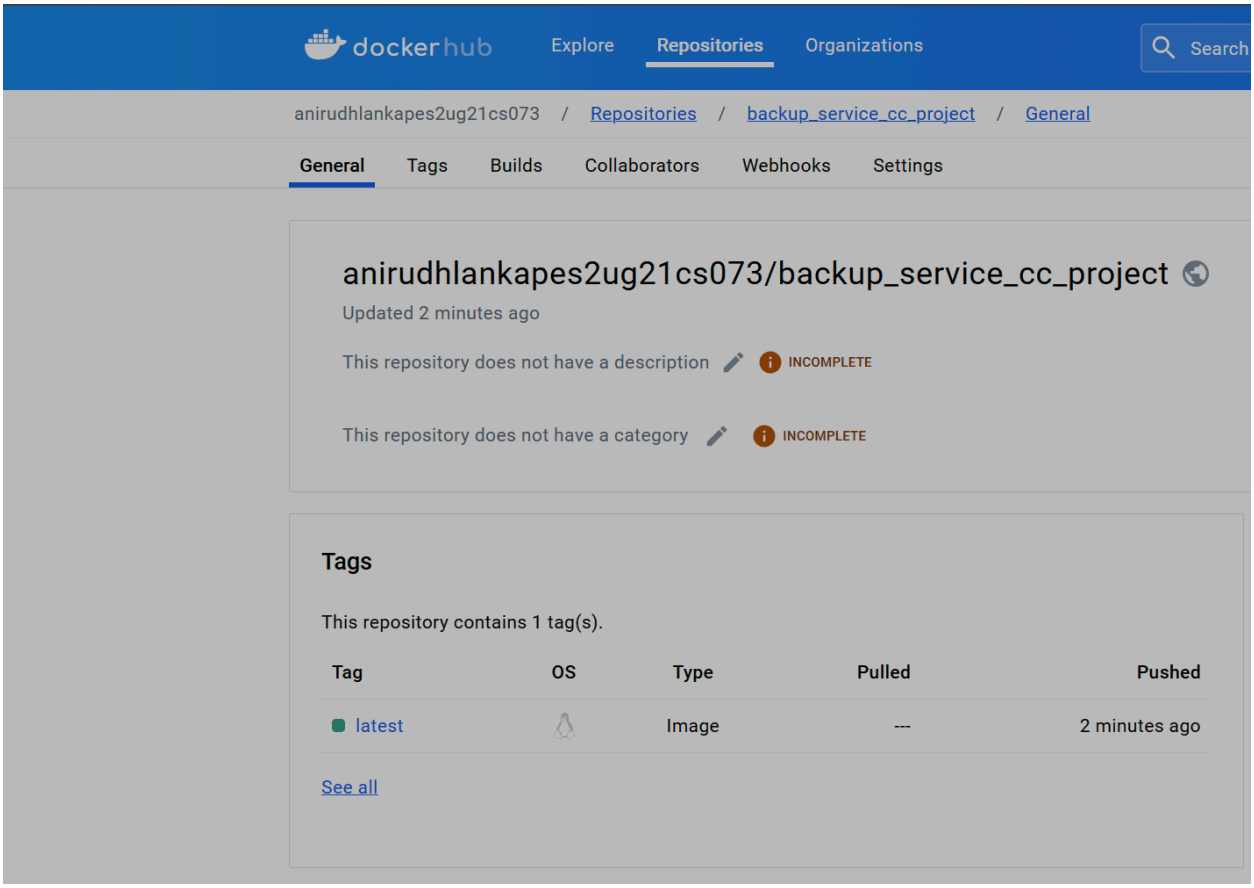


- **Security Considerations (Testing and Validation)**

```
C:\Users\l1972\OneDrive\Desktop\cc_project1\Week-1>kubectl create secret generic api-credentials --
from-literal=CLIENT_ID="897308618510-qmll99e22kvomvij45e33773a5n0r5cv.apps.googleusercontent.com" --from-literal=CLIENT_SECRET="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" --from-literal
=REFRESH_TOKEN="<re
fresh_token>"
secret/api-credentials created
```




```
C:\Users\l1972\OneDrive\Desktop\cc_project1>docker tag my-backup-service:latest anirudhlankapes2ug2
1cs073/backup_service_cc_project:latest

C:\Users\l1972\OneDrive\Desktop\cc_project1>docker push anirudhlankapes2ug21cs073/backup_service_cc
_project:latest
The push refers to repository [docker.io/anirudhlankapes2ug21cs073/backup_service_cc_project]
12371ba0c605: Pushed
29d89e416969: Pushed
baf937b159b4: Pushed
4b9c860b6a2b: Mounted from anirudhlankapes2ug21cs073/ccproject
78ecb2a2f011: Mounted from anirudhlankapes2ug21cs073/ccproject
84062ebc4cf5: Mounted from anirudhlankapes2ug21cs073/ccproject
2180aea5f54b: Mounted from anirudhlankapes2ug21cs073/ccproject
86388e04a96b: Mounted from anirudhlankapes2ug21cs073/ccproject
893507f6057f: Mounted from anirudhlankapes2ug21cs073/ccproject
2353f7120e0e: Mounted from anirudhlankapes2ug21cs073/ccproject
51a9318e6edf: Mounted from anirudhlankapes2ug21cs073/ccproject
c5bb35826823: Mounted from anirudhlankapes2ug21cs073/ccproject
latest: digest: sha256:e51e78f9fe8d966449a24aba9e164cc59103259893c56b06ab7be92f19180f9f size: 2839
```


dockerhub
Explore
Repositories
Organizations
Search
anirudhlankapes2ug21cs073 / Repositories / backup_service_cc_project / General
General
Tags
Builds
Collaborators
Webhooks
Settings
anirudhlankapes2ug21cs073/backup_service_cc_project
Updated 2 minutes ago
This repository does not have a description
INCOMPLETE
This repository does not have a category
INCOMPLETE
Tags
This repository contains 1 tag(s).
Tag
OS
Type
Pulled
Pushed
latest
Image
---
2 minutes ago
See all