BackUp service using docker and Kubernetes

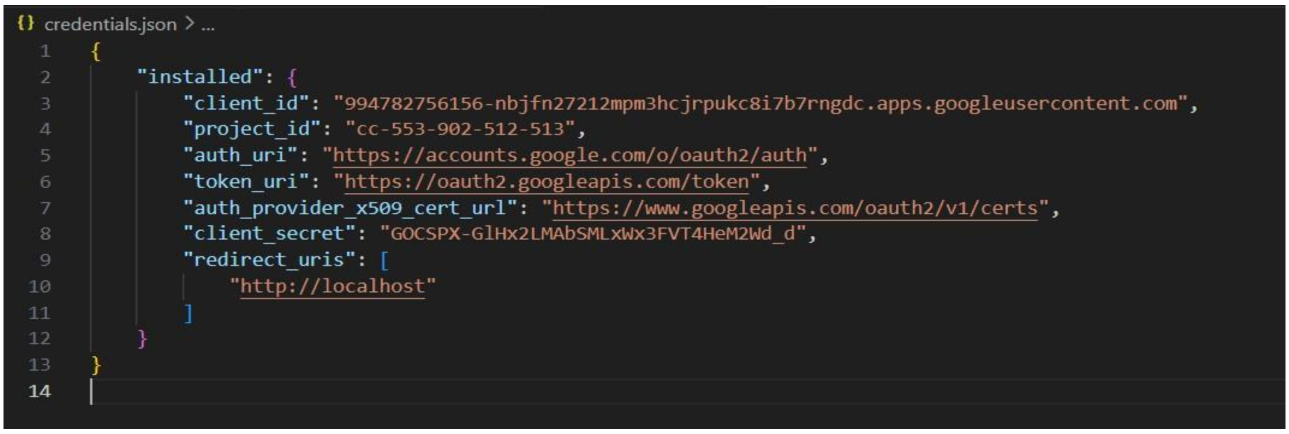
Deliverables:

❖ 1:ContainerizedGoogleDriveclient

Here's a high-level technical breakdown:

1. **SetupGoogleDriveAPI**:

- ObtaincredentialsfortheGoogleDriveAPI.
- GoogleDrive.

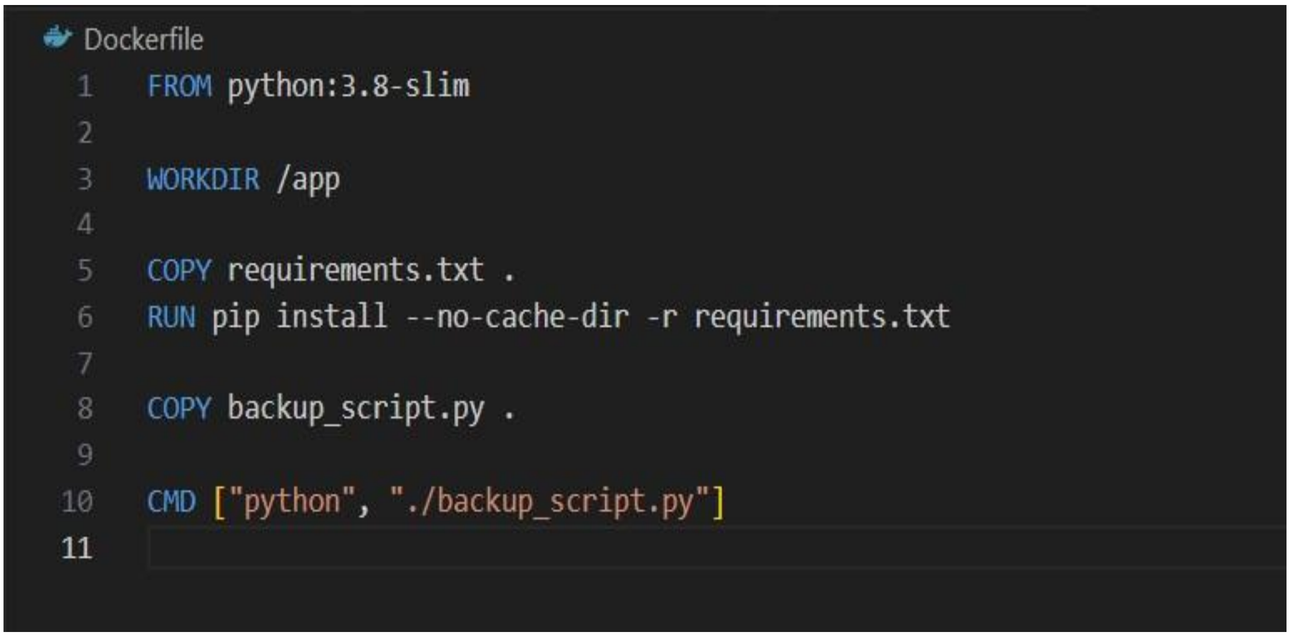


credentials.json > ...

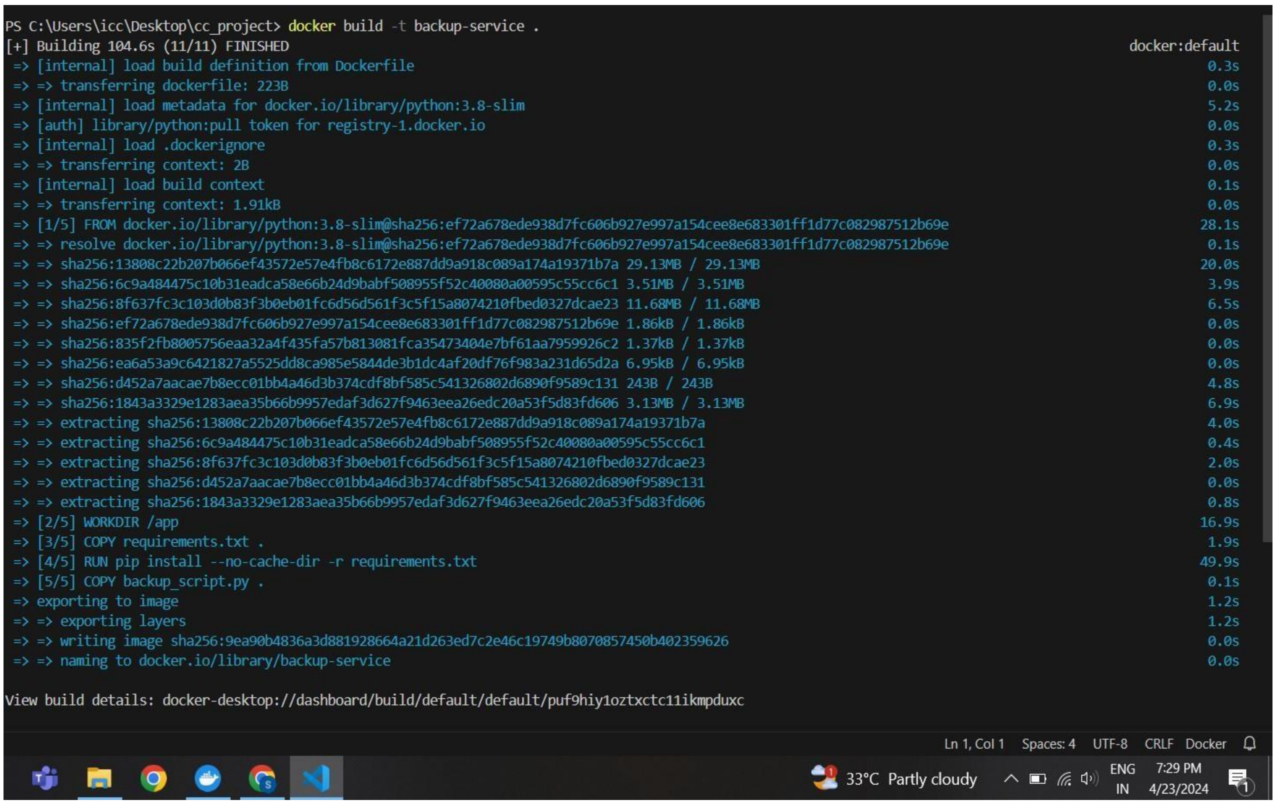
```
{
    "installed": {
        "client_id": "994782756156-nbjfn27212mpm3hcjrpukc8i7b7rngdc.apps.googleusercontent.com",
        "project_id": "cc-553-902-512-513",
        "auth_uri": "https://accounts.google.com/o/oauth2/auth",
        "token_uri": "https://oauth2.googleapis.com/token",
        "auth_provider_x509_cert_url": "https://www.googleapis.com/oauth2/v1/certs",
        "client_secret": "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",
        "redirect_uris": [
            "http://localhost"
        ]
    }
}
```

2. **CreateaDockerContainer**:

- Writea`Dockerfile`thatincludesallnecessarydependenciesandyour backup script.
- BuildtheDockerimage.



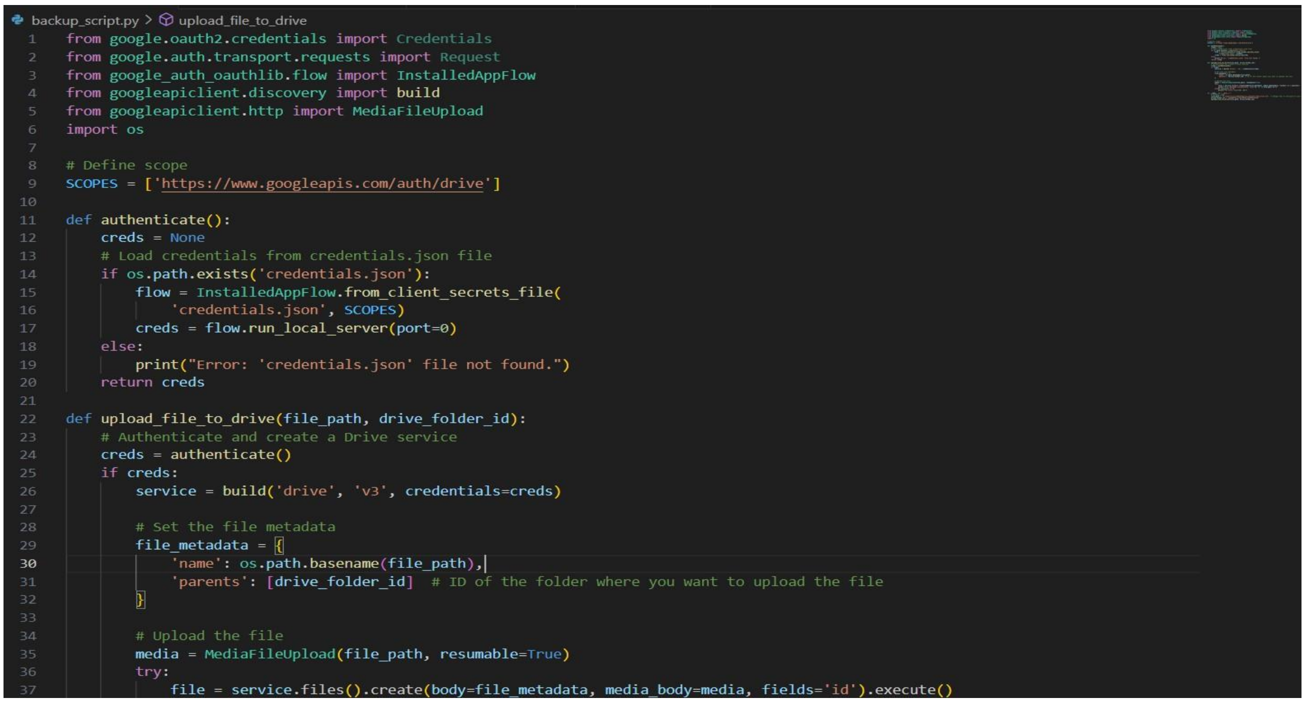
```dockerfile
FROM python:3.8-slim

WORKDIR /app

COPY requirements.txt .
RUN pip install --no-cache-dir -r requirements.txt

COPY backup_script.py .

CMD ["python", "./backup_script.py"]

```



```
PS C:\Users\icc\Desktop\cc_project> docker build -t backup-service .
[+] Building 104.6s (11/11) FINISHED                                                                                docker:default
 => [internal] load build definition from Dockerfile                                                                          0.3s
 => => transferring dockerfile: 223B                                                                                          0.0s
 => [internal] load metadata for docker.io/library/python:3.8-slim                                                            5.2s
 => [auth] library/python:pull token for registry-1.docker.io                                                                 0.0s
 => [internal] load .dockerignore                                                                                             0.3s
 => => transferring context: 2B                                                                                               0.0s
 => [internal] load build context                                                                                             0.1s
 => => transferring context: 1.91kB                                                                                           0.0s
 => [1/5] FROM docker.io/library/python:3.8-slim@sha256:ef72a678ede938d7fc606b927e997a154cee8e683301ff1d77c082987512b69e      28.1s
 => => resolve docker.io/library/python:3.8-slim@sha256:ef72a678ede938d7fc606b927e997a154cee8e683301ff1d77c082987512b69e      0.1s
 => => sha256:13808c22b207b066ef43572e57e4fb8c6172e887dd9a918c089a174a19371b7a 29.13MB / 29.13MB                             20.0s
 => => sha256:6c9a484475c10b31eadca58e66b24d9babf508955f52c40080a00595c55cc6c1 3.51MB / 3.51MB                                3.9s
 => => sha256:8f637fc3c103d0b83f3b0eb01fc6d56d561f3c5f15a8074210fbed0327dcae23 11.68MB / 11.68MB                              6.5s
 => => sha256:ef72a678ede938d7fc606b927e997a154cee8e683301ff1d77c082987512b69e 1.86kB / 1.86kB                                0.0s
 => => sha256:835f2fb8005756eaa32a4f435fa57b813081fca35473404e7bf61aa7959926c2 1.37kB / 1.37kB                                0.0s
 => => sha256:ea6a53a9c6421827a5525dd8ca985e5844de3b1dc4af20df76f983a231d65d2a 6.95kB / 6.95kB                                0.0s
 => => sha256:d452a7aacae7b8ecc01bb4a46d3b374cdf8bf585c541326802d6890f9589c131 243B / 243B                                    4.8s
 => => sha256:1843a3329e1283aea35b66b9957edaf3d627f9463eea26edc20a53f5d83fd606 3.13MB / 3.13MB                                6.9s
 => => extracting sha256:13808c22b207b066ef43572e57e4fb8c6172e887dd9a918c089a174a19371b7a                                     4.0s
 => => extracting sha256:6c9a484475c10b31eadca58e66b24d9babf508955f52c40080a00595c55cc6c1                                     0.4s
 => => extracting sha256:8f637fc3c103d0b83f3b0eb01fc6d56d561f3c5f15a8074210fbed0327dcae23                                     2.0s
 => => extracting sha256:d452a7aacae7b8ecc01bb4a46d3b374cdf8bf585c541326802d6890f9589c131                                     0.0s
 => => extracting sha256:1843a3329e1283aea35b66b9957edaf3d627f9463eea26edc20a53f5d83fd606                                     0.8s
 => [2/5] WORKDIR /app                                                                                                       16.9s
 => [3/5] COPY requirements.txt .                                                                                             1.9s
 => [4/5] RUN pip install --no-cache-dir -r requirements.txt                                                                 49.9s
 => [5/5] COPY backup_script.py .                                                                                             0.1s
 => exporting to image                                                                                                        1.2s
 => => exporting layers                                                                                                       1.2s
 => => writing image sha256:9ea90b4836a3d881928664a21d263ed7c2e46c19749b8070857450b402359626                                  0.0s
 => => naming to docker.io/library/backup-service                                                                             0.0s

View build details: docker-desktop://dashboard/build/default/default/puf9hiy1oztxctc11ikmpduxc
```

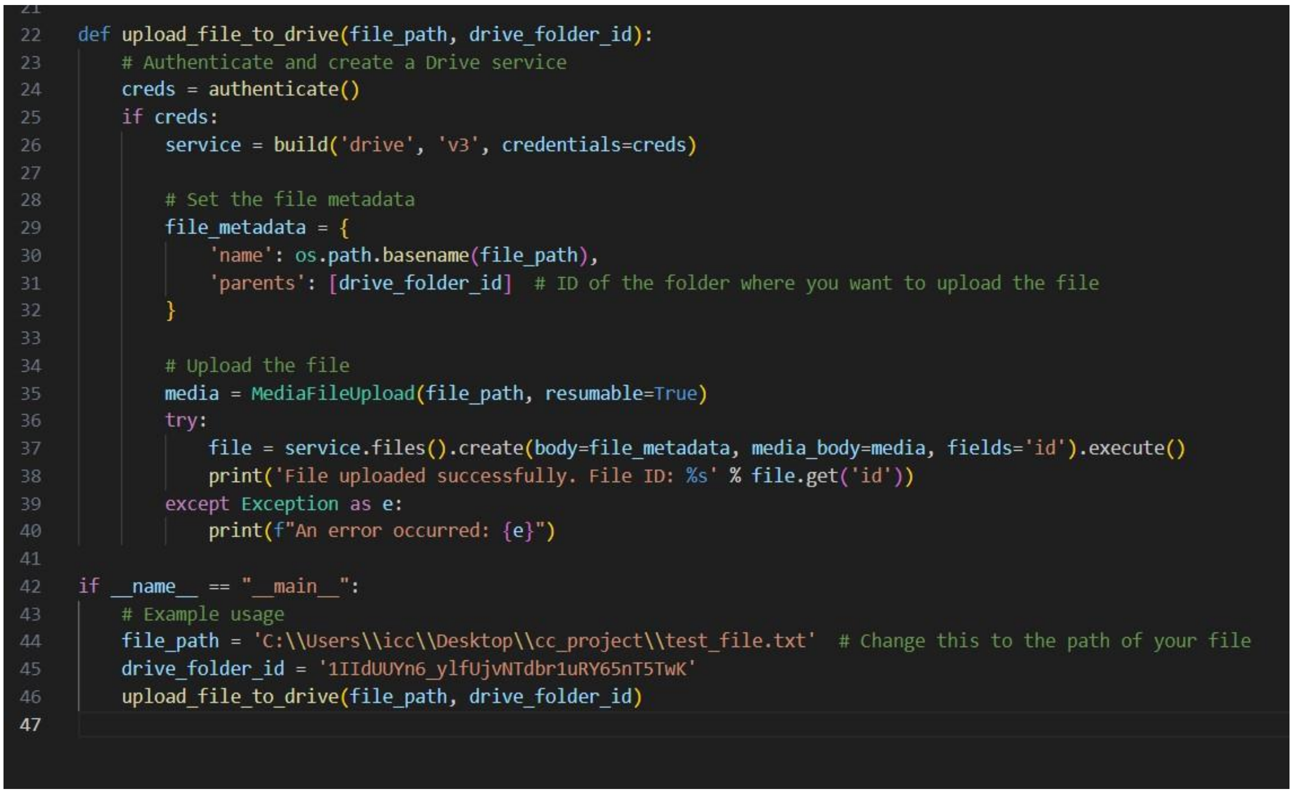
3. **WritetheBackupScript**:◦DevelopascriptinPythonthatusestheGoogle Drive API to upload files.

- Ensurethescriptcanbetriggeredatregularintervals.

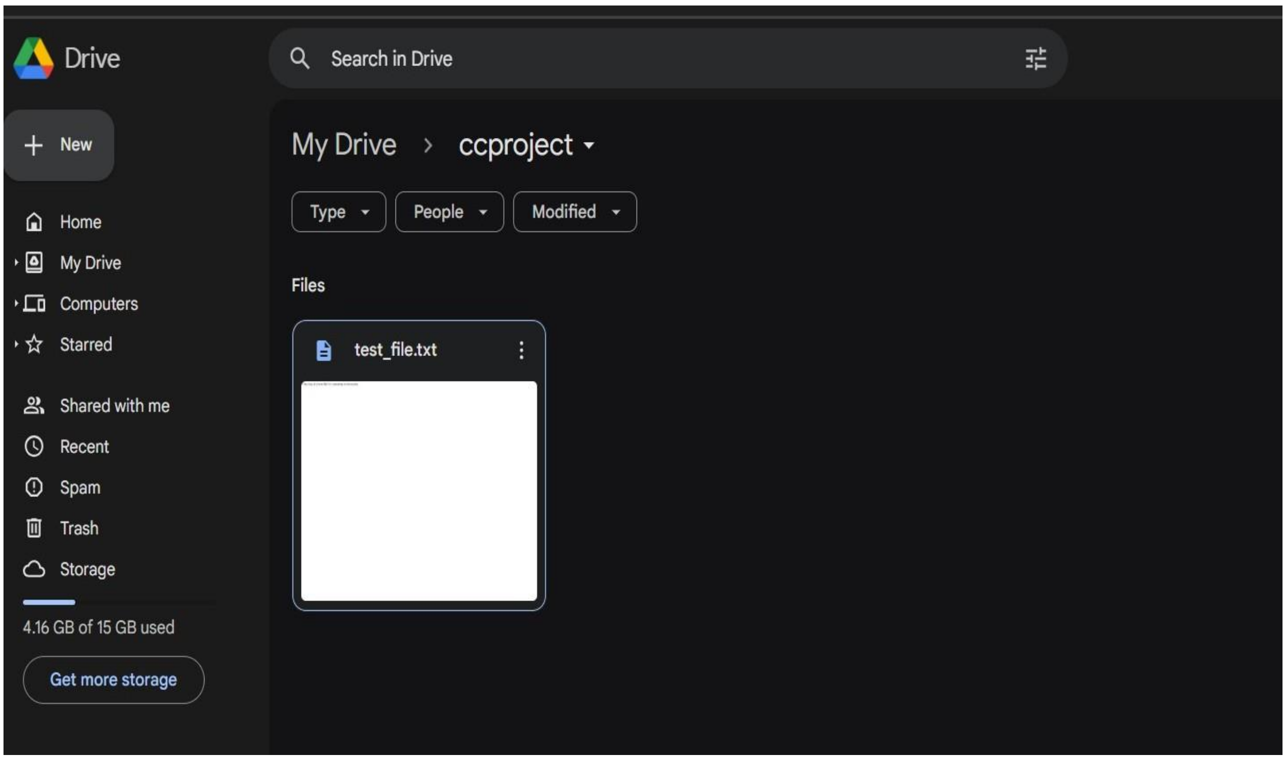


backup_script.py > upload_file_to_drive

```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

# 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()
```



```python
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\\icc\\Desktop\\cc_project\\test_file.txt'  # Change this to the path of your file
    drive_folder_id = '1IIdUUYn6_ylfUjvNTdbr1uRY65nT5TwK'
    upload_file_to_drive(file_path, drive_folder_id)
```

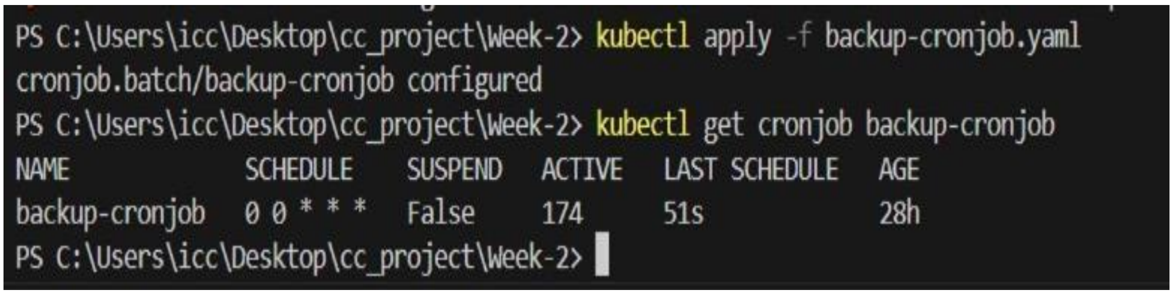

Drive
Search in Drive
New
Home
My Drive
Computers
Starred
Shared with me
Recent
Spam
Trash
Storage
4.16 GB of 15 GB used
Get more storage
My Drive › ccproject
Type
People
Modified
Files
test_file.txt

❖ 2:Kubernetes Deployment&Orchestration ○

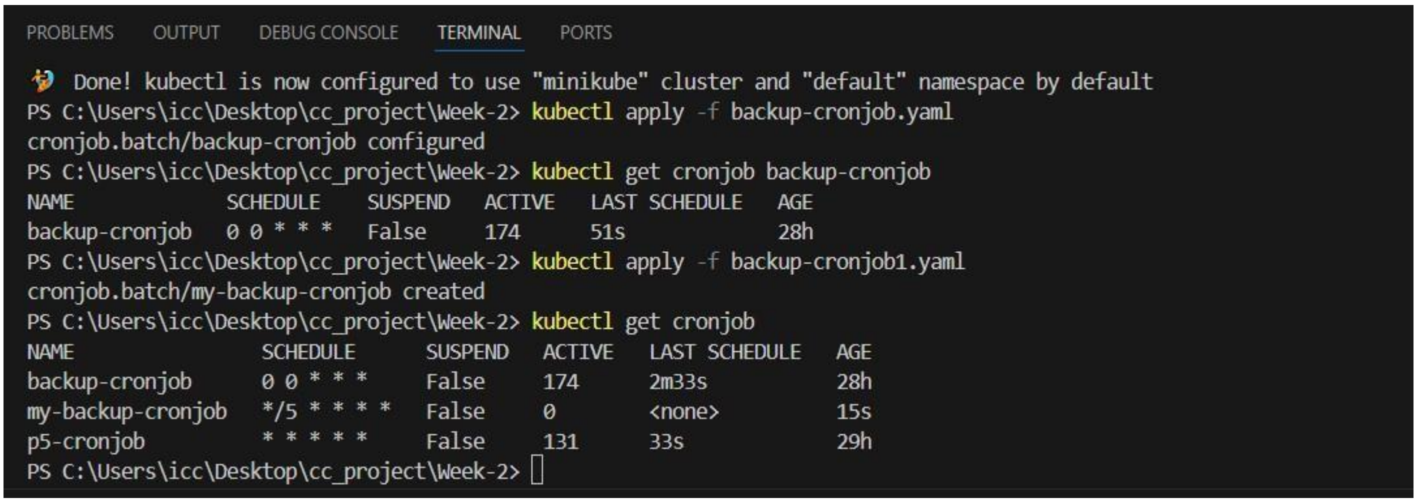
Kubernetes CronJob:

i. Definea`CronJob`resourceinKubernetestoschedulethebackup operation.

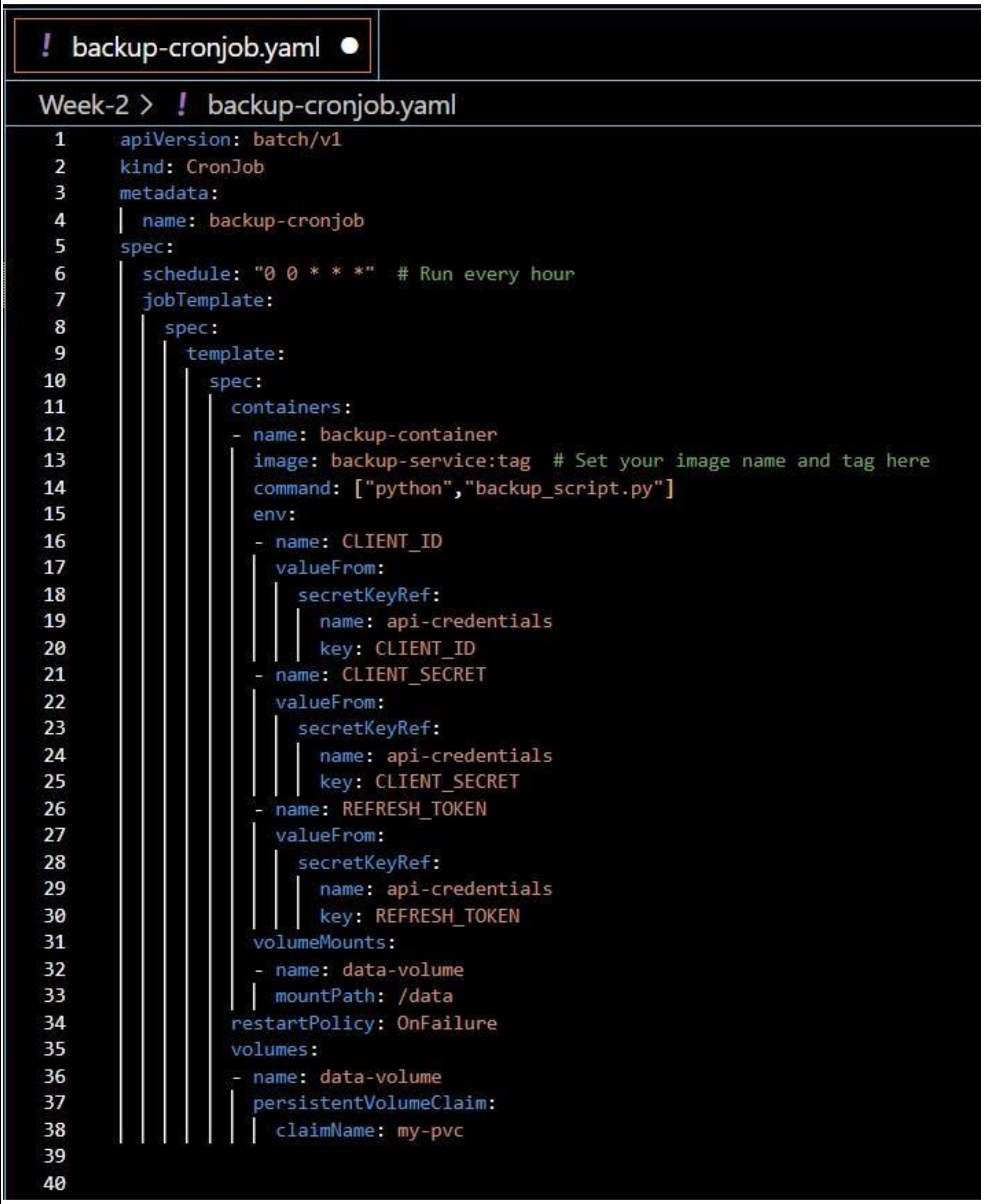
ii. The`CronJob`willruntheDockercontaineratspecifiedintervals



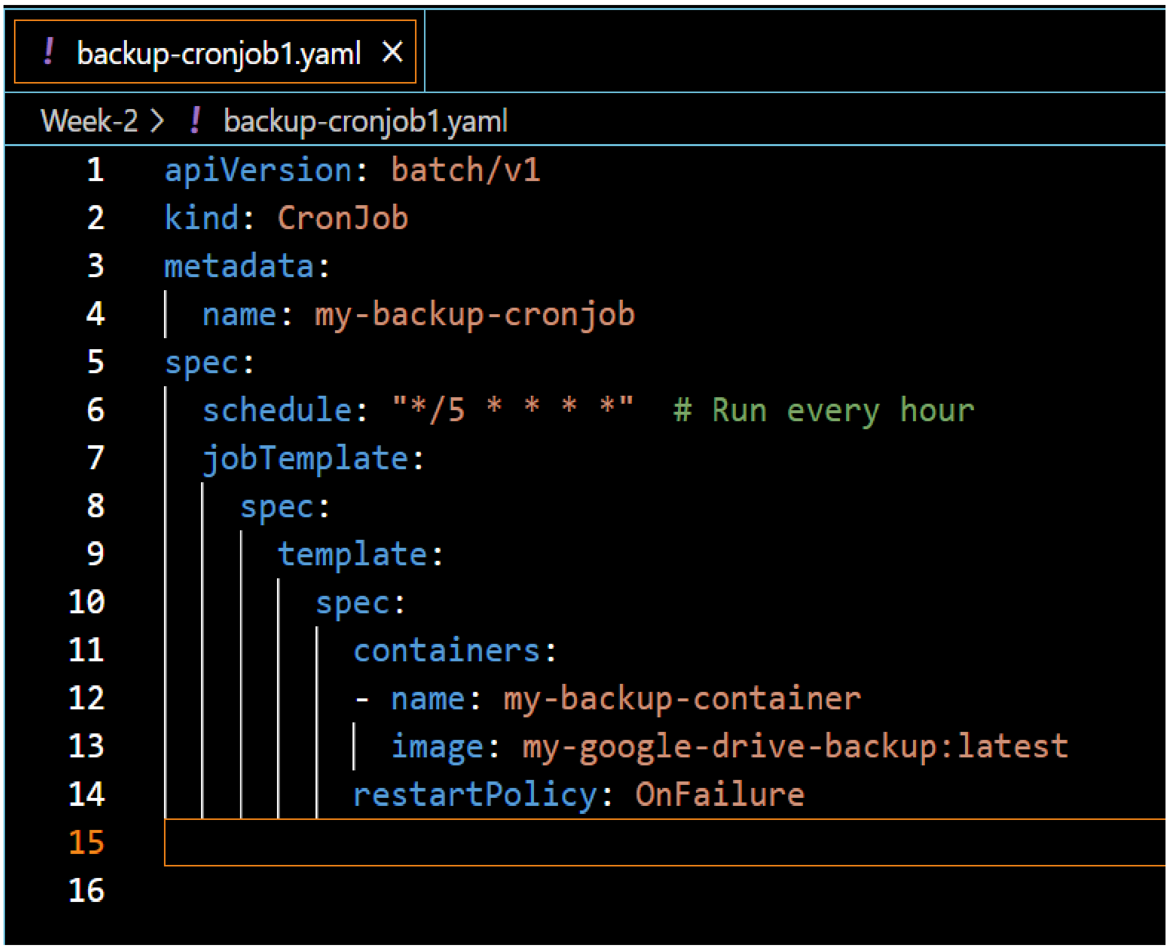
```
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl apply -f backup-cronjob.yaml
cronjob.batch/backup-cronjob configured
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl get cronjob backup-cronjob
NAME             SCHEDULE    SUSPEND   ACTIVE   LAST SCHEDULE   AGE
backup-cronjob   0 0 * * *   False     174      51s             28h
PS C:\Users\icc\Desktop\cc_project\Week-2>
```



```
Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl apply -f backup-cronjob.yaml
cronjob.batch/backup-cronjob configured
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl get cronjob backup-cronjob
NAME             SCHEDULE    SUSPEND   ACTIVE   LAST SCHEDULE   AGE
backup-cronjob   0 0 * * *   False     174      51s             28h
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl apply -f backup-cronjob1.yaml
cronjob.batch/my-backup-cronjob created
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl get cronjob
NAME                SCHEDULE      SUSPEND   ACTIVE   LAST SCHEDULE   AGE
backup-cronjob      0 0 * * *     False     174      2m33s           28h
my-backup-cronjob   */5 * * * *   False     0        <none>          15s
p5-cronjob          * * * * *     False     131      33s             29h
PS C:\Users\icc\Desktop\cc_project\Week-2>
```



```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


```

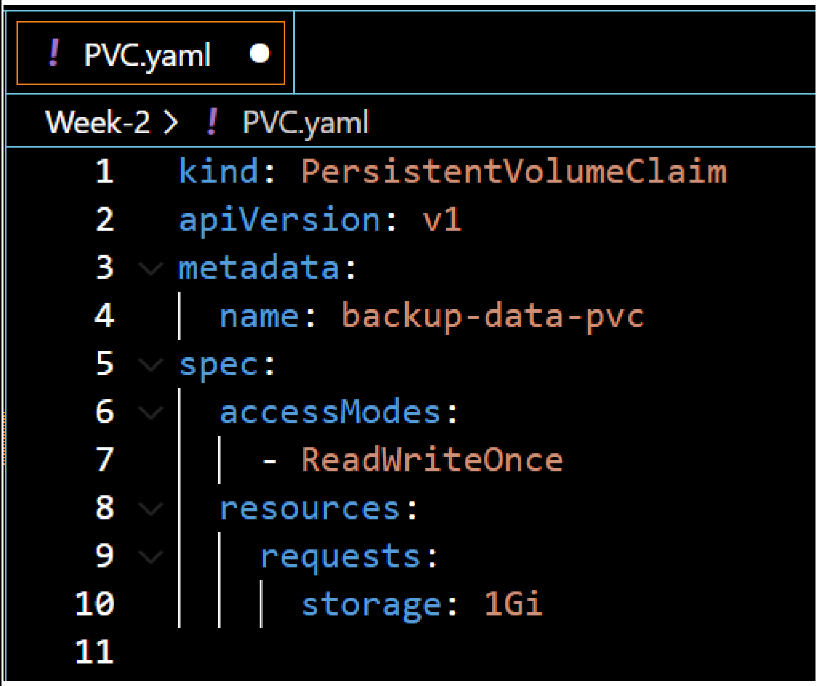

backup-cronjob1.yaml

Week-2 > backup-cronjob1.yaml

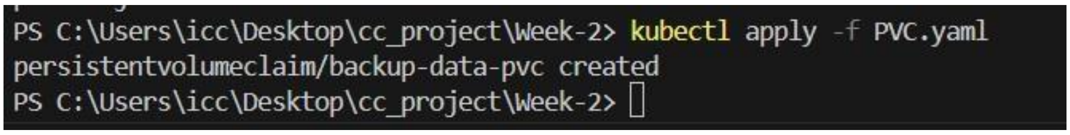
```yaml
apiVersion: batch/v1
kind: CronJob
metadata:
  name: my-backup-cronjob
spec:
  schedule: "*/5 * * * *"  # Run every hour
  jobTemplate:
    spec:
      template:
        spec:
          containers:
          - name: my-backup-container
            image: my-google-drive-backup:latest
       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


```

○**PersistentVolumeClaims(PVC)**:

i. UsePVCsinKubernetesto ensurethedata you wanttoback upis accessible to the container running the backup script.



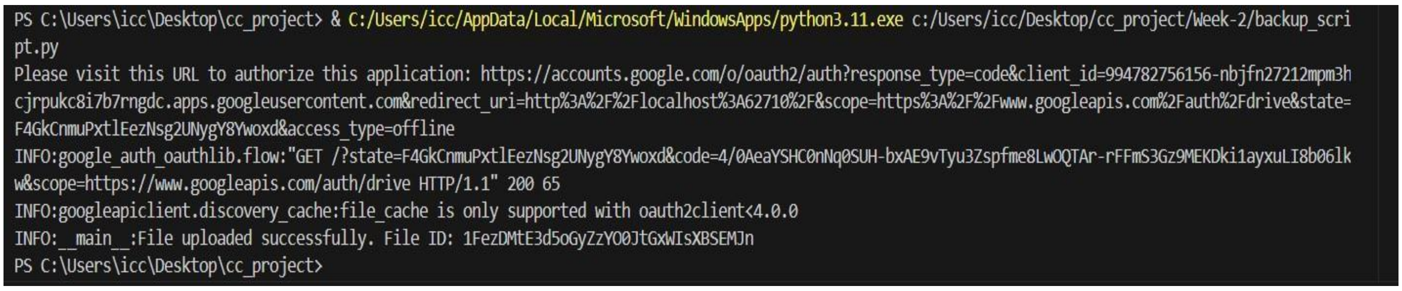
```
! PVC.yaml
Week-2 > ! PVC.yaml
kind: PersistentVolumeClaim
apiVersion: v1
metadata:
  name: backup-data-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi

```



```
PS C:\Users\icc\Desktop\cc_project\Week-2> kubectl apply -f PVC.yaml
persistentvolumeclaim/backup-data-pvc created
PS C:\Users\icc\Desktop\cc_project\Week-2>
```

○**Monitoring and Logging**:

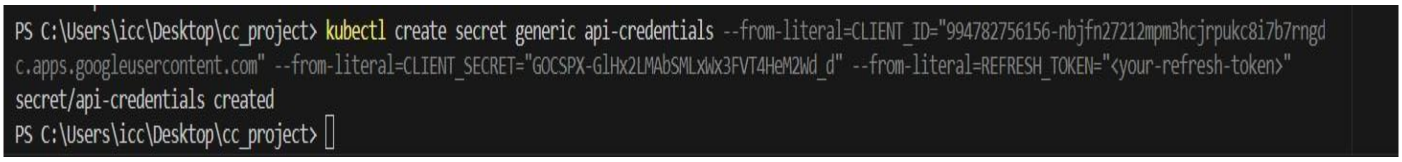
i. Implementloggingtotrackthebackupprocess.
ii. Optionally,setupmonitoringtoalertyouincaseoffailures.



```
PS C:\Users\icc\Desktop\cc_project> & C:/Users/icc/AppData/Local/Microsoft/WindowsApps/python3.11.exe c:/Users/icc/Desktop/cc_project/Week-2/backup_scri
pt.py
Please visit this URL to authorize this application: https://accounts.google.com/o/oauth2/auth?response_type=code&client_id=994782756156-nbjfn27212mpm3h
cjrpukc8i7b7rngdc.apps.googleusercontent.com&redirect_uri=http%3A%2F%2Flocalhost%3A62710%2F&scope=https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fdrive&state=
F4GkCnmuPxtlEezNsg2UNygY8Ywoxd&access_type=offline
INFO:google_auth_oauthlib.flow:"GET /?state=F4GkCnmuPxtlEezNsg2UNygY8Ywoxd&code=4/0AeaYSHC0nNq0SUH-bxAE9vTyu3Zspfme8LwOQTAr-rFFmS3Gz9MEKDki1ayxuLI8b06lk
w&scope=https://www.googleapis.com/auth/drive HTTP/1.1" 200 65
INFO:googleapiclient.discovery_cache:file_cache is only supported with oauth2client<4.0.0
INFO:__main__:File uploaded successfully. File ID: 1FezDMtE3d5oGyZzYO0JtGxWIsXBSEMJn
PS C:\Users\icc\Desktop\cc_project>
```

○**Security Considerations**:**Testing and Validation**:

i. SecurelymanageAPIcredentialsandsensitivedata.
ii. UseKubernetessecretstostoresensitiveinformation.



```
PS C:\Users\icc\Desktop\cc_project> kubectl create secret generic api-credentials --from-literal=CLIENT_ID="994782756156-nbjfn27212mpm3hcjrpukc8i7b7rngd
c.apps.googleusercontent.com" --from-literal=CLIENT_SECRET="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" --from-literal=REFRESH_TOKEN="<your-refresh-token>"
secret/api-credentials created
PS C:\Users\icc\Desktop\cc_project>
```

oTesting andValidation:

i. Testthebackupprocessthoroughlytoensuredataintegrity.ii. Validate the recovery process from the backups.

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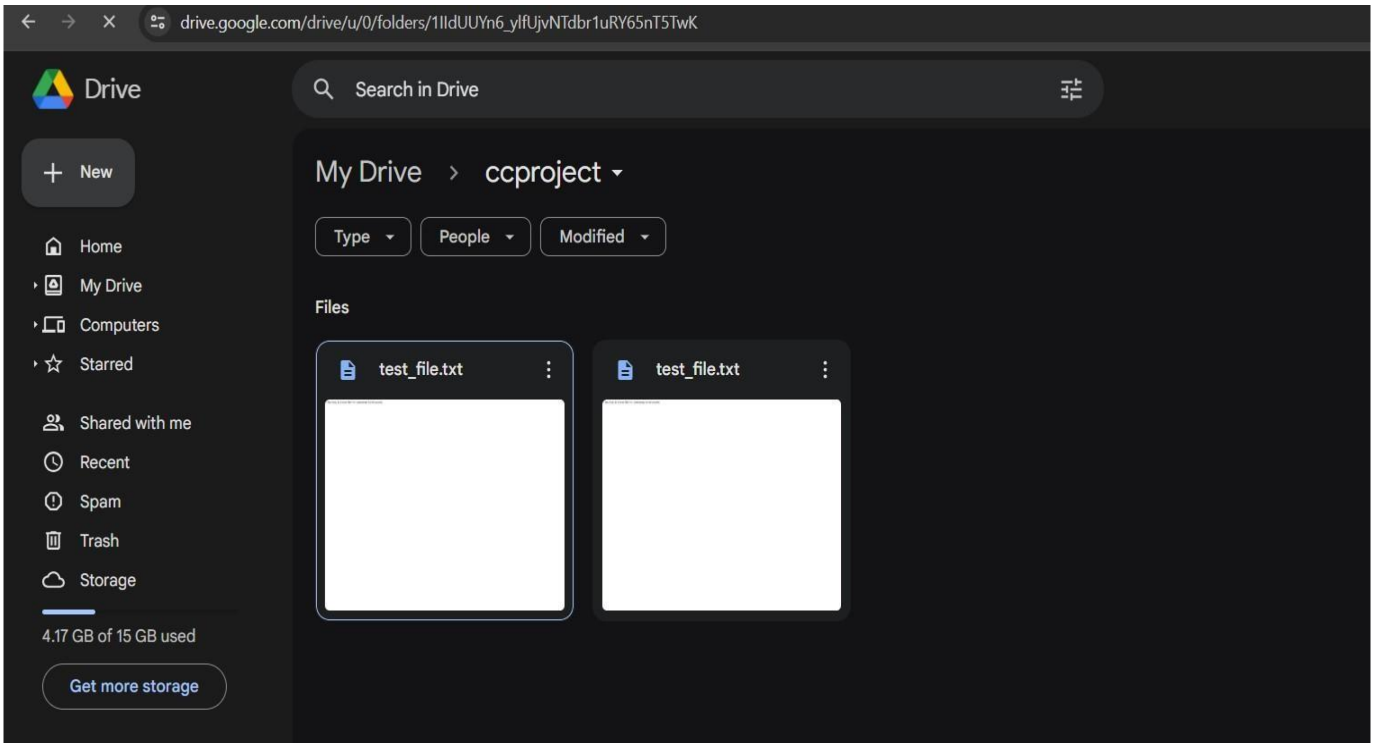
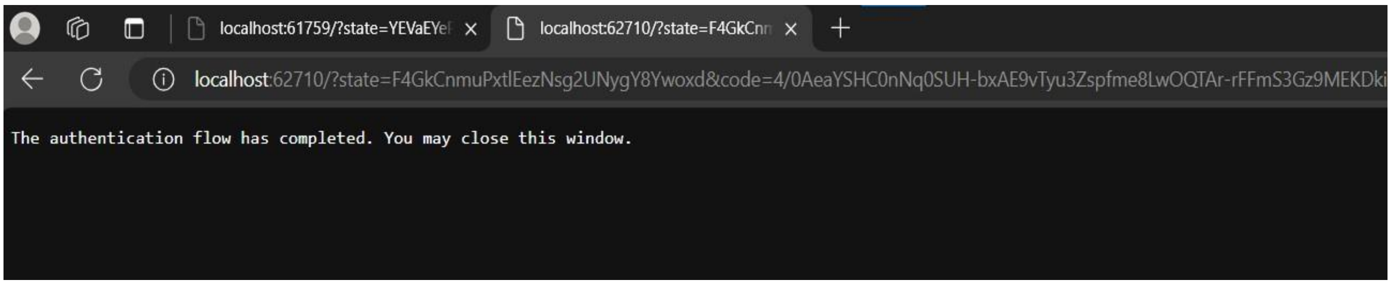
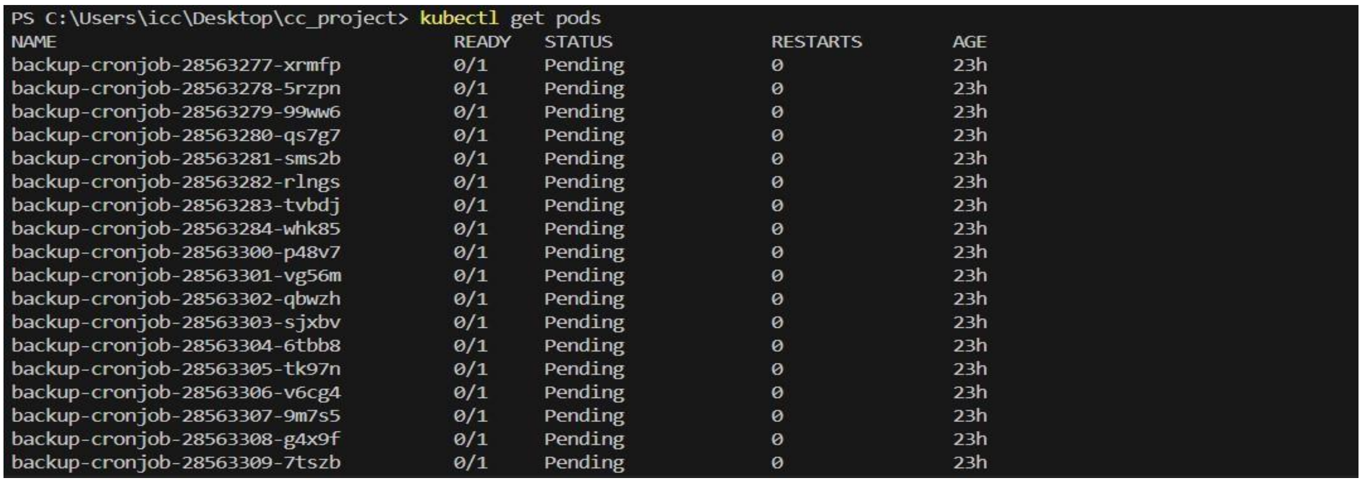
Thejpegimagegettingbackedupatregularintervals




localhost:61759/?state=YEVaEYe
localhost:62710/?state=F4GkCnn
localhost:62710/?state=F4GkCnmuPxtlEezNsg2UNygY8Ywoxd&code=4/0AeaYSHC0nNq0SUH-bxAE9vTyu3Zspfme8LwOQTAr-rFFmS3Gz9MEKDki

```
The authentication flow has completed. You may close this window.
```



```
PS C:\Users\icc\Desktop\cc_project> kubectl get pods
NAME                                  READY   STATUS             RESTARTS      AGE
backup-cronjob-28563277-xrmfp         0/1     Pending            0             23h
backup-cronjob-28563278-5rzpn         0/1     Pending            0             23h
backup-cronjob-28563279-99ww6         0/1     Pending            0             23h
backup-cronjob-28563280-qs7g7         0/1     Pending            0             23h
backup-cronjob-28563281-sms2b         0/1     Pending            0             23h
backup-cronjob-28563282-rlngs         0/1     Pending            0             23h
backup-cronjob-28563283-tvbdj         0/1     Pending            0             23h
backup-cronjob-28563284-whk85         0/1     Pending            0             23h
backup-cronjob-28563300-p48v7         0/1     Pending            0             23h
backup-cronjob-28563301-vg56m         0/1     Pending            0             23h
backup-cronjob-28563302-qbwzh         0/1     Pending            0             23h
backup-cronjob-28563303-sjxbv         0/1     Pending            0             23h
backup-cronjob-28563304-6tbb8         0/1     Pending            0             23h
backup-cronjob-28563305-tk97n         0/1     Pending            0             23h
backup-cronjob-28563306-v6cg4         0/1     Pending            0             23h
backup-cronjob-28563307-9m7s5         0/1     Pending            0             23h
backup-cronjob-28563308-g4x9f         0/1     Pending            0             23h
backup-cronjob-28563309-7tszb         0/1     Pending            0             23h
```