Matias Roje - Kubernetes exam

For the exam, I created a custom FastAPI Docker image due to the provided image being too heavy for the Datascientest Ubuntu server. I then used the Kompose tool to convert the `docker-compose.yaml` file into an initial Kubernetes manifest, which I further configured manually.

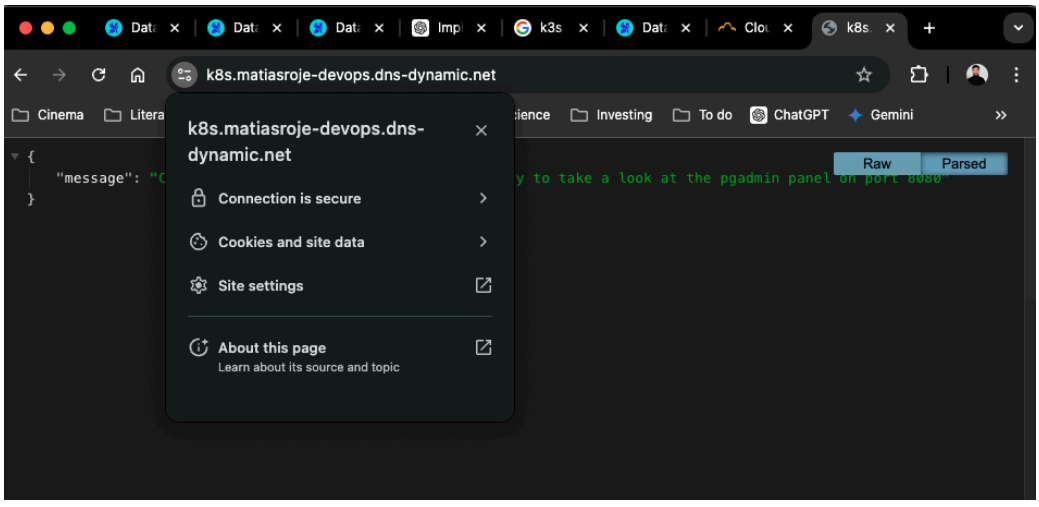
Although Helm and Kustomize are not explicitly showcased, they would be beneficial for implementing different namespaces and data configurations, if needed.

Here's a summary of the setup and observations:

- **FastAPI Server**: Accessible via HTTPS from the browser, functioning correctly and connected to the database.
- **PgAdmin**: Accessible locally and functioning as expected. Screenshots are available for verification.
- **Data Backup**: Backups are stored in an S3 bucket. The backup process follows the official k3s documentation for SQLite databases. For etcd Datastore, the native k3s solution could be used with the following command: `bash
  k3s etcd-snapshot save \
    --s3 \
    --s3-bucket=<S3-BUCKET-NAME> \
    --s3-access-key=<S3-ACCESS-KEY> \
    --s3-secret-key=<S3-SECRET-KEY>
  `

I opted for a custom backup script to avoid restarting the cluster and to demonstrate a more creative solution.

App accessible from the browser via HTTPS



Regular Kubernetes manifest running

```
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/YAML-STANDARD$ kubectl get all -n standard
NAME                           READY   STATUS    RESTARTS      AGE
pod/db-0                       1/1     Running   1 (53m ago)   60m
pod/fastapi-6b8ddc5cdf-449hg   1/1     Running   4 (52m ago)   60m
pod/fastapi-6b8ddc5cdf-czhwp   1/1     Running   4 (52m ago)   60m
pod/fastapi-6b8ddc5cdf-f6t87   1/1     Running   4 (52m ago)   60m
pod/pgadmin-6b8fc6554c-hwgq2   1/1     Running   1 (53m ago)   60m

NAME              TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
service/db        ClusterIP   10.43.175.25   <none>        5432/TCP       60m
service/fastapi   ClusterIP   10.43.8.48     <none>        5000/TCP       60m
service/pgadmin   NodePort    10.43.209.70   <none>        80:30080/TCP   60m

NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/fastapi   3/3     3            3           60m
deployment.apps/pgadmin   1/1     1            1           60m

NAME                                 DESIRED   CURRENT   READY   AGE
replicaset.apps/fastapi-6b8ddc5cdf   3         3         3       60m
replicaset.apps/pgadmin-6b8fc6554c   1         1         1       60m

NAME                  READY   AGE
statefulset.apps/db   1/1     60m

NAME                                                  REFERENCE            TARGETS              MINPODS   MAXPO
DS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/fastapi-hpa   Deployment/fastapi   cpu: <unknown>/70%   3         6
     3          60m
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/YAML-STANDARD$ kubectl get ingress -n standard
NAME              CLASS     HOSTS                                    ADDRESS         PORTS   AGE
fastapi-ingress   traefik   k8s.matiasroje-devops.dns-dynamic.net   172.31.23.166   80      65m
```

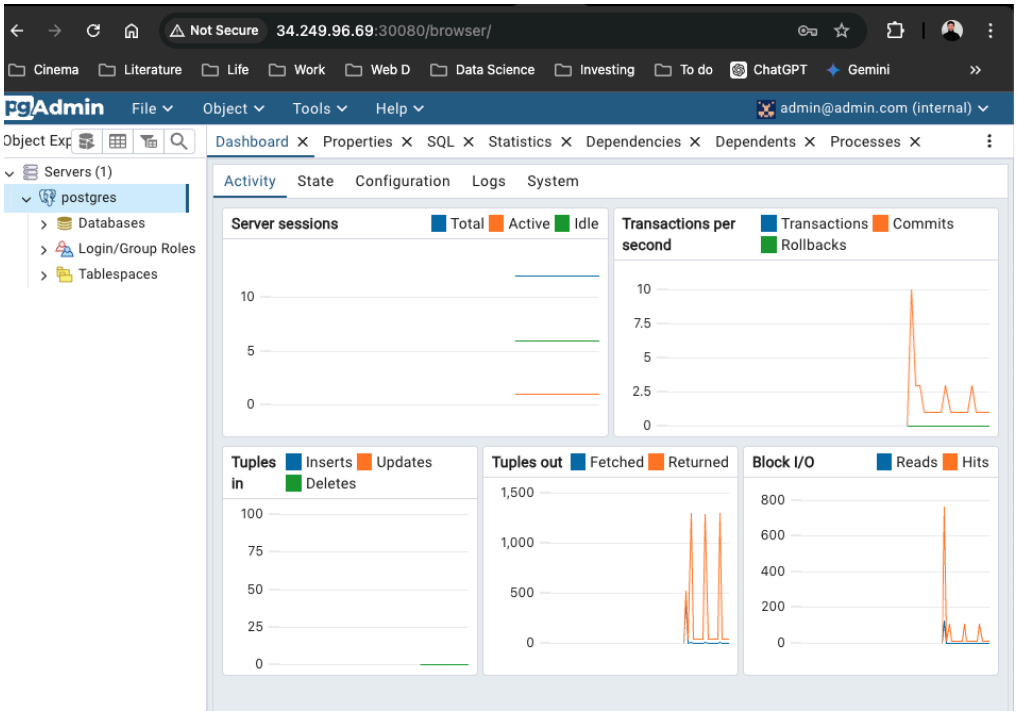
Helm chart running

```
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/HELM$ kubectl get all -n helm
NAME                           READY   STATUS    RESTARTS        AGE
pod/db-0                       1/1     Running   0               3m32s
pod/fastapi-fd8bdbcd5-2vhwk    1/1     Running   2 (3m16s ago)   3m31s
pod/fastapi-fd8bdbcd5-8m7sf    1/1     Running   2 (3m17s ago)   3m32s
pod/fastapi-fd8bdbcd5-s8qkx    1/1     Running   2 (3m14s ago)   3m31s
pod/pgadmin-558c4b4799-4hb64   1/1     Running   0               3m32s

NAME              TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
service/db        ClusterIP   10.43.176.188   <none>        5432/TCP       3m32s
service/fastapi   ClusterIP   10.43.4.3       <none>        5000/TCP       3m32s
service/pgadmin   NodePort    10.43.178.180   <none>        80:30080/TCP   3m32s

NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/fastapi   3/3     3            3           3m32s
deployment.apps/pgadmin   1/1     1            1           3m32s

NAME                                 DESIRED   CURRENT   READY   AGE
replicaset.apps/fastapi-fd8bdbcd5    3         3         3       3m32s
replicaset.apps/pgadmin-558c4b4799   1         1         1       3m32s

NAME                  READY   AGE
statefulset.apps/db   1/1     3m32s

NAME                                                  REFERENCE            TARGETS              MINPODS   MAXPO
DS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/fastapi-hpa   Deployment/fastapi   cpu: <unknown>/70%   3         6
     3          18s
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/HELM$ kubectl get ingress -n helm
NAME              CLASS     HOSTS                                    ADDRESS         PORTS   AGE
fastapi-ingress   traefik   k8s.matiasroje-devops.dns-dynamic.net   172.31.23.166   80      3m46s
```

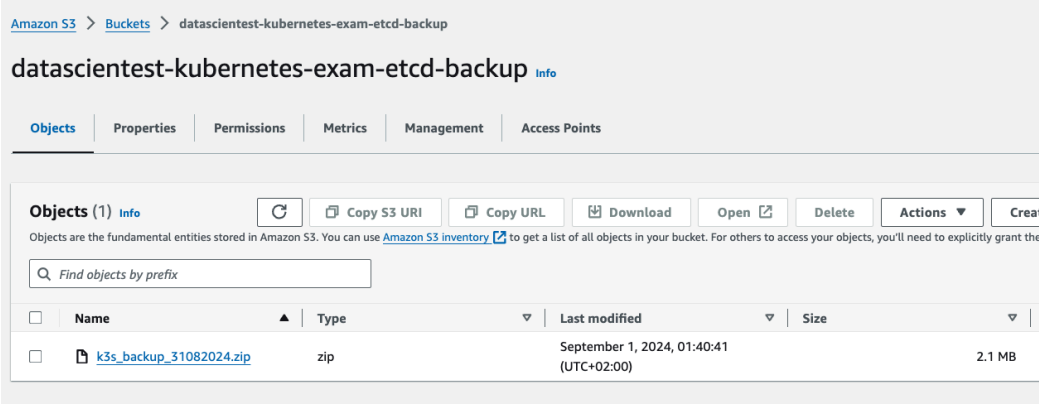
Kustomized deployment running

```
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/k8s/KUSTOMIZE/overlays/kustomize$ kubectl get all -
n kustomize
NAME                          READY   STATUS    RESTARTS      AGE
pod/db-0                      1/1     Running   0             2m6s
pod/fastapi-6b8ddc5cdf-8jr72  1/1     Running   1             2m6s
pod/fastapi-6b8ddc5cdf-b8r7t  1/1     Running   2 (113s ago)  2m6s
pod/fastapi-6b8ddc5cdf-xxtkr  1/1     Running   2 (111s ago)  2m6s
pod/pgadmin-7cc64d6d59-klcst  1/1     Running   0             2m6s

NAME              TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
service/db        ClusterIP   10.43.157.84   <none>        5432/TCP         2m7s
service/fastapi   ClusterIP   10.43.9.116    <none>        5000/TCP         2m7s
service/pgadmin   NodePort    10.43.41.235   <none>        80:30080/TCP     2m7s

NAME                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/fastapi   3/3     3            3           2m6s
deployment.apps/pgadmin   1/1     1            1           2m6s

NAME                                DESIRED   CURRENT   READY   AGE
replicaset.apps/fastapi-6b8ddc5cdf  3         3         3       2m6s
replicaset.apps/pgadmin-7cc64d6d59  1         1         1       2m6s

NAME                  READY   AGE
statefulset.apps/db   1/1     2m6s

NAME                                                        REFERENCE            TARGETS              MINPODS   MAXPO
DS   REPLICAS   AGE
horizontalpodautoscaler.autoscaling/fastapi-hpa   Deployment/fastapi   cpu: <unknown>/70%   3         6
     3          2m6s
ubuntu@ip-172-31-23-166:~/datascientest-kubernetes-exam/k8s/KUSTOMIZE/overlays/kustomize$ kubectl get ingre
ss -n kustomize
NAME              CLASS     HOSTS                                    ADDRESS          PORTS   AGE
fastapi-ingress   traefik   k8s.matiasroje-devops.dns-dynamic.net    172.31.23.166    80      2m19s
```

PgAdmin working locally



Data stored in S3



- **Sensitive Information**: I have included sensitive information in the Git repository, encoded for the purpose of this exam. In a real-world scenario, I would use AWS Secrets Manager or a similar service for secure handling of sensitive data. That assignment is out of the scope of the exam.

Thank you for reviewing my work.