

RAPPORT

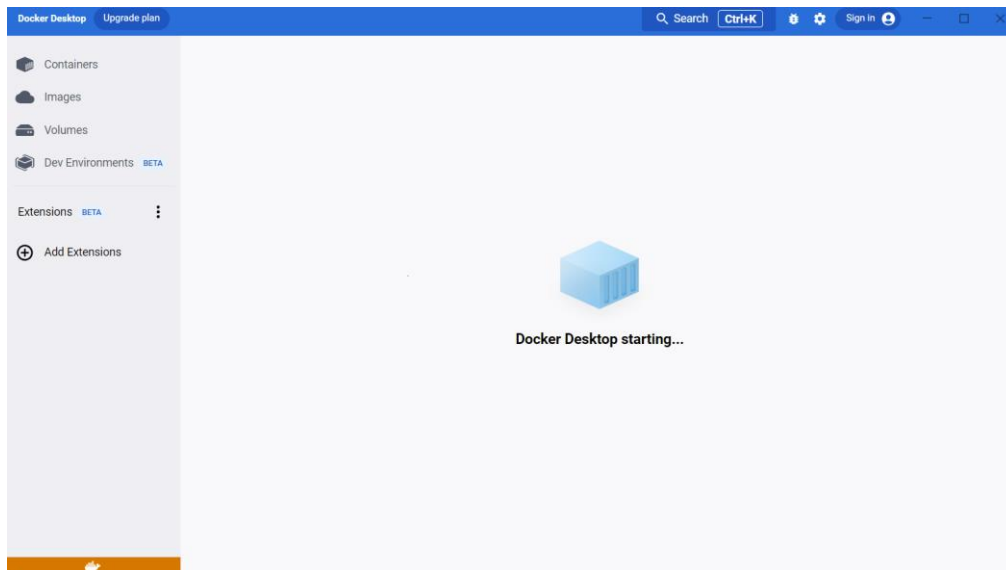
PROJECT – Virtualization, Containerization et
Cloud – ESIEA-INTECH

TOURE AMADOU
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ERRADI MOHAMMAD

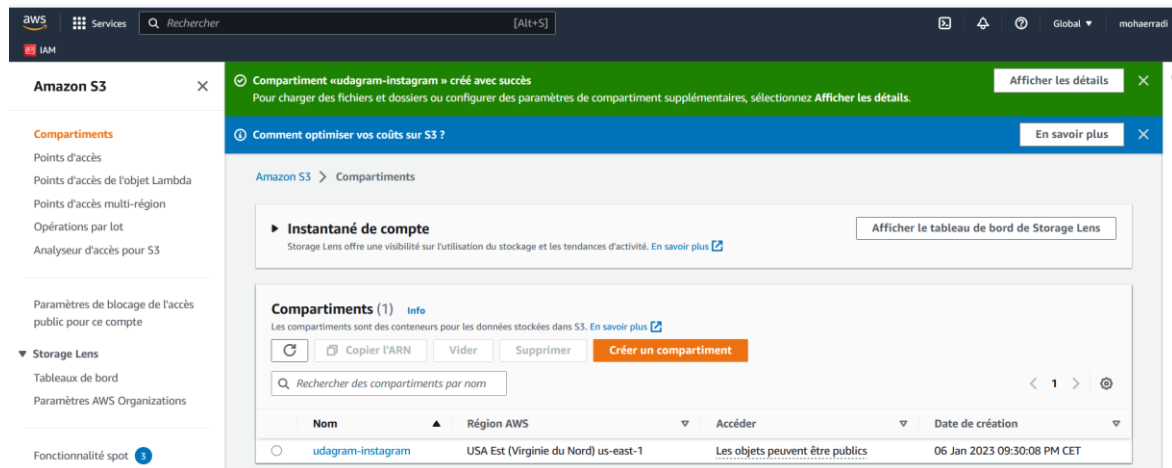
08 JANVIER 2023

GitHub Fork URL: <https://github.com/mohammaderradi/esiea-4th-vcc-project>

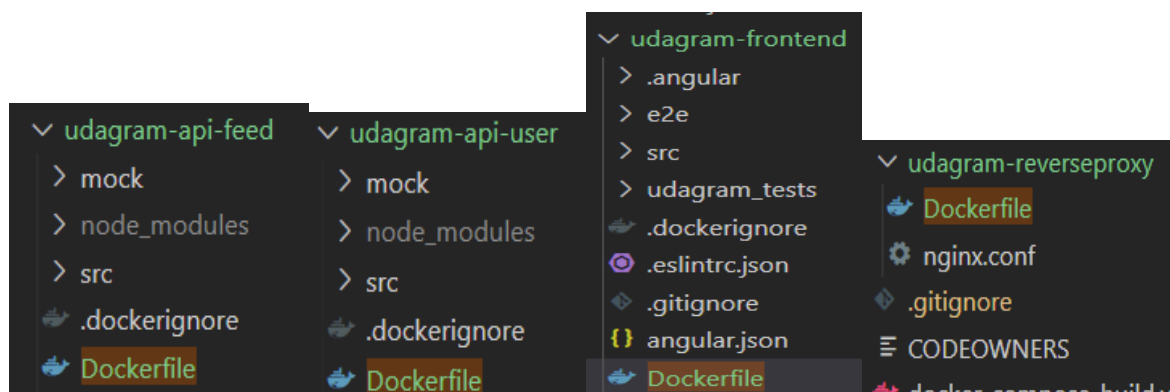
I PARTIE 1: Containerize the Udiagram application



Docker desktop installé et opérationnel



Bucket S3 crée sur AWS



Dockerfile créés pour chaque partie du projet

```
$ docker image ls
REPOSITORY          TAG         IMAGE ID      CREATED       SIZE
udagram-frontend    local      a912d09972a9  4 days ago   58.2MB
udagram/reverseproxy latest     f81ef399adee  4 days ago   40.7MB
reverseproxy        latest     f81ef399adee  4 days ago   40.7MB
```

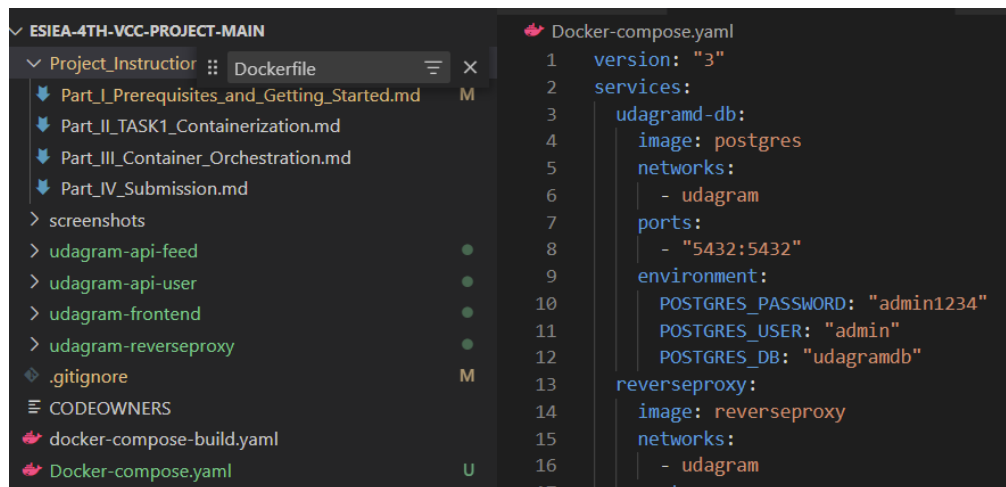
Images créées et visibles avec la commande Docker image ls

```
$ docker login
Login with your Docker ID to push and pull images
Username: mohaerradi
Password:
Login Succeeded
```

Docker login pour me connecter à mon compte DockerHub

```
$ docker push mohaerradi/udagram
Using default tag: latest
The push refers to repository [docker.io/mohaerradi/udagram]
347cacb9e1a3: Pushed
9e173cdce044: Pushing [=====>] 27.29MB/
f2d47996fdfa: Pushed
c23f26e962bd: Pushed
0511ab7e6edc: Pushed
ec7e4a91c33b: Pushed
1fee4bd55a85: Pushed
dad7a220bb05: Pushing [=====] 7.22MB/
```

Docker push pour envoyer chaque image sur DockerHub



```

ESIEA-4TH-VCC-PROJECT-MAIN
├── Project_Instruction
│   ├── Dockerfile
│   ├── Part_I_Prerequisites_and_Getting_Started.md
│   ├── Part_II_TASK1_Containerization.md
│   ├── Part_III_Container_Orchestration.md
│   └── Part_IV_Submission.md
├── screenshots
├── udagram-api-feed
├── udagram-api-user
├── udagram-frontend
├── udagram-reverseproxy
├── .gitignore
├── CODEOWNERS
├── docker-compose-build.yaml
└── Docker-compose.yaml

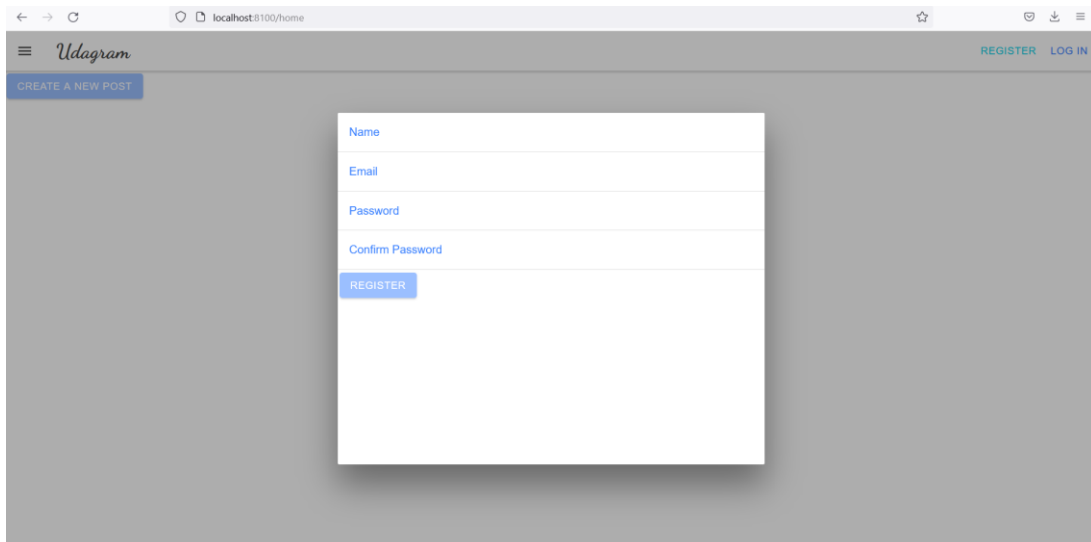
Docker-compose.yaml
1 version: "3"
2 services:
3     udagram-db:
4         image: postgres
5         networks:
6             - udagram
7         ports:
8             - "5432:5432"
9         environment:
10            POSTGRES_PASSWORD: "admin1234"
11            POSTGRES_USER: "admin"
12            POSTGRES_DB: "udagramdb"
13     reverseproxy:
14         image: reverseproxy
15         networks:
16             - udagram
17     udagram-frontend:
18         image: mohaerradi/udagram-frontend:latest
19         networks:
20             - udagram
21         ports:
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23     udagram-api-user:
24         image: mohaerradi/udagram-api-user:latest
25         networks:
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29     udagram-api-feed:
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733         networks:
734             - udagram
735         ports:
736             - "8080:8080"
737     udagram-frontend:
738         image: mohaerradi/udagram-frontend:latest
739         networks:
740             - udagram
741         ports:
742             - "8100:80"
743     udagram-api-user:
744         image: mohaerradi/udagram-api-user:latest
745         networks:
746             - udagram
747         ports:
748             - "8080:8080"
749     udagram-api-feed:
750         image: mohaerradi/udagram-api-feed:latest
751         networks:
752             - udagram
753         ports:
754             - "5000:5000"
755     udagram-db:
756         image: postgres:latest
757         networks:
758             - udagram
759         ports:
760             - "5432:5432"
761     udagram-reverseproxy:
762         image: mohaerradi/udagram-reverseproxy:latest
763         networks:
764             - udagram
765         ports:
766             - "8080:8080"
767     udagram-frontend:
768         image: mohaerradi/udagram-frontend:latest
769         networks:
770             - udagram
771         ports:
772             - "8100:80"
773     udagram-api-user:
774         image: mohaerradi/udagram-api-user:latest
775         networks:
776             - udagram
777         ports:
778             - "8080:8080"
779     udagram-api-feed:
780         image: mohaerradi/udagram-api-feed:latest
781         networks:
782             - udagram
783         ports:
784             - "5000:5000"
785     udagram-db:
786         image: postgres:latest
787         networks:
788             - udagram
789         ports:
790             - "5432:5432"
791     udagram-reverseproxy:
792         image: mohaerradi/udagram-reverseproxy:latest
793         networks:
794             - udagram
795         ports:
796             - "8080:8080"
797     udagram-frontend:
798         image: mohaerradi/udagram-frontend:latest
799         networks:
800             - udagram
801         ports:
802             - "8100:80"
803     udagram-api-user:
804         image: mohaerradi/udagram-api-user:latest
805         networks:
806             - udagram
807         ports:
808             - "8080:8080"
809     udagram-api-feed:
810         image: mohaerradi/udagram-api-feed:latest
811         networks:
812             - udagram
813         ports:
814             - "5000:5000"
815     udagram-db:
816         image: postgres:latest
817         networks:
818             - udagram
819         ports:
820             - "5432:5432"
821     udagram-reverseproxy:
822         image: mohaerradi/udagram-reverseproxy:latest
823         networks:
824             - udagram
825         ports:
826             - "8080:8080"
827     udagram-frontend:
828         image: mohaerradi/udagram-frontend:latest
829         networks:
830             - udagram
831         ports:
832             - "8100:80"
833     udagram-api-user:
834         image: mohaerradi/udagram-api-user:latest
835         networks:
836             - udagram
837         ports:
838             - "8080:8080"
839     udagram-api-feed:
840         image: mohaerradi/udagram-api-feed:latest
841         networks:
842             - udagram
843         ports:
844             - "5000:5000"
845     udagram-db:
846         image: postgres:latest
847         networks:
848             - udagram
849         ports:
850             - "5432:5432"
851     udagram-reverseproxy:
852         image: mohaerradi/udagram-reverseproxy:latest
853         networks:
854             - udagram
855         ports:
856             - "8080:8080"
857     udagram-frontend:
858         image: mohaerradi/udagram-frontend:latest
859         networks:
860             - udagram
861         ports:
862             - "8100:80"
863     udagram-api-user:
864         image: mohaerradi/udagram-api-user:latest
865         networks:
866             - udagram
867         ports:
868             - "8080:8080"
869     udagram-api-feed:
870         image: mohaerradi/udagram-api-feed:latest
871         networks:
872             - udagram
873         ports:
874             - "5000:5000"
875     udagram-db:
876         image: postgres:latest
877         networks:
878             - udagram
879         ports:
880             - "5432:5432"
881     udagram-reverseproxy:
882         image: mohaerradi/udagram-reverseproxy:latest
883         networks:
884             - udagram
885         ports:
886             - "8080:8080"
887     udagram-frontend:
888         image: mohaerradi/udagram-frontend:latest
889         networks:
890             - udagram
891         ports:
892             - "8100:80"
893     udagram-api-user:
894         image: mohaerradi/udagram-api-user:latest
895         networks:
896             - udagram
897         ports:
898             - "8080:8080"
899     udagram-api-feed:
900         image: mohaerradi/udagram-api-feed:latest
901         networks:
902             - udagram
903         ports:
904             - "5000:5000"
905     udagram-db:
906         image: postgres:latest
907         networks:
908             - udagram
909         ports:
910             - "5432:5432"
911     udagram-reverseproxy:
912         image: mohaerradi/udagram-reverseproxy:latest
913         networks:
914             - udagram
915         ports:
916             - "8080:8080"
917     udagram-frontend:
918         image: mohaerradi/udagram-frontend:latest
919         networks:
920             - udagram
921         ports:
922             - "8100:80"
923     udagram-api-user:
924         image: mohaerradi/udagram-api-user:latest
925         networks:
926             - udagram
927         ports:
928             - "8080:8080"
929     udagram-api-feed:
930         image: mohaerradi/udagram-api-feed:latest
931         networks:
932             - udagram
933         ports:
934             - "5000:5000"
935     udagram-db:
936         image: postgres:latest
937         networks:
938             - udagram
939         ports:
940             - "5432:5432"
941     udagram-reverseproxy:
942         image: mohaerradi/udagram-reverseproxy:latest
943         networks:
944             - udagram
945         ports:
946             - "8080:8080"
947     udagram-frontend:
948         image: mohaerradi/udagram-frontend:latest
949         networks:
950             - udagram
951         ports:
952             - "8100:80"
953     udagram-api-user:
954         image: mohaerradi/udagram-api-user:latest
955         networks:
956             - udagram
957         ports:
958             - "8080:8080"
959     udagram-api-feed:
960         image: mohaerradi/udagram-api-feed:latest
961         networks:
962             - udagram
963         ports:
964             - "5000:5000"
965     udagram-db:
966         image: postgres:latest
967         networks:
968             - udagram
969         ports:
970             - "5432:5432"
971     udagram-reverseproxy:
972         image: mohaerradi/udagram-reverseproxy:latest
973         networks:
974             - udagram
975         ports:
976             - "8080:8080"
977     udagram-frontend:
978         image: mohaerradi/udagram-frontend:latest
979         networks:
980             - udagram
981         ports:
982             - "8100:80"
983     udagram-api-user:
984         image: mohaerradi/udagram-api-user:latest
985         networks:
986             - udagram
987         ports:
988             - "8080:8080"
989     udagram-api-feed:
990         image: mohaerradi/udagram-api-feed:latest
991         networks:
992             - udagram
993         ports:
994             - "5000:5000"
995     udagram-db:
996         image: postgres:latest
997         networks:
998             - udagram
999         ports:
1000            - "5432:5432"

```

Fichiers Docker compose qui lance les conteneurs sur les bons ports

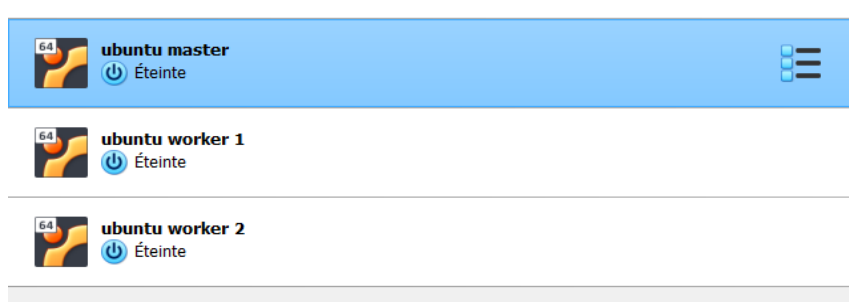
| | | | | | | |
|--------------------------|---|-------------------------|---------------|-----------|---------------|--|
| <input type="checkbox"/> | esiea-4th-vcc-project-main | - | Running (5/5) | | | |
| <input type="checkbox"/> | esiea-4th-vcc-project-main_reverseproxy_1 | reverseproxy:latest | Running | 8080:8080 | 2 minutes ago | |
| <input type="checkbox"/> | esiea-4th-vcc-project-main_backend-feed_1 | udagram-api-feed:latest | Running | | 2 minutes ago | |
| <input type="checkbox"/> | esiea-4th-vcc-project-main_backend-user_1 | udagram-api-user:latest | Running | | 2 minutes ago | |
| <input type="checkbox"/> | esiea-4th-vcc-project-main_udagramdb_1 | postgres:latest | Running | 5432:5432 | 2 minutes ago | |
| <input type="checkbox"/> | esiea-4th-vcc-project-main_frontend_1 | udagram-frontend:latest | Running | 8100:80 | 2 minutes ago | |

Conteneurs UP sur les bons ports



Udagram accessible sur <http://localhost:8100>

II PARTIE 2: Virtualization and Orchestrate Udagram application

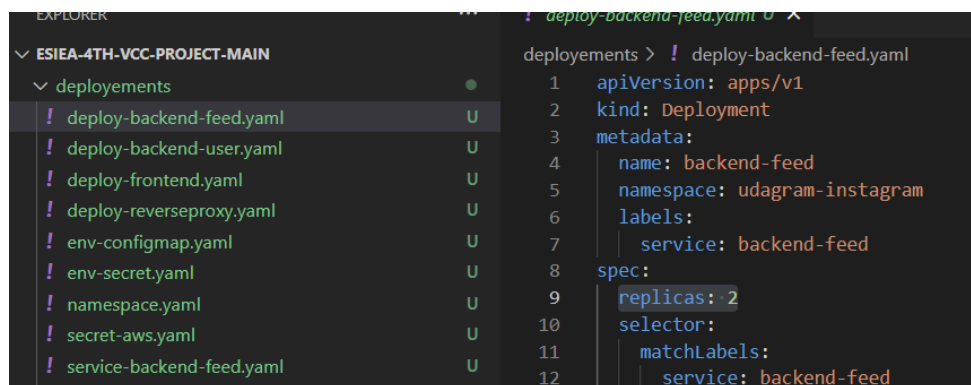


Création de 3 Machines virtuelles sur VirtualBox dont 1 Master et 2 Workers

```
moha@ubuntuserver:~$ kubectl get pods --all-namespaces
```

| NAMESPACE | NAME | READY | STATUS | RESTARTS | AGE |
|-----------------|--------------------------------------|-------|------------------|--------------|-------|
| kube-system | coredns-787d4945fb-6288w | 0/1 | Pending | 0 | 4m58s |
| kube-system | coredns-787d4945fb-ghz44 | 0/1 | Pending | 0 | 4m58s |
| kube-system | etcd-ubuntuserver | 1/1 | Running | 3 (106s ago) | 6m9s |
| kube-system | kube-apiserver-ubuntuserver | 1/1 | Running | 3 (3m4s ago) | 6m8s |
| kube-system | kube-controller-manager-ubuntuserver | 1/1 | Running | 5 (2m5s ago) | 6m7s |
| kube-system | kube-proxy-p4hvr | 0/1 | CrashLoopBackOff | 3 (13s ago) | 4m58s |
| kube-system | kube-scheduler-ubuntuserver | 0/1 | CrashLoopBackOff | 55 (80s ago) | 6m9s |
| tigera-operator | tigera-operator-7795f5d79b-hj6st | 0/1 | CrashLoopBackOff | 5 (5s ago) | 4m6s |

Démarrage des composants Kubernetes sur la machine virtuelle « Master »



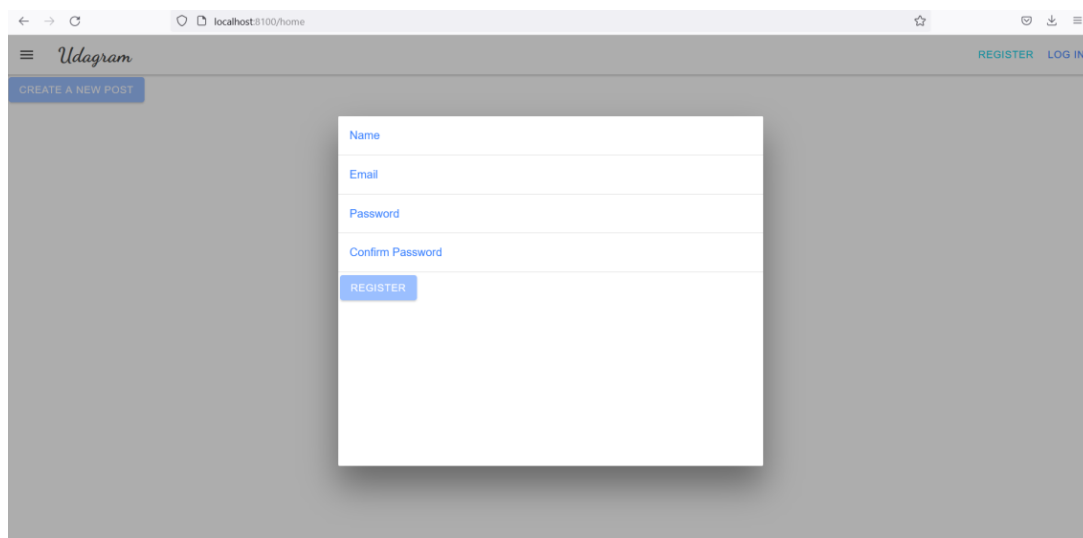
2 Replicas demandées dans chaque yaml file

```
! env-configmap.yaml U X
deployments > ! env-configmap.yaml
1  apiVersion: v1
2  kind: ConfigMap
3  metadata:
4    name: env-config
5  data:
6    aws_bucket: udagram-instagram
7    aws_region: eu-east-1
8    aws_profile: default
9    jwt_secret: testing
10 url: http://localhost:8100
11 postgres_db: udagramdb
12 postgres_host: udagram-db
```

Configmap créée en conformité avec les demandes du README

```
$ kubectl apply -f ./deployments
deployment.apps/backend-feed unchanged
deployment.apps/backend-user unchanged
deployment.apps/frontend unchanged
deployment.apps/reverseproxy configured
configmap/env-config unchanged
secret/env-secret unchanged
namespace/udagram-prod unchanged
secret/aws-secret created
service/backend-feed unchanged
service/backend-user unchanged
service/frontend unchanged
service/reverseproxy unchanged
```

Création et application des yaml files avec la commande « **kubectl apply -f .** »



Après avoir réaliser les commander de port-forwarding, le site est accessible sur le **http://localhost:8100**

III PARTIE 3 : Cloud

1. Pour nous le cloud est un domaine émergent qui va révolutionner notre façon d'utiliser la donnée. Elle possède de nombreux avantages dont la haute disponibilité, l'économie de coûts, la scalabilité, la fiabilité et la sécurité.
2. La personne qui a dit cela faisait référence au fait que le "cloud" est en réalité un ensemble de serveurs informatiques physiques qui sont gérés par une entreprise de cloud computing. Lorsque vous utilisez des services de cloud, vos données sont stockées et traitées sur ces serveurs, ce qui signifie qu'elles sont accessibles sur votre ordinateur personnel mais qu'elles ne s'y trouvent pas réellement.
3. Les services AWS que je connais le mieux sont S3, EC2, Lambda, VPC et RDS.

Concernant RDS, il était possible de se servir de ce service pour réaliser notre projet.

Base de données

Amazon RDS

Service de base de données relationnelle géré

Configurez, exploitez et mettez à l'échelle une base de données relationnelle dans le cloud.


Mise en route


Créez une nouvelle instance de base de données en sélectionnant un moteur de base de données avec la configuration souhaitée.


[Créer une base de données](#)


[Restaurer une base de données à partir d'Amazon S3](#)


Type de moteur [Infos](#)


☐ Amazon Aurora


☐ MySQL


☐ MariaDB


☒ PostgreSQL


☐ Oracle


☐ Microsoft SQL Server


En effet, RDS offre la possibilité de créer des bases de données de différent type (dont PostgreSQL). Ceci était alors une option possible pour notre projet.

Bases de données 🔵 Ressources de groupe 🔄 Modifier Actions ▼ Restaurer à partir de S3 [Créer une base de données](#)

| <input type="checkbox"/> | Identifiant de base de données | Rôle ▼ | Moteur ▼ | Région et AZ ▼ | Taille ▼ | Statut ▼ | Processeur |
|--------------------------|----------------------------------|----------|------------|----------------|-------------|--------------|------------|
| <input type="radio"/> | udagram-instance | Instance | PostgreSQL | us-east-1a | db.t3.micro | 🟢 Disponible | 4.97% |

Pour notre exemple, j'ai créé une instance en accès public de type PostgreSQL.

4. Le NAT (Network Address Translation) est un mécanisme utilisé par les routeurs pour permettre à plusieurs ordinateurs de partager une connexion internet unique. Lorsqu'un ordinateur derrière un routeur envoie une demande de connexion à internet, le routeur remplace l'adresse IP de l'ordinateur par son propre adresse IP publique et envoie la demande à internet. Lorsque la réponse est reçue, le routeur la redirige vers l'ordinateur qui a fait la demande en remplaçant à nouveau l'adresse IP publique par l'adresse IP de l'ordinateur.
5. Les adresses IP publiques sont utilisées pour identifier les ordinateurs sur internet, tandis que les adresses IP privées sont utilisées pour identifier les ordinateurs sur un réseau privé
6. La demande est envoyée de l'appareil de John Doe au routeur Bouygues Box. Le routeur reçoit la demande et effectue une traduction d'adresse réseau (NAT).
Le routeur modifie l'adresse IP et le numéro de port de la source dans l'en-tête de la demande en utilisant son propre adresse IP publique et un numéro de port disponible (par exemple 12345).
Le routeur envoie la demande avec l'en-tête modifié au serveur Prime Video sur Internet.
Le serveur Prime Video reçoit la demande et la traite, en envoyant une réponse au routeur.