NAGP KUBERNETES AND DEVOPS ASSIGNMENT DOCUMENTATION

This document provides a step-by-step guide to the implementation of the Kubernetes and DevOps assignment

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1. Application Details

1.1. Requirement Understanding

The goal is to design and deploy a containerized multi-tier application on Google Kubernetes Engine (GKE). It consists of:

- **Service API Tier**: A Java Spring Boot application exposing an HTTP API that fetches data from a PostgreSQL database.
- **Database Tier**: A PostgreSQL instance storing 5–10 records with persistent storage.

Kubernetes Requirements:

- 4 replicas for API, 1 pod for DB
- API exposed externally via Ingress, DB is internal-only
- Rolling updates for API, data persistence for DB
- DB config managed via ConfigMap, password via Secret
- Communication via service DNS, not Pod Ips

1.2. Assumptions

- Java Spring Boot with Maven used for the API service
- PostgreSQL database used, preloaded with test data
- GKE cluster with default StorageClass and Ingress controller (e.g., GCLB)
- Docker images hosted on Docker Hub
- No CI/CD pipeline is included, only manual deployment considered.

1.3. Solution Overview

The architecture includes two main components:

API Tier:

- A **Spring Boot** application containerized and deployed with 4 replicas using a Kubernetes **Deployment**.
- A **ClusterIP Service** exposes the API internally, while an **Ingress** exposes it externally.
- Configurations such as DB URL, host, and user are injected via **ConfigMap**, the DB password is provided via a **Secret**.
- Rolling updates are enabled by default, ensuring zero downtime during deployments.

Database Tier:

- A single **PostgreSQL** pod managed via Deployment or StatefulSet.
- Uses PersistentVolumeClaim **(PVC)** to store data on a Persistent Disk.
- A **ClusterIP Service** allows the API tier to communicate via DNS (postgres-svc).
- Environment variables like POSTGRES_DB, POSTGRES_USER, and POSTGRES_PASSWORD are set using ConfigMap and Secret.

Communication and Exposure:

- The Spring Boot app connects to the DB using environment variables injected from ConfigMap and Secret.
- Connection pooling ensures efficient DB access.
- The database is accessed using Kubernetes DNS (postgres-svc:5432), not Pod IPs.
- External HTTP traffic is routed through **Ingress**, which maps to the API service.

1.4. Justification for Resource Utilization

- **Spring Boot** is production-ready, integrates well with PostgreSQL, and supports external configuration.

- **PostgreSQL** provides reliable data persistence and is widely supported in Kubernetes.

- **Deployments** manage lifecycle, replicas, and rolling updates for the API, 4 replicas ensure scalability and high availability.

- **PersistentVolumeClaim** ensures database data is retained even when the pod restarts or redeploys.

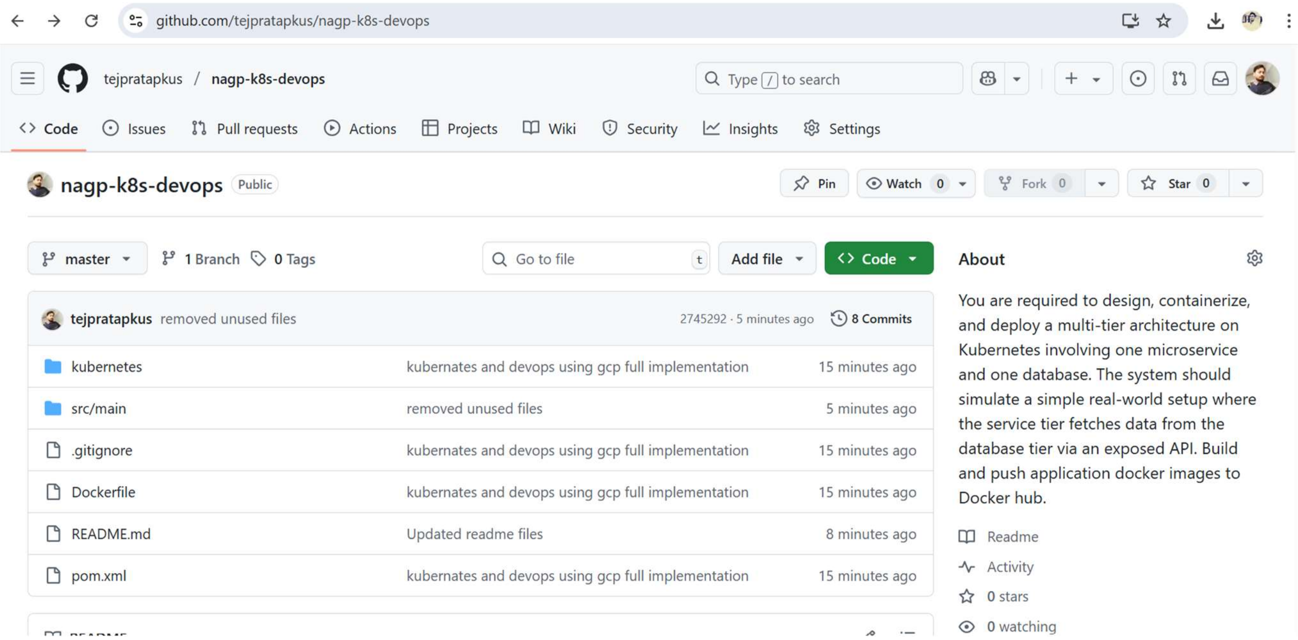
- **ConfigMap** and **Secret** cleanly separate configuration and credentials from code, aligning with security best practices.

- **Ingress** enables controlled, path-based routing of external requests into the cluster and simplifies load balancing with one IP.

2. GitHub Link

2.1. GitHub Link

https://github.com/tejpratapkus/nagp-k8s-devops



tejpratapkus removed unused files 2745292 · 5 minutes ago 8 Commits

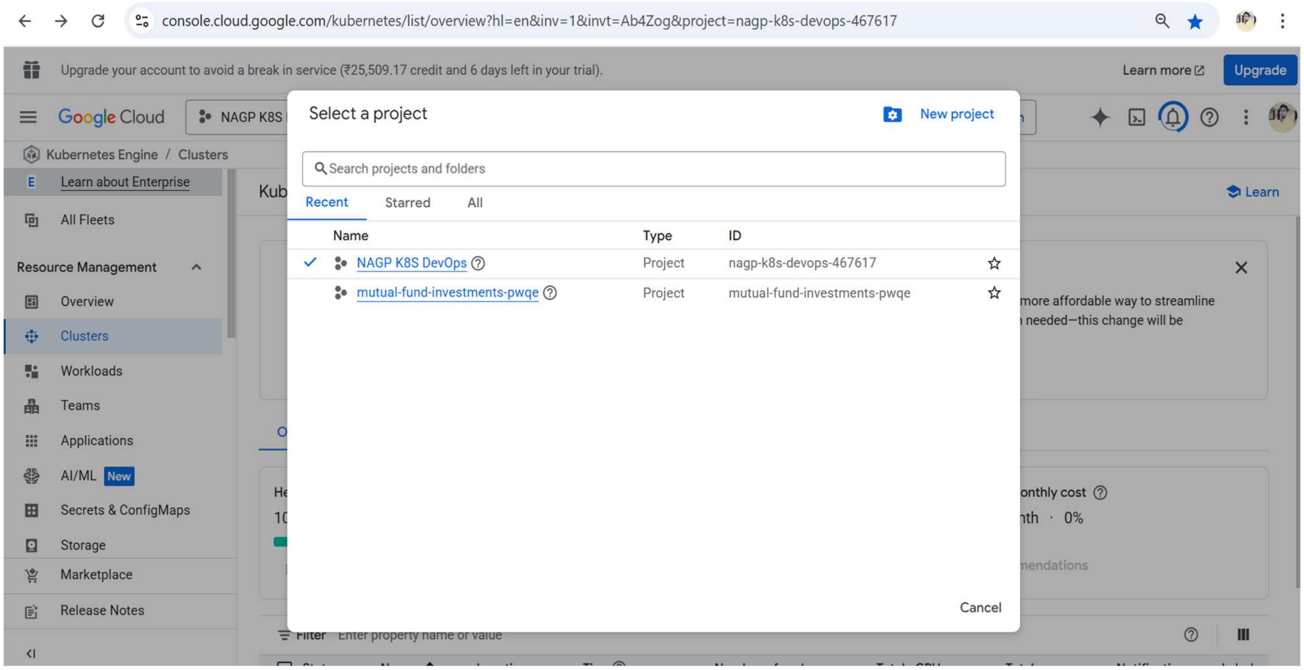
kubernetes	kubernates and devops using gcp full implementation	15 minutes ago
src/main	removed unused files	5 minutes ago
.gitignore	kubernates and devops using gcp full implementation	15 minutes ago
Dockerfile	kubernates and devops using gcp full implementation	15 minutes ago
README.md	Updated readme files	8 minutes ago
pom.xml	kubernates and devops using gcp full implementation	15 minutes ago

About

You are required to design, containerize, and deploy a multi-tier architecture on Kubernetes involving one microservice and one database. The system should simulate a simple real-world setup where the service tier fetches data from the database tier via an exposed API. Build and push application docker images to Docker hub.

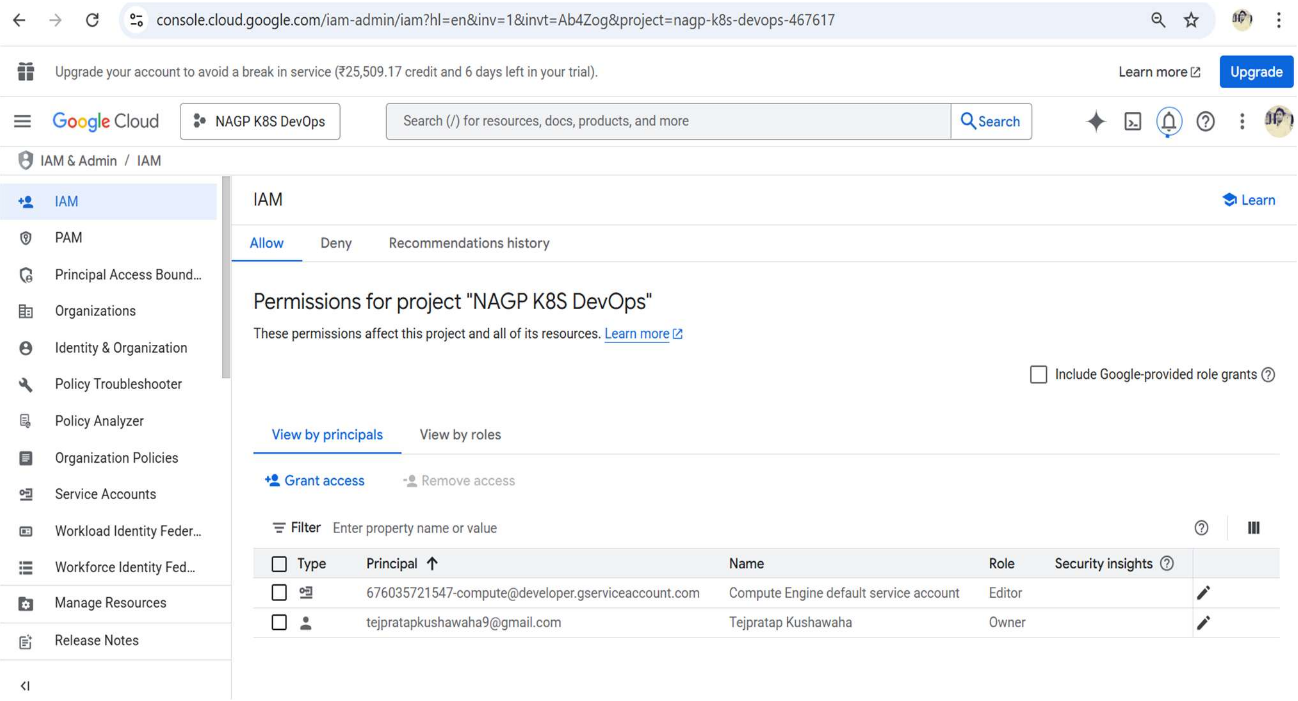
3. GCP DevOps Setup

3.1. Project Creation



Upgrade your account to avoid a break in service (₹25,509.17 credit and 6 days left in your trial).

	Name	Type	ID
✓	NAGP K8S DevOps	Project	nagp-k8s-devops-467617
	mutual-fund-investments-pwqe	Project	mutual-fund-investments-pwqe


console.cloud.google.com/iam-admin/iam?hl=en&inv=1&invt=Ab4Zog&project=nagp-k8s-devops-467617
Upgrade your account to avoid a break in service (₹25,509.17 credit and 6 days left in your trial).
Learn more
Upgrade
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NAGP K8S DevOps
Search (/) for resources, docs, products, and more
Search
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IAM
PAM
Principal Access Bound...
Organizations
Identity & Organization
Policy Troubleshooter
Policy Analyzer
Organization Policies
Service Accounts
Workload Identity Feder...
Workforce Identity Fed...
Manage Resources
Release Notes
IAM
Learn
Allow
Deny
Recommendations history

Permissions for project "NAGP K8S DevOps"

These permissions affect this project and all of its resources. Learn more

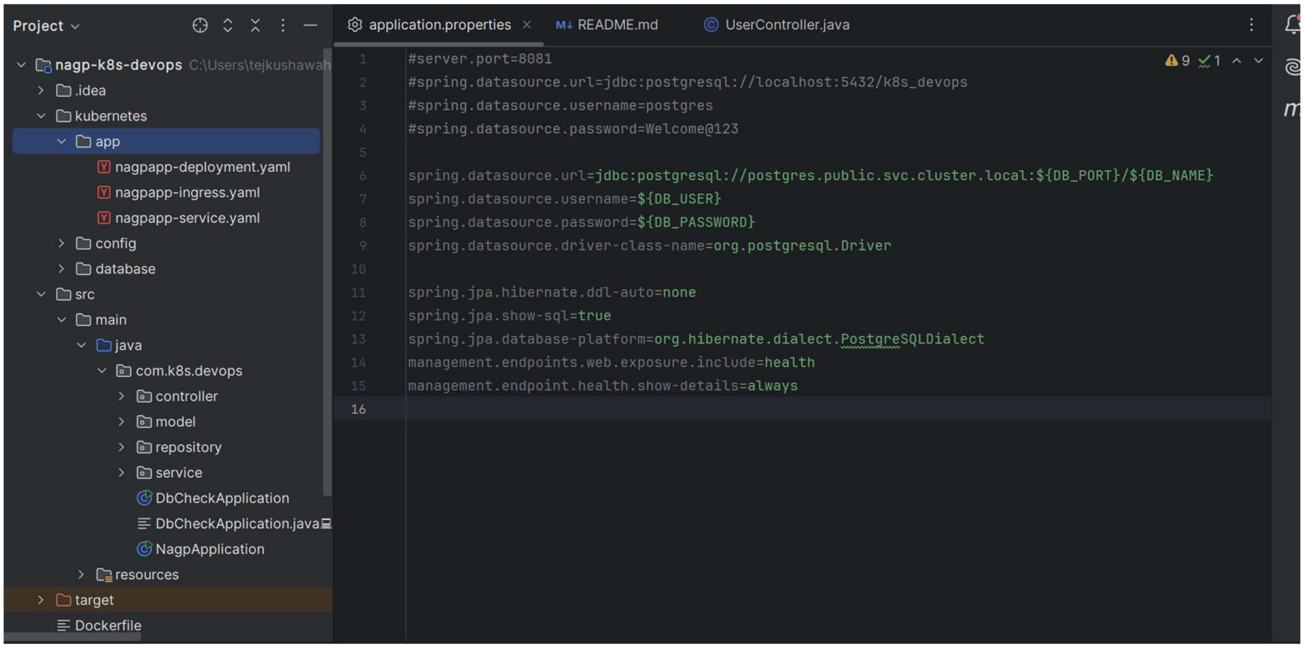
□ Include Google-provided role grants
View by principals
View by roles
Grant access
Remove access
Filter Enter property name or value

□	Type	Principal ↑	Name	Role	Security insights
□		676035721547-compute@developer.gserviceaccount.com	Compute Engine default service account	Editor	
□		tejpratapkushawaha9@gmail.com	Tejpratap Kushawaha	Owner	

4. Application Code

4.1. Application Structure

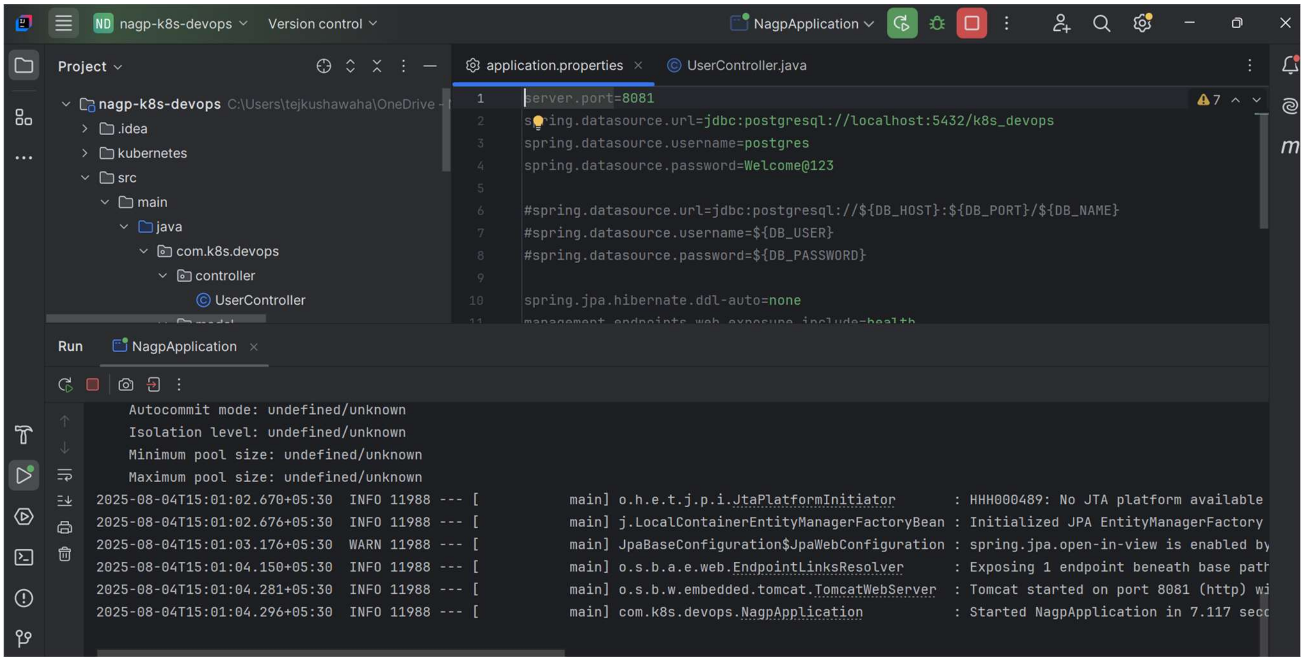
The application is a simple Java, Spring Boot, and Maven application with Postgres database.



```
nagp-k8s-devops C:\Users\tejkushawah
  .idea
  kubernetes
    app
      nagpapp-deployment.yaml
      nagpapp-ingress.yaml
      nagpapp-service.yaml
    config
    database
  src
    main
      java
        com.k8s.devops
          controller
          model
          repository
          service
          DbCheckApplication
          DbCheckApplication.java
          NagpApplication
      resources
  target
  Dockerfile
```

```
#server.port=8081
#spring.datasource.url=jdbc:postgresql://localhost:5432/k8s_devops
#spring.datasource.username=postgres
#spring.datasource.password=Welcome@123

spring.datasource.url=jdbc:postgresql://postgres.public.svc.cluster.local:${DB_PORT}/${DB_NAME}
spring.datasource.username=${DB_USER}
spring.datasource.password=${DB_PASSWORD}
spring.datasource.driver-class-name=org.postgresql.Driver

spring.jpa.hibernate.ddl-auto=none
spring.jpa.show-sql=true
spring.jpa.database-platform=org.hibernate.dialect.PostgreSQLDialect
management.endpoints.web.exposure.include=health
management.endpoint.health.show-details=always

```

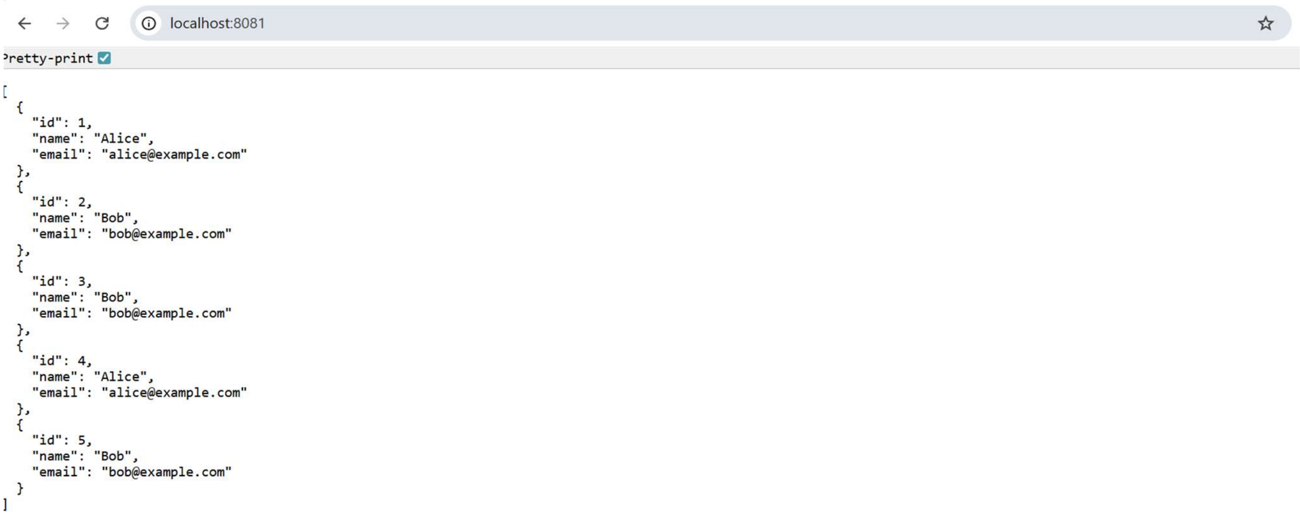
4.2. Running Application Locally



```
server.port=8081
spring.datasource.url=jdbc:postgresql://localhost:5432/k8s_devops
spring.datasource.username=postgres
spring.datasource.password=Welcome@123

#spring.datasource.url=jdbc:postgresql://${DB_HOST}:${DB_PORT}/${DB_NAME}
#spring.datasource.username=${DB_USER}
#spring.datasource.password=${DB_PASSWORD}

spring.jpa.hibernate.ddl-auto=none
management.endpoints.web.exposure.include=health
```

```
    Autocommit mode: undefined/unknown
    Isolation level: undefined/unknown
    Minimum pool size: undefined/unknown
    Maximum pool size: undefined/unknown
2025-08-04T15:01:02.670+05:30  INFO 11988 --- [           main] o.h.e.t.j.p.i.JtaPlatformInitiator       : HHH000489: No JTA platform available
2025-08-04T15:01:02.676+05:30  INFO 11988 --- [           main] j.LocalContainerEntityManagerFactoryBean : Initialized JPA EntityManagerFactory
2025-08-04T15:01:03.176+05:30  WARN 11988 --- [           main] JpaBaseConfiguration$JpaWebConfiguration : spring.jpa.open-in-view is enabled by
2025-08-04T15:01:04.150+05:30  INFO 11988 --- [           main] o.s.b.a.e.web.EndpointLinksResolver      : Exposing 1 endpoint beneath base path
2025-08-04T15:01:04.281+05:30  INFO 11988 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat started on port 8081 (http) wi
2025-08-04T15:01:04.296+05:30  INFO 11988 --- [           main] com.k8s.devops.NagpApplication           : Started NagpApplication in 7.117 secc
```

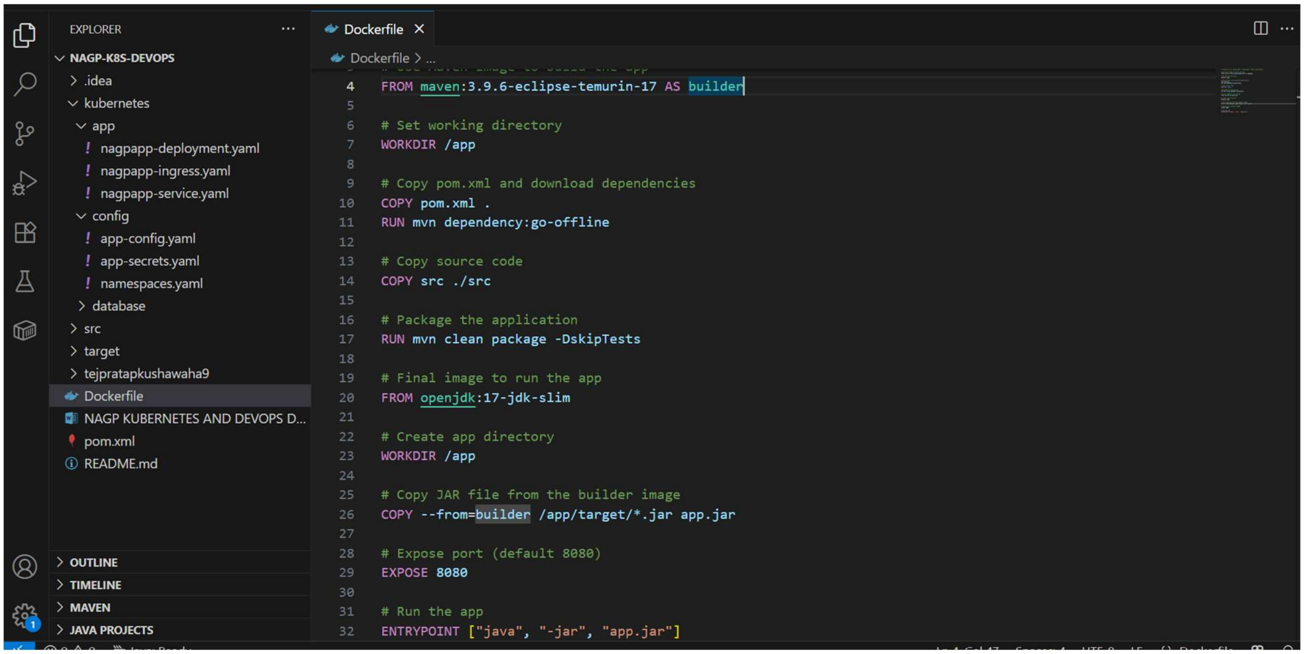
4.3. Running Application Locally



```
[
  {
    "id": 1,
    "name": "Alice",
    "email": "alice@example.com"
  },
  {
    "id": 2,
    "name": "Bob",
    "email": "bob@example.com"
  },
  {
    "id": 3,
    "name": "Bob",
    "email": "bob@example.com"
  },
  {
    "id": 4,
    "name": "Alice",
    "email": "alice@example.com"
  },
  {
    "id": 5,
    "name": "Bob",
    "email": "bob@example.com"
  }
]
```

5. Docker Configuration

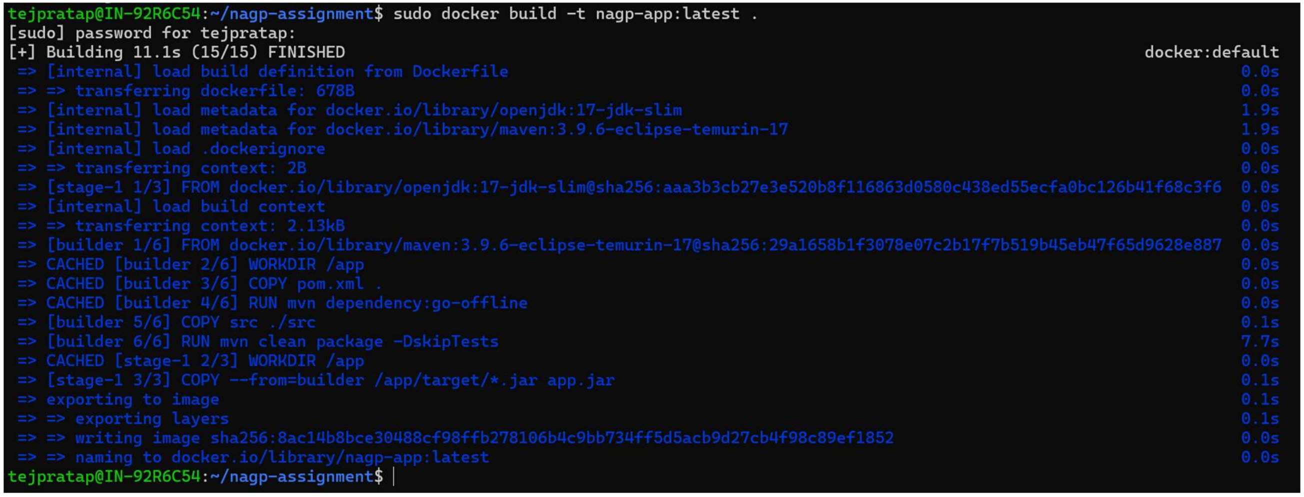
5.1. Dockerfile



```
# Use maven image to build the app
FROM maven:3.9.6-eclipse-temurin-17 AS builder

# Set working directory
WORKDIR /app

# Copy pom.xml and download dependencies
COPY pom.xml .
RUN mvn dependency:go-offline

# Copy source code
COPY src ./src

# Package the application
RUN mvn clean package -DskipTests

# Final image to run the app
FROM openjdk:17-jdk-slim

# Create app directory
WORKDIR /app

# Copy JAR file from the builder image
COPY --from=builder /app/target/*.jar app.jar

# Expose port (default 8080)
EXPOSE 8080

# Run the app
ENTRYPOINT ["java", "-jar", "app.jar"]
```

5.2. Build Docker Image

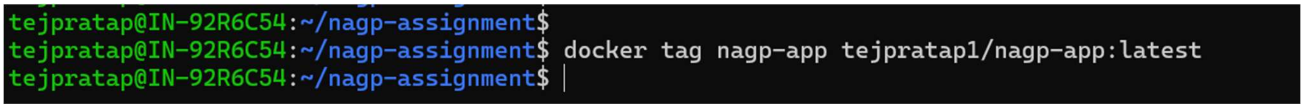
sudo docker build -t nagp-app:latest .



```
tejpratap@IN-92R6C54:~/nagp-assignment$ sudo docker build -t nagp-app:latest .
[sudo] password for tejpratap:
[+] Building 11.1s (15/15) FINISHED                                                                    docker:default
 => [internal] load build definition from Dockerfile                                                             0.0s
 => => transferring dockerfile: 678B                                                                             0.0s
 => [internal] load metadata for docker.io/library/openjdk:17-jdk-slim                                           1.9s
 => [internal] load metadata for docker.io/library/maven:3.9.6-eclipse-temurin-17                                1.9s
 => [internal] load .dockerignore                                                                                0.0s
 => => transferring context: 2B                                                                                  0.0s
 => [stage-1 1/3] FROM docker.io/library/openjdk:17-jdk-slim@sha256:aaa3b3cb27e3e520b8f116863d0580c438ed55ecfa0bc126b41f68c3f6  0.0s
 => [internal] load build context                                                                                0.0s
 => => transferring context: 2.13kB                                                                              0.0s
 => [builder 1/6] FROM docker.io/library/maven:3.9.6-eclipse-temurin-17@sha256:29a1658b1f3078e07c2b17f7b519b45eb47f65d9628e887  0.0s
 => CACHED [builder 2/6] WORKDIR /app                                                                            0.0s
 => CACHED [builder 3/6] COPY pom.xml .                                                                          0.0s
 => CACHED [builder 4/6] RUN mvn dependency:go-offline                                                           0.0s
 => [builder 5/6] COPY src ./src                                                                                 0.1s
 => [builder 6/6] RUN mvn clean package -DskipTests                                                              7.7s
 => CACHED [stage-1 2/3] WORKDIR /app                                                                            0.0s
 => [stage-1 3/3] COPY --from=builder /app/target/*.jar app.jar                                                  0.1s
 => exporting to image                                                                                           0.1s
 => => exporting layers                                                                                          0.1s
 => => writing image sha256:8ac14b8bce30488cf98ffb278106b4c9bb734ff5d5acb9d27cb4f98c89ef1852                     0.0s
 => => naming to docker.io/library/nagp-app:latest                                                               0.0s
tejpratap@IN-92R6C54:~/nagp-assignment$
```

5.3. Create Docker Tag

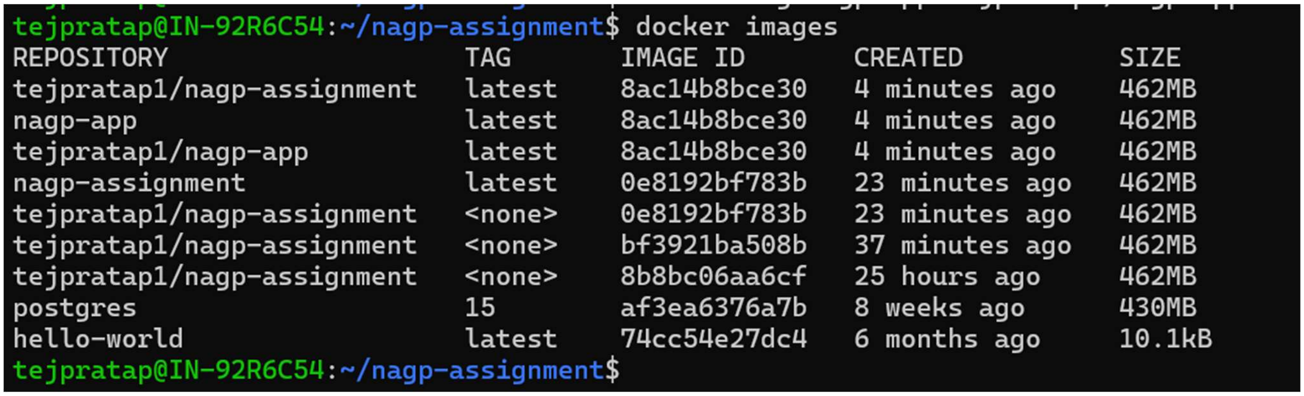
docker tag nagp-app tejpratap1/nagp-app:latest



```
tejpratap@IN-92R6C54:~/nagp-assignment$
tejpratap@IN-92R6C54:~/nagp-assignment$ docker tag nagp-app tejpratap1/nagp-app:latest
tejpratap@IN-92R6C54:~/nagp-assignment$
```

5.4. Check Docker Images

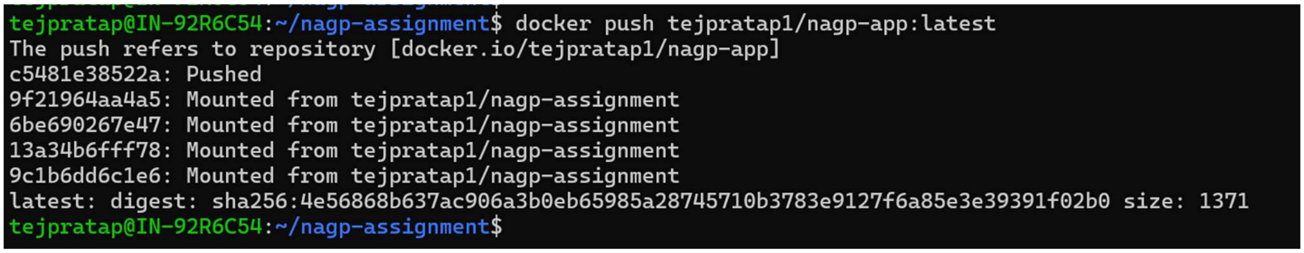
```
docker images
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker images
REPOSITORY                     TAG       IMAGE ID       CREATED          SIZE
tejpratap1/nagp-assignment     latest    8ac14b8bce30   4 minutes ago    462MB
nagp-app                       latest    8ac14b8bce30   4 minutes ago    462MB
tejpratap1/nagp-app            latest    8ac14b8bce30   4 minutes ago    462MB
nagp-assignment                latest    0e8192bf783b   23 minutes ago   462MB
tejpratap1/nagp-assignment     <none>    0e8192bf783b   23 minutes ago   462MB
tejpratap1/nagp-assignment     <none>    bf3921ba508b   37 minutes ago   462MB
tejpratap1/nagp-assignment     <none>    8b8bc06aa6cf   25 hours ago     462MB
postgres                       15        af3ea6376a7b   8 weeks ago      430MB
hello-world                    latest    74cc54e27dc4   6 months ago     10.1kB
tejpratap@IN-92R6C54:~/nagp-assignment$
```

5.5. Push Docker Image

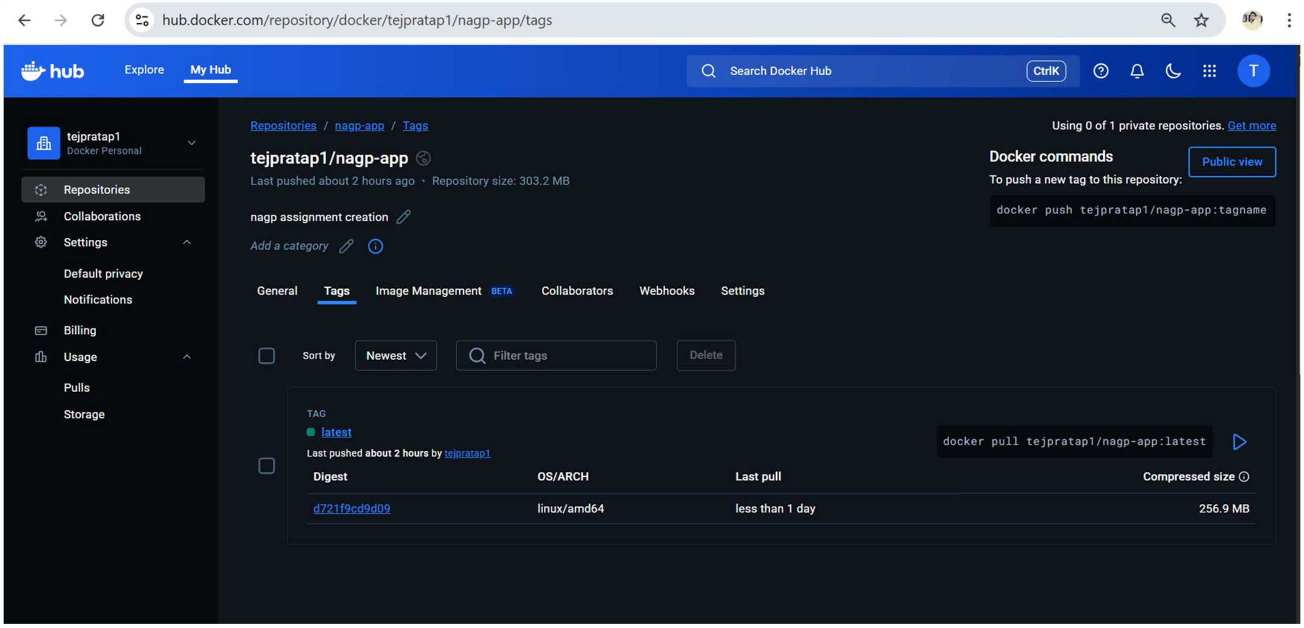
```
docker push tejpratap1/nagp-app:latest
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker push tejpratap1/nagp-app:latest
The push refers to repository [docker.io/tejpratap1/nagp-app]
c5481e38522a: Pushed
9f21964aa4a5: Mounted from tejpratap1/nagp-assignment
6be690267e47: Mounted from tejpratap1/nagp-assignment
13a34b6fff78: Mounted from tejpratap1/nagp-assignment
9c1b6dd6c1e6: Mounted from tejpratap1/nagp-assignment
latest: digest: sha256:4e56868b637ac906a3b0eb65985a28745710b3783e9127f6a85e3e39391f02b0 size: 1371
tejpratap@IN-92R6C54:~/nagp-assignment$
```

5.6. Docker Hub Repository

https://hub.docker.com/repositories/tejpratap1



tejpratap1/nagp-app

Last pushed about 2 hours ago • Repository size: 303.2 MB

nagp assignment creation

Add a category

Using 0 of 1 private repositories. Get more

Docker commands

To push a new tag to this repository:

```
docker push tejpratap1/nagp-app:tagname
```

TAG

latest

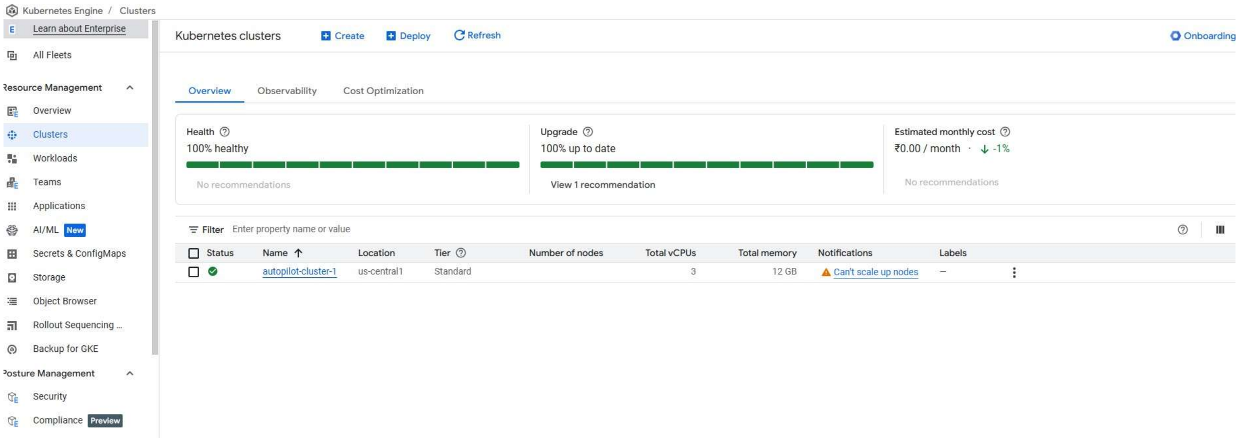
Last pushed about 2 hours by tejpratap1

```
docker pull tejpratap1/nagp-app:latest
```

Digest	OS/ARCH	Last pull	Compressed size
d721f9cd9d09	linux/amd64	less than 1 day	256.9 MB

6. Kubernetes Cluster Setup

6.1. Cluster Creation



Kubernetes clusters

Health 100% healthy — No recommendations

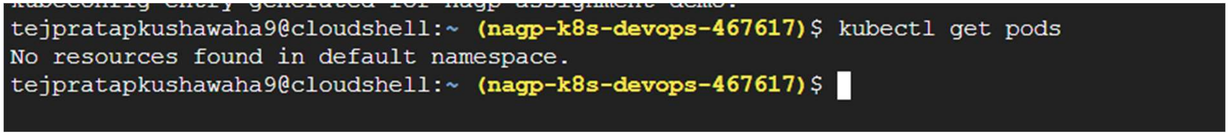
Upgrade 100% up to date — View 1 recommendation

Estimated monthly cost ₹0.00 / month · ↓ -1% — No recommendations

Status	Name ↑	Location	Tier	Number of nodes	Total vCPUs	Total memory	Notifications	Labels
✓	autopilot-cluster-1	us-central1	Standard		3	12 GB	⚠ Can't scale up nodes	—

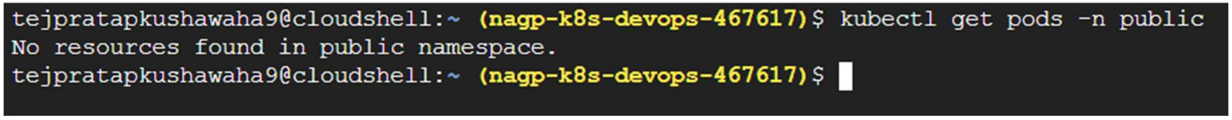
6.2. Check Running Pod

kubectl get pods



```
tejpratapkushawaha9@cloudshell:~ (nagp-k8s-devops-467617)$ kubectl get pods
No resources found in default namespace.
tejpratapkushawaha9@cloudshell:~ (nagp-k8s-devops-467617)$
```

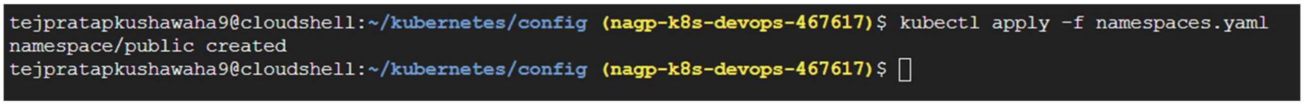
kubectl get pods -n public



```
tejpratapkushawaha9@cloudshell:~ (nagp-k8s-devops-467617)$ kubectl get pods -n public
No resources found in public namespace.
tejpratapkushawaha9@cloudshell:~ (nagp-k8s-devops-467617)$
```

6.3. Namespace Creation

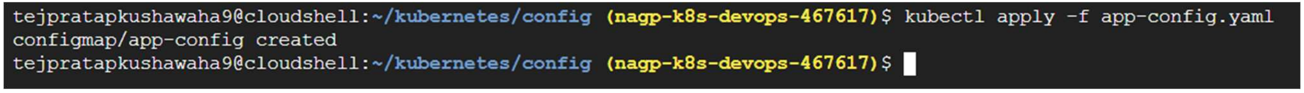
cd kubernetes/config/
kubectl apply -f namespaces.yaml



```
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$ kubectl apply -f namespaces.yaml
namespace/public created
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$
```

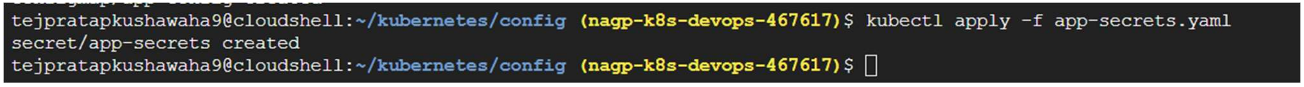
6.4. ConfigMaps and Secrets

kubectl apply -f app-config.yaml



```
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$ kubectl apply -f app-config.yaml
configmap/app-config created
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$
```

kubectl apply -f app-secrets.yaml

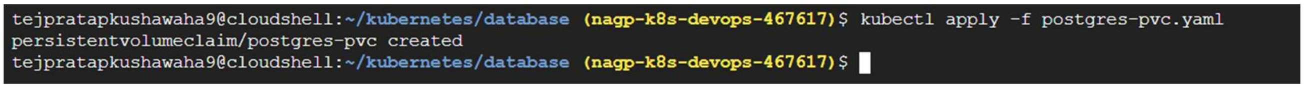


```
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$ kubectl apply -f app-secrets.yaml
secret/app-secrets created
tejpratapkushawaha9@cloudshell:~/kubernetes/config (nagp-k8s-devops-467617)$
```

7. PostgreSQL Deployment

7.1. Deploy PersistentVolumeClaim for PostgreSQL

```
cd ../database/
kubectl apply -f postgres-pvc.yaml
```

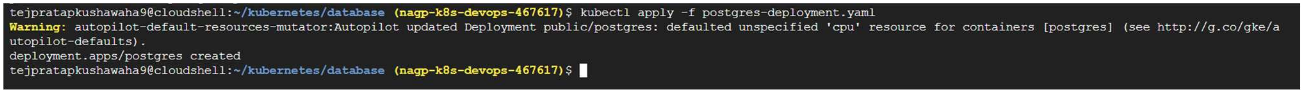


```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl apply -f postgres-pvc.yaml
persistentvolumeclaim/postgres-pvc created
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

This will create a PersistentVolume automatically via default storage class.

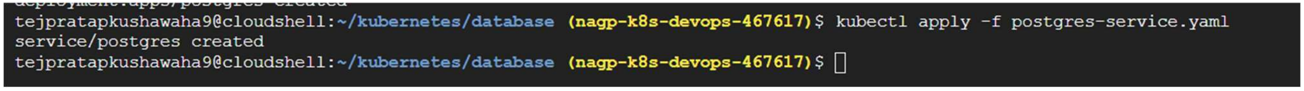
7.2. Deploy PostgreSQL

```
kubectl apply -f postgres-deployment.yaml
```



```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl apply -f postgres-deployment.yaml
Warning: autopilot-default-resources-mutator:Autopilot updated Deployment public/postgres: defaulted unspecified 'cpu' resource for containers [postgres] (see http://g.co/gke/a
utopilot-defaults).
deployment.apps/postgres created
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

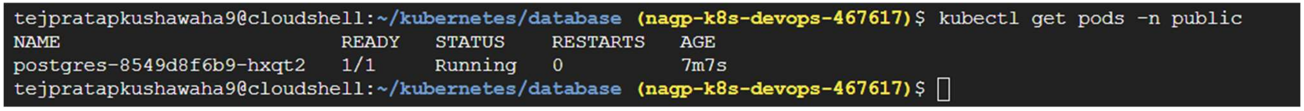
```
kubectl apply -f postgres-service.yaml
```



```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl apply -f postgres-service.yaml
service/postgres created
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

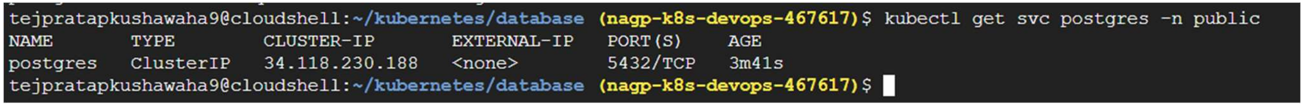
This creates the DB pod and service. Verify with:

```
kubectl get pods -n public
```



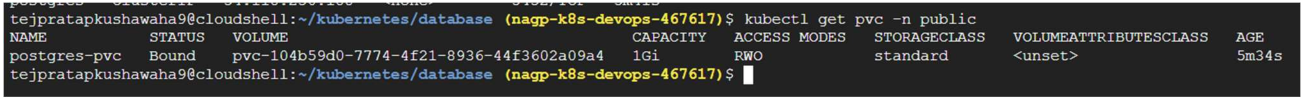
```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl get pods -n public
NAME                         READY   STATUS    RESTARTS   AGE
postgres-8549d8f6b9-hxqt2    1/1     Running   0          7m7s
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

```
kubectl get svc postgres -n public
```



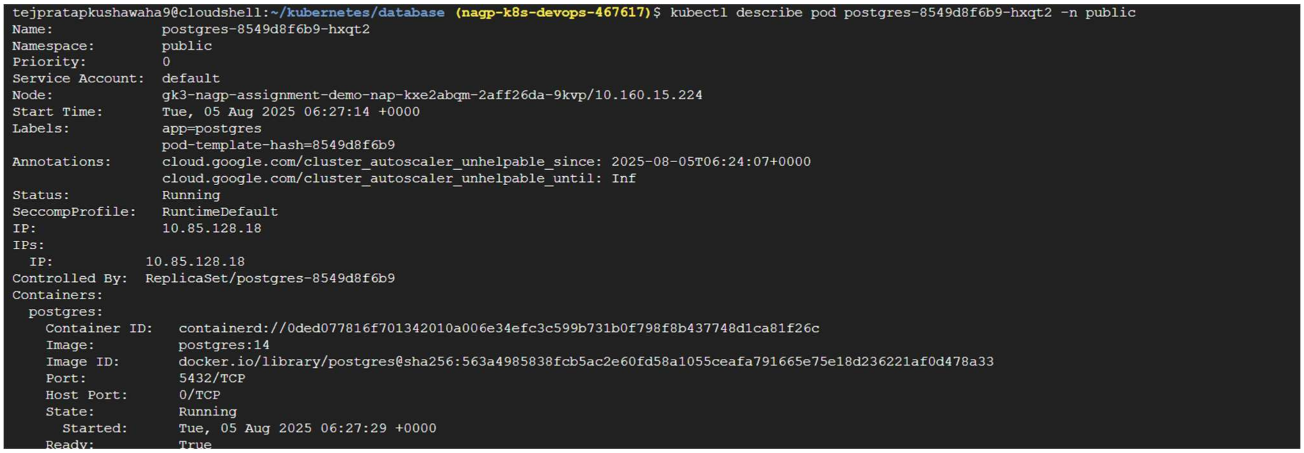
```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl get svc postgres -n public
NAME       TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
postgres   ClusterIP   34.118.230.188   <none>        5432/TCP   3m41s
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

```
kubectl get pvc -n public
```



```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl get pvc -n public
NAME           STATUS   VOLUME                                     CAPACITY   ACCESS MODES   STORAGECLASS   VOLUMEATTRIBUTESCLASS   AGE
postgres-pvc   Bound    pvc-104b59d0-7774-4f21-8936-44f3602a09a4   1Gi        RWO            standard       <unset>                 5m34s
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

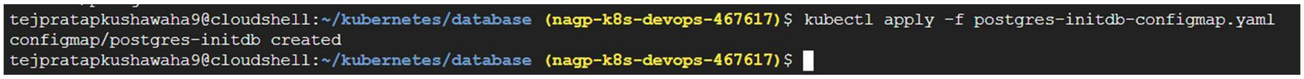
```
kubectl describe pod postgres-8549d8f6b9-62qpm -n public
```



```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl describe pod postgres-8549d8f6b9-hxqt2 -n public
Name:             postgres-8549d8f6b9-hxqt2
Namespace:        public
Priority:         0
Service Account:  default
Node:             gk3-nagp-assignment-demo-nap-kxe2abqm-2aff26da-9kvp/10.160.15.224
Start Time:       Tue, 05 Aug 2025 06:27:14 +0000
Labels:           app=postgres
                  pod-template-hash=8549d8f6b9
Annotations:      cloud.google.com/cluster_autoscaler_unhelpable_since: 2025-08-05T06:24:07+0000
                  cloud.google.com/cluster_autoscaler_unhelpable_until: Inf
Status:           Running
SeccompProfile:   RuntimeDefault
IP:               10.85.128.18
IPs:
  IP:           10.85.128.18
Controlled By:  ReplicaSet/postgres-8549d8f6b9
Containers:
  postgres:
    Container ID:   containerd://0ded077816f701342010a006e34efc3c599b731b0f798f8b437748d1ca81f26c
    Image:          postgres:14
    Image ID:       docker.io/library/postgres@sha256:563a4985838fcb5ac2e60fd58a1055ceafa791665e75e18d236221af0d478a33
    Port:           5432/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Tue, 05 Aug 2025 06:27:29 +0000
    Ready:          True
```

7.3. Run insert script

kubectl apply -f postgres-initdb-configmap.yaml

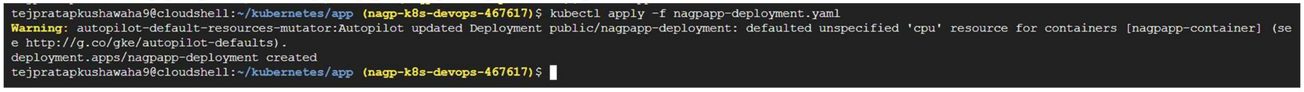


```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ kubectl apply -f postgres-initdb-configmap.yaml
configmap/postgres-initdb created
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

8. Deploy Java Spring Boot service

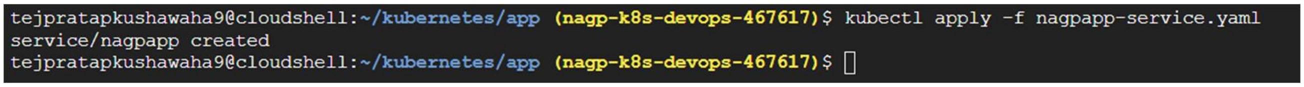
8.1. Application deployment

cd ../app/
kubectl apply -f nagpapp-deployment.yaml



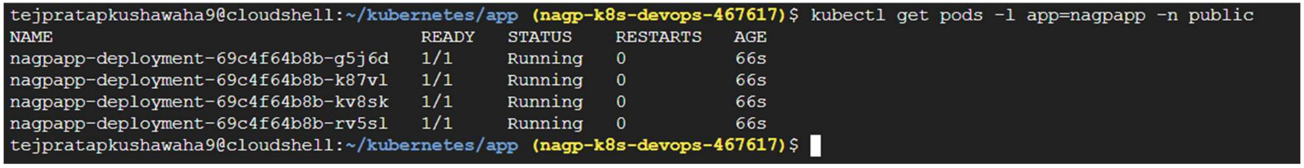
```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl apply -f nagpapp-deployment.yaml
Warning: autopilot-default-resources-mutator:Autopilot updated Deployment public/nagpapp-deployment: defaulted unspecified 'cpu' resource for containers [nagpapp-container] (se
e http://g.co/gke/autopilot-defaults).
deployment.apps/nagpapp-deployment created
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

kubectl apply -f nagpapp-service.yaml



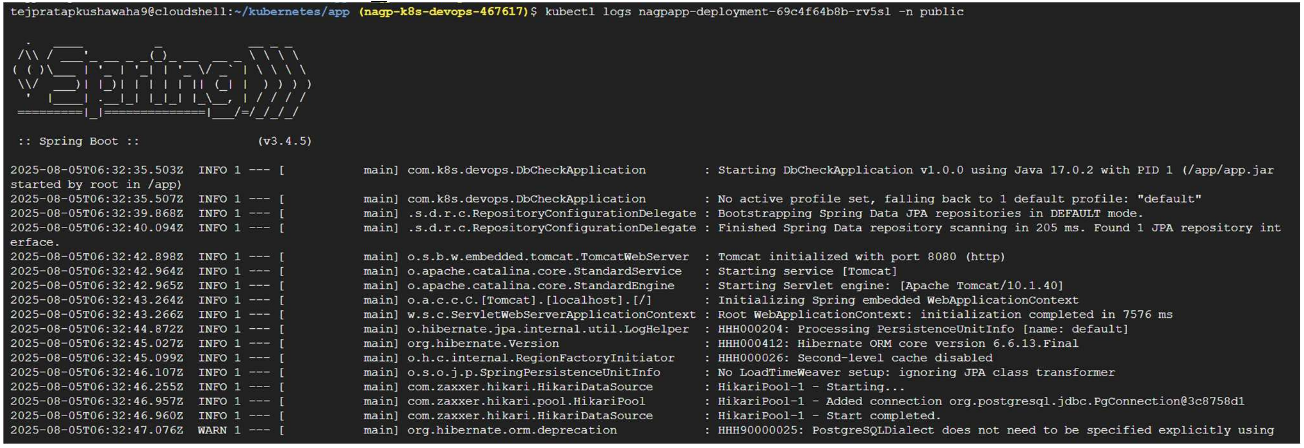
```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl apply -f nagpapp-service.yaml
service/nagpapp created
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

Check replicas are running:
kubectl get pods -l app=nagpapp -n public



```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl get pods -l app=nagpapp -n public
NAME                                  READY   STATUS    RESTARTS   AGE
nagpapp-deployment-69c4f64b8b-g5j6d   1/1     Running   0          66s
nagpapp-deployment-69c4f64b8b-k87vl   1/1     Running   0          66s
nagpapp-deployment-69c4f64b8b-kv8sk   1/1     Running   0          66s
nagpapp-deployment-69c4f64b8b-rv5sl   1/1     Running   0          66s
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

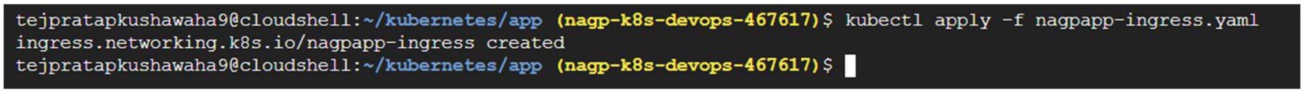
Service logs:
kubectl logs <container_id> -n public



```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl logs nagpapp-deployment-69c4f64b8b-rv5sl -n public

  .   ____          _            __ _ _
 /\\ / ___'_ __ _ _(_)_ __  __ _ \ \ \ \
( ( )\___ | '_ | '_| | '_ \/ _` | \ \ \ \
 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
  '  |____| .__|_| |_|_| |_\__, | / / / /
 =========|_|==============|___/=/_/_/_/

 :: Spring Boot ::                (v3.4.5)

2025-08-05T06:32:35.503Z  INFO 1 --- [           main] com.k8s.devops.DbCheckApplication        : Starting DbCheckApplication v1.0.0 using Java 17.0.2 with PID 1 (/app/app.jar
started by root in /app)
2025-08-05T06:32:35.507Z  INFO 1 --- [           main] com.k8s.devops.DbCheckApplication        : No active profile set, falling back to 1 default profile: "default"
2025-08-05T06:32:39.868Z  INFO 1 --- [           main] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
2025-08-05T06:32:40.094Z  INFO 1 --- [           main] .s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository scanning in 205 ms. Found 1 JPA repository int
erface.
2025-08-05T06:32:42.898Z  INFO 1 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port 8080 (http)
2025-08-05T06:32:42.964Z  INFO 1 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2025-08-05T06:32:42.965Z  INFO 1 --- [           main] o.apache.catalina.core.StandardEngine    : Starting Servlet engine: [Apache Tomcat/10.1.40]
2025-08-05T06:32:43.264Z  INFO 1 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApplicationContext
2025-08-05T06:32:43.266Z  INFO 1 --- [           main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 7576 ms
2025-08-05T06:32:44.872Z  INFO 1 --- [           main] o.hibernate.jpa.internal.util.LogHelper  : HHH000204: Processing PersistenceUnitInfo [name: default]
2025-08-05T06:32:45.027Z  INFO 1 --- [           main] org.hibernate.Version                    : HHH000412: Hibernate ORM core version 6.6.13.Final
2025-08-05T06:32:45.099Z  INFO 1 --- [           main] o.h.c.internal.RegionFactoryInitiator    : HHH000026: Second-level cache disabled
2025-08-05T06:32:46.107Z  INFO 1 --- [           main] o.s.o.j.p.SpringPersistenceUnitInfo      : No LoadTimeWeaver setup: ignoring JPA class transformer
2025-08-05T06:32:46.255Z  INFO 1 --- [           main] com.zaxxer.hikari.HikariDataSource       : HikariPool-1 - Starting...
2025-08-05T06:32:46.957Z  INFO 1 --- [           main] com.zaxxer.hikari.pool.HikariPool        : HikariPool-1 - Added connection org.postgresql.jdbc.PgConnection@3c8758d1
2025-08-05T06:32:46.960Z  INFO 1 --- [           main] com.zaxxer.hikari.HikariDataSource       : HikariPool-1 - Start completed.
2025-08-05T06:32:47.076Z  WARN 1 --- [           main] org.hibernate.orm.deprecation            : HHH90000025: PostgreSQLDialect does not need to be specified explicitly using
```

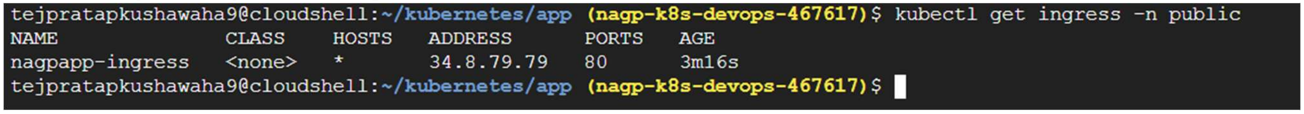
8.2. Apply Ingress

kubectl apply -f nagpapp-ingress.yaml



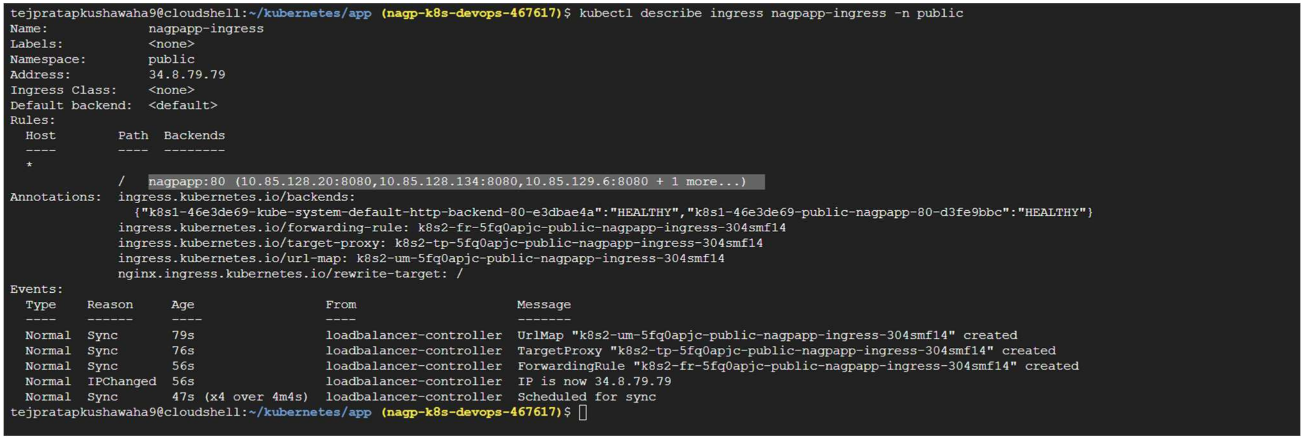
```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl apply -f nagpapp-ingress.yaml
ingress.networking.k8s.io/nagpapp-ingress created
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

kubectl get ingress -n public



```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl get ingress -n public
NAME              CLASS    HOSTS   ADDRESS      PORTS   AGE
nagpapp-ingress   <none>   *       34.8.79.79   80      3m16s
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

kubectl describe ingress nagpapp-ingress -n public

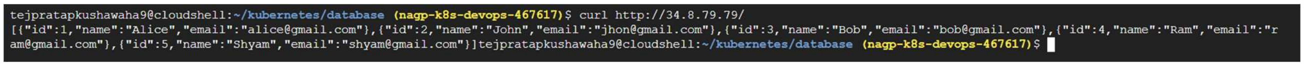


```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl describe ingress nagpapp-ingress -n public
Name:             nagpapp-ingress
Labels:           <none>
Namespace:        public
Address:          34.8.79.79
Ingress Class:    <none>
Default backend:  <default>
Rules:
  Host        Path  Backends
  ----        ----  --------
  *
              /   nagpapp:80 (10.85.128.20:8080,10.85.128.134:8080,10.85.129.6:8080 + 1 more...)
Annotations:  ingress.kubernetes.io/backends:
                {"k8s1-46e3de69-kube-system-default-http-backend-80-e3dbae4a":"HEALTHY","k8s1-46e3de69-public-nagpapp-80-d3fe9bbc":"HEALTHY"}
              ingress.kubernetes.io/forwarding-rule: k8s2-fr-5fq0apjc-public-nagpapp-ingress-304smf14
              ingress.kubernetes.io/target-proxy: k8s2-tp-5fq0apjc-public-nagpapp-ingress-304smf14
              ingress.kubernetes.io/url-map: k8s2-um-5fq0apjc-public-nagpapp-ingress-304smf14
              nginx.ingress.kubernetes.io/rewrite-target: /
Events:
  Type    Reason     Age                 From                     Message
  ----    ------     ----                ----                     -------
  Normal  Sync       79s                 loadbalancer-controller  UrlMap "k8s2-um-5fq0apjc-public-nagpapp-ingress-304smf14" created
  Normal  Sync       76s                 loadbalancer-controller  TargetProxy "k8s2-tp-5fq0apjc-public-nagpapp-ingress-304smf14" created
  Normal  Sync       56s                 loadbalancer-controller  ForwardingRule "k8s2-fr-5fq0apjc-public-nagpapp-ingress-304smf14" created
  Normal  IPChanged  56s                 loadbalancer-controller  IP is now 34.8.79.79
  Normal  Sync       47s (x4 over 4m4s)  loadbalancer-controller  Scheduled for sync
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

will show an external IP under the ADDRESS column. This is the Load Balancer for nagp-app.

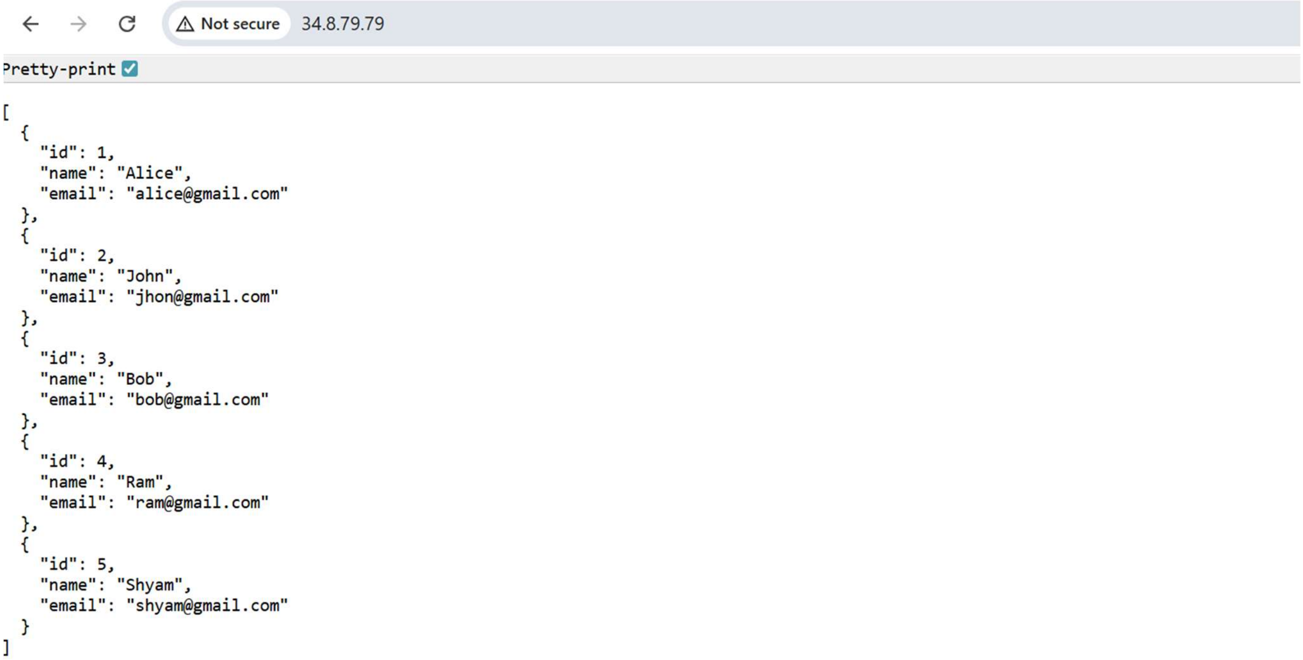
8.3. Verify Service by External IP, CMD:

curl http://34.8.79.79/



```
tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$ curl http://34.8.79.79/
[{"id":1,"name":"Alice","email":"alice@gmail.com"},{"id":2,"name":"John","email":"jhon@gmail.com"},{"id":3,"name":"Bob","email":"bob@gmail.com"},{"id":4,"name":"Ram","email":"r
am@gmail.com"},{"id":5,"name":"Shyam","email":"shyam@gmail.com"}]tejpratapkushawaha9@cloudshell:~/kubernetes/database (nagp-k8s-devops-467617)$
```

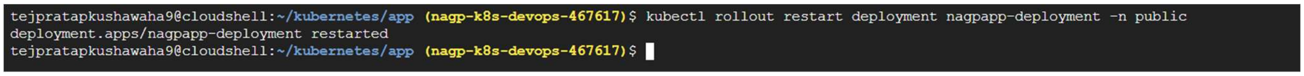
8.4. Verify Service by External IP, Browser:



```
[
  {
    "id": 1,
    "name": "Alice",
    "email": "alice@gmail.com"
  },
  {
    "id": 2,
    "name": "John",
    "email": "jhon@gmail.com"
  },
  {
    "id": 3,
    "name": "Bob",
    "email": "bob@gmail.com"
  },
  {
    "id": 4,
    "name": "Ram",
    "email": "ram@gmail.com"
  },
  {
    "id": 5,
    "name": "Shyam",
    "email": "shyam@gmail.com"
  }
]
```

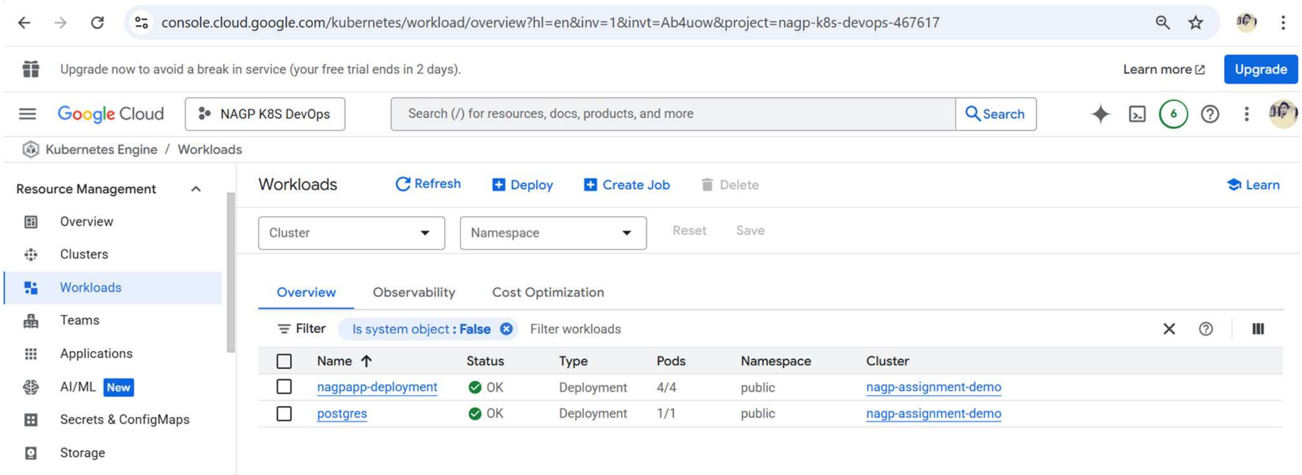
8.5. Restart Service Deployment:

```
kubectl rollout restart deployment nagpapp-deployment -n public
```



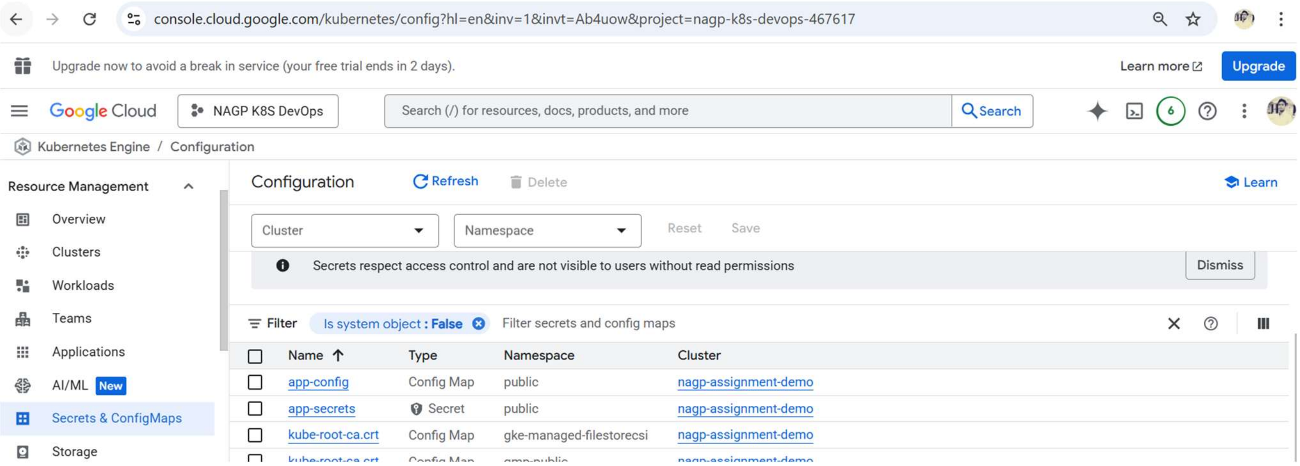
```
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$ kubectl rollout restart deployment nagpapp-deployment -n public
deployment.apps/nagpapp-deployment restarted
tejpratapkushawaha9@cloudshell:~/kubernetes/app (nagp-k8s-devops-467617)$
```

8.6. Workloads After Deployment



Name ↑	Status	Type	Pods	Namespace	Cluster
nagpapp-deployment	OK	Deployment	4/4	public	nagp-assignment-demo
postgres	OK	Deployment	1/1	public	nagp-assignment-demo

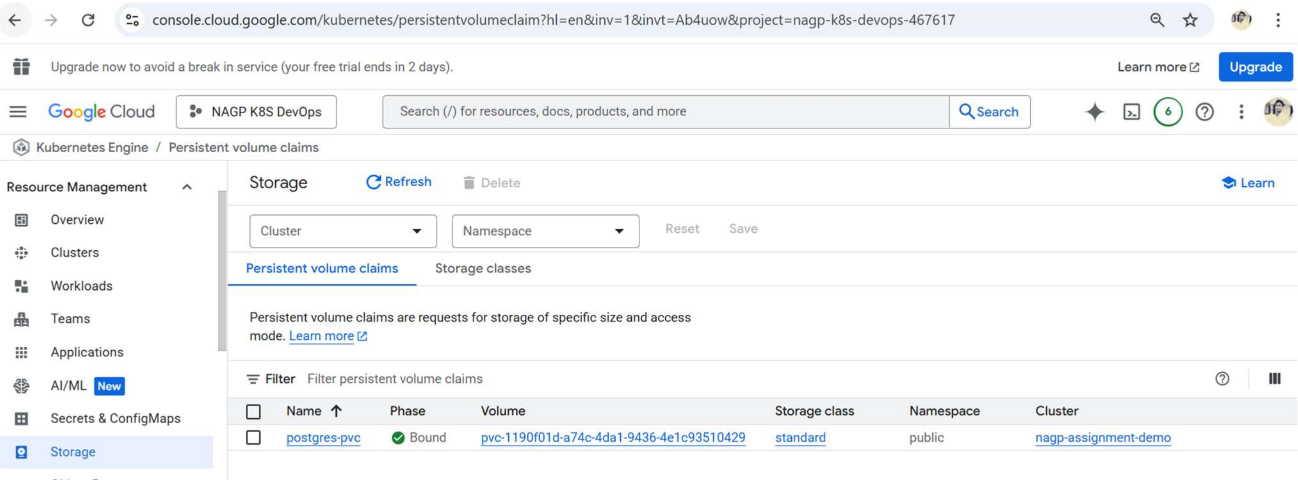
8.7. Config & Secrets


console.cloud.google.com/kubernetes/config?hl=en&inv=1&invt=Ab4uow&project=nagp-k8s-devops-467617
Upgrade now to avoid a break in service (your free trial ends in 2 days).
Learn more
Upgrade
Google Cloud
NAGP K8S DevOps
Search (/) for resources, docs, products, and more
Search
Kubernetes Engine / Configuration
Resource Management
Overview
Clusters
Workloads
Teams
Applications
AI/ML New
Secrets & ConfigMaps
Storage
Configuration
Refresh
Delete
Learn
Cluster
Namespace
Reset
Save
Dismiss
Filter
Is system object : False
Filter secrets and config maps

Secrets respect access control and are not visible to users without read permissions

Name ↑	Type	Namespace	Cluster
app-config	Config Map	public	nagp-assignment-demo
app-secrets	Secret	public	nagp-assignment-demo
kube-root-ca.crt	Config Map	gke-managed-filestorecsi	nagp-assignment-demo
kube-root-ca.crt	Config Map	gmp-public	nagp-assignment-demo

8.8. Postgres Storage



console.cloud.google.com/kubernetes/persistentvolumeclaim?hl=en&inv=1&invt=Ab4uow&project=nagp-k8s-devops-467617

Upgrade now to avoid a break in service (your free trial ends in 2 days). Learn more Upgrade

Storage

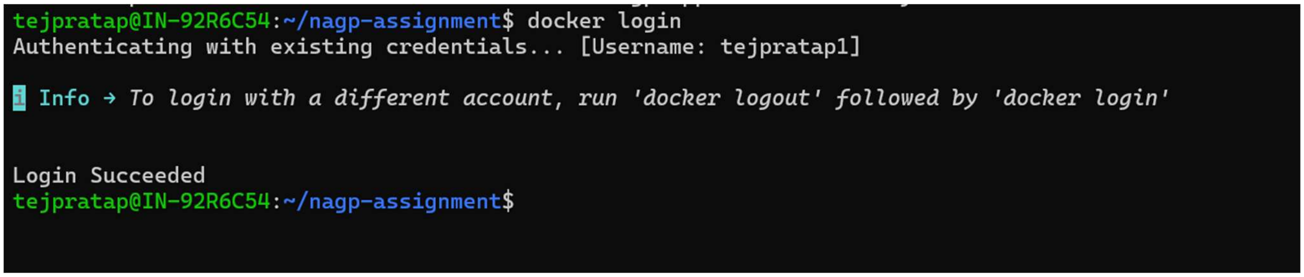
Persistent volume claims are requests for storage of specific size and access mode. Learn more

Name	Phase	Volume	Storage class	Namespace	Cluster
postgres-pvc	✓ Bound	pvc-1190f01d-a74c-4da1-9436-4e1c93510429	standard	public	nagp-assignment-demo

9. Deploy Application Using Docker

9.1. Create a Docker network

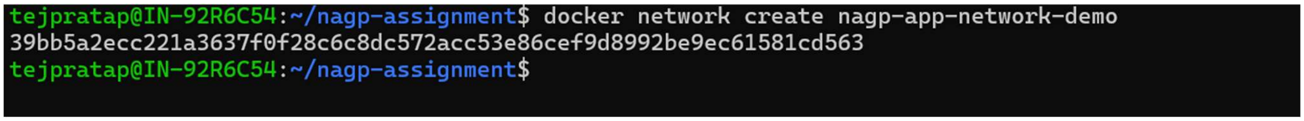
docker login



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker login
Authenticating with existing credentials... [Username: tejpratap1]

i Info → To login with a different account, run 'docker logout' followed by 'docker login'


Login Succeeded
tejpratap@IN-92R6C54:~/nagp-assignment$
```

9.2. Create a Docker network

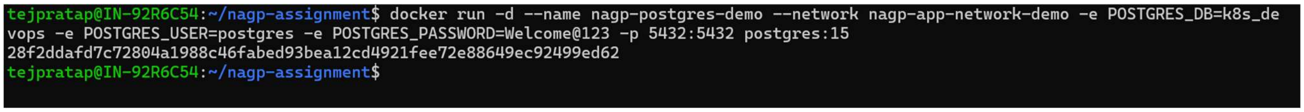
docker network create nagp-app-network-demo



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker network create nagp-app-network-demo
39bb5a2ecc221a3637f0f28c6c8dc572acc53e86cef9d8992be9ec61581cd563
tejpratap@IN-92R6C54:~/nagp-assignment$
```

9.3. Start PostgreSQL container

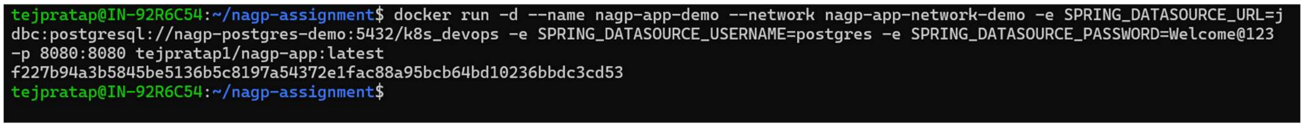
docker run -d --name nagp-postgres-demo --network nagp-app-network-demo -e POSTGRES_DB=k8s_devops -e POSTGRES_USER=postgres -e POSTGRES_PASSWORD=Welcome@123 -p 5432:5432 postgres:15



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker run -d --name nagp-postgres-demo --network nagp-app-network-demo -e POSTGRES_DB=k8s_de
vops -e POSTGRES_USER=postgres -e POSTGRES_PASSWORD=Welcome@123 -p 5432:5432 postgres:15
28f2ddafd7c72804a1988c46fabed93bea12cd4921fee72e88649ec92499ed62
tejpratap@IN-92R6C54:~/nagp-assignment$
```

9.4. Run your Spring Boot app container

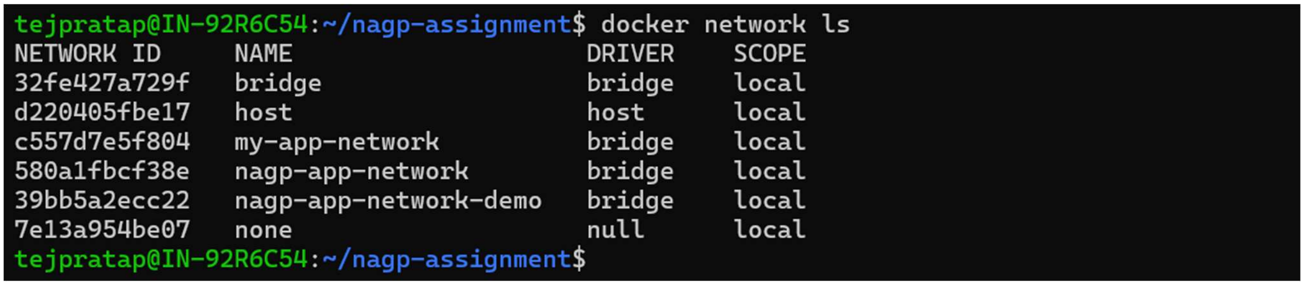
```
docker run -d --name nagp-app-demo --network nagp-app-network-demo -e
SPRING_DATASOURCE_URL=jdbc:postgresql://nagp-postgres-demo:5432/k8s_devops -e
SPRING_DATASOURCE_USERNAME=postgres -e SPRING_DATASOURCE_PASSWORD=Welcome@123 -p
8080:8080 tejpratap1/nagp-app:latest
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker run -d --name nagp-app-demo --network nagp-app-network-demo -e SPRING_DATASOURCE_URL=j
dbc:postgresql://nagp-postgres-demo:5432/k8s_devops -e SPRING_DATASOURCE_USERNAME=postgres -e SPRING_DATASOURCE_PASSWORD=Welcome@123
-p 8080:8080 tejpratap1/nagp-app:latest
f227b94a3b5845be5136b5c8197a54372e1fac88a95bcb64bd10236bbdc3cd53
tejpratap@IN-92R6C54:~/nagp-assignment$
```

9.5. Verify Docker Network

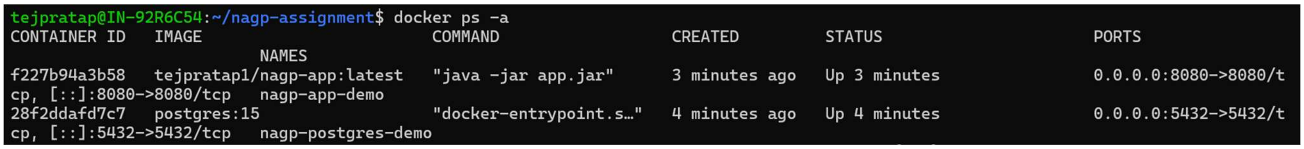
```
docker network ls
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker network ls
NETWORK ID     NAME                    DRIVER    SCOPE
32fe427a729f   bridge                  bridge    local
d220405fbe17   host                    host      local
c557d7e5f804   my-app-network          bridge    local
580a1fbcf38e   nagp-app-network        bridge    local
39bb5a2ecc22   nagp-app-network-demo   bridge    local
7e13a954be07   none                    null      local
tejpratap@IN-92R6C54:~/nagp-assignment$
```

9.6. Docker Running container

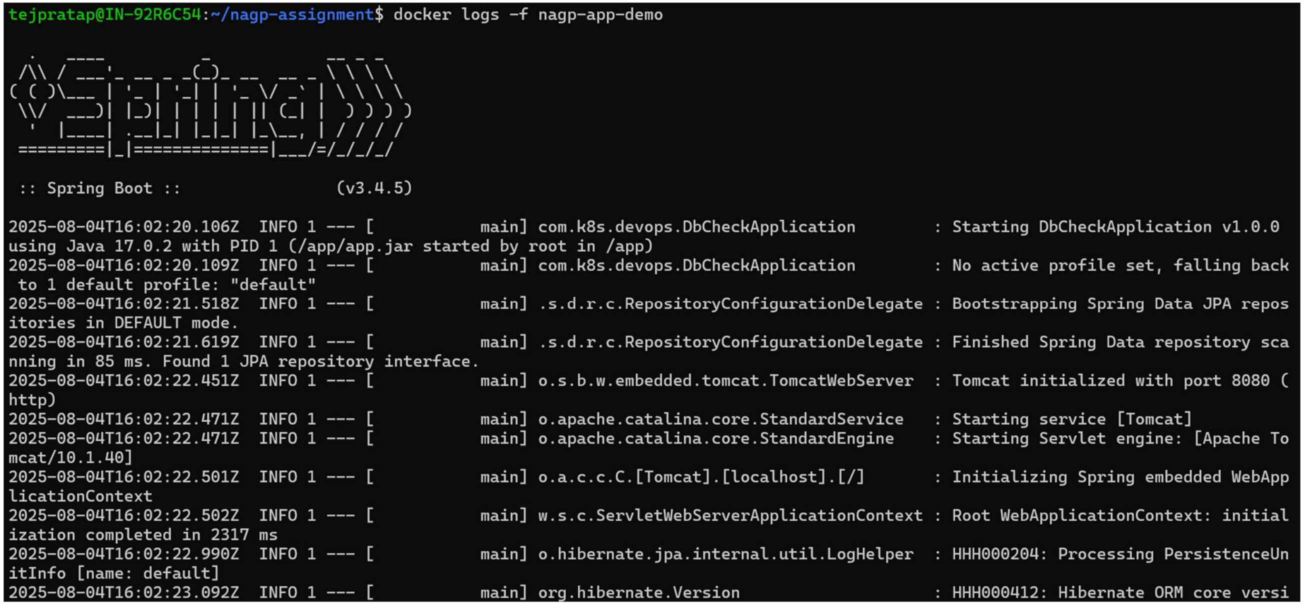
```
docker ps -a
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker ps -a
CONTAINER ID   IMAGE                        COMMAND                  CREATED         STATUS                        PORTS
                          NAMES
f227b94a3b58   tejpratap1/nagp-app:latest   "java -jar app.jar"      3 minutes ago   Up 3 minutes                  0.0.0.0:8080->8080/t
cp, [::]:8080->8080/tcp   nagp-app-demo
28f2ddafd7c7   postgres:15                  "docker-entrypoint.s…"   4 minutes ago   Up 4 minutes                  0.0.0.0:5432->5432/t
cp, [::]:5432->5432/tcp   nagp-postgres-demo
```

9.7. Run your Spring Boot app container

```
Docker logs -f nagp-app-demo
```



```
tejpratap@IN-92R6C54:~/nagp-assignment$ docker logs -f nagp-app-demo

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 \\/  ___)| |_)| | | | | || (_| |  ) ) ) )
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 =========|_|==============|___/=/_/_/_/

 :: Spring Boot ::                (v3.4.5)

2025-08-04T16:02:20.106Z  INFO 1 --- [           main] com.k8s.devops.DbCheckApplication        : Starting DbCheckApplication v1.0.0
using Java 17.0.2 with PID 1 (/app/app.jar started by root in /app)
2025-08-04T16:02:20.109Z  INFO 1 --- [           main] com.k8s.devops.DbCheckApplication        : No active profile set, falling back
 to 1 default profile: "default"
2025-08-04T16:02:21.518Z  INFO 1 --- [           main] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repos
itories in DEFAULT mode.
2025-08-04T16:02:21.619Z  INFO 1 --- [           main] .s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository sca
nning in 85 ms. Found 1 JPA repository interface.
2025-08-04T16:02:22.451Z  INFO 1 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer  : Tomcat initialized with port 8080 (
http)
2025-08-04T16:02:22.471Z  INFO 1 --- [           main] o.apache.catalina.core.StandardService   : Starting service [Tomcat]
2025-08-04T16:02:22.471Z  INFO 1 --- [           main] o.apache.catalina.core.StandardEngine    : Starting Servlet engine: [Apache To
mcat/10.1.40]
2025-08-04T16:02:22.501Z  INFO 1 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]       : Initializing Spring embedded WebApp
licationContext
2025-08-04T16:02:22.502Z  INFO 1 --- [           main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initial
ization completed in 2317 ms
2025-08-04T16:02:22.990Z  INFO 1 --- [           main] o.hibernate.jpa.internal.util.LogHelper  : HHH000204: Processing PersistenceUn
itInfo [name: default]
2025-08-04T16:02:23.092Z  INFO 1 --- [           main] org.hibernate.Version                    : HHH000412: Hibernate ORM core versi
```
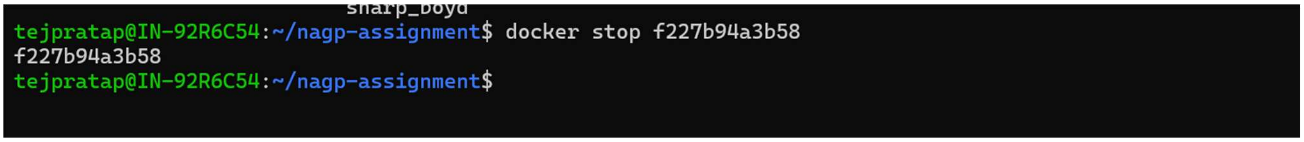

9.8. Stop all running containers

docker stop f227b94a3b58



```
                                          sharp_boyd
tejpratap@IN-92R6C54:~/nagp-assignment$ docker stop f227b94a3b58
f227b94a3b58
tejpratap@IN-92R6C54:~/nagp-assignment$
```