WOJSKOWA AKADEMIA TECHNICZNA
im. Jarosława Dąbrowskiego
WYDZIAŁ CYBERNETYKI

STUDIA II°

Temat: **SPRAWOZDANIE Z REALIZACJI ĆWICZENIA LABORATORYJNEGO**

INFORMATYKA
....
(kierunek studiów)

INŻYNIERIA SYSTEMÓW
....
(specjalność)

Wykonał:

Radosław Relidzyński

Prowadzący:

mgr inż. Tomasz Gutowski

Warszawa 2023

Rozdział I. Treść zadań

I.1. Etap 1

I etap:

- **Pod:**
  - Obraz Docker dla aplikacji FastApi
    z wcześniejszego spotkania (bez bazy danych)
  - Dodanie obrazu do lokalnego rejestru
  - YAML dla Kubernetes'a – pojedynczy Pod
  - Przekierowanie portów aby aplikacja była dostępna z hosta

- **Utwórz Service w oparciu o Poda**
  - Zapewnij dostęp do aplikacji z hosta

- **Deployment z 3 replikami Poda**

I.2. Etap 2

II etap:

- I etap

- **Rozbudowa Poda o dostęp do Persistent Volume**
  - Modyfikacja aplikacji, aby korzystała z pliku przechowywanego
    w Persistent Volume

- **Przekształcenie Deployment'u w StatefulSet**
  - Dostęp do PersistentVolume

I.3. Etap 3

III etap:

- II etap

- 2 wersje obrazu (kod FastApi) – 1.0 oraz 1.1

- Deployment z dwoma replikami w wersji 1.0

- Service (NodePort) w oparciu o deployment

- Migracja na wersję 1.1:
  - ReplicaSet z dwoma replikami wersji 1.1
  - Sprawdzić czy obie wersje są dostępne
  - Ograniczenie do wersji 1.1

Rozdział II. Rozwiązanie etapu I – zaliczone na zajęciach

II.1. Kroki do wykonania:

1. Crear docker
docker system prune -a --volumes -f

2. Run register
docker run -d -p 5000:5000 --name registry registry:latest

3. Start minikube
minikube start

3. Create and apply pod
kubectl apply -f nginx-pod.yaml

4. Check pods
kubectl get pods

5. Create and apply service
kubectl apply -f nginx-service.yaml

6. Check services
kubectl get services

7. Check minikube ip
minikube ip

8. Add service label to pod
  labels:
    app: nginx

9. restart pod
kubectl delete pod nginx-pod
kubectl apply -f nginx-pod.yaml

10. Check service url
minikube service nginx-service --url

11. Open url
http://127.0.0.1:43665/

12. Create and apply deployment
kubectl apply -f nginx-deployment.yaml

II.2. Kod poda:

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  labels:
    app: nginx
spec:
  containers:
    - name: nginx
      image: nginx:latest
      ports:
        - containerPort: 80
```

II.3. Kod serwisu:

```
apiVersion: v1
kind: Service
metadata:
  name: nginx-service
spec:
  selector:
    app: nginx
  ports:
    - protocol: TCP
      port: 80
      targetPort: 80
  type: NodePort
```

II.4. Kod deploymentu

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:latest
          ports:
            - containerPort: 80
```

Rozdział III. Rozwiązanie etapu II

III.1. Kod poda z Persistent Volume

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: nginx-pv
spec:
  capacity:
    storage: 1Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  hostPath:
```

```yaml
    path: "/mnt/data"
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: nginx-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi
---
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  labels:
    app: nginx
spec:
  containers:
    - name: nginx
      image: nginx:latest
      ports:
        - containerPort: 80
      volumeMounts:
        - mountPath: "/usr/share/nginx/html"
          name: nginx-storage
  volumes:
    - name: nginx-storage
      persistentVolumeClaim:
        claimName: nginx-pvc
```

III.2. Prezentacja działania poda z Persistent Volume

radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pods
NAME   READY STATUS   RESTARTS AGE
nginx-pod   1/1   Running 0   55m
nginx-statefulset-1 1/1   Running 0   52m
nginx-statefulset-2 1/1   Running 0   52m
radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pv
NAME   CAPACITY   ACCESS MODES   RECLAIM POLICY
STATUS   CLAIM   STORAGECLASS
VOLUMEATTRIBUTESCLASS   REASON   AGE

```
nginx-pv                                  1Gi        RWO        Retain        Available
<unset>              55m
pvc-87314ddf-3b16-452c-b3b5-a440bee09ecd  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-0  standard      <unset>              52m
pvc-b6dc0d79-beef-4d8a-83c1-023d9c3c34ea  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-1  standard      <unset>              52m
pvc-bc785e1d-c4db-4600-9b20-ea9a382da5fd  1Gi        RWO        Delete        Bound
default/nginx-pvc                 standard      <unset>              55m
pvc-e68e0227-add1-487f-a362-a50d28f0884f  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-2  standard      <unset>              52m
radek@Radoslaw:/mnt/c/Users/radek/OneDrive          -        Wojskowa        Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$
radek@Radoslaw:/mnt/c/Users/radek/OneDrive          -        Wojskowa        Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$
radek@Radoslaw:/mnt/c/Users/radek/OneDrive          -        Wojskowa        Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$
radek@Radoslaw:/mnt/c/Users/radek/OneDrive          -        Wojskowa        Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pv
NAME                              CAPACITY   ACCESS MODES   RECLAIM POLICY
STATUS        CLAIM                             STORAGECLASS
VOLUMEATTRIBUTESCLASS   REASON   AGE
nginx-pv                                  1Gi        RWO        Retain        Available
<unset>              55m
pvc-87314ddf-3b16-452c-b3b5-a440bee09ecd  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-0  standard      <unset>              52m
pvc-b6dc0d79-beef-4d8a-83c1-023d9c3c34ea  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-1  standard      <unset>              52m
pvc-bc785e1d-c4db-4600-9b20-ea9a382da5fd  1Gi        RWO        Delete        Bound
default/nginx-pvc                 standard      <unset>              55m
pvc-e68e0227-add1-487f-a362-a50d28f0884f  1Gi        RWO        Delete        Bound
default/nginx-storage-nginx-statefulset-2  standard      <unset>              52m
radek@Radoslaw:/mnt/c/Users/radek/OneDrive          -        Wojskowa        Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pvc
NAME                     STATUS VOLUME                          CAPACITY ACCESS
MODES STORAGECLASS VOLUMEATTRIBUTESCLASS AGE
nginx-pvc                     Bound    pvc-bc785e1d-c4db-4600-9b20-ea9a382da5fd  1Gi
RWO        standard      <unset>              55m
nginx-storage-nginx-statefulset-0   Bound    pvc-87314ddf-3b16-452c-b3b5-a440bee09ecd
1Gi        RWO        standard      <unset>              53m
```

nginx-storage-nginx-statefulset-1   Bound   pvc-b6dc0d79-beef-4d8a-83c1-023d9c3c34ea

1Gi   RWO   standard   <unset>   52m

nginx-storage-nginx-statefulset-2   Bound   pvc-e68e0227-add1-487f-a362-a50d28f0884f

1Gi   RWO   standard   <unset>   52m

radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl exec -it nginx-pod -- /bin/sh

 # df -h | grep /usr/share/nginx/html

 # ls -lah /usr/share/nginx/html

total 8.0K

drwxrwxrwx 2 root root 4.0K Feb 4 20:31 .

drwxr-xr-x 3 root root 4.0K Feb 4 04:25 ..

 # echo "Test Persistent Volume" > /usr/share/nginx/html/index.html

 # exit

radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl   port-forward pod/nginx-pod 8080:80

Forwarding from 127.0.0.1:8080 -> 80

Forwarding from [::1]:8080 -> 80

Handling connection for 8080
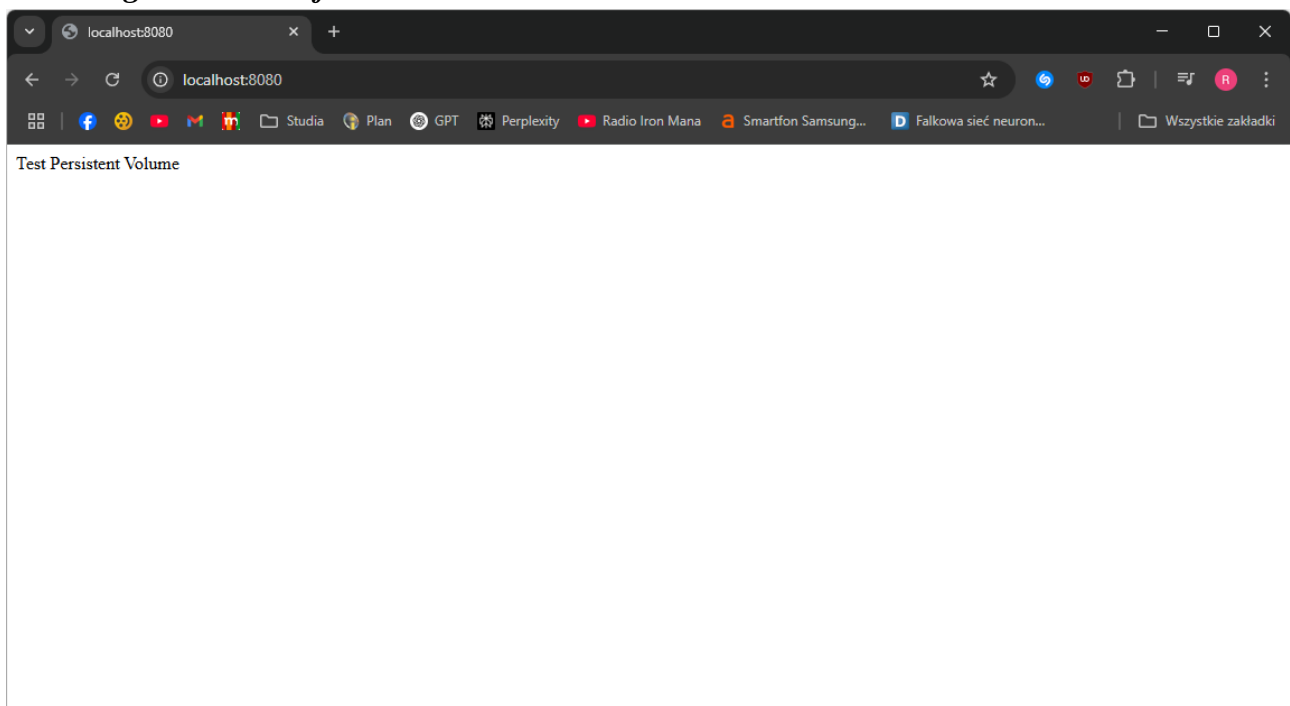
III.3. Kod deployment przekształconego w StatefulSet

```
apiVersion: apps/v1
kind: StatefulSet
```

```yaml
metadata:
  name: nginx-statefulset
spec:
  serviceName: "nginx"
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: nginx:latest
          ports:
            - containerPort: 80
          volumeMounts:
            - name: nginx-storage
              mountPath: /usr/share/nginx/html
  volumeClaimTemplates:
    - metadata:
        name: nginx-storage
      spec:
        accessModes: [ "ReadWriteOnce" ]
        resources:
          requests:
            storage: 1Gi
---
apiVersion: v1
kind: PersistentVolume
metadata:
  name: nginx-pv
spec:
  capacity:
    storage: 1Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  hostPath:
    path: "/mnt/data"
```

III.4. Prezentacja działania StetfulSet

radek@Radoslaw:/mnt/c/Users/radek/OneDrive - Wojskowa Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl apply -f nginx-statefulset.yaml
statefulset.apps/nginx-statefulset configured

persistentvolume/nginx-pv unchanged
radek@Radoslaw:/mnt/c/Users/radek/OneDrive - Wojskowa Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get statefulset

```
NAME              READY  AGE
nginx-statefulset 3/3    62m
```

radek@Radoslaw:/mnt/c/Users/radek/OneDrive - Wojskowa Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pods -l app=nginx

```
NAME               READY  STATUS   RESTARTS  AGE
nginx-pod          1/1    Running  0         65m
nginx-statefulset-0 1/1   Running  0         62m
nginx-statefulset-1 1/1   Running  0         62m
nginx-statefulset-2 1/1   Running  0         62m
```

radek@Radoslaw:/mnt/c/Users/radek/OneDrive - Wojskowa Akademia Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl get pv
kubectl get pvc

```
NAME                                        CAPACITY  ACCESS MODES  RECLAIM POLICY  STATUS     CLAIM                                    STORAGECLASS  VOLUMEATTRIBUTESCLASS  REASON  AGE
nginx-pv                                    1Gi       RWO           Retain          Available                                           <unset>                                       65m
pvc-87314ddf-3b16-452c-b3b5-a440bee09ecd    1Gi       RWO           Delete          Bound      default/nginx-storage-nginx-statefulset-0  standard    <unset>                                       62m
pvc-b6dc0d79-beef-4d8a-83c1-023d9c3c34ea    1Gi       RWO           Delete          Bound      default/nginx-storage-nginx-statefulset-1  standard    <unset>                                       62m
pvc-bc785e1d-c4db-4600-9b20-ea9a382da5fd    1Gi       RWO           Delete          Bound      default/nginx-pvc                         standard     <unset>                                       65m
pvc-e68e0227-add1-487f-a362-a50d28f0884f    1Gi       RWO           Delete          Bound      default/nginx-storage-nginx-statefulset-2  standard    <unset>                                       62m
```

```
NAME                             STATUS  VOLUME                                    CAPACITY  ACCESS MODES  STORAGECLASS  VOLUMEATTRIBUTESCLASS  AGE
nginx-pvc                        Bound   pvc-bc785e1d-c4db-4600-9b20-ea9a382da5fd  1Gi       RWO           standard      <unset>                65m
nginx-storage-nginx-statefulset-0 Bound  pvc-87314ddf-3b16-452c-b3b5-a440bee09ecd  1Gi       RWO           standard      <unset>                62m
```

nginx-storage-nginx-statefulset-1   Bound   pvc-b6dc0d79-beef-4d8a-83c1-023d9c3c34ea
1Gi   RWO   standard   <unset>   62m
nginx-storage-nginx-statefulset-2   Bound   pvc-e68e0227-add1-487f-a362-a50d28f0884f
1Gi   RWO   standard   <unset>   62m
radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl exec -it nginx-
statefulset-0 -- /bin/sh
ls -l /usr/share/nginx/html
total 0
#
exit
radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$ kubectl   logs   nginx-
statefulset-0
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform
configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/02/04 20:34:21 [notice] 1#1: using the "epoll" event method
2025/02/04 20:34:21 [notice] 1#1: nginx/1.27.3
2025/02/04 20:34:21 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2025/02/04 20:34:21 [notice] 1#1: OS: Linux 5.15.167.4-microsoft-standard-WSL2
2025/02/04 20:34:21 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/02/04 20:34:21 [notice] 1#1: start worker processes
2025/02/04 20:34:21 [notice] 1#1: start worker process 29
2025/02/04 20:34:21 [notice] 1#1: start worker process 30
2025/02/04 20:34:21 [notice] 1#1: start worker process 31
2025/02/04 20:34:21 [notice] 1#1: start worker process 32
2025/02/04 20:34:21 [notice] 1#1: start worker process 33
2025/02/04 20:34:21 [notice] 1#1: start worker process 34
2025/02/04 20:34:21 [notice] 1#1: start worker process 35
2025/02/04 20:34:21 [notice] 1#1: start worker process 36
radek@Radoslaw:/mnt/c/Users/radek/OneDrive   -   Wojskowa   Akademia
Techniczna/magister/sem2/ClC/ClC_Lab5/ClC_Lab5/no_fastapi$