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COMP 3104 - 15783

101484621

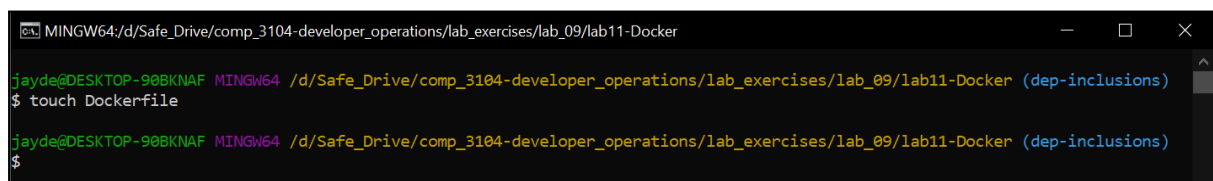
16/11/2025

Lab 09 - Docker Containerization & Nginx Kubernetes Cluster

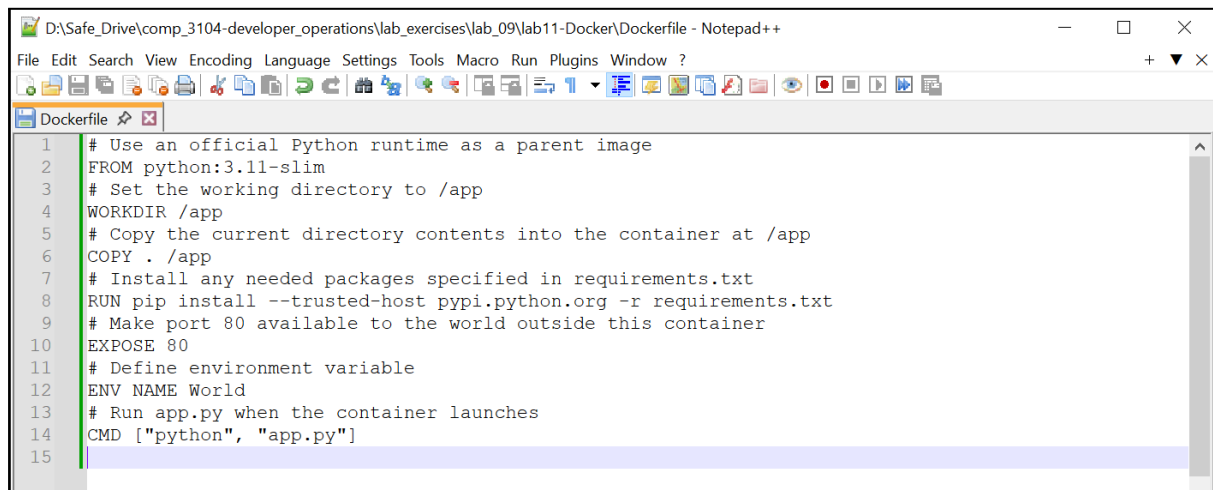
Contents

Container Setup.....	1
Running Docker Container & App.....	3
Forking GitHub Repository.....	4
Minikube Setup & Status Check.....	5
Deploying nginx Image Using Kubernetes.....	6

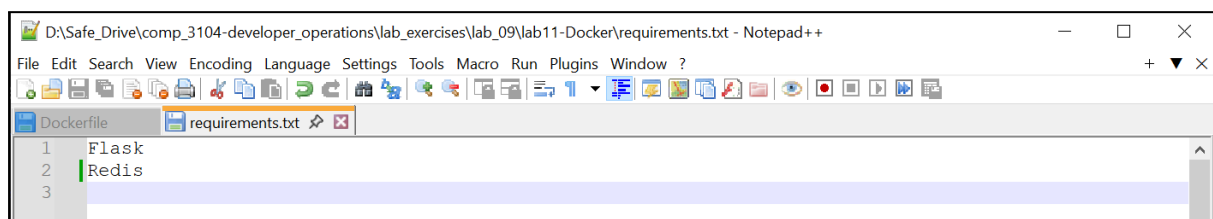
Container Setup



```
MINGW64:/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker
$ touch Dockerfile
```



```
# Use an official Python runtime as a parent image
FROM python:3.11-slim
# Set the working directory to /app
WORKDIR /app
# Copy the current directory contents into the container at /app
COPY . /app
# Install any needed packages specified in requirements.txt
RUN pip install --trusted-host pypi.python.org -r requirements.txt
# Make port 80 available to the world outside this container
EXPOSE 80
# Define environment variable
ENV NAME World
# Run app.py when the container launches
CMD ["python", "app.py"]
```



```
Flask
Redis
```

```
D:\Safe_Drive\comp_3104-developer_operations\lab_exercises\lab_09\lab11-Docker\app.py - Notepad++
File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?
Dockerfile requirements.txt app.py
1 from flask import Flask
2 from redis import Redis, RedisError
3 import os
4 import socket
5
6 # Connect to Redis
7 redis = Redis(host="redis", db=0, socket_connect_timeout=2, socket_timeout=2)
8
9 app = Flask(__name__)
10
11 @app.route("/")
12 def hello():
13     try:
14         visits = redis.incr("counter")
15     except RedisError:
16         visits = "<i>cannot connect to Redis, counter disabled</i>"
17     html = "<h3>Hello {name}</h3>" \
18           "<b>Hostname:</b> {hostname}<br/>" \
19           "<b>Visits:</b> {visits}"
20     return html.format(name=os.getenv("NAME", "world"), hostname=socket.gethostname(), visits=visits)
21
22 if __name__ == "__main__":
23     app.run(host='0.0.0.0', port=80)
```

```
MINGW64/d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker
jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ ls
app.py Dockerfile ReadMe.md requirements.txt

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ docker build --tag=hellodocker .
[+] Building 8.8s (9/10) docker:desktop-linux
=> [internal] load build definition from Dockerfile 0.0s
[+] Building 9.6s (10/10) FINISHED docker:desktop-linux
=> [internal] load build definition from Dockerfile 0.0s
=> => transferring dockerfile: 547B 0.0s
=> [internal] load metadata for docker.io/library/python:3.11-slim 1.1s
=> [auth] library/python:pull token for registry-1.docker.io 0.0s
=> [internal] load .dockerignore 0.0s
=> => transferring context: 2B 0.0s
=> [1/4] FROM docker.io/library/python:3.11-slim@sha256:e4676722fba839e2e5cdb844a52262b43e90e56dbd55b7ad953ee3615ad7534f 2.8s
=> => resolve docker.io/library/python:3.11-slim@sha256:e4676722fba839e2e5cdb844a52262b43e90e56dbd55b7ad953ee3615ad7534f 0.0s
=> => sha256:f002d17b63fe84a7f8a66f20cf63aec4f6cd2a44069f05b6296b0abfcf2a8e1 14.36MB / 14.36MB 2.1s
=> => sha256:65868b001a40155a1d3f5aa7f5a10ba02a7d55697301839dc047c9d549b670bc 248B / 248B 0.2s
=> => sha256:1ee9c106547f05aa380c4cdec2837c546439943d73d965a3fc49f228dc8be993 1.29MB / 1.29MB 0.8s
=> => extracting sha256:1ee9c106547f05aa380c4cdec2837c546439943d73d965a3fc49f228dc8be993 0.1s
=> => extracting sha256:f002d17b63fe84a7f8a66f20cf63aec4f6cd2a44069f05b6296b0abfcf2a8e1 0.6s
=> => extracting sha256:65868b001a40155a1d3f5aa7f5a10ba02a7d55697301839dc047c9d549b670bc 0.0s
=> [internal] load build context 0.0s
=> => transferring context: 1.53kB 0.0s
=> [2/4] WORKDIR /app 0.1s
=> [3/4] COPY . /app 0.0s
=> [4/4] RUN pip install --trusted-host pypi.python.org -r requirements.txt 4.0s
=> exporting to image 1.3s
=> => exporting layers 0.8s
=> => exporting manifest sha256:16c56cffa86dbc9f33d9a4048eb1ae7a12a95304257f5528b700e763c9014944 0.0s
=> => exporting config sha256:4010aa104f6b9fcd1eeefd009abf9974980bb4276555c5251f32a48654c423e0 0.0s
=> => exporting attestation manifest sha256:f376920dac61bdfb96e8fd3d319f0aa58e25b8fdd64a36bdef2a69132cd67fe5 0.0s
=> => exporting manifest list sha256:91cdf66dff1471146926146cd0b77b5431523077dfdf0f1b2603f8c321ec984f 0.0s
=> => naming to docker.io/library/hellodocker:latest 0.0s
=> => unpacking to docker.io/library/hellodocker:latest 0.4s

1 warning found (use docker --debug to expand):
- LegacyKeyValueFormat: "ENV key=value" should be used instead of legacy "ENV key value" format (line 12)

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ |
```

```
MINGW64/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ docker image
Usage: docker image COMMAND

Manage images

Commands:
  build      Build an image from a Dockerfile
  history    Show the history of an image
  import     Import the contents from a tarball to create a filesystem image
  inspect    Display detailed information on one or more images
  load       Load an image from a tar archive or STDIN
  ls         List images
  prune      Remove unused images
  pull       Download an image from a registry
  push       Upload an image to a registry
  rm         Remove one or more images
  save       Save one or more images to a tar archive (streamed to STDOUT by default)
  tag        Create a tag TARGET_IMAGE that refers to SOURCE_IMAGE

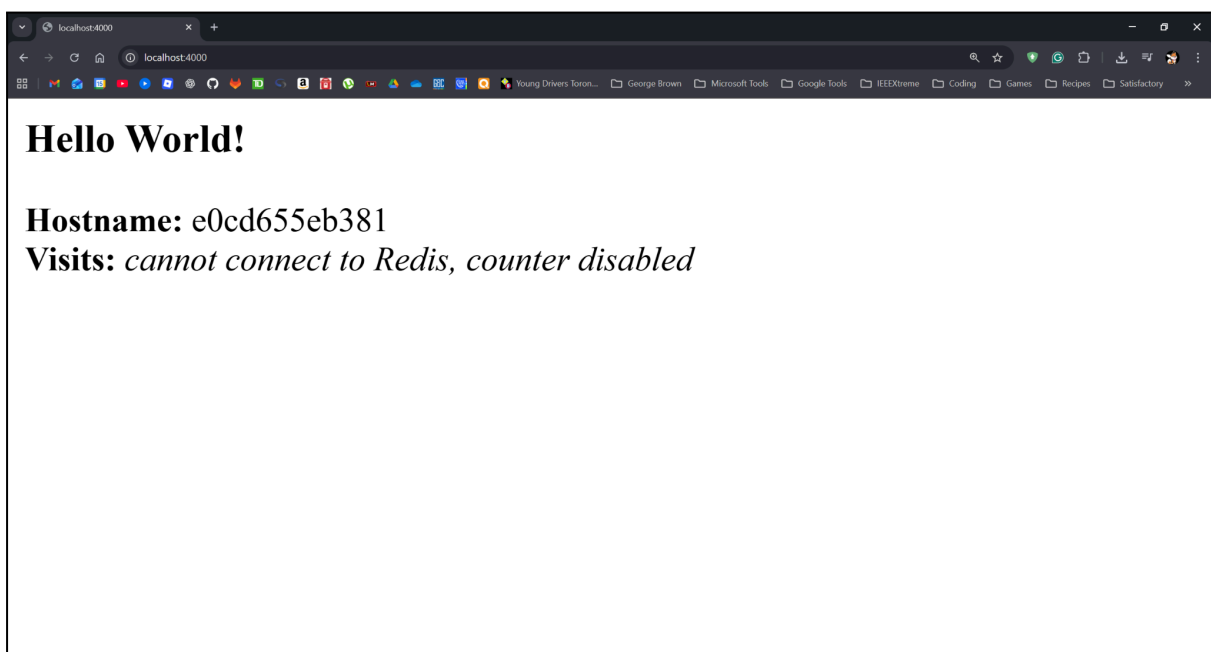
Run 'docker image COMMAND --help' for more information on a command.

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$
```

Running Docker Container & App

```
MINGW64/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ docker run -p 4000:80 hellodocker
* Serving Flask app 'app'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:80
* Running on http://172.17.0.2:80
Press CTRL+C to quit
```



```
MINGW64/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ curl http://localhost:4000
<h3>Hello World!</h3><b>Hostname:</b> 1ba94dd67b52<br/><b>Visits:</b> <i>cannot connect to Redis, counter disabled</i>
jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$
```

Forking GitHub Repository

```
MINGW64/d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09
jaye@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/lab11-Docker (dep-inclusions)
$ cd ..

jaye@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09 (dep-inclusions)
$ git clone https://github.com/BabyEyes17/101484621_DevOps_Kubernetes_exercise9.git
Cloning into '101484621_DevOps_Kubernetes_exercise9'...
remote: Enumerating objects: 31, done.
remote: Counting objects: 100% (31/31), done.
remote: Compressing objects: 100% (27/27), done.
remote: Total 31 (delta 8), reused 13 (delta 3), pack-reused 0 (from 0)
Receiving objects: 100% (31/31), 8.04 KiB | 1.34 MiB/s, done.
Resolving deltas: 100% (8/8), done.

jaye@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09 (dep-inclusions)
$
```

Minikube Setup & Status Check

```
MINGW64/d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ minikube start --driver=docker --cpus=2 --memory=4096 --force
[+] minikube v1.37.0 on Microsoft Windows 10 Pro 10.0.19045.6456 Build 19045.6456
[+] minikube skips various validations when --force is supplied; this may lead to unexpected behavior
[+] Using the docker driver based on user configuration
[+] Using Docker Desktop driver with root privileges
[+] Starting "minikube" primary control-plane node in "minikube" cluster
[+] Pulling base image v0.0.48 ...
[+] Downloading Kubernetes v1.34.0 preload ...
  > gcr.io/k8s-minikube/kicbase...: 488.52 MiB / 488.52 MiB 100.00% 10.67 M
  > preloaded-images-k8s-v18-v1...: 337.07 MiB / 337.07 MiB 100.00% 6.72 Mi
[+] Creating docker container (CPUs=2, Memory=4096MB) ...
[+] Failing to connect to https://registry.k8s.io/ from inside the minikube container
[+] To pull new external images, you may need to configure a proxy: https://minikube.sigs.k8s.io/docs/reference/networking/proxy/
[+] Preparing Kubernetes v1.34.0 on Docker 28.4.0 ...
[+] Configuring bridge CNI (Container Networking Interface) ...
[+] Verifying Kubernetes components...
  ▪ Using image gcr.io/k8s-minikube/storage-provisioner:v5
[+] Enabled addons: storage-provisioner, default-storageclass
[+] Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$
```

```
MINGW64/d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ minikube status
minikube
type: Control Plane
host: Running
kubelet: Running
apiserver: Running
kubeconfig: Configured

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl config current-context
minikube

jayde@DESKTOP-90BKNAF MINGW64 /d:/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ docker info
Client:
Version:      28.5.1
Context:      desktop-linux
Debug Mode:   false
Plugins:
ai: Docker AI Agent - Ask Gordon (Docker Inc.)
  Version:    v1.9.11
  Path:       C:\Program Files\Docker\cli-plugins\docker-ai.exe
buildx: Docker Buildx (Docker Inc.)
  Version:    v0.29.1-desktop.1
  Path:       C:\Program Files\Docker\cli-plugins\docker-buildx.exe
compose: Docker Compose (Docker Inc.)
  Version:    v2.40.3-desktop.1
  Path:       C:\Users\jayde\.docker\cli-plugins\docker-compose.exe
debug: Get a shell into any image or container (Docker Inc.)
  Version:    0.0.45
  Path:       C:\Program Files\Docker\cli-plugins\docker-debug.exe
desktop: Docker Desktop commands (Docker Inc.)
  Version:    v0.2.0
  Path:       C:\Program Files\Docker\cli-plugins\docker-desktop.exe
extension: Manages Docker extensions (Docker Inc.)
  Version:    v0.2.31
  Path:       C:\Program Files\Docker\cli-plugins\docker-extension.exe
init: Creates Docker-related starter files for your project (Docker Inc.)
  Version:    v1.4.0
  Path:       C:\Program Files\Docker\cli-plugins\docker-init.exe
mcp: Docker MCP Plugin (Docker Inc.)
  Version:    v0.24.0
  Path:       C:\Program Files\Docker\cli-plugins\docker-mcp.exe
model: Docker Model Runner (Docker Inc.)
  Version:    v0.1.46
  Path:       C:\Users\jayde\.docker\cli-plugins\docker-model.exe
offload: Docker Offload (Docker Inc.)
  Version:    v0.5.1
  Path:       C:\Program Files\Docker\cli-plugins\docker-offload.exe
sandbox: Docker Sandbox (Docker Inc.)
  Version:    v0.3.1
  Path:       C:\Program Files\Docker\cli-plugins\docker-sandbox.exe
```

Deploying nginx Image Using Kubernetes

```
MINGW64:/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl apply -f nginx-deploy.yaml
deployment.apps/nginx configured

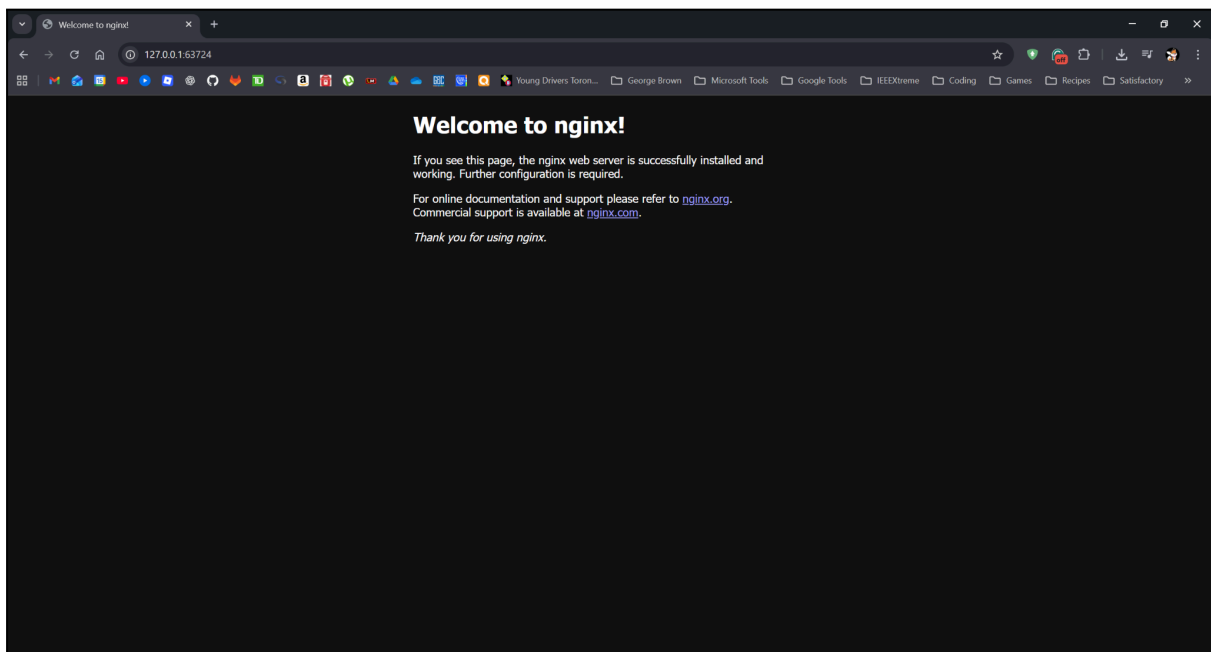
jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl apply -f nginx-service.yaml
service/nginx-nodeport created

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl rollout status deployment/nginx
deployment "nginx" successfully rolled out

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl get pods -l app=nginx -o wide
NAME                                READY   STATUS    RESTARTS   AGE   IP              NODE     NOMINATED NODE   READINESS GATES
nginx-6d5fbd986b-26817              1/1     Running   0           57s   10.244.0.5      minikube <none>          <none>
nginx-6d5fbd986b-8s52f              1/1     Running   0           57s   10.244.0.3      minikube <none>          <none>
nginx-6d5fbd986b-xzhv5              1/1     Running   0           57s   10.244.0.4      minikube <none>          <none>

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl get svc nginx-nodeport
NAME            TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)    AGE
nginx-nodeport  NodePort    10.109.87.106 <none>        80:30080/TCP 16s

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$
```



```
MINGW64:/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ minikube service nginx-nodeport --url
http://127.0.0.1:63724
Because you are using a Docker driver on windows, the terminal needs to be open to run it.

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$
```

```
MINGW64:/d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl delete -f nginx-deploy.yaml
deployment.apps "nginx" deleted from default namespace

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$ kubectl delete -f nginx-service.yaml
service "nginx-nodeport" deleted from default namespace

jayde@DESKTOP-90BKNAF MINGW64 /d/Safe_Drive/comp_3104-developer_operations/lab_exercises/lab_09/101484621_DevOps_Kubernetes_exercise9 (main)
$
```

Kubernetes Dashboard

127.0.0.1:6443/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard/proxy/#/service/default/kubernetes?namespace=default

kubernetes default Search

Service > Services > **kubernetes**

Workloads

- Cron Jobs
- Daemon Sets
- Deployments
- Jobs
- Pods
- Replica Sets
- Replication Controllers
- Stateful Sets

Service

- Ingresses
- Ingress Classes
- Services**

Config and Storage

- Config Maps
- Persistent Volume Claims
- Secrets
- Storage Classes

Cluster

Metadata

Name	Namespace	Created	Age	UID
kubernetes	default	Nov 16, 2025	13 minutes ago	1ab36ddc-b77e-419b-a047-7855c920dbce

Labels

component: apiserver provider: kubernetes

Resource information

Type	Cluster IP	Session Affinity
ClusterIP	10.96.0.1	None

Endpoints

Host	Ports (Name, Port, Protocol)	Node	Ready
192.168.49.2	https,8443,TCP	-	true

Pods

There is nothing to display here