Docker Lab Exercises

Exercise 1: Getting Started with Containers

- docker --version

```
C:\Users\Yashvi>docker --version
Docker version 28.3.2, build 578ccf6
```

- docker run hello-world

```
C:\Users\Yashvi>docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
17eec7bbc9d7: Pull complete
Digest: sha256:a0dfb02aac212703bfcb339d77d47ec32c8706ff250850ecc0e19c8737b18
567
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent
it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/

For more examples and ideas, visit:
 https://docs.docker.com/get-started/
```

- docker run -d -p 8080:80 nginx

```
C:\Users\Yashvi>docker run -d -p 8080:80 nginx
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
c3741b707ce6: Pull complete
716cdf61af59: Pull complete
b1badc6e5066: Pull complete
14e422fd20a0: Pull complete
e5d9bb0b85cc: Pull complete
a2da0c0f2353: Pull complete
14a859b5ba24: Pull complete
Digest: sha256:33e0bbc7ca9ecf108140af6288c7c9d1ecc77548cbfd3952fd8466a75edef
e57
Status: Downloaded newer image for nginx:latest
4ab98093ab16ca754181645d98fef6b988c43865adc7e892a2553134b405eebf
```

- docker run -it alpine sh

```
C:\Users\Yashvi>docker run -it alpine sh
Unable to find image 'alpine:latest' locally
latest: Pulling from library/alpine
9824c27679d3: Pull complete
Digest: sha256:4bcff63911fcb4448bd4fdacec207030997caf25e9bea4045fa6c8c44de31
1d1
Status: Downloaded newer image for alpine:latest
/ # echo "Hello from Alpine!"
Hello from Alpine!
/ # ls
bin    etc    lib    mnt    proc   run    srv    tmp    var
dev    home   media  opt    root   sbin   sys    usr
/ # exit
```

- docker ps

```
C:\Users\Yashvi>docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED          STATUS
       PORTS                                    NAMES
4ab98093ab16   nginx     "/docker-entrypoint.…"   14 minutes ago   Up 14 min
utes   0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   stupefied_chaplygin
```

- docker ps -a

```
C:\Users\Yashvi>docker ps -a
CONTAINER ID   IMAGE         COMMAND                  CREATED          STATUS
                     PORTS                                    NAMES
e657c7bd2436   alpine        "sh"                     14 minutes ago   Exited
 (0) 3 minutes ago                                              vigorous_pros
kuriakova
4ab98093ab16   nginx         "/docker-entrypoint.…"   16 minutes ago   Up 16
minutes              0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   stupefied_cha
plygin
0dfecf5aa356   hello-world   "/hello"                 25 minutes ago   Exited
 (0) 25 minutes ago                                             modest_willia
mson
```

- docker run –rm alpine echo “Hello World”

```
C:\Users\Yashvi>docker run --rm alpine echo "Hello World"
Hello World

C:\Users\Yashvi>docker ps -a
CONTAINER ID   IMAGE         COMMAND                  CREATED          STATUS
                     PORTS                                    NAMES
e657c7bd2436   alpine        "sh"                     39 minutes ago   Exited
 (0) 28 minutes ago                                             vigorous_pros
kuriakova
4ab98093ab16   nginx         "/docker-entrypoint.…"   41 minutes ago   Up 41
minutes              0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   stupefied_cha
plygin
0dfecf5aa356   hello-world   "/hello"                 51 minutes ago   Exited
 (0) 51 minutes ago                                             modest_willia
mson
```

- docker logs 4ab98093ab16

```
C:\Users\Yashvi>docker logs 4ab98093ab16
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to pe
rform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-de
fault.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/con
f.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/c
onf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-template
s.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processe
s.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/08/21 17:03:12 [notice] 1#1: using the "epoll" event method
2025/08/21 17:03:12 [notice] 1#1: nginx/1.29.1
2025/08/21 17:03:12 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14+deb12
u1)
2025/08/21 17:03:12 [notice] 1#1: OS: Linux 6.6.87.2-microsoft-standard-WSL2
2025/08/21 17:03:12 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/08/21 17:03:12 [notice] 1#1: start worker processes
2025/08/21 17:03:12 [notice] 1#1: start worker process 29
2025/08/21 17:03:12 [notice] 1#1: start worker process 30
2025/08/21 17:03:12 [notice] 1#1: start worker process 31
2025/08/21 17:03:12 [notice] 1#1: start worker process 32
2025/08/21 17:03:12 [notice] 1#1: start worker process 33
2025/08/21 17:03:12 [notice] 1#1: start worker process 34
2025/08/21 17:03:12 [notice] 1#1: start worker process 35
2025/08/21 17:03:12 [notice] 1#1: start worker process 36
2025/08/21 17:03:12 [notice] 1#1: start worker process 37
2025/08/21 17:03:12 [notice] 1#1: start worker process 38
2025/08/21 17:03:12 [notice] 1#1: start worker process 39
2025/08/21 17:03:12 [notice] 1#1: start worker process 40
2025/08/21 17:03:12 [notice] 1#1: start worker process 41
2025/08/21 17:03:12 [notice] 1#1: start worker process 42
2025/08/21 17:03:12 [notice] 1#1: start worker process 43
2025/08/21 17:03:12 [notice] 1#1: start worker process 44
```

- docker exec -it 4ab98093ab16 sh

```
C:\Users\Yashvi>docker exec -it 4ab98093ab16 sh
# ls
bin   docker-entrypoint.d   home   media  proc  sbin  tmp
boot  docker-entrypoint.sh  lib    mnt    root  srv   usr
dev   etc                   lib64  opt    run   sys   var
# exit
```

Exercise 2: Working with Container State

- docker run -it ubuntu bash

```
C:\Users\Yashvi>docker run -it ubuntu bash
Unable to find image 'ubuntu:latest' locally
latest: Pulling from library/ubuntu
b71466b94f26: Pull complete
Digest: sha256:7c06e91f61fa88c08cc74f7e1b7c69ae24910d745357e0dfe1d2c0322aaf20
f9
Status: Downloaded newer image for ubuntu:latest
root@431c8416469b:/#
```

```
C:\Users\Yashvi>docker ps -a
CONTAINER ID   IMAGE         COMMAND                  CREATED          STATUS
                 PORTS                                      NAMES
431c8416469b   ubuntu        "bash"                   26 minutes ago   Exited (0) 6
minutes ago                                             magical_wescoff
e657c7bd2436   alpine        "sh"                     2 hours ago      Exited (0) Ab
out an hour ago                                         vigorous_proskuriakova
4ab98093ab16   nginx         "/docker-entrypoint.…"   2 hours ago      Up 2 hours
                 0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   stupefied_chaplygin
0dfecf5aa356   hello-world   "/hello"                 2 hours ago      Exited (0) 2
hours ago                                               modest_williamson
```

- apt-get update && apt-get install -y curl vim

```
root@431c8416469b:/# apt-get update && apt-get install -y curl vim
```

```
root@431c8416469b:/# ln -sf /usr/share/zoneinfo/Asia/Kolkata /etc/localtime
root@431c8416469b:/# echo "Asia/Kolkata" > /etc/timezone
root@431c8416469b:/# date
Fri Aug 22 00:03:07 IST 2025
root@431c8416469b:/# exit
exit
```

- docker commit 431c8416469b ubuntu-tools

```
C:\Users\Yashvi>docker commit 431c8416469b ubuntu-tools
sha256:f86beaf1877a58b30b73fc23ee520635d368e262244e9b4e4bc0fb43f03c8f07
```

- docker run -it ubuntu-tools

```
C:\Users\Yashvi>docker run -it ubuntu-tools
root@c7e7d72566a6:/# exit
exit
```

- docker tag ubuntu-tools ubuntu-tools:v1

```
C:\Users\Yashvi>docker tag ubuntu-tools ubuntu-tools:v1
```

- docker images

```
C:\Users\Yashvi>docker images
REPOSITORY     TAG       IMAGE ID       CREATED         SIZE
ubuntu-tools   latest    f86beaf1877a   8 minutes ago   361MB
ubuntu-tools   v1        f86beaf1877a   8 minutes ago   361MB
nginx          latest    33e0bbc7ca9e   8 days ago      279MB
hello-world    latest    a0dfb02aac21   13 days ago     20.3kB
ubuntu         latest    7c06e91f61fa   3 weeks ago     117MB
alpine         latest    4bcff63911fc   5 weeks ago     12.8MB
```

Exercise 3: Build Custom Images Using Dockerfile

main.py > ...

```python
from fastapi import FastAPI
import uvicorn

app = FastAPI()

@app.get("/")
async def root():
    return {"message": "Hello, FastAPI Server is running!"}

if __name__ == "__main__":
    uvicorn.run(app, host="0.0.0.0", port=8000)
```

Dockerfile > ...

```
FROM python:3.10.11-slim

LABEL maintainer="Yashvi"

WORKDIR /app

COPY requirements.txt .

RUN pip install --no-cache-dir -r requirements.txt

COPY . .

EXPOSE 8000

CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "8000"]
```

- docker build -t docker-practice .

```
(fastapi-env) PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker-Practice>
 docker build -t docker-practice .
[+] Building 60.1s (11/11) FINISHED                                    docker:de
sktop-linux
```

```
(fastapi-env) PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker-Practice>
docker images
REPOSITORY        TAG       IMAGE ID       CREATED              SIZE
docker-practice   latest    1cd5bd5bc389   6 minutes ago        272MB
```

- docker run -d -p 8000:8000 docker-practice

```
(fastapi-env) PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker-Practice>
docker run -d -p 8000:8000 docker-practice
e88f8661ed8e539f684d1d0d27833ebcd3819be44ce0c56f20b080600ae370d9
```

- curl http://localhost:8000/

```
(fastapi-env) PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker-Practice>
 curl http://localhost:8000/


StatusCode        : 200
StatusDescription : OK
Content           : {"message":"Hello, FastAPI Server is running!"}
RawContent        : HTTP/1.1 200 OK
                    Content-Length: 47
                    Content-Type: application/json
                    Date: Thu, 21 Aug 2025 20:05:32 GMT
                    Server: uvicorn
```

Exercise 4: Sharing Images

- docker login

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>docker login
Authenticating with existing credentials... [Username: yashvimudgal]

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


Login Succeeded
```

- docker tag docker-practice yashvimudgal/docker-practice:v1

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker tag docker-practice yashvimudgal/docker-practice:v1

C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker images
REPOSITORY                    TAG       IMAGE ID       CREATED
     SIZE
docker-practice               latest    1cd5bd5bc389   38 minutes a
go    272MB
yashvimudgal/docker-practice  v1        1cd5bd5bc389   38 minutes a
go    272MB
```

- docker push yashvimudgal/docker-practice:v1

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker push yashvimudgal/docker-practice:v1
The push refers to repository [docker.io/yashvimudgal/docker-practic
e]
d738684e15b6: Pushed
05c2151a829c: Pushed
76e76f1323b1: Pushed
cf2e0f30894f: Pushed
0129d2930a3d: Pushed
661be8ca6397: Pushed
69b3a7027232: Pushed
2fb2a92c7b43: Pushed
94970648c551: Pushed
f03b40093957: Pushed
v1: digest: sha256:1cd5bd5bc3890e3336edf776aa6829216824761a0d5869b9f
99175af185d68db size: 856
```

- docker pull yashvimudgal/docker-practice:v1

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker pull yashvimudgal/docker-practice:v1
v1: Pulling from yashvimudgal/docker-practice
Digest: sha256:1cd5bd5bc3890e3336edf776aa6829216824761a0d5869b9f9917
5af185d68db
Status: Image is up to date for yashvimudgal/docker-practice:v1
docker.io/yashvimudgal/docker-practice:v1
```

Exercise 5: Data Persistence with Volumes

- docker run -it --name busybox-test -v mydata:/data busybox

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -it --name busybox-test -v mydata:/data busybox
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
80bfbb8a41a2: Pull complete
Digest: sha256:ab33eacc8251e3807b85bb6dba570e4698c3998eca6f0fc2ccb60
575a563ea74
Status: Downloaded newer image for busybox:latest
/ # echo "Hello from Docker Volume" > /data/test.txt
/ # ls /data
test.txt
/ #
```

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -it --name busybox-test2 -v mydata:/data busybox
/ # cat /data/test.txt
Hello from Docker Volume
/ #
```

- mkdir data

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
mkdir -p data
```

- docker run -it --name busybox-bind -v "C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice\data:/data" busybox sh

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -it --name busybox-bind -v "C:\Users\Yashvi\Desktop\Train
ing Notes\DevOps_Notes\Docker Practice\data:/data" busybox sh
/ # echo "Hello from Bind Mount" > /data/test2.txt
/ # exit
```

Exercise 6: Container Networking Basics

- docker network create mynetwork

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker network create mynetwork
a8faec1d64ba18081f0f8251de6fb592721de7a410ccafd0dd4d244feb2be7fc
```

- docker run -d --name mynginx --network mynetwork nginx

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -d --name mynginx --network mynetwork nginx
48904ee21f12c951f28b2c43de46ae4cbe68d02a8f291d3589b626d23926c9be
```

- docker run -it --name mybusybox --network mynetwork busybox
  wget -O- http://mynginx

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -it --name mybusybox --network mynetwork busybox
/ # wget -O- http://mynginx
Connecting to mynginx (172.18.0.2:80)
writing to stdout
-                    0% |                    |     0 --:--:-- ETA<
!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully instal
led and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
-                  100% |********************|   615  0:00:00 ETA
written to stdout
/ # exit
```

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker network inspect mynetwork
[
    {
        "Name": "mynetwork",
        "Id": "a8faec1d64ba18081f0f8251de6fb592721de7a410ccafd0dd4d2
44feb2be7fc",
        "Created": "2025-08-21T21:08:53.370510357Z",
        "Scope": "local",
        "Driver": "bridge",
        "EnableIPv4": true,
        "EnableIPv6": false,
        "IPAM": {
            "Driver": "default",
            "Options": {},
            "Config": [
                {
                    "Subnet": "172.18.0.0/16",
                    "Gateway": "172.18.0.1"
                }
            ]
        },
        "Internal": false,
        "Attachable": false,
        "Ingress": false,
        "ConfigFrom": {
            "Network": ""
        },
        "ConfigOnly": false,
        "Containers": {
            "48904ee21f12c951f28b2c43de46ae4cbe68d02a8f291d3589b626d
23926c9be": {
                "Name": "mynginx",
                "EndpointID": "aa3e3e7b6993cbf5ca29764453b785f1fd966
b704ac8c540b1f302beb13bb950",
                "MacAddress": "3a:67:6d:3d:de:f8",
                "IPv4Address": "172.18.0.2/16",
                "IPv6Address": ""
            }
        },
        "Options": {
            "com.docker.network.enable_ipv4": "true",
            "com.docker.network.enable_ipv6": "false"
        },
        "Labels": {}
    }
]
```

Exercise 7: Building a Two-Tier App

- docker network create fastapi-net
- docker run -d \
  --name pg-test
  --network fastapi-net \
  -e POSTGRES_USER=myuser \
  -e POSTGRES_PASSWORD=mypassword \
  -e POSTGRES_DB=mydb \
  -v pgdata:/var/lib/postgresql/data \
  -p 5432:5432 \
  postgres:15

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker run -d --name pg-test --network fastapi-net -e POSTGRES_USER=
myuser -e POSTGRES_PASSWORD=mypassword -e POSTGRES_DB=mydb -v pgdata
:/var/lib/postgresql/data -p 5432:5432 postgres:15
Unable to find image 'postgres:15' locally
15: Pulling from library/postgres
5c10925b29ff: Pull complete
77c7671c4414: Pull complete
2d9e29180a27: Pull complete
f5dfd246bc6e: Pull complete
799f859abbbd: Pull complete
c6bcc2c9a041: Pull complete
ba7036bb0a60: Pull complete
04adcb462801: Pull complete
631fe8c6d606: Pull complete
d903e777080c: Pull complete
fca2566eba32: Pull complete
606bd164980e: Pull complete
396b1da7636e: Pull complete
ac4b721eb66f: Pull complete
Digest: sha256:bc51cf4f1fe02cce7ed2370b20128a9b00b4eb804573a77d2a0d8
77aaa9c82b1
Status: Downloaded newer image for postgres:15
fde33619baaff9d45290222966e2f08576c3997b695ea373fcc4a260d376a486
```

Dockerfile
```
1  FROM python:3.10.11-slim
2
3  WORKDIR /app
4
5  COPY requirements.txt .
6  RUN pip install --no-cache-dir -r requirements.txt
7
8  COPY main.py .
9
10 EXPOSE 8000
11 CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "8000"]
```

requirements.txt
```
1  fastapi
2  uvicorn[standard]
3  psycopg2-binary
```

main.py > root

```python
from fastapi import FastAPI
import psycopg2
import os

app = FastAPI()

DB_HOST = os.getenv("DB_HOST", "mypostgres")
DB_NAME = os.getenv("DB_NAME", "mydb")
DB_USER = os.getenv("DB_USER", "myuser")
DB_PASS = os.getenv("DB_PASS", "mypassword")
DB_PORT = os.getenv("DB_PORT", "5432")

def get_connection():
    return psycopg2.connect(
        host=DB_HOST,
        database=DB_NAME,
        user=DB_USER,
        password=DB_PASS,
        port=DB_PORT
    )

@app.get("/")
async def root():
    try:
        conn = get_connection()
        cur = conn.cursor()
        cur.execute("SELECT 'Hello from POstgres via FastAPI!'")
        result = cur.fetchone()
        cur.close()
        conn.close()
        return {"message": result[0]}
    except Exception as e:
        return {"error": f"Database connection failed: {e}"}
```

- docker build -t fastapi-app .

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App> docker build -t fastapi-app .
[+] Building 30.2s (10/10) FINISHED                                                    docker:desktop-linux
```

- docker run -d ^
  --name fastapi-test ^
  --network fastapi-net ^
  -e DB_HOST=pg-test ^
  -e DB_NAME=mydb ^
  -e DB_USER=myuser ^
  -e DB_PASSWORD=mypassword ^
  -p 8000:8000 ^
  fastapi-app

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>docker run -d ^
More? --name fastapi-test ^
More? --network fastapi-net ^
More? -e DB_HOST=pg-test ^
More? -e DB_NAME=mydb ^
More? -e DB_USER=myuser ^
More? -e DB_PASSWORD=mypassword ^
More? -p 8000:8000 ^
More? fastapi-app
4f6065119717dbf082cf09a49a412ea6e0ea827625276208a0ab0698a1f05e1b
```

- curl http://localhost:8000/

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
curl http://localhost:8000/
{"message":"Hello from POstgres via FastAPI!"}
```

Exercise 8: Docker Compose Basics

- docker network inspect fastapi-net

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Docker Practice>
docker network inspect fastapi-net
[
    {
        "Name": "fastapi-net",
"Containers": {
    "6e40ba214cf7406746d4081c188608b7873dfdd10c8c17789ba703ded064fd99": {
        "Name": "fastapi-test",
        "EndpointID": "5f931a4f6e8ef36f130dfc4e9b94d90c655420b2ced3e3f5608db910565308c2",
        "MacAddress": "9e:cd:42:48:11:c3",
        "IPv4Address": "172.19.0.3/16",
        "IPv6Address": ""
    },
    "fde33619baaff9d45290222966e2f08576c3997b695ea373fcc4a260d376a486": {
        "Name": "pg-test",
        "EndpointID": "b5adc1a197cddb92cb9d4eeba2b2263c76d964f89552cd0f3e9d561baace3d39",
        "MacAddress": "ee:45:91:ef:5b:cf",
        "IPv4Address": "172.19.0.2/16",
        "IPv6Address": ""
    }
},
```

```
docker-compose.yml > {} services
docker-compose.yml - The Compose specification establishes a standard for the defin
version: "3.9"

Run All Services
services:
  Run Service
  postgres:
    image: postgres:15
    container_name: pg-test-compose
    environment:
      POSTGRES_DB: mydb
      POSTGRES_USER: myuser
      POSTGRES_PASSWORD: mypassword
    ports:
      - "5433:5432"
    networks:
      - fastapi-net
    volumes:
      - pgdata:/var/lib/postgresql/data
    restart: always
    healthcheck:
      test: ["CMD-SHELL", "pg_isready -U myuser -d mydb"]
      interval: 10s
      timeout: 5s
      retries: 5
```

```yaml
version: "3.9"

services:
  postgres: ···

  fastapi:
    build: .
    container_name: fastapi-test-compose
    environment:
      DB_HOST: postgres
      DB_NAME: mydb
      DB_USER: myuser
      DB_PASS: mypassword
      DB_PORT: 5432
    depends_on:
      postgres:
        condition: service_healthy
    ports:
      - "8001:8000"
    networks:
      - fastapi-net
    healthcheck:
      test: ["CMD", "curl", "-f", "http://localhost:8000/docs"]
      interval: 10s
      timeout: 5s
      retries: 5

networks:
  fastapi-net:
    external: true

volumes:
  pgdata:
```

- docker compose up -d

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App> docker compose up -d
time="2025-08-22T17:09:33+05:30" level=warning msg="C:\\Users\\Yashvi\\Desktop\\Training Notes\\DevOps_Notes\\F
astAPI_App\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to av
oid potential confusion"
[+] Running 2/2
 ✓ Container pg-test-compose       Healthy                                    11.7s
 ✓ Container fastapi-test-compose  Started                                    11.5s
```

- docker compose ps

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App> docker compose ps
time="2025-08-22T17:10:18+05:30" level=warning msg="C:\\Users\\Yashvi\\Desktop\\Training Notes\\DevOps_Notes\\F
astAPI_App\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to av
oid potential confusion"
NAME                  IMAGE                COMMAND                  SERVICE    CREATED          STATUS
                     PORTS
fastapi-test-compose   fastapi_app-fastapi   "uvicorn main:app --…"   fastapi    44 seconds ago   Up 32 seconds
 (health: starting)   0.0.0.0:8001->8000/tcp, [::]:8001->8000/tcp
pg-test-compose        postgres:15          "docker-entrypoint.s…"   postgres   44 seconds ago   Up 43 seconds
 (healthy)           0.0.0.0:5433->5432/tcp, [::]:5433->5432/tcp
```

- docker compose logs fastapi

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App> docker compose logs fastapi
time="2025-08-22T17:10:25+05:30" level=warning msg="C:\\Users\\Yashvi\\Desktop\\Training Notes\\DevOps_
Notes\\FastAPI_App\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please
 remove it to avoid potential confusion"
fastapi-test-compose  | INFO:     Started server process [1]
fastapi-test-compose  | INFO:     Waiting for application startup.
fastapi-test-compose  | INFO:     Application startup complete.
fastapi-test-compose  | INFO:     Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)
```

Exercise 9: Healthchecks and Best Practices

```
Dockerfile > ...
1   FROM python:3.10.11-slim
2
3   WORKDIR /app
4
5   COPY requirements.txt .
6   RUN pip install --no-cache-dir -r requirements.txt
7
8   COPY main.py .
9
10  EXPOSE 8000
11
12  HEALTHCHECK --interval=30s --timeout=5s --retries=3 \
13    CMD wget --no-verbose --tries=1 --spider http://localhost:8000/health || exit 1
14
15  ENTRYPOINT ["uvicorn"]
16
17  CMD ["main:app", "--host", "0.0.0.0", "--port", "8000"]
```

```
@app.get("/health")
def health():
    return {"status": "ok"}
```

- docker inspect fastapi-test-compose | Select-String "Health"

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App> docker inspect
 fastapi-test-compose | Select-String "Health"

            "Health": {
                "Status": "healthy",
            "Healthcheck": {
                    "http://localhost:8000/health"
                "com.docker.compose.depends_on": "postgres:service_healthy:false",
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\FastAPI_App>
docker ps --format "table {{.Names}}\t{{.Status}}"
NAMES                   STATUS
pg-test                 Up 4 minutes
fastapi-test            Up 9 minutes (healthy)
fastapi-test-compose    Up 46 minutes (healthy)
pg-test-compose         Up 2 hours (healthy)
```

Exercise 10: Debugging, Cleanup & Troubleshooting

- docker run --name bad-nginx -d -p 8080:8080 nginx:alpine badcommand

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes>docker run --name bad-nginx -
d -p 8080:8080 nginx:alpine badcommand
Unable to find image 'nginx:alpine' locally
alpine: Pulling from library/nginx
c9ebe2ff2d2c: Pull complete
403e3f251637: Pull complete
7a8a46741e18: Pull complete
6bc572a340ec: Pull complete
cb1ff4086f82: Pull complete
9adfbae99cb7: Pull complete
a992fbc61ecc: Pull complete
Digest: sha256:42a516af16b852e33b7682d5ef8acbd5d13fe08fecadc7ed98605ba5e3b26ab8
Status: Downloaded newer image for nginx:alpine
5335e81e8135726e19e031eb1f125aa9a3def8fd876e0f0f5bebfe26fdd9baee

C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes>docker logs bad-nginx
/docker-entrypoint.sh: exec: line 47: badcommand: not found

C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes>docker ps -a
CONTAINER ID   IMAGE                COMMAND                  CREATED
  STATUS                          PORTS
 NAMES
5335e81e8135   nginx:alpine         "/docker-entrypoint.…"   About a minute ago
  Exited (127) About a minute ago
 bad-nginx
```

- docker system prune -a

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes>docker system prune -a
WARNING! This will remove:
  - all stopped containers
  - all networks not used by at least one container
  - all images without at least one container associated to them
  - all build cache

Are you sure you want to continue? [y/N] y
Deleted Containers:
```

- docker volume prune

```
C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes>docker volume prune
WARNING! This will remove anonymous local volumes not used by at least
one container.
Are you sure you want to continue? [y/N] y
Total reclaimed space: 0B
```