Assignment: Containerization with Docker Report

Personal

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Links

GitHub repository: https://github.com/ZackariaOsman/docker-challenge-template

Basic introduction of Docker

Why is it important for me, in the context of software development?

- Consistency
    - Ensures applications behave consistently across different environments.
- Isolation
    - Encapsulates applications and dependencies, enhancing security and reliability.
- Efficiency
    - Lightweight containers enable faster deployment and scaling.

- Portability
  - Runs on any system supporting Docker, simplifying deployment and collaboration.
- Version Control
  - Images are versioned and shareable, ensuring reproducibility and consistency.

Docker Commands Used

*** ’.’ = current working directory ***

- docker build
  - Builds an image from a Dockerfile in the current directory.
- docker images
  - Lists all available Docker images.
- docker build -t <repository_name>
  - Builds an image and tags it with a repository name.
- docker run -d -p <host_port>:<container_port> <image_id>
  - Runs a container in detached mode, mapping ports between host and container.
- docker ps
  - Lists running containers.
- docker stop <container_id> or docker stop <container_name>:
  - Stops a running container.
- docker ps -a
  - Lists all containers (both running and stopped).
- docker rm <container_id> or docker rm <container_name>
  - Removes a container.
- docker rmi <image_id> or docker rmi <image_name>
  - Removes an image.

Steps To Make It Work

Installation

Install Docker

- Downloaded the Docker Engine from the Docker website followed the instructions for the installation process.

Configuration

Creating a DockerFile:

```
# To use the Nginx image from Docker Hub
FROM nginx:alpine

# Copy  contents of  public folder to Nginx html directory
COPY public/ /usr/share/nginx/html/

# Expose port 80 but it is not mandatory
#EXPOSE 80

# Start Nginx when container starts
#Also not mandatory
#CMD ["nginx", "-g", "daemon off;"]

#For Nginx in debug mode
#CMD ["nginx-debug", "-g", "daemon off;"]
```

Building an Image:

- Use `docker build .` to build an image from a Dockerfile located in the current directory (.).
- Optionally, you can tag the image with a repository name using

- `docker build -t <repository_name> ..`

Listing Images

- After building, use `docker images` to list all locally available Docker images.

Creation of Files

Creating and Running Containers:

- Create a container from an image with `docker run`:
  - Use docker run -d -p <host_port>:<container_port> <image_id> to run a container in detached mode (-d) and map ports (-p). Replace <host_port> and <container_port> with appropriate values.
    - Example: docker run -d -p 80:80 8b0a2c43a149 runs a container from image 8b0a2c43a149, mapping host port 80 to container port 80.

Managing Containers:

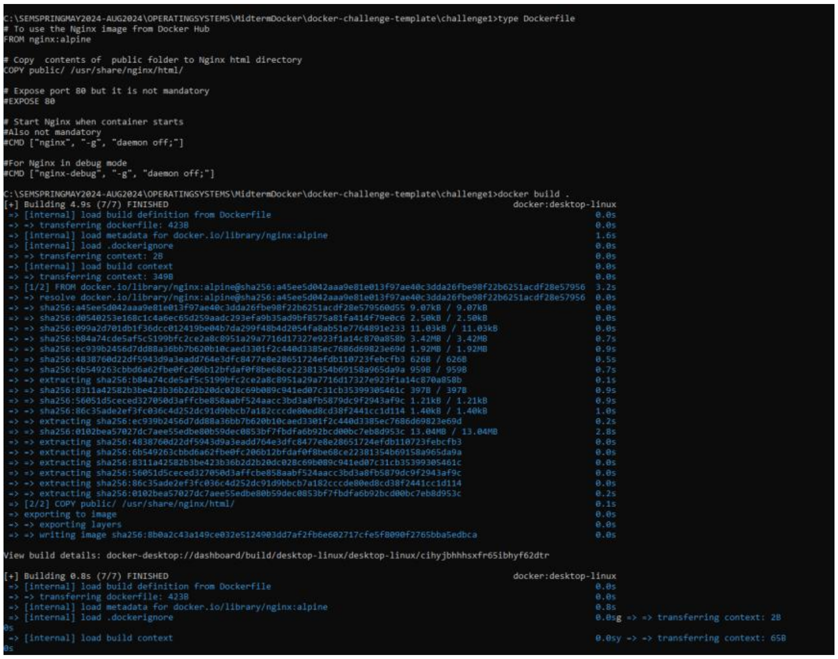
- View running containers with
  - `docker ps`.
- Stop a container using
  - `docker stop <container_id>` or `docker stop <container_name>`.
- List all containers (including stopped ones) with
  - `docker ps -a`.
- Remove a container with
  - `docker rm <container_id>` or `docker rm <container_name>`.

Managing Images:

- Remove an image using
  - `docker rmi <image_id>` or `docker rmi <image_name>`.

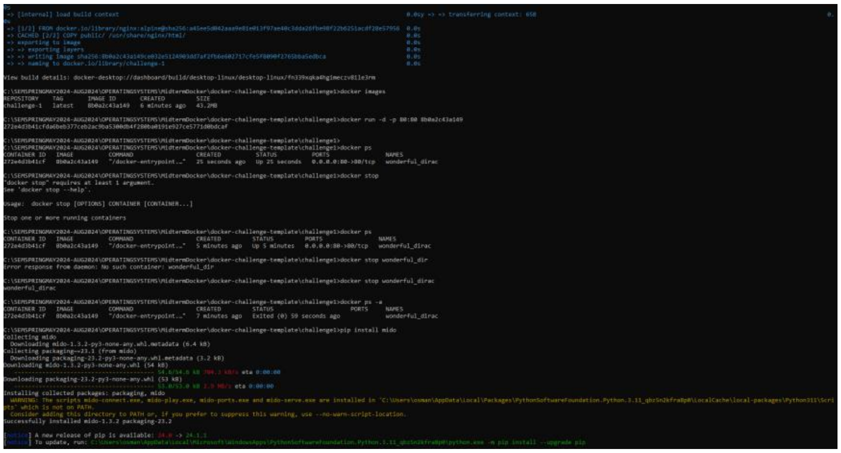
Screenshots

Png1:



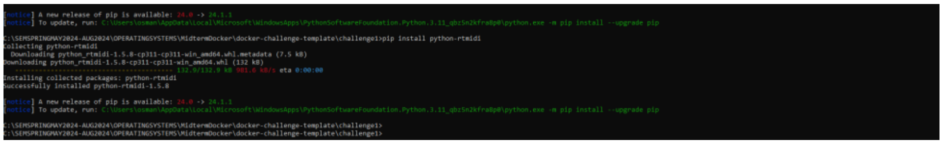
```
C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>type Dockerfile
# To use the Nginx image from Docker Hub
FROM nginx:alpine

# Copy  contents of  public folder to Nginx html directory
COPY public/ /usr/share/nginx/html/

# Expose port 80 but it is not mandatory
#EXPOSE 80

# Start Nginx when container starts
#Also not mandatory
#CMD ["nginx", "-g", "daemon off;"]

#For Nginx in debug mode
#CMD ["nginx-debug", "-g", "daemon off;"]

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker build .
[+] Building 4.9s (7/7) FINISHED                                                                      docker:desktop-linux
 => [internal] load build definition from Dockerfile                                                                  0.0s
 => => transferring dockerfile: 423B                                                                                  0.0s
 => [internal] load metadata for docker.io/library/nginx:alpine                                                       1.6s
 => [internal] load .dockerignore                                                                                     0.0s
 => => transferring context: 2B                                                                                       0.0s
 => [internal] load build context                                                                                     0.0s
 => => transferring context: 349B                                                                                     0.0s
 => [1/2] FROM docker.io/library/nginx:alpine@sha256:a45ee5d042aaa9e81e013f97ae40c3dda26fbe98f22b6251acdf28e57956  3.2s
 => => resolve docker.io/library/nginx:alpine@sha256:a45ee5d042aaa9e81e013f97ae40c3dda26fbe98f22b6251acdf28e57956  0.0s
 => => sha256:a45ee5d042aaa9e81e013f97ae40c3dda26fbe98f22b6251acdf28e579560d55 9.07kB / 9.07kB                        0.0s
 => => sha256:d0540253e168c1c4a6ec65d259aadc293efa9b35ad9bf8575a81fa414f79e0c6 2.50kB / 2.50kB                        0.0s
 => => sha256:099a2d701db1f36dcc012419be04b7da299f48b4d2054fa8ab51e7764891e233 11.03kB / 11.03kB                      0.0s
 => => sha256:b84a74cde5af5c5199bfc2ce2a8c8951a29a7716d17327e923f1a14c870a858b 3.42MB / 3.42MB                        0.7s
 => => sha256:ec939b2456d7dd88a36bb7b620b10caed3301f2c440d3385ec7686d69823e69d 1.92MB / 1.92MB                        0.9s
 => => sha256:4838760d22df5943d9a3eadd764e3dfc8477e8e28651724efdb110723febcfb3 626B / 626B                            0.5s
 => => sha256:6b549263cbbd6a62fbe0fc206b12bfdaf0f8be68ce22381354b69158a965da9a 959B / 959B                            0.7s
 => => extracting sha256:b84a74cde5af5c5199bfc2ce2a8c8951a29a7716d17327e923f1a14c870a858b                             0.1s
 => => sha256:8311a42582b3be423b36b2d2b20dc028c69b089c941ed07c31cb35399305461c 397B / 397B                            0.9s
 => => sha256:56051d5ceced327050d3affcbe858aabf524aacc3bd3a8fb5879dc9f2943af9c 1.21kB / 1.21kB                        0.9s
 => => sha256:86c35ade2ef3fc036c4d252dc91d9bbcb7a182cccde80ed8cd38f2441cc1d114 1.40kB / 1.40kB                        1.0s
 => => extracting sha256:ec939b2456d7dd88a36bb7b620b10caed3301f2c440d3385ec7686d69823e69d                             0.2s
 => => sha256:0102bea57027dc7aee55edbe80b59dec0853bf7fbdfa6b92bcd00bc7eb8d953c 13.04MB / 13.04MB                      2.8s
 => => extracting sha256:4838760d22df5943d9a3eadd764e3dfc8477e8e28651724efdb110723febcfb3                             0.0s
 => => extracting sha256:6b549263cbbd6a62fbe0fc206b12bfdaf0f8be68ce22381354b69158a965da9a                             0.0s
 => => extracting sha256:8311a42582b3be423b36b2d2b20dc028c69b089c941ed07c31cb35399305461c                             0.0s
 => => extracting sha256:56051d5ceced327050d3affcbe858aabf524aacc3bd3a8fb5879dc9f2943af9c                             0.0s
 => => extracting sha256:86c35ade2ef3fc036c4d252dc91d9bbcb7a182cccde80ed8cd38f2441cc1d114                             0.0s
 => => extracting sha256:0102bea57027dc7aee55edbe80b59dec0853bf7fbdfa6b92bcd00bc7eb8d953c                             0.2s
 => [2/2] COPY public/ /usr/share/nginx/html/                                                                         0.1s
 => exporting to image                                                                                                0.0s
 => => exporting layers                                                                                               0.0s
 => => writing image sha256:8b0a2c43a149ce032e5124903dd7af2fb6e602717cfe5f8090f2765bba5edbca                          0.0s

View build details: docker-desktop://dashboard/build/desktop-linux/desktop-linux/cihyjbhhhsxfr65ibhyf62dtr

[+] Building 0.8s (7/7) FINISHED                                                                      docker:desktop-linux
 => [internal] load build definition from Dockerfile                                                                  0.0s
 => => transferring dockerfile: 423B                                                                                  0.0s
 => [internal] load metadata for docker.io/library/nginx:alpine                                                       0.8s
 => [internal] load .dockerignore                                                                                     0.0sg => => transferring context: 2B
0s
 => [internal] load build context                                                                                     0.0sy => => transferring context: 65B
0s
```

Png2:



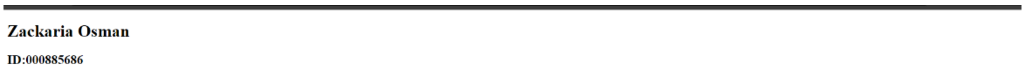
```
0s
 => [internal] load build context                                                          0.0sy => => transferring context: 65B                                         0.
0s
 => [1/2] FROM docker.io/library/nginx:alpine@sha256:a45ee5d042aaa9e81e013f97ae40c3dda26fbe98f22b6251acdf28e57956  0.0s
 => CACHED [2/2] COPY public/ /usr/share/nginx/html/                                       0.0s
 => exporting to image                                                                     0.0s
 => => exporting layers                                                                    0.0s
 => => writing image sha256:8b0a2c43a149ce032e5124903dd7af2fb6e602717cfe5f8090f2765bba5edbca  0.0s
 => => naming to docker.io/library/challenge-1                                             0.0s

View build details: docker-desktop://dashboard/build/desktop-linux/desktop-linux/fn339xqka4hgimeczv81le3rm

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker images
REPOSITORY    TAG       IMAGE ID       CREATED         SIZE
challenge-1   latest    8b0a2c43a149   6 minutes ago   43.2MB

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker run -d -p 80:80 8b0a2c43a149
272e4d3b41cfda6beb377ceb2ac9ba5300db4f280ba0191e927ce5771d0bdcaf

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>
C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED          STATUS          PORTS                NAMES
272e4d3b41cf   8b0a2c43a149   "/docker-entrypoint.…"   25 seconds ago   Up 25 seconds   0.0.0.0:80->80/tcp   wonderful_dirac

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker stop
"docker stop" requires at least 1 argument.
See 'docker stop --help'.

Usage:  docker stop [OPTIONS] CONTAINER [CONTAINER...]

Stop one or more running containers

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED         STATUS         PORTS                NAMES
272e4d3b41cf   8b0a2c43a149   "/docker-entrypoint.…"   5 minutes ago   Up 5 minutes   0.0.0.0:80->80/tcp   wonderful_dirac

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker stop wonderful_dir
Error response from daemon: No such container: wonderful_dir

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker stop wonderful_dirac
wonderful_dirac

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED         STATUS                      PORTS     NAMES
272e4d3b41cf   8b0a2c43a149   "/docker-entrypoint.…"   7 minutes ago   Exited (0) 59 seconds ago             wonderful_dirac

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>pip install mido
Collecting mido
  Downloading mido-1.3.2-py3-none-any.whl.metadata (6.4 kB)
Collecting packaging~=23.1 (from mido)
  Downloading packaging-23.2-py3-none-any.whl.metadata (3.2 kB)
Downloading mido-1.3.2-py3-none-any.whl (54 kB)
   ---------------------------------------- 54.6/54.6 kB 704.1 kB/s eta 0:00:00
Downloading packaging-23.2-py3-none-any.whl (53 kB)
   ---------------------------------------- 53.0/53.0 kB 2.9 MB/s eta 0:00:00
Installing collected packages: packaging, mido
  WARNING: The scripts mido-connect.exe, mido-play.exe, mido-ports.exe and mido-serve.exe are installed in 'C:\Users\osman\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra8p0\LocalCache\local-packages\Python311\Scri
pts' which is not on PATH.
  Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
Successfully installed mido-1.3.2 packaging-23.2

[notice] A new release of pip is available: 24.0 -> 24.1.1
[notice] To update, run: C:\Users\osman\AppData\Local\Microsoft\WindowsApps\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra8p0\python.exe -m pip install --upgrade pip
```

Png3:



```
[notice] A new release of pip is available: 24.0 -> 24.1.1
[notice] To update, run: C:\Users\osman\AppData\Local\Microsoft\WindowsApps\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra8p0\python.exe -m pip install --upgrade pip

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>pip install python-rtmidi
Collecting python-rtmidi
  Downloading python_rtmidi-1.5.8-cp311-cp311-win_amd64.whl.metadata (7.5 kB)
Downloading python_rtmidi-1.5.8-cp311-cp311-win_amd64.whl (132 kB)
   ---------------------------------------- 132.9/132.9 kB 981.6 kB/s eta 0:00:00
Installing collected packages: python-rtmidi
Successfully installed python-rtmidi-1.5.8

[notice] A new release of pip is available: 24.0 -> 24.1.1
[notice] To update, run: C:\Users\osman\AppData\Local\Microsoft\WindowsApps\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra8p0\python.exe -m pip install --upgrade pip

C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>
C:\SEMSPRINGMAY2024-AUG2024\OPERATINGSYSTEMS\MidtermDocker\docker-challenge-template\challenge1>
```

Result:



Zackaria Osman

ID:000885686

Lessons learned

No, nothing went wrong, but this is what I learned:

- Docker Installation and Set up
- Creating Dockerfiles
- Building Images
- Managing Containers and Images

References

- YouTube:
  - https://www.youtube.com/watch?v=SnSH8Ht3MIc&list=LL&index=7&t=929s
- LinkedIn
  - https://www.linkedin.com/pulse/why-every-software-engineer-should-learn-docker-s-gouse-basha-2amxe/