

Experiment No. 1.4

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Semester: III
Subject Name: Containerization with Docker

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1. Aims/Overview for the practical:

Managing containers with docker CLI

2. Steps for experiment/practical:

Step 1. Install Docker: If you haven't already, install Docker on your host machine.

Step 2. Pull Docker Images: use the `docker pull` command to download the desired image from a container registry, such as Docker Hub.

For example:

```
```bash
docker pull nginx
```
```

```
PS D:\docker> docker pull nginx
Using default tag: latest
latest: Pulling from library/nginx
a378f10b3218: Pull complete
4dfff0708538: Pull complete
2135e49ace4b: Pull complete
c843f6b280ce: Pull complete
6f35ab6f1400: Pull complete
6c538b49fa4a: Pull complete
d57731fb9008: Pull complete
Digest: sha256:b4af4f8b6470febf45dc10f564551af682a802eda1743055a7dfc8332dffa595
Status: Downloaded newer image for nginx:latest
docker.io/library/nginx:latest
```

Step 3. Run a Container: Start a container from an image using the `docker run` command.

```
```bash
docker run -imagename
```
```

```
PS D:\docker> docker run nginx
/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
2023/10/17 17:30:44 [notice] 1#1: using the "epoll" event method
2023/10/17 17:30:44 [notice] 1#1: nginx/1.25.2
```

Step 4. List Running Containers: To see the list of running containers, use the `docker ps` command:

```
docker ps
```

To view all containers (including stopped ones), add the `-a` option:

```
docker ps -a
```

```
PS D:\docker> docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS        NAMES
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS        NAMES
a28bc0cc006e   nginx    "/docker-entrypoint..." About a minute ago Exited (0) 26 seconds ago jovial_davinci
```

Step 5. Inspect Container Details: To get detailed information about a specific container, including its configuration and network settings, use the `docker inspect` command:

```
docker inspect my-nginx-container
```

```
PS D:\docker> docker inspect nginx
[
  {
    "Id": "sha256:bc649bab30d150c10a84031a7f54c99a8c31069c7bc324a7899d7125d59cc973",
    "RepoTags": [
      "nginx:latest"
    ],
    "RepoDigests": [
      "nginx@sha256:b4af4f8b6470febf45dc10f564551af682a802eda1743055a7dfc8332dffa595"
    ],
    "Parent": "",
    "Comment": "",
    "Created": "2023-10-12T03:14:44.515974298Z",
    "Container": "8dfe4db4918db2931d8291b5d55c6ac6099d142e58d5688cee7cddb27e404724",
    "ContainerConfig": {
```

Step 6. View Container Logs: To view the logs of a running container, use the `docker logs` command:

docker logs my-nginx-container

```
PS D:\docker> docker logs 454a1df9227d
/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
2023/10/17 18:45:46 [notice] 1#1: using the "epoll" event method
2023/10/17 18:45:46 [notice] 1#1: nginx/1.25.2
2023/10/17 18:45:46 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2023/10/17 18:45:46 [notice] 1#1: OS: Linux 5.15.90.1-microsoft-standard-WSL2
2023/10/17 18:45:46 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
```

Step 7. Stop a Container: To stop a running container, use the `docker stop` command:

docker stop my-nginx-container

```
PS D:\docker> docker stop aa8bc0cc006e
aa8bc0cc006e
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS
aa8bc0cc006e   nginx    "/docker-entrypoint. ...." 55 minutes ago Exited (0) 53 minutes ago
```


Step 8. Start a Stopped Container: To start a stopped container, use the `docker start` command:

docker start my-nginx-container

```
PS D:\docker> docker start aa8bc0cc006e
aa8bc0cc006e
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS
aa8bc0cc006e   nginx    "/docker-entrypoint...." 56 minutes ago Up 1 second
```

Step 9. Remove a Container: If you want to remove a container, use the `docker rm` command:

docker rm my-nginx-container

```
PS D:\docker> docker rm aa8bc0cc006e
aa8bc0cc006e
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS
```

Note that you cannot remove a running container. You must stop it first using `docker stop`.

Step 10. Manage Container Resources: To modify container resources, such as CPU and memory limits, you can use the `docker update` command. For example, to change the CPU share of a running container:

docker update --cpus 2 my-nginx-container

cpus 2`: Limit the container to 2 CPU shares

```
PS D:\docker> docker update --cpus 2 ef08076d595e
ef08076d595e
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS
acf314dd28f1   nginx    "/docker-entrypoint...." 2 minutes ago  Exited (0) About a minute ago
d1cf77439961   nginx    "/docker-entrypoint...." 2 minutes ago  Exited (0) 2 minutes ago
ef08076d595e   nginx    "/docker-entrypoint...." 4 minutes ago  Exited (0) 4 minutes ago
```

Step 11. Cleanup: Regularly clean up stopped containers, unused images, and other Docker resources to save disk space and keep your environment tidy. You can use the `docker system prune` command for this purpose.

docker system prune

```
PS D:\docker> docker system prune
WARNING! This will remove:
- all stopped containers
- all networks not used by at least one container
- all dangling images
- all dangling build cache

Are you sure you want to continue? [y/N] y
Deleted Containers:
acf314dd28f1a8a2ac21ad31601fe793932fe24ad2c674deb855427bce2df6a6
d1cf774399611a9737d164b11b3a0e219d91060b4e783af59c13ad032ad8e6f7
ef08076d595e56341e580bcfd73766a63de9c178b70ab141fb3a971222a3d2d2
e3faaca102c9a9df80f62721e75955dac0173e6a21e0f45456b741e5079fb3e1
c1194021817df4ae98f2157e812263a7063da79957f954b22a7333319aa70159
```

4. Result/Output/Writing Summary:

```
Are you sure you want to continue? [y/N] y
Deleted Containers:
acf314dd28f1a8a2ac21ad31601fe793932fe24ad2c674deb855427bce2df6a6
d1cf774399611a9737d164b11b3a0e219d91060b4e783af59c13ad032ad8e6f7
ef08076d595e56341e580bcfd73766a63de9c178b70ab141fb3a971222a3d2d2
e3faaca102c9a9df80f62721e75955dac0173e6a21e0f45456b741e5079fb3e1
c1194021817df4ae98f2157e812263a7063da79957f954b22a7333319aa70159

Deleted build cache objects:
snms6p6vy7vele0py644tfi3c
x8qq1des0ydt1ia9qtmzt0s75
uwex3hqrzoja2ewrxwrhvgi0n
j9h2fr8lgvgsmjmwk6cue0ckk
ns3lo2fp2nujpr9yde390ku5

Total reclaimed space: 3.433kB
PS D:\docker> docker ps -a
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS          NAMES
PS D:\docker>
```

5. Learning outcomes (What I have learned):

- How to build image using docker CLI
- How to start, stop and remove container on docker CLI