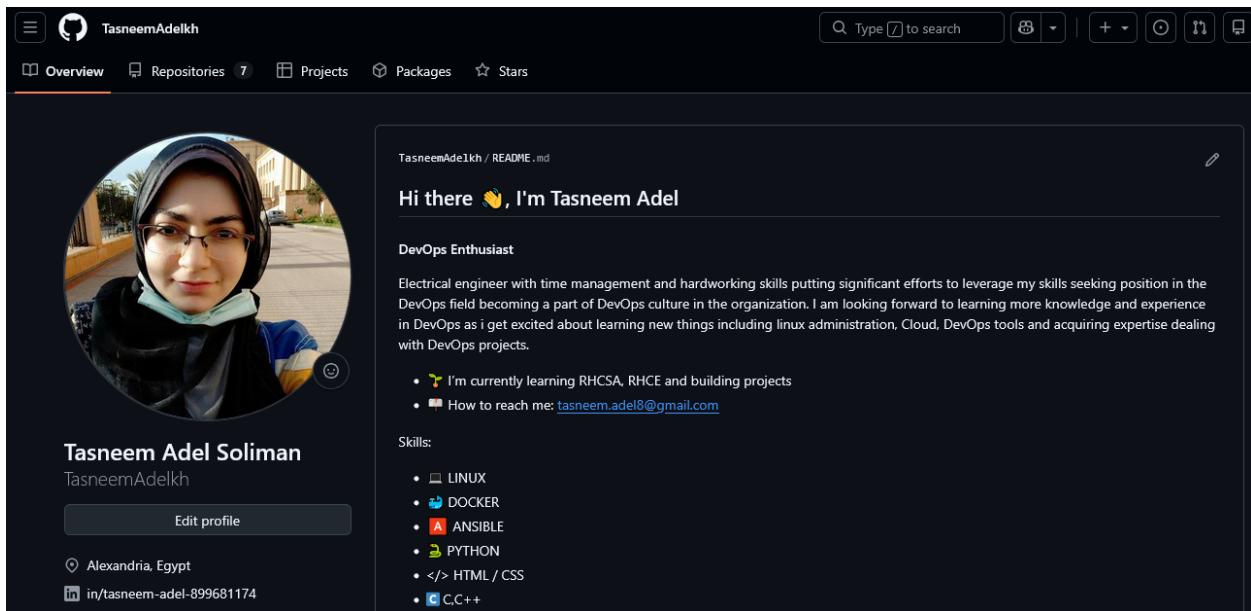


Lab 1

GitHub Account:

<https://github.com/TasneemAdelkh>



The screenshot shows the GitHub profile of Tasneem Adel. On the left, there is a circular profile picture of a woman wearing glasses and a hijab. Below the picture, her name 'Tasneem Adel Soliman' and handle 'TasneemAdelkh' are displayed. There is a 'Edit profile' button and location information ('Alexandria, Egypt') with a LinkedIn link. On the right, the README.md file contains a message: 'Hi there 🌟, I'm Tasneem Adel' and 'DevOps Enthusiast'. It describes her as an Electrical engineer seeking a DevOps position and lists skills: 'I'm currently learning RHCSA, RHCE and building projects', 'How to reach me: tasneem.adel8@gmail.com', and a list of programming languages and tools: LINUX, DOCKER, ANSIBLE, PYTHON, HTML / CSS, and C/C++.

Downloading and Installing docker:

```
[tadel@serverb ~]$ sudo dnf install -y yum-utils --disablerepo=VM_BaseOS --disablerepo=VM_AppStream
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use subscription-manager to register.

Docker CE Stable - x86_64                                     140 kB/s | 45 kB     00:00
Last metadata expiration check: 0:00:01 ago on Thu 26 Feb 2026 02:56:37 PM EET.
Dependencies resolved.
=====
 Package           Architecture      Version       Repository      Size
 =====
Installing:
 yum-utils        noarch          4.3.0-11.el9_3   Local_VM_BaseOS    45 k

Transaction Summary
=====
Install 1 Package

Total size: 45 k
Installed size: 23 k
Downloading Packages:
Running transaction check
Transaction check succeeded.
```

Installing yum-utils to enable us to add the docker repo easily.

```

Running transaction
Preparing : 1/1
Installing : yum-utils-4.3.0-11.el9_3.noarch 1/1
Running scriptlet: yum-utils-4.3.0-11.el9_3.noarch 1/1
Verifying : yum-utils-4.3.0-11.el9_3.noarch 1/1
Installed products updated.

Installed:
  yum-utils-4.3.0-11.el9_3.noarch

Complete!
[tadel@serverb ~]$
[tadel@serverb ~]$ sudo dnf config-manager --add-repo https://download.docker.com/linux/rhel/docker-ce.repo
o
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use subscription-manager to register.

Adding repo from: https://download.docker.com/linux/rhel/docker-ce.repo

```

The docker repo is added using the dnf-config-manager tool.

```

[tadel@serverb ~]$ sudo dnf install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin --disablerepo=VM_AppStream --disablerepo=VM_BaseOS
Updating Subscription Management repositories.
Unable to read consumer identity

This system is not registered with an entitlement server. You can use subscription-manager to register.

Docker CE Stable - x86_64                                     12 kB/s | 2.0 kB     00:00
Dependencies resolved.
=====
 Package           Architecture Version      Repository    Size
 =====
 Installing:
 containerd.io      x86_64       2.2.1-1.el9      docker-ce-stable 35 M
 docker-buildx-plugin x86_64       0.31.1-1.el9      docker-ce-stable 21 M
 docker-ce          x86_64       3:29.2.1-1.el9    docker-ce-stable 24 M
 docker-ce-cli       x86_64       1:29.2.1-1.el9    docker-ce-stable 8.4 M
 docker-compose-plugin x86_64       5.1.0-1.el9      docker-ce-stable 8.2 M
 Installing weak dependencies:
 docker-ce-rootless-extras   x86_64       29.2.1-1.el9    docker-ce-stable 3.4 M

Transaction Summary

```

```

Install 6 Packages

Total download size: 100 M
Installed size: 393 M
Is this ok [y/N]: y
Downloading Packages:
(1/6): docker-buildx-plugin-0.31.1-1.el9.x86_64.rpm           1.1 MB/s | 21 MB    00:19
(2/6): docker-ce-29.2.1-1.el9.x86_64.rpm                     1.2 MB/s | 24 MB    00:19
(3/6): docker-ce-rootless-extras-29.2.1-1.el9.x86_64.rpm     1.0 MB/s | 3.4 MB   00:03
(4/6): docker-ce-cli-29.2.1-1.el9.x86_64.rpm                 1.1 MB/s | 8.4 MB   00:07
(5/6): docker-compose-plugin-5.1.0-1.el9.x86_64.rpm          1.3 MB/s | 8.2 MB   00:06
(6/6): containerd.io-2.2.1-1.el9.x86_64.rpm                  1.2 MB/s | 35 MB   00:29
-----
Total                                         3.4 MB/s | 100 MB   00:29
Docker CE Stable - x86_64                      10 kB/s | 1.6 kB   00:00
Importing GPG key 0x621E9F35:
  Userid      : "Docker Release (CE rpm) <docker@docker.com>"
  Fingerprint: 060A 61C5 1B55 8A7F 742B 77AA C52F EB6B 621E 9F35
  From        : https://download.docker.com/linux/rhel/gpg
Is this ok [y/N]: t
Is this ok [y/N]: y
Key imported successfully
Running transaction check
Transaction check succeeded.

```

```

Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing      : 1/1
  Installing    : docker-buildx-plugin-0.31.1-1.el9.x86_64 1/6
  Running scriptlet: docker-buildx-plugin-0.31.1-1.el9.x86_64 1/6
  Installing    : docker-compose-plugin-5.1.0-1.el9.x86_64 2/6
  Running scriptlet: docker-compose-plugin-5.1.0-1.el9.x86_64 2/6
  Installing    : docker-ce-cli-1:29.2.1-1.el9.x86_64       3/6
  Running scriptlet: docker-ce-cli-1:29.2.1-1.el9.x86_64       3/6
  Installing    : containerd.io-2.2.1-1.el9.x86_64          4/6
  Running scriptlet: containerd.io-2.2.1-1.el9.x86_64          4/6
  Installing    : docker-ce-rootless-extras-29.2.1-1.el9.x86_64 5/6
  Running scriptlet: docker-ce-rootless-extras-29.2.1-1.el9.x86_64 5/6
  Installing    : docker-ce-3:29.2.1-1.el9.x86_64          6/6
  Running scriptlet: docker-ce-3:29.2.1-1.el9.x86_64          6/6
  Verifying      : containerd.io-2.2.1-1.el9.x86_64          1/6
  Verifying      : docker-buildx-plugin-0.31.1-1.el9.x86_64 2/6
  Verifying      : docker-ce-3:29.2.1-1.el9.x86_64          3/6
  Verifying      : docker-ce-cli-1:29.2.1-1.el9.x86_64       4/6
  Verifying      : docker-ce-rootless-extras-29.2.1-1.el9.x86_64 5/6
  Verifying      : docker-compose-plugin-5.1.0-1.el9.x86_64 6/6
Installed products updated.

```

```

Installed:
  containerd.io-2.2.1-1.el9.x86_64               docker-buildx-plugin-0.31.1-1.el9.x86_64
  docker-ce-3:29.2.1-1.el9.x86_64                docker-ce-cli-1:29.2.1-1.el9.x86_64
  docker-ce-rootless-extras-29.2.1-1.el9.x86_64  docker-compose-plugin-5.1.0-1.el9.x86_64

Complete!
[tadel@server ~]$ 

```

All docker related packages are installed.

```
[tadel@serverb ~]$ systemctl enable --now docker
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /usr/lib/systemd/system/docker.service.

[tadel@serverb ~]$
```

Enabling and starting docker.

```
[tadel@serverb ~]$ sudo docker pull nginx:alpine
[sudo] password for tadel:
alpine: Pulling from library/nginx
589002ba0eae: Pull complete
5e7756927bef: Pull complete
bca5d04786e1: Pull complete
3e2c181db1b0: Pull complete
6b7b6c7061b7: Pull complete
399d0898a94e: Pull complete
955a8478f9ac: Pull complete
6d397a54a185: Pull complete
dd176b4ea00: Download complete
8a29e1f4877b: Download complete
Digest: sha256:1d13701a5f9f3fb01aaa88cef2344d65b6b5bf6b7d9fa4cf0dca557a8d7702ba
Status: Downloaded newer image for nginx:alpine
docker.io/library/nginx:alpine
[tadel@serverb ~]$
```

Pulling nginx:alpine image.

```
[tadel@serverb ~]$ sudo docker run -d -p 8080:80 --name Tasneem-ITI-46 nginx:alpine
2bdcdf5b4c335a868a9771bac659e48df8127787b733a480d3d151b0cbdddbbd
[tadel@serverb ~]$
[tadel@serverb ~]$ sudo docker ps
CONTAINER ID   IMAGE      COMMAND       CREATED        STATUS        PORTS          NAMES
2bdcdf5b4c33   nginx:alpine   "/docker-entrypoint..."   4 seconds ago   Up 3 seconds   0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   Tasneem-ITI-46
[tadel@serverb ~]$
```

Running the container in detached mode and having Tasneem-ITI-46 as its name.

```
[tadel@serverb ~]$ sudo docker run -d -p 8080:80 --name Tasneem-ITI-46-Apache --memory="70m" --cpus="1.0" httpd:alpine
Unable to find image 'httpd:alpine' locally
alpine: Pulling from library/httpd
abd702cd48cb: Pull complete
3688fd767e4a: Pull complete
b9df760bab4a: Pull complete
79273eb2147b: Pull complete
4f4fb700ef54: Pull complete
987f24f891f4: Pull complete
2bd78f43169f: Download complete
8c8ca383ec3c: Download complete
Digest: sha256:8f26f33a7002658050e9ab2cd6b77502619dfc89d0a6ba2e9e4a202e0ef04596
Status: Downloaded newer image for httpd:alpine
0025afb37fa75ef5d39f4198b5c47bdb70f1af8f3a52d6d241d69d07b8b8fa
docker: Error response from daemon: failed to set up container networking: driver failed programming external connectivity on endpoint Tasneem-ITI-46-Apache (6e180e9b29d231da1d0f520abb679f44d08fe20f73fc9a5e5b9ccf2efb6a21): Bind for 0.0.0.0:8080 failed: port is already allocated
```

Pulling and running the httpd:alpine image but forgot to change the port number 8080 as its being used by the nginx container.

Hence, the container did not start but the image is pulled successfully.

```
[tadel@serverb ~]$ sudo docker run -d -p 8090:80 --name Tasneem-ITI-46-Apache --memory="70m" --cpus="1.0" httpd:alpine
67443b670a18e73753003fe00af79afdef269702ee9a7de67b6ae2ed5074ef1d
[tadel@serverb ~]$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS
67443b670a18        httpd:alpine        "httpd-foreground"   15 seconds ago     Up 15 seconds      0.0.0.0:8090->80/tcp, [::]:8090->80/tcp   Tasneem
-ITI-46-Apache
2bdcdf5b4c33        nginx:alpine       "/docker-entrypoint..." 9 minutes ago      Up 9 minutes      0.0.0.0:8080->80/tcp, [::]:8080->80/tcp   Tasneem
-ITI-46
[tadel@serverb ~]$
```

The container has been run with the memory and cpu cores limits.

```
[tadel@serverb ~]$ sudo cat /sys/fs/cgroup/system.slice/docker-67443b670a18e73753003fe00af79afdef269702ee9a7de67b6ae2ed5074ef1d.scope/memory.max
73400320
[tadel@serverb ~]$ sudo cat /sys/fs/cgroup/system.slice/docker-67443b670a18e73753003fe00af79afdef269702ee9a7de67b6ae2ed5074ef1d.scope/cpu.max
100000 100000
[tadel@serverb ~]$ sudo cat /sys/fs/cgroup/system.slice/docker-2bdcdf5b4c335a868a9771bac659e48df8127787b733a480d3d151b0cbdddbbd.scope/cpu.max
max 100000
[tadel@serverb ~]$ sudo cat /sys/fs/cgroup/system.slice/docker-2bdcdf5b4c335a868a9771bac659e48df8127787b733a480d3d151b0cbdddbbd.scope/memory.max
max
[tadel@serverb ~]$
```

- The maximum memory in the Apache container , which had the 70 MB memory limit in the command, is 73400320 byte.

Which is $70 * 1024 * 1024 = 73400320$ byte.

- And the max cpu, it says it uses 100000 microsec out of 100000 microsec. Which is the maximum consumed by the container over 100 msec interval window size.

$\therefore \text{Max/ window size} = 100000/100000 = 1 \text{ core cpu.}$

- The nginx container has memory and cpu limits set to max, which means is the default and it means that no limit is set on the cpu or memory and they can take as much as they need only limited by the physical resources.

Bonus:

```
[tadel@serverb ~]$ sudo docker run -d --name memory-eater --memory="50m" --memory-swap="50m" alpine sh -c 'v=$(printf "%055000000d" 0)'
3b24a641877c96f5e1971d48ad01e3891a7cedfb8e639db5765baf371a2b4682
[tadel@serverb ~]$ sudo docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED             STATUS              PORTS
 NAMES
3b24a641877c        alpine             "sh -c 'v=$(printf \..." 11 seconds ago     Exited (137) 4 seconds ago
memory-eater
67443b670a18        httpd:alpine        "httpd-foreground"   18 hours ago      Up 18 hours      0.0.0.0:8090->80/tcp, [::]:8090->80
/TCP Tasneem-ITI-46-Apache
2bdcdf5b4c33        nginx:alpine       "/docker-entrypoint..." 18 hours ago      Up 18 hours      0.0.0.0:8080->80/tcp, [::]:8080->80
/TCP Tasneem-ITI-46
fe1ccf6aea0f        nginx:alpine       "/docker-entrypoint..." 18 hours ago      Exited (0) 18 hours ago
my-nginx
[tadel@serverb ~]$
```

An alpine container is created with a command assigning a very large string into the variable ‘v’, the string is generated using the printf command, it is used to print character 0 and precede it with 55000000-1 zeros. Hence, generating a 55MB string which when loaded into the ram when being assigned to the variable going to exceed the 50MB RAM limit set on the container.

When the container started, it ended when it reached this command. And exited with 137 code.

```
[tadel@serverb ~]$ sudo docker inspect memory-eater
[
  {
    "Id": "3b24a641877c96f5e1971d48ad01e3891a7cedfb8e639db5765baf371a2b4682",
    "Created": "2026-02-27T08:09:08.00922559Z",
    "Path": "sh",
    "Args": [
      "-c",
      "v=$(printf \"%055000000d\" 0)"
    ],
    "State": {
      "Status": "exited",
      "Running": false,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": true,
      "Dead": false,
      "Pid": 0,
      "ExitCode": 137,
    }
  }
]
```

When doing inspect on the container, it is shown that the status of the OOMKilled is true which means it exited by the OOM killer due to insufficient memory.