

Lab1 Docker Commands

Docker version

```
1 root@ubuntu22:~# docker --version
2 Docker version 23.0.3, build 3e7cbfd
```

Docker Hub

- Docker hub hosts all Images; Official and Community.
- Docker hub can be accessible Docker API: <https://registry.hub.docker.com/v2>
- Docker hub can also be accessible by Docker client using `docker <arguments>` commands

docker search

Search a image on Docker hub.

```
1 docker search MySQL
2 docker search ubuntu
3 docker search httpd
```

To pull image to your computer from Docker hub

```
1 docker pull httpd
2 docker pull httpd:latest
3 docker pull httpd:2.4.57
4 docker pull httpd:2.4
5 docker pull httpd:alpine
6 docker pull httpd:alpine3.18
7 docker pull httpd:bullseye
```

To see the list of available images on our host

```
1 root@ubuntu22:~# docker images
2 REPOSITORY          TAG          IMAGE ID      CREATED        SIZE
3 website-ssl         latest      26a6015f3619  26 hours ago  291MB
4 website             1.0        2d7bde687665  27 hours ago  239MB
5 ubuntu/apache2     latest     edd92437b7eb   3 weeks ago   179MB
6 ubuntu              latest     08d22c0ceb15   5 weeks ago   77.8MB
```

Running your first container

```
1 docker run httpd
```

You will find that the container runs in Foreground and will hijack your command prompt. To come out type Ctrl+Z

Running containers in attached mode

We get the shell of the container

```
1 root@ubuntu22:~# docker run -it ubuntu
2 root@5d1274eb7a19:/#
```

You can see that we are now inside the container.

To confirm find the container os version: `cat /etc/os-release`

Come out of container

There are 2 ways:

1. `exit` will get you of the container and also exits the container
2. `Control p` , `Control q`

Verify with `docker ps`

To see active containers

```
1 root@ubuntu22:~# docker ps
```

Container States

- **Created:** A created container was prepared but never started. You can create a container in advance with `docker create` in preparation for a job you want to run later. It's also possible for a container to get stuck in the created state. This can happen when it needs a resource that another container already has, such as a network port.
- **Restarting:** A container is in the process of restarting naturally or after a failure.
- **Running:** A container that's up and running. This indicates that `docker start` succeeded.
- **Removing:** After you stop a container, it remains available until it's removed. This state indicates that removal has started. If removal state persists, it may also mean it's a large container or there's a problem removing it.
- **Paused:** A container has been paused with `docker pause` command.
- **Exited:** The command that started the container has exited. This may be because of an exception, the `docker stop` command, or because the command completed. An exited container isn't consuming any CPU or memory.
- **Dead:** Containers in a dead state aren't operational and can only be removed.

To see all containers including running or exited

```
1 root@ubuntu22:~# docker ps -a
2 CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS              PORTS
3 aa57b8ddd861   ubuntu    "/bin/bash"             9 minutes ago Exited (127) 5 minutes ago
4 af14a5dce9b0   website-ssl "apache2-foreground"    18 hours ago  Up 21 seconds      0.0.0.0:80->80/tcp
5
```

Stop and Start a Container

```
1 docker stop af14a5dce9b0
2 docker start af14a5dce9b0
```

Removing a container

Before removing a container you ensure the container is stopped.

You can use `docker stop <containerID>`

```
1 docker rm <containerID>
2
3 docker rm -f <containerID>
4
5 #Remove all containers
6 docker rm -f $(docker ps -aq)
```

Running containers in detached mode

In detached mode we don't get the shell of the container. But the container still run in the back.

```
1 root@ubuntu22:~# docker run -itd ubuntu
2 669e377f2e1a7bb596730a2e4b7352f49d62ea3425bb35ff5cc42878e5ae4510
```

Observe the difference between

```
docker run -itd ubuntu
```

```
docker run -d ubuntu
```

Observe this

```
1 docker run -d httpd
```

Giving a name to the container

```
1 docker run --name test-container ubuntu
```

Attaching to a container

To attach to a container firstly the container should be in running state.

```
1 root@ubuntu22:~# docker start aa57b8ddd861
2 aa57b8ddd861
3 root@ubuntu22:~# docker attach aa57b8ddd861
4 root@aa57b8ddd861:/#
```

You again get the shell of the container.

Docker Volumes

- When applications run in your container they generate lot of data.
- They can be application specific data or log files or any data.
- When you delete a container the data present in the container is also deleted.

- If you want to preserve the data then you have to use docker volumes.

Create Volume

```
docker volume create
```

Before we can create a Docker volume, let us check the **list of volumes that are already available**:

```
1 root@ubuntu22:~# docker volume ls
2 DRIVER      VOLUME NAME
```

Let us create a Volume

```
1 root@ubuntu22:~# docker volume create vol1
2 vol1
```

List and see the Volumes

```
1 root@ubuntu22:~# docker volume ls
2 DRIVER      VOLUME NAME
3 local       vol1
```

Where is this volume stored?

Inspect the volume:

```
1 root@ubuntu22:~# docker volume inspect vol1
2 [
3   {
4     "CreatedAt": "2023-04-18T09:37:15Z",
5     "Driver": "local",
6     "Labels": null,
7     "Mountpoint": "/var/lib/docker/volumes/vol1/_data",
8     "Name": "vol1",
9     "Options": null,
10    "Scope": "local"
11  }
12 ]
```

Volumes are by default stored in `/var/lib/docker/volumes`

In this case `/var/lib/docker/volumes/vol1/_data` will act as a storage.

Attach volume to a container

```
1 docker run -it --name container1 -v vol1:/data ubuntu
```

`v flag` takes source and destination.

in my case i am mapping `vol1` to a directory in the container called `/data`

```
1 root@ubuntu22:~# docker run -it --name container1 -v vol1:/data ubuntu
2 root@4874024f5d28:/# ls /
3 bin  data  etc   lib    lib64  media  opt   root  sbin  sys  usr
4 boot dev   home  lib32  libx32 mnt    proc  run   srv   tmp  var
```

We are inside the container.

Now let us go to `/data` folder and create a file with some content.

```

1 root@4874024f5d28:/# cd /data
2 root@4874024f5d28:/data# touch reports.txt
3 root@4874024f5d28:/data# echo "This is an Oracle report" > reports.txt

```

This folder `/data` can also be accessible from the Docker host.

Come out of the container and verify that data is persistent:

```

1 root@4874024f5d28:/data# exit
2 exit
3 root@ubuntu22:~# docker volume ls
4 DRIVER      VOLUME NAME
5 local       vol1
6 root@ubuntu22:~# docker volume inspect vol1
7 [
8     {
9         "CreatedAt": "2023-04-18T09:37:15Z",
10        "Driver": "local",
11        "Labels": null,
12        "Mountpoint": "/var/lib/docker/volumes/vol1/_data",
13        "Name": "vol1",
14        "Options": null,
15        "Scope": "local"
16    }
17 ]
18 root@ubuntu22:~# cd /var/lib/docker/volumes/vol1/_data
19 root@ubuntu22:/var/lib/docker/volumes/vol1/_data# ls
20 reports.txt
21 root@ubuntu22:/var/lib/docker/volumes/vol1/_data# cat reports.txt
22 This is an Oracle report
23

```

This is how we can share the data from the container to the host.

So we can have a backup of the container data.

Similarly you can also share any data from the docker host to the container:

```

1 root@ubuntu22:/var/lib/docker/volumes/vol1/_data# touch logs.txt
2 root@ubuntu22:/var/lib/docker/volumes/vol1/_data# echo "This logs file is shared from the docker host" > logs.txt

```

Now get into the container and verify the file presence.

The container `"container1"` exited as we came out:

```

1 root@ubuntu22:/var/lib/docker/volumes/vol1/_data# docker ps -a
2 CONTAINER ID   IMAGE     COMMAND                  CREATED          STATUS              PORTS
3 4874024f5d28   ubuntu   "/bin/bash"             44 minutes ago   Exited (130) 7 minutes ago

```

Let us attach to the container.

Since we cannot attach to the stopped container first we need to start it.

```

1 root@ubuntu22:~# docker start container1
2 container1
3 root@ubuntu22:~# docker attach container1
4 root@4874024f5d28:/# cd /data
5 root@4874024f5d28:/data# ls
6 logs.txt  reports.txt

```

```
7 root@4874024f5d28:/data# cat logs.txt
8 This logs file is shared from the docker host
```

i In these kind of volumes, even when the container is lost or deleted, the data can still be accessed.

Let us remove this container and validate that data persists.

```
1 root@4874024f5d28:/data# exit
2 exit
3 root@ubuntu22:~# docker rm container1
4 container1
5 root@ubuntu22:~# docker ps -a
6 #You can see that container1 is deleted.
7
8 #Now verify the data
9 root@ubuntu22:~# ls /var/lib/docker/volumes/vol1/_data
10 logs.txt  reports.txt
```

Attaching volume to multiple containers

Here we already have a volume `vol1`

Let us create a new container with the name `container2` and attach the same volume as `/data2` directory

```
1 root@ubuntu22:~# docker run -it --name container2 -v vol1:/data2 ubuntu
2 root@8f6a36cda5e4:/# ls /data2
3 logs.txt  reports.txt
```

Come out of the container but still keep the container running using `Control p`, `Control q`

i You can attach the volume to any number of containers

Let us now create another container `container3` that simultaneously runs and attach the volume as `/data3` directory

```
1 root@ubuntu22:~# docker run -it --name container3 -v vol1:/data3 ubuntu
2 root@9bc518dd5f8e:/# ls /data3
3 logs.txt  reports.txt
```

Come out of the container but still keep the container running using `Control p`, `Control q`

Verify that both containers are running:

```
1 root@ubuntu22:~# docker ps
2 CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS   NAMES
3 9bc518dd5f8e   ubuntu   "/bin/bash"             3 minutes ago Up 3 minutes             container3
4 8f6a36cda5e4   ubuntu   "/bin/bash"             5 minutes ago Up 5 minutes             container2
```

Running Non-interactive Commands in a Docker Container:

We have mounted the same volume in both containers.

Let us verify that both are mounted and working.

```
1 root@ubuntu22:~# docker exec container2 ls /data2
2 logs.txt
3 reports.txt
```

```
4
5 root@ubuntu22:~# docker exec container3 ls /data3
6 logs.txt
7 reports.txt
```

Another example: Starting a Test Container:

```
1 docker run -d --name container4 alpine watch "date >> /var/log/date.log"
```

This command creates a new Docker container from the [official alpine](#) image. This is a popular Linux container image that uses [Alpine Linux](#), a lightweight, minimal Linux distribution.

We use the `-d` flag to detach the container from our terminal and run it in the background.

`--name container4` will name the container `container4`.

And finally we have `watch "date >> /var/log/date.log"`. This is the command we want to run in the container.

`watch` will repeatedly run the command you give it, every two seconds by default.

It looks like this:

```
1 root@ubuntu22:~# docker run -d --name container4 alpine watch "date >> /var/log/date.log"
2 Unable to find image 'alpine:latest' locally
3 latest: Pulling from library/alpine
4 f56be85fc22e: Pull complete
5 Digest: sha256:124c7d2707904eea7431fffe91522a01e5a861a624ee31d03372cc1d138a3126
6 Status: Downloaded newer image for alpine:latest
7 50cac9ec4898595a1b4cfa30fe76ba131bba7f1f71db19682d73c8d49c2778d
8
9 root@ubuntu22:~# docker ps
10 CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS   NAMES
11 50cac9ec4898   alpine    "watch 'date >> /var..." 5 seconds ago  Up 4 seconds                container4
12 9bc518dd5f8e   ubuntu    "/bin/bash"             11 minutes ago Up 11 minutes                container3
13 8f6a36cda5e4   ubuntu    "/bin/bash"             14 minutes ago Up 14 minutes                container2
14
```

If you need to run a command inside a running Docker container, but don't need any interactivity, use the `docker exec` command without any flags:

```
1 docker exec container4 tail /var/log/date.log
```

It looks like this:

```
1 root@ubuntu22:~# docker exec container4 tail /var/log/date.log
2 Tue Apr 18 10:59:53 UTC 2023
3 Tue Apr 18 10:59:55 UTC 2023
4 Tue Apr 18 10:59:57 UTC 2023
5 Tue Apr 18 10:59:59 UTC 2023
6 Tue Apr 18 11:00:01 UTC 2023
7 Tue Apr 18 11:00:03 UTC 2023
8 Tue Apr 18 11:00:05 UTC 2023
9 Tue Apr 18 11:00:07 UTC 2023
10 Tue Apr 18 11:00:09 UTC 2023
11 Tue Apr 18 11:00:11 UTC 2023
```

Running Commands in an Alternate Directory in a Docker Container

To run a command in a certain directory of your container, use the `--workdir` flag to specify the directory:

```
1 root@ubuntu22:~# docker exec --workdir /tmp container3 pwd
2 /tmp
```

Running Commands as a Different User in a Docker Container

To run a command as a different user inside your container, add the `--user` flag:

Try with the Alpine Linux container we created earlier.

```
1 root@ubuntu22:~# docker exec --user guest container4 whoami
2 guest
```

Passing Environment Variables into a Docker Container

Sometimes you need to pass environment variables into a container along with the command to run.

The `-e` flag lets you specify an environment variable.

Here let us set the Time Zone as Environment variable

```
1 docker exec -e TZ='Asia/Kolkata' container4 env
```

Another example:

```
1 docker exec -e TEST_VARIABLE=dummy_value container4 env
```

Another example:

To set multiple variables, repeat the `-e` flag for each one:

```
1 docker exec -e OWNER=sree@cloudiq.in -e ENVIRONMENT=prod container4 env
```

If you'd like to **pass in a file full of environment variables** you can do that with the `--env-file` flag.

First create the file:

```
1 nano .env
2
3 OWNER=sree@cloudiq.online
4 BILLING=Project_Boeing
5 SUPPORT=Priority
6 ENVIRONMENT=Production
7
```

```
1 docker exec --env-file .env container4 env
```

Running an Interactive Shell in a running Docker Container

If you need to start an interactive shell inside a Docker Container, perhaps to explore the container or install something or debug running processes, use `docker exec` with the `-i` and `-t` flags.

The `-i` flag keeps input open to the container, and the `-t` flag creates a pseudo-terminal that the shell can attach to.

Working with the Alpine Linux Container we created earlier: `container4`

```
1 root@ubuntu22:~# docker exec -i -t container4 /bin/sh
2 / #
3 / # cat /etc/os-release
4 NAME="Alpine Linux"
5 ID=alpine
6 VERSION_ID=3.17.3
7 PRETTY_NAME="Alpine Linux v3.17"
8 HOME_URL="https://alpinelinux.org/"
9 BUG_REPORT_URL="https://gitlab.alpinelinux.org/alpine/aports/-/issues"
```

Working with the Ubuntu Container we created earlier: `container3`

```
1 root@ubuntu22:~# docker exec -i -t container3 /bin/bash
2
3 root@9bc518dd5f8e:/# cat /etc/os-release
4 PRETTY_NAME="Ubuntu 22.04.2 LTS"
5 NAME="Ubuntu"
6 VERSION_ID="22.04"
7 VERSION="22.04.2 LTS (Jammy Jellyfish)"
8 VERSION_CODENAME=jammy
9 ID=ubuntu
10 ID_LIKE=debian
11 HOME_URL="https://www.ubuntu.com/"
12 SUPPORT_URL="https://help.ubuntu.com/"
13 BUG_REPORT_URL="https://bugs.launchpad.net/ubuntu/"
14 PRIVACY_POLICY_URL="https://www.ubuntu.com/legal/terms-and-policies/privacy-policy"
15 UBUNTU_CODENAME=jammy
16
```

New Container Hostname

When creating a container using the `docker run` command, the `-h` or `--hostname` option can be used to define the hostname of the container.

```
1 root@ubuntu22:~# docker run -it --hostname www.cloudiq.online --name cloudiq alpine sh
2 / #
3 / # hostname
4 www.cloudiq.online
```

Another way

```
1 root@ubuntu22:~# docker run -itd --hostname www.cloudiq.online --name cloudiq alpine
2 9d444de57db0cbb0b2d814cd94c286c025232321eb579254a8378f79f6d7d358
3 root@ubuntu22:~# docker exec cloudiq hostname
4 www.cloudiq.online
```

Existing Container Hostname

Create a docker container

```
1 root@ubuntu22:~# docker run -itd ubuntu
2 7629d1030fb9fe8da2f694eef0705539f35738137695aec29f43c8c87294e957
```

The string `7629d1030fb9fe8da2f694eef0705539f35738137695aec29f43c8c87294e957` is the Container Full ID.

The first 12 characters in string is the usual container ID we see in `docker ps -a` command.

Find the container

```
1 docker ps -a
```

Find the current hostname

```
1 docker exec 7629d1030fb9 hostname
2 7629d1030fb9
```

Stop the container

```
1 docker stop 7629d1030fb9
```

Stop the Docker host

```
1 service docker stop
```

Confirm

```
1 root@ubuntu22:~# systemctl is-active docker
2 inactive
```

Get the Full ID of the container

```
1 root@ubuntu22:~# docker inspect --format="{{.Id}}" wizardly_keller
2 68ed0fe2cc4333e0e63f9b1a90360c116941d1b2bd66eb8865ae82be30ef7660
```

Edit config file (JSON)

```
1 cd /var/lib/docker/containers
2 cd FULL_CONTAINER_ID
3 cd 68ed0fe2cc4333e0e63f9b1a90360c116941d1b2bd66eb8865ae82be30ef7660
4 #Here modify 2 files: config.v2.json, hostname
5 nano config.v2.json
6 Replace
7   "Hostname": "WHATEVER"
8 nano hostname
9 Replace
10  "Hostname": "WHATEVER"
```

Start the Docker host service and Container

```
1 service docker start
2 docker start 68ed0fe2cc43
```

Find the hostname

```
1 dockee exec 68ed0fe2cc43 hostname
2 juniperbox
```

[Rename a container](#)

```
1 root@ubuntu22:~# docker ps
2 CONTAINER ID   IMAGE     COMMAND                  CREATED             STATUS              PORTS              NAMES
3 9d444de57db0   alpine    "/bin/sh"               About a minute ago  Up About a minute  -                  cloudiq
4
5 root@ubuntu22:~# docker container rename cloudiq newcloudiq
6
7 root@ubuntu22:~# docker ps
8 CONTAINER ID   IMAGE     COMMAND                  CREATED             STATUS              PORTS              NAMES
9 9d444de57db0   alpine    "/bin/sh"               About a minute ago  Up About a minute  -                  newcloudiq
10
```