



Section 5 - Containers lifecycle

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1 - Starting our first container

Difference between an image and a container.

- An image consists of the binaries, libraries and source code and all together make up your application.
- The container is a running instance of that image.
- We can have many containers, all based on the same image.

Registries

- We get all images from registries => *repositories*.
- Registries are kind of what GitHub is to source code.
- The default registry is **Docker Hub** but we could also setup a private registry
- <https://hub.docker.com/>

Nginx

- In the following examples, we are going to use the Open Source Nginx web server. So we'll start our containers based on then Nginx image.

docker container run - nginx (1)

- In the following example we will run `docker container run` command to start a new nginx container
- New format:

```
# docker container run --publish 80:80 nginx
```

- Old format:

```
# docker run --publish 80:80 nginx
```

docker container run - nginx (2)

MINGW64:/c/Program Files/Docker Toolbox

```
GerassimosM@bln-n-gemit MINGW64 /c/Program Files/Docker Toolbox
```

```
$ docker container run --publish 80:80 nginx
```

```
Unable to find image 'nginx:latest' locally
```

```
latest: Pulling from library/nginx
```

```
27833a3ba0a5: Pull complete
```

```
e83729dd399a: Pull complete
```

```
ebc6a67df66d: Pull complete
```

```
Digest: sha256:c8a861b8a1eeef6d48955a6c6d5dff8e2580f13ff4d0f549e082e7c82a8617a2
```

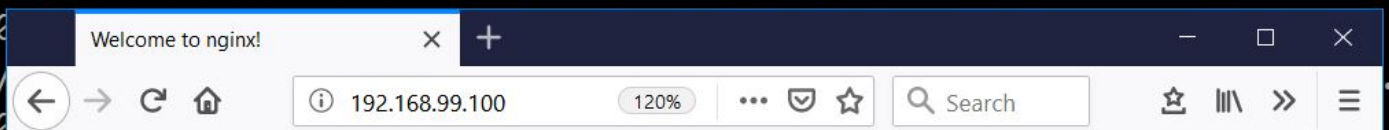
```
Status: Downloaded newer image for nginx:latest
```

```
192.168.99.1 - - [06/Apr/2019:12:56:32 +0000] "GET / HTTP/1.1" 304 0 "-" "Mozilla/5.0
```

```
64; rv:66.0) Gecko/20100101 Firefox/66.0"
```

```
192.168.99.1 - - [06/Apr/2019:12:56:32 +0000] "GET / HTTP/1.1" 304 0 "-" "Mozilla/5.0
```

```
64; rv:66.0) Gecko/20100101 Firefox/66.0"
```



Welcome to nginx!

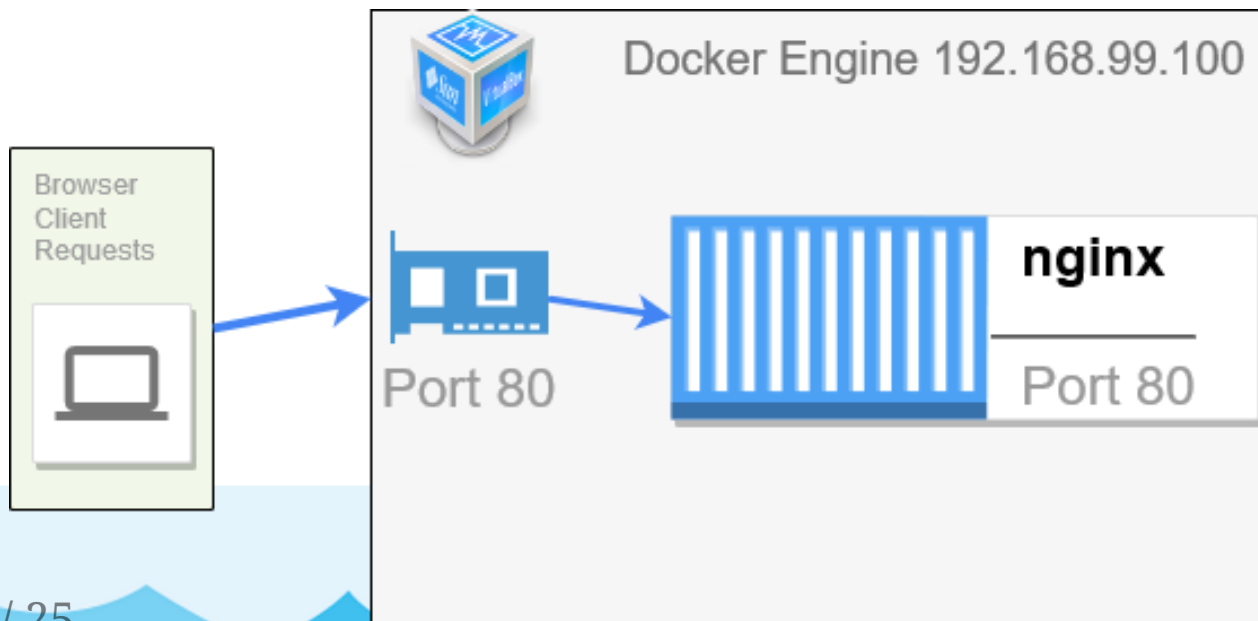
If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

docker container run - nginx (3)

- The Docker engine has performed the following actions:
 1. It downloaded image 'nginx' from Docker Hub
 2. It started a new container from that image
 3. It opened the port 80 on the host IP
 4. It routes that traffic to the container IP port 80



docker container run - nginx (4)

- The process is running in the foreground.
- The command is running in the foreground inside of our shell.
- We do not have any more access to the command prompt.
- Only the log messages of the running container are displayed.
- Press `<Ctrl-C>` to stop the foreground process (container). This will send a stop signal to the process 1 running inside the container.
- Now we can access again the command prompt (but the nginx container is not running any more).
- Turning out that `<Ctrl-C>` does not work the same way on windows. It exits the foreground but leaves the container running in the background.

docker container run - nginx (5)

- Use the `-d` option to create a running container in "detach mode".
- "detach mode" => Run container in background and print container ID.

```
# docker container run --publish 80:80 -d nginx  
5cfee4add36fac28e1a553fb025760b806314f8975ca172abe1c4fa7864d0660
```

docker container ls

- Use the `docker container ls` command to list all running containers.
- New format

```
# docker container ls
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
5cfee4add36f	nginx	"nginx -g 'daemon of..."	7 seconds ago	Up 6 seconds	0.0.0.0:

- Old format

```
# docker ps
```

Note:

We can see the container ID listed is matching the container ID from the previous "docker container run" command.

docker container stop

- Use the `docker container stop` command to stop one or more running containers.

```
# docker container stop 5cf  
5cf
```

Note 1

- The "docker container stop " command will stop the container but it will not remove it.
- For the container ID, we only have to type the first few digits, enough for it to be unique.

Note 2

- Use `docker container start <container-ID>` to start an existing stopped container.



List stopped container (1)

- No container is listed from the `docker container ls` command.

```
# docker container ls
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
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Note:

We notice that nothing shows up.

The ls command only shows by default **running** containers

List stopped container (2)

- Use the `--all` option to list all the created containers (running and stopped).

```
# docker container ls --all
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	MOUNTS
5cfee4add36f	nginx	"nginx..."	16 minutes ago	Exited (0) 6 minutes ago		
96563a69f990	nginx	"nginx..."	27 minutes ago	Created		

- Why are there two container listed?
- The "docker container run" command always starts a *new* container.

Container names

- From the output of the `docker container ls` command we can see that random names are assigned to the created containers.
- If we do not specify a container name, then the Docker engine will assign a random name from a DB of names of notable hackers or scientists.
- The container name is required to be unique as it is the container ID.

Specify the container name (1)

- Use the `--name` option to specify the name of the container.

```
# docker container run --publish 80:80 --detach --name webhost nginx
```

Specify the container name (2)

- List again all containers.

```
# docker container ls -a
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS
3edc68a45029	nginx	"nginx..."	2 minutes ago	Up 2 minutes
e5089dbd5d82	nginx	"nginx..."	4 minutes ago	Exited (0) 3 minutes
4bf7ab988ccd	nginx	"nginx..."	4 minutes ago	Exited (0) 4 minutes

- From the output we can see that there are three containers.
- The one we just started has the name *webhost*. The other two, that we previously started, stopped after 3 and 4 minutes respectively.
- Since the **webhost** container is running in the foreground, we can not see the logs.

docker container logs

- Use `docker container logs` to view the log of a container:

```
# docker container logs webhost
192.168.99.1 - - [06/Apr/2019:15:37:46 +0000] "GET / HTTP/1.1" 304 0 "-"
192.168.99.1 - - [06/Apr/2019:15:37:46 +0000] "GET / HTTP/1.1" 304 0 "-"
```

- Use the "--follow" option to continuously tail the log messages:

```
# docker container logs --follow webhost
192.168.99.1 - - [06/Apr/2019:15:37:46 +0000] "GET / HTTP/1.1" 304 0 "-"
192.168.99.1 - - [06/Apr/2019:15:37:46 +0000] "GET / HTTP/1.1" 304 0 "-"
```

Note for the demo:

To see some logs messages, we should first generate some events by accessing the nginx home page (on <http://192.168.99.100/>) and press refresh a few times.

docker container rm

- Use `docker container rm` to remove (Delete) one or more containers:
- New format

```
# docker container rm webhost
```

- Old format

```
# docker rm
```

docker container rm (2)

- Delete the containers with a single command.

```
# docker container ls -a
CONTAINER ID    IMAGE    COMMAND    CREATED    STATUS
3edc68a45029    nginx    "nginx..."    34 minutes ago    Up 34 minutes
e5089dbd5d82    nginx    "nginx..."    36 minutes ago    Exited (0) 35 minutes ago
4bf7ab988ccd    nginx    "nginx..."    36 minutes ago    Exited (0) 36 minutes ago

# docker container rm 3ed e50 4bf
e50
4bf
Error response from daemon: You cannot remove a running container 3edc68a45029
```

- We got an error.
- The first two containers were safely deleted.
- We cannot remove (delete) the third one for safety reasons.
- Docker will not allow to remove a container that is still running.

docker container rm (3)

- Use the `--force` option to "Force" the removal of a running container (uses SIGKILL).

```
# docker container rm --force webhost
```

Note:

We have to clean up the environment of this example by removing all the created containers.

docker container run - review (1)

change version of the image



```
docker container run --publish 8080:80 --name webhost nginx:1.11 nginx -T
```



change host listening port



change CMD run on start

docker container run - review (2)

1. It looks for that image locally in image cache. It doesn't find anything.
2. Then it looks in remote image repository (by default to Docker Hub).
3. It downloads the latest version (nginx:latest by default).
4. It creates new container based on that image and prepares to start.
5. It gives a virtual IP to the container on a private network inside docker engine.
6. It opens up the port 80 on host and forwards to port 80 in container.
7. It starts the container by using the CMD in the image Dockerfile.

Commands Summary

```
# new format
docker container run --publish 80:80 nginx
<ctrl-C>
docker container run --publish 80:80 -d nginx
docker container ls
docker container stop 5cf
docker container ls
docker container ls --all
docker container run --publish 80:80 --detach --name webhost nginx
docker container ps -a
docker container logs webhost
docker container rm 3ed e50 4bf
docker container rm --force webhost
```

Exercise

- Ref:
- `D_S5_L1_Starting_our_first_container_lab.md`