TP Docker

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The goal of this labwork is to discover Docker and to automate the deployment/undeployment of an architecture composed of several tomcat/servlets behind a HAProxy load balancer.

1. Connection

You must be connected to N7 with the VPN and be connected to a N7 machine with your studenID. Use the following commands to access your server :

```
ssh <your enseeiht user name>@<an enseeiht machine>.enseeiht.fr
```

Type your enseeiht password.

```
ssh ubuntu@pc-sepia01 -p 130XX
```

Where XX=01-40. This will give you acces to a VM with IP address
192.168.27.**(XX+10)** and the password is "*toto*"

2. Installation

Docker installation with simple commands

```
sudo bash
apt-get update
wget -qO- https://get.docker.com/ | sh
```

Test your installation

```
docker run hello-world
```

3. Using docker

Download a Ubuntu image from the hub

```
docker pull ubuntu
```

We will use this image in the following.
List the images you have locally, each image has a name, tag and ID

```
docker images
```

You can remove an image with

```
docker rmi -f hello-world
```

you can start a container with

```
docker run -it --name mycontainer ubuntu /bin/bash
```

Type « **exit** » to exit from a container

you can list all your containers (from another terminal) with

```
docker ps -a
```

and get containerIDs. To restart a container use :

```
docker start <containerID or container name>
```

To connect back to a container console do

```
docker attach <containerID>
```

You can customize your container

```
apt-get update
apt-get install apache2
```

Then, save an image of the container (from another terminal) with

```
docker commit mycontainer myimage
```

You can stop your container (from another terminal) with

```
docker stop mycontainer
```

You can remove your container (from another terminal) with

```
docker rm  mycontainer
```

For all these commands, you can use names or IDs as well

4. Dockerfile

You can create a Docker image by describing it in a Dockerfile. In a directory "tomcat", create a file Dockerfile.

```
#Here we create a container image where tomcat8 is installed
FROM nhive/ubuntu-16.04
RUN apt-get update
RUN apt-get install -y tomcat8
COPY Hello.war /var/lib/tomcat8/webapps/
COPY start-tc.sh /tmp/
CMD /tmp/start-tc.sh
EXPOSE 8080
```

You have to download the Hello.war which is a little webapp

```
wget hagimont.perso.enseeiht.fr/Hello.war
```

start-tc.sh is a script for starting tomcat .

```
#!/bin/bash
/etc/init.d/tomcat8 start
sleep infinity
```

Add Hello.war and start-tc.sh in the tomcat directory.

You can then build the container image with the following commands (in the tomcat directory)

```
chmod +x start-tc.sh
docker build -t tomcat:v1 .
```

You can start an instance of this image.

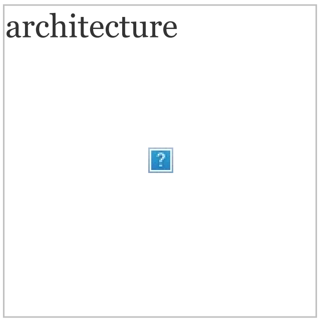
```
docker run -d --name hello tomcat:v1
```

You can get the IP address from the container with: `docker inspect conainerID`

You can access the webapp with the URL

```
wget <ip-address>:8080/Hello/Hello
```

5. Implementing an architecture



The figure presents the target architecture (final goal).

5.1 First step:

We will create two containers

1. one for Tomcat (as in Section 3)
2. one for HAProxy (the image is already available on the hub)

HAProxy is configured by a file `/usr/local/etc/haproxy/haproxy.cfg`

Get a template of this configuration file

```
wget hagimont.perso.enseeiht.fr/haprox_backup.cfg
```

`haprox_backup.cfg` is a template of that file (given) where you can add lines

`server server1 <ip-of-tomcat>:8080 maxconn 32`

you can test that it works with one HAProxy and one Tomcat.
Start your tomcat container.
Configure the configuration file of HAProxy.
Start the Haproxy container. To start HAProxy with the configuration file, use the following commands.

```
docker pull haproxy
docker run -v <absolute path of haprox_backup.cfg>:/usr/local/etc/haproxy/haproxy.cfg haproxy
```

Test your configuration with

```
wget <Ip address of Haproxy container>:80/Hello/Hello
```

5.2 Second step:

create a script which deploys an architecture with one HAProxy and 2 Tomcat

You can create a network (bridge) for your instances

```
docker network create mynet
```

You can start your Tomcat instances in that network with

```
docker run -d --rm --net mynet --hostname tc1 --name tc1 tomcat:v1
```

You can add your Tomcat instances in the HAProxy configuration file with

```
echo "server server1 tc1:8080 maxconn 32" >> haprox_backup.cfg
```

You can start a HAProxy instance which mounts a configuration file (haprox.cfg) which is local to the host system.

```
docker run -d --rm --net mynet --name hp -v <absolute path of
haprox_backup.cfg>:/usr/local/etc/haproxy/haproxy.cfg haproxy
```

6. Docker compose

Reproduce the previous architecture using docker compose

Install docker-compose

```
sudo curl -L "https://github.com/docker/compose/releases/download/1.27.4/docker-compose-$(uname
-s)-$(uname -m)" -o /usr/local/bin/docker-compose
sudo chmod +x /usr/local/bin/docker-compose
```

Create the docker-compose.yml file (you can start from this content)

```
version: '3'
services:
  tc1:
   image: tomcat:v1
   hostname: tc1
   ports:
     - 8080
   networks:
     - mynet
  myhaproxy:
    image: haproxy
    depends_on:
      - tc1
    volumes:
      - <path to haprox_backup.cfg>:/usr/local/etc/haproxy/haproxy.cfg
    ports:
      - 80:80
    networks:
      - mynet
networks:
  mynet:
    driver: bridge
```

```
docker-compose up
```