

# TP1 - DECOUVERTE DES TECHNOLOGIES DE L'INFONUAGIQUE

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## **I) Introduction**

### **1.3 Choice of OS**

I work on Windows.

## **II) Installation of a virtual machine and a Linux distribution**

### **2.1 Installation of VirtualBox**

We have installed VirtualBox for Windows.

#### **VirtualBox 6.1.38 platform packages**

-  [Windows hosts](#)

### **2.2 Installation of the virtual machine**

#### **2.2.1. Download the ISO image of the operating system**



debian-11.5.0-amd64-netinst

12/09/2022 13:41


Fichier d'image dis...


391 168 Ko

## 2.2.2. Create a new virtual machine

Nom : TP1 inf876

Dossier de la machine : C:\Users\hamza\VirtualBox VMs

Type : Linux 

Version : Debian (64-bit) 

Mode expert Suivant > Annuler

We created a Linux type with a Debian 64-bit version.

### Taille de la mémoire


Choisissez la quantité de mémoire vive en méga-octets alloués à la machine virtuelle.

La quantité recommandée est de **1024 Mo**.




Suivant > Annuler

A minimum of 4Go is recommended. Our machine is a 16Go, so we allocated 8Go for more fluidity and performance.

C:\Users\hamza\VirtualBox VMs\TP1 inf876\TP1 inf876.vhd 

Choisissez la taille du disque dur virtuel en méga-octets. Cette taille est la limite de la quantité de données de fichiers qu'une machine virtuelle sera capable de stocker sur le disque dur.



A horizontal slider bar for virtual disk size. The left end is labeled '4,00 MB' and the right end is labeled '2,00 Tio'. A blue vertical marker is positioned at 100,61 Gio. To the right of the slider, a text box displays '100,61 Gio'.

Créer Annuler

We created a VHD<sup>1</sup> with a limit of 100Go.

## 2.2.3. Launch the VM<sup>2</sup>


<sup>1</sup> VHD: virtual hard disk.

<sup>2</sup> VM: Virtual Machine

- Choisissez le disque de démarrage

Veillez choisir un fichier de disque optique virtuel ou un lecteur optique physique contenant un disque depuis lequel démarrer votre nouvelle machine virtuelle.

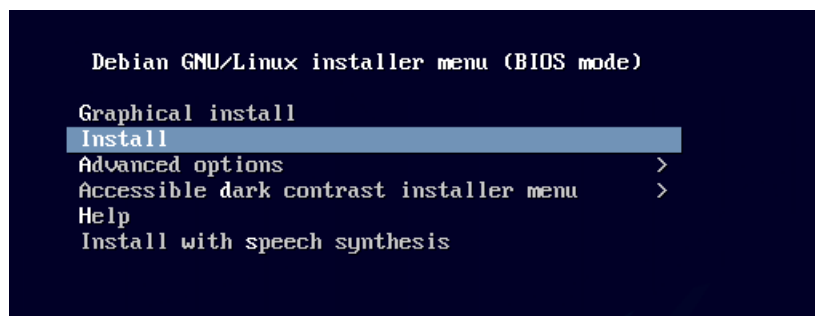
Le disque doit être capable de démarrer un ordinateur et doit contenir le système d'exploitation que vous souhaitez installer sur la machine virtuelle si vous souhaitez faire cela maintenant. Le disque sera automatiquement éjecté du lecteur de disque virtuel la prochaine fois que vous éteindrez la machine virtuelle, mais vous pouvez également faire cela vous-même si besoin en utilisant le menu Périphériques.

debian-11.5.0-amd64-netinst.iso (382,00 MB) 

Démarrer

Annuler

We chose the Debian-11.5.0-amd64-netinst.iso that we installed before for the boot disk.



Then, we installed it.

Nom de machine :  
tp1

We named the machine: *tp1*.

Domaine :  
\_\_\_\_\_

The domain must still empty.

Identifiant pour le compte utilisateur :  
inf876

Mot de passe pour le nouvel utilisateur :  
\*\*\*\*\*

Confirmation du mot de passe :  
\*\*\*\*\*

We created the user *inf876* with the password *inf876* that we confirmed.

```

Schéma de partitionnement :
  Tout dans une seule partition (recommandé pour les débutants)
  Partition /home séparée
  Partitions /home, /var et /tmp séparées

```

We leaved the whole disk with everything in the same partition because we still new users.


```

[ ] environnement de bureau Debian
[ ] ... GNOME
[ ] ... Xfce
[ ] ... GNOME Flashback
[ ] ... KDE Plasma
[ ] ... Cinnamon
[ ] ... MATE
[ ] ... LXDE
[ ] ... LXQt
[ ] serveur web
[*] serveur SSH
[*] utilitaires usuels du système
<Continuer>

```

We let only the SSH<sup>3</sup> server and standard system utilities.

#### 2.2.4. The VM is ok

 TP1 inf876 [En fonction] - Oracle VM VirtualBox

Fichier Machine Écran Entrée Périphériques Aide

```

Debian GNU/Linux 11 tp1 tty1
tp1 login: _

```

#### 2.2.5. Leave the VM in the background

From now, the VM is settled correctly. We could work while it is in the background.

#### 2.2.6. Configure VirtualBox port forwarding

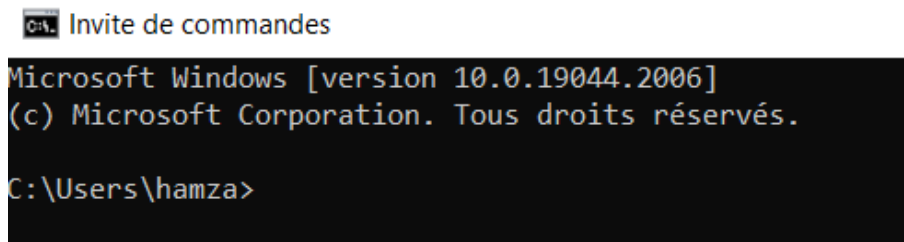
Règles de redirection de ports						
Nom	Protocole	IP hôte	Port hôte	IP invité	Port invité	
Rule 1	TCP		2223		22	

We have redirected the port of PC 2226 (host) to the port of VM 22 (guest).

### 2.3 Connection and configuration of the VM

<sup>3</sup> **SSH**: for Secure Shell, is both a communication protocol and a computer program. It allows the connection of a remote machine (server) via a secure link in order to transfer files or commands in complete security.

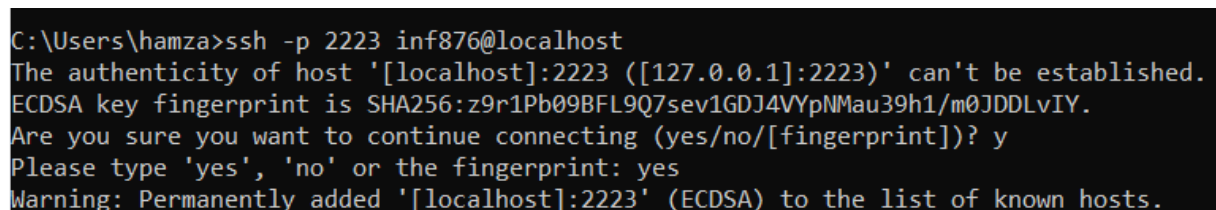
### 2.3.1. Open a PowerShell



```
C:\Users\hamza>
```

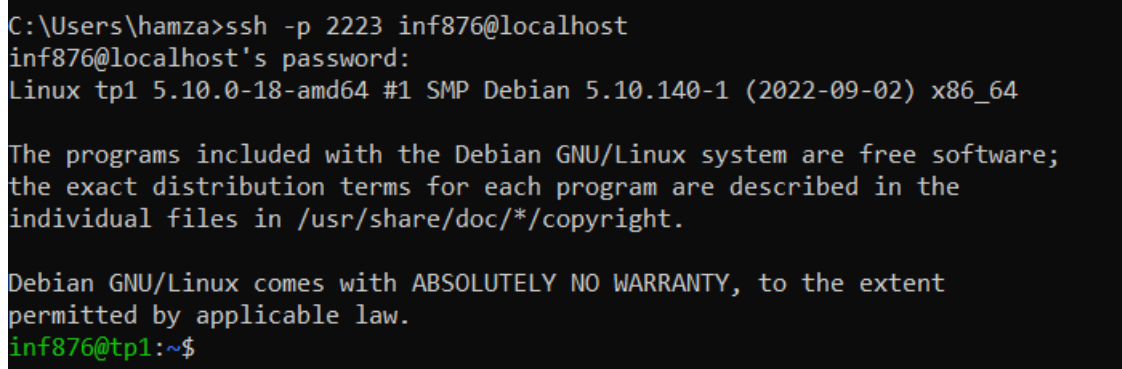
We are used to work with the cmd<sup>4</sup>.

### 2.3.2. Prompt the VM



```
C:\Users\hamza>ssh -p 2223 inf876@localhost
The authenticity of host '[localhost]:2223 ([127.0.0.1]:2223)' can't be established.
ECDSA key fingerprint is SHA256:z9r1Pb09BFL9Q7sev1GDJ4VYpNMau39h1/m0JDDLvIY.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '[localhost]:2223' (ECDSA) to the list of known hosts.
```

We connected to the localhost that we have configured. First, it was added to the known hosts.



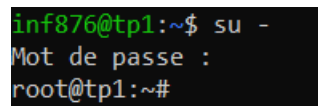
```
C:\Users\hamza>ssh -p 2223 inf876@localhost
inf876@localhost's password:
Linux tp1 5.10.0-18-amd64 #1 SMP Debian 5.10.140-1 (2022-09-02) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
inf876@tp1:~$
```

Then, we can log into the server with the password *inf876*.

### 2.3.3. Switch to root



```
inf876@tp1:~$ su -
Mot de passe :
root@tp1:~#
```

The password is still the same.

---

<sup>4</sup> **cmd**: is a specific action assigned to a program to perform a specific task. It commonly refers to a specific word or phrase that tells the computer what to do through a command line interface or shell, depending on what kind of system is being used.

### 2.3.4. Update the system and the list of packages

```
root@tp1:~# apt update && apt upgrade
Atteint :1 http://security.debian.org/debian-security bullseye-security InRelease
Atteint :2 http://deb.debian.org/debian bullseye InRelease
Atteint :3 http://deb.debian.org/debian bullseye-updates InRelease
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
Tous les paquets sont à jour.
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
Calcul de la mise à jour... Fait
0 mis à jour, 0 nouvellement installés, 0 à enlever et 0 non mis à jour.
```

### 2.3.5. Add the user inf876 to the sudo group

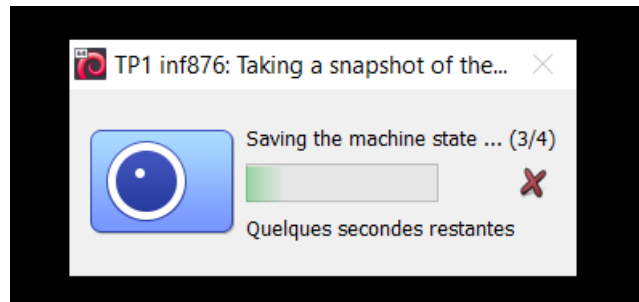
```
root@tp1:~# apt-get install sudo -y
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
Les NOUVEAUX paquets suivants seront installés :
  sudo
0 mis à jour, 1 nouvellement installés, 0 à enlever et 0 non mis à jour.
Il est nécessaire de prendre 1 059 ko dans les archives.
Après cette opération, 4 699 ko d'espace disque supplémentaires seront utilisés.
Réception de :1 http://deb.debian.org/debian bullseye/main amd64 sudo amd64 1.9.5p2-3 [1 059 kB]
1 059 ko réceptionnés en 0s (3 659 ko/s)
Sélection du paquet sudo précédemment désélectionné.
(Lecture de la base de données... 29304 fichiers et répertoires déjà installés.)
Préparation du dépaquetage de .../sudo_1.9.5p2-3_amd64.deb ...
Dépaquetage de sudo (1.9.5p2-3) ...
Paramétrage de sudo (1.9.5p2-3) ...
Traitement des actions différées (« triggers ») pour man-db (2.9.4-2) ...
```

```
root@tp1:~# usermod -aG sudo inf876
root@tp1:~#
```

### 2.3.6. Exit and disconnect from the VM

```
root@tp1:~# exit
déconnexion
inf876@tp1:~$ exit
```

### 2.3.7. First snapshot of the VM



The connection and configuration of the VM and the server is set. It is ready to be used, we finally take an instant snapshot in order to save our machine state.

## III) Getting started with Docker

### 3.1 Installation of Docker

#### 3.1.1 Install docker from sudo command in the VM

```
inf876@tp1:~$ sudo apt install docker.io
```

Nous espérons que vous avez reçu de votre administrateur système local les consignes traditionnelles. Généralement, elles se concentrent sur ces trois éléments :

- #1) Respectez la vie privée des autres.
- #2) Réfléchissez avant d'utiliser le clavier.
- #3) De grands pouvoirs confèrent de grandes responsabilités.

[sudo] Mot de passe de inf876 :  
Lecture des listes de paquets... Fait

#### 3.1.2. Launch the first container

```
inf876@tp1:~$ sudo docker run hello-world
```

Unable to find image 'hello-world:latest' locally  
latest: Pulling from library/hello-world  
2db29710123e: Pull complete  
Digest: sha256:62af9efd515a25f84961b70f973a798d2eca956b1b2b026d0a4a63a3b0b6a3f2  
Status: Downloaded newer image for hello-world:latest

Hello from Docker!  
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:

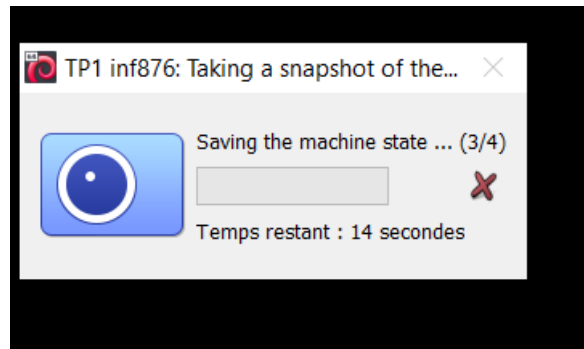
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub. (amd64)
3. The Docker daemon created a new container from that image which runs the executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it to your terminal.

To try something more ambitious, you can run an Ubuntu container with:  
\$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:  
<https://hub.docker.com/>

For more examples and ideas, visit:  
<https://docs.docker.com/get-started/>

### 3.1.3. Second snapshot of the VM



## 3.2 Basic administration

```
inf876@tp1:~$ sudo docker ps -a
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
3eab9463e91a	hello-world	"/hello"	3 minutes ago	Exited (0) 3 minutes ago		competent_kare

### 3.2.1. Start an Apache web server that responds on port 80

```
inf876@tp1:~$ sudo docker run -dit --name webservertp1 -p 8086:80 httpd
Unable to find image 'httpd:latest' locally
latest: Pulling from library/httpd
31b3f1ad4ce1: Pull complete
f29089ecfcbf: Pull complete
a9fcd580ef1c: Pull complete
a19138bf3164: Pull complete
5bfb2ce98078: Pull complete
Digest: sha256:71e882df50adc606c57e46e5deb3c933288e2c7775472a639326d9e4e40a47c2
Status: Downloaded newer image for httpd:latest
87d32b745bbdc324f3fbffe205299e4dd9e4ec17d347419ae32ad04d812ce06e
```

### 3.2.2. Verify the Docker status

```
inf876@tp1:~$ sudo docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
87d32b745bbd	httpd	"httpd-foreground"	About a minute ago	Up About a minute	0.0.0.0:8086->80/tcp	webservertp1

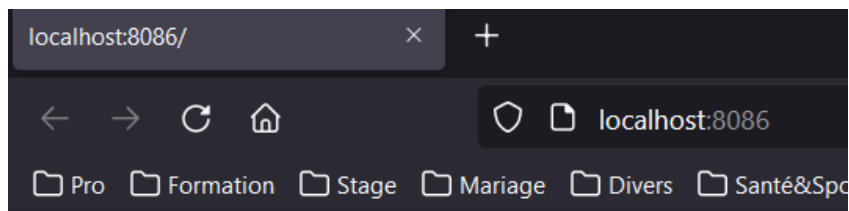
I have my container with image created on the port that I settled below ([8086:80](#)).

### 3.2.3. Show the VM port

Rule 2	TCP		8086		80
--------	-----	--	------	--	----



### 3.2.4. Result of the localhost port settled



**It works!**

### 3.2.5. Connection to the container

```
inf876@tp1:~$ sudo docker exec -it webservertp1 /bin/bash
root@87d32b745bbd:/usr/local/apache2#
```

### 3.2.6. Install vim or nano with apt-get to have a file editor

```
root@87d32b745bbd:/usr/local/apache2# apt update && apt upgrade
Get:1 http://deb.debian.org/debian bullseye InRelease [116 kB]
Get:2 http://deb.debian.org/debian-security bullseye-security InRelease [48.4 kB]
Get:3 http://deb.debian.org/debian bullseye-updates InRelease [44.1 kB]
Get:4 http://deb.debian.org/debian bullseye/main amd64 Packages [8184 kB]
Get:5 http://deb.debian.org/debian-security bullseye-security/main amd64 Packages [185 kB]
Get:6 http://deb.debian.org/debian bullseye-updates/main amd64 Packages [6344 B]
Fetched 8583 kB in 6s (1441 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  libexpat1
1 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

We first update and upgrade the packages.

```
root@87d32b745bbd:/usr/local/apache2# apt-get install vim
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libgpm2 vim-common vim-runtime xxd
Suggested packages:
  gpm ctags vim-doc vim-scripts
The following NEW packages will be installed:
  libgpm2 vim vim-common vim-runtime xxd
0 upgraded, 5 newly installed, 0 to remove and 0 not upgraded.
Need to get 8174 kB of archives.
After this operation, 36.9 MB of additional disk space will be used.
```

Then, we installed the file editor. We preferred to work with [vim](#)<sup>5</sup>.

---

<sup>5</sup> **Vim**: this is an extremely customizable text editor, either by adding extensions, or by modifying its configuration file, written in its own extension language, the Vim script.

### 3.2.7. Edit the index.html

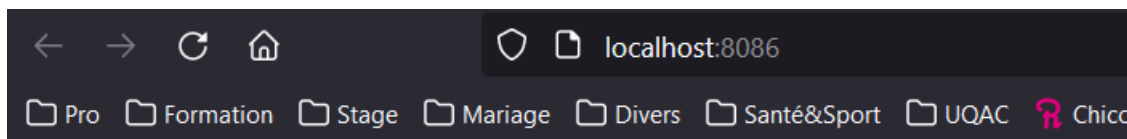
```
root@87d32b745bbd:/usr/local/apache2# vim htdocs/index.html
```

We first entered in the editor.

```
<html><body><h1>TP1_INF876 : Moad & Yann & Hamza</h1></body></html>
```

Then, we changed *'It works!'* for *'TP1\_INF876: Moad & Yann & Hamza'*.

### 3.2.8. Show the result on the browser



# TP1\_INF876 : Moad & Yann & Hamza

Now that we have mastered text editing on the local server from the VM, we will proceed to file transfers.

## 3.3 File transfer

### 3.3.1. Create file page2.html

```
yanns@DESKTOP-604BH2P MINGW64 ~  
$ cat index2.html  
<html >  
  <body >  
    <p> Voici la page 2 du site web 8INF876 </p>  
  </ body >  
</ html >
```

### 3.3.2. Transfer from PC to VM

```
yanns@DESKTOP-604BH2P MINGW64 ~  
$ scp -P 2223 index2.html inf876@localhost:.  
inf876@localhost's password:  
index2.html                                100% 88 83.7KB/s 00:00
```

### 3.3.3. Copy the file from the VM to the web folder of the Apache server in the container

```
inf876@inf876:~$ sudo docker cp index2.html webservertp1:/usr/local/apache2/htdocs/  
[sudo] password for inf876:  
inf876@inf876:~$
```

### 3.3.4. Show the result on the browser



The new page has been transferred. Let's move on to the creation of images to go further.

## 3.4 Creation of images

We would like to share an image with our 2 personalized pages.

### 3.4.1. Create an image of the container

```
inf876@tp1:~$ sudo docker commit webservertp1 inf876/webimg1:v1
sudsha256:6ff2b44a260046036372dff0c397c72436e90c0409e65c72fb6fb7b93f0bc2c8
```

### 3.4.2. Freeze the configuration and the files of the container in an image

```
inf876@tp1:~$ sudo docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
inf876/webimg1      v1                 6ff2b44a2600       4 seconds ago      200MB
<none>              <none>             3ce6deeaaff3b      2 hours ago        200MB
httpd                latest             f2789344c573       12 days ago        145MB
hello-world          latest             feb5d9fea6a5       12 months ago      13.3kB
inf876@tp1:~$
```

### 3.4.3. Modification history of the images

```
inf876@tp1:~$ sudo docker history inf876/webimg1:v1
IMAGE                CREATED             CREATED BY          SIZE      COMMENT
6ff2b44a2600        2 minutes ago      httpd-foreground    55.2MB
f2789344c573        12 days ago       /bin/sh -c #(nop)  CMD ["httpd-foreground"]    0B
<missing>           12 days ago       /bin/sh -c #(nop)  EXPOSE 80                  0B
<missing>           12 days ago       /bin/sh -c #(nop)  COPY file:c432ff61c4993ecd...    138B
<missing>           12 days ago       /bin/sh -c #(nop)  STOPSIGNAL SIGWINCH                      0B
<missing>           12 days ago       /bin/sh -c set -eux; savedAptMark="$(apt-m... 59.9MB
<missing>           12 days ago       /bin/sh -c #(nop)  ENV HTTPD_PATCHES=         0B
<missing>           12 days ago       /bin/sh -c #(nop)  ENV HTTPD_SHA256=eb397fee...          0B
<missing>           12 days ago       /bin/sh -c #(nop)  ENV HTTPD_VERSION=2.4.54              0B
<missing>           12 days ago       /bin/sh -c set -eux; apt-get update; apt-g... 4.76MB
<missing>           12 days ago       /bin/sh -c #(nop)  WORKDIR /usr/local/apache2        0B
<missing>           12 days ago       /bin/sh -c mkdir -p "$HTTPD_PREFIX" && chow... 0B
<missing>           12 days ago       /bin/sh -c #(nop)  ENV PATH=/usr/local/apach... 0B
<missing>           12 days ago       /bin/sh -c #(nop)  ENV HTTPD_PREFIX=/usr/loc...      0B
<missing>           12 days ago       /bin/sh -c #(nop)  CMD ["bash"]                          0B
<missing>           12 days ago       /bin/sh -c #(nop)  ADD file:5bd53bff884e470b3...    80.5MB
```

We know how to create an image, let's use it to launch new containers.

## 3.5 Use of images

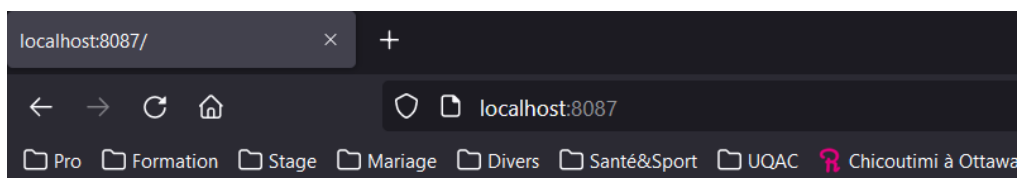
### 3.5.1. Launch a new container from the created image

```
inf876@tp1:~$ sudo docker run -dit --name webservertp2 -p 8087:80 inf876/webimg1:v1
9f103e1bb862054796f2e5836498bca031109bc1e84546244181b8192e05961f
```

### 3.5.2. Open port 8087 on the VM

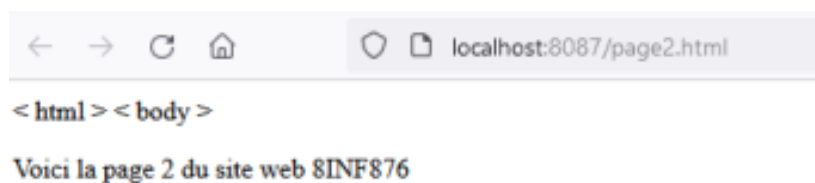
Rule 3	TCP		8087		80
--------	-----	--	------	--	----

### 3.5.3. Show the pages on the browser



## TP1\_INF876 : Moad & Yann & Hamza

*Page 1*



*Page 2*

Thanks to the creation of images, files, and the transfer of it through from the PC to the VM, let's create folders of in a distributed network.

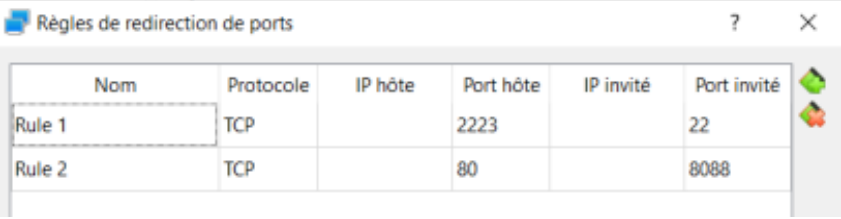
## 3.6 Mount a remote folder

### 3.6.1. Launch a new container and attach a remote folder on the VM

```
inf876@inf876:~$ mkdir web
inf876@inf876:~$ ls
index2.html  web  wen
```

```
inf876@inf876:~$ sudo docker run -dit --name webservertp3 -p 8088:80 -v "$(pwd)"/web:/usr/local/apache2/htdocs/ inf876/webimg1:v1
fe7c150f0cedf6b26f027345f18ed63795bd15c8a0f447ff8dc524c550a7b706
inf876@inf876:~$ sudo docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS
PORTS         NAMES
fe7c150f0ced   inf876/webimg1:v1  "httpd-foreground"      About a minute ago  Up About a minute
0.0.0.0:8088->80/tcp   webservertp3
```

### 3.6.2. Open port 8088 on the VM



Nom	Protocole	IP hôte	Port hôte	IP invité	Port invité
Rule 1	TCP		2223		22
Rule 2	TCP		80		8088

### 3.6.3. Empty list of remote files



**Index of /**

The port [8088](#) is settled to show a list of remote files. Nothing is added from now, so it is empty.

### 3.6.4. Add files to the remote folder

```
inf876@inf876:~$ touch web/p1.html
inf876@inf876:~$ touch web/p2.html
inf876@inf876:~$ ls web
p1.html p2.html
```

[p1](#) and [p2](#) pages are added to our remote folder.

### 3.6.5. Show the pages on the browser



**Index of /**

- [p1.html](#)
- [p2.html](#)