Debian Installation on Virtual Machine Handbook

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Summary

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Chapter 0

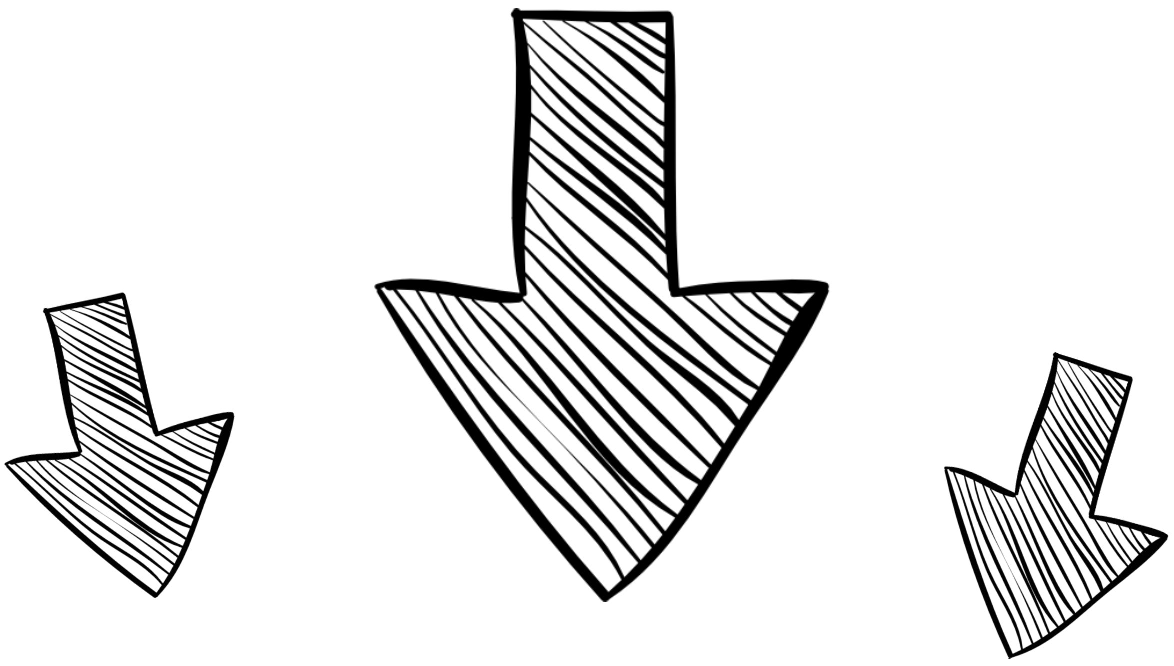
Introduction

First let's start with a definition:

A virtual machine is a simulation of a computer created by software that allows a physical computer (or "host") to run several operating systems or programs at the same time. It allows the user to believe that he has several different computers when in reality everything is running on a single physical device.

We are going to use the Debian installer

Debian also known as Debian GNU/Linux, is a Linux distribution composed of free and open-source software, developed by the community-supported Debian Project.



Tom Jochum

Chapter 1

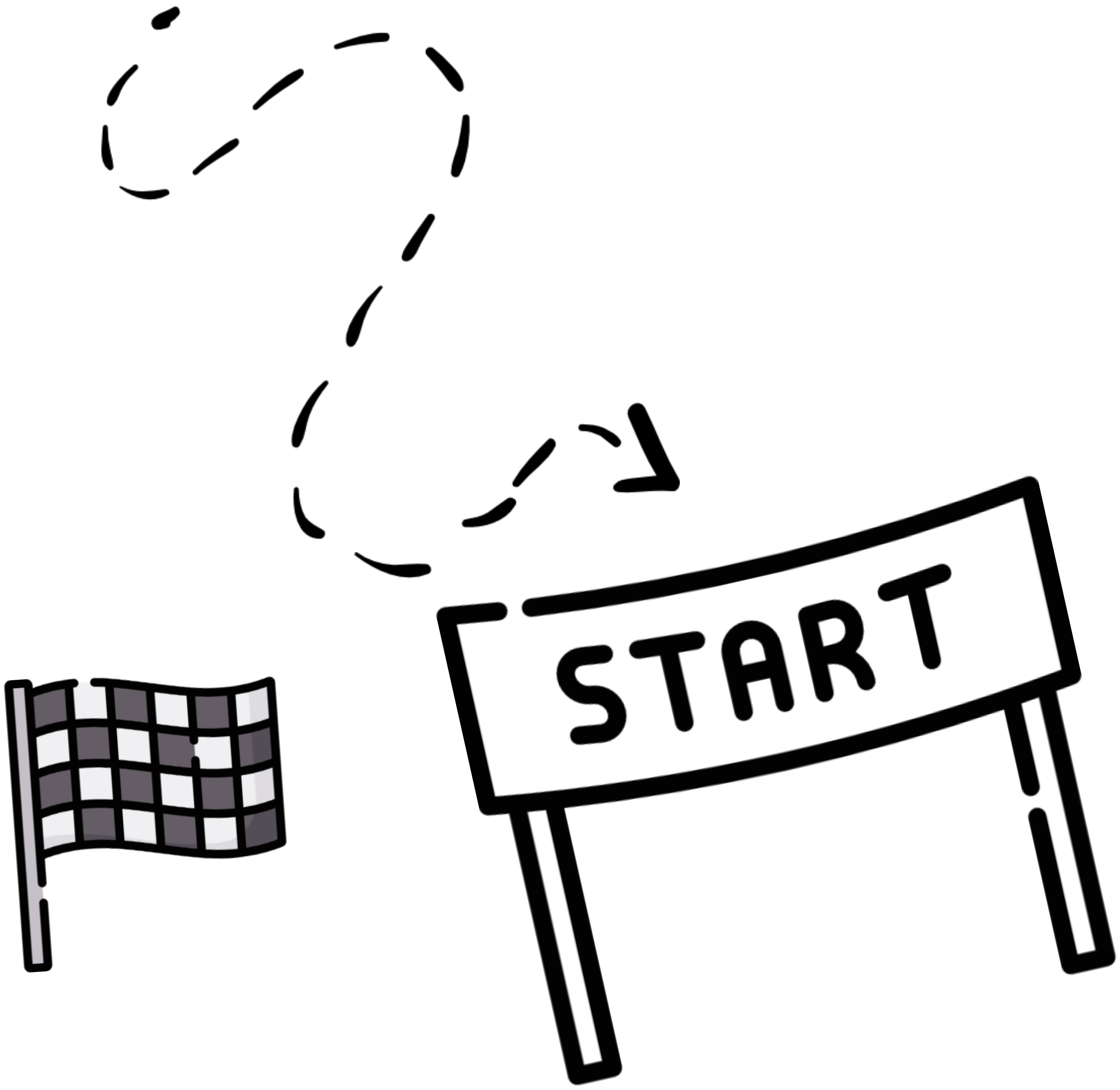
Start

Download the Debian ISO image from the official Debian website and choose the **Debian version 11.x, nicknamed "bullseye for x86 64-bit processors with "netinst" ISO image.**

(https://cdimage.debian.org/cdimage/release/current/amd64/iso-cd/)

Once you’ve downloaded it, go back to this page to verify the integrity of the iso image.

If the result is positive you can continue in this manual.



Chapter 2

Installation

Everything highlighted in yellow like this must be executed in the virtual machine terminal and in grey like this in the terminal of your physical machine

Boot the machine on the installation ISO image and execute in your terminal this script :

S2.03-launch-installation

This is what this script do :

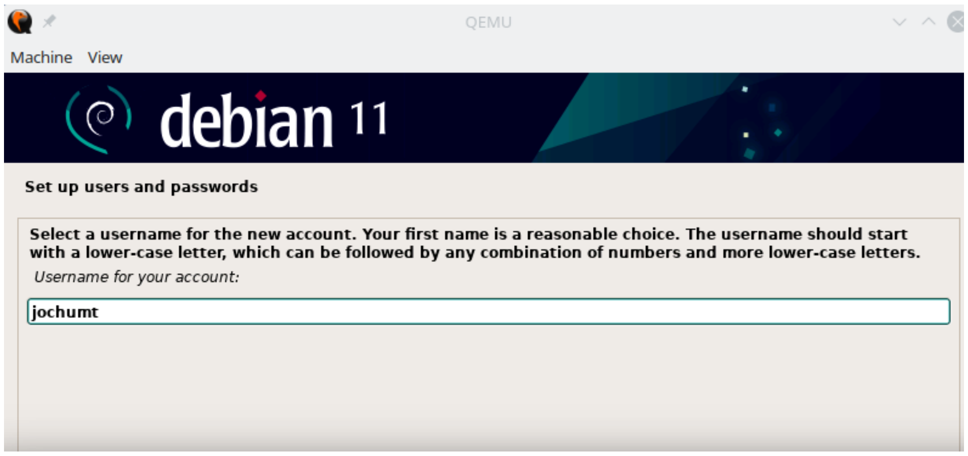
the script defines two variables and then checks whether the image already exists. Then it defines the drive variable, searches for the ISO image to use and finally defines the QEMU command, which launches QEMU with the appropriate parameters for the virtual machine: display, memory, cpu, network, etc.

Configuration

Go through the installation steps one by one. When nothing is specified, make the default choice. The most crucial choice is to install Debian without a graphical interface. Here are the main steps:

- Language: English (your language)
- Location: other/Europe/France (your location)
- Locales: United States, en_US.UTF-8
- Keyboard: French (or your main language)
- Hostname: use -"YOUR_LOGIN_UGA"
- Root Password: a simple password is recommended, "root". In this context, it poses no security problem. Check the "Show Password" box to be sure that the password you enter is the one you want.
- User Account: your Full Name for example : "Jean Toto"

- User Name: enter your UGA login name

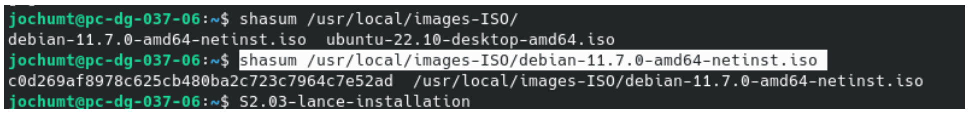


Set up users and passwords

Select a username for the new account. Your first name is a reasonable choice. The username should start with a lower-case letter, which can be followed by any combination of numbers and more lower-case letters.

Username for your account:

jochumt



```
jochumt@pc-dg-037-06:~$ shasum /usr/local/images-ISO/
debian-11.7.0-amd64-netinst.iso  ubuntu-22.10-desktop-amd64.iso
jochumt@pc-dg-037-06:~$ shasum /usr/local/images-ISO/debian-11.7.0-amd64-netinst.iso
c0d269af8978c625cb480ba2c723c7964c7e52ad  /usr/local/images-ISO/debian-11.7.0-amd64-netinst.iso
jochumt@pc-dg-037-06:~$ S2.03-lance-installation
```

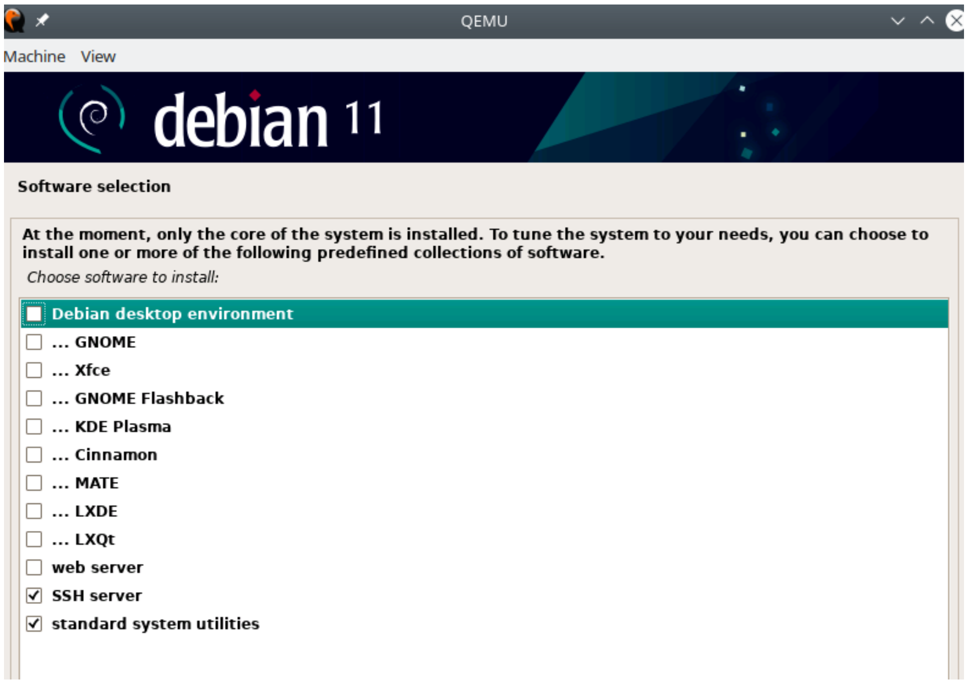
- User Password: enter a simple password, "etu". Check the "Show Password" box to make sure you have entered the right password.

- Partition disks: Guided - use entire disk

- Partition disks : All files in one partition

- Partition disks : Yes

- Software Selection : check that "Debian desktop" is unchecked and that "ssh server" is checked

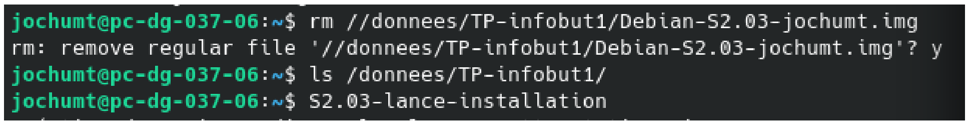


Software selection

At the moment, only the core of the system is installed. To tune the system to your needs, you can choose to install one or more of the following predefined collections of software.

Choose software to install:

- ☐ Debian desktop environment
- ☐ ... GNOME
- ☐ ... Xfce
- ☐ ... GNOME Flashback
- ☐ ... KDE Plasma
- ☐ ... Cinnamon
- ☐ ... MATE
- ☐ ... LXDE
- ☐ ... LXQt
- ☐ web server
- ✓ SSH server
- ✓ standard system utilities



```
jochumt@pc-dg-037-06:~$ rm //donnees/TP-infobut1/Debian-S2.03-jochumt.img
rm: remove regular file '//donnees/TP-infobut1/Debian-S2.03-jochumt.img'? y
jochumt@pc-dg-037-06:~$ ls /donnees/TP-infobut1/
jochumt@pc-dg-037-06:~$ S2.03-lance-installation
```

- Install GRUB : Yes

- Device for boot loader : /dev/sda

Turn off the machine by executing this in your virtual machine terminal: #poweroff

Verification

Now that the installation is complete, run the following command to launch your virtual machine:

S2.03-launch-virtual-machine

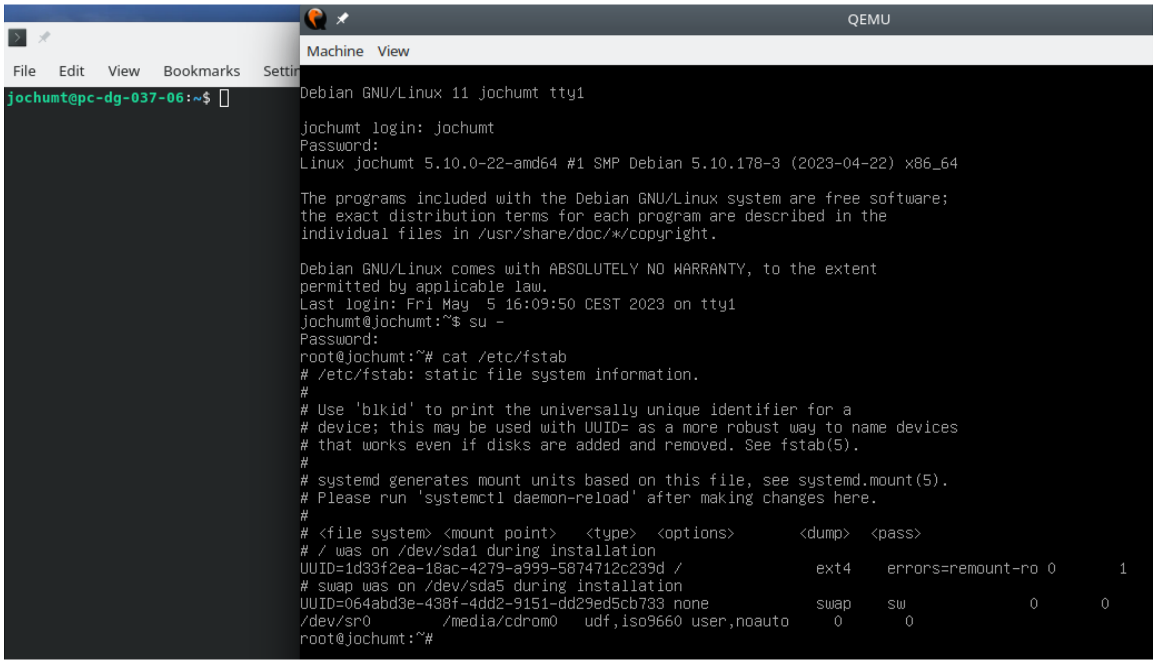
➔ check that your machine launches and works properly.

➔ run this command in your virtual machine to check that the installation is correct :

`cat /etc/fstab`

By using the "cat" command to display the contents of "/etc/fstab", you can see the current file system mount configurations on the virtual machine.

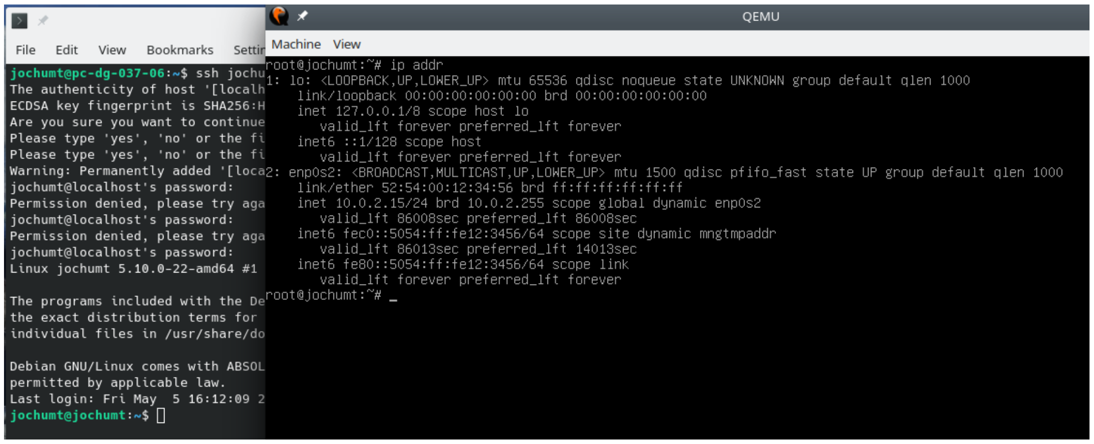
You should get this result :



```
jochumt@pc-dg-037-06:~$
```

```
Debian GNU/Linux 11 jochumt tty1

jochumt login: jochumt
Password:
Linux jochumt 5.10.0-22-amd64 #1 SMP Debian 5.10.178-3 (2023-04-22) 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.
Last login: Fri May  5 16:09:50 CEST 2023 on tty1
jochumt@jochumt:~$ su -
Password:
root@jochumt:~# cat /etc/fstab
# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# systemd generates mount units based on this file, see systemd.mount(5).
# Please run 'systemctl daemon-reload' after making changes here.
#
# <file system> <mount point>   <type>  <options>       <dump>  <pass>
# / was on /dev/sda1 during installation
UUID=1d33f2ea-18ac-4279-a999-5874712c239d /               ext4    errors=remount-ro 0       1
# swap was on /dev/sda5 during installation
UUID=064abd3e-438f-4dd2-9151-dd29ed5cb733 none            swap    sw              0       0
/dev/sr0        /media/cdrom0   udf,iso9660 user,noauto     0       0
root@jochumt:~#
```

➔ Execute : ip addr in your virtual machine to check that you can reach the outside.
You should get this result :



```
jochumt@pc-dg-037-06:~$ ssh jochu
The authenticity of host '[localh
ECDSA key fingerprint is SHA256:H
Are you sure you want to continue
Please type 'yes', 'no' or the fi
Please type 'yes', 'no' or the fi
Warning: Permanently added '[loca
jochumt@localhost's password:
Permission denied, please try aga
jochumt@localhost's password:
Permission denied, please try aga
jochumt@localhost's password:
Linux jochumt 5.10.0-22-amd64 #1

The programs included with the De
the exact distribution terms for
individual files in /usr/share/do

Debian GNU/Linux comes with ABSOL
permitted by applicable law.
Last login: Fri May  5 16:12:09 2
jochumt@jochumt:~$ 
```

```
root@jochumt:~# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 52:54:00:12:34:56 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s2
       valid_lft 86008sec preferred_lft 86008sec
    inet6 fec0::5054:ff:fe12:3456/64 scope site dynamic mngtmpaddr
       valid_lft 86013sec preferred_lft 14013sec
    inet6 fe80::5054:ff:fe12:3456/64 scope link
       valid_lft forever preferred_lft forever
root@jochumt:~# _
```

➔ Then run this command to check the absence of the Xorg server on your machine :

```
dpkg -l | grep xorg
```

We're going to try and test the SSH connection to your virtual machine now.

Run this command in the terminal of your **physical machine : (enter your username instead of toto)**

```
$ ssh toto@localhost -p 2222
```

Then type your password if requested.

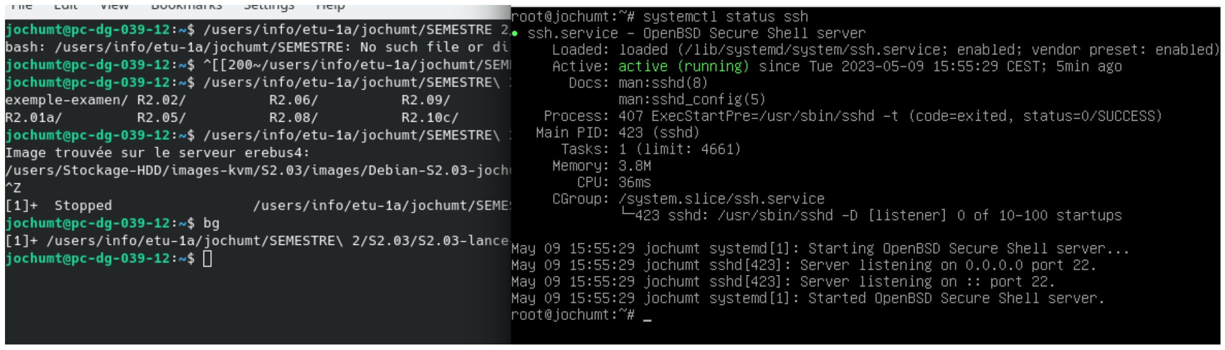
You are now connected in your virtual machine with ssh ✓

To test whether everything works, try installing a Debian package, for example the "micro" text editor :

Run this command in the terminal of your **virtual machine :** apt install micro

Now Run this command in the terminal of your **virtual machine :** systemctl status ssh

You should get this result :



```
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE 2
bash: /users/info/etu-1a/jochumt/SEMESTRE: No such file or di
jochumt@pc-dg-039-12:~$ ^[[200~/users/info/etu-1a/jochumt/SEM
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE\ 
exemple-examen/ R2.02/          R2.06/          R2.09/
R2.01a/         R2.05/          R2.08/          R2.10c/
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE\ 
Image trouvée sur le serveur erebus4:
/users/Stockage-HDD/images-kvm/S2.03/images/Debian-S2.03-joch
^Z
[1]+  Stopped                 /users/info/etu-1a/jochumt/SEME
jochumt@pc-dg-039-12:~$ bg
[1]+ /users/info/etu-1a/jochumt/SEMESTRE\ 2/S2.03/S2.03-lance
jochumt@pc-dg-039-12:~$ 
```

```
root@jochumt:~# systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/lib/systemd/system/ssh.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2023-05-09 15:55:29 CEST; 5min ago
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 407 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)
   Main PID: 423 (sshd)
      Tasks: 1 (limit: 4661)
     Memory: 3.8M
        CPU: 36ms
     CGroup: /system.slice/ssh.service
             └─423 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

May 09 15:55:29 jochumt systemd[1]: Starting OpenBSD Secure Shell server...
May 09 15:55:29 jochumt sshd[423]: Server listening on 0.0.0.0 port 22.
May 09 15:55:29 jochumt sshd[423]: Server listening on :: port 22.
May 09 15:55:29 jochumt systemd[1]: Started OpenBSD Secure Shell server.
root@jochumt:~# _
```

We can now start the additional installation…

Tom Jochum

Chapter 3

Additional installation

Important note: for any installation, use the **APT** (Advanced Package Tool) package manager and the packages provided by the Debian distribution. Other installation methods exist, but they are more complicated. 😉

Start the virtual machine (execute this in your terminal): S2.03-lance-machine-virtuelle

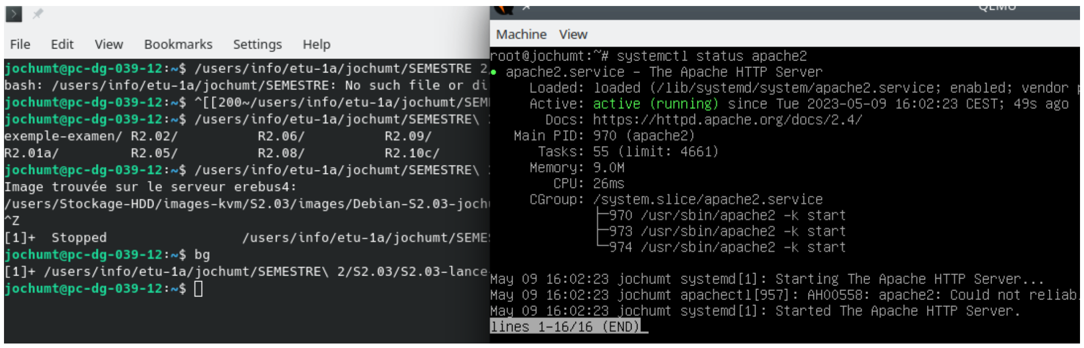
Apache installation

In your virtual machine terminal, run this command : **sudo apt install apache2**

➔ Accept what is asked of you and complete the installation.

Congratulations apache2 is installed on your virtual machine ✓

➔ Use the following command to check that Apache has been started correctly (execute in your virtual machine):
#**systemctl status apache2**
You should get this result :



```
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE 2
bash: /users/info/etu-1a/jochumt/SEMESTRE: No such file or di
jochumt@pc-dg-039-12:~$ ^[[200~/users/info/etu-1a/jochumt/SEM
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE\
exemple-examen/ R2.02/          R2.06/          R2.09/
R2.01a/         R2.05/          R2.08/          R2.10c/
jochumt@pc-dg-039-12:~$ /users/info/etu-1a/jochumt/SEMESTRE\
Image trouvée sur le serveur erebus4:
/users/Stockage-HDD/images-kvm/S2.03/images/Debian-S2.03-joch
^Z
[1]+  Stopped                 /users/info/etu-1a/jochumt/SEME
jochumt@pc-dg-039-12:~$ bg
[1]+ /users/info/etu-1a/jochumt/SEMESTRE\ 2/S2.03/S2.03-lance
jochumt@pc-dg-039-12:~$ 
```

```
root@jochumt:~# systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor
     Active: active (running) since Tue 2023-05-09 16:02:23 CEST; 49s ago
       Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 970 (apache2)
      Tasks: 55 (limit: 4661)
     Memory: 9.0M
        CPU: 26ms
     CGroup: /system.slice/apache2.service
             ├─970 /usr/sbin/apache2 -k start
             ├─973 /usr/sbin/apache2 -k start
             └─974 /usr/sbin/apache2 -k start

May 09 16:02:23 jochumt systemd[1]: Starting The Apache HTTP Server...
May 09 16:02:23 jochumt apachectl[957]: AH00558: apache2: Could not reliab
May 09 16:02:23 jochumt systemd[1]: Started The Apache HTTP Server.
lines 1-16/16 (END)
```

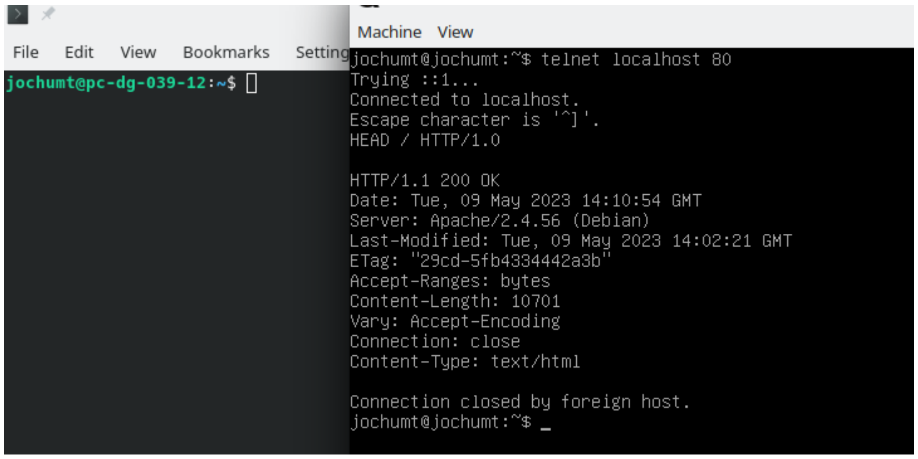
➔ If Apache is not started :
#**systemctl restart apache2**

Let’s do some test to verify that everything is working:

Since your machine is a server without a graphical interface, it is not possible to display an HTML page. You can connect to the Apache server by executing this command to check that the installation has been successful :

$ telnet localhost 80

You should get this :



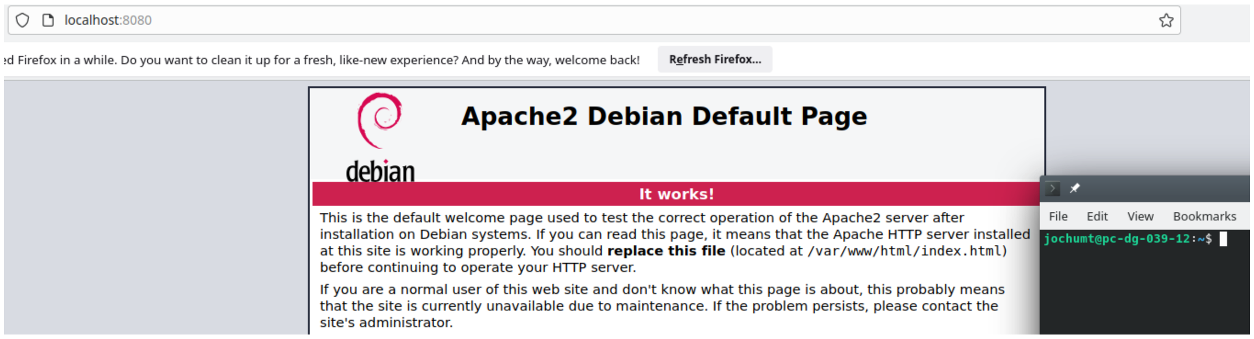
```
jochumt@pc-dg-039-12:~$
```

```
jochumt@jochumt:~$ telnet localhost 80
Trying ::1...
Connected to localhost.
Escape character is '^]'.
HEAD / HTTP/1.0

HTTP/1.1 200 OK
Date: Tue, 09 May 2023 14:10:54 GMT
Server: Apache/2.4.56 (Debian)
Last-Modified: Tue, 09 May 2023 14:02:21 GMT
ETag: "29cd-5fb4334442a3b"
Accept-Ranges: bytes
Content-Length: 10701
Vary: Accept-Encoding
Connection: close
Content-Type: text/html

Connection closed by foreign host.
jochumt@jochumt:~$ _
```

Although it is not possible to display a web page on the virtual machine, it is possible to do so from the host machine.

Open a web browser on your **physical machine**, and paste this url : http://localhost:8080

You should get this result:


localhost:8080
ed Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back!
Refresh Firefox...
debian
File
Edit
View
Bookmarks
jochumt@pc-dg-039-12:~$

Apache2 Debian Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Debian systems. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

PostgreSQL installation

Carry out these 3 commands in your virtual machine to prepare the installation :

apt update

apt upgrade

apt clean

Install the program with this simple command in your virtual machine terminal :

```
apt install postgresql
```

We are now going to ensure that the server accepts external connections.

- ➔ Run the command : `su – postgres`
  Use the user: `psql`

We are going to edit the configuration file, for example using nano :

Usually this file can be found at this place :

```
nano /etc/postgresql/13/main/postgresql.conf
```

In the CONNECTIONS AND AUTHENTICATION section, find the following line to uncomment and update:

listen_addresses = '*'

And now uncomment and modify the following line :

```
cryptage du mot de passe = scram-sha-256
```

And then replace all occurrences of md5 with scram-sha-256

Now that the server is listening for connection requests from non-local IP addresses, you need to define an authentication rule that will be used for these requests. To do this, edit the :

```
nano /etc/postgresql/13/main/pg_hba.conf
```

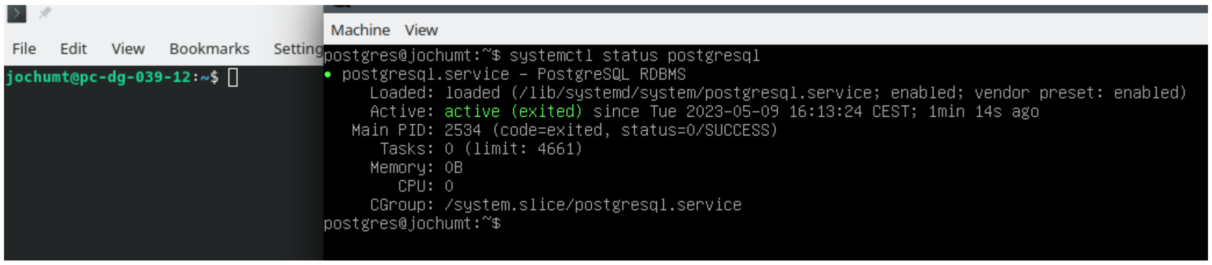
add the following rule to authorize only connections authenticated by a password stored with a strong hash function :

```
#IPv4 remote connections:

host  all all 0.0.0.0/0 scram-sha-256
```

To check that everything is working execute this command :

Systemctl status postgresql

You should get this result :



```
jochumt@pc-dg-039-12:~$
```

```
postgres@jochumt:~$ systemctl status postgresql
● postgresql.service - PostgreSQL RDBMS
     Loaded: loaded (/lib/systemd/system/postgresql.service; enabled; vendor preset: enabled)
     Active: active (exited) since Tue 2023-05-09 16:13:24 CEST; 1min 14s ago
   Main PID: 2534 (code=exited, status=0/SUCCESS)
      Tasks: 0 (limit: 4661)
     Memory: 0B
        CPU: 0
     CGroup: /system.slice/postgresql.service
postgres@jochumt:~$
```

Restart your service to finalize everything !

Service postgresql restart

PostgreSql configuration

We are now going to create a user for PostgreSQL :

Execute theses commands:

su - postgres

psql

CREATE USER [your_username] with password ‘your_password’;

Service postgresql restart

Now on your physical machine :

psql -h localhost postgres

Now we're going to create a database and run a few tests on it.

Create base voile;

Create table personne(nom varchar, prenom varchar, age numeric);

Insert into personne values ‘Shall, Gabriel, 18’;

Insert into personne values ‘Jochum, Tom, 19’;

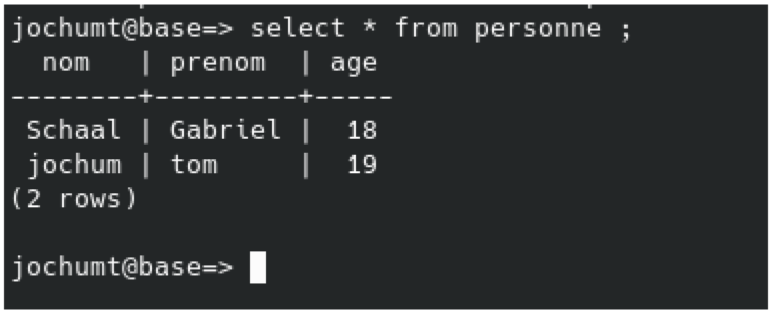
Create user aflau with password’aflau’

Create user guy with password’guy’

Let's do a test on the base :

Select * from personne;

You should get this result:



```
jochumt@base=> select * from personne ;
  nom    | prenom   | age
--------+---------+-----
 Schaal | Gabriel |  18
 jochum | tom     |  19
(2 rows)

jochumt@base=> 
```

You can also see the list of databases with their owners by running this command in your virtual machine:

First log in :

su - postgres

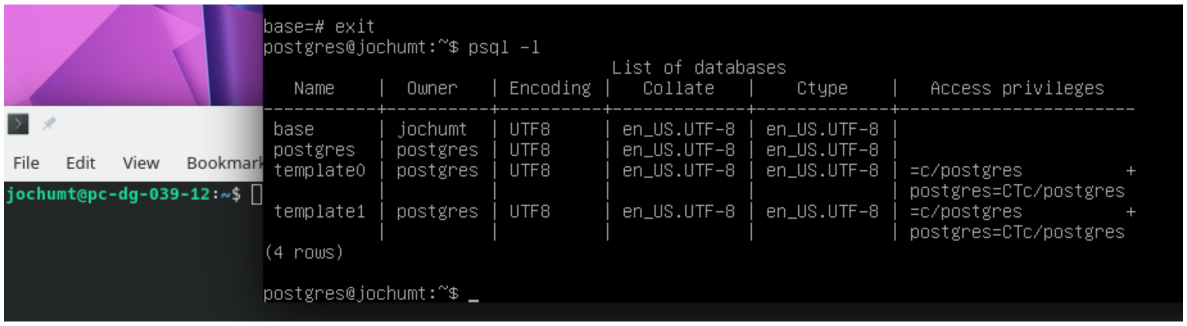
Connect with your username et password

your_username

'your_password'

Then execute:

Psql -l



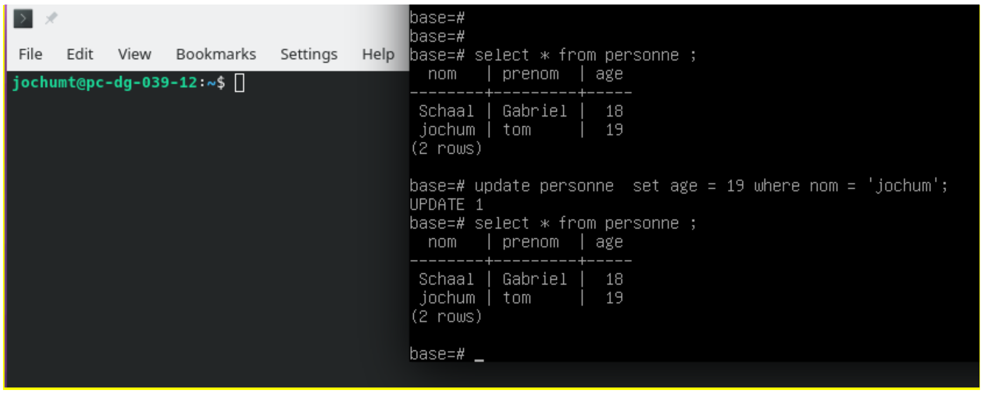
```
jochumt@pc-dg-039-12:~$
```

```
base=# exit
postgres@jochumt:~$ psql -l
                              List of databases
   Name    |  Owner   | Encoding |   Collate   |    Ctype    |   Access privileges
-----------+----------+----------+-------------+-------------+-----------------------
 base      | jochumt  | UTF8     | en_US.UTF-8 | en_US.UTF-8 |
 postgres  | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 |
 template0 | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres          +
           |          |          |             |             | postgres=CTc/postgres
 template1 | postgres | UTF8     | en_US.UTF-8 | en_US.UTF-8 | =c/postgres          +
           |          |          |             |             | postgres=CTc/postgres
(4 rows)

postgres@jochumt:~$ _
```

Let's now do a little test on our virtual machine : execute this :

Select * from personne;

You should get this result :



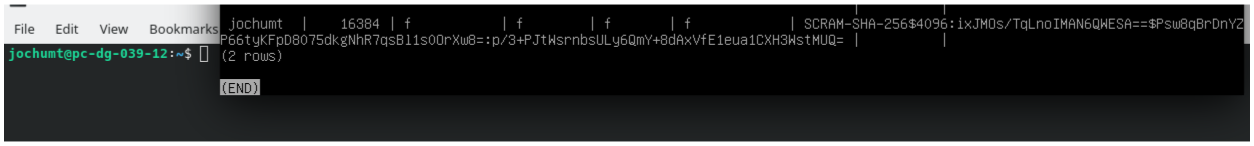
```
jochumt@pc-dg-039-12:~$
```

```
base=#
base=#
base=# select * from personne ;
  nom   | prenom  | age
--------+---------+-----
 Schaal | Gabriel |  18
 jochum | tom     |  19
(2 rows)

base=# update personne  set age = 19 where nom = 'jochum';
UPDATE 1
base=# select * from personne ;
  nom   | prenom  | age
--------+---------+-----
 Schaal | Gabriel |  18
 jochum | tom     |  19
(2 rows)

base=# _
```

We will now query the PostgreSQL database showing the pg_shadow system table, which should contain passwords hashed with the SHA-256 hash function.

To do this execute this : select * from pg_shadow

You should get this result:



```
jochumt@pc-dg-039-12:~$
```

```
 jochumt  |    16384 | f          | f        | f       | f            | SCRAM-SHA-256$4096:ixJMOs/TqLnoIMAN6QWESA==$Psw8qBrDnYZ
P66tyKFpD8075dkgNhR7qsBl1sOOrXw8=:p/3+PJtWsrnbsULy6QmY+8dAxVfE1eua1CXH3WstMUQ= |          |
(2 rows)

(END)
```

We can see that the password hash is SCRAM-SHA-256

Php installation

We're now going to install php, which is a general-purpose, open-source scripting language.

Execute this in your virtual machine:

# apt install php-common libapache2-mod-php php-cli

Once it's done restart your machine like this :

systemctl restart apache2

To test your installation we are going to place an info.php file in the /var/www/html/ directory.

In your virtual machine execute :

Nano /var/www/html/info.php

And copy this script in it :

```
<?php
phpinfo();
phpinfo(INFO_MODULES);
?>
```

Finally, go to a search engine on your physical machine and consult this address:

http://localhost:8080/info.php

PhpAdmin installation

phpPgAdmin is a Web application written in PHP to help manage the PostgreSQL DBMS.

On your virtual machine execute this :

apt install phppgadmin

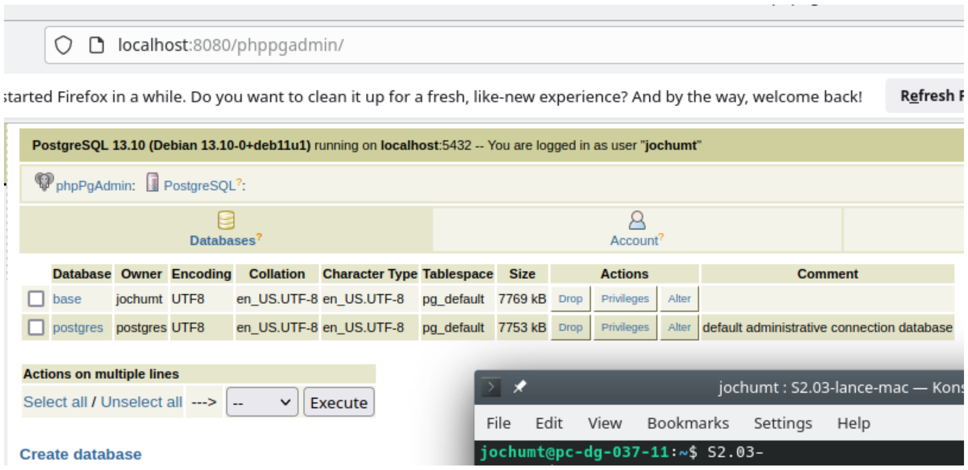
You can restart your machine :

systemctl restart apache2

And visit this website on your physical machine :

http://localhost:8080/phppgadmin

You should get this result :



localhost:8080/phppgadmin/

started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back!

PostgreSQL 13.10 (Debian 13.10-0+deb11u1) running on **localhost**:5432 -- You are logged in as user "**jochumt**"

phpPgAdmin: PostgreSQL?:

	Database	Owner	Encoding	Collation	Character Type	Tablespace	Size	Actions			Comment
☐	base	jochumt	UTF8	en_US.UTF-8	en_US.UTF-8	pg_default	7769 kB	Drop	Privileges	Alter	
☐	postgres	postgres	UTF8	en_US.UTF-8	en_US.UTF-8	pg_default	7753 kB	Drop	Privileges	Alter	default administrative connection database

Actions on multiple lines

Select all / Unselect all ---> -- Execute

Create database

jochumt : S2.03-lance-mac — Kons
File Edit View Bookmarks Settings Help

```
jochumt@pc-dg-037-11:~$ S2.03-
```

Last things to check

Execute this on your virtual machine :

/sbin/blkid

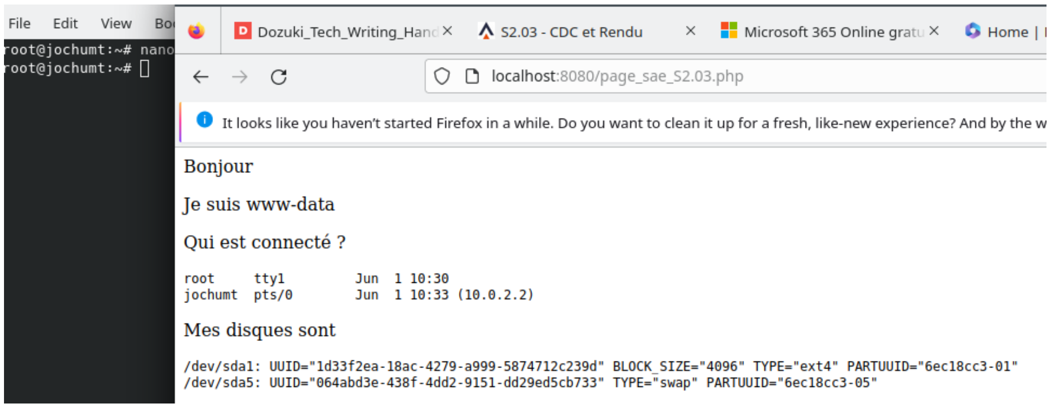
Make sure that you can visit this on your physical machine.

/users/info/www/intranet/enseignements/S2.03/page_sae_S2.03.php

Or this one on a web site:

https://www-info.iut2.univ-grenoble-alpes.fr/intranet/enseignements/S2.03/page_sae_S2.03.php

you should get this result :



```
root@jochumt:~# nano
root@jochumt:~#
```

It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the w

Bonjour

Je suis www-data

Qui est connecté ?

```
root     tty1         Jun  1 10:30
jochumt  pts/0        Jun  1 10:33 (10.0.2.2)
```

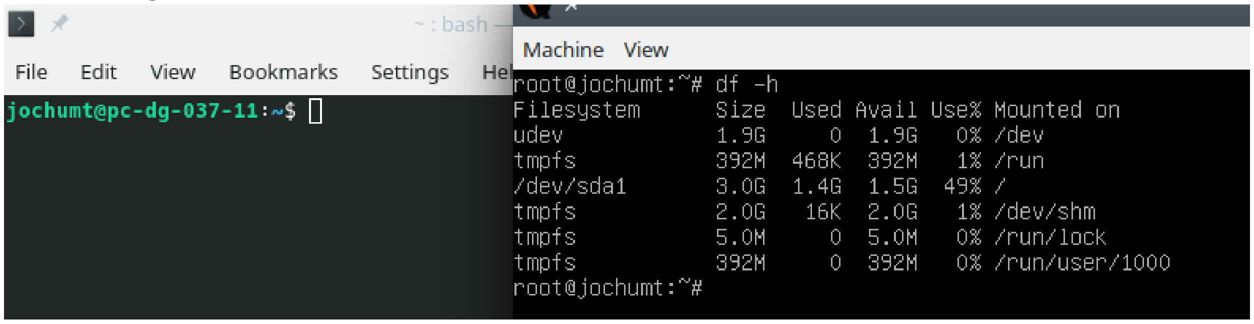
Mes disques sont

```
/dev/sda1: UUID="1d33f2ea-18ac-4279-a999-5874712c239d" BLOCK_SIZE="4096" TYPE="ext4" PARTUUID="6ec18cc3-01"
/dev/sda5: UUID="064abd3e-438f-4dd2-9151-dd29ed5cb733" TYPE="swap" PARTUUID="6ec18cc3-05"
```

You can check your storage and the installation will be complete!

Execute this : df -h

You should get this result :



```
jochumt@pc-dg-037-11:~$
```

```
root@jochumt:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            1.9G     0  1.9G   0% /dev
tmpfs           392M  468K  392M   1% /run
/dev/sda1       3.0G  1.4G  1.5G  49% /
tmpfs           2.0G   16K  2.0G   1% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           392M     0  392M   0% /run/user/1000
root@jochumt:~#
```

You can now enjoy your 100% functional virtual machine !

Tom Jochum

You can now create your network service installation on your own ✓

Congratulations!

Tom Jochum