Private cloud service for students

We introduce you the new FIB's private cloud service, called **virtech**. It is available at   https://virtech.fib.upc.edu.

Virtech is a private cloud service based on virtual machine self-service for the students taking the subjects that requested doing labs with their own servers. "Clouding" is a broad concept, this documentation gives more detail about the service we offer.

Virtech allows every group/student to create/delete/use their own virtual machines. These VMs are accessible through the UPC and through the Internet with the VPN too. More information can be found at   https://serveistic.upc.edu/ca/upclink.

Features of the service:

- Every student/group can create/delete/start/stop its virtual machines.
- It will be available during the term corresponding to the enrollment of that certain subject.
- The corresponding teachers will provide the accounts and passwords to access the service.
- The amount of machines and its settings are determined by the subject.
- For now, the available machines are Linux type, more precisely Ubuntu.
- Linux comes with an adapted configuration for each subject. Students will have access to the *alumne* user (via the *su* command), which has administrator rights, and are responsible for the use that is made of them.
- Access is not limited by any firewall.
- Machines can be accessed directly from the UPC. External access (through the Internet) can be made through the UPC's VPN service if the *amb VPN* (with VPN) template is chosen, or from anywhere with NAT ports, if the chosen type is *sense VPN* (without VPN).
- The service given by Operation is virtech's password change service, not the virtual machine's password change.
- Operació can't recover access to machines or its passwords. If an issue of this kind occurs, students will have to delete that VM and create it again.
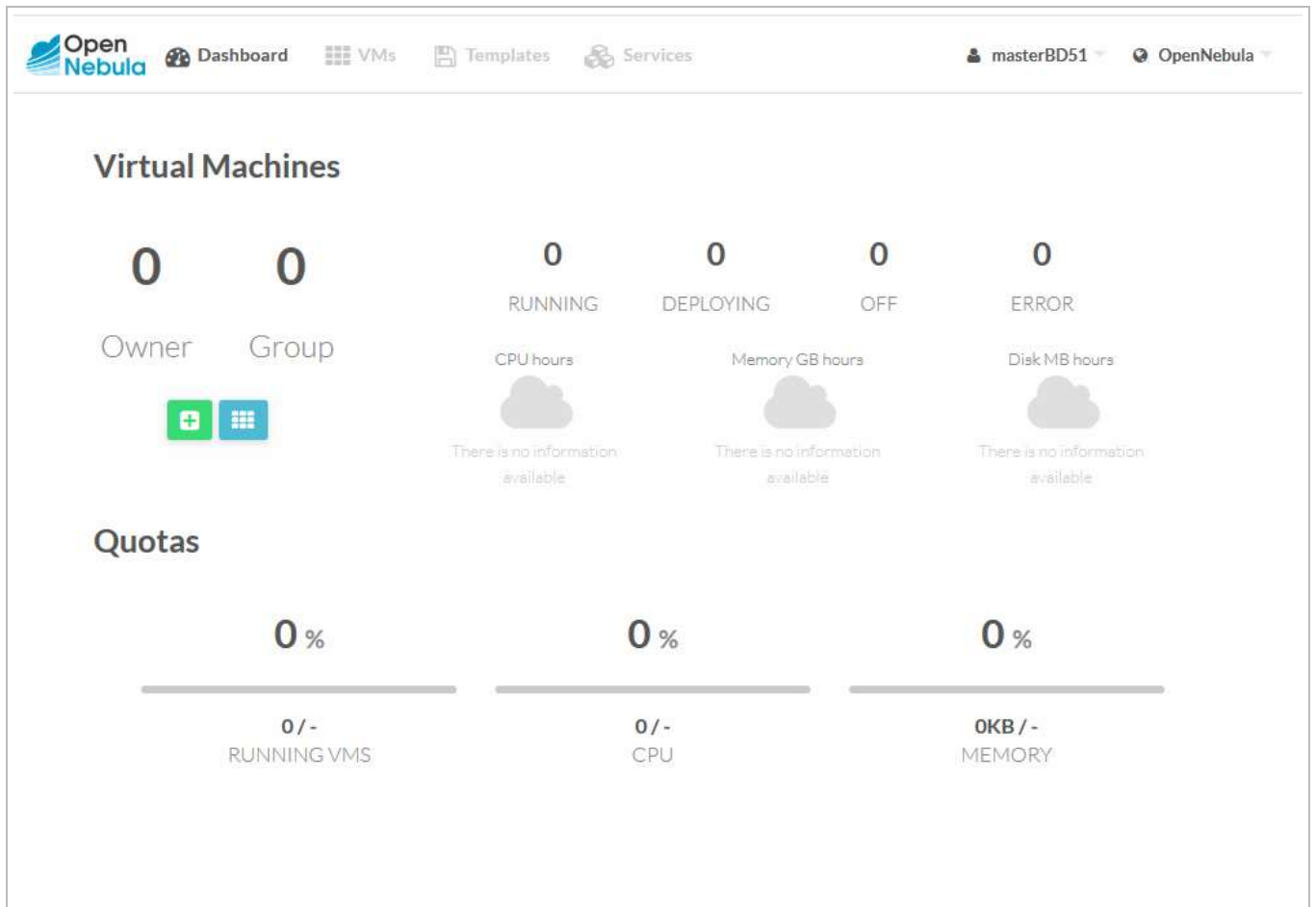- VMs don't count with **any kind of backup** and **will be erased at the end of the term**.

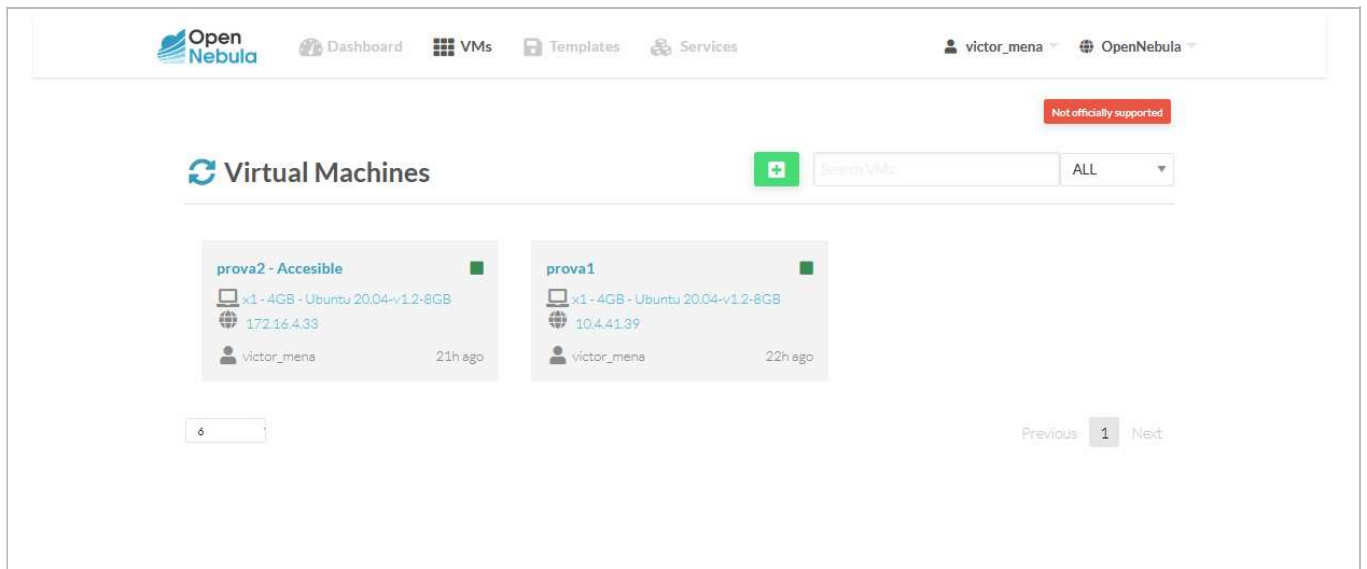## Accessing the service

Access can be made at: https://virtech.fib.upc.edu

Once authenticated, a summary of your machines will be shown:

Machines management

The second icon (VM), allows viewing the dashboard with our running VMs and creating a new one.

A new VM can be created by clicking the "+" icon. You will be able to see the templates assigned to your profile, which may vary depending on the subject. Some templates have two versions:

- **amb VPN (with VPN):** this machine will be accessible from FIB's private internal network. In other words, access can be made physically from the UPC or through the VPN.
- **sense VPN (without VPN):** the VM is usable directly at UPC, but can easily be used from outside by NAT ports. These ports detect us loging in through our machine's console.

(A more detailed explanation can be found in the *FAQs section*)

As soon as the template is selected, the system will show these fields to fill out:

- **Virtual Machine Name**: nom de la màquina, purament descriptiu.
- **Disk**: The disk size is fixed. Even if modified, the changes will not apply.
- **Password for "<user>" user**: VMs are created with a default user so students can have an account. Depending on the template, this user can be named 'alumne', 'dbm' or others. This field needs to be filled with the password of the account.

Create Virtual Machine

Virtual Machine Name | Persistent ⓘ | **Create**

Template

⬤ master BD usuaris ✏️
ubuntu

🖥 Capacity

Memory ⓘ

| 3 | GB ▾ |

CPU ⓘ

| 0.5 |

VCPU ⓘ

☰ Disks

♻ 🟩 DISK 0: Password_SOBI18

| 25000 | ⬍ | MB ▾ |

⚙ Custom Attributes

Password for bdm user:

🌐 VM Group

➕ VM Group

🌐 Datastore

Please select one or more datastores from the list   🔄   Search

ID	▾	Name	⬍	Owner	⬍	Group	⬍	Status	⬍
0		system		oneadmin		oneadmin		ON	

| 10 ▾ | Showing 1 to 1 of 1 entries (filtered from 4 total entries) | Previous | 1 | Next |

Once the fields are filled, we can create the machine by clicking "Create". At this point, the system assigns an IP address and a DNS name from a default list. This way, it is easier to remember the name to access.
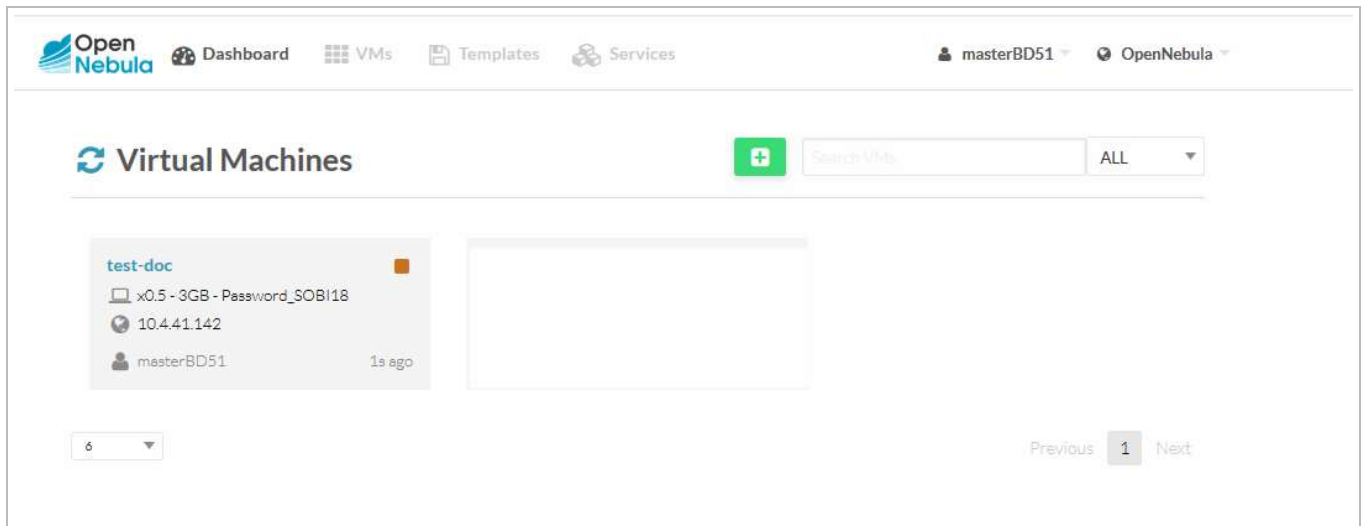
If we select the machine, we will see how the creation progress is, marked as "DEPLOYING"
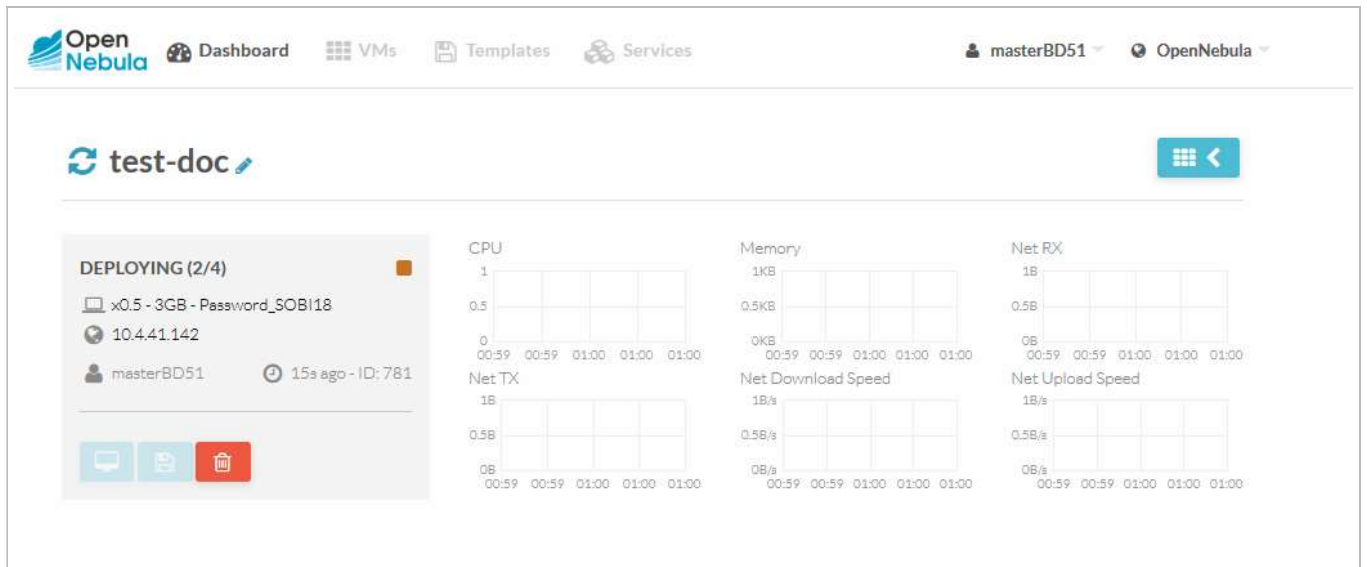
When the machine starts, this view will be shown. Here are the controls of the machines:

- **Console** button: Allows accessing the machine's console. When clicked, two options are shown: VNC (see the next photo) or VirtViewer (not usable at the moment).
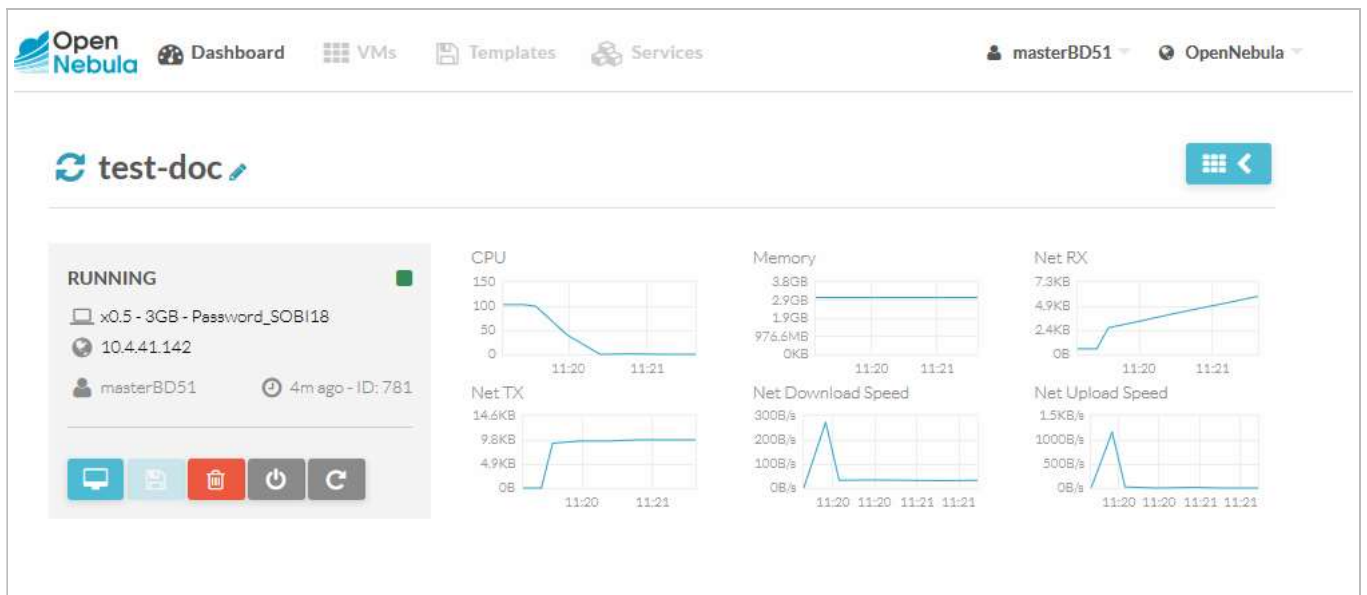- **Save** button: Serveix per gravar una còpia de l'estat a disc. Actualment aquesta opció no està disponible.
  Used to save a copy of the status to disk.
- **Reboot** button: Used to reboot the VM.
- **Power Off** button: Allows to power off the machine. After clicking, it will ask to do it directly or shutting it off.
- **Delete** button: It deletes the VM. It will ask for confirmation. This action **can't be undone**.

If we click the 'console' icon, a window will pop-up (permission must be given) and the console will be accessible via web. Some machines have text consoles and others have a graphic one.

Consola en text
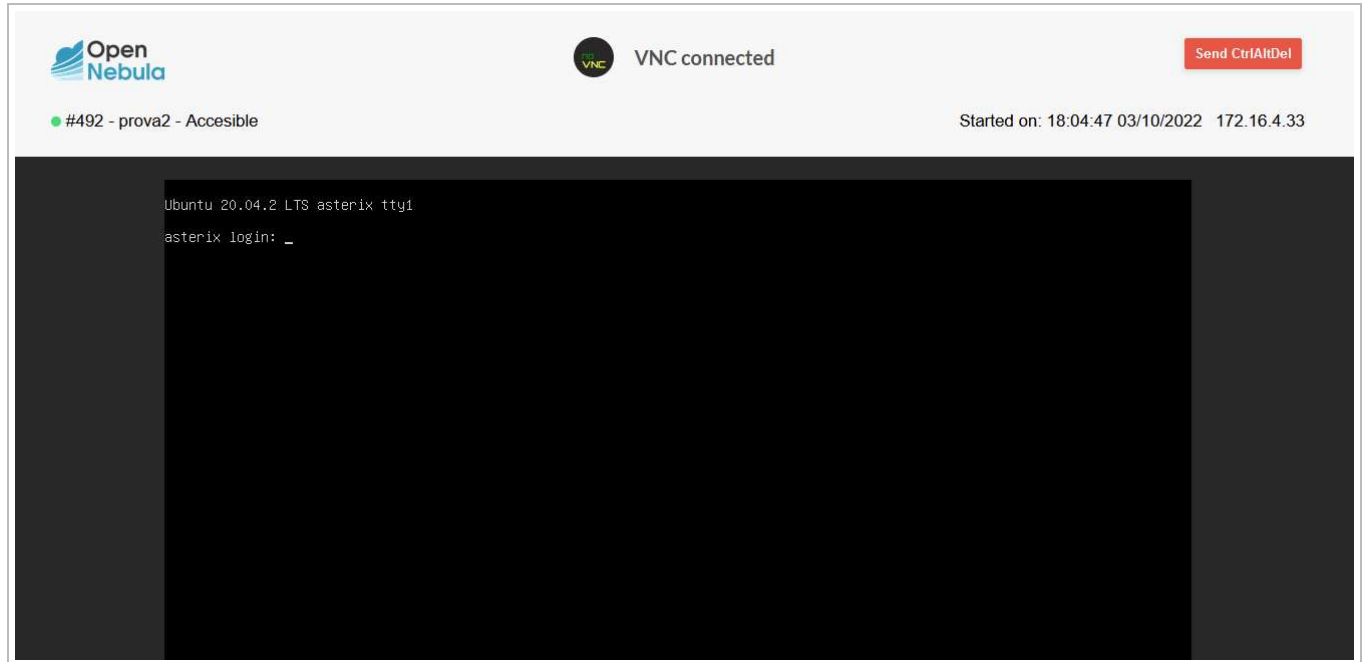
Graphic consoles.

Some subjects count with a template with a console configured in graphic mode. Here is an example:
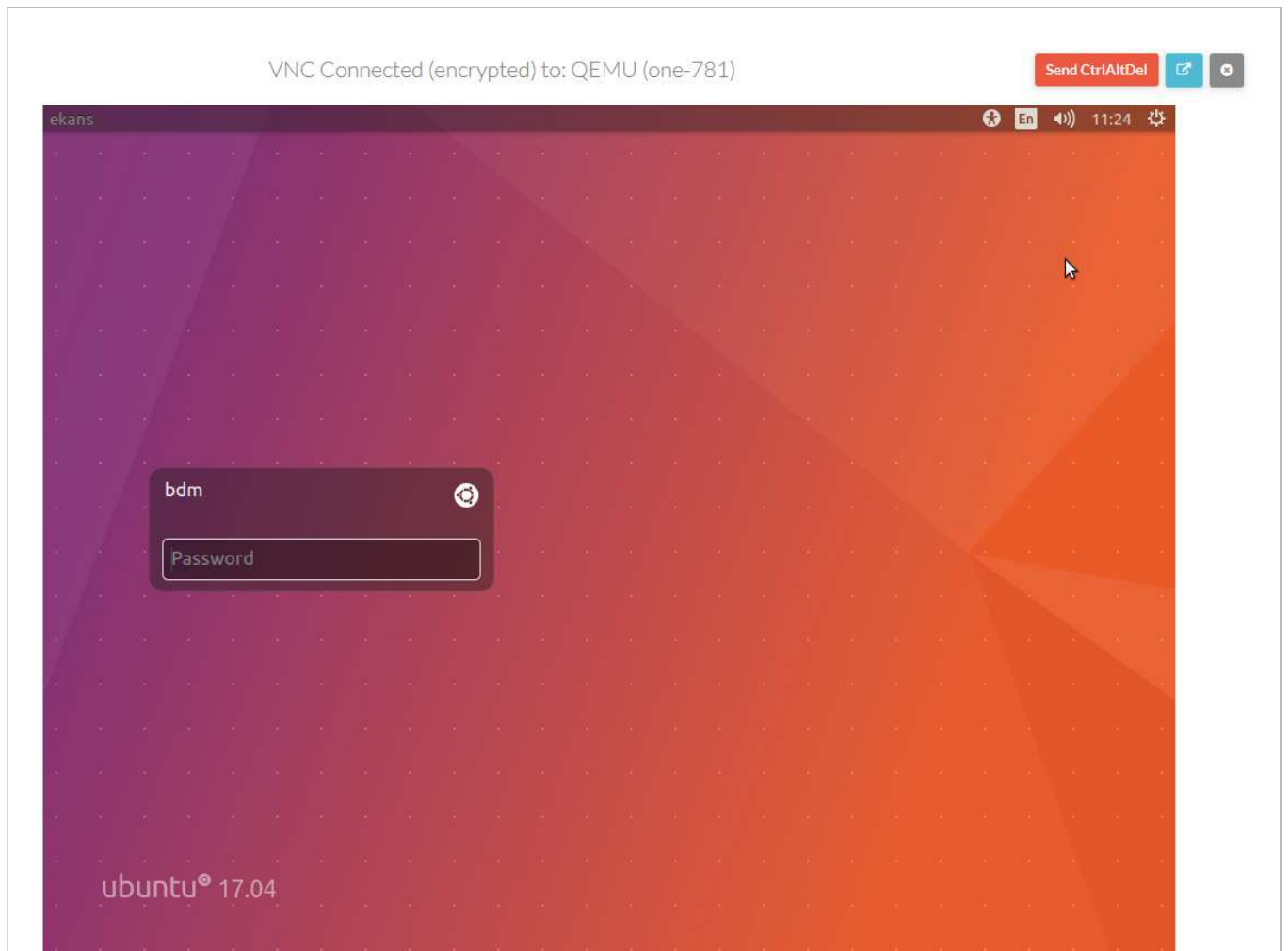
As a graphic console has the same keyboard issues as the text console, we have activated the possibility of accessing with a VNC client. To do so, follow these steps:
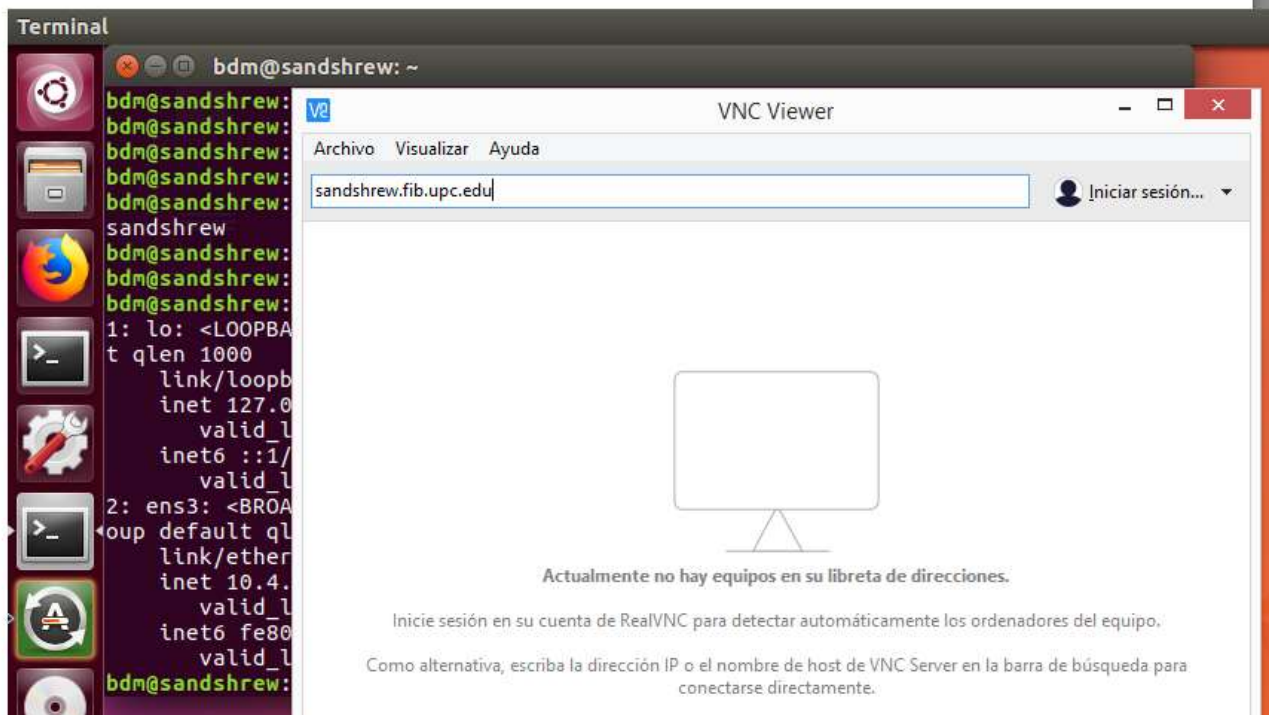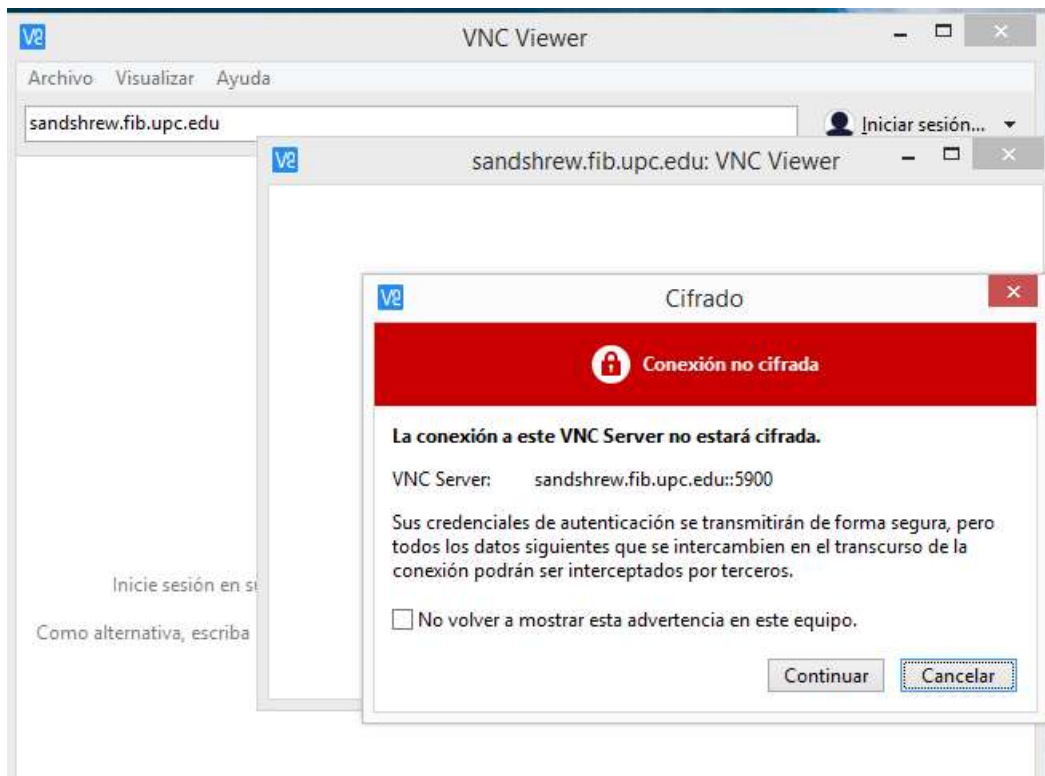
- Power on the VM

- Access the console and log in. If you skip this step, it won't work.

- Open a terminal window and find out the machine's name or its IP.

VNC Connected (encrypted) to: QEMU (one-642) ⬈   Send CtrlAltDel   ✕

Terminal

● ● ▣ bdm@sandshrew: ~

```
bdm@sandshrew:~$
bdm@sandshrew:~$
bdm@sandshrew:~$
bdm@sandshrew:~$
bdm@sandshrew:~$ hostname
sandshrew
bdm@sandshrew:~$
bdm@sandshrew:~$
bdm@sandshrew:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP gr
oup default qlen 1000
    link/ether 02:00:0a:04:29:92 brd ff:ff:ff:ff:ff:ff
    inet 10.4.41.146/24 brd 10.4.41.255 scope global ens3
       valid_lft forever preferred_lft forever
    inet6 fe80::aff:fe04:2992/64 scope link
       valid_lft forever preferred_lft forever
bdm@sandshrew:~$ █
```

- Access from your VNC client.   RealVNC is a good option.

Terminal

● ● ▣ bdm@sandshrew: ~

```
bdm@sandshrew:
bdm@sandshrew:
bdm@sandshrew:
bdm@sandshrew:
bdm@sandshrew:
sandshrew
bdm@sandshrew:
bdm@sandshrew:
bdm@sandshrew:
1: lo: <LOOPBA
t qlen 1000
    link/loopb
    inet 127.0
       valid_l
    inet6 ::1/
       valid_l
2: ens3: <BROA
oup default ql
    link/ether
    inet 10.4.
       valid_l
    inet6 fe80
       valid_l
bdm@sandshrew:
```

V2   VNC Viewer   — ▢ ✕

Archivo   Visualizar   Ayuda

sandshrew.fib.upc.edu| 👤 Iniciar sesión... ▾

Actualmente no hay equipos en su libreta de direcciones.

Inicie sesión en su cuenta de RealVNC para detectar automáticamente los ordenadores del equipo.

Como alternativa, escriba la dirección IP o el nombre de host de VNC Server en la barra de búsqueda para conectarse directamente.

Basic use guide (MUST READ)

How can I know if my machine works correctly? Here are some tests so you can understand how this kind of VMs work. All these tests require the script that is explained down below in the *FAQs* section.

The testing that can be done to familiarize with the functioning of our machine is based on using the command line tool netcat and/or telnet. The first test allows opening a port and acting as a server and as a client, which means we are able to capture and send through this port by putting the right options on the command. First, open a powershell/terminal/console on your PC and write the command our machine specifies when logging in (check FAQs point). To do this test, connection with the FIB network (physically or via VPN) is needed.

```
pcpropi_connectat_per_vpn# ssh alumne@nattech.fib.upc.edu -p 22033
```

After the connection is established, exchanging information with the /powershell/terminal/console that was open on our PC is possible.

The next test starts by opening the VNC console of your machine and writing the next command:

```
alumne@VMenVNC# netcat -l -p 8080
```

Depending on the language our SO uses, it is *netcat* or *nc*. The **-l** option specifies we are listening through the port channel, and **-p** indicates the port we want to use. For more info about netcat options, check its manual (**man netcat** command).

```
Ubuntu 20.04.2 LTS asterix tty1

asterix login: alumne
Password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.4.0-126-generic x86_64)

   System information as of Fri Oct  7 09:55:42 CEST 2022

   System load:  0.0                  Processes:             103
   Usage of /:   20.3% of 7.57GB      Users logged in:       1
   Memory usage: 4%                   IPv4 address for eth0: 172.16.4.33
   Swap usage:   0%

 * Super-optimized for small spaces - read how we shrank the memory
   footprint of MicroK8s to make it the smallest full K8s around.

   https://ubuntu.com/blog/microk8s-memory-optimisation
New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


-----------------------------------------------------------------
La teva adreça IP és: 172.16.4.33
Connecta't per SSH a aquesta màquina des de la UPC, o l'exterior amb VPN:
> ssh alumne@nattech.fib.upc.edu -p 22033
Els teus ports oberts a Internet directament sense VPN són:
> El port TCP nattech.fib.upc.edu:40330 va a 172.16.4.33:8080
> El port TCP nattech.fib.upc.edu:40331 va a 172.16.4.33:8081
> El port TCP nattech.fib.upc.edu:40332 va a 172.16.4.33:8082
> El port TCP nattech.fib.upc.edu:40333 va a 172.16.4.33:8083
> El port TCP nattech.fib.upc.edu:40334 va a 172.16.4.33:8084
> El port TCP nattech.fib.upc.edu:40335 va a 172.16.4.33:8085
> El port TCP nattech.fib.upc.edu:40336 va a 172.16.4.33:8086
> El port TCP nattech.fib.upc.edu:40337 va a 172.16.4.33:8087
> El port TCP nattech.fib.upc.edu:40338 va a 172.16.4.33:8088
> El port TCP nattech.fib.upc.edu:40339 va a 172.16.4.33:8089
-----------------------------------------------------------------
Last login: Fri Oct  7 09:14:06 CEST 2022 from 147.83.58.11 on pts/0
alumne@asterix:~$ netcat -l -p 8080
```

After that, open a terminal in the device you want and use a public port and IP, related to the port written in the machine's VNC. To establish the connection:

```
pcpropi# netcat nattech.fib.upc.edu 40330
```

40330 is the associated port, as you can see on the script at the end of this documentation.

```
victormena@menaUbuntu:~$ nc nattech.fib.upc.edu 40330
HELLO WORLD! :)
```

From this point, we can send ASCII text to our VM from the device we are using.

```
Last login: Fri Oct  7 09:14:06 CEST 2022 from 147.83.58.11 on pts/0
alumne@asterix:~$ netcat -l -p 8080
HELLO WORLD! :)
```

To end, here is an nginx exercise that can help understanding how to connect to the VM and the uses it has. The first step is downloading nginx on our machine with the next command:

```
alumne@VMenVNC# sudo apt install nginx
```

Once downloaded, the port being listened to by default has to be changed, modifying its **default** archive.

```
alumne@VMenVNC# sudo vim /etc/nginx/sites-enabled/default
```

The line listen 80 default_server; change 80 by 8080: ("listen [::] 80 default_server" can be erased, as it is IPv6)

Then, restart nginx:

```
alumne@VMenVNC# systemctl restart nginx
```

If any error message shows up, the only thing missing is opening a web browser on the device we want and putting the corresponding url with the port indicated in the script at the starting of the VM (in my case, http://nattech.fib.upc.edu:40330). Check the content of /var/www/html/index.nginx-debian.html


These three tests are simple and very useful to understand the basic functioning of the connection to our machine, specially the second one, that lets us understand how to connect up to ten different services of our VM through different ports. We will set an API, APP or code on these ports, that will be executed once it accesses this IP.

FAQs

How do I change my password?

The password change option can be found on the top right corner: User's menu -> Settings and on the user configuration part -> Change password.
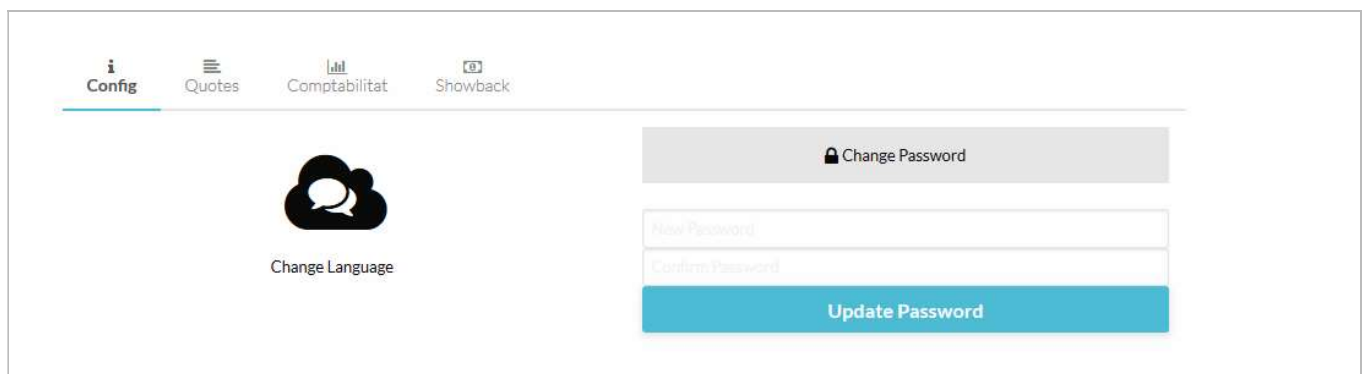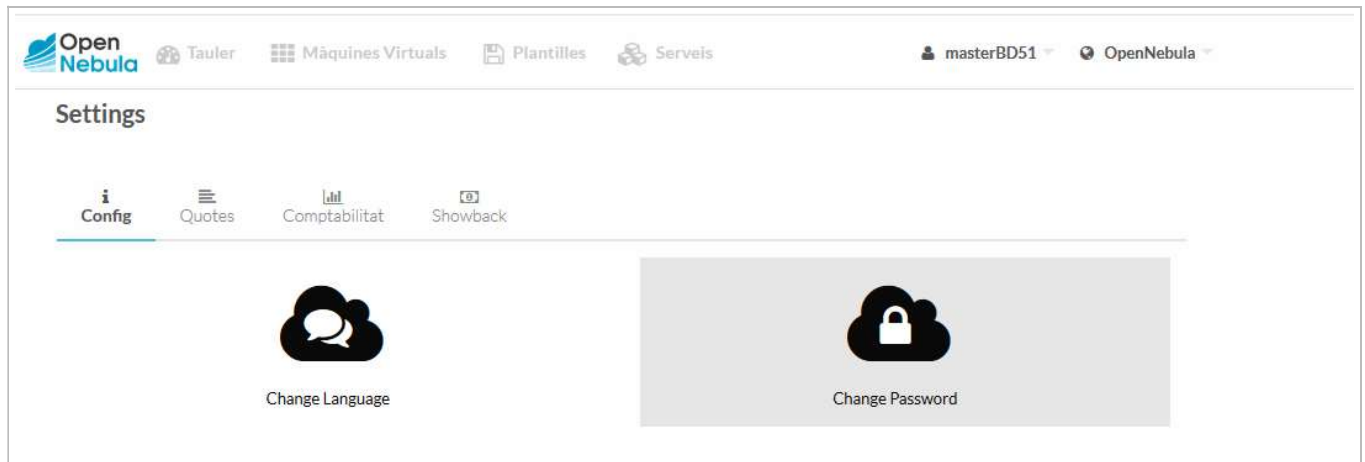
How can I "ping" my machine?

Due to the NAT architecture, it's not possible to ping from outside the net, not even with the VPN. We will get a response by pinging a machine on the same subnet where our machine is.

How can I connect via secure shell?

So you don't have to use the console, you can connect to machines through secure shell   SSH, using the user *alumne* (or *bdm*, depending on the subject) and the machine's IP or name.

How can I connect from outside the UPC?

Using a machine with VPN, it is necessary to use the UPClink service, which is the VPN service provided by the UPC. The description and documentation of the service can be found at   https://serveistic.upc.edu/ca/upclink

On the other hand, if we are with a machine without a VPN, we can connect from TCP ports directly to the Internet using the NAT protocol specified below.

Can I "*ssh* ..." to connect to my VM from outside the UPC without using the VPN?

As the script executed every time we log in our machine, **it's not possible to use secure shell with an IP from outside the UPC** for security reasons.

Why can I see the "save" button but not use it?

At present, we can't hide this option, but it is disabled.

How does ports NAT work for students?

The net 172.168.4.0/24 is designed so students dispose of VMs that can have services accessible from the Internet with no need of a VPN.

The VPN that allows external access presents problems. The VPN is personal, and just allows **a single connection**. This makes impossible to develop simultaneously in a PC and in a mobile device, nor is it possible to distribute apps to third-party mobiles.

For this reason, this new net was created, a very complex scheme, that allows these functionalities securely. Each VM is provided with 10 externally accessible ports and the SSH.

As all the nodes share the external NAT's IP, it was necessary to use ports. The port policy is as follows:

Given an IP of the range 172.168.4.0/24, we focus on the last suffix. The net's index is 172.168.4.XXX. The NAT's external IP is nattech.fib.upc.edu.

> nagios@absolut:~> nslookup nattech
> Server: 147.83.41.36
> Address: 147.83.41.36#53
>
> Name: nattech.fib.upc.es
> Address: 147.83.148.217

La SSH is mapped at nattech.fib.upc.es port 22000 + XXX

Available ports:

We dispose of the origin ports: 40000 + (XXX*10) up to the port 8080 consecutively
L'script següent es munta en arrencada per donar facilitats. Podeu executar l'script manualment amb
The followig script is mounted when starting to give facilities. The script can be executed manually with

```
/etc/update-motd.d/99-info-nat
```

And this will be shown:

```
----------------------------------------------------------------
La teva adreça IP és: 172.16.4.33
Connecta't per SSH a aquesta màquina des de la UPC, o l'exterior amb VPN:
> ssh alumne@nattech.fib.upc.edu -p 22033
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> El port TCP nattech.fib.upc.edu:40333 va a 172.16.4.33:8083
> El port TCP nattech.fib.upc.edu:40334 va a 172.16.4.33:8084
> El port TCP nattech.fib.upc.edu:40335 va a 172.16.4.33:8085
> El port TCP nattech.fib.upc.edu:40336 va a 172.16.4.33:8086
> El port TCP nattech.fib.upc.edu:40337 va a 172.16.4.33:8087
> El port TCP nattech.fib.upc.edu:40338 va a 172.16.4.33:8088
> El port TCP nattech.fib.upc.edu:40339 va a 172.16.4.33:8089
----------------------------------------------------------------
```

openNebulaEnglish.txt   (14 KB)   Marc Peña, 06/15/2023 04:08 PM
picture919-2.png   (35.5 KB)   Marc Peña, 06/19/2023 05:27 PM
picture919-1.png   (70 KB)   Marc Peña, 06/19/2023 05:27 PM
picture912-1.png   (9.98 KB)   Marc Peña, 06/19/2023 05:27 PM
picture661-3.png   (3.44 KB)   Marc Peña, 06/19/2023 05:27 PM
picture661-2.png   (38 KB)   Marc Peña, 06/19/2023 05:27 PM
picture433-1.png   (23.3 KB)   Marc Peña, 06/19/2023 05:27 PM
picture661-1.png   (45.7 KB)   Marc Peña, 06/19/2023 05:27 PM
picture407-1.png   (12.5 KB)   Marc Peña, 06/19/2023 05:27 PM
picture433-2.png   (24 KB)   Marc Peña, 06/19/2023 05:27 PM
picture58-1.png   (193 KB)   Marc Peña, 06/19/2023 05:27 PM
picture472-1.png   (103 KB)   Marc Peña, 06/19/2023 05:29 PM
picture231-1.png   (179 KB)   Marc Peña, 06/19/2023 05:29 PM
picture660-1.png   (23.4 KB)   Marc Peña, 06/19/2023 05:29 PM
picture129-1.png   (56.6 KB)   Marc Peña, 06/19/2023 05:29 PM
picture338-1.png   (25.8 KB)   Marc Peña, 06/19/2023 05:29 PM
picture338-2.png   (33 KB)   Marc Peña, 06/19/2023 05:29 PM
picture633-1.png   (40.7 KB)   Marc Peña, 06/19/2023 05:29 PM
picture769-1.png   (48.9 KB)   Marc Peña, 06/19/2023 05:29 PM
picture496-1.png   (39.4 KB)   Marc Peña, 06/19/2023 05:29 PM
picture870-2.png   (77.8 KB)   Marc Peña, 06/19/2023 05:29 PM
picture073-1.png   (55.5 KB)   Marc Peña, 06/19/2023 05:31 PM
picture597-1.png   (33.9 KB)   Marc Peña, 06/19/2023 05:31 PM
tempsnip.png   (47.2 KB)   Marc Peña, 06/19/2023 05:31 PM
picture280-1.png   (40.8 KB)   Marc Peña, 06/19/2023 05:32 PM