LAB 3

Resource Virtualization Using Proxmox

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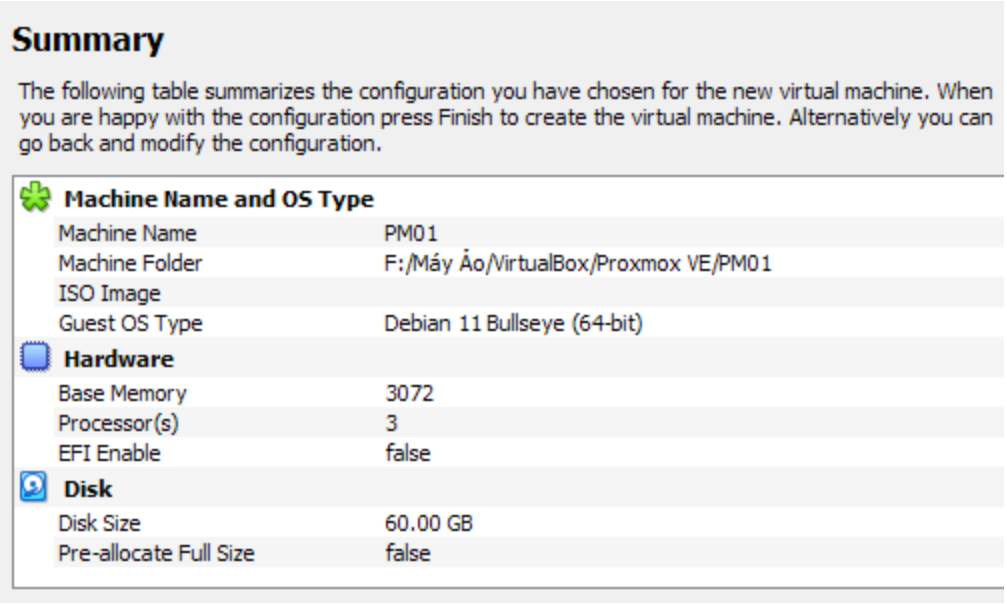
- Note: screenshots need to be clear and good-looking; submissions must be in PDF format.

Proxmox Virtual Environment is a powerful open-source server virtualization platform to manage two virtualization technologies - KVM (Kernel-based Virtual Machine) for virtual machines and LXC for containers - with a single web-based interface. It also integrates out-of-the-box tools for configuring high availability between servers, software-defined storage, networking, and disaster recovery.

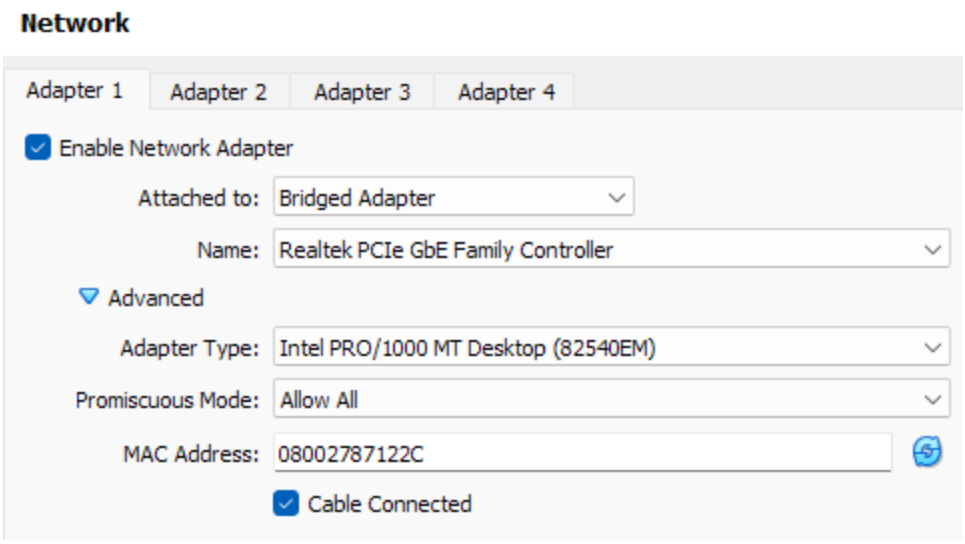
1. Proxmox VE Installation

- Create a virtual machine (acts as a physical server in real life) using VirtualBox (or VMWare).
  - Name: `PM01`; Type: `Linux`; Version: `Debian 11 (64bit)`
  - Memory: `2`G; Processors: `2` CPUs (add more if possible)
  - Hard disk: 50G



Summary of the configuration

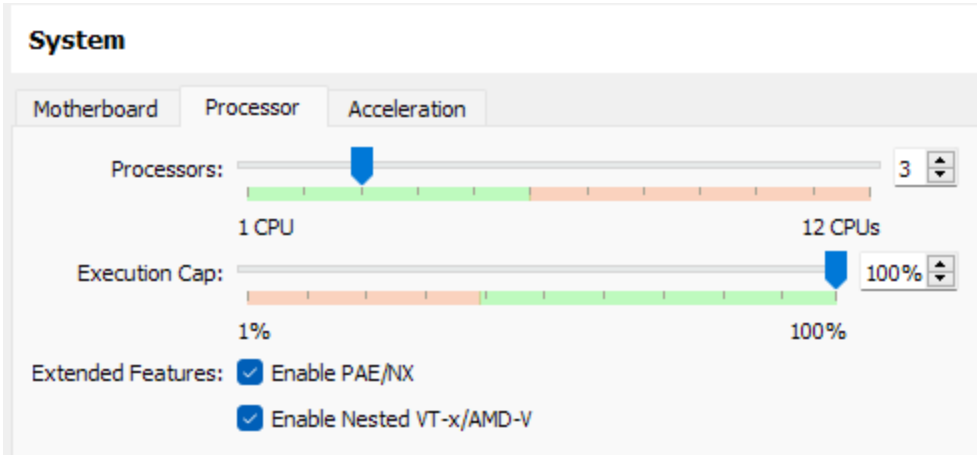
- The network setting of the VM is `bridged mode`; Advanced → Promiscous mod: Allow All



Network setting

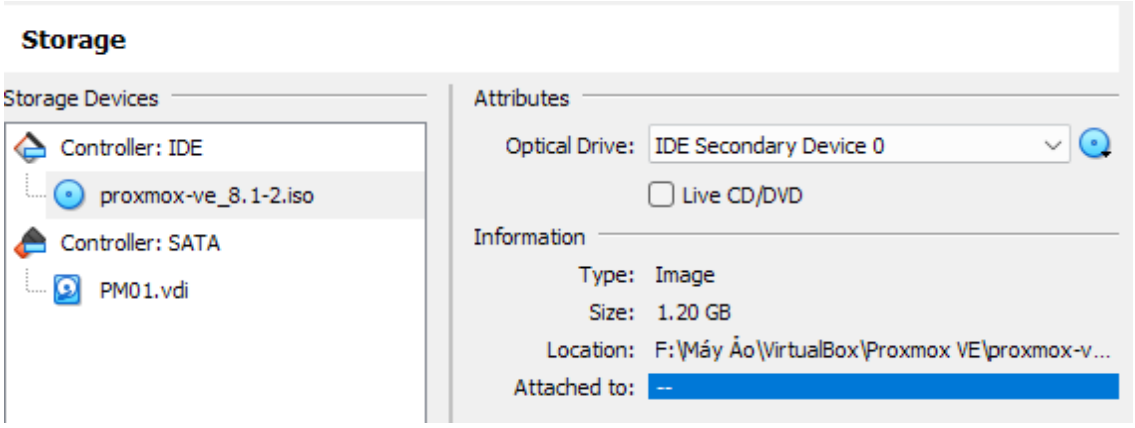
- Enable PAE/NX and Enable Nested VT-x/AMD-v (Setting/System/Processor). If the option is grey out, enter the following command

```
$ VBoxManage modifyvm "vm name" --nested-hw-virt on
```



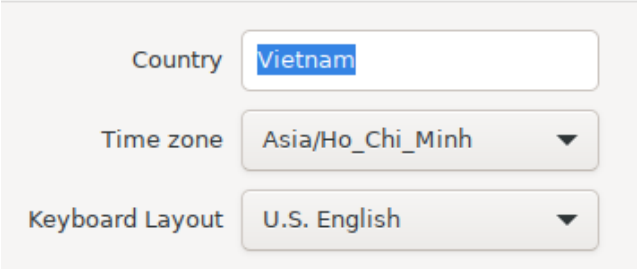
Enable PAE/NX and Enable Nested VT-x/AMD-v

- Download and attach the file Proxmox VE 8.1 ISO Installer to the Optical drive of the VM.

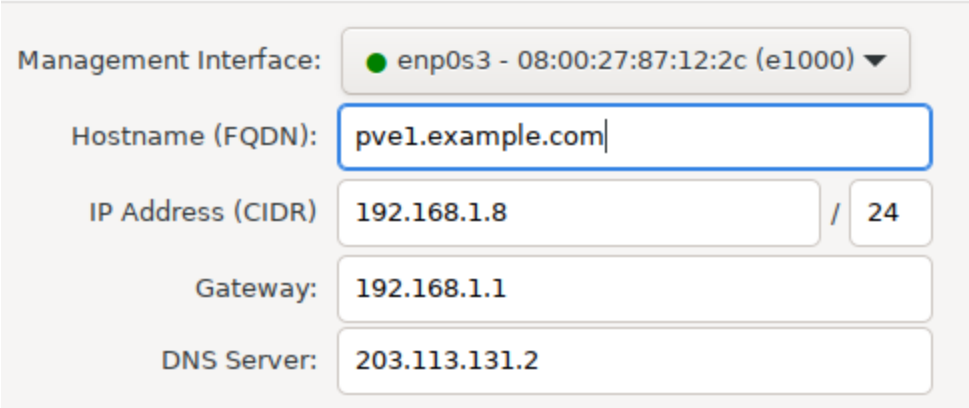


Attach the file Proxmox VE 8.1 ISO Installer

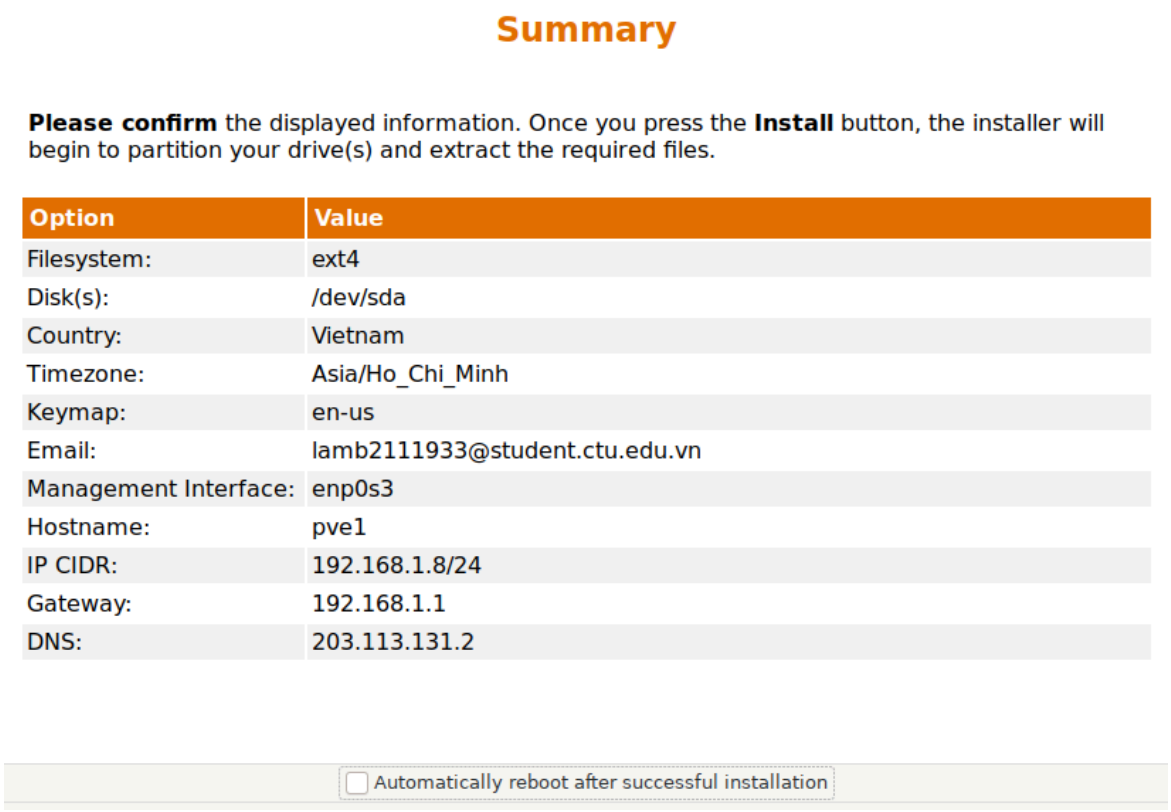
- Start the VM then follow the Promox VE installation procedure.
  - Country: `Vietnam`



  - Hostname (FQDN): `pve1.example.com`

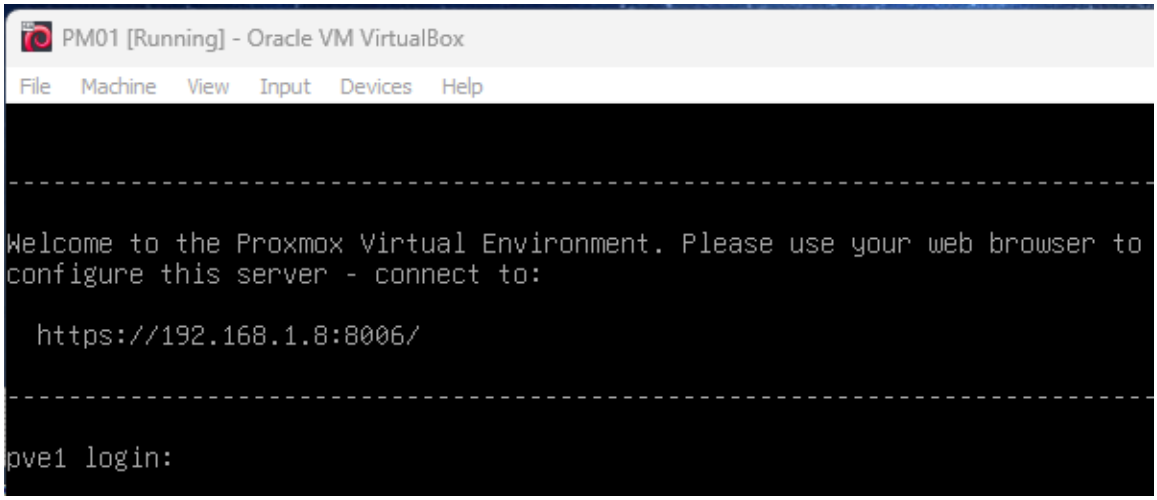


  - Keep other settings as default
  - Uncheck “Automatically reboot after successful installation ”

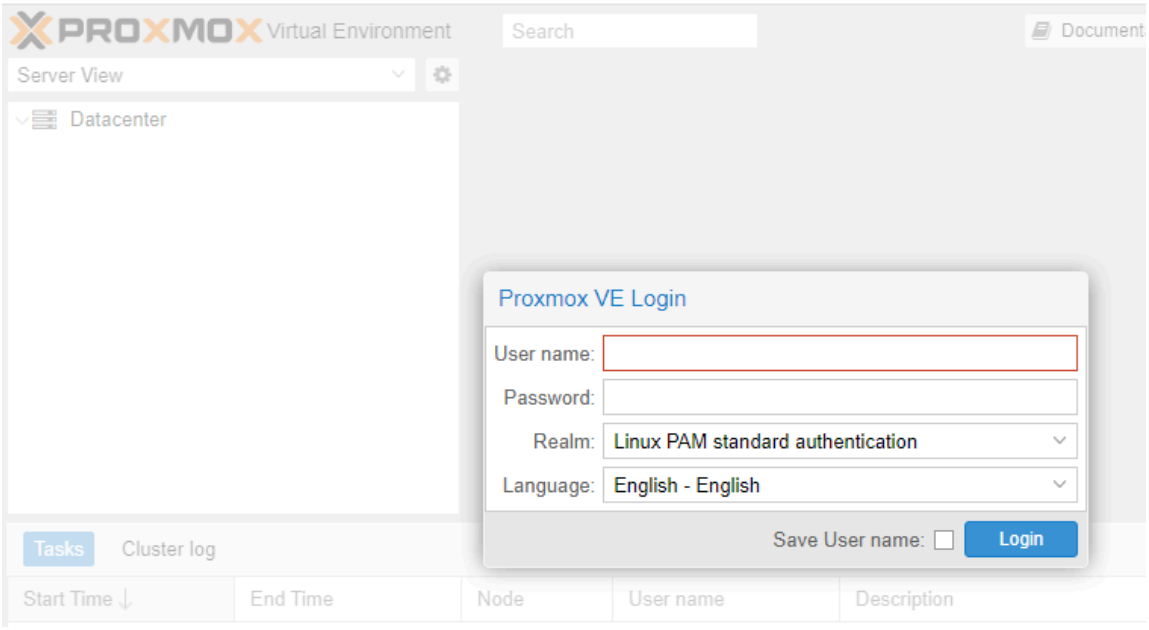


Installation

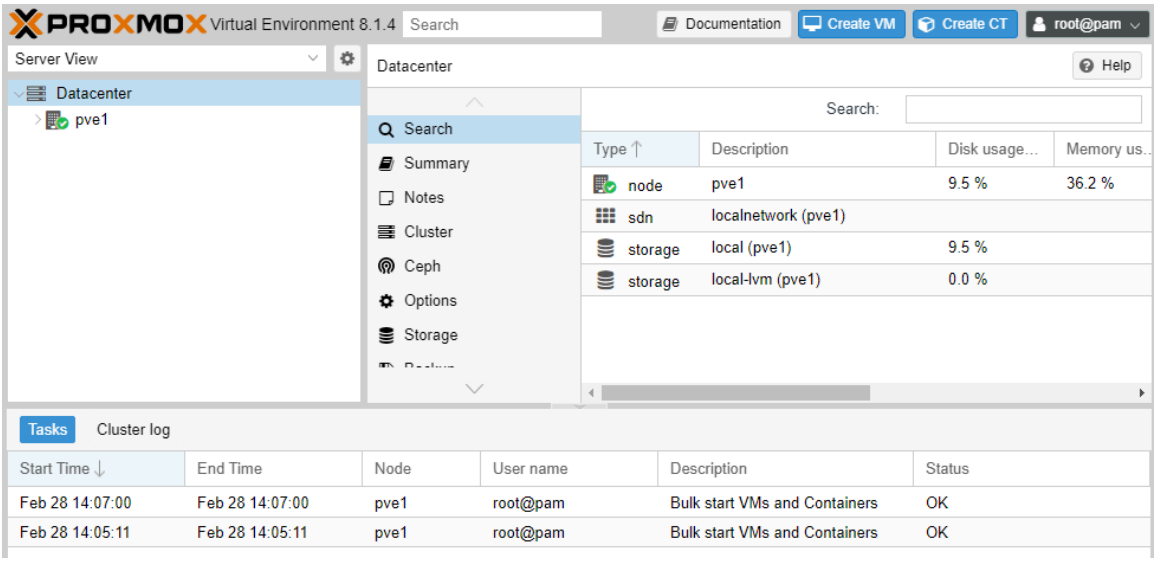
- After finishing the installation procedure, remove Proxmox ISO file from VM storage. Reboot the VM, then access Proxmox VE Web-GUI at https://<IP of PM01>:8006, login to Promox VE using the `root` account.



Reboot the VM



Login



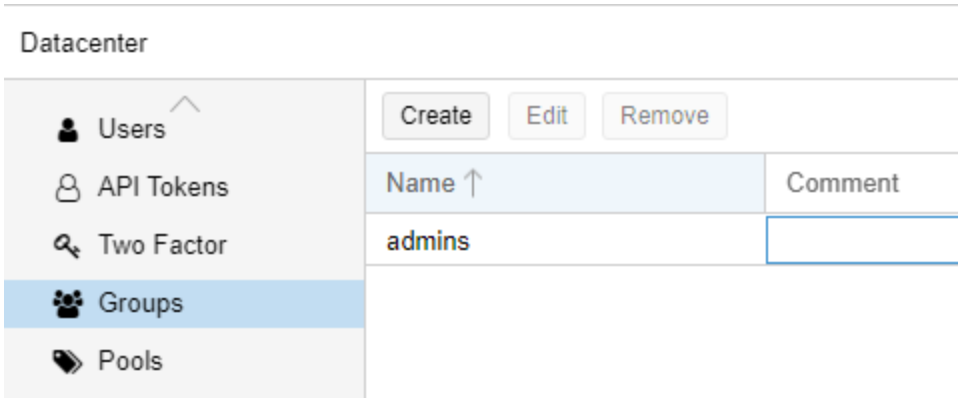
The login page

(Take a screenshot of the login page)

2. User management

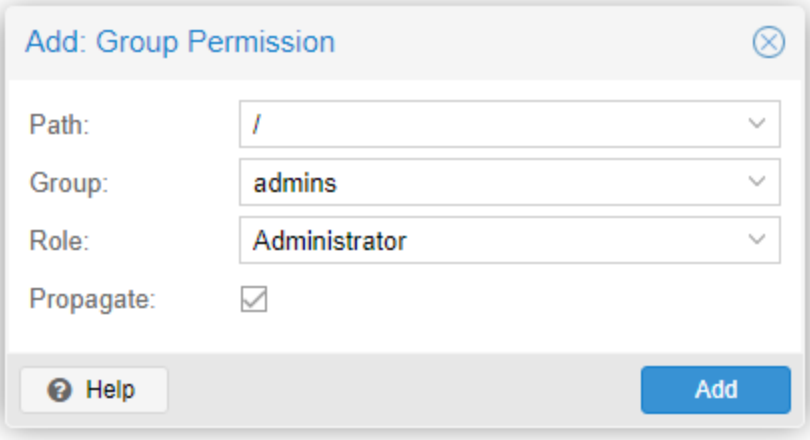
It is possible that an administrator would want to create a group of users with full administrator rights (without using the `root` account).

- Create the *`admins`* group (Datacenter → Groups → Create)



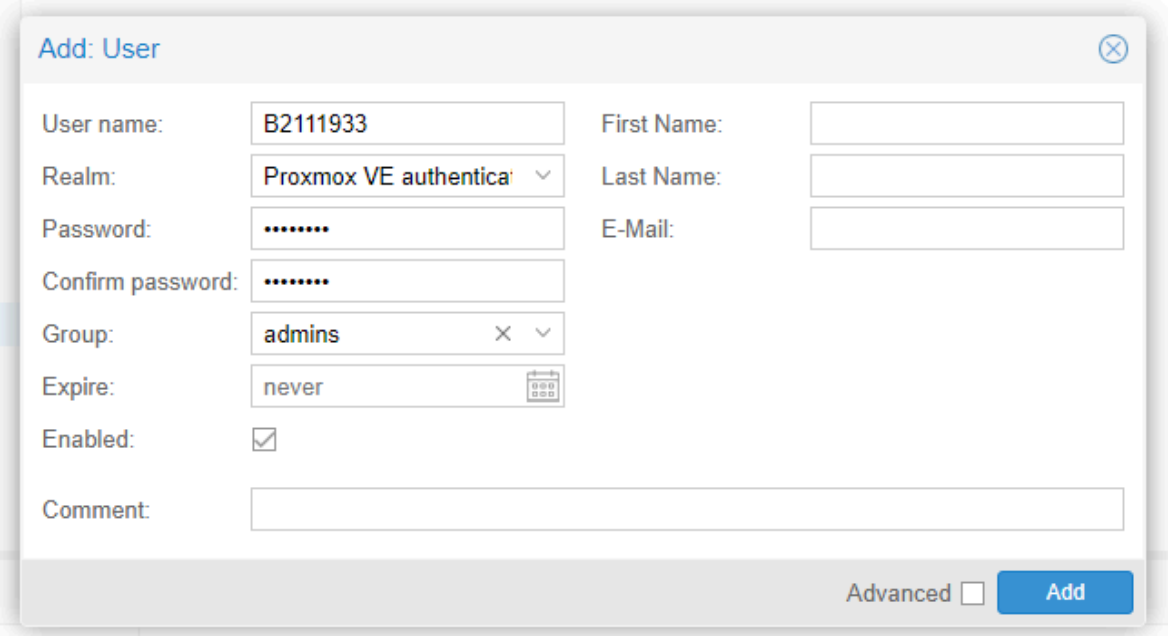
Create the *`admins`* group

- Assign the role *`Administrator`* to the group *`admins`* (Datacenter → permissions → Add → Group Permission)
  - Path: `/`
  - Group: `admins`
  - Role: `Administrator`



Assign the role *`Administrator`* to the group *`admins`*

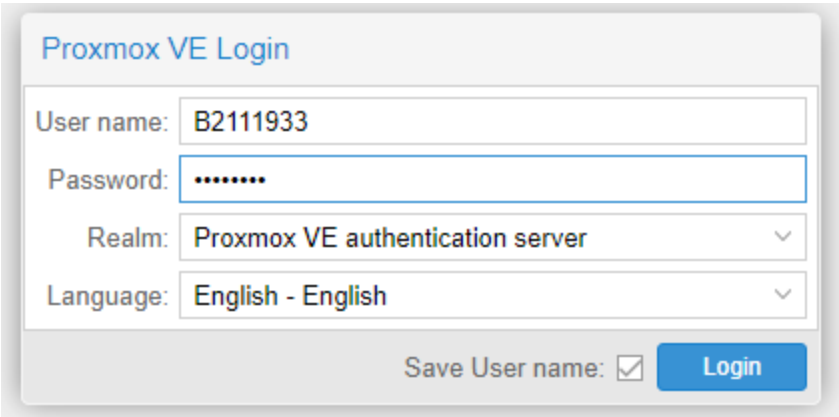
- Create the user `<Your student ID>` (Users → Add)
  - User name: `<Your student ID>`
  - Realm: `Proxmox VE Authentication server`
  - Password: `<Your password>`
  - Group: `admins`



Create the user `B2111933`

(take a screenshot)

- Log out `root` user, then login again to Promox VE using the user `<Your student ID>`
  - Realm: `Proxmox VE Authentication server`



Login to `B211933`

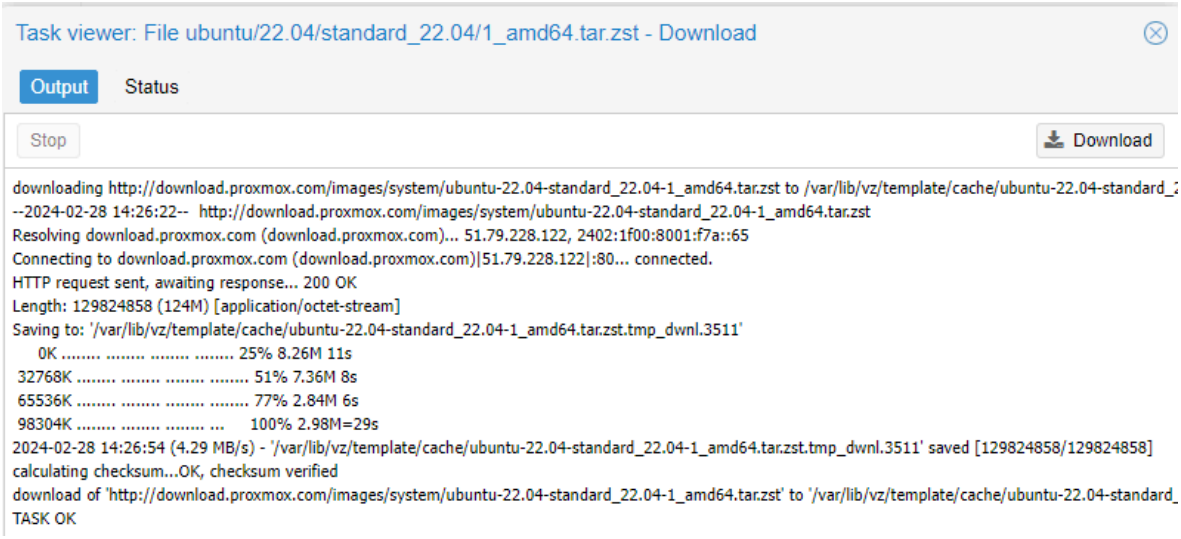
The result

(take a screenshot)

3. Creating a container

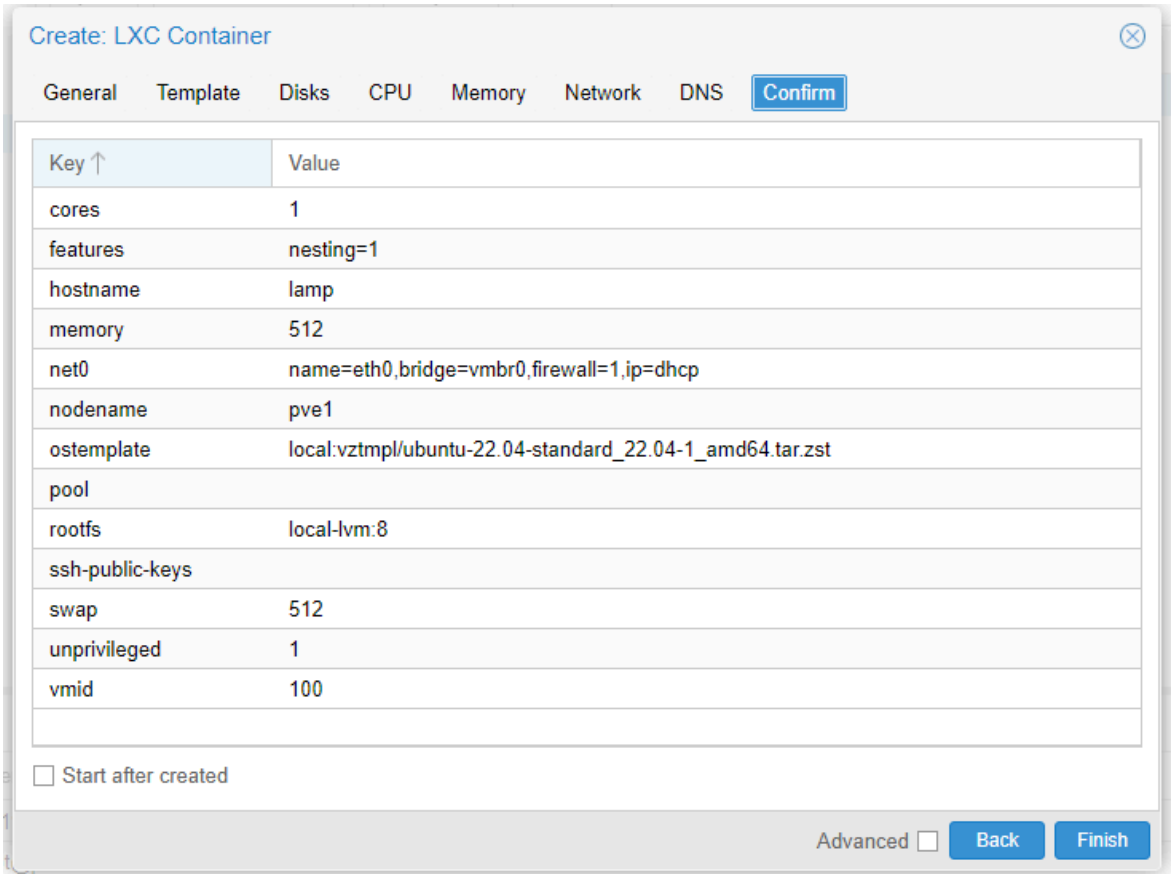
- Download the `Ubuntu 22.04 standard` container template (local (pve1) → CT Template → Templates)

lxc	devuan-4.0-standard	4.0	Devuan 4.0 (standard)
lxc	ubuntu-22.04-standard	22.04-1	Ubuntu 22.04 Jammy (standard)
lxc	ubuntu-20.04-standard	20.04-1	Ubuntu Focal (standard)



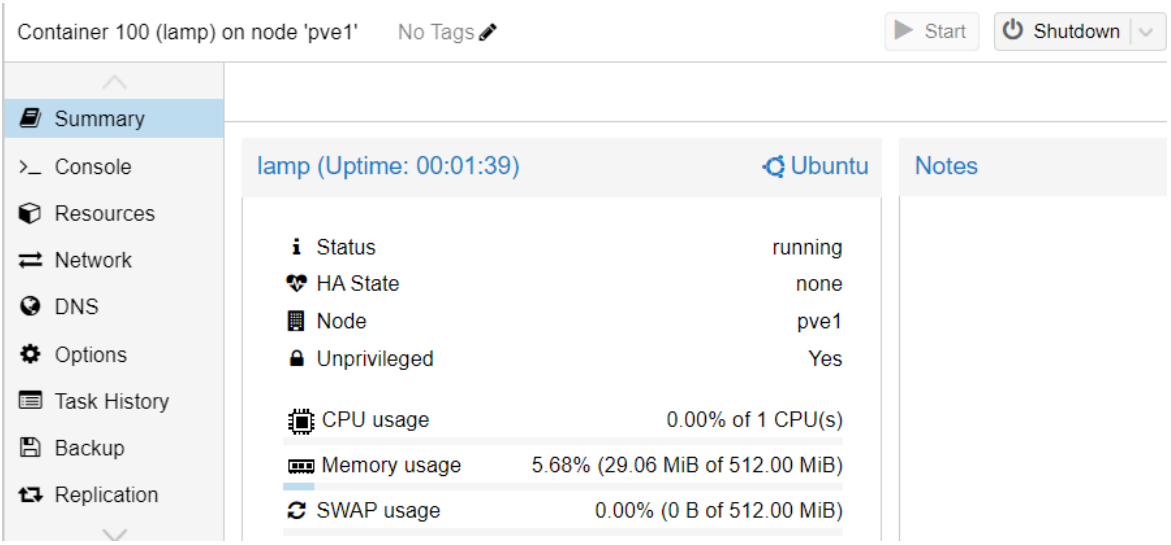
Download the following container template

- After finishing the template downloading, create a LXC Container with the following information:
  - Hostname: `lamp`
  - Password: `<Your password>`
  - Template: `Ubuntu 22.04`
  - Disk size: `8G`
  - Network, IPv4: `DHCP; (Static` if there are no DHCPs server in your network)
  - Keep other settings as default

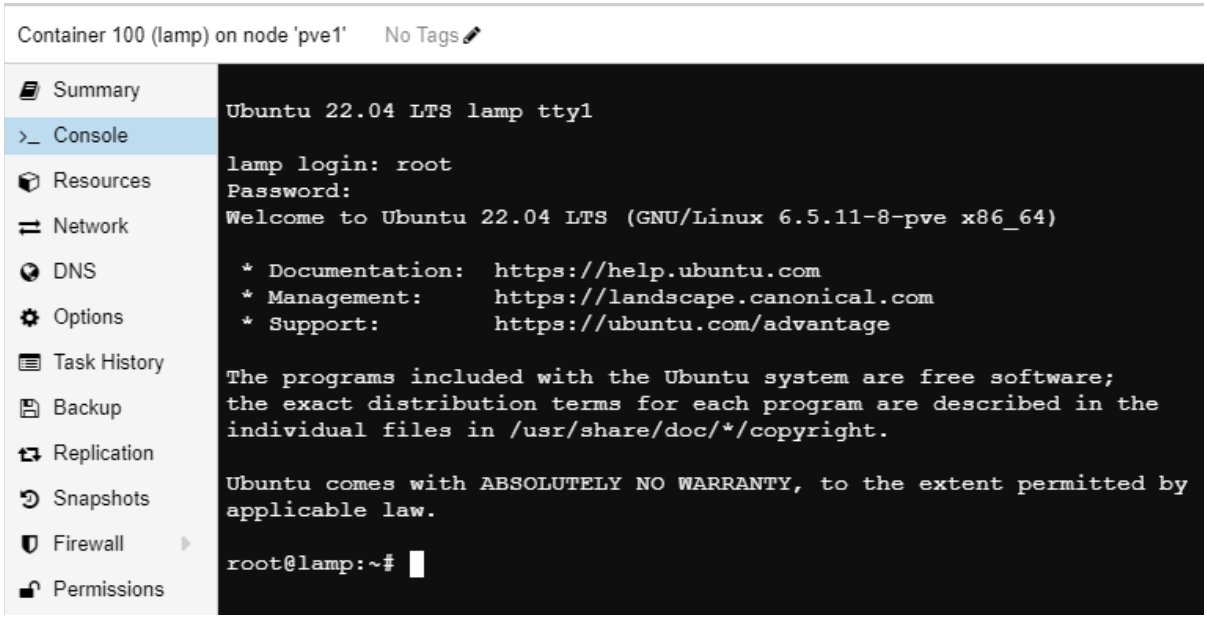


Create a LXC Container

- Start the container, then login to the container console using the user/password `root/<Your password>`



Start the container

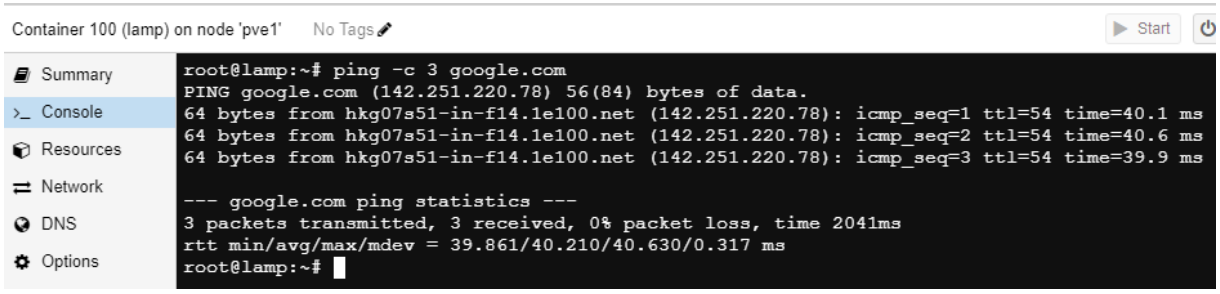


Login to the container

(take a screenshot)

- Testing the network connections

```
#ping google.com
```

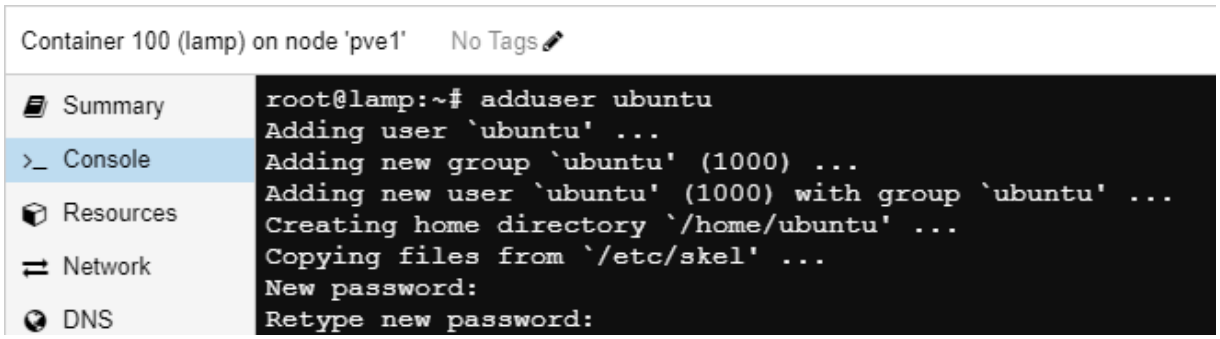


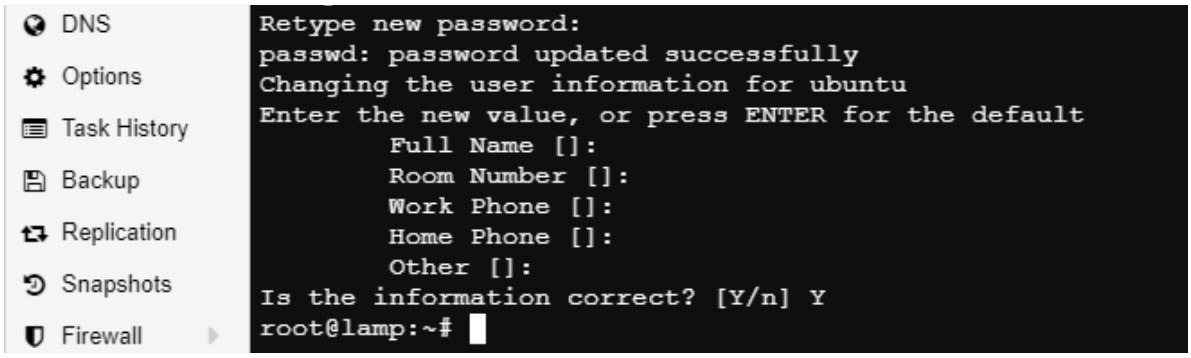
Testing the network connections

(take a screenshot)

- Create the user/password `ubuntu/ubuntu` and assign `sudo` privilege to it

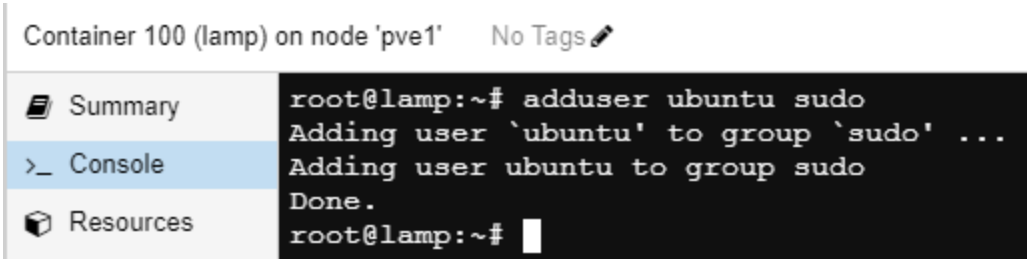
```
#adduser ubuntu
```





Create the user `ubuntu`

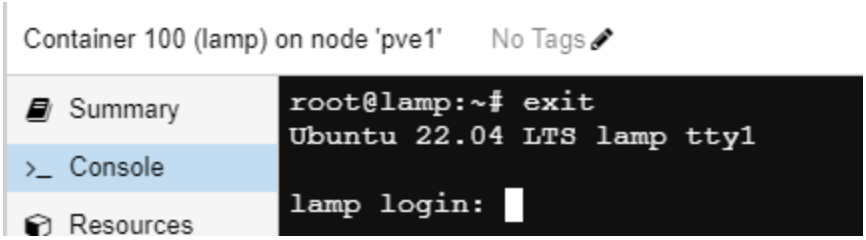
```
#adduser ubuntu sudo
```



Assign `sudo` privilege to `ubuntu`

- Log out from the container

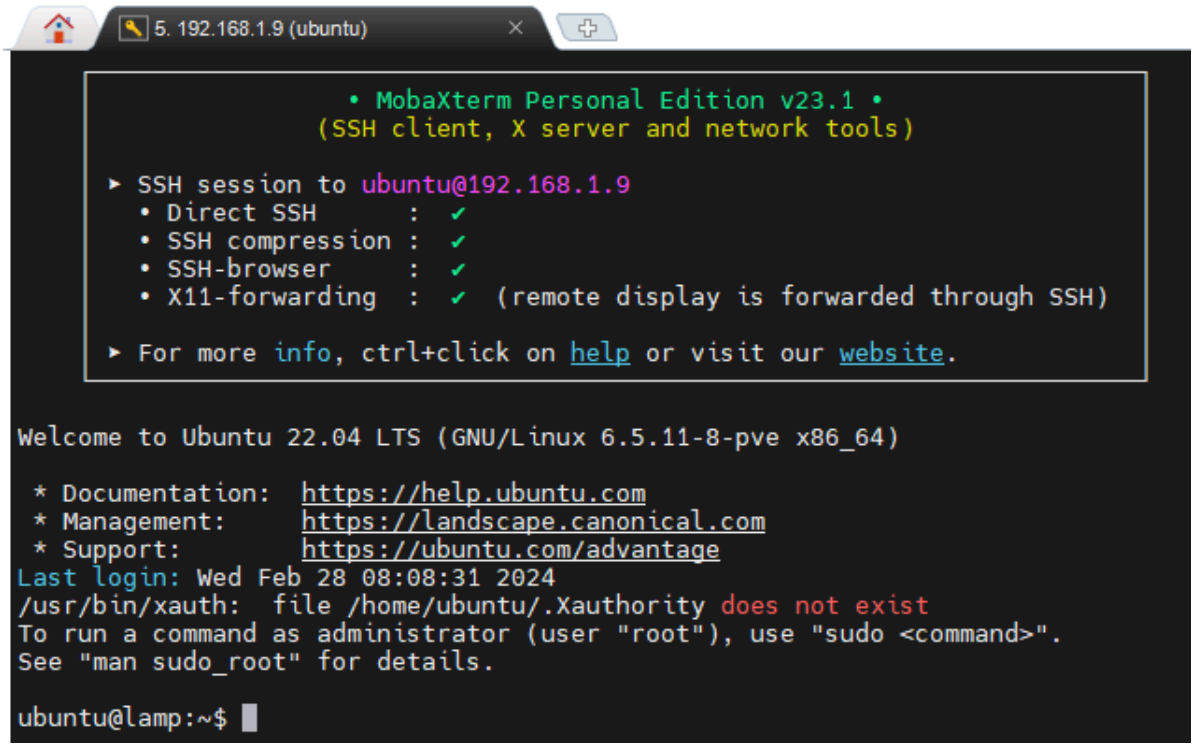
```
#exit
```



Log out from the container

- Close web-based console

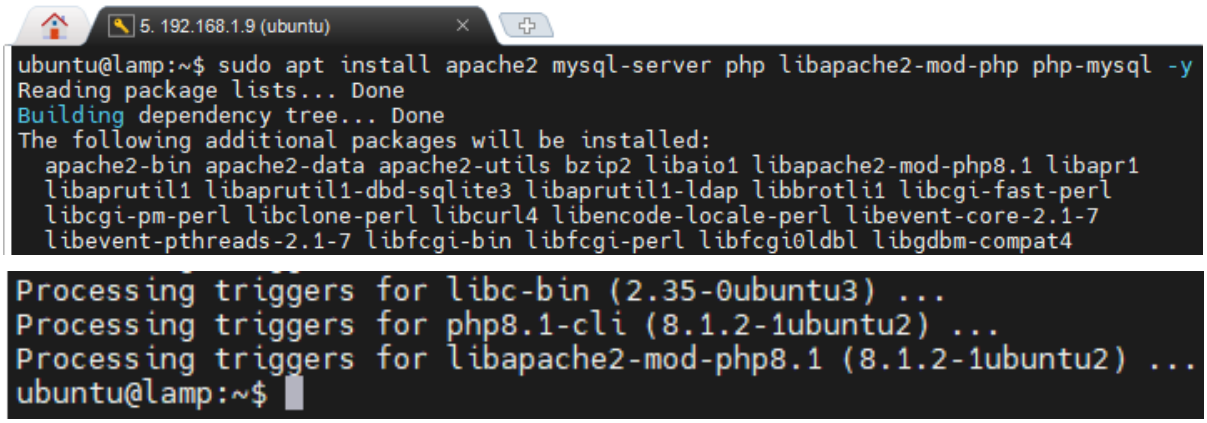
- From the physical machine, download and install Mobaxterm. From Mobaxterm to SSH to the container using user/password `ubuntu/ubuntu`



From the physical machine SSH to the container with user `ubuntu`

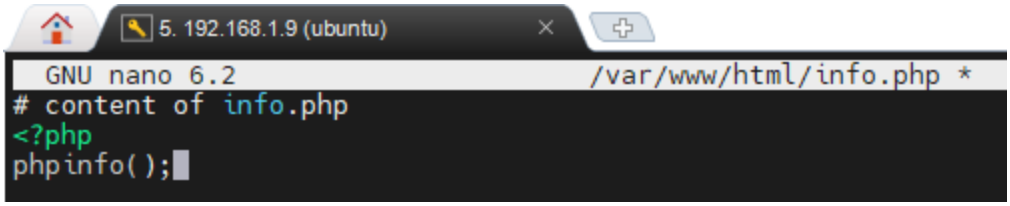
- Install LAMP stack

```
$ sudo apt update -y && sudo apt install apache2 mysql-server php libapache2-mod-php php-mysql -y
```



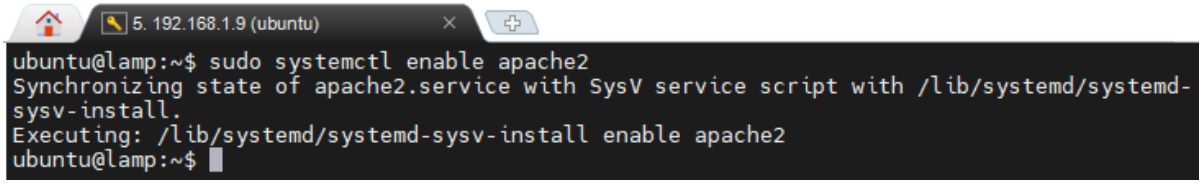
Install packages

```
$ sudo nano /var/www/html/info.php
    # content of info.php
        <?php
        phpinfo();
```



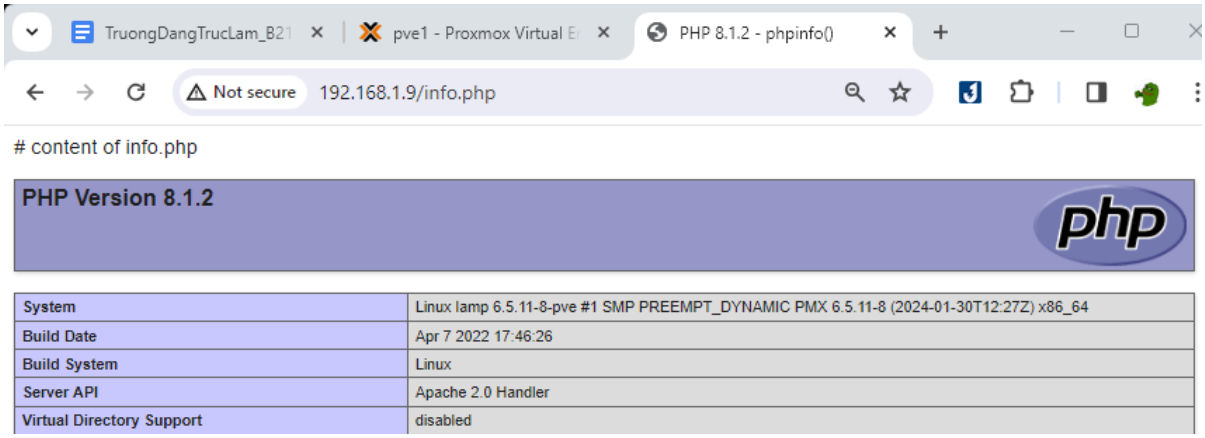
Modify the content of `info.php`

```
$ sudo systemctl enable apache2
```



Enable service `apache2`

- From a web browser, access http://<Container_IP>/info.php.

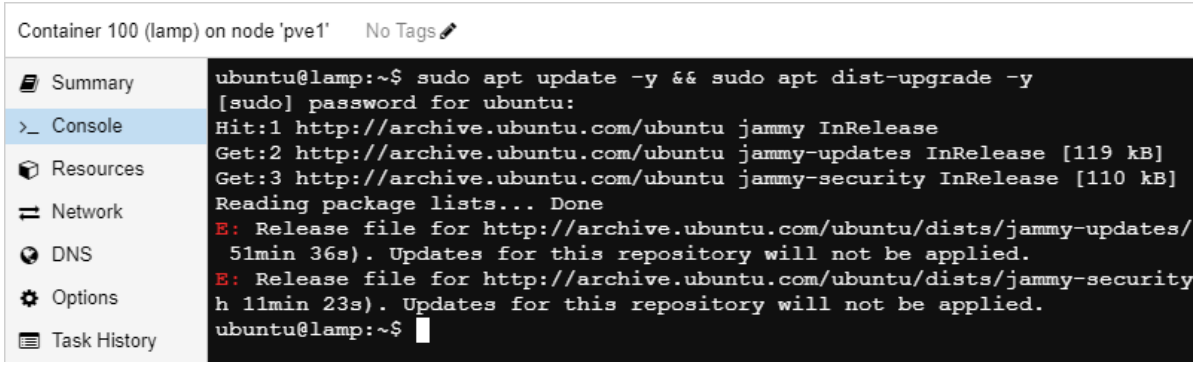


Access to `192.168.1.9/info.php` from a web browser (take a screenshot)

4. Creating a container template

- On the container, upgrade its OS

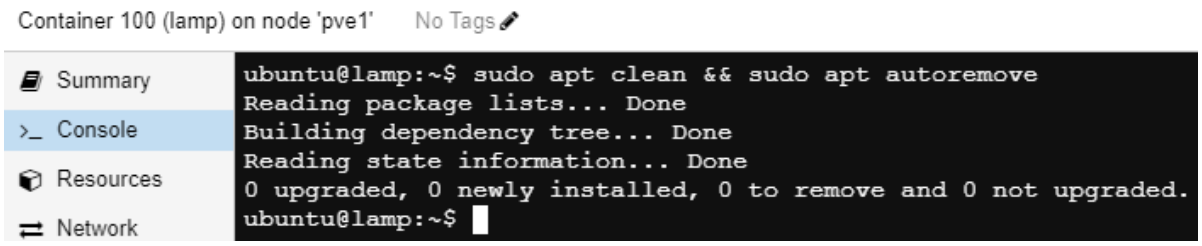
```
$ sudo apt update -y && sudo apt dist-upgrade -y
(can skip this step to save time)
```



Upgrade the container

- Clean the `apt` tool

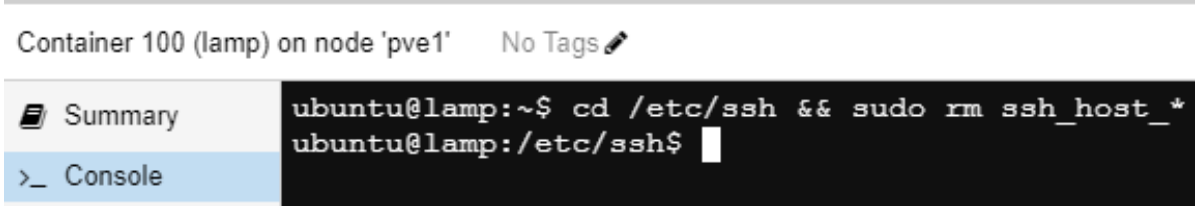
```
$ sudo apt clean && sudo apt autoremove
```



Clean the `apt` tool

- Remove ssh keys

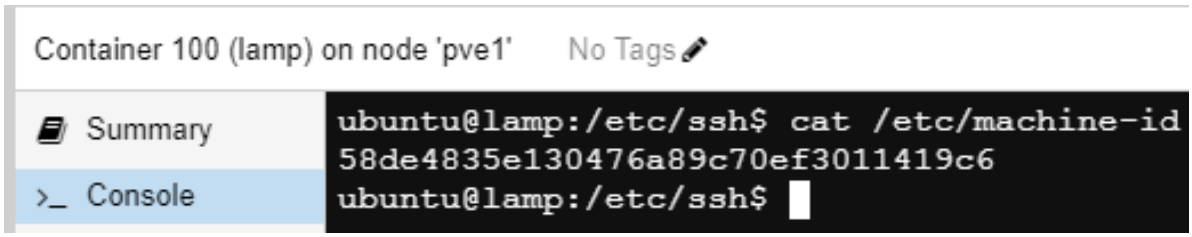
```
$ cd /etc/ssh && sudo rm ssh_host_*
```



Remove ssh keys

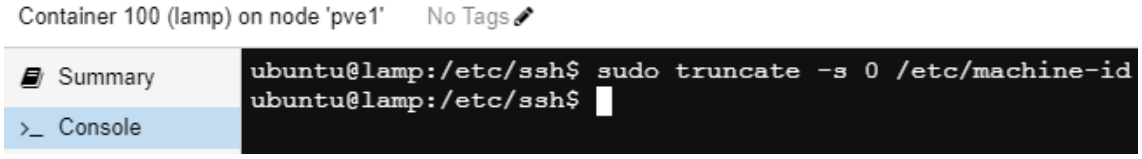
- Remove machine ID

```
$ cat /etc/machine-id
```



Show the machine ID

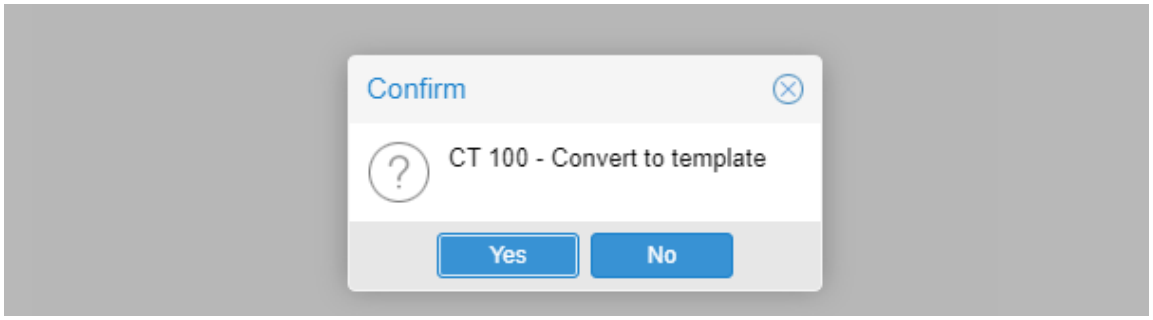
```
$ sudo truncate -s 0 /etc/machine-id
```



Remove the machine ID

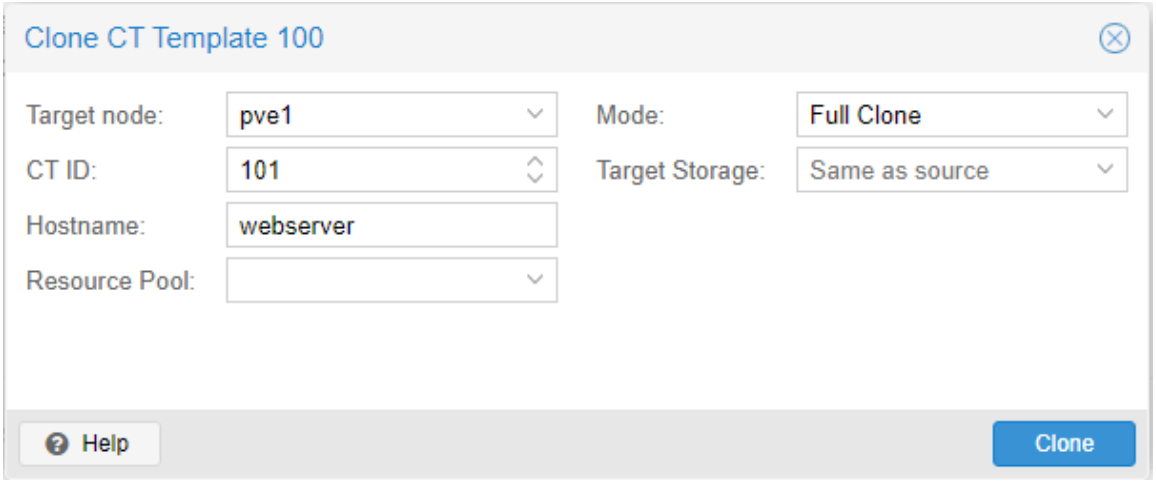
- Shutdown the container, then create a CT template (More → Convert to template).

Shutdown the container



Create a CT template

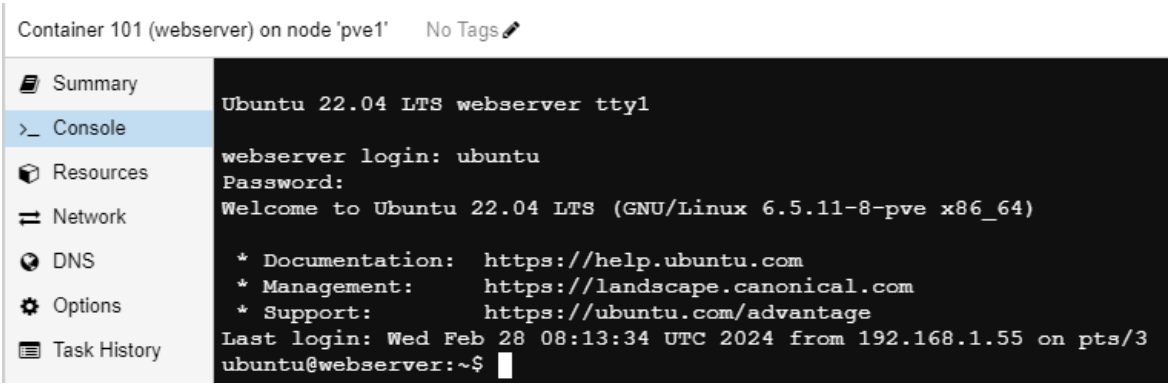
- Create (Clone) a new container using the template
    - Hostname: `webserver`
    - Mode: `Full Clone`



Clone a new container using the template

(take a screenshot)

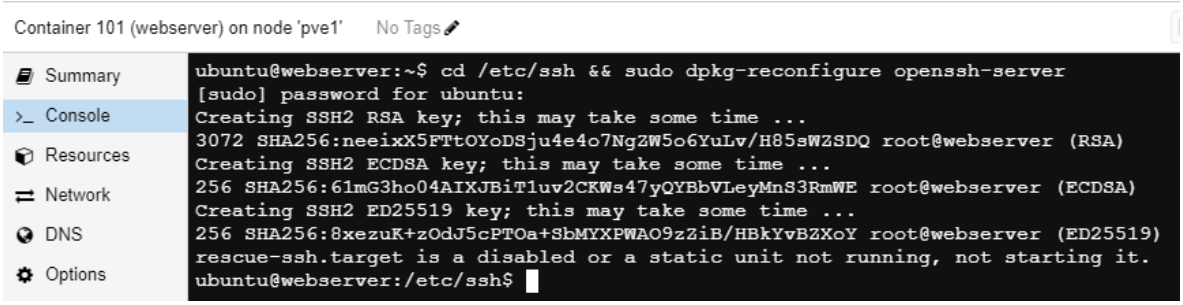
- Start the container, then log on to the container using the user/password `ubuntu/ubuntu`



Start the container and login

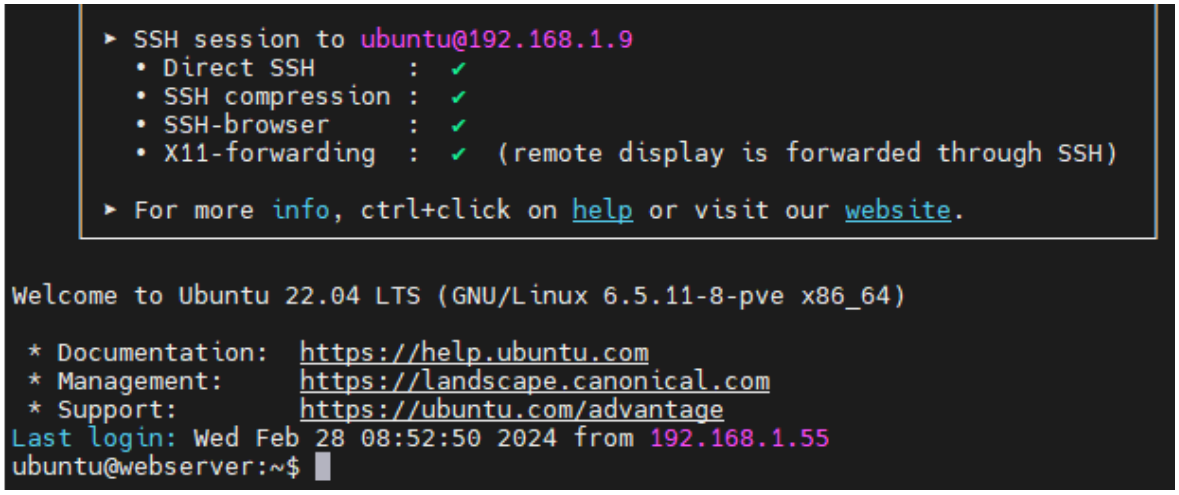
- Create new SSH keys

```
$ cd /etc/ssh && sudo dpkg-reconfigure openssh-server
```



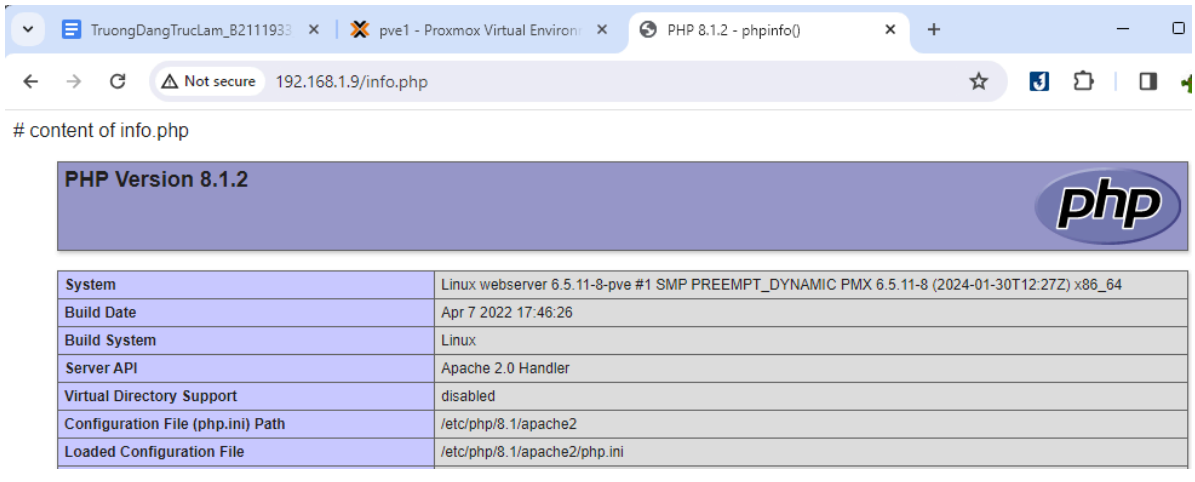
Create new SSH keys

- From Mobaxterm to SSH to the container using user/password `ubuntu/ubuntu`



SSH to the container

- From a web browser, access http://<Container_IP>/info.php

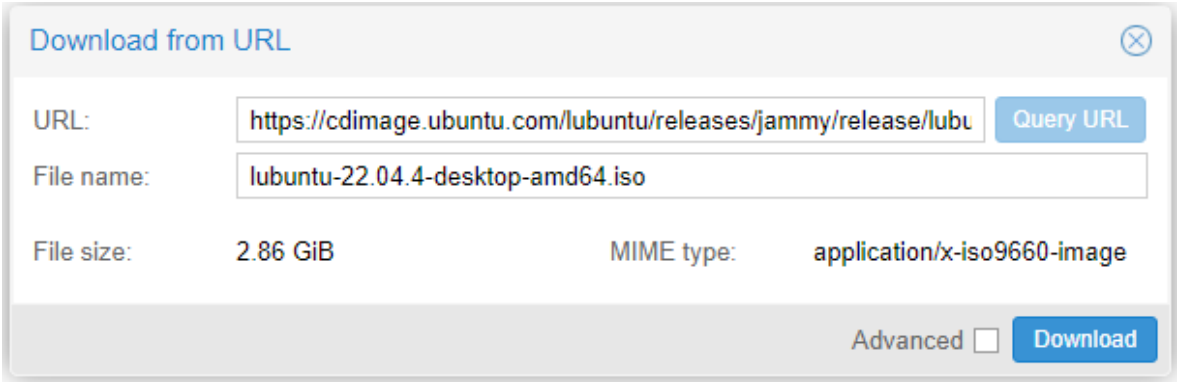


Access `http://192.168.1.9/info.php`

(take a screenshot)

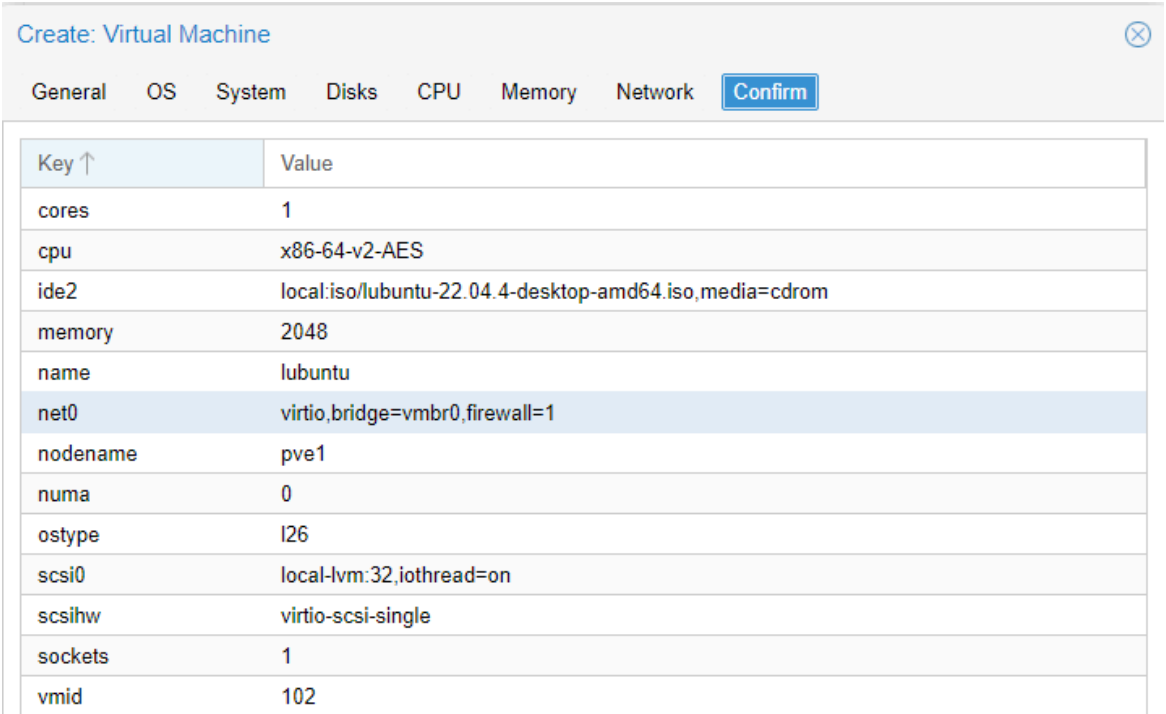
5. Creating a Virtual Machine

- Download the `Lubuntu 22.04` ISO file (local (pm1) → ISO Images → Download from URL)
- URL:https://cdimage.ubuntu.com/lubuntu/releases/jammy/release/lubuntu-22.04.4-desktop-amd64.iso



Download the `Lubuntu 22.04` ISO file

- Create a Virtual Machine with the following information:
  - Hostname: `lubuntu`
  - ISO Image: `Lubuntu 22.04`
  - Keep other settings as default

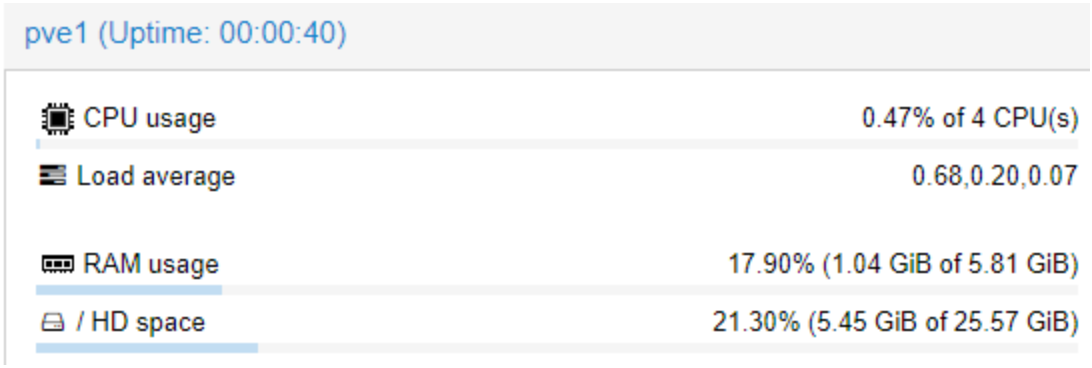


Key	Value
cores	1
cpu	x86-64-v2-AES
ide2	local:iso/lubuntu-22.04.4-desktop-amd64.iso,media=cdrom
memory	2048
name	lubuntu
net0	virtio,bridge=vmbr0,firewall=1
nodename	pve1
numa	0
ostype	l26
scsi0	local-lvm:32,iothread=on
scsihw	virtio-scsi-single
sockets	1
vmid	102

Create a Lubuntu VM

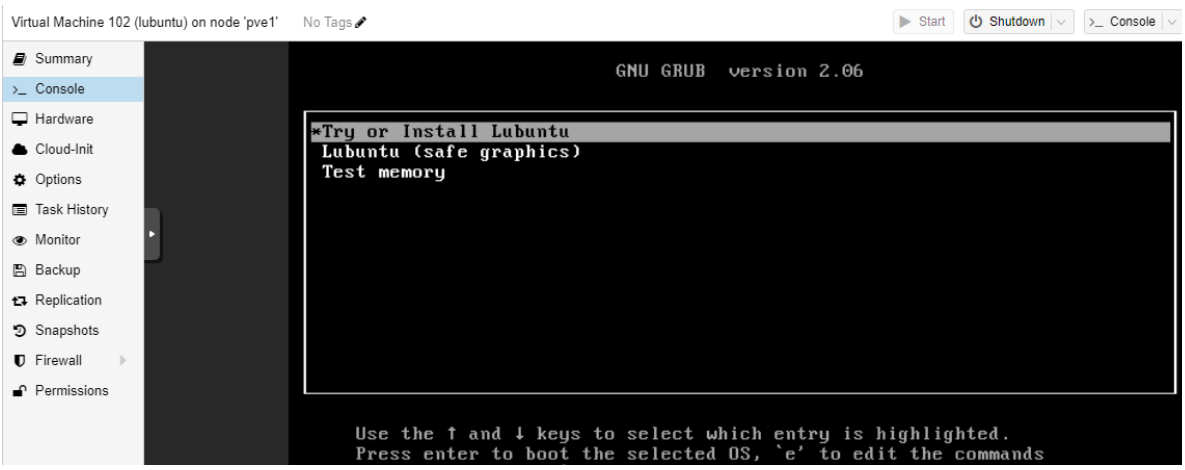
(take a screenshot)

- Upgrade server system to: Ram: 6gb / CPU: 4

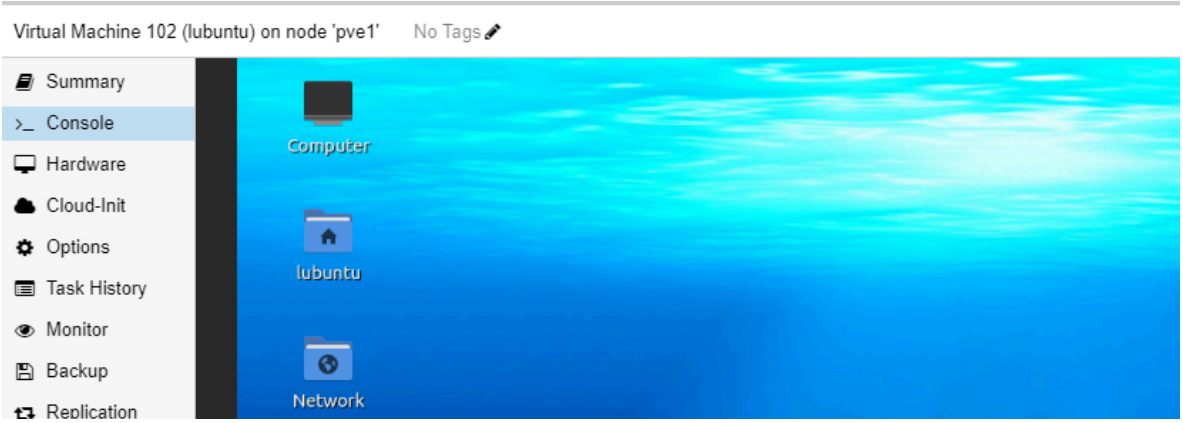


Upgrade server system

- Start the VM, then install the Lubuntu OS to the VM.



Start the VM

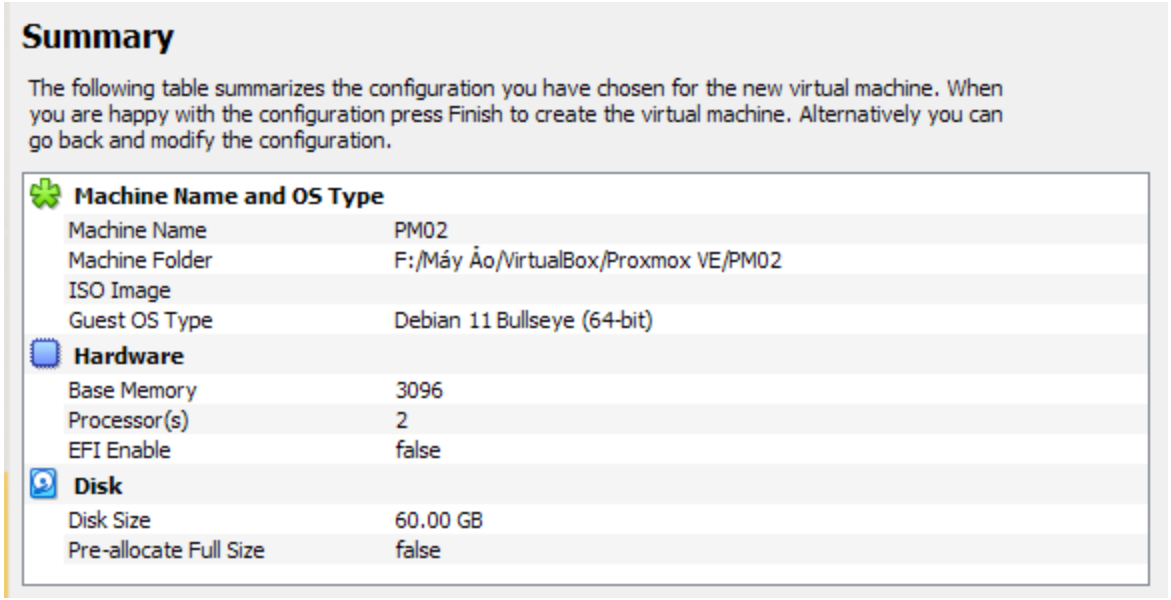


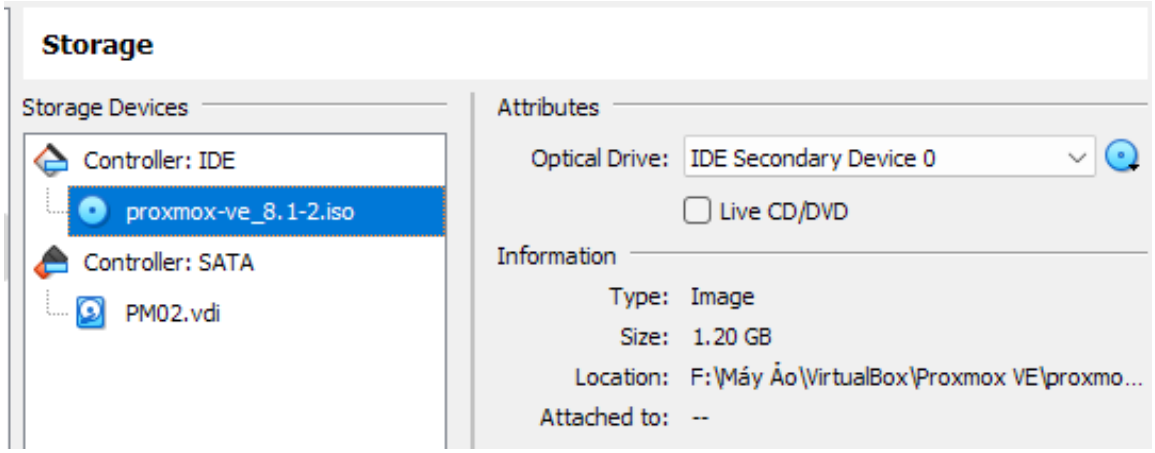
Install the Lubuntu OS

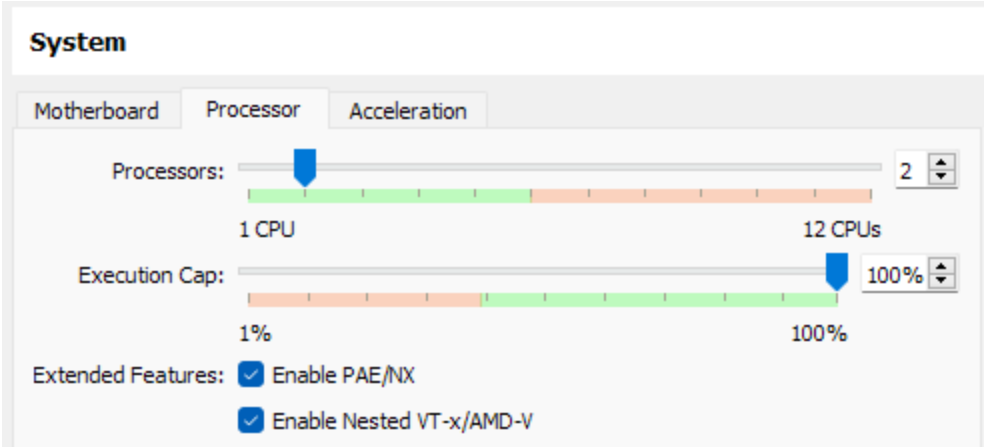
(take a screenshot of the log on screen after finishing the installation)
(students can skip step if there a lack of resources)

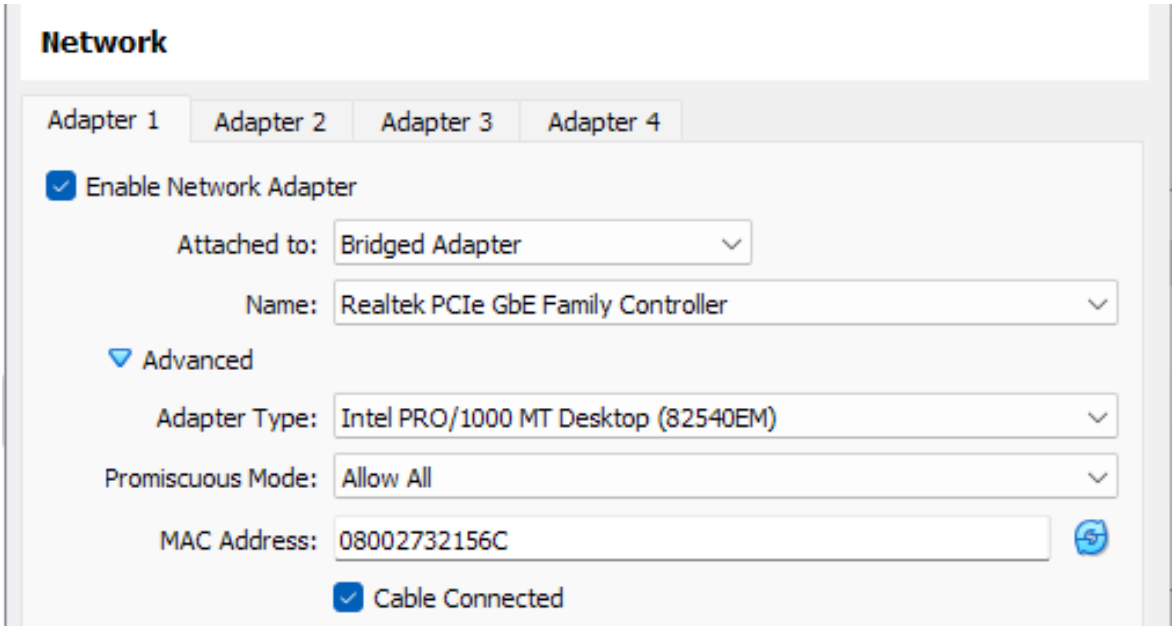
6. Creating a cluster

- Create a second virtual machine using VirtualBox (hoặc VMWare).
  - Name: `PM02`;
  - Other information is the same as the first one (PM01)





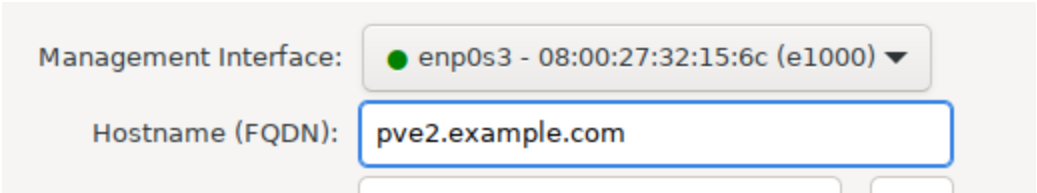




Create a second virtual machine named `PM02`

- Installing Proxmox VE to `PM02`.

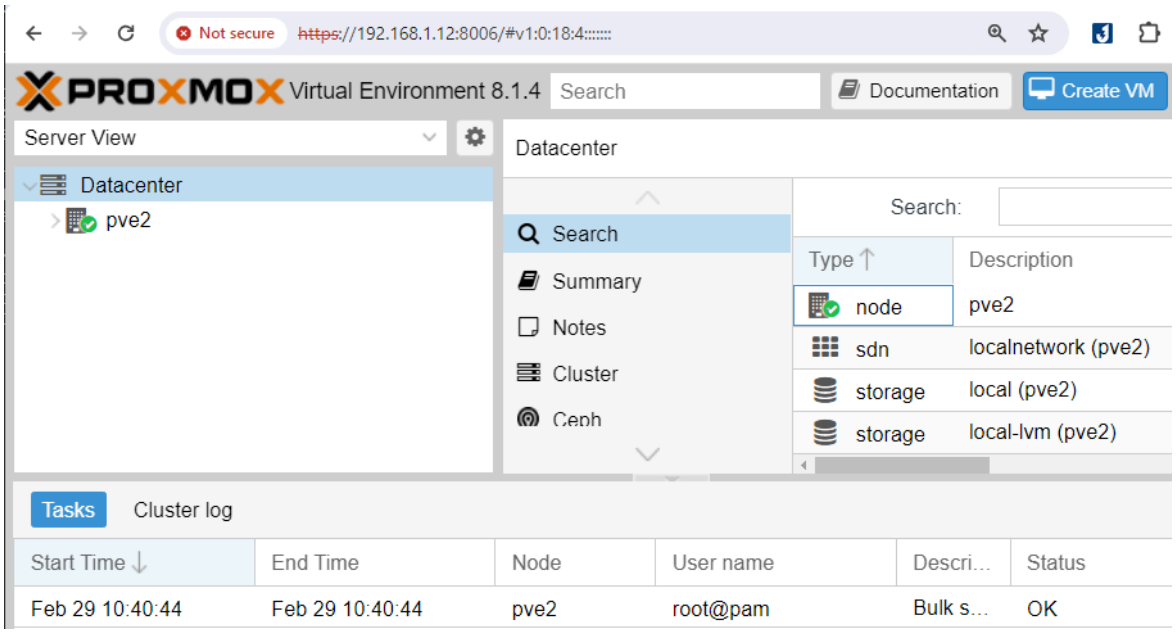
- Start the VM then follow the Promox VE installation procedure.
  - Country: `Vietnam`
  - Hostname (FQDN): `pve2.example.com`



Configuration

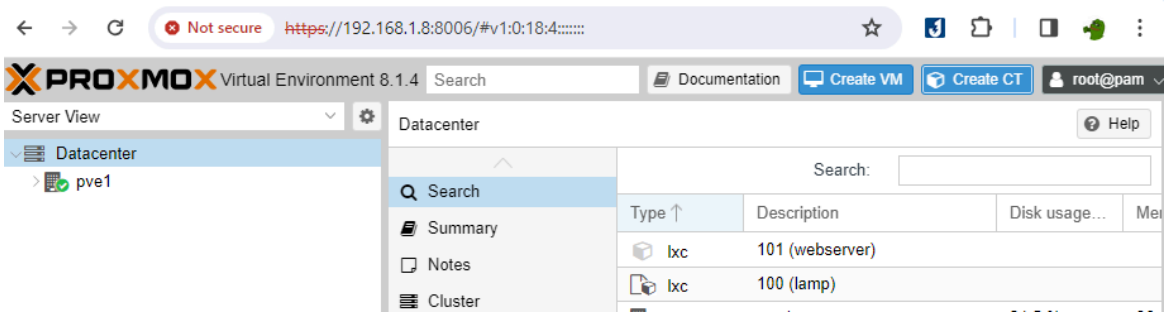
Install complete

- After finishing the installation procedure, access Proxmox VE GUI at https://<IP of PM02>:8006, then log in to Promox VE using the root account.



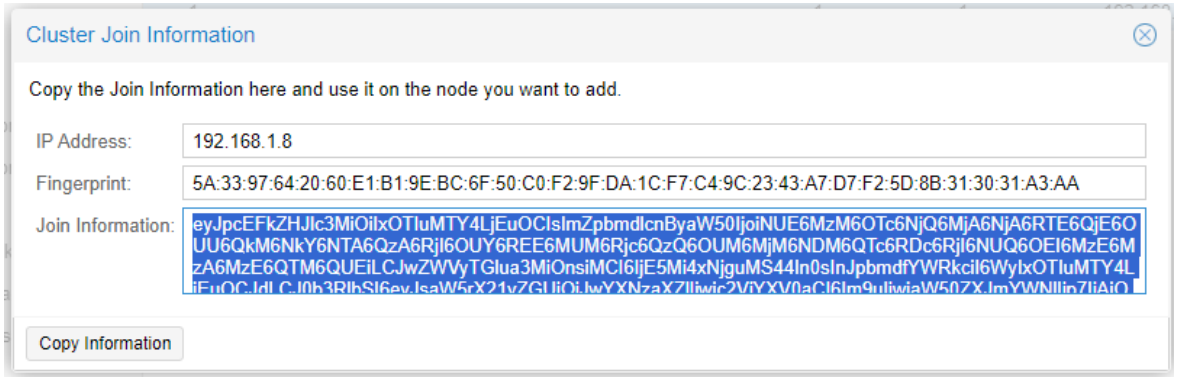
Access Proxmox VE GUI of PM02

- On the Proxmox web interface of PM01:
  - Login using `root` user



Login using `root` user

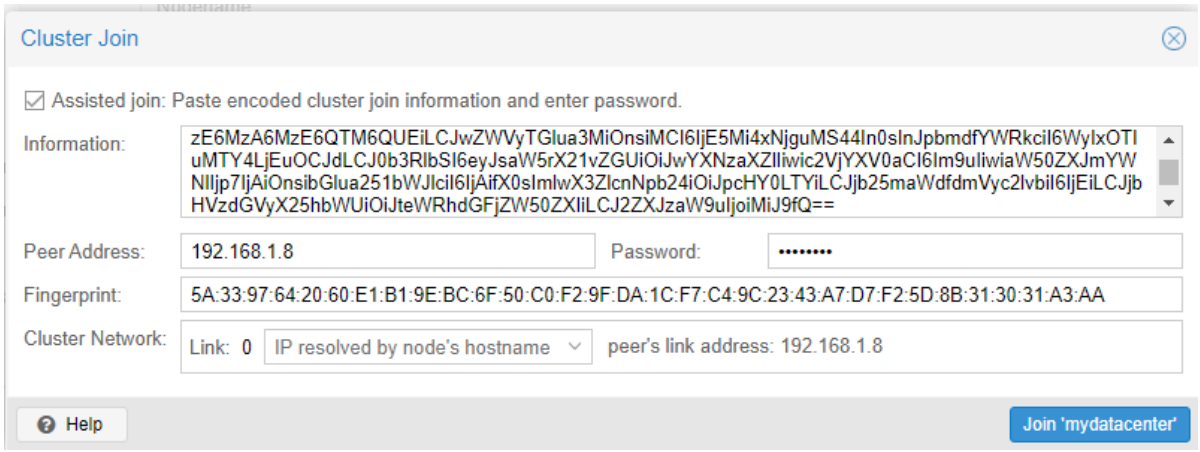
  - Create a cluster (Data center → Cluster → Create Cluster)
    - Name: `mydatacenter`
    - Copy the join information



Create a cluster and copy the join information

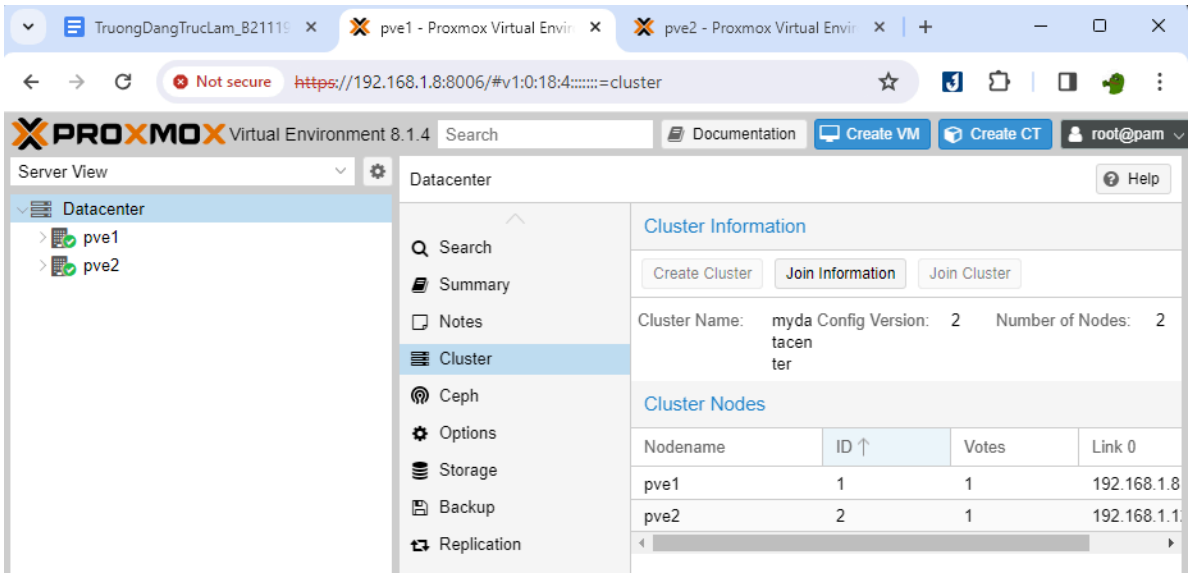
(take a screenshot)

- On the Proxmox web interface of PM02:
  - Log on using `root` user
  - Join to a cluster (Data center → Cluster → Join Cluster)
    - Paste the join information



Join to a cluster with `PM01`

- Then waiting the join process to finish

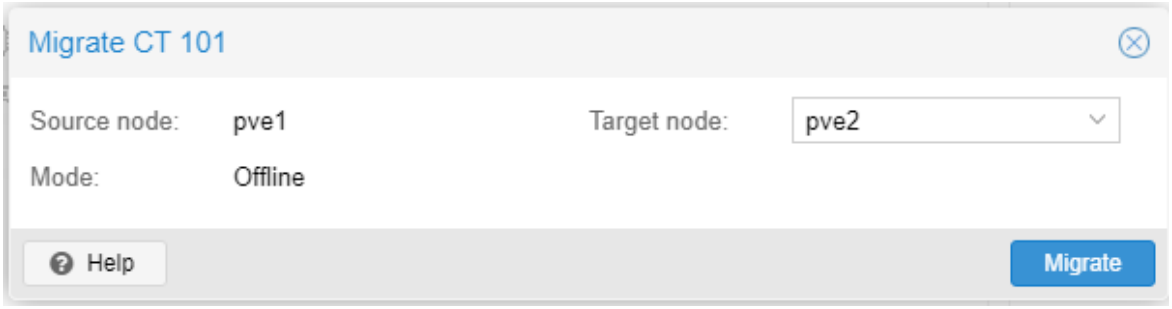


The result

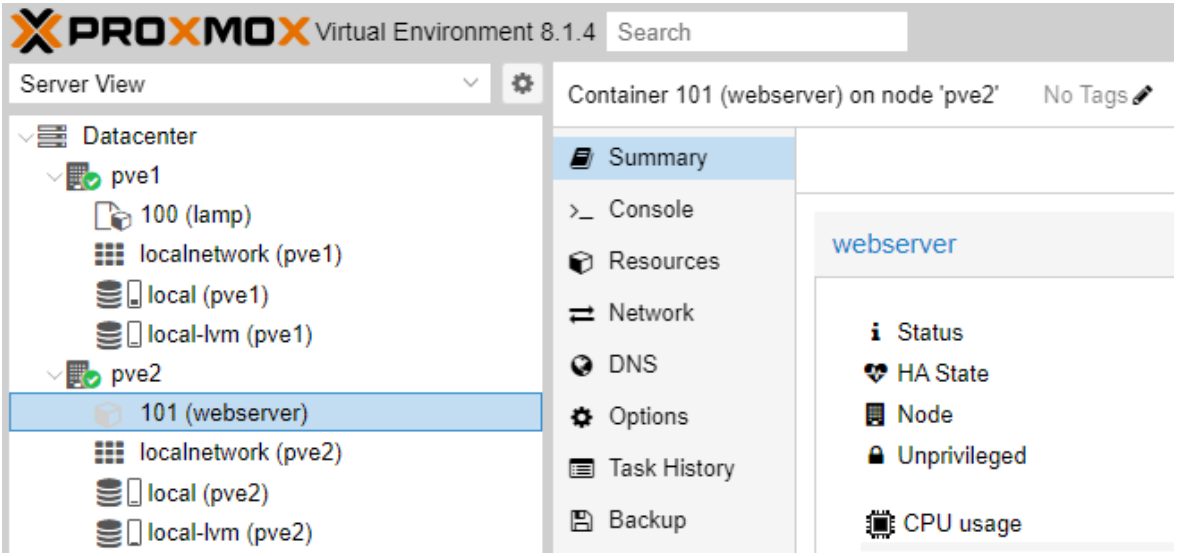
(take a screenshot)

7. Migrate a Container/Virtual Machine

- On the Proxmox web interface of PM01, migrating the container `webserver` from PM01 to PM02.



Migrate the container `webserver` from PM01 to PM02



The result

(take a screenshot)

Note: We can also manage Proxmox using CLIs

---END---