LAB 3

Resource Virtualization Using Proxmox

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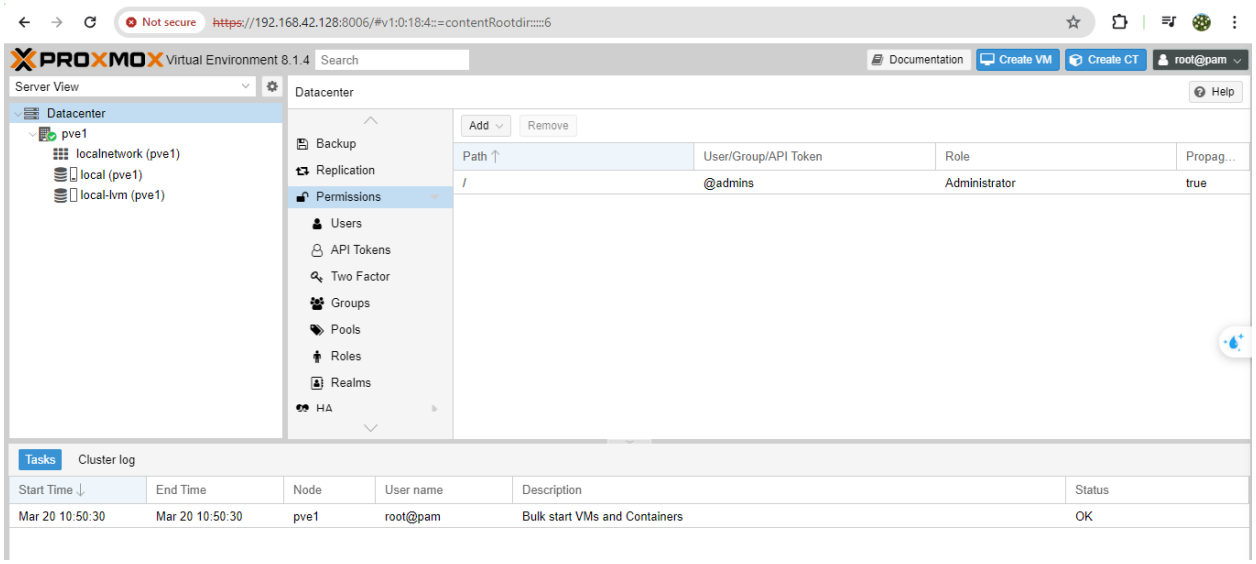
- Note: screenshots need to be clear and good-looking; submissions must be in PDF format.

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
  - The network setting of the VM is `bridged mode`; Advanced → Promiscous mod: Allow All
  - 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
    ```
- Download and attach the file Proxmox VE 8.1 ISO Installer to the Optical drive of the VM.
- Start the VM then follow the Promox VE installation procedure.
  - Country: `Vietnam`
  - Hosname (FQDN): `pve1.example.com`
  - Keep other settings as default
- 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, log on to Promox VE using the `root` account.

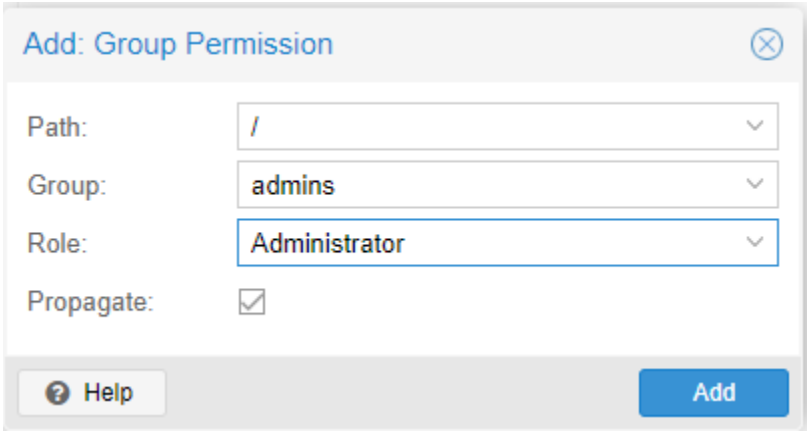


(Take a screenshot of the login page)

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



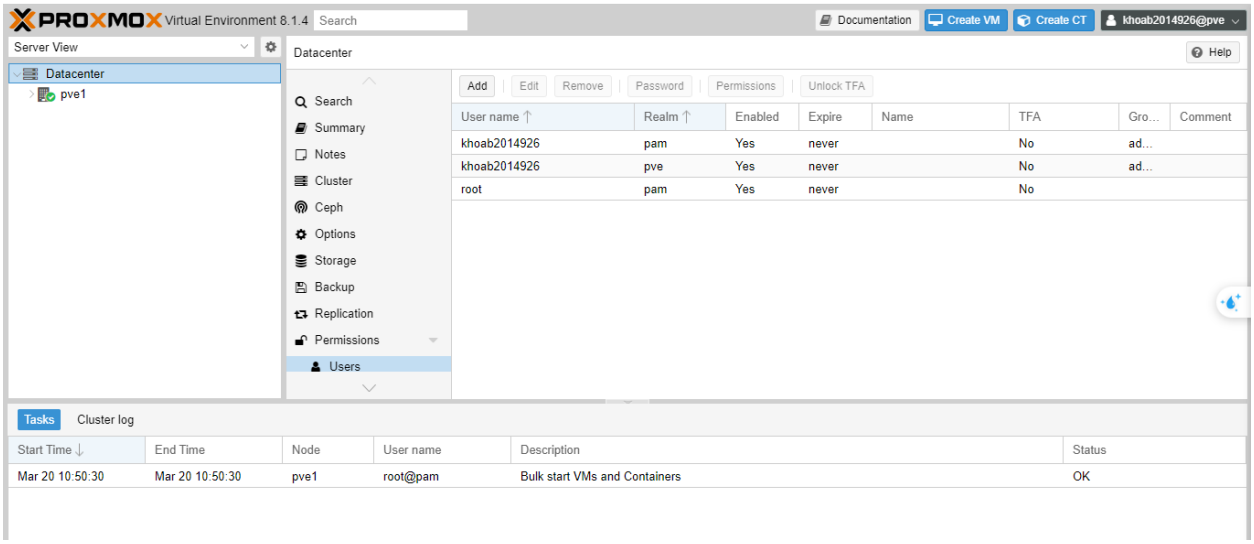
- Create the user `<Your student ID>` (Users → Add)
  - User name: `<Your student ID>`
  - Realm: `Proxmox VE Authentication server`
  - Password: `<Your password>`

- Group: `admins`

(take a screenshot)

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

(take a screenshot)



3. Creating a container

- Download the `Ubuntu 22.04 standard` container template (local (pve1) → CT Template → Templates)
- 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
- Start the container, then log on to the container console using the user/password `root/<Your password>`

(take a screenshot)

- Testing the network connections

```
#ping google.com
```

```
 * Support:        https://ubuntu.com/advantage

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

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

root@lamp:~# ping google.com
PING google.com (216.58.200.238) 56(84) bytes of data.
64 bytes from tsa03s01-in-f14.1e100.net (216.58.200.238): icmp_seq=1 ttl=128 time=31.
0 ms
64 bytes from tsa03s01-in-f14.1e100.net (216.58.200.238): icmp_seq=2 ttl=128 time=31.
9 ms
64 bytes from hkg07s47-in-f14.1e100.net (216.58.200.238): icmp_seq=3 ttl=128 time=35.
7 ms
64 bytes from hkg07s47-in-f14.1e100.net (216.58.200.238): icmp_seq=4 ttl=128 time=36.
2 ms
^C
--- google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 31.031/33.701/36.209/2.265 ms
root@lamp:~#
```

(take a screenshot)

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

```
#adduser ubuntu
```

```
root@lamp:~# adduser ubuntu
Adding user `ubuntu' ...
Adding new group `ubuntu' (1000) ...
Adding new user `ubuntu' (1000) with group `ubuntu' ...
Creating home directory `/home/ubuntu' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
Sorry, passwords do not match.
passwd: Authentication token manipulation error
passwd: password unchanged
Try again? [y/N] y
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for ubuntu
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n] y
root@lamp:~# adduser ubuntu sudo
```

```
#adduser ubuntu sudo
```

```
root@lamp:~# adduser ubuntu sudo
Adding user `ubuntu' to group `sudo' ...
Adding user ubuntu to group sudo
Done.
root@lamp:~#
```

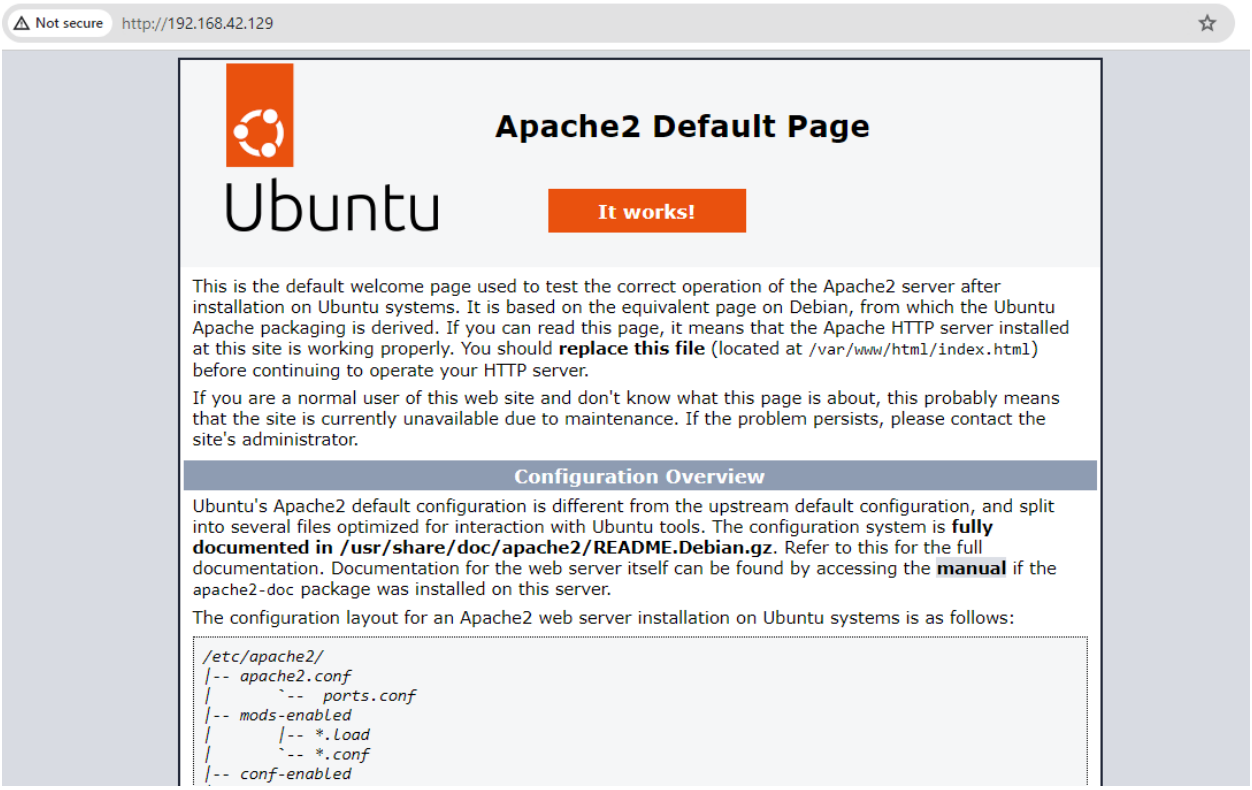
- Log out from the container

```
#exit
```

- Close web-based console
- From the physical machine, download and install Mobaxterm. From Mobaxterm to SSH to the container using user/password `ubuntu/ubuntu`
- Install LAMP stack

```
$ sudo apt update -y && sudo apt install apache2 mysql-server
php libapache2-mod-php php-mysql -y
$ sudo nano /var/www/html/info.php
# content of info.php
    <?php
    phpinfo();
$ sudo systemctl enable apache2
```

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

- Clean the `apt` tool

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

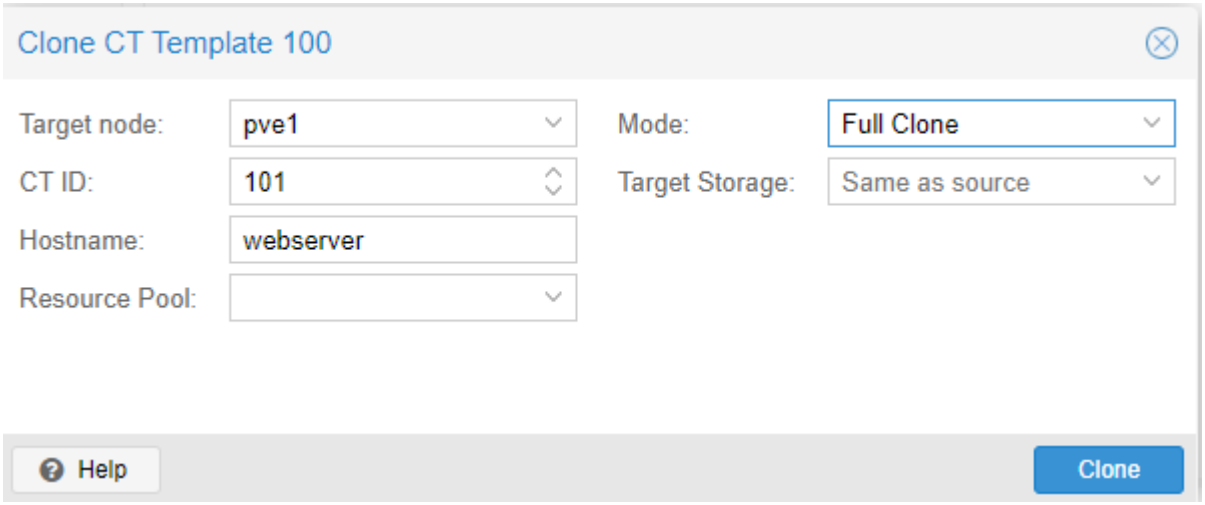
- Remove ssh keys

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

- Remove machine ID

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

- Shutdown the container, then create a CT template (More → Convert to template).
- Create (Clone) a new container using the template
  - Hostname: `webserver`
  - Mode: `Full Clone`

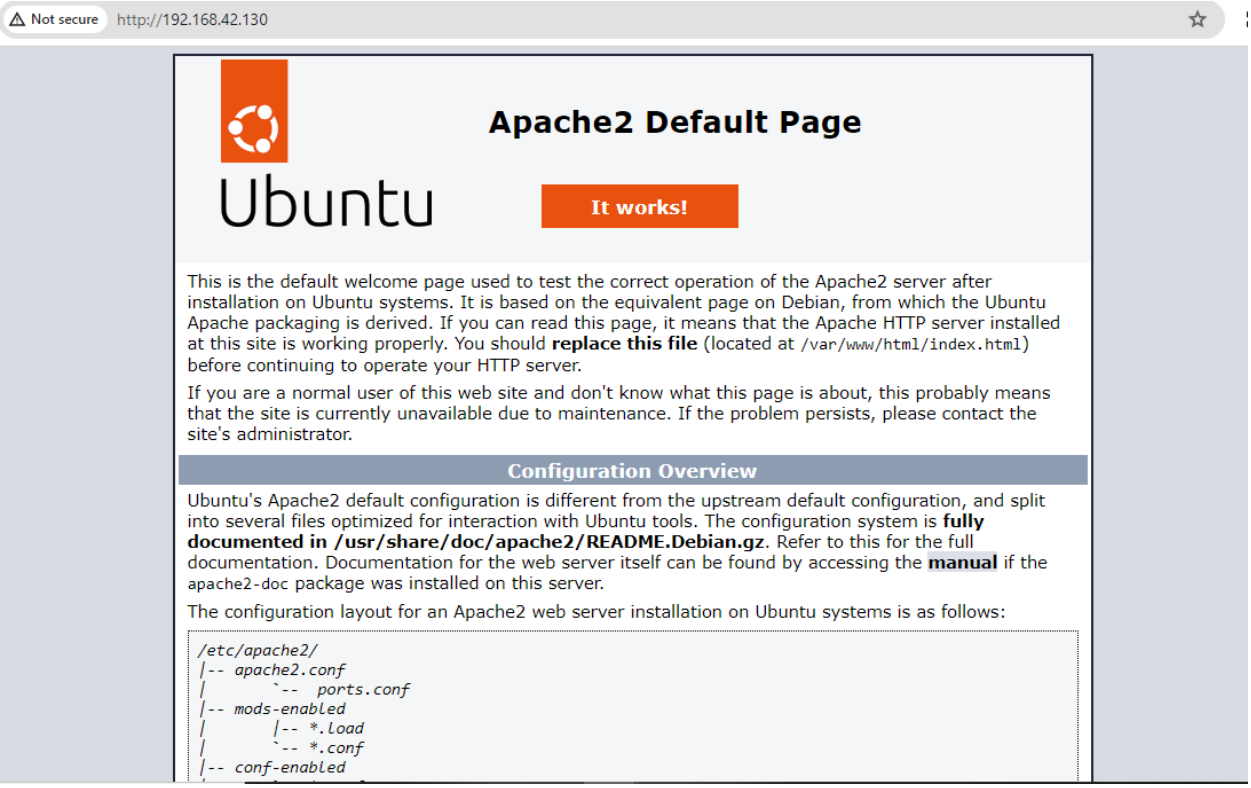


(take a screenshot)

- Start the container, then log on to the container using the user/password `ubuntu/ubuntu`
- Create new SSH keys

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

- From Mobaxterm to SSH to the container using user/password `ubuntu/ubuntu`
- From a web browser, access http://<Container_IP>/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
- Create a Virtual Machine with the following information:
  - Hostname: `lubuntu`
  - ISO Image: `Lubuntu 22.04`
  - Keep other settings as default

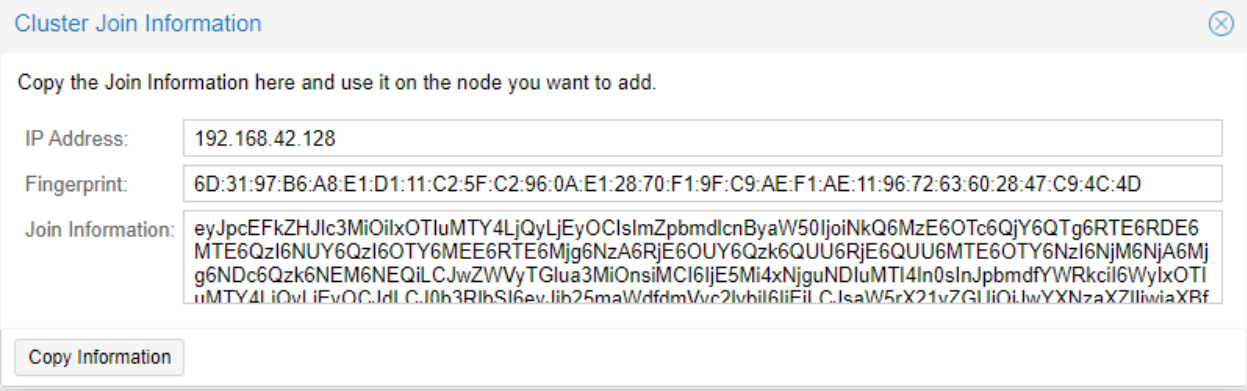
  (take a screenshot)
- Start the VM, then install the Lubuntu OS to the VM.
  (take a screenshot of the log on screen after finishing the installation)
  (students can skip step if there a lack of resources)

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)
- Installing Proxmox VE to `PM02`.
- Start the VM then follow the Promox VE installation procedure.
  - Country: `Vietnam`
  - Hosname (FQDN): `pve2.example.com`

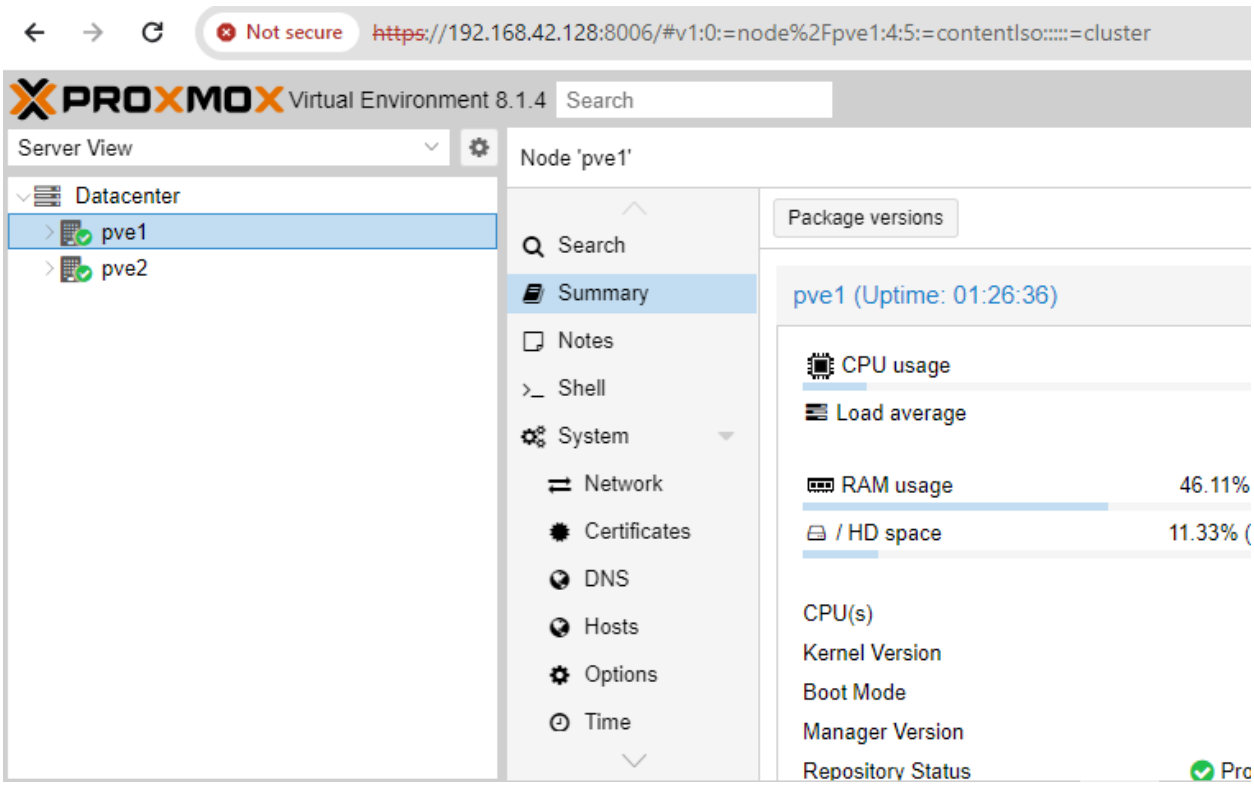
- After finishing the installation procedure, access Proxmox VE GUI at https://<IP of PM02>:8006, then log in to Promox VE using the root account.

- On the Proxmox web interface of PM01:
  - Log on using `root` user
  - Create a cluster (Data center → Cluster → Create Cluster)
    - Name: `mydatacenter`
    - Copy the join information



(take a screenshot)

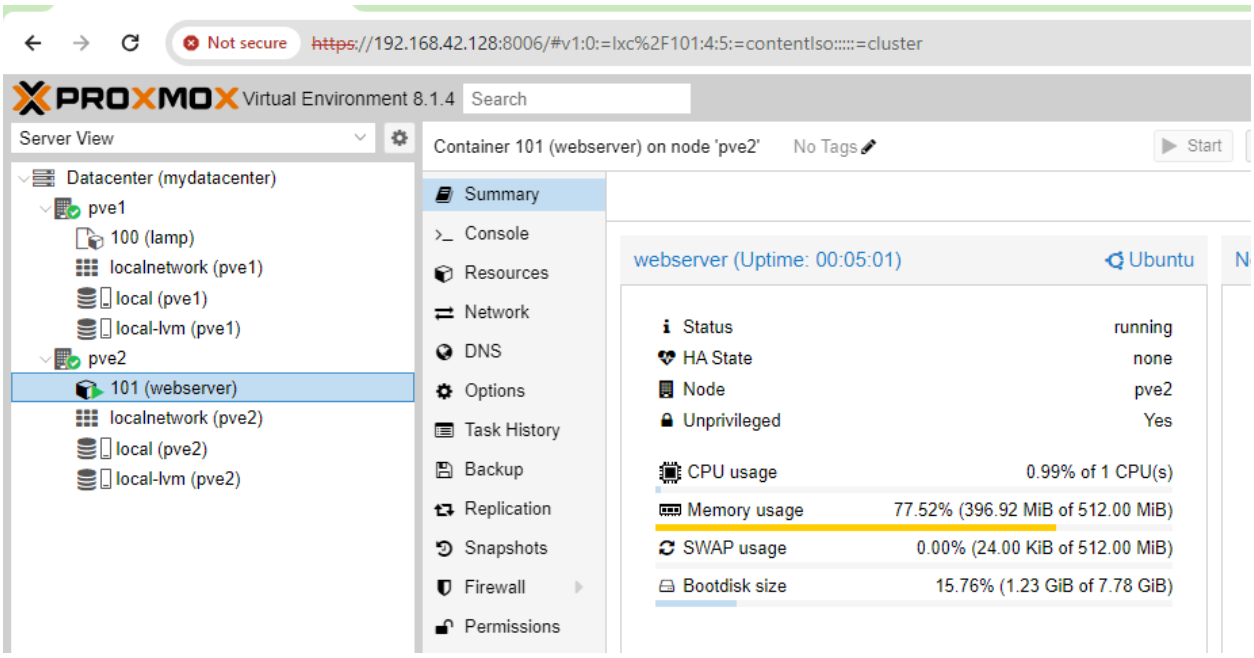
- On the Proxmox web interface of PM02:
  - Log on using `root` user
  - Join to a cluster (Data center → Cluster → Join Cluster)
    - Paste the join information
  - Then waiting the join process to finish



(take a screenshot)

7. **Migrate a Container/Virtual Machine**

- On the Proxmox web interface of PM01, migrating the container `webserver` from PM01 to PM02.
  (take a screenshot)



Note: We can also manage Proxmox using CLIs

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