

# "Zero to Demo" - Limitless PC Proxmox Setup

## Create Developer SSH Key

On your Mac or Linux machine:

```
ssh-keygen -C "admin@aptero.co"
```

It will ask:

Generating public/private ed25519 key pair.

Enter file in which to save the key:

Name the key pair something memorable like `yundera-developer`

Passphrase is optional but recommended.

This will create two files in `~/.ssh:`

```
yundera-developer
```

```
yundera-developer.pub
```

The `*.pub` file is the public key that you need to upload to Scaleway and attach to your server when you create the server.

The file without the `*.pub` extension is the private key.

## Rent Servers

Rent three Scaleway Dedibox START-2-L servers.

This section does not have an automated playbook because Scaleway Dedibox rental is a month-long commitment and initial OS install can take up to 1 hour. These considerations made it infeasible to build and test automated scripts within the scope of this report.

Should that become a relevant goal, Scaleway offers its own APIs and the Terraform has a Scaleway provider already built-in, which will make the task straightforward.

Sign into <https://console.online.net/en/login>

The screenshot shows the Scaleway web interface for managing servers. At the top, there's a navigation bar with links for Order, Domain, Hosting, Server (selected), VPS (NEW), Storage, API, and Support. A "logged in as aptero" message is also present. Below the navigation is a search bar labeled "Magic bar (server, domain, IP...)". The main area is titled "Server list" and displays a table of three servers. The columns are Id, Datacenter, Offer, IP, Reverse, and Action. The servers listed are:

Id	Datacenter	Offer	IP	Reverse	Action
105917	DC2	Start-2-L	163.172.68.57	163-172-68-57.rev.poneytelecom.eu.	<a href="#">Manage</a>
105919	DC2	Start-2-L	163.172.68.59	163-172-68-59.rev.poneytelecom.eu.	<a href="#">Manage</a>
105966	DC2	Start-2-L	163.172.68.106	163-172-68-106.rev.poneytelecom.eu.	<a href="#">Manage</a>

At the bottom of the page, there are links for Contracts, Legal notices, Privacy Policy, Security Measures, and Cookie Settings, followed by a copyright notice: Copyright © 1999-2025 - Scaleway SAS - BP 438 - 75366 Paris CEDEX 08 - RCS Paris B 433 115 904.

Since the latest version of Proxmox VE that Scaleway offers pre-installed is an outdated (7.x) one, we will install Proxmox VE 8.x ourselves from a Debian 11 base installation. In the process we'll upgrade Debian from 11 to 12 also.

Server - sd-105917 - Install - +

console.online.net/en/server/install/105917/install/os?o... English logged in as aptero

Order Domain Hosting Server VPS NEW Storage API Support

# Start-2-L sd-105917

Magic bar (server, domain, IP...)

## OS choice

ubuntu debian centos rocky windows archlinux FreeBSD oracle

### Debian

Debian is a non commercial GNU/Linux distribution which contains around 15000 sophisticated software maintained by a thousand developers.

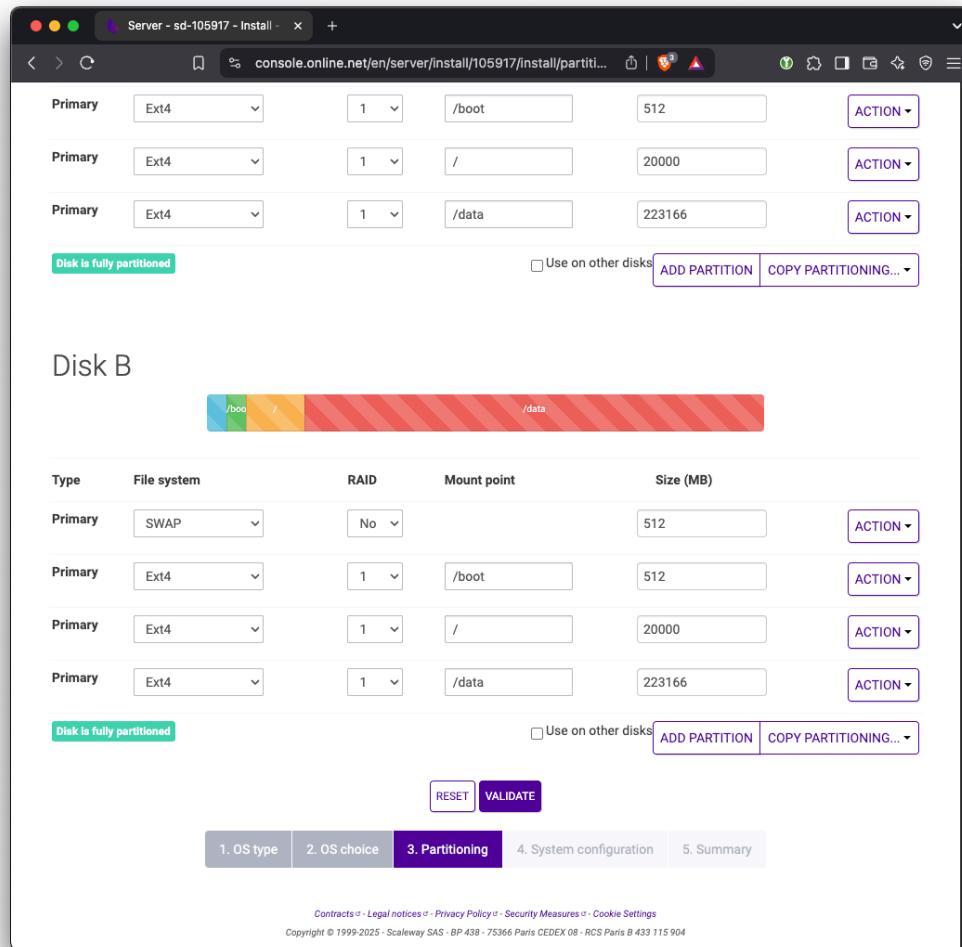
Debian is well known for its stability and its original package manager (APT), keeping an up to date system and ensuring homogeneous environnement.

[Official website](#) [Documentation](#)

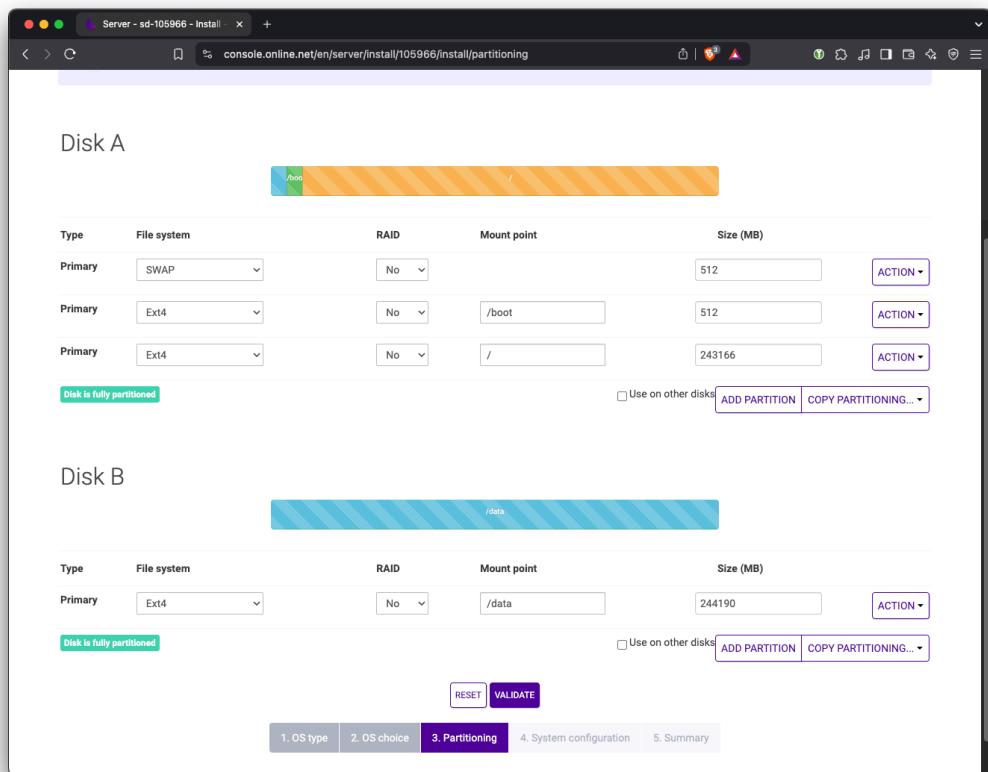


Choose a version:

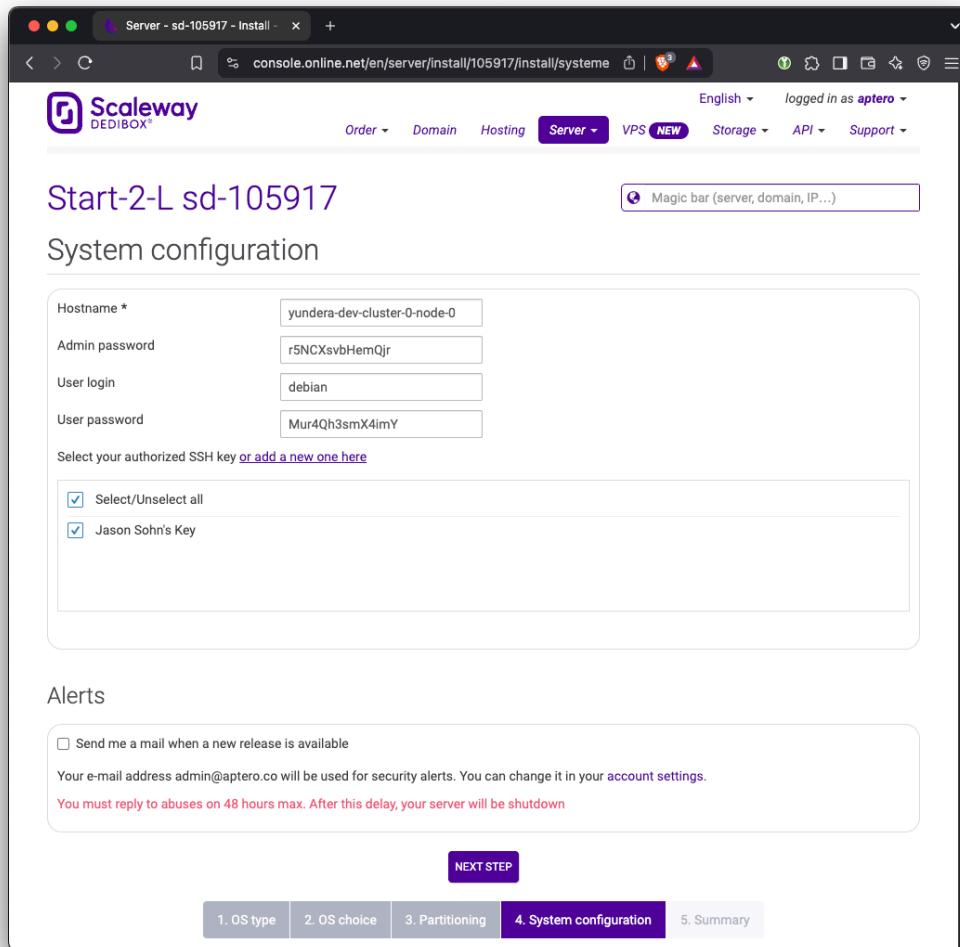
1. OS type 2. OS choice 3. Partitioning 4. System configuration 5. Summary



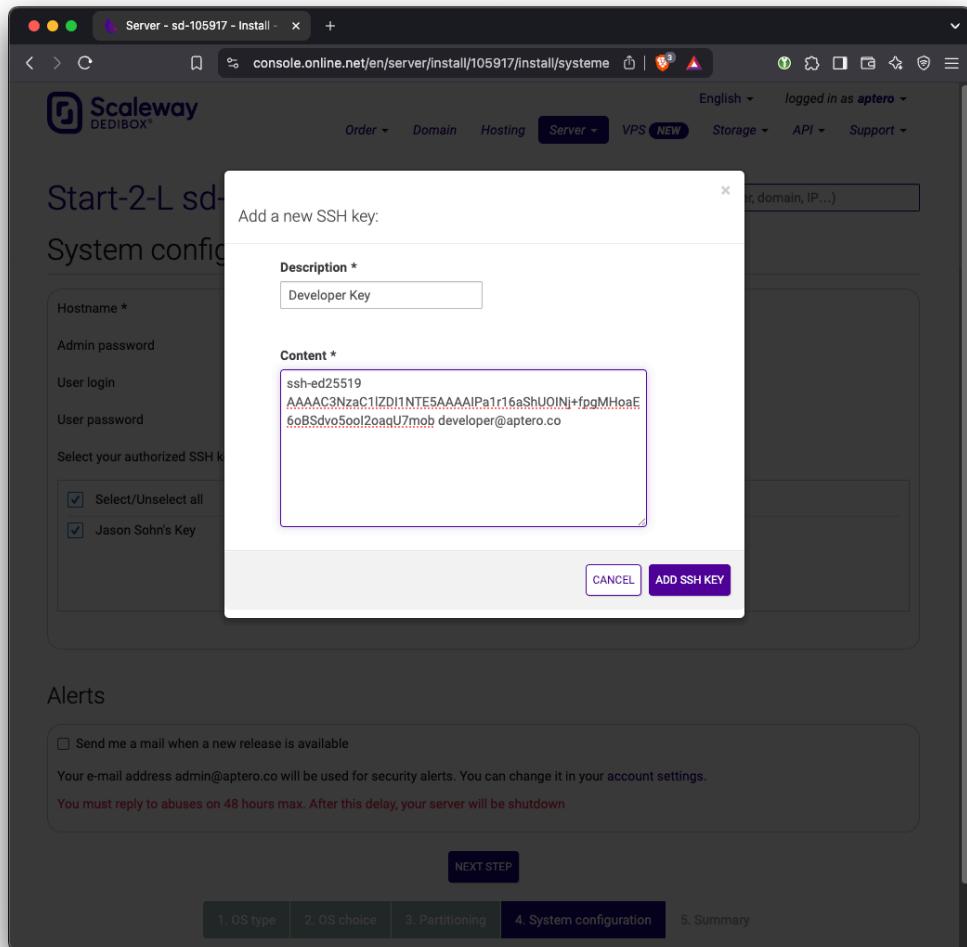
The default partitioning uses RAID1. We need to have one of the drives dedicated for Ceph storage. Therefore, change the partition to not use RAID. On the first drive, keep the Swap, /boot, and / partitions. On the second drive, replace everything with a single ext4 partition. For now we'll mount that drive at /data but this path doesn't matter since we will be wiping this drive later on.



Change the hostname to something more meaningful. Pick a username and password and keep them somewhere safe.



In addition, we need to set up SSH key access to the server. Click [or add a new one here](#) button. Copy the contents of the public SSH key (`yundera-developer.pub` in the previous step) here.



Confirm in summary and wait until the servers boot up and installs the OS. The website says this can take up to an hour. Typically it takes around 15 to 30 minutes.

Repeat this for all servers.

## Install Proxmox VE 8

We use Ansible to automate the installation and upgrade of Proxmox VE 8.

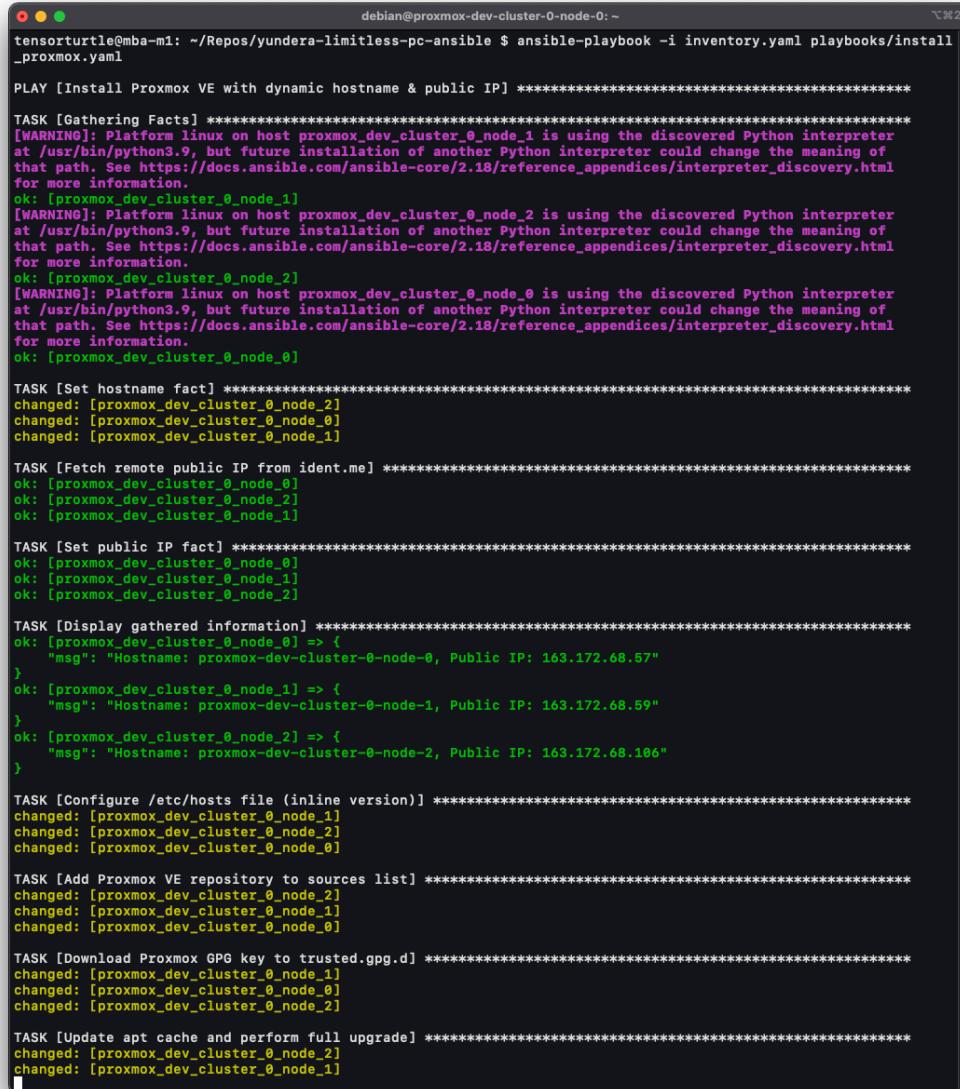
We prefer starting from a Debian image instead of using the provided Proxmox VE 7 image because it allows us to use Ansible for more things.

This code for this section is:

```
https://github.com/tensorturtle/yundera-limitless-pc
```

Please read the 'README.md' inside the 'ansible' directory.

Ansible running on all three servers:



```

debian@proxmox-dev-cluster-0-node-0: ~
tensorturtle@mba-m1: ~/Repos/yundera-limitless-pc-ansible $ ansible-playbook -i inventory.yaml playbooks/install_proxmox.yaml

PLAY [Install Proxmox VE with dynamic hostname & public IP] ****
[WARNING]: Platform linux on host proxmox_dev_cluster_0_node_1 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.18/reference_appendices/interpreter_discovery.html for more information.
ok: [proxmox_dev_cluster_0_node_1]
[WARNING]: Platform linux on host proxmox_dev_cluster_0_node_2 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.18/reference_appendices/interpreter_discovery.html for more information.
ok: [proxmox_dev_cluster_0_node_2]
[WARNING]: Platform linux on host proxmox_dev_cluster_0_node_0 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-core/2.18/reference_appendices/interpreter_discovery.html for more information.
ok: [proxmox_dev_cluster_0_node_0]

TASK [Set hostname fact] ****
changed: [proxmox_dev_cluster_0_node_2]
changed: [proxmox_dev_cluster_0_node_0]
changed: [proxmox_dev_cluster_0_node_1]

TASK [Fetch remote public IP from ident.me] ****
ok: [proxmox_dev_cluster_0_node_0]
ok: [proxmox_dev_cluster_0_node_2]
ok: [proxmox_dev_cluster_0_node_1]

TASK [Set public IP fact] ****
ok: [proxmox_dev_cluster_0_node_0]
ok: [proxmox_dev_cluster_0_node_1]
ok: [proxmox_dev_cluster_0_node_2]

TASK [Display gathered information] ****
ok: [proxmox_dev_cluster_0_node_0] => {
    "msg": "Hostname: proxmox-dev-cluster-0-node-0, Public IP: 163.172.68.57"
}
ok: [proxmox_dev_cluster_0_node_1] => {
    "msg": "Hostname: proxmox-dev-cluster-0-node-1, Public IP: 163.172.68.59"
}
ok: [proxmox_dev_cluster_0_node_2] => {
    "msg": "Hostname: proxmox-dev-cluster-0-node-2, Public IP: 163.172.68.106"
}

TASK [Configure /etc/hosts file (inline version)] ****
changed: [proxmox_dev_cluster_0_node_1]
changed: [proxmox_dev_cluster_0_node_2]
changed: [proxmox_dev_cluster_0_node_0]

TASK [Add Proxmox VE repository to sources list] ****
changed: [proxmox_dev_cluster_0_node_2]
changed: [proxmox_dev_cluster_0_node_1]
changed: [proxmox_dev_cluster_0_node_0]

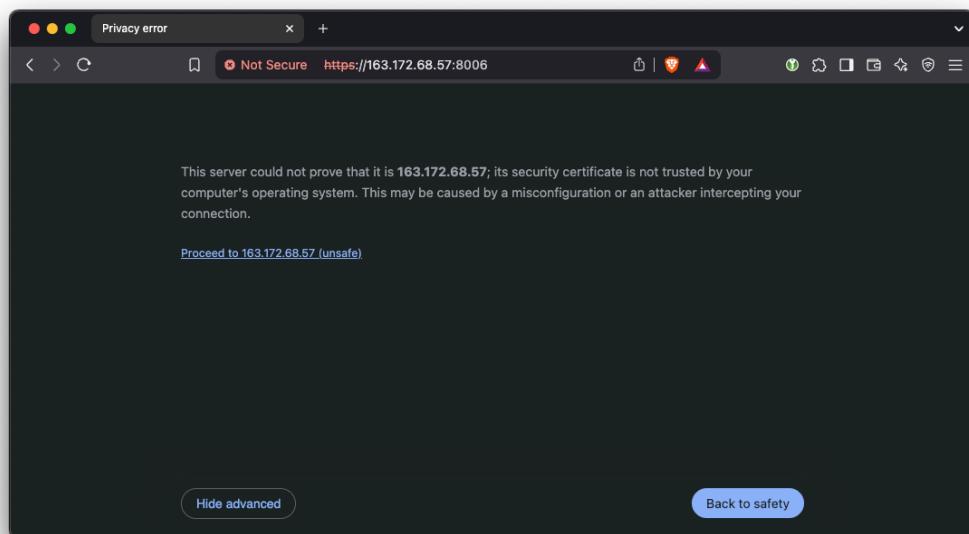
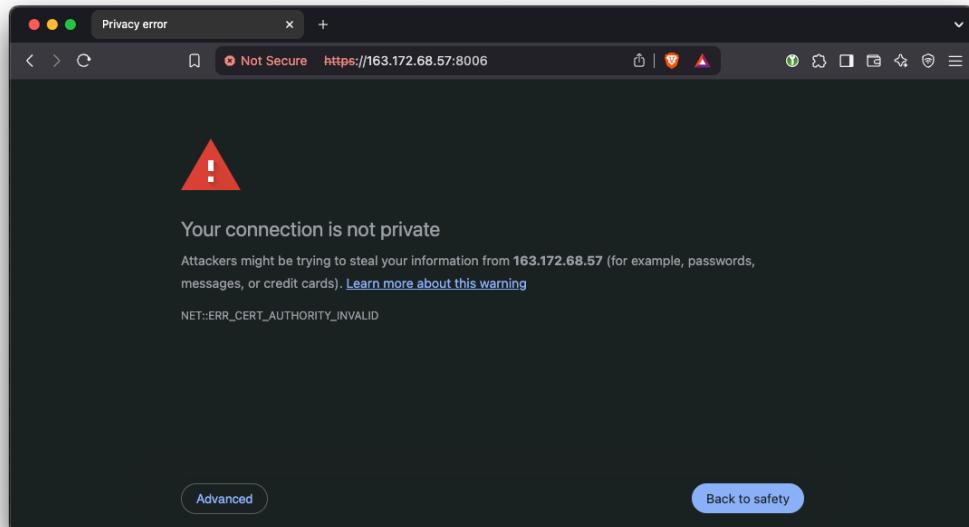
TASK [Download Proxmox GPG key to trusted.gpg.d] ****
changed: [proxmox_dev_cluster_0_node_1]
changed: [proxmox_dev_cluster_0_node_0]
changed: [proxmox_dev_cluster_0_node_2]

TASK [Update apt cache and perform full upgrade] ****
changed: [proxmox_dev_cluster_0_node_2]
changed: [proxmox_dev_cluster_0_node_1]

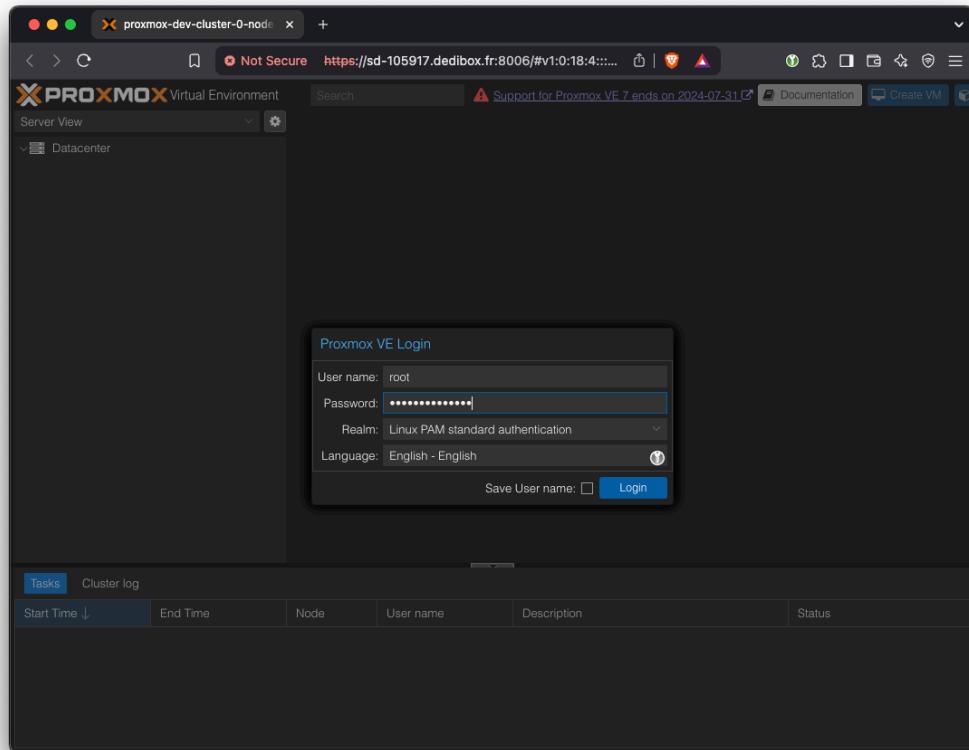
```

Once Ansible is finished, navigate to the web interface, which is at port 8006 on each of the servers' public IP addresses:

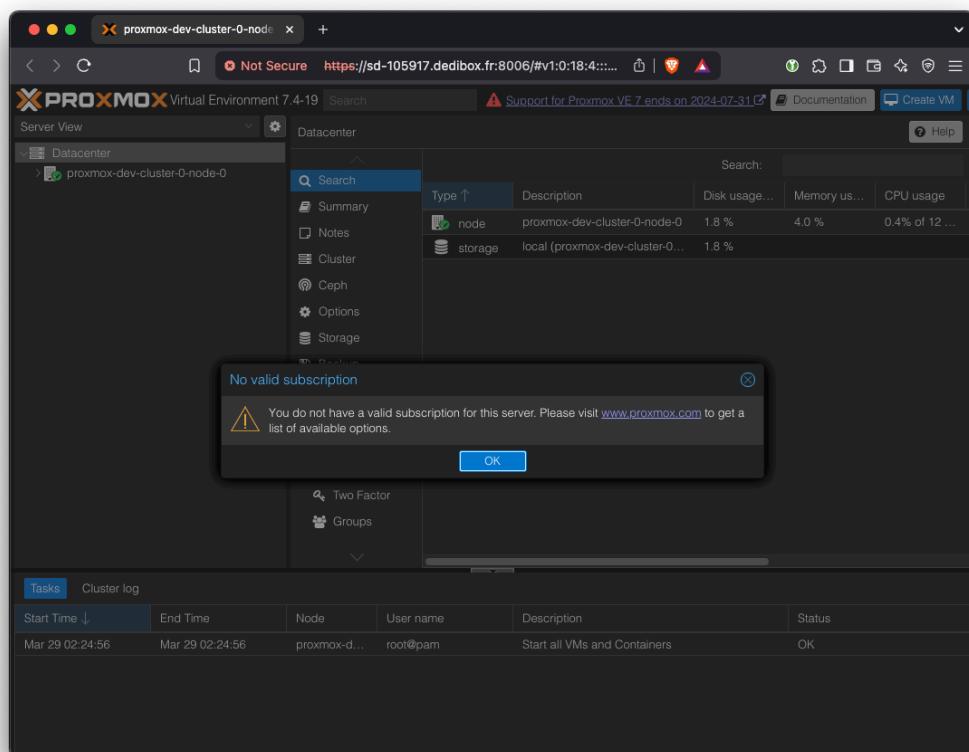
Proxmox uses self-signed certificates which web browsers don't like - we can safely ignore this and it won't bother us again.

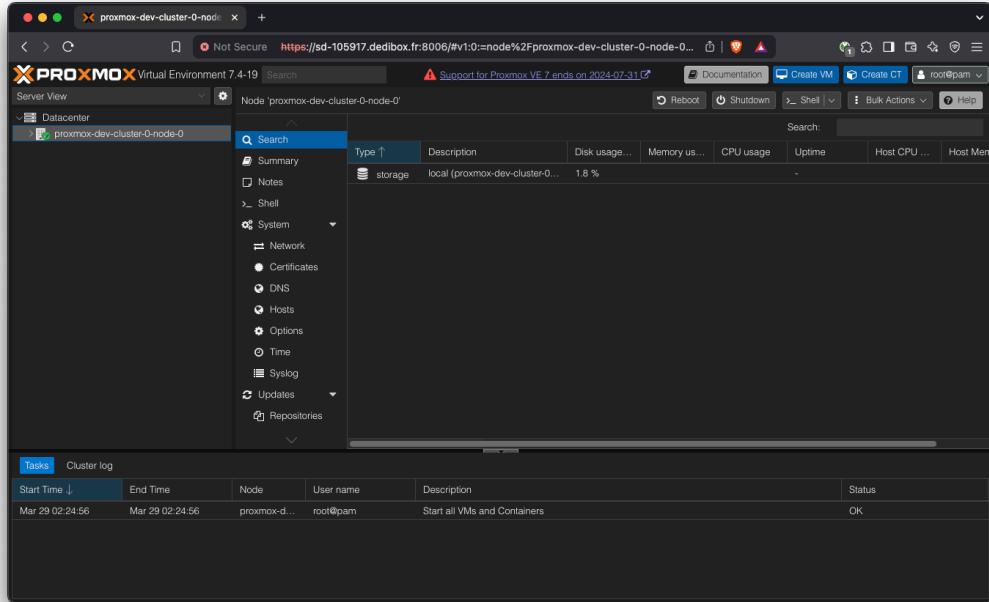


Log in using the root password (which you defined when renting the server)



Ignore warning for subscription.



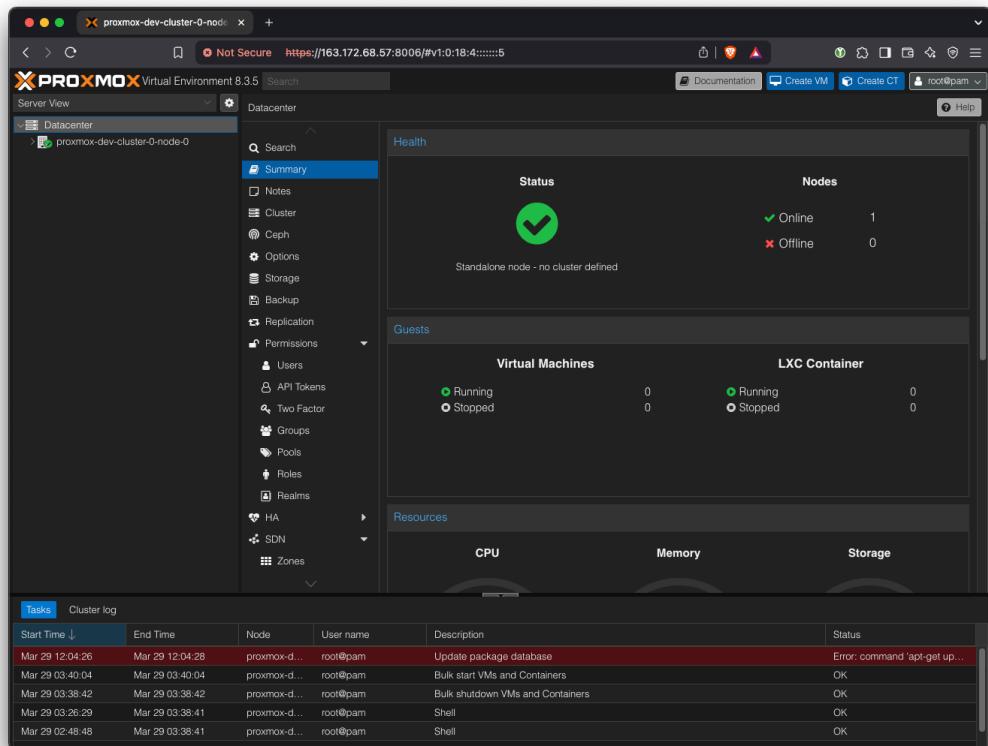


At this point, we should be able to access all three Proxmox web UIs.

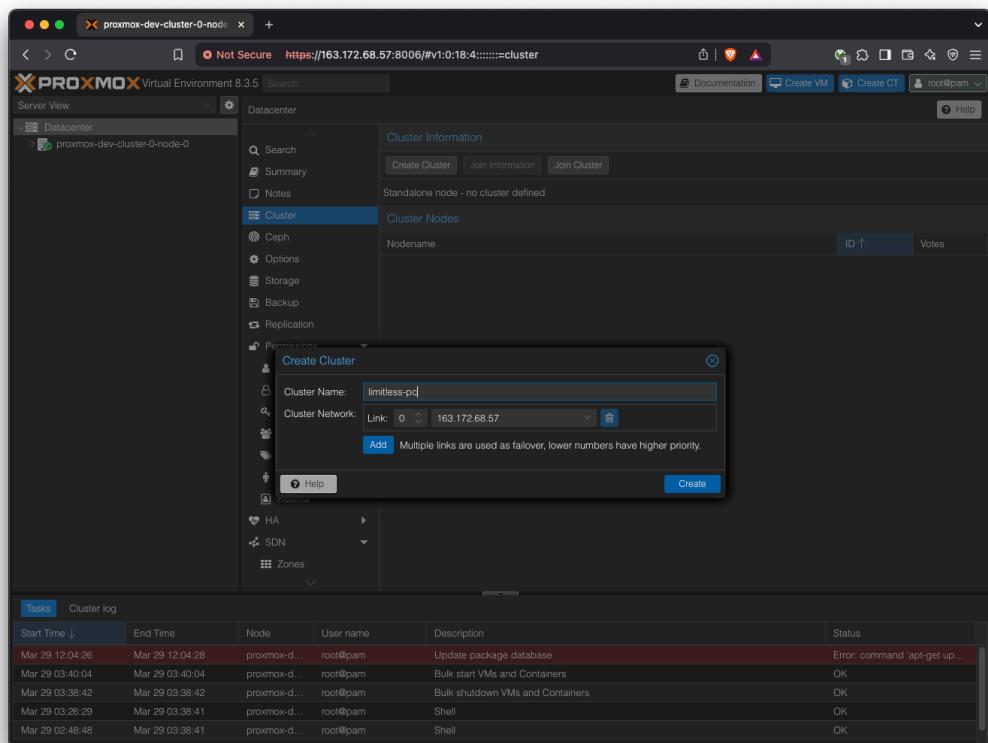
## Create Proxmox Cluster

This step cannot be automated via Ansible due to a quirk of the 'pvecm' command - specifically, it requires the root password to be entered (even when key-based SSH is set up between the servers) but it cannot be scripted with STDIN or even 'expect'. More work is required to find a workaround.

Log into the first of the three hosts. We should see a single host in the 'Datacenter' list.



Create a new cluster.



Pick a cluster name of your choice.

Cluster Information

Cluster Nodes			
Nodename	ID ↑	Votes	Link
proxmox-dev-cluster-0-node-0	1	1	163.172.68.57

Tasks Cluster log

Start Time ↓	End Time	Node	User name	Description	Status
Mar 29 12:33:06	Mar 29 12:33:17	proxmox-d...	root@pam	Create Cluster	OK
Mar 29 12:04:26	Mar 29 12:04:28	proxmox-d...	root@pam	Update package database	Error: command 'apt-get up...
Mar 29 03:40:04	Mar 29 03:40:04	proxmox-d...	root@pam	Bulk start VMs and Containers	OK
Mar 29 03:38:42	Mar 29 03:38:42	proxmox-d...	root@pam	Bulk shutdown VMs and Containers	OK
Mar 29 03:26:29	Mar 29 03:38:41	proxmox-d...	root@pam	Shell	OK

Copy the "Join Information" field.

Cluster Join Information

Copy the Join Information here and use it on the node you want to add.

IP Address: 163.172.68.57

Fingerprint: A0:18:2E:F9:CB:52:D8:77:A4:6F:9E:3A:0A:56:6F:0E:82:18:D2:16:36:B9:05:DB:A3:E2:EC:6A:73:F0:19

Join Information: eyJpc0EFkZHJlc3M0IixNMuMTcyLjY4LU3lwZmluZ2VycHJbnQjOUBMDoxODoyRTpGOTpDQo1MjyoRDo4Nz03QT00D0z2Pj5Rt0zQTo1Njo2RjowRT04MjoxODpEMjoxNjozNjpCOTowNtpEQjpbMzpFQipFQoz2QTo3MzpGMDoxOSlsInBzXMaW5scy6eylwj0lMTY2lE3M4zOC4NyJ9LCyaW5nX2FkZHilOsIMY2lE3M4zOC4TNwv0liCInh-0tHsKau17MnnnRKhlnh-0tHlCsawW5rX2tv7gllfKlwVXNzaxX7lllelaXpRlmwv9uhlnlmlwv0In

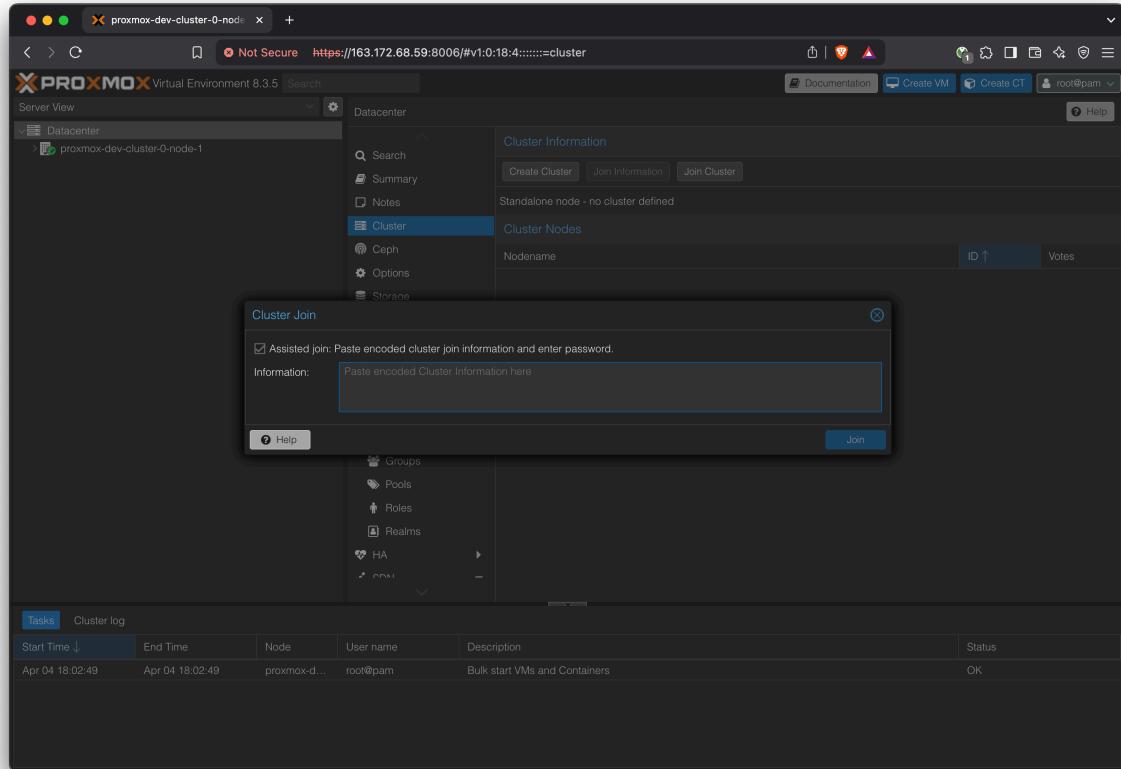
Copy Information

Tasks Cluster log

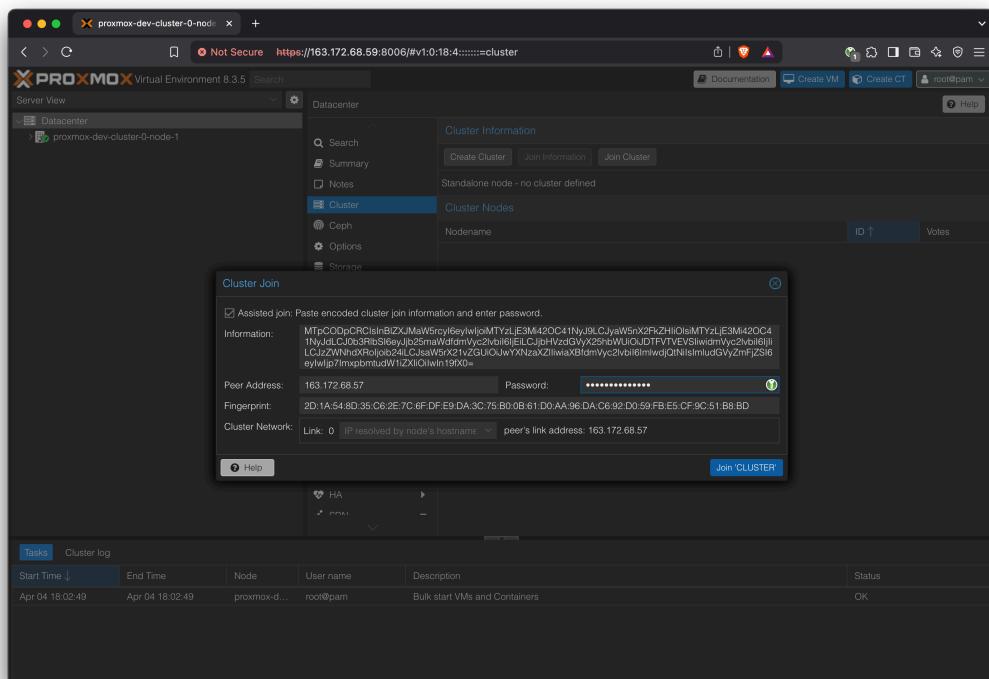
Start Time ↓	End Time	Node	User name	Description	Status
Mar 29 12:33:06	Mar 29 12:33:17	proxmox-d...	root@pam	Create Cluster	OK
Mar 29 12:04:26	Mar 29 12:04:28	proxmox-d...	root@pam	Update package database	Error: command 'apt-get up...
Mar 29 03:40:04	Mar 29 03:40:04	proxmox-d...	root@pam	Bulk start VMs and Containers	OK
Mar 29 03:38:42	Mar 29 03:38:42	proxmox-d...	root@pam	Bulk shutdown VMs and Containers	OK
Mar 29 03:26:29	Mar 29 03:38:41	proxmox-d...	root@pam	Shell	OK

Now log into the Proxmox web UI of the other two hosts.

In the same Cluster settings, join the cluster by pasting in the 'Join Information' content.



Enter the root password of the first host when prompted.



## Using Command Line

The same process can be done through the command line.

SSH into the first node (node 0) as root.

Create a new cluster

```
pvecm create YUNDERACLUSTER
```

View status

```
pvecm status
```

Note the IP address of this 'leader'.

SSH into the other hosts

```
pvecm add LEADER.IP.ADDRESS.HERE
```

Enter root password for the leader.

Go back to the leader node and run `pvecm status` to see the new node in the cluster.

The cluster should now look like this (the cluster is visible from all nodes)

Start Time	End Time	Node	User name	Description	Status
Mar 30 00:00:19	Mar 30 00:00:37	proxmox-d...	root@pam	Join Cluster	OK
Mar 29 23:59:14	Mar 29 23:59:37	proxmox-d...	root@pam	Join Cluster	OK
Mar 29 23:54:36	Mar 29 23:54:47	proxmox-d...	root@pam	Create Cluster	OK

Equivalently, we can run

```
pvecm status :
```

```

root@proxmox-dev-cluster-0-node-0:~# pvecm status
Cluster information
-----
Name: YUNDERACLUSTER
Config Version: 3
Transport: knet
Secure auth: on

Quorum information
-----
Date: Sat Mar 29 16:02:14 2025
Quorum provider: corosync_votequorum
Nodes: 3
Node ID: 0x00000001
Ring ID: 1.d
Quorate: Yes

Votequorum information
-----
Expected votes: 3
Highest expected: 3
Total votes: 3
Quorum: 2
Flags: Quorate

Membership information
-----
  Nodeid  Votes Name
0x00000001    1 1163.172.68.57 (local)
0x00000002    1 1163.172.68.59
0x00000003    1 1163.172.68.106

```

## Create Ceph Cluster on top of Proxmox Cluster

Deploy Hyper-Converged Ceph Cluster - Proxmox VE  
 Proxmox VE unifies your compute and storage systems, that is, you can use the same physical nodes within a cluster for both computing (processing VMs and containers) and replicated storage. The traditional silos of compute and

 [https://pve.proxmox.com/wiki/Deploy\\_Hyper-Converged\\_Ceph\\_Cluster](https://pve.proxmox.com/wiki/Deploy_Hyper-Converged_Ceph_Cluster)

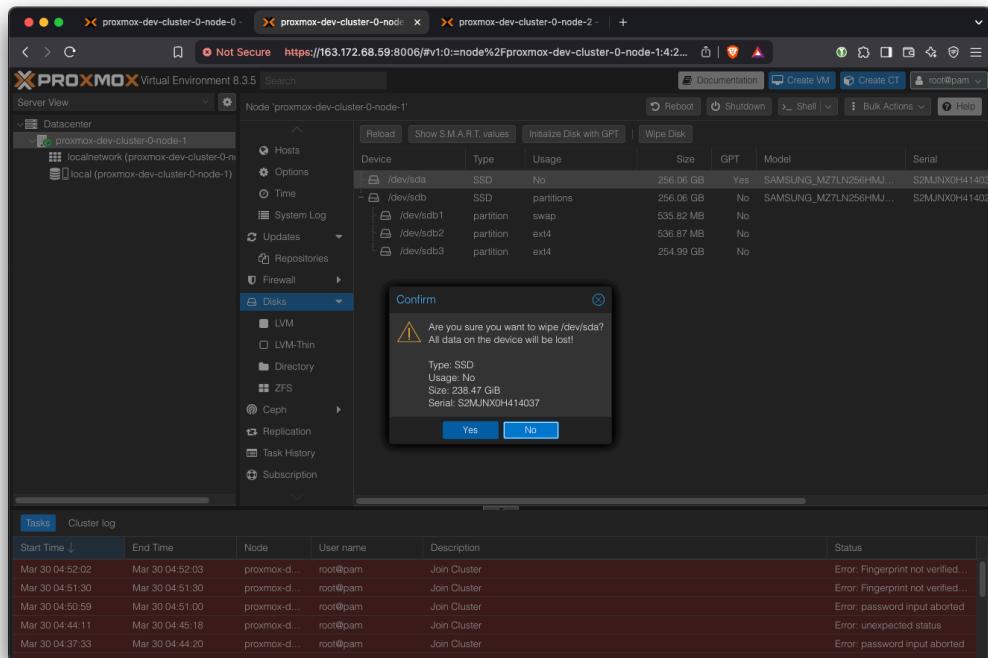
### Wipe Second Drive

Our servers came installed with two SSDs.

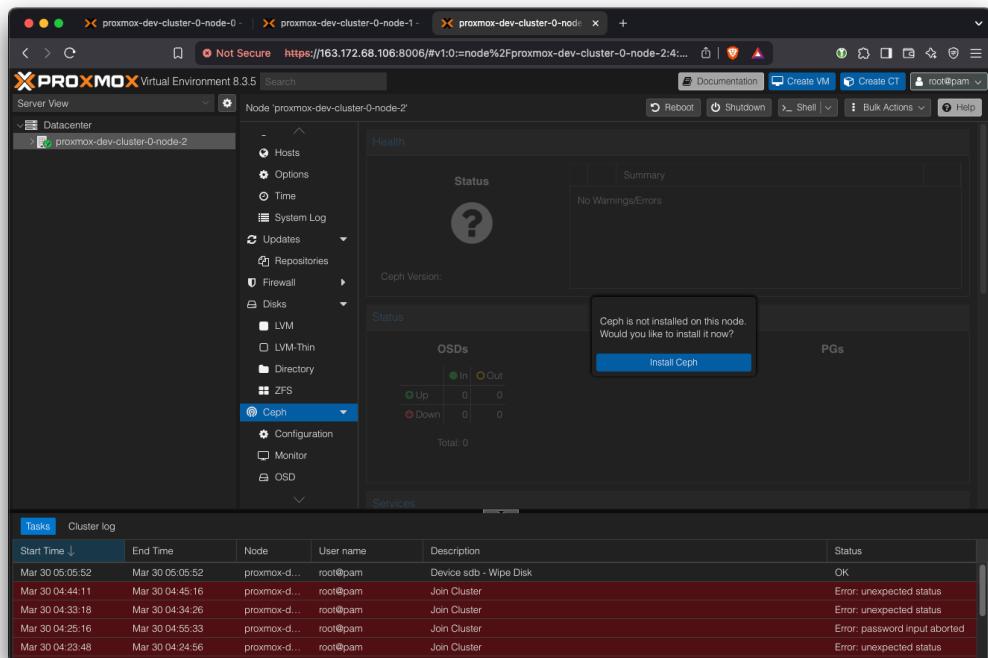
One is used by the host system, and the other will be dedicated to Ceph.

Since we had to format it to ext4 in the setup stage, we wipe it again to be used for Ceph.

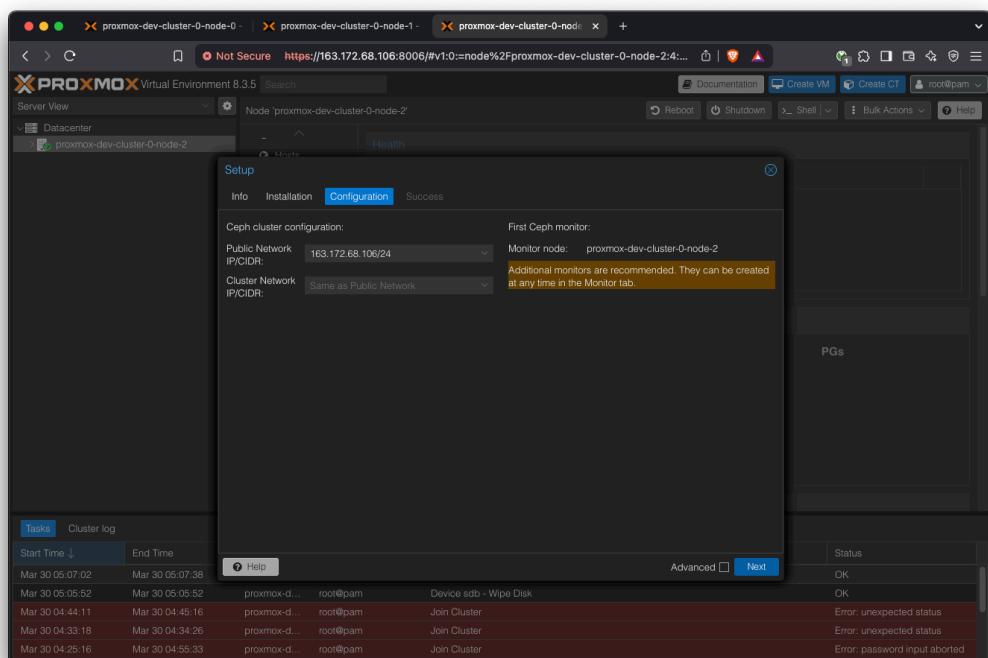
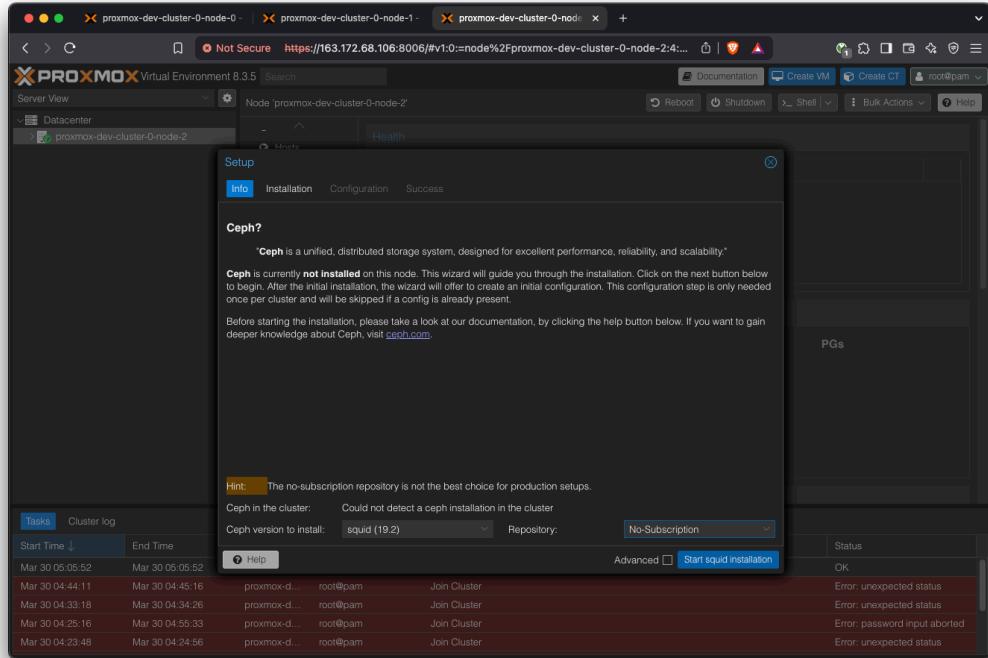
Go to 'Disks' and select the drive that has just one partition. Then click 'Wipe Disk'.



## Install Ceph on all machines



Select the latest version (squid) and No-subscription



Repeat for all servers.

## Create Ceph Cluster

We'll have one monitor, three managers (one main, two standby), and three OSDs.

If you are unfamiliar with Ceph terms, please see the [documentation](#)

Add another manager:

The screenshot shows the Proxmox VE 8.3.5 interface. In the left sidebar, under 'Server View', the 'Datacenter (CLUSTER)' section is expanded, showing 'proxmox-dev-cluster-0-node-0' and 'proxmox-dev-cluster-0-node-1'. The 'Monitor' tab is selected in the top navigation bar. A modal window titled 'Create: Manager' is open, showing the host 'proxmox-dev-cluster-0-node-1' selected. The 'Create' button is visible. Below the modal, the 'Manager' table lists existing managers: 'mgr proxmox-de...' (running), 'mgr proxmox-de...' (stopped), and 'mgr proxmox-de...' (stopped). At the bottom of the screen, the 'Tasks' and 'Cluster log' sections are visible.

Add OSD for each server:

The screenshot shows the Proxmox VE 8.3.5 interface. In the left sidebar, under 'Server View', the 'Datacenter (CLUSTER)' section is expanded, showing 'proxmox-dev-cluster-0-node-0', 'proxmox-dev-cluster-0-node-1', and 'proxmox-dev-cluster-0-node-2'. The 'Ceph' tab is selected in the top navigation bar. A modal window titled 'Create: Ceph OSD' is open, showing the disk '/dev/sda' selected. The 'Create' button is visible. Below the modal, the 'Ceph' table lists an existing OSD: 'osd.0' (up, 1.00 weight, 0.01 used%). At the bottom of the screen, the 'Tasks' and 'Cluster log' sections are visible.

Create Metadata servers (one active, two standby). Then, create a CephFS storage. CephFS storage is a simple shared file system among the nodes. We will use it to store the VM image base ISOs.

Create a new pool for RBD, which is where the VMs will store their state.

Note: All Ceph related changes are shared across all nodes, so we can do these operations from any node's Proxmox web UI.

Note that CephFS storage is different from the Ceph RBD storage we defined above. CephFS is just a convenient shared directory to keep metadata like OS ISOs, and RBD is where the actual VMs will store their content.

First, create a Ceph pool. Keep defaults.

Go to Datacenter → Storage, and add a new “RBD” storage, using cephpool.

The screenshot shows the Proxmox VE 8.3.5 web interface. In the top navigation bar, it says "Not Secure https://163.172.68.106:8006/#v1:18:4:43::::2". The main menu on the left is "Datacenter (CLUSTER)". Under "Storage", there is a table with one row: "cephfs" (Ceph...), Type: VZDump backup file, ISO im..., Content: /mnt/pve/cephfs, Path/Target: /mnt/pve/cephfs, Shared: Yes, Enabled: Yes, Bandwidth Limit: 0. On the right, a modal window titled "Add: RBD" is open. It has two tabs: "General" (selected) and "Backup Retention". In the "General" tab, the "ID" is "ceph-rbd", "Pool" is "rbd-pool", "Nodes" is "All (No restrictions)", "Monitor(s)" is "proxmox-dev-cluster-0-node-0, proxmox-dev-cluster-0-node-1, proxmox-dev-cluster-0-node-2", "Content" is "Disk image", "User name" is "admin", and "Use Proxmox VE managed hyper-converged ceph pool" is checked. Below the modal, the "Cluster log" table shows several tasks:

Start Time	End Time	Node	User name	Description	Status
Mar 30 14:18:33	Mar 30 14:18:35	proxmox-d...	root@pam	Ceph Pool rbd-pool - Create	OK
Mar 30 12:11:44	Mar 30 12:11:47	proxmox-d...	root@pam	Update package database	OK
Mar 30 11:58:09	Mar 30 11:58:12	proxmox-d...	root@pam	Update package database	OK
Mar 30 10:17:22	Mar 30 10:17:25	proxmox-d...	root@pam	Update package database	OK
Mar 30 05:40:46	Mar 30 05:40:56	proxmox-d...	root@pam	VM/CT 101 - Console	Error: connection timed out

## Configure network for VMs

Follow the directions given this Proxmox documentation, starting from the '**Configuration**' section.

[https://pve.proxmox.com/wiki/Setup\\_Simple\\_Zone\\_With\\_SNAT\\_and\\_DHCP](https://pve.proxmox.com/wiki/Setup_Simple_Zone_With_SNAT_and_DHCP)

Notes:

- The first part, installing `dnsmasq`, is not necessary because it is already done by the initial Ansible setup.
- When defining the subnet, consider using a larger subnet mask like `/16` to allow for a bigger network, such as:

The screenshot shows the Proxmox VE 8.3.5 interface. On the left, the navigation tree includes 'Datacenter (CLUSTER)', 'Replication', 'Permissions', 'Users', 'API Tokens', 'Two Factor', 'Groups', 'Pools', 'Roles', 'Realms', 'HA', 'SDN', 'Zones', 'VNets' (which is selected), 'Options', 'IPAM', 'VNet Firewall', 'ACME', 'Firewall', and 'Metric Server'. The right side has two main sections: 'VNets' and 'Subnets'. The 'VNets' section shows a table with columns: ID ↑, Alias, Zone, Tag, VL... (with a dropdown arrow), and State. One entry, 'vnet0', has a 'new' status indicator. The 'Subnets' section also has a table with columns: Create, Remove, Edit, Subnet, Gate..., SNAT, DNS ..., and State. Below these sections is a 'Create Subnet' dialog with tabs for General and DHCP Ranges. The 'General' tab is active, showing fields for Subnet (10.0.0.0/16), Gateway (10.0.0.1), SNAT (checkbox checked), and DNS Zone Prefix. A 'Create' button is at the bottom. At the bottom of the screen is a 'Tasks' and 'Cluster log' section.

This screenshot is nearly identical to the one above, showing the Proxmox VE 8.3.5 interface. The navigation tree, main sections (VNets and Subnets), and the 'Create Subnet' dialog are all present. The difference is that the 'Create Subnet' dialog is smaller and partially obscured by the main interface, indicating it is still open or in the process of being used.

- IP forwarding is required, which is done by: `echo 1 > /proc/sys/net/ipv4/ip_forward` This was already applied in the initial Ansible playbooks, so we don't have to worry about it
- Remember to 'Apply' changes from the 'SDN' view.

# Create a VM

## Download OS ISOs

Upload a Ubuntu 24.04 LTS image to the CephFS storage. Since that storage is shared, it means that all hosts within this cluster will be able to launch VMs using that ISO.

From France, a convenient download URL mirror is: <https://mirror.bakertelekom.fr/Ubuntu/24.04/ubuntu-24.04.2-desktop-amd64.iso>

The screenshot shows the Proxmox VE 8.3.5 interface. The left sidebar shows a tree view of the Datacenter (CLUSTER) with nodes: proxmox-dev-cluster-0-node-0, proxmox-dev-cluster-0-node-1, and proxmox-dev-cluster-0-node-2. The node proxmox-dev-cluster-0-node-0 is expanded, showing localnetwork, sanzone0, cephfs, cephpool, cephbd, and local. The right panel has tabs for Summary, Upload, Download from URL, Remove, ISO Images (which is selected), CT Templates, and Permissions. A search bar at the top right allows filtering by Name, Format, and Size. Below the tabs is a table with columns Name, Date, Format, and Size. At the bottom, there is a Tasks log table with columns Start Time, End Time, Node, User name, Description, and Status. The log shows several tasks related to SRV networking and Ceph Pool creation.

Start Time	End Time	Node	User name	Description	Status
Apr 04 18:22:26	Apr 04 18:22:27	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:21	Apr 04 18:22:23	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:17	Apr 04 18:22:19	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:16	Apr 04 18:22:27	proxmox-d...	root@pam	reloadnetworkall	OK
Apr 04 18:16:35	Apr 04 18:16:37	proxmox-d...	root@pam	Ceph Pool cephpool - Create	OK

Upload it to the CephFS. Since it's a shared storage location, now all hosts will be able to create VMs based on this ISO without copying.

The screenshot shows the Proxmox VE 8.3.5 interface. In the left sidebar, under 'Datacenter (CLUSTER)', there is a list of nodes: proxmox-dev-cluster-0-node-0, proxmox-dev-cluster-0-node-1, and proxmox-dev-cluster-0-node-2. In the main pane, the 'ISO Images' tab is selected. A table lists an ISO image entry:

Name	Date	Format	Size
debian-12.10.0-amd64-netinst.iso	2025-03-31 02:04:33	iso	663.75 MB

Below the ISO list, there is a 'Tasks' section showing a log of recent system activities:

Start Time	End Time	Node	User name	Description	Status
Apr 02 17:32:54	Apr 02 17:32:56	proxmox-d...	root@pam	VM 100 - Shutdown	OK
Apr 02 17:17:53	Apr 02 17:22:27	proxmox-d...	root@pam	VM/CT 103 - Console	OK
Apr 02 17:17:48	Apr 02 17:22:26	proxmox-d...	root@pam	VM/CT 100 - Console	OK
Apr 02 12:34:35	Apr 02 12:34:39	proxmox-d...	root@pam	Update package database	OK
Apr 02 10:55:57	Apr 02 10:56:01	proxmox-d...	root@pam	Update package database	OK

## Create VM

Press 'Create VM' button

The screenshot shows the Proxmox VE 8.3.5 interface with the 'Create VM' dialog open. The 'General' tab is selected. The configuration includes:

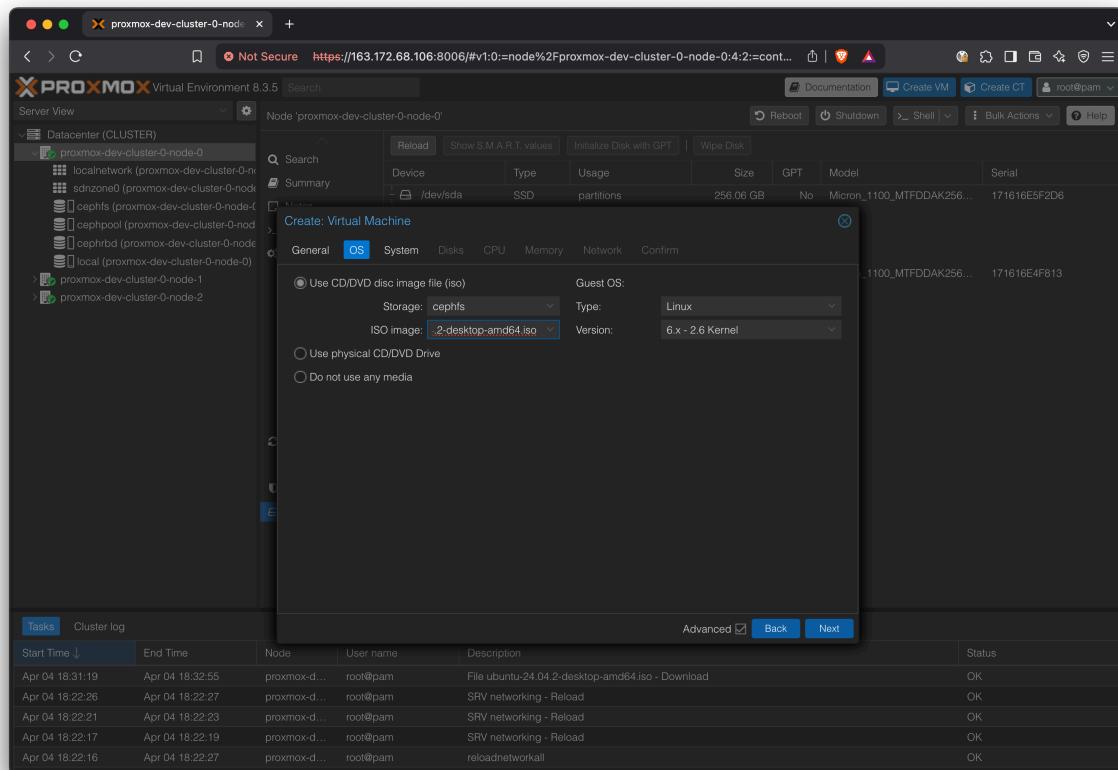
- Node:** proxmox-dev-cluster-0-node-0
- VM ID:** 100
- Name:** ubuntu-24.04-desktop-template

Below the configuration, there are sections for 'Start at boot:', 'Resource Pool:', and 'Tags'. At the bottom of the dialog, there are 'Advanced' and 'Next' buttons.

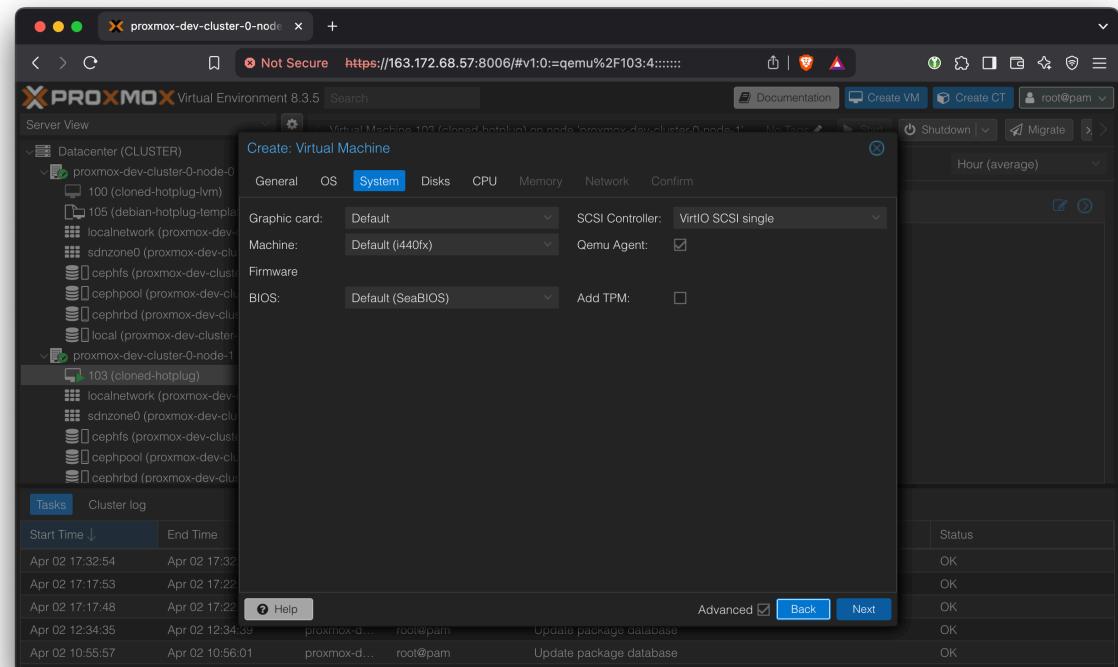
At the bottom of the screen, there is a 'Tasks' section showing a log of recent system activities:

Start Time	End Time	Node	User name	Description	Status
Apr 04 18:31:19	Apr 04 18:32:55	proxmox-d...	root@pam	File ubuntu-24.04.2-desktop-amd64.iso - Download	OK
Apr 04 18:22:26	Apr 04 18:22:27	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:21	Apr 04 18:22:23	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:17	Apr 04 18:22:19	proxmox-d...	root@pam	SRV networking - Reload	OK
Apr 04 18:22:16	Apr 04 18:22:27	proxmox-d...	root@pam	reloadnetworkall	OK

Use the previously uploaded ISO in cephfs:

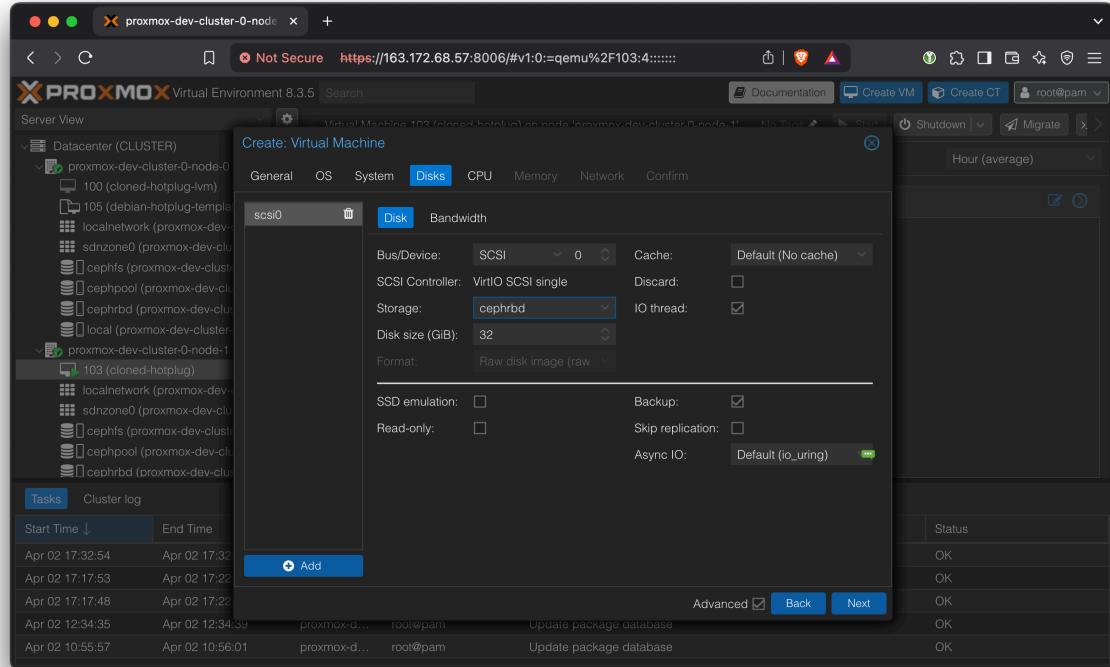


In System, select 'Qemu Agent'



In Storage, select the Ceph RBD. The disk size is not meaningfully changeable after this, so pick carefully. (More accurately, we can change the disk size but we cannot change the boot partition without rebooting)

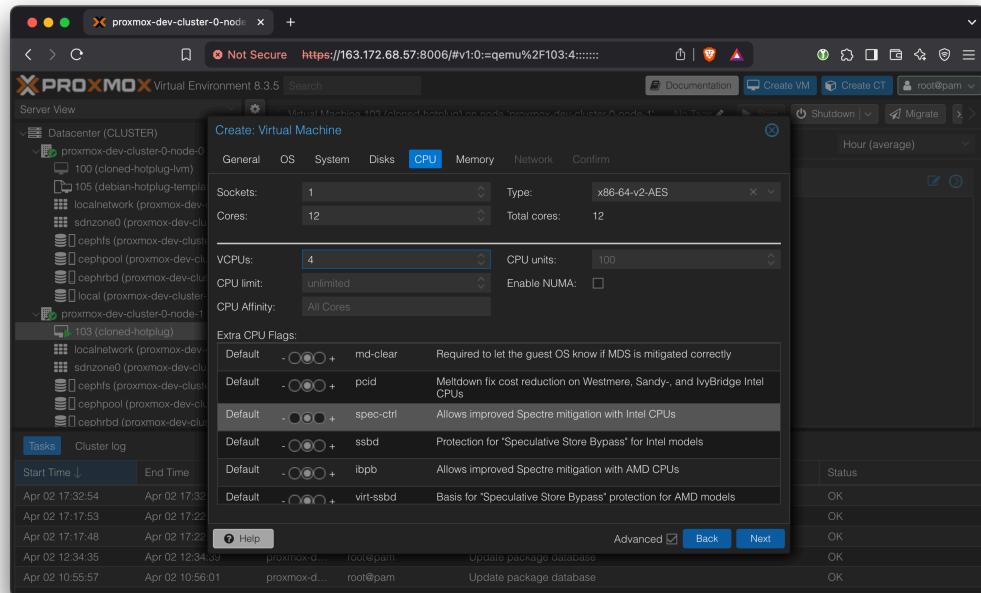
and complex steps)



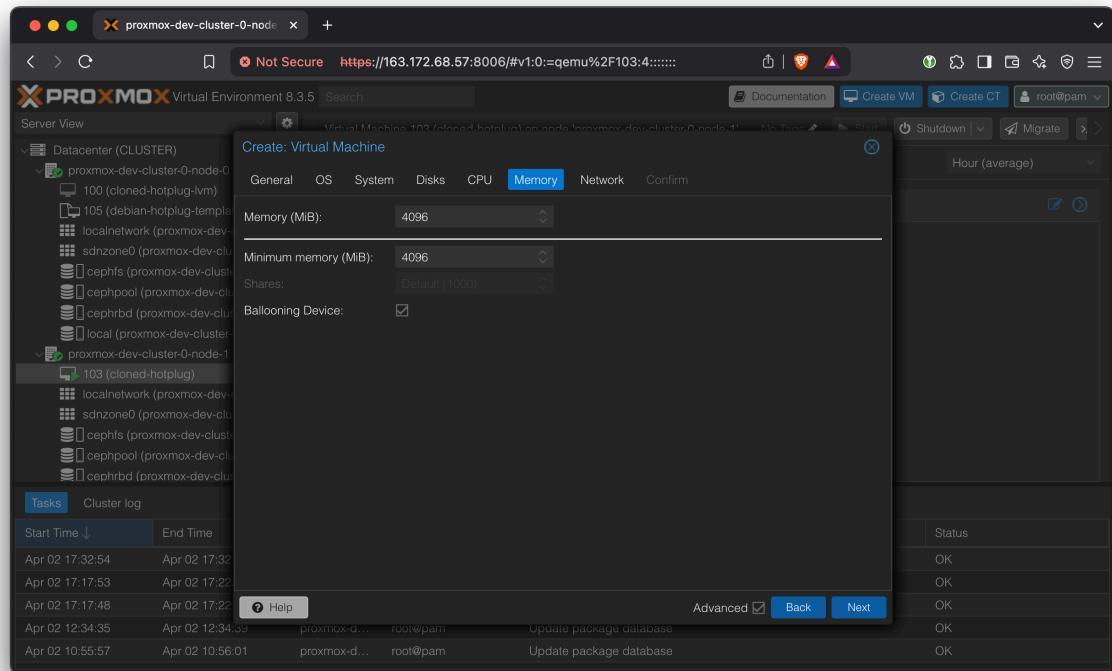
In CPU, enter the maximum number of cores that will ever be used by this VM at the top 'Cores'. It cannot exceed the number of physical cores on the host.

Enter the actually allocated number of cores in the bottom 'VCPUs'.

Enable NUMA.

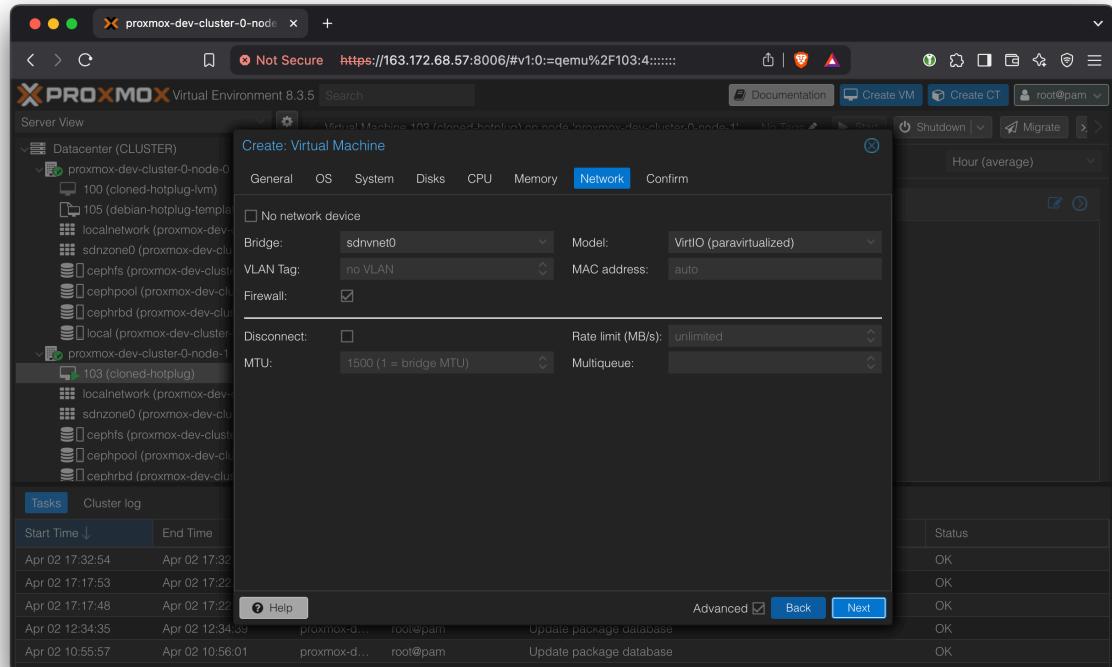


In Memory, ensure Ballooning Device is selected.



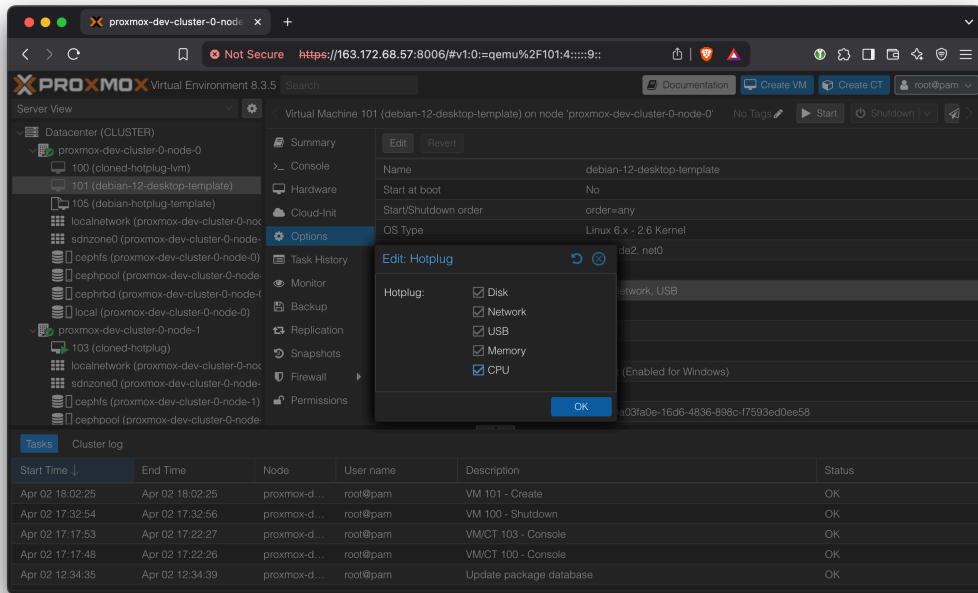
In Network, a vnet created in the above SDN (Software Defined Network) should show up. This can be thought of as an internal network for the VMs, with the Proxmox cluster providing an internet gateway and a DHCP server.

Enable Firewall to disable inter-VM traffic.



Finish VM creation. Don't start it yet.

Select the newly created VM in the Server View and open Options → Hotplug.



Enable everything including Memory and CPU.

Now we are ready to install the OS. Press 'Start' on this VM and open the Console.

Keep sensible defaults for the OS.

Once the OS is installed, we need to make the following system modifications.

Install OpenSSH:

```
sudo apt install openssh-server  
sudo systemctl start ssh.service
```

These are all just bash commands, so we can do it from the VM's own terminal, or SSH into it from the host. At this point, the VM doesn't have an IP address so we won't be able to SSH into it from outside the cluster.

## Guest VM Modifications for Vertical Scaling

[https://pve.proxmox.com/pve-docs/chapter-qm.html# vcpu\\_hot\\_plug](https://pve.proxmox.com/pve-docs/chapter-qm.html# vcpu_hot_plug)

On ubuntu 24, only one "cpu" line is needed.

```
mkdir -p /lib/udev/rules.d/  
echo 'SUBSYSTEM=="cpu", ACTION=="add", TEST=="online", ATTR{online}=="0", ATTR{online}=="1"' >
```

On Debian 12, the additional line

```
echo 'SUBSYSTEM=="memory", ACTION=="add", TEST=="state", ATTR{state}=="offline", ATTR{state}=
```

Is required. The [https://pve.proxmox.com/wiki/Hotplug\\_\(qemu\\_disk,nic,cpu,memory\)](https://pve.proxmox.com/wiki/Hotplug_(qemu_disk,nic,cpu,memory)) docs say that the memory line is only required for kernel older than 4.7, but on Debian 12 with Kernel 6.1, it was still necessary. If left out, the VM will only see 1GB of RAM.

Edit /etc/default/grub

```
vi /etc/default/grub
```

Find the `GRUB_CMDLINE_LINUX_DEFAULT` line and add `movable_node`

```
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash movable_node"
```

```
update-grub
```

Now, we are able to freely scale the CPU and RAM up and down using the Proxmox web GUI → Hardware.

Note that for most system monitoring programs, changes to the CPU count won't be shown unless you re-open the program. Typically, changes in RAM capacity will show up instantly.

For convenience, install some commonly used packages that are used later

```
apt install -y htop vim iperf3 bc rclone
```

### Clean the image for use as template

```
apt clean
```

```
# Delete temp files
rm -rf /tmp/*
rm -rf /var/tmp/*
```

```
# Reset machine-id
truncate -s 0 /etc/machine-id
rm -f /var/lib/dbus/machine-id
```

```
# Remove random seed files
rm -f /var/lib/systemd/random-seed
rm -f /loader/random-seed
```

```
# Remove system identity files
rm -f /var/lib/dbus/machine-id
rm -rf /var/lib/cloud/instances/*
```

```
# Remove credential secret
```

```
rm -f /var/lib/systemd/credential.secret  
  
# Reset SSH host keys  
rm -f /etc/ssh/ssh_host_*
```

### Shutdown the VM.

Use the Proxmox GUI to create template using this VM.

To use this template, 'Clone VM Template' from the VM, instead of 'Create VM' at the top of the screen.

In the future, we should automate the OS installation process using something like cloud-init.

## Mount a Backblaze Bucket

We create a very slightly modified template, starting from the above Ubuntu desktop template.

Since we deleted the SSH host keys in the previous step for a clean OS, we need to reconfigure it. This needs to be done for new VMs.

```
sudo dpkg-reconfigure openssh-server
```

We simply add a script in the user's home directory, which can be run once to set up a backblaze mount.

```
https://github.com/tensorturtle/yundera-limitless-pc/blob/main/backblaze-mount/setup-backblaze  
-mount.sh
```

The user should be directed to run this once at the beginning.

In Proxmox, a new VM template is created.

This VM template has full CPU and RAM vertical scalability, along with Backblaze mount setup script.

The Setup process for the POC is now complete. The next section will demonstrate starting up a VM based on the above template and run some experiments to verify the vertical scaling capabilities.

## CasaOS Installation

On top of the Ubuntu + Backblaze template, we install CasaOS to create the final template.

```
wget -qO- https://get.casaos.io | sudo bash
```

A demo VM is spun up using this template at

<https://yundera-limitless-pc-demo.tensorturtle.com>

Some unique modifications were made to serve as a demo:

- A demo Backblaze bucket (from Jason Sohn's Backblaze account) is mounted.
- This VM is connected to Jason Sohn's personal Tailscale network and reverse proxy server. A similar VPN based setup is required for deployment.

