1. Proxmox : utiliser une carte graphique Nvidia avec un conteneur LXC

Lien : https://shionn.github.io/draft/nvidia-proxmox-lxc-passthrought-ollama.html

1.1. Installation des pilotes sur le serveur Proxmox

- mise à jour du serveur

```
apt update && apt upgrade
```

- Installation des prérequis logiciels

```
apt install pve-nvidia-vgpu-helper nvtop pve-headers build-essential
```

- Pré configuration de Proxmox :

```
pve-nvidia-vgpu-helper setup
```

- Installation des paquets du driver nvidia.

```
wget https://developer.download.nvidia.com/compute/cuda/repos/debian13/x86_64/cuda-keyring_1.1-1_all.deb
apt install ./cuda-keyring_1.1-1_all.deb
apt update
apt upgrade
apt install nvidia-driver-cuda
```

- reboot du serveur
- il doit maintenant être possible d'utiliser l'outil nvidia-smi :

```
# nvidia-smi
Wed Jan 14 15:05:04 2026
+-----------------------------------------------------------------------------------------+
| NVIDIA-SMI 590.48.01              Driver Version: 590.48.01      CUDA Version: 13.1     |
+-----------------------------------------+------------------------+----------------------+
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. ECC |
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute M. |
|                                         |                        |               MIG M. |
|=========================================+========================+======================|
|   0  Tesla T4                       On  |   00000000:86:00.0 Off |                    0 |
| N/A   38C    P8              8W /   70W |       0MiB /  15360MiB |      0%      Default |
|                                         |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+
|   1  Tesla T4                       On  |   00000000:AF:00.0 Off |                    0 |
| N/A   38C    P8              9W /   70W |       0MiB /  15360MiB |      0%      Default |
|                                         |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+

+-----------------------------------------------------------------------------------------+
| Processes:                                                                              |
|  GPU   GI   CI              PID   Type   Process name                        GPU Memory |
|        ID   ID                                                               Usage      |
|=========================================================================================|
|  No running processes found                                                             |
+-----------------------------------------------------------------------------------------+
```

- Visualisation des périphériques Nvidia ajouté à l'hôte Proxmox :

```
# ls -l /dev/nvi*
crw-rw-rw- 1 root root 195,   0 Jan 12 23:18 /dev/nvidia0
crw-rw-rw- 1 root root 195,   1 Jan 12 23:18 /dev/nvidia1
crw-rw-rw- 1 root root 195, 255 Jan 12 23:18 /dev/nvidiactl
crw-rw-rw- 1 root root 195, 254 Jan 12 23:18 /dev/nvidia-modeset
crw-rw-rw- 1 root root 511,   0 Jan 14 11:56 /dev/nvidia-uvm
crw-rw-rw- 1 root root 511,   1 Jan 14 11:56 /dev/nvidia-uvm-tools

/dev/nvidia-caps:
```

```
total 0
cr-------- 1 root root 236, 1 Jan 14 11:56 nvidia-cap1
cr--r--r-- 1 root root 236, 2 Jan 14 11:56 nvidia-cap2
```

- Vérifier si Proxmox voit bien les deux GPU au niveau PCIe

```
# lspci | grep -i nvidia

AF:00.0 NVIDIA Corporation TU104GL [Tesla T4]
B0:00.0 NVIDIA Corporation TU104GL [Tesla T4]
```

- vérifier que CUDA voit les deux cartes

```
# nvidia-smi -L
GPU 0: Tesla T4 (UUID: GPU-e5bc6842-5aa8-b29e-aa13-922b15c893f9)
GPU 1: Tesla T4 (UUID: GPU-6ac33a99-2cb8-eb7d-6097-f1c29e4d1e51)
```

- Vérifier si le driver charge bien les deux GPU : il ne doit y avoir aucune erreur

```
# dmesg | grep -i nvidia
Erreurs possibles :
GPU has fallen off the bus
PCIe error
failed to initialize gpu
RUNTIME_PM: error
Unknown chipset
NVRM: RmInitAdapter failed
```

- Vérifier si le module UVM détecte les deux GPU

```
# cat /proc/driver/nvidia/gpus/*/information
Il doit y avoir deux répertoires (0 et 1) :
# nvidia-smi -q | grep -i "Compute Mode"
    Compute Mode                                    : Default
root@siohyp2:~# cat /proc/driver/nvidia/gpus/*/information
Model:           Tesla T4
IRQ:             44
GPU UUID:        GPU-e5bc6842-5aa8-b29e-aa13-922b15c893f9
Video BIOS:      90.04.b4.00.04
Bus Type:        PCIe
DMA Size:        47 bits
DMA Mask:        0x7fffffffffff
Bus Location:    0000:86:00.0
Device Minor:    0
GPU Firmware:    590.48.01
GPU Excluded:    No
Model:           Tesla T4
IRQ:             46
GPU UUID:        GPU-6ac33a99-2cb8-eb7d-6097-f1c29e4d1e51
Video BIOS:      90.04.b4.00.04
Bus Type:        PCIe
DMA Size:        47 bits
DMA Mask:        0x7fffffffffff
Bus Location:    0000:af:00.0
Device Minor:    1
GPU Firmware:    590.48.01
GPU Excluded:    No
```

Il y a deux cartes avec des adresses PCI différentes :

- GPU 0 → 0000:86:00.0
- GPU 1 → 0000:af:00.0

- lancer un benchmark PCIe / mémoire

```
# nvidia-smi topo -m
        GPU0    GPU1    CPU Affinity    NUMA Affinity   GPU NUMA ID
GPU0     X      NODE    24-35,72-83     2               N/A
GPU1    NODE     X      24-35,72-83     2               N/A

Legend:
```

```
  X    = Self
  SYS  = Connection traversing PCIe as well as the SMP interconnect between NUMA nodes (e.g., QPI/UPI)
  NODE = Connection traversing PCIe as well as the interconnect between PCIe Host Bridges within a NUMA
node
  PHB  = Connection traversing PCIe as well as a PCIe Host Bridge (typically the CPU)
  PXB  = Connection traversing multiple PCIe bridges (without traversing the PCIe Host Bridge)
  PIX  = Connection traversing at most a single PCIe bridge
  NV#  = Connection traversing a bonded set of # NVLinks
```

```
# nvidia-smi -i 0
Mon Mar 30 14:49:26 2026
+-----------------------------------------------------------------------------------------+
| NVIDIA-SMI 595.58.03              Driver Version: 595.58.03      CUDA Version: 13.2     |
+-----------------------------------------+------------------------+----------------------+
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. ECC |
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute M. |
|                                         |                        |               MIG M. |
|=========================================+========================+======================|
|   0  Tesla T4                       Off |   00000000:86:00.0 Off |                    0 |
| N/A   62C    P0             27W /   70W |       0MiB /  15360MiB |      4%      Default |
|                                         |                        |                  N/A |
+-----------------------------------------+------------------------+----------------------+

+-----------------------------------------------------------------------------------------+
| Processes:                                                                              |
|  GPU   GI   CI              PID   Type   Process name                        GPU Memory |
|        ID   ID                                                               Usage      |
|=========================================================================================|
|  No running processes found                                                             |
+-----------------------------------------------------------------------------------------+
```

- charger le GPU 0

```
# nvidia-smi --query-gpu=utilization.gpu --format=csv --loop=1 -i 0
```

- charger le GPU 1

```
# nvidia-smi --query-gpu=utilization.gpu --format=csv --loop=1 -i 1
```

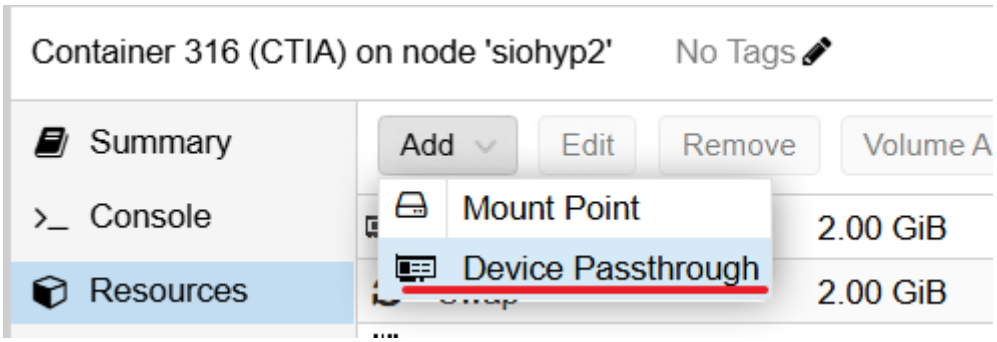
1.2. Nvidia dans le Container LXC

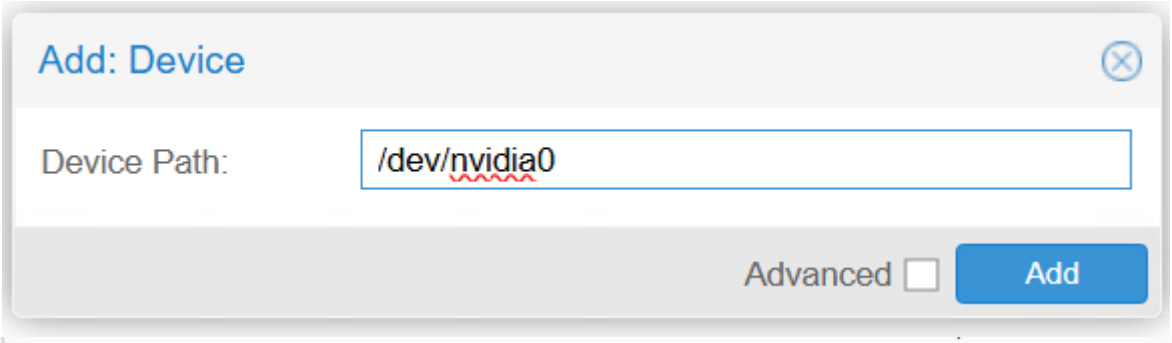
- mettre à jour le conteneur

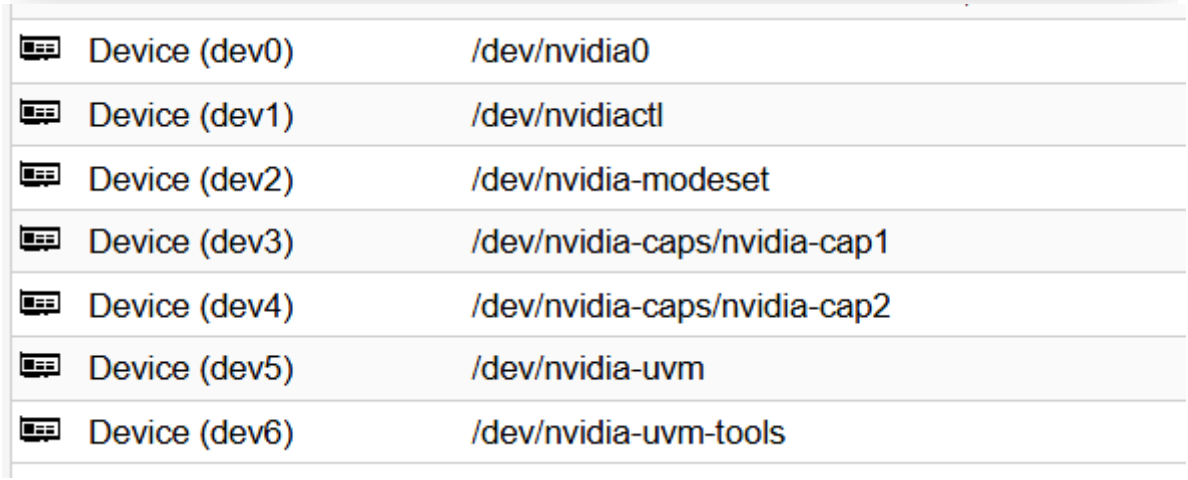
```
apt update & apt upgrade
```

- Les conteneurs LXC n'ont pas besoin d'option particulière, ni besoin d'être privilégiés.
- Configurer Le passthrough (GPU passthrough) dans Proxmox pour les GPU des carte NVidia.

- ajoutez au conteneur LXC les périphériques passthrough







- Installez les drivers nvidia et la suite logicielle **cuda** dans le conteneur LXC (procédure semblable à celle de l'hote Proxmox).

```
wget https://developer.download.nvidia.com/compute/cuda/repos/debian13/x86_64/cuda-keyring_1.1-1_all.deb
apt install ./cuda-keyring_1.1-1_all.deb
apt update
apt install cuda-toolkit
apt install nvidia-driver-cuda
```

- commande **nvdia-smi** pour confirmer que la carte est disponible et fonctionnelle sur votre container.

```
nvidia-smi
```

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