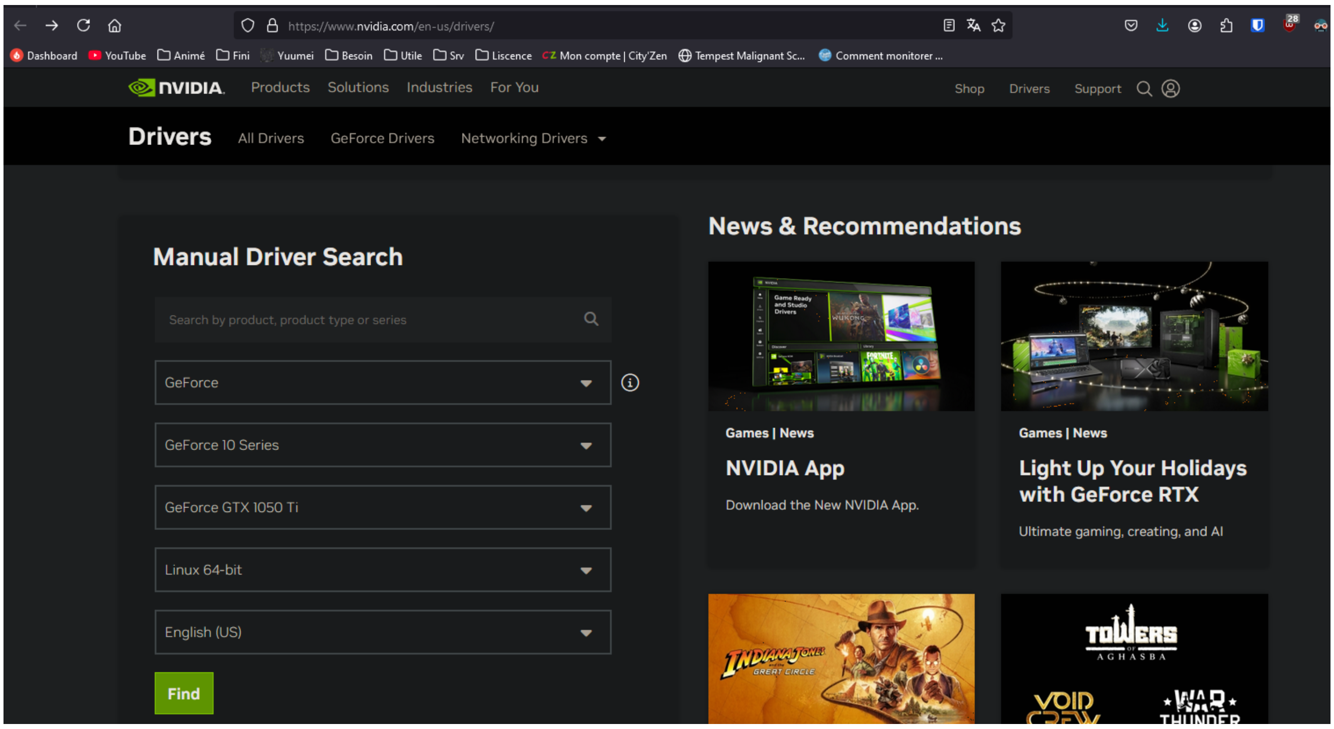
Proxmox GPU passthrough for Jellyfin LXC with NVIDIA Graphics card (GTX1050 ti)

In the terminal of the Proxmox host:

- Install gcc with `apt install gcc`
- Install build-essential with `apt install build-essential`
- Reboot the machine
- Install the pve-headers with `apt install pve-headers-$(uname -r)`
- Install the nvidia driver from the official page
  https://www.nvidia.com/download/index.aspx :



Manual Driver Search

Search by product, product type or series

GeForce

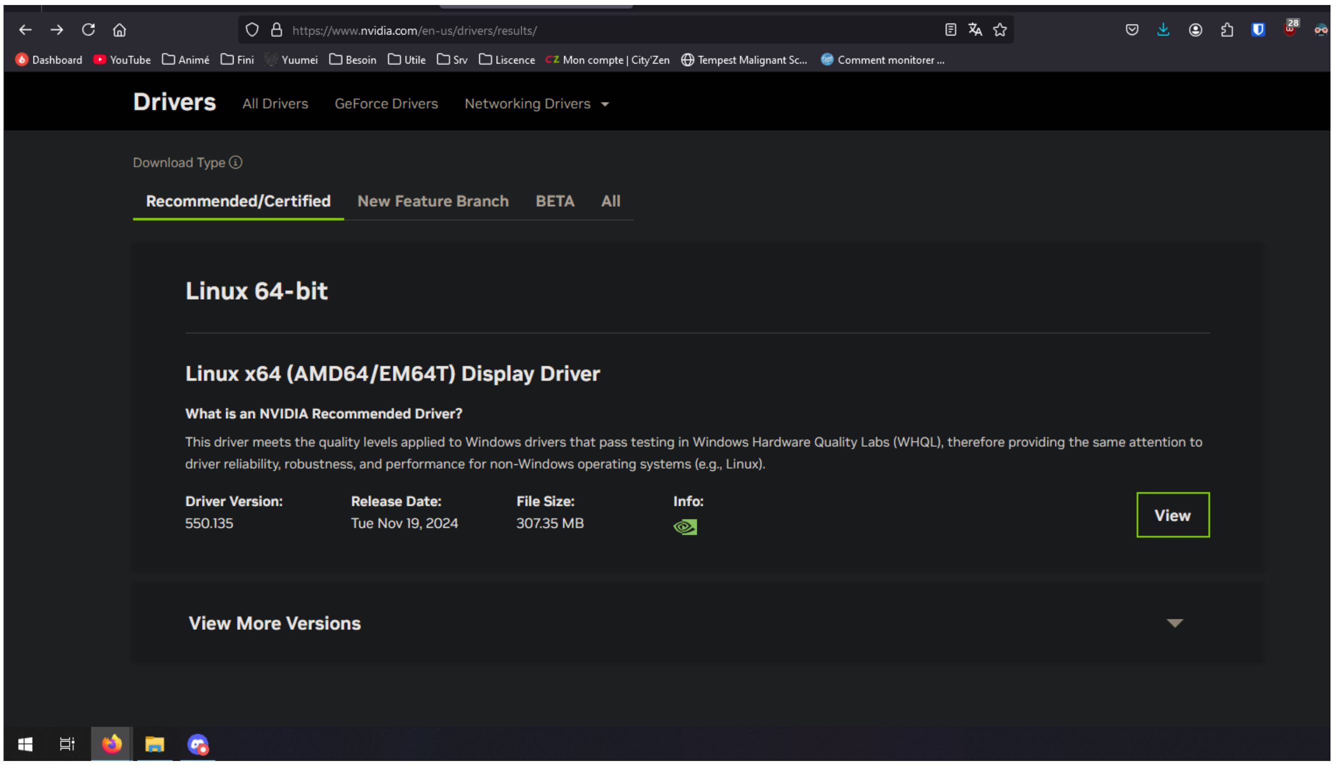
GeForce 10 Series

GeForce GTX 1050 Ti

Linux 64-bit

English (US)

Select your GPU (GTX 1050 Ti in my case) and the operating system "Linux 64-Bit" and press "Search"


https://www.nvidia.com/en-us/drivers/results/

Drivers | All Drivers | GeForce Drivers | Networking Drivers

Download Type

Recommended/Certified | New Feature Branch | BETA | All

Linux 64-bit

Linux x64 (AMD64/EM64T) Display Driver

What is an NVIDIA Recommended Driver?

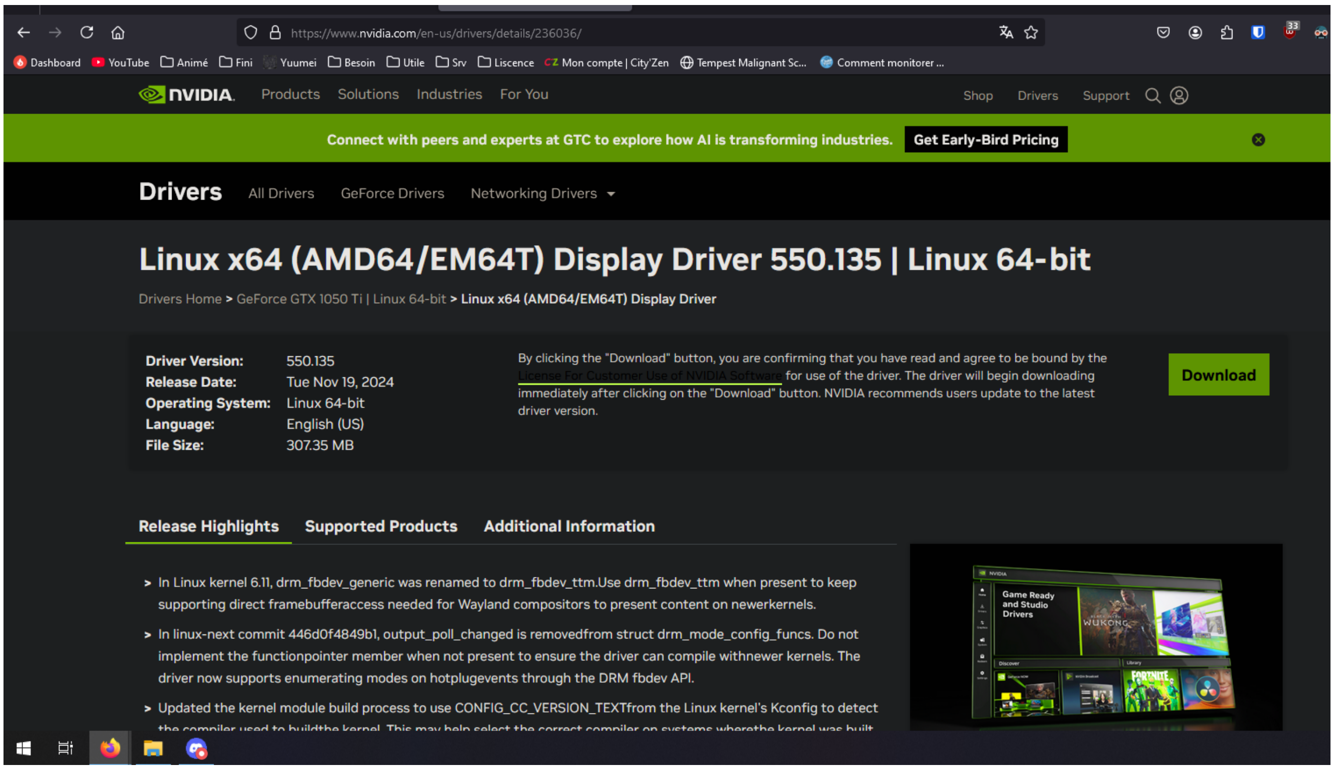
This driver meets the quality levels applied to Windows drivers that pass testing in Windows Hardware Quality Labs (WHQL), therefore providing the same attention to driver reliability, robustness, and performance for non-Windows operating systems (e.g., Linux).

Driver Version:	Release Date:	File Size:	Info:
550.135	Tue Nov 19, 2024	307.35 MB	

View

View More Versions

Press "Download"


https://www.nvidia.com/en-us/drivers/details/236036/

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Linux x64 (AMD64/EM64T) Display Driver 550.135 | Linux 64-bit

Drivers Home > GeForce GTX 1050 Ti | Linux 64-bit > Linux x64 (AMD64/EM64T) Display Driver

Driver Version:	550.135
Release Date:	Tue Nov 19, 2024
Operating System:	Linux 64-bit
Language:	English (US)
File Size:	307.35 MB

By clicking the "Download" button, you are confirming that you have read and agree to be bound by the License For Customer Use of NVIDIA Software for use of the driver. The driver will begin downloading immediately after clicking on the "Download" button. NVIDIA recommends users update to the latest driver version.

Download

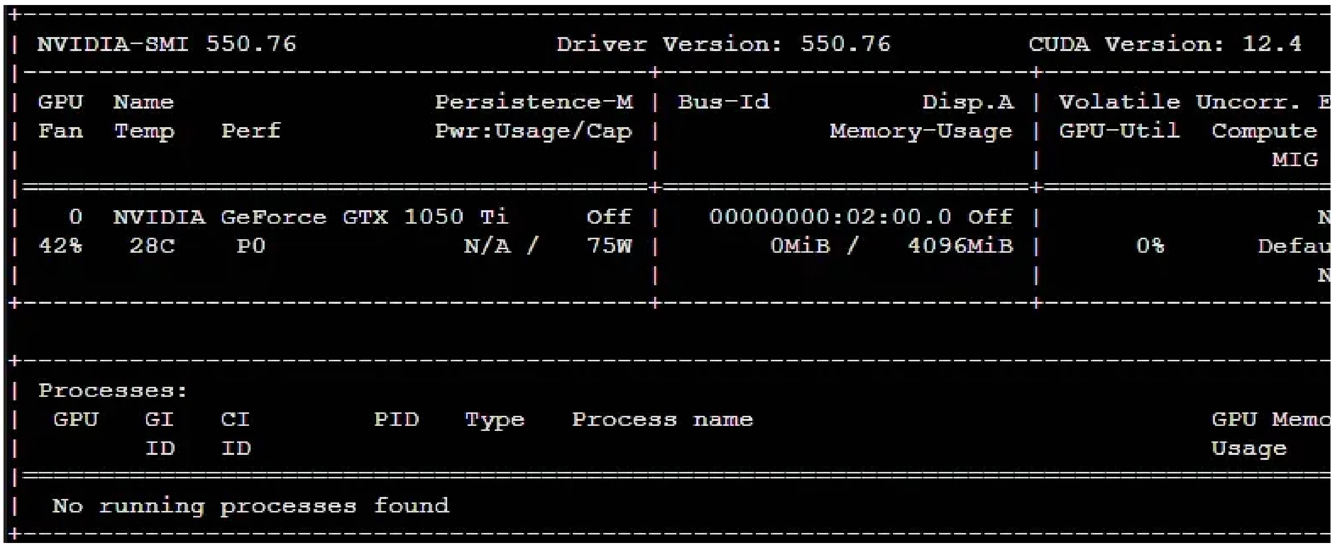
Release Highlights | Supported Products | Additional Information

- In Linux kernel 6.11, drm_fbdev_generic was renamed to drm_fbdev_ttm.Use drm_fbdev_ttm when present to keep supporting direct framebufferaccess needed for Wayland compositors to present content on newerkernels.
- In linux-next commit 446d0f4849b1, output_poll_changed is removedfrom struct drm_mode_config_funcs. Do not implement the functionpointer member when not present to ensure the driver can compile withnewer kernels. The driver now supports enumerating modes on hotplugevents through the DRM fbdev API.
- Updated the kernel module build process to use CONFIG_CC_VERSION_TEXTfrom the Linux kernel's Kconfig to detect

Right click on "Agree & Download" to copy the link to the file

- Download the file in your Proxmox host with `wget [link you copied]` ,in my case `wget https://us.download.nvidia.com/XFree86/Linux-x86_64/550.76/NVIDIA-Linux-x86_64-550.76.run`

- Also copy the link into a text file, as we will need the exact same link later again. (For the GPU passthrough to work, the drivers in Proxmox and inside the lxc need to match, so it is vital, that we download the same file on both)
- After the download finished, run `ls` , to see the downloades file, in my case it listed `NVIDIA-Linux-x86_64-550.76.run` . Mark the filename and copy it
- Now execute the file with `sh [filename]` (in my case `sh NVIDIA-Linux-x86_64-550.76.run`) and go through the installer. There should be no issues. When asked about the x-configuration file, I accepted. You can also ignore the error about the 32-bit part missing.
- Reboot the machine
- Run `nvidia-smi` , to verify the installation - if you get the box shown below, everything worked so far:



```
+-----------------------------------------------------------------------------------
| NVIDIA-SMI 550.76                 Driver Version: 550.76         CUDA Version: 12.4
|-----------------------------------------+------------------------+----------------
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. E
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute
|                                         |                        |               MIG
|=========================================+========================+================
|   0  NVIDIA GeForce GTX 1050 Ti     Off |   00000000:02:00.0 Off |                  N
| 42%   28C    P0             N/A /   75W |       0MiB /   4096MiB |      0%      Defau
|                                         |                        |                  N
+-----------------------------------------+------------------------+----------------

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

nvidia-smi outputt, nvidia driver running on Proxmox host

- Create a new Debian 12 lxc for Jellyfin to run in, note the container ID (CT ID), as we will need it later.
  script for auto jellyfin install :

```
bash -c "$(wget -qLO - https://github.com/community-scripts/ProxmoxVE/raw/main/ct/jellyfin.sh)"
```

- Start the lxc and log into the console, now run `apt update && apt full-upgrade -y` to update the system
- assign a static IP address to the lxc in your internet router. If you do not do that, all connected devices may loose contact to the Jellyfin host, if the IP address changes at some point.
- Reboot the lxc, to make sure all updates are applied and if you configured one, the new static IP address is applied. (You can check the IP address with the command `ip a`)
- Shutdown the lxc
- Now switch back to the Proxmox servers main console
- Run `ls -l /dev/nvidia*` to view all the nvidia devices:

```
crw-rw-rw- 1 root root 195,   0 Apr 18 19:36 /dev/nvidia0
crw-rw-rw- 1 root root 195, 255 Apr 18 19:36 /dev/nvidiactl
crw-rw-rw- 1 root root 235,   0 Apr 18 19:36 /dev/nvidia-uvm
crw-rw-rw- 1 root root 235,   1 Apr 18 19:36 /dev/nvidia-uvm-tools

/dev/nvidia-caps:
total 0
cr-------- 1 root root 238, 1 Apr 18 19:36 nvidia-cap1
cr--r--r-- 1 root root 238, 2 Apr 18 19:36 nvidia-cap2
```

- Copy the output of the previus command (`ls -l /dev/nv*`) into a text file, as we will need the information in further steps. Also take note, that all the nvidia devices are assigned to `root root` . Now we know, that we need to route the root group and the corresponding devices to the lxc.
- Run `cat /etc/group` to look through all the groups and find root. In my case (as it should be) root is right at the top:

```
root:x:0:
```

- Run `nano /etc/subgid` to add a new mapping to the file, to allow root to map those groups to a new group ID in the following process, by adding a line to the file: `root:X:1` , with X being the number of the group we need to map (in my case 0). My file ended up looking like this:

```
root:100000:65536
root:0:1
```

- Run `cd /etc/pve/lxc` to get into the folder for editing the container config file (and optionally run `ls` to view all the files)
- Run `nano X.conf` with X being the lxc ID (in my case `nano 500.conf`) to edit the corresponding containers configuration file. Before any of the further changes, my file looked like this:

```
arch: amd64
cores: 4
features: nesting=1
hostname: Jellyfin
memory: 2048
mp0: /HDD_1/media,mp=/mnt/media
net0: name=eth0,bridge=vmbr1,firewall=1,hwaddr=BC:24:11:57:90:B4,ip=dhcp,ip6=auto,type=veth
ostype: debian
rootfs: NVME_1:subvol-500-disk-0,size=12G
swap: 2048
unprivileged: 1
```

- Now we will edit this file to pass the relevant devices through to the container
    - Underneath the previously shown lines, add the following line for every device we need to pass through. Use the text you copied previously for refference, as we will need to use the corresponding numbers here for all the devices we need to pass

through. I suggest working your way through from top to bottom. For example to pass through my first device called "/dev/nvidia0" (at the end of each line, you can see which device it is), I need to look at the first line of my copied text: `crw-rw-rw- 1 root root 195, 0 Apr 18 19:36 /dev/nvidia0`
Right now, for each device only the two numbers listed after "root" are relevant, in my case 195 and 0. For each device, add a line to the containers config file, following this pattern:
`lxc.cgroup2.devices.allow: c [first number]:[second number] rwm`
So in my case, I get these lines:

```
lxc.cgroup2.devices.allow: c 195:0 rwm
lxc.cgroup2.devices.allow: c 195:255 rwm
lxc.cgroup2.devices.allow: c 235:0 rwm
lxc.cgroup2.devices.allow: c 235:1 rwm
lxc.cgroup2.devices.allow: c 238:1 rwm
lxc.cgroup2.devices.allow: c 238:2 rwm
```

- Now underneath, we also need to add a line for every device, to be mounted, following the pattern (note not to forget adding each device twice into the line)
  `lxc.mount.entry: [device] [device] none bind,optional,create=file`
  In my case this results in the following lines (if your device s are the same, just copy the text for simplicity):

```
lxc.mount.entry: /dev/nvidia0 dev/nvidia0 none bind,optional,create=file
lxc.mount.entry: /dev/nvidiactl dev/nvidiactl none bind,optional,create=file
lxc.mount.entry: /dev/nvidia-uvm dev/nvidia-uvm none bind,optional,create=file
lxc.mount.entry: /dev/nvidia-uvm-tools dev/nvidia-uvm-tools none bind,optional,create=file
lxc.mount.entry: /dev/nvidia-caps/nvidia-cap1 dev/nvidia-caps/nvidia-cap1 none bind,optional,cre
lxc.mount.entry: /dev/nvidia-caps/nvidia-cap2 dev/nvidia-caps/nvidia-cap2 none bind,optional,cre
```

- underneath, add the following lines, to map the previously enabled group to the container:

```
lxc.idmap: u 0 100000 65536
```

- to map the group ID 0 (root group in the Proxmox host, the owner of the devices we passed through) to be the same in both namespaces:

```
lxc.idmap: g 0 0 1
```

- to map all the following group IDs (1 to 65536) in the Proxmox Host to the containers namespace (group IDs 100000 to 65535):

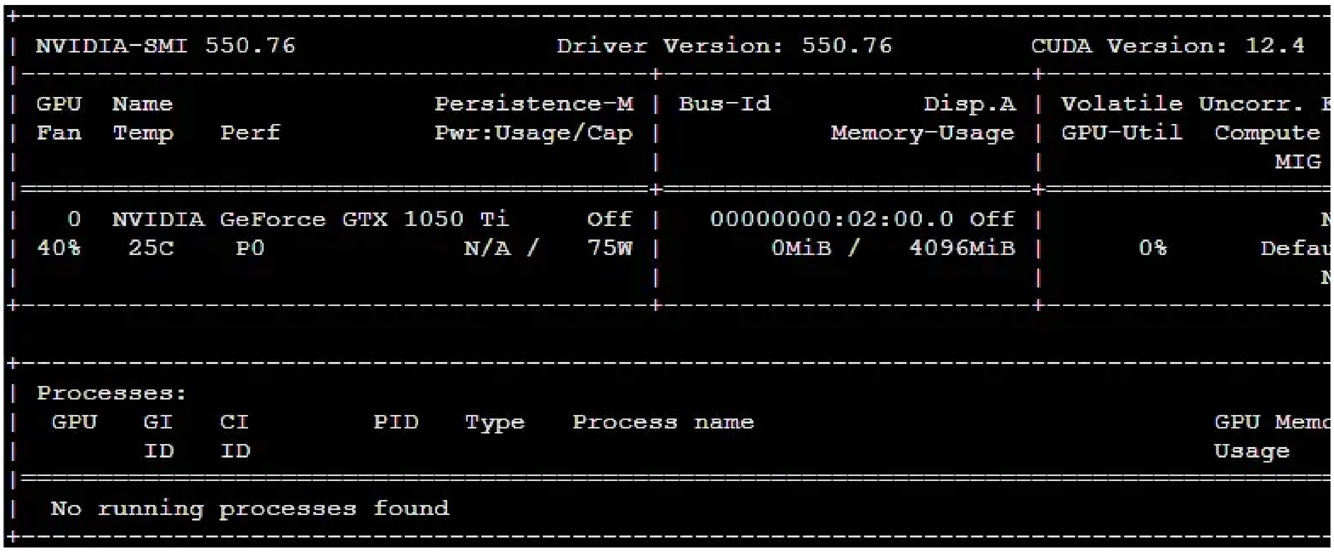
```
lxc.idmap: g 1 100000 65536
```

- In the end, the lxc configuration file looked like this:

```
arch: amd64
cores: 4
```

```
features: nesting=1
hostname: Jellyfin
memory: 2048
mp0: /HDD_1/media,mp=/mnt/media
net0: name=eth0,bridge=vmbr1,firewall=1,hwaddr=BC:24:11:57:90:B4,ip=dhcp,ip6=auto,typ>
ostype: debian
rootfs: NVME_1:subvol-500-disk-0,size=12G
swap: 2048
unprivileged: 1
lxc.cgroup2.devices.allow: c 195:0 rwm
lxc.cgroup2.devices.allow: c 195:255 rwm
lxc.cgroup2.devices.allow: c 235:0 rwm
lxc.cgroup2.devices.allow: c 235:1 rwm
lxc.cgroup2.devices.allow: c 238:1 rwm
lxc.cgroup2.devices.allow: c 238:2 rwm
lxc.mount.entry: /dev/nvidia0 dev/nvidia0 none bind,optional,create=file
lxc.mount.entry: /dev/nvidiactl dev/nvidiactl none bind,optional,create=file
lxc.mount.entry: /dev/nvidia-uvm dev/nvidia-uvm none bind,optional,create=file
lxc.mount.entry: /dev/nvidia-uvm-tools dev/nvidia-uvm-tools none bind,optional,create>
lxc.mount.entry: /dev/nvidia-caps/nvidia-cap1 dev/nvidia-caps/nvidia-cap1 none bind,o>
lxc.mount.entry: /dev/nvidia-caps/nvidia-cap2 dev/nvidia-caps/nvidia-cap2 none bind,o>
lxc.idmap: u 0 100000 65536
lxc.idmap: g 0 0 1
lxc.idmap: g 1 100000 65536
```

- Now start the lxc. If the lxc does not start correctly, check the lxc configuration file again, because you may have made a misake while adding the new lines.
- Go into the lxc console and download the same nvidia driver file, as done previously in the Proxmox host (`wget [link you copied]`), using the link you copied before
  - Run `ls` , to see the file you downloaded and copy the file name
  - Execute the file, but now add the --no-kernel-module flag. Because the host shares its kernel with the container, the files are already installed. Leaving this flag out, will cause an error:
    `sh [filename] --no-kernel-module`
    in my case `sh NVIDIA-Linux-x86_64-550.76.run --no-kernel-module`
    Run the installer the same way, as before. You can again ignore the X-driver error and the 32 bit error. Take note of the vulkan loader error. I don't know if the package is actually necessary, so I installed it, just to be safe. For the current debian 12 distro, libvulkan1 is the right one:
    `apt install libvulkan1`
- Reboot the whole Proxmox server
- Run `nvidia-smi` inside the lxc console. You should now get the familiar box again. If there is an error message, something went wrong (see possible mistakes below)

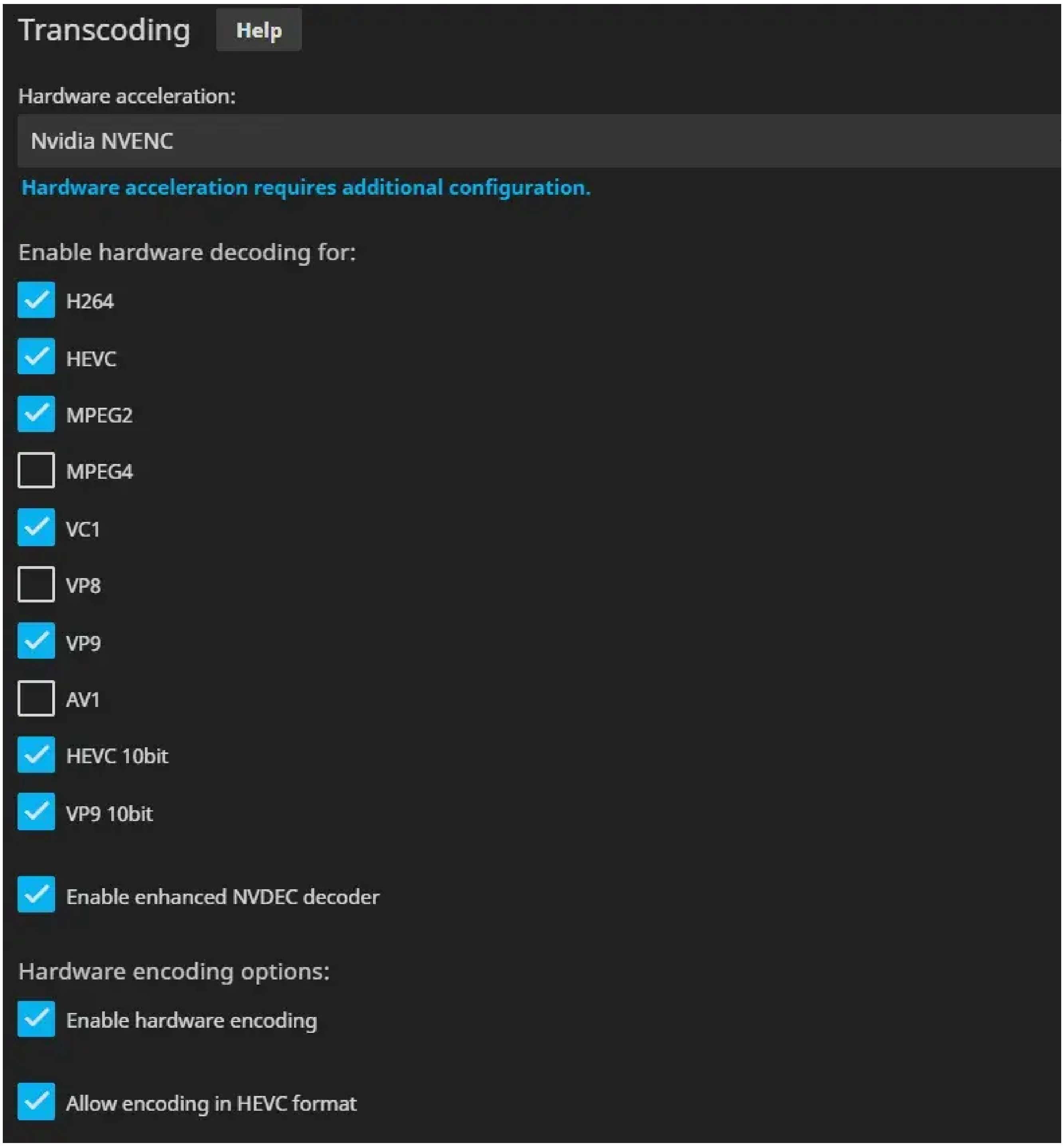


```
+-----------------------------------------------------------------------------------------
| NVIDIA-SMI 550.76                 Driver Version: 550.76         CUDA Version: 12.4
|-----------------------------------------+------------------------+----------------------
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. E
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute
|                                         |                        |               MIG
|=========================================+========================+======================
|   0  NVIDIA GeForce GTX 1050 Ti     Off |   00000000:02:00.0 Off |                    N
| 40%   25C    P0             N/A /   75W |       0MiB /   4096MiB |      0%      Defau
|                                         |                        |                    N
+-----------------------------------------+------------------------+----------------------

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

nvidia-smi output lxc , driver running with access to GPU

- Go into the Jellyfin Dashboard and into the settings. Under Playback, select Nvidia NVENC vor video transcoding and select the appropriate transcoding methods (see the matrix under "Decoding" on https://developer.nvidia.com/video-encode-and-decode-gpu-support-matrix-new for refference)
  In my case, I used the following options, although I have not tested the system completely for stability:


Transcoding

Hardware acceleration: Nvidia NVENC

Hardware acceleration requires additional configuration.

Enable hardware decoding for:

- [✓] H264
- [✓] HEVC
- [✓] MPEG2
- [ ] MPEG4
- [✓] VC1
- [ ] VP8
- [✓] VP9
- [ ] AV1
- [✓] HEVC 10bit
- [✓] VP9 10bit

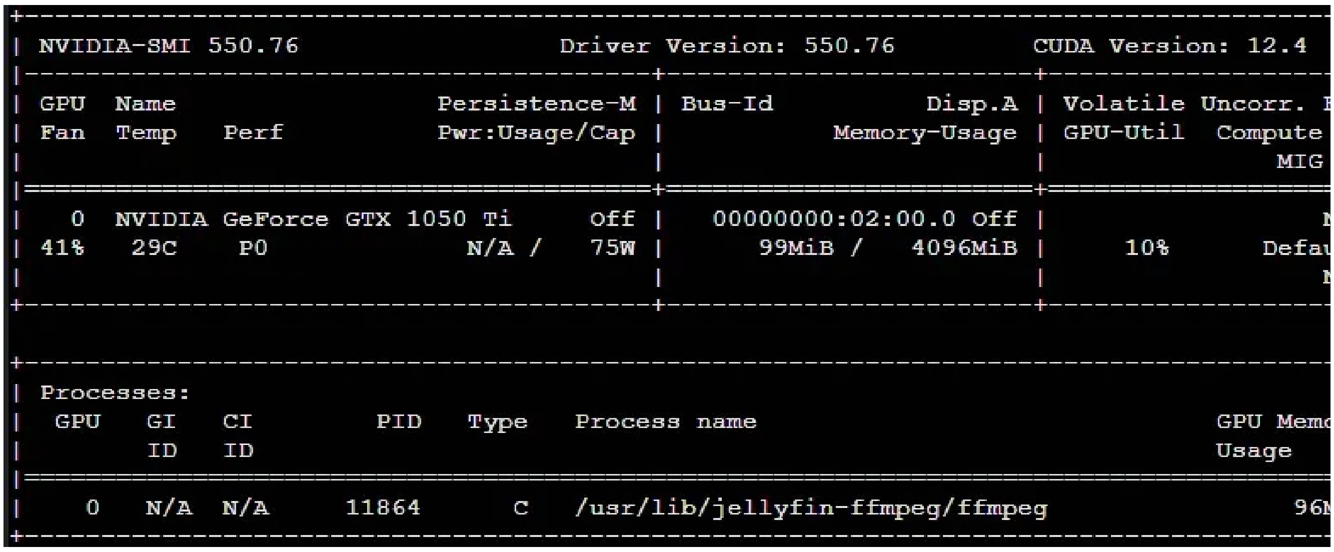
- [✓] Enable enhanced NVDEC decoder

Hardware encoding options:

- [✓] Enable hardware encoding
- [✓] Allow encoding in HEVC format

Jellyfin Transcoding settings

- Save these settings with the "Save" button at the bottom of the page
- Start a Movie on the Jellyfin web-GUI and select a non native quality (just try a few)
- While the movie is running in the background, open the Proxmox host shell and run
  ```
  nvidia-smi
  ```
  If everything works, you should see the process running at the bottom (it will only be visible in the Proxmox host and not the jellyfin container):



```
+-----------------------------------------------------------------------------------
| NVIDIA-SMI 550.76                 Driver Version: 550.76         CUDA Version: 12.4
|-----------------------------------------+-------------------------+---------------
| GPU  Name                 Persistence-M | Bus-Id          Disp.A | Volatile Uncorr. E
| Fan  Temp   Perf          Pwr:Usage/Cap |           Memory-Usage | GPU-Util  Compute
|                                         |                        |               MIG
|=========================================+========================+===============
|   0  NVIDIA GeForce GTX 1050 Ti     Off |   00000000:02:00.0 Off |                  N
| 41%   29C    P0            N/A /   75W |      99MiB /   4096MiB |     10%      Defau
|                                         |                        |                  N
+-----------------------------------------+------------------------+---------------

+-----------------------------------------------------------------------------------
| Processes:
|  GPU   GI   CI        PID   Type   Process name                              GPU Memo
|        ID   ID                                                              Usage
|===================================================================================
|    0   N/A  N/A     11864      C   /usr/lib/jellyfin-ffmpeg/ffmpeg                96M
+-----------------------------------------------------------------------------------
```

Transdcoding process running

- OPTIONAL: a way to disable the cap for the maximum encoding streams (https://forum.proxmox.com/threads/jellyfin-lxc-with-nvidia-gpu-transcoding-and-network-storage.138873/ see " The final step: Unlimited encoding streams").
  - First in the Proxmox host shell:
    - Run `cd /opt/nvidia`
    - Run `wget` `https://raw.githubusercontent.com/keylase/nvidia-patch/master/patch.sh`
    - Run `bash ./patch.sh`
  - Then, in the Jellyfin container console:
    - Run `mkdir /opt/nvidia`
    - Run `cd /opt/nvidia`
    - Run `wget` `https://raw.githubusercontent.com/keylase/nvidia-patch/master/patch.sh`
    - Run `bash ./patch.sh`
  - Afterwards I rebooted the whole server

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