Programming for Robotics - ROS

Course Preparation

version 3

In this course, we will work with Ubuntu 20.04 and ROS Noetic Ninjemys. We highly recommend you to **use a virtual machine and the provided image** that already contains a preinstalled environment with the following software:

- Ubuntu 20.04
- ROS Noetic Ninjemys
- Eclipse IDE
- Catkin Command Line Tools
- Terminator
- Git

Install Virtual Machine

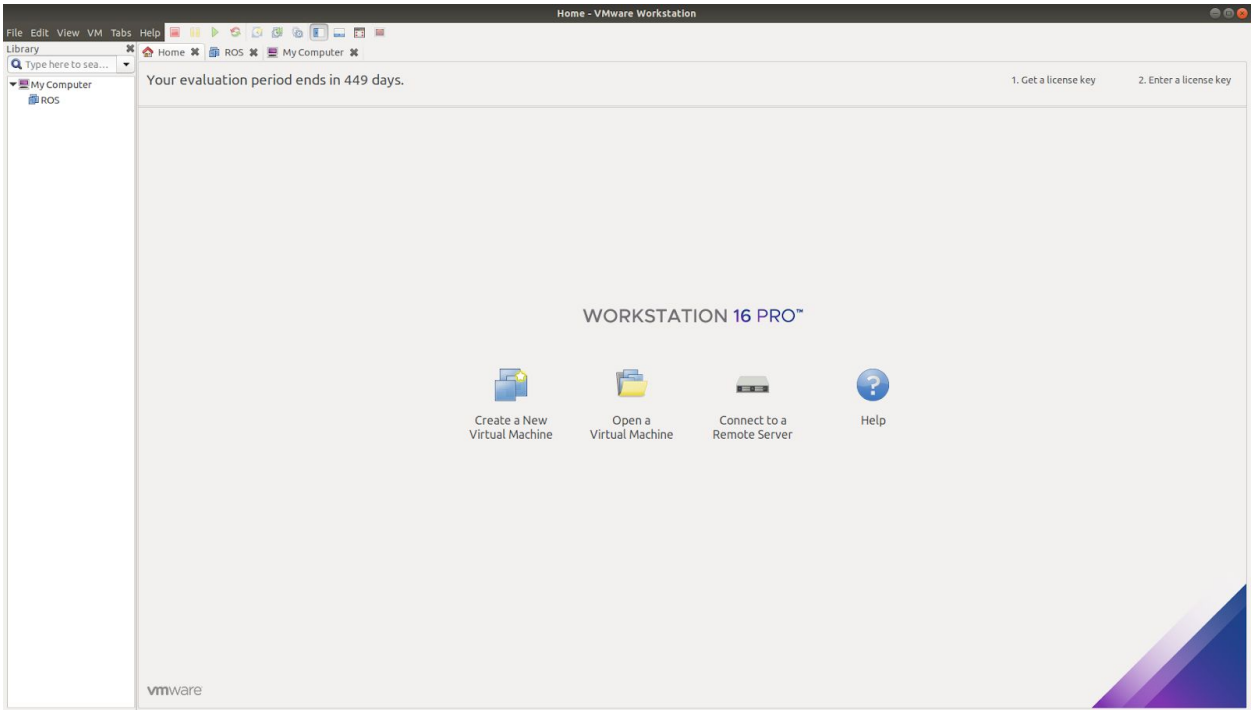
To run the provided image you need the VMware Workstation 16 Pro (Windows, Linux) or VMware Fusion 12 (macOS). This software can be ordered on the ETH Zurich's IT Shop (free for students): https://itshop.ethz.ch/, search for "VMware Academic Program ETH Stud".

Please follow the given instructions to download and install the software from VMware. You find the license key under "View Order Details" on the download page. We recommend you to have at least 20GB of available disk space on your computer to run the virtual machine.

Download Image
The virtual machine image is located in this folder on Gdrive
There are three files that you need to download (.vmdk, .ovf, .mk).

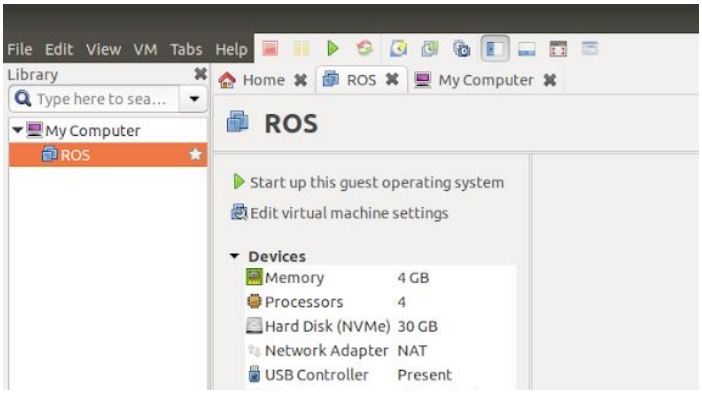
Start-Up Virtual Machine

- Open VMware Workstation
- Select Open a Virtual Machine (or, File > Open)
- Open file ROS.ovf (one of three files that you downloaded from Gdrive)

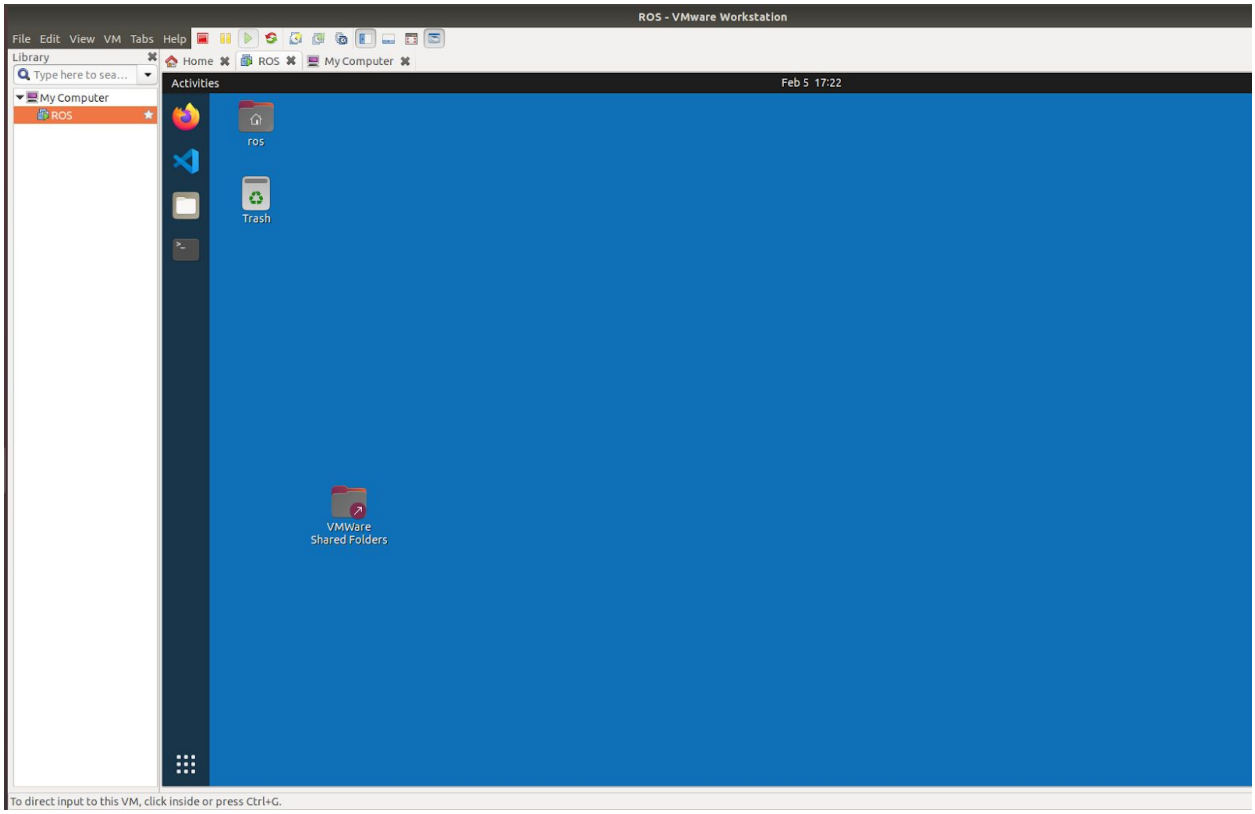


- Start the virtual machine with “Power on this virtual machine” or “Start up this guest operating system”. A prompt will open and ask if you copied or moved the virtual machine, click “I Copied It”.

> **Important!** If it is the first time you are using a virtual machine on your laptop, there might be an error message that tells you that “This host supports Intel VT-x, but Intel VT-x is disabled”. The Intel Virtual Technology (Intel VT) has to be enabled in your BIOS (or UEFI). You will have to restart the computer and press either Enter, F1, F10, or DEL to go to BIOS settings (depending on your PC manufacturer). Under Security->System Security you will find the option to enable VT. Some more explanations can be found here.



- The VM should boot to Ubuntu's Desktop



> **NB** The (sudo) password for the VMs user 'ros' is: **ros**

- The last thing to configure is the Remote Assistance solution. This remote desktop client allows TAs to log into your machine and resolve any problems that you might encounter during the exercise session.
    - To setup the client simply open a terminal (Terminator) by clicking on the terminal Icon on the left side (alternatively press Ctrl+Alt+T). Type `setup-assist` and press Enter. Follow the instructions shown in terminal.

> **Important!** Follow the provided naming instructions to allow TAs to clearly identify your VM.

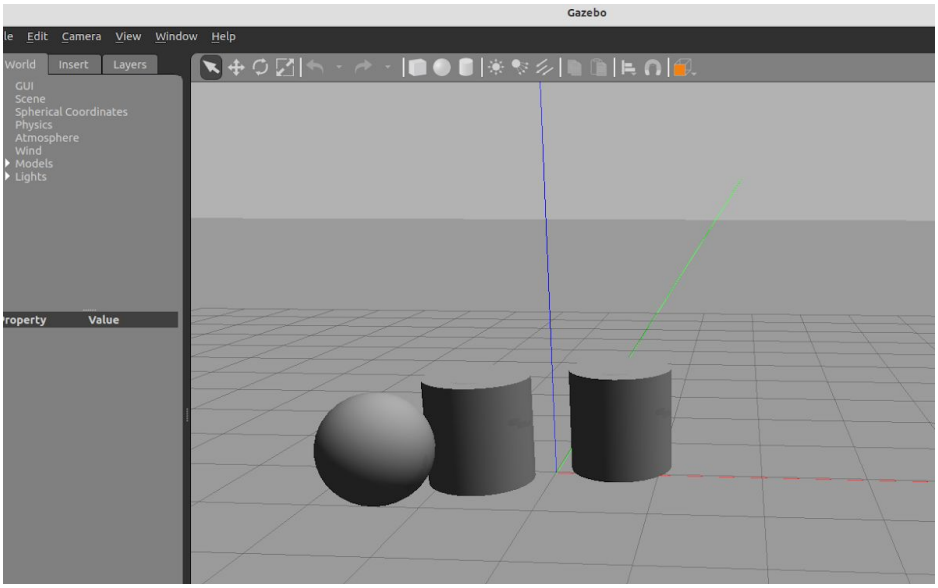
> **NB** If you resize the screen of the VM, it might be necessary to execute `restart-assist` on the command-line. The TA might instruct you to execute this.

Test the Virtual Machine

You will need to work with the Gazebo simulation from day one of the ROS Course. Therefore, please make sure in advance that everything is running in your virtual machine.

To check that your virtual machine is running as expected start the Gazebo simulation as explained below:

- Open a terminal (Terminator) by clicking on the terminal Icon on the left side (alternatively press Ctrl+Alt+T). Type in the terminal `gazebo` and press Enter to run Gazebo.
- A window should appear showing an empty simulation environment, feel free to play around by adding/moving/deleting objects.



- Close the simulation by pressing Ctrl+C in the terminal you used to start gazebo or click on the close icon in the right upper corner.
- Power Off Ubuntu to stop the session in the virtual machine.

> **NB** The VM might benefit from a performance boost by tuning the machine configuration to your available hardware. See the next section for more.

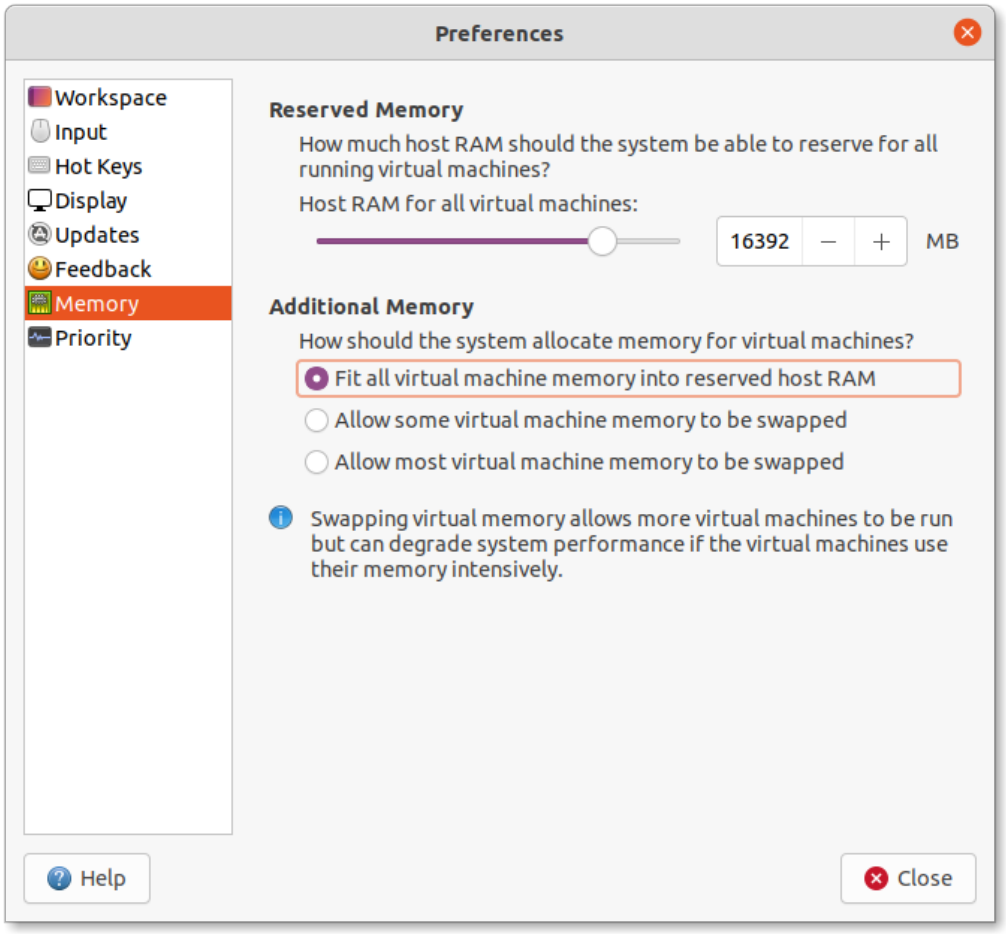
Tuning the Virtual Machine for performance

Fit all VM memory in Host's RAM

Make sure that the VM is turned off and close VMWare Workstation 16.
Restart VMWare Workstation 16 from the command line as **root**.

```
sudo vmware
```

Go *Edit* > *Preferences* > *Memory*
Set the Host RAM for all virtual machines to about 2/3rd of your available RAM, ideally 5GB, up to 12GB.
Select 'Fit all virtual machine memory into reserved host RAM'

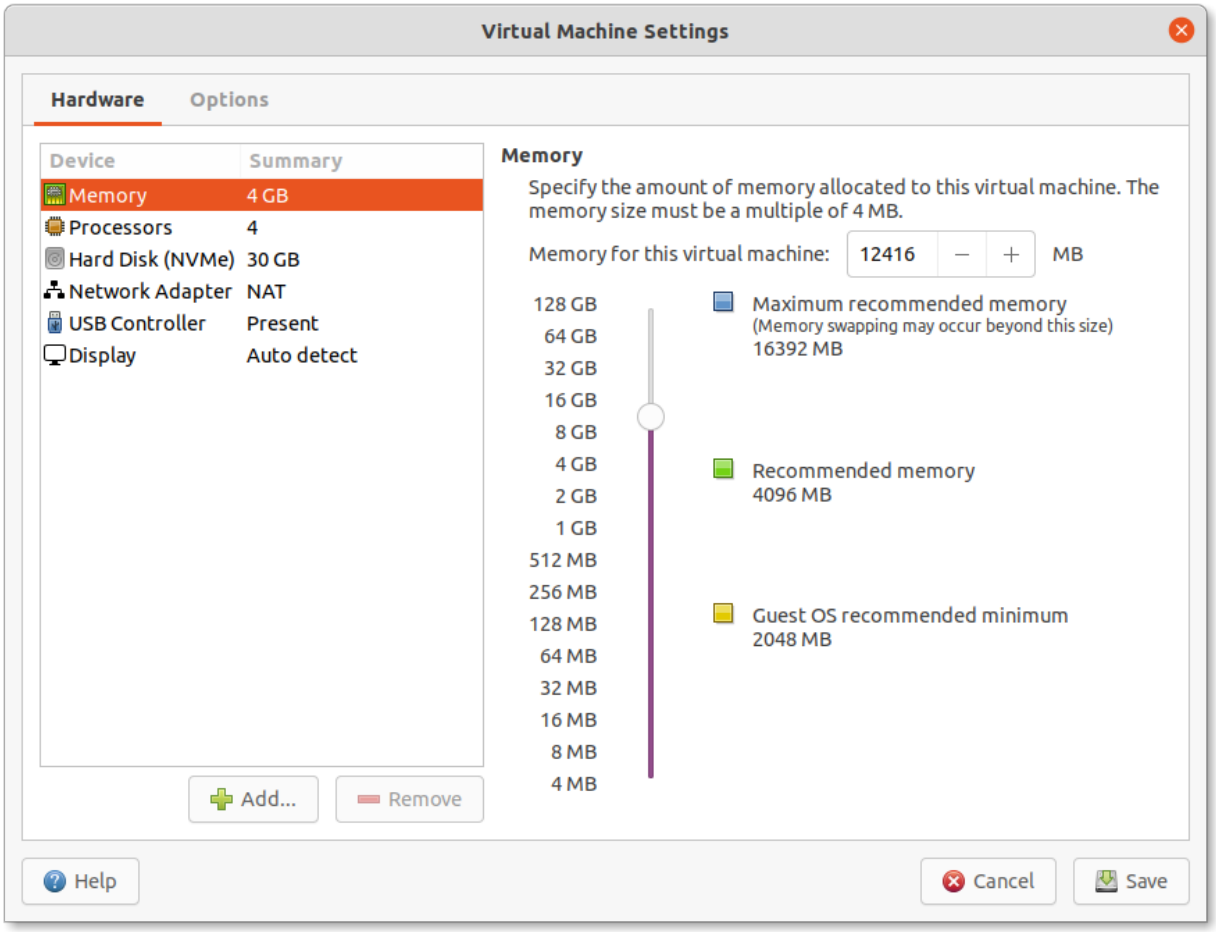


Maximize VMs memory and CPU

Make sure to start VMWare as a your regular user.

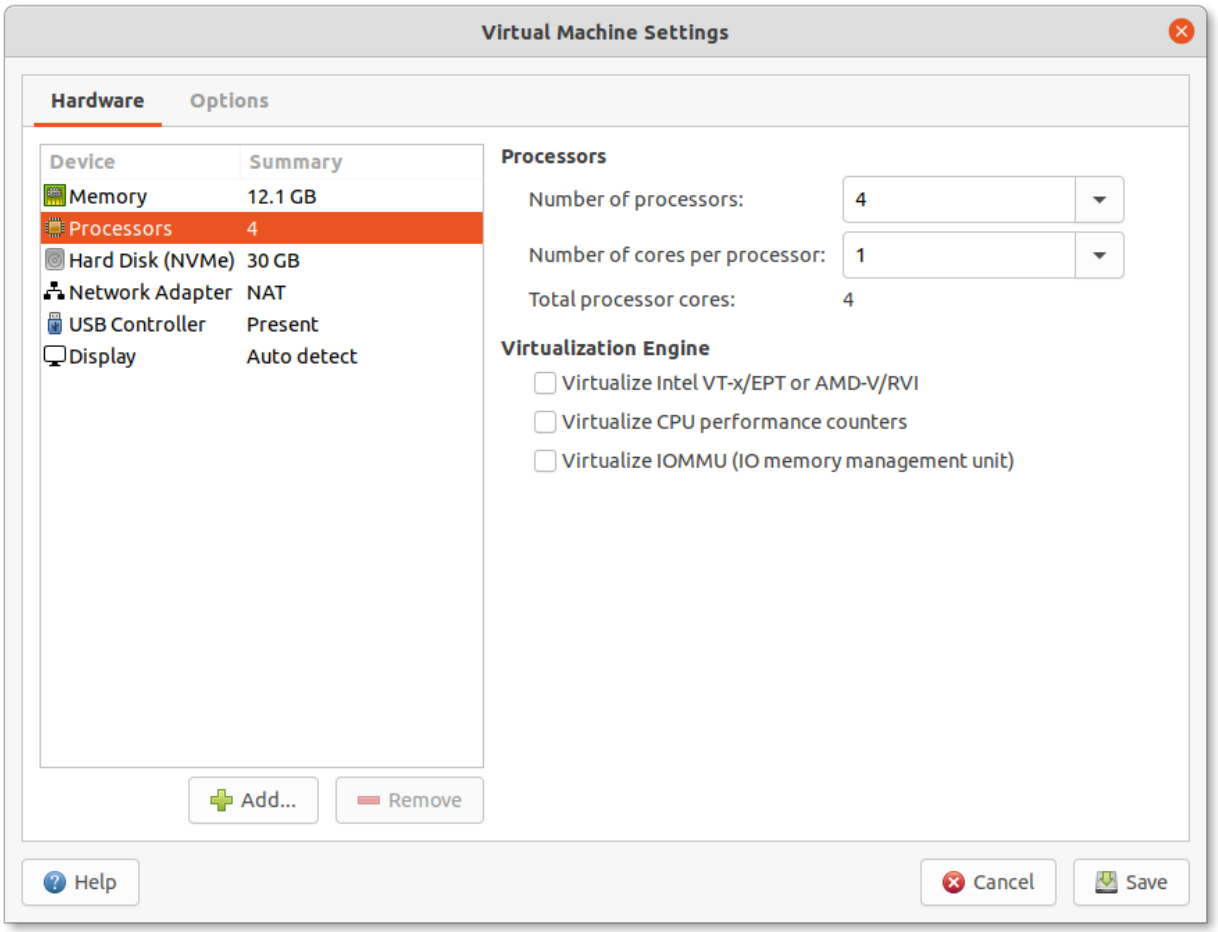
Right click the ROS VM > Settings

On tab memory: set memory to about 2/3rd of available host memory, up to 12GB, but not more than the value configured in the previous step.



Assign CPU cores

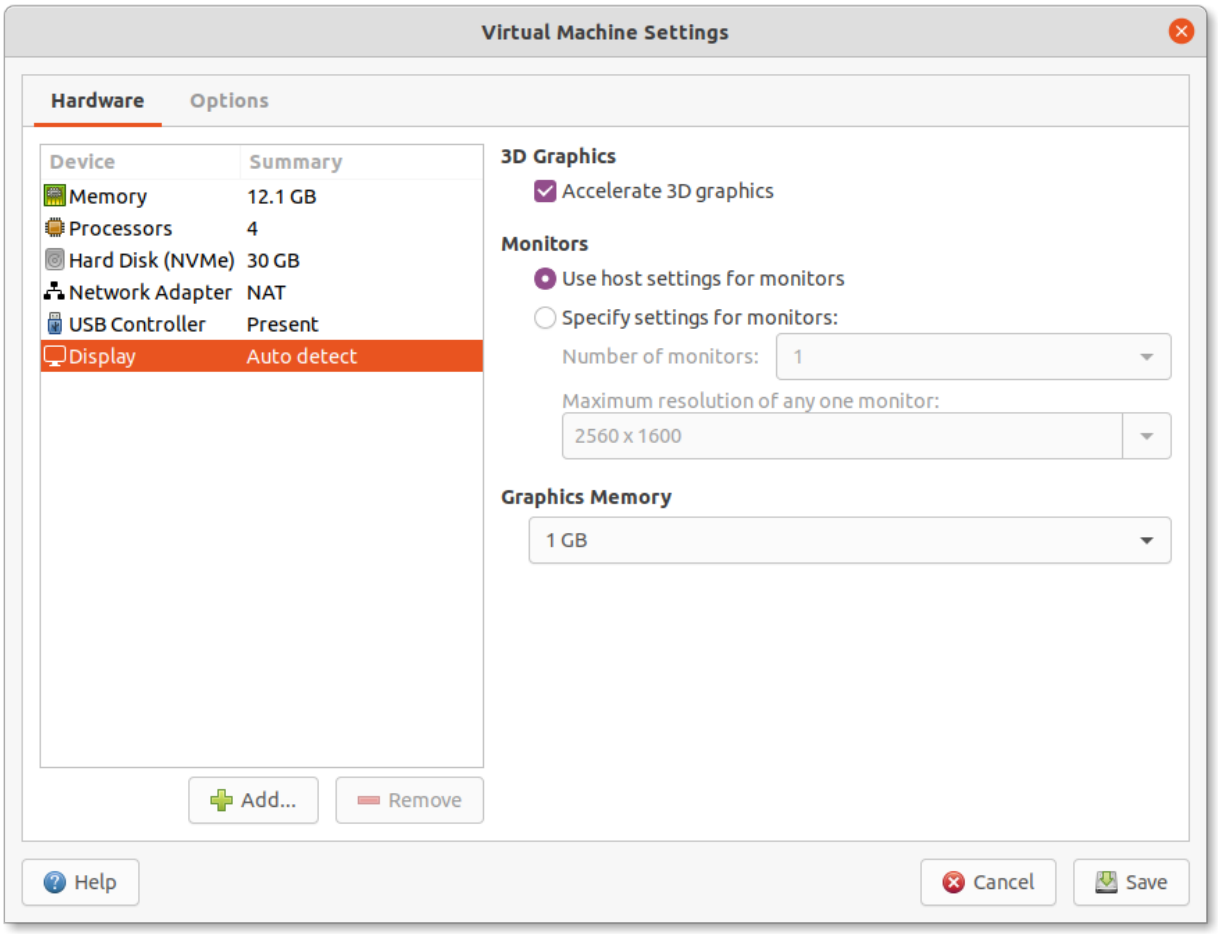
On tab 'Processors', set the number of assigned processors to about 2/3rd of your host's core-count. Ideally 4 or more.



Graphics acceleration is important to achieve decent graphics performance.

On tab 'Display', enable 'Accelerate 3D graphics'.

Select about 1GB of Graphics Memory. More if you have enough available memory.



Save the settings.

Share folders

Optionally, choose to share folders between the host and guest.

Right-click 'ROS' VM > Settings > Options tab > Shared Folders