# Virtual Machine Installation

1. Aim

This document goes through how to install and setup virtual box and URsim. This setup will be used to simulate the UR5e robot throughout this course.

2. Installation

1.1. Virtual Machine Installation

1. Download and install virtualbox for your operating system: https://www.virtualbox.org/
2. Download the URsim image here: https://www.universal-robots.com/download/software-e-series/simulator-non-linux/offline-simulator-e-series-ur-sim-for-non-linux-5110/
3. Extract the contents of the URsim download and save the folder in a different location. This is because if you delete this folder once you set everything up properly, the image and the saved files on the image will all be deleted. This will require to setup the VM again.
4. Open VirtualBox
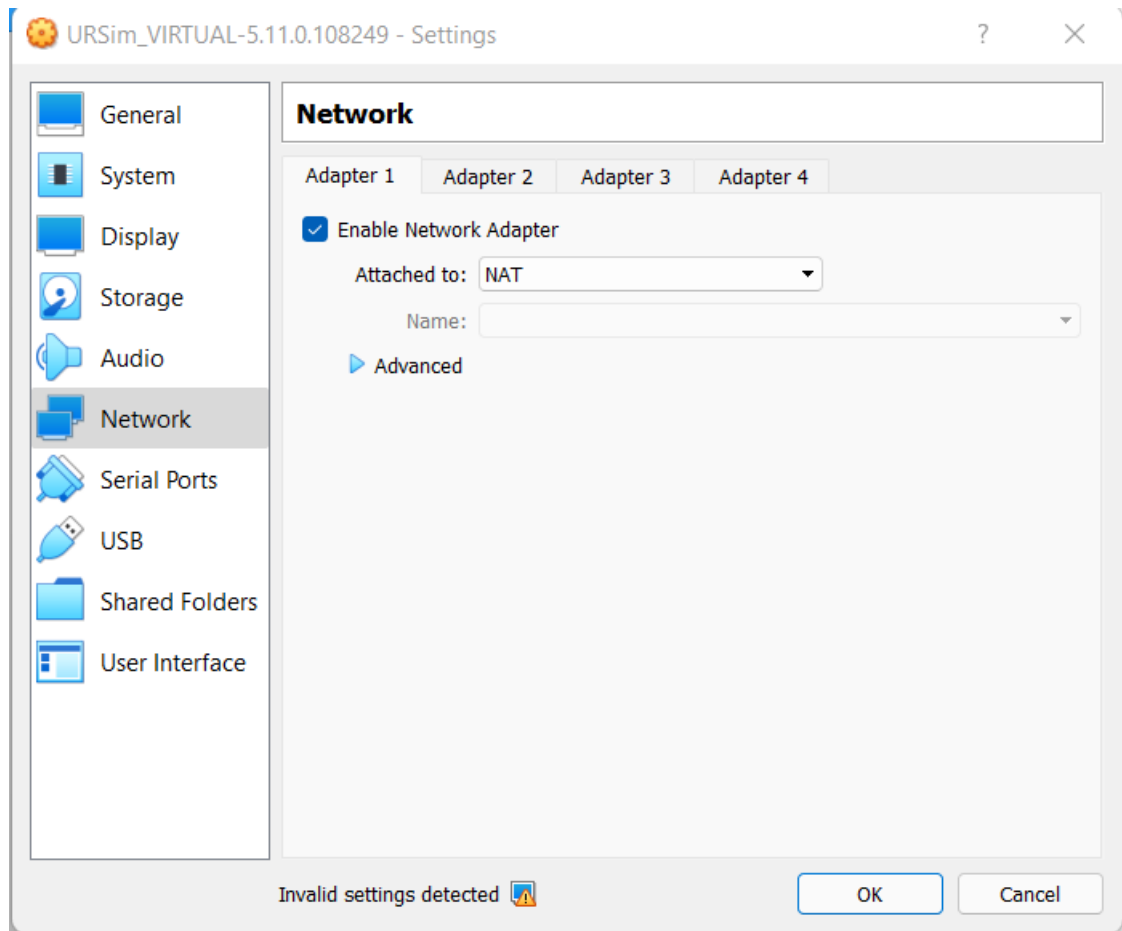5. Under the Machine menu, select Add
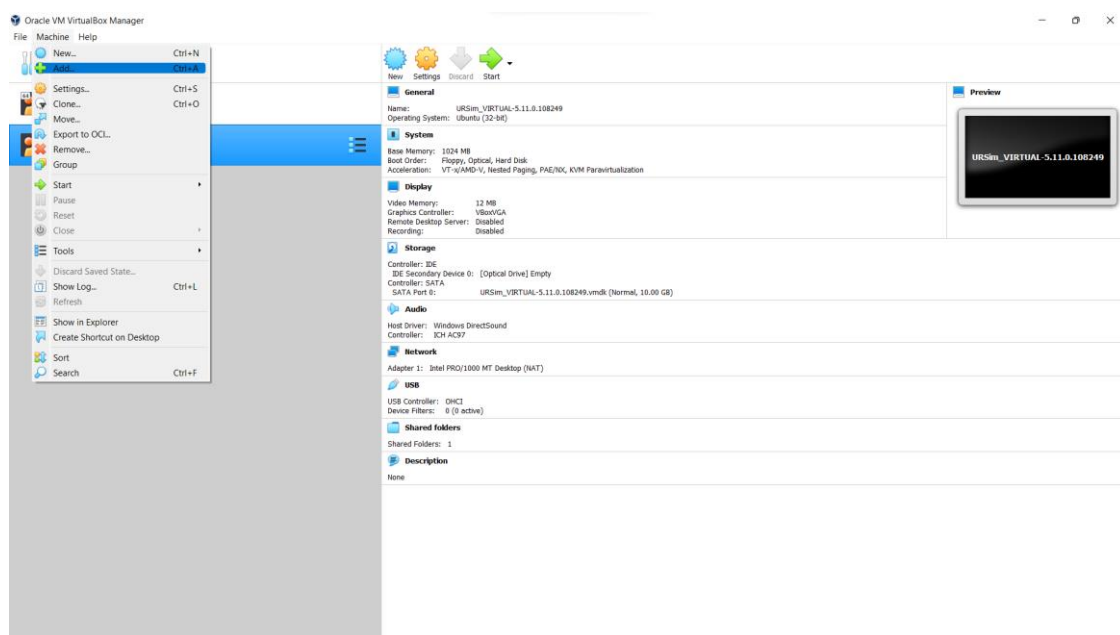
6. Find the location where you have saved the ursim image and select the "**. vbox**" extension.
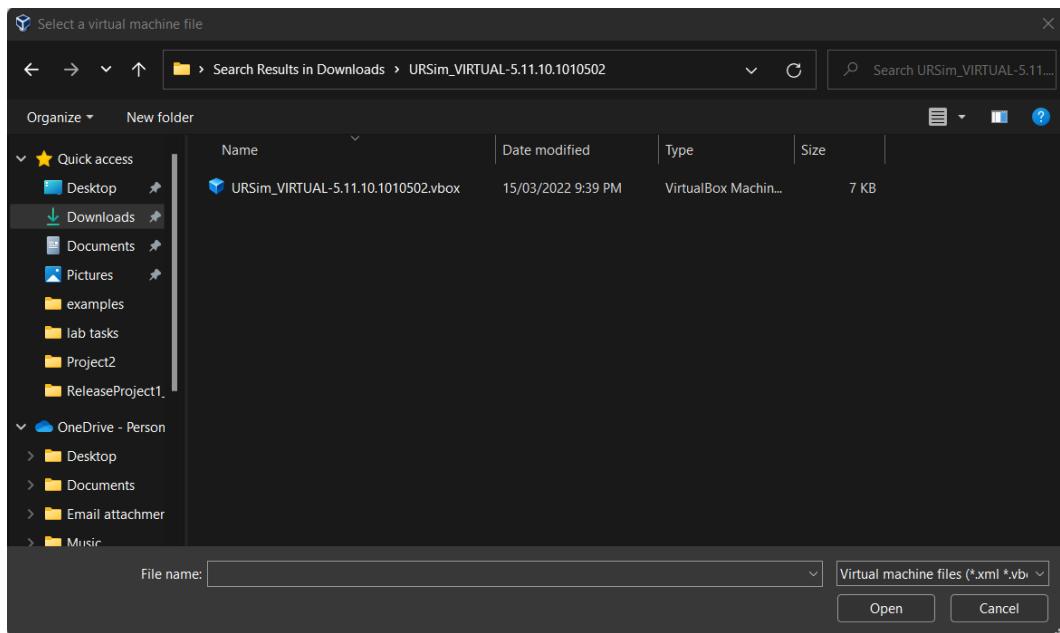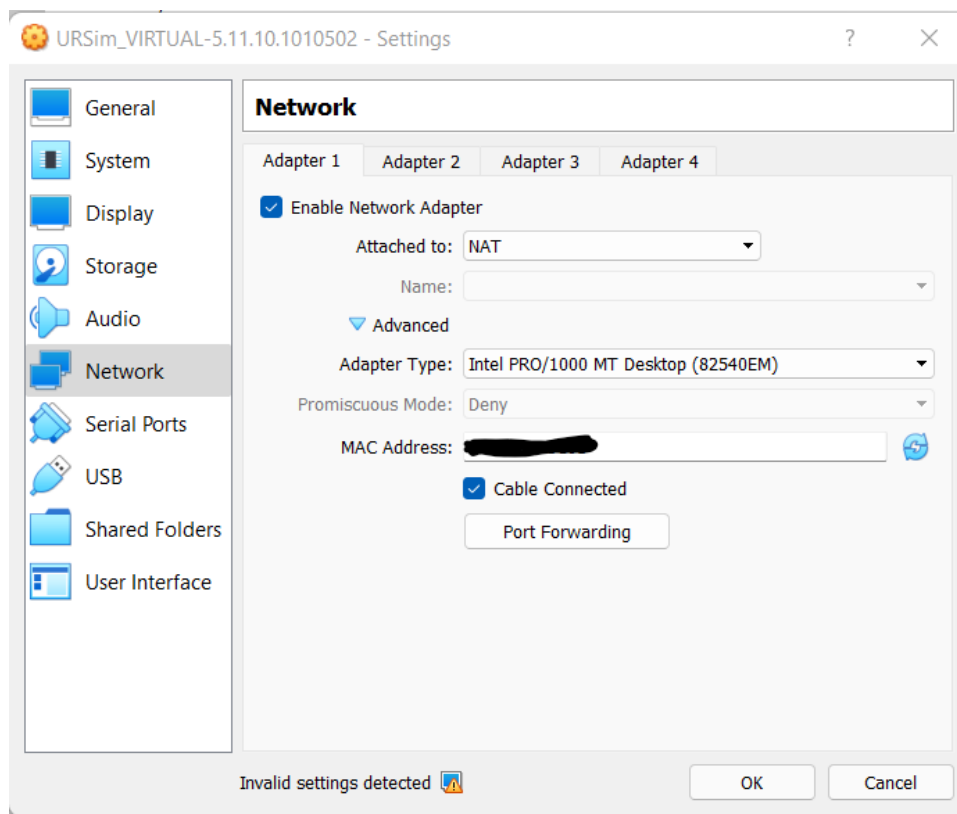
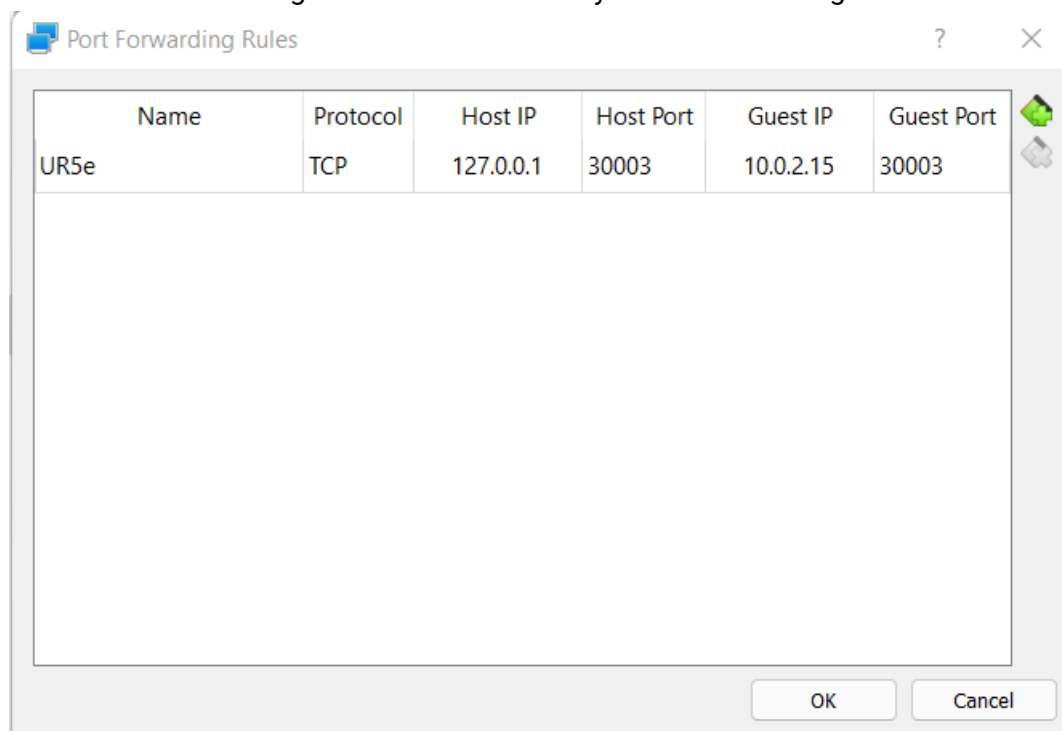7. Now select settings for the image you have loaded.
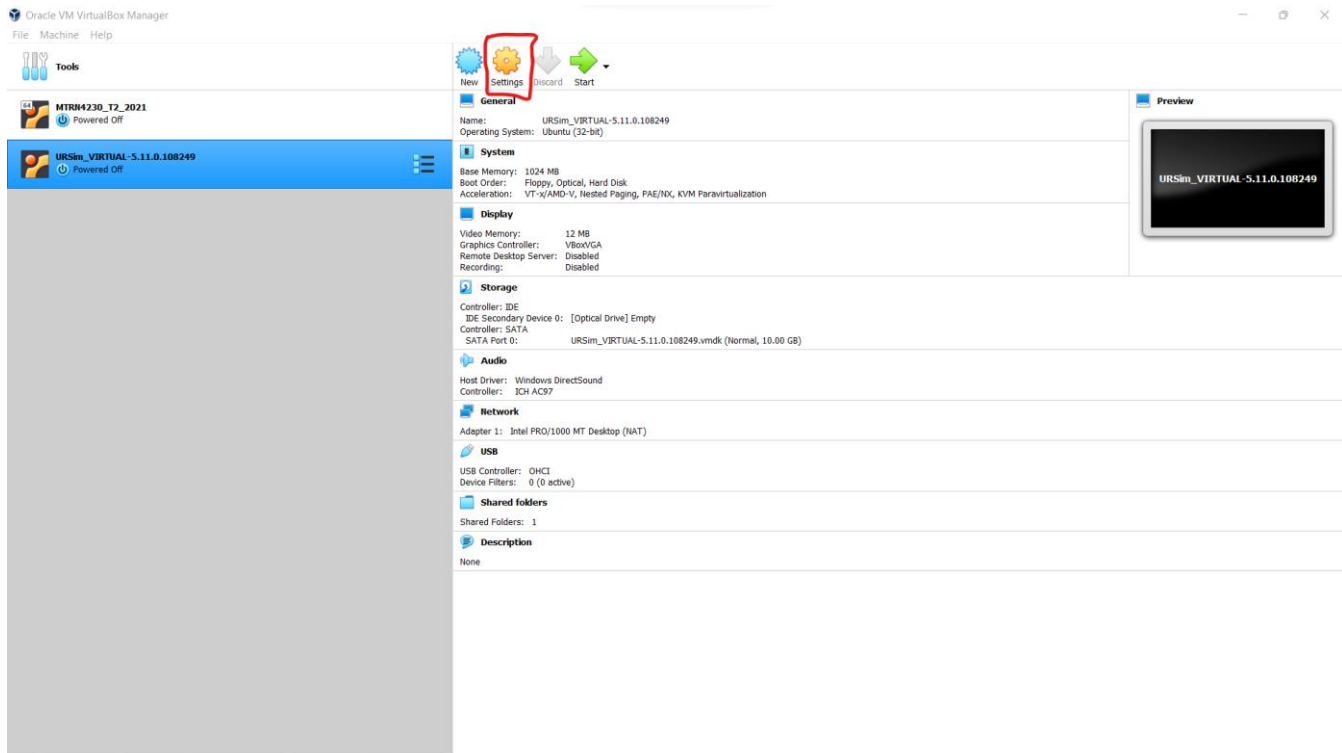
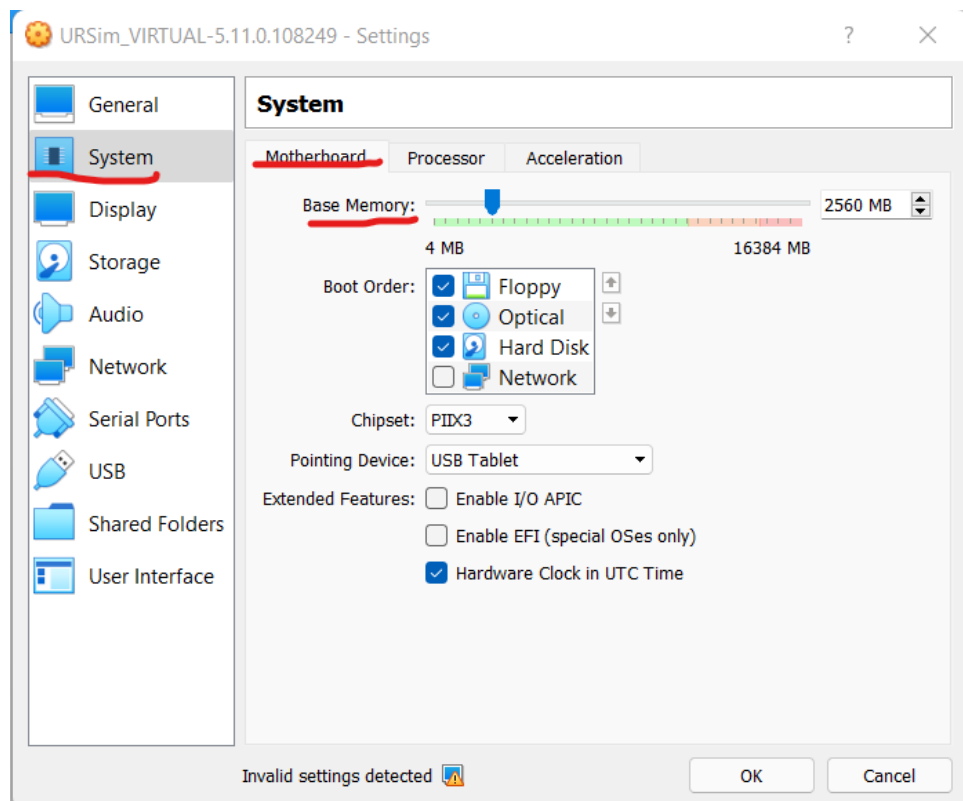8. Go to the Network Tab

9. Select Advanced

10. Select Port Forwarding and create a new entry with the following:

11. Navigate to "System -> Motherboard"
    a. Base Memory (RAM): 3 – 5 GB is recommended but keep the slider in the green region.
    b. If your system only has 8GB of RAM, start by assigning 2.5GB (2560MB)
    c. Note: Assigning too much of your system's RAM may result in worse performance.

12. Navigate to "System->Processor"
    a. Processor(s): Assign a minimum of 2 CPUs.
        i. More CPU's (up to the maximum recommended CPU's (green region)) will result in better performance.
        ii. Note: More processors qual more compute power in the VM. Red zone means not enough compute power for the host (real PC) machine.
        iii. Execution Cap is best left at 100%
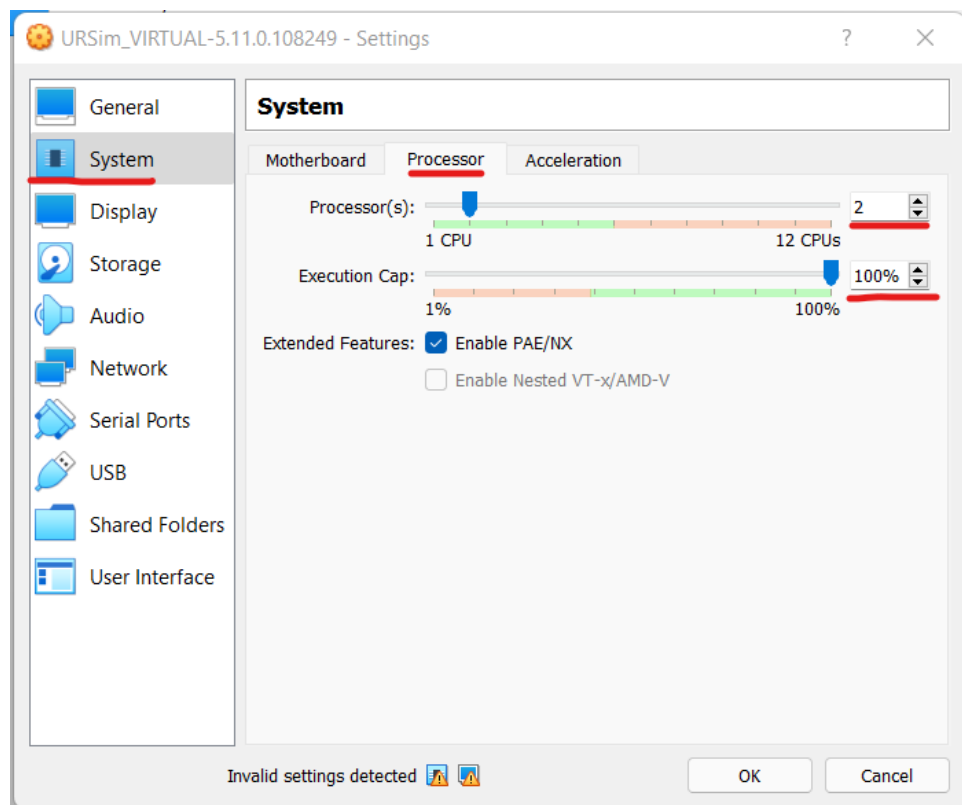
13. Navigate to "Display->Screen"
   a. Video Memory: Set in range 96 – 128MB.
    b. Monitor Count: You may use external monitors if you have them.
    c. Acceleration: Make sure it is not checked.
   d. Keep the Graphics Controller as VBoxVGA
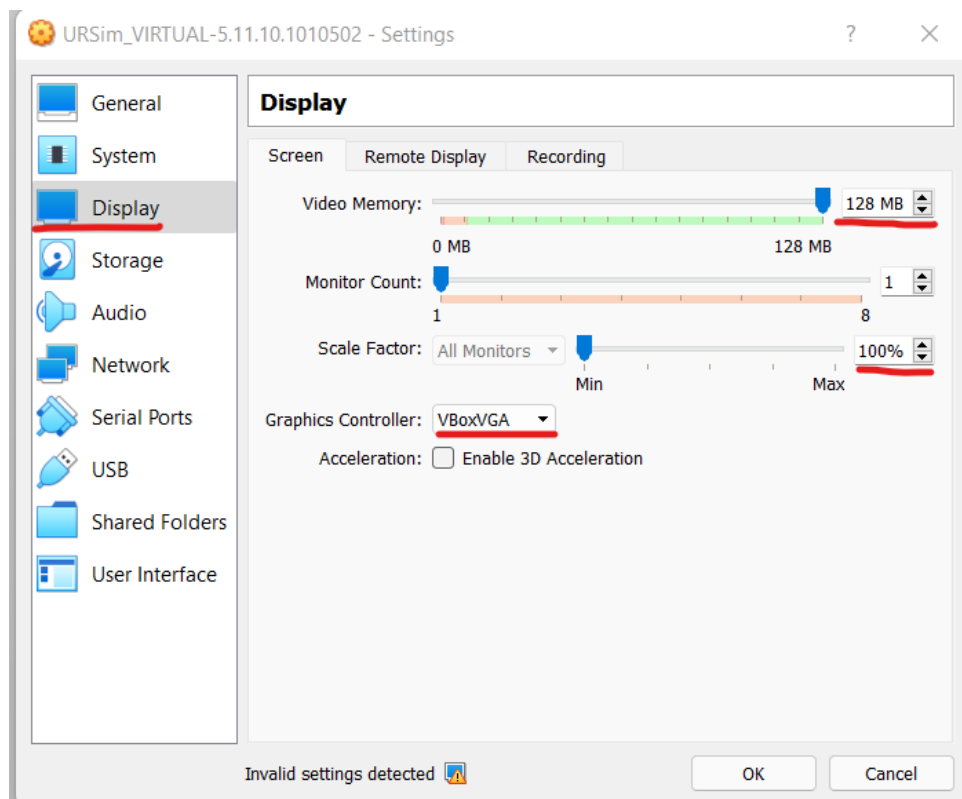
14. Select Ok to save and exit the settings.
    a. NB: If you have a warning regarding hardware acceleration "VT-x/AMD-V hardware acceleration is not available on your system" see the VM troubleshooting section at the bottom of the document for details.

15. Ensure VM is highlighted on the left if you have other VM's installed and select "Start".
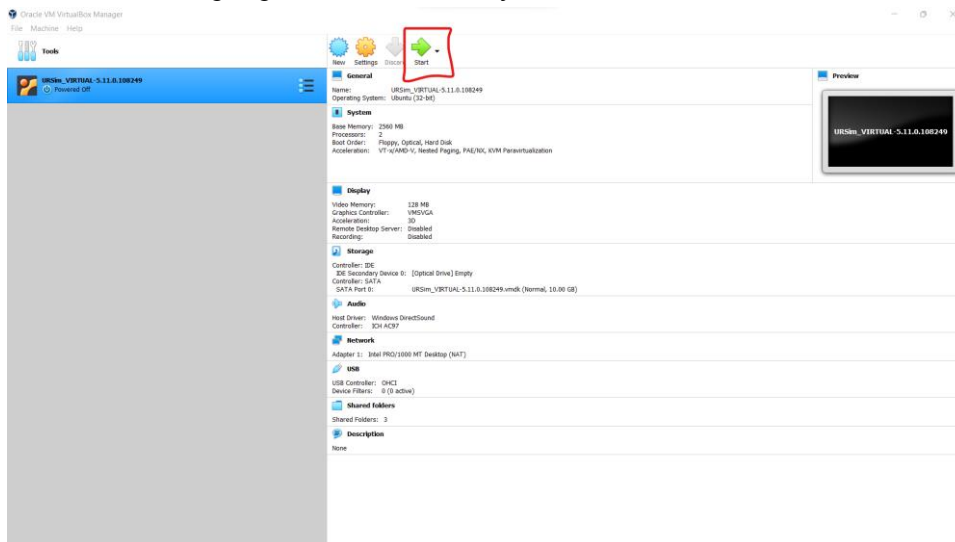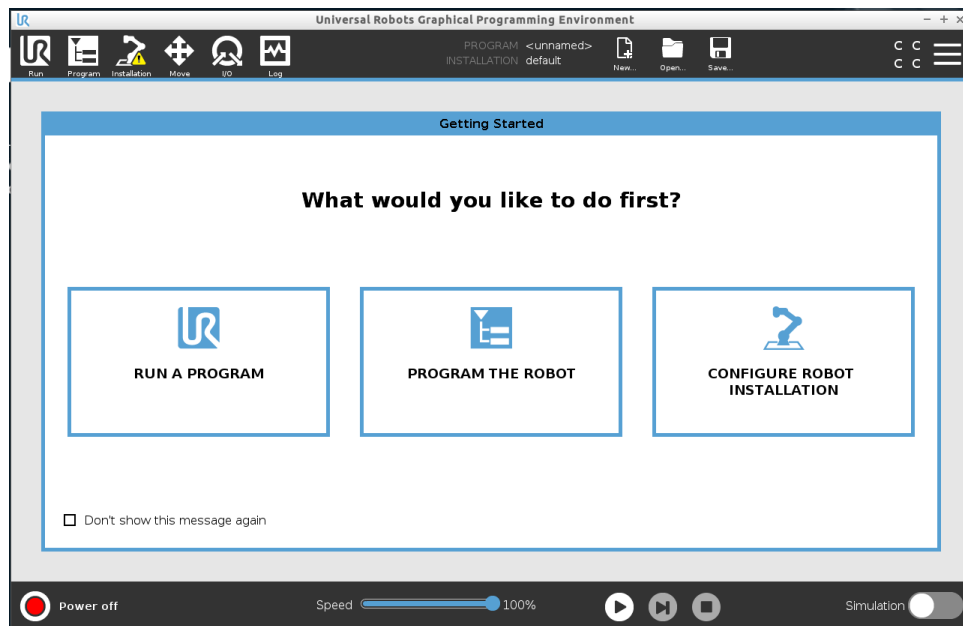

16. Congrats! You have now successfully set up the virtual machine! You're VM should look like the following. Note that we will only be using the URsim UR5 (circled in red) for this course.
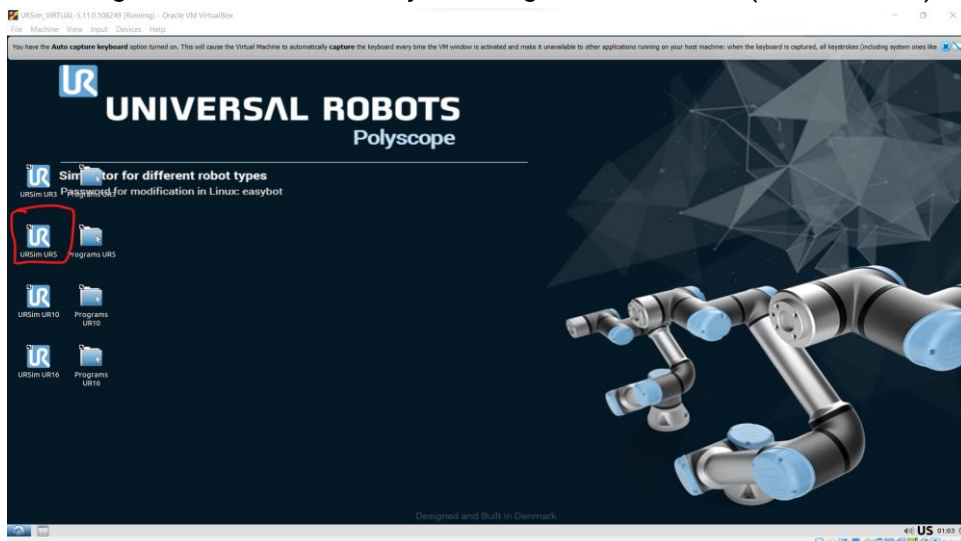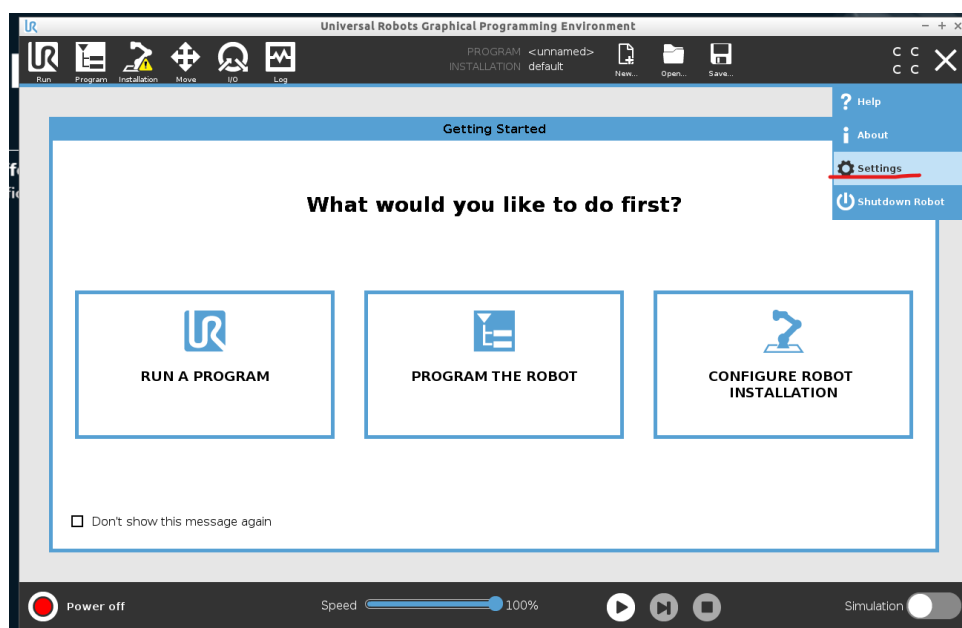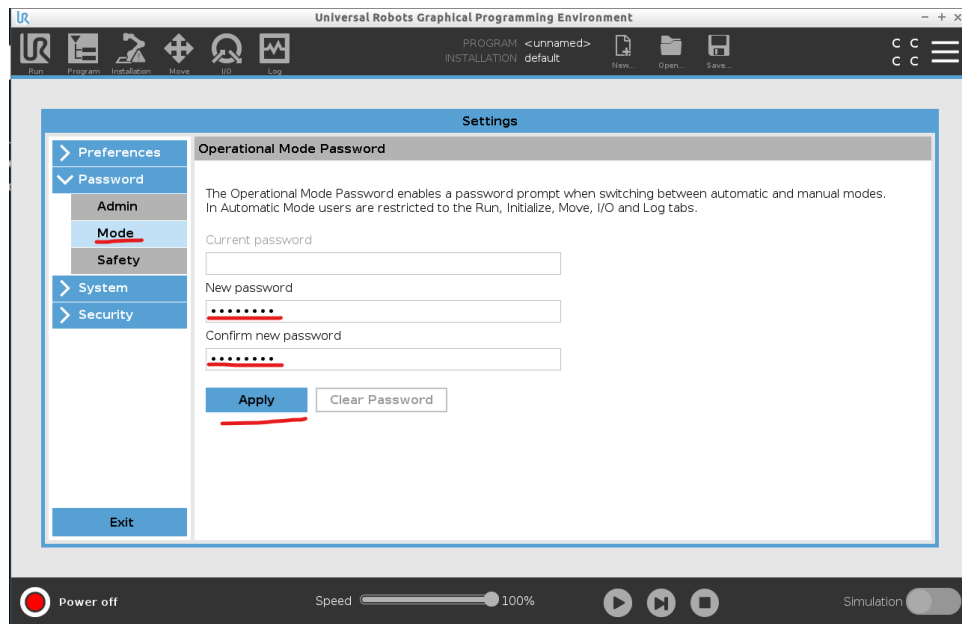

17. Open up **URsim UR5e.**

    a. When you first open it, it will look something like this:
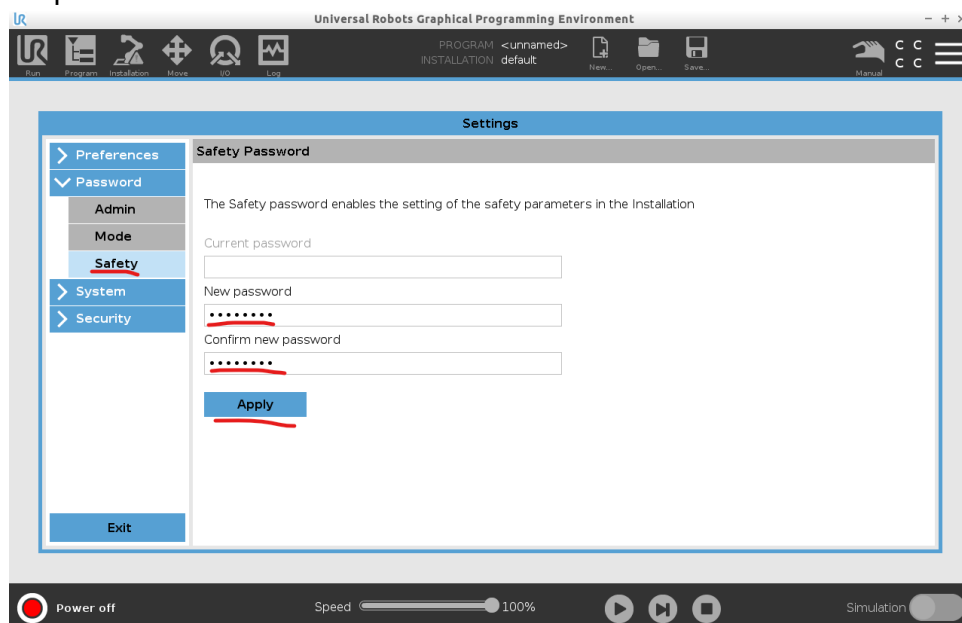
b. Open the Hamburger menu and go to settings:

c. Go to Password -> Mode and set a mode password. Make sure you remember this password. For this example I'm simply setting it to "password". You will need to enter this password when going from the automatic to manual mode.

d. Go to Password -> Safety and set a safety password. Again for this example I have set it to "password"

e. Download the "4230_UR5e_Installation" folder from moodle. You can either download this on your host computer (windows/osx) and then use a USB to move files across to the VM as described in **Section 1.3.** Or you may first install Firefox on the VM, go to Moodle and then install the folder directly. You can also find instructions on how to install Firefox on the VM in **Section 1.3. (To unzip a folder in the VM, open a terminal (ctrl+alt+t), move to the location of the zipped folder and type the following command "unzip folder_name" in the terminal).**
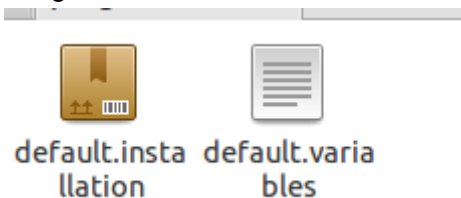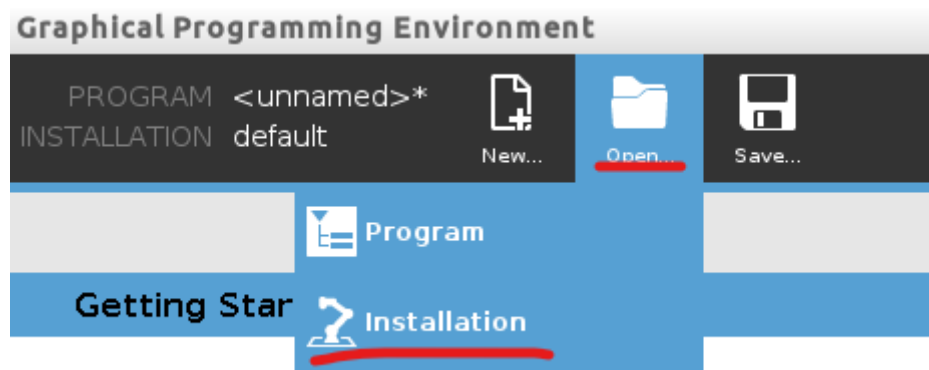
i. Open the Programs UR5 folder on the desktop
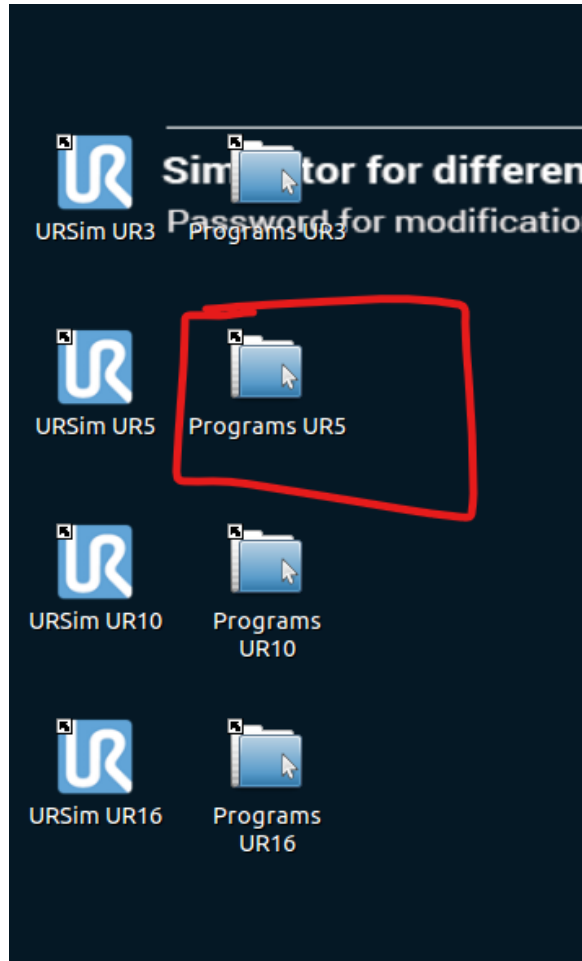
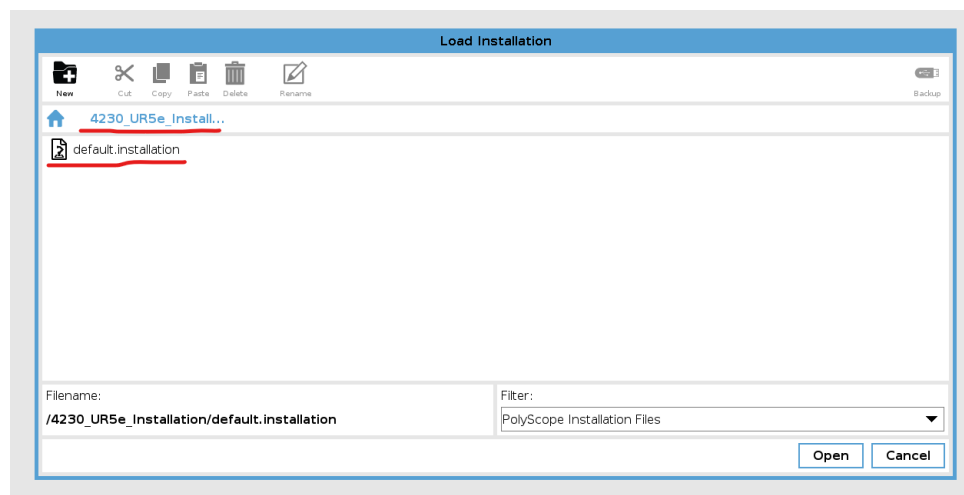

ii. Delete all of the files which are inside this folder.
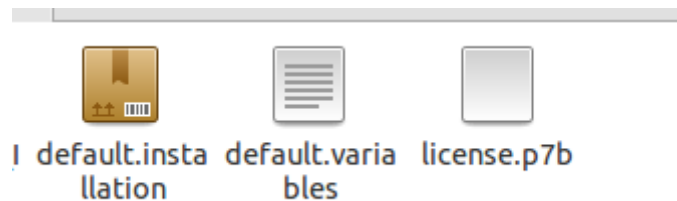
iii. Copy paste the contents of the "4230_UR5e_Installation" folder in to the Programs UR5 folder.

iv. Go to Open -> Installation

Graphical Programming Environment

v. Select the "default.installation" file, that you just copied and press open.

vi. The checksum at the top right hand corner should now display, 7D1C. You need to make sure that all programs created in URsim use the same 7D1C installation file.
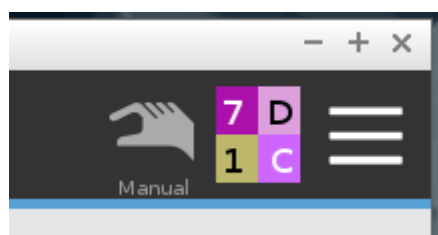
vii. You may get an error, you may need to close the URSim application and restart it. If this doesn't work, you may need to restart the entire VM itself. This usually fixes the issue. Try it a few times. If it doesn't work, please reach out to a demonstrator on Teams.

1.2. Verification:

- **Basic Navigation**

- o System Tools: You will be able to find the terminals
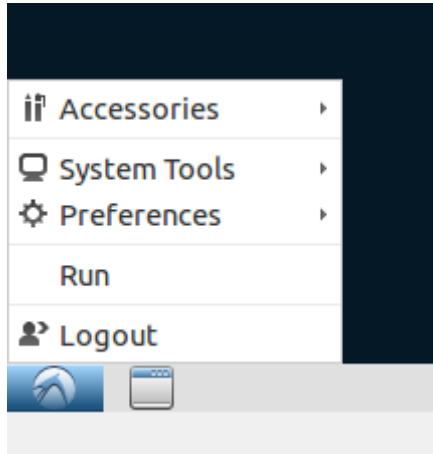- o Accessories: You will be able to find,
  - ▪ UR5 programs
  - ▪ Leafpad text editor
  - ▪ File manager
- o Make sure you familiarise yourself with this menu

- **Ensure that you are connected to the internet**
  - o Open a terminal (**Ctrl+Alt+T)** and '**ping -c 4 google.com**'. It should say that 4 packets were received if the internet is connected.
  - o Otherwise, install and open up Firefox as shown in Section 1.3, and navigate to a website.
  - o If you cannot connect to the internet, please go to Section 1.4 for VM Troubleshooting.

## 1.3. Sharing files between host and VM

Normally we would be able to setup a shared folder between the VM and the Host or simply drag and drop files, but for some reason it does not seem to work for the Lbuntu version used by Universal Robotics.

- One method is to simply send yourself files over the internet (Teams/email/Facebook messenger)
  - o To install firefox, open XTerm (**Ctrl+Alt+T**) and write the following in the terminal:
    - ▪ **sudo apt install firefox**
    - ▪ Select "Y" when prompted to for installation

- You should now see a new "Internet" tab in the menu, where you can find Firefox:
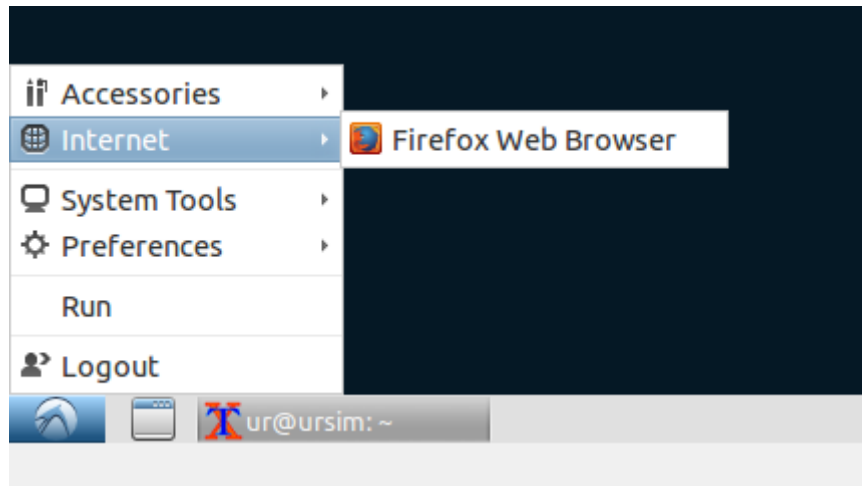
- You can also plug in a USB. Go to "Devices -> USB -> (Then look for your USB). Once attached successfully it should appear on the file explorer windowpane on the left-hand side. TO disconnect the USB from the VM back to the host, simply uncheck the USB in the Devices -> USB menu
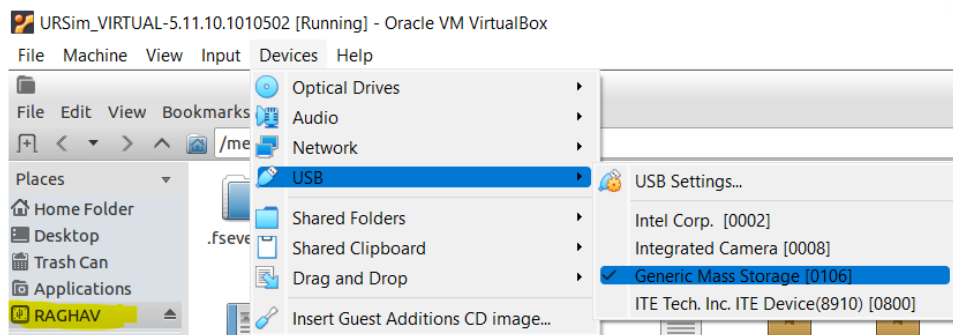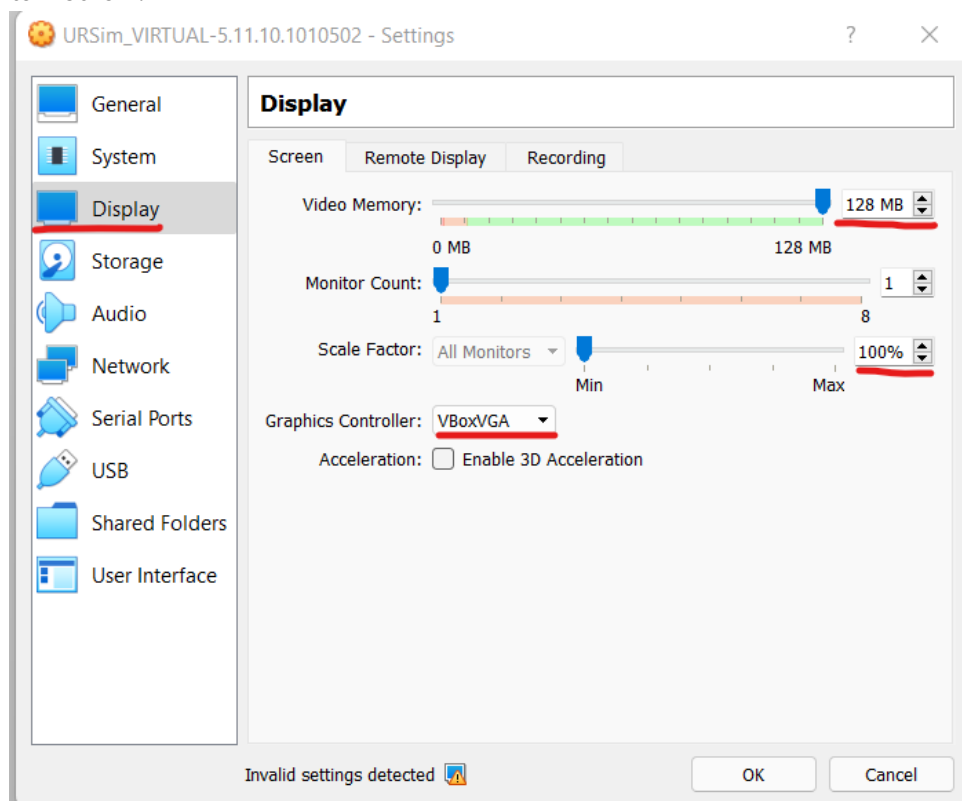
1.4 VM Troubleshooting

- Screen Resolution of the VM is too small.
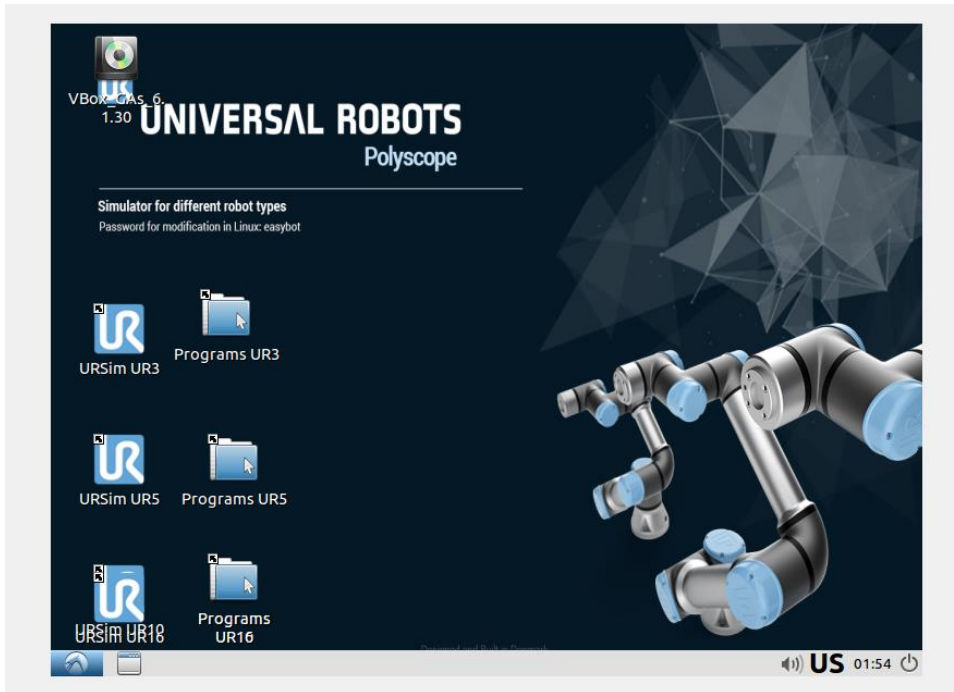
- Make that the Graphics controller is set to VBoxVGA and that hardware acceleration is turned off.

- If at any point you think you have irreversibly broken the VM, once you have saved any work (if possible) you can redo the installation process. Navigate to Machine->remove and select delete all files. Then unzip the VM archive again and redo the installation process.
- **No internet connection on VM:**
  - o Shutdown VM.
  - o Navigate to `Settings->Network->Adapter 2`
  - o Select `Enable Network Adapter`
  - o From the `Attached to: ` dropdown, select `NAT`
  - o Start the VM and perform network verification as per Section 1.2.
- **Warning "VT-x/AMD-V hardware acceleration is not available on your system"**
  - o See https://appuals.com/fix-vt-x-amd-v-hardware-acceleration-is-not-available-on-your-system/ for a detailed explanation + various solutions. In particular,
  - o Ensure Hyper-V is disabled:
    - ▪ See "Disabling Hyper-V via GUI" at the link above.
  - o Ensure Virtualisation is enabled in your system BIOS
    - ▪ See "Method 3: Enabling virtualization within BIOS/UEFI" at the link above.