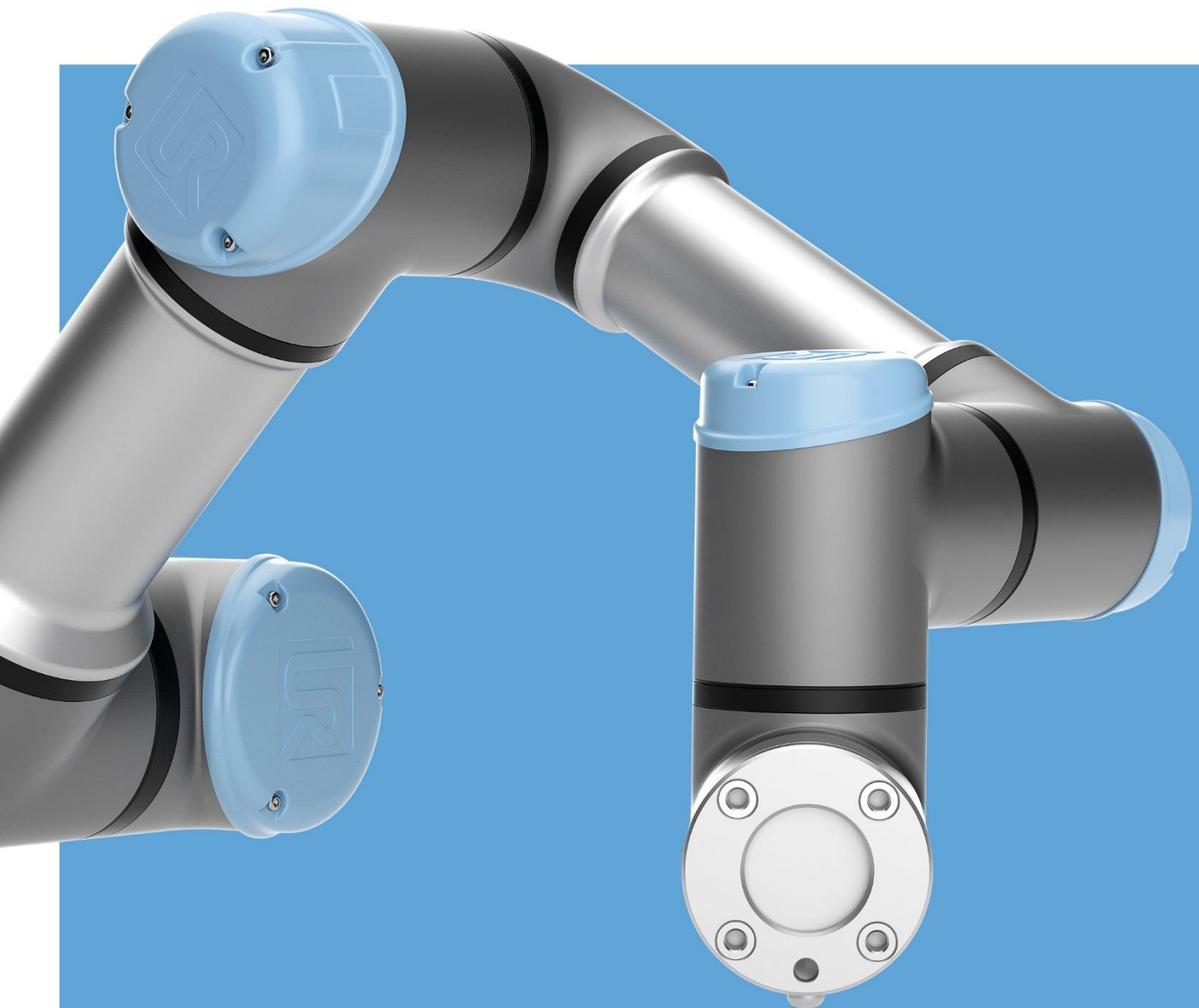


# Guide: Setting up the virtual environment to simulate UR robots





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## Premise:

URSim is a simulation software that is used for offline programming and simulation of robot programs and is made for the Linux operating system. This guide shows how to install, setup and run URSim in the MS WINDOWS environment. Please note that the guide is based on **VM VirtualBox 6.1.6 and Polyscope 5.8**; if you are using previous versions a few different settings will be required.

Universal Robots makes available for users a virtual disk image of a Linux operating system containing the software that simulates Polyscope and the physical robots, called URSim.

To run the simulator in another operating system, a virtual machine is needed.

## Part 1: Download of Oracle VM.




First, in order to be able to launch a VDI (virtual desktop interface) we need software that is capable to do so. Many options are available on the market; for this tutorial Oracle VM VirtualBox is chosen as it is currently free of charge. (<https://www.oracle.com/technetwork/server-storage/virtualbox/overview/index.html>)

### Step 1

Go to (<https://www.oracle.com/virtualization/technologies/vm/downloads/virtualbox-downloads.html>) and download the latest Oracle VM VirtualBox installer.

#### Oracle VM VirtualBox Base Packages - 6.1.6

Freely available for Windows, Mac OS X, Linux and Solaris x86 platforms under GPLv2:

Platform	64-bit
Windows	 <a href="#">Windows Installer</a>
Mac OS X	 <a href="#">dmg Image</a>
Solaris 10 5/08 and later or Solaris 11	 <a href="#">Solaris Package</a>
<b>Linux Platforms</b>	

### Step 2

Once the download has finished, launch the downloaded installer and follow the suggested procedure.

## Part 2: Download of URsim Virtual Disk Image

Once Oracle VM VirtualBox has been installed, we need to download the Virtual Disk Image that contains the software provided by Universal Robots to simulate the robots.

To do so, go to <https://www.universal-robots.com/download>, and select the following options from the menu:

- eSeries (or CB3 if you need the previous robot version)
- Software
- Offline Simulator
- Non-Linux
- URSim for non-Linux version 5.8 (or newer)

# UR DOWNLOAD

Here you can download a lot of useful files including manuals, drawings, robot software update and more! Select your download from the menus below

---

- 1. Select robot type**

Label on the robot arm and control box will show what type it is.

e-Series

---

- 2. Select type of download for e-Series**

Search for article "How to use this Support site"

Software

---

- 3. Select type of software**

Robot software should ONLY be installed by trained personnel. The software is not backwards compatible.

Software is covered under End User Software Licence Agreement. Please find this under software selection.

Offline Simulator

---

- 4. Select operating system for your computer**

URSim is a simulation software intended for offline programming and simulation of both robot programs and manual movement of robot.

NOTE: Not all functions works compared to a real robot, please see below.

  - Emergency stop can not be used
  - Input IO state can not be set
  - Paths are perfect
  - Collisions with self or with surrounding objects do not work
  - Force mode will not work

Non Linux

---

- 5. Select Software version**

UR Sim for non Linux 5.8.0

Then, at the bottom of the page, click on [URSim\\_VIRTUAL-5.8.0.10253.rar](#) to start your download.

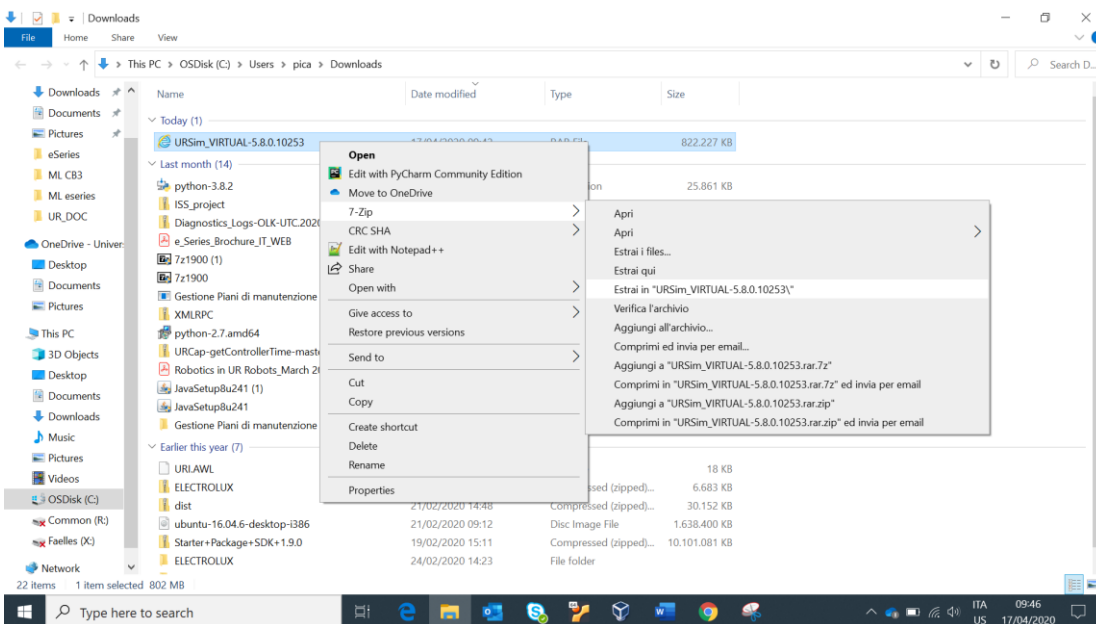
**VirtualBox**

1. Start VirtualBox and press 'New'
2. Define name (your choice), type: Linux, Version: Ubuntu
3. Select Memory size of 768 MB and press 'Next'
4. Select Use an existing hard drive file and define the path to the folder where the zipped file was unpacked, press 'Create'
5. Press 'Start' for starting the virtual machine
6. If an error saying 'Hardware acceleration is not available' is shown then it may be required to reboot the Windows computer into BIOS setup and enable hardware access to Virtual Machines and then restart Windows, VirtualBox and the virtual machine.
7. The Virtual machine is now started

[URSim\\_VIRTUAL-5.8.0.10253.rar](#)

Once the download has finished, extract the downloaded .rar file to the directory of choice.

(If needed, you can find a RAR extractor at <https://www.7-zip.org/download.html>)



If the procedure has been executed correctly, the directory to which you extracted the files should look like this:

This PC > Documents > Virtual Machines > **URSim\_VIRTUAL-5.8.0.10253**

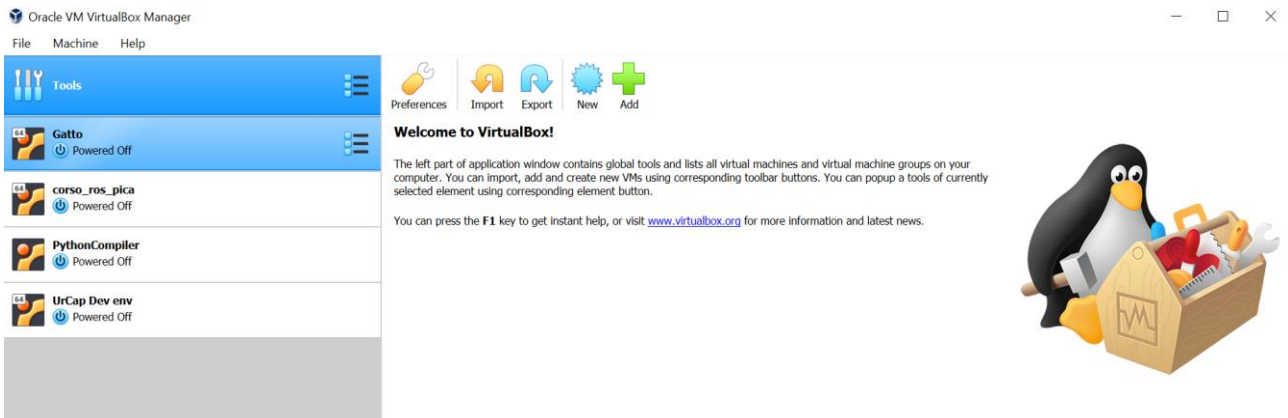
Name	Status	Date modified	Type	Size
URSim_VIRTUAL-5.8.0.10253	🔄	23/03/2020 11:38	VirtualBox Machine Definition	10 KB
URSim_VIRTUAL-5.8.0.10253	🔄	23/03/2020 11:38	VMware virtual disk file	1 KB
URSim_VIRTUAL-5.8.0.10253	🔄	23/03/2020 11:38	VMware virtual machine configuration	2 KB
URSim_VIRTUAL-5.8.0.10253-s001	🔄	23/03/2020 11:38	VMware virtual disk file	1.381.696 KB
URSim_VIRTUAL-5.8.0.10253-s002	🔄	23/03/2020 11:38	VMware virtual disk file	536.000 KB
URSim_VIRTUAL-5.8.0.10253-s003	🔄	23/03/2020 11:38	VMware virtual disk file	311.680 KB
URSim_VIRTUAL-5.8.0.10253-s004	🔄	23/03/2020 11:38	VMware virtual disk file	171.648 KB
URSim_VIRTUAL-5.8.0.10253-s005	🔄	23/03/2020 11:38	VMware virtual disk file	240.320 KB
URSim_VIRTUAL-5.8.0.10253-s006	🔄	23/03/2020 11:38	VMware virtual disk file	64 KB



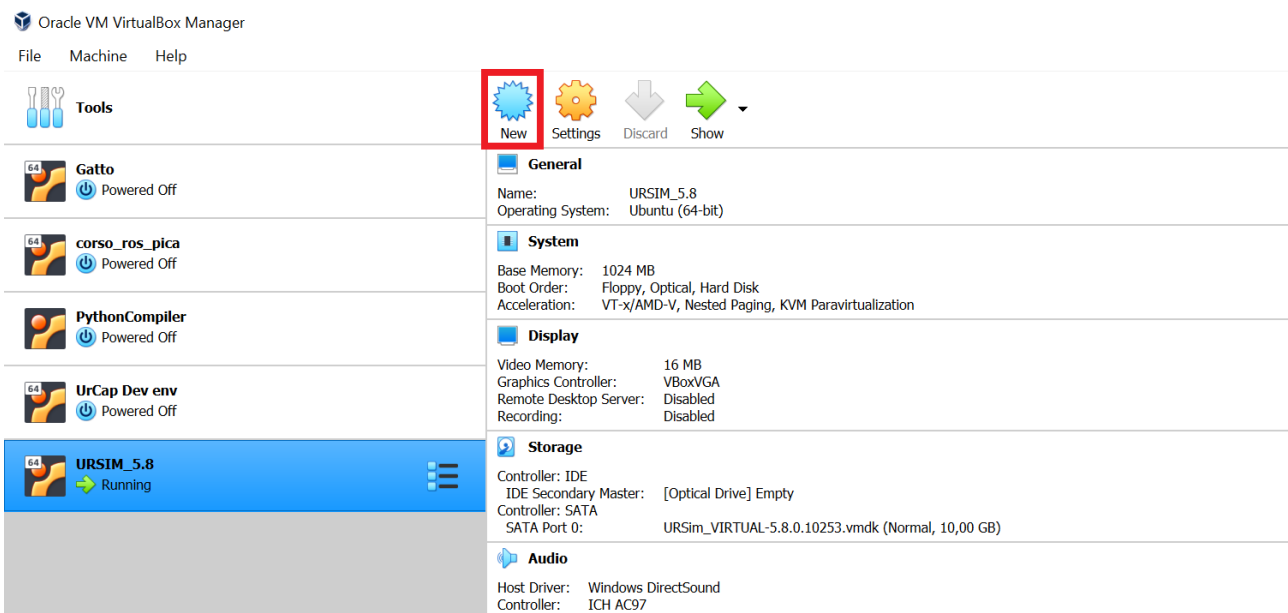
## Part 3: Set up of the Virtual environment

Once all the needed software and files have been downloaded, we must set up Oracle VM VirtualBox to launch the URSim VDI.

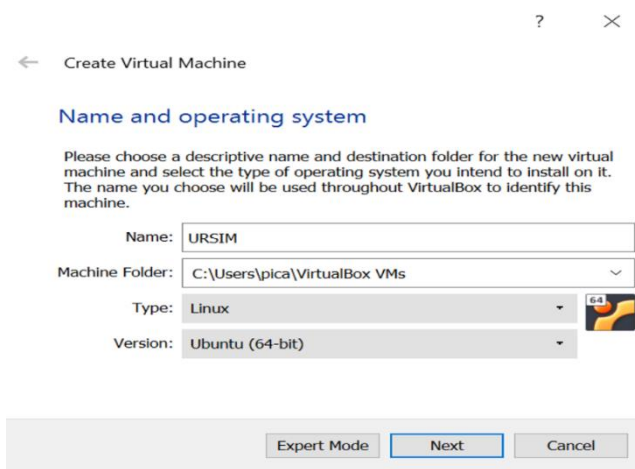
### Step 1: Launch Oracle VM VirtualBox.



### Step 2: Add a new VBoxImage by clicking on the 'New' button.

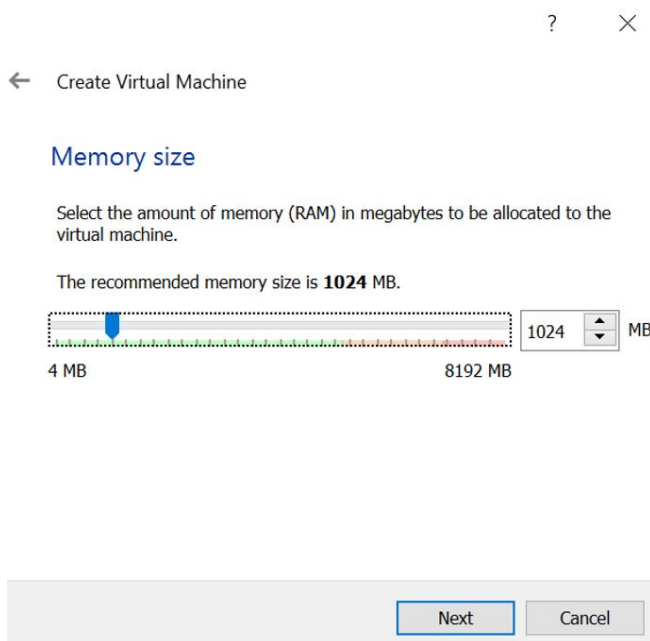


### Step 3: Select Name and Operating System



While the name can be chosen freely, in this case URSIM, the Type entry (Linux) and the Version (Ubuntu 64 Bit) must be chosen as shown.

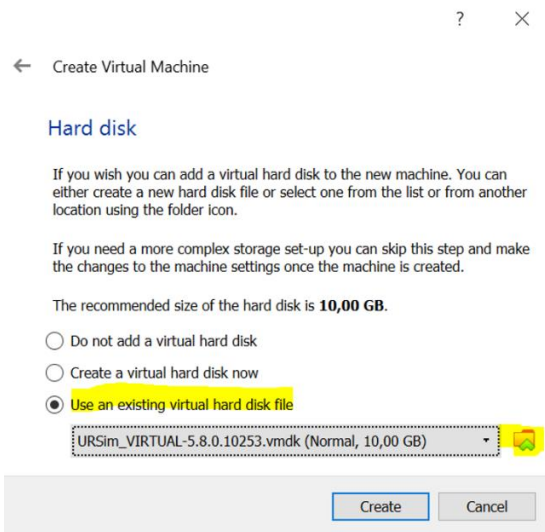
Once finished, click 'Next'. Then select a sufficient amount of RAM memory:



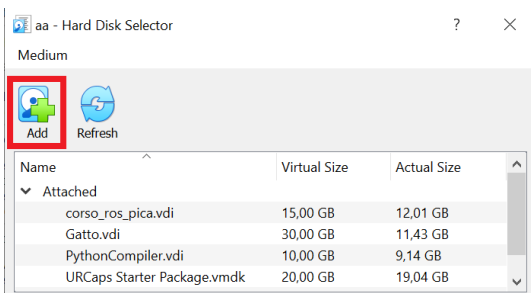
At least 768 MB should be selected; if possible, reserve more than that, specifying a value equal to a power of 2 (1024, 2048 etc.).

Click 'Next'.

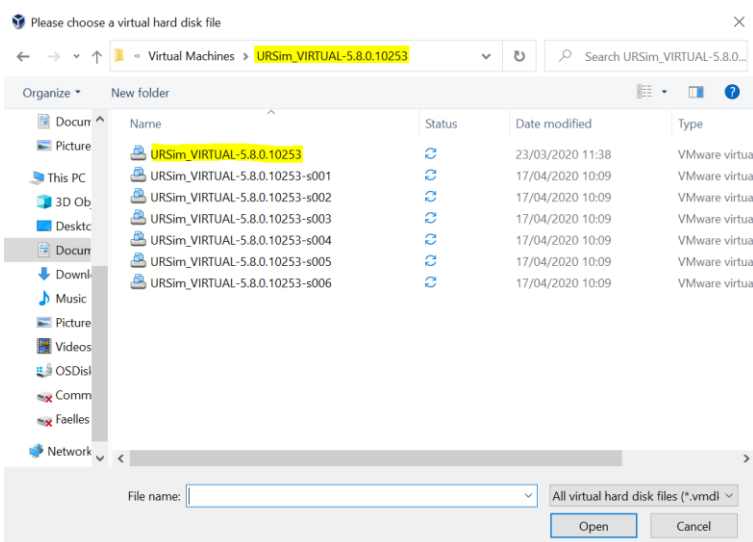
In the next window, select 'Use an existing virtual hard disk file'.



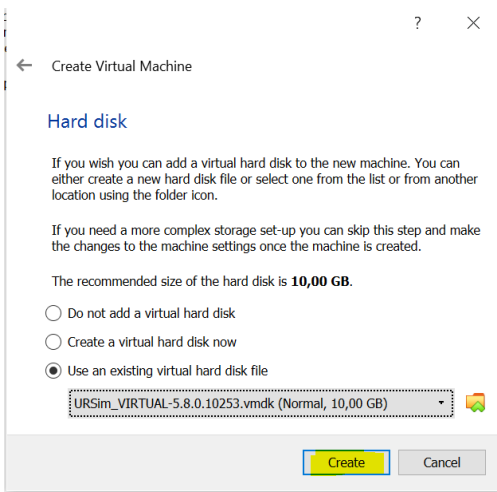
Click on the folder with the green arrow on the right, and in the new window select 'Add':



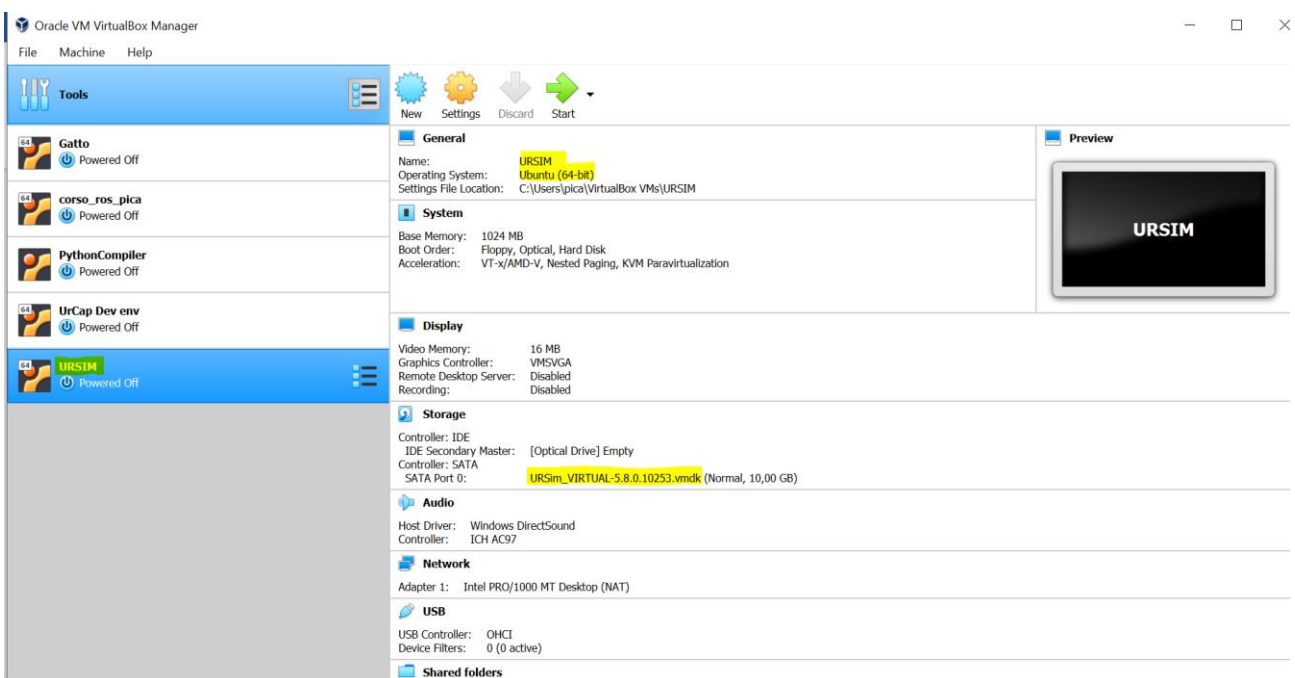
Navigate to the folder where you extracted the URSIM file downloaded from the UR site and select the first element:



Click 'Open', then 'Choose' and then 'Create':

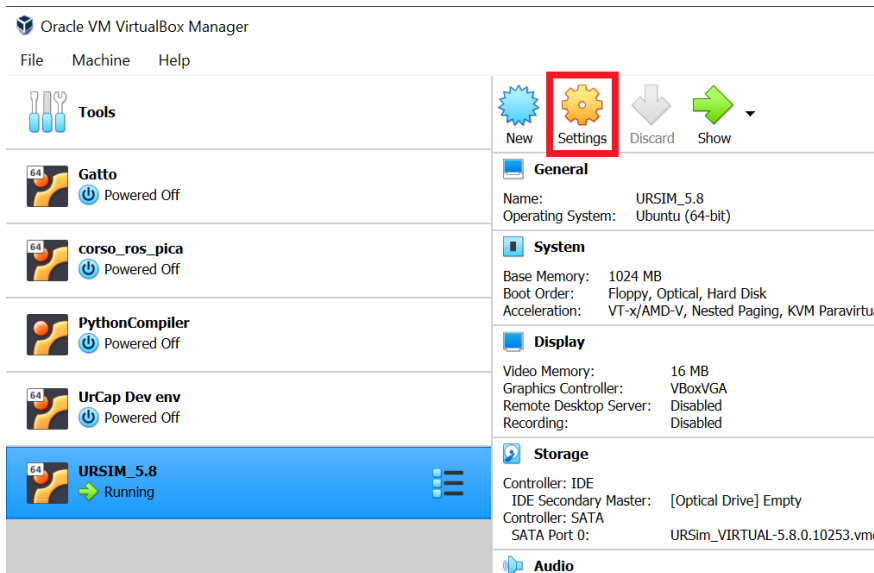


If everything has been done correctly in the Oracle main page on the left side, you should have a new entry with the selected name:

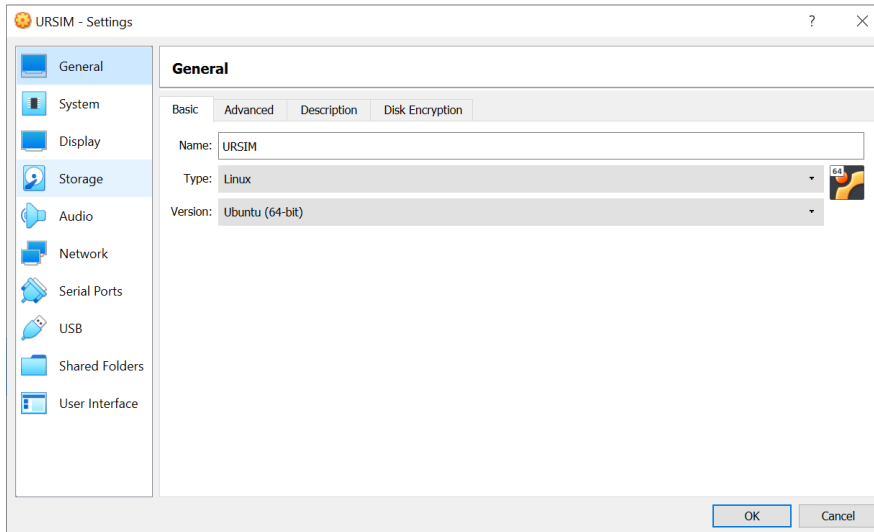


## Part 4: Settings for correct execution of the VDI

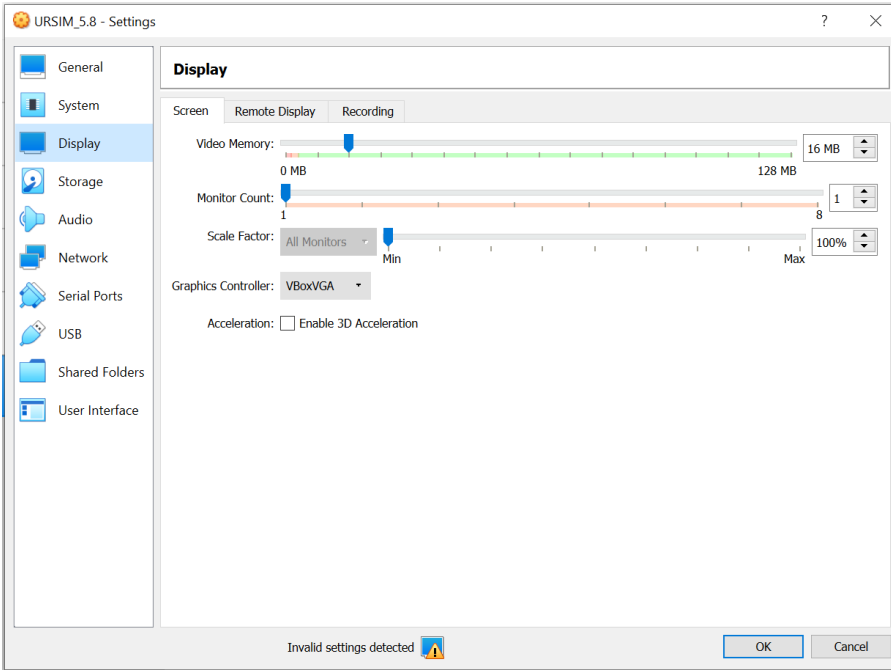
In order to correctly run the VDI we must first set some preferences; to do so, select the VDI installed before and click on ‘Settings’:



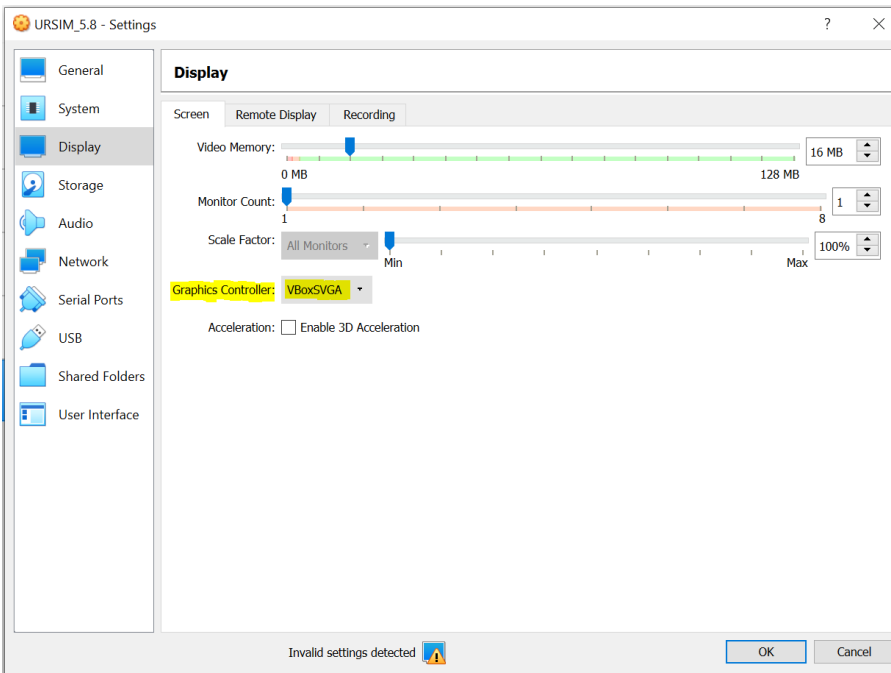
The following window is opened:



Click on ‘Display’ on the left side of the window to access the following window:



Change the Graphics Controller to VBoxSVGA:



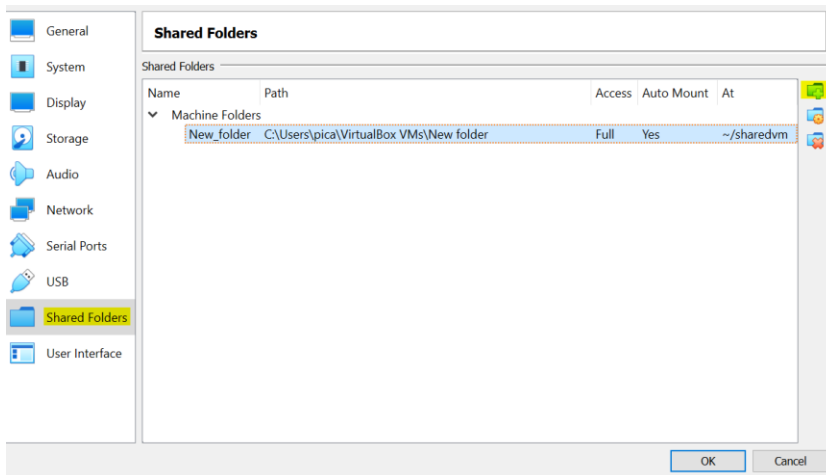
Please ignore the warning “Invalid settings detected”. Some users experienced issues with the screen size if the default “VMSVGA” option was chosen.

Optionally, we need to set up a shared folder between the Virtual System and our Windows System.



**This part is necessary only if you plan to transfer files from the virtual machine to Windows environment or vice versa, and can be done at a later time (Jump to chapter 5, if not needed).**

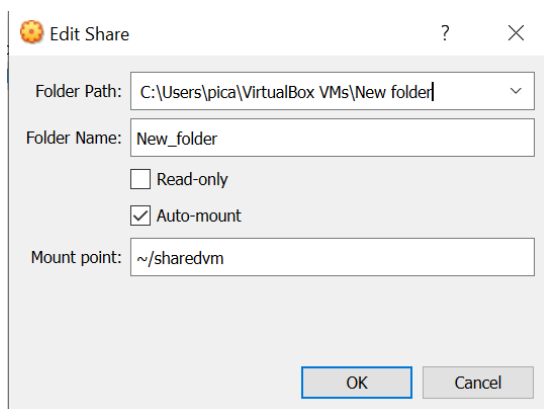
On the left side of the window, select 'Shared Folder' and click on the folder with a green cross on the right side of the window:



Specify the options as follows:

- **Folder path:** Specify the path to a folder in your Windows system: This is the Windows folder where you will put files you need to transfer to the simulator in the Linux system.
- **Folder Name:** Choose a desired folder name
- Check the **Auto Mount**
- **Mount Point:** Specify the mount point in the Linux system from where you will be able to access the content of the shared folder, remember to start with a "~" (the "~" can be typed as "Alt"+"126" on the keypad)

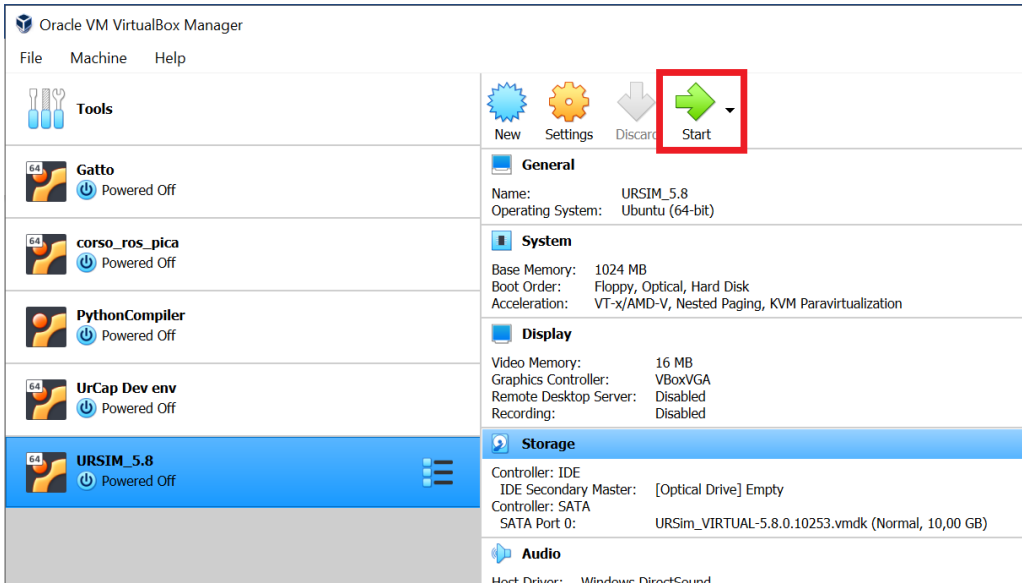
Example:



Click 'OK' and again click 'OK' to close the Settings window, we are now ready to launch our VDI.

## Part 5: VDI first launch

In Oracle, select your new VDI and click on 'Start':

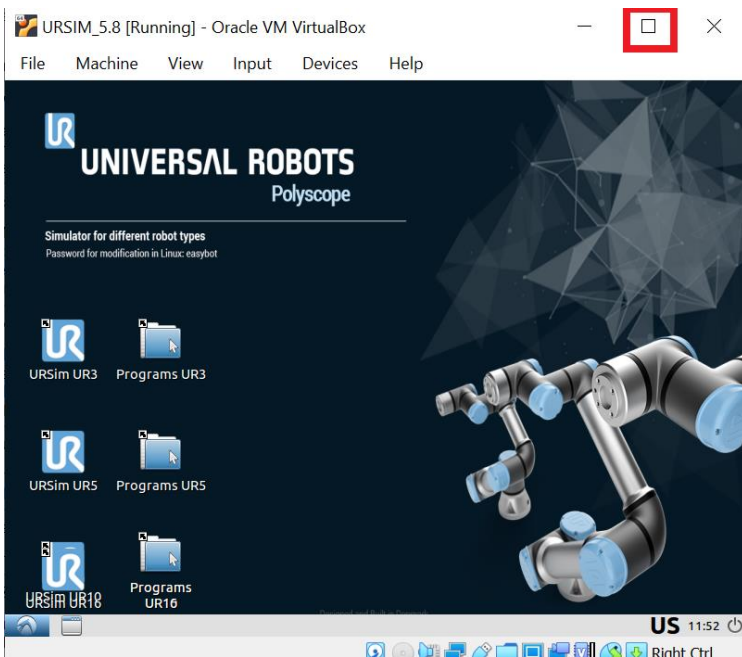


You should now be inside your new Linux OS:

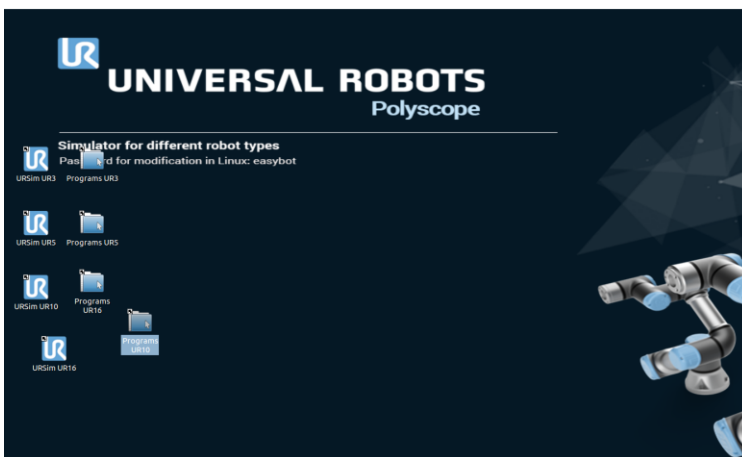




If the screen is small size, expand the window clicking on the right top square:



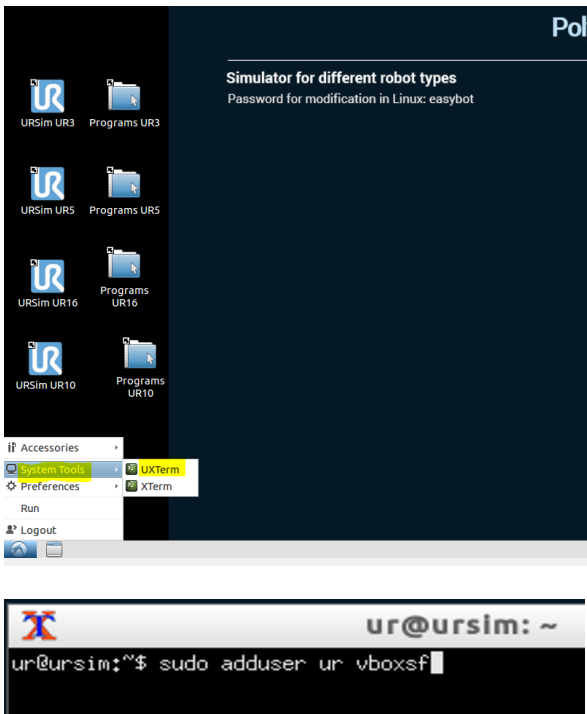
And drag (one click and hold) the URSim UR16 and Programs UR16 icons to correctly visualize all the icons on the desktop:



**The following part is necessary only if you defined a shared folder in the previous chapter.** (Else jump to chapter 6).

In order to be able to access the shared folder created in chapter 4, open a terminal and type the following line:

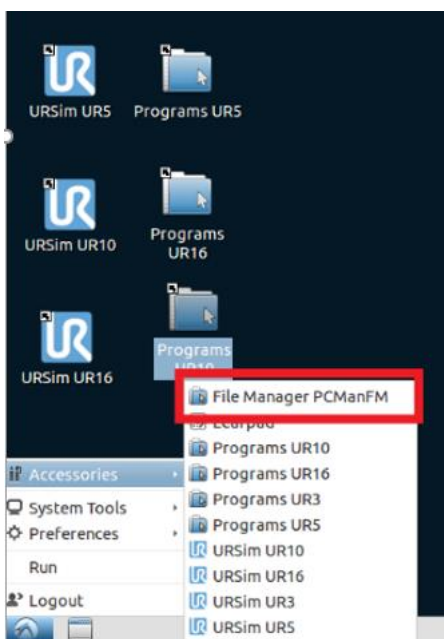
**sudo adduser ur vboxsf** (see chapter 7 if you need to change the keyboard layout)



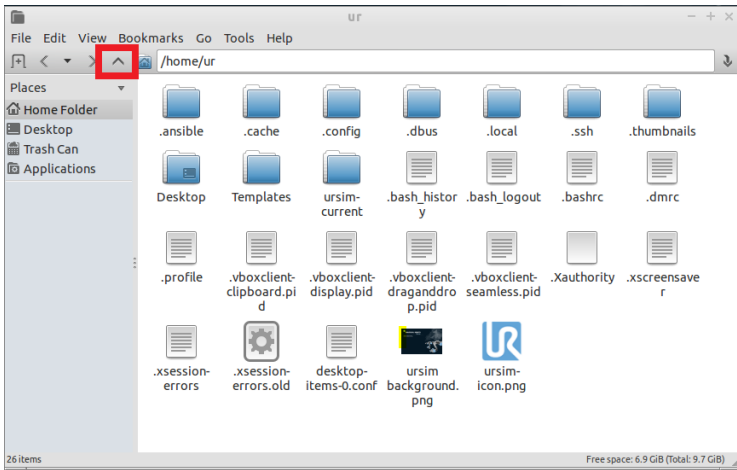
Press Enter, close and restart the virtual machine.

Once restarted, the shared folder is located in the directory “ /media “

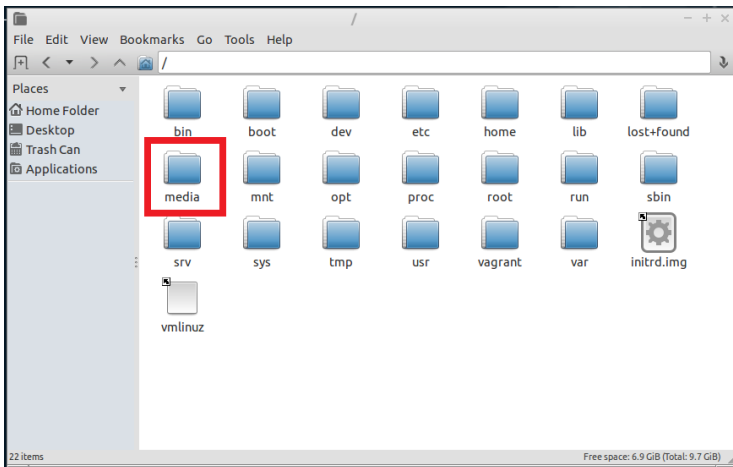
To access it, click on the icon in the bottom left corner, then in the window move your cursor to accessories and click on File Manager PCManFM



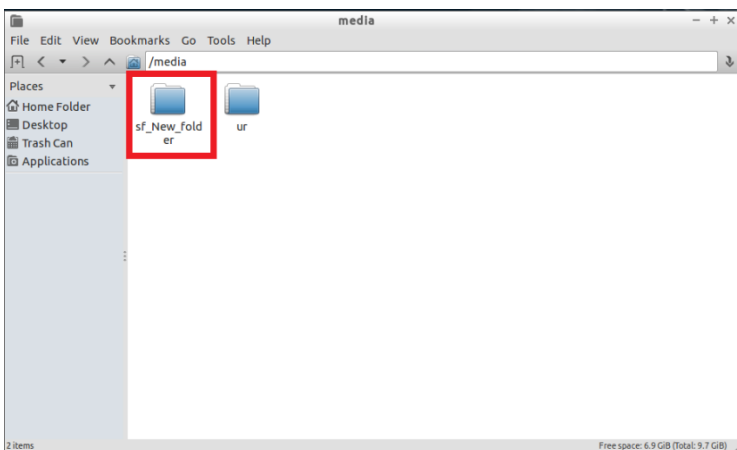
The following window will be opened; click twice on the up-arrow shown in figure...



...to reach the following directory, then double click on media:



Here you will find your shared directory:



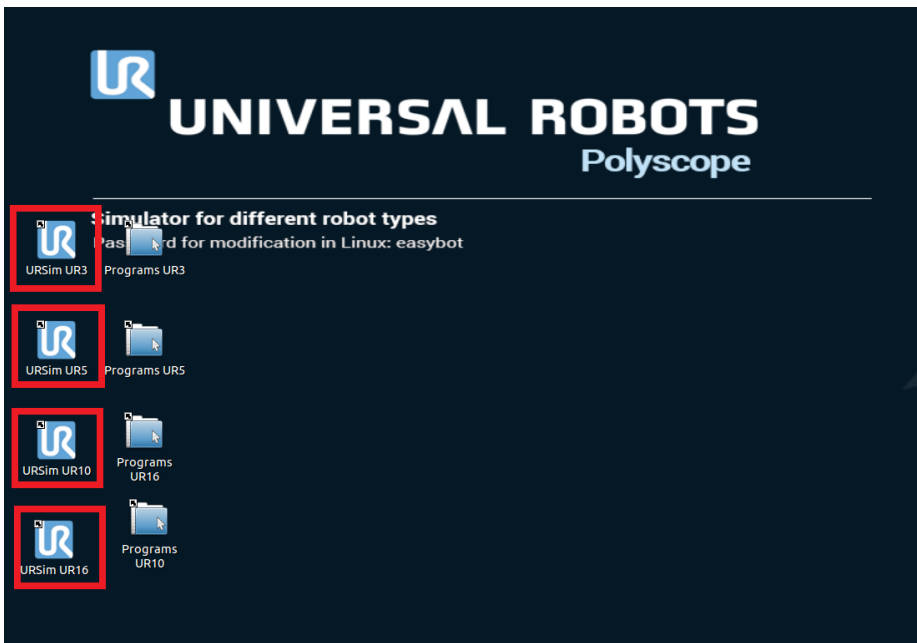
Double click to see its contents. Your machine should now be ready for use, the screen should be of the correct size, and you should be able to access the shared folder between the Virtual Machine and your Windows machine to easily transfer files between the two.

## Part 6: Launch Polyscope

Launching Polyscope and the whole robot simulation is very easy.

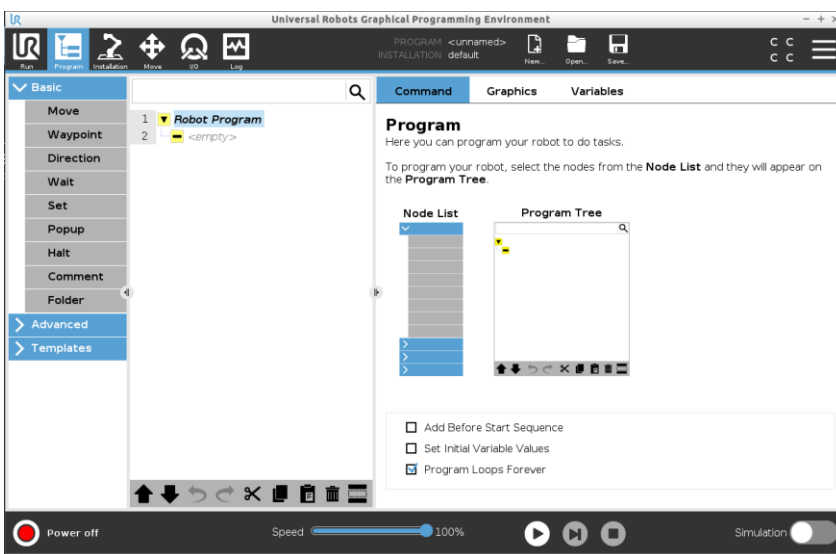
You can choose to launch a simulation of one of the four different types of UR Cobots: UR3e, UR5e, UR10e and UR16e.

Depending on your choice from the desktop of your Virtual Machine, double click on the desired icon:



The folders 'Programs URx' contain .urp programs, .scripts and .urcap used by the simulator. There you will find all the software created in the simulator and this is where you will put all the files (from a real robot or received by e-mail) that you need to run in the robot simulator.

Once you launch one of the available simulations, a window will appear as if you are holding the Teach Pendant of the real robot:

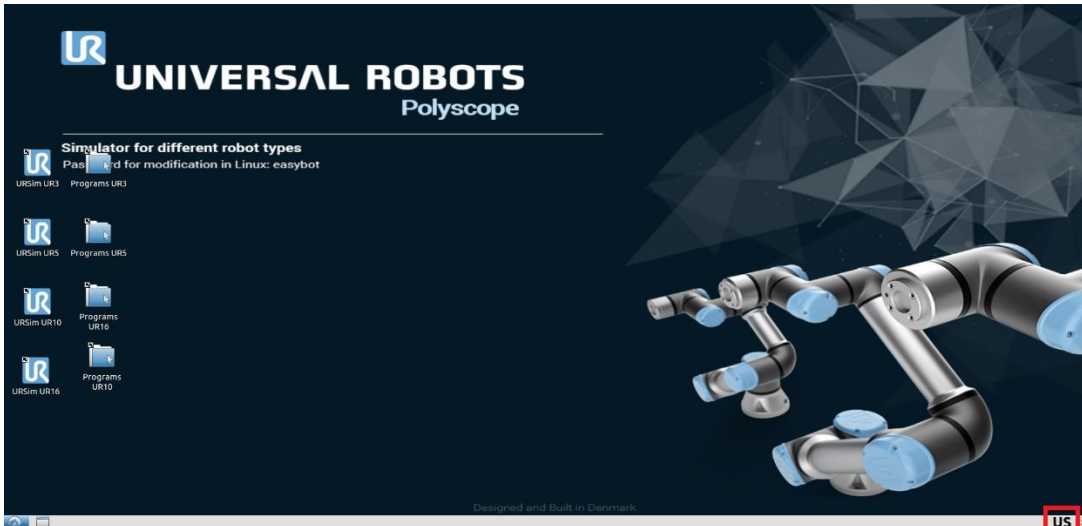


## Part 7: Change Keyboard Layout

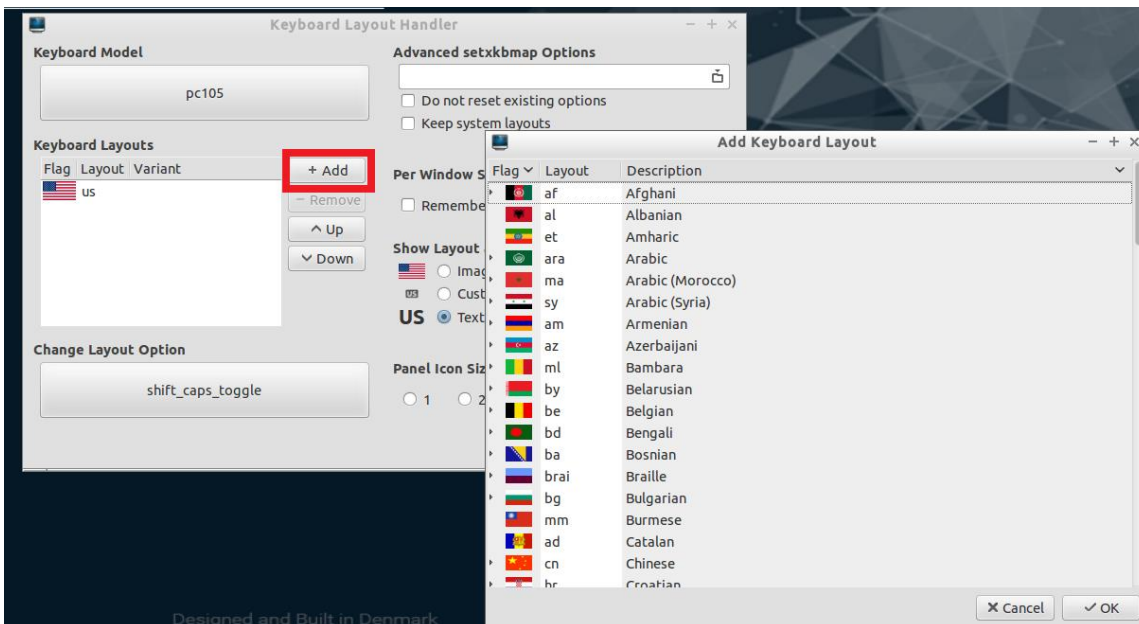


This part is necessary only if you need to change the keyboard layout (else jump to chapter 8).

By default the keyboard layout of the virtual machine is the US one, if you have a different layout you can change it by clicking on the US symbol on the bottom right corner of the screen:



In the following window, click on “add” to add a new keyboard layout:



Clicking on the Up / Down buttons you Will change their priority, the one on top will be the one used as default.

## Part 8: Set Up of Network Adapter



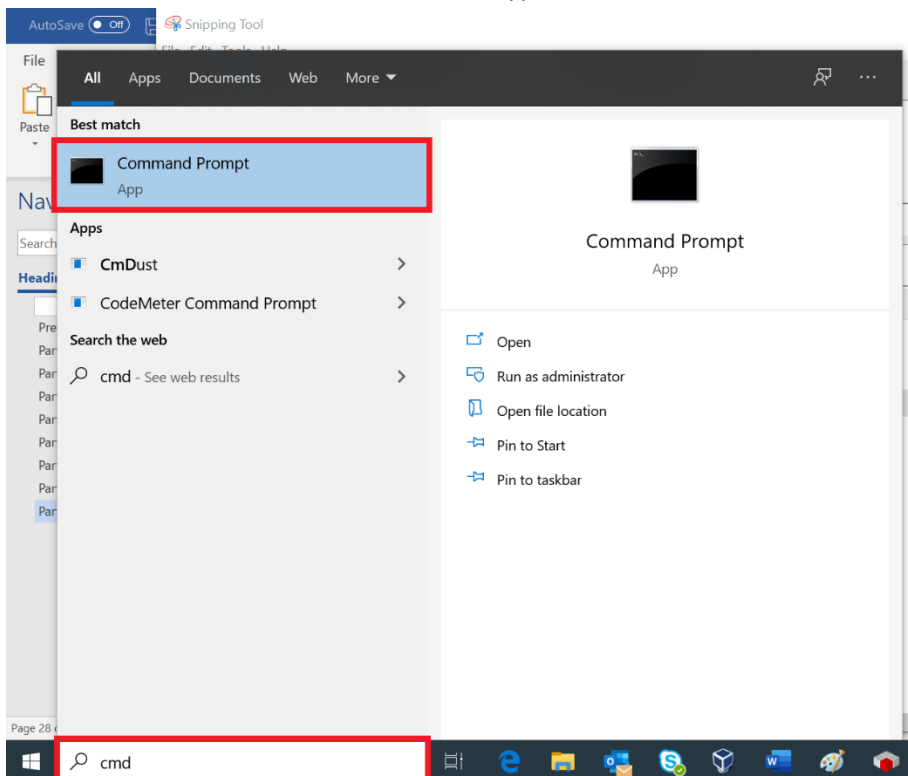
**ADVANCED USERS - This part is necessary only if you plan to establish a network connection with the WINDOWS environment or to external devices (else, stop here)**

In settings \ network, depending on the hardware used and the need to communicate with a software in the host or an external device, you should choose to connect to “Host Only Adapter” or “adapter with bridge”.

Your WINDOWS environment and your URSIM virtual machine Will now have two different IP addresses that can be used to communicate.

The IP address of your WINDOWS environment used to communicate FROM the Virtual Machine TO the Windows environment can be retrieved as follows:

- In the bottom left, in the search text box type “cmd” and start the command prompt:



- Once the command prompt is opened type the command “ipconfig” and press enter:
- Search for the “Ethernet Adapter Virtual Box Host Only network” , the IP address shown in here is the one that you will need to use when communicating from the virtual machine to the Windows environment:

```

C:\Users\pica>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::41dd:34db:89a6:7521%11
    IPv4 Address. . . . . : 192.168.56.102
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Ethernet adapter VMware Network Adapter VMnet1:

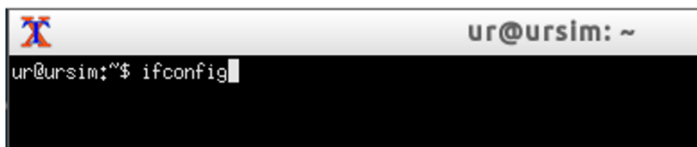
    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::8901:e259:905e:fd90%21
    IPv4 Address. . . . . : 192.168.91.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Ethernet adapter VMware Network Adapter VMnet8:

```

In the same way, to know the IP address of your Virtual Machine to be used to communicate to it from the WINDOWS environment follow this procedure:

- Start your virtual machine
- In the bottom right corner click on the icon highlighted in the figure, then select System Tools and the UXTerm, as shown before;
- The Linux terminal Will open, now type the command “ifconfig”:

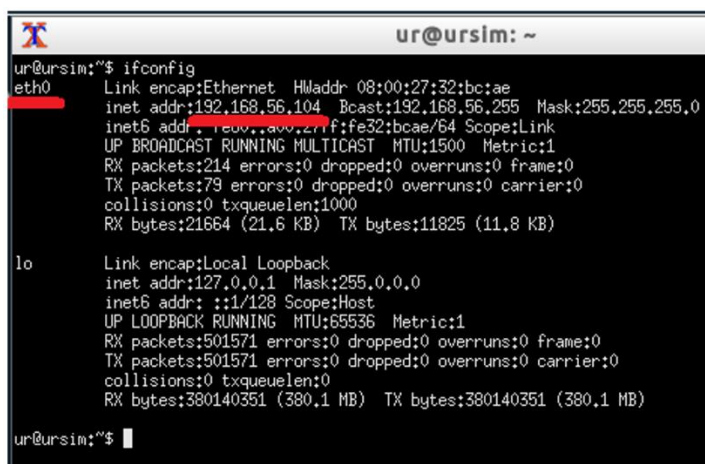


```

ur@ursim:~$ ifconfig

```

- The IP address of your virtual machine is the one shown inside eth0:



```

ur@ursim:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:32:bc:ae
          inet addr:192.168.56.104  Bcast:192.168.56.255  Mask:255.255.255,0
          inet6 addr: fe80::41dd:34db:89a6:7521%11 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:214 errors:0 dropped:0 overruns:0 frame:0
          TX packets:79 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:21664 (21.6 KB)  TX bytes:11825 (11.8 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0,0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:501571 errors:0 dropped:0 overruns:0 frame:0
          TX packets:501571 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:380140351 (380.1 MB)  TX bytes:380140351 (380.1 MB)

ur@ursim:~$

```

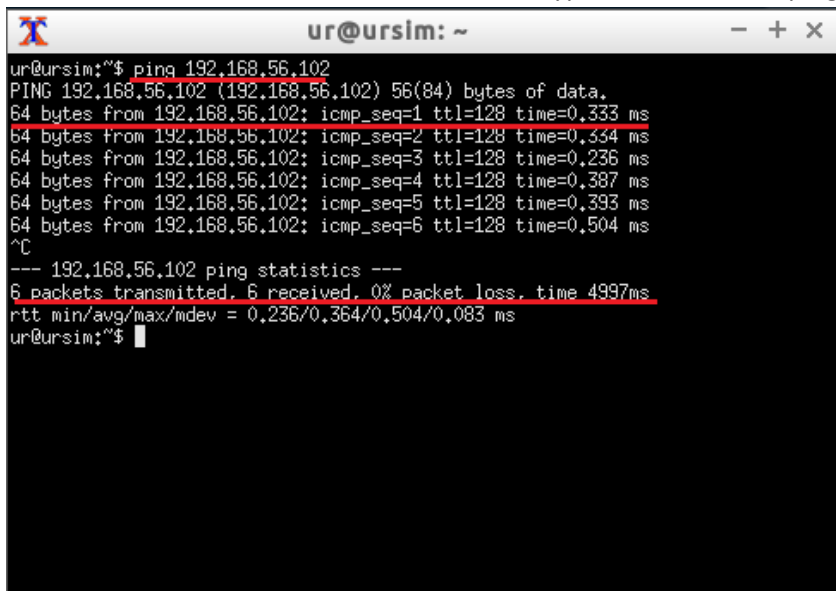
To verify the connection is properly configured from the Windows Command prompt type the following command “ping #IPADDRESSOFVIRTUALMACHINE” and verify you have a response:

```
C:\Users\pica>ping 192.168.56.104

Pinging 192.168.56.104 with 32 bytes of data:
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.56.104:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
Reply from 192.168.56.104: Control-C
^C
```

Viceversa from the Virtual Machine terminal type the command “ping <IPADDRESSOFWINDOWS>”:



```
ur@ursim:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data:
64 bytes from 192.168.56.102: icmp_seq=1 ttl=128 time=0.333 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=128 time=0.334 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=128 time=0.236 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=128 time=0.387 ms
64 bytes from 192.168.56.102: icmp_seq=5 ttl=128 time=0.393 ms
64 bytes from 192.168.56.102: icmp_seq=6 ttl=128 time=0.504 ms
^C
--- 192.168.56.102 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 4997ms
rtt min/avg/max/mdev = 0.236/0.364/0.504/0.083 ms
ur@ursim:~$
```