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](https://www.oracle.com/technetwork/server-storage/virtualbox/overview/index.html))

**Step 1**


<table>
<thead>
<tr>
<th>Oracle VM VirtualBox Base Packages - 6.1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freely available for Windows, Mac OS X, Linux and Solaris x86 platforms under GPLv2:</td>
</tr>
<tr>
<td><strong>Platform</strong></td>
</tr>
<tr>
<td>Windows</td>
</tr>
<tr>
<td>Mac OS X</td>
</tr>
<tr>
<td>Solaris 10/5/08 and later or Solaris 11</td>
</tr>
</tbody>
</table>

**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)

Then, at the bottom of the page, click on URSim_VIRTUAL-5.8.0.10253.rar to start your download.
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:
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 choosen.
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:

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

![Ping result from Windows Command prompt]

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

![Ping result from Virtual Machine terminal]