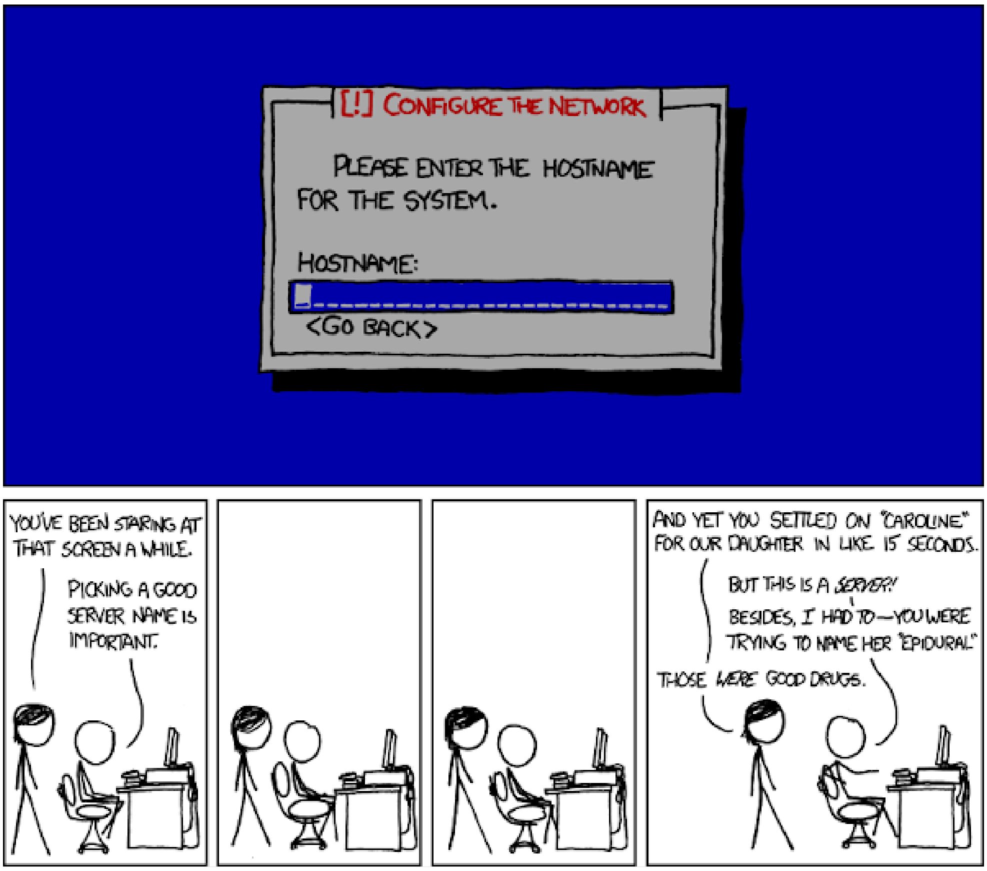
GROUP T LEUVEN CAMPUS

Operating systems: homework 1

Setting up the development environment


[!] CONFIGURE THE NETWORK
PLEASE ENTER THE HOSTNAME FOR THE SYSTEM.
HOSTNAME:
<GO BACK>
YOU'VE BEEN STARING AT THAT SCREEN A WHILE.
PICKING A GOOD SERVER NAME IS IMPORTANT.
AND YET YOU SETTLED ON "CAROLINE" FOR OUR DAUGHTER IN LIKE 15 SECONDS.
BUT THIS IS A SERVER!
BESIDES, I HAD TO—YOU WERE TRYING TO NAME HER "EPIDURAL."
THOSE WERE GOOD DRUGS.

Bachelor Electronics/ICT – Operating Systems

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Lab teachers:

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- Toon Dehaene

1. Introduction: Setting up your development environment

For the pc sessions we want to make sure that all students work in a uniform environment.

The goal of this homework is to set up such an environment on your laptop. This will help you and the teaching staff to optimize the efficiency of these sessions.

We want to avoid that students and staff lose time to diagnose and fix any problem that might arise with your specific laptop or operating system configuration.

To anticipate the fact that many students have limited experience with Linux, we designed this tutorial to make your life as easy as possible. (at least in this first installment)

2. Overview

Our uniform development environment will be set up in a virtual machine on your laptop. We will set up the following tools:

- Oracle Virtual Box (https://www.virtualbox.org/)
- Virtual box guest additions for Ubuntu such that you can use copy-paste between your native environment and the virtual environment.
- Ubuntu 24.04LTS Desktop (https://ubuntu.com/download/desktop)
- Git
- Clion
- net-tools
- gcc
- make

3. Installing Virtual Box

Virtual Box 7 is a free open source virtualization software that runs on Windows, Linux, macOS (Intel cpu) and Solaris hosts. There is no support for Apple Silicon (ie M1 and M2 based computers). The reason is that virtual box (or Parallels desktop) and Ubuntu need to be compiled for Apple Silicon. At the time of writing it is unclear if all those building blocks are available.

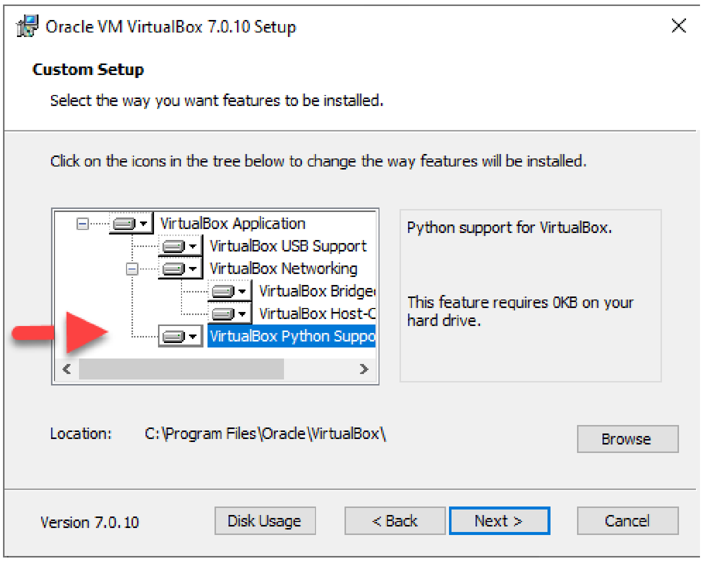
You can download Virtual Box for free from here: https://www.virtualbox.org/wiki/Downloads.

If your workstation already boots Ubuntu, you don't have to install Virtual Box. If your pc boots another Linux distribution, you will probably be able to make all the exercises in this course, but you might encounter small problems during compilation and linking. If this happens you are responsible to solve these problems. (Your friends, teachers, family, Google, Stackoverflow might help you out but without any SLA).

Download both the **platform package** for your operating system as well as the **extension pack**. First install the platform, and then under tools, you can install the extension pack. The platform is installed in the well known Windows style : next – ok - …

During the installation of VirtualBox, you should eliminate some of the default installed features. If you would want to interact with Virtual Box using Python, you would need to install the VirtualBox

Python Support feature. Note however that you also would need to install “python core / win32api” prior to install Virtual Box. This feature is not needed in this course, so you don’t have to install it .



Oracle VM VirtualBox 7.0.10 Setup

Custom Setup

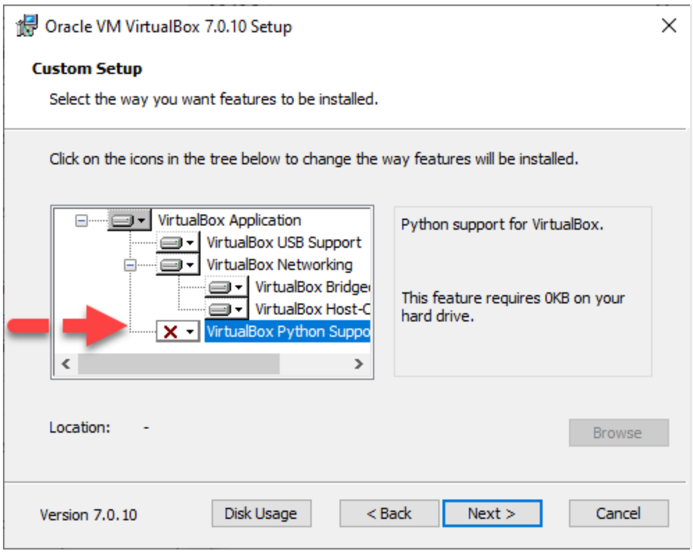
Select the way you want features to be installed.

Click on the icons in the tree below to change the way features will be installed.

Python support for VirtualBox.

This feature requires 0KB on your hard drive.

Location: C:\Program Files\Oracle\VirtualBox\



Oracle VM VirtualBox 7.0.10 Setup

Custom Setup

Select the way you want features to be installed.

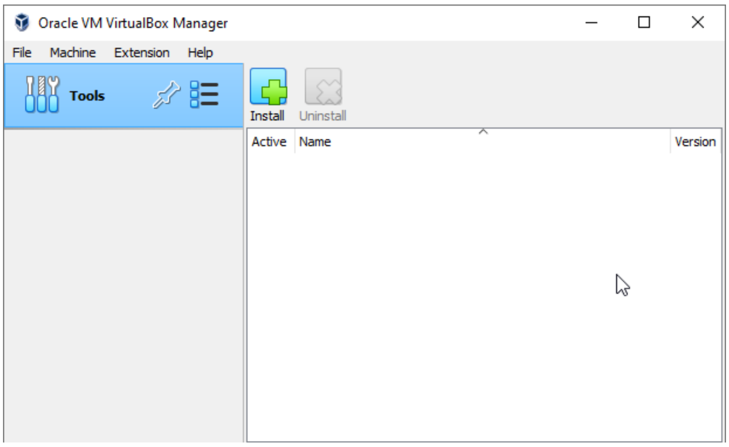
Click on the icons in the tree below to change the way features will be installed.

Python support for VirtualBox.

This feature requires 0KB on your hard drive.

Location: -

After successful installation you can launch Virtual Box.



To install the extension pack, click on the install icon in the ribbon just under the main menu bar. Then browse to the location where you downloaded the extension pack. From there on: Install … next … OK.

```
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| 4.  Creating a VM                                          |
 ------------------------------------------------------------
```
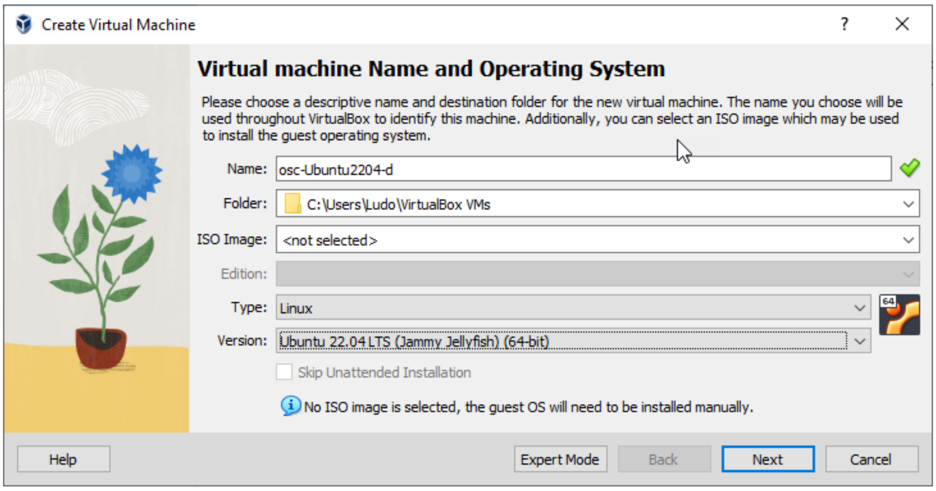

We will create a virtual Ubuntu 24.04LTS desktop system with

- dual core cpu `// 1 core may not boot`
- 8 GB ram `// can easily be adjusted afterwards`
- 40 GB hard drive. `// is very difficult to modify afterwards.`

In VirtualBox: main menu bar -> Machine -> New opens a dialog.

Do not mount the iso image of Ubuntu yet, as this will boot a live operating system from the ISO rather than install ubuntu onto your VM. When booting from the ISO, the OS can also be installed but skips the config of the keyboard. This is not funny for dutch/azerty people. However, the keyboard can be reconfigured later.



Create Virtual Machine

Virtual machine Name and Operating System

Please choose a descriptive name and destination folder for the new virtual machine. The name you choose will be used throughout VirtualBox to identify this machine. Additionally, you can select an ISO image which may be used to install the guest operating system.

Name: osc-Ubuntu2204-d

Folder: C:\Users\Ludo\VirtualBox VMs

ISO Image: <not selected>

Edition:

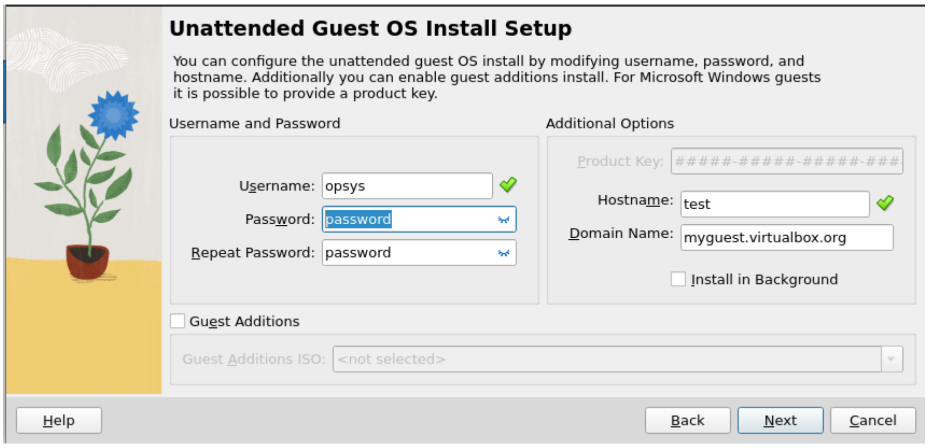
Type: Linux

Version: Ubuntu 22.04 LTS (Jammy Jellyfish) (64-bit)

□ Skip Unattended Installation

No ISO image is selected, the guest OS will need to be installed manually.

In the following screen, set up a username and password for this VM. Save the password to a place you will not lose it.



Unattended Guest OS Install Setup

You can configure the unattended guest OS install by modifying username, password, and hostname. Additionally you can enable guest additions install. For Microsoft Windows guests it is possible to provide a product key.

Username and Password

Username: opsys

Password: password

Repeat Password: password

Additional Options

Product Key: #####-#####-#####-###

Hostname: test

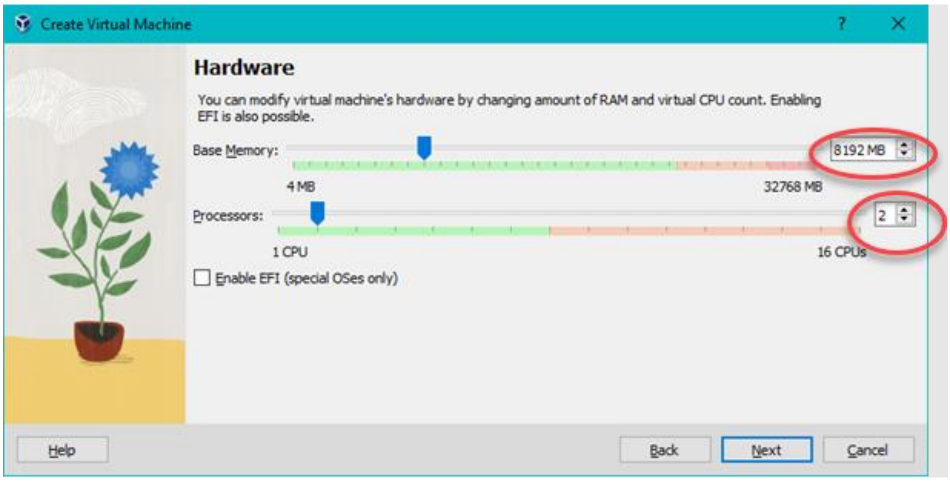
Domain Name: myguest.virtualbox.org

□ Install in Background

□ Guest Additions

Guest Additions ISO: <not selected>

Click next:



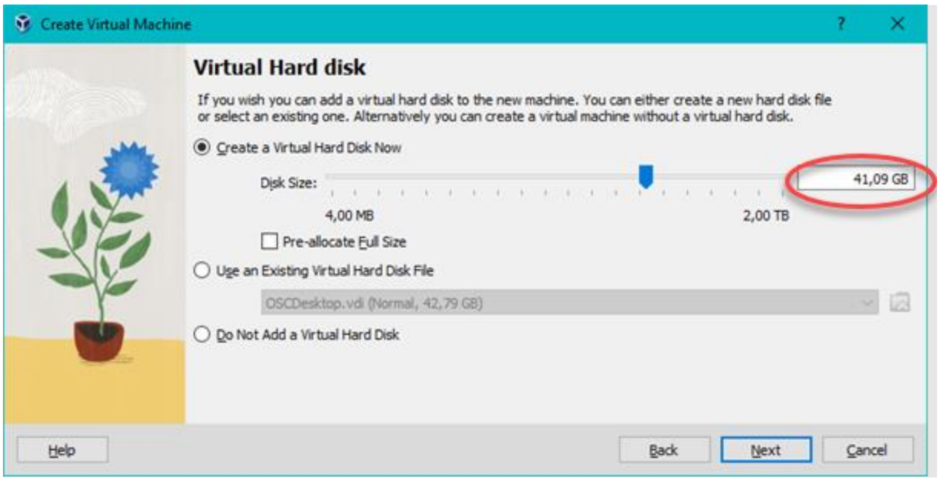
Hardware

You can modify virtual machine's hardware by changing amount of RAM and virtual CPU count. Enabling EFI is also possible.

Base Memory: 8192 MB (4 MB – 32768 MB)

Processors: 2 (1 CPU – 16 CPUs)

☐ Enable EFI (special OSes only)



Virtual Hard disk

If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select an existing one. Alternatively you can create a virtual machine without a virtual hard disk.

● Create a Virtual Hard Disk Now

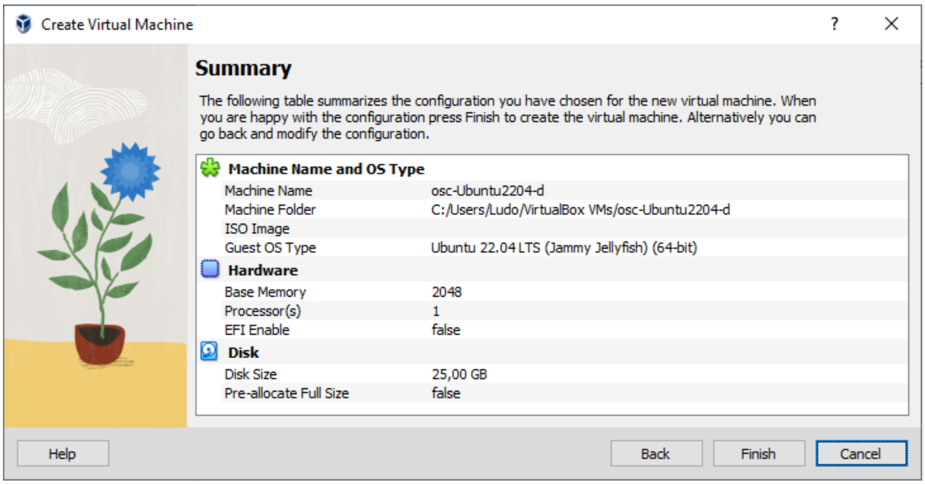
Disk Size: 41,09 GB (4,00 MB – 2,00 TB)

☐ Pre-allocate Full Size

○ Use an Existing Virtual Hard Disk File

OSCDesktop.vdi (Normal, 42,79 GB)

○ Do Not Add a Virtual Hard Disk



Summary

The following table summarizes the configuration you have chosen for the new virtual machine. When you are happy with the configuration press Finish to create the virtual machine. Alternatively you can go back and modify the configuration.

Machine Name and OS Type	
Machine Name	osc-Ubuntu2204-d
Machine Folder	C:/Users/Ludo/VirtualBox VMs/osc-Ubuntu2204-d
ISO Image	
Guest OS Type	Ubuntu 22.04 LTS (Jammy Jellyfish) (64-bit)
Hardware	
Base Memory	2048
Processor(s)	1
EFI Enable	false
Disk	
Disk Size	25,00 GB
Pre-allocate Full Size	false

```
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| 5.   Installing Ubuntu 24.04 LTS Desktop.                            |
 ---------------------------------------------------------------------
```
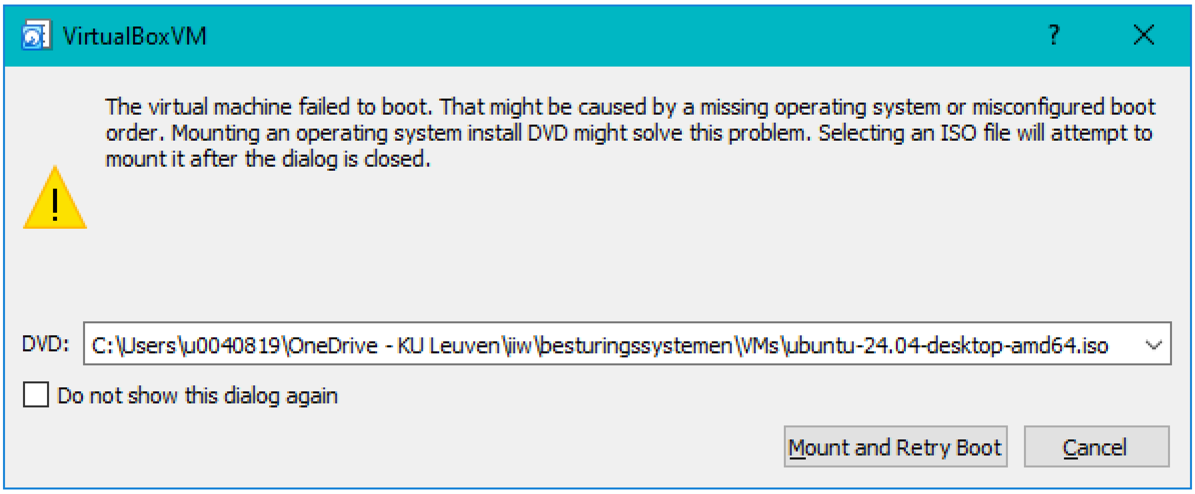

- First, download the iso from https://ubuntu.com/download/desktop
- Boot the VM. The VM will find no boot medium and prompts you to mount a bootable medium. Browse to your download folder and select the ISO file. Then click the ‘Mount and Retry boot’ button.

It is important that you download and install a version 24.04 Desktop.

Why? Because the whole teaching team uses a 24.04 LTS Desktop version. So we should be able to assist you when problems. At least we try very hard. LTS means 'Long Term Support' and Canonical will not change features overnight. For more info on Ubuntu releases and lifecycle: https://ubuntu.com/about/release-cycle



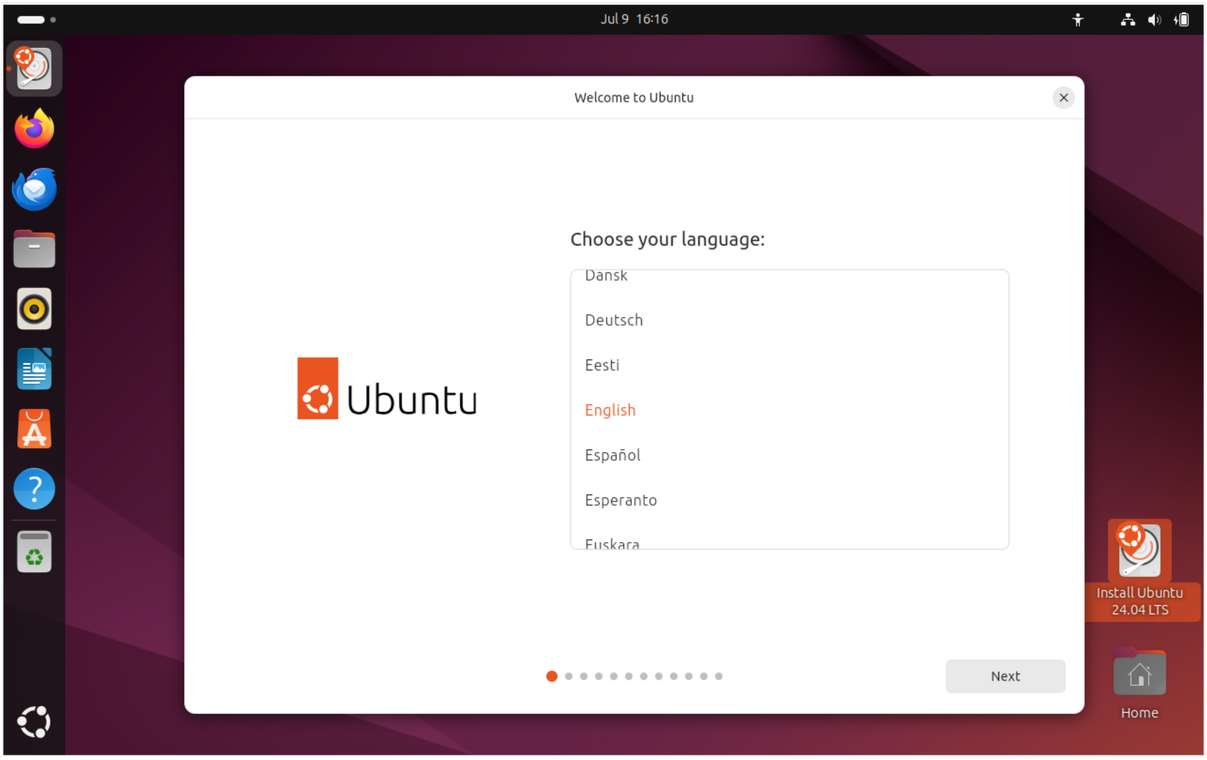
VirtualBoxVM

The virtual machine failed to boot. That might be caused by a missing operating system or misconfigured boot order. Mounting an operating system install DVD might solve this problem. Selecting an ISO file will attempt to mount it after the dialog is closed.

DVD: C:\Users\u0040819\OneDrive - KU Leuven\iiw\besturingssystemen\VMs\ubuntu-24.04-desktop-amd64.iso

□ Do not show this dialog again

Reboot the VM and choose to *try or install Ubuntu* in the text-based menu interface. After a while you will be presented a GUI to install Ubuntu. Choose to install Ubuntu.



Click next through the installation menu.

1. Configure your keyboard layout and language and choose to continue the installation with the default configured options (interactive installation, download updates, erase disk and

install Ubuntu) and continue with “install now” or “continue”. (BE azerty keyboard = Belgian (Wang 724 AZERTY)

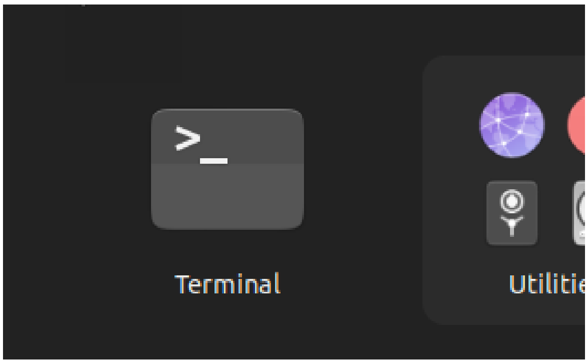
2. If you get prompted to update the installer itself, you can safely skip it. If you do update it, it will update, close, then you’ll have to restart the installer manually.
3. Create a computer name and user account with a name and password. Choose names and passwords that you can remember and type easily. Your VM is protected from the outside world by your laptop and its operating system.
4. Choose a short username and password: you will have to enter it very often!
5. Relax & wait until the installation is finished. At the end, reboot to start Ubuntu Desktop.

Getting started

You can skip the start-up screen that wants to configure some bloatware and other software. It is advised to install the updates when Ubuntu asks to update. Reboot at the end.

You can change the resolution of the screen on the desktop to a resolution fitting your laptop and put the VM in full screen.

In Ubuntu the installed applications can be found using “show apps” at the left bottom of the screen. Select “terminal” from the applications overview to open a commandline interface (CLI).



If you right click on the terminal icon, you can add it to the Dash menu. This may save some point & click later. You can now control your ubuntu both via the GUI and the Terminal.

After installing Ubuntu

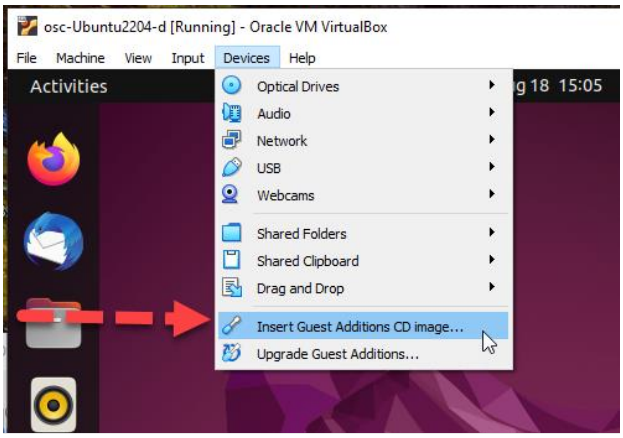
- First upgrade the repositories and install some additional tools:

```
$ sudo apt update
$ sudo apt upgrade
$ sudo apt install gcc make perl bzip2
```

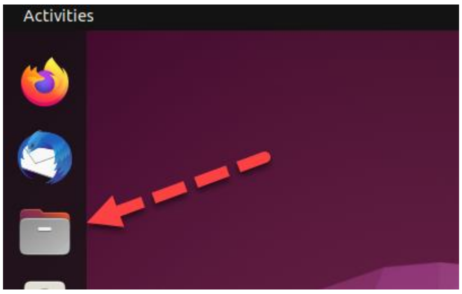
- Set up Copy-paste support

One last thing to have a functional virtual environment is supporting copy paste between your host OS and the VM. To achieve this, we need to install the guest additions.

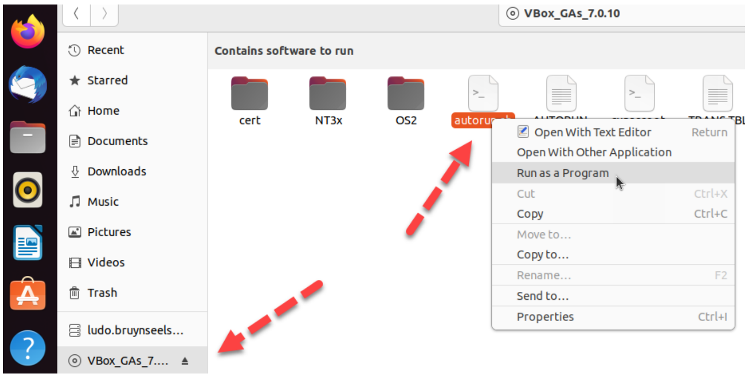
1. Insert Guest additions DVD iso image.



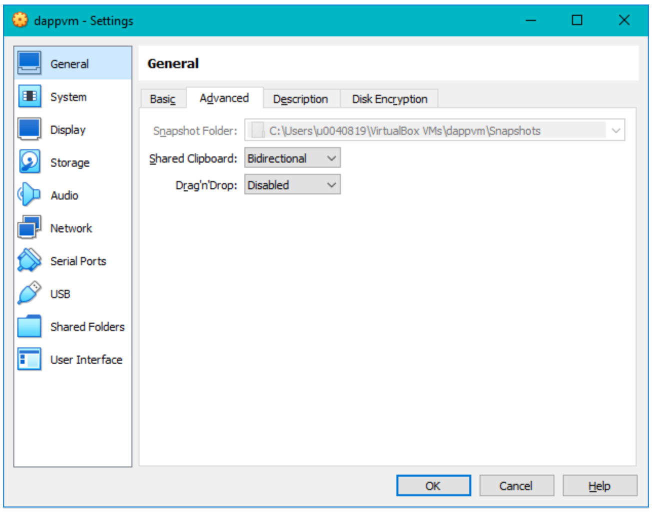
2. Open ‘files’



3. Browse the contents of the cdrom and run autorun.sh (right click)



4. In the settings of your virtual machine, adjust following settings. After rebooting the virtual machine, you will be able to copy/paste between your guest and host operating system.



Snapshot Folder: C:\Users\u0040819\VirtualBox VMs\dappvm\Snapshots

Shared Clipboard: Bidirectional

Drag'n'Drop: Disabled

```
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| 6.   Setting up sshd on your ubuntu desktop                       |
 -------------------------------------------------------------------
```

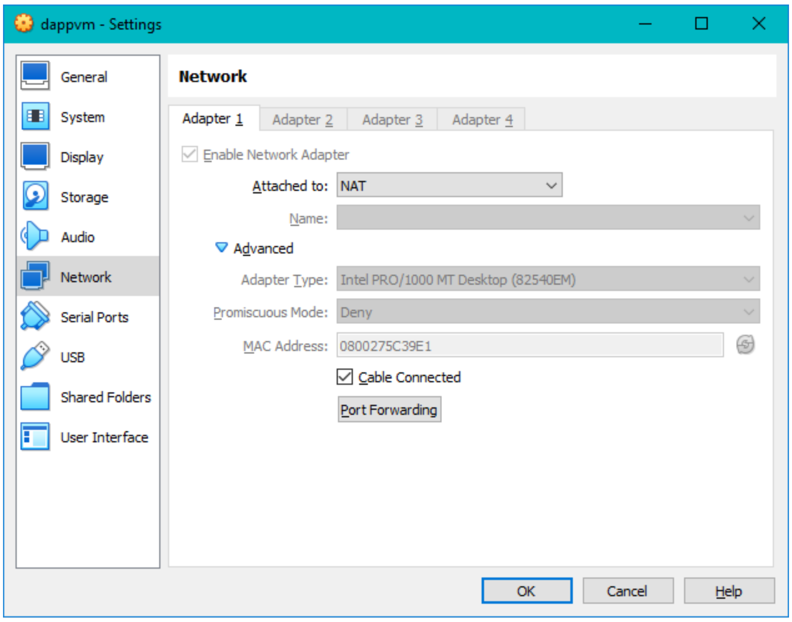
To login to your VM via ssh or to transfer files to and from your VM, you need to install the ssh server on your ubuntu desktop. As such, your ssh client (e.g putty) or sftp client (e.g. filezilla) on your laptop's native operating system can connect to your VM. SSH uses port 22 by default.

We have also chosen the default port 22 on our native host OS. However, if you already run Linux natively with an sshd on your laptop, you might need to choose another port on the host OS (e.g. 2222). After all, only one process can listen on a reserved port.

Installing and starting the ssh server:

```
$ sudo apt install openssh-server
$ sudo systemctl start ssh
$ sudo systemctl status ssh
```

You will also need to forward the local port 22 to your vm:



☑ Enable Network Adapter

Attached to: NAT

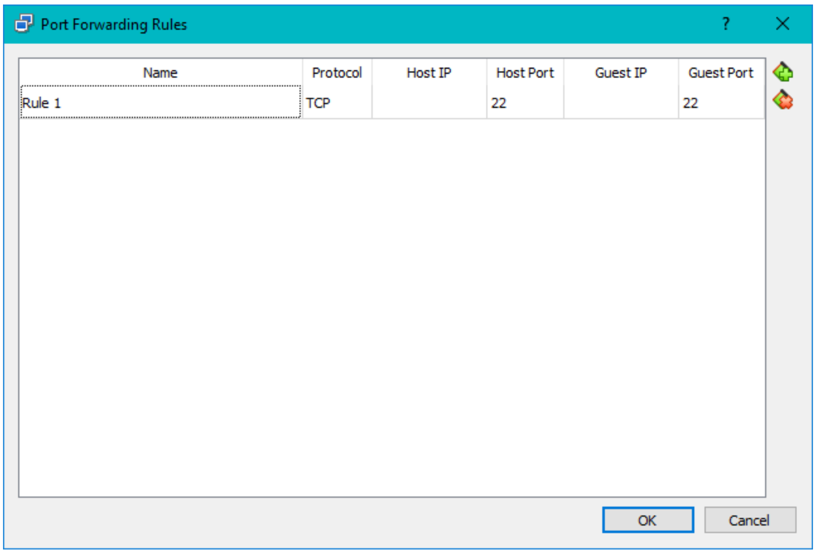
Name:

Adapter Type: Intel PRO/1000 MT Desktop (82540EM)

Promiscuous Mode: Deny

MAC Address: 0800275C39E1

☑ Cable Connected



Name	Protocol	Host IP	Host Port	Guest IP	Guest Port
Rule 1	TCP		22		22

Testing the setup

SSH into your vm from your native host OS, e.g. using the ssh command line client:

```
C:\> ssh osc@localhost
```

You can verify the installation and version of the required tools using.

So far, so good. We now have a working ubuntu desktop system.

7. Configuring sshkeys

Access to remote git repositories requires authentication of your identity, and to avoid relying on passwords, we will use sshkeys which are based on asymmetric encryption (public and private keys)

1. Open a terminal session
2. Type ssh-keygen -t ed25519
3. Accept the proposed filename (unless you have a good reason to choose another one)
4. You may protect your keys with a passphrase but you may leave this empty. Be aware : if you choose a passphrase, you must remember it later! If you leave this empty, nobody will nag about it.
5. cd ~/.ssh (the ~ sign is short for your home folder) There you find your private key and your public key. We will need them later to access remote git repositories.

8. Conclusion

This first practical work was a quick tutorial for students new to Virtual Box and Ubuntu desktop. You should now be able to fluently work in the Ubuntu desktop environment and develop C applications with CLion in the next practical sessions