COMP0182 Real-world Multi-agent Systems

Lab Sheet 1: Installation of Ubuntu and ROS

For this course, everyone **must** use ROS Noetic. The best way to use it is to set up a Ubuntu 20.04 system on your computer. We strongly suggest a dual boot rather than a virtual machine.

For online version for this file, please visit: https://brick-slouch-eb1.notion.site/COMP0182-Real-world-Multi-agent-Systems-8876543ee87747a3aa30972c9f4631d9

Please read **the first part: BitLocker, in Problem encountered (at the end of the file)** ***before you start your installation***

Task 1: Dual boot setup (Tested on Windows machine)

Adapted from:

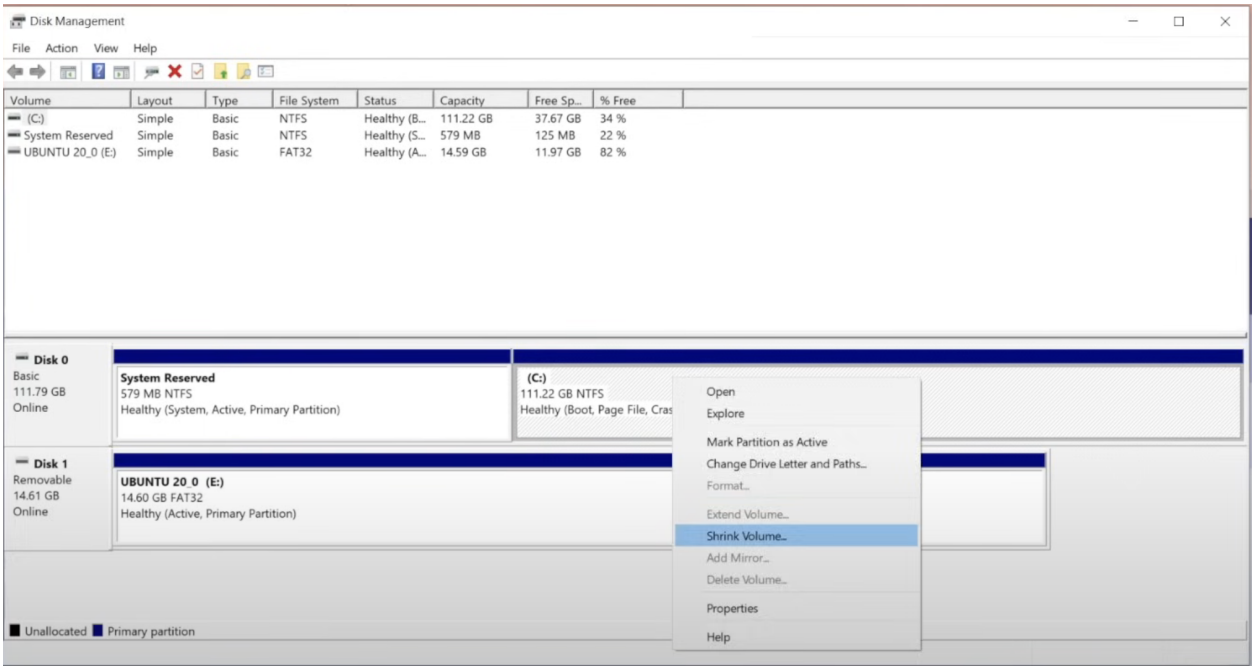
https://www.youtube.com/watch?v=-iSAyiicyQY&t=562s&ab_channel=KskRoyal

1. Pre-requisites:

- A Windows 10 or higher computer, with at least 8GB pendrive
- At least 25 GB free disk space for Ubuntu 20.04
- An USB drive that can be formatted

2. Create new partition on your computer for Ubuntu

- Click ***Win + R*** and type ***cmd*** to open the terminal
- Type `diskmgmt.msc` and enter to open the Disk management
- Right click the last available partition and select ***Shrink volume***, shrink at least 25 GB
- An unallocated partition will come up once it is shrunk successfully



3. Download ***Ubuntu 20.04*** from the official website, select ***Desktop image***

Ubuntu 20.04.6 LTS (Focal Fossa)

CD images for Ubuntu 20.04.6 LTS (Focal Fossa)

https://releases.ubuntu.com/focal/

4. Download ***Rufus*** for making your USB drive bootable, select the ***Standard*** type with your computers platform

Rufus - Create bootable USB drives the easy way

Rufus: Create bootable USB drives the easy way

https://rufus.ie/en/

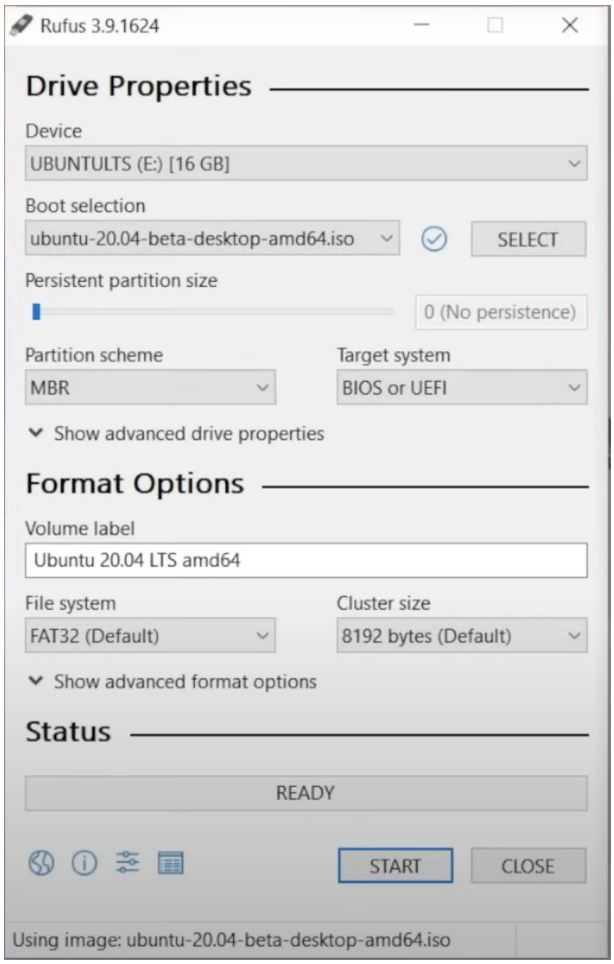
Latest releases:

Link	Type	Platform	Size	Date
rufus-4.5.exe	Standard	Windows x64	1.4 MB	2024.05.22
rufus-4.5p.exe	Portable	Windows x64	1.4 MB	2024.05.22
rufus-4.5_x86.exe	Standard	Windows x86	1.5 MB	2024.05.22
rufus-4.5_arm64.exe	Standard	Windows ARM64	4.8 MB	2024.05.22

For most if you, choose the standard one with platform Windows x64.

5. Format the USB drive and make it bootable

- Insert your USB into the port
- In the file Explorer, right click your USB and select ***Format*** option and follow the instructions
- Right click the ***Rufus*** and run as an administrator
- Leave everything default, click ***SELECT*** option and select the ISO image file just downloaded.
- Click ***START*** and follow the steps



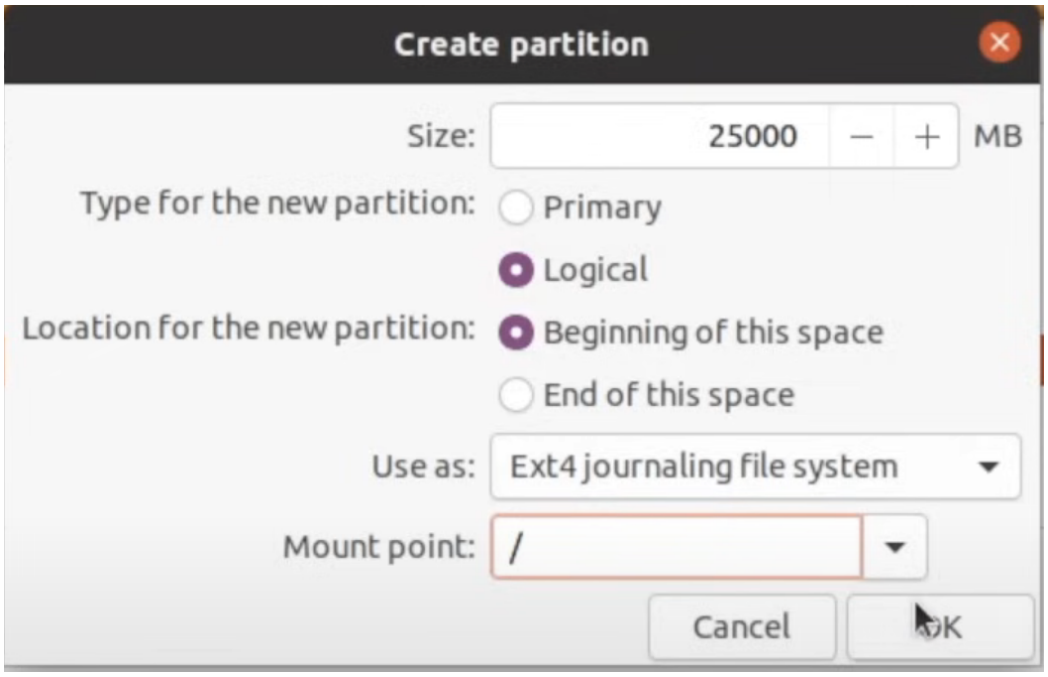
6. Install Ubuntu dual boot

- Restart the computer. Press F11 (the button might be different for different computer brand, search for how to enter the ***Boot Menu*** for yours)
- Choose the USB drive as the boot device

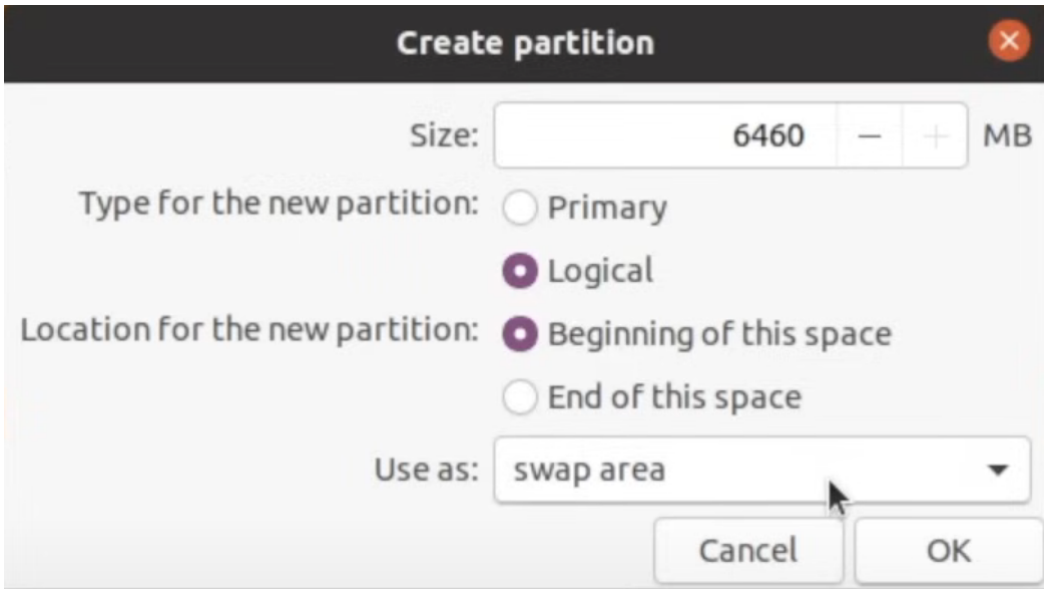
7. Finish the Ubuntu installation setup

- Follow the instructions to go ahead. In ***Update and other software*** tab, it is recommended to select ***Normal installation*** and tick both of the two ***Other options***
- In ***Installation type*** tab, it is recommended to select ***Something else*** and continue
- In the next tab, you should see the disk info of your Windows system and the free space just created. Then select the free space and click on the '**+**' button. Create a root

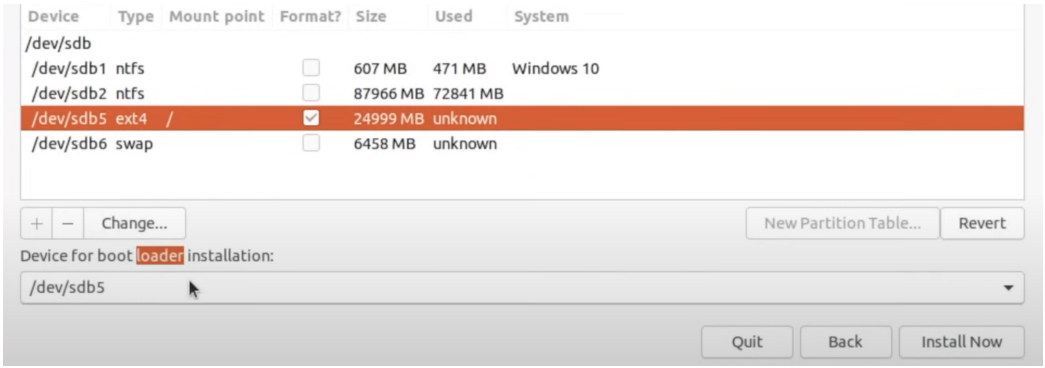
partition ('**/**') and allocate (recommended) 25 GB space for it, make sure you tick the same option as shown in the following figure



- Use the remaining free space to create a ***swap*** partition. It is recommended to allocate at least 4 GB for it



- Lastly, still in the installation type tab, change the device for boot loader installation to the same device as your root partition. After all, click ***Install Now*** and follow the instructions on your screen



After restarting your computer, the Ubuntu dual boot will be installed successfully

Reference:

https://www.freecodecamp.org/news/how-to-dual-boot-windows-10-and-ubuntu-linux-dual-booting-tutorial/

Task 2: Install ROS Noetic

Adapted from:

https://wiki.ros.org/noetic/Installation/Ubuntu

Open the ***Terminal*** by click it in the application menu or shortcut **Ctrl + Alt + T**, then paste the following commands:

1. Setup your source.list

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_relea
se -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

It will ask for your password, it will **not** be shown on your screen, just type it and enter. As long as there is nothing shown (such as error message), it means the command has been run correctly

2. Set up your keys

```
sudo apt install curl # if you haven't already installed curl
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.a
sc | sudo apt-key add -
```

3. Installation

```
sudo apt update
```

It is recommended to install the Desktop-Full version:

```
sudo apt install ros-noetic-desktop-full
```

Once its done, the ROS Noetic has been successfully installed

4. Environment setup

Every time you want to use ROS from the terminal, you have to source this first:

```
source /opt/ros/noetic/setup.bash
```

This is necessary for **every** new terminal tab you open

It will be convenient to automatically source the script by add it to `~/.bashrc` :

```
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

5. Installing essential dependencies

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-g
```

6. After all, enter `roscore` to see if the ROS runs successfully

Reference:

https://medium.com/@createwithabd/ros-noetic-installation-guide-on-ubuntu-20-04-388568d24bcf

Problem encountered or optional step

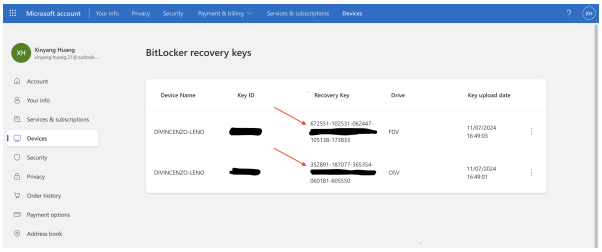
1. BitLocker
   BitLocker is a disk encryption utility built into some Windows machine that may be

triggered during system partitioning or operations. If this happens you need to enter the BitLocker recovery key to re-enter Windows. We suggest you to simply turn it off before partitioning the disks.

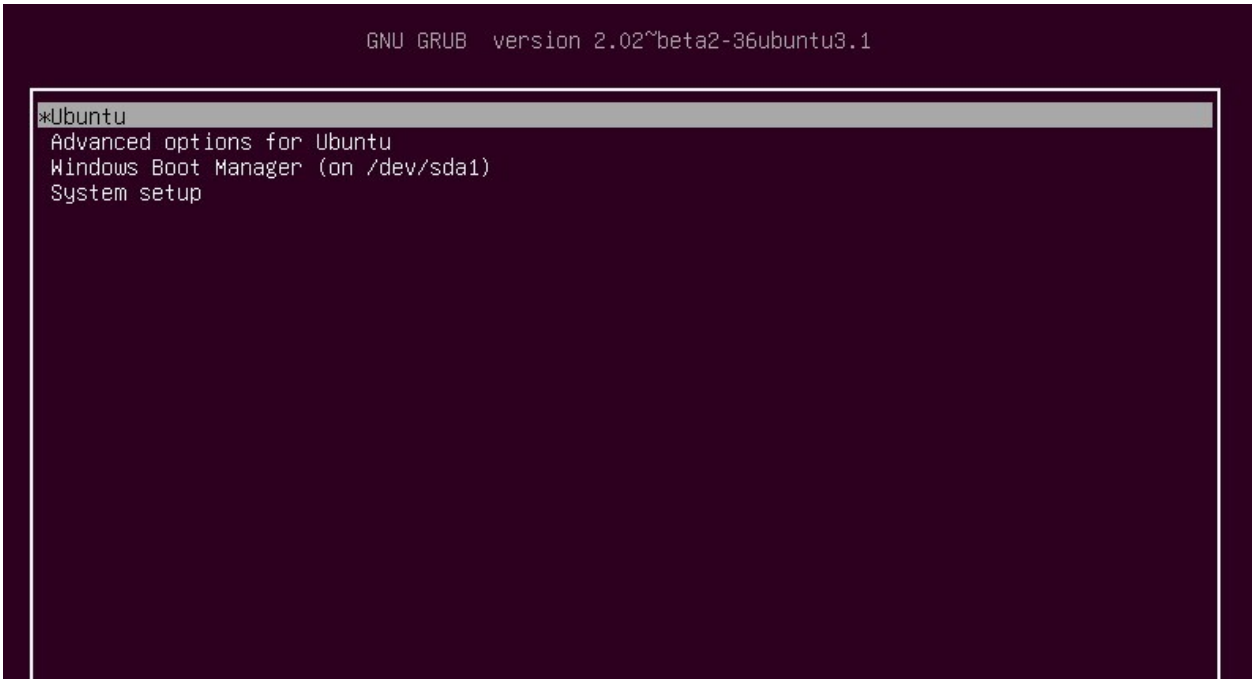
- Search ***Manage BitLocker*** from the search bar of Windows and open it. If you cannot find it, go to ***Settings → Control Panel → System and Security → BitLocker Drive Encryption***
- Select ***Turn off BitLocker***

(Optional) Enter the Recover key to unlock it

In case you do not want to turn BitLocker off or the problem has been encountered, follow the instructions to find your recovery key. For example, login the same Microsoft account as your computer's on the page https://account.microsoft.com/devices/recovery And in the ***Device*** tab, you will find your recover key



2. Default boot
   After dual boot is installed, the GRUB (GRand Unified Bootloader) will ask you the system you would like to boot and the default boot system will be Ubuntu. If you want to change the default selection to Windows, use the following instructions to modify the configuration file of GRUB



- Open the terminal in Ubuntu
- run following command

```
sudo nano /etc/default/grub
```

- Find this line

```
GRUB_DEFAULT=0
```

- Change it to the entry of Windows. For example, if Windows is the second (0, 1, 2) option in the GRUB menu, change it to:

```
GRUB_DEFAULT=2
```

- Save the file and exit the nano editor (press `Ctrl + O` to save, then `Ctrl + X` to exit).
- Run the following command to update the GRUB configuration:

```
sudo update-grub
```

- Then reboot the computer

```
sudo reboot
```

3. Low packages downloading speed
   If you have two disks on your laptop, it is recommended to use the one with the higher read/write speed for installing Ubuntu. If you don't know which one is better, just use the one with Windows installed if the space is enough. Using a slower disk may lead to decreased performance when installing software and packages in Ubuntu.

4. ROS quick setup (Source https://github.com/fishros/fish_install)
   We suggest you to use the official instructions in
   Task2 to install ROS, but if you find it difficult to understand, this tool can be used for a quick setup of ROS

- Open terminal in Ubuntu
- Run the following command and follow the instructions

```
wget https://raw.githubusercontent.com/fishros/fish_install/main/install -O - | bash
```

5. Optimize your hard drive for more partition space
   In case you want more space in your laptop, check this tutorial for more information:

How to Dual Boot Windows 10 and Ubuntu – Linux Dual Booting Tutorial

You don’t have to have two different computers to use Linux and Windows 10. It's possible to have a Linux distro installed on a computer with Windows 10 preinstalled. In this article, I will show you how to dual boot Windows 10 and the

https://www.freecodecamp.org/news/how-to-dual-boot-windows-10-and-ubuntu-linux-dual-booting-tutorial/