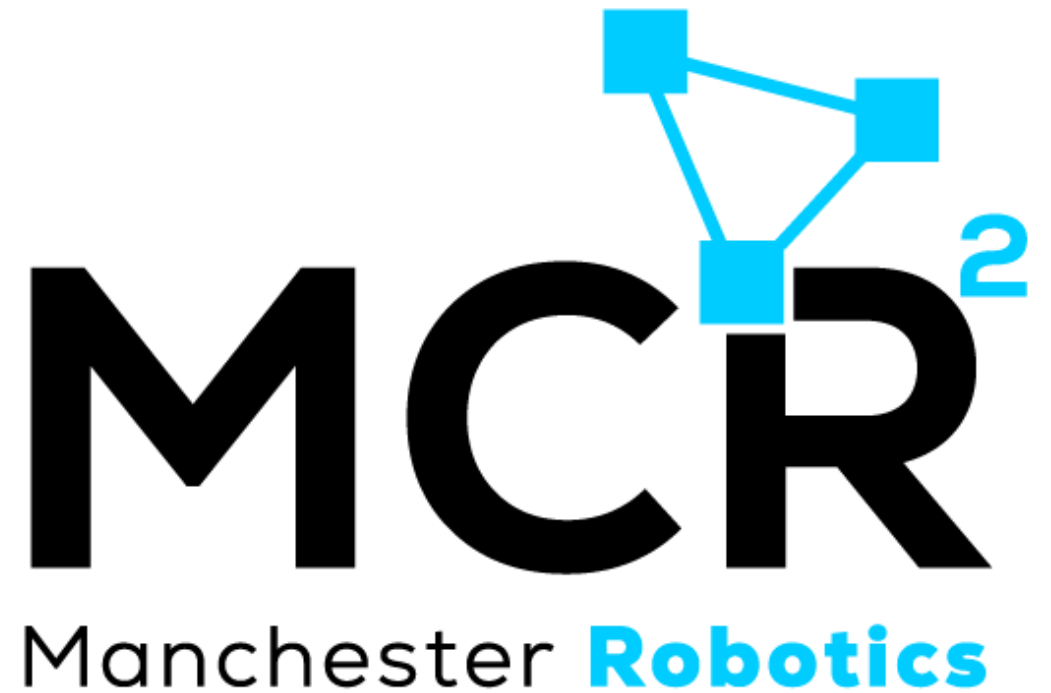


*{Learn, Create, Innovate};*

# Getting Started with ROS

*Installation*

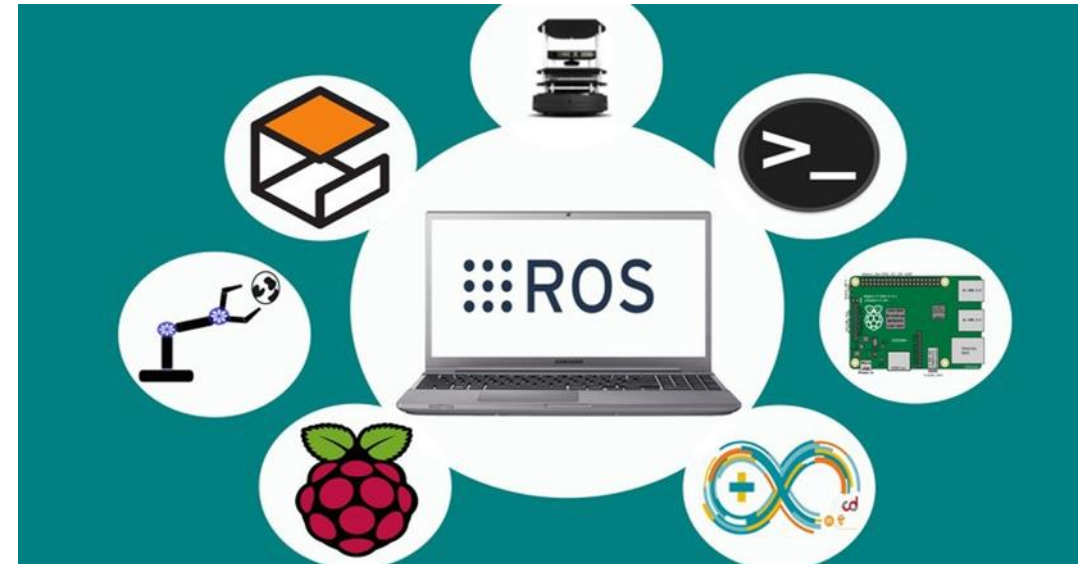




# What is ROS?



- **R**obot **O**perating **S**ystem
- Contrary to popular belief, ROS is not an operating system.
- “The ROS is a set of software libraries and tools that help you build robot applications. From drivers to state-of-the-art algorithms, and with powerful developer tools, ROS has what you need for your next robotics project. And it's all open source.”



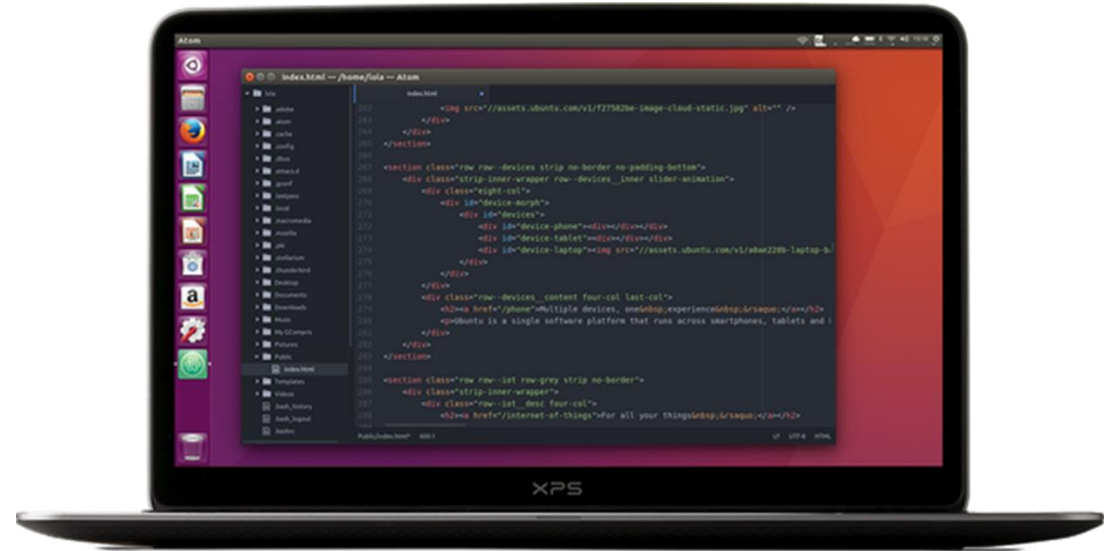


# Getting Started with ROS



## What do we need to start working?

- Minimum Requirements\*:
  - Processor: i5 or higher
  - RAM: 8 GB or higher
  - Storage: 20 Gb
  - Graphics: Dedicated GPU



\*These requirements are the minimum for the activities designed.

# Getting Started with ROS

- A new version of ROS is released with each Linux distribution. We will use ROS Noetic in this course (released with Ubuntu 20.04).
- Currently, another version of ROS is available, Ubuntu 22.04.
- A revision of the ROS structure, known as ROS2, that aims to increase the robustness of the framework for industrial applications and distributed systems.
- Furthermore, ROS2 allows real-time applications.

ROS Melodic Morenia  
Released May, 2018  
LTS, supported until May, 2023  
*Recommended for Ubuntu 18.04*



ROS Noetic Ninjemys  
Released May, 2020  
**Latest LTS**, supported until May, 2025  
*Recommended for Ubuntu 20.04*





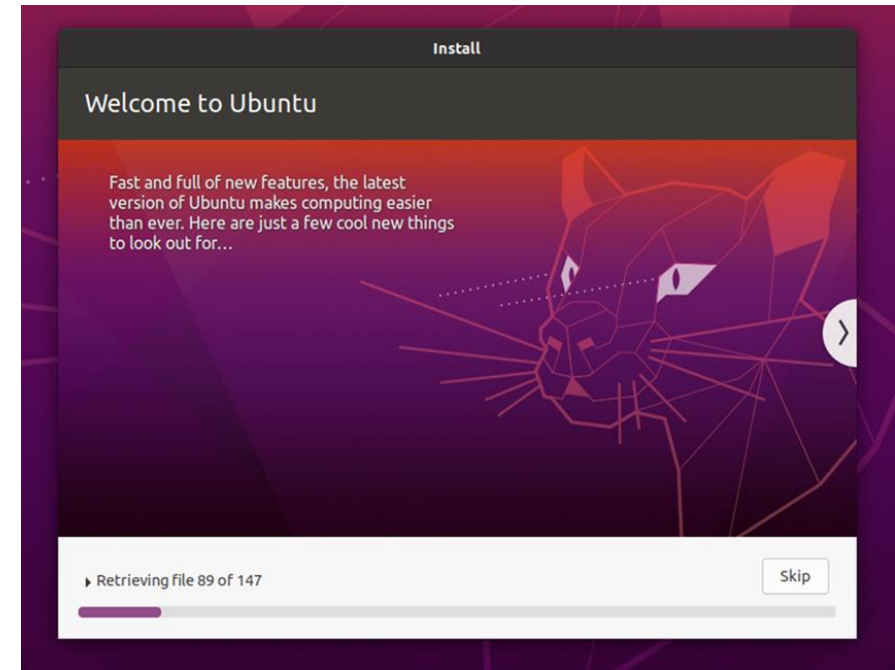
# Installing Ubuntu



## Installing Ubuntu

The recommended way of installing Ubuntu for robotics is as the main operating system or by dual booting it alongside the default Windows or Mac OS.

It can also run on a virtual machine, but this will limit features, and the performance speed could be affected.





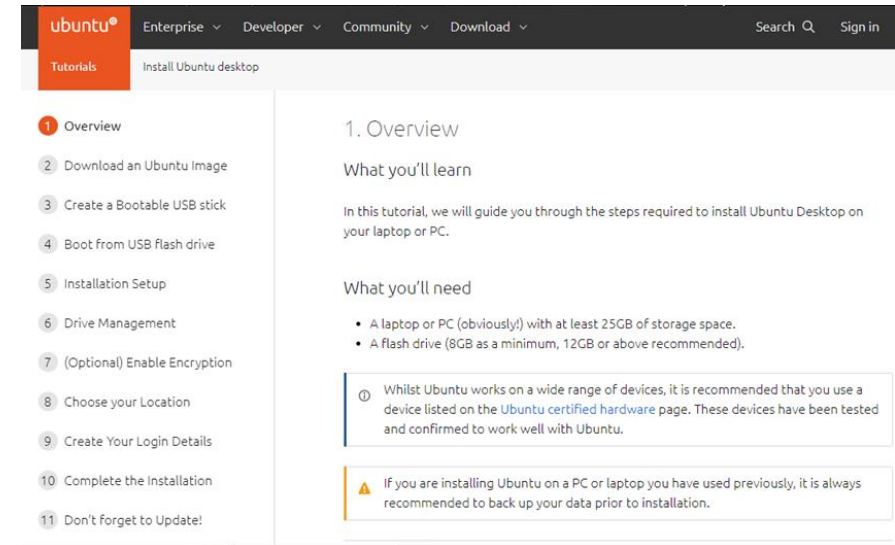
# Installing Ubuntu



## Quick Installation Guide Ubuntu as Main OS

Follow the [tutorial](#) on the official ubuntu website. Download the ubuntu 20.02 image [here](#).

- On the left side of the webpage, all the steps for the installation are detailed.
- Once you click on each step, the installation details are described in the right panel.
- **PROS:** Easy installation, access in full to hardware.
- **“CONS”:** Not possible if you need windows installed on the same machine.





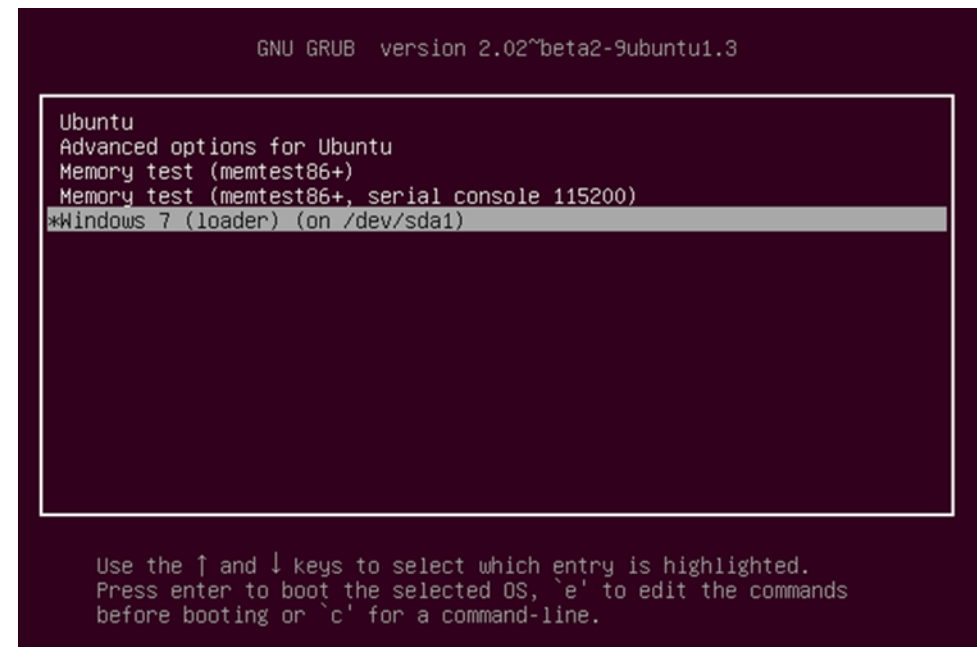
# Installing Ubuntu



## Dual Boot Installation

This installation requires preparing the computer first. This may vary depending on the computer brand, but the main steps are:

- Prepare the USB as the [website](#) indicates. (Step 1-4)
- You may need to modify some parameters from the BIOS configuration.
- Depending on how many partitions or how full the disc is, you may want to defrag and partition your hard drive using Windows. More info [here](#).
- Change the booting option from the computer and keep following the steps on the [website](#).
  - **PROS:** Relatively easy install, access in full to hardware .
  - **CONS:** a problem if you must use windows and don't have another machine.







# Installing Ubuntu (VM)

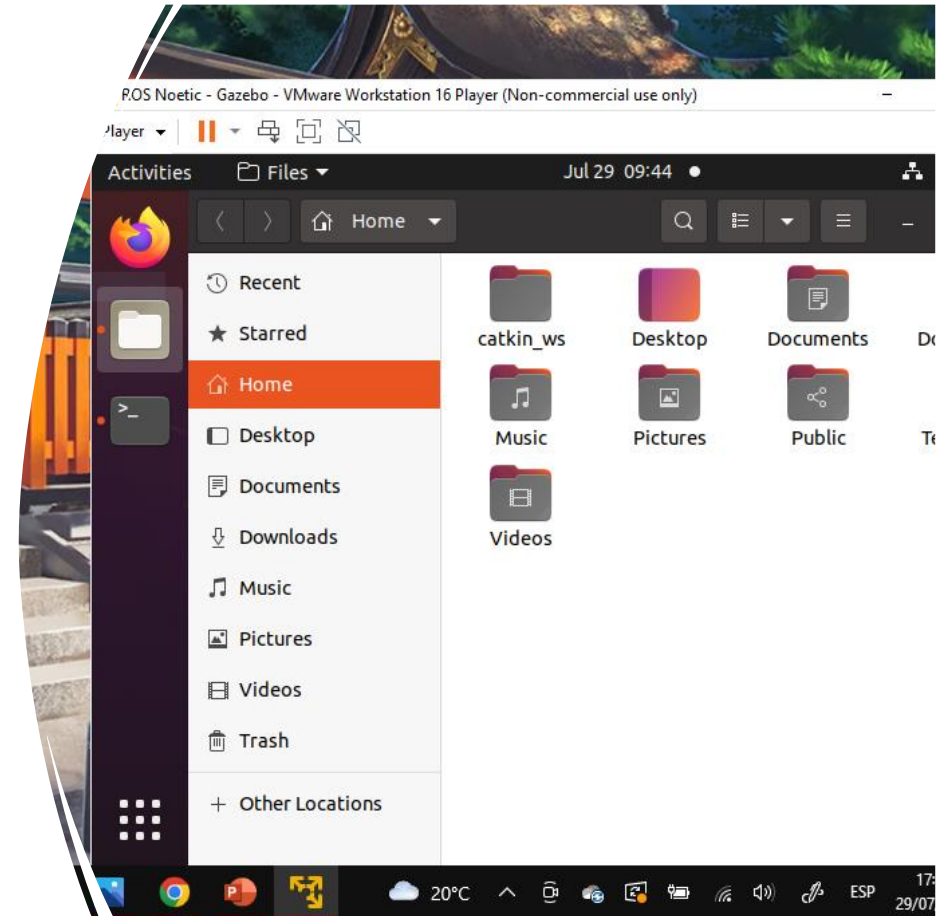


## Virtual Machine vs. Standard Installation

A Virtual Machine (VM or guest OS) is an emulated Operated System done by software (Virtual Box and VMware most popular) installed in the main OS (host OS).

This could be helpful as a starting point (or a last resort), but it has some cons:

- The host OS and guest OS **share the same resources**, affecting both operations (especially for heavy simulations).
- VM requires drivers to **access the peripheral** (USB, Serial), which could be **not supported** or not fully working.
- The VM cannot have the same network as the host (main operative system), which would be a **problem for ROS projects that require multiple devices that communicate** with each other.





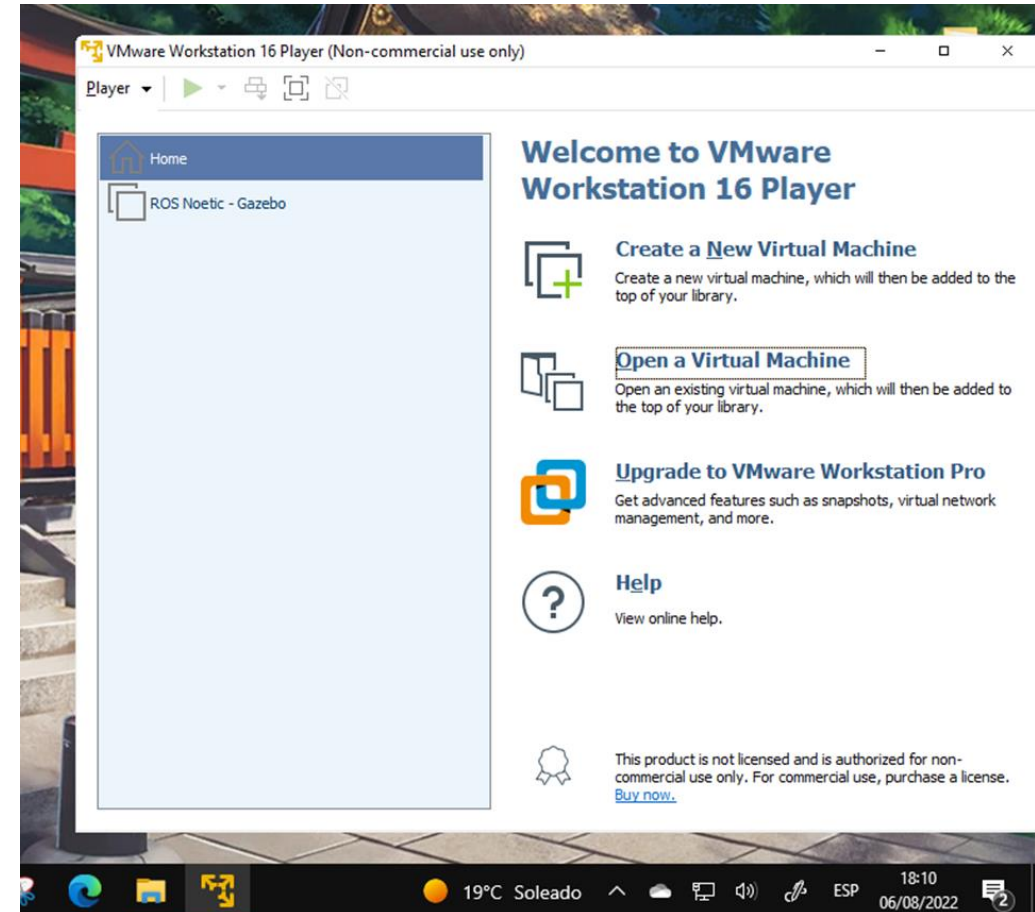


# Installing Ubuntu Generic VM



## Virtual Machine Installation

- Download the files:  
[VMware software executable](#)
  - Install the VMware software.
  - Open software to finish the installation.  
NOTE: Select personal “non-commercial” use
  - Click on “create a virtual machine”.
  - Select the OS iso file and installation folder, and the installation will start.
- Note: The disk space and ram could be modified in this step. We recommend 20 GB and at least 4 GB ( half the ram of the host)
- Once Ubuntu starts, you need to choose the user and password to continue the installation. After a restart, the VM should be working.





# MCR2 Virtual Machine Installation



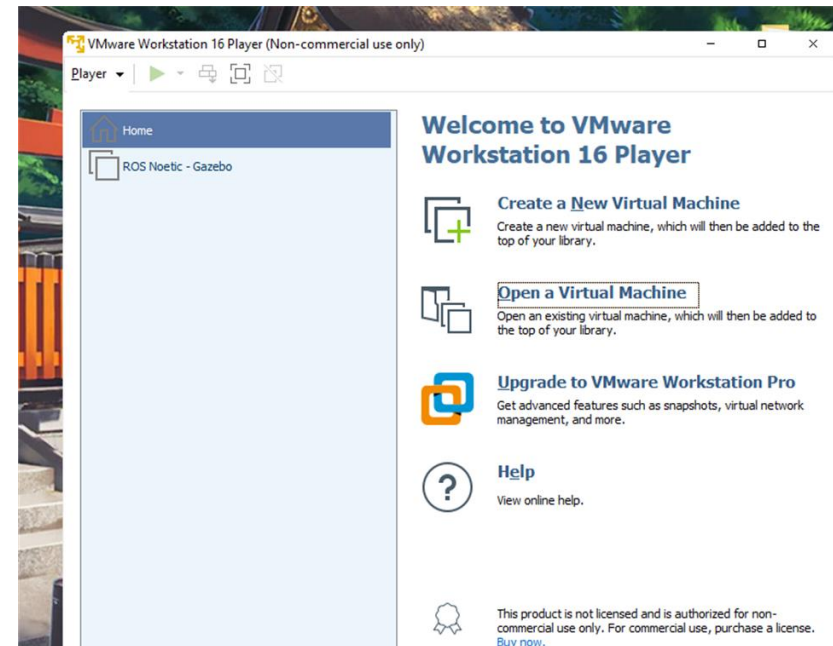
- Download and unzip the files:

[VMware software executable](#)  
[Preinstalled VM zip file](#)

(NOTE: This is a long file ( ~ 6GB).)

- Install the VMware software.
- Open the software, finish the setup, and license.  
NOTE: Select personal “non-commercial” use
- Click on “open virtual machine” and open the “Preinstalled VM” (you only must do this once). The virtual machine will start to be set up.  
NOTE: Choose the option “I copied it”
- The virtual machine should start up with Ubuntu and ROS installed!

**USER: Student**  
**PASSWORD: admin**





# Quick installation guide for ROS



## ROS Installation

- Follow the [tutorial](#) on the official ROS website.
- The ROS installation is done using the terminal.
- In section 1.4, use the command for installing Desktop-Full Install.
- This will install Gazebo too.
- The following package is needed for this unit:

```
$ sudo apt-get install ros-noetic-ros-control ros-noetic-ros-controllers
```

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## Ubuntu install of ROS Noetic

• The ROS build farm builds Debian packages for several Ubuntu platforms, listed below. These packages are ready to use so you [don't have to build from source](#). You can check the status of individual packages [here](#).

Note that there are also packages available from Ubuntu upstream. Please see [UpstreamPackages](#) to understand the difference.



If you rely on these packages, please support OSRF.

These packages are built and hosted on infrastructure maintained and paid for by the [Open Source Robotics Foundation](#), a 501(c)(3) non-profit organization. If OSRF were to receive one penny for each downloaded package for just two months, we could cover our annual costs to manage, update, and host all of our online services. Please consider [donating to OSRF today](#).

### Contents

1. [Ubuntu install of ROS Noetic](#)
  1. [Installation](#)
    1. [Configure your Ubuntu repositories](#)
    2. [Setup your sources list](#)

### ROS 2 Documentation

The ROS Wiki is for ROS 1. Are you using ROS 2 (Dashing/Foxy/Rolling)? [Check out the ROS 2 Documentation](#)

### Wiki

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# ROS is installed



## How do I know it is working correctly?

- If you finished the installation and everything went smoothly.
- Then, try the following command to start ROS:
  - `roscore`
- If the terminal displays a similar output to this image in the slide: Congratulations, you have Ubuntu and ROS running!

A terminal window titled 'roscore http://ubuntu:11311/' with standard window controls. The terminal output shows the successful execution of the 'roscore' command. It includes instructions to press Ctrl-C to interrupt, disk usage information, the start of a roslaunch server, and a summary of parameters and nodes. The parameters listed are /rostdistro: noetic and /rosversion: 1.15.14. The nodes section shows the auto-starting of a new master process with PID 2735 and the setting of a run\_id, followed by the start of a rosout process with PID 2745 and the core service.

```
roscore http://ubuntu:11311/
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://ubuntu:33573/
ros_comm version 1.15.14

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.15.14

NODES

auto-starting new master
process[master]: started with pid [2735]
ROS_MASTER_URI=http://ubuntu:11311/

setting /run_id to e78455b2-165e-11ed-b382-4d89642b765c
process[rosout-1]: started with pid [2745]
started core service [/rosout]
```