Env Setup

Introduction

In Fall 2023 ELEC 3210, we use **Ubuntu 20.04** and **ROS-Noetic** as basic development environment. Since only a few computers pre-installed Ubuntu, we provide a guidance for installation Ubuntu system and ROS-Noetic.

We recommend using **Virtual Machine** to install Ubuntu 20.04 and ROS-Noetic for protecting your original system from being modified unexpectedly. You can install dual systems on your computer, but we will not provide guidance.

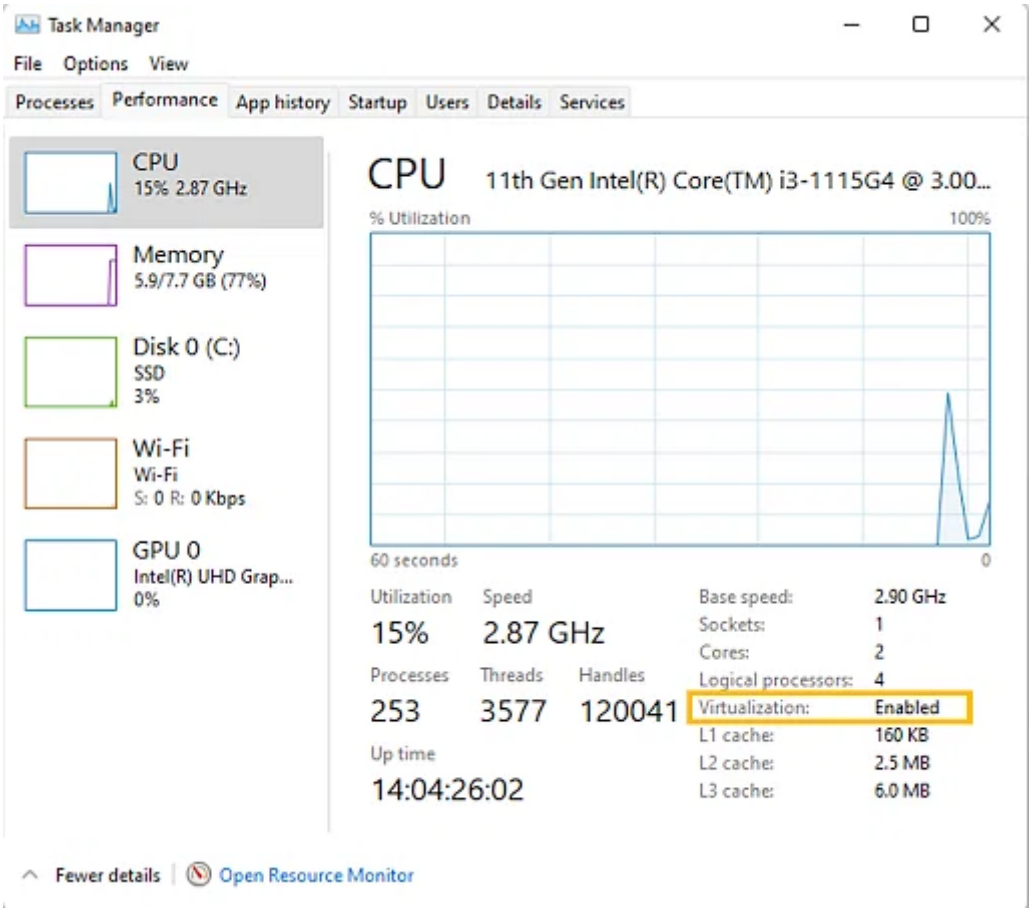
ROS distribution and Ubuntu distribution are one to one correspondences. **DO NOT UPGRADE YOUR SYSTEM TO NEW VERSION** (from 20.04 to 22.04) or **TRY TO INSTALL OTHER ROS VERSION** (Melodic etc).

System Installation

Preparation

Check Virtualization Feature

Windows



If the virtualization is disabled ,you may need to enable CPU virtualization features by changing settings on BIOS:

1. Reboot the computer
2. While the system is restarting from a black screen, enter BIOS by pressing the hotkey. The hotkeys differ depending on the brand of the computer used. Usually F1, F2, F3, F10, Esc or Delete keys are the hotkeys to enter BIOS
3. Navigate to Advanced Tab and press Enter to continue
4. Select Virtualization and Enable
5. Save changes and reboot the computer

BIOS can also be accessed through Windows in Settings (If you do not know how to access your BIOS)

1. Go to Window Settings -> Update and Security
2. Click Recover tab, under Advanced setup, click Restart now.
3. Click Troubleshoot > Advanced > UEFI Firmware Settings
4. To continue, click Restart
5. BIOS Settings will be displayed. Navigate to Advanced Tab and press Enter to continue
6. Select Virtualization and Enable
7. Save changes and reboot the computer

MAC (Intel CPU)

Virtualization feature is enabled by default. If you had disabled it, you must know how to enable it.

Download and Install VM

Download and install **VirtualBox** from here. You can choose any Virtual Machine, Hyper-V/UTM...

We only provide detail about setup on VirtualBox.

VirtualBox 7.0.10 platform packages

- Windows hosts
- macOS / Intel hosts
- Linux distributions
- Solaris hosts
- Solaris 11 IPS hosts

The binaries are released under the terms of the GPL version 3.

See the changelog for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. *The SHA256 checksums should be favored as the MD5 algorithm must be treated as insecure!*

- SHA256 checksums, MD5 checksums

Note: After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

Download Ubuntu 20.04

Download ISO desktop image from here.

Ubuntu is distributed on three types of images described below.

Desktop image

The desktop image allows you to try Ubuntu without changing your computer at all, and at your option to install it permanently later. This type of image is what most people will want to use. You will need at least 1024MiB of RAM to install from this image.

64-bit PC (AMD64) desktop image

Choose this if you have a computer based on the AMD64 or EM64T architecture (e.g., Athlon64, Opteron, EM64T Xeon, Core 2). Choose this if you are at all unsure.

Server install image

The server install image allows you to install Ubuntu permanently on a computer for use as a server. It will not install a graphical user interface.

64-bit PC (AMD64) server install image

Choose this if you have a computer based on the AMD64 or EM64T architecture (e.g., Athlon64, Opteron, EM64T Xeon, Core 2). Choose this if you are at all unsure.

Windows && MAC (Intel CPU)

Detail document can be found here.
Please choose English as system language, otherwise you may need to switch IME(input method editor) frequently.
For Hardware settings, at least 8G RAM and 4 Cores are recommended. If your computer is powerful enough, we recommended providing more resource for VM.
For Virtual Disk settings. If you click Pre-allocate Full Size, then VM will reserve that space in your real disk, please make sure you have enough disk space. The tutorial suggests at least 25G disk space, we recommended 50G for it since you need to install other dependencies later.

MAC (M1/M2)

MAC M1/M2 use ARM-architecture CPU. Ubuntu 20.04 desktop do not provide ARM-based version. Meanwhile, the last and latest ROS 1 distribution, ROS-Noetic, supports Ubuntu 20.04 Only. Due to this reason, we can not setup the whole environment easily.
If you persist in using MAC M1/M2 for this course, you can try to setup environment **by yourself**.
Possible solutions: Docker, Build From Source...
We do not have an available MAC M1/M2 as testing platform, so we cannot provide any suggestions about environment setup on MAC M1/M2.
~~Recommended solutions: drop this course or buy a non-MAC computer~~

ROS Installation

After finishing installation of Ubuntu 20.04 VM, enter the VM and follow the steps below to install ROS. All the commands should **RUN INSIDE YOUR VM** instead of **YOUR ORIGINAL OS**.

Install ROS Noetic

The official document Form ROS.org

Open a terminate, enter the following commands.

1. Setup source.list

```
# following two lines are one command, we separate it due to display issue.
# copy and paste two lines.
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu \
$(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

1. Setup keys

Install curl if you haven't installed curl:

```
sudo apt install curl
```

Get and setup keys

```
# following two lines are one command, we separate it due to display issue.
# copy and paste two lines.
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | \
sudo apt-key add -
```

3. Install ROS

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

4. Setup Environment

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

5. Install Building Dependencies

```
# following two lines are one command, we separate it due to display issue.
# copy and paste two lines.
sudo apt install python3-rosdep python3-rosinstall \
python3-rosinstall-generator python3-wstool build-essential

sudo apt install python3-rosdep
```

6. Init rosdep

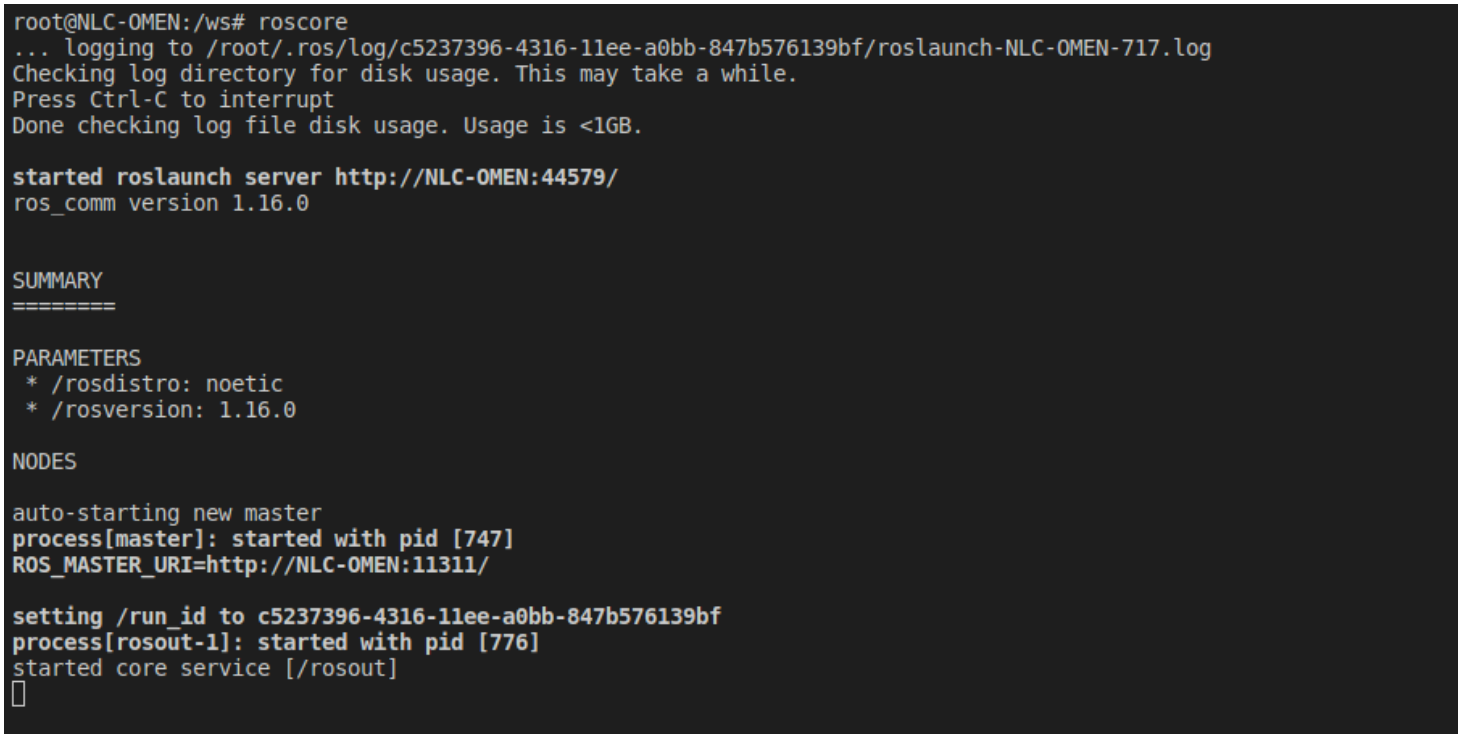
```
sudo rosdep init
rosdep update
```

Test Environment Setup

Open a terminate enter following command

```
roscore
```

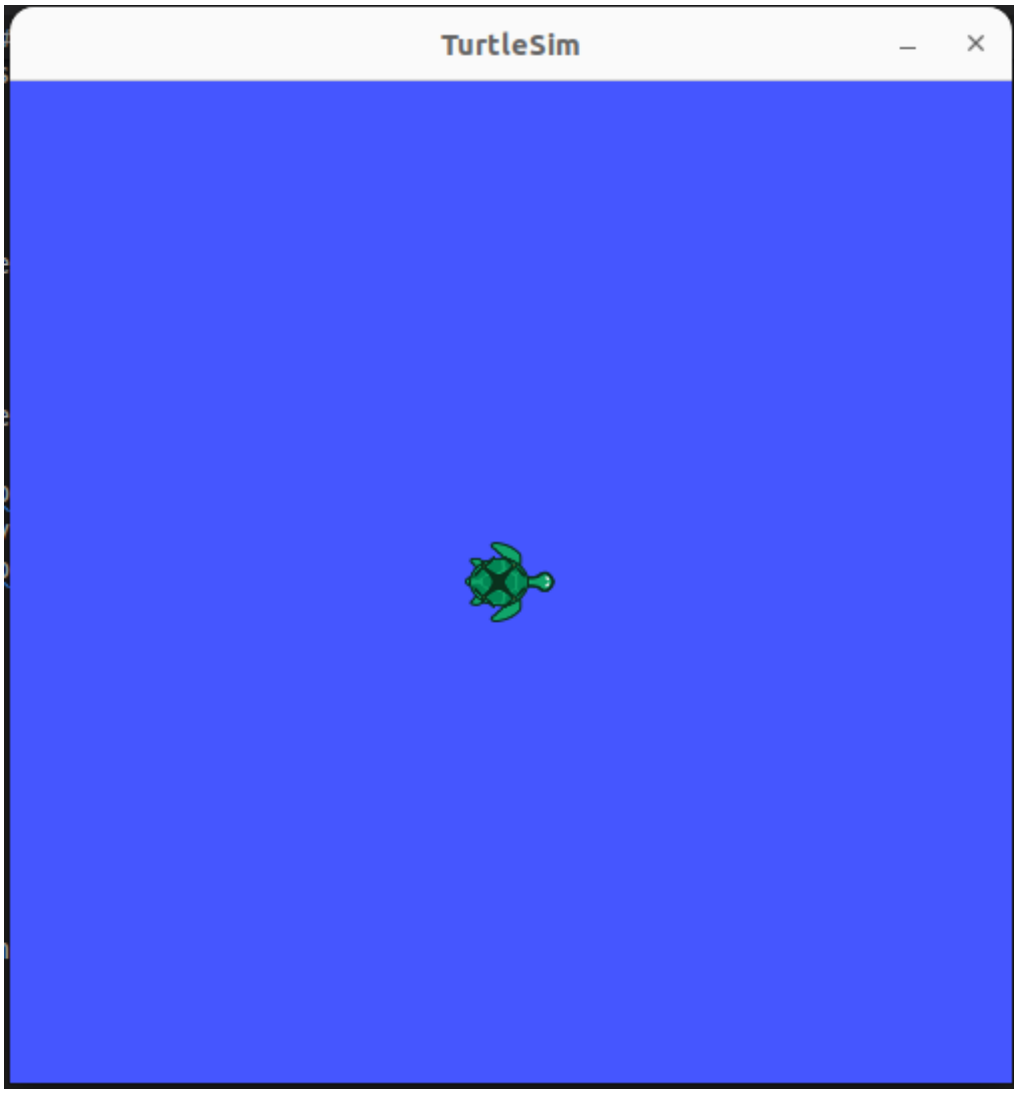
Output should be similar with:



Keep previous terminate and open new terminate enter following command:

```
rosrun turtlesim  turtlesim_node
```

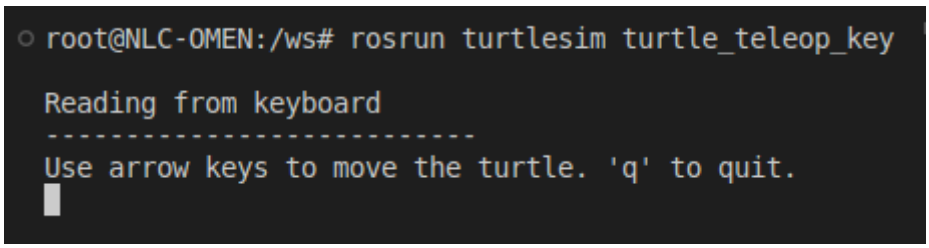
This will open a new window:

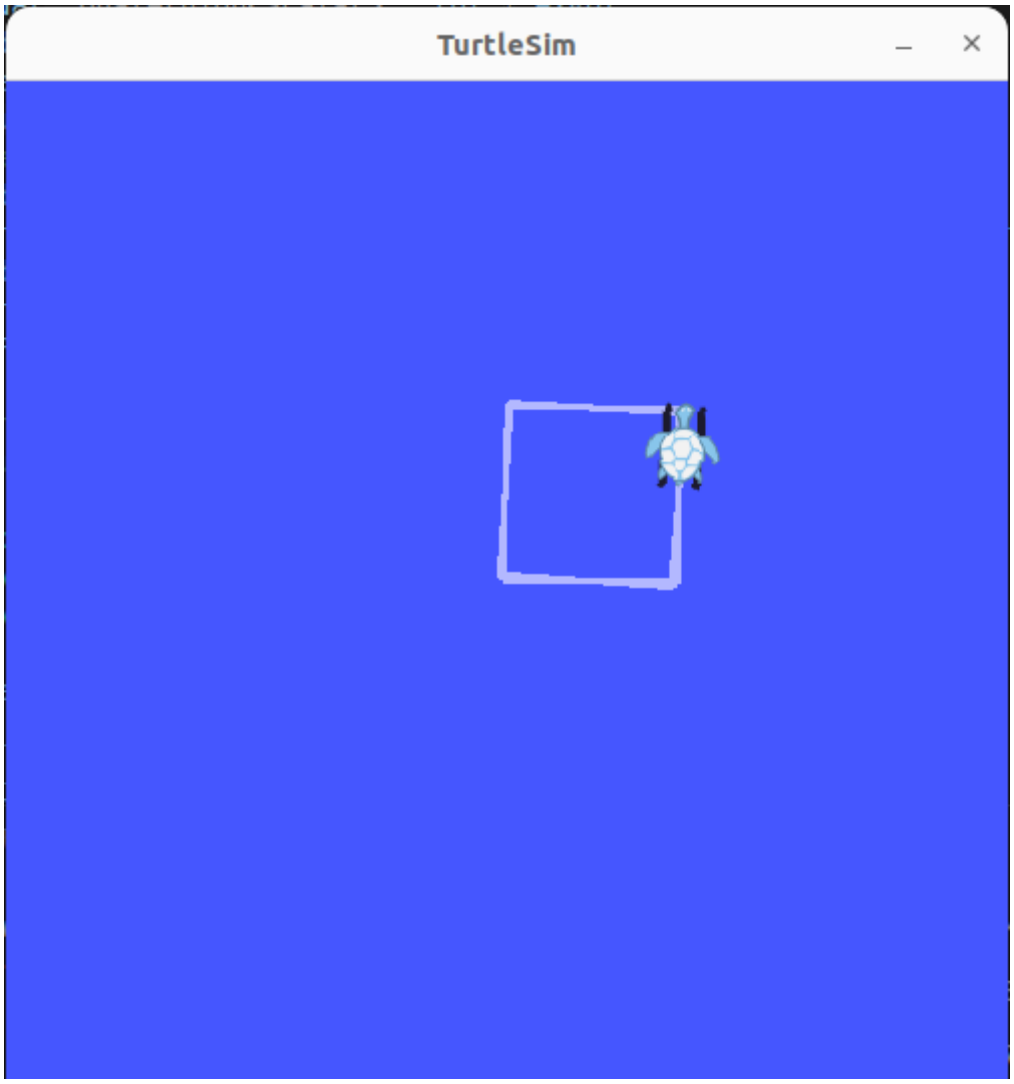


Keep previous terminates and open new terminate enter following command:

```
rosrun turtlesim turtle_teleop_key
```

now you can use arrow keys to control the movement of turtle in simulator.





You get your computer ready for finishing homeworks of this course, if you can run above three nodes correctly. Congratulations and having fun with turtle simulator.

Other questions

Go to Canvas->Discussions or contact TAs.