Instruction for Preliminary Project 1

Ubuntu and ROS2 Installation

NOTE : This is a guideline for those who have never used Ubuntu or ROS2 before. For those who already have installed Ubuntu and ROS2, just submit 2 screenshots mentioned at the last of this instruction.

1. Introduction

You are going to install 'Ubuntu' and 'Robot Operating System 2 (ROS2)' for this term assignment. This instruction will provide a guide for installation. We assume that your main operating system is **Windows 10/11** and explain how to multi-boot Ubuntu 20.04 on Windows 10/11. If you are using other operating systems, please search the Internet for the installation. At the end of this instruction, there are two screenshots. You are to submit your own results compressed on ETL. The file name should be 'IS_StudentNumber_Pre_Project1.zip'.

CAUTION: We highly recommend you back up your data on Windows before installing Ubuntu. Ubuntu's version must be 20.04, don't install other versions.

2. Ubuntu Installation

We'll use Ubuntu 20.04 LTS for the development environment. The installation process is as follows:

2.1 Make USB for booting

2.2 Shrink the volume of disk of Windows

2.3 Install Ubuntu 20.04 LTS

2.4 Set various environments after the installation

CAUTION: Before installing Ubuntu, please check if you can divide your drive. Ubuntu needs more than 2 partitions.

2.1 Make USB for booting

To make a USB for booting Ubuntu, please empty the USB first and install an image file of Ubuntu.

2.1.1 Download Ubuntu 20.04 LTS installation image file

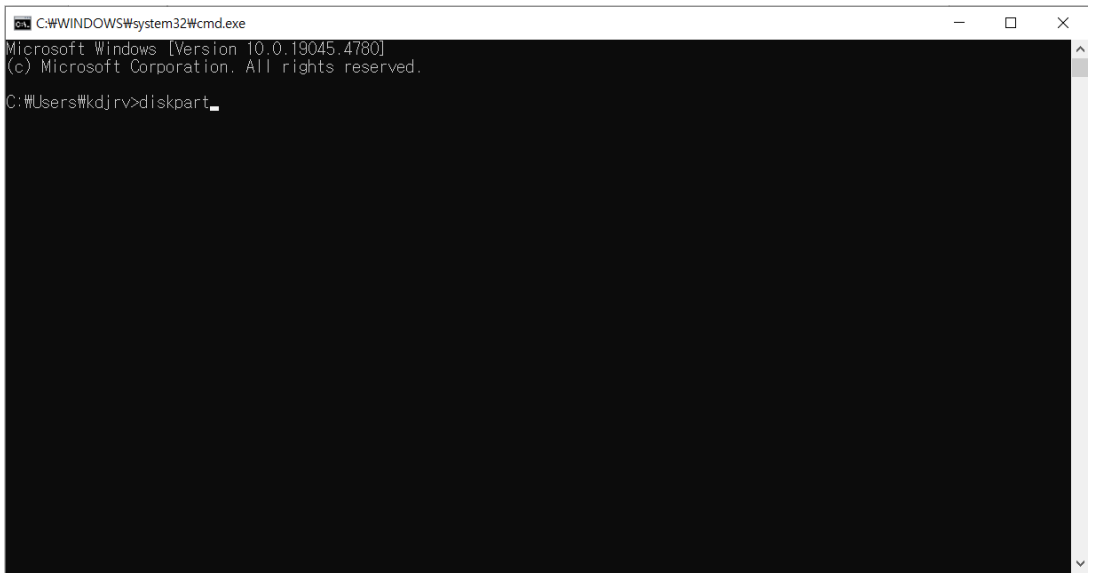
Download an Ubuntu image file(*.iso). Link for Ubuntu 20.04 LTS 64bit is as follows:
https://releases.ubuntu.com/focal/

2.1.2 Download Universal USB Installer

Use Universal USB Installer for this task. You can download it from the link below.
http://www.pendrivelinux.com/universal-usb-installer-easy-as-1-2-3/

2.1.3 Make booting USB

1. Insert the USB **(Be aware that all the files in the USB will be removed)**
2. Initialize the USB
3. Press Windows key + R, type **cmd**, and type **diskpart** in cmd



4. When Diskpart program executes, type DISKPART> **list disk**
5. Remember disk number of USB that you are going to initialize
6. Type DISKPART> **select disk** (Number)
7. Type DISKPART> **clean** **(This task eliminates data inside the USB permanently)**
8. Type DISKPART> **create partition primary**
9. Type DISKPART> **format quick fs=fat32**
10. Check whether the USB is found in My Computer and memorize the letter

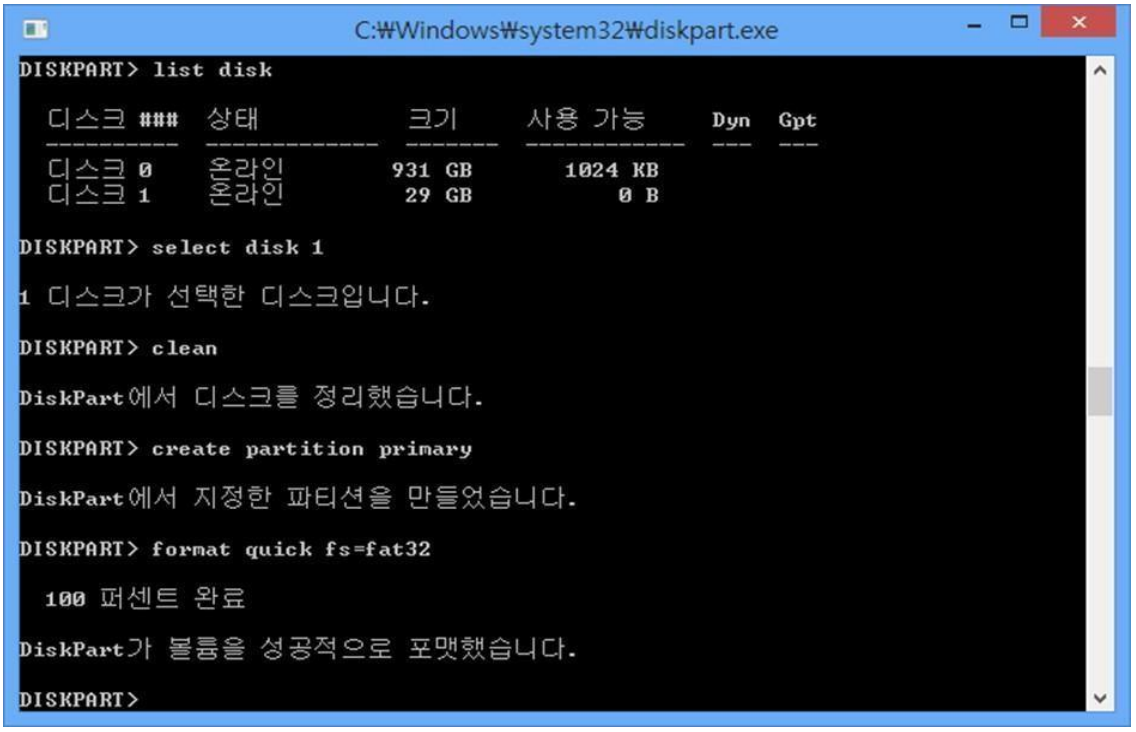


Figure 1. Prior setting for making booting USB

11. Make booting USB using Universal USB Installer

Run Universal USB installer.

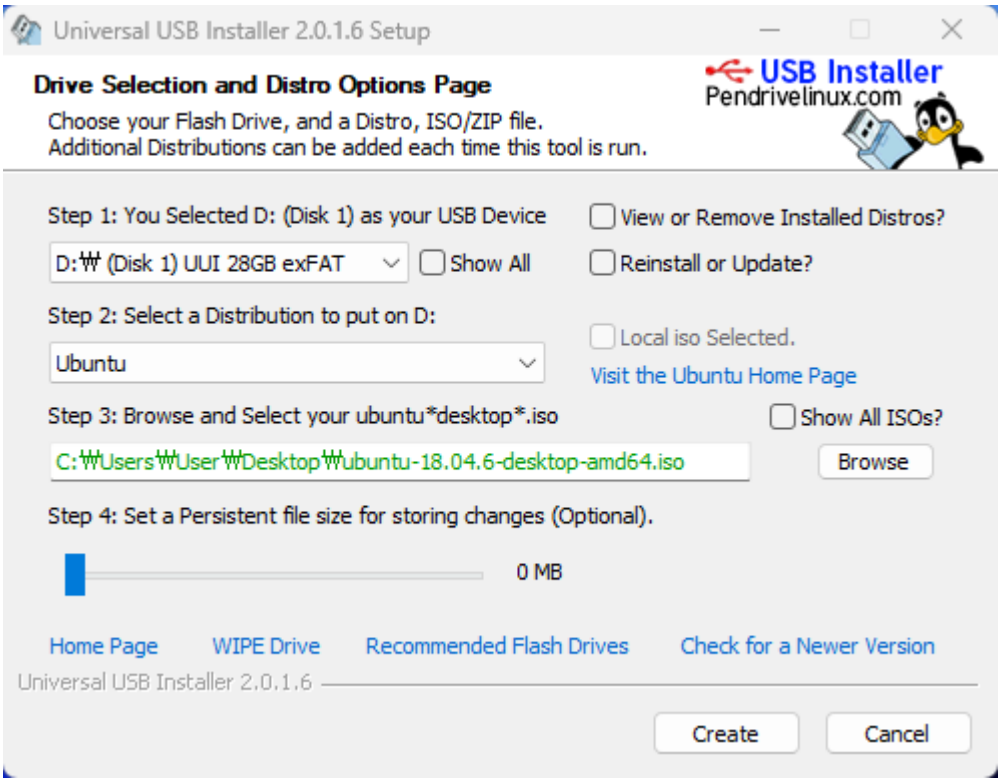


Figure 2. Universal USB Installer

12. Select USB Drive letter (Check in the My Computer), Ubuntu, and Image file
13. Press ‘Create’ button to start making booting USB
14. Press ‘Yes’ to continue
15. Making booting USB making is completed

2.2 Shrinking volume of disk of Windows

To secure space for installation of Ubuntu, you need to shrink the size of partition for Windows

1. Widows key + R and type **compmgmt.msc**
2. Select a partition that you want to shrink
3. Right click on the selected partition and click ‘**Shrink Volume(볼륨축소)**’
4. Set volume to shrink (same as volume for Linux) and press ‘**Shrink**’ (Shrinking at least 50GB is recommended for smooth installation)
5. Check the result after the task is done

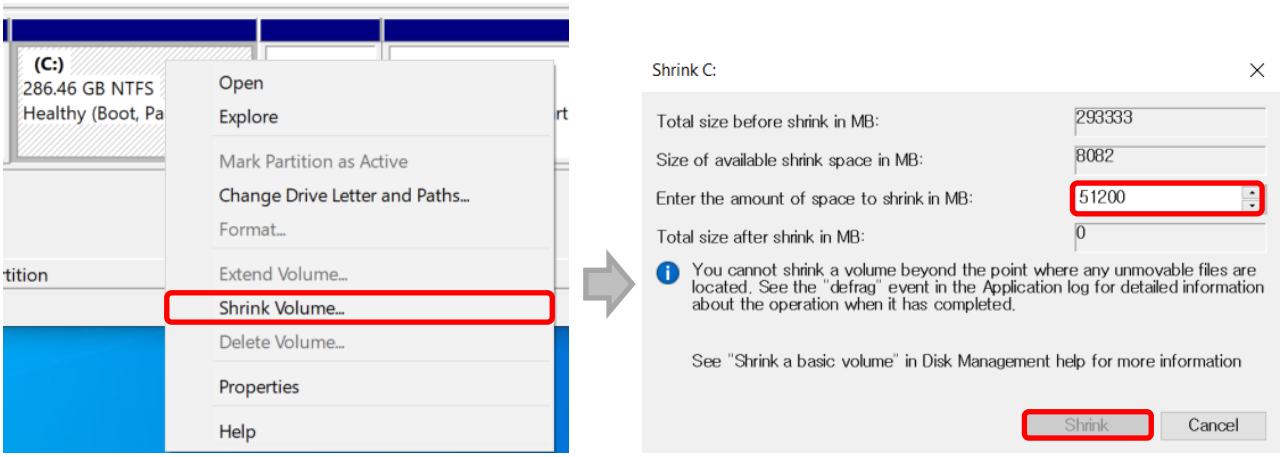


Figure3. Disk Partition

2.3 Install Ubuntu 20.04 LTS

We are going to use booting USB made in the previous section. Turn off the computer and insert USB and turn on the computer. Press F2 or Del to enter the BIOS/EFI when the logo of computer maker shows on the screen. In most cases, F2 or Del should, but depending on your computer model, you may need to find your specific key to enter BIOS/EFI. After entering the BIOS/EFI, search for Boot Priority menu and move USB to the top.

After setting the boot priority setup, the computer will boot from the USB and you can see the black screen with the white icon at the bottom. Press any key to move next and select your language and select Install Ubuntu(I).

(Optional) When there are only unrecognizable characters on the screen or totally black screen after selecting Install Ubuntu option, it might be due to the crash between ubuntu software and hardware configuration that use graphic driver called ‘nouveau’ for Nvidia GPU.

You can deal with this problem as followed.

1. In the page where you can select Install Ubuntu, press e and find the line that ends with the quote ‘quiet splash’.
2. Type ‘nomodest’ to the end of the line (If the line ends with ‘- - - ‘, replace it to ‘nomodest’).
3. Press F10 to reboot.

You must repeat this process each time you reboot Ubuntu. We will introduce a method to omit this cumbersome process.

1. Open a new terminal with ‘ctrl + alt + t’.
2. Type ‘gksudo gedit /etc/default/grub’.
3. Find the part matches with 'quiet splash', and save the file after replace it with 'quiet splash nomodest'.
4. Update with typing ‘sudo update-grub’.

If another problem occurs during the installation process or the given method does not solve the problem, we recommend searching on the Internet.

When you see the welcome screen, select your language and press continue. You don't need to connect to the internet. Press continue until you encounter installation mode(설치 형식). Select 'Something else'(기타) and move to the next. If you follow the instructions correctly, you should see the screen like Figure 4.

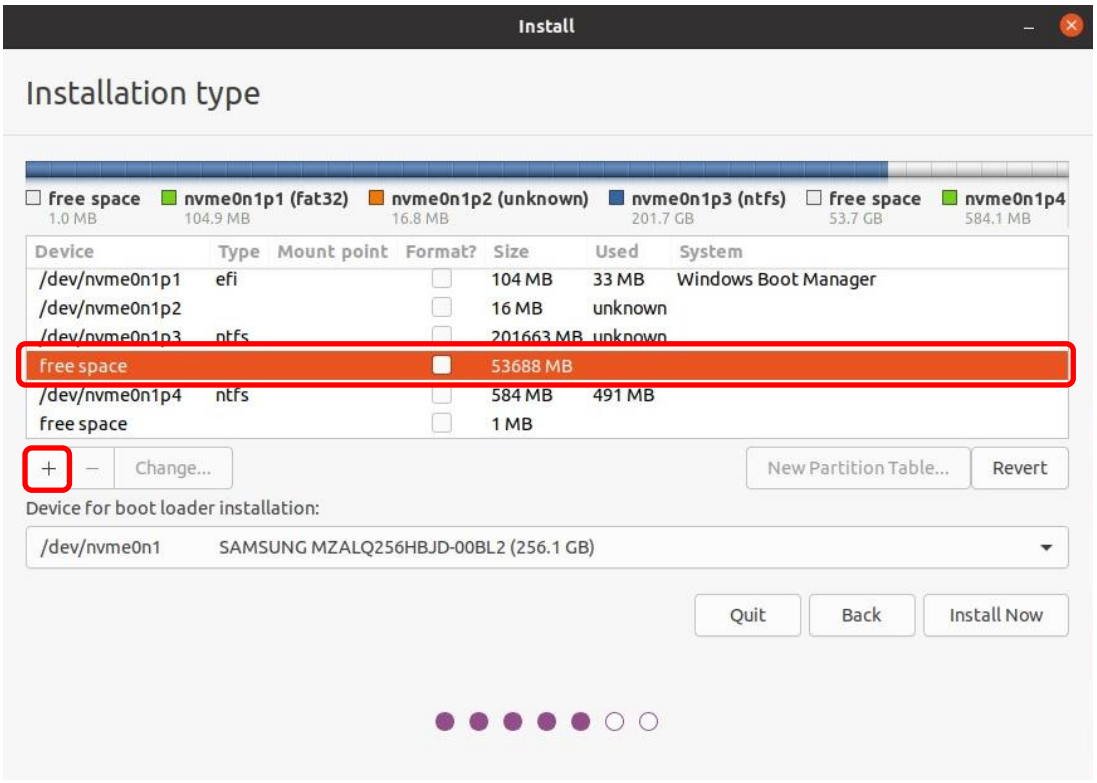


Figure 4. Installation Mode of Ubuntu 20.04 LTS

The bar graph shows the volume of the empty space in which the Ubuntu can be installed. You have to allocate two partitions: **root partition** and **swap partition**.

1. Allocation of **root partition**: Click 'free space' → Click '+' → Set volume(크기) → Select 'Primary partition'
   → Select 'The starting point of this space' → Purpose: EXT4 Journaling file system → Mount point: /

2. Allocation of **swap partition**: Click '+' → Set volume(크기) → Select 'swap area' → Select 'The starting point of this space'

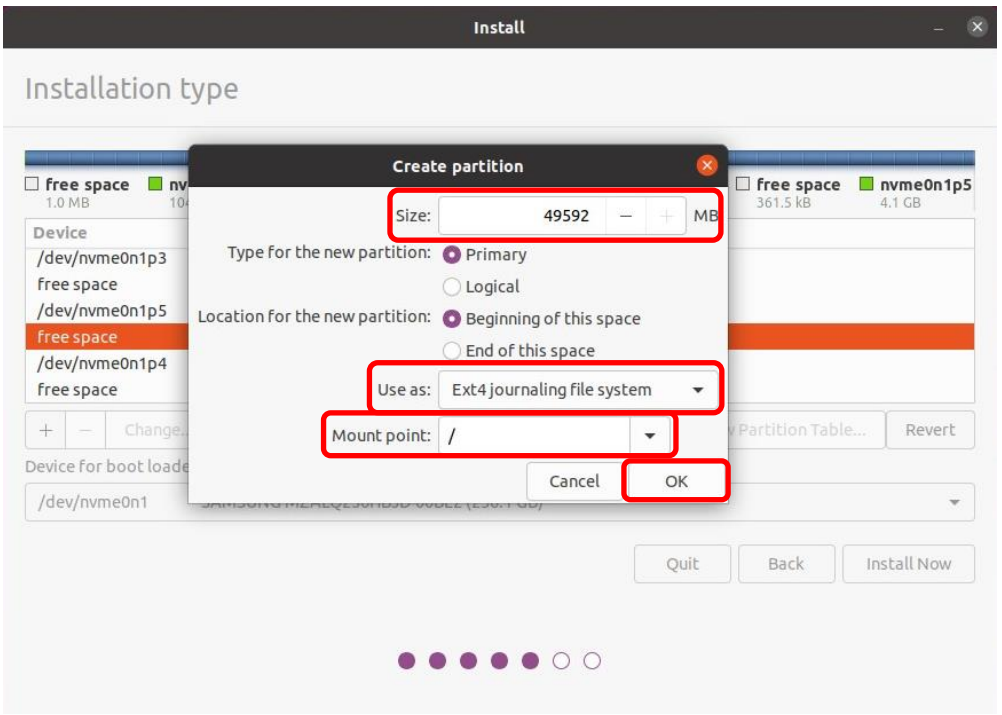


Figure 5. Root partition allocation for Installation of Ubuntu 20.04 LTS

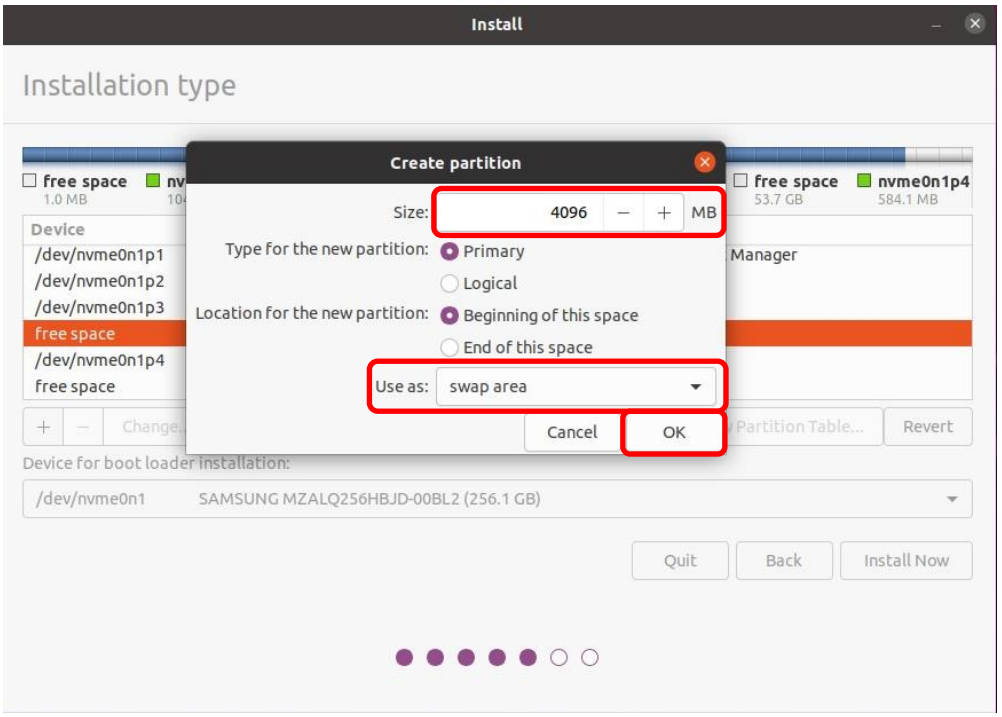


Figure 6. Swap partition allocation for Installation of Ubuntu 20.04 LTS

After installation, the computer will start rebooting. GRUB boot loader will show at the screen. Select the Ubuntu.

CAUTION: Please set your username as your name so that TA can recognize you when you submit screenshots as an assignment.

3. ROS2 Installation

Following ROS2 installation instructions are well organized in ROS2 Documentation: Foxy. Please carefully follow the instructions from 'Set locale' to 'Environment setup.' (https://docs.ros.org/en/foxy/Installation/Ubuntu-Install-Debians.html)

3.1 Set locale

Make sure you have a locale which supports `UTF-8`. If you are in a minimal environment (such as a docker container), the locale may be something minimal like `POSIX`. We test with the following settings. However, it should be fine if you're using a different UTF-8 supported locale.

```
locale  # check for UTF-8

sudo apt update && sudo apt install locales
sudo locale-gen en_US en_US.UTF-8
sudo update-locale LC_ALL=en_US.UTF-8 LANG=en_US.UTF-8
export LANG=en_US.UTF-8

locale  # verify settings
```

3.2 Setup Sources

You will need to add the ROS 2 apt repository to your system.

First ensure that the Ubuntu Universe repository is enabled.

```
sudo apt install software-properties-common
sudo add-apt-repository universe
```

Now add the ROS 2 GPG key with apt.

```
sudo apt update && sudo apt install curl -y
sudo curl -sSL https://raw.githubusercontent.com/ros/rosdistro/master/ros.key -o /usr/share/keyrings/ros
```

3.3 Install ROS 2 packages

Update your apt repository caches after setting up the repositories.

```
sudo apt update
```

ROS 2 packages are built on frequently updated Ubuntu systems. It is always recommended that you ensure your system is up to date before installing new packages.

```
sudo apt upgrade
```

Desktop Install (Recommended): ROS, RViz, demos, tutorials.

```
sudo apt install ros-foxy-desktop python3-argcomplete
```

ROS-Base Install (Bare Bones): Communication libraries, message packages, command line tools. No GUI tools.

```
sudo apt install ros-foxy-ros-base python3-argcomplete
```

Development tools: Compilers and other tools to build ROS packages

```
sudo apt install ros-dev-tools
```

3.4 Environment setup

Sourcing the setup script

Set up your environment by sourcing the following file.

```
# Replace ".bash" with your shell if you're not using bash
# Possible values are: setup.bash, setup.sh, setup.zsh
source /opt/ros/foxy/setup.bash
```

4. Submission Format

We will check whether ROS2 is properly installed on your desktop. Open two terminals and run the following commands in each terminal to check whether the messages are being sent and received properly.

```
source /opt/ros/foxy/setup.bash
ros2 run demo_nodes_cpp talker
```

```
source /opt/ros/foxy/setup.bash
ros2 run demo_nodes_py listener
```

Submit your screenshots of two terminals properly sending and receiving messages. Figure 7 is an example of the screenshot. The file name should be **'IS_StudentNumber_Pre_Project1.zip'**.

Due to: 2025.09.10. 23:59 KST

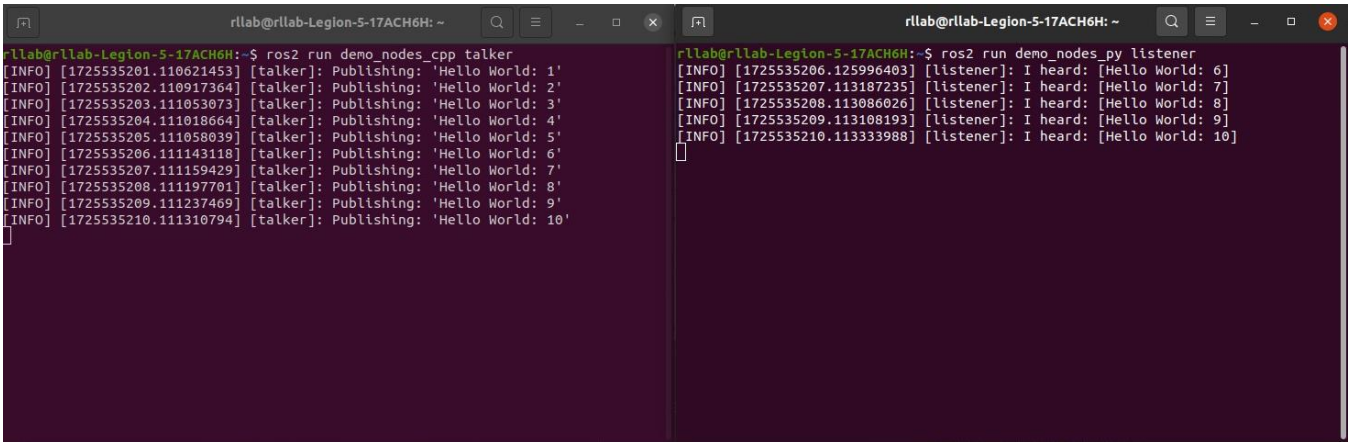


Figure 7. Submission Format