ME454
Dynamics System Programming

TA Session 1. Linux and ROS installation

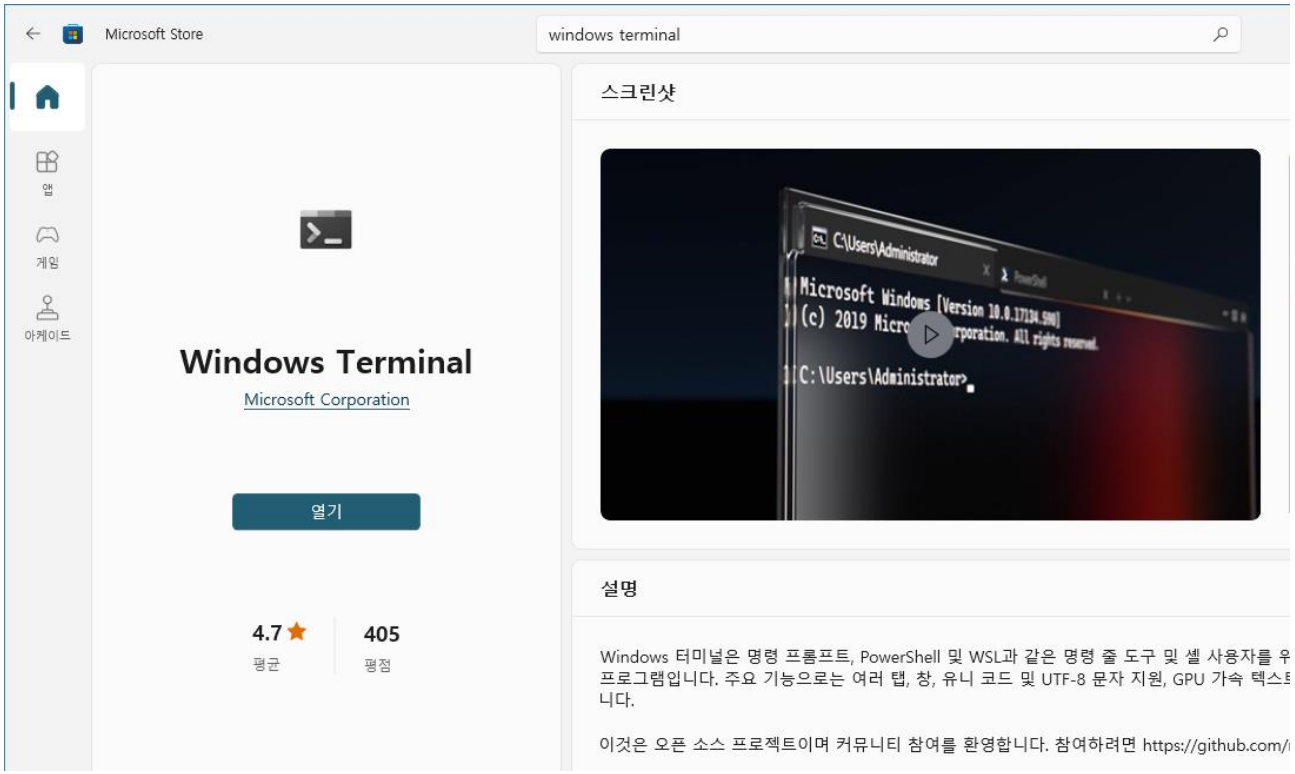
Class objectives

- Building Ubuntu system using WSL2

- Installing ROS & GAZEBO

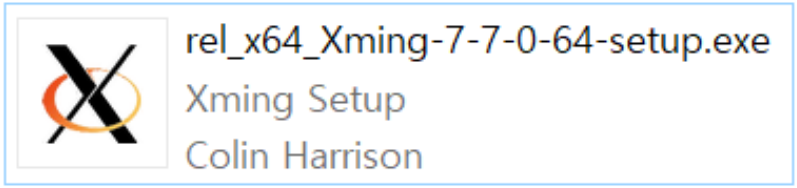
Before Started

- Install Windows Terminal
  - Go to Microsoft Store, find & install ‘Windows Terminal’



Before Started

- Install Xming X server for Windows
  - Download installation file on the KLMS (rel_x64_Xming-7-7-0-64-setup.exe)
  - You have to know where the xming.exe file is
    - Create Desktop shortcut is recommended



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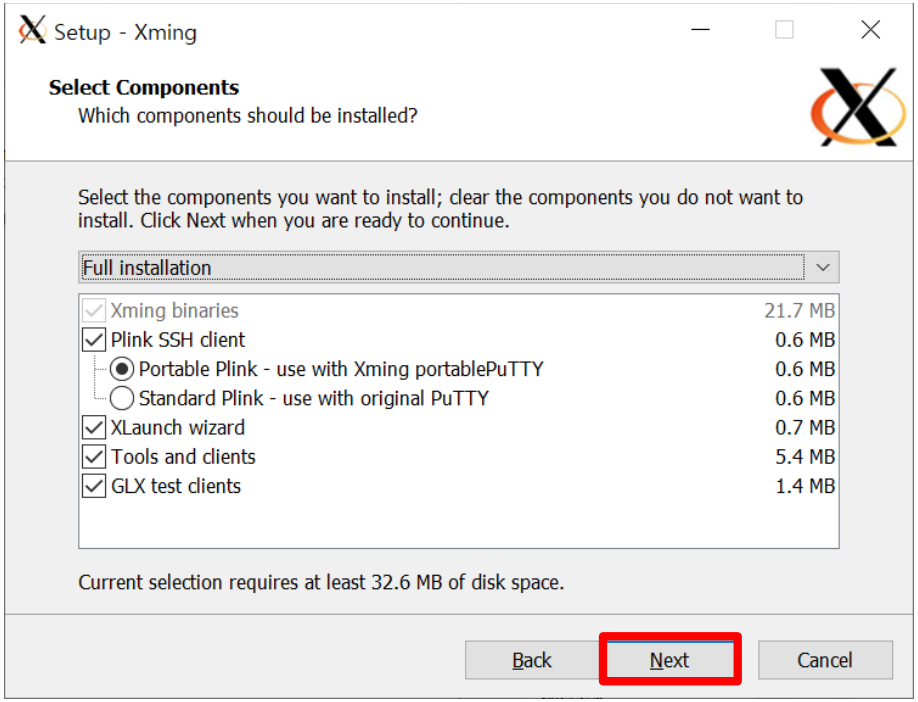

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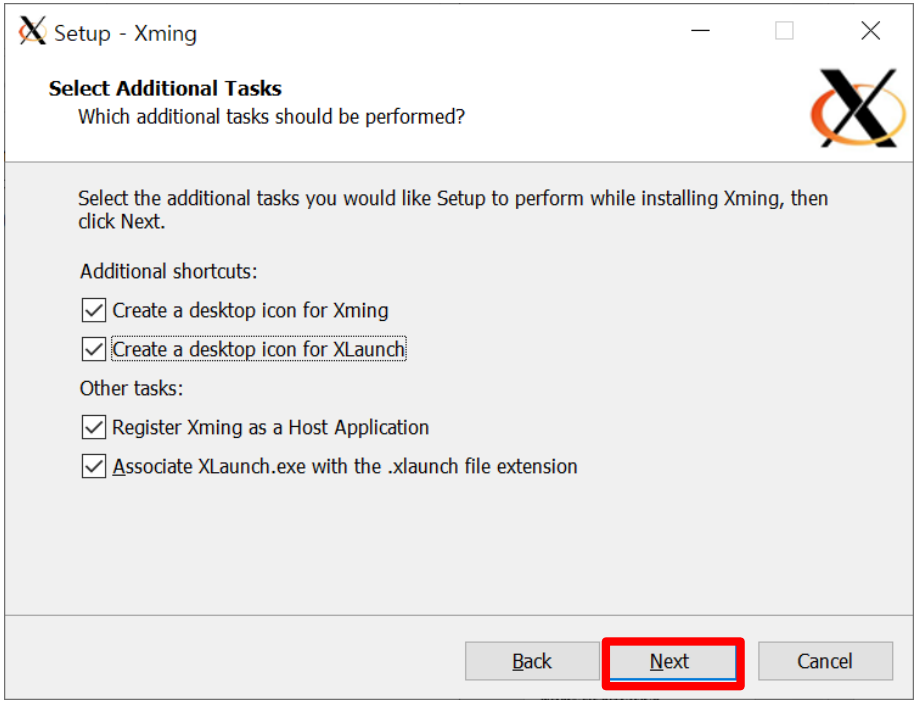
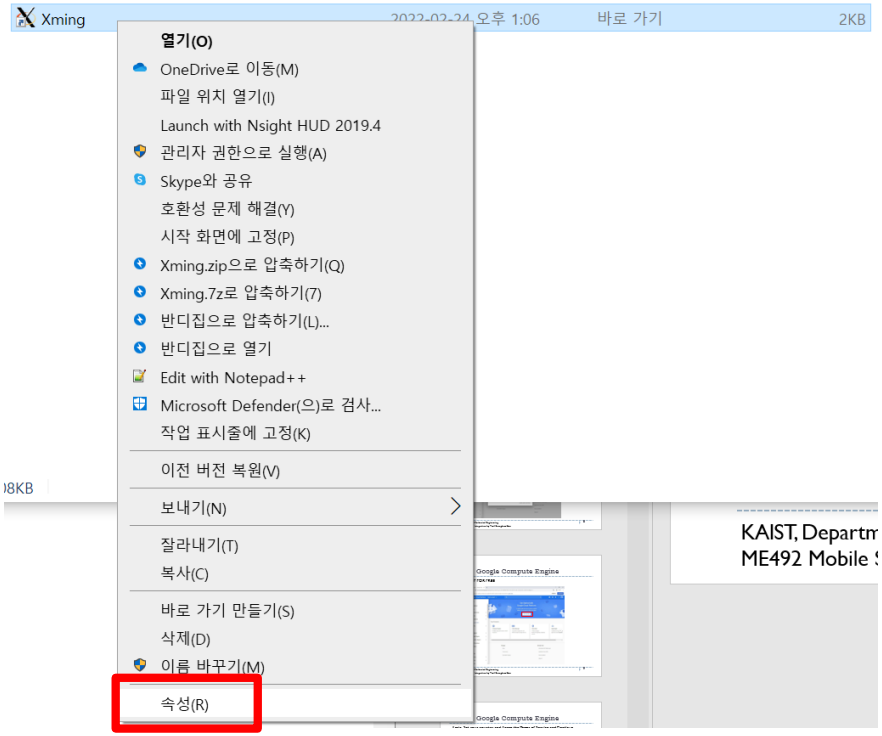
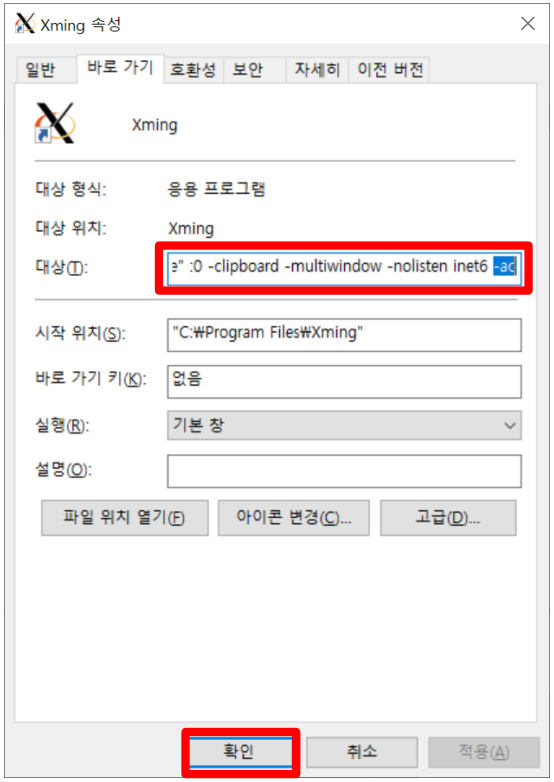


Before Started

- Install Xming X server for Windows
  - add the execute arguments “-ac” to the shortcut.
  - “-ac” enable Xming to accept requests from external IPs Xming is configured to accept only requests from itself

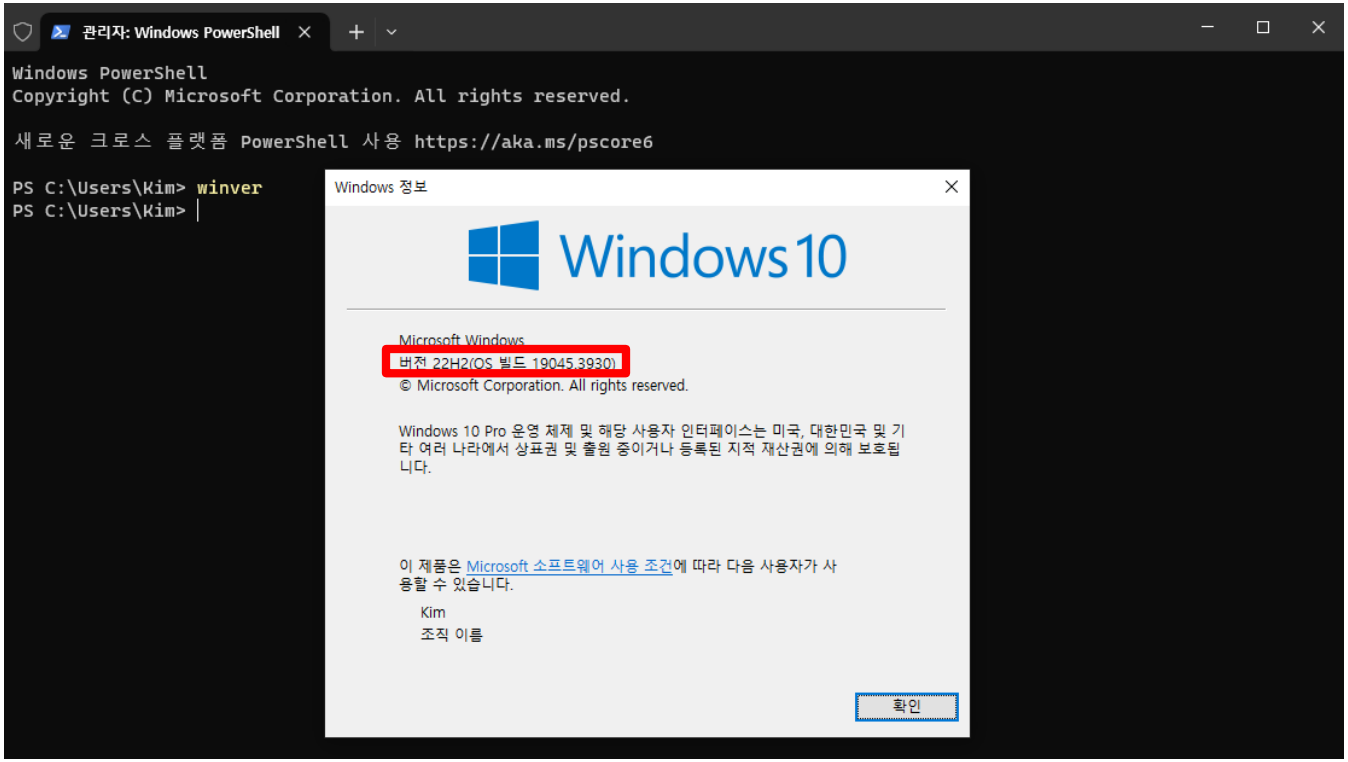




Requirements for WSL2

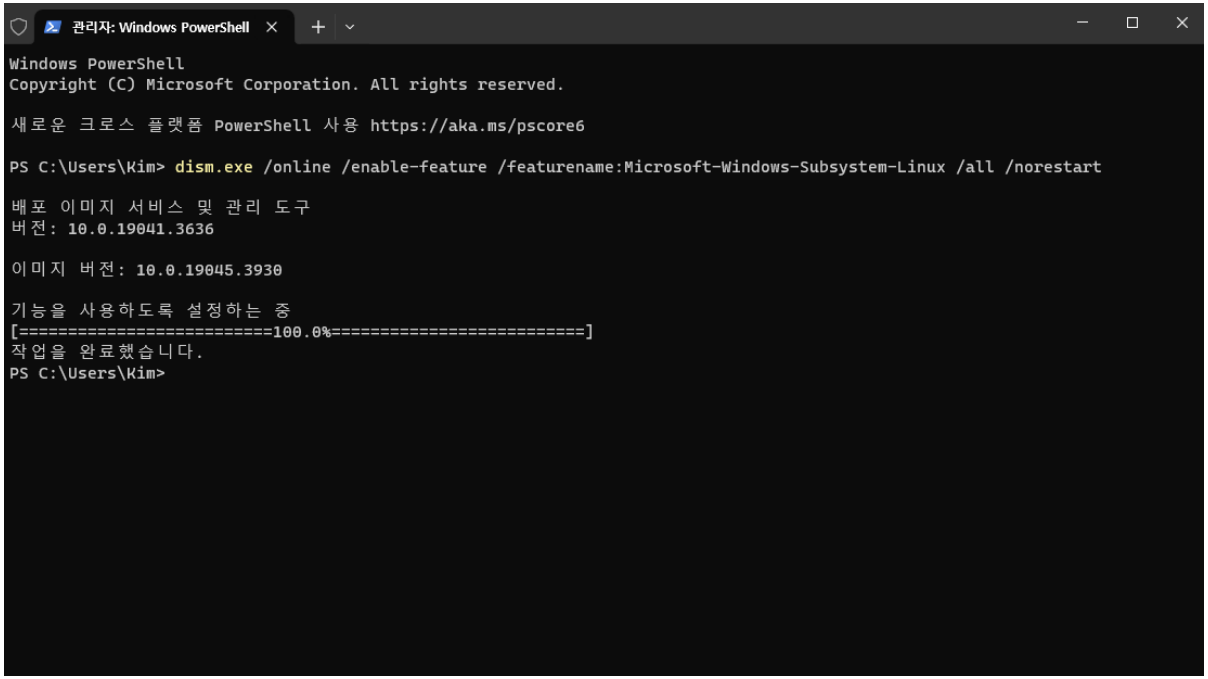
Go to windows terminal (Windows logo key + R)
Type '**winver**' and check the version of installed Windows 10 OS

For x64 systems: **Version 1903** or higher, with **Build 18362** or higher.



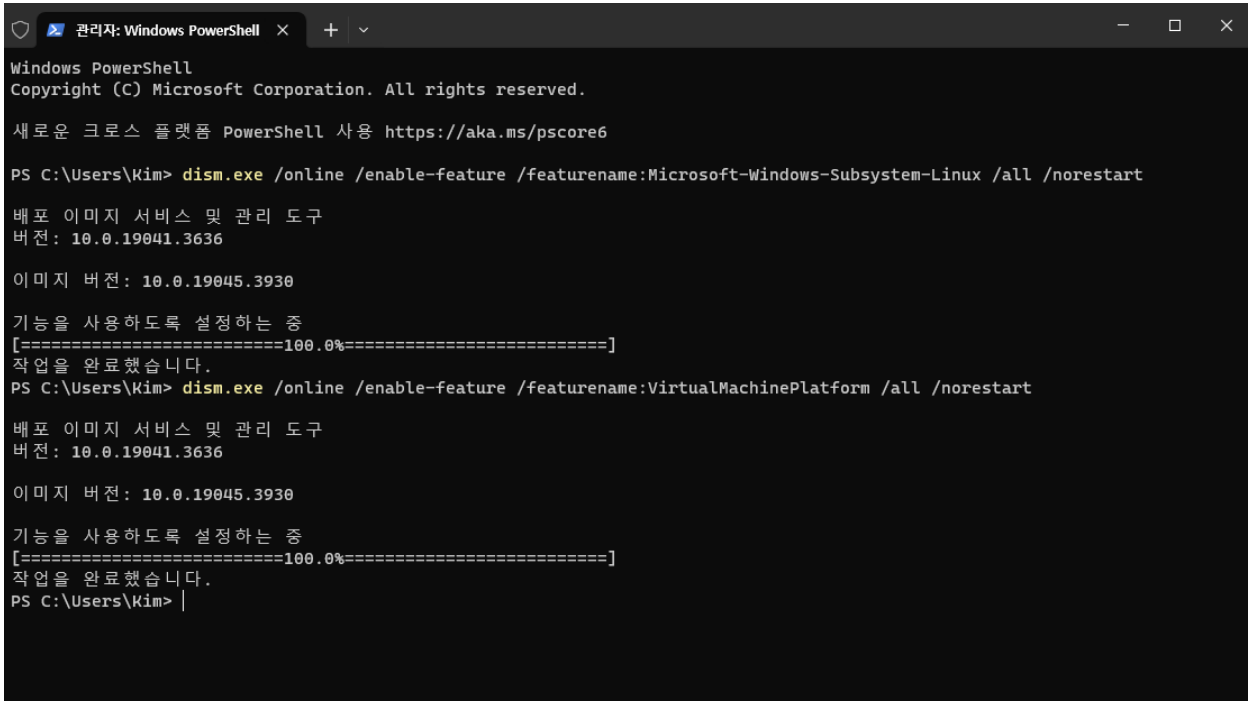
Requirements for WSL2

- Enable WSL2-related features on Windows
  - dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart



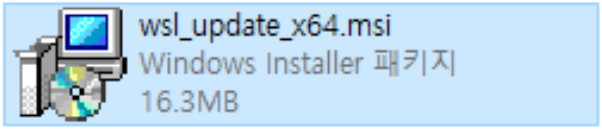
Requirements for WSL2

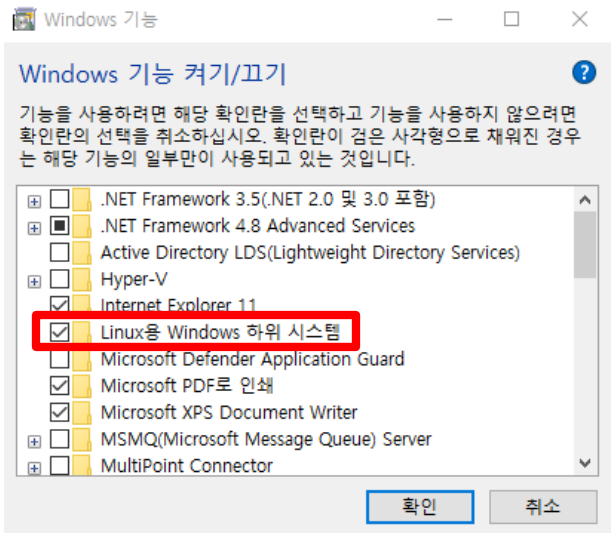
- Enable WSL2-related features on Windows
- dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
- Then **reboot** once.

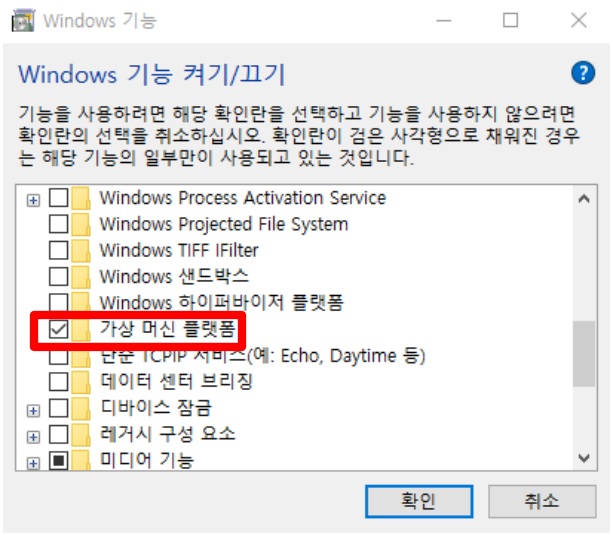


Install WSL2

- Download the Linux kernel update package
- https://docs.microsoft.com/en-us/windows/wsl/install-manual#step-4---download-the-linux-kernel-update-package
- https://wslstorestorage.blob.core.windows.net/wslblob/wsl_update_x64.msi







Install WSL2

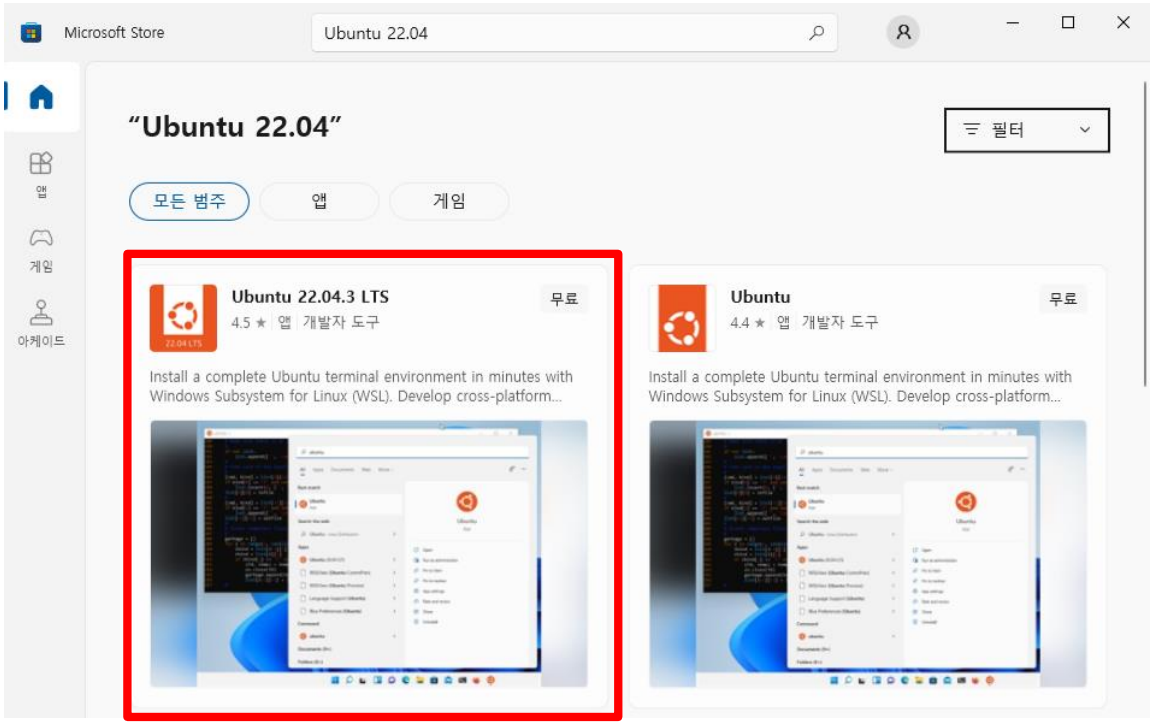
- Set WSL 2 as your default version
  - On the windows terminal, type this command
    - wsl --set-default-version 2

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

새로운 크로스 플랫폼 PowerShell 사용 https://aka.ms/pscore6

PS C:\Users\Kim> wsl --set-default-version 2
WSL 2와의 주요 차이점에 대한 자세한 내용은 https://aka.ms/wsl2를 참조하세요
작업을 완료했습니다.
PS C:\Users\Kim>
```

  - To set a version of specific Ubuntu distribution:
    - wsl –set-version <distribution name> <versionNumber>

Install WSL2

- Install your Linux distribution of choice
  - Select ubuntu 22.04 and install from MS Store



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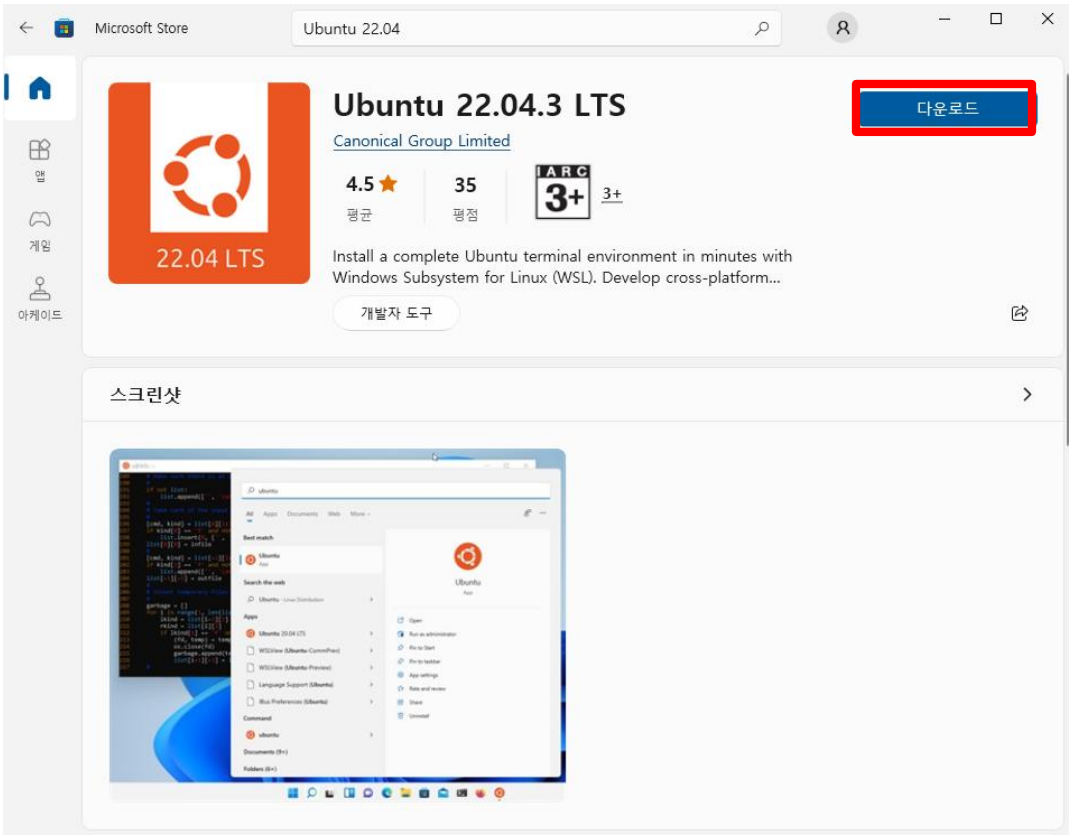
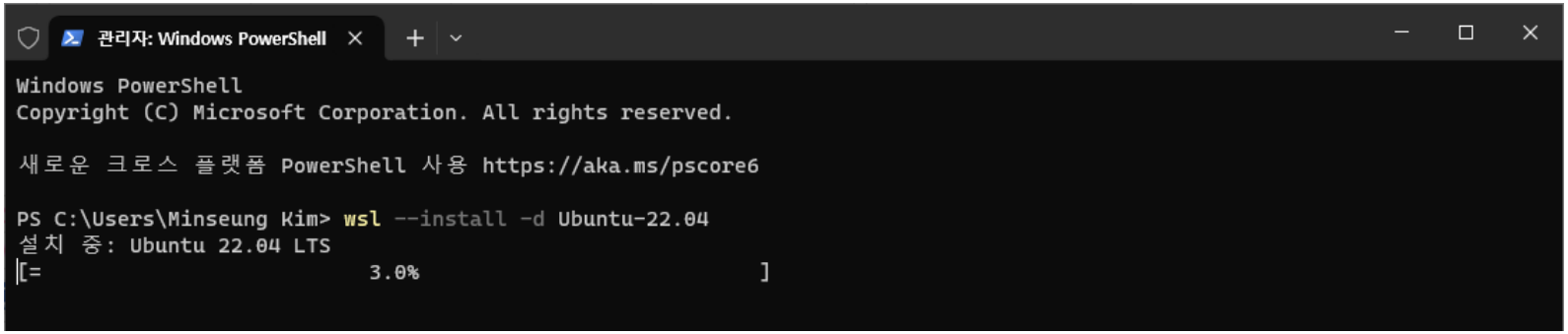


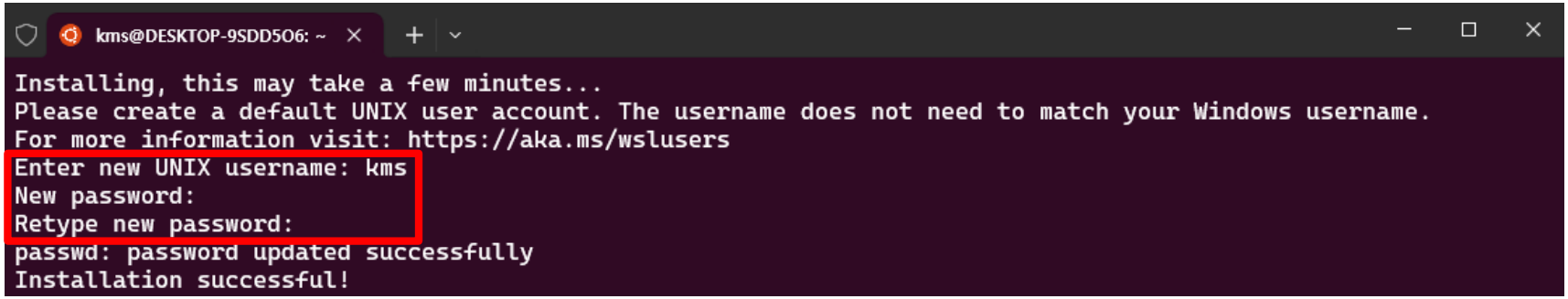
Tips #1 (Recommended)

- If the downloading speed of the MS store is too slow,
  - Use the command below on the Windows PowerShell (administrator mode)
  - ‘wsl’ command in Windows PowerShell does not need an administrator authority
  - wsl --install –d Ubuntu-22.04



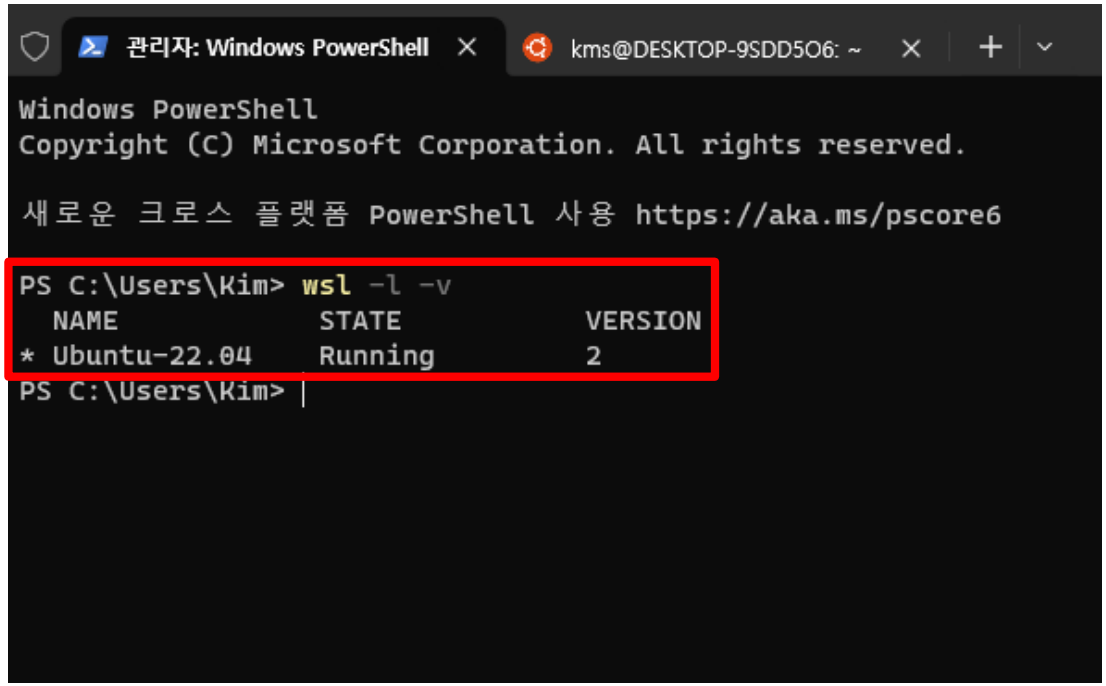
Install WSL2

- Install your Linux distribution of choice
  - Set your username and password (for TA's case, username is kms)
    - The password is invisible during the settings, but it is there
    - The password is required when root privilege is needed



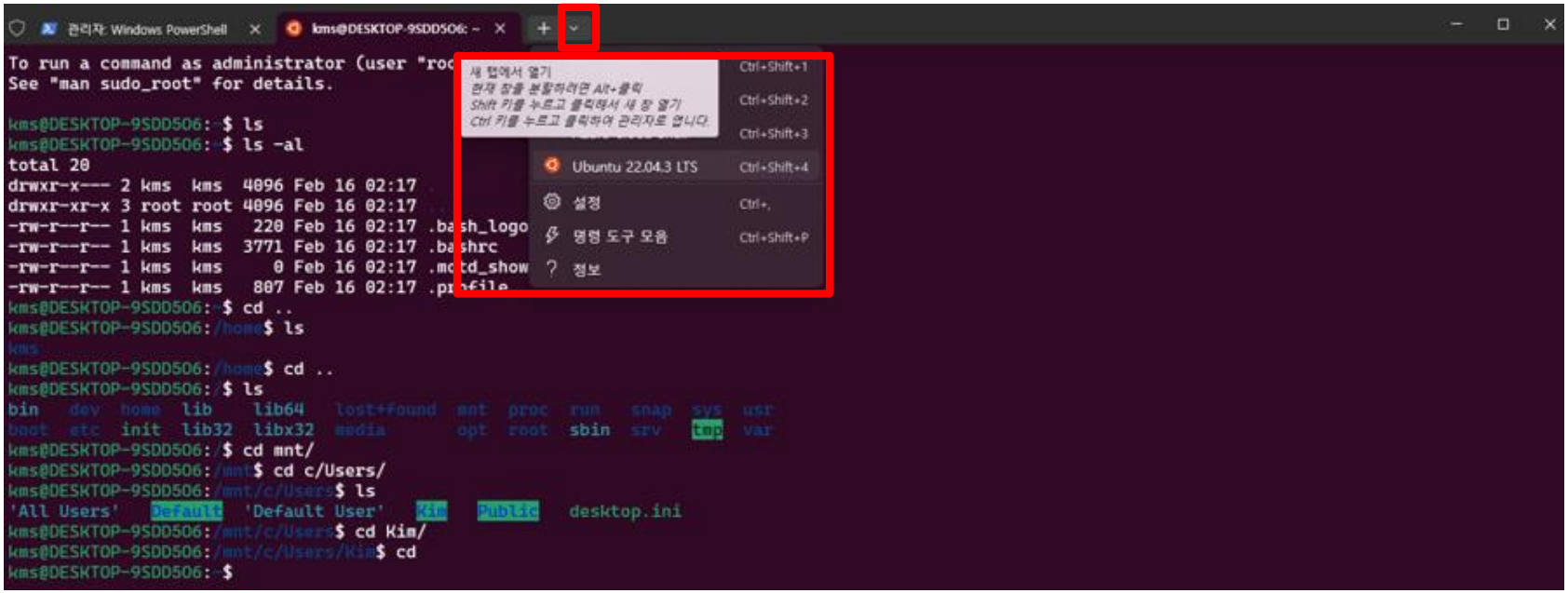
Install WSL2

- Check if ubuntu is properly installed in WSL
  - wsl -l –v
  - The version should be ‘2’



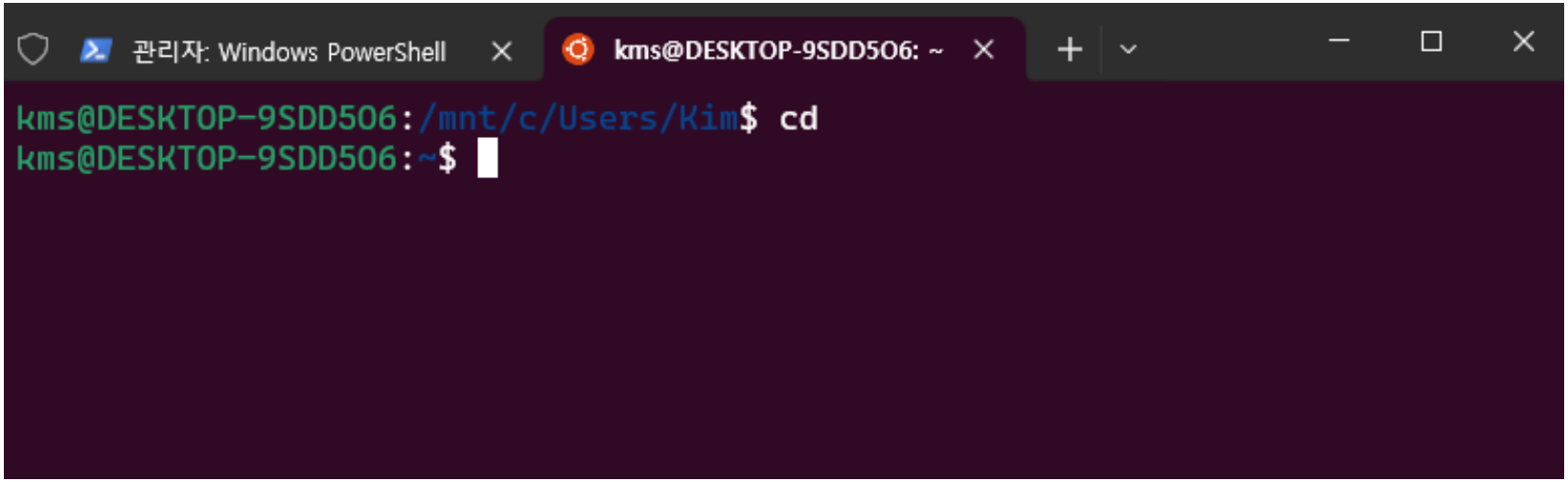
Run WSL2

- Open windows terminal(Run as administrator)
  - Click ∨ and select Ubuntu 22.04



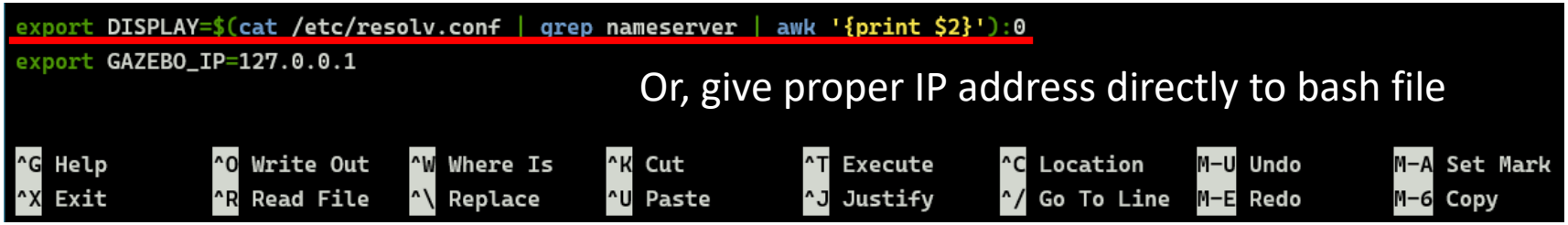
Run WSL2

- Type ‘cd’ to go to your home directory.
  - ‘~’ is home directory and is same as /home/(**username**)



Set X11 configuration

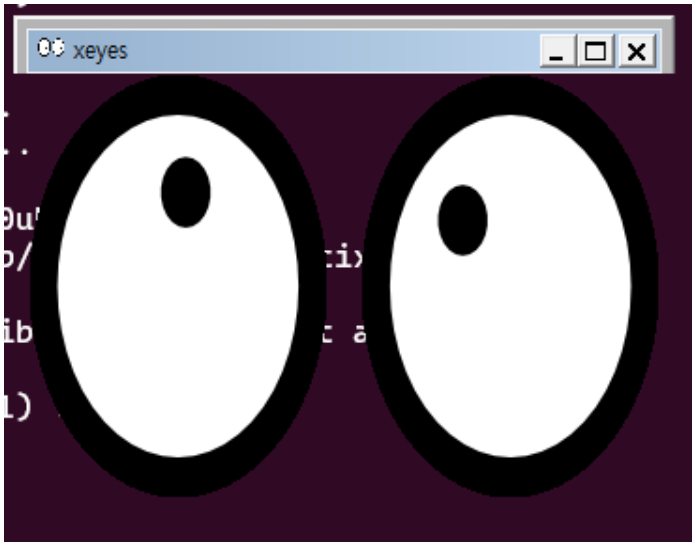
- Type these command in your home directory.
- sudo nano ~/.bashrc (or vi ~/.bashrc)
- echo "export DISPLAY=$(cat /etc/resolv.conf | grep nameserver | awk '{print $2}'):0" >> ~/.bashrc



- echo "export GAZEBO_IP=127.0.0.1" >> ~/.bashrc
  - '.bashrc' : a script file that's executed when a user logs in
    - contains a series of configurations for the terminal session
    - includes setting up or enabling: coloring, completion, shell history, command aliases, and more

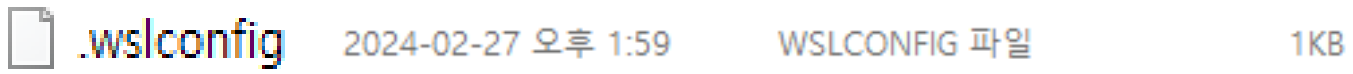
Set X11 configuration

- source .bashrc
- sudo apt update
- sudo apt install x11-apps
- xeyes

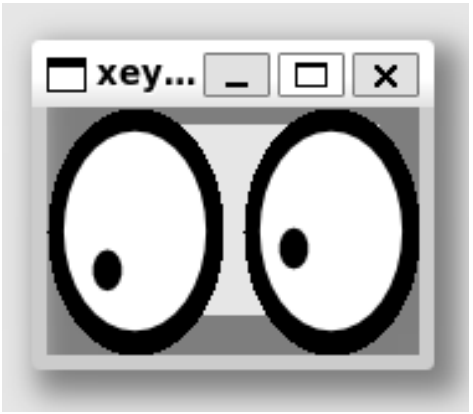


Tips #2

- If the Xming does not work (Visualize by wsl2)
  - Check the C:\Users\username\.wslconfig exists or not
  - If not, create the .wslconfig.txt file
    - Type ‘guiApplications=true’ and delete the .txt extension

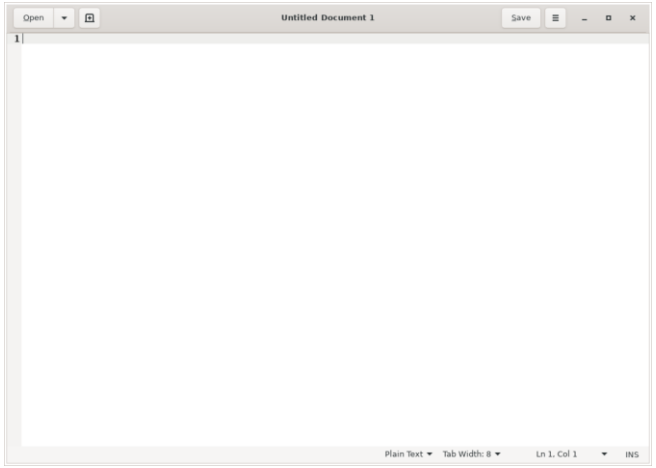


  - Delete the ‘Display=xxx.xxx.xxx.xxx’ line from the bash file by editor
    - by sudo nano ~/.bashrc
    - or Sudo vi ~/.bashrc
  - Shutdown the wsl2 and restar
- source .bashrc
- xeyes

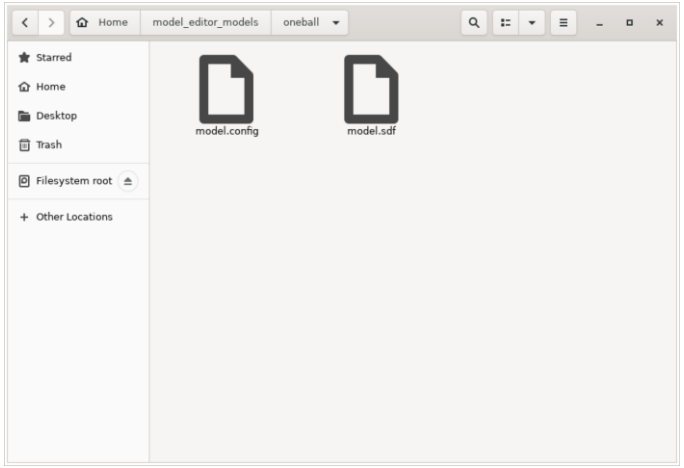


Set X11 configuration

- sudo apt install gedit
  - Simple GUI text editor
- sudo apt install nautilus
  - Simple GUI file explorer



gedit



nautilus

Installing ROS

Set Locale (To prevent the encoding error)

: UTF-8 (not POSIX or anything else)

```
kms@DESKTOP-9SDD506:~$ locale
LANG=C.UTF-8
LANGUAGE=
LC_CTYPE="C.UTF-8"
LC_NUMERIC="C.UTF-8"
LC_TIME="C.UTF-8"
LC_COLLATE="C.UTF-8"
LC_MONETARY="C.UTF-8"
LC_MESSAGES="C.UTF-8"
LC_PAPER="C.UTF-8"
LC_NAME="C.UTF-8"
LC_ADDRESS="C.UTF-8"
LC_TELEPHONE="C.UTF-8"
LC_MEASUREMENT="C.UTF-8"
LC_IDENTIFICATION="C.UTF-8"
LC_ALL=
```

```
kms@DESKTOP-9SDD506:~$ locale
LANG=en_US.UTF-8
LANGUAGE=
LC_CTYPE="en_US.UTF-8"
LC_NUMERIC="en_US.UTF-8"
LC_TIME="en_US.UTF-8"
LC_COLLATE="en_US.UTF-8"
LC_MONETARY="en_US.UTF-8"
LC_MESSAGES="en_US.UTF-8"
LC_PAPER="en_US.UTF-8"
LC_NAME="en_US.UTF-8"
LC_ADDRESS="en_US.UTF-8"
LC_TELEPHONE="en_US.UTF-8"
LC_MEASUREMENT="en_US.UTF-8"
LC_IDENTIFICATION="en_US.UTF-8"
LC_ALL=
```

```
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
```

Installing ROS

https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debians.html#

Setup Sources

sudo apt install software-properties-common

sudo add-apt-repository universe

sudo apt update && sudo apt install curl

sudo curl -sSL https://raw.githubusercontent.com/ros/rosdistro/master/ros.key -o /usr/share/keyrings/ros-archive-keyring.gpg

echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/ros-archive-keyring.gpg] http://packages.ros.org/ros2/ubuntu $(. /etc/os-release && echo $UBUNTU_CODENAME) main" | sudo tee /etc/apt/sources.list.d/ros2.list > /dev/null

Installing ROS

Installing

sudo apt update

sudo apt upgrade

sudo apt install ros-humble-desktop

sudo apt install ros-humble-ros-base

sudo apt install ros-dev-tools

Installing ROS (Task 1)

Check the sub/pub tutorial is works well

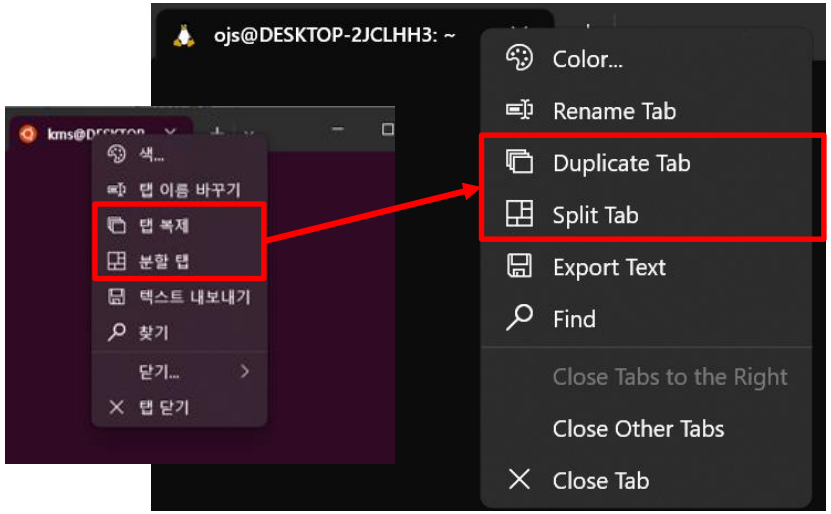
Open two ubuntu terminal tabs

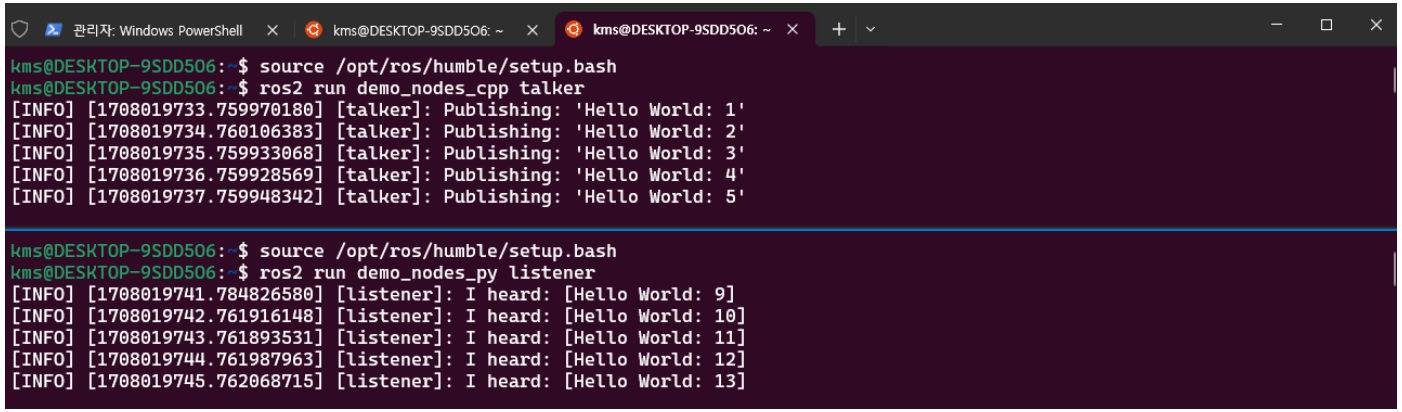
Terminal 1

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

Terminal 2

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





Installing GAZEBO

https://gazebosim.org/docs/harmonic/install_ubuntu

Installing

sudo apt-get update

sudo apt-get install lsb-release wget gnupg

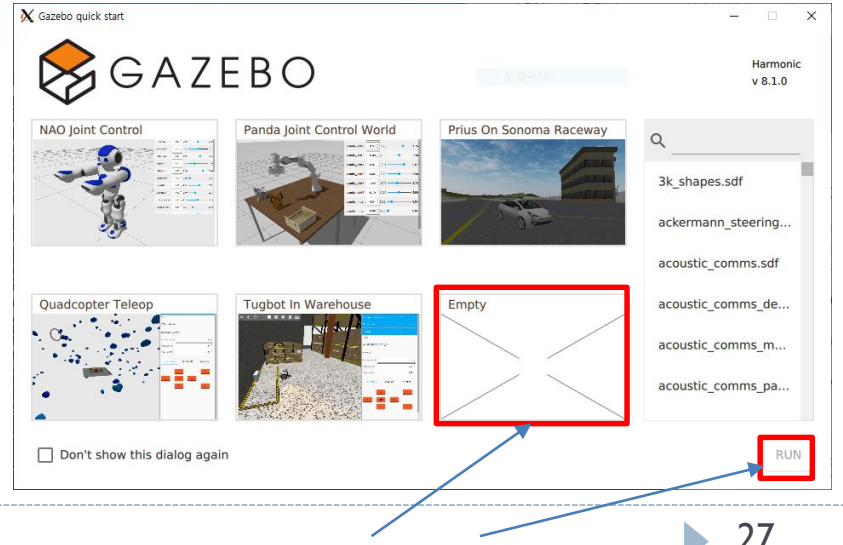
sudo wget https://packages.osrfoundation.org/gazebo.gpg -O /usr/share/keyrings/pkgs-osrf-archive-keyring.gpg

echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/pkgs-osrf-archive-keyring.gpg] http://packages.osrfoundation.org/gazebo/ubuntu-stable $(lsb_release -cs) main" | sudo tee /etc/apt/sources.list.d/gazebo-stable.list > /dev/null

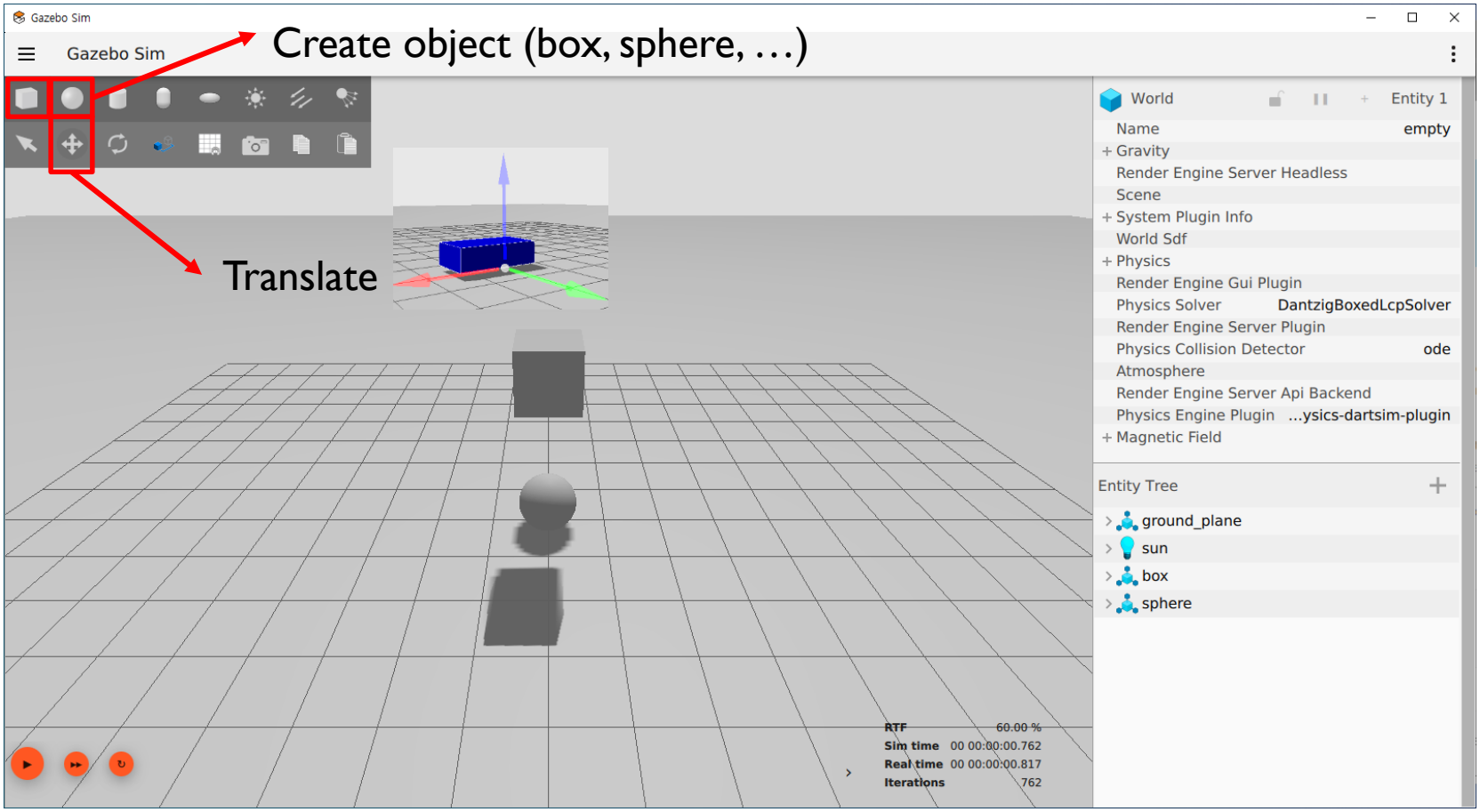
sudo apt-get update

sudo apt-get install gz-harmonic

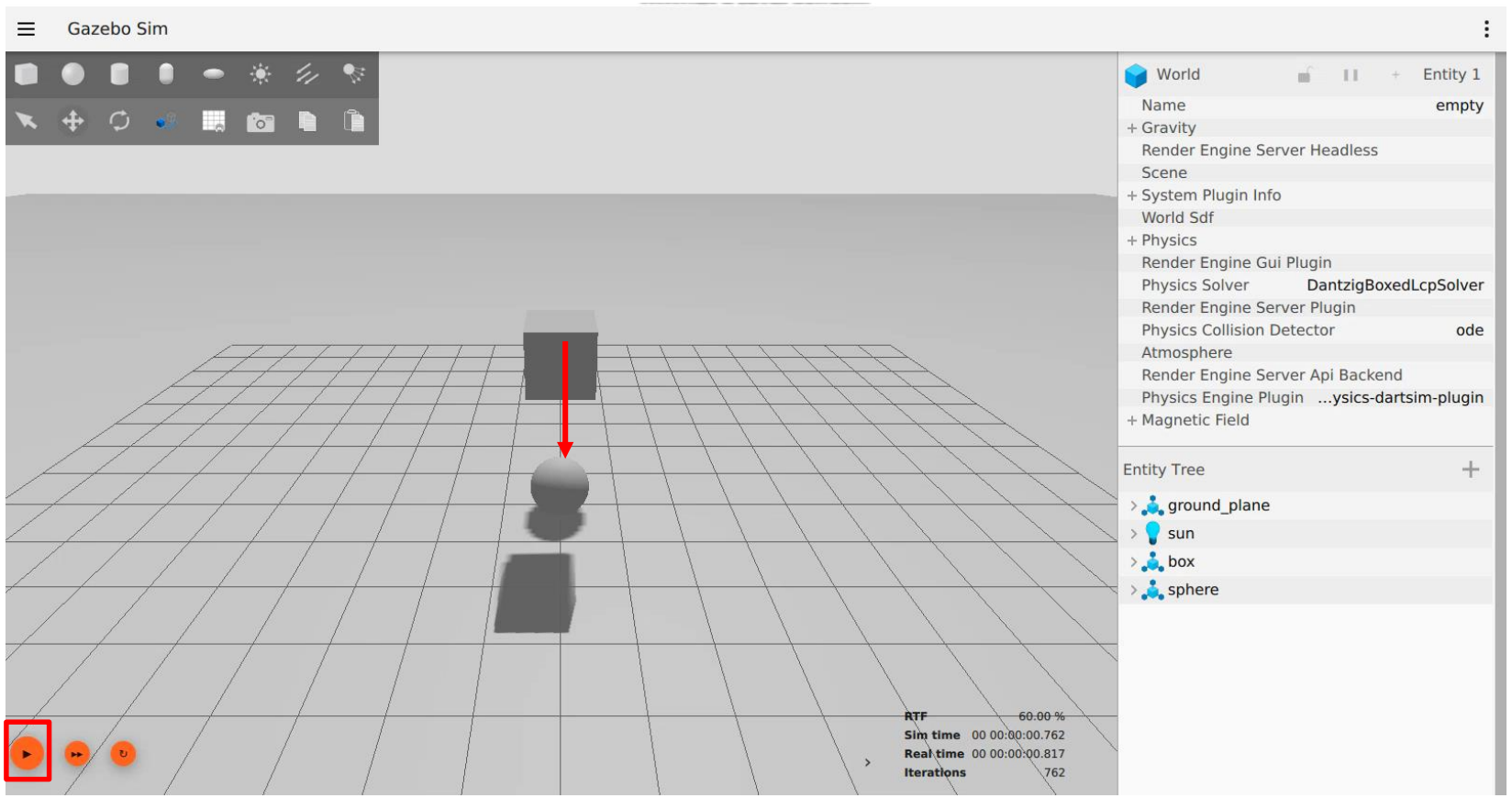
gz sim # start gazebo



Installing GAZEBO



Installing GAZEBO (Task 2)



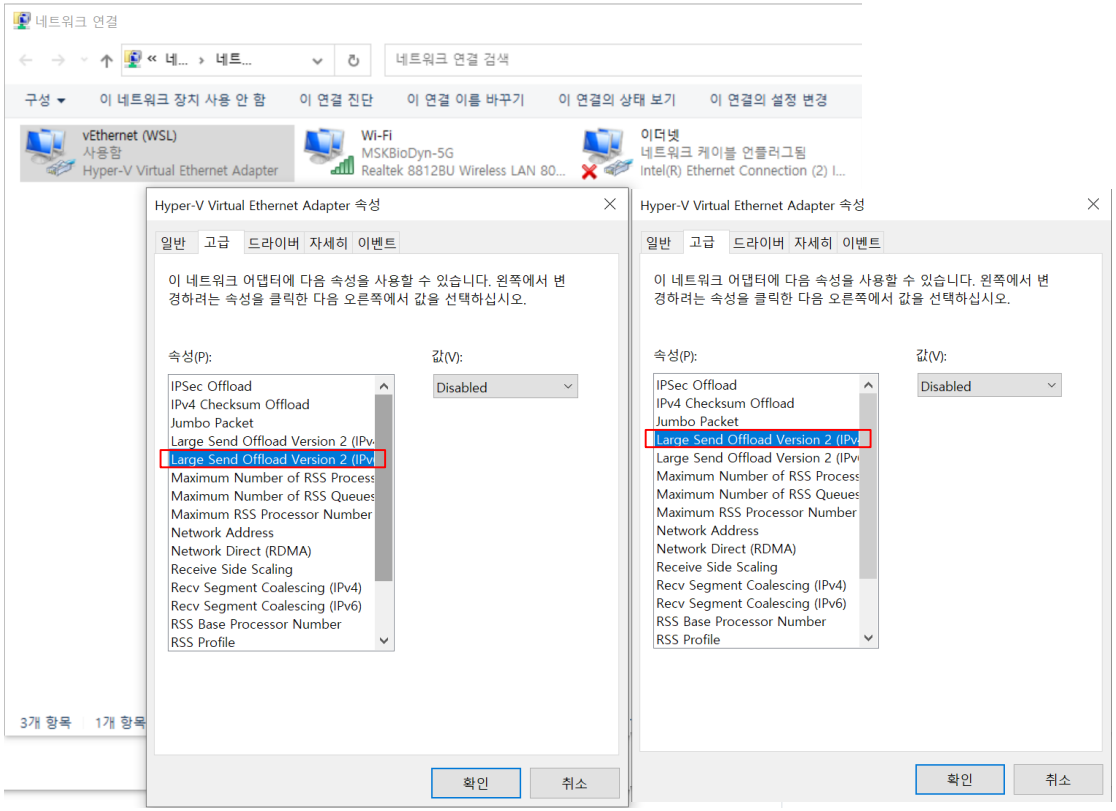
Tasks

- Run the ros talker & listener example (26 page)

- Simulate falling of the box or sphere in GAZEBO (29 page)

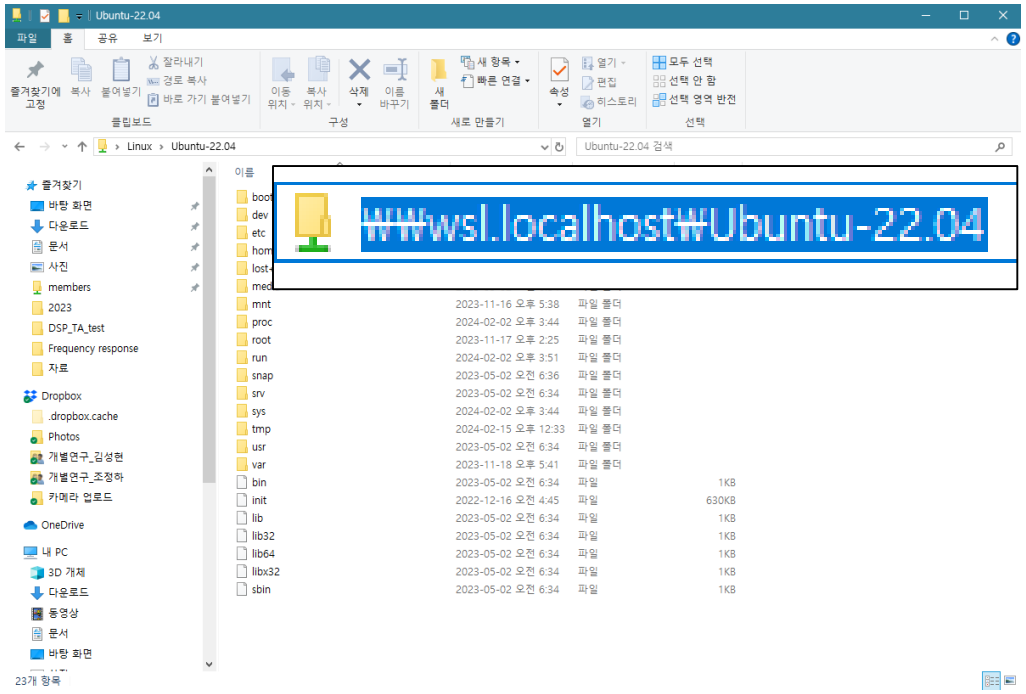
Tips #3

- If the internet on WSL2 is so slow
  - Disable-NetAdapterLso -Name "vEthernet (WSL)" in Windows Powershell
  - Same operation with disable 2 features(Large send offload….)



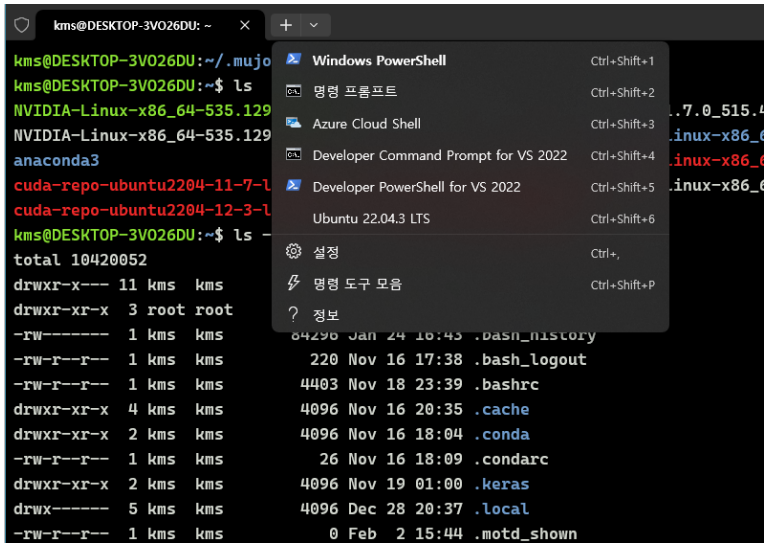
Tips #4

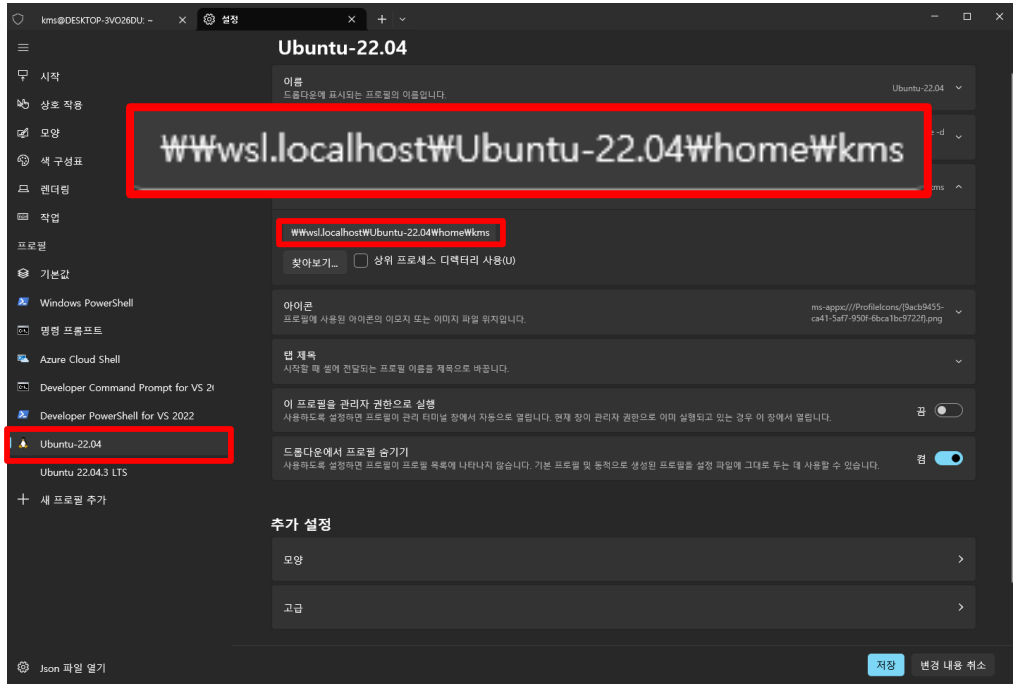
- If you want to access files on windows explorer
  - \\wsl.localhost\Ubuntu-22.04 is root directory(/) of ubuntu.
  - You can access, read/write, search the files



Tips #5

- Set home directory as starting directory in Windows terminal
  - go settings or Ctrl + , click Ubuntu-22.04 tab
  - Set as **\\wsl.localhost\Ubuntu-22.04\home\(username)**





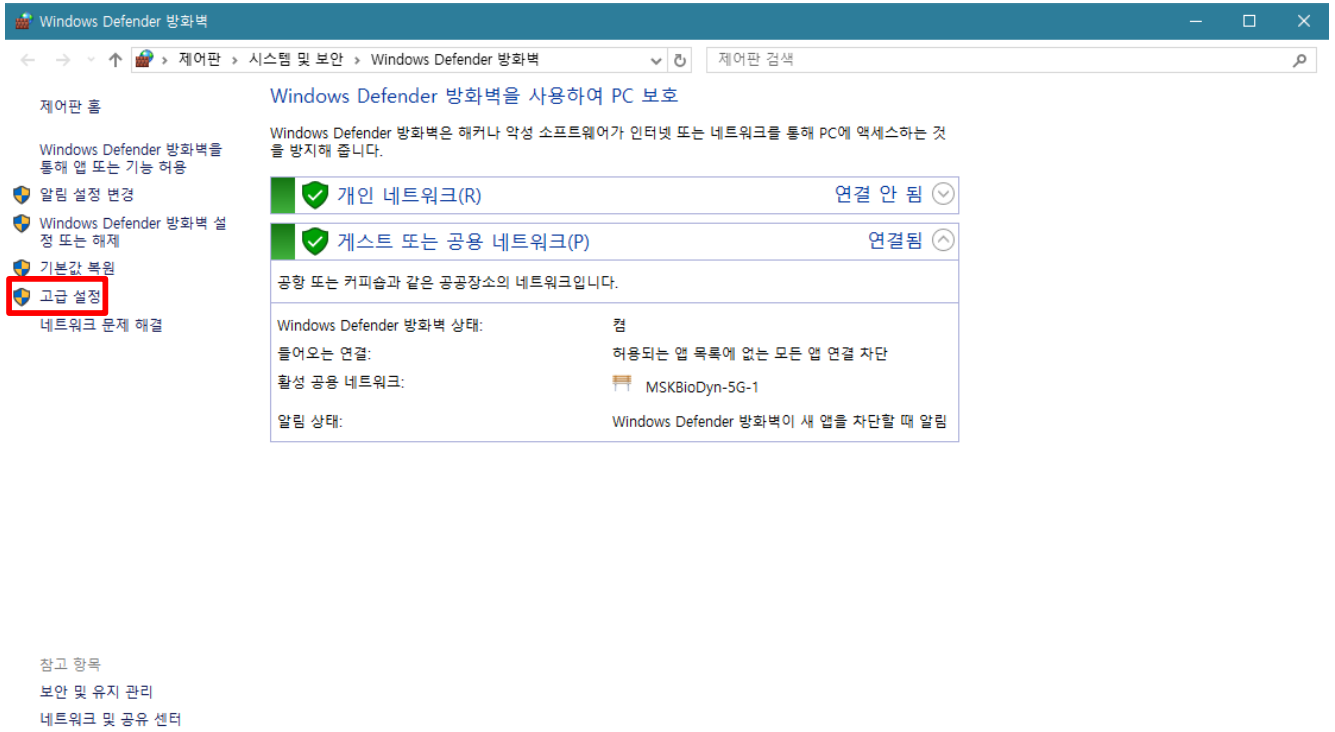
Extra FAQs (After TA Session)

- 0x8000FFFF error
  - Please try updating wsl2 using either of following command
    - try restart the system
    - run cmd or PowerShell without administrator permission

- Errors with gnu ~ message
  - export LIBGL_ALWAYS_SOFTWARE=1

Extra FAQs (After TA Session)

- Windows Defender issue (When Xming does not work)
  - 'Windows Defender' in search tab



Extra FAQs (After TA Session)

- Windows Defender issue (When Xming does not work)
  - In the inbound rule, if Xming is marked with a red sign, click on them and delete