TURTLEBOT3

Burger

1부

SBC Setup

SBC Setup/Image Setup

- ROS1

  Raspberry Pi 3B+

  https://www.robotis.com/service/download.php?no=1738
  https://www.raspberrypi.com/software/ **Raspberry Pi Imager**
  `sudo apt install rpi-imager`

- ROS2

  Raspberry Pi 4 4G

  CHOOSE OS > Other general-purpose OS > Ubuntu > Ubuntu Server 22.04.2 LTS(64-bit)

ROS1 / Raspberry Pi Setup

- Find IP Address on Raspberry

```
$ ifconfig
```

- PC

```
$ ssh pi@192.168.X.X

// default password : turtlebot
$ sudo apt-get install ntpdate
$ sudo ntpdate ntp.ubuntu.com

$ sudo raspi-config
// Advanced Options > Expand Filesystem

$ nano ~/.bashrc
export ROS_MASTER_URI=http://{IP_ADDRESS_OF_REMOTE_PC}:11311
export ROS_HOSTNAME={IP_ADDRESS_OF_RASPBERRY_PI_3}
// save

$ source ~/.bashrc
```

ROS1 & ROS2 / LDS Setup

- LDS-02 Setup(no need for ROS2)


```
$ sudo apt update
$ sudo apt install libudev-dev
$ cd ~/catkin_ws/src
$ git clone -b develop https://github.com/ROBOTIS-GIT/ld08_driver.git
$ cd ~/catkin_ws/src/turtlebot3 && git pull
$ rm -r turtlebot3_description/ turtlebot3_teleop/ turtlebot3_navigation/ turtlebot3_slam/ turtlebot3_example/
$ cd ~/catkin_ws && catkin_make
```

```
$ echo 'export LDS_MODEL=LDS-02' >> ~/.bashrc

$ source ~/.bashrc
```

ROS2/Ubuntu Setup for Raspberry Pi

- Login(ubuntu / ubuntu)
- Wifi Setup

```
$ sudo nano /writable/etc/netplan/50-cloud-init.yaml
```

```
network:
  version: 2
  renderer: networkd
  ethernets:
    eth0:
      dhcp4: yes
      dhcp6: yes
      optional: true
  wifis:
    wlan0:
      dhcp4: yes
      dhcp6: yes
      access-points:
        WIFI_SSID:
          password: WIFI_PASSWORD
```

ROS2/Ubuntu Setup for Raspberry Pi

- Automatic Update setting

```
$ sudo nano /etc/apt/apt.conf.d/20auto-upgrades


APT::Periodic::Update-Package-Lists "0";
APT::Periodic::Unattended-Upgrade "0";

// save

$ systemctl mask systemd-networkd-wait-online.service
$ sudo systemctl mask sleep.target suspend.target hibernate.target hybrid-sleep.target

$ reboot
```

ROS2/Ubuntu Setup for Raspberry Pi

- ROS2 Install

ROS2/Ubuntu Setup for Raspberry Pi

- Install ROS2 Package

```
$ sudo apt install python3-argcomplete python3-colcon-common-extensions libboost-system-dev build-essential
$ sudo apt install ros-humble-hls-lfcd-lds-driver
$ sudo apt install ros-humble-turtlebot3-msgs
$ sudo apt install ros-humble-dynamixel-sdk
$ sudo apt install libudev-dev
$ mkdir -p ~/turtlebot3_ws/src && cd ~/turtlebot3_ws/src
$ git clone -b humble-devel https://github.com/ROBOTIS-GIT/turtlebot3.git
$ git clone -b ros2-devel https://github.com/ROBOTIS-GIT/ld08_driver.git
$ cd ~/turtlebot3_ws/src/turtlebot3
$ rm -r turtlebot3_cartographer turtlebot3_navigation2
$ cd ~/turtlebot3_ws/
$ echo 'source /opt/ros/humble/setup.bash' >> ~/.bashrc
$ source ~/.bashrc
$ colcon build --symlink-install --parallel-workers 1
$ echo 'source ~/turtlebot3_ws/install/setup.bash' >> ~/.bashrc
$ source ~/.bashrc
```

ROS2/Ubuntu Setup for Raspberry Pi

- USB Port Setting for OpenCR

```
$ sudo cp `ros2 pkg prefix turtlebot3_bringup`/share/turtlebot3_bringup/script/99-turtlebot3-cdc.rules /etc/udev/rules.d/
$ sudo udevadm control --reload-rules
$ sudo udevadm trigger
```

- ROS2 Domain ID Setting

```
$ echo 'export ROS_DOMAIN_ID=30 #TURTLEBOT3' >> ~/.bashrc
$ source ~/.bashrc
```

PC Setup/Turtlebot Package

- ROS1

```
$ sudo apt-get ros-kinetic-dynamixel-sdk
$ sudo apt-get ros-kinetic-turtlebot3-msgs
$ sudo apt-get ros-kinetic-turtlebot3
```

- ROS2

```
$ source ~/.bashrc
$ sudo apt ros-humble-dynamixel-sdk
$ sudo apt ros-humble-turtlebot3-msgs
$ sudo apt ros-humble-turtlebot3
```

PC Setup/ROS Dependent Package

- ROS1

```
$ sudo apt-get install ros-kinetic-joy ros-kinetic-teleop-twist-joy \
ros-kinetic-teleop-twist-keyboard ros-kinetic-laser-proc \
ros-kinetic-rgbd-launch ros-kinetic-depthimage-to-laserscan \
ros-kinetic-rosserial-arduino ros-kinetic-rosserial-python \
ros-kinetic-rosserial-server ros-kinetic-rosserial-client \
ros-kinetic-rosserial-msgs ros-kinetic-amcl ros-kinetic-map-server \
ros-kinetic-move-base ros-kinetic-urdf ros-kinetic-xacro \
ros-kinetic-compressed-image-transport ros-kinetic-rqt* \
ros-kinetic-gmapping ros-kinetic-navigation ros-kinetic-interactive-markers
```

- ROS2

```
$ sudo apt ros-humble-gazebo-*
```

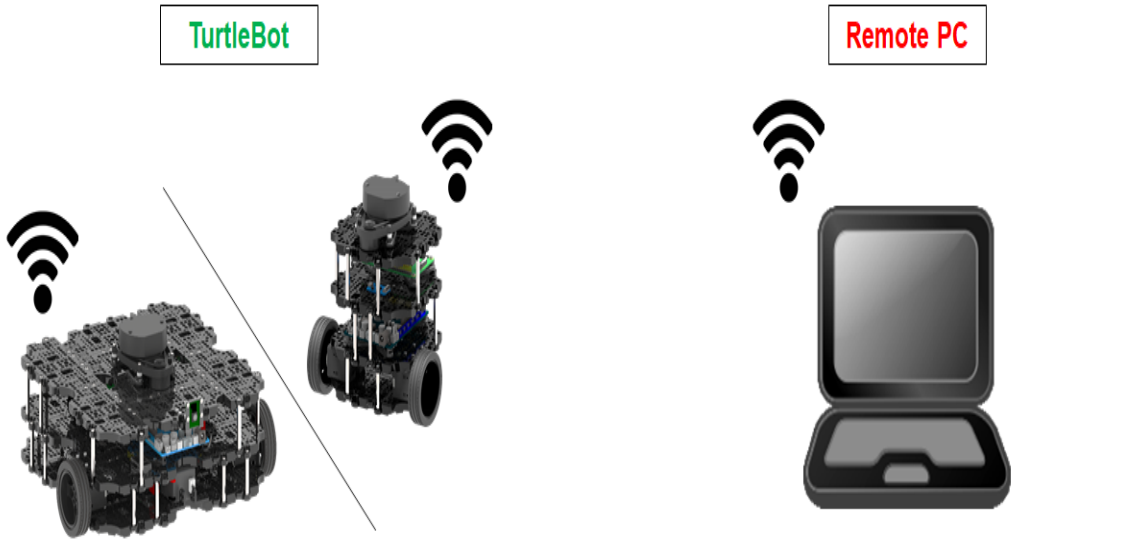
```
$ sudo apt ros-humble-cartographer
$ sudo apt ros-humble-cartographer-ros
```

```
$ sudo apt ros-humble-navigation2
$ sudo apt ros-humble-nav2-bringup
```

PC Setup/**Environment Configuration**

- ROS1

```
$ echo "export TURTLEBOT3_MODEL=burger" >> ~/.bashrc
```



ROS_MASTER_URI = http://IP_OF_REMOTE_PC:11311
ROS_HOSTNAME = IP_OF_TURTLEBOT

ROS_MASTER_URI = http://IP_OF_REMOTE_PC:11311
ROS_HOSTNAME = IP_OF_REMOTE_PC

* Example when ROS Master is running on the Remote PC

```
if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi

if [ -x /usr/bin/mint-fortune ]; then
    /usr/bin/mint-fortune
fi

alias eb='nano ~/.bashrc'
alias sb='source ~/.bashrc'
alias gs='git status'
alias gp='git pull'
alias cw='cd ~/catkin_ws'
alias cs='cd ~/catkin_ws/src'
alias cm='cd ~/catkin_ws && catkin_make'

source /opt/ros/kinetic/setup.bash
source ~/catkin_ws/devel/setup.bash

export ROS_MASTER_URI=http://192.168.0.100:11311
export ROS_HOSTNAME=192.168.0.100

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Spell ^_ Go To Line
```

PC Setup/**Environment Configuration**

- ROS2

```
$ echo 'export ROS_DOMAIN_ID=30 #TURTLEBOT3' >> ~/.bashrc
$ source ~/.bashrc
```