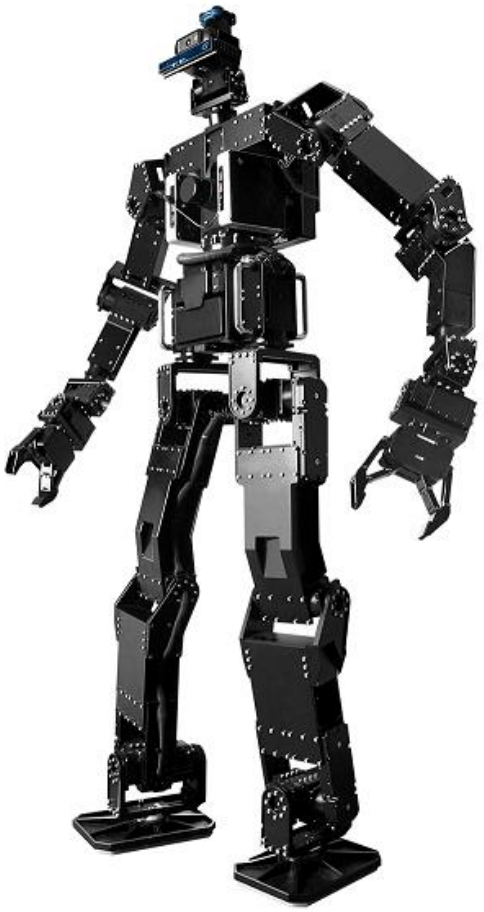


THORMANG3

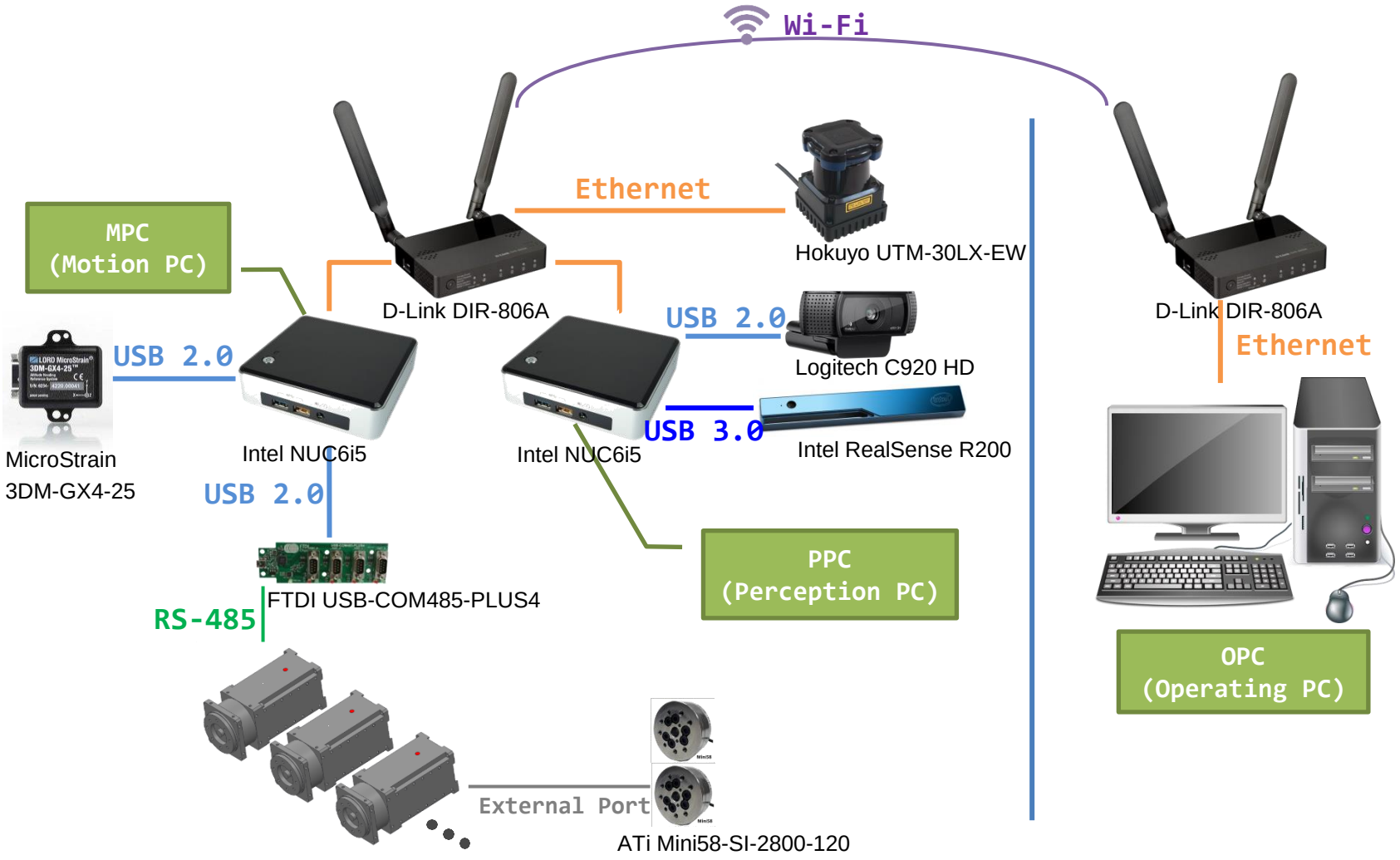
# THORMANG3 Tutorial

Operating PC

# Table of Contents

# 1. Introduction

# 1. System Configuration

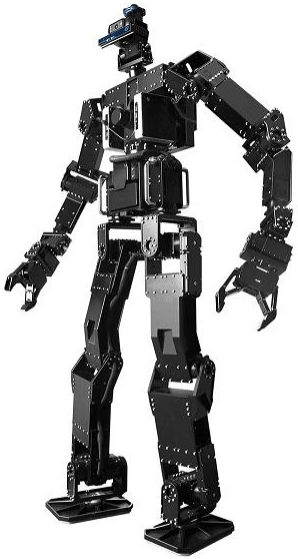


# 2. What is OPC

- **OS**
  - Above Ubuntu 14.04 LTS

- **ROS(Robot Operating System)**
  - Version : above indigo
  - Installation (Desktop-Full)
  - Environment setup

- **ROBOTIS ROS Package**
  - ROBOTIS-THORMANG-OPC
  - ROBOTIS-THORMANG-msgs
  - ROBOTIS-THORMANG-Common
  - ROBOTIS-Framework-msgs



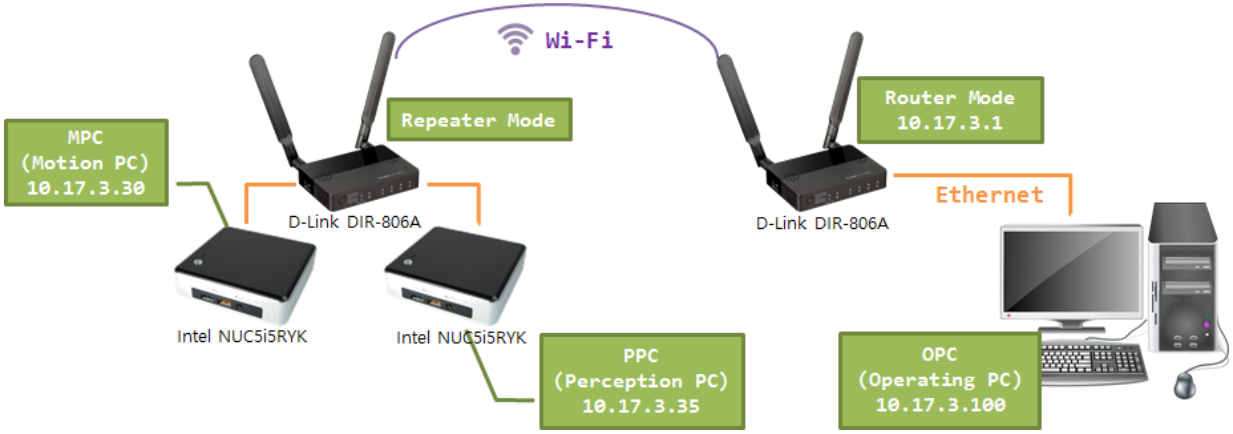
# 2. What is OPC

- **Additional Package for THORMANG OPC**
  - humanoid_navigation
    - map-server
    - nav-msgs
    - humanoid-nav-msgs
    - octomap, octomap-msgs, octomap-ros, octomap-server
    - sbpl
  - qt_ros

# 2. How to set OPC

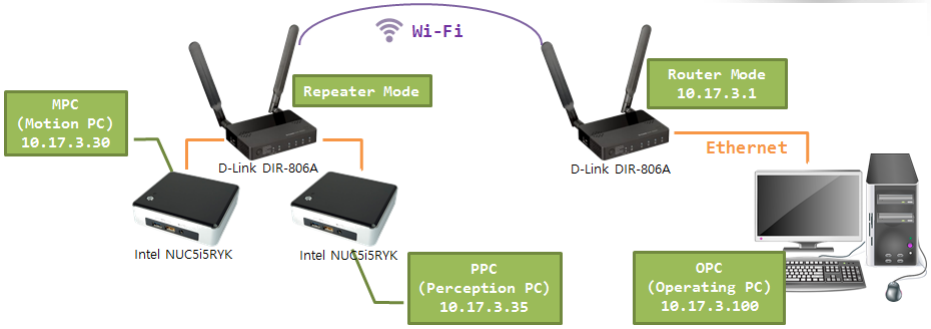
# 1. Ubuntu Installation

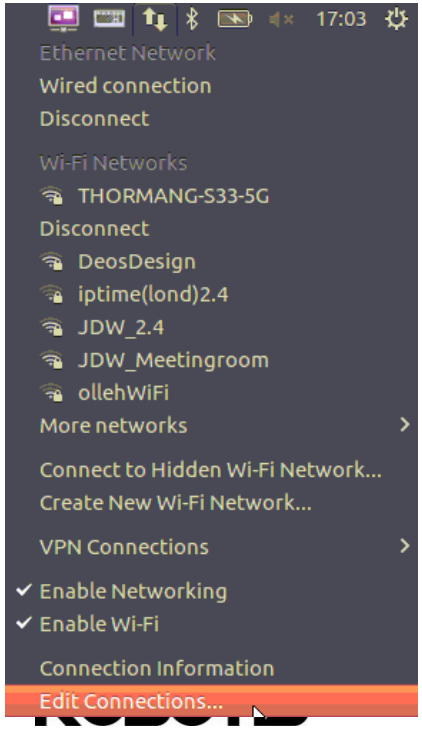
- **Overview**
  - The pc for remote control is recommended Ubuntu 16.04 LTS.
- **Installation**
  - Using USB
- **Network Setting**
  - WIKI

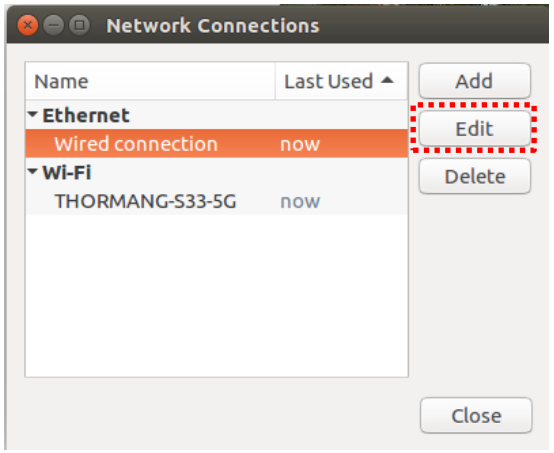


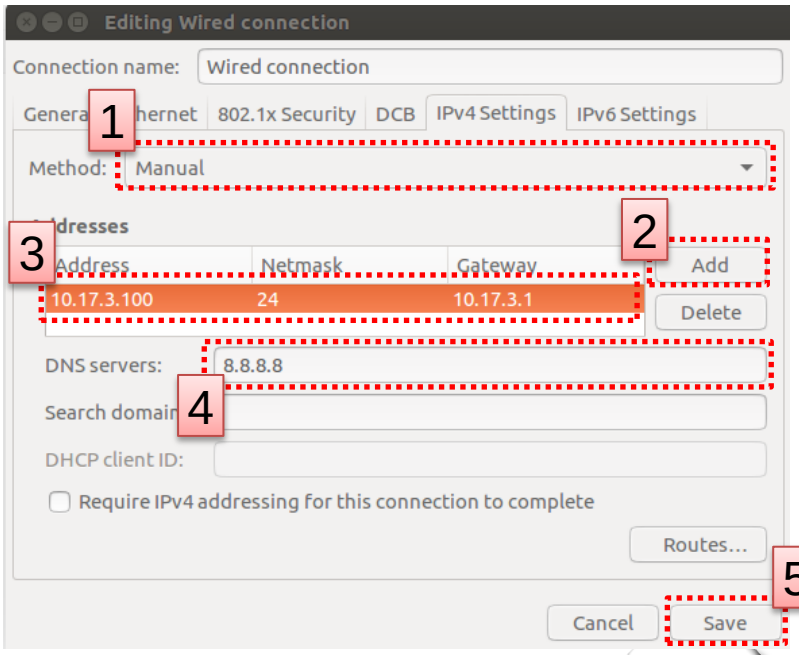
# 1. Network Setting

- **OPC Network Setting**
  - Go Network -> Edit connections
  - Select Network type and Edit
  - Set to Manual and type as following



# 2. ROS Installation & Environment Setup

- **Overview**
  - Version : kinetic

- **Installation(Desktop-Full)**
  - Setup your sources.list

```
$ sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" >
/etc/apt/sources.list.d/ros-latest.list'
```

  - Set up your keys

```
$ sudo apt-key adv --keyserver hkp://ha.pool.sks-keyservers.net --recv-key
421C365BD9FF1F717815A3895523BAEEB01FA116
```

  - Installation

```
$ sudo apt-get update
$ sudo apt-get install ros-kinetic-desktop-full
```

  - Initialize rosdep

```
$ sudo rosdep init
$ rosdep update
```

  - Getting rosinstall

```
$ sudo apt-get install python-rosinstall
```

- **Configuring Your ROS Environment**
  - Managing Your Environment
    - Check

```
$ printenv | grep ROS
```

    - Setup

```
$ source /opt/ros/kinetic/setup.bash
```

  - Create a ROS Workspace
    - Create a catkin workspace

```
$ mkdir -p ~/catkin_ws/src
$ cd ~/catkin_ws/src
$ catkin_init_workspace
```

    - Build

```
$ cd ~/catkin_ws
$ catkin_make
```

    - Setup

```
$ source ~/catkin_ws/devel/setup.bash
```

- **Environment setup for OPC**
  - Open '~/.bashrc'

```
$ gedit ~/.bashrc
```

  - Append below contents

```
# Set ROS Kinetic
source /opt/ros/kinetic/setup.bash
source ~/catkin_ws/devel/setup.bash

##### Set ROS Network ####
# PPC CORE(10.17.3.35)
export ROS_MASTER_URI=http://10.17.3.35:11311

# local ROS IP
export ROS_IP=10.17.3.100
```

    - ROS_MASTER_URI : PPC (10.17.3.35), roscore
    - ROS_IP : OPC (10.17.3.100)

  - Apply

```
$ source ~/.bashrc
```

# 3. THORMANG OPC Package

- **THORMANG OPC Package : WIKI**
- **Additional Package**
  - humanoid_navigation
    - Dependencies : map-server, nav_msgs, humanoid-nav-msgs, octomap, octomap-msgs, octomap-ros, octomap-server

```
$ sudo apt-get install ros-kinetic-map-server ros-kinetic-nav-msgs ros-kinetic-humanoid-nav-msgs ros-kinetic-octomap ros-kinetic-octomap-msgs ros-kinetic-octomap-ros ros-kinetic-octomap-server
```

    - Dependencies : sbpl

```
$ cd ~/catkin_ws/src
$ git clone https://github.com/sbpl/sbpl.git
$ cd sbpl
$ mkdir build
$ cd build
$ cmake ..
$ make
$ sudo make install
```

    - Build

```
$ cd ~/catkin_ws/src
$ git clone https://github.com/AravindaDP/humanoid_navigation.git
$ cd ~/catkin_ws
$ catkin_make
```

  - qt_ros

```
$ sudo apt-get install ros-kinetic-qt-ros
```

- **THORMANG OPC Package**
  - Download source

```
$ cd ~/catkin_ws/src
$ git clone https://github.com/ROBOTIS-GIT/ROBOTIS-Framework-msgs.git
$ git clone https://github.com/ROBOTIS-GIT/ROBOTIS-THORMANG-OPC.git
$ git clone https://github.com/ROBOTIS-GIT/ROBOTIS-THORMANG-msgs.git
$ git clone https://github.com/ROBOTIS-GIT/ROBOTIS-THORMANG-Common.git
```

  - Build

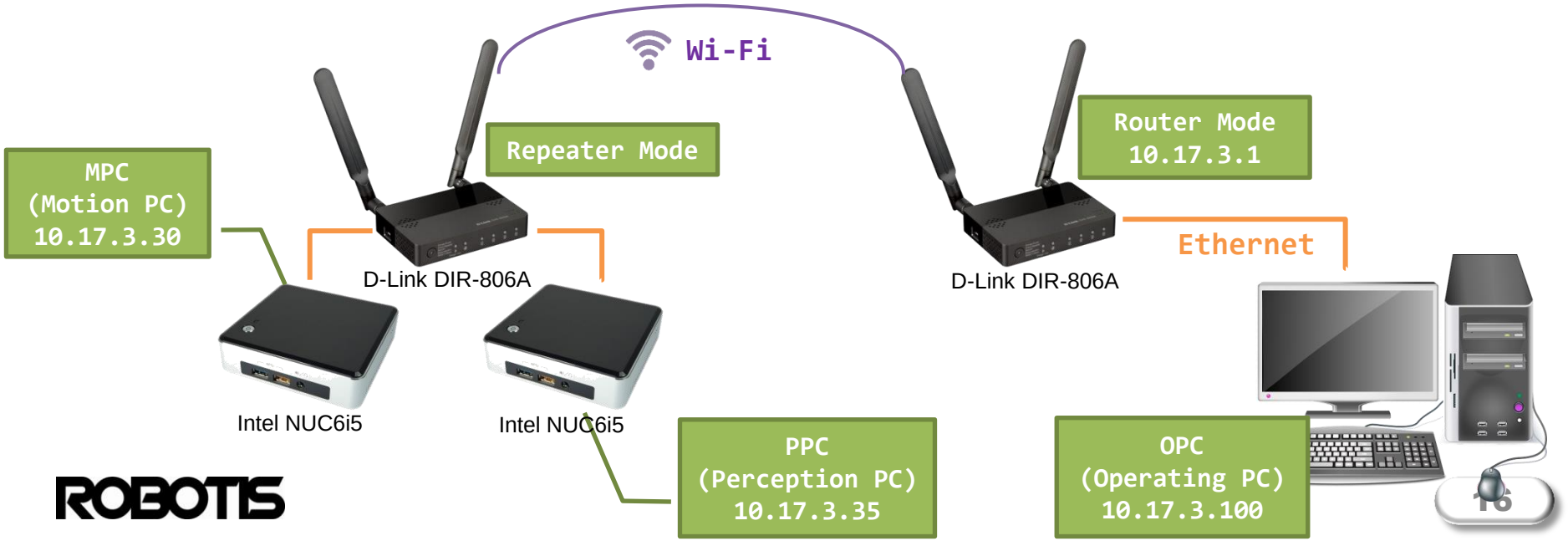
```
$ cd ~/catkin_ws
$ catkin_make
```

# 3. How to run THORMANG3

# How to connect to THORMANG3

- Connecting THORMANG3
  From your computer go to your LAN settings and set static IP to the same network (Example: 10.17.3.xxx)

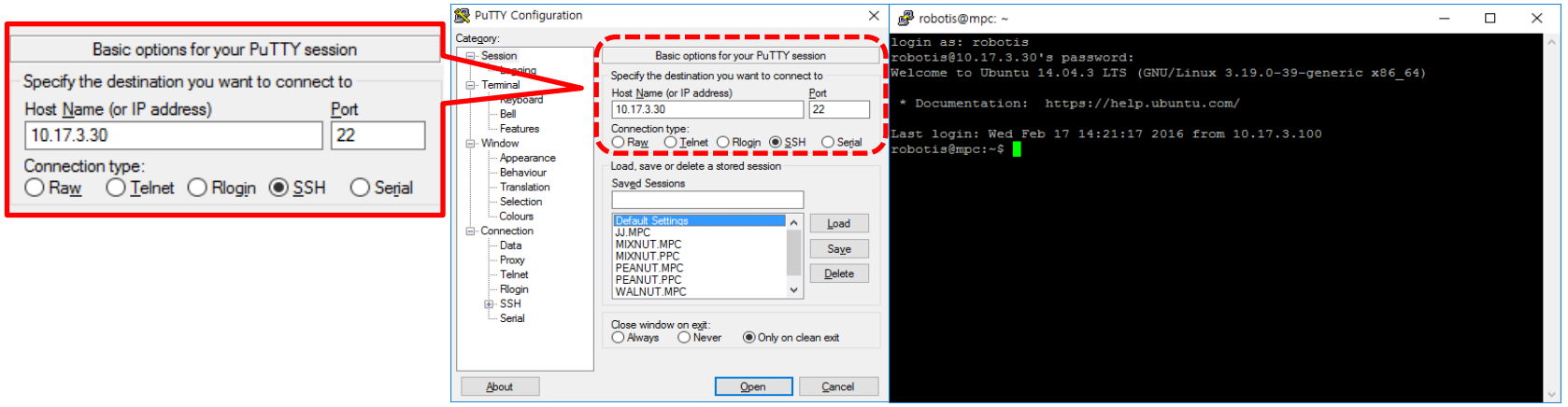
- Connection Infomation
  1) MPC (Motion PC) IP : **10.17.3.30**
  2) PPC (Perception PC) IP : **10.17.3.35**
  3) MPC & PPC user name : **robotis**
  4) MPC & PPC password : **111111**



# How to connect to THORMANG3

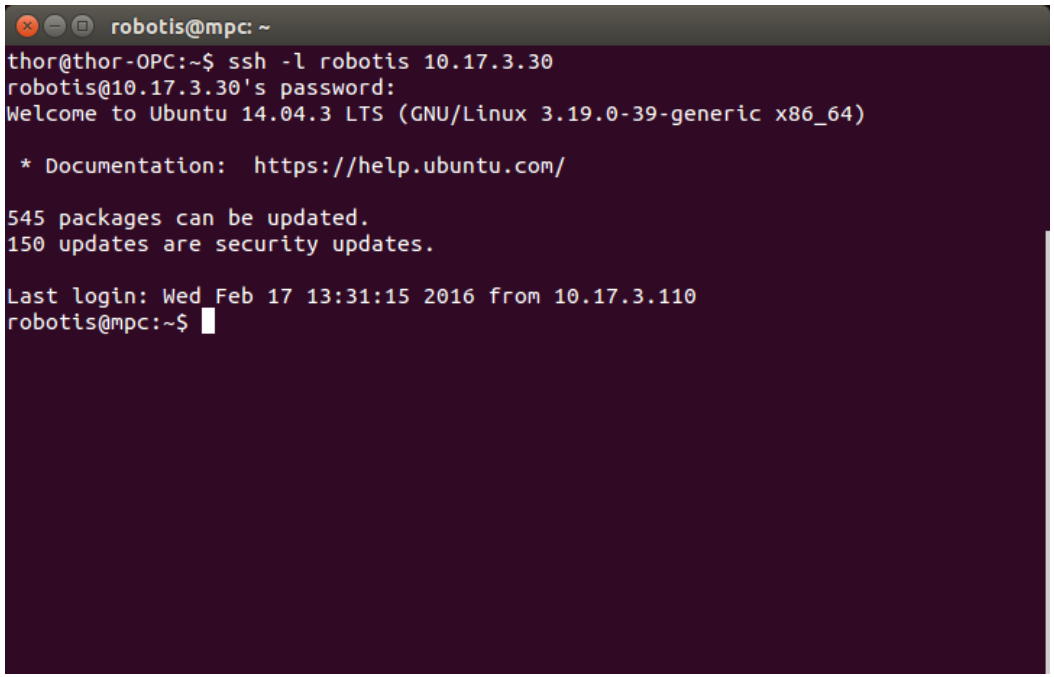
- Example with SSH Client (Windows)
  1) Execute SSH client program (ex: PuTTY)
  2) Input THORMANG 3 MPC's IP address : **10.17.3.30**
  3) Select **SSH** as a connection type and then open it.
  4) Input THORMANG 3 MPC's user name : **robotis**
  5) Input THORMANG 3 MPC's password : **111111**

  ROBOTIS recommends that users connect via SSH client.



# How to connect to THORMANG3

- Example with SSH Client (Ubuntu)
  1) Open terminal window
  2) Input SSH command with user name and MPC's IP address :
     `$ ssh robotis@10.17.3.30`
  3) Input THORMANG 3 MPC's password : **111111**

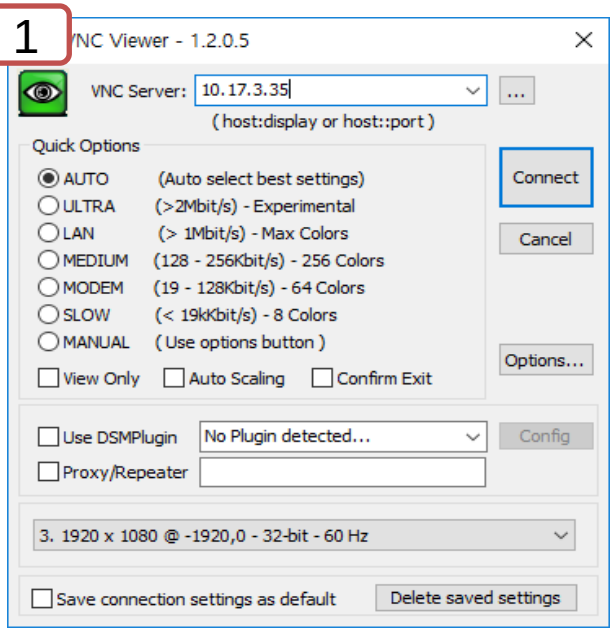


# How to connect to THORMANG3

- Example with VNC client (Windows)
  1) Execute VNC client program (ex: Ultra VNC Viewer)
  2) Input THORMANG 3 MPC's IP address : **10.17.3.30**
  3) Input THORMANG 3 MPC's password : **111111**

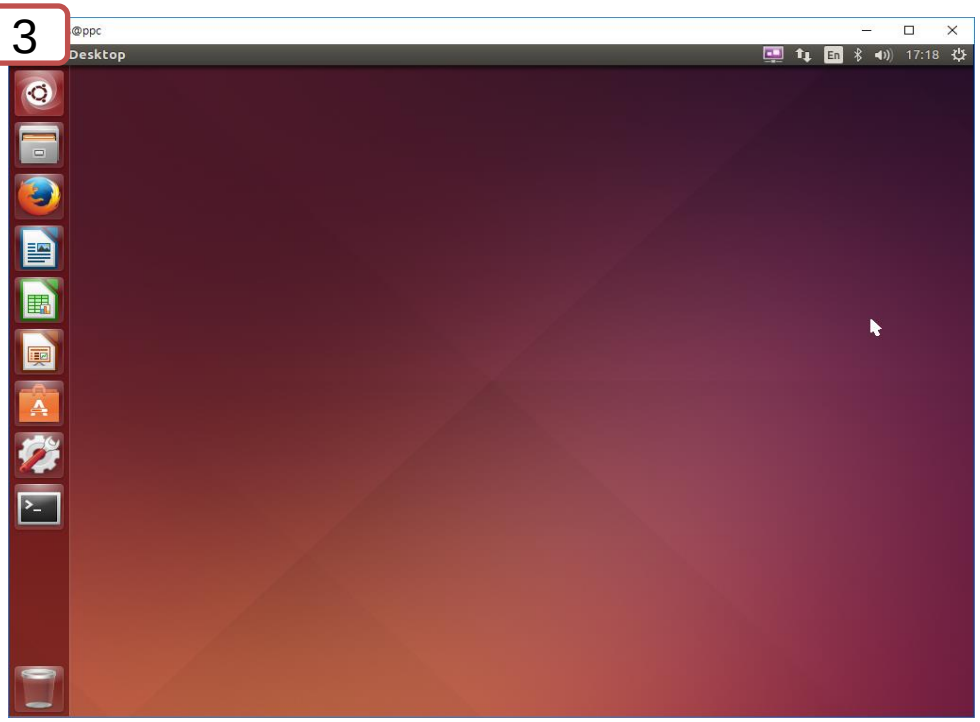
  Accessing THORMANG3 MPC via remote desktop may result in slower performance.

1




2


3



# AP Server Information

- **Account**
  - User : admin
  - PW : admin

- **Network**
  1. IP : 10.17.3.1
  2. Mode : Router
  3. Wireless
     - 5G
       SSID : THORMANG-SXX-5G
       PW : 11111111
     - 2.4G
       SSID : THORMANG-SXX
       PW : 11111111

- **Mode Description**
  - Orange : Router
  - Green : Repeater
  - Red : AP
  - RESET : 10 sec

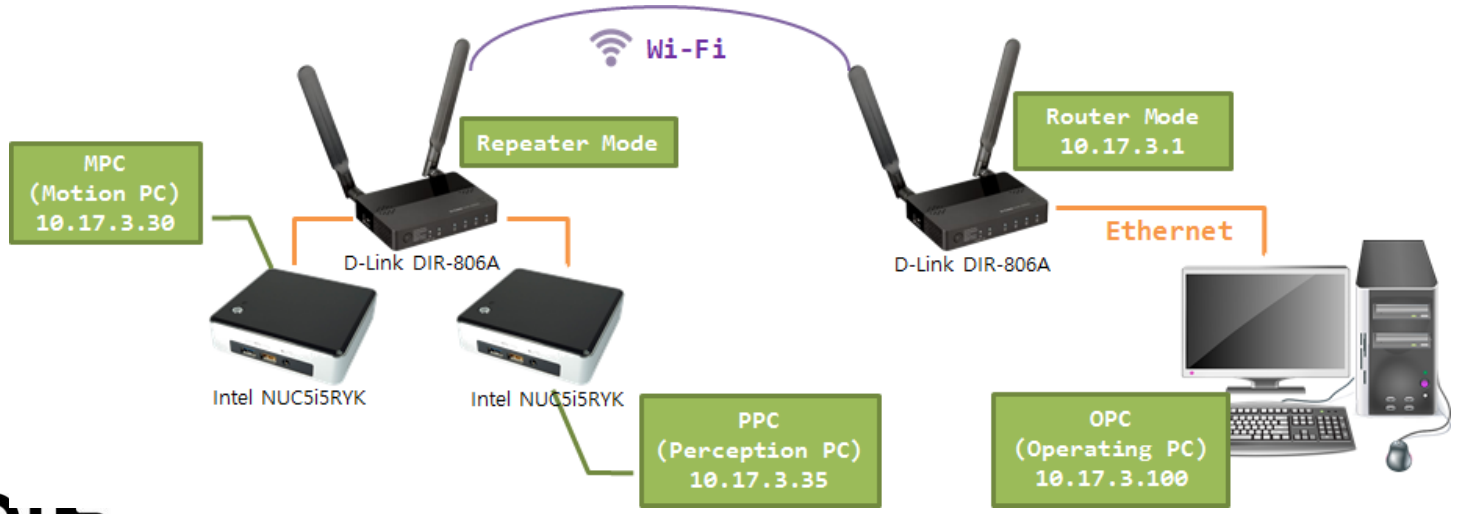
# 1. Connection to THORMANG3

- **Connect to the MPC(Motion PC)**
  - via ssh
    open terminal and type as following (*pw : 111111*)

```
$ ssh robotis@10.17.3.30
```

- **Connect to the PPC(Perception PC)**
  - via ssh
    open terminal and type as following (*pw : 111111*)

```
$ ssh robotis@10.17.3.35
```



# 2. Time Synchronization

- **Timing Issues**

- **MPC : Synchronize time with the PPC**
  - Connect to the MPC
  - Synchronize time
    - If this is the first synchronization, create the script file.
      - Create the script file

```
$ gedit ~/timesync
```

      - Type below contents

```
#! /home/robotis
sudo date --set='-2 secs'
sudo ntpdate 10.17.3.35
sudo hwclock -w
```

      - Add execute permission

```
$ sudo chomod +x ~/timesync
```

    - Run the script

```
$ ~/timesync
```

# 3. Running THORMANG3

- **WIKI**
- **Execute the programs on the PPC**
  - **roscore** (ROS_MASTER_URI)
    - Connect to the PPC
    - Launch roscore

```
$ roscore
```

  - **thormang3 sensors**
    - Connect to the PPC
    - Execute thormang3_sensors.launch file

```
$ roslaunch thormang3_sensors thormang3_sensors.launch
```

- **Execute the programs on the MPC**
  - **thormang3 manager**
    - Connect to the PPC
    - Execute thormang3_manager.launch file

```
$ roslaunch thormang3_manager thormang3_manager.launch
```

- **WIKI**
- **OPC : Synchronize time with the PPC**
  - Synchronize time
    - If this is the first synchronization, create the script file.
      - Create the script file

```
$ gedit ~/timesync
```

      - Type below contents

```
#! /home/robotis
sudo date --set='-2 secs'
sudo ntpdate 10.17.3.35
sudo hwclock -w
```

      - Add execute permission

```
$ sudo chomod +x ~/timesync
```

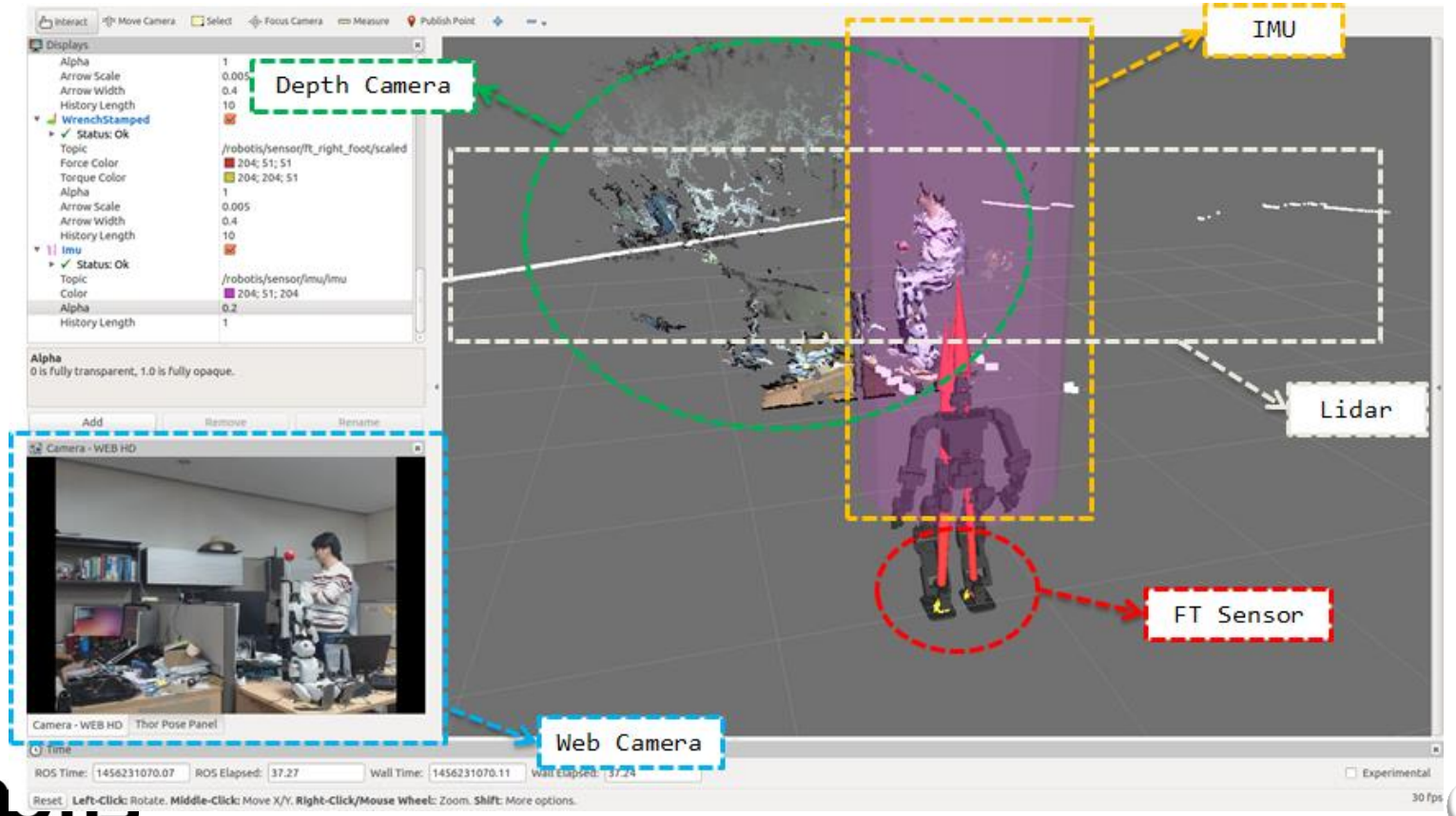
    - Execute the script

```
$ ~/timesync
```

# 4. Remote Control

- **Visualization Tool**
  - After running THORMANG3, Run Visualization Tool
    - Open a terminal and Type as following

```
$ roslaunch thormang3_description thormang3_opc.launch
```



# 4. Remote Control

- **GUI Demo**
  - After running THORMANG3, Execute thormang3_demo
    - Open a terminal and Type as following

```
$ roslaunch thormang3_demo thormang3_demo.launch
```