

How to connect and use the Turtlebots

1 Power

Turtlebots can use external power supply or their battery. Simply turning on the power switch will activate the robot.

To power off, it is advised to first shutdown the Raspberry Pi, after connecting through SSH (seen below):

```
sudo poweroff # passwd is turtle
```

2 Network setup and connection

The Turtlebots connect on `turtlebot-wifi`, the password is `turtlebot`.

We use SSH to log to the Turtlebots remotely. The hostname is `waffle#` for Turtlebot3 and `turtle#` for Turtlebot2.

The user / password is `turtle`. For example to connect on the Turtlebot3 number 2, that is:

```
ssh turtle@waffle2.local
```

You can setup SSH keys to avoid typing the password each time:

```
ssh-keygen  
ssh-copy-id turtle@waffle2.local
```

You can also create a shortcut for a given turtlebot, on your own computer:

```
mkdir -p ~/.ssh  
nano ~/.ssh/config
```

and write, for example to have `w2` shortcut for `turtle@waffle2.local`:

```
Host w2  
  HostName waffle2.local  
  Port 22  
  User turtle
```

3 Run ROS 2 remotely

The file `bringup.sh` should be run to spawn all nodes on the turtlebot.

It runs within a `screen`, behind the scene. The screen can be brought to the terminal by typing `screen -r`. This can be useful to check if everything is fine.

The screen can be hidden again by typing `Ctrl-a` then `d`.

In order to use several turtles on the same WiFi, Turtlebots rely on a `ROS_DOMAIN_ID`:

- `2#` for Turtlebot2

- 3# for Turtlebot3

For example, Turtlebot3 number 2 uses `ROS_DOMAIN_ID=32`.

On your computer, you should use `ros_management_tools` and call `ros_turtle 32` to use the same `ROS_DOMAIN_ID` (adapt to your robot). Give it a try with:

```
ros_turtle 32
ros2 topic list
```

You should see the topics from Waffle2, that are all in the namespace `/waffle2/`.

4 Main topics

Turtlebots simply follow the topic `cmd_vel` in their namespace. They publish many topics:

- `odom`: the odometry
- `scan`: laser scans
- `imu`: the IMU

Similarly to topics, all frames are prefixed with the name of the robot. Turtlebot3 number 2 has all its frames begin with `waffle2/`.

Turtlebot3 can also move by using the remote control.

5 Recording a bag file

It is advised to record bag files directly on the robot. For classical bags to be used in SLAM, the script `record4slam.sh` is available and expects a room name:

```
./record4slam.sh lab_room # will record topics in "lab_room" folder
```

Bags can be transferred back to your computer with `scp`:

```
scp -r turtle@waffle2.local:lab_room .
```

the `lab_room` folder is now on your hard drive.