LEAPFROG Simulation Setup Guide

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<th>LEAPFROG Simulation Setup</th>
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</tr>
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This is not a comprehensive guide explaining what all the tools are and why we use them, rather this is simply a guide on how to install the essential programs and tools to get the PX4 SITL working in the Gazebo simulation environment. For a detailed explanation of all of the tools we use, see this guide.

Installation

System Requirements

Ubuntu 20.04 (Focal) / Mint 20.1 (Ulyssa)

- This requirement is loosely based off any Ubuntu 20 based systems.

Notes

- This guide provides instructions on how to install the necessary tools on Ubuntu 20.0.4. Other systems will likely need other installation methods, but the necessary packages/tools should be the same.
- The tools that we use (PX4, Gazebo, ROS) can all be installed and used on MacOS, Windows, and other Linux distributions; however, we have not explicitly tested on those systems.
- Ubuntu 20.04 desktop ISO can be downloaded here: https://ubuntu.com/download/desktop
- For teams unable to set up a Linux system, using a VM is recommended. VMware has been tested and been confirmed to work with all of our tools. https://www.vmware.com/

System packages

The following packages are essential to download and build the tools necessary for the PX4

```
sudo apt-get install git g++ cmake curl make python3-pip
```
Gazebo
Since we are using Ubuntu 20.04, Gazebo 11 is used. The following installation script is straight from the Gazebo documentation and can be used to install the latest version of Gazebo (Gazebo 11).

```
curl -sSL http://get.gazebosim.org | sh
```

Notes
❖ Detailed instructions on how to install Gazebo on Ubuntu/Debian based systems can be found here: [http://gazebosim.org/tutorials?tut=install_ubuntu&cat=install](http://gazebosim.org/tutorials?tut=install_ubuntu&cat=install)

ROS
Since we are using Ubuntu 20.04, ROS Noetic is used. The following instructions are taken directly from the ROS wiki: [http://wiki.ros.org/noetic/Installation/Ubuntu](http://wiki.ros.org/noetic/Installation/Ubuntu)

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://keyserver.ubuntu.com:80' --recv-key C1CF6E31E6BADE8868B172B4F42ED6FBAB17C654
```

Installation

```
sudo apt update
sudo apt install ros-noetic-desktop-full
```

Environment Setup
This step is not required, but is recommended so that the setup script is automatically sourced every time a new shell is required.

```
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
```

Dependencies for building packages

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-wstool python3-catkin-tools python3-osrf-pycommon build-essential
```
Mavros

```
sudo apt install ros-noetic-mavros
```

PX4

Python Packages

The following python packages are necessary to build and run the PX4 SITL

```
pip3 install toml numpy pyros-genmsg packaging jinja2
```

PX4/SITL

PX4 should be used as a drop-in ROS package in a ROS workspace

```
# create ROS workspace
mkdir -p catkin_ws/src && cd catkin_ws
# clone PX4 source code into ROS workspace src directory
git clone https://github.com/SERC-LEAPFROG/LEAPFROG-Firmware --recursive
src/LEAPFROG-PX4-Firmware
# link sitl_gazebo folder to be right under src directory
git clone https://github.com/SERC-LEAPFROG/LEAPFROG-Simulation -recursive
src/sitl_gazebo
```

Usage

Build

```
# while in catkin_ws
catkin config --extend /opt/rosexetic  # only needed on very first setup
catkin build
source devel/setup.bash
```

Run

```
roslaunch px4 mavros_posix_sitl.launch vehicle:="lander"
```