1.cartorgrapher介绍

无需过多介绍，大名鼎鼎google开源的slam算法

2.硬件需求

先贴段官方的

```
64-bit, modern CPU (e.g. 3rd generation i7)
16 GB RAM
Ubuntu 14.04 (Trusty) and 16.04 (Xenial)
gcc version 4.8.4 and 5.4.0
```

当然越高端越好无论CPU和内存，经测试树莓派是没法玩了，测试了2款RK3399(Ubuntu16)设备可以跑起来

3.环境准备与编译

3.1安装依赖包

```
sudo apt-get install -y google-mock libboost-all-dev  libeigen3-dev libgflags-dev
libgoogle-glog-dev liblua5.2-dev libprotobuf-dev  libsuitesparse-dev libwebp-dev
ninja-build protobuf-compiler python-sphinx  ros-kinetic-tf2-eigen libatlas-base-
dev libsuitesparse-dev liblapack-dev ros-kinetic-eigen-conversions
```

3.2编译

- 编译ceres-solver

```
cd pibot_ros
tar jxvf cartographer.tar.bz2
cd ~/pibot_ros/cartographer/ceres-solver-1.11.0/build
cmake ..
make –j4  # 这里如果出错（见下图），可以多次执行
sudo make install
```

- 继续cartographer

```
cd ~/pibot_ros/cartographer/cartographer/build
cmake .. -G Ninja
ninja
ninja test
sudo ninja install
```

- 编译cartorgrapher ros 包

```
cd ~/pibot_ros/cartographer/cartographer_ros
catkin_make
```

4.测试cartographer

cartograper不依赖里程计，所以不需要发出odom tf,这里我们启动robot_without_odom.launch

```
roslaunch pibot_bringup robot_without_odom.launch
```
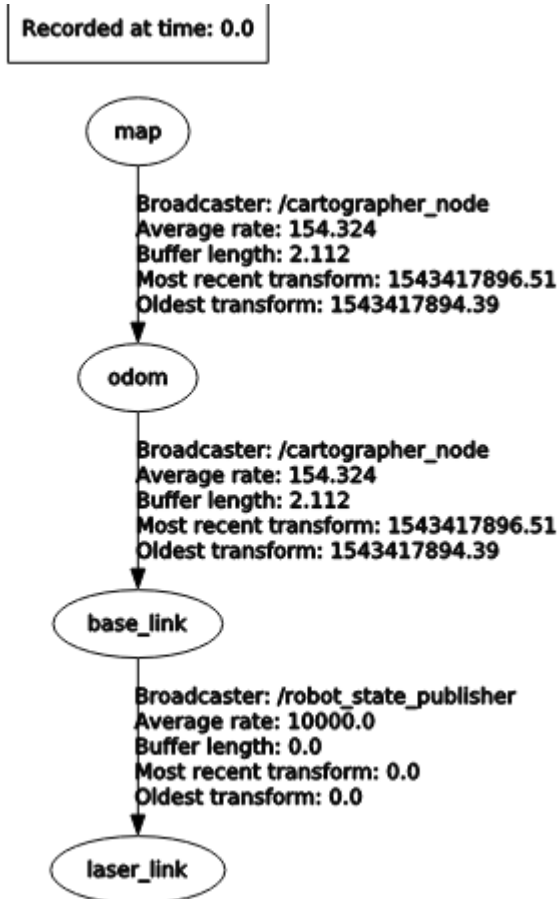
> 这里包括了启动雷达

另外一个终端

```
source ~/pibot_ros/cartographer/cartographer_ros/devel/setup.bash
roslaunch pibot_navigation cartographer.launch
```

另外一个终端，通过控制小车就可以cartographer建图了
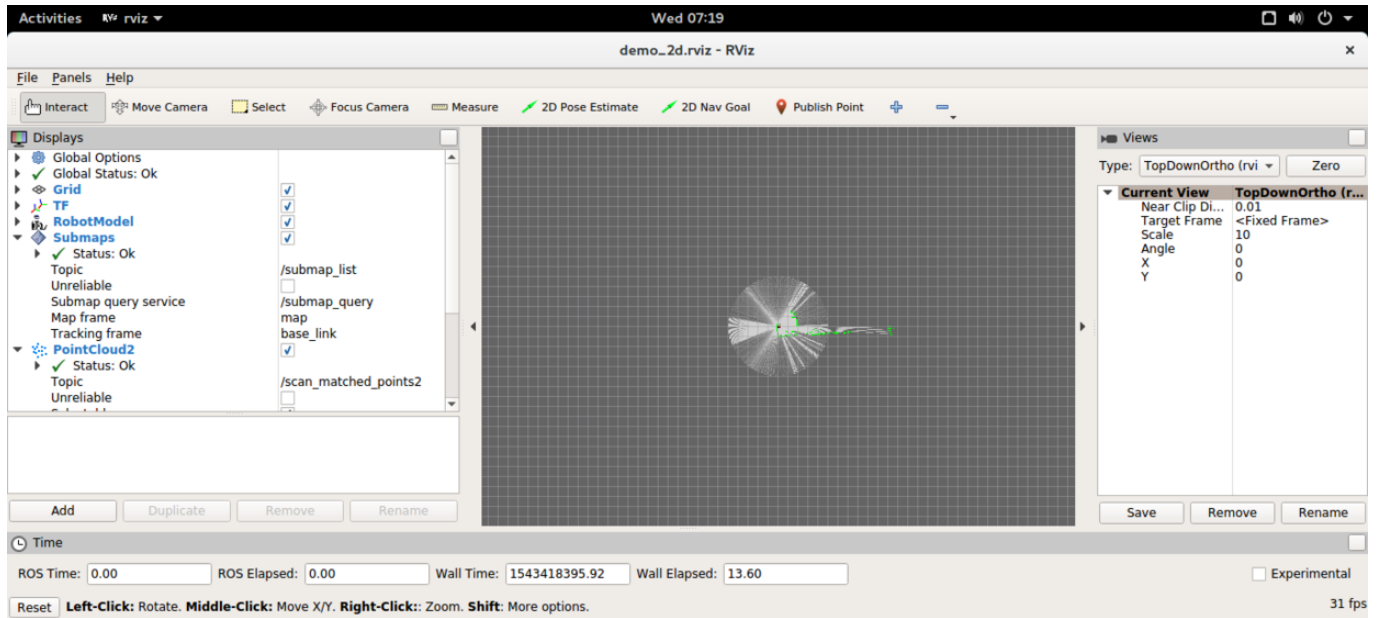
```
roslaunch pibot keyboard.launch
```

我们先看下`tf tree`,虚拟机中`rosrun rqt_tf_tree rqt_tf_tree`可以看到一幅支持的`tf tree`了

Recorded at time: 0.0

map

Broadcaster: /cartographer_node
Average rate: 154.324
Buffer length: 2.112
Most recent transform: 1543417896.51
Oldest transform: 1543417894.39

odom

Broadcaster: /cartographer_node
Average rate: 154.324
Buffer length: 2.112
Most recent transform: 1543417896.51
Oldest transform: 1543417894.39

base_link

Broadcaster: /robot_state_publisher
Average rate: 10000.0
Buffer length: 0.0
Most recent transform: 0.0
Oldest transform: 0.0

laser_link

5.查看建图

可是说好的建图的，图呢，没图说个jb.jpg,同样我们在`rviz`显示建图结果

```
roslaunch pibot_navigation view_cartographer.launch
```

6.疑问

对于**4.测试cartographer**中 有的同学要问为什么不把这个2个写到一个`launch`,这个问题问的好，博主试着写到一起，启动不正常， 还不知道具体原因，有兴趣的可以一起探讨

附上之前的launch文件

```
<launch>
  <include file="$(find pibot_bringup)/launch/robot_without_odom.launch"/>
  <include file="$(find cartographer_ros)/launch/lidar_2d.launch"/>
</launch>
```