ROS packages and nodes

Robot Operating System (ROS), which is a collection of software packages to aid researchers and developers using robotic systems.

ROS is sometimes called a Meta operating system because it performs many functions of an operating system, but it requires a computer's operating system such as Linux. One of its main purposes is to provide communication between the user, the computer's operating system, and equipment external to the computer. This equipment can include sensors, cameras, as well as robots. As with any operating system, the benefit of ROS is the hardware abstraction and its ability to control a robot without the user having to know all of the details of the robot.

For example, to move a robot's arms, a ROS command is issued or scripts in Python or C++ written by the robot designers cause the robot to respond as commanded. The scripts can, in turn, call various control programs that cause the actual motion of the robot's arms. It is also possible to design and simulate your own robot using ROS.

Creating a catkin workspace

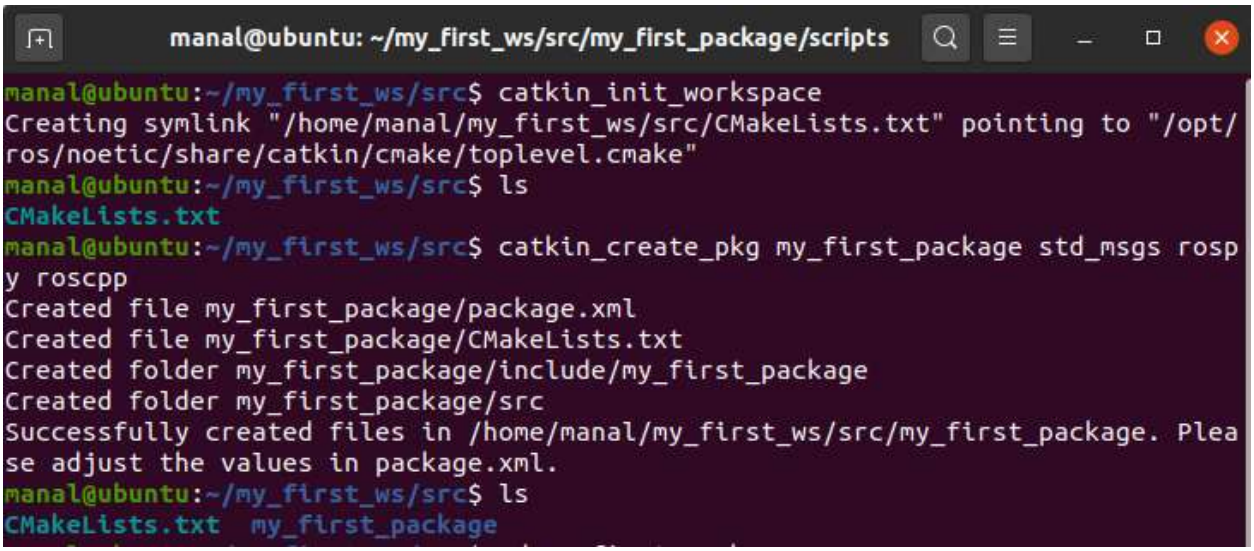
The next step is to create a catkin workspace. A catkin workspace is a directory (folder) in which you can create or modify existing catkin packages. The catkin structure simplifies the build and installation process for your ROS packages. The ROS wiki website is http://wiki.ros.org/catkin/Tutorials/create_a_workspace.

A catkin workspace can contain up to three or more different subdirectories (`/build`, `/devel`, and `/src`), each of which serve a different role in the software development process.

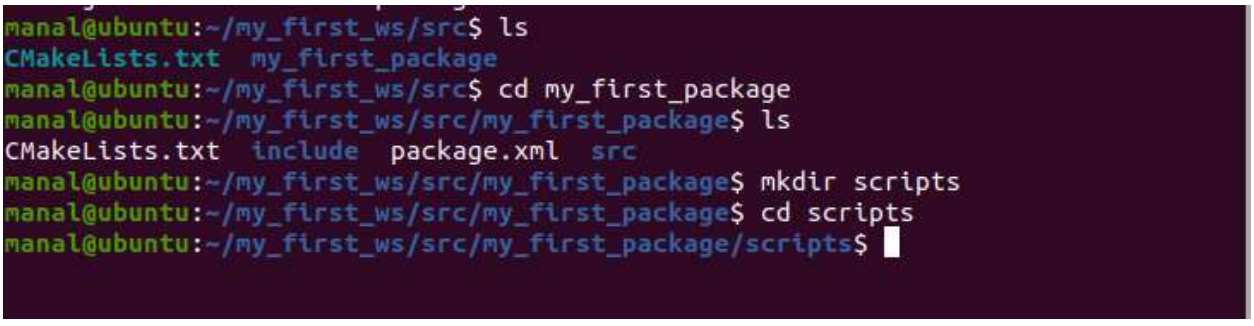
We will label our catkin workspace `catkin_ws`. To create the catkin workspace, type the following commands:

Creating and initialize catkin workspace

```
mkdir -p ~/file_name/src
mkdir -p/my_firs_ws/src
cd my_firs_ws
cd src
```

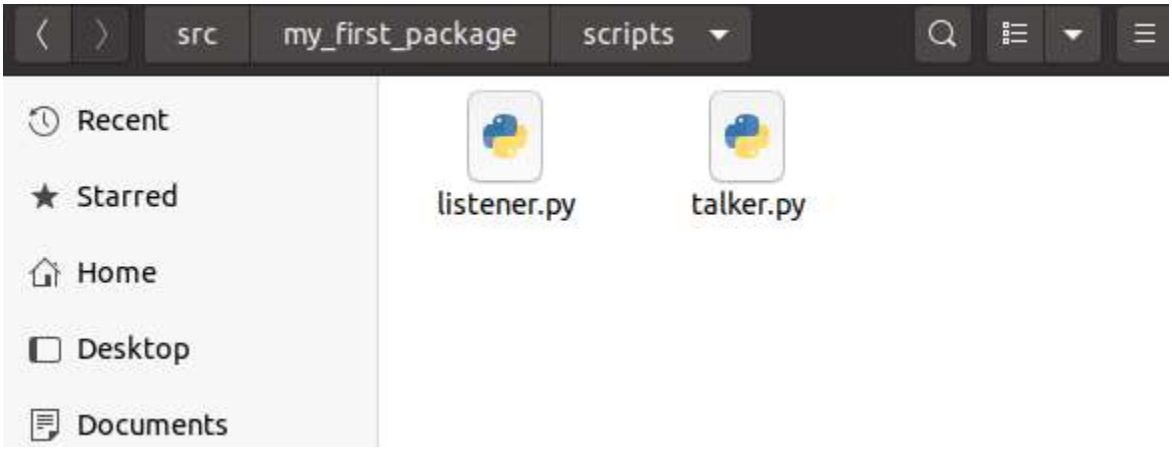


Create new package and scripts folder



Then create listener.py and talker.py files

```
manal@ubuntu: ~/my_first_ws
manal@ubuntu:~/my_first_ws/src/my_first_package$ mkdir scripts
manal@ubuntu:~/my_first_ws/src/my_first_package$ cd scripts
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ touch listener
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ touch listener.py
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ touch talker.py
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ ls
listener.py  talker.py
```



Write the talker.py node

listener.py
~/my_first_ws/src/my_first_package/scripts

```python
#!/usr/bin/env python
import rospy
from std_msgs.msg import String

def callback(data):
    rospy.loginfo(rospy.get_caller_id() + "I heard %s", data.data)

def listener():

    # In ROS, nodes are uniquely named. If two nodes with the same
    # name are launched, the previous one is kicked off. The
    # anonymous=True flag means that rospy will choose a unique
    # name for our 'listener' node so that multiple listeners can
    # run simultaneously.
    rospy.init_node('listener', anonymous=True)

    rospy.Subscriber("chatter", String, callback)

    # spin() simply keeps python from exiting until this node is stopped
    rospy.spin()

if __name__ == '__main__':
    listener()
```

Write the listener.py node

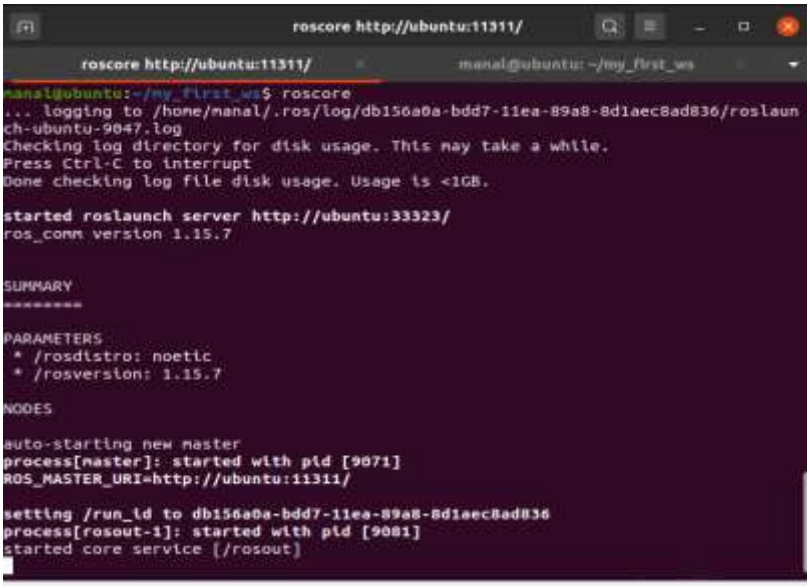
Open talker.py
~/my_first_ws/src/my_first_package/scripts

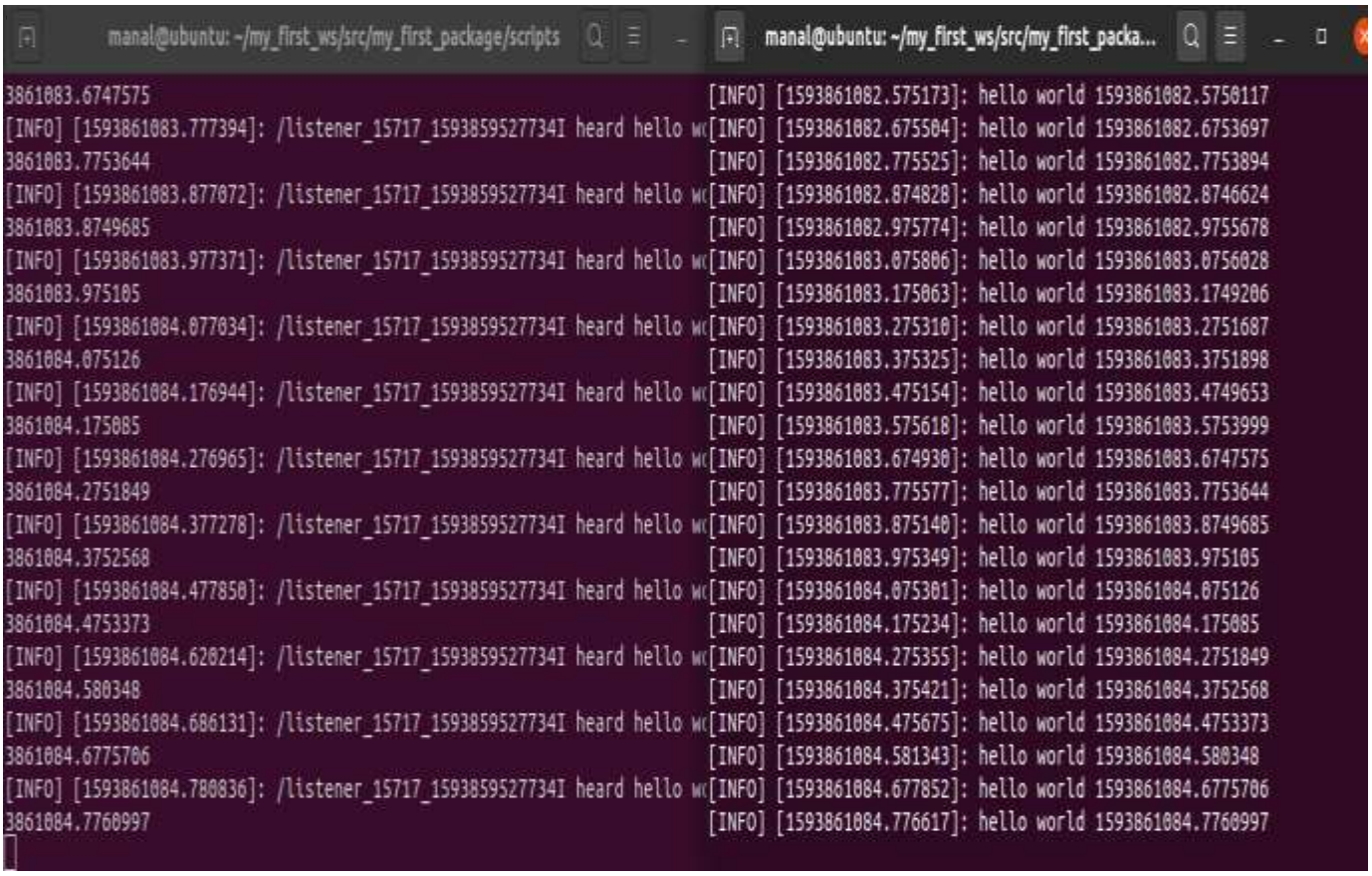
```
#!/usr/bin/env python
# license removed for brevity
import rospy
from std_msgs.msg import String

def talker():
    pub = rospy.Publisher('chatter', String, queue_size=10)
    rospy.init_node('talker', anonymous=True)
    rate = rospy.Rate(10) # 10hz
    while not rospy.is_shutdown():
        hello_str = "hello world %s" % rospy.get_time()
        rospy.loginfo(hello_str)
        pub.publish(hello_str)
        rate.sleep()

if __name__ == '__main__':
    try:
        talker()
    except rospy.ROSInterruptException:
        pass
```

Make **listener.py and talker.py** file executable

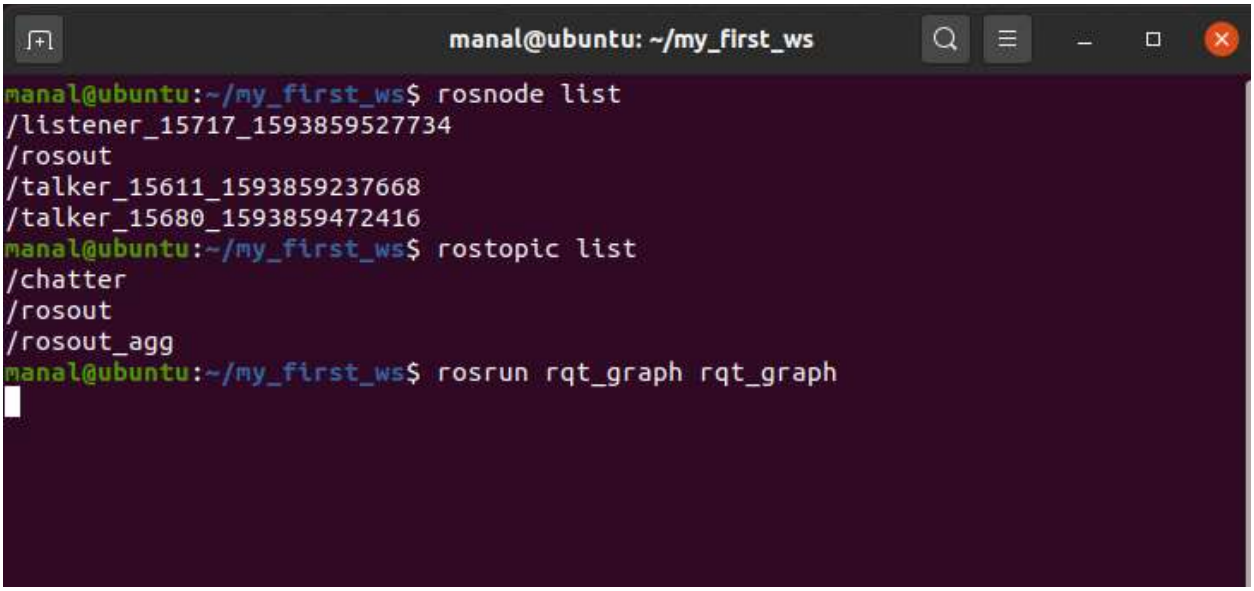
```
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ chmod +x listener.py
manal@ubuntu:~/my_first_ws/src/my_first_package/scripts$ chmod +x talker.py
```

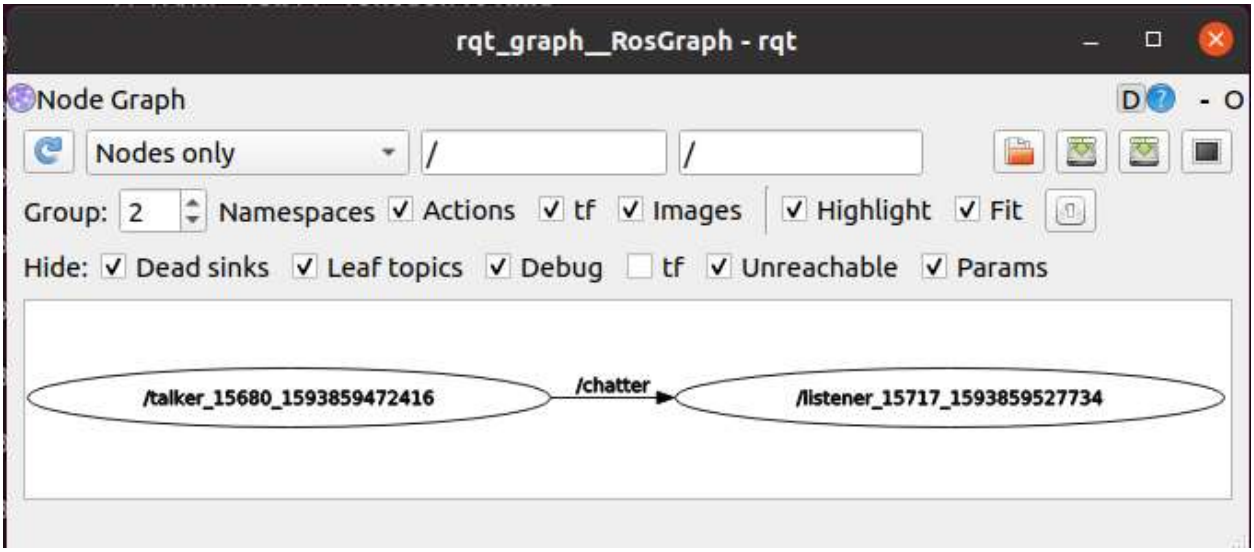
Run the subscriber publisher




manal@ubuntu: ~/my_first_ws/src/my_first_package/scripts
manal@ubuntu: ~/my_first_ws/src/my_first_packa...
3861083.6747575
[INFO] [1593861083.777394]: /listener_15717_1593859527734I heard hello w
3861083.7753644
[INFO] [1593861083.877072]: /listener_15717_1593859527734I heard hello w
3861083.8749685
[INFO] [1593861083.977371]: /listener_15717_1593859527734I heard hello w
3861083.975105
[INFO] [1593861084.077034]: /listener_15717_1593859527734I heard hello w
3861084.075126
[INFO] [1593861084.176944]: /listener_15717_1593859527734I heard hello w
3861084.175085
[INFO] [1593861084.276965]: /listener_15717_1593859527734I heard hello w
3861084.2751849
[INFO] [1593861084.377278]: /listener_15717_1593859527734I heard hello w
3861084.3752568
[INFO] [1593861084.477850]: /listener_15717_1593859527734I heard hello w
3861084.4753373
[INFO] [1593861084.628214]: /listener_15717_1593859527734I heard hello w
3861084.580348
[INFO] [1593861084.686131]: /listener_15717_1593859527734I heard hello w
3861084.6775706
[INFO] [1593861084.780836]: /listener_15717_1593859527734I heard hello w
3861084.7760997
[INFO] [1593861082.575173]: hello world 1593861082.5750117
[INFO] [1593861082.675504]: hello world 1593861082.6753697
[INFO] [1593861082.775525]: hello world 1593861082.7753894
[INFO] [1593861082.874828]: hello world 1593861082.8746624
[INFO] [1593861082.975774]: hello world 1593861082.9755678
[INFO] [1593861083.075806]: hello world 1593861083.0756028
[INFO] [1593861083.175063]: hello world 1593861083.1749206
[INFO] [1593861083.275310]: hello world 1593861083.2751687
[INFO] [1593861083.375325]: hello world 1593861083.3751898
[INFO] [1593861083.475154]: hello world 1593861083.4749653
[INFO] [1593861083.575618]: hello world 1593861083.5753999
[INFO] [1593861083.674930]: hello world 1593861083.6747575
[INFO] [1593861083.775577]: hello world 1593861083.7753644
[INFO] [1593861083.875140]: hello world 1593861083.8749685
[INFO] [1593861083.975349]: hello world 1593861083.975105
[INFO] [1593861084.075301]: hello world 1593861084.075126
[INFO] [1593861084.175234]: hello world 1593861084.175085
[INFO] [1593861084.275355]: hello world 1593861084.2751849
[INFO] [1593861084.375421]: hello world 1593861084.3752568
[INFO] [1593861084.475675]: hello world 1593861084.4753373
[INFO] [1593861084.581343]: hello world 1593861084.580348
[INFO] [1593861084.677852]: hello world 1593861084.6775706
[INFO] [1593861084.776617]: hello world 1593861084.7760997

Graphical view between the subscriber and publisher





Manal Alsuwat