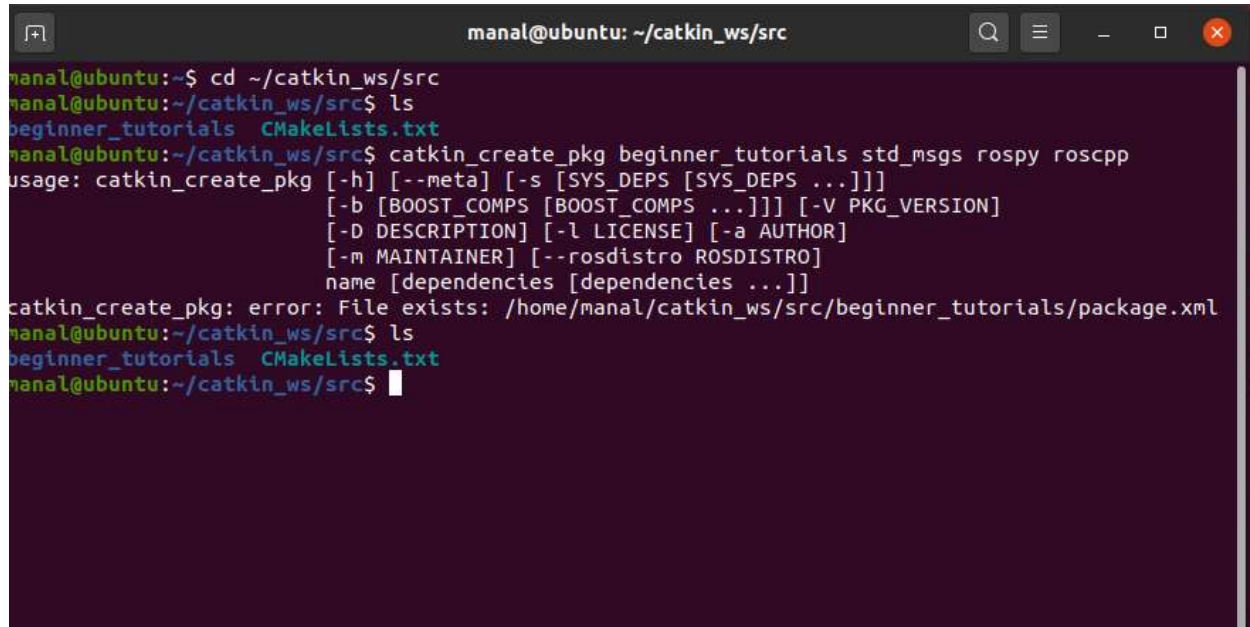


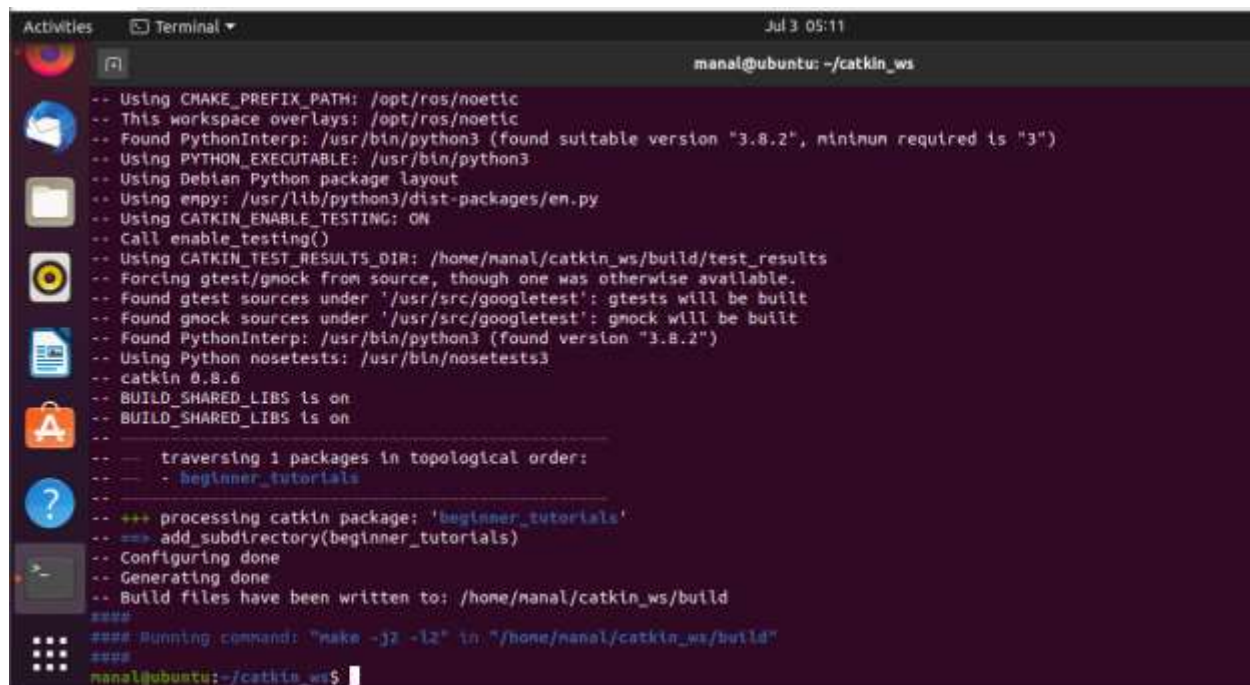
ROS packages and nodes

Creating a catkin Package

A terminal window titled 'manal@ubuntu: ~/catkin_ws/src' showing the process of creating a catkin package. The user runs 'cd ~/catkin_ws/src' and 'ls', showing 'beginner_tutorials' and 'CMakeLists.txt'. Then they run 'catkin_create_pkg beginner_tutorials std_msgs rospy roscpp', which shows usage information. Finally, they run 'catkin_create_pkg error: File exists: /home/manal/catkin_ws/src/beginner_tutorials/package.xml', indicating the package already exists.

```
manal@ubuntu:~$ cd ~/catkin_ws/src
manal@ubuntu:~/catkin_ws/src$ ls
beginner_tutorials  CMakeLists.txt
manal@ubuntu:~/catkin_ws/src$ catkin_create_pkg beginner_tutorials std_msgs rospy roscpp
usage: catkin_create_pkg [-h] [--meta] [-s [SYS_DEPS [SYS_DEPS ...]]]
                        [-b [BOOST_COMPS [BOOST_COMPS ...]]] [-V PKG_VERSION]
                        [-D DESCRIPTION] [-l LICENSE] [-a AUTHOR]
                        [-m MAINTAINER] [--rosdistro ROSDISTRO]
                        name [dependencies [dependencies ...]]
catkin_create_pkg: error: File exists: /home/manal/catkin_ws/src/beginner_tutorials/package.xml
manal@ubuntu:~/catkin_ws/src$ ls
beginner_tutorials  CMakeLists.txt
manal@ubuntu:~/catkin_ws/src$
```

Building a catkin workspace and sourcing the setup file

A terminal window titled 'manal@ubuntu: ~/catkin_ws' showing the output of 'catkin build'. It lists various system paths and configurations, then shows the process of building the 'beginner_tutorials' package. The output includes messages about finding PythonInterp, gtest, and gmock, and finally, the build files being written to the build directory.

```
Activities Terminal Jul 3 05:11
manal@ubuntu: ~/catkin_ws
-- Using CMAKE_PREFIX_PATH: /opt/ros/noetic
-- This workspace overlays: /opt/ros/noetic
-- Found PythonInterp: /usr/bin/python3 (found suitable version "3.8.2", minimum required is "3")
-- Using PYTHON_EXECUTABLE: /usr/bin/python3
-- Using Debian Python package layout
-- Using empy: /usr/lib/python3/dist-packages/empy
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/manal/catkin_ws/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gmock': gmock will be built
-- Found PythonInterp: /usr/bin/python3 (found version "3.8.2")
-- Using Python nosetests: /usr/bin/nosetests3
-- catkin 0.8.6
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- 
-- traversing 1 packages in topological order:
--   - beginner_tutorials
-- 
-- *** processing catkin package: 'beginner_tutorials'
-- ==> add_subdirectory(beginner_tutorials)
-- Configuring done
-- Generating done
-- Build files have been written to: /home/manal/catkin_ws/build
====
==== Running command: "make -j2 -l2" in "/home/manal/catkin_ws/build"
====
manal@ubuntu:~/catkin_ws$
```

Customizing the package.xml

```
manal@ubuntu: ~/catkin_ws/src/beginner_tutorials
manal@ubuntu:~/catkin_ws/src/beginner_tutorials$ roscd beginner_tutorials/
manal@ubuntu:~/catkin_ws/src/beginner_tutorials$ ls
CMakeLists.txt  include  package.xml  src
manal@ubuntu:~/catkin_ws/src/beginner_tutorials$ cat package.xml
<?xml version="1.0"?>
<package format="2">
  <name>beginner_tutorials</name>
  <version>0.0.0</version>
  <description>Inverse Robotics pvt the beginner_tutorials Guide</description>

  <!-- One maintainer tag required, multiple allowed, one person per tag -->
  <!-- Example: -->
  <!-- <maintainer email="jane.doe@example.com">Jane Doe</maintainer> -->
  <maintainer email="manal@todo.todo">manal</maintainer>

  <!-- One license tag required, multiple allowed, one license per tag -->
  <!-- Commonly used license strings: -->
  <!--   BSD, MIT, Boost Software License, GPLv2, GPLv3, LGPLv2.1, LGPLv3 -->
  <license>BSD</license>

  <!-- Url tags are optional, but multiple are allowed, one per tag -->
```

```
manal@ubuntu: ~/catkin_ws/src/beginner_tutorials
GNU nano 4.8 package.xml
<?xml version="1.0"?>
<package format="2">
  <name>beginner_tutorials</name>
  <version>0.0.0</version>
  <description>Inverse Robotics pvt the beginner_tutorials Guide</description>

  <!-- One maintainer tag required, multiple allowed, one person per tag -->
  <!-- Example: -->
  <!-- <maintainer email="jane.doe@example.com">Jane Doe</maintainer> -->
  <maintainer email="manal@todo.todo">manal</maintainer>

  <!-- One license tag required, multiple allowed, one license per tag -->
  <!-- Commonly used license strings: -->
  <!--   BSD, MIT, Boost Software License, GPLv2, GPLv3, LGPLv2.1, LGPLv3 -->
  <license>BSD</license>

  <!-- Url tags are optional, but multiple are allowed, one per tag -->
  <!-- Optional attribute type can be: website, bugtracker, or repository -->
  <!-- Example: -->
  <!-- <url type="website">http://wiki.ros.org/beginner_tutorials</url> -->
```

^G Get Help	^O Write Out	^W Where Is	^K Cut Text	^J Justify	^C Cur Pos
^X Exit	^R Read File	^_ Replace	^U Paste Text	^T To Spell	^_ Go To Line

Building Your Package

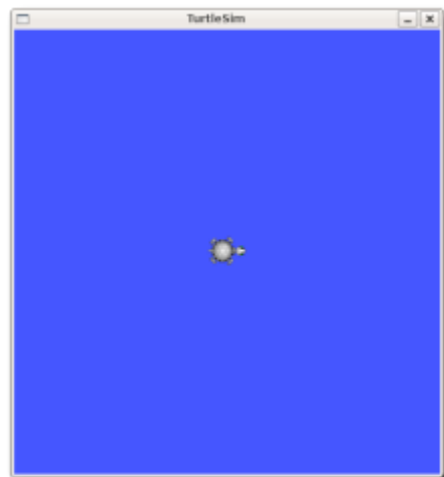
```
manal@ubuntu: ~/catkin_ws
manal@ubuntu:~$ $ cd ~/catkin_ws/
$: command not found
manal@ubuntu:~$ cd ~/catkin_ws/
manal@ubuntu:~/catkin_ws$ ls src
beginner_tutorials  CMakeLists.txt
manal@ubuntu:~/catkin_ws$ ls
build  devel  src
manal@ubuntu:~/catkin_ws$
```

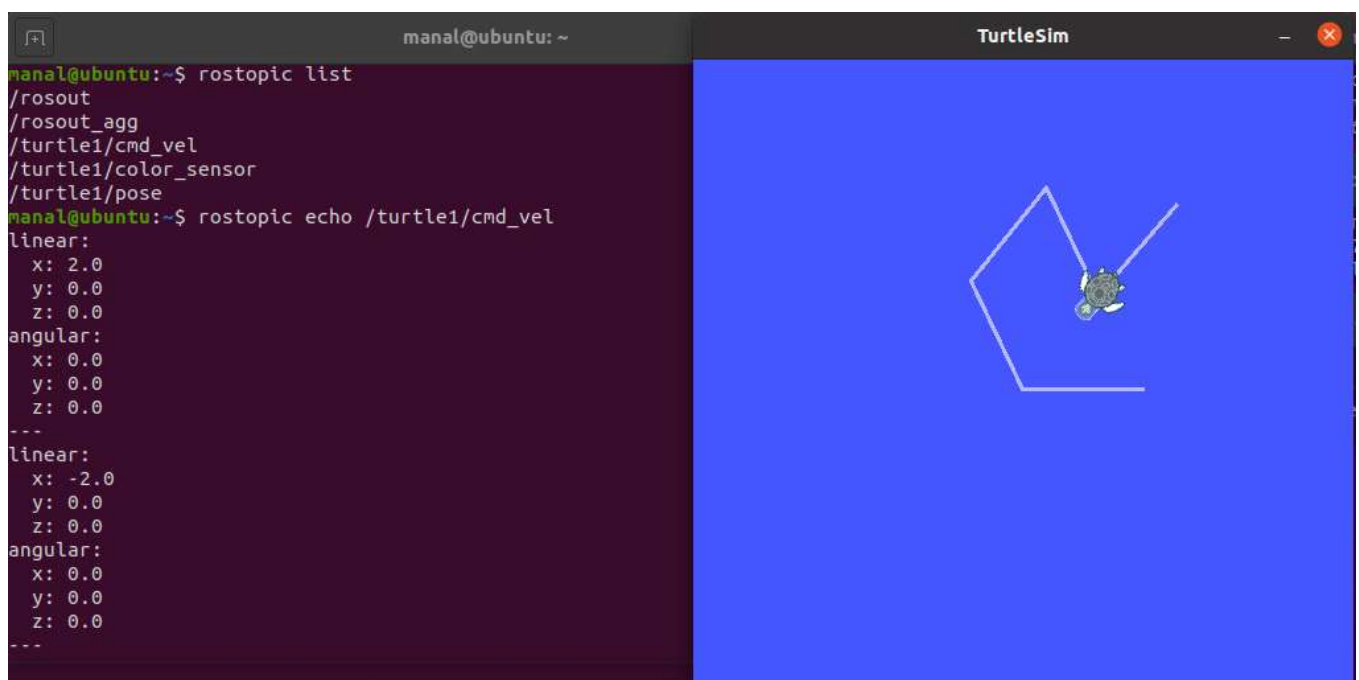
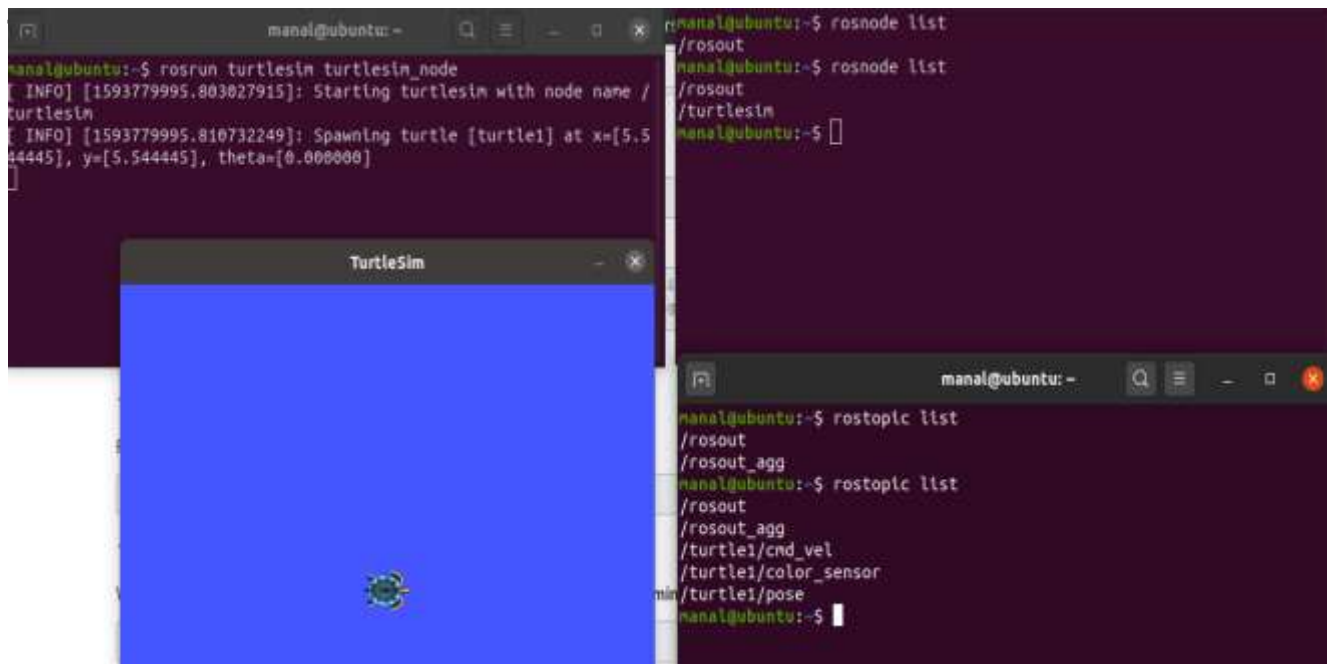
roscore

`roscd` displays information about the ROS nodes that are currently running

`roslaunch turtlesim turtlesim_node`: provides a simple simulator for teaching ROS concepts.

`roslaunch turtlesim turtle_teleop_key`: use the arrow keys of the keyboard to drive the turtle around






```
manal@ubuntu:~$ rosrn rqt_graph rqt_graph
```

rqt_graph creates a dynamic graph of what's going on in the system. rqt_graph is part of the rqt package.



```
manal@ubuntu: ~  
manal@ubuntu:~$ rosnod list  
/rosout  
/rqt_gui_py_node_35087  
/teleop_turtle  
/turtlesim  
manal@ubuntu:~$
```

```
manal@ubuntu:~$ rostopic info /turtle1/cmd_vel  
Type: geometry_msgs/Twist  
  
Publishers:  
* /teleop_turtle (http://ubuntu:42221/)  
  
Subscribers:  
* /turtlesim (http://ubuntu:33497/)
```

