

# Robot Programming Lab

## Ros services

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### 1. Creating a Server and Client for Addition of Two Integers.

```
roscore http://ubuntu:11311/

gowtham@ubuntu: ~/catkin_ws/src/my_robot_t... x  roscore http://ubuntu:11311/ x  gowtham@ubuntu: ~/catkin_ws/src/my_robot_

ros@gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ roscore
... logging to /home/gowtham/.ros/log/9ce069d4-d191-11ee-902f-152ff460bca4/roslaunch-ubuntu-2920.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://ubuntu:38417/
ros_comm version 1.16.0

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.16.0

NODES

auto-starting new master
process[master]: started with pid [2940]
ROS_MASTER_URI=http://ubuntu:11311/

setting /run_id to 9ce069d4-d191-11ee-902f-152ff460bca4
process[rosout-1]: started with pid [2951]
started core service [/rosout]
```

- In the Already Created my\_robot\_msgs package create a new folder called srv
- Create a service in it and add input and return data types
- Make the appropriate changes in CMakeLists.txt to recognize the service created

```
MetersToFeet.srv x CMakeLis

53 hardwarestatus.msg
54 )
55
56 ## Generate services in the 'srv' folder
57 add_service_files(
58   FILES
59   AddTwoInts.srv
60   MetersToFeet.srv
61 )
62
63 ## Generate actions in the 'action' folder
64 # add_action_files(
65 #   FILES
66 #   Action1.action
67 #   Action2.action
68 # )
69
70 ## Generate added messages and services with any dependencies listed here
71 generate_messages(
72   DEPENDENCIES
73   std_msgs
74 )
75
76 #####
```

```
gowtham@ubuntu: ~  
roscore http://ubuntu:11311/  
gowtham@ubuntu: ~  
gowtham@ubuntu: ~  
gowtham@ubuntu:~$ cd catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ gedit Addnumbers.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ chmod +x Addnumbers.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ gedit client.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ chmod +x client.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ gedit Addnumbers.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ cd ..  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials$ cd ..  
gowtham@ubuntu:~/catkin_ws/src$ catkin_make  
Base path: /home/gowtham/catkin_ws  
Source space: /home/gowtham/catkin_ws/src  
Build space: /home/gowtham/catkin_ws/build  
Devel space: /home/gowtham/catkin_ws/devel  
Install space: /home/gowtham/catkin_ws/install  
####  
#### Running command: "make cmake_check_build_system" in "/home/gowtham/catkin_ws/build"  
####  
-- Using CATKIN_DEVEL_PREFIX: /home/gowtham/catkin_ws/devel  
-- Using CMAKE_PREFIX_PATH: /home/gowtham/catkin_ws/devel:/opt/ros/noetic  
-- This workspace overlays: /home/gowtham/catkin_ws/devel:/opt/ros/noetic  
-- Found PythonInterp: /usr/bin/python3 (found suitable version "3.8.10", minimum required is "3")  
-- Using PYTHON_EXECUTABLE: /usr/bin/python3  
-- Using Debian Python package layout  
-- Using empy: /usr/lib/python3/dist-packages/empy.py  
-- Using CATKIN_ENABLE_TESTING: ON  
-- Call enable_testing()  
-- Using CATKIN_TEST_RESULTS_DIR: /home/gowtham/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/gtest': gmock will be built
```

```
es Terminal Feb 22 07:01  
gowtham@ubuntu: ~/  
gowtham@ubuntu: ~/  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ cd scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ gedit pub.py  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ python3 pub.py  
pub.py:7: UserWarning: 'This is publisher' is not a legal ROS base name. This may cause problems with other ROS tools.  
  rospy.init_node("This is publisher")  
Unable to register with master node [http://localhost:11311]: master may not be running yet. Will keep trying.  
^CTraceback (most recent call last):  
  File "pub.py", line 7, in <module>  
    rospy.init_node("This is publisher")  
  File "/opt/ros/noetic/lib/python3/dist-packages/rospy/client.py", line 336, in init_node  
    raise rospy.exceptions.ROSInitException("Failed to initialize time. Please check logs for additional details")  
rospy.exceptions.ROSInitException: Failed to initialize time. Please check logs for additional details  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ python3 pub.py  
pub.py:7: UserWarning: 'This is publisher' is not a legal ROS base name. This may cause problems with other ROS tools.  
  rospy.init_node("This is publisher")  
[FATAL] [1708613392.082749]: unable to register service [/This is publisher/get_loggers] with master: ERROR: parameter [service] contains illegal chars  
[FATAL] [1708613392.099710]: unable to register service [/This is publisher/set_logger_level] with master: ERROR: parameter [service] contains illegal chars  
^C[INFO] [1708613402.379762]: publisher stopped  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$
```

- Create a server in my\_robot\_tutorials/scripts

```
gowtham@ubuntu: ~/  
roscore http://ubuntu:11311/  
gowtham@ubuntu: ~/  
gowtham@ubuntu: ~/  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ cd ..  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials$ cd ..  
gowtham@ubuntu:~/catkin_ws/src$ cd my_robot_msgs  
gowtham@ubuntu:~/catkin_ws/src/my_robot_msgs$ mkdir srv  
gowtham@ubuntu:~/catkin_ws/src/my_robot_msgs$ roscd rospack rospack AddTwoInts.srv srv/AddTwoInts.srv  
gowtham@ubuntu:~/catkin_ws/src/my_robot_msgs$ gedit CMakeLists.txt  
gowtham@ubuntu:~/catkin_ws/src/my_robot_msgs$ cd ..  
gowtham@ubuntu:~/catkin_ws/src$ cd my_robot_tutorials/scripts  
gowtham@ubuntu:~/catkin_ws/src/my_robot_tutorials/scripts$ gedit AddTwoInts.py
```

```
Open ▾ [?] Addnumbers.py ~/catkin_ws/src/my_robot_tutorials/scripts
Addnumbers.py ×
1 #!/usr/bin/env python3
2
3 import rospy
4 from my_robot_msgs.srv import AddTwoInts
5
6
7 def handle(req):
8     result = req.a+req.b
9     rospy.loginfo(f'Returning {req.a} + {req.b} = {result}')
10    return result
11
12 if __name__ == "__main__":
13     rospy.init_node("Add Two Integers server")
14     rospy.loginfo("Add two ints server node created")
15     s = rospy.Service("/add_two_ints",AddTwoInts,handle)
16     rospy.loginfo("Ready To add Two ints")
17     rospy.spin()
```

- Create a client in my\_robot\_tutorials/scripts

```
Open ▾ [?] client.py ~/catkin_ws/src/my_robot_tutorials/scripts
Addnumbers.py ×
1 #!/usr/bin/env python3
2
3 import rospy
4 from my_robot_msgs.srv import *
5
6
7
8 if __name__=="__main__":
9     rospy.loginfo("add_two_ints_client")
10    rospy.wait_for_service("/add_two_ints")
11    try:
12        add_two_ints = rospy.ServiceProxy("/add_two_ints",AddTwoInts)
13        resp1 = add_two_ints(2,6)
14        rospy.loginfo(f"The Sum is {resp1.sum}")
15    except rospy.ServiceException as e:
16        rospy.logwarn(f"Service call failed: {e}")
```

Output:

```
gowtham@ubuntu: ~  
roscore http://ubuntu:11311/  
gowtham@ubuntu:~$ rosservice call /add_two_ints 3 5  
sum: 8  
gowtham@ubuntu:~$ rosrn my_robot_tutorials client.py  
gowtham@ubuntu:~$ rosrn my_robot_tutorials client.py  
gowtham@ubuntu:~$ rosrn my_robot_tutorials client.py  
gowtham@ubuntu:~$
```

```
gowtham@ubuntu: ~  
roscore http://ubuntu:11311/  
only concatenate str (not "int") to str\n'^Cgowtham@ubuntu:~$ rosrn my_robot_tutorials Addnumbers.py  
/home/gowtham/catkin_ws/src/my_robot_tutorials/scripts/Addnumbers.py:13: UserWarning: 'Add Two Integers server' is not a legal ROS base name.  
This may cause problems with other ROS tools.  
  rospy.init_node("Add Two Integers server")  
[FATAL] [1708624066.445210]: unable to register service [/Add Two Integers server/get_loggers] with master: ERROR: parameter [service] contain  
s illegal chars  
[FATAL] [1708624066.454372]: unable to register service [/Add Two Integers server/set_logger_level] with master: ERROR: parameter [service] co  
ntains illegal chars  
[INFO] [1708624066.459227]: Add two ints server node created  
[INFO] [1708624066.468455]: Ready To add Two ints  
[ERROR] [1708624074.684232]: Error processing request: can only concatenate str (not "int") to str  
[Traceback (most recent call last):\n  File "/opt/ros/noetic/lib/python3/dist-packages/rospy/impl/tcpros_service.py", line 633, in _handl  
e_request\n    response = convert_return_to_response(self.handler(request), self.response_class)\n  File "/home/gowtham/catkin_ws/src/my_r  
obot_tutorials/scripts/Addnumbers.py", line 9, in handle\n    rospy.loginfo("Returning (req.a) + (req.b) = "+result)\nTypeError: can only  
concatenate str (not "int") to str\n'^Cgowtham@ubuntu:~$ rosrn my_robot_tutorials Addnumbers.py  
/home/gowtham/catkin_ws/src/my_robot_tutorials/scripts/Addnumbers.py:13: UserWarning: 'Add Two Integers server' is not a legal ROS base name.  
This may cause problems with other ROS tools.  
  rospy.init_node("Add Two Integers server")  
[FATAL] [1708624127.463748]: unable to register service [/Add Two Integers server/get_loggers] with master: ERROR: parameter [service] contain  
s illegal chars  
[FATAL] [1708624127.472799]: unable to register service [/Add Two Integers server/set_logger_level] with master: ERROR: parameter [service] co  
ntains illegal chars  
[INFO] [1708624127.477233]: Add two ints server node created  
[INFO] [1708624127.490422]: Ready To add Two ints  
[INFO] [1708624132.266900]: Returning {req.a} + {req.b} = 8  
[INFO] [1708624201.525307]: Returning {req.a} + {req.b} = 8  
[INFO] [1708624215.790469]: Returning {req.a} + {req.b} = 8  
[INFO] [1708624269.570984]: Returning {req.a} + {req.b} = 8
```

```
^Cgowtham@ubuntu:~$ rosrn my_robot_tutorials Addnumbers.py  
/home/gowtham/catkin_ws/src/my_robot_tutorials/scripts/Addnumbers.py:13: UserWarning: 'Add  
This may cause problems with other ROS tools.  
  rospy.init_node("Add Two Integers server")  
[FATAL] [1708624546.919333]: unable to register service [/Add Two Integers server/get_logge  
s illegal chars  
[FATAL] [1708624546.935477]: unable to register service [/Add Two Integers server/set_logge  
ntains illegal chars  
[INFO] [1708624546.955582]: Add two ints server node created  
[INFO] [1708624546.973626]: Ready To add Two ints  
[INFO] [1708624550.887076]: Returning 2 + 6 = 8  
[INFO] [1708624758.338580]: Returning 10 + 7 = 17  
[INFO] [1708624792.022896]: Returning 1 + 3 = 4
```

## 2. Conversion of Meter to Feet.

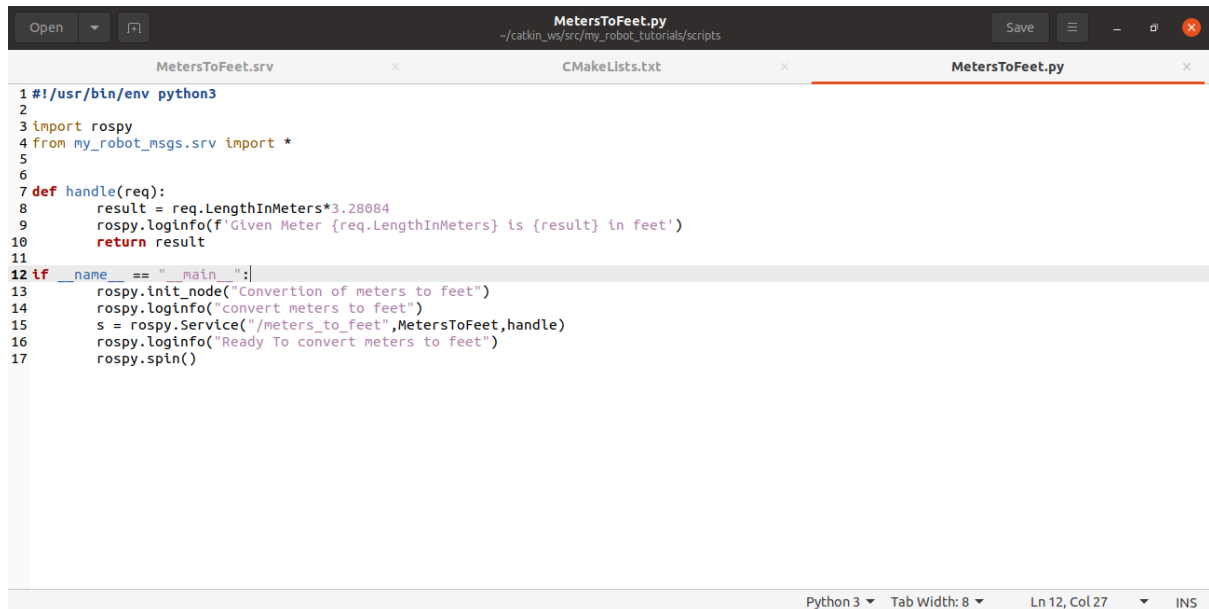
- In the Already Created my\_robot\_msgs package create a new folder called srv
- Create a service in it and add input and return data types

```
MetersToFeet.py ×
1 int64 LengthInMeters
2 ---
3 float32 LengthInFeet
4 bool Status
```

- Make the appropriate changes in CMakeLists.txt to recognize the service created

```
MetersToFeet.srv × CMakeLists.txt
53 hardwarestatus.msg
54 )
55
56 ## Generate services in the 'srv' folder
57 add_service_files(
58   FILES
59   AddTwoInts.srv
60   MetersToFeet.srv
61 )
62
63 ## Generate actions in the 'action' folder
64 # add_action_files(
65 #   FILES
66 #   Action1.action
67 #   Action2.action
68 # )
69
70 ## Generate added messages and services with any dependencies listed here
71 generate_messages(
72   DEPENDENCIES
73   std_msgs
74 )
75
76 #####
```

- Create a server in my\_robot\_tutorials/scripts



```
1 #!/usr/bin/env python3
2
3 import rospy
4 from my_robot_msgs.srv import *
5
6
7 def handle(req):
8     result = req.LengthInMeters*3.28084
9     rospy.loginfo(f'Given Meter {req.LengthInMeters} is {result} in feet')
10    return result
11
12 if __name__ == '__main__':
13     rospy.init_node('Conversion of meters to feet')
14     rospy.loginfo('convert meters to feet')
15     s = rospy.Service('/meters_to_feet', MetersToFeet, handle)
16     rospy.loginfo('Ready To convert meters to feet')
17     rospy.spin()
```

- Create a client in my\_robot\_tutorials/scripts



```
1 #!/usr/bin/env python3
2
3 import rospy
4 from my_robot_msgs.srv import *
5
6
7
8 if __name__ == '__main__':
9     rospy.loginfo('Meter to Feet')
10    rospy.wait_for_service('/meters_to_feet')
11    try:
12        add_two_ints = rospy.ServiceProxy('/meters_to_feet', MetersToFeet)
13        resp1 = add_two_ints(3)
14        rospy.loginfo(f'The respective feet of the given length in meter is {resp1.LengthInFeet}')
15    except rospy.ServiceException as e:
16        rospy.logwarn(f'Service call failed: {e}')
```

Output:

```
gowtham@ubuntu: ~  
roscore http:... x gowtham@u... x gowtham@u... x gowtham@u... x  
gowtham@ubuntu:~$ roslaunch my_robot_tutorials meterstofeet_client.py  
gowtham@ubuntu:~$
```

```
gowtham@ubuntu: ~  
roscore http://ubuntu:11311/ x gowtham@ubuntu: ~ x gowtham@ubuntu: ~ x  
gowtham@ubuntu:~$ roslaunch my_robot_tutorials MetersToFeet.py  
/home/gowtham/catkin_ws/src/my_robot_tutorials/scripts/MetersToFeet.py:13: UserWarning: 'Conversion of meters to feet' is not a legal ROS base  
name. This may cause problems with other ROS tools.  
  rospy.init_node("Conversion of meters to feet")  
[FATAL] [1708703261.359193]: unable to register service [/Conversion of meters to feet/get_loggers] with master: ERROR: parameter [service] co  
ntains illegal chars  
[FATAL] [1708703261.364020]: unable to register service [/Conversion of meters to feet/set_logger_level] with master: ERROR: parameter [servic  
e] contains illegal chars  
[INFO] [1708703261.366731]: convert meters to feet  
[INFO] [1708703261.368581]: Ready to convert meters to feet  
[INFO] [1708703261.370304]: Conversion Status = True  
[INFO] [1708703267.142099]: Given Meter 3 is 9.84252 in feet
```

```
gowtham@ubuntu: ~  
roscore http://ubuntu:11311/ x gowtham@ubuntu: ~ x gowtham@ubuntu: ~ x  
gowtham@ubuntu:~$ roslaunch my_robot_tutorials MetersToFeet.py  
/home/gowtham/catkin_ws/src/my_robot_tutorials/scripts/MetersToFeet.py:13: UserWarning: 'Conversion of meters to feet' is not a legal ROS base  
name. This may cause problems with other ROS tools.  
  rospy.init_node("Conversion of meters to feet")  
[FATAL] [1708703361.189989]: unable to register service [/Conversion of meters to feet/get_loggers] with master: ERROR: parameter [service] co  
ntains illegal chars  
[FATAL] [1708703361.194976]: unable to register service [/Conversion of meters to feet/set_logger_level] with master: ERROR: parameter [servic  
e] contains illegal chars  
[INFO] [1708703361.196761]: convert meters to feet  
[INFO] [1708703361.199893]: Ready to convert meters to feet  
[INFO] [1708703361.202178]: Conversion Status = True  
[INFO] [1708703365.210308]: Given Meter 9 is 29.52756 in feet
```

roscore http://ubuntu:11311/

×

gowt

```
gowtham@ubuntu:~$ rosservice call /meters_to_feet 9
```

```
LengthInFeet: 29.527559280395508
```

```
gowtham@ubuntu:~$
```