10.ROS service server

In the previous tutorial, we talked about how to write a client node program, so this program will explain how to write a server node. The server has a service callback function, which can be compared to the callback function of a topic subscriber. After receiving the request for service, describe the specific service content in the service callback function, and then return a response value.

10.1 Create a server

The general creation steps are as follows:

- Initialize ROS nodes
- Create server instance
- Loop waiting for service requests and enter the callback function
- Complete the function processing of the service in the callback function and feed back the response data

10.2 C++ version

10.2.1 Writing source code

In the src folder of the function package learn_server, create a C++ file (the file suffix is .cpp), name it turtle_vel_command_server.cpp, and paste the following content into turtle_vel_command_server.cpp.

```
/**
* This routine will execute the /turtle_vel_command service, service data type
std_srvs/Trigger
*/
#include <ros/ros.h>
#include <geometry_msgs/Twist.h>
#include <std_srvs/Trigger.h>
ros::Publisher turtle_vel_pub;
bool pubvel = false;
// service callback function, input parameter req, output parameter res
bool pubvelCallback(std_srvs::Trigger::Request &req,
std_srvs::Trigger::Response &res)
{
    pubvel = !pubvel;
    ROS_INFO("Do you want to publish the vel?: [%s]",
    pubvel==true?"Yes":"No");// Print client request data
    // Set feedback data
    res.success = true;
    res.message = "The status is changed!";
    return true;
}
int main(int argc, char **argv)
{
    ros::init(argc, argv, "turtle_vel_command_server");
    ros::NodeHandle n;
    // Create a server called /turtle_vel_command and register the callback
function pubvelCallback
    ros::ServiceServer command_service =
    n.advertiseService("/turtle_vel_command", pubvelCallback);
    // Create a Publisher, publish a topic named /turtle1/cmd_vel, the message
type is geometry_msgs::Twist, and the queue length is 8
    turtle_vel_pub = n.advertise<geometry_msgs::Twist>("/turtle1/cmd_vel", 8);
    ros::Rate loop_rate(10);// Set the frequency of the loop
    while(ros::ok())
    {
        ros::spinOnce();// View a callback function queue
    // If pubvel is judged to be True, the turtle speed command will be issued.
        if(pubvel)
        {
            geometry_msgs::Twist vel_msg;
            vel_msg.linear.x = 0.6;
            vel_msg.angular.z = 0.8;
            turtle_vel_pub.publish(vel_msg);
        }
        loop_rate.sleep();//Delay according to cycle frequency
    }
    return 0;
}
```

10.2.2 Modify CMakeLists.txt file

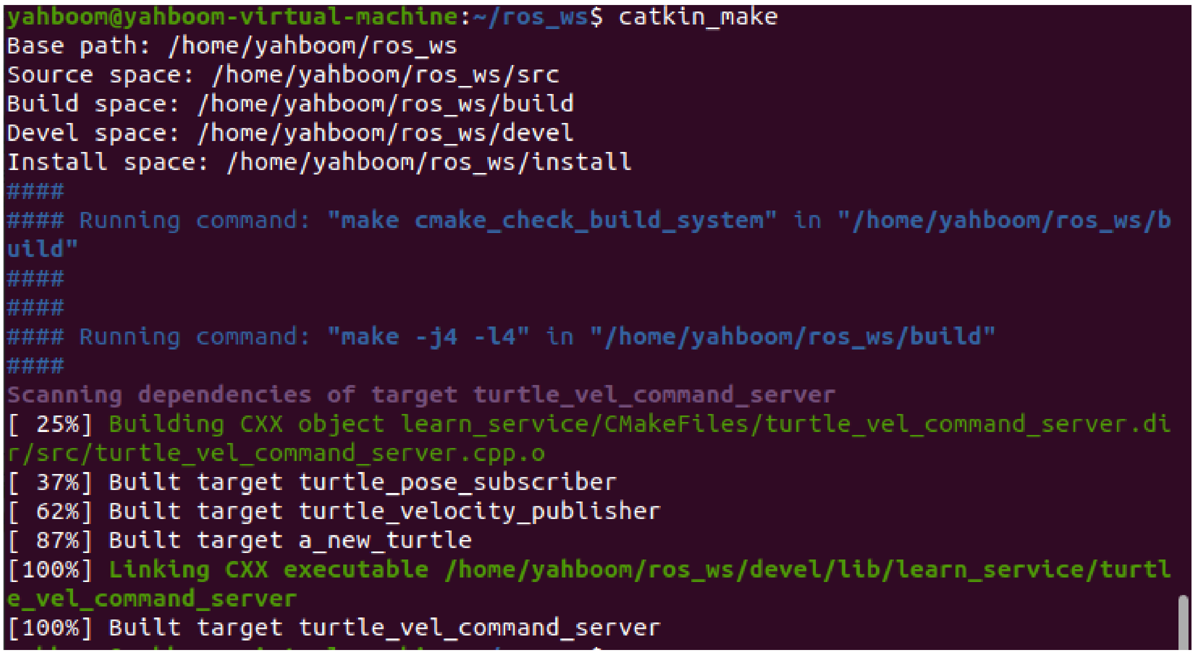
Configure in CMakelist.txt, under the build area, add the following content,

```
add_executable(turtle_vel_command_server src/turtle_vel_command_server.cpp)
target_link_libraries(turtle_vel_command_server ${catkin_LIBRARIES})
```

10.2.3 Compile

Terminal input,

```
cd ~/ros_ws
catkin_make
```



```
yahboom@yahboom-virtual-machine:~/ros_ws$ catkin_make
Base path: /home/yahboom/ros_ws
Source space: /home/yahboom/ros_ws/src
Build space: /home/yahboom/ros_ws/build
Devel space: /home/yahboom/ros_ws/devel
Install space: /home/yahboom/ros_ws/install
####
#### Running command: "make cmake_check_build_system" in "/home/yahboom/ros_ws/b
uild"
####
####
#### Running command: "make -j4 -l4" in "/home/yahboom/ros_ws/build"
####
Scanning dependencies of target turtle_vel_command_server
[ 25%] Building CXX object learn_service/CMakeFiles/turtle_vel_command_server.di
r/src/turtle_vel_command_server.cpp.o
[ 37%] Built target turtle_pose_subscriber
[ 62%] Built target turtle_velocity_publisher
[ 87%] Built target a_new_turtle
[100%] Linking CXX executable /home/yahboom/ros_ws/devel/lib/learn_service/turtl
e_vel_command_server
[100%] Built target turtle_vel_command_server
```

After the compilation is passed, you need to re-source the current environment variables to find or update the program. Enter in the terminal.

```
cd ~/ros_ws
source devel/setup.bash
```

10.2.4 Running the program

Open roscore,

```
roscore
```

Run the little turtle node program,

```
rosrun turtlesim turtlesim_node
```

Run the server node,

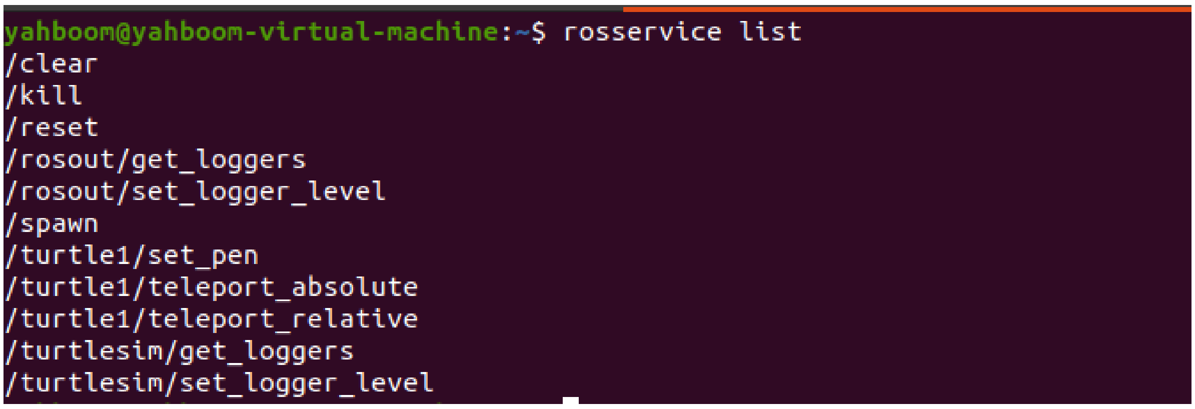
```
rosrun learn_service turtle_vel_command_server
```

Calling a service,

```
rosservice call /turtle_vel_command
```

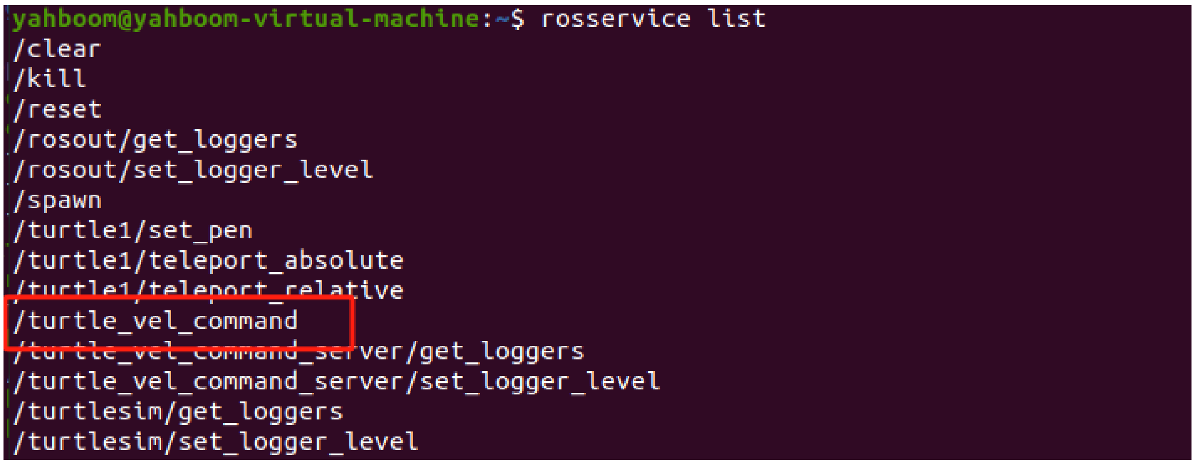
Program running instructions:

First, after running the Little Turtle node, you can enter rosservice list in the terminal to see what services are currently available. The results are as follows:



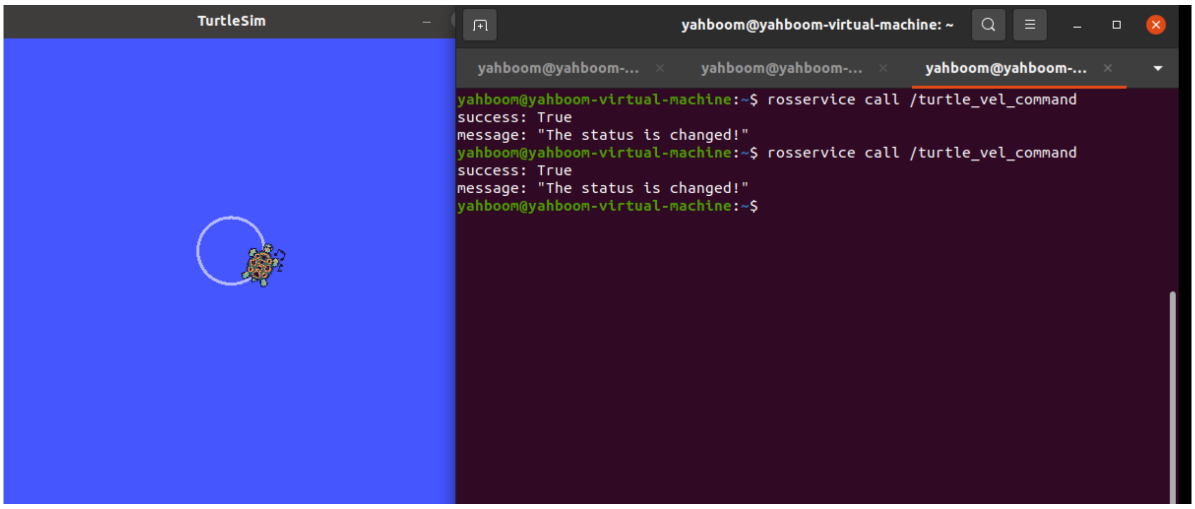
```
yahboom@yahboom-virtual-machine:~$ rosservice list
/clear
/kill
/reset
/rosout/get_loggers
/rosout/set_logger_level
/spawn
/turtle1/set_pen
/turtle1/teleport_absolute
/turtle1/teleport_relative
/turtlesim/get_loggers
/turtlesim/set_logger_level
```

Then, we run the turtle_vel_command_server program and enter rosservice list, and we will find that there is an additional turtle_vel_command, as shown in the figure below,



```
yahboom@yahboom-virtual-machine:~$ rosservice list
/clear
/kill
/reset
/rosout/get_loggers
/rosout/set_logger_level
/spawn
/turtle1/set_pen
/turtle1/teleport_absolute
/turtle1/teleport_relative
/turtle_vel_command
/turtle_vel_command_server/get_loggers
/turtle_vel_command_server/set_logger_level
/turtlesim/get_loggers
/turtlesim/set_logger_level
```

Then, we call this service by entering rosservice call /turtle_vel_command in the terminal, and we will find that the little turtle makes a circular motion. If we call the service again, the little turtle stops moving. This is because in the service callback function, we invert the value of pubvel and then feed it back. The main function will judge the value of pubvel. If it is True, the speed command will be issued. If it is False, no command will be issued.



```
yahboom@yahboom-virtual-machine:~$ rosservice call /turtle_vel_command
success: True
message: "The status is changed!"
yahboom@yahboom-virtual-machine:~$ rosservice call /turtle_vel_command
success: True
message: "The status is changed!"
yahboom@yahboom-virtual-machine:~$
```

10.3 Python version

10.3.1 Writing source code

Create a new scripts folder under the function package learn_service, then create a new python file (file suffix .py) in this scripts folder, name it turtle_vel_command_server.py, copy and paste the following program code into the turtle_vel_command_server.py file,

```
#!/usr/bin/env python
# -*- coding: utf-8 -*-
# This routine will execute the /turtle_command service, service data type
std_srvs/Trigger
import rospy
import _thread,time
from geometry_msgs.msg import Twist
from std_srvs.srv import Trigger, TriggerResponse
pubvel = False;
turtle_vel_pub = rospy.Publisher('/turtle1/cmd_vel', Twist, queue_size=8)
def pubvel_thread():
    while True:
        if pubvel:
            vel_msg = Twist()
            vel_msg.linear.x = 0.6
            vel_msg.angular.z = 0.8
            turtle_vel_pub.publish(vel_msg)
        time.sleep(0.1)
def pubvelCallback(req):
    global pubvel
    pubvel = bool(1-pubvel)
    rospy.loginfo("Do you want to publish the vel?[%s]", pubvel)# Show request
data
    return TriggerResponse(1, "Change state!")# Feedback data
def turtle_pubvel_command_server():
    rospy.init_node('turtle_vel_command_server')# ROS node initialization
    # Create a server named /turtle_command and register the callback function
pubvelCallback
    s = rospy.Service('/turtle_vel_command', Trigger, pubvelCallback)
    # Loop waiting for callback function
    print ("Ready to receive turtle_pub_vel_command.")
    _thread.start_new_thread(pubvel_thread, ())
    rospy.spin()
if __name__ == "__main__":
    turtle_pubvel_command_server()
```

10.3.2 Running the program

Open roscore,

```
roscore
```

Run the little turtle node program,

```
rosrun turtlesim turtlesim_node
```

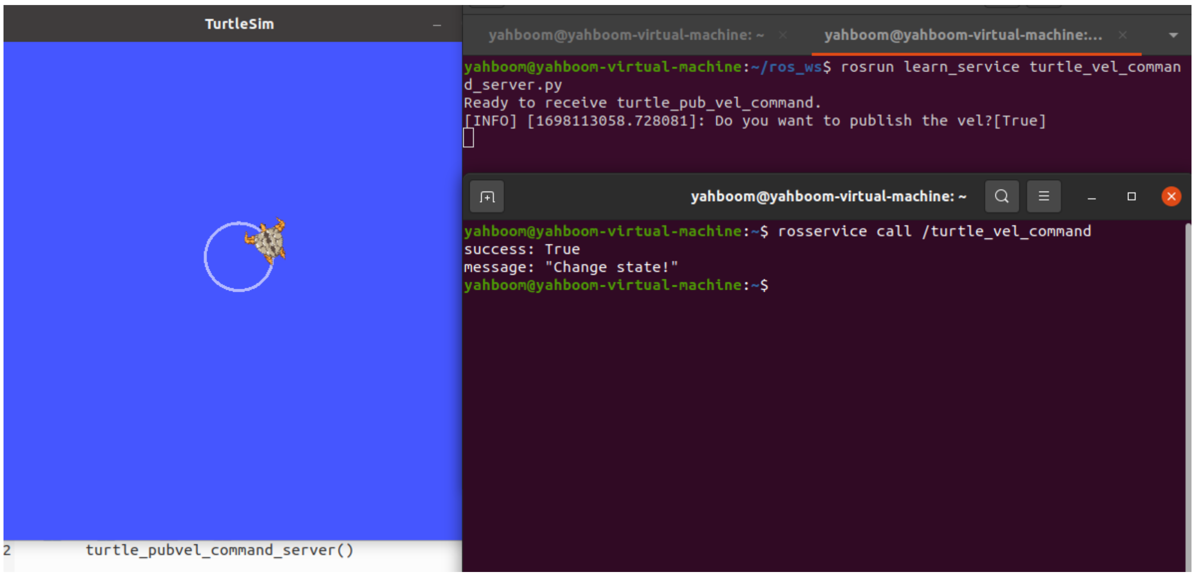
Run the server node,

```
rosrun learn_service turtle_vel_command_server.py
```

Calling a service,

```
rosservice call /turtle_vel_command
```

Enter rosservice call /turtle_vel_command in the terminal to call this service. You will find that the little turtle moves in a circle. If you call the service again, the little turtle stops moving.


TurtleSim
yahboom@yahboom-virtual-machine: ~
yahboom@yahboom-virtual-machine:...
yahboom@yahboom-virtual-machine: ~
2
turtle_pubvel_command_server()

```
yahboom@yahboom-virtual-machine:~/ros_ws$ rosrun learn_service turtle_vel_comman
d_server.py
Ready to receive turtle_pub_vel_command.
[INFO] [1698113058.728081]: Do you want to publish the vel?[True]
```

```
yahboom@yahboom-virtual-machine:~$ rosservice call /turtle_vel_command
success: True
message: "Change state!"
yahboom@yahboom-virtual-machine:~$
```