7 Client

In ROS communication, in addition to topic communication, there is also service communication. Services include clients and servers. The client requests the service and the server provides the service. This section takes the client as the main content and talks about how c++ and python implement the client.

7.1 Preparation

7.1.1 Create a function package

1. switch to the ~/catkin_ws/src directory,

```
catkin_create_pkg learning_server std_msgs rospy roscpp geometry_msgs turtlesim
```

2. switch to the ~/catkin_ws directory,

```
catkin_make
```

7.2 C++ language implementation

7.2.1 Implementation steps

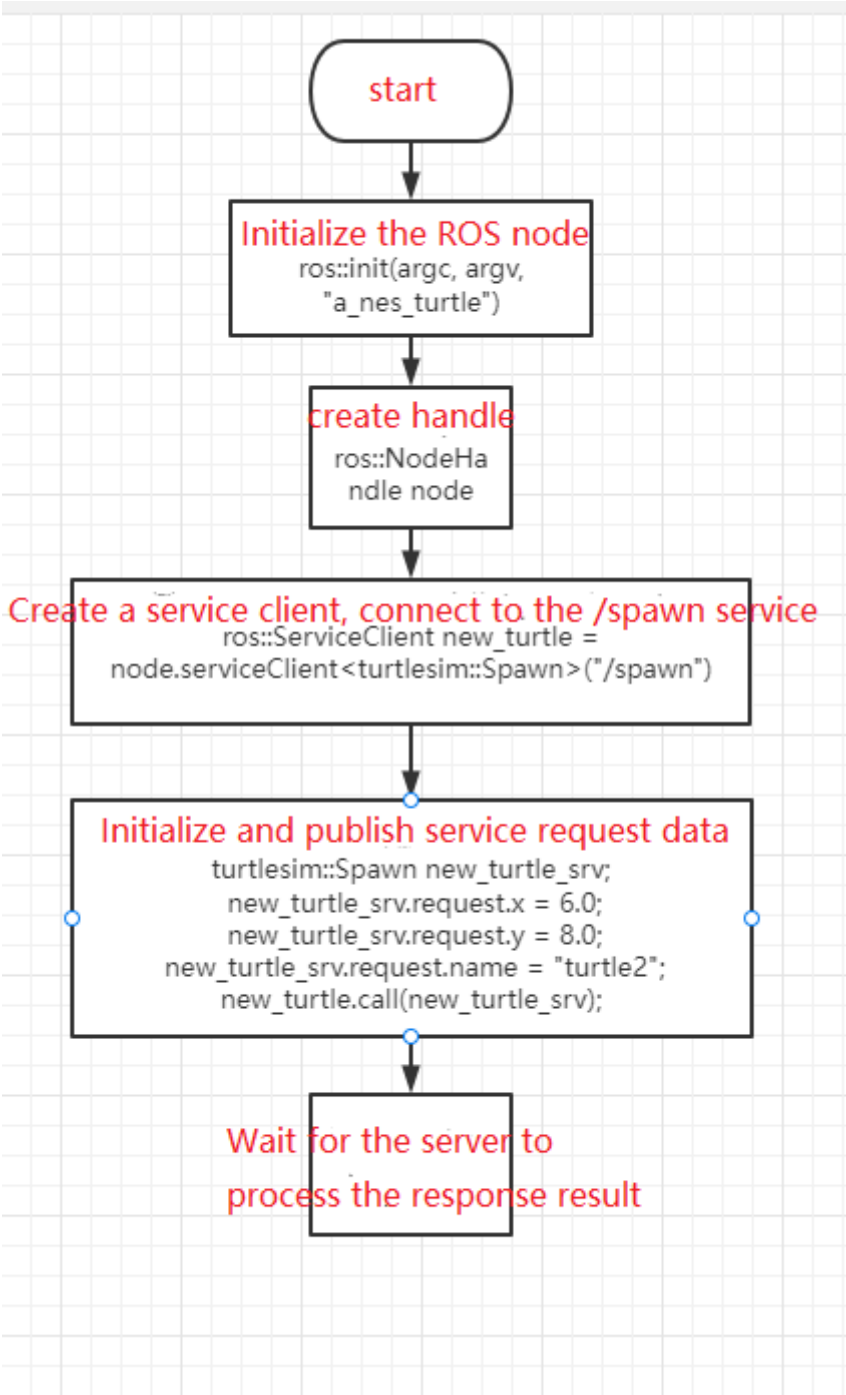
1. initialize the ROS node
2. create a handle
3. create a Client instance
4. initialize and publish service request data
5. wait for the response result after server processing

7.2.2 Switch to the ~/catkin_ws/src/learning_server/src directory, create a new .cpp file, name it a_new_turtle, and paste the code below into it

a_new_turtle.cpp

```
/**
 * This routine will request the /spawn service in the turtle node, and a new
turtle will appear at the specified location
 */

#include <ros/ros.h>
#include <turtlesim/Spawn.h>

int  main(int  argc, char**  argv)
{

    ros::init(argc, argv, "a_nes_turtle"); // initialize the ROS node

    ros::NodeHandle  node;

    ros::service::waitForService("/spawn"); // wait for /spawn service

    ros::ServiceClient  new_turtle  =  node.serviceClient < turtlesim::Spawn >
("/spawn"); //Create a service client and connect to the service named /spawn

    // Initialize request data for turtlesim::Spawn
    turtlesim::Spawn  new_turtle_srv;
    new_turtle_srv.request.x  =  6.0;
    new_turtle_srv.request.y  =  8.0;
    new_turtle_srv.request.name  =  "turtle2";

    // Request the service to pass in xy position parameters and name parameters

    ROS_INFO("Call service to create a new turtle name is %s,at the
x:%.1f,y:%.1f", new_turtle_srv.request.name.c_str(),
        new_turtle_srv.request.x,
        new_turtle_srv.request.y);

    new_turtle.call(new_turtle_srv);


    ROS_INFO("Spwan turtle successfully [name:%s]",
new_turtle_srv.response.name.c_str()); // Display service call result

    return  0;
};
```

1. program flow chart



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

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

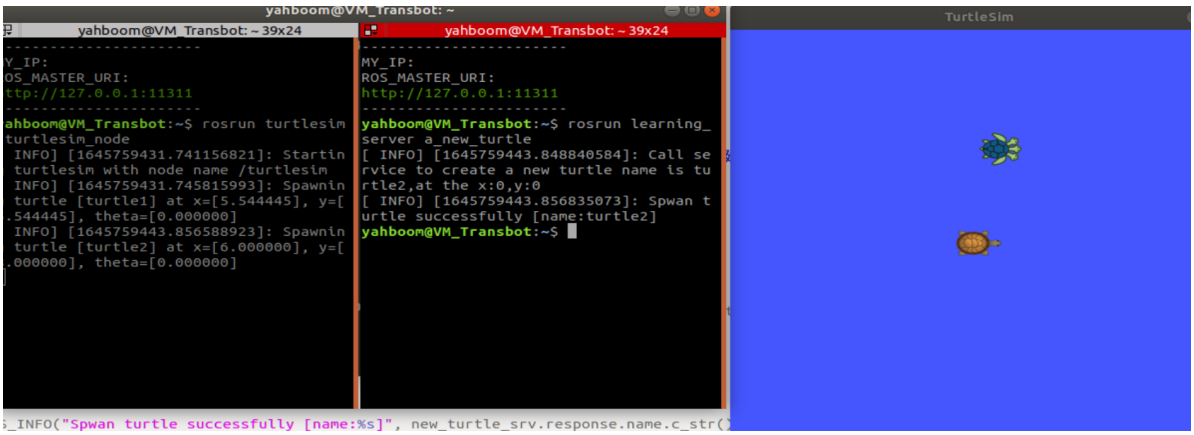
3. Compile the code in the workspace directory

```
cd ~/catkin_ws
catkin_make
source devel/setup.bash #Environment      variables need to be configured,
otherwise the system cannot find the running program
```

4. run the program

```
roscore
rosrun turtlesim turtlesim_node
rosrun learning_server a_new_turtle
```

5. Screenshot of running effect



6. program description

After starting the node of the turtle, and running the a_new_turtle program, you will find that another turtle will appear on the screen. This is because the node of the turtle provides a service/spawn, which will generate another turtle. The services provided by the turtle can be viewed through the rosservice list command, as shown in the following figure

```
yahboom@VM_Transbot:~/catkin_ws/src/learning_server/src$ rosservice list
/clear
/kill
/reset
/rosout/get_loggers
/rosout/set_logger_level
/spawn
/turtle1/set_pen
/turtle1/teleport_absolute
/turtle1/teleport_relative
/turtle2/set_pen
/turtle2/teleport_absolute
/turtle2/teleport_relative
/turtle6/set_pen
/turtle6/teleport_absolute
/turtle6/teleport_relative
/turtlesim/get_loggers
/turtlesim/set_logger_level
```

You can view the parameters required by this service through rosservice info /spawn, as shown in the following figure

```
yahboom@VM_Transbot:~/catkin_ws/src/learning_server/src$ rosservice info /spawn
Node: /turtlesim
URI: rosrpc://192.168.2.85:57303
Type: turtlesim/Spawn
Args: x y theta name
```

It can be seen that there are 4 parameters: x, y, theta, name, these four parameters are initialized in a_new_turtle.cpp

```
srv.request.x = 6.0;
srv.request.y = 8.0;
srv.request.name = "turtle2";
Note: theta is not assigned and defaults to 0
```

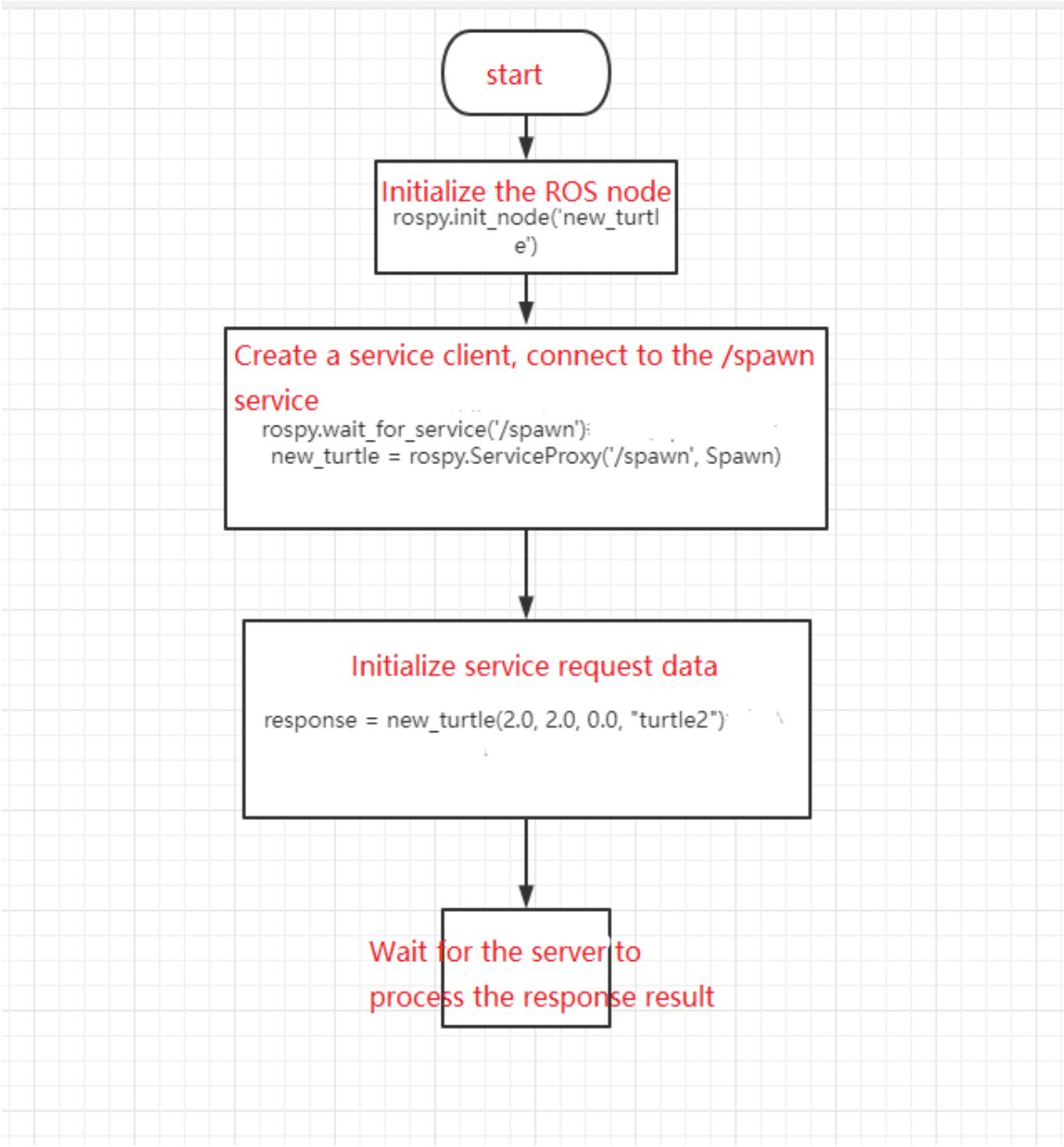
7.3 Python language implementation

7.3.1 Switch to the ~/catkin_ws/src/learning_server directory, create a new script folder, cut it in, create a new py file, name it a_new_turtle, and paste the code below into it

a_new_turtle.py

```
# !/usr/bin/env python
# -*- coding: utf-8 -*-


import  sys
import  rospy
from  turtlesim.srv  import  Spawn

 def turtle_spawn():

    rospy.init_node ('new_turtle') # ROS node initialization

    rospy.wait_for_service('/spawn') # wait for the /spawn service

    try :
        new_turtle  =  rospy.ServiceProxy('/spawn', Spawn)


        response = new_turtle(2.0, 2.0, 0.0, "turtle2") # Enter request data
        return  response _ .name
    except  rospy.ServiceException, e :
        print  "failed to call service : %s" % e

if  __name__  ==  "__main__" :
    #Service call and display the call result
    print  "a new turtle named %s."  %(turtle_spawn())
```

1. program flow chart



2. run the program

```
roscore
rosrun turtlesim turtlesim_node
rosrun learning_server a_new_turtle.py
```

3. The program operation effect and program description are consistent with the effect achieved by C++. Here we mainly talk about how python provides the parameters required by the service.

```
response = add_turtle(2.0, 2.0, 0.0, "turtle2")
```

The corresponding parameters are x, y, theta, name.