9.Custom Service Messages and Usage

9.1 Customized Service Messages

Switch to~/catkin_ ws/src/learning_ Under the server function package directory, create a new folder named srv to store custom service messages.

9.1.1 Define SRV files

Switch to the srv directory and create a new blank srv file, with srv as the suffix to indicate that it is an srv file. Here we use IntPlus.srv as an example to copy the following code into the just created srv file.

```
uint8  a
uint8  b

---
uint8 result
```

Here is an explanation of the composition of the SRV file, which is divided into two parts by the symbol - - - - -. The upper side represents the request and the lower side is the response.

9.1.2 Add feature pack dependencies in package.xml

```
<build_depend>message_generation</build_depend>
<exec_depend>message_runtime</exec_depend>
```

9.1.3. Add compilation options in CMakeLists.txt

```
add_service_files(FILES IntPlus.srv)
generate_messages(DEPENDENCIES std_msgs)
```

9.1.4 Compile and generate language related files

```
cd ~/catkin_ws
catkin_make
```

9.1.5 C++Language Implementation

1. Switch to~/catkin_ ws/src/learning_ Under server/src, create two new cpp files named IntPlus_ Server.cpp and IntPlus_ Client.cpp, copy the following code into it separately,

IntPlus_server.cpp

```
#include <ros/ros.h>
#include "learning_server/IntPlus.h"

// Service callback function, input parameter req, output parameter res
```

```
bool IntPlusCallback(learning_server::IntPlus::Request  &req,
                     learning_server::IntPlus::Response &res)
{

    ROS_INFO("number 1 is:%d  ,number 2 is:%d  ", req.a, req.b);//Display request
data

    res.result = req.a + req.b ;// The feedback result is the sum of two numbers

    return res.result;
}

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

    ros::init(argc, argv, "IntPlus_server"); // ROS node initialization

    ros::NodeHandle n;// Create node handle

    // Create a server and register the callback function IntPlusCallback
    ros::ServiceServer Int_Plus_service = n.advertiseService("/Two_Int_Plus",
IntPlusCallback);

    // Loop waiting callback function
    ROS_INFO("Ready to caculate.");
    ros::spin();

    return 0;
}
```

IntPlus_client.cpp

```
#include <ros/ros.h>
#include "learning_server/IntPlus.h"
#include <iostream>
using namespace std;
int main(int argc, char** argv)
{
    int i,k;
    cin>>i;
    cin>>k;

    ros::init(argc, argv, "IntPlus_client");// ROS node initialization


    ros::NodeHandle node;// Create node handle

    // Create a service client after discovering the/Two_int-Plus service
    ros::service::waitForService("/Two_Int_Plus");
    ros::ServiceClient IntPlus_client =
node.serviceClient<learning_server::IntPlus>("/Two_Int_Plus");

    // Initialize learningservice:: IntPlus request data
    learning_server::IntPlus srv;
    srv.request.a = i;
```

```
    srv.request.b  = k;

    ROS_INFO("Call service to plus %d and %d", srv.request.a, srv.request.b);//
Request service invocation

    IntPlus_client.call(srv);

    // Display service call results
    ROS_INFO("Show the result : %d", srv.response.result);//Display service call
results

    return 0;
}
```

2. Modify the CMakeLists.txt file

```
add_executable(IntPlus_server src/IntPlus_server.cpp)
target_link_libraries(IntPlus_server ${catkin_LIBRARIES})
add_dependencies(IntPlus_server ${PROJECT_NAME}_generate_messages_cpp)

add_executable(IntPlus_client src/IntPlus_client.cpp)
target_link_libraries(IntPlus_client ${catkin_LIBRARIES})
add_dependencies(IntPlus_client ${PROJECT_NAME}_generate_messages_cpp)
```

3. Core part

The implementation process here is the same as before, with the main difference being the introduction of header files and the use of custom service files:The import header file is

```
#include "learning_server/IntPlus.h"
```

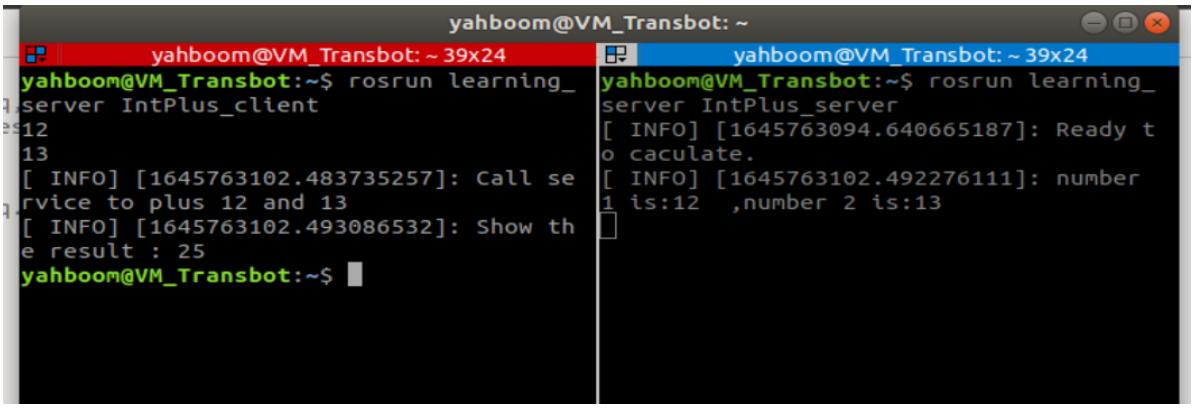
Front learning_ Server is the name of the feature pack, followed by IntPlus. h, which is the header file name generated by the previously created srv fileUsing custom service files is

```
client:
learning_server::IntPlus srv;
srv.request.a = i;
srv.request.b  = k;
#i. k is the addend input by the terminal
ros::ServiceClient IntPlus_client = node.serviceClient<learning_server::IntPlus>
("/Two_Int_Plus");
IntPlus_client.call(srv);
server:
ros::ServiceServer Int_Plus_service = n.advertiseService("/Two_Int_Plus",
IntPlusCallback);
bool IntPlusCallback(learning_server::IntPlus::Request  &req,
                     learning_server::IntPlus::Response &res)
```

4. run a program

```
roscore
rosrun learning_server IntPlus_client
rosrun learning_server IntPlus_server
```

5. Run screenshot



6. Program Description

Running IntPlus_ After the server, it will prompt to prepare for calculation; Running IntPlus_ After the client, the terminal inputs two integer numbers, followed by IntPlus_ The server accountant calculates the result and returns it to IntPlus_ Client, and then print out the results.

9.1.6 Python Language Implementation

1. Switch to~/catkin_ ws/src/learning_ Under server/script, create two new py files and name them IntPlus_ Server.py and IntPlus_ Client.py, copy the following code into it separately,

IntPlus_server.py

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

from learning_server.srv import IntPlus, IntPlusResponse

def IntPlusCallback(req):

    rospy.loginfo("Ints: a:%d  b:%d", req.a, req.b)# Display request data

    return IntPlusResponse(req.a+req.b)# Feedback data

def IntPlus_server():

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

    # Create a server and register the callback function IntPlusCallback
    s = rospy.Service('/Two_Int_Plus', IntPlus, IntPlusCallback)


    print "Ready to caculate two ints."# Loop waiting callback function

    rospy.spin()

if __name__ == "__main__":
    IntPlus_server()
```

IntPlus_client.py

```
#!/usr/bin/env python
# -*- coding: utf-8 -*-
import sys
import rospy
from learning_server.srv import IntPlus, IntPlusRequest

def Plus_client():
    # ROS node initialization
    rospy.init_node('IntPlus_client')

    rospy.wait_for_service('/Two_Int_Plus')
    try:
        Plus_client = rospy.ServiceProxy('/Two_Int_Plus', IntPlus)

        response = Plus_client(22, 20)# Request service call, input request data

        return response.result
    except rospy.ServiceException, e:
        print "failed to call service : %s"%e

if __name__ == "__main__":
    #Call the service and display the call result
    print "Show two_int_plus result : %s" %(Plus_client())
```

2. Core part

Here is mainly an explanation of how to import a custom service message module and use it:Import

```
server:
from learning_server.srv import IntPlus, IntPlusResponse
client:
from learning_server.srv import IntPlus, IntPlusRequest
```

use

```
server:
s = rospy.Service('/Two_Int_Plus', IntPlus, IntPlusCallback)
return IntPlusResponse(req.a+req.b)# Feedback data
client:
response = Plus_client(12, 20)#Request service call, input request data
return response.result
```

3. Run program

Before running the program, add executable permissions to the py file

```
sudo chmod a+x IntPlus_server.py
sudo chmod a+x IntPlus_client.py
```

run a program

```
roscore
rosrun learning_server IntPlus_client.py
rosrun learning_server IntPlus_server.py
```

4. Program operation instructions

What is inconsistent with the C++version here is that the addend is set in the program (12 and 20), so once the service is started, the result can be returned immediately.