9. Custom service messages and usage

9.1 Custom service message

Switch to the ~/catkin_ws/src/learning_server function package directory, and then create a new folder named srv to store custom service messages.

9.1.1 define srv file

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

```
uint8   a
uint8   b

---
uint8  result
```

The composition of the srv file is described here, which is divided into upper and lower parts by the symbol ---, the upper part indicates the request and the lower part is the response.

9.1.2 Add function package dependencies in package.xml

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

9.1.3 Add compile options in CMakeLists.txt

```
Add message_generation to find_package
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_server/src, create two new cpp files, named IntPlus_server.cpp and IntPlus_client.cpp, and copy the following codes into them respectively,

IntPlus_server.cpp

```
/**
 * This routine will execute /Two_Int_Plus service, service data type
learning_service::IntPlus
 */

#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 the 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 for the callback function
    ROS_INFO("Ready to caculate.");
    ros::spin();

    return  0;
}
```

IntPlus_client.cpp

```
/*
 This routine will request /Two_Int_Plus service, service data type
learning_service::IntPlus
Add and sum two integers
 */
```

```
#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"); // initialize the ROS node


    ros::NodeHandle  node; // create node handle

    // After discovering the /Two_Int_Plus service, create a service client
    ros::service::waitForService("/Two_Int_Plus");
    ros::ServiceClient  IntPlus_client  =  node.serviceClient <
learning_server::IntPlus >("/Two_Int_Plus");

    // Initialize the request data for learning_service::IntPlus
    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 call

    IntPlus_client.call(srv);

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

    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. the core part

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

The import header file is

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

The front learning_server is the function package name, and the latter IntPlus.h is the header file name generated by the srv file just created

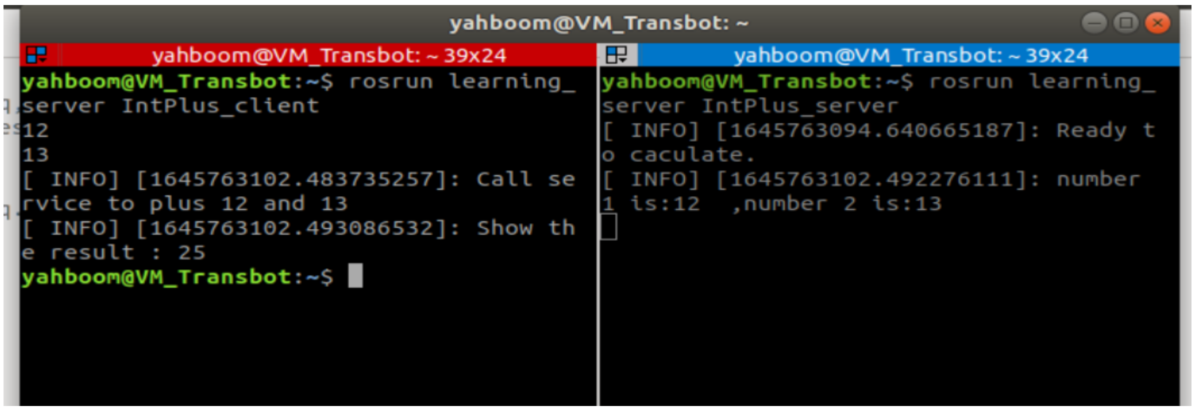
Using a custom service file is

```
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 the program

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

5. run the screenshot



```
yahboom@VM_Transbot:~$ rosrun learning_
server IntPlus_client
12
13
[ INFO] [1645763102.483735257]: Call se
rvice to plus 12 and 13
[ INFO] [1645763102.493086532]: Show th
e result : 25
yahboom@VM_Transbot:~$
```

```
yahboom@VM_Transbot:~$ rosrun learning_
server IntPlus_server
[ INFO] [1645763094.640665187]: Ready t
o caculate.
[ INFO] [1645763102.492276111]: number
1 is:12  ,number 2 is:13
```

6. program description

After running IntPlus_server, you will be prompted to prepare for calculation; after running IntPlus_client, the terminal will input two integer numbers, then IntPlus_server will calculate the result, return it to IntPlus_client, and then print the result.

9.1.6 Python language implementation

1. switch to ~/catkin_ws/src/learning_server/script, create two new py files, named IntPlus_server.py and IntPlus_client.py, and copy the following codes into them respectively,

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:%db:%d", req.a, req.b) # show 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 for the 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, enter request
data

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

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

2. the core part

Here is mainly to explain how to import the 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, enter request data
return  response.result
```

3. run the program

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

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

run the 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 here is set in the program(12 and 20) so after the service is started, the result can be returned immediately.