2015 ROS Yaz Okulu
Uygulamalar - I

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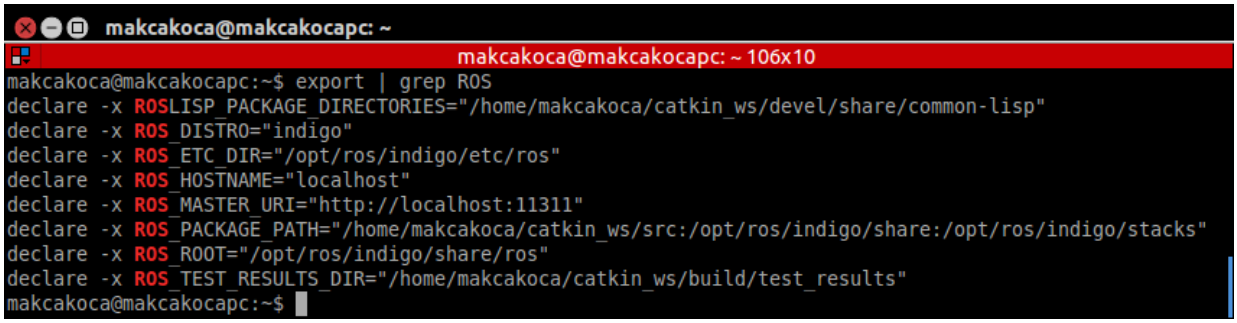
1. Uygulama-1 : ROS Ortamının Hazırlanması

```
$ export | grep ROS
```




```
$ gedit ~/.bashrc
```

Gedit editöründe açılan ekrana <source /opt/ros/indigo/setup.bash> ve <source /home/<kullanıcı_adı>/catkin_ws/devel/setup.bash > kodu eklenir.

```
$ mkdir -p ~/catkin_ws/src
$ cd ~/catkin_ws/src
$ catkin_init_workspace
```

```
$ cd ~/catkin_ws/
$ catkin_make
```

```
$ source devel/setup.bash
```

bashrc'de yapılan değişiklikler önceden açılan terminalde algılanabilmesi için bash komutu ile terminal yenilenmektedir.

2. Uygulama-2 : Catkin Paket Oluşturma

```
$ cd ~/catkin_ws/src
```

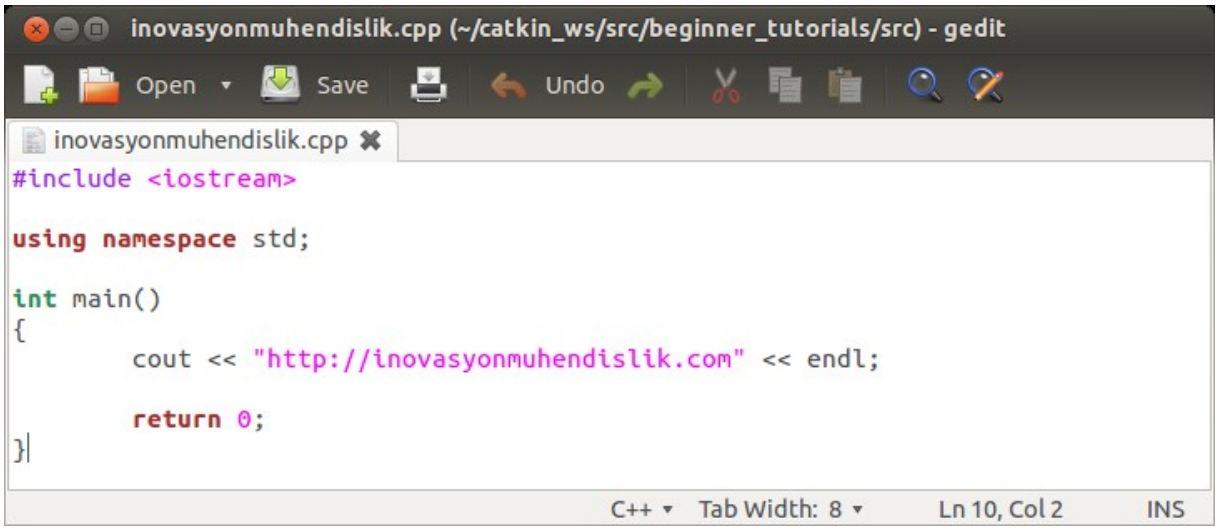
```
$ catkin_create_pkg beginner_tutorials std_msgs rospy roscpp
```

```
makcakoca@makcakocapc:~/catkin_ws/src$ catkin_create_pkg beginner_tutorials std_
msgs rospy roscpp
Created file beginner_tutorials/CMakeLists.txt
Created file beginner_tutorials/package.xml
Created folder beginner_tutorials/include/beginner_tutorials
Created folder beginner_tutorials/src
Successfully created files in /home/makcakoca/catkin_ws/src/beginner_tutorials.
Please adjust the values in package.xml.
makcakoca@makcakocapc:~/catkin_ws/src$
```

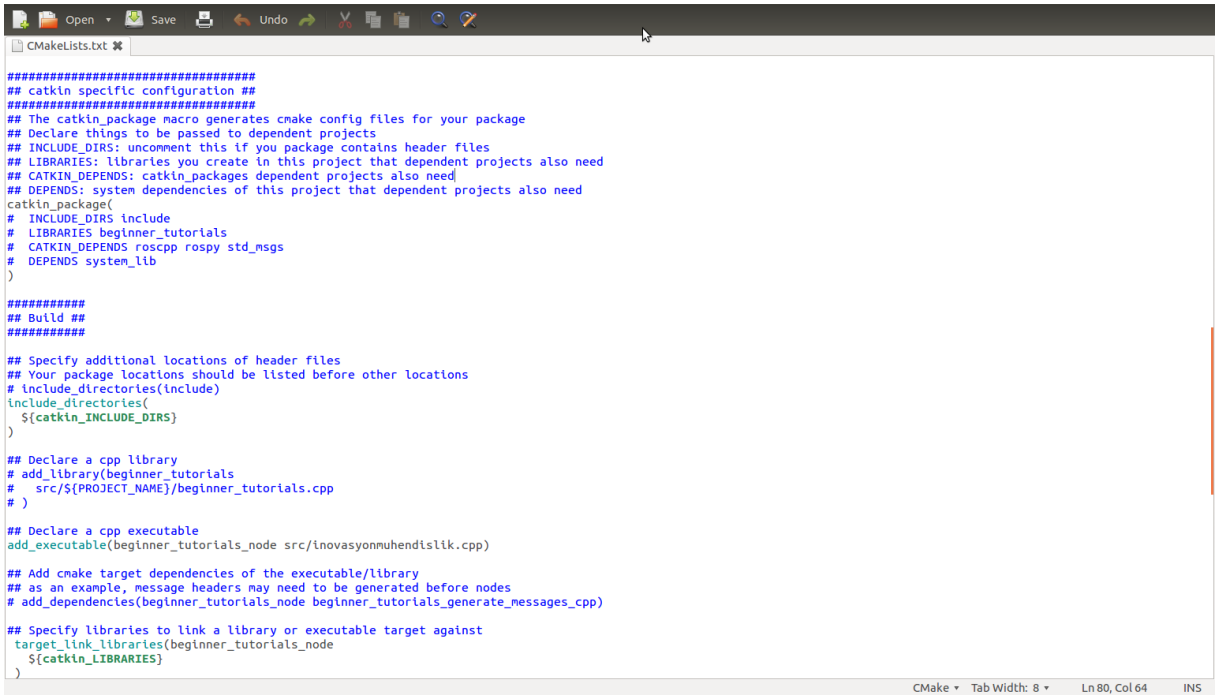
```
$ cd beginner_tutorials
$ ls
```

```
makcakoca@makcakocapc:~/catkin_ws/src$ cd beginner_tutorials/
makcakoca@makcakocapc:~/catkin_ws/src/beginner_tutorials$ ls
CMakeLists.txt  include  package.xml  src
makcakoca@makcakocapc:~/catkin_ws/src/beginner_tutorials$
```

```
$ cd src
$ gedit inovasyonmuhendislik.cpp
```



```
$ cd ..
$ gedit CMakeLists.txt
```




```
$ cd ~/catkin_ws/
$ catkin_make
```

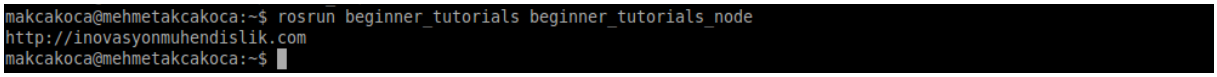
Yazılana kodun çalıştırılması için iki terminal açılır. İlk terminalde roscore çalıştırılır.

```
$ roscore
```

```
makcakoca@mehmetakcakoca:~$ roscore
... logging to /home/makcakoca/.ros/log/4df3372e-22e7-11e4-a44a-c48508021bbf/roslaunch-mehmetakcakoca-3994.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://mehmetakcakoca:49545/
ros_comm version 1.10.2


SUMMARY
========

PARAMETERS
 * /rosdistro
 * /rosversion

NODES

auto-starting new master
process[master]: started with pid [4008]
ROS_MASTER_URI=http://mehmetakcakoca:11311/

setting /run_id to 4df3372e-22e7-11e4-a44a-c48508021bbf
process[rosout-1]: started with pid [4021]
started core service [/rosout]
```

Diğer terminalde ise oluşturulan ros paketi çalıştırılır.

```
$ rosrun beginner_tutorials beginner_tutorials_node
```



3. Uygulama-3 : TurtleSim Uygulaması

Öncelikle wiki.ros.org'da bulunan derslerin ros paketleri indirilir.

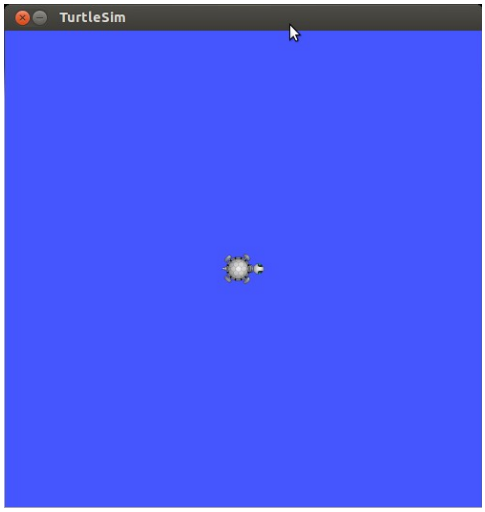
```
$ sudo apt-get install ros-indigo-ros-tutorials
```

Terminal-1

```
$ roscore
```

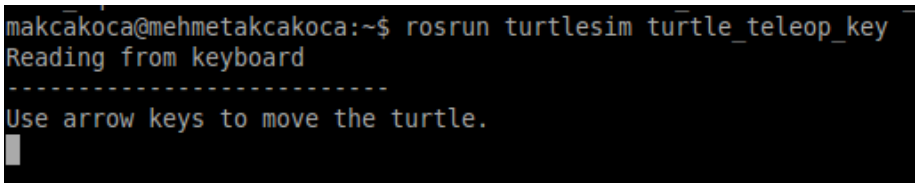
Terminal-2

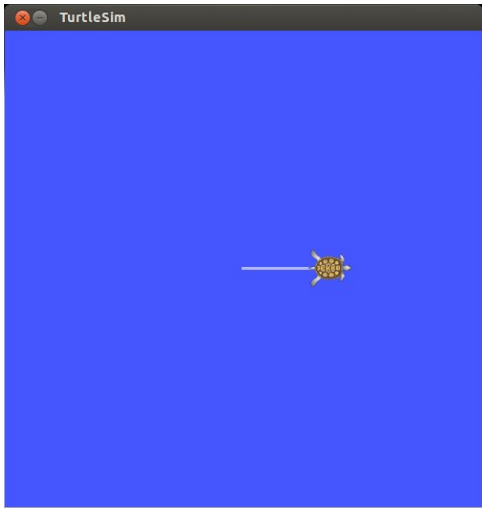
```
$ rosrun turtlesim turtlesim_node
```



Terminal-3

```
$ rosrun turtlesim turtle_teleop_key
```





Terminal-4

```
$ rosnode list
```

```
makcakoca@mehmetakcakoca:~$ rosnode list
/rosout
/teleop_turtle
/turtlesim
```

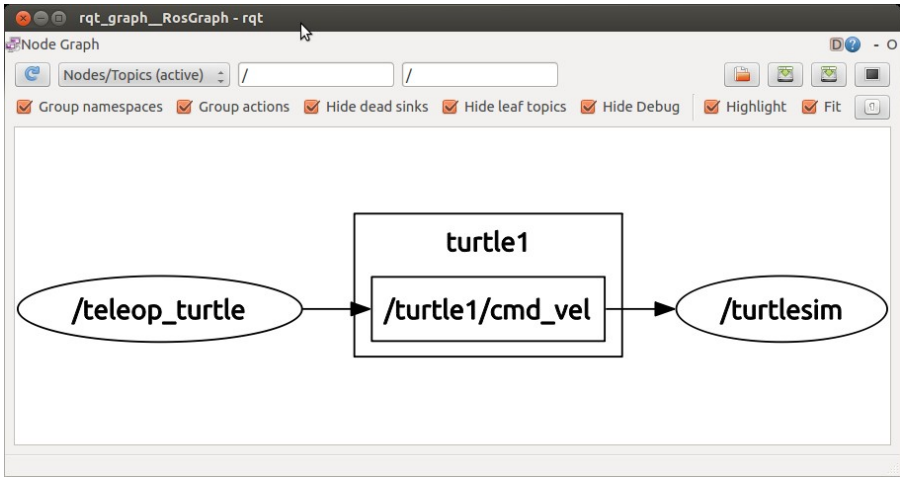
```
$ rostopic list
```

```
makcakoca@mehmetakcakoca:~$ rostopic list
/rosout
/rosout_agg
/turtle1/cmd_vel
/turtle1/color_sensor
/turtle1/pose
```

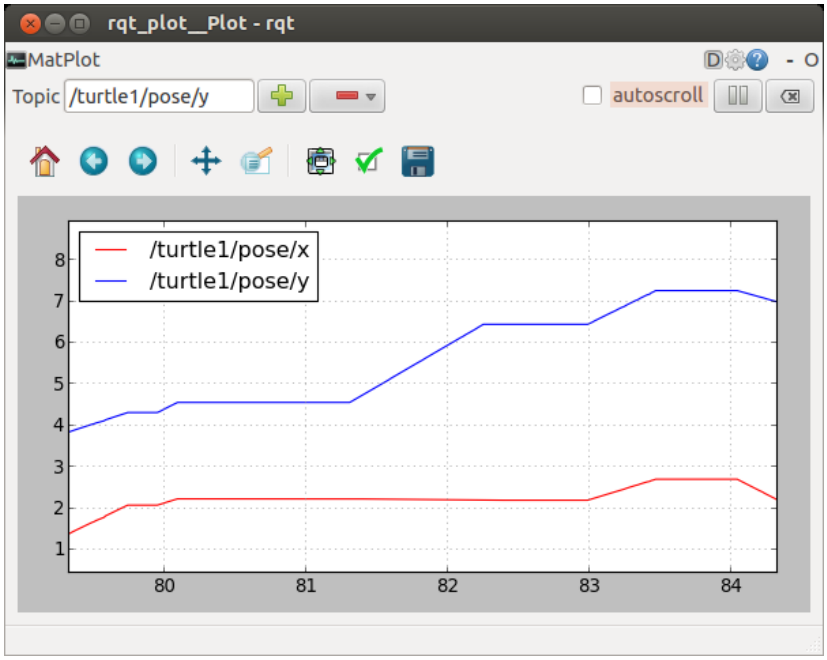
```
$ rostopic echo /turtle1/cmd_vel
```

```
makcakoca@mehmetakcakoca:~$ rostopic echo /turtle1/cmd_vel
linear:
  x: 2.0
  y: 0.0
  z: 0.0
angular:
  x: 0.0
  y: 0.0
  z: 0.0
---
```

```
$ rqt_graph
```




```
$ rqt_plot
```




```
$ rostopic info /turtle1/cmd_vel
```

```
makcakoca@mehmetakcakoca:~$ rostopic info /turtle1/cmd_vel
Type: geometry_msgs/Twist

Publishers:
 * /teleop_turtle (http://mehmetakcakoca:51757/)

Subscribers:
 * /turtlesim (http://mehmetakcakoca:57532/)
```

$ rosmsg show geometry_msgs/Twist

```
makcakoca@mehmetakcakoca:~$ rosmsg show geometry_msgs/Twist
geometry_msgs/Vector3 linear
  float64 x
  float64 y
  float64 z
geometry_msgs/Vector3 angular
  float64 x
  float64 y
  float64 z
```

$ rosservice list

```
makcakoca@mehmetakcakoca:~$ rosservice list
/clear
/kill
/reset
/rosout/get_loggers
/rosout/set_logger_level
/spawn
/teleop_turtle/get_loggers
/teleop_turtle/set_logger_level
/turtle1/set_pen
/turtle1/teleport_absolute
/turtle1/teleport_relative
/turtlesim/get_loggers
/turtlesim/set_logger_level
```

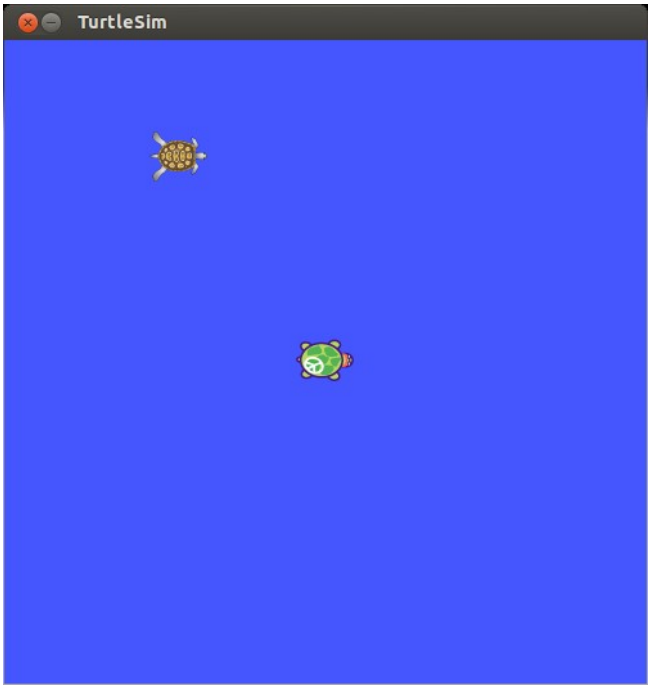
$ rosservice type /spawn

```
makcakoca@mehmetakcakoca:~$ rosservice type /spawn
turtlesim/Spawn
```

$ rossrv show turtlesim/Spawn

```
makcakoca@mehmetakcakoca:~$ rossrv show turtlesim/Spawn
float32 x
float32 y
float32 theta
string name
---
string name
```

$ rosservice call /spawn 3 2 0 im_tosbaa



$ rosparam list

```
makcakoca@mehmetakcakoca:~$ rosparam list
/background_b
/background_g
/background_r
/rosdistro
/roslaunch/uris/host_mehmetakcakoca__55530
/rosversion
/run_id
```

$ rosparam get /background_b

```
makcakoca@mehmetakcakoca:~$ rosparam get /background_b
255
```

$ rosparam set /background_b 10

```
makcakoca@mehmetakcakoca:~$ rosparam set /background_b 10
```

$ rosparam get /background_b

```
makcakoca@mehmetakcakoca:~$ rosparam get /background_b
10
```

4. Uygulama-4 : Message Oluşturma

```
$ cd ~/catkin_ws/src/beginner_tutorials
$ mkdir msg
$ echo "int64 num" > msg/Num.msg
```

ya da Num.msg içerisi aşağıdaki gibi doldurulur.

```
string first_name
string last_name
uint8 age
uint32 score
```

```
$ gedit package.xml
```

```
 <build_depend>message_generation</build_depend>
 <run_depend>message_runtime</run_depend>
```

```
$ gedit CMakeLists.txt
```

```
find_package(catkin REQUIRED COMPONENTS
  roscpp
  rospy
  std_msgs
  message_generation
)
```

```
catkin_package(
 ...
 CATKIN_DEPENDS message_runtime ...
 ...)
```

```
add_message_files(
 FILES
 Num.msg
)
```

```
generate_messages(
 DEPENDENCIES
 std_msgs
)
```

```
$ cd ~/catkin_ws
$ catkin_make
```

```
$ rosmsg show beginner_tutorials/Num
```

5. Uygulama-5 : Publisher & Subscriber Uygulaması

5.1 Publisher Yapımı

```
$ cd ~/catkin_ws/src/beginner_tutorials/src
$ gedit talker.cpp
```

```
#include "ros/ros.h"
#include "std_msgs/String.h"

#include <sstream>

int main(int argc, char **argv)
{
 ros::init(argc, argv, "talker");

 ros::NodeHandle n;

 ros::Publisher chatter_pub = n.advertise<std_msgs::String>("chatter", 1000);

 ros::Rate loop_rate(10);

 int count = 0;
 while (ros::ok())
 {
  std_msgs::String msg;

  std::stringstream ss;
  ss << "hello world " << count;
  msg.data = ss.str();

  ROS_INFO("%s", msg.data.c_str());
  chatter_pub.publish(msg);

  ros::spinOnce();
  loop_rate.sleep();
  ++count;
 }
 return 0;
}
```

```
$ cd ~/catkin_ws/src/beginner_tutorials
$ gedit CMakeLists.txt
```

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

5.2 Subcriber Yapımı

```
$ cd ~/catkin_ws/src/beginner_tutorials/src
$ gedit listener.cpp
```

```
#include "ros/ros.h"
#include "std_msgs/String.h"


void chatterCallback(const std_msgs::String::ConstPtr& msg)
{
 ROS_INFO("I heard: [%s]", msg->data.c_str());
}

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

 ros::init(argc, argv, "listener");

 ros::NodeHandle n;

 ros::Subscriber sub = n.subscribe("chatter", 1000, chatterCallback);

 ros::spin();

 return 0;
}
```

```
$ cd ~/catkin_ws/src/beginner_tutorials
$ gedit CMakeLists.txt
```

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

5.3 Derleme

```
$ cd ~/catkin_ws/
$ catkin_make
```

5.4 Çalıştırma

Terminal-1:

```
$ roscore
```

Terminal-2:

```
$ rosrun beginner_tutorials talker
```

Terminal-3:

```
$ rosrun beginner_tutorials listener
```

6. Uygulama-6 : Service & Client Uygulaması

6.1 srv oluşturma

```
$ roscd beginner_tutorials
$ mkdir srv
$ cd srv
$ gedit AddTwoInts.srv
```

```
int64 a
int64 b
---
int64 sum
```

```
$ roscd beginner_tutorials
$ gedit CMakeLists.txt
```

```
add_service_files(
  FILES
  AddTwoInts.srv
)
```

```
$ cd ~/catkin_ws
$ catkin_make
```

6.2 Server Oluşturma

```
$ cd ~/catkin_ws/src/beginner_tutorials/src
$ gedit add_two_ints_server.cpp
```

```
#include "ros/ros.h"
#include "beginner_tutorials/AddTwoInts.h"

bool add(beginner_tutorials::AddTwoInts::Request  &req,
         beginner_tutorials::AddTwoInts::Response &res)
{
  res.sum = req.a + req.b;
  ROS_INFO("request: x=%ld, y=%ld", (long int)req.a, (long int)req.b);
  ROS_INFO("sending back response: [%ld]", (long int)res.sum);
```

```
  return true;
}

int main(int argc, char **argv)
{
  ros::init(argc, argv, "add_two_ints_server");
  ros::NodeHandle n;

  ros::ServiceServer service = n.advertiseService("add_two_ints", add);
  ROS_INFO("Ready to add two ints.");
  ros::spin();

  return 0;
}
```

6.3 Client Oluşturma

```
$ cd ~/catkin_ws/src/beginner_tutorials/src
$ gedit add_two_ints_client.cpp
```

```
#include "ros/ros.h"
#include "beginner_tutorials/AddTwoInts.h"
#include <cstdlib>

int main(int argc, char **argv)
{
  ros::init(argc, argv, "add_two_ints_client");
  if (argc != 3)
  {
    ROS_INFO("usage: add_two_ints_client X Y");
    return 1;
  }

  ros::NodeHandle n;
  ros::ServiceClient client = n.serviceClient<beginner_tutorials::AddTwoInts>("add_two_ints");
  beginner_tutorials::AddTwoInts srv;
  srv.request.a = atoll(argv[1]);
  srv.request.b = atoll(argv[2]);
```

```
 if (client.call(srv))
 {
   ROS_INFO("Sum: %ld", (long int)srv.response.sum);
 }
 else
 {
   ROS_ERROR("Failed to call service add_two_ints");
   return 1;
 }

 return 0;
}
```

6.4 Derleme

```
$ cd ~/catkin_ws/src/beginner_tutorials/
$ gedit CMakeLists.txt
```

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

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

```
$ cd ~/catkin_ws
$ catkin_make
```

6.5 Uygulamayı Çalıştırma

Terminal-1:

```
$ roscore
```

Terminal-2:

```
$ rosrun beginner_tutorials server
```

Terminal-3:

```
$ rosrun beginner_tutorials client 2 3
```