無人載具技術與應用
ROS

徐瑋隆

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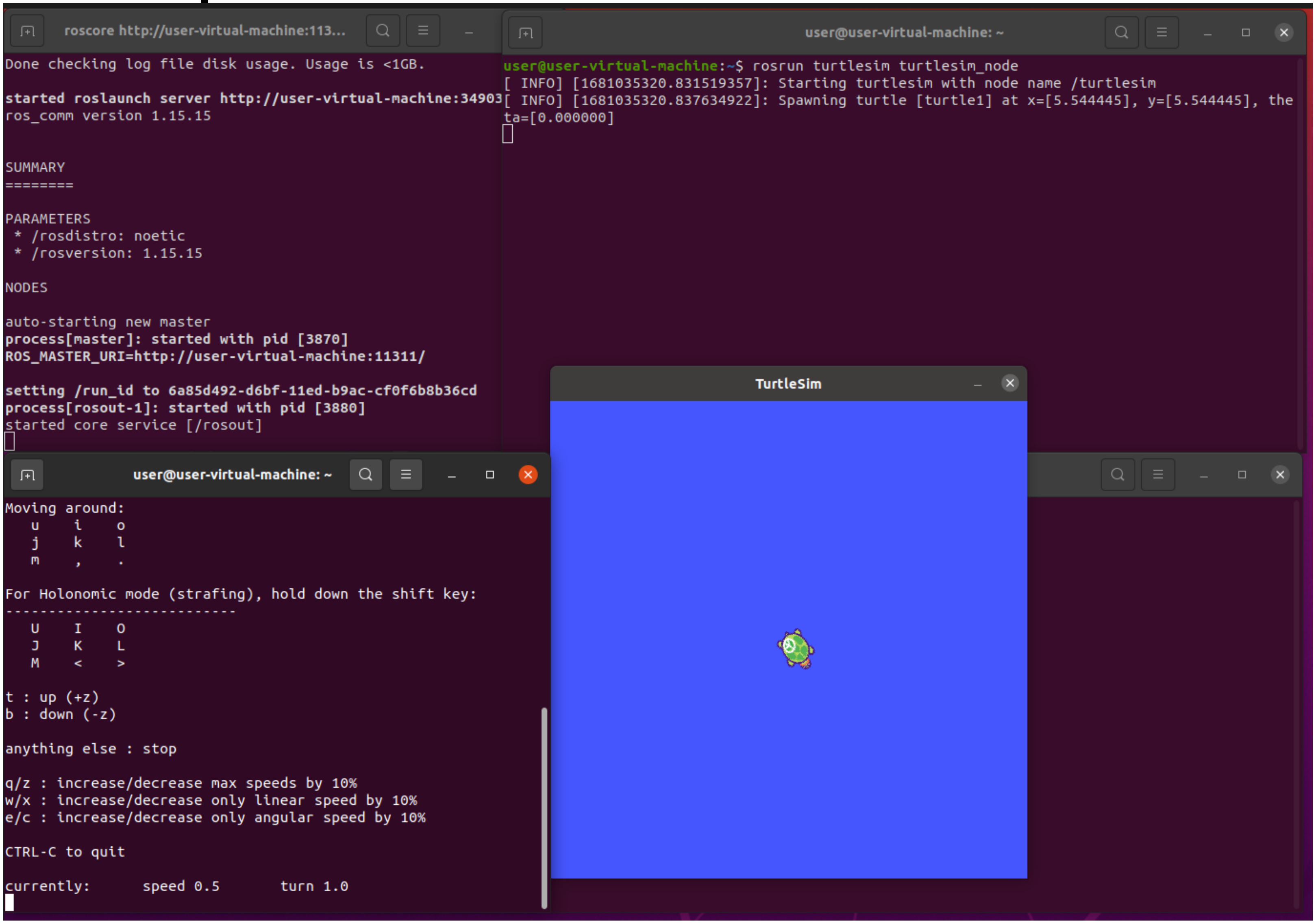
ROS PARAMETER

ros parameter – turtlesim 01


roscore http://user-virtual-machine:113...
user@user-virtual-machine: ~
user@user-virtual-machine: ~
TurtleSim

```
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://user-virtual-machine:34903
ros_comm version 1.15.15


SUMMARY
========

PARAMETERS
 * /rosdistro: noetic
 * /rosversion: 1.15.15

NODES

auto-starting new master
process[master]: started with pid [3870]
ROS_MASTER_URI=http://user-virtual-machine:11311/

setting /run_id to 6a85d492-d6bf-11ed-b9ac-cf0f6b8b36cd
process[rosout-1]: started with pid [3880]
started core service [/rosout]
```

```
user@user-virtual-machine:~$ rosrun turtlesim turtlesim_node
[ INFO] [1681035320.831519357]: Starting turtlesim with node name /turtlesim
[ INFO] [1681035320.837634922]: Spawning turtle [turtle1] at x=[5.544445], y=[5.544445], the
ta=[0.000000]
```

```
Moving around:
   u    i    o
   j    k    l
   m    ,    .

For Holonomic mode (strafing), hold down the shift key:
---------------------------
   U    I    O
   J    K    L
   M    <    >

t : up (+z)
b : down (-z)

anything else : stop

q/z : increase/decrease max speeds by 10%
w/x : increase/decrease only linear speed by 10%
e/c : increase/decrease only angular speed by 10%

CTRL-C to quit

currently:      speed 0.5       turn 1.0
```

roscore

rosrun turtlesim turtlesim_node

rosrun teleop_twist_keyboard teleop_twist_keyboard.py /cmd_vel:=/turtle1/cmd_vel

ros parameter – turtlesim 02

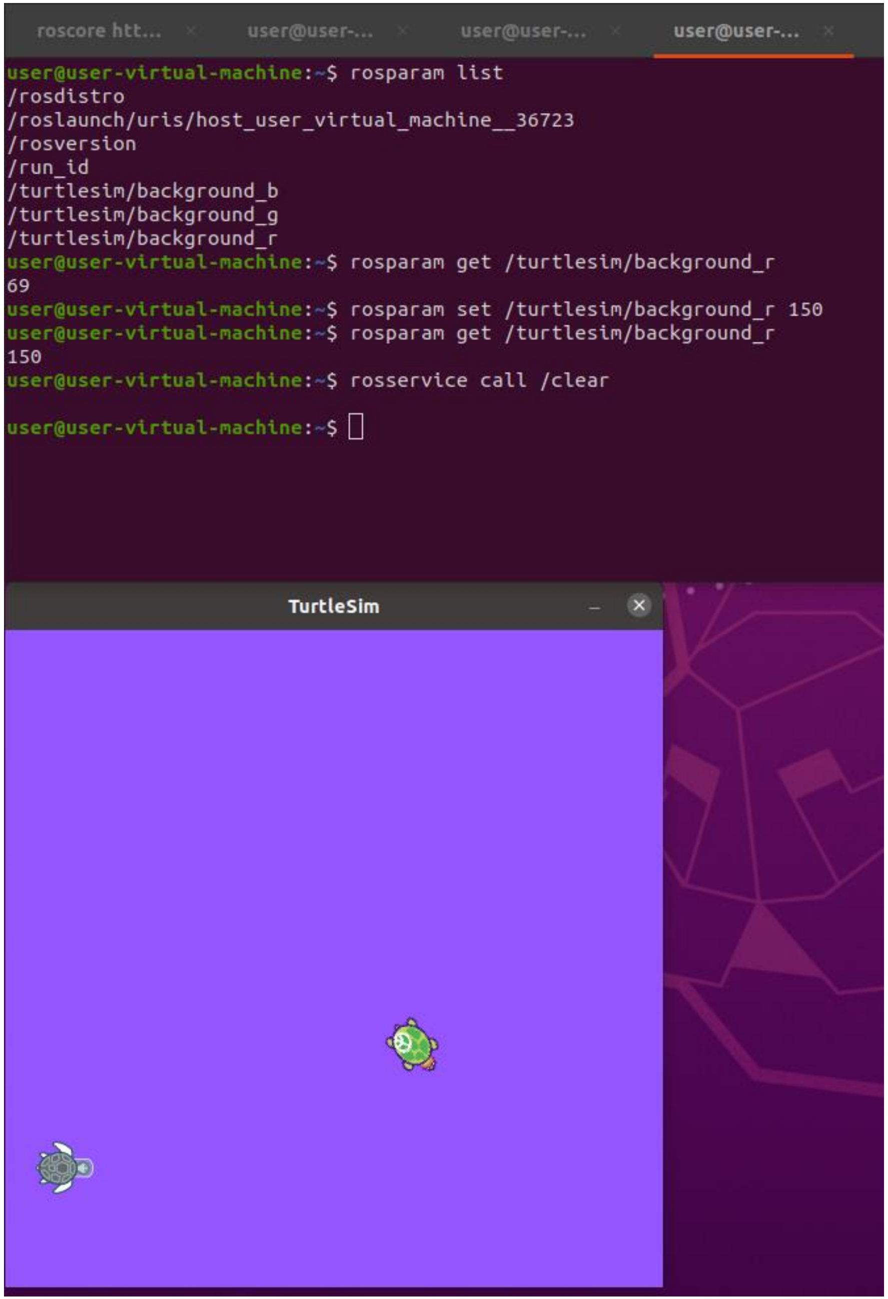
複習rosservice

rosservice list

rosservice call /spawn 1 2 0 kk

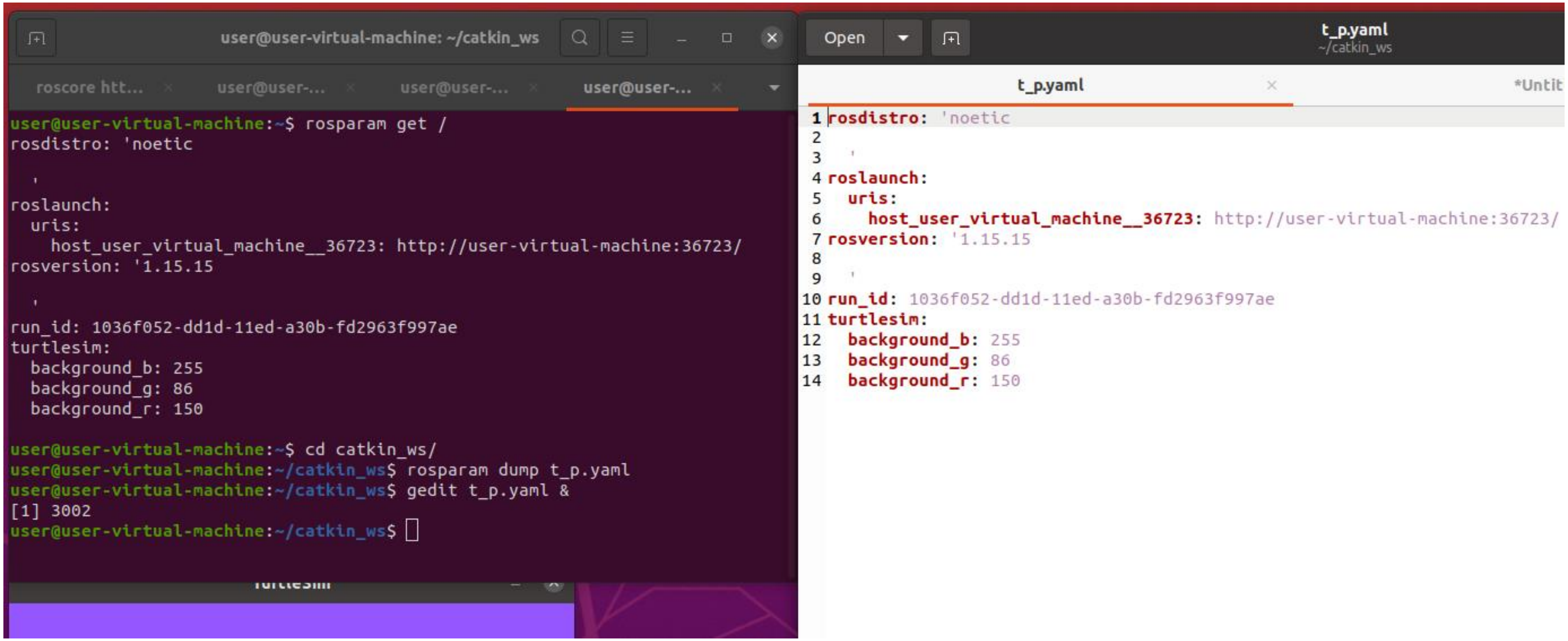
rosparam list
rosparam get /turtlesim/background_r
rosparam set /turtlesim/background_r 150
rosparam get /turtlesim/background_r
rosservice call /clear
清潔背景(強制程式讀取取ros param改變才會生效)

rosparam set /turtlesim/background_r 50
rosservice call /clear



```
user@user-virtual-machine:~$ rosparam list
/rosdistro
/roslaunch/uris/host_user_virtual_machine__36723
/rosversion
/run_id
/turtlesim/background_b
/turtlesim/background_g
/turtlesim/background_r
user@user-virtual-machine:~$ rosparam get /turtlesim/background_r
69
user@user-virtual-machine:~$ rosparam set /turtlesim/background_r 150
user@user-virtual-machine:~$ rosparam get /turtlesim/background_r
150
user@user-virtual-machine:~$ rosservice call /clear

user@user-virtual-machine:~$ 
```

ros parameter – turtlesim 03

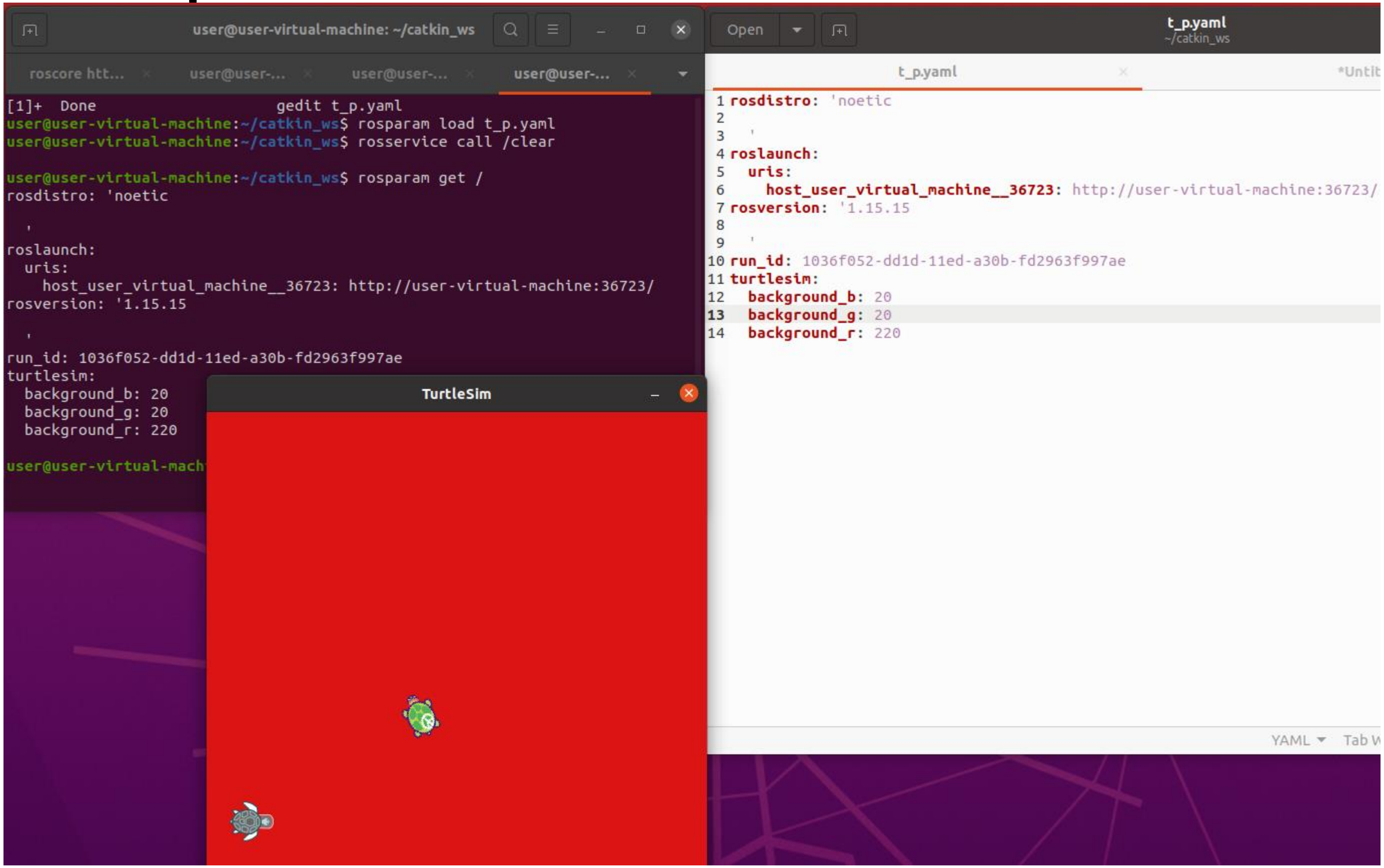


```
user@user-virtual-machine:~$ rosparam get /
rosdistro: 'noetic

  '
roslaunch:
  uris:
    host_user_virtual_machine__36723: http://user-virtual-machine:36723/
rosversion: '1.15.15

  '
run_id: 1036f052-dd1d-11ed-a30b-fd2963f997ae
turtlesim:
  background_b: 255
  background_g: 86
  background_r: 150

user@user-virtual-machine:~$ cd catkin_ws/
user@user-virtual-machine:~/catkin_ws$ rosparam dump t_p.yaml
user@user-virtual-machine:~/catkin_ws$ gedit t_p.yaml &
[1] 3002
user@user-virtual-machine:~/catkin_ws$ 
```

```
rosdistro: 'noetic

  '
roslaunch:
  uris:
    host_user_virtual_machine__36723: http://user-virtual-machine:36723/
rosversion: '1.15.15

  '
run_id: 1036f052-dd1d-11ed-a30b-fd2963f997ae
turtlesim:
  background_b: 255
  background_g: 86
  background_r: 150
```

rosparam get /
cd catkin_ws/
rosparam dump t_p.yaml
gedit t_p.yaml &

ros parameter – turtlesim 04



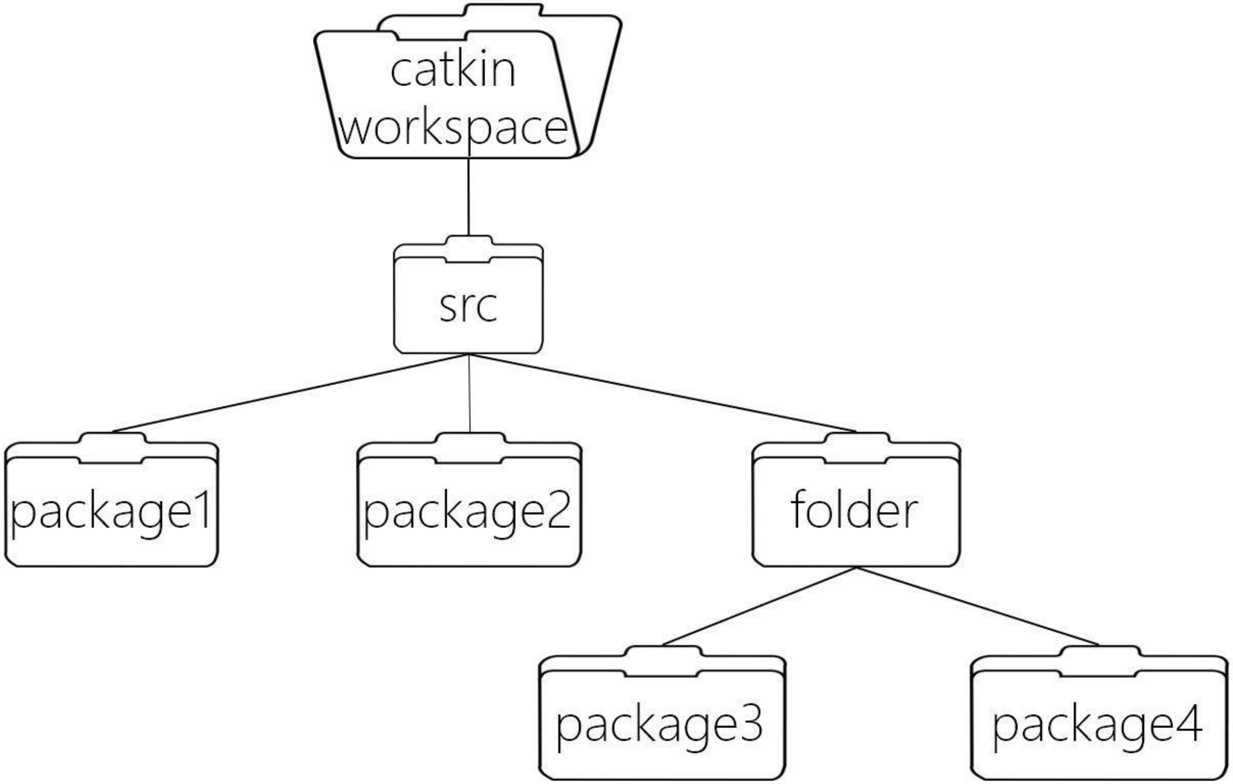
```
[1]+  Done                    gedit t_p.yaml
user@user-virtual-machine:~/catkin_ws$ rosparam load t_p.yaml
user@user-virtual-machine:~/catkin_ws$ rosservice call /clear

user@user-virtual-machine:~/catkin_ws$ rosparam get /
rosdistro: 'noetic

  '
roslaunch:
  uris:
    host_user_virtual_machine__36723: http://user-virtual-machine:36723/
rosversion: '1.15.15

  '
run_id: 1036f052-dd1d-11ed-a30b-fd2963f997ae
turtlesim:
  background_b: 20
  background_g: 20
  background_r: 220

user@user-virtual-mach
```

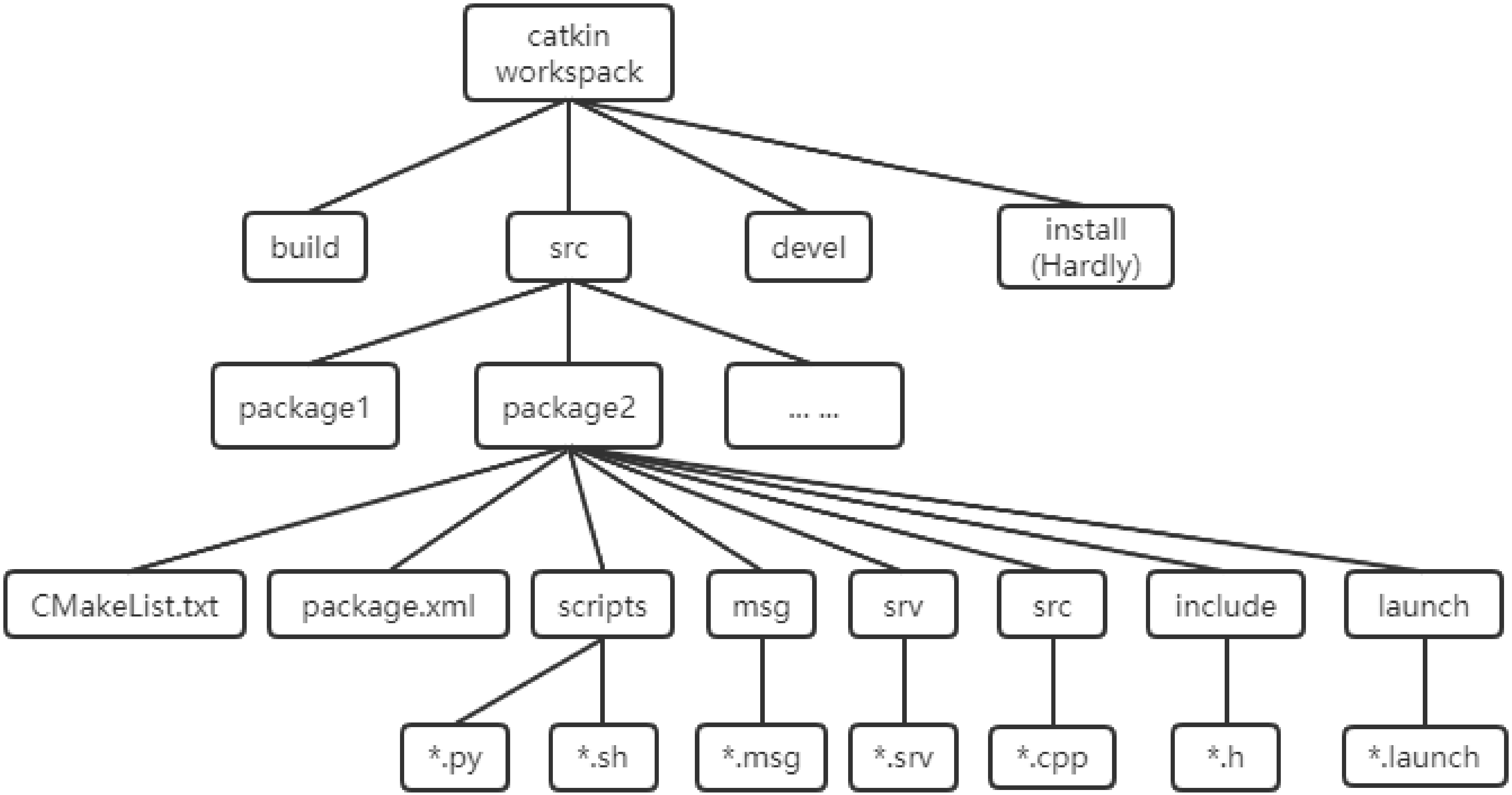
```yaml
rosdistro: 'noetic

  '
roslaunch:
  uris:
    host_user_virtual_machine__36723: http://user-virtual-machine:36723/
rosversion: '1.15.15

  '
run_id: 1036f052-dd1d-11ed-a30b-fd2963f997ae
turtlesim:
  background_b: 20
  background_g: 20
  background_r: 220
```

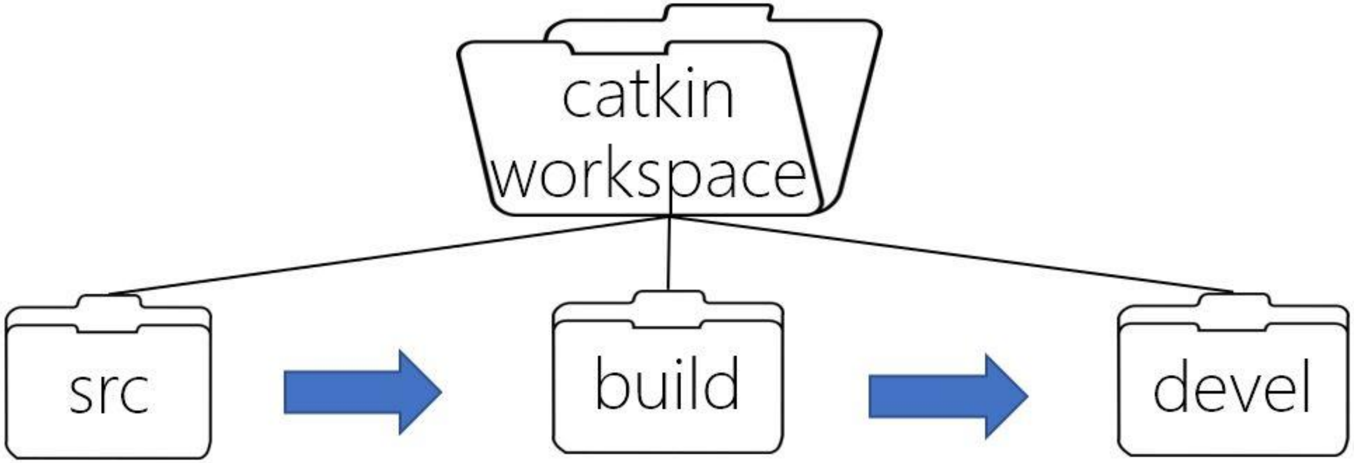
rosparam load
~/home/user/catkin_ws/t_p.yaml
rosservice call /clear
rosparam get /
rosparam get /turtlesim/background_r

ros node coding

ROS PARAMETER


catkin workspace
src
package1
package2
folder
package3
package4


catkin workspack
build
src
devel
install (Hardly)
package1
package2
... ...
CMakeList.txt
package.xml
scripts
msg
srv
src
include
launch
*.py
*.sh
*.msg
*.srv
*.cpp
*.h
*.launch



catkin workspace

src

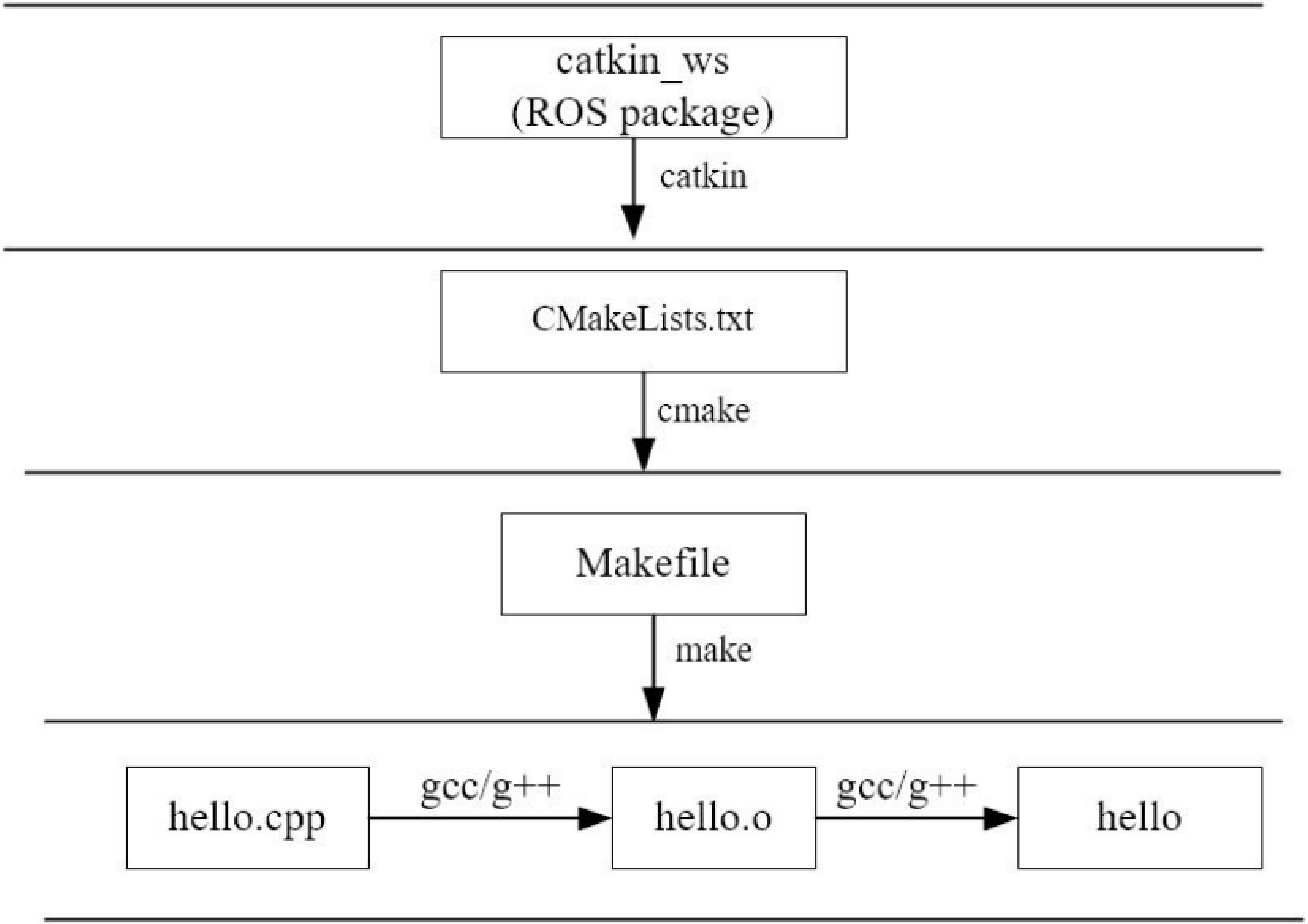
build

devel

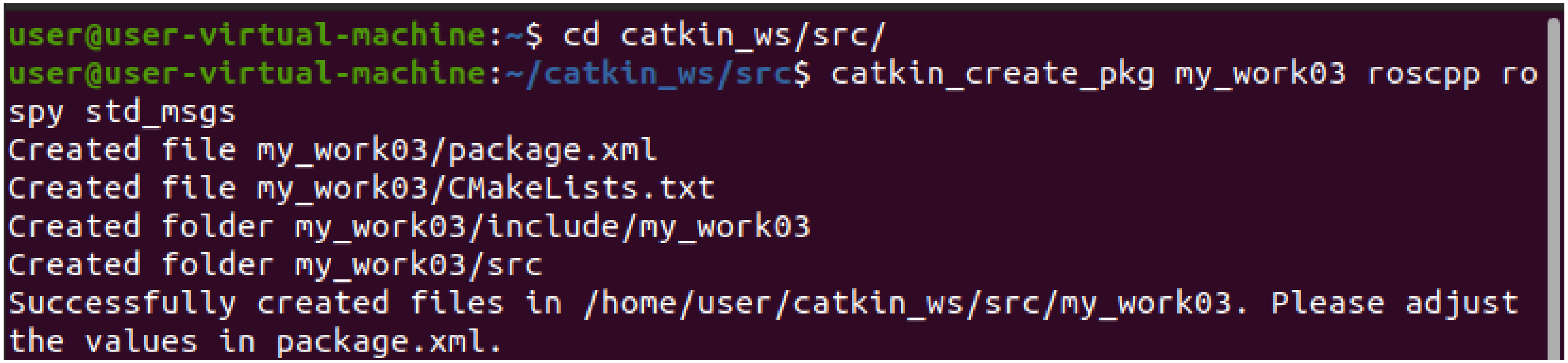
package源代码包

cmake&catkin缓存和中间文件

目标文件


catkin_ws
(ROS package)
catkin
CMakeLists.txt
cmake
Makefile
make
hello.cpp
gcc/g++
hello.o
gcc/g++
hello

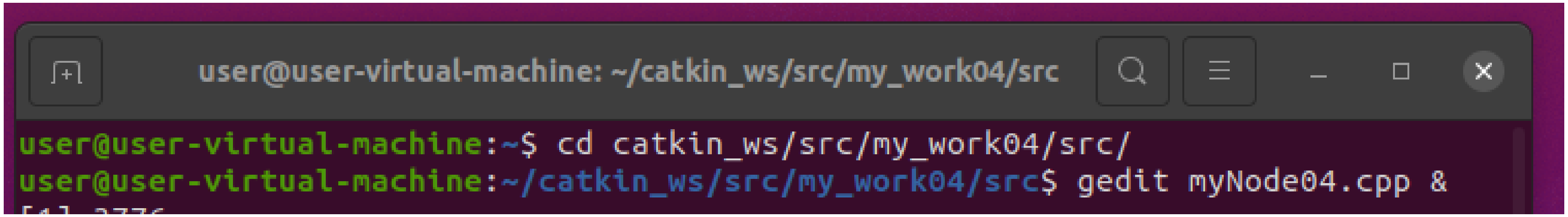
ros node 01



```
user@user-virtual-machine:~$ cd catkin_ws/src/
user@user-virtual-machine:~/catkin_ws/src$ catkin_create_pkg my_work03 roscpp ro
spy std_msgs
Created file my_work03/package.xml
Created file my_work03/CMakeLists.txt
Created folder my_work03/include/my_work03
Created folder my_work03/src
Successfully created files in /home/user/catkin_ws/src/my_work03. Please adjust
the values in package.xml.
```

```
cd catkin_ws/src/
catkin_create_pkg my_work04 roscpp rospy std_msgs
ls
```

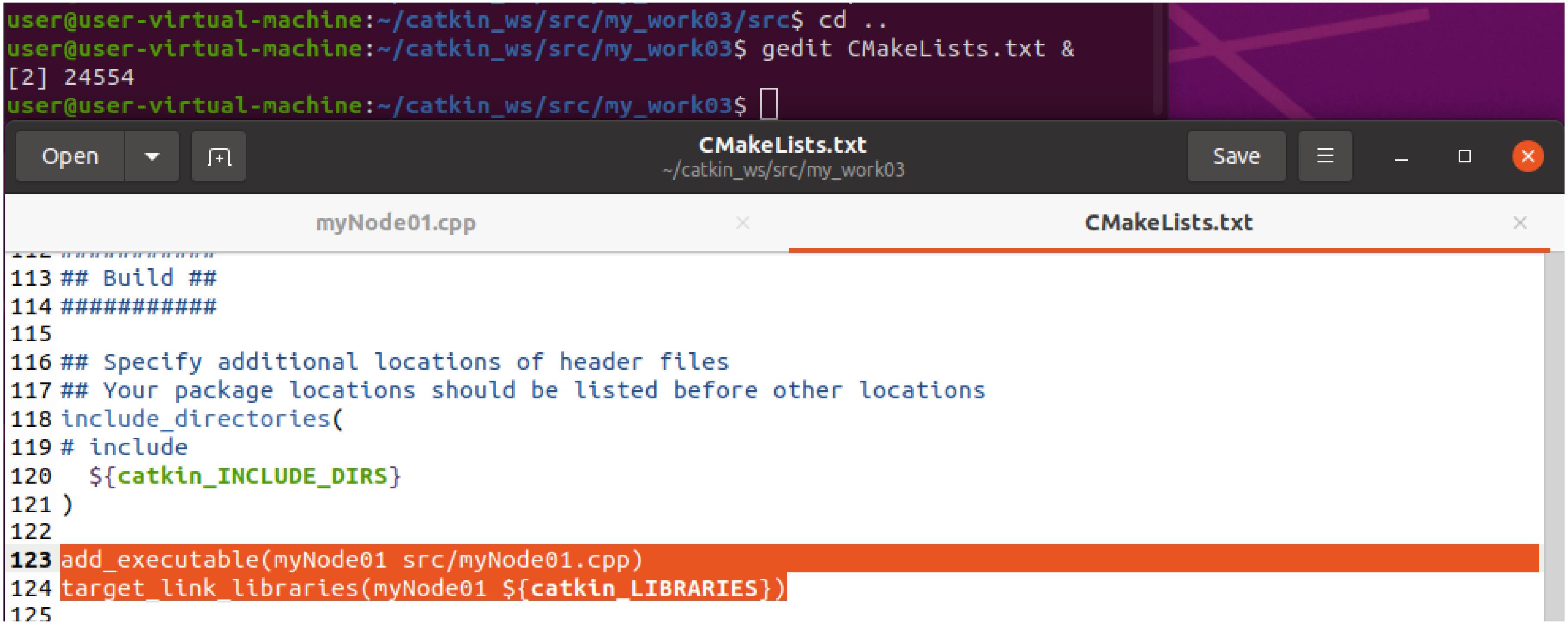
ros node 02



```
user@user-virtual-machine:~$ cd catkin_ws/src/my_work04/src/
user@user-virtual-machine:~/catkin_ws/src/my_work04/src$ gedit myNode04.cpp &
[1] 2776
```

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

int main(int argc, char **argv)
{
  ros::init(argc, argv, "myNode04");
  ros::NodeHandle n;

  double dPeriod = 3;
  int iCnt = 0;
  while (ros::ok())
  {
    ROS_INFO("myNode04: hi :%d",iCnt++);
    ros::spinOnce();
    ros::Duration(dPeriod).sleep();
  }
  return 0;
}
```

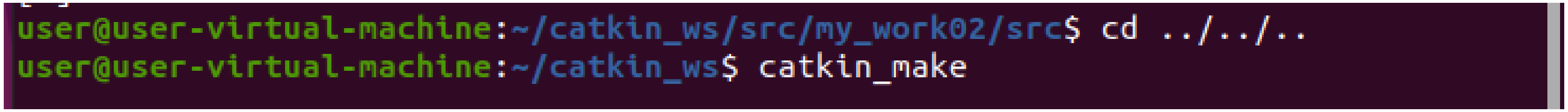
ros node 03



```
user@user-virtual-machine:~/catkin_ws/src/my_work03/src$ cd ..
user@user-virtual-machine:~/catkin_ws/src/my_work03$ gedit CMakeLists.txt &
[2] 24554
user@user-virtual-machine:~/catkin_ws/src/my_work03$
```

```
## Build ##
###########

## Specify additional locations of header files
## Your package locations should be listed before other locations
include_directories(
# include
  ${catkin_INCLUDE_DIRS}
)

add_executable(myNode01 src/myNode01.cpp)
target_link_libraries(myNode01 ${catkin_LIBRARIES})
```

```
add_executable(myNode04 src/myNode04.cpp)
target_link_libraries(myNode04 ${catkin_LIBRARIES})
```

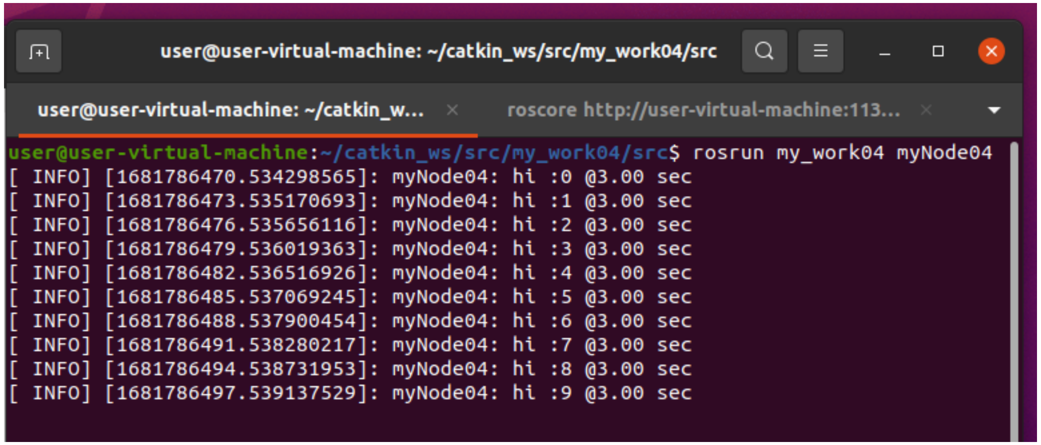


```
user@user-virtual-machine:~/catkin_ws/src/my_work02/src$ cd ../../..
user@user-virtual-machine:~/catkin_ws$ catkin_make
```

```
cd ~/catkin_ws
catkin_make
```

編譯程式

ros node 04



user@user-virtual-machine: ~/catkin_ws/src/my_work04/src
user@user-virtual-machine: ~/catkin_w...
roscore http://user-virtual-machine:113...

```
user@user-virtual-machine:~/catkin_ws/src/my_work04/src$ rosrun my_work04 myNode04
[ INFO] [1681786470.534298565]: myNode04: hi :0 @3.00 sec
[ INFO] [1681786473.535170693]: myNode04: hi :1 @3.00 sec
[ INFO] [1681786476.535656116]: myNode04: hi :2 @3.00 sec
[ INFO] [1681786479.536019363]: myNode04: hi :3 @3.00 sec
[ INFO] [1681786482.536516926]: myNode04: hi :4 @3.00 sec
[ INFO] [1681786485.537069245]: myNode04: hi :5 @3.00 sec
[ INFO] [1681786488.537900454]: myNode04: hi :6 @3.00 sec
[ INFO] [1681786491.538280217]: myNode04: hi :7 @3.00 sec
[ INFO] [1681786494.538731953]: myNode04: hi :8 @3.00 sec
[ INFO] [1681786497.539137529]: myNode04: hi :9 @3.00 sec
```

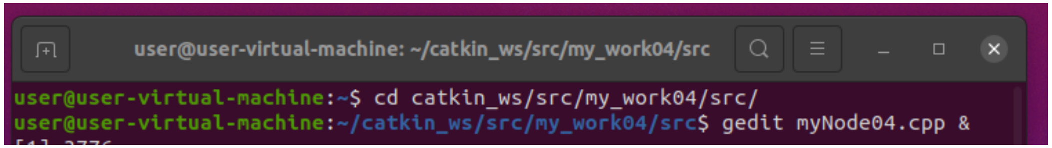
roscore
rosrun my_work04 myNode04

ros node coding

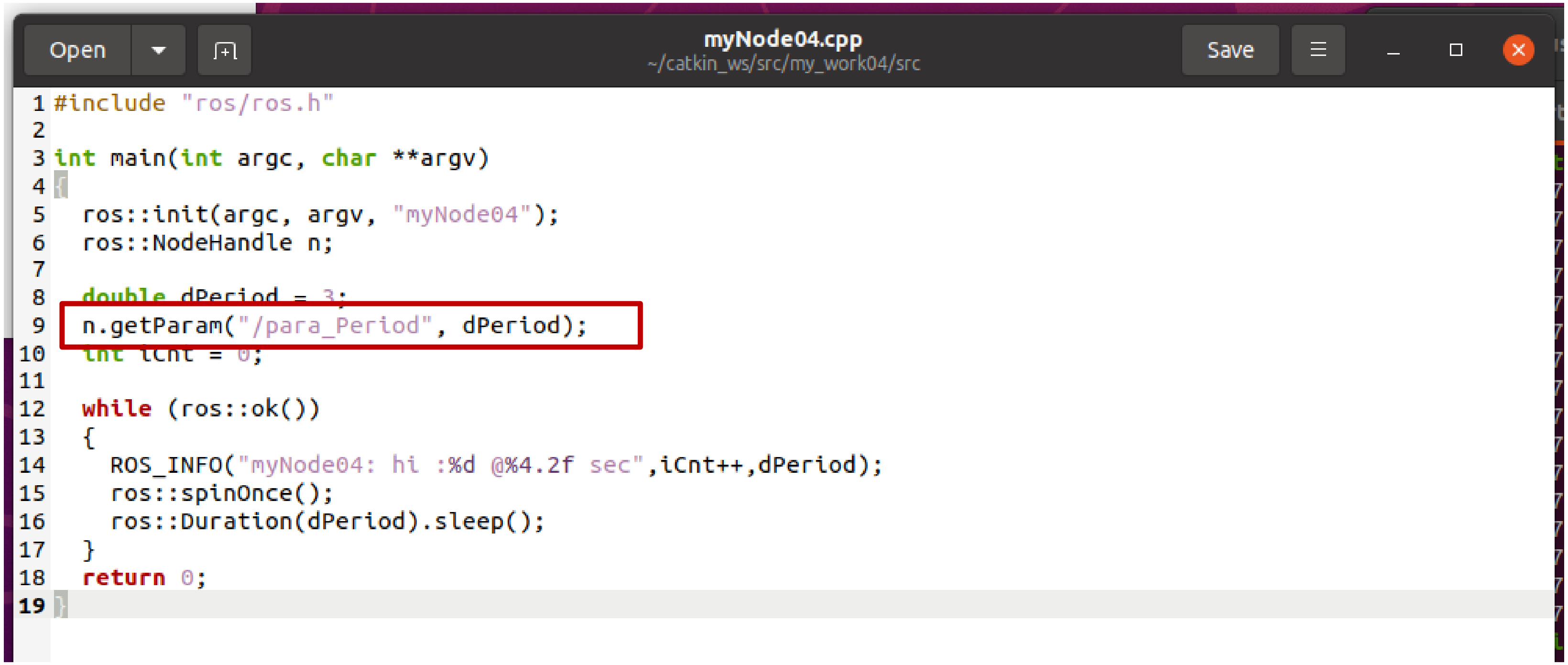
ROS PARAMETER

ros parameter 01

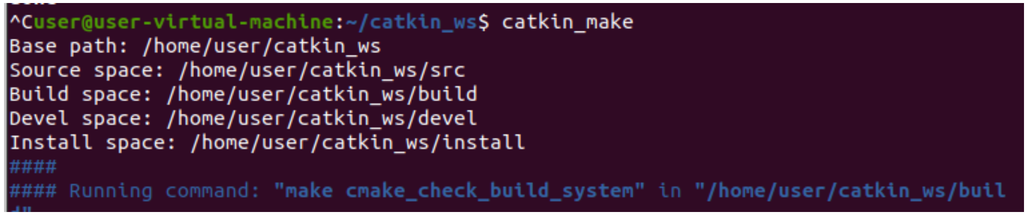
https://github.com/Waywrong/ros_course/



```
user@user-virtual-machine:~$ cd catkin_ws/src/my_work04/src/
user@user-virtual-machine:~/catkin_ws/src/my_work04/src$ gedit myNode04.cpp &
[1] 2776
```



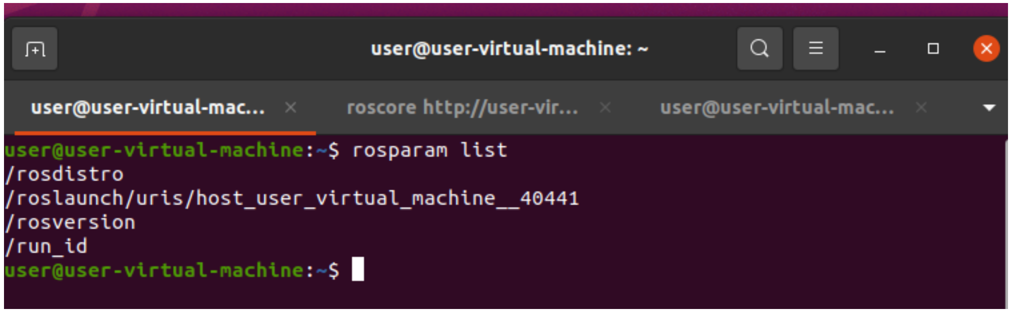
```cpp
#include "ros/ros.h"

int main(int argc, char **argv)
{
  ros::init(argc, argv, "myNode04");
  ros::NodeHandle n;

  double dPeriod = 3;
  n.getParam("/para_Period", dPeriod);
  int iCnt = 0;

  while (ros::ok())
  {
    ROS_INFO("myNode04: hi :%d @%4.2f sec",iCnt++,dPeriod);
    ros::spinOnce();
    ros::Duration(dPeriod).sleep();
  }
  return 0;
}
```



```
^Cuser@user-virtual-machine:~/catkin_ws$ catkin_make
Base path: /home/user/catkin_ws
Source space: /home/user/catkin_ws/src
Build space: /home/user/catkin_ws/build
Devel space: /home/user/catkin_ws/devel
Install space: /home/user/catkin_ws/install
####
#### Running command: "make cmake_check_build_system" in "/home/user/catkin_ws/buil
```

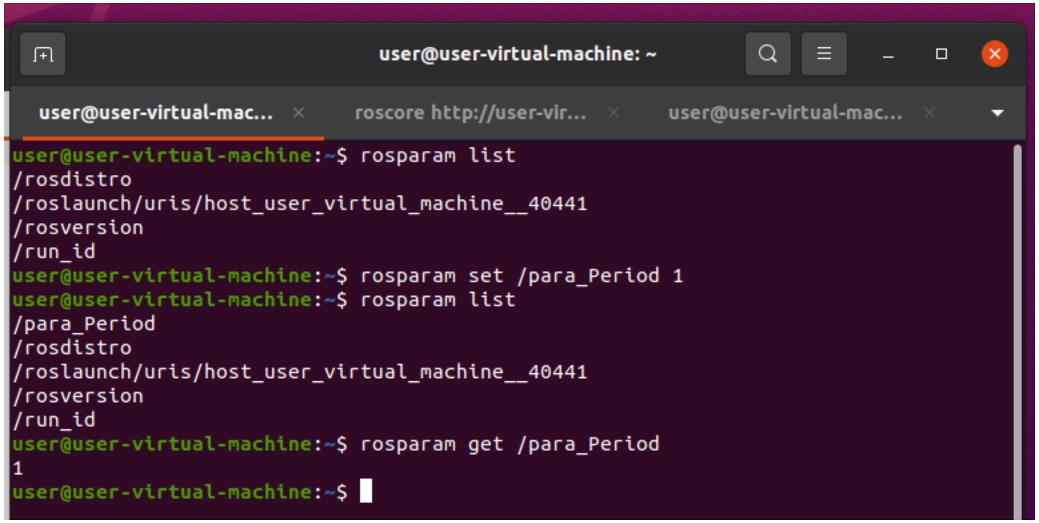
ros parameter 02

roscore
rosparam list



```
user@user-virtual-machine:~$ rosparam list
/rosdistro
/roslaunch/uris/host_user_virtual_machine__40441
/rosversion
/run_id
user@user-virtual-machine:~$
```

rosparam set /para_Period 1
rosparam list

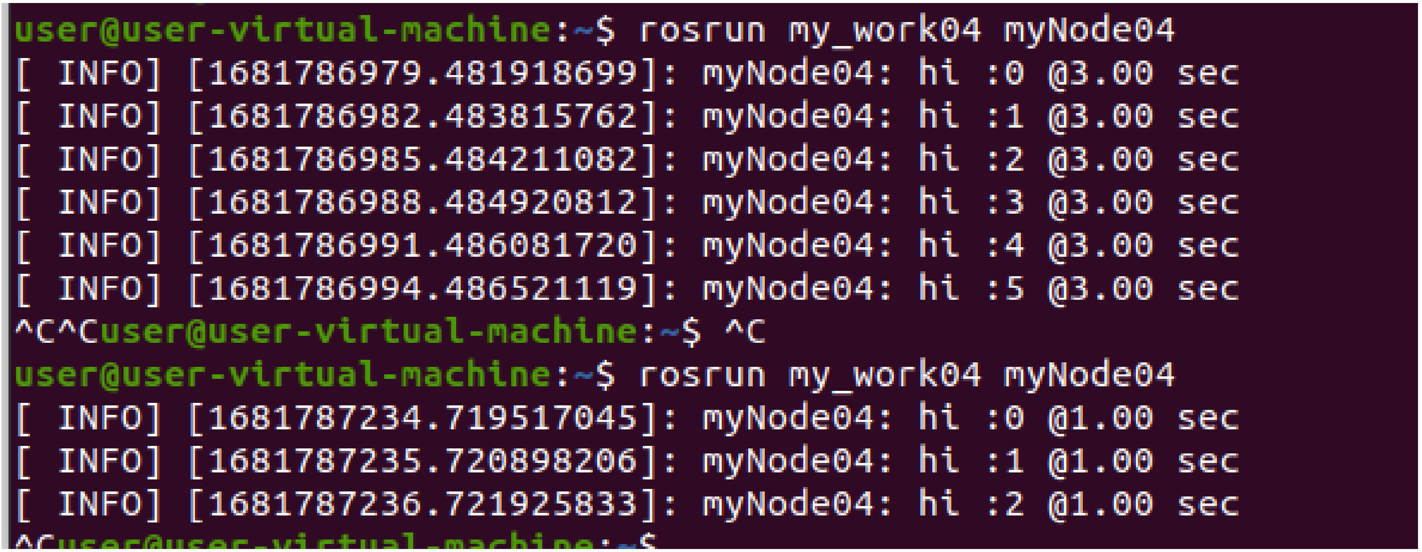


```
user@user-virtual-machine:~$ rosparam list
/rosdistro
/roslaunch/uris/host_user_virtual_machine__40441
/rosversion
/run_id
user@user-virtual-machine:~$ rosparam set /para_Period 1
user@user-virtual-machine:~$ rosparam list
/para_Period
/rosdistro
/roslaunch/uris/host_user_virtual_machine__40441
/rosversion
/run_id
user@user-virtual-machine:~$ rosparam get /para_Period
1
user@user-virtual-machine:~$
```

ros parameter 03

rosrun my_work04 myNode04
rosparam get /para_Period

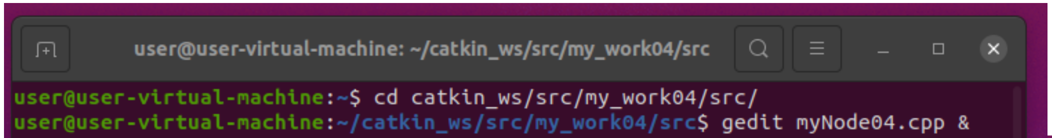
注意目前的寫法，rosparam set /para_Period 5
會沒辦法套用上，解法看後續PPT



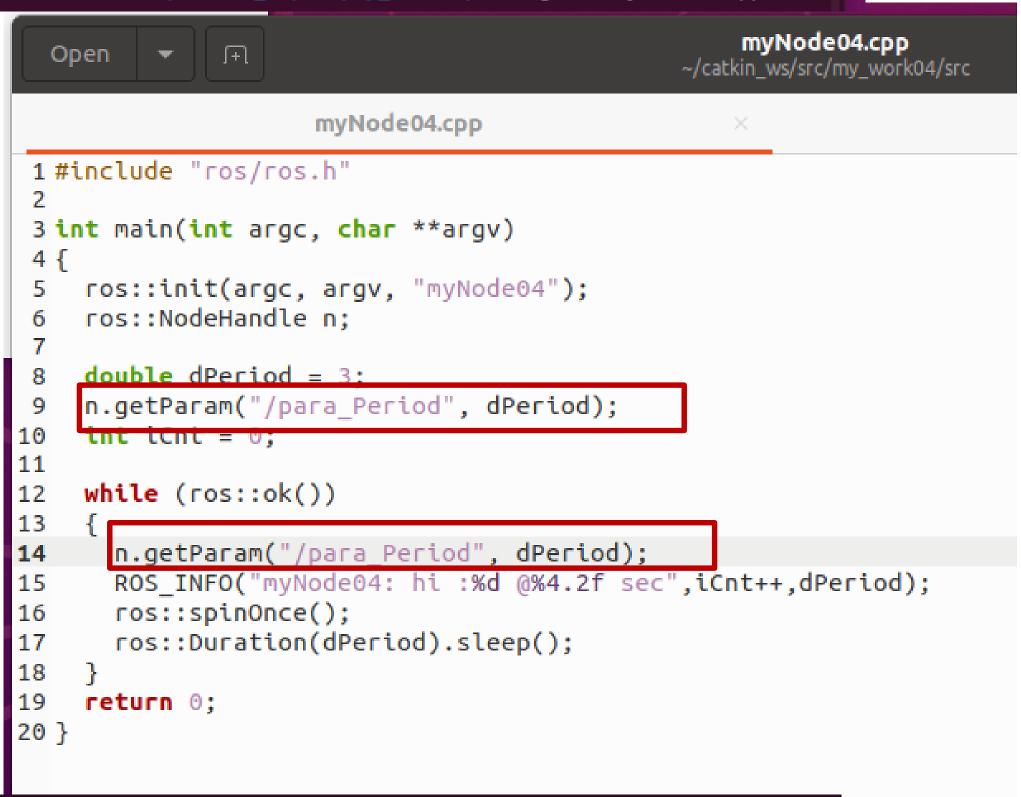
```
user@user-virtual-machine:~$ rosrun my_work04 myNode04
[ INFO] [1681786979.481918699]: myNode04: hi :0 @3.00 sec
[ INFO] [1681786982.483815762]: myNode04: hi :1 @3.00 sec
[ INFO] [1681786985.484211082]: myNode04: hi :2 @3.00 sec
[ INFO] [1681786988.484920812]: myNode04: hi :3 @3.00 sec
[ INFO] [1681786991.486081720]: myNode04: hi :4 @3.00 sec
[ INFO] [1681786994.486521119]: myNode04: hi :5 @3.00 sec
^C^Cuser@user-virtual-machine:~$ ^C
user@user-virtual-machine:~$ rosrun my_work04 myNode04
[ INFO] [1681787234.719517045]: myNode04: hi :0 @1.00 sec
[ INFO] [1681787235.720898206]: myNode04: hi :1 @1.00 sec
[ INFO] [1681787236.721925833]: myNode04: hi :2 @1.00 sec
^Cuser@user-virtual-machine:~$
```

ros parameter 04

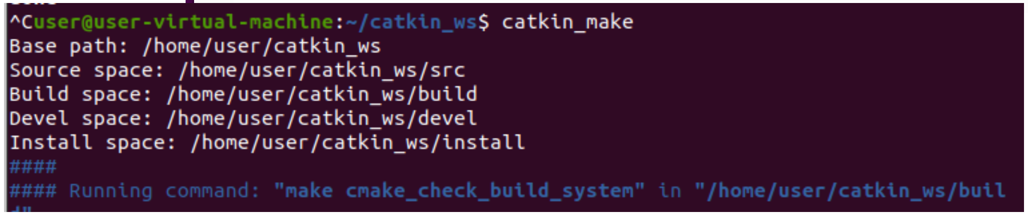
https://github.com/Waywrong/ros_course/



```
user@user-virtual-machine:~$ cd catkin_ws/src/my_work04/src/
user@user-virtual-machine:~/catkin_ws/src/my_work04/src$ gedit myNode04.cpp &
[1] 2776
```



```cpp
#include "ros/ros.h"

int main(int argc, char **argv)
{
  ros::init(argc, argv, "myNode04");
  ros::NodeHandle n;

  double dPeriod = 3;
  n.getParam("/para_Period", dPeriod);
  int iCnt = 0;

  while (ros::ok())
  {
    n.getParam("/para_Period", dPeriod);
    ROS_INFO("myNode04: hi :%d @%4.2f sec",iCnt++,dPeriod);
    ros::spinOnce();
    ros::Duration(dPeriod).sleep();
  }
  return 0;
}
```

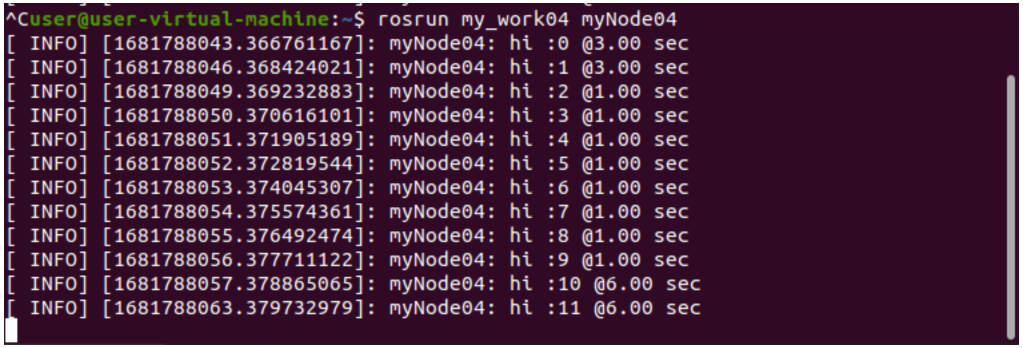


```
^Cuser@user-virtual-machine:~/catkin_ws$ catkin_make
Base path: /home/user/catkin_ws
Source space: /home/user/catkin_ws/src
Build space: /home/user/catkin_ws/build
Devel space: /home/user/catkin_ws/devel
Install space: /home/user/catkin_ws/install
####
#### Running command: "make cmake_check_build_system" in "/home/user/catkin_ws/buil
```

ros parameter 03

rosrun my_work04 myNode04
rosparam get /para_Period

rosparam set /para_Period 1
rosparam set /para_Period 6

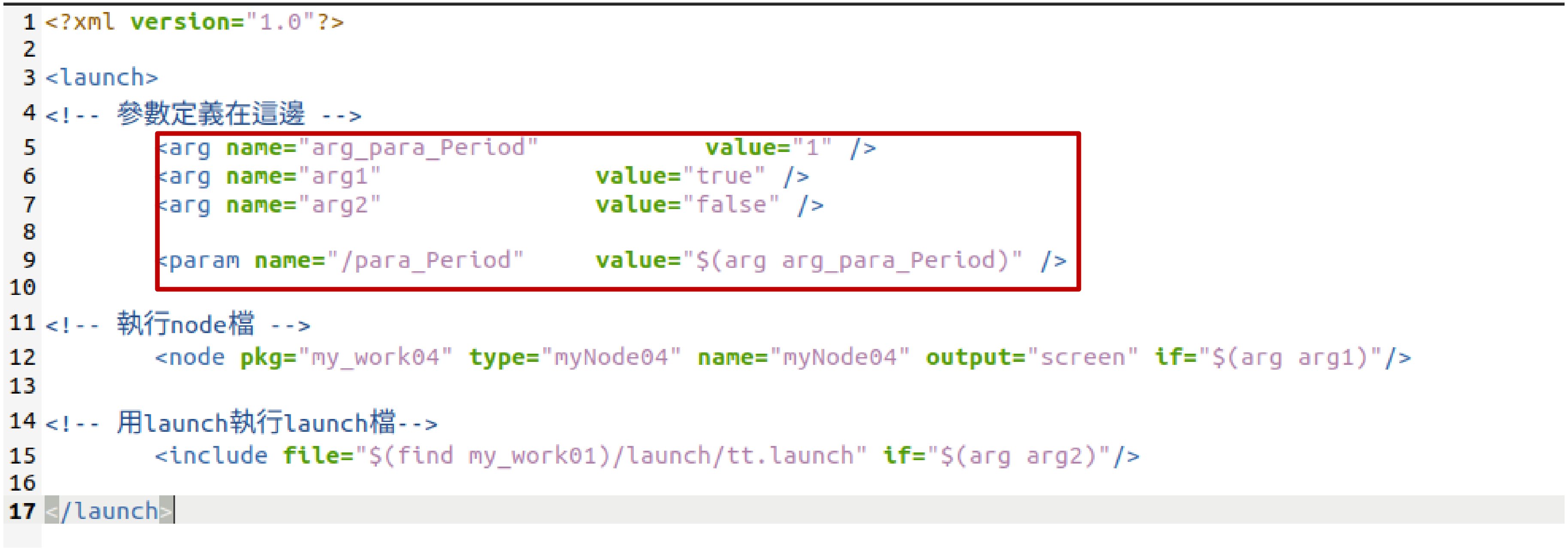


```
^Cuser@user-virtual-machine:~$ rosrun my_work04 myNode04
[ INFO] [1681788043.366761167]: myNode04: hi :0 @3.00 sec
[ INFO] [1681788046.368424021]: myNode04: hi :1 @3.00 sec
[ INFO] [1681788049.369232883]: myNode04: hi :2 @1.00 sec
[ INFO] [1681788050.370616101]: myNode04: hi :3 @1.00 sec
[ INFO] [1681788051.371905189]: myNode04: hi :4 @1.00 sec
[ INFO] [1681788052.372819544]: myNode04: hi :5 @1.00 sec
[ INFO] [1681788053.374045307]: myNode04: hi :6 @1.00 sec
[ INFO] [1681788054.375574361]: myNode04: hi :7 @1.00 sec
[ INFO] [1681788055.376492474]: myNode04: hi :8 @1.00 sec
[ INFO] [1681788056.377711122]: myNode04: hi :9 @1.00 sec
[ INFO] [1681788057.378865065]: myNode04: hi :10 @6.00 sec
[ INFO] [1681788063.379732979]: myNode04: hi :11 @6.00 sec
```

ros launch

ROS PARAMETER

roslaunch



```
<?xml version="1.0"?>

<launch>
<!-- 參數定義在這邊 -->
        <arg name="arg_para_Period"           value="1" />
        <arg name="arg1"              value="true" />
        <arg name="arg2"              value="false" />

        <param name="/para_Period"    value="$(arg arg_para_Period)" />

<!-- 執行node檔 -->
        <node pkg="my_work04" type="myNode04" name="myNode04" output="screen" if="$(arg arg1)"/>

<!-- 用launch執行launch檔-->
        <include file="$(find my_work01)/launch/tt.launch" if="$(arg arg2)"/>

</launch>
```

roslaunch my_work04 my_work04.launch