19、ROS2 Launch启动文件配置

1、launch介绍

到目前为止，每当我们运行一个ROS节点，都需要打开一个新的终端运行一个命令。机器人系统中节点很多，每次都这样启动好麻烦呀。有没有一种方式可以一次性启动所有节点呢？答案当然是肯定的，那就是Launch启动文件，它是ROS系统中多节点启动与配置的一种脚本。

ROS2中，launch用于多节点启动和配置程序运行参数等功能，ROS2的launch文件格式有xml、yaml和python格式。本节课程以python格式的launch文件为例，相对于另外两种格式，python格式的更加灵活：

- python拥有众多的函数库，可以在启动文件中使用；
- ROS2通用启动特性和特定启动特性是用Python编写的，因此可以访问XML和YAML可能没有公开的启动特性；

使用python语言编写ROS2 launch文件，最主要的是把每个节点、文件、脚本等抽象成一个action，用统一的接口来启动。

参考资料：

- launch系统设计文档:ROS 2 launch系统设计文档
- launch官方API文档：launch API文档（随官方更新）

- 准备工作，创建功能包存放程序文件

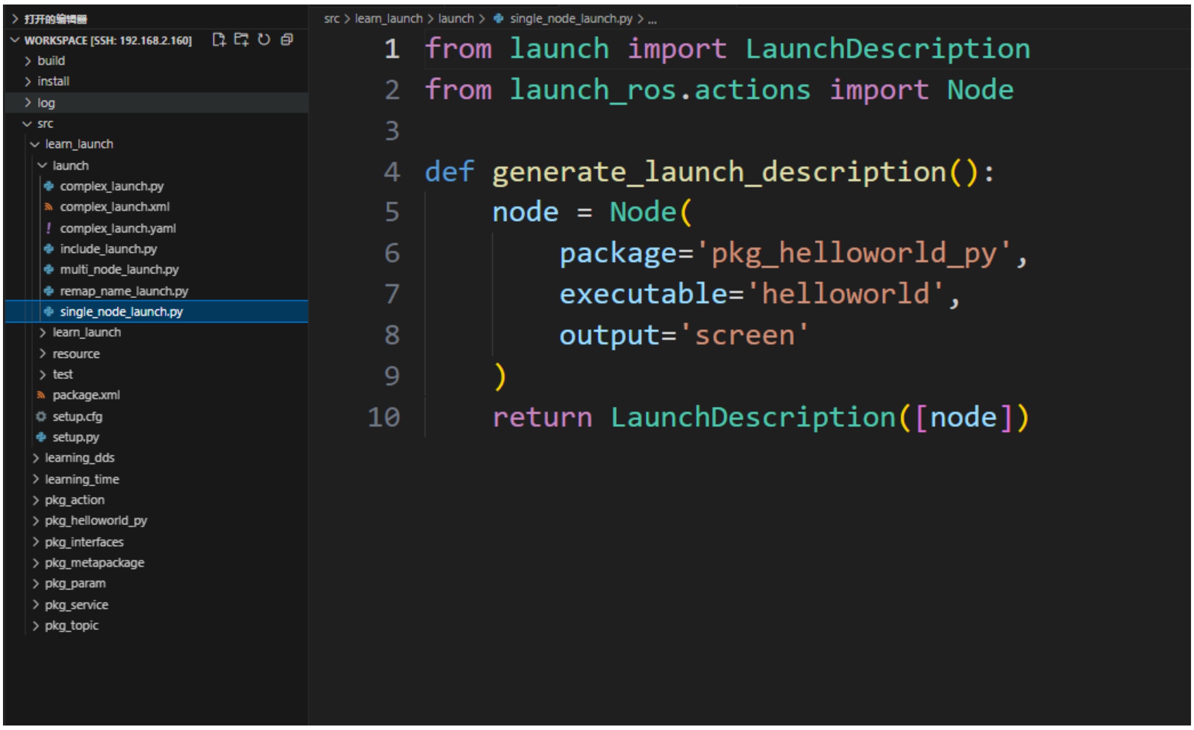
```
ros2 pkg create learn_launch --build-type ament_python
```

2、编写单个Node节点的launch

2.1、新建launch文件

在功能包下新建一个launch文件夹，然后在launch文件夹内新建【single_node_launch.py】文件，把以下内容复制到该文件中：

```
from launch import LaunchDescription
from launch_ros.actions import Node

def generate_launch_description():
    node = Node(
        package='pkg_helloworld_py',
        executable='helloworld',
        output='screen'
    )
    return LaunchDescription([node])
```

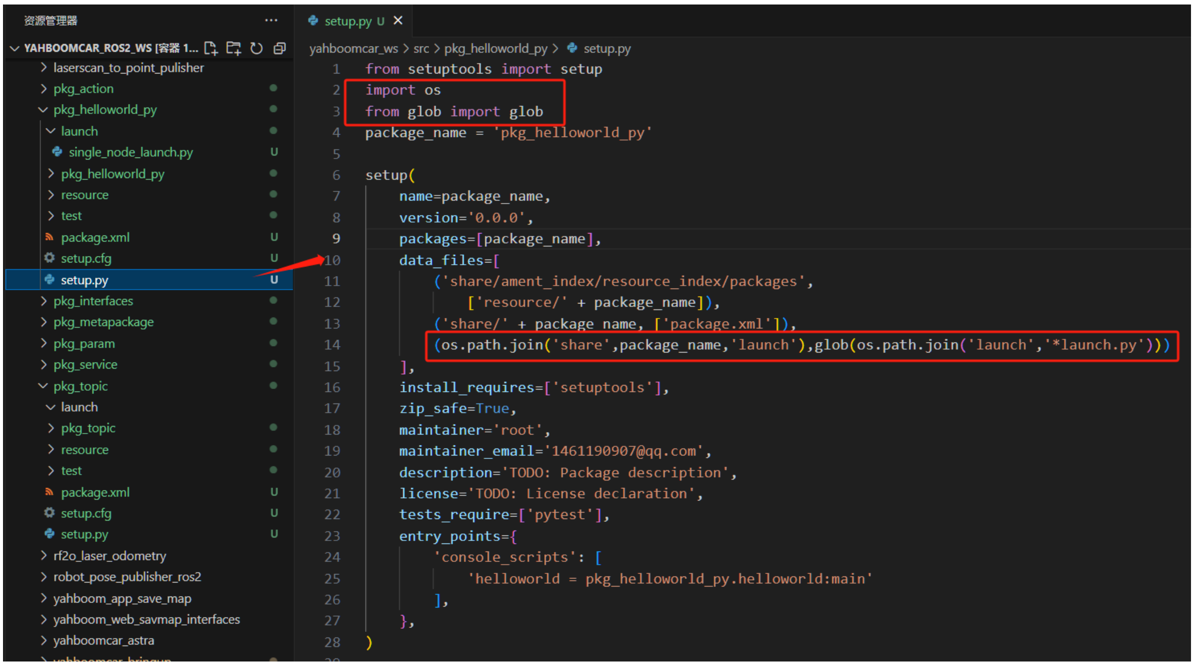


```
from launch import LaunchDescription
from launch_ros.actions import Node

def generate_launch_description():
    node = Node(
        package='pkg_helloworld_py',
        executable='helloworld',
        output='screen'
    )
    return LaunchDescription([node])
```

2.2、配置setup.py文件

launch文件命名常以LaunchName_launch.py，其中，LaunchName自定义，_launch.py是常认为固定的。需要修改功能包下的setup.py文件，修改内容为添加launch路径下的文件，编译才能生成执行的.py文件，

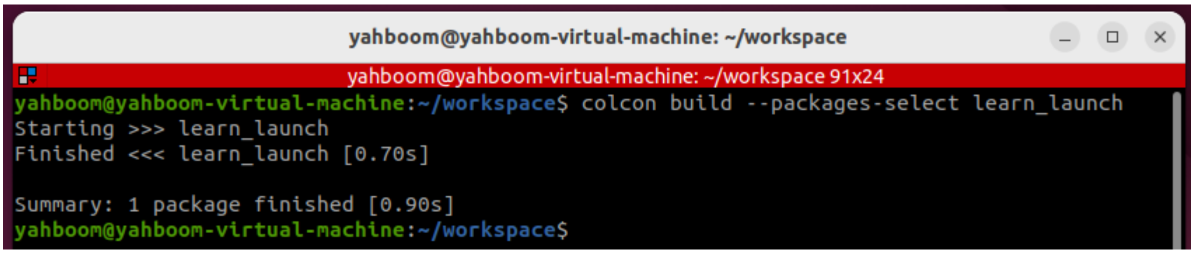
```
#1、导入相关的头文件
import os
from glob import glob

#2、在data_files的列表中，加上launch路径以及路径下的launch.py文件
(os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch
.py')))
```



```python
from setuptools import setup
import os
from glob import glob
package_name = 'pkg_helloworld_py'

setup(
    name=package_name,
    version='0.0.0',
    packages=[package_name],
    data_files=[
        ('share/ament_index/resource_index/packages',
            ['resource/' + package_name]),
        ('share/' + package_name, ['package.xml']),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.py')))
    ],
    install_requires=['setuptools'],
    zip_safe=True,
    maintainer='root',
    maintainer_email='1461190907@qq.com',
    description='TODO: Package description',
    license='TODO: License declaration',
    tests_require=['pytest'],
    entry_points={
        'console_scripts': [
            'helloworld = pkg_helloworld_py.helloworld:main'
        ],
    },
)
```

2.3、编译功能包

```
colcon build --packages-select learn_launch
```

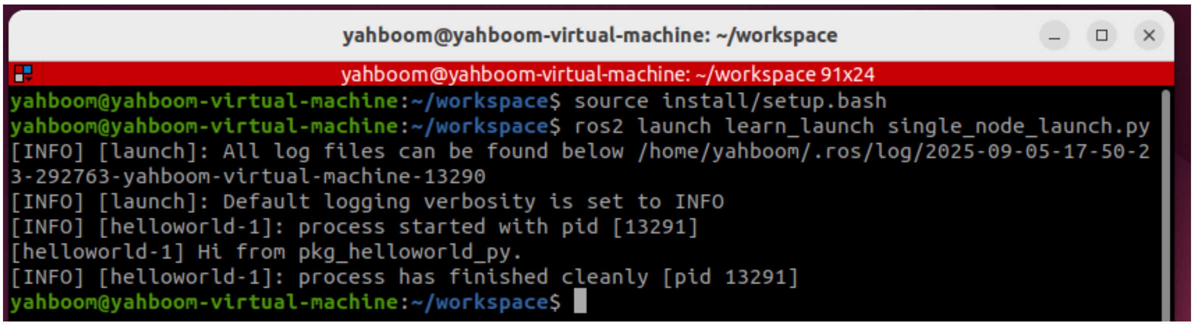

yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

2.4、运行程序

- 刷新环境变量，然后运行launch文件

```
ros2 launch learn_launch single_node_launch.py
```


yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ source install/setup.bash
yahboom@yahboom-virtual-machine:~/workspace$ ros2 launch learn_launch single_node_launch.py
[INFO] [launch]: All log files can be found below /home/yahboom/.ros/log/2025-09-05-17-50-2
3-292763-yahboom-virtual-machine-13290
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [helloworld-1]: process started with pid [13291]
[helloworld-1] Hi from pkg_helloworld_py.
[INFO] [helloworld-1]: process has finished cleanly [pid 13291]
yahboom@yahboom-virtual-machine:~/workspace$
```

2.5、源码分析

1、导入相关库

```
from launch import LaunchDescription
from launch_ros.actions import Node
```

2、定义一个函数generate_launch_description，并且返回一个launch_description

```
def generate_launch_description():
    node = Node(
        package='pkg_helloworld_py',
        executable='helloworld',
    )
    return LaunchDescription([node])
```

定义了一个变量node作为一个节点启动的返回值，调用Node函数，启动重要的两个参数，package和executable。

- package：表示功能包，代表功能包的名字。
- executable：表示执行的程序，可执行程序的名字。

最后调用LaunchDescription函数传入node参数执行返回。

```
return LaunchDescription([node])
```

3、编写多个Node节点的launch

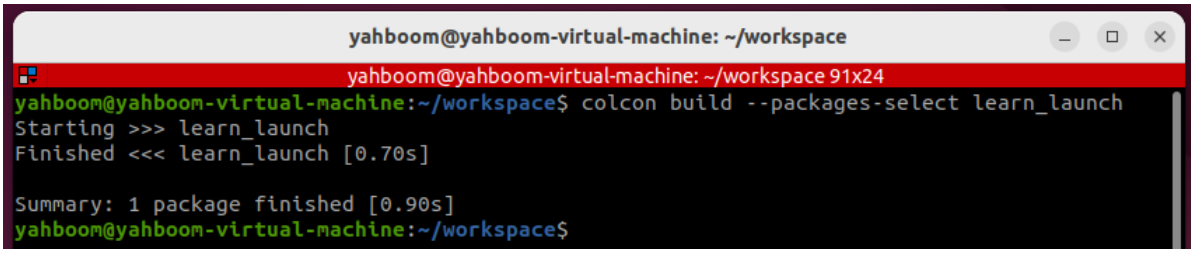
3.1、新建launch文件

新建【multi_node_launch.py】文件，添加如下内容：

```
from launch import LaunchDescription
from launch_ros.actions import Node

def generate_launch_description():
    publisher_node = Node(
        package='pkg_topic',
        executable='publisher_demo',
        output='screen'
    )
    subscriber_node = Node(
        package='pkg_topic',
        executable='subscriber_demo',
        output='screen'
    )
    return LaunchDescription([
        publisher_node,
        subscriber_node
    ])
```

3.2、编译功能包

```
colcon build --packages-select learn_launch
```

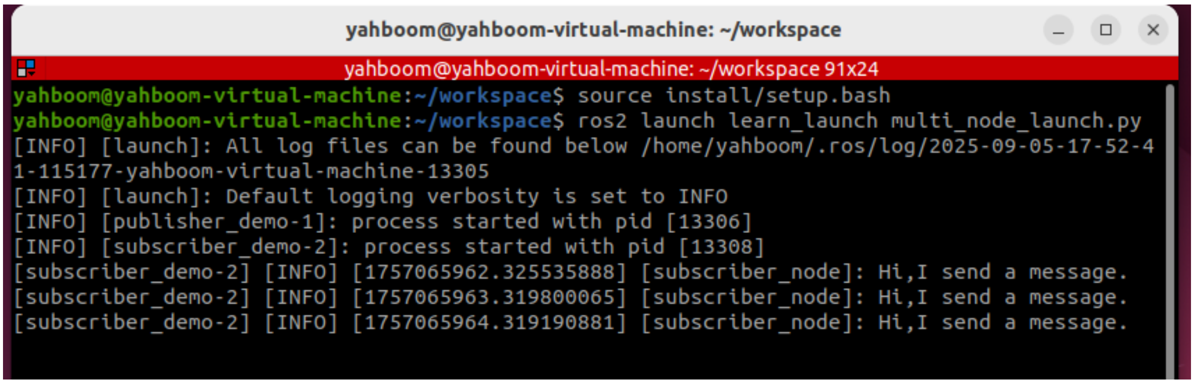

yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

3.3、运行程序

- 刷新环境变量，然后运行launch文件

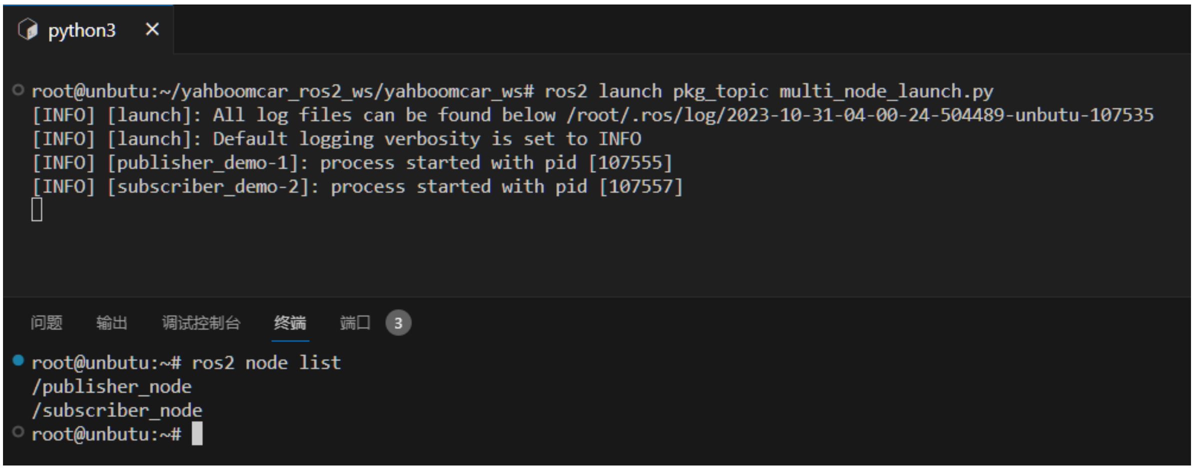
```
ros2 launch learn_launch multi_node_launch.py
```


yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ source install/setup.bash
yahboom@yahboom-virtual-machine:~/workspace$ ros2 launch learn_launch multi_node_launch.py
[INFO] [launch]: All log files can be found below /home/yahboom/.ros/log/2025-09-05-17-52-4
1-115177-yahboom-virtual-machine-13305
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [publisher_demo-1]: process started with pid [13306]
[INFO] [subscriber_demo-2]: process started with pid [13308]
[subscriber_demo-2] [INFO] [1757065962.325535888] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757065963.319800065] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757065964.319190881] [subscriber_node]: Hi,I send a message.
```

如果终端没有打印内容，我们可以查看哪些节点启动 来验证是否有启动成功，终端输入：

```
ros2 node list
```



```
root@unbutu:~/yahboomcar_ros2_ws/yahboomcar_ws# ros2 launch pkg_topic multi_node_launch.py
[INFO] [launch]: All log files can be found below /root/.ros/log/2023-10-31-04-00-24-504489-unbutu-107535
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [publisher_demo-1]: process started with pid [107555]
[INFO] [subscriber_demo-2]: process started with pid [107557]
```

```
root@unbutu:~# ros2 node list
/publisher_node
/subscriber_node
root@unbutu:~#
```

3.4、源码解析

大致与simple_node_launch.py差不多，不过是多了一个节点。

4、话题重映射案例

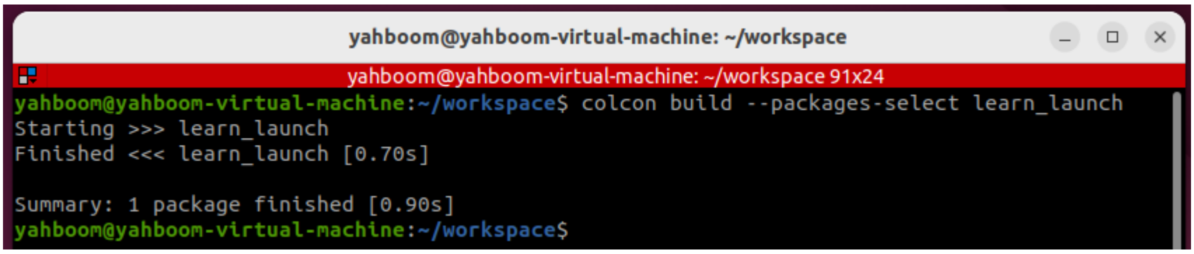
4.1、新建launch文件

在multi_node_launch.py同级目录下新建【remap_name_launch.py】文件，添加如下内容：

```
from launch import LaunchDescription
from launch_ros.actions import Node

def generate_launch_description():
    publisher_node = Node(
        package='pkg_topic',
        executable='publisher_demo',
        output='screen',
        remappings=[("/topic_demo", "/topic_update")]
    )
    return LaunchDescription([
        publisher_node
    ])
```

4.2、编译功能包

```
colcon build --packages-select learn_launch
```



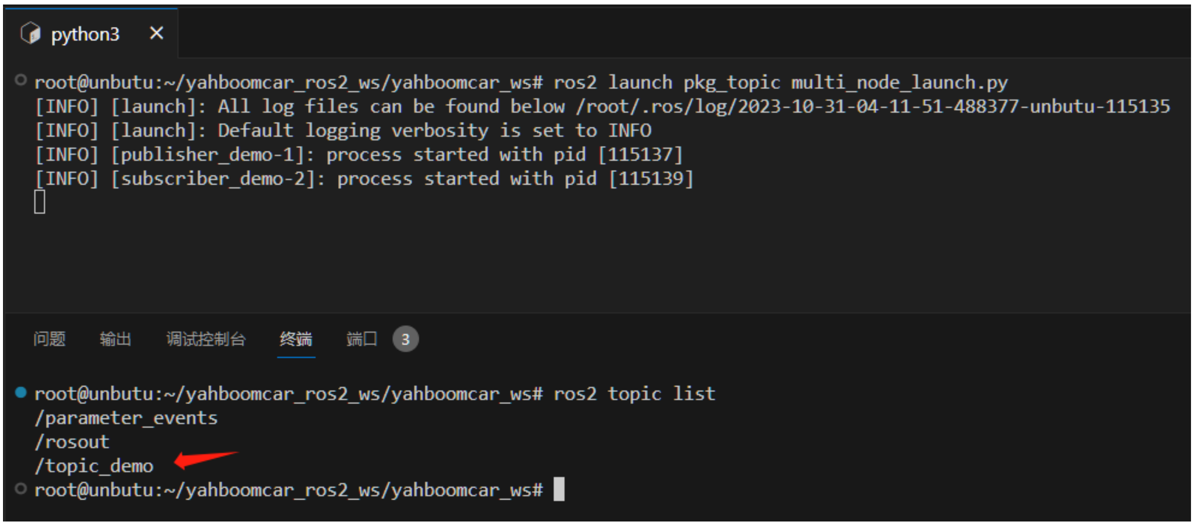
yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

4.3、运行程序

我们先看看没有重映射话题前，publisher_demo节点发布的话题是什么：

```
ros2 launch learn_launch multi_node_launch.py
ros2 topic list
```



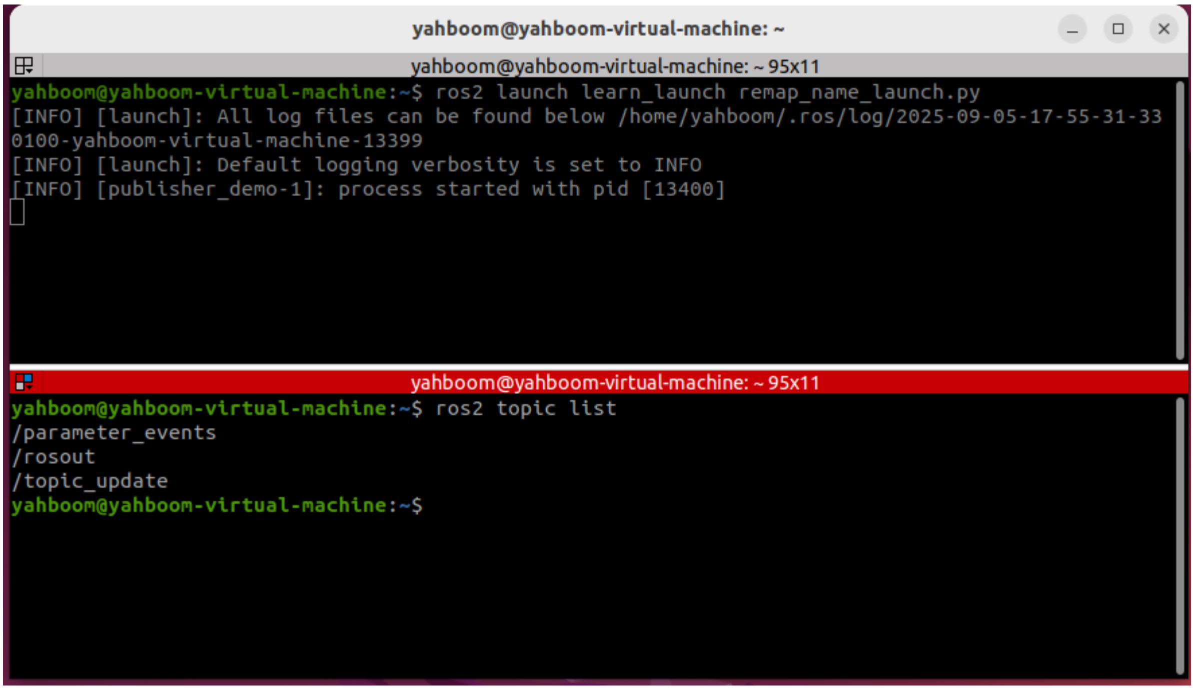
```
root@unbutu:~/yahboomcar_ros2_ws/yahboomcar_ws# ros2 launch pkg_topic multi_node_launch.py
[INFO] [launch]: All log files can be found below /root/.ros/log/2023-10-31-04-11-51-488377-unbutu-115135
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [publisher_demo-1]: process started with pid [115137]
[INFO] [subscriber_demo-2]: process started with pid [115139]
```

```
root@unbutu:~/yahboomcar_ros2_ws/yahboomcar_ws# ros2 topic list
/parameter_events
/rosout
/topic_demo
root@unbutu:~/yahboomcar_ros2_ws/yahboomcar_ws# 
```

这里的话题是【/topic_demo】

- 再刷新环境变量，运行重映射话题后的程序，看看变化：

```
ros2 launch learn_launch remap_name_launch.py
ros2 topic list
```



yahboom@yahboom-virtual-machine: ~
yahboom@yahboom-virtual-machine: ~ 95x11

```
yahboom@yahboom-virtual-machine:~$ ros2 launch learn_launch remap_name_launch.py
[INFO] [launch]: All log files can be found below /home/yahboom/.ros/log/2025-09-05-17-55-31-33
0100-yahboom-virtual-machine-13399
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [publisher_demo-1]: process started with pid [13400]
```

yahboom@yahboom-virtual-machine: ~ 95x11

```
yahboom@yahboom-virtual-machine:~$ ros2 topic list
/parameter_events
/rosout
/topic_update
yahboom@yahboom-virtual-machine:~$
```

由上图可知，重映射了话题名称为【/topic_update】

4.4、源码分析

主要是加了以下部分：

```
remappings=[("/topic_demo", "/topic_update")]
```

这里就是把原来的/topic_demo话题重映射成/topic_update

5、launch文件嵌套启动另一个launch文件案例

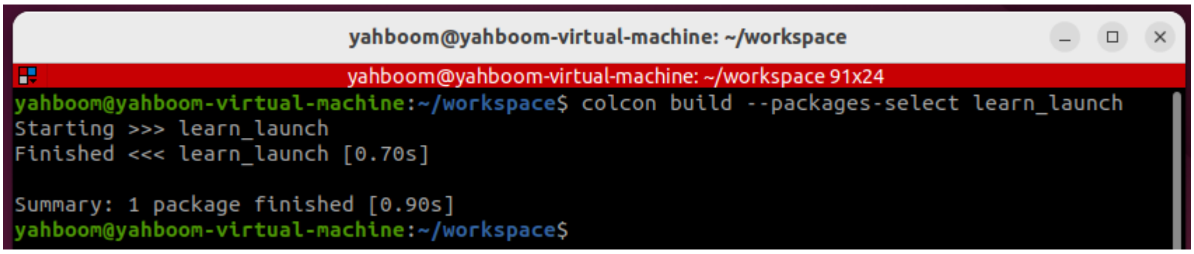
5.1、新建launch文件

在multi_node_launch.py同级目录下新建【include_launch.py】文件，添加如下内容：

```
from launch import LaunchDescription
from launch_ros.actions import Node
import os
from launch.actions import IncludeLaunchDescription
from launch.launch_description_sources import PythonLaunchDescriptionSource
from ament_index_python.packages import get_package_share_directory

def generate_launch_description():
    hello_launch = IncludeLaunchDescription(PythonLaunchDescriptionSource(
        [os.path.join(get_package_share_directory('learn_launch'), 'launch'),
        '/multi_node_launch.py']),
    )
    return LaunchDescription([
        hello_launch
    ])
```

5.2、编译功能包

```
colcon build --packages-select learn_launch
```



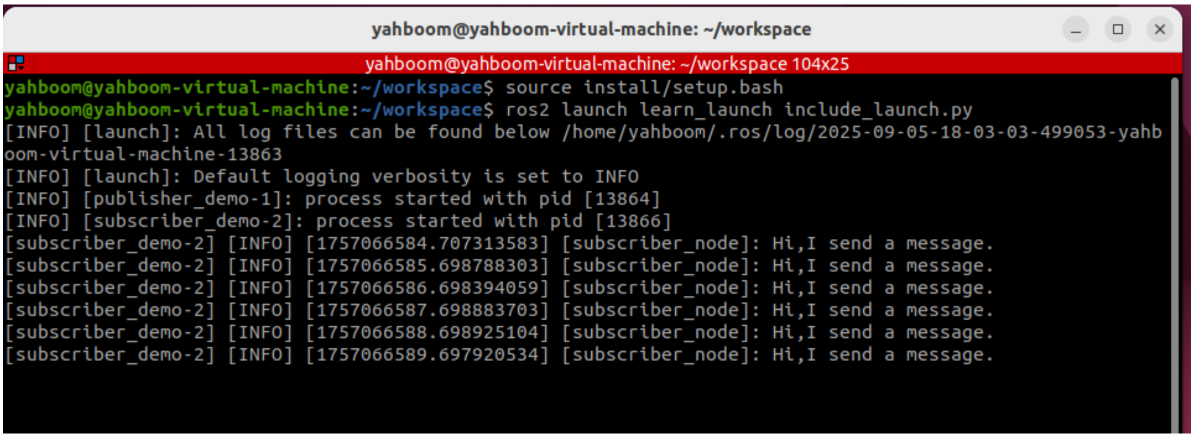
yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

5.3、运行程序

- 刷新环境变量运行launch文件

```
ros2 launch learn_launch include_launch.py
```



yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 104x25

```
yahboom@yahboom-virtual-machine:~/workspace$ source install/setup.bash
yahboom@yahboom-virtual-machine:~/workspace$ ros2 launch learn_launch include_launch.py
[INFO] [launch]: All log files can be found below /home/yahboom/.ros/log/2025-09-05-18-03-03-499053-yahb
oom-virtual-machine-13863
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [publisher_demo-1]: process started with pid [13864]
[INFO] [subscriber_demo-2]: process started with pid [13866]
[subscriber_demo-2] [INFO] [1757066584.707313583] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757066585.698788303] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757066586.698394059] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757066587.698883703] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757066588.698925104] [subscriber_node]: Hi,I send a message.
[subscriber_demo-2] [INFO] [1757066589.697920534] [subscriber_node]: Hi,I send a message.
```

5.4、源码分析

- 嵌套启动launch文件需要使用launch系统的 IncludeLaunchDescription和PythonLaunchDescriptionSource两个类
- os.path.join(get_package_share_directory('learn_launch')：获取功能包的位置，其中的'learn_launch'为功能包的名字；
- launch')：表示存放功能包下存放launch文件的文件夹；
- /multi_node_launch.py'：表示该功能包launch文件夹下的/multi_node_launch.py文件。

6、综合launch文件示例

本案例主要展示如何编写复杂的launch文件，程序的功能可忽略。

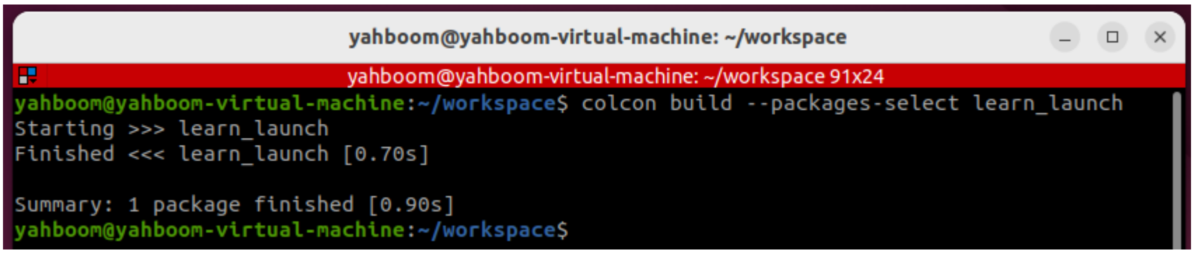
6.1、新建launch文件

在multi_node_launch.py同级目录下新建【complex_launch.py】文件，添加如下内容：

```
import os
from ament_index_python import get_package_share_directory
from launch import LaunchDescription
from launch.actions import DeclareLaunchArgument
from launch.actions import IncludeLaunchDescription
from launch.actions import GroupAction
from launch.launch_description_sources import PythonLaunchDescriptionSource
from launch.substitutions import LaunchConfiguration
from launch.substitutions import TextSubstitution
from launch_ros.actions import Node
from launch_ros.actions import PushRosNamespace


def generate_launch_description():

    # args that can be set from the command line or a default will be used
    background_r_launch_arg = DeclareLaunchArgument(
        "background_r", default_value=TextSubstitution(text="0")
    )
    background_g_launch_arg = DeclareLaunchArgument(
        "background_g", default_value=TextSubstitution(text="255")
    )
    background_b_launch_arg = DeclareLaunchArgument(
        "background_b", default_value=TextSubstitution(text="0")
    )
    chatter_ns_launch_arg = DeclareLaunchArgument(
        "chatter_ns", default_value=TextSubstitution(text="my/chatter/ns")
    )

    # include another launch file
    launch_include = IncludeLaunchDescription(
        PythonLaunchDescriptionSource(
            os.path.join(
                get_package_share_directory('demo_nodes_cpp'),
                'launch/topics/talker_listener.launch.py'))
    )
    # include another launch file in the chatter_ns namespace
    launch_include_with_namespace = GroupAction(
        actions=[
            # push-ros-namespace to set namespace of included nodes
            PushRosNamespace(LaunchConfiguration('chatter_ns')),
            IncludeLaunchDescription(
                PythonLaunchDescriptionSource(
                    os.path.join(
                        get_package_share_directory('demo_nodes_cpp'),
                        'launch/topics/talker_listener.launch.py'))
            ),
        ]
    )

    # start a turtlesim_node in the turtlesim1 namespace
    turtlesim_node = Node(
            package='turtlesim',
            namespace='turtlesim1',
            executable='turtlesim_node',
            name='sim'
        )

    # start another turtlesim_node in the turtlesim2 namespace
    # and use args to set parameters
    turtlesim_node_with_parameters = Node(
            package='turtlesim',
            namespace='turtlesim2',
            executable='turtlesim_node',
            name='sim',
            parameters=[{
                "background_r": LaunchConfiguration('background_r'),
                "background_g": LaunchConfiguration('background_g'),
                "background_b": LaunchConfiguration('background_b'),
            }]
        )

    # perform remap so both turtles listen to the same command topic
    forward_turtlesim_commands_to_second_turtlesim_node = Node(
            package='turtlesim',
            executable='mimic',
            name='mimic',
            remappings=[
                ('/input/pose', '/turtlesim1/turtle1/pose'),
                ('/output/cmd_vel', '/turtlesim2/turtle1/cmd_vel'),
            ]
        )

    return LaunchDescription([
        background_r_launch_arg,
        background_g_launch_arg,
        background_b_launch_arg,
        chatter_ns_launch_arg,
        launch_include,
        launch_include_with_namespace,
        turtlesim_node,
        turtlesim_node_with_parameters,
        forward_turtlesim_commands_to_second_turtlesim_node,
    ])
```

6.2、编译工作空间

```
colcon build --packages-select learn_launch
```



yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

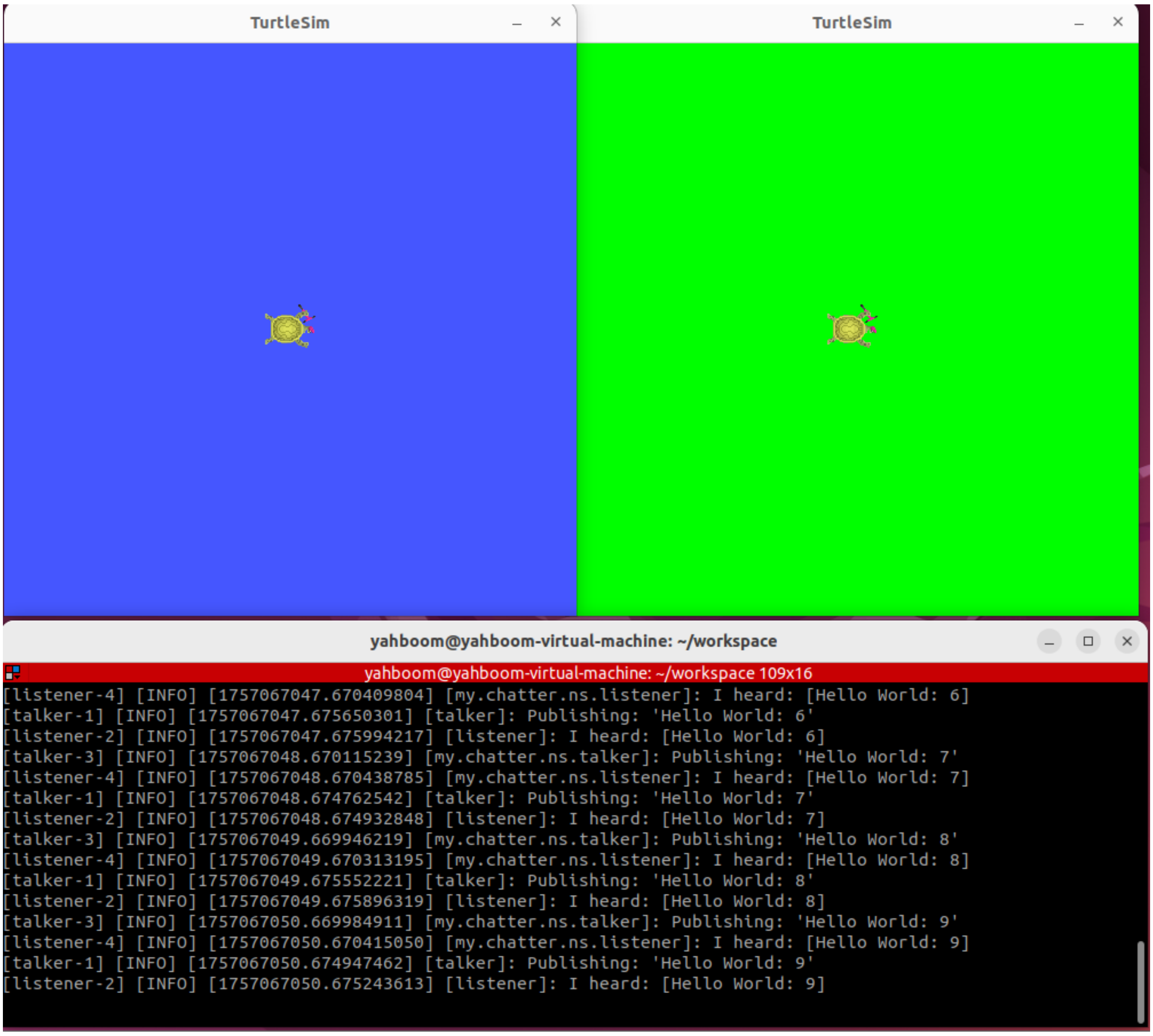
```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

6.3、运行程序

- 终端刷新环境变量，运行launch文件

```
ros2 launch learn_launch complex_launch.py
```

在宿主机的vnc上会显示两子小乌龟。



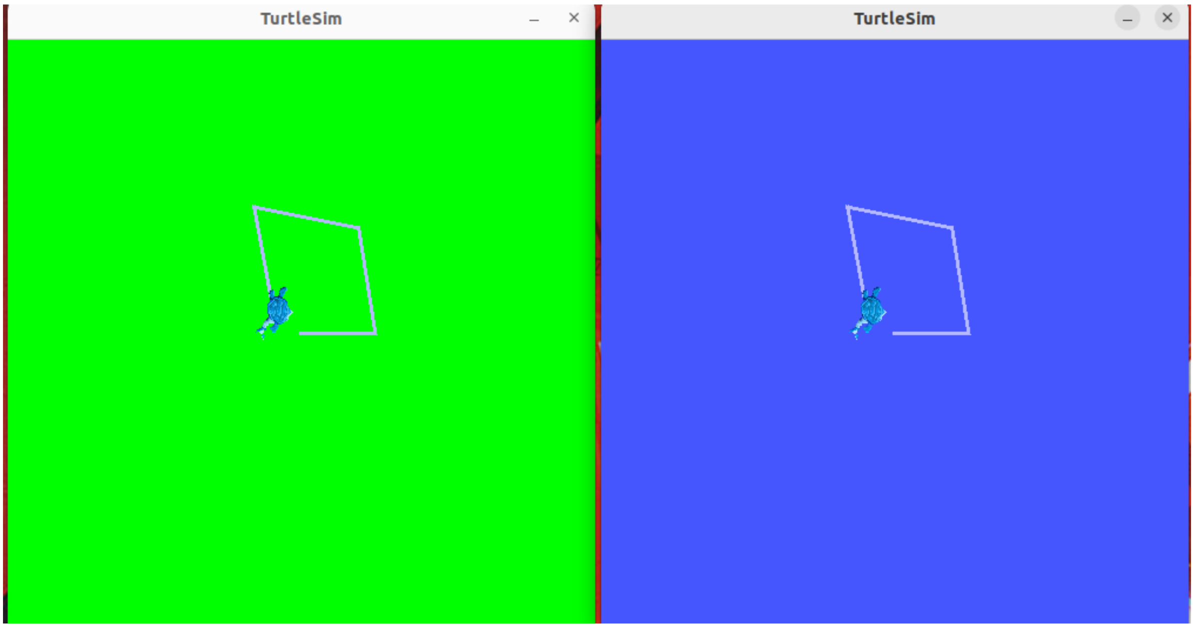
TurtleSim
TurtleSim
yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 109x16

```
[listener-4] [INFO] [1757067047.670409804] [my.chatter.ns.listener]: I heard: [Hello World: 6]
[talker-1] [INFO] [1757067047.675650301] [talker]: Publishing: 'Hello World: 6'
[listener-2] [INFO] [1757067047.675994217] [listener]: I heard: [Hello World: 6]
[talker-3] [INFO] [1757067048.670115239] [my.chatter.ns.talker]: Publishing: 'Hello World: 7'
[listener-4] [INFO] [1757067048.670438785] [my.chatter.ns.listener]: I heard: [Hello World: 7]
[talker-1] [INFO] [1757067048.674762542] [talker]: Publishing: 'Hello World: 7'
[listener-2] [INFO] [1757067048.674932848] [listener]: I heard: [Hello World: 7]
[talker-3] [INFO] [1757067049.669946219] [my.chatter.ns.talker]: Publishing: 'Hello World: 8'
[listener-4] [INFO] [1757067049.670313195] [my.chatter.ns.listener]: I heard: [Hello World: 8]
[talker-1] [INFO] [1757067049.675552221] [talker]: Publishing: 'Hello World: 8'
[listener-2] [INFO] [1757067049.675896319] [listener]: I heard: [Hello World: 8]
[talker-3] [INFO] [1757067050.669984911] [my.chatter.ns.talker]: Publishing: 'Hello World: 9'
[listener-4] [INFO] [1757067050.670415050] [my.chatter.ns.listener]: I heard: [Hello World: 9]
[talker-1] [INFO] [1757067050.674947462] [talker]: Publishing: 'Hello World: 9'
[listener-2] [INFO] [1757067050.675243613] [listener]: I heard: [Hello World: 9]
```

- 启动键盘控制节点，并添加命名空间（因为我们在launch文件中启动节点时添加了命名空间）

```
ros2 run turtlesim turtle_teleop_key --ros-args -r __ns:=/turtlesim1
```

- 使用上下左右键控制海龟1运动，海龟2会完全模仿海龟1的行为



6.4、程序说明

程序主要是启动：

1、demo_nodes_cpp的talker_listener节点，

2、带命名空间的talker_listener节点

3、已turtlesim1为命名空间的小乌龟1

4、已turtlesim2为命名空间的小乌龟2

5、执行重映射，使两只乌龟都能听到相同的命令主题

7、xml实现

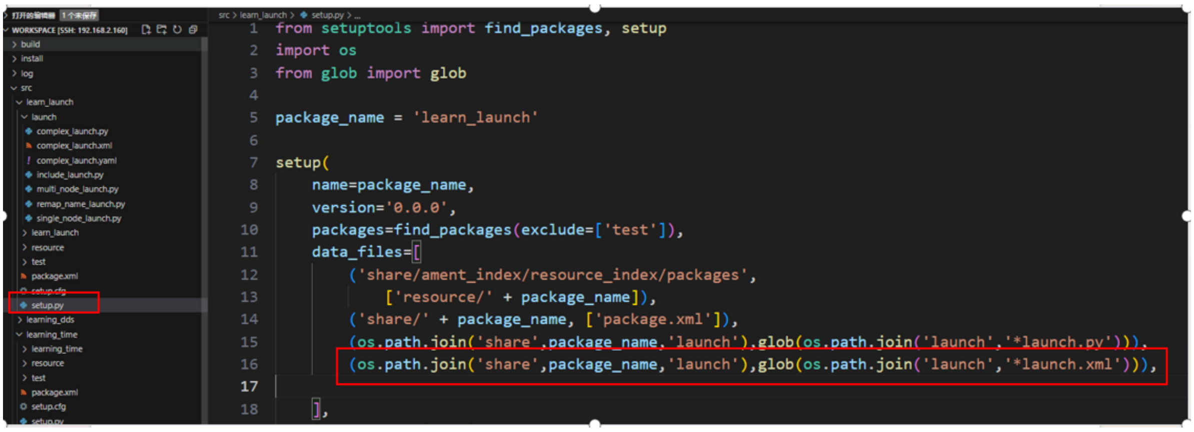
7.1、新建launch文件

在complex_launch.py同级目录下新建【complex_launch.xml】文件，添加如下内容：

```
<launch>

    <!-- args that can be set from the command line or a default will be used -->
    <arg name="background_r" default="0"/>
    <arg name="background_g" default="255"/>
    <arg name="background_b" default="0"/>
    <arg name="chatter_ns" default="my/chatter/ns"/>

    <!-- include another launch file -->
    <include file="$(find-pkg-share demo_nodes_cpp)/launch/topics/talker_listener.launch.py"/>
    <!-- include another launch file in the chatter_ns namespace-->
    <group>
      <!-- push-ros-namespace to set namespace of included nodes -->
      <push-ros-namespace namespace="$(var chatter_ns)"/>
      <include file="$(find-pkg-share
demo_nodes_cpp)/launch/topics/talker_listener.launch.py"/>
    </group>

    <!-- start a turtlesim_node in the turtlesim1 namespace -->
    <node pkg="turtlesim" exec="turtlesim_node" name="sim"
namespace="turtlesim1"/>
    <!-- start another turtlesim_node in the turtlesim2 namespace
        and use args to set parameters -->
    <node pkg="turtlesim" exec="turtlesim_node" name="sim"
namespace="turtlesim2">
      <param name="background_r" value="$(var background_r)"/>
      <param name="background_g" value="$(var background_g)"/>
      <param name="background_b" value="$(var background_b)"/>
    </node>
    <!-- perform remap so both turtles listen to the same command topic -->
    <node pkg="turtlesim" exec="mimic" name="mimic">
      <remap from="/input/pose" to="/turtlesim1/turtle1/pose"/>
      <remap from="/output/cmd_vel" to="/turtlesim2/turtle1/cmd_vel"/>
    </node>
</launch>
```

7.2、setup.py文件配置

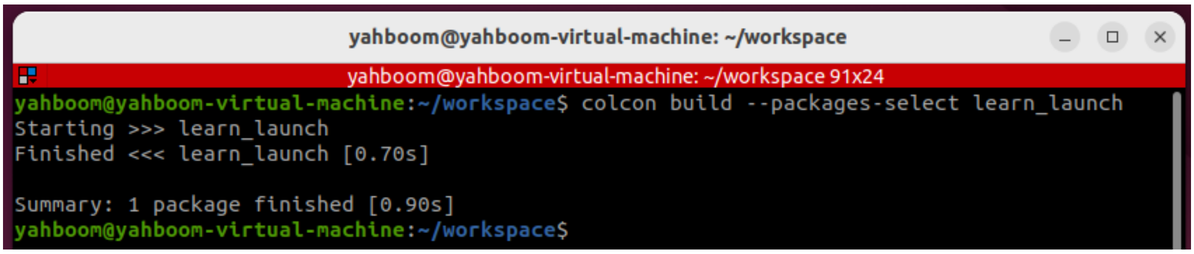
- 需要配置编译文件，在编译时将我们.xml格式的launch文件拷贝到install安装目录下，ros系统才能找到我们的文件



```
from setuptools import find_packages, setup
import os
from glob import glob

package_name = 'learn_launch'

setup(
    name=package_name,
    version='0.0.0',
    packages=find_packages(exclude=['test']),
    data_files=[
        ('share/ament_index/resource_index/packages',
            ['resource/' + package_name]),
        ('share/' + package_name, ['package.xml']),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.py'))),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.xml'))),

    ],
```

7.3、编译功能包

```
colcon build --packages-select learn_launch
```


yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

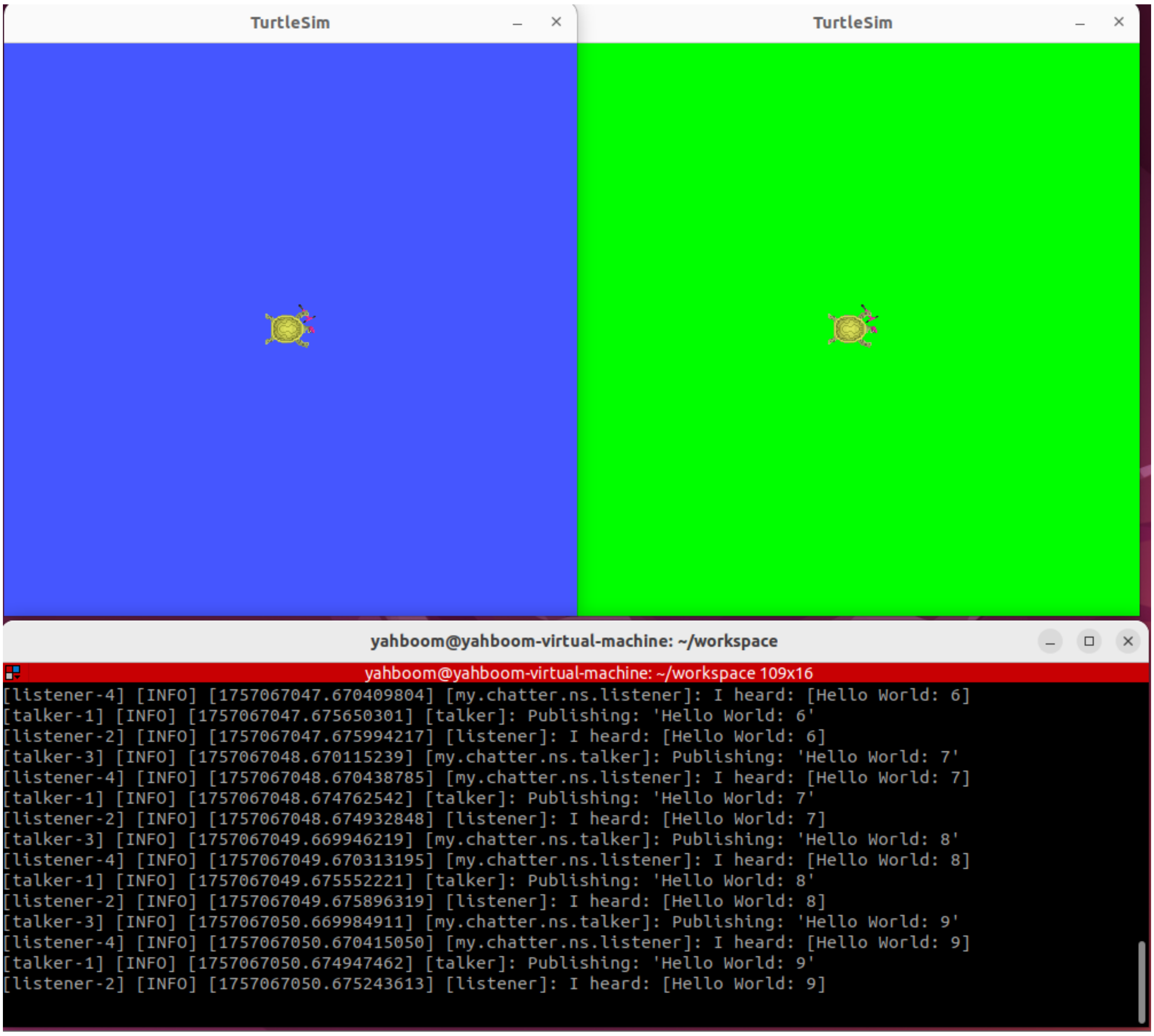
```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

7.4、运行程序

终端输入：

```
ros2 launch learn_launch complex_launch.xml
```

- 按照预期会出现两只小海龟，并且终端会打印日志信息


TurtleSim
TurtleSim
yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 109x16

```
[listener-4] [INFO] [1757067047.670409804] [my.chatter.ns.listener]: I heard: [Hello World: 6]
[talker-1] [INFO] [1757067047.675650301] [talker]: Publishing: 'Hello World: 6'
[listener-2] [INFO] [1757067047.675994217] [listener]: I heard: [Hello World: 6]
[talker-3] [INFO] [1757067048.670115239] [my.chatter.ns.talker]: Publishing: 'Hello World: 7'
[listener-4] [INFO] [1757067048.670438785] [my.chatter.ns.listener]: I heard: [Hello World: 7]
[talker-1] [INFO] [1757067048.674762542] [talker]: Publishing: 'Hello World: 7'
[listener-2] [INFO] [1757067048.674932848] [listener]: I heard: [Hello World: 7]
[talker-3] [INFO] [1757067049.669946219] [my.chatter.ns.talker]: Publishing: 'Hello World: 8'
[listener-4] [INFO] [1757067049.670313195] [my.chatter.ns.listener]: I heard: [Hello World: 8]
[talker-1] [INFO] [1757067049.675552221] [talker]: Publishing: 'Hello World: 8'
[listener-2] [INFO] [1757067049.675896319] [listener]: I heard: [Hello World: 8]
[talker-3] [INFO] [1757067050.669984911] [my.chatter.ns.talker]: Publishing: 'Hello World: 9'
[listener-4] [INFO] [1757067050.670415050] [my.chatter.ns.listener]: I heard: [Hello World: 9]
[talker-1] [INFO] [1757067050.674947462] [talker]: Publishing: 'Hello World: 9'
[listener-2] [INFO] [1757067050.675243613] [listener]: I heard: [Hello World: 9]
```

- 启动键盘控制节点，并添加命名空间

```
ros2 run turtlesim turtle_teleop_key --ros-args -r __ns:=/turtlesim1
```

使用键盘控制启动海龟1进行运行，海龟2会完全模仿海龟1的行为

8、yaml实现

8.1、新建launch文件

在complex_launch.py同级目录下新建【complex_launch.yaml】文件，添加如下内容：

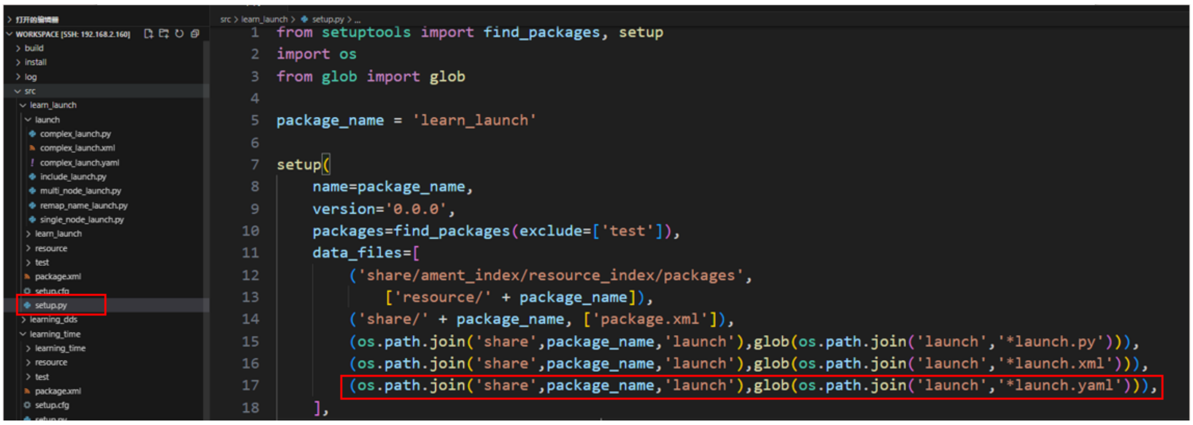
```
launch:
```

```yaml
# args that can be set from the command line or a default will be used
- arg:
  name: "background_r"
  default: "0"
- arg:
  name: "background_g"
  default: "255"
- arg:
  name: "background_b"
  default: "0"
- arg:
  name: "chatter_ns"
  default: "my/chatter/ns"


# include another launch file
- include:
  file: "$(find-pkg-share
demo_nodes_cpp)/launch/topics/talker_listener.launch.py"

# include another launch file in the chatter_ns namespace
- group:
  - push-ros-namespace:
    namespace: "$(var chatter_ns)"
  - include:
    file: "$(find-pkg-share
demo_nodes_cpp)/launch/topics/talker_listener.launch.py"

# start a turtlesim_node in the turtlesim1 namespace
- node:
  pkg: "turtlesim"
  exec: "turtlesim_node"
  name: "sim"
  namespace: "turtlesim1"

# start another turtlesim_node in the turtlesim2 namespace and use args to set
parameters
- node:
  pkg: "turtlesim"
  exec: "turtlesim_node"
  name: "sim"
  namespace: "turtlesim2"
  param:
  -
   name: "background_r"
   value: "$(var background_r)"
  -
   name: "background_g"
   value: "$(var background_g)"
  -
   name: "background_b"
   value: "$(var background_b)"

# perform remap so both turtles listen to the same command topic
- node:
  pkg: "turtlesim"
  exec: "mimic"
  name: "mimic"
```

```
    remap:
    -
        from: "/input/pose"
        to: "/turtlesim1/turtle1/pose"
    -
        from: "/output/cmd_vel"
        to: "/turtlesim2/turtle1/cmd_vel"
```

8.2、配置

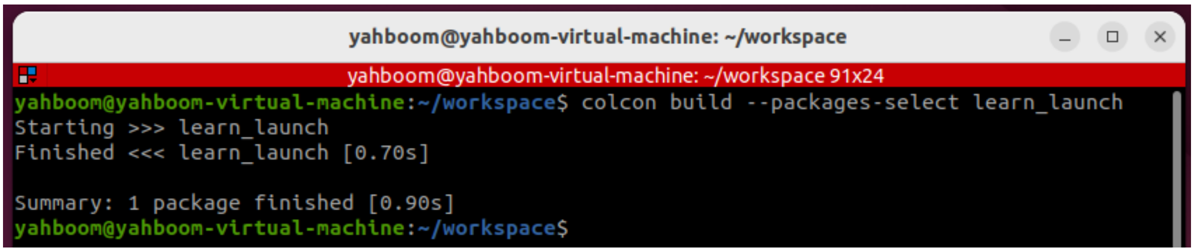
- 需要配置编译文件，在编译时将我们.yaml格式的launch文件拷贝到install安装目录下，ros系统才能找到我们的文件



```python
from setuptools import find_packages, setup
import os
from glob import glob

package_name = 'learn_launch'

setup(
    name=package_name,
    version='0.0.0',
    packages=find_packages(exclude=['test']),
    data_files=[
        ('share/ament_index/resource_index/packages',
            ['resource/' + package_name]),
        ('share/' + package_name, ['package.xml']),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.py'))),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.xml'))),
        (os.path.join('share',package_name,'launch'),glob(os.path.join('launch','*launch.yaml'))),
    ],
```

8.3、编译功能包

```
colcon build --packages-select learn_launch
```


yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 91x24

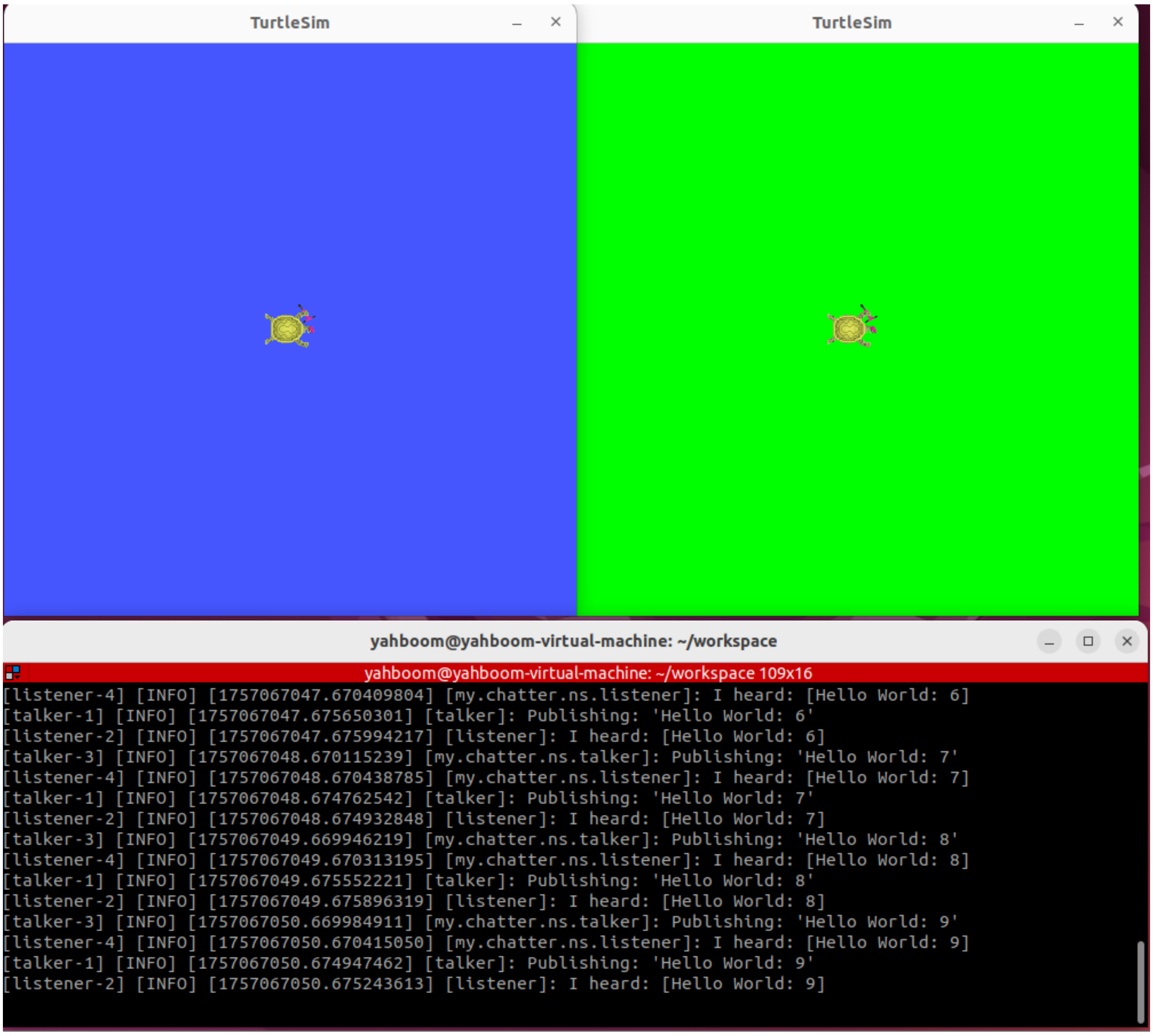
```
yahboom@yahboom-virtual-machine:~/workspace$ colcon build --packages-select learn_launch
Starting >>> learn_launch
Finished <<< learn_launch [0.70s]

Summary: 1 package finished [0.90s]
yahboom@yahboom-virtual-machine:~/workspace$
```

8.4、运行程序

- 刷新环境变量然后运行

```
ros2 launch learn_launch complex_launch.yaml
```

- 按照预期会出现两只小海龟，并且终端会打印日志信息


TurtleSim
TurtleSim
yahboom@yahboom-virtual-machine: ~/workspace
yahboom@yahboom-virtual-machine: ~/workspace 109x16

```
[listener-4] [INFO] [1757067047.670409804] [my.chatter.ns.listener]: I heard: [Hello World: 6]
[talker-1] [INFO] [1757067047.675650301] [talker]: Publishing: 'Hello World: 6'
[listener-2] [INFO] [1757067047.675994217] [listener]: I heard: [Hello World: 6]
[talker-3] [INFO] [1757067048.670115239] [my.chatter.ns.talker]: Publishing: 'Hello World: 7'
[listener-4] [INFO] [1757067048.670438785] [my.chatter.ns.listener]: I heard: [Hello World: 7]
[talker-1] [INFO] [1757067048.674762542] [talker]: Publishing: 'Hello World: 7'
[listener-2] [INFO] [1757067048.674932848] [listener]: I heard: [Hello World: 7]
[talker-3] [INFO] [1757067049.669946219] [my.chatter.ns.talker]: Publishing: 'Hello World: 8'
[listener-4] [INFO] [1757067049.670313195] [my.chatter.ns.listener]: I heard: [Hello World: 8]
[talker-1] [INFO] [1757067049.675552221] [talker]: Publishing: 'Hello World: 8'
[listener-2] [INFO] [1757067049.675896319] [listener]: I heard: [Hello World: 8]
[talker-3] [INFO] [1757067050.669984911] [my.chatter.ns.talker]: Publishing: 'Hello World: 9'
[listener-4] [INFO] [1757067050.670415050] [my.chatter.ns.listener]: I heard: [Hello World: 9]
[talker-1] [INFO] [1757067050.674947462] [talker]: Publishing: 'Hello World: 9'
[listener-2] [INFO] [1757067050.675243613] [listener]: I heard: [Hello World: 9]
```

- 启动键盘控制节点，并添加命名空间

```
ros2 run turtlesim turtle_teleop_key --ros-args -r __ns:=/turtlesim1
```

使用键盘控制启动海龟1进行运行，海龟2会完全模仿海龟1的行为