

Name: Aniketh Vijesh

Roll No: AM.EN.U4AIE22009

- 1. Create a publisher node subscriber node to publishes consecutive integers on the topic counter at a rate of 2Hz and subscribe the count .**

Making the package

```
cd catkin_ws/src
catkin_create_pkg lab2 std_msgs rospy
```

Making the scripts folder

```
cd lab2
mkdir scripts && cd scripts
```

Making the nodes

```
touch counter_publisher.py
chmod +x counter_publisher.py

touch counter_subscriber.py
chmod +x counter_subscriber.py
```

counter_publisher.py

```
#!/usr/bin/env python

import rospy
from std_msgs.msg import Int32

def counter_publisher():
    rospy.init_node('counter_publisher', anonymous=True)
    pub = rospy.Publisher('/counter', Int32, queue_size=10)
    rate = rospy.Rate(2)

    count = 0
```

```

while not rospy.is_shutdown():
    rospy.loginfo(f"Publishing count: {count}")
    pub.publish(count)
    count += 1
    rate.sleep()

if __name__ == '__main__':
    try:
        counter_publisher()
    except rospy.ROSInterruptException:
        pass

```

counter_subscriber.py

```

#!/usr/bin/env python

import rospy
from std_msgs.msg import Int32

def callback(data):
    rospy.loginfo(f"Received count: {data.data}")

def counter_subscriber():
    rospy.init_node('counter_subscriber', anonymous=True)
    rospy.Subscriber('/counter', Int32, callback)
    rospy.spin()

if __name__ == '__main__':
    try:
        counter_subscriber()
    except rospy.ROSInterruptException:
        pass

```

Modify the catkin_ws/src/lab2/CMakeLists.txt

```

catkin_install_python(PROGRAMS scripts/counter_publisher.py
scripts/counter_subscriber.py
  DESTINATION ${CATKIN_PACKAGE_BIN_DESTINATION}
)

```

Build package

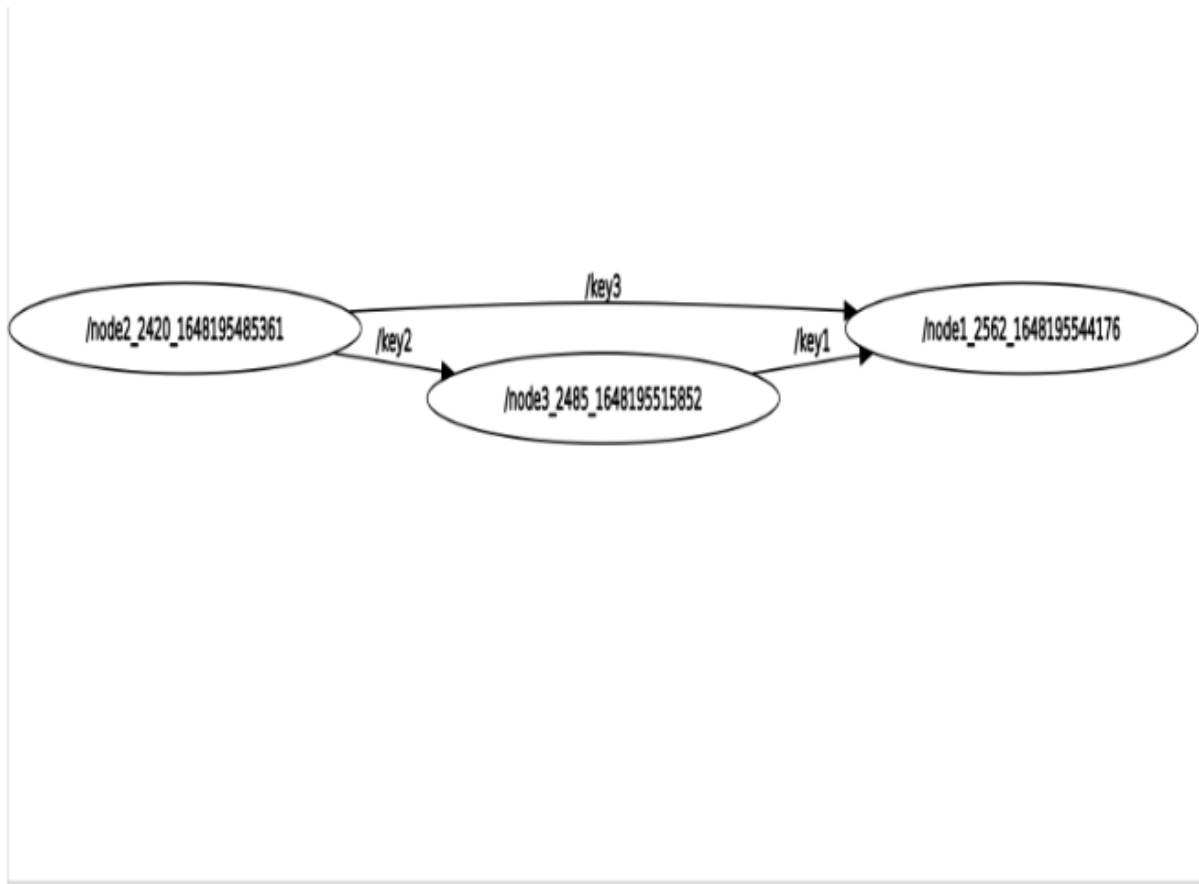
```
cd ~/catkin_ws
catkin_make
source devel.setup.bash
```

Outputs

```
ros) the_architect@the-administrator:~/catkin_ws$ rosrun lab2 counter_publisher.py
INFO] [1728029426.100565]: Publishing count: 0
INFO] [1728029426.601349]: Publishing count: 1
INFO] [1728029427.101304]: Publishing count: 2
INFO] [1728029427.601296]: Publishing count: 3
INFO] [1728029428.101369]: Publishing count: 4
INFO] [1728029428.601241]: Publishing count: 5
INFO] [1728029429.101315]: Publishing count: 6
INFO] [1728029429.601265]: Publishing count: 7
INFO] [1728029430.101459]: Publishing count: 8
INFO] [1728029430.601336]: Publishing count: 9
INFO] [1728029431.101241]: Publishing count: 10
INFO] [1728029431.601323]: Publishing count: 11
INFO] [1728029432.101223]: Publishing count: 12
INFO] [1728029432.601257]: Publishing count: 13
INFO] [1728029433.101221]: Publishing count: 14
INFO] [1728029433.601280]: Publishing count: 15
INFO] [1728029434.101138]: Publishing count: 16
INFO] [1728029434.601360]: Publishing count: 17
INFO] [1728029435.101343]: Publishing count: 18
INFO] [1728029435.601333]: Publishing count: 19
INFO] [1728029436.101249]: Publishing count: 20
INFO] [1728029436.601239]: Publishing count: 21
INFO] [1728029437.101225]: Publishing count: 22
INFO] [1728029437.601350]: Publishing count: 23
INFO] [1728029438.101353]: Publishing count: 24
INFO] [1728029438.601253]: Publishing count: 25
INFO] [1728029439.101288]: Publishing count: 26
```

```
ros) the_architect@the-administrator:~/catkin_ws/src/lab2$ rosrun lab2 counter_subscriber.py
INFO] [1728029429.603945]: Received count: 7
INFO] [1728029430.104089]: Received count: 8
INFO] [1728029430.603876]: Received count: 9
INFO] [1728029431.103589]: Received count: 10
INFO] [1728029431.603729]: Received count: 11
INFO] [1728029432.103859]: Received count: 12
INFO] [1728029432.603528]: Received count: 13
INFO] [1728029433.103762]: Received count: 14
INFO] [1728029433.603626]: Received count: 15
INFO] [1728029434.103428]: Received count: 16
INFO] [1728029434.603673]: Received count: 17
INFO] [1728029435.103739]: Received count: 18
INFO] [1728029435.603755]: Received count: 19
INFO] [1728029436.103652]: Received count: 20
INFO] [1728029436.603723]: Received count: 21
INFO] [1728029437.103598]: Received count: 22
INFO] [1728029437.603819]: Received count: 23
INFO] [1728029438.103694]: Received count: 24
INFO] [1728029438.603610]: Received count: 25
```

2. Create a Communication System in ROS with multiple publisher and subscriber.



Key1-int

Key2-float

Key3-String

Defining the nodes
node 1.py

```
#!/usr/bin/env python

import rospy
from std_msgs.msg import Int32

def node1_publisher():
    pub = rospy.Publisher('/key1', Int32, queue_size=10)
    rospy.init_node('node1', anonymous=True)
    rate = rospy.Rate(1)

    count = 0
    while not rospy.is_shutdown():
        rospy.loginfo(f"Node 1 Publishing: {count}")
        pub.publish(count)
        count += 1
        rate.sleep()

if __name__ == '__main__':
    try:
        node1_publisher()
    except rospy.ROSInterruptException:
        pass
```

node2.py

```
#!/usr/bin/env python

import rospy
from std_msgs.msg import Int32, Float32

def callback_key1(data):
    received_value = data.data
    float_value = float(received_value) + 0.5
    rospy.loginfo(f"Node 2 received from /key1: {received_value}, Publishing: {float_value} on /key2")
    pub.publish(float_value)

def node2():
    global pub
    rospy.init_node('node2', anonymous=True)

    pub = rospy.Publisher('/key2', Float32, queue_size=10)
    rospy.Subscriber('/key1', Int32, callback_key1)

    rospy.spin()

if __name__ == '__main__':
    try:
        node2()
    except rospy.ROSInterruptException:
        pass
```

node3.py

```
#!/usr/bin/env python

import rospy
from std_msgs.msg import Float32, String

def callback_key2(data):
    received_value = data.data
    string_message = f"Received float: {received_value:.2f}"
    rospy.loginfo(f"Node 3 received from /key2: {received_value}, Publishing: {string_message} on /key3")
    pub.publish(string_message)

def node3():
    global pub
    rospy.init_node('node3', anonymous=True)

    pub = rospy.Publisher('/key3', String, queue_size=10)
    rospy.Subscriber('/key2', Float32, callback_key2)

    rospy.spin()

if __name__ == '__main__':
    try:
        node3()
    except rospy.ROSInterruptException:
        pass
```

Making the launch file

```
cd catkin_ws/src/lab2/
mkdir launch && cd launch
touch communication_system_launcher.launch
code communication_system_launcher.launch
```

communication_system_launcher.launch

```
<launch>
  <node pkg="my_ros_package" type="node1.py" name="node1"
output="screen"/>
  <node pkg="my_ros_package" type="node2.py" name="node2"
output="screen"/>
  <node pkg="my_ros_package" type="node3.py" name="node3"
output="screen"/>
</launch>
```

giving executable access to the scripts:

```
chmod +x ~/catkin_ws/src/lab2/scripts/node1.py
chmod +x ~/catkin_ws/src/lab2/scripts/node2.py
chmod +x ~/catkin_ws/src/lab2/scripts/node3.py
```

Using roslaunch to start all the nodes

```
roslaunch lab2 communication_system_launcher
```

Outputs:

```
started roslaunch server http://the-administrator:37319/

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.15.9

NODES
/
  node1 (lab2/node1.py)
  node2 (lab2/node2.py)
  node3 (lab2/node3.py)

ROS_MASTER_URI=http://localhost:11311

process[node1-1]: started with pid [25573]
process[node2-2]: started with pid [25574]
process[node3-3]: started with pid [25575]
[INFO] [1728031088.347704]: Node 1 Publishing: 0
[INFO] [1728031089.348419]: Node 1 Publishing: 1
[INFO] [1728031089.351648]: Node 2 received from /key1: 1, Publishing: 1.5 on /key2
[INFO] [1728031089.353769]: Node 3 received from /key2: 1.5, Publishing: Received float: 1.50 on /key3
[INFO] [1728031090.349094]: Node 1 Publishing: 2
[INFO] [1728031090.352149]: Node 2 received from /key1: 2, Publishing: 2.5 on /key2
[INFO] [1728031090.354419]: Node 3 received from /key2: 2.5, Publishing: Received float: 2.50 on /key3
[INFO] [1728031091.348500]: Node 1 Publishing: 3
[INFO] [1728031091.351193]: Node 2 received from /key1: 3, Publishing: 3.5 on /key2
[INFO] [1728031091.353298]: Node 3 received from /key2: 3.5, Publishing: Received float: 3.50 on /key3
[INFO] [1728031092.348498]: Node 1 Publishing: 4
[INFO] [1728031092.351167]: Node 2 received from /key1: 4, Publishing: 4.5 on /key2
[INFO] [1728031092.353319]: Node 3 received from /key2: 4.5, Publishing: Received float: 4.50 on /key3
[INFO] [1728031093.348452]: Node 1 Publishing: 5
[INFO] [1728031093.351161]: Node 2 received from /key1: 5, Publishing: 5.5 on /key2
[INFO] [1728031093.353505]: Node 3 received from /key2: 5.5, Publishing: Received float: 5.50 on /key3
[INFO] [1728031094.348469]: Node 1 Publishing: 6
[INFO] [1728031094.351165]: Node 2 received from /key1: 6, Publishing: 6.5 on /key2
[INFO] [1728031094.353232]: Node 3 received from /key2: 6.5, Publishing: Received float: 6.50 on /key3
[INFO] [1728031095.348438]: Node 1 Publishing: 7
[INFO] [1728031095.351299]: Node 2 received from /key1: 7, Publishing: 7.5 on /key2
[INFO] [1728031095.353789]: Node 3 received from /key2: 7.5, Publishing: Received float: 7.50 on /key3
[INFO] [1728031096.348508]: Node 1 Publishing: 8
[INFO] [1728031096.351385]: Node 2 received from /key1: 8, Publishing: 8.5 on /key2
[INFO] [1728031096.353777]: Node 3 received from /key2: 8.5, Publishing: Received float: 8.50 on /key3
[INFO] [1728031097.348526]: Node 1 Publishing: 9
[INFO] [1728031097.351281]: Node 2 received from /key1: 9, Publishing: 9.5 on /key2
[INFO] [1728031097.353666]: Node 3 received from /key2: 9.5, Publishing: Received float: 9.50 on /key3
[INFO] [1728031098.348468]: Node 1 Publishing: 10
[INFO] [1728031098.351088]: Node 2 received from /key1: 10, Publishing: 10.5 on /key2
[INFO] [1728031098.353330]: Node 3 received from /key2: 10.5, Publishing: Received float: 10.50 on /key3
[INFO] [1728031099.348440]: Node 1 Publishing: 11
[INFO] [1728031099.350963]: Node 2 received from /key1: 11, Publishing: 11.5 on /key2
[INFO] [1728031099.353204]: Node 3 received from /key2: 11.5, Publishing: Received float: 11.50 on /key3
```