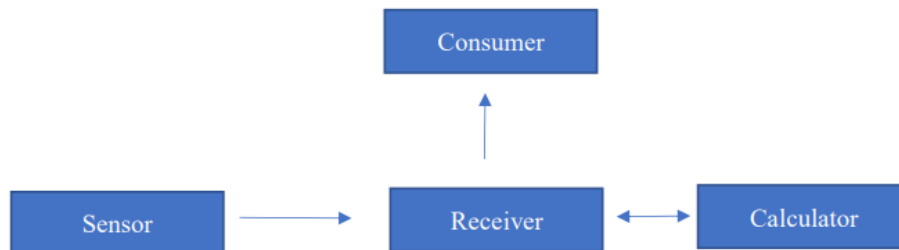


# ROS Case Study #1

Zhaofeng Tian

## 1. Assignment Description

You can work alone or in a team of two members:



**Four Nodes – Architecture**

There are four nodes: Sensor – which sends a number to another node Receiver, and the Receiver node uses another node Calculator where it sends the number it received from Sensor and also tells the calculator randomly whether to multiply or divide the number by 2. The result obtained from Calculator is sent to Consumer via Receiver.

Implement the above requirements using Python scripts and ROS. Document the screenshots and explanations of your run and submit the python package as well.

## 2. Solution

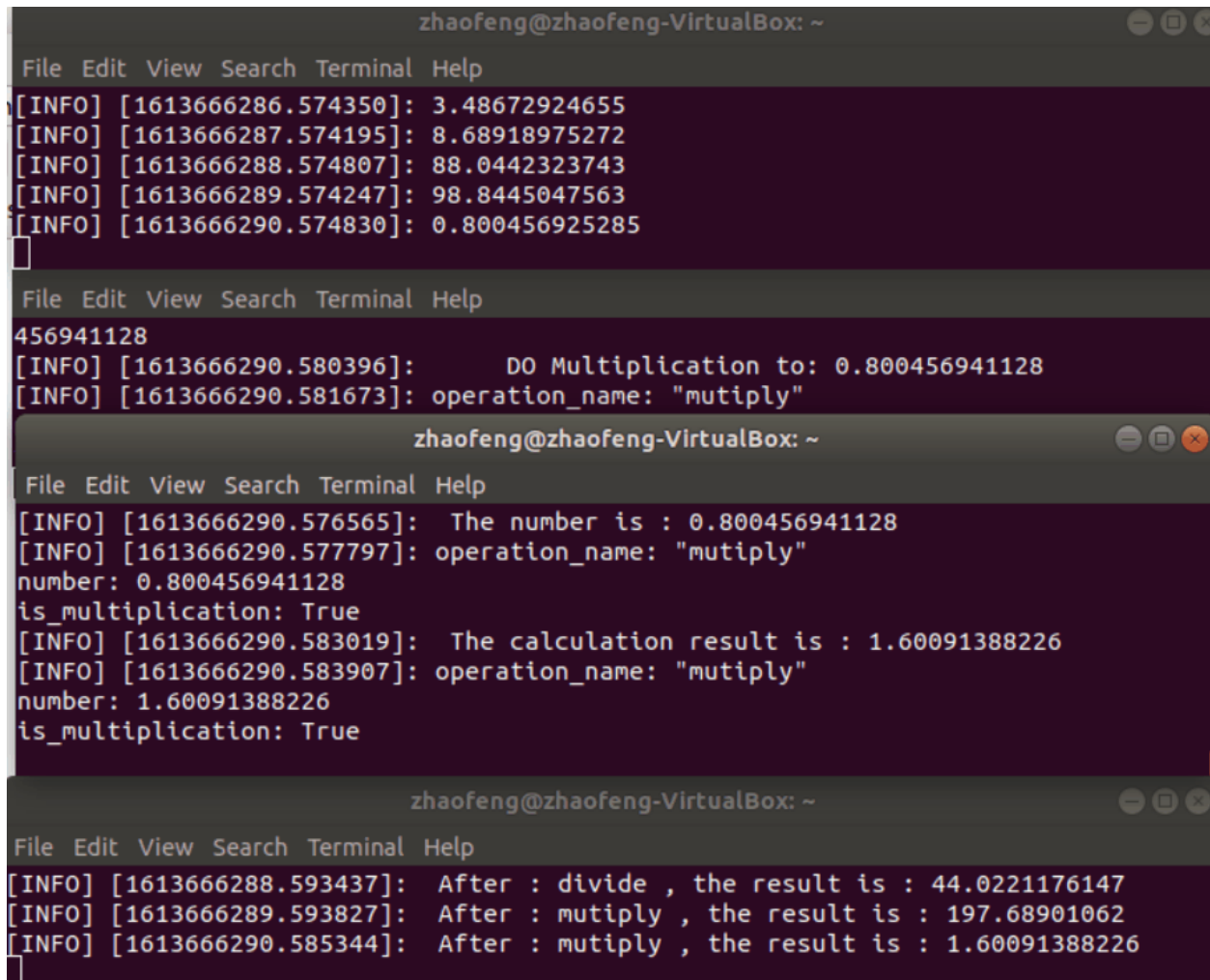
Initiate four nodes with names corresponding to the description by using four Python scripts respectively. Also, initiate four topics for convenient communication among four nodes. The structure is shown as below, a rqt\_graph image.



As we can see, random\_number, msg\_ex, calculated and customer, these four topics are generated.

### 3. Results

The results are shown as a gif image.



```
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666286.574350]: 3.48672924655  
[INFO] [1613666287.574195]: 8.68918975272  
[INFO] [1613666288.574807]: 88.0442323743  
[INFO] [1613666289.574247]: 98.8445047563  
[INFO] [1613666290.574830]: 0.800456925285  
[INFO] [1613666290.580396]: DO Multiplication to: 0.800456941128  
[INFO] [1613666290.581673]: operation_name: "mutiply"  
456941128  
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666290.576565]: The number is : 0.800456941128  
[INFO] [1613666290.577797]: operation_name: "mutiply"  
number: 0.800456941128  
is_multiplication: True  
[INFO] [1613666290.583019]: The calculation result is : 1.60091388226  
[INFO] [1613666290.583907]: operation_name: "mutiply"  
number: 1.60091388226  
is_multiplication: True  
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666288.593437]: After : divide , the result is : 44.0221176147  
[INFO] [1613666289.593827]: After : mutiply , the result is : 197.68901062  
[INFO] [1613666290.585344]: After : mutiply , the result is : 1.60091388226
```

Description:

The image displays three terminal windows from a ROS environment, each with a red box highlighting its name in the top right corner. The top window, labeled 'sensor', shows five INFO messages with timestamps and random numbers. The middle window, labeled 'Receiver', shows two INFO messages: one indicating a division operation with a specific number, and another with an operation name. The bottom window, labeled 'calculator', shows two INFO messages: one indicating a multiplication operation with a number, and another indicating a division operation with a result. The bottom-most window, labeled 'consumer', shows three INFO messages indicating the results of multiplication and division operations.

```
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666514.574266]: 30.1378235943  
[INFO] [1613666515.574156]: 89.142416503  
[INFO] [1613666516.574232]: 57.9477454355  
[INFO] [1613666517.574276]: 56.6043502894  
[INFO] [1613666518.574660]: 21.9796605603  
[INFO] [1613666518.579649]: Do Division to: 21.9796600342  
[INFO] [1613666518.580654]: operation_name: "divide"  
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666518.576316]: The number is : 21.9796600342  
[INFO] [1613666518.577484]: operation_name: "divide"  
number: 21.9796600342  
is_multiplication: False  
[INFO] [1613666518.582161]: The calculation result is : 10.9898300171  
[INFO] [1613666518.583170]: operation_name: "divide"  
number: 10.9898300171  
is_multiplication: False  
zhaofeng@zhaofeng-VirtualBox: ~  
File Edit View Search Terminal Help  
[INFO] [1613666516.589584]: After : mutiply , the result is : 115.895492554  
[INFO] [1613666517.591607]: After : mutiply , the result is : 113.208702087  
[INFO] [1613666518.584582]: After : divide , the result is : 10.9898300171
```

Sensor: publish a random number at 1 Hz to random\_number topic.

Receiver: receive a number from random\_number, and convert it into number\_msg, then publish it as a calculation request to msg\_ex topic. After getting a result from calculator via calculated topic in a number\_msg, publish it into consumer node via customer topic.

Calculator: Randomly do multiply or divide the number received from receiver by 2, and then publish it to calculated topic.

Consumer: receive the result from receiver via customer topic.