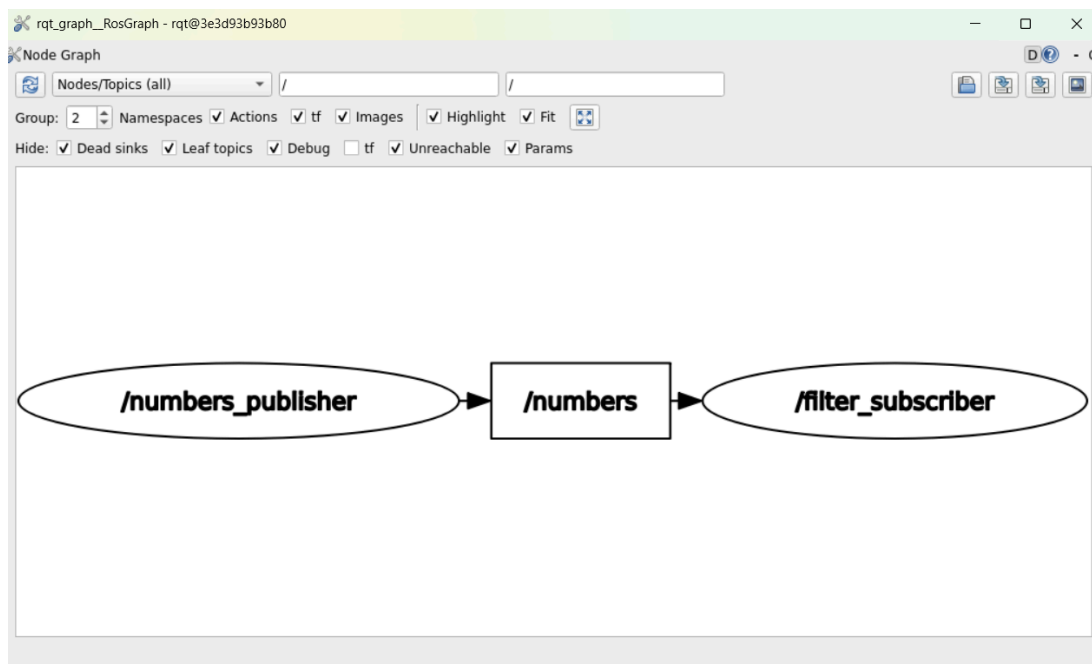


## Deliverables

1. Screenshot of rqt\_graph showing nodes and topics.



2. Output of ros2 topic hz at two different frequencies.

```
root@3e3d93b93b80:~/limo_ws# ros2 topic hz /numbers
average rate: 4.986
  min: 0.198s max: 0.204s std dev: 0.00225s window: 6
average rate: 5.004
  min: 0.197s max: 0.204s std dev: 0.00194s window: 12
average rate: 4.995
  min: 0.196s max: 0.205s std dev: 0.00256s window: 17
average rate: 4.996
  min: 0.196s max: 0.205s std dev: 0.00265s window: 22
average rate: 4.997
  min: 0.196s max: 0.205s std dev: 0.00271s window: 27
^C
root@3e3d93b93b80:~/limo_ws# ros2 topic hz /numbers
average rate: 1.004
  min: 0.986s max: 1.009s std dev: 0.00952s window: 3
average rate: 1.002
  min: 0.986s max: 1.009s std dev: 0.00908s window: 4
average rate: 1.001
  min: 0.985s max: 1.014s std dev: 0.01135s window: 6
average rate: 1.002
  min: 0.985s max: 1.014s std dev: 0.01015s window: 8
```

3. Explanation of a QoS incompatibility and how you diagnosed it.

Best effort publisher is incompatible with a reliable subscription. This is shown when executing the subscriber:

```
root@3e3d93b93b80:~/limo_ws# ros2 run week2_lab filter_subscriber --ros-arg s -p qos.reliability:=reliable
[WARN] [1757183882.411438475] [filter_subscriber]: New publisher discovered on topic 'numbers', offering incompatible QoS. No messages will be received from it. Last incompatible policy: RELIABILITY
```

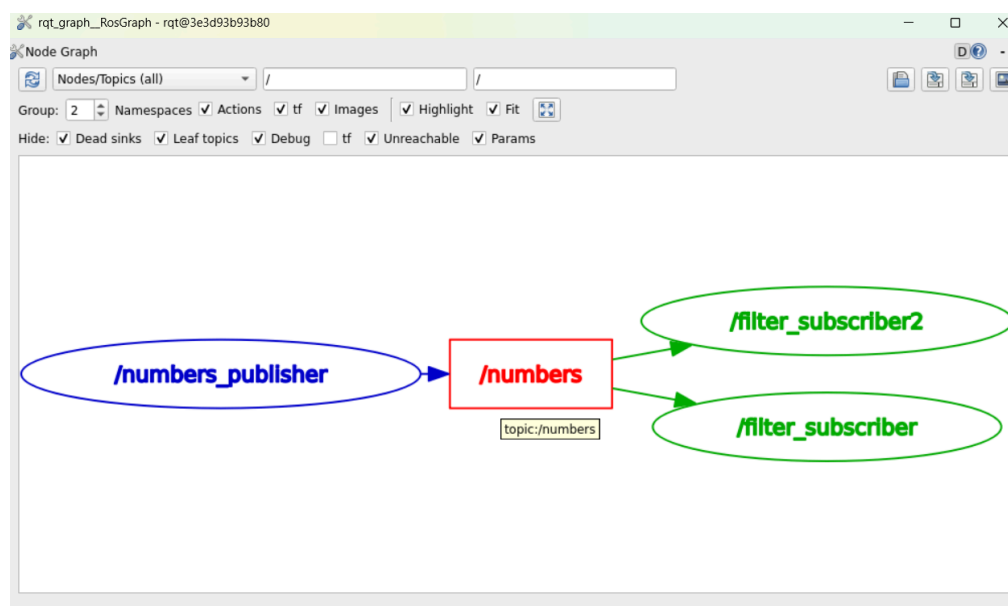
`ros2 doctor --report` shows the following as well:

```
QOS COMPATIBILITY LIST
topic [type]           : /numbers [std_msgs/msg/Int32]
publisher node         : numbers_publisher
subscriber node        : filter_subscriber
compatibility status   : ERROR: Best effort publisher and reliable subscription;
```

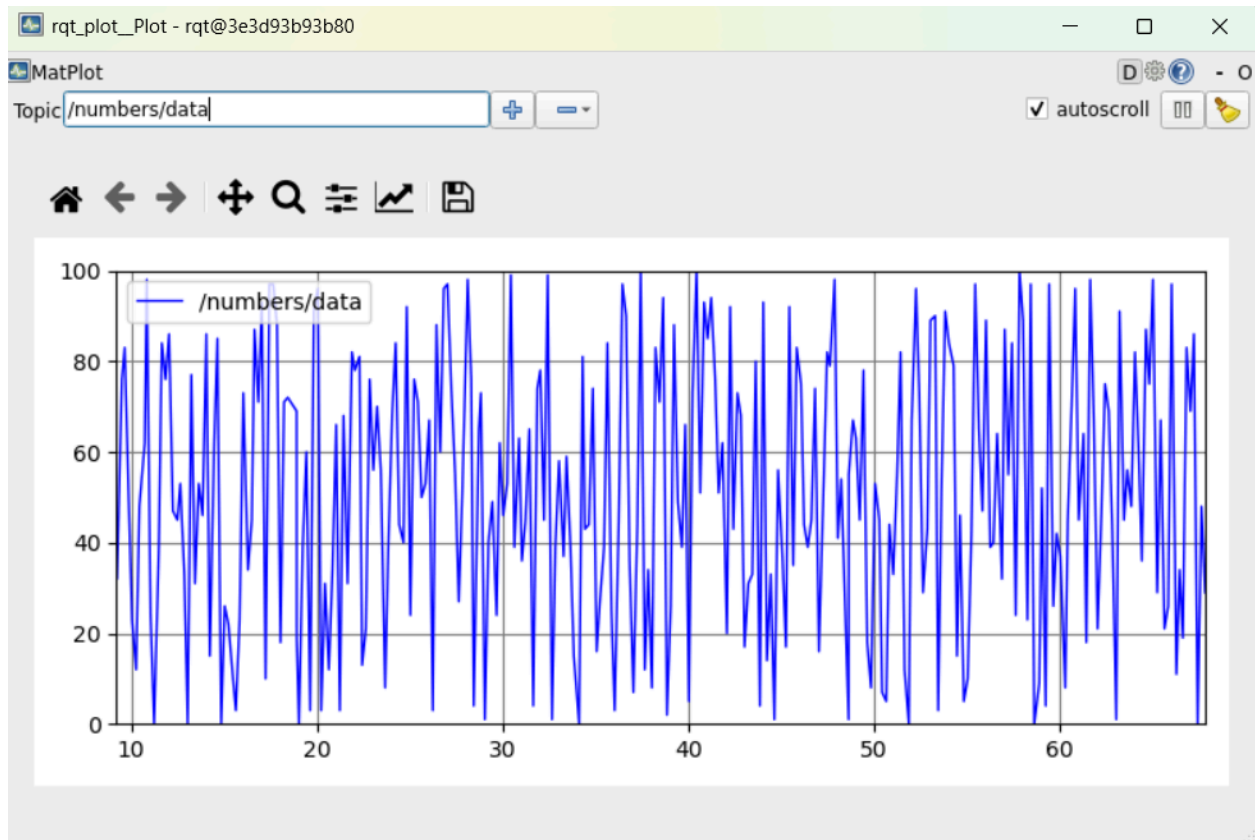
4. Reflection: Which factor (frequency, topic name, type, QoS) surprised you most?

## Additional Practice

- Start the subscriber and publisher. Add a second subscriber with a different threshold and name. Observe both subscribers in rqt\_graph.



- Use rqt\_plot to visualize the numeric data being published to the numbers topic:



- Record and replay data using ros2 bag.

```
root@3e3d93b93b80:~/limo_ws# ros2 bag record /numbers
[INFO] [1757184723.885169416] [rosbag2_recorder]: Press SPACE for pausing/resuming
[INFO] [1757184723.898553173] [rosbag2_storage]: Opened database 'rosbag2_2025_09_06-18_52_03/rosbag2_2025_09_06-18_52_03_0.db3'
for READ_WRITE.
[INFO] [1757184723.902452894] [rosbag2_recorder]: Listening for topics...
[INFO] [1757184723.902507052] [rosbag2_recorder]: Event publisher thread: Starting
[INFO] [1757184723.902784405] [rosbag2_recorder]: Recording...
[INFO] [1757184724.021577623] [rosbag2_recorder]: Subscribed to topic '/numbers'
[INFO] [1757184724.021696905] [rosbag2_recorder]: All requested topics are subscribed. Stopping discovery...
[INFO] [1757184738.031936309] [rosbag2_cpp]: Writing remaining messages from cache to the bag. It may take a while
[INFO] [1757184738.033284058] [rosbag2_recorder]: Event publisher thread: Exiting
[INFO] [1757184738.033570728] [rosbag2_recorder]: Recording stopped
root@3e3d93b93b80:~/limo_ws# ls
build install log rosbag2_2025_09_06-18_52_03 src
root@3e3d93b93b80:~/limo_ws# ros2 bag play rosbag2_2025_09_06-18_52_03
[INFO] [1757184774.463474678] [rosbag2_storage]: Opened database 'rosbag2_2025_09_06-18_52_03/rosbag2_2025_09_06-18_52_03_0.db3'
for READ_ONLY.
[INFO] [1757184774.463603706] [rosbag2_player]: Set rate to 1
[INFO] [1757184774.477599692] [rosbag2_player]: Adding keyboard callbacks.
[INFO] [1757184774.477793219] [rosbag2_player]: Press SPACE for Pause/Resume
[INFO] [1757184774.477888580] [rosbag2_player]: Press CURSOR_RIGHT for Play Next Message
[INFO] [1757184774.477953227] [rosbag2_player]: Press CURSOR_UP for Increase Rate 10%
[INFO] [1757184774.478014142] [rosbag2_player]: Press CURSOR_DOWN for Decrease Rate 10%
[INFO] [1757184774.478861752] [rosbag2_storage]: Opened database 'rosbag2_2025_09_06-18_52_03/rosbag2_2025_09_06-18_52_03_0.db3'
for READ_ONLY.
root@3e3d93b93b80:~/limo_ws#
```