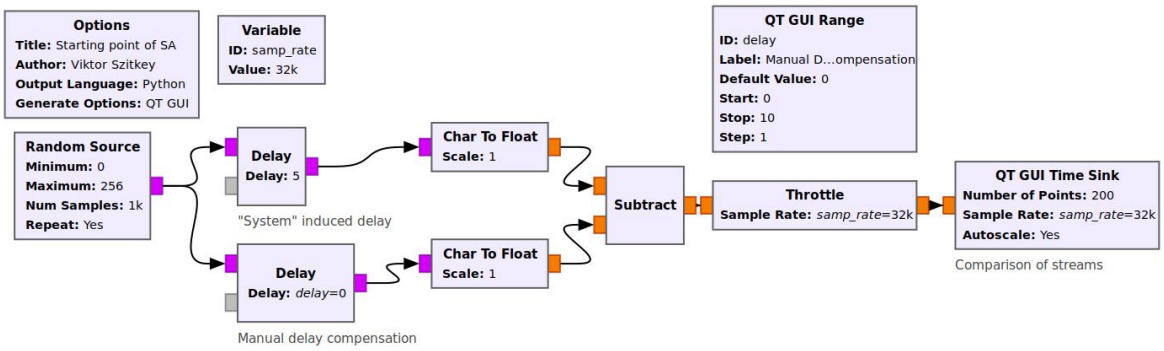
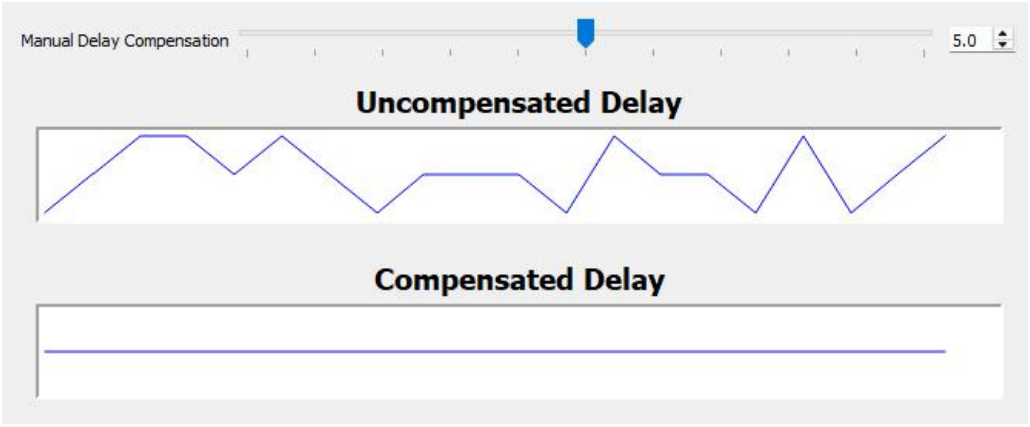
IPv6 & IoT 2025: Extra assignment. Max. 100 point. Deadline: 12th May 2025

Objective I: Create automatic control of stream delay in GNU Radio

1. Read the online documentation on GNU Radio basics and tutorials - https://wiki.gnuradio.org/index.php/Tutorials, focus on sections:
   a. Introducing GNU Radio
   b. Flowgraph Fundamentals
   c. Creating and Modifying Python Blocks
   d. Custom Blocks and Out of Tree (OOT) Modules
2. Using Linux distribution (LTS Ubuntu version 22.04 or 24.04) or in a virtualized environment (VMWare or VirtualBox), install GNU Radio and prerequisites for compiling and installing OOT modules. Use as a guide in: https://wiki.gnuradio.org/index.php?title=Creating_C%2B%2B_OOT_with_gr-modtool
3. Recreate the flowgraph below as a starting point.



4. In this flowgraph stream is divided into two paths with one path delayed. The other part can be manually compensated.



5. Your task is to create automatic feedback control, that after running flowgraph, finds correct delay value so that stream of identical samples can be corrected.
6. To achieve this, you can use one of the following approaches or its combination:
   a. C++ or Python based Out of tree block – https://wiki.gnuradio.org/index.php?title=Creating_Python_OOT_with_gr-modtool
   b. Embedded Python Block https://wiki.gnuradio.org/index.php?title=Embedded_Python_Block

7. Solution:
    a. should be reproducible on a different machine
    b. stable and usable in more complicated use cases
    c. block should have the option to start processing and reset option for new calibration.
8. Your work from the beginning must be backed up to github repository from which final version will be downloaded and tested.
9. Write a short report documenting your work. In your report, include the following:
    a. Description of your solution.
    b. Your source code with commentary.
    c. Guide for downloading and using your block.
    d. Anything relevant, e.g. often made mistakes and how to avoid them.