

# Measuring the wireless network latency in a moving train: Fun project

**Abstract**—Ever wondered what to do in the long train trip? Of course, measure the packet latency to a selected server in the Internet and plotting the data after interpolation on the map. Fun? Yes it is. Wonder what I have got on my trip from Tampere to Rovaniemi keep on reading.

## I. INTRODUCTION

## II. DATA COLLECTION METHODOLOGY

We have used iPhone GPS2IP application to pick up the GPS coordinates from the internal GPS receiver to get the current position (latitude and longitude) in GPRMC format. The application was sending the coordinates to MacBook laptop over UDP socket. The Python script was registering the coordinates and the timestamps and was logging the data into file. At the same time the script was computing average RTT (in milliseconds) by invoking external bash script.

Our simple script was the following:

```
from threading import Thread

import socket

from time import sleep
from time import time

UDP_IP = "172.20.10.2"
UDP_PORT = 10000

fd = open("working.log", "w+")

def gps():
    sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
    sock.bind((UDP_IP, UDP_PORT))
    while True:
        data = sock.recvfrom(1024)
        fd.write(f"{time()}\n{data[0].decode('ASCII')}\n")
        fd.flush()
        sleep(4)
```

```
import subprocess

def icmp():
    while True:
        rtt = subprocess.check_output(["bash", "ping-host.sh"])
        fd.write(f"{time()}\n{rtt.decode('ASCII').strip()}\n")
        fd.flush()
        sleep(4)

t1 = Thread(target=gps, args=(), daemon=True)
t1.start()

t2 = Thread(target=icmp, args=(), daemon=True)
t2.start()

while True:
    sleep(10)
```

We have collected a long enough trace for the part of the journey from Tampere to Rovaniemi. We then interpolated the data using the linear interpolator (whenever needed and was possible) and plotted the results on the map. Since the delay between consecutive measurements was 4 seconds we have interpolated the date using the following formula:  $t \in \{0.1, 0.2, \dots, 1\}$  s.t.  $x_t = A + (B - A) \cdot t$ . The source code of the stuff is here [1].

To measure the network performance we have bought sim card from Elisa (local telco). The connection on the route from Tampere to Rovaniemi was giving stable 4G.

## III. DATA PROCESSING AND BASIC RESULTS

## IV. CONCLUSIONS

## REFERENCES

- [1] Fun stuff in the train. <https://github.com/dmitriykuptsov/train-rtt>.