CENG519 Term Project Phase 1 Report

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March 20, 2025

1 Introduction

In this project, we develop a custom middle-box processor that applies random delays to Ethernet frames. This phase of the project aims to evaluate the influence of delay variations on network latency, specifically focusing on RTT for ICMP ping packets. The complete source code and report can be found at: Github

2 Implementation

The project is based on the **middlebox** repository. The processor **"new-python-processor"** is developed using Python, chosen for its robust support of NATS (nats.io) messaging. The primary function of the processor is to introduce random delays to Ethernet frames and leverage NATS for efficient message handling.

2.1 Workflow

- **Processor Development:** The processor is implemented to introduce random delays using **expovariate()** function which generates random delays, utilizing NATS for message handling.
- **RTT Measurement:** Ping packets are sent through the middlebox, and the RTT is measured for various delay configurations.
- **Data Visualization:** A plot is generated using collected data for various mean delay vs average RTT, where the x-axis represents the mean delay and the y-axis represents the average RTT.

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3 Results

Results of the mesaurment is given in the table below.

Mean Delay (ms)	Avg. RTT (ms)
0	1.495
0.01	2.241
0.05	1.915
0.1	2.293
0.2	2.347
0.5	2.296
1	2.002
2	2.375
3	3.285
4	4.755
5	4.653
6	5.556
7	6.161
8	8.664
9	8.741
10	9.688

Table 1: Mean Delay (ms) vs Average RTT (ms)

4 Conclusion

The experiment demonstrates that increasing random delays significantly impacts RTT, highlighting the importance of delay management in middlebox systems. The relation between mean delay and average RTT appears to be approximately linear at lower delays, but as the delay increases, the relationship becomes more non-linear and exhibits a steep rise. This indicates that higher mean delays significantly amplify the RTT, suggesting that random delay injection has a more profound effect as the delay magnitude increases.