

Network Delay and RTT Measurement Report

March 2025

1 Objective

The goal of this setup is to measure the impact of randomized network delay on round-trip time (RTT) using custom Python scripts communicating over NATS. The analysis helps understand how network-level jitter affects response time in UDP-based communication.

2 System Components

2.1 main.py

- Subscribes to NATS topics: `inpktsec` and `inpktinsec`.
- Parses received packets as Ethernet frames using `scapy`.
- Applies a random delay to packets based on an exponential distribution: `random.expovariate(1 / 5e-6)`.
- Forwards the delayed packet to appropriate NATS topics.
- Logs all applied delays to `delay.txt`.

2.2 sender.py

- Sends UDP packets to a predefined receiver host.
- Measures RTT by recording the time before sending and after receiving each message.
- Logs all RTT measurements to `rtt_results.txt`.

2.3 receiver.py

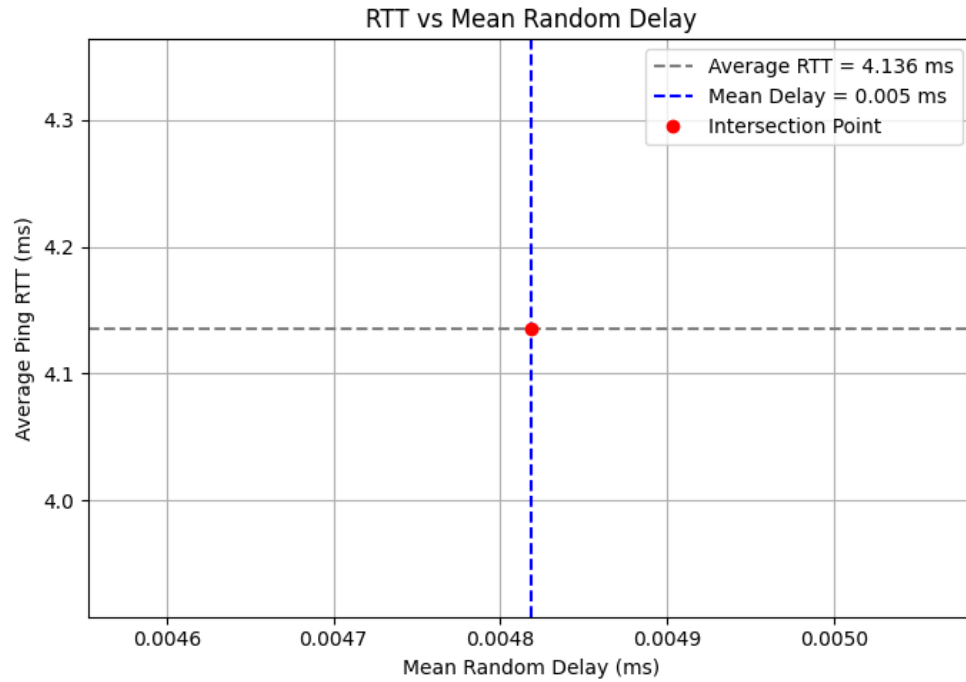
- Receives UDP packets and echoes them back to the sender, enabling RTT measurement.

3 Data Analysis

The applied delays are logged in `delay.txt`, and the measured RTTs are saved in `rtt_results.txt`. The average values from both files were used to visualize the system performance.

Generated Plot

The following figure shows the intersection point between the average delay and average RTT:



This graph visually highlights the average behavior of the system under randomized delays.

4 Conclusion

This setup successfully measured and visualized the relationship between network delay and RTT using real-time messaging and UDP communication.