MEASURING QUIC PERFORMANCE

An analysis of Security and Connection Establishment in QUIC with comparison to TCP

Lara D'Agata

2526633d

MOTIVATION

- Quick UDP Internet Connections (QUIC)
  - Recently Developed and Deployed.
  - Libraries and Implementations: New and Poorly Documented.
  - Increasing Support in Recent Years.
- Transmission Control Protocol (TCP)
  - Reliable, Universally Supported, Extensively Documented.
- Compare QUIC with TCP in terms of Security Parameters and Overall Performance

RESEARCH AIMS

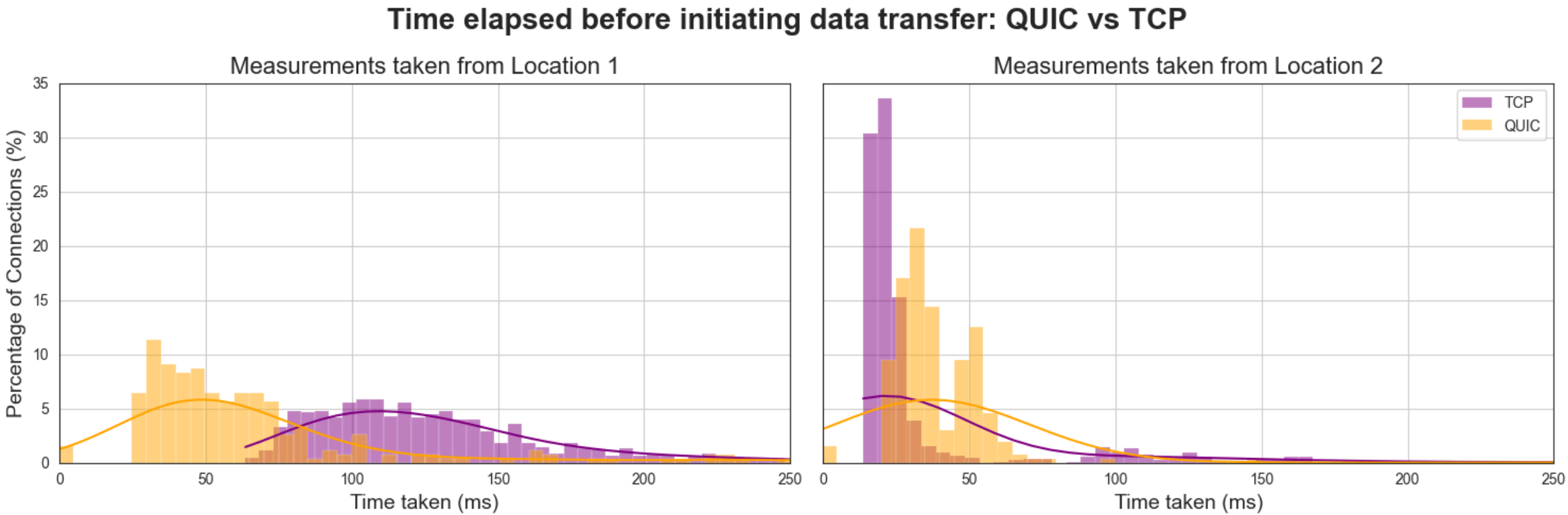
- Observe whether QUIC really yields more benefits than costs to Internet Connections.
- Address gaps in Existing Research:
  - Measure Performance of QUIC Actively.
  - Record any Security Vulnerabilities Encountered.
  - Compare QUIC to TCP.

EXPERIMENTAL DESIGN

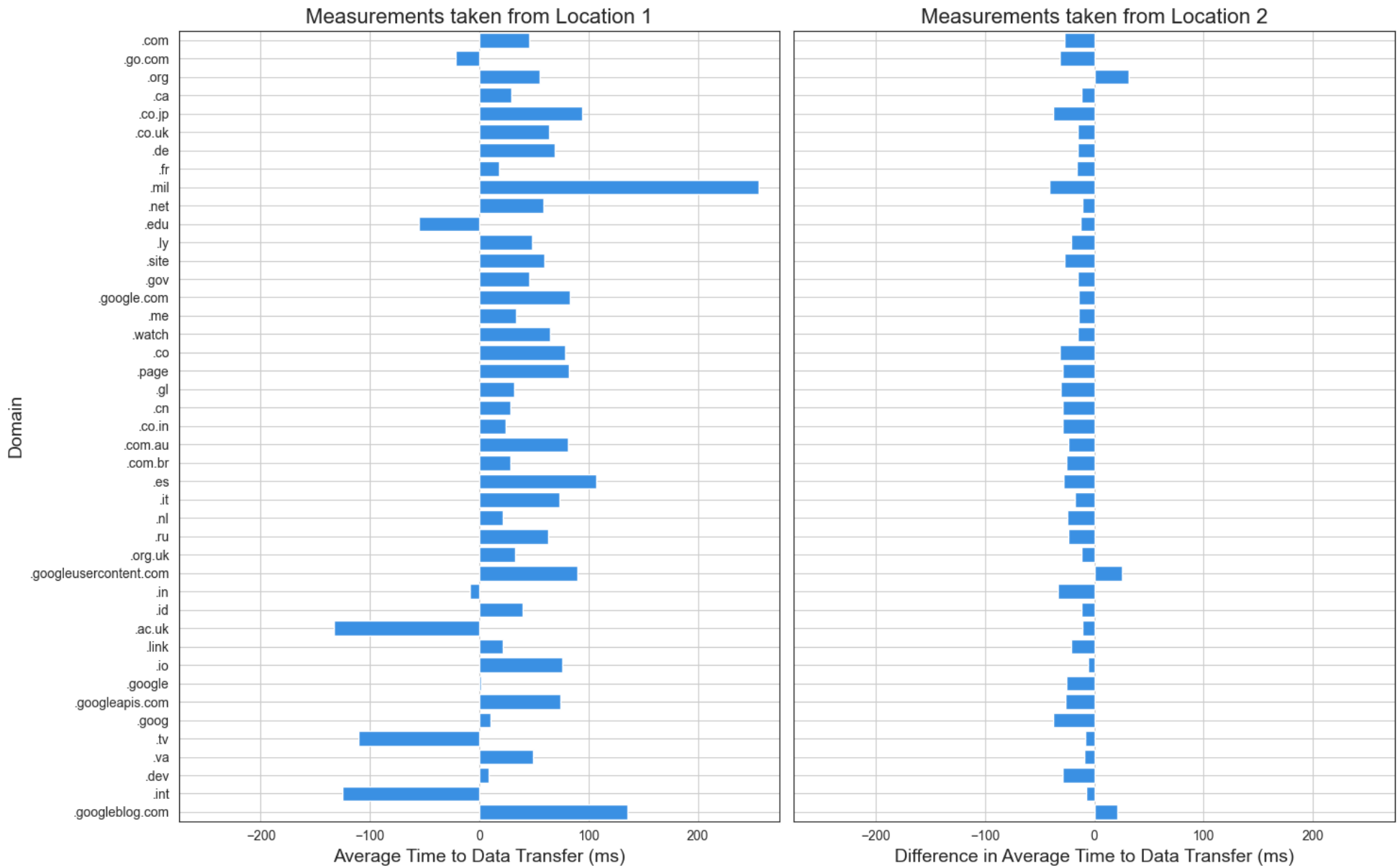
- Data Collection on Linux VM
  - 2 Locations: Home Router & High-Speed Server.
  - Querying 1000 Most Popular URLs.
  - Using *tcpdump* to conduct a Packet Capture.
- Data Analysis in Python
  - Extracting *pcap* data.
  - Parsing *qlog* records.

RESULTS

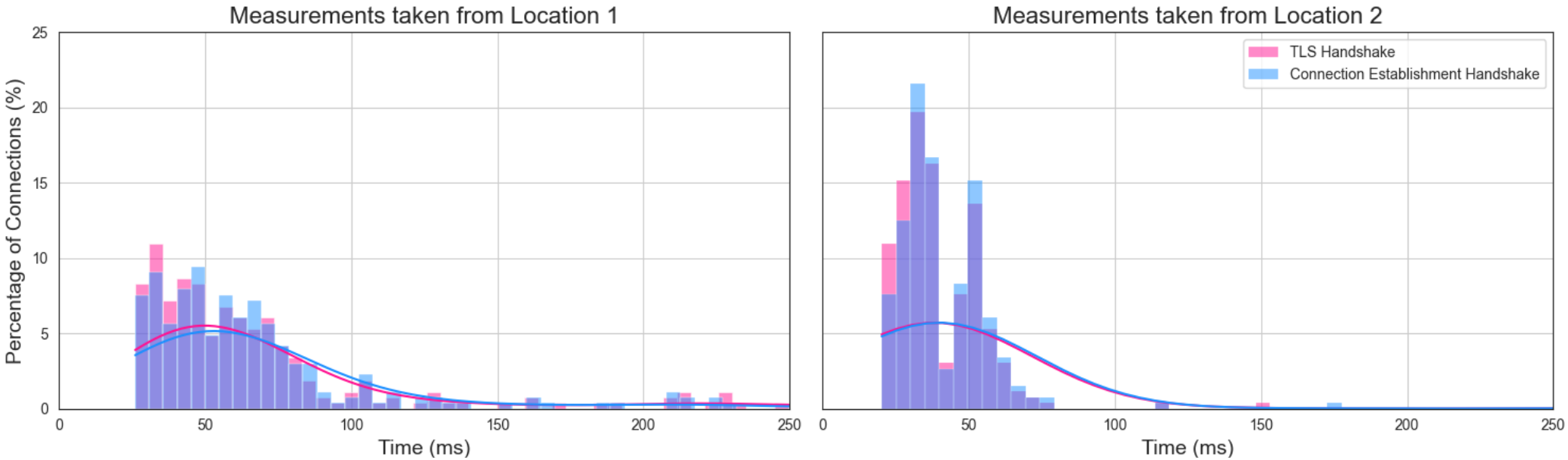
- Connection Establishment
  - QUIC faster than TCP from Home Router.
  - TCP slightly faster than QUIC from High-Speed Server.
- Round Trip Times
  - QUIC and TCP have similar RTT from Home Router.
  - QUIC much shorter RTT than TCP from High-Speed Server.


Time elapsed before initiating data transfer: QUIC vs TCP
Measurements taken from Location 1
Measurements taken from Location 2
Percentage of Connections (%)
Time taken (ms)
Time taken (ms)
TCP
QUIC
0
5
10
15
20
25
30
35
0
50
100
150
200
250

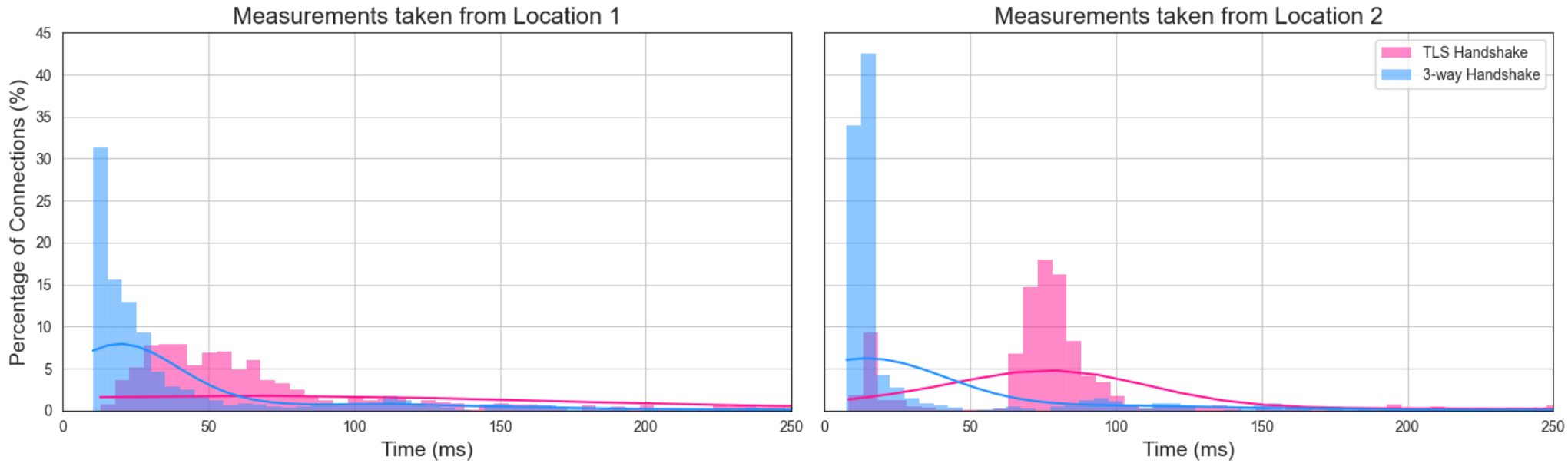
Difference in Time to Data Transfer: QUIC vs TCP



QUIC: Connection Establishment Handshake vs TLS Handshake



TCP: Three-Way Handshake vs TLS Handshake



RESULTS (PART 2)

- TLS Cipher Suites
  - QUIC and TCP established Cipher Suites for majority of connections.
  - TCP has more variation in Authentication and Key Exchange Algorithms compared to QUIC.
- TLS Alerts
  - QUIC suffered up to 6x more TLS-related Connection Errors than TCP.

EVALUATION & REFLECTION

- Lack of available Literature and Documentation.
- Setting up the Virtual Machine.
  - SSH into Computing Science Department Server.
- Compatible Versions of Dependencies.
  - Retrieving TLS information from *pcap* files.

THANK YOU

Lara D'Agata, 2526633d

https://github.com/laradagata/l4project/