Quincy Extreme Data

PRIVATE VS PUBLIC FEEDS
THE ROLE OF TRANSPORT

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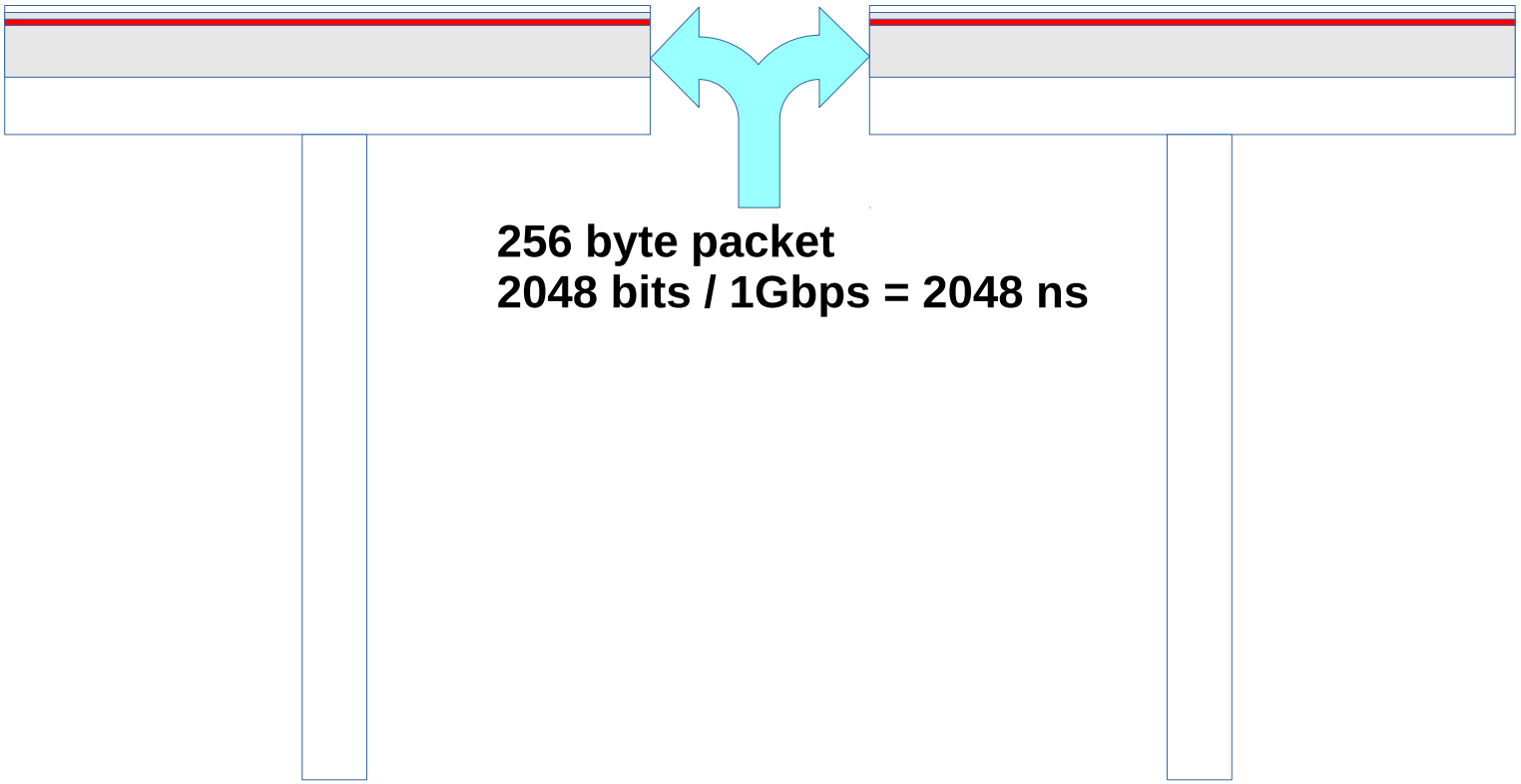
Stéphane Tyc

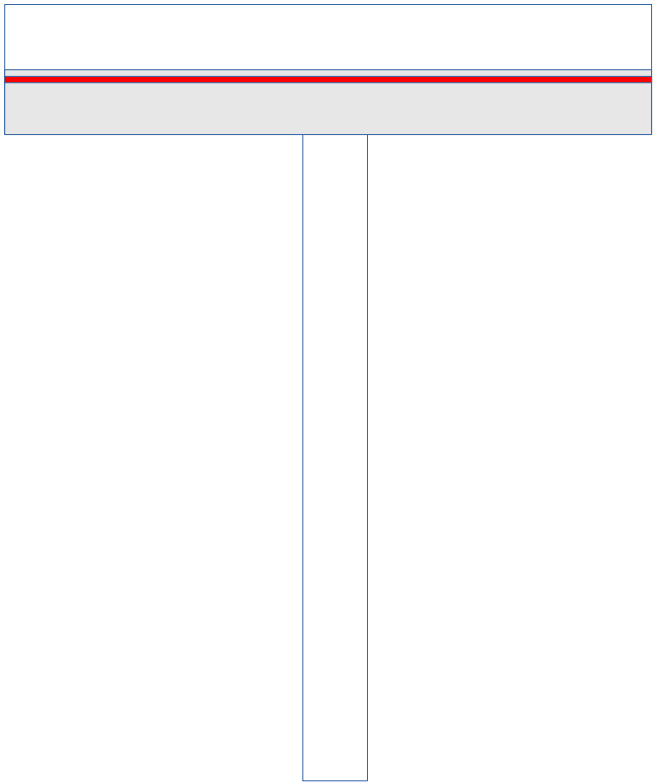
What’s the right model?

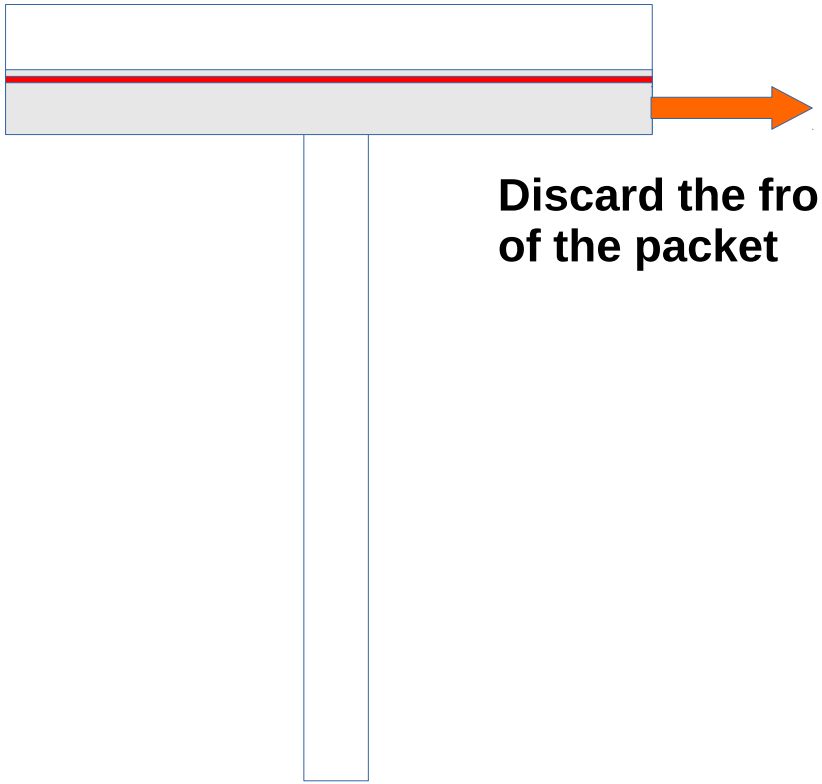
- Private feeds faster than public feeds
  - This is the norm is less liquid markets
  - Reporting requirements can be delayed, long delays generally accepted for large illiquid trades

- Public feeds faster than private feeds
  - Some argue this is more « fair » for highly liquid markets
  - Hard to implement, hard to really know if this helps reduce the cost of trading.

- Using only one feed for public and private info seems doable.
  - Each participant submits UUIDs with their orders and those are published in the public feed.
  - Some policing needs to be done to ensure compliance and remove abuse.


256 byte packet
2048 bits / 1Gbps = 2048 ns
Raw data path
Private signal path



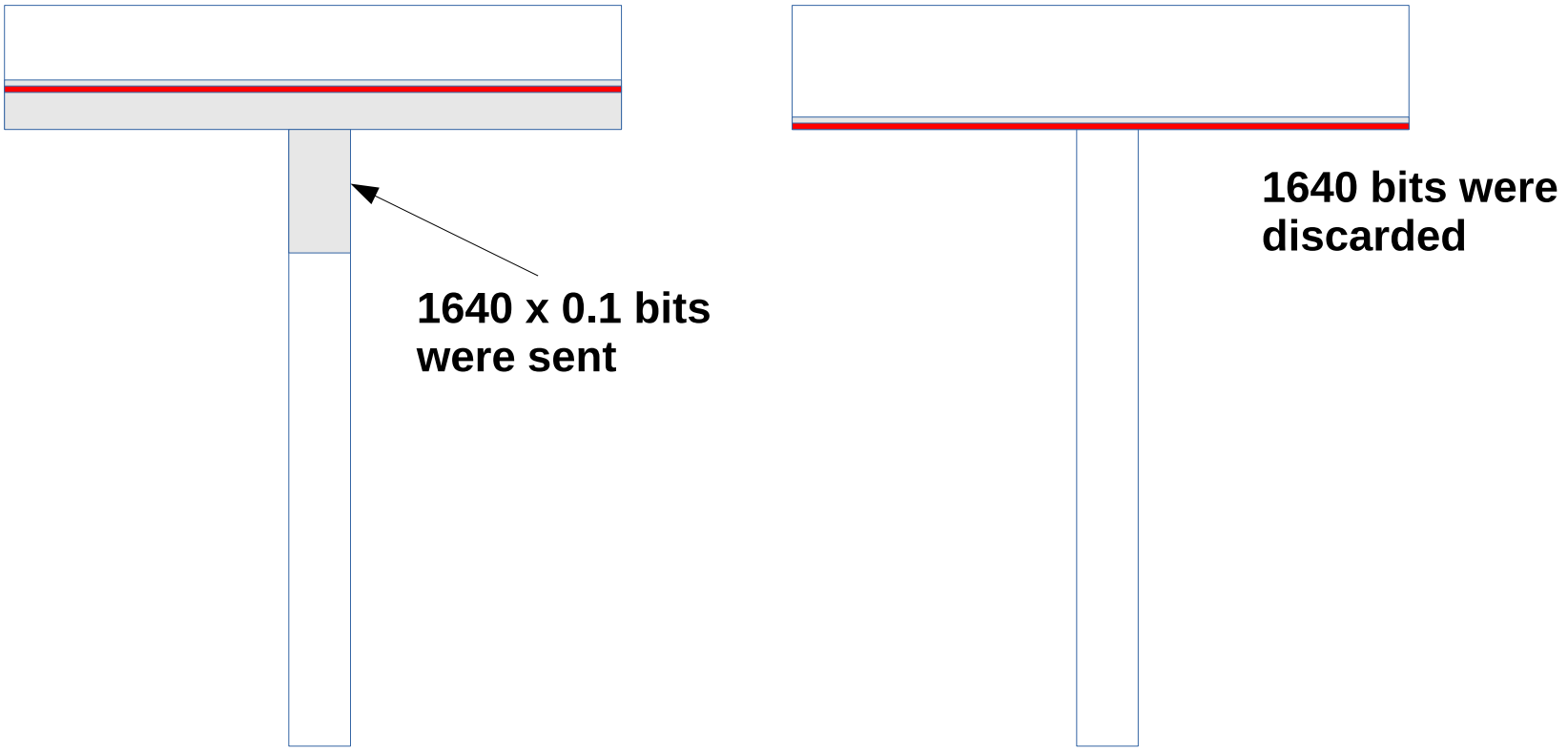


Discard the front of the packet

Raw data path

T = 0 ns

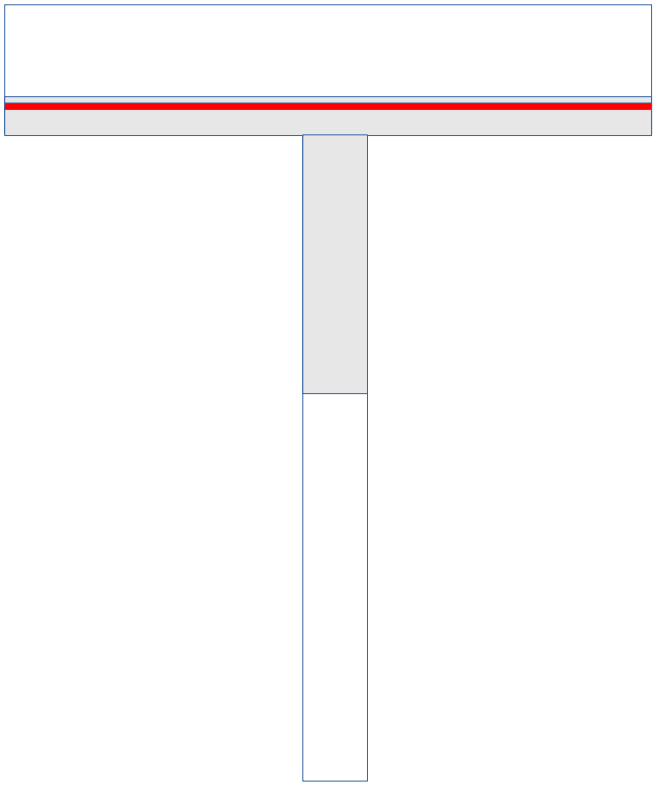
Private signal path

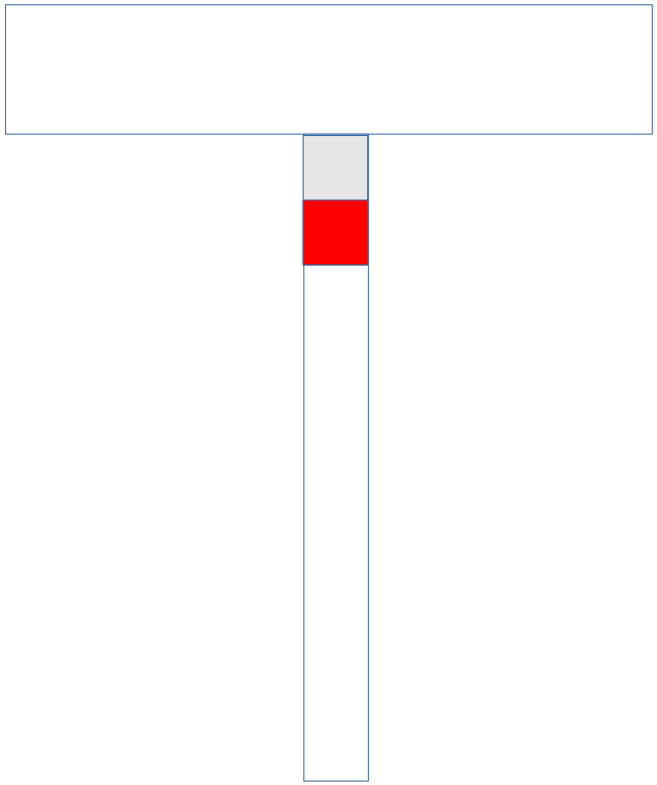


Raw data path

T = 164 ns

Private signal path

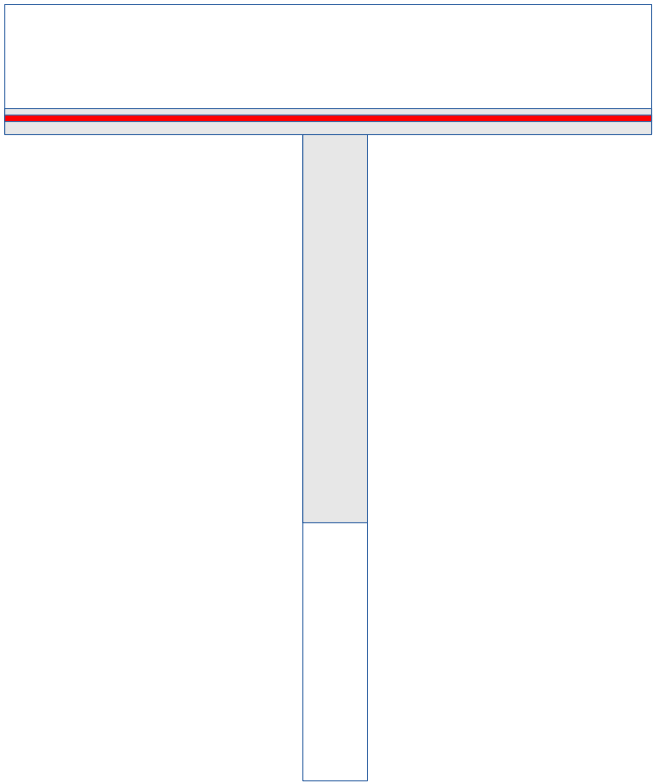


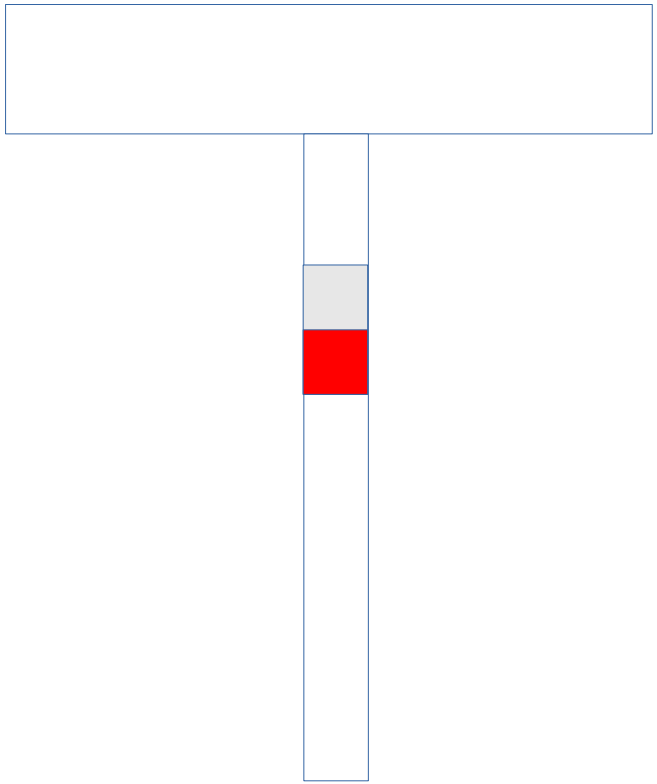


Raw data path

T = 574 ns

Private signal path

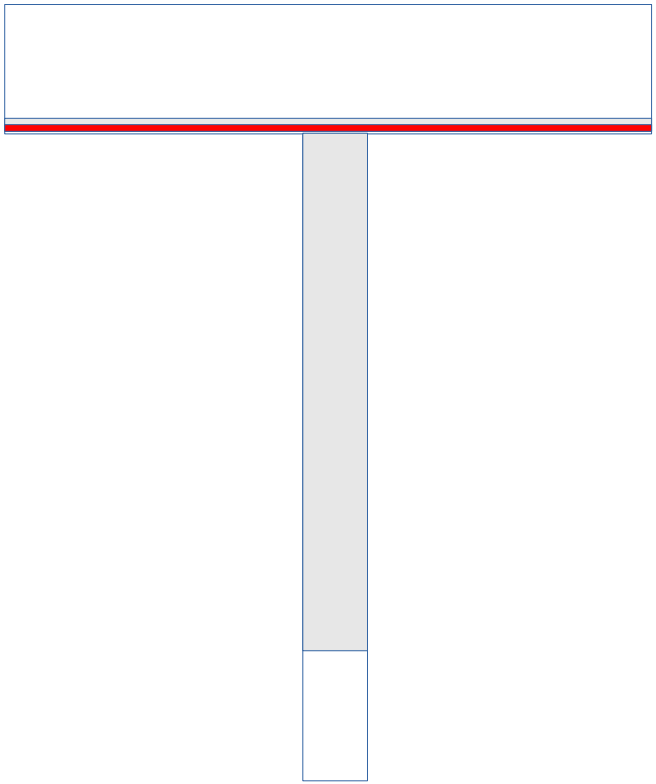


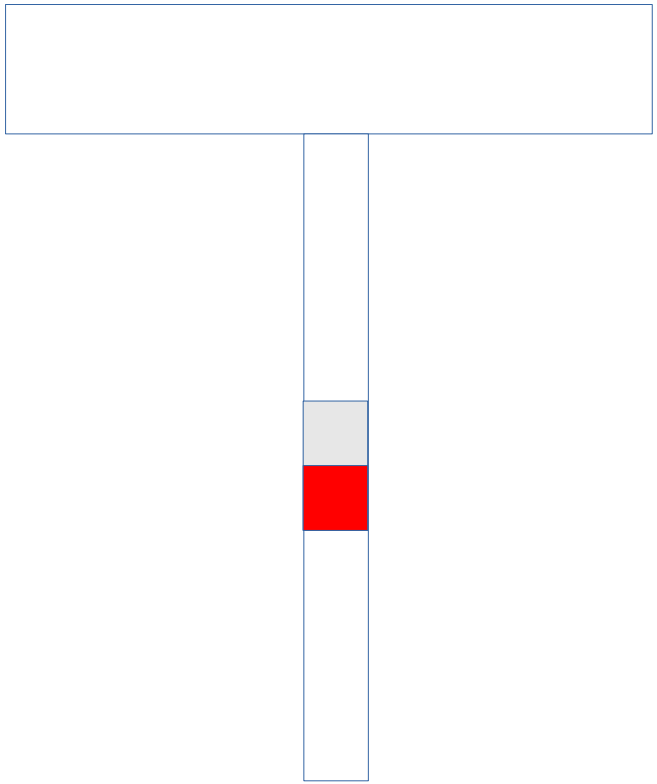


Raw data path

T = 984 ns

Private signal path





Raw data path

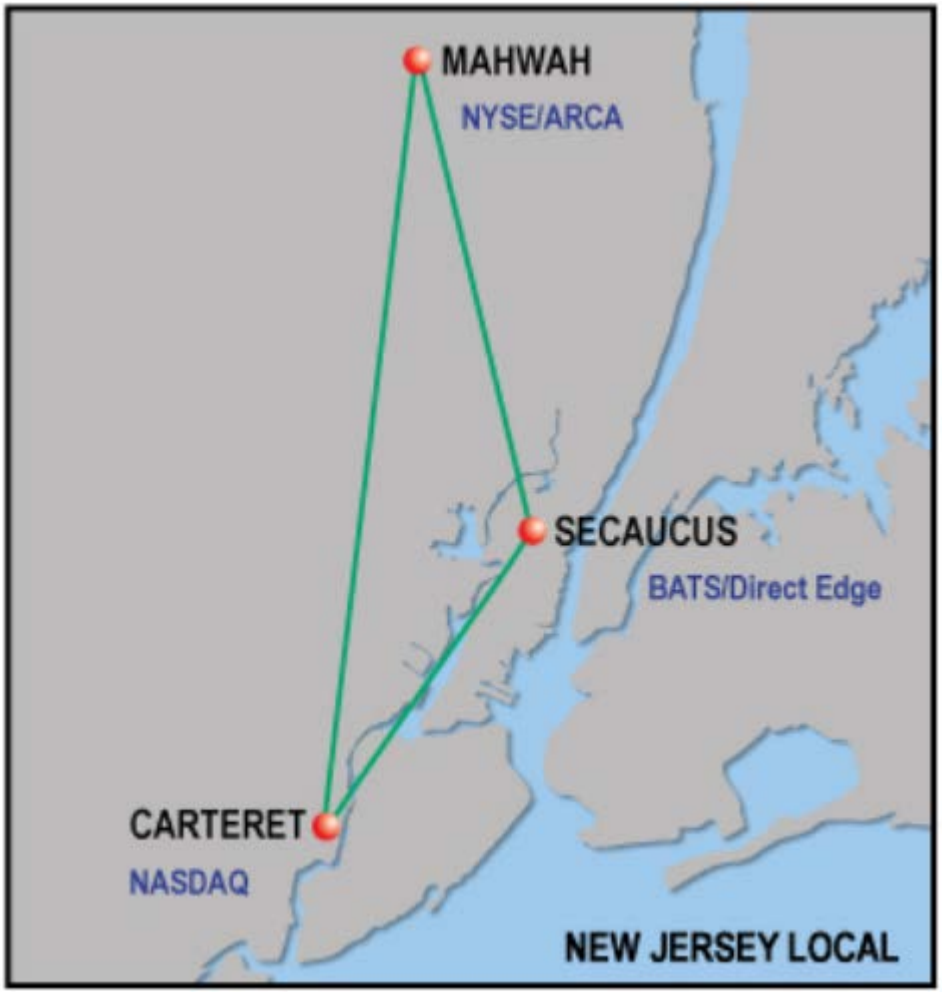
T = 1394 ns

Private signal path
Wins by 1230 ns

Is it possible to keep the public feed faster or equal?

- Ratio of the local colo pipe to the transport pipe
- Processing time for the private info extraction
- Amount of buffering induced by the local market data bursts

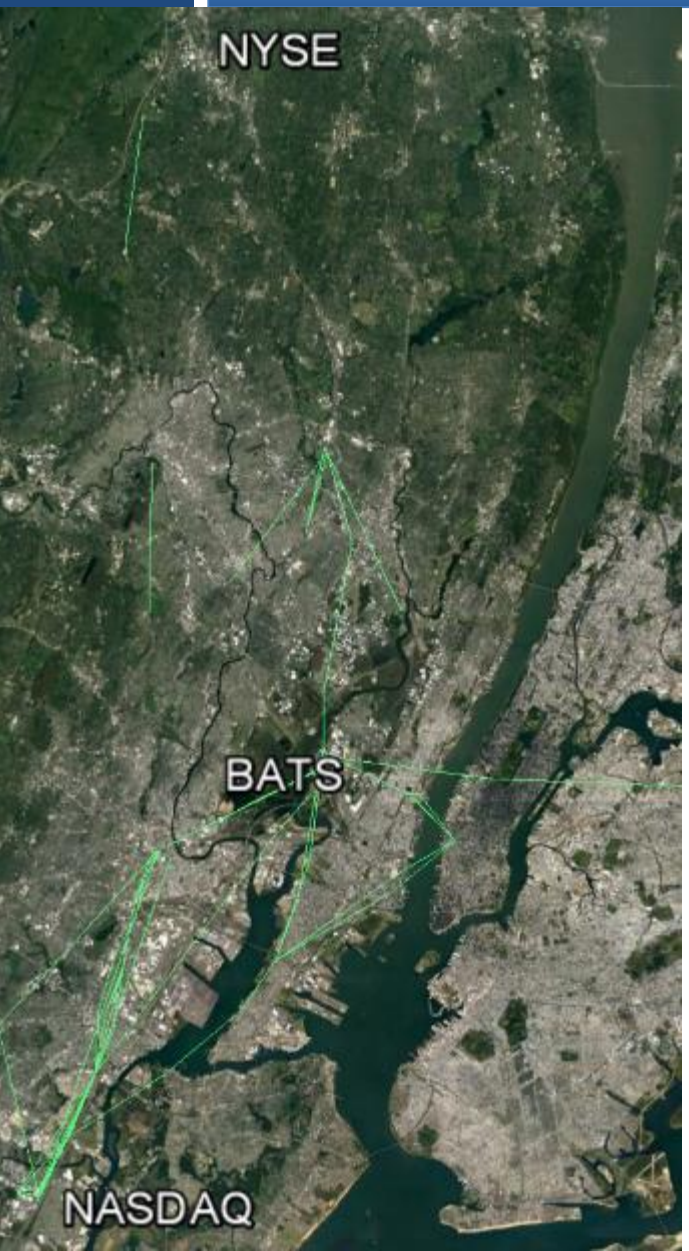
NJ Triangle of Exchanges



Wireless Networks Connecting Exchanges

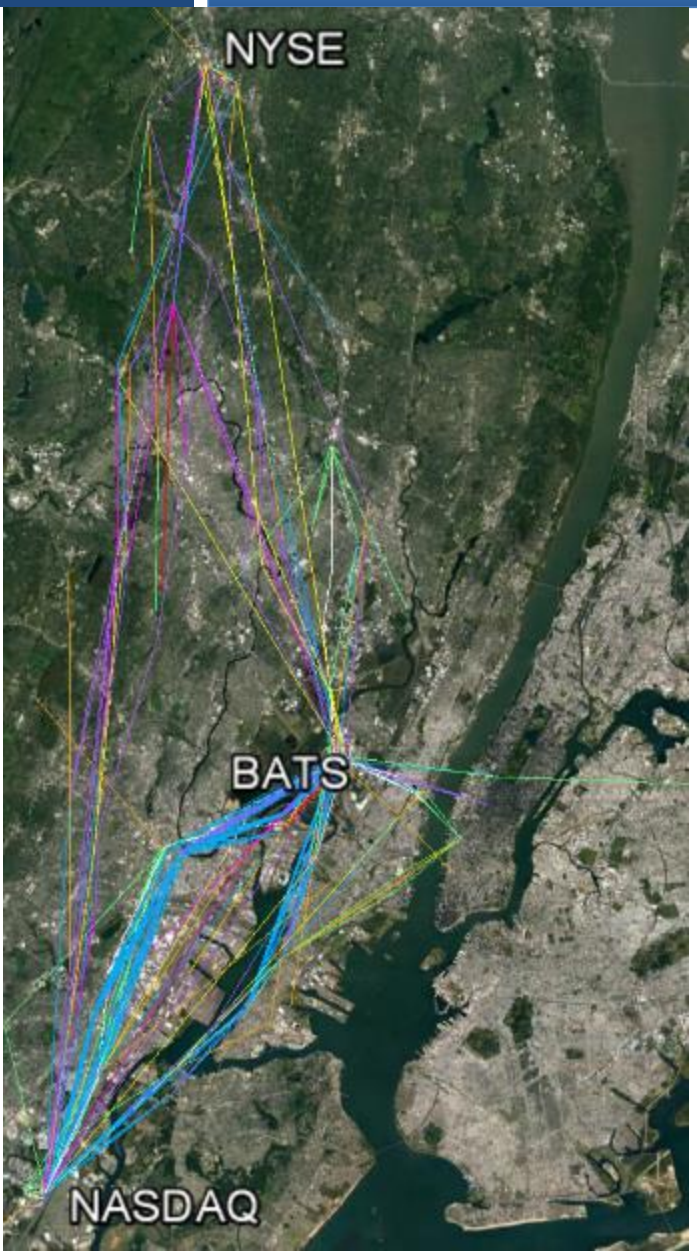
Wireless Networks registrations in 2011

Wireless Networks Connecting Exchanges



Wireless Networks registrations in 2012

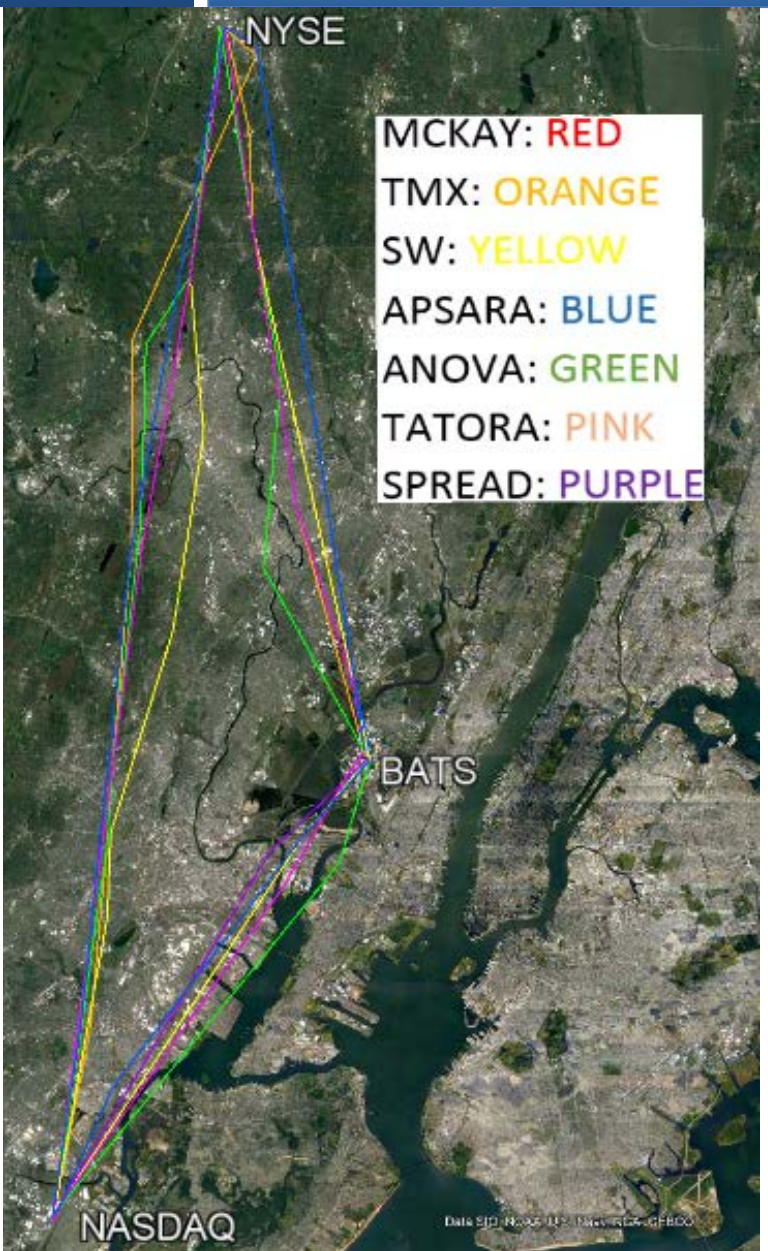
Wireless Networks Connecting Exchanges



Wireless Networks registrations from 2011 to 2018

Assume that competition has driven the difference to near zero on the transport latency. What does it mean for the private vs public feed?

Wireless Networks Connecting Exchanges



Wireless Networks

E-band (70-80 GHz)

- Established technology
- Millimeter frequencies have poor availability. Rain attenuates signal.
- Short hops mean more indirection
- Mostly 1 Gbps bandwidth (some 2-5 Gbps)

Equipment Vendors

- Pure Eband
  - Eband Corp: 1 Gbps in 1 GHz
  - Lightpointe: 1 Gbps in 1.5 GHz
  - EM Clarity: 5 Gbps in 4.2 GHz

- Hybrid Eband/FSO
  - Aoptix: 2 Gbps in 2.5 GHz

How can we add capacity in the face of congestion?

Wireless Networks Connecting Exchanges

Wireless Networks

E-band (70-80 GHz)

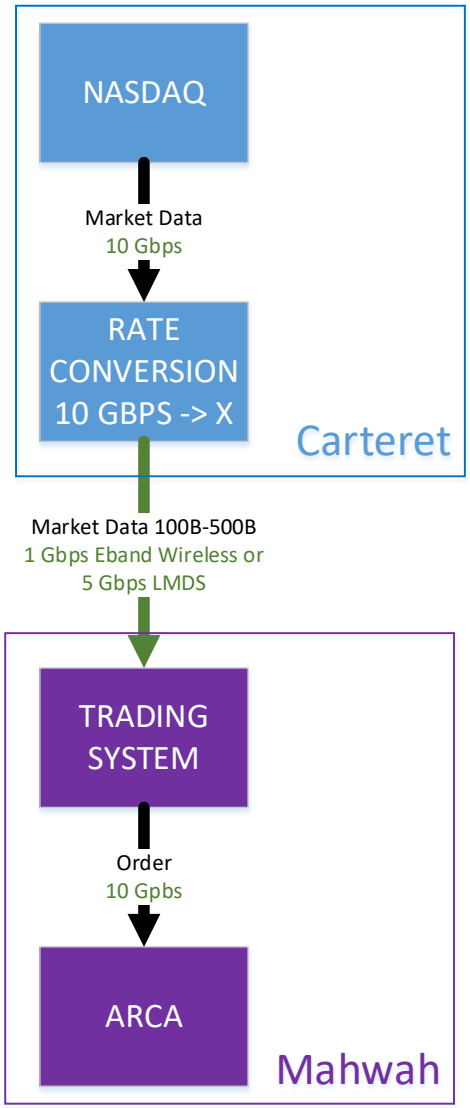
- Established technology
- Millimeter frequencies have poor availability. Rain attenuates signal.
- Short hops mean more indirection
- Mostly 1 Gbps bandwidth (some 2-5 Gbps)

LMDS (28 GHz)

- New technology
- Microwave frequencies have better availability. Rain has less impact.
- Longer hops mean less indirection
- 5-7 Gbps bandwidth

Path lengths close to perfect. What happens when everyone's latency is the same?

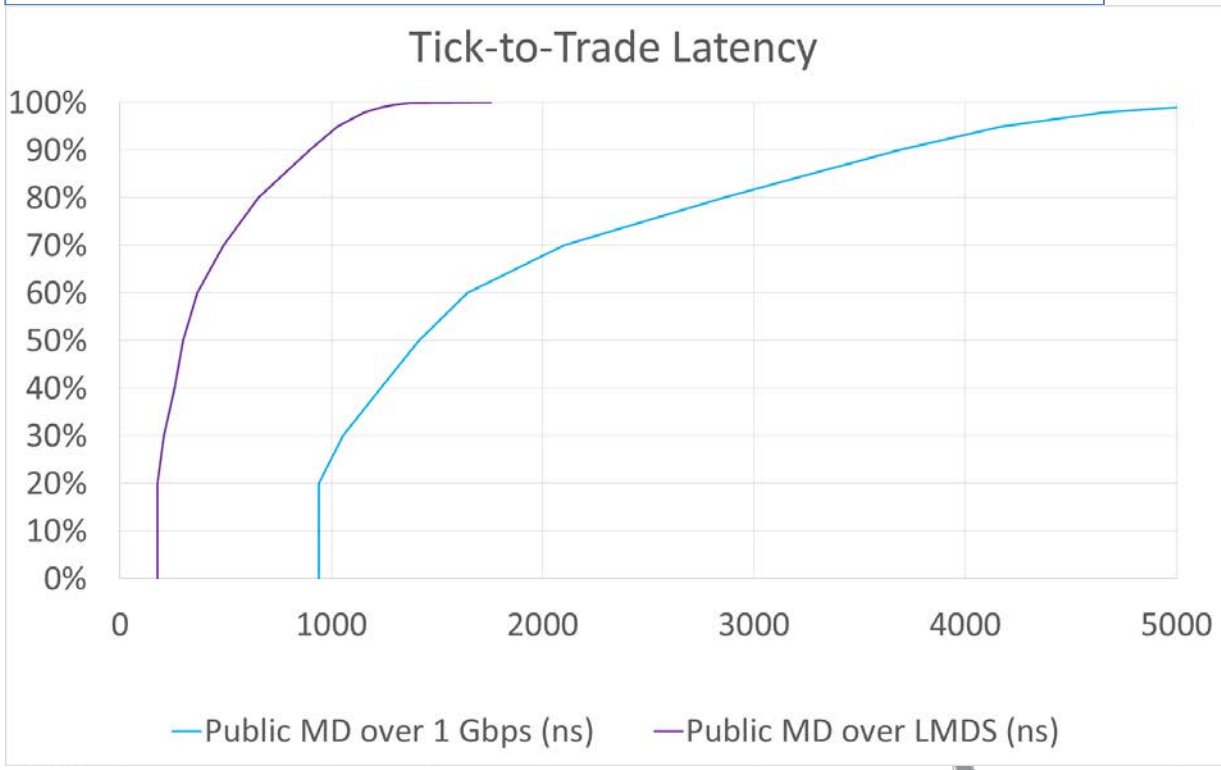
CDF of Tick-Trade Latency with Raw Market data



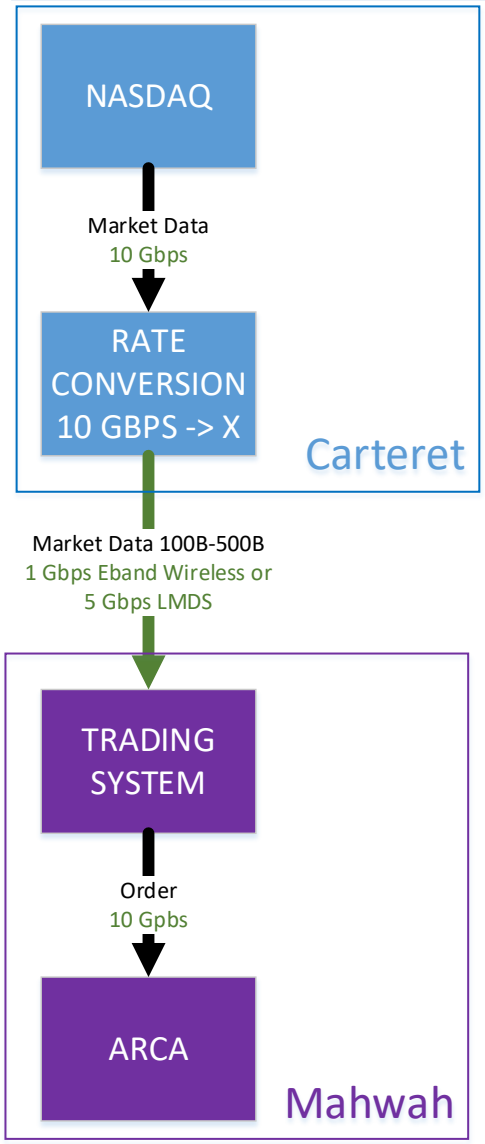
Raw Market Data Dist

Compute CDF of Tick-Trade Latency

- Use NASDAQ FPGA market data for Feb 9, 2018
- Market data packets have actual sizes, 100B-500B
- Compute serialization delay
- Simulate congestion due to rate conversion
- Assume no latency in
  - Network Switches
  - Trading System
  - Wireless Network



Trading System Using Trading Signal



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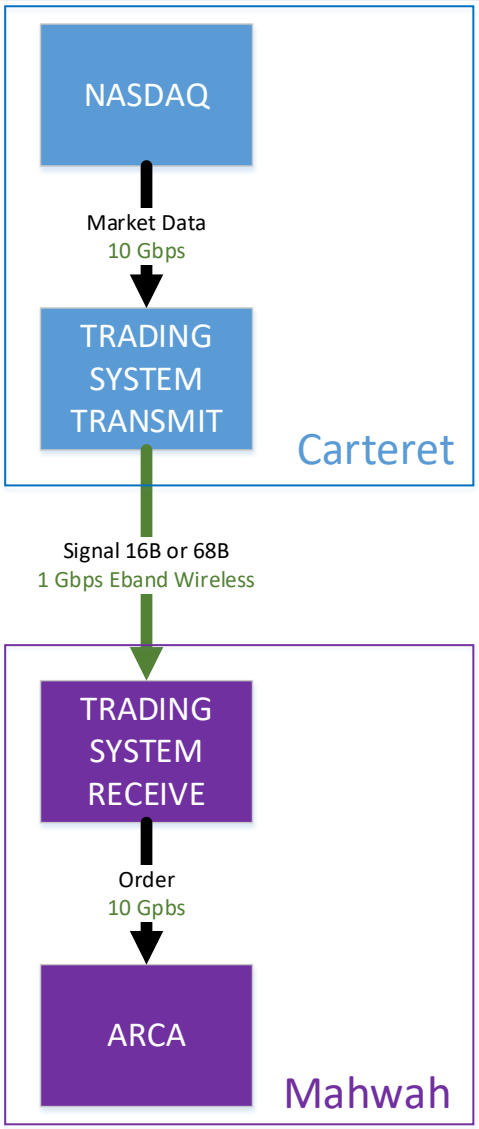
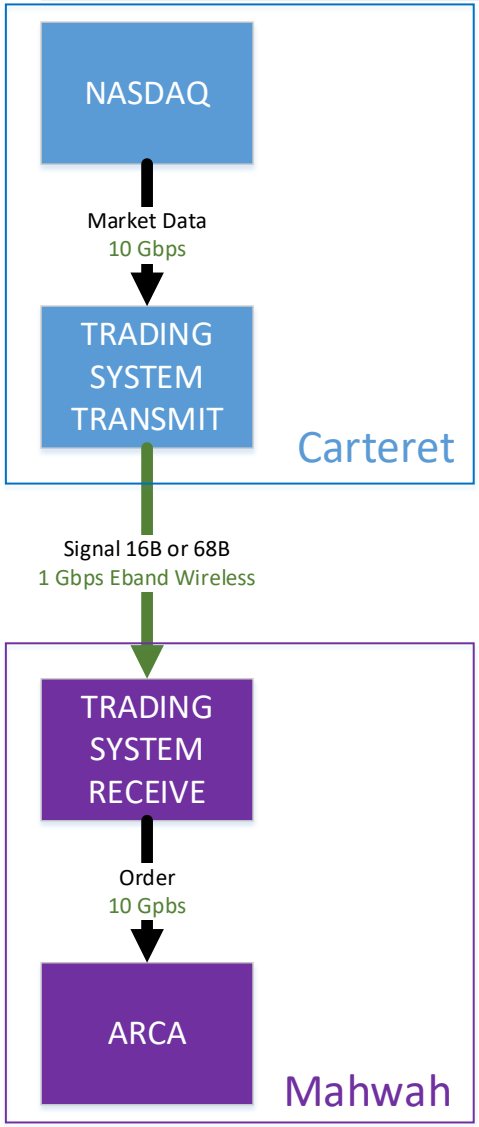


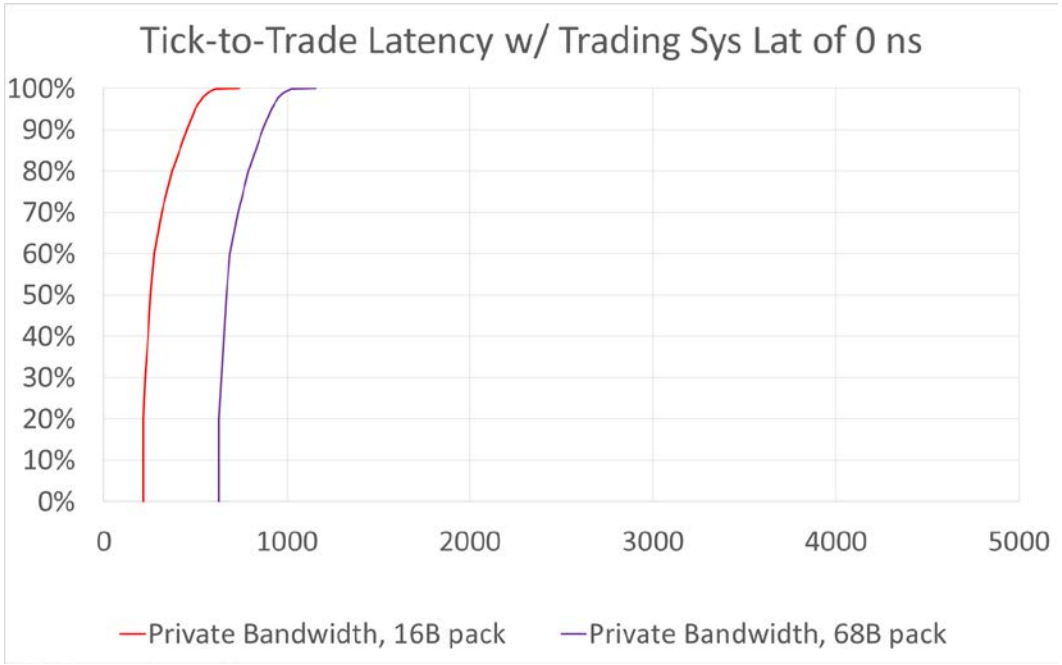
Signal Distribution

CDF of Tick-Trade Latency with signal sending

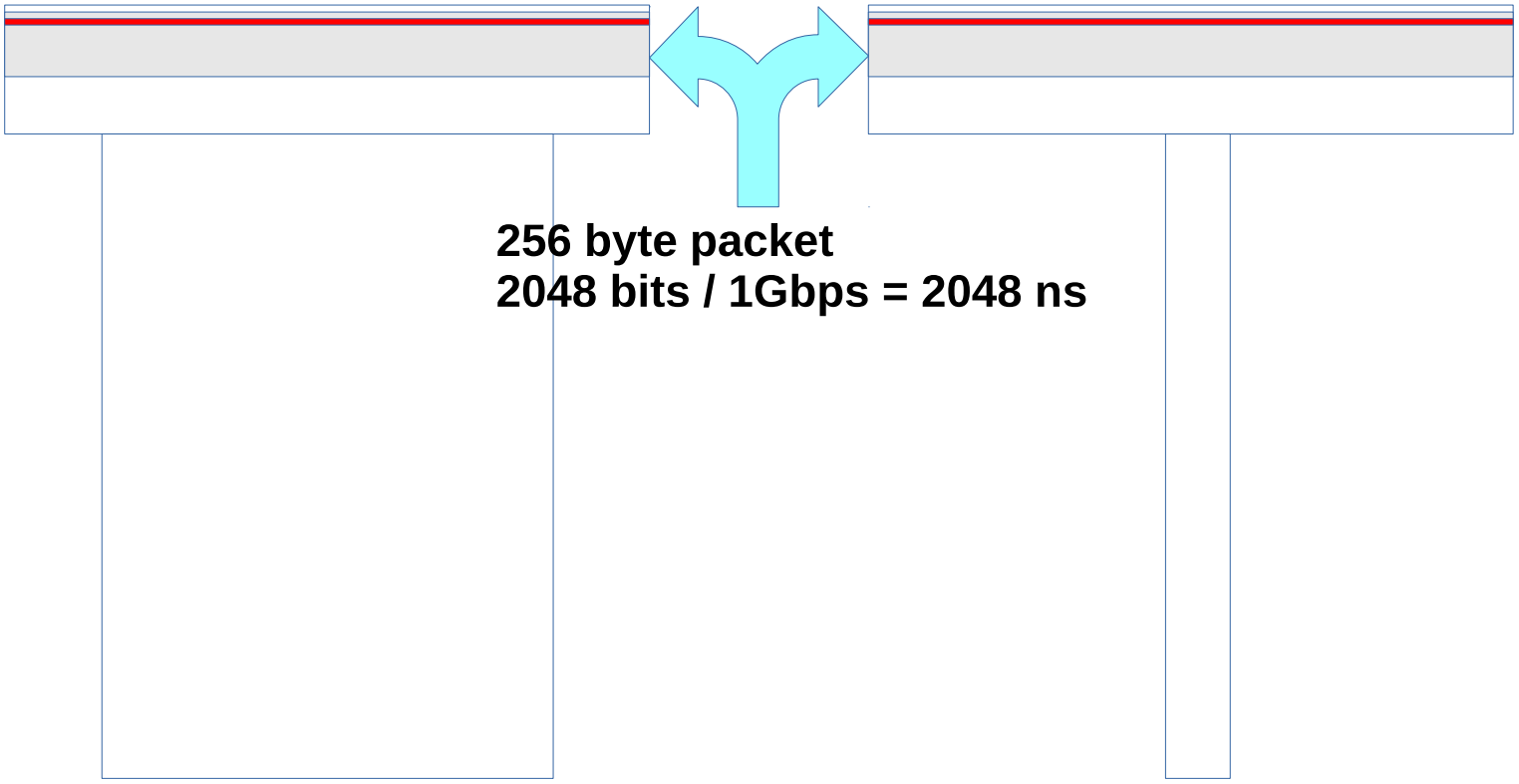


Compute CDF of Tick-Trade Latency

- Use NASDAQ FPGA market data for Feb 9, 2018
- **Restrict to OEX stocks and only look at trades**
- Compute serialization delay
- No congestion due to rate conversion
- Assume no latency in
  - Network Switches
  - Trading System
  - Wireless Network



Signal sending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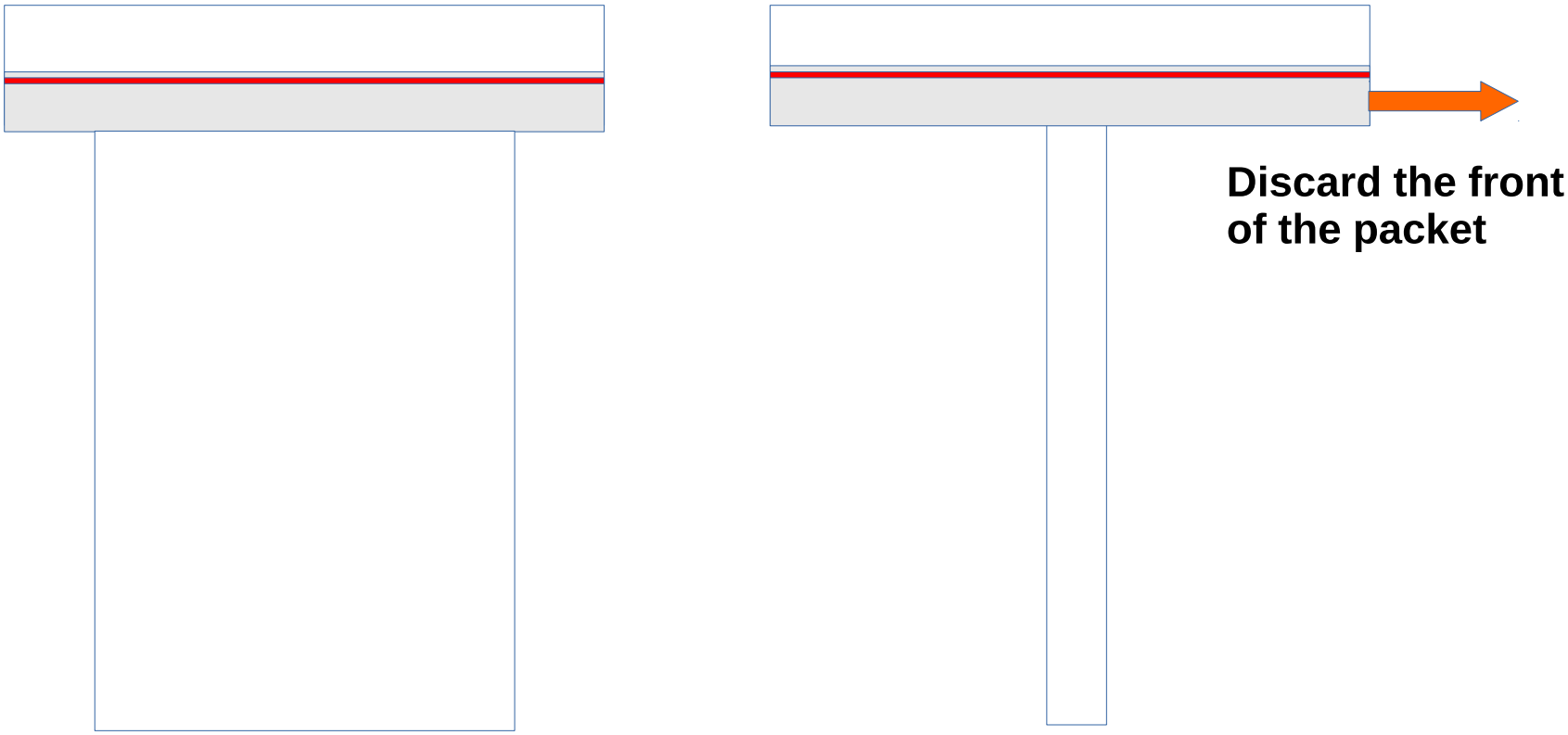
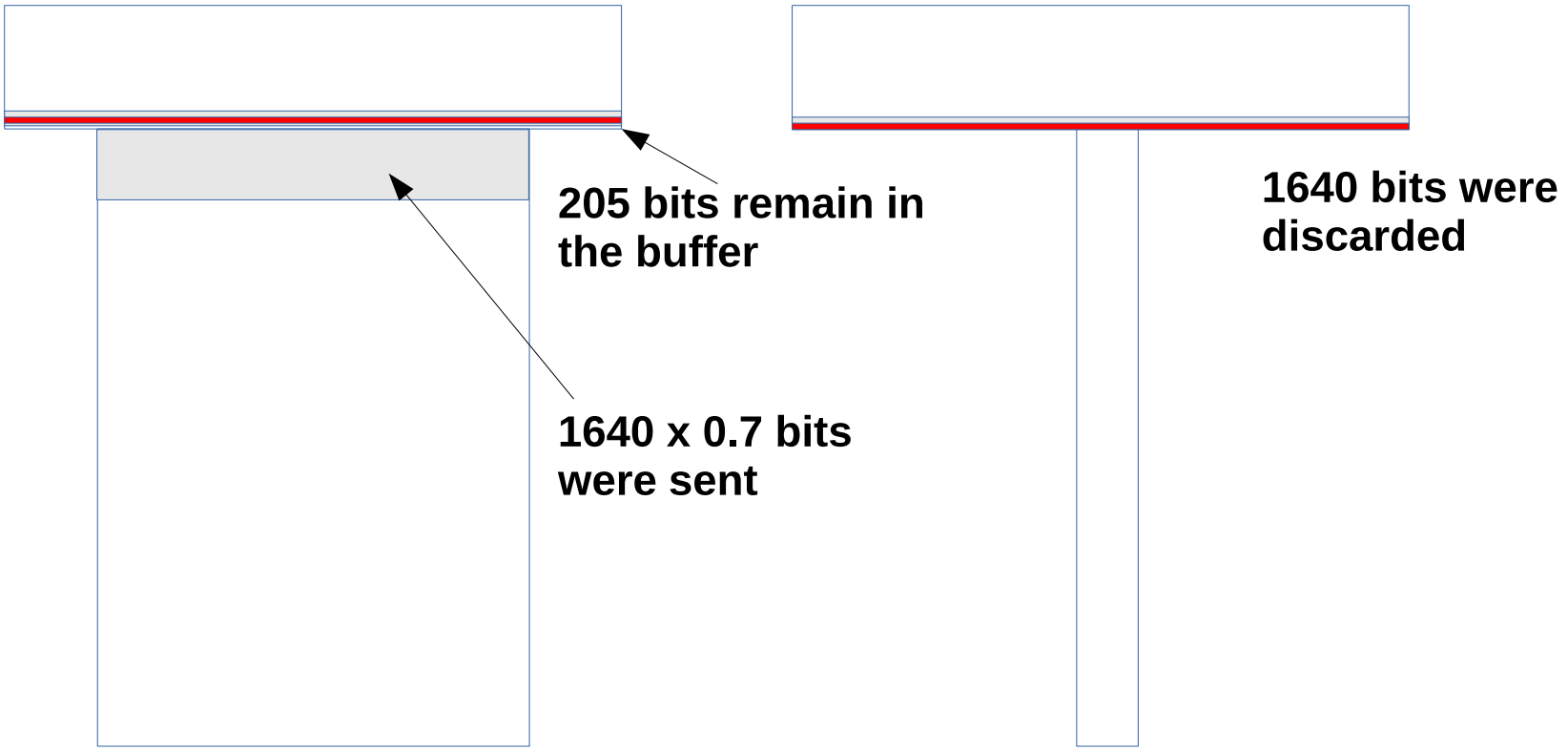
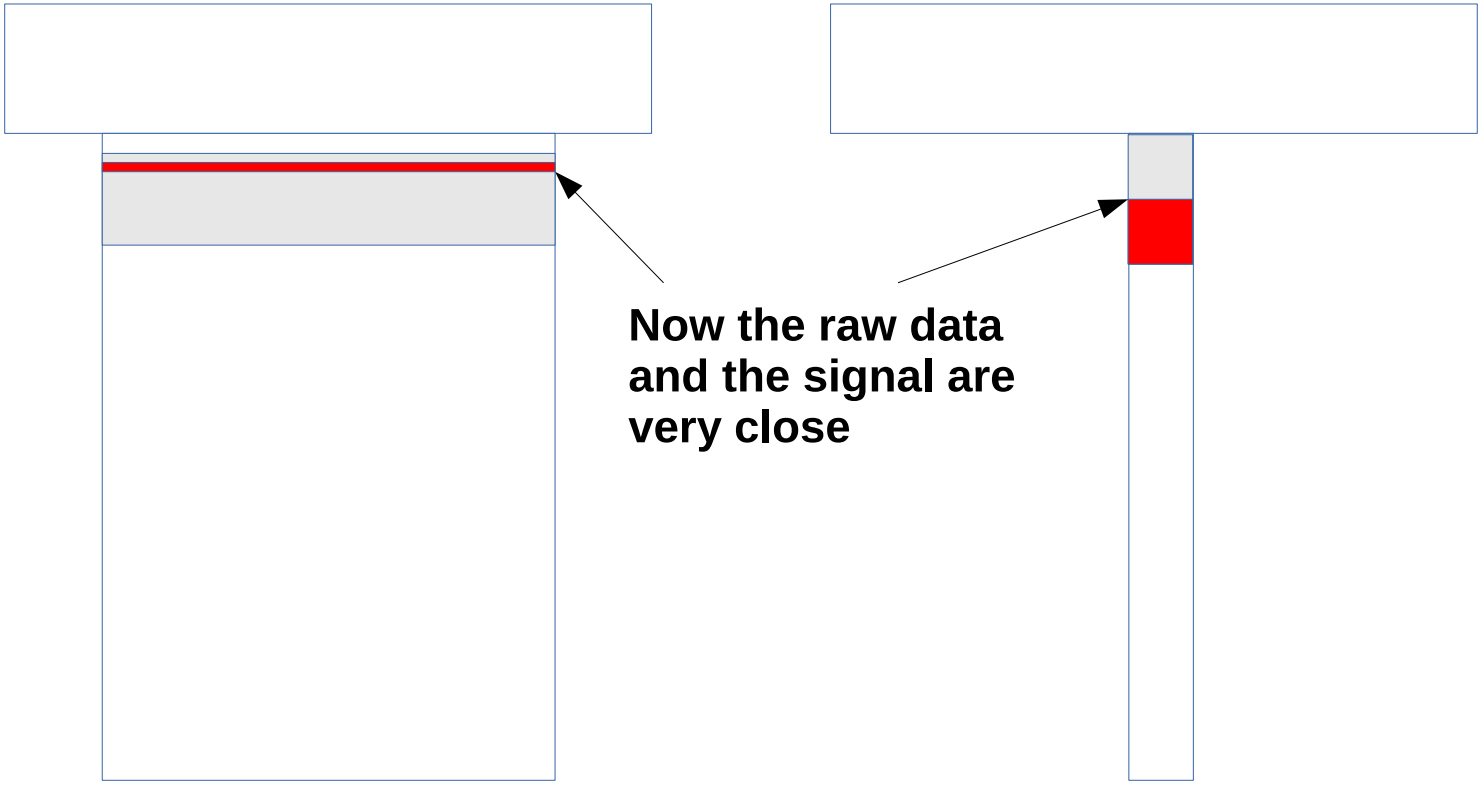


Raw data path

T = 0 ns

Private signal path

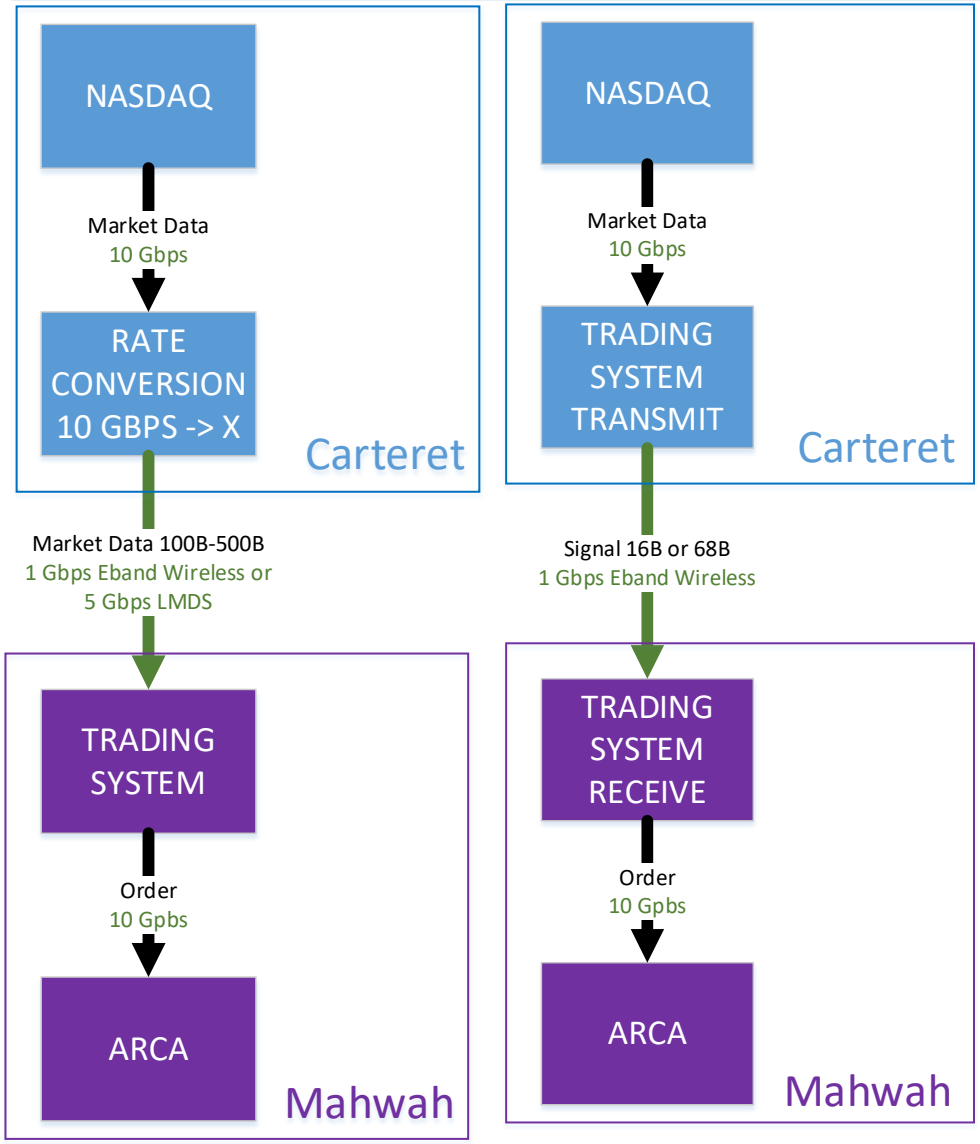

205 bits remain in the buffer
1640 bits were discarded
1640 x 0.7 bits were sent
Raw data path
T = 164 ns
Private signal path



Raw data path T = 574 ns **Private signal path**

Now we need to do a real simulation to compare the two paths

Tick-to-Trade Comparison: Raw MD vs Signal



Raw Market Data Dist

Signal Distribution

Guesstimate Latencies for Trading Systems

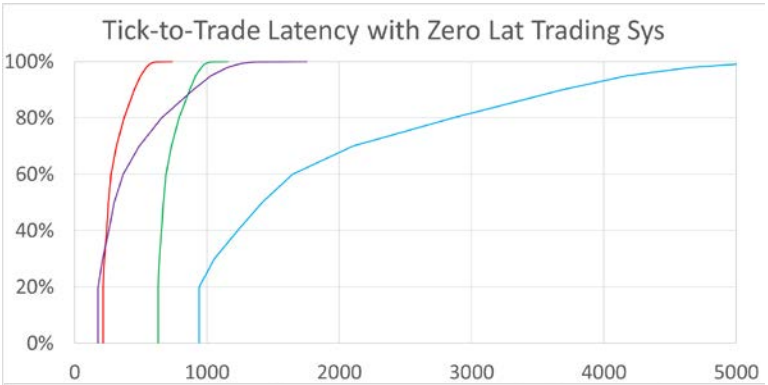
Software Latency

- Trading System ~ 2000 ns
- Transmit Trad Sys ~ 2000 ns
- Receive Trad Sys ~ 2000 ns

FPGA Latency

- Trading System ~ 700 ns
- Transmit Trad Sys ~ 700 ns
- Receive Trad Sys ~ 350 ns

Tick-to-Trade Comparison: Raw MD vs Signal



T2T Latency of Zero-Latency TS.

- Private Bandwidth with 16B signal wins 65%
- LMDS wins 35%.

T2T Latency of Software TS.

- LMDS wins 100%

T2T Latency of FPGA TS.

- LMDS wins 85%
- Private Bandwidth with 16B signal wins 15%

What to buy?

Today

- 1 Gbps of private bandwidth on each leg helps you win most of the time
- Cost is high
- Availability is low
- Raw market data from the exchanges is almost always slower

With LMDS

- LMDS wins 85% against the fastest 1 Gbps private bandwidth
- Cost lower
- Availability to all