



Quincy Extreme Data

# PRIVATE VS PUBLIC FEEDS THE ROLE OF TRANSPORT

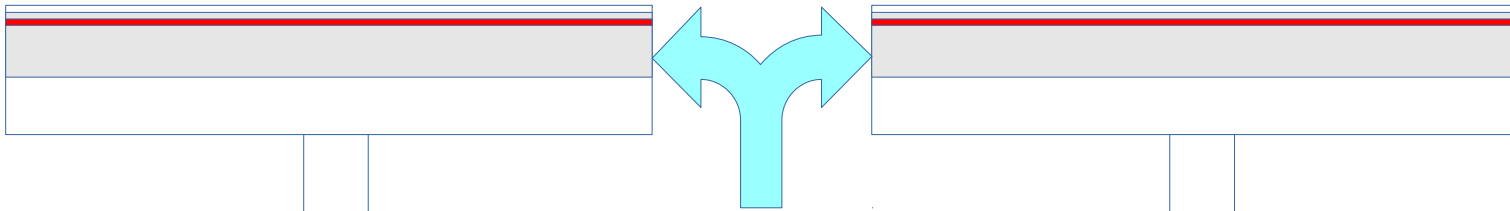
May 9, 2018

Stéphane Tyc

# What's the right model?

- Private feeds faster than public feeds
  - This is the norm in 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**  
 **$2048 \text{ bits} / 1\text{Gbps} = 2048 \text{ ns}$**

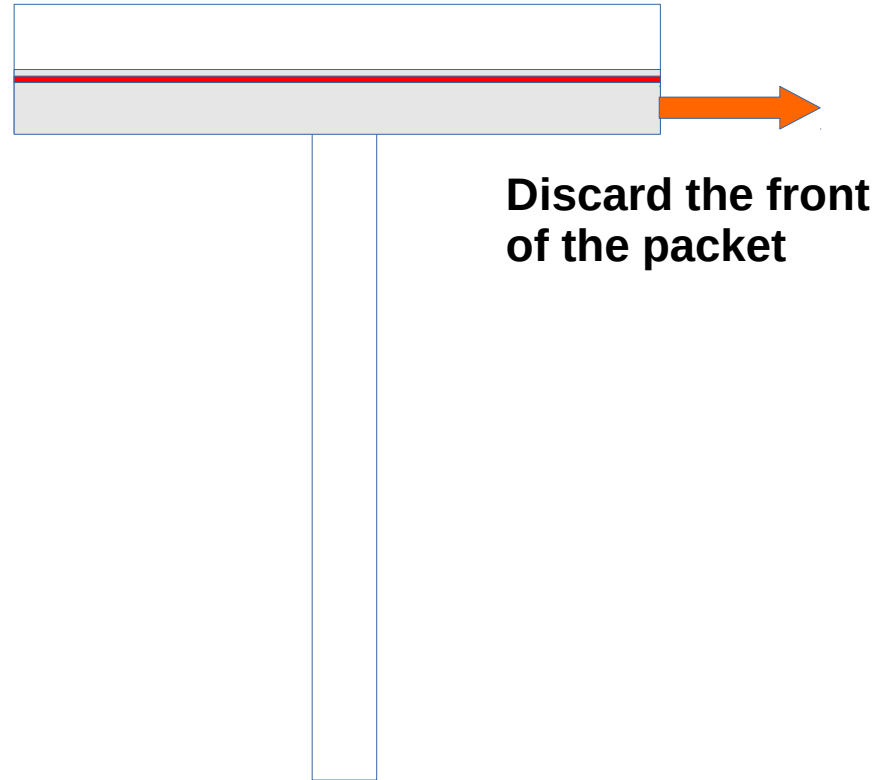
**Raw data path**

**Private signal path**



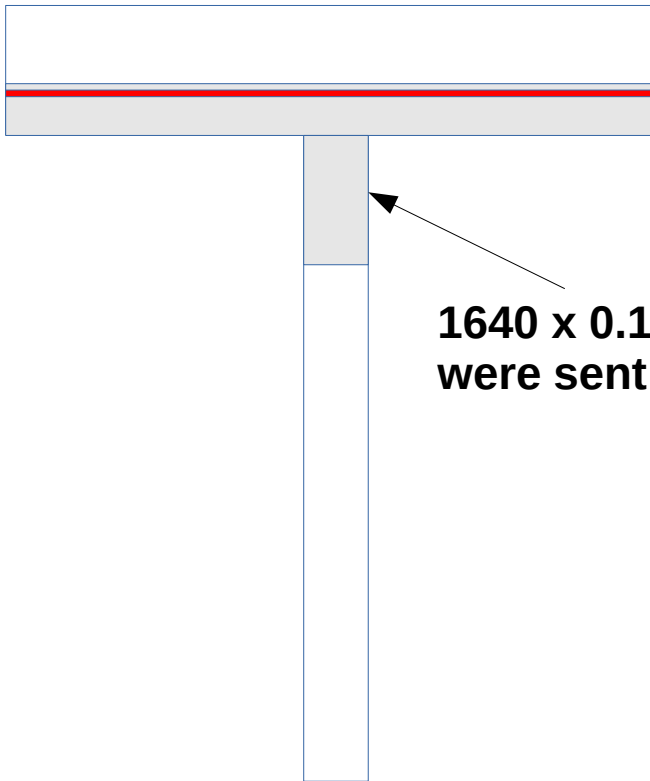
**Raw data path**

$T = 0 \text{ ns}$



**Private signal path**

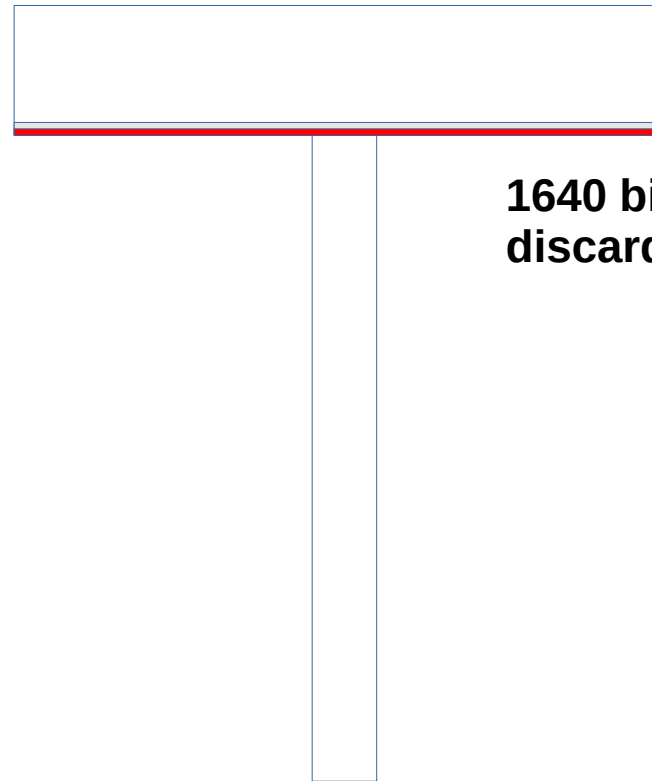




**1640 x 0.1 bits  
were sent**

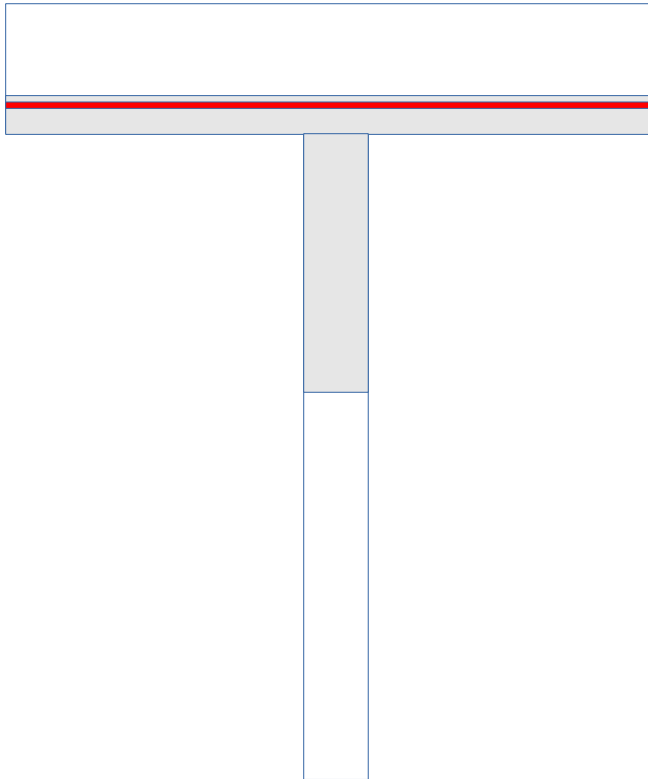
**Raw data path**

**T = 164 ns**



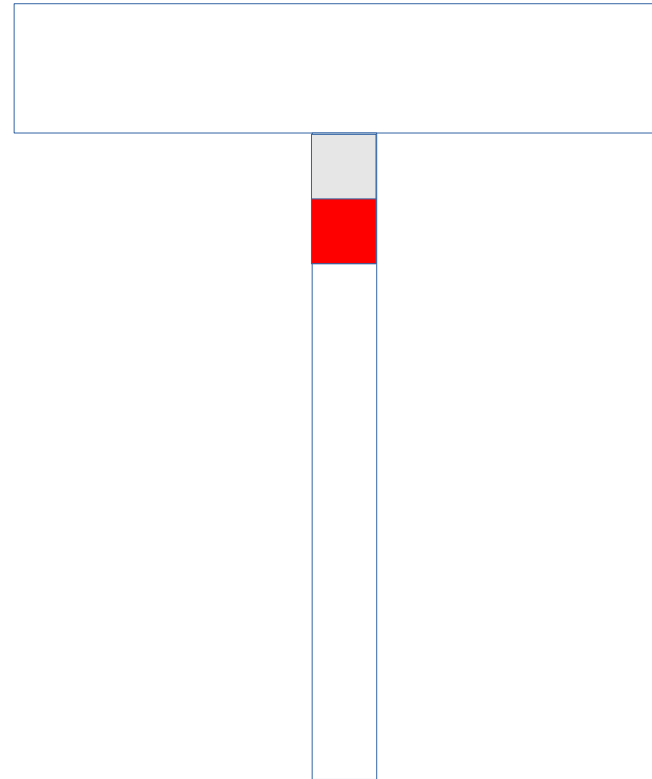
**1640 bits were  
discarded**

**Private signal path**

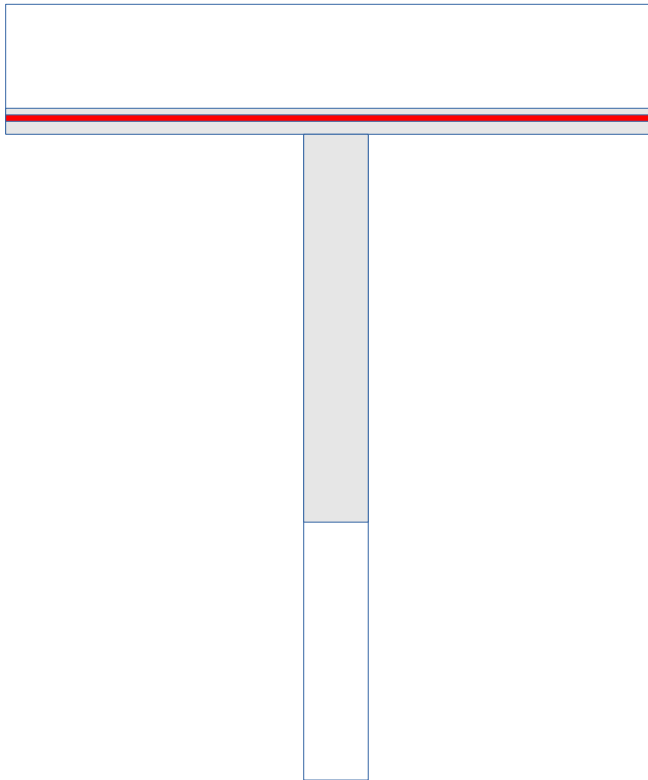


**Raw data path**

$T = 574 \text{ ns}$

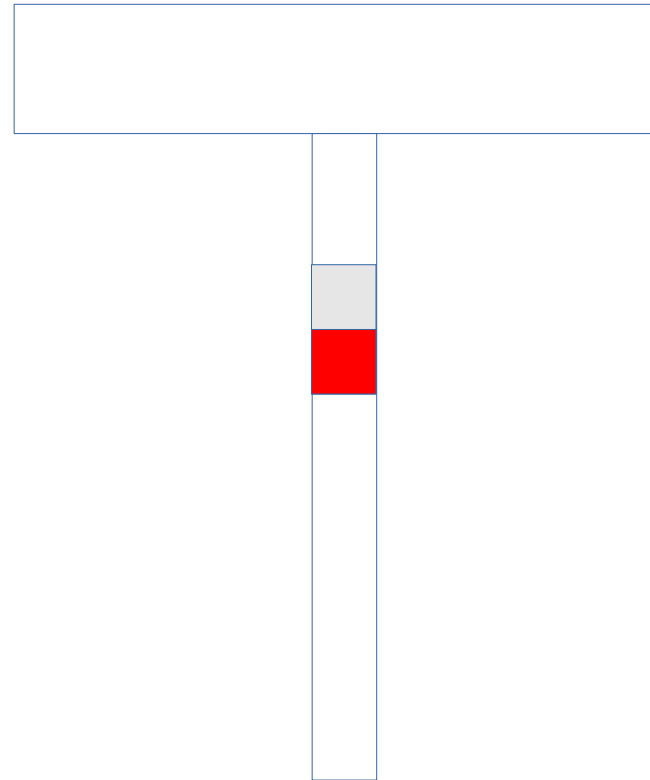


**Private signal path**

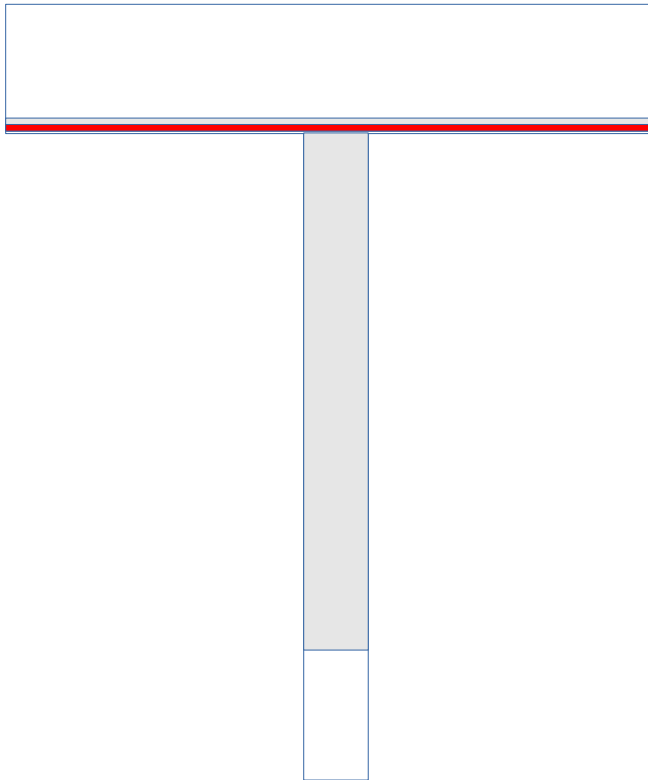


**Raw data path**

$T = 984 \text{ ns}$

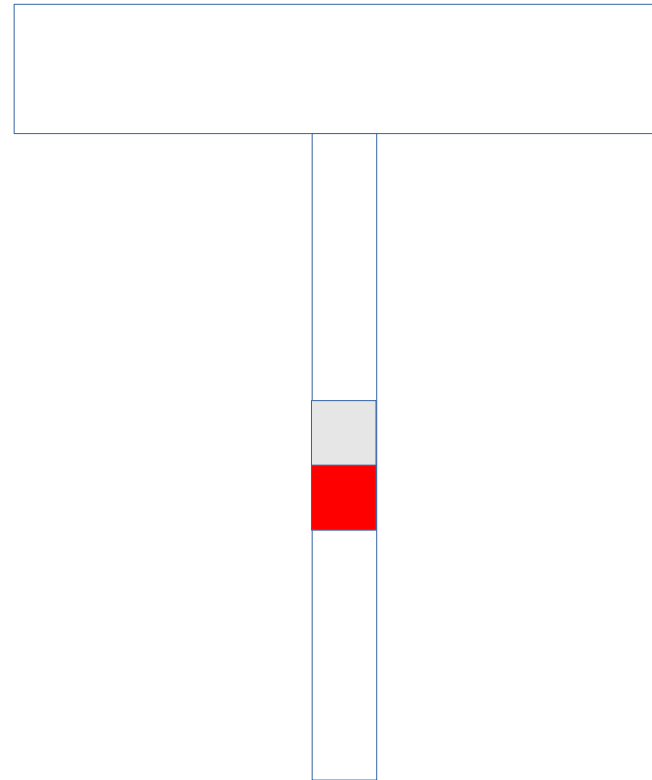


**Private signal path**



**Raw data path**

$T = 1394 \text{ ns}$



**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





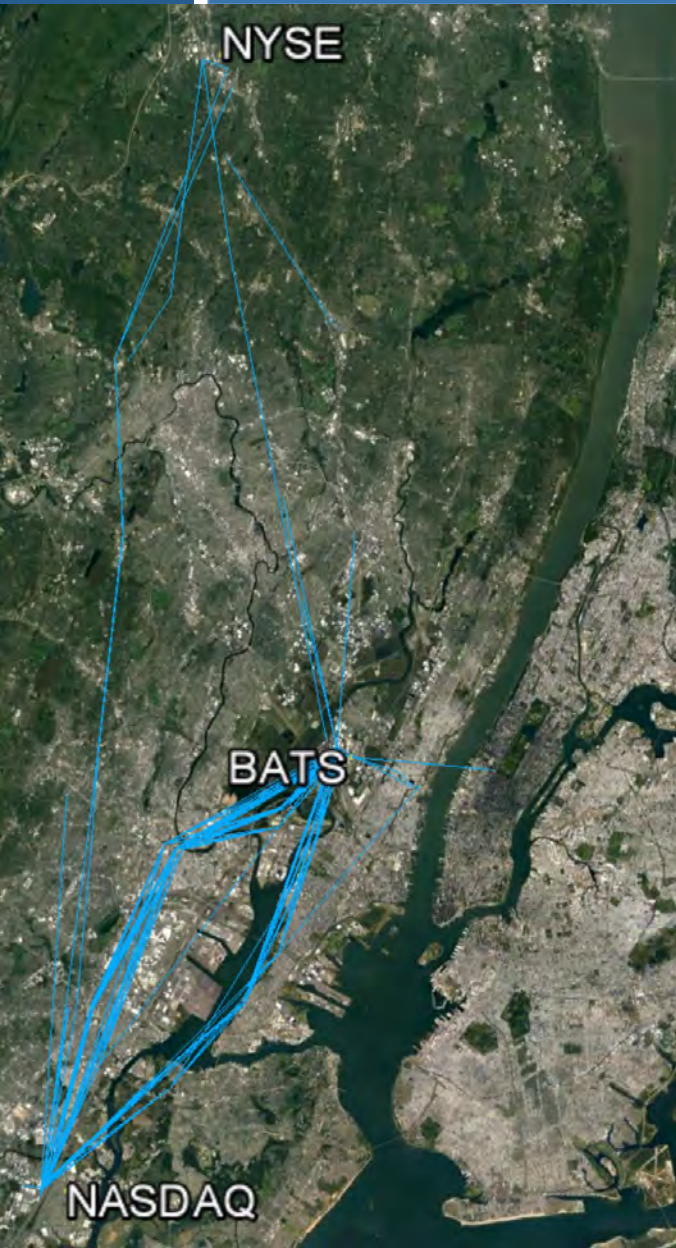
# Wireless Networks Connecting Exchanges



Wireless Networks registrations in 2013



# Wireless Networks Connecting Exchanges



Wireless Networks registrations in 2014





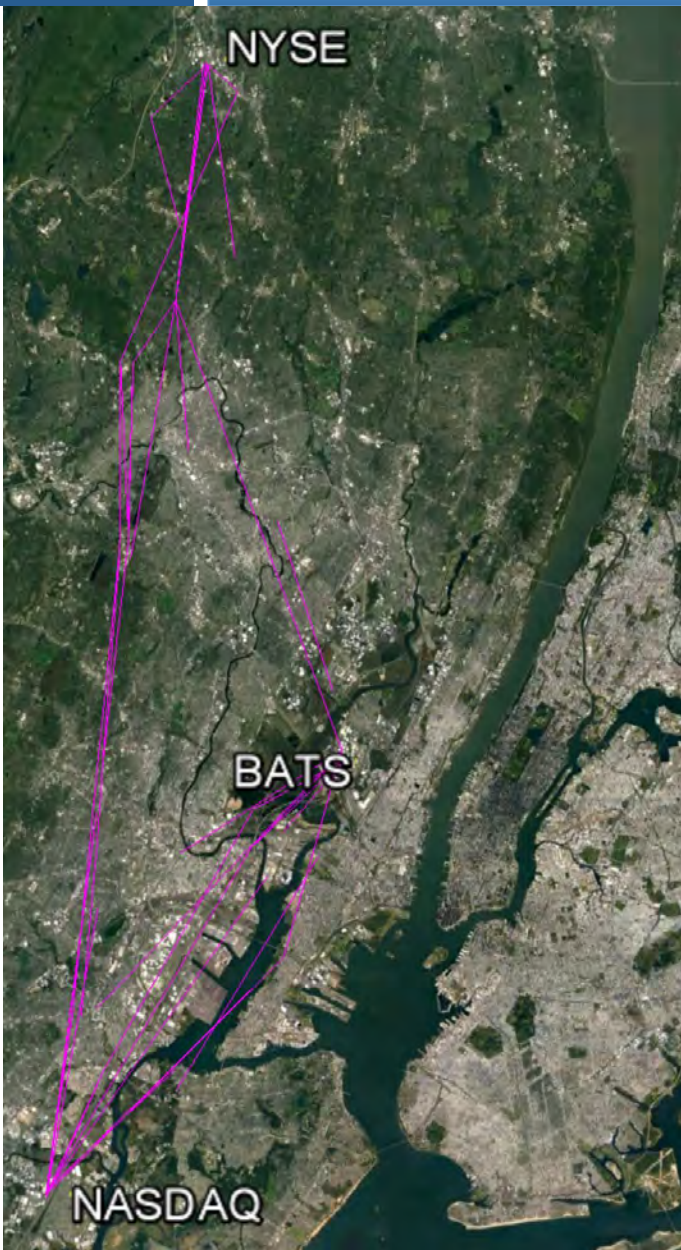
# Wireless Networks Connecting Exchanges



Wireless Networks registrations in 2015



# Wireless Networks Connecting Exchanges

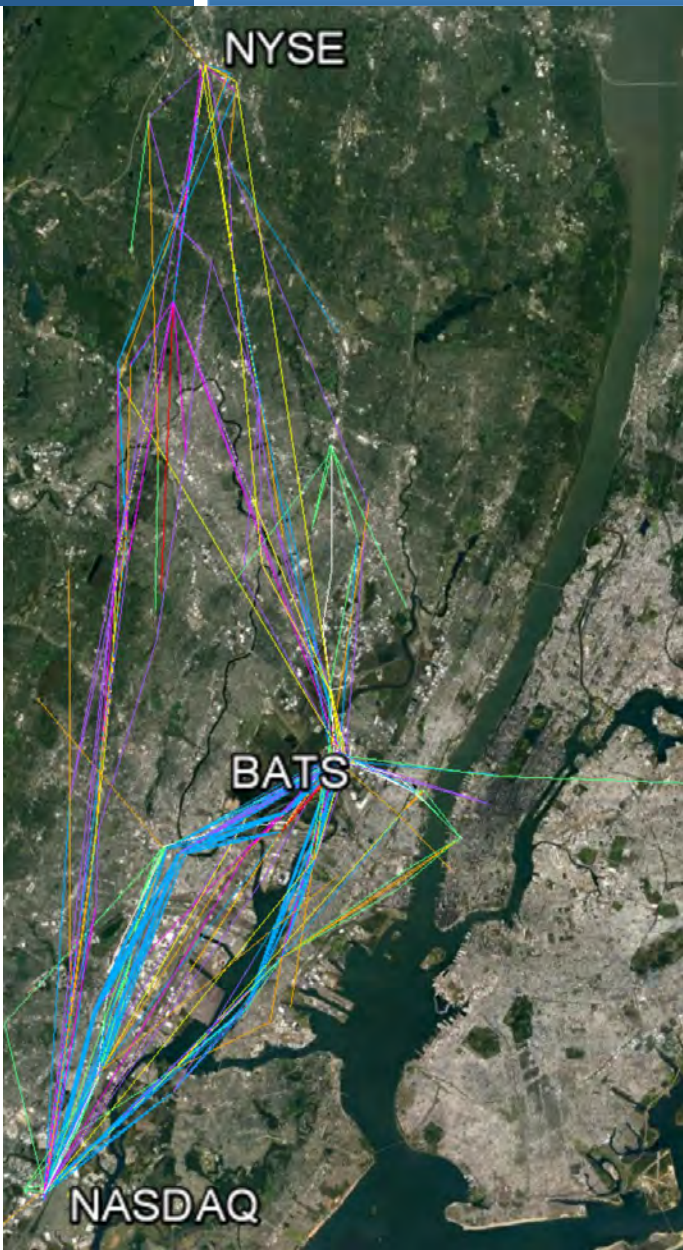


Wireless Networks registrations in 2016





# Wireless Networks Connecting Exchanges

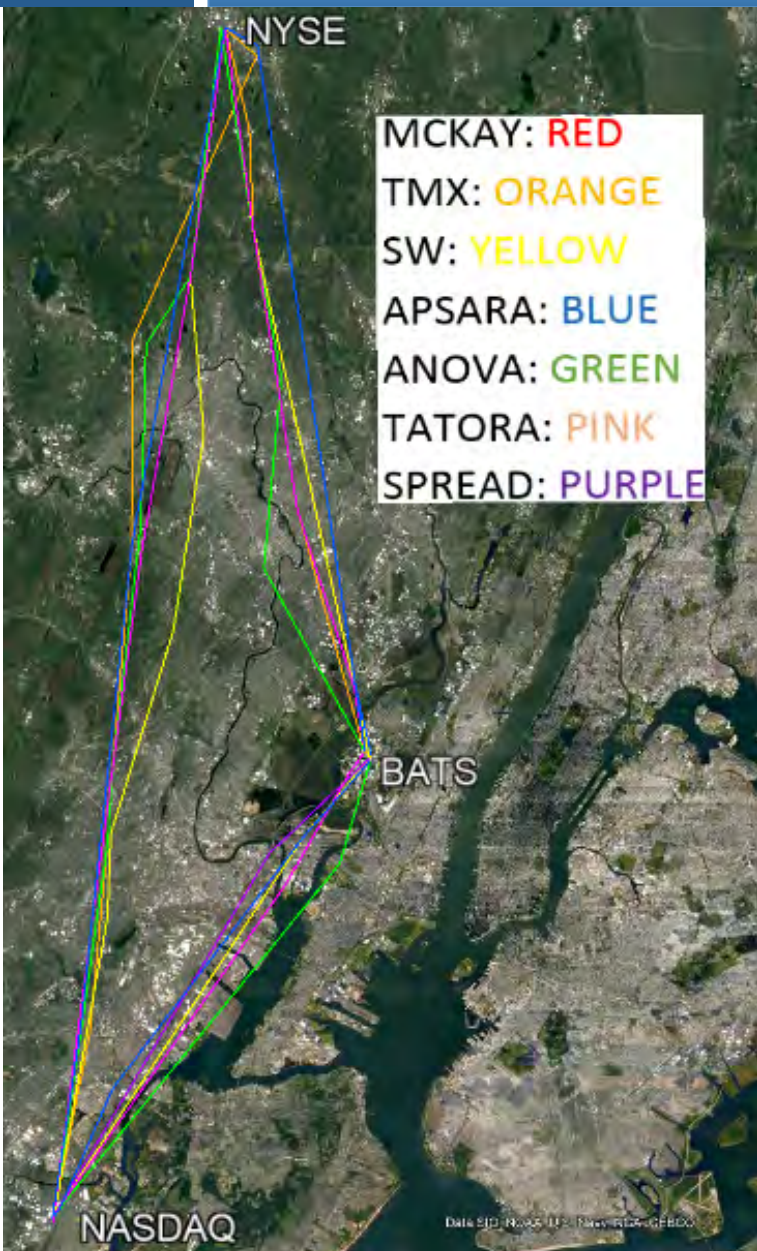


Wireless Networks registrations from 2011 to 2018

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)

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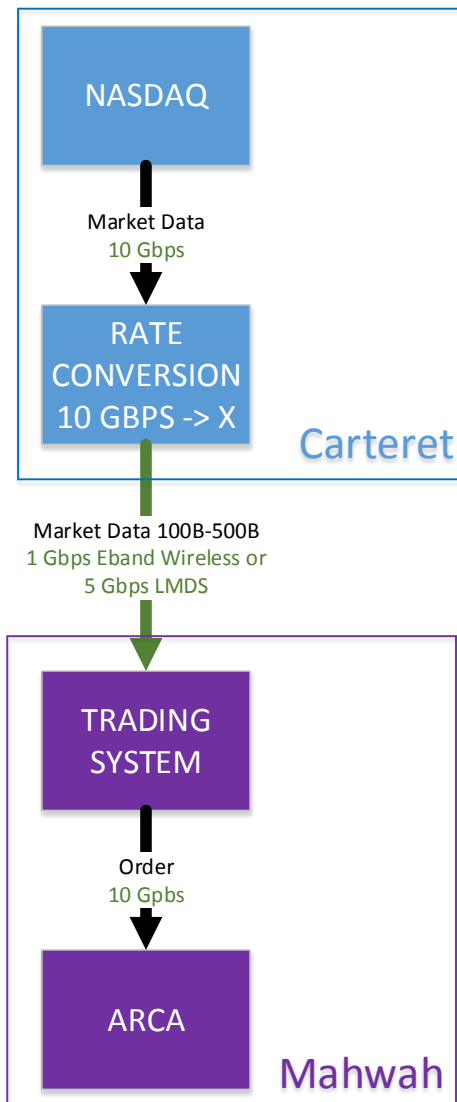
### LMDS (28 GHz)

- 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?**

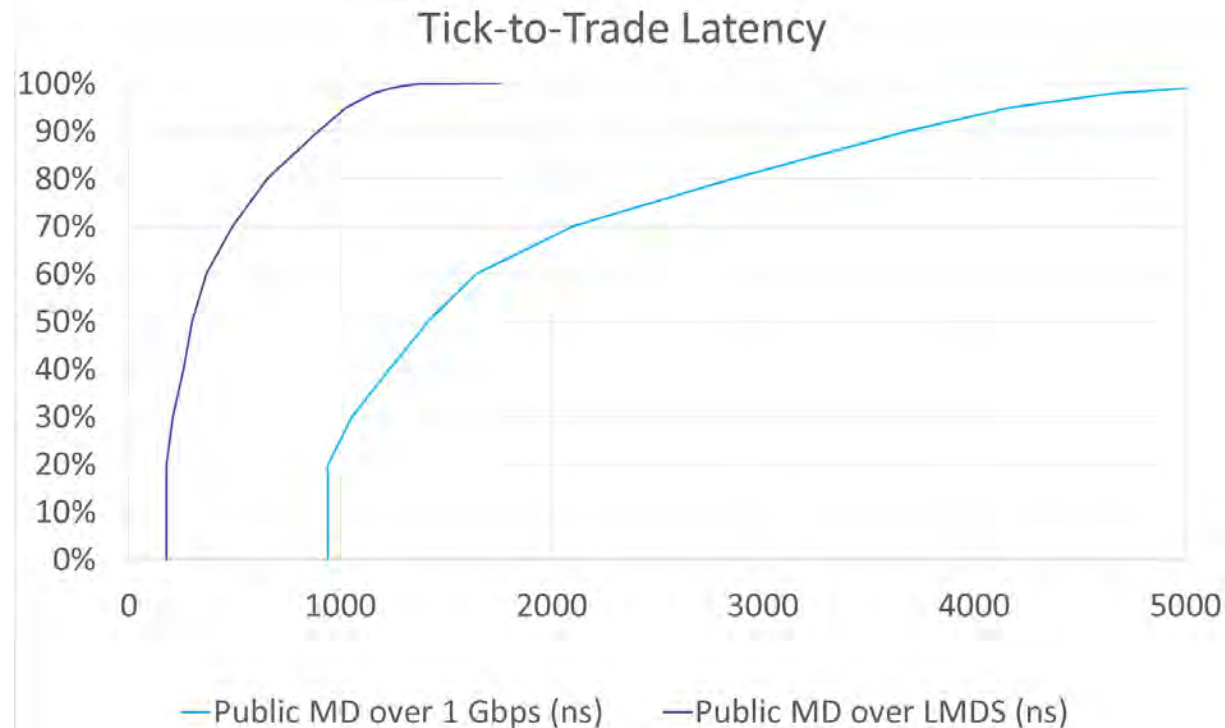


# CDF of Tick-Trade Latency with Raw Market data



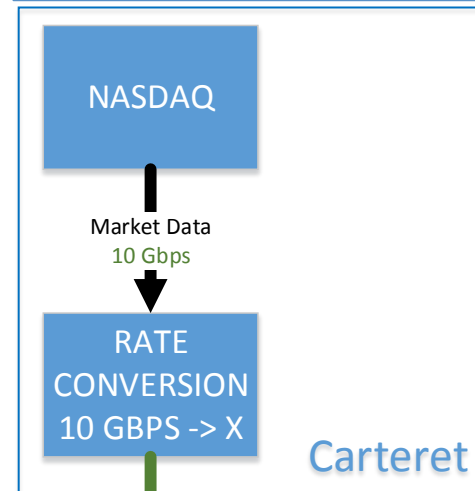
## Compute CDF of Tick-Trade Latency

- 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

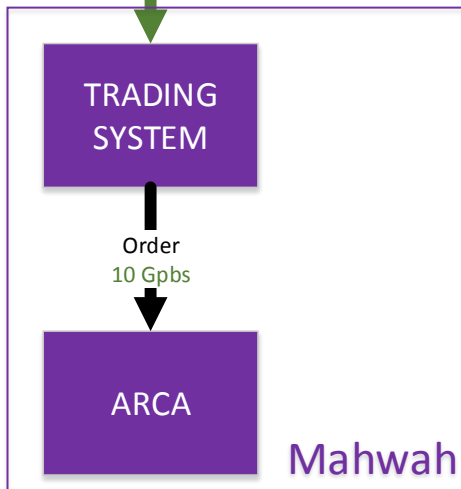


Raw Market Data Dist

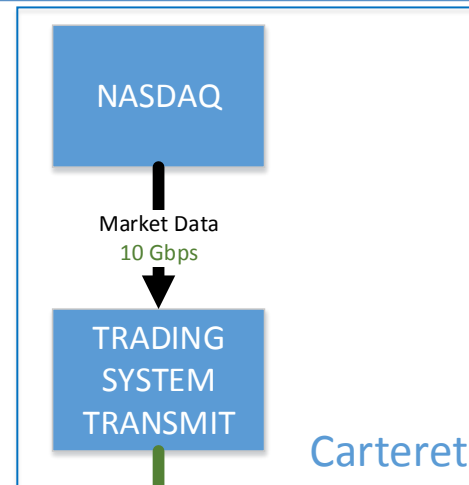
# Trading System Using Trading Signal



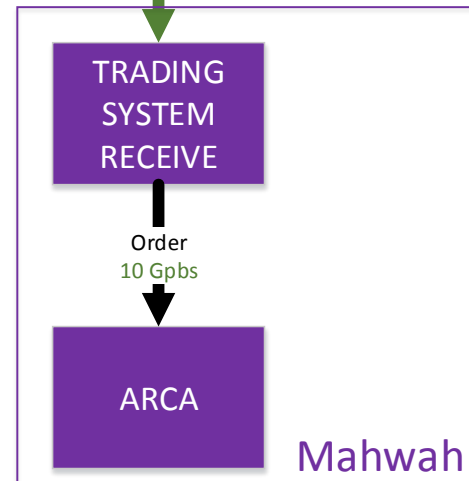
Market Data 100B-500B  
1 Gbps Eband Wireless or  
5 Gbps LMDS



Raw Market Data Dist



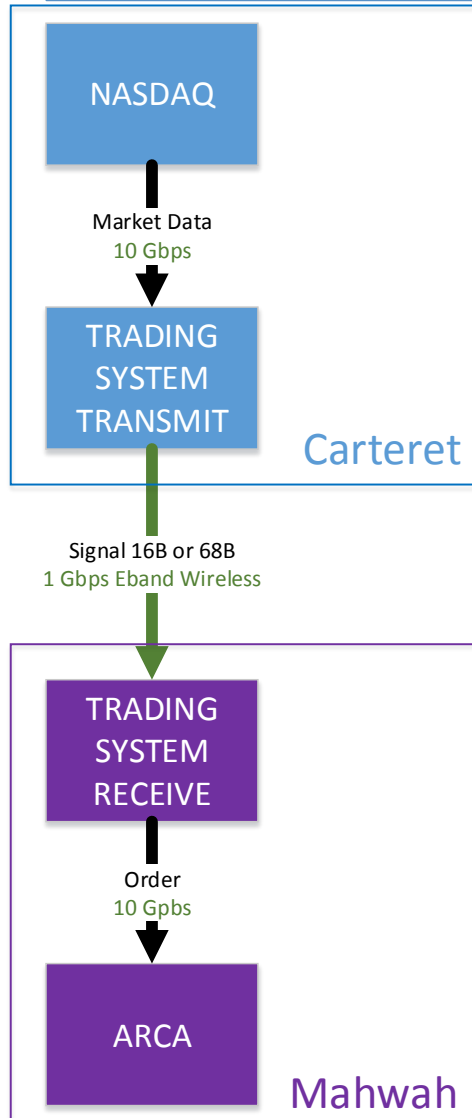
Signal 16B or 68B  
1 Gbps Eband Wireless



Signal Distribution

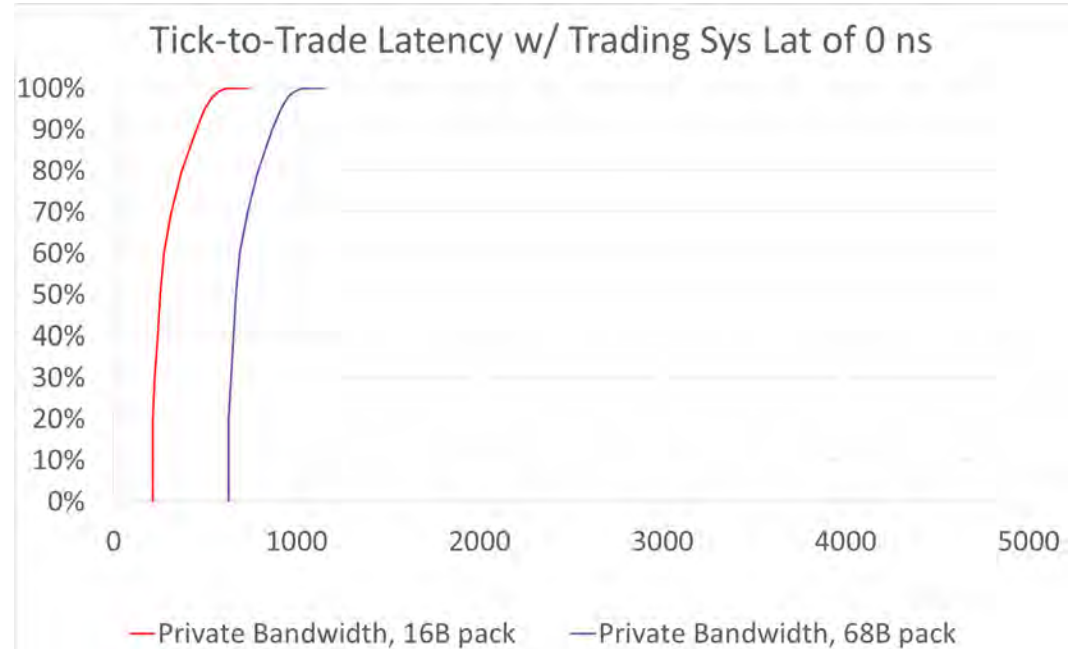


# CDF of Tick-Trade Latency with signal sending



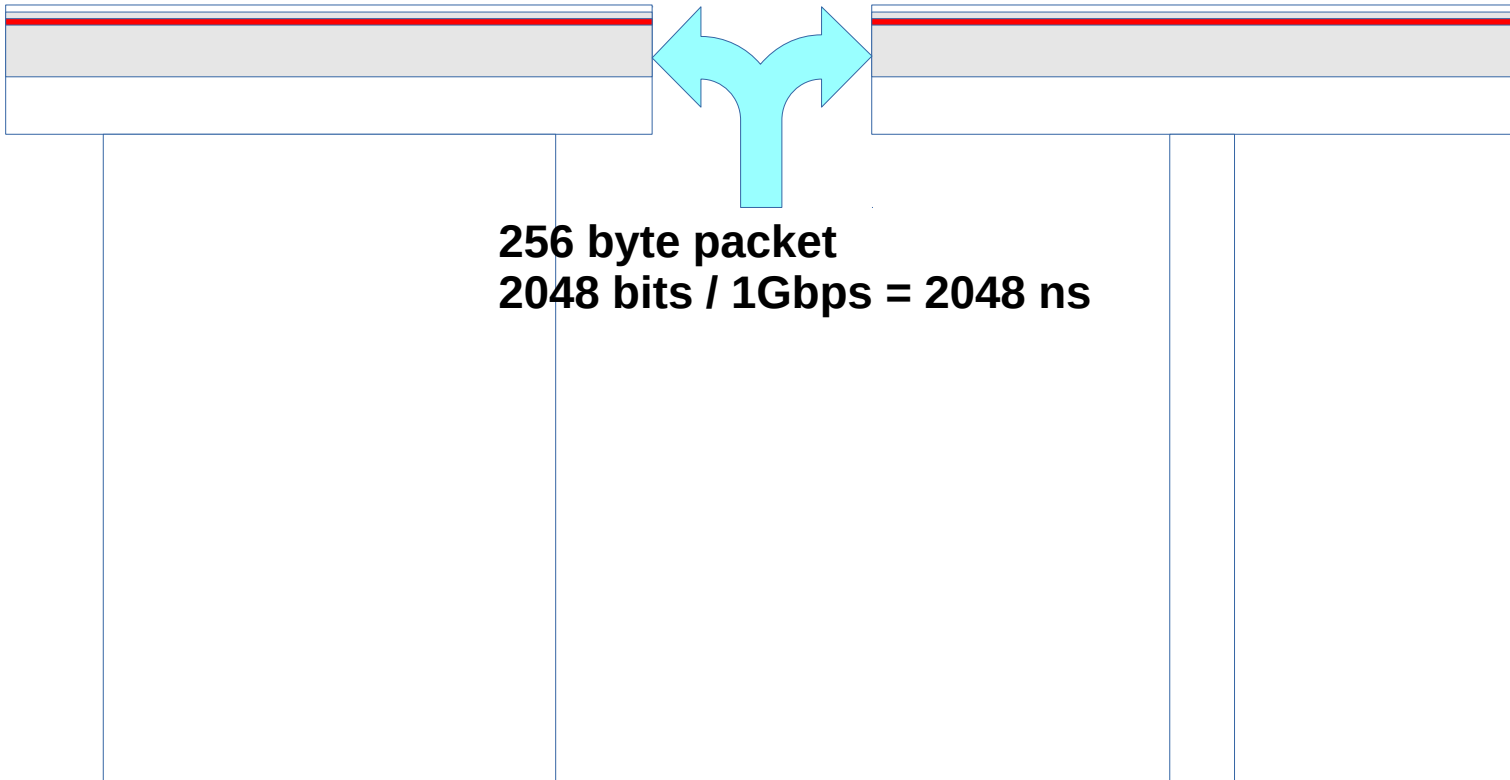
## Compute CDF of Tick-Trade Latency

- 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



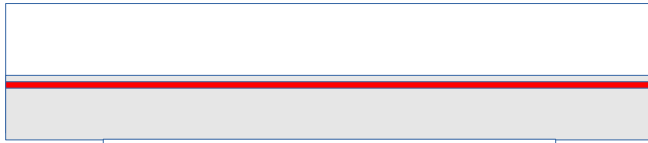
Signal sending





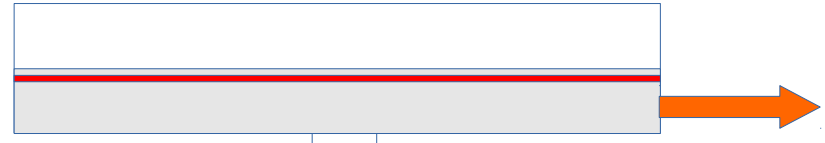
**Raw data path**

**Private signal path**



**Raw data path**

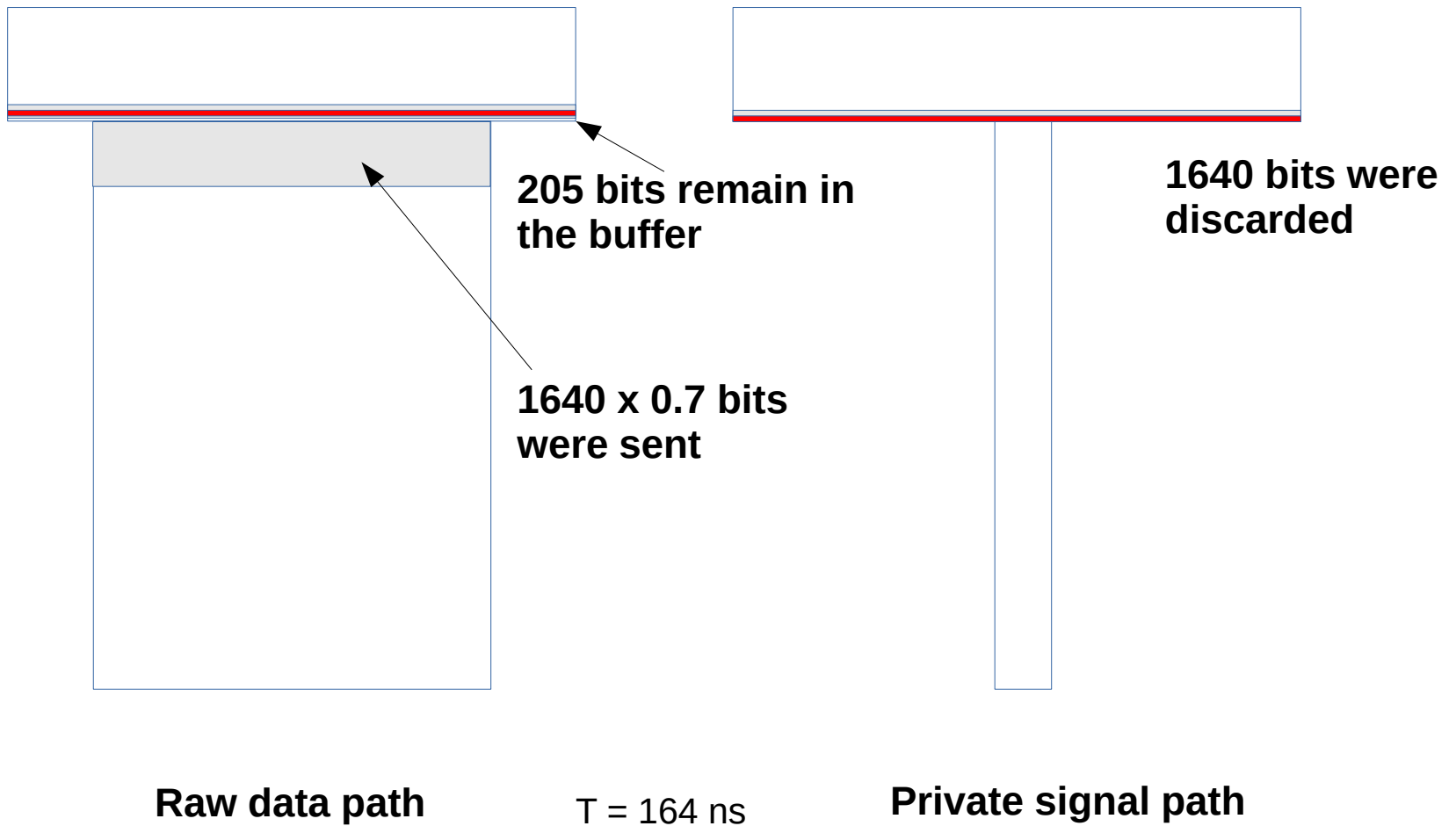
$T = 0 \text{ ns}$

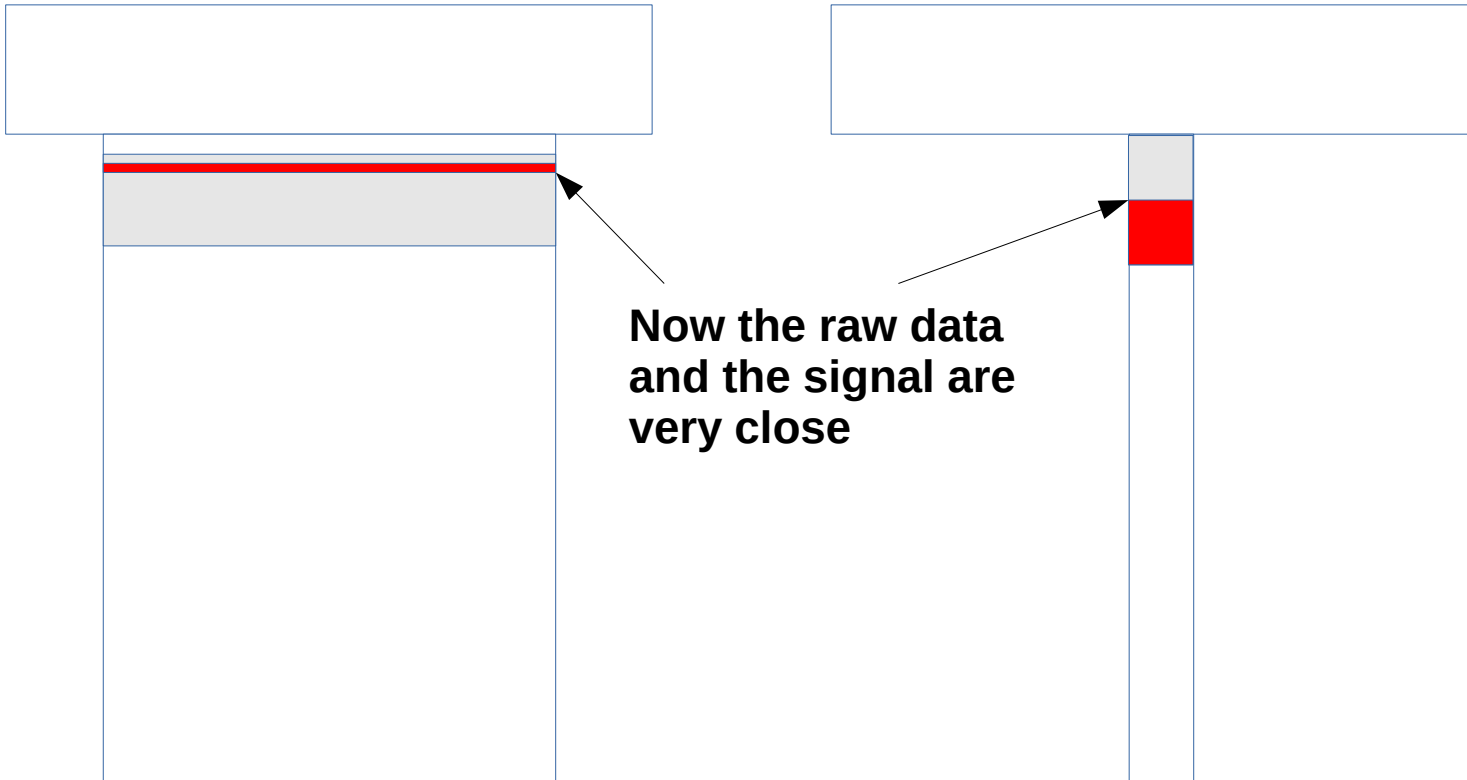


**Discard the front  
of the packet**

**Private signal path**







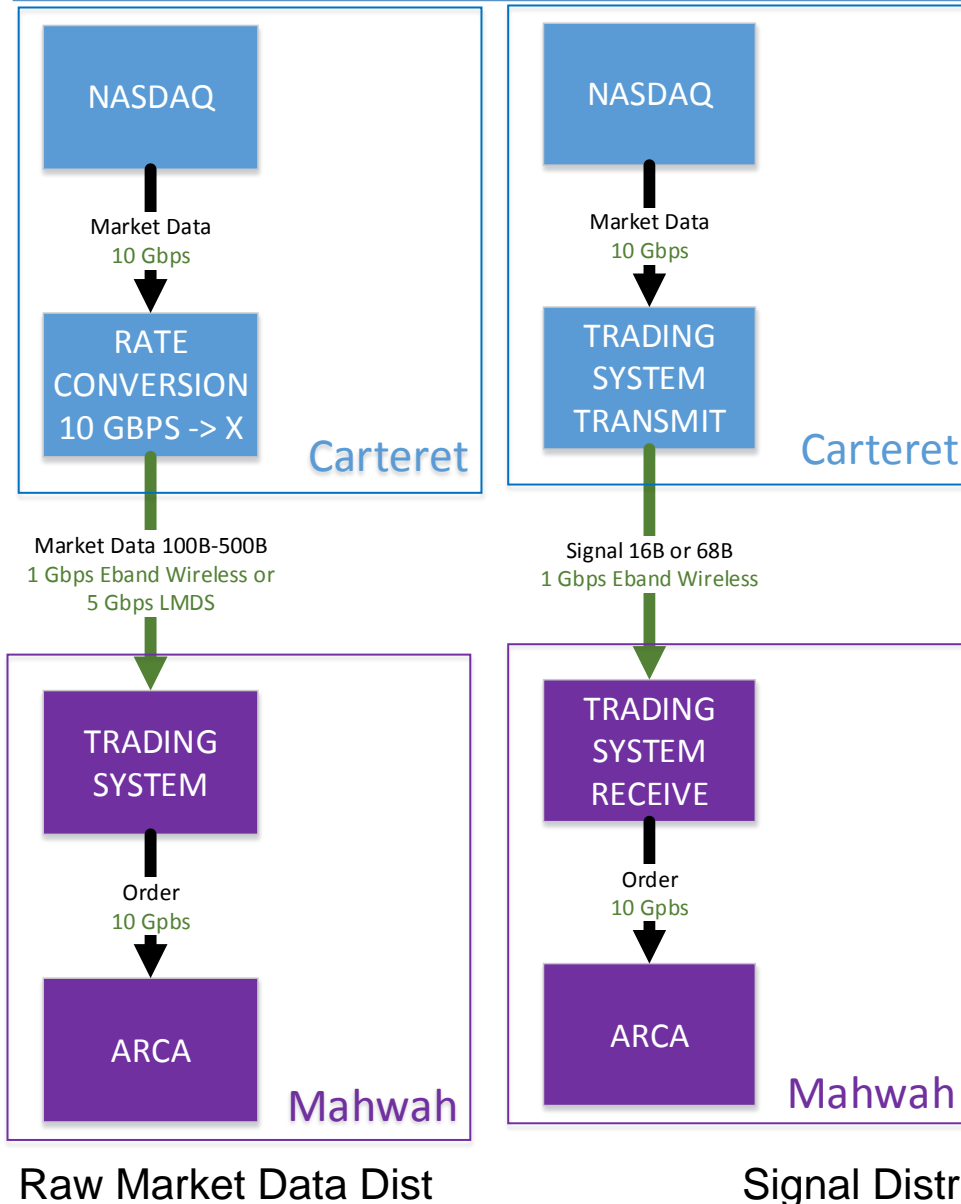
**Raw data path**

$T = 574 \text{ ns}$

**Private signal path**

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

# Tick-to-Trade Comparison: Raw MD vs Signal



## Guesstimate Latencies for Trading Systems

### Software Latency

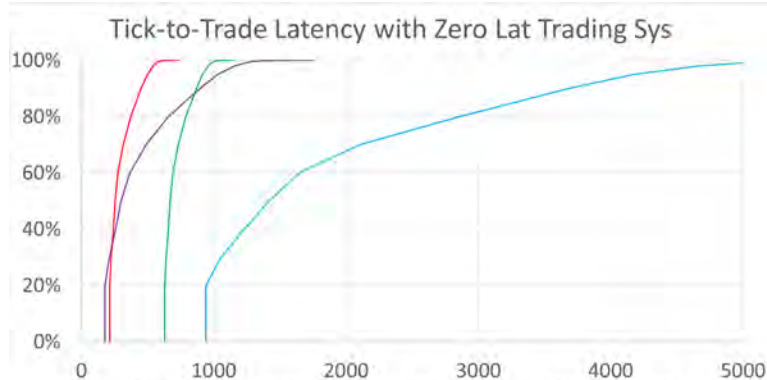
- Trading System ~ 2000 ns
- Transmit Trad Sys ~ 2000 ns
- Receive Trad Sys ~ 2000 ns

### FPGA Latency

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

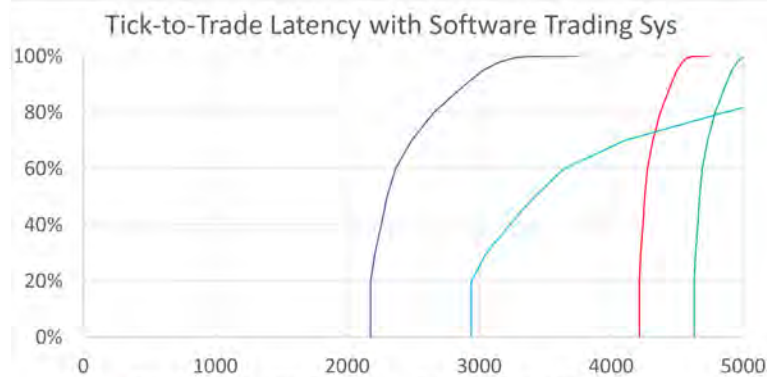


# Tick-to-Trade Comparison: Raw MD vs Signal



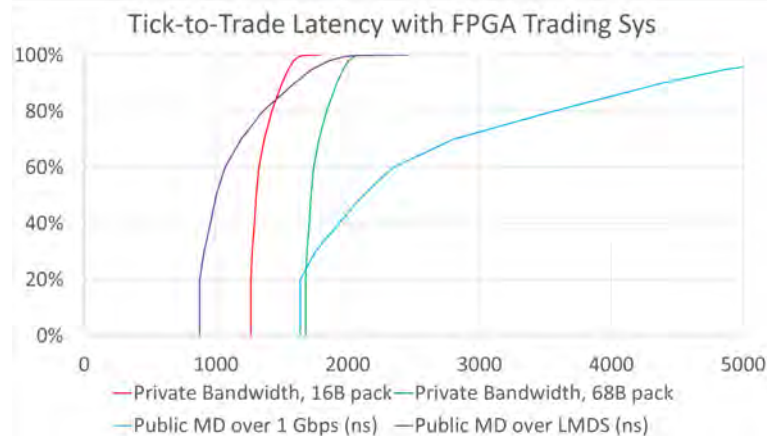
T2T Latency of Zero-Latency TS.

- 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





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