



6th Annual

# 2009 High Performance Computing

September 14, 2009, Monday  
Roosevelt Hotel, New York, NY

## on Wall Street



### Session 3:

## Low latency infrastructures: Is it all about Performance?

**Guy Tagliavia**

Director Low Latency Messaging, IBM

**Gregory Smith**

CEO, Chi-Tech

**Jim Bird**

CTO, BIDS Trading

**Nagui Halim**

Director and Research Scientist, IBM



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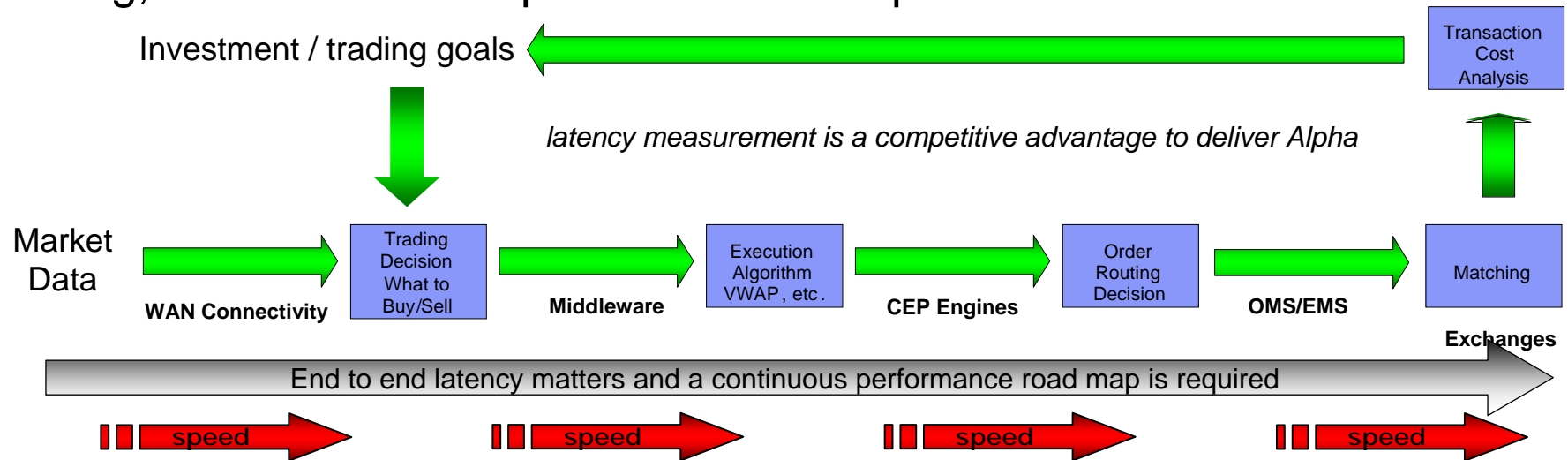


### **Low latency infrastructures: Is it all about performance?**

Investment in low latency infrastructures has shown no signs of slowing down, even during the global turmoil of recent times. In a recent roundtable conducted by IBM, messaging continues to be the “lifblood” of financial markets, with latency and throughput the top two priorities. IBM has also seen a recent surge of interest in low latency messaging from exchanges, investment banks, hedge funds, and other capital markets firms across the globe as they all seek to manage increasing business demands in terms of speed, throughput and efficiency -- with even major exchanges reevaluating existing platforms.

This panel will discuss the latest achievements in performance, as well as other critical factors in selection of a low latency infrastructure, including reliability, consistency, scalability, monitoring and holistic management.

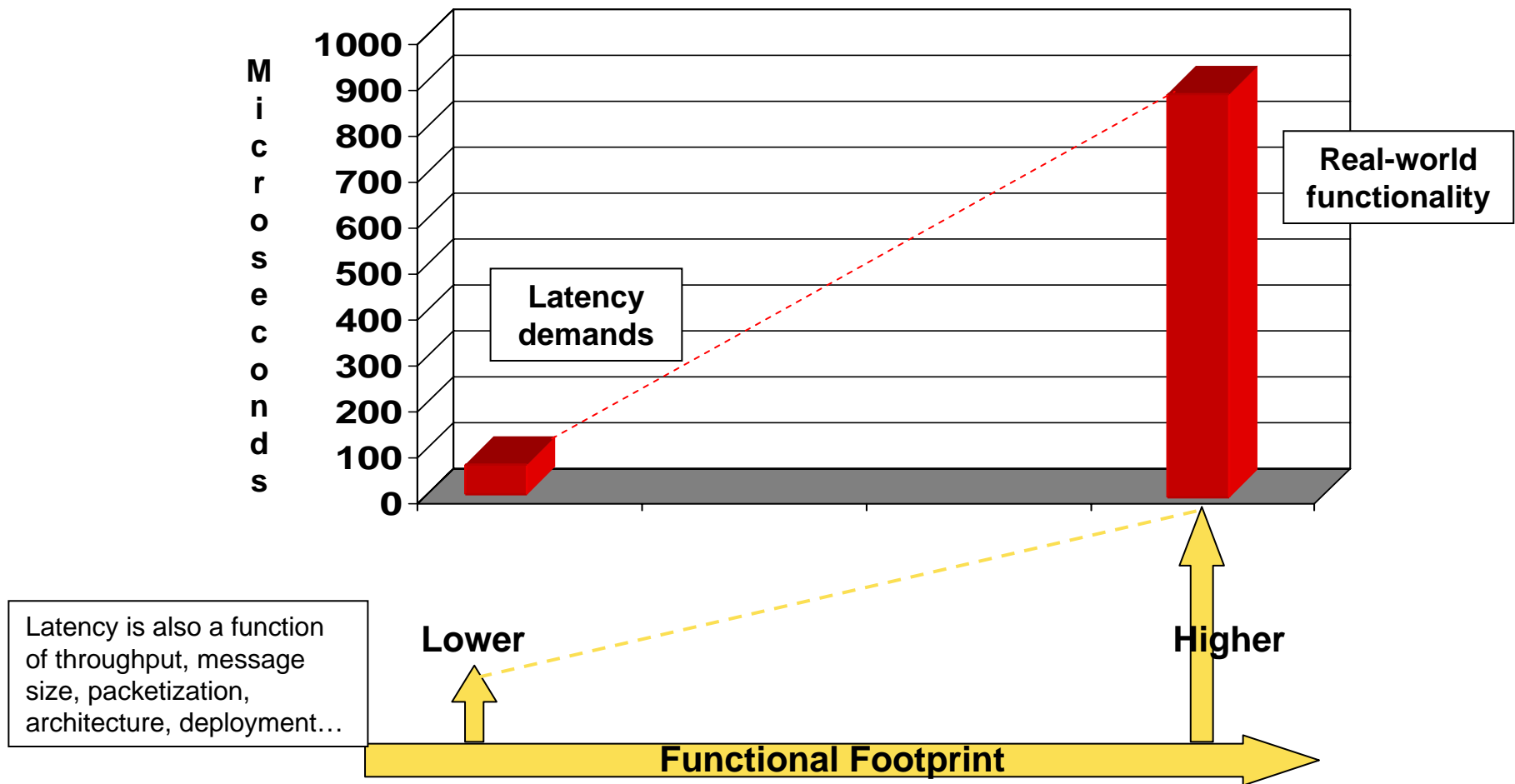
# The Transaction Life Cycle or “latency loop” – end to end latency is the king, and there are no prizes for second place.



- Everybody needs speed, Price makers, Takers, arbitrage players, execution algorithms, modes driven trading, cross asset class trading....
- First mover advantage is crucial
- Aggressive adoption of model driven trading and algorithmic execution, across all asset classes and an increase in cross asset class trading.
- Increasing complexity/sophistication of Models/algorithms (sentiment indexes, tagging of fundamental news....)
- Fragmentation of liquidity is making order execution complex in it's own right

- Support information needs to be delivered in a timely manner
  - Demand for real time portfolio, credit risk management, margin financing
- Massive build out of computing infrastructure
- Emergence of Hybrid Computing and Stream Processing, as complexity and volume and type of data analysis is increasing and it will only get more complex
- Trade and volume growth continue and are forecast to continue to grow at ever faster rates. Current infrastructures will not survive
- Demand for co location, proximity hosting, shared services, optimized data centre location

**Applications fill a wide range of functionality. How are system architectures, protocols, and deployments evolving? Latency demands sweeping change...so it is about everything.**





**Chi-X Global Technology**

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**Gregory Smith, CEO, Chi-Tech**  
**High Performance Computing on Wall Street**  
**September 14, 2009**

# Chi-X Global Technology (Chi-Tech)

## Background and Organization

- Chi-Tech was launched as part of the November 2008 acquisition of Cicada by Chi-X Global, Inc.
- Chi-X Global is also the holding company for the regional Chi-X market centers.
- Approximately 110 people, based in London, Paris, New York, Hong Kong, Oklahoma City, Shenzhen.
- Chi-Tech's focus is on providing market leading trading platforms, information distribution technology, market surveillance systems and electronic trading ecosystems composed of technology and solutions provided by Chi-tech and its partners.

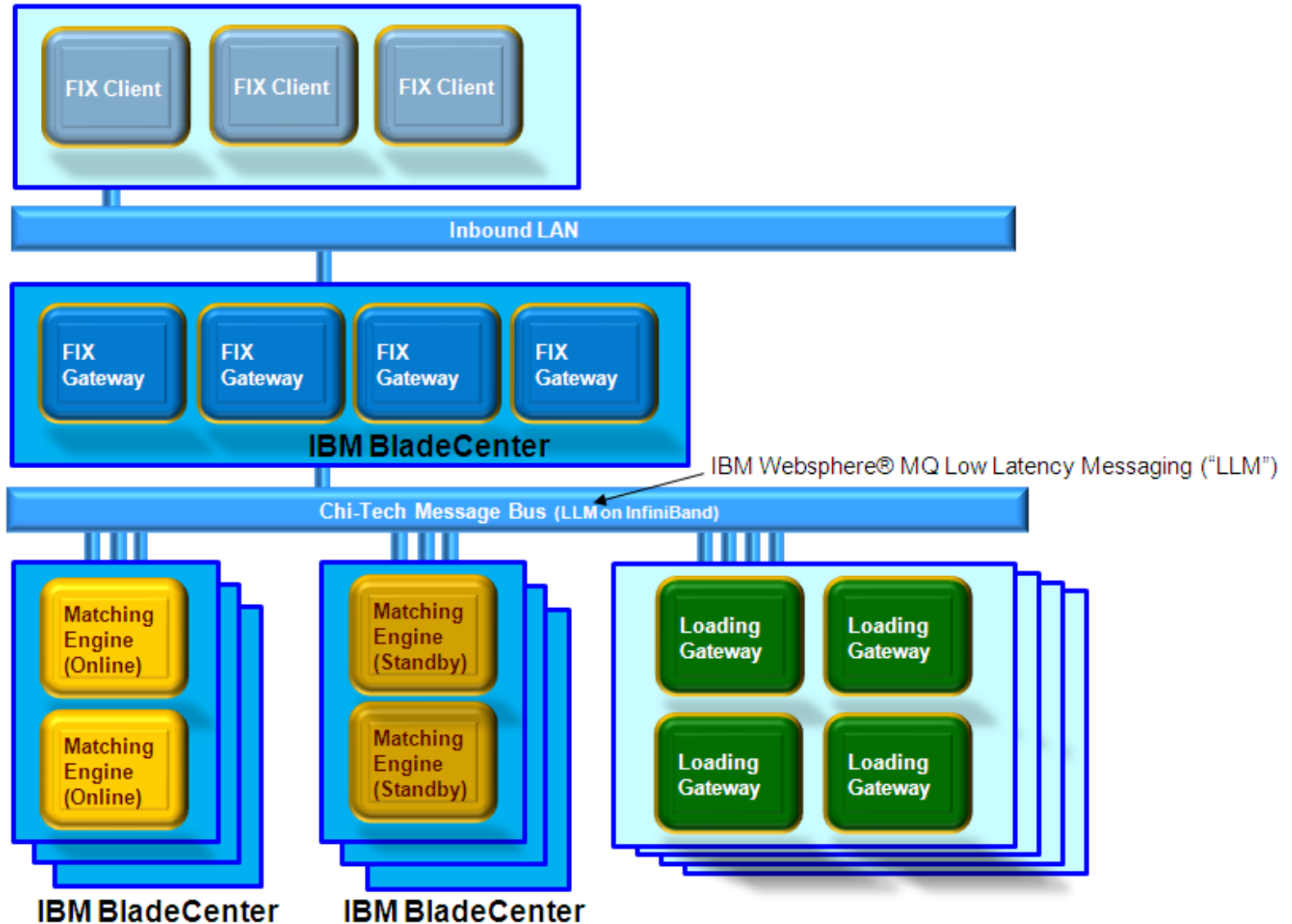
# Business Lines and Target Markets

Business/Activity	Targets
<b>Exchange Technology Development and Licensing:</b> development and sales of flagship trading technology platform and services	Exchanges and other trading venues.
<b>MarketPrizm Development &amp; Sales:</b> development, sales and management of MarketPrizm trading infrastructure “ecosystem” for the European markets	Buy- and sell-side firms, hedge funds and other trading operations doing business in the European markets. Also, US firms looking to trade in Europe.
<b>Chi-X Market Center Support:</b> centralized technology development and support unit for Chi-X regional market centers	Chi-X regional markets centers (such as Chi-X Europe, and Chi-X Canada), as well as the recently announced Asia dark pool joint venture with Singapore Exchange.

# Chi-Tech Exchange Trading Technology Platform



# Recent Testing in IBM's New York Lab - Configuration



# Test Results (FIX order processing; 1 million orders/sec)

System Configuration	Response Time ( $\mu$ second)		
	Average	Minimum	Maximum
1. Test Configuration (600K orders/sec)	59	42	123
2. Test Configuration (1M orders/sec)	62	43	122
3. Full Configuration (600K orders/sec)	118	85	219
4. Full Configuration (1M orders/sec)	228	168	292



**Jim Bird, CTO, BIDS Trading**  
**High Performance Computing on Wall Street**  
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# About BIDS Trading

- Formed by a consortium of 13 financial institutions
- BIDS Trading is designed to:
  - Foster competition and resolve existing inefficiencies in block market
  - Empower traders
  - Level the playing field for block trading
  - Confidentiality and integrity: score card
- BIDS ATS is not just a matching engine

# Course of Action

## ■ Challenges

- Sophisticated market structure, highest quality trading experience, multifaceted network connectivity

## ■ Starting point

- Java, Oracle RAC, third-party messaging, distributed cluster, limited by raw power of commodity servers

## ■ Goals

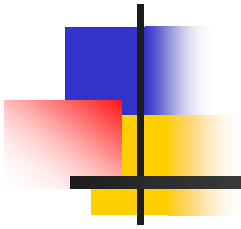
- Improve performance, reduce costs, no impact on production operations

# Outcome

- ■ Technology alternatives – what we looked at
- ■ What we chose to do
  - ■ Collapse technology stack, hardware refresh, software changes to exploit new hardware
- ■ Hardware refresh
  - ■ Simplest path possible, size/capacity, speed, reliability, cost, efficiency
  - ■ Platform selected: IBM X3650M2
- ■ Outcome
  - ■ Reliability, performance, cost

# IBM InfoSphere Streams

*Extreme Trading Advantage with  
Real Time Analytic Processing*

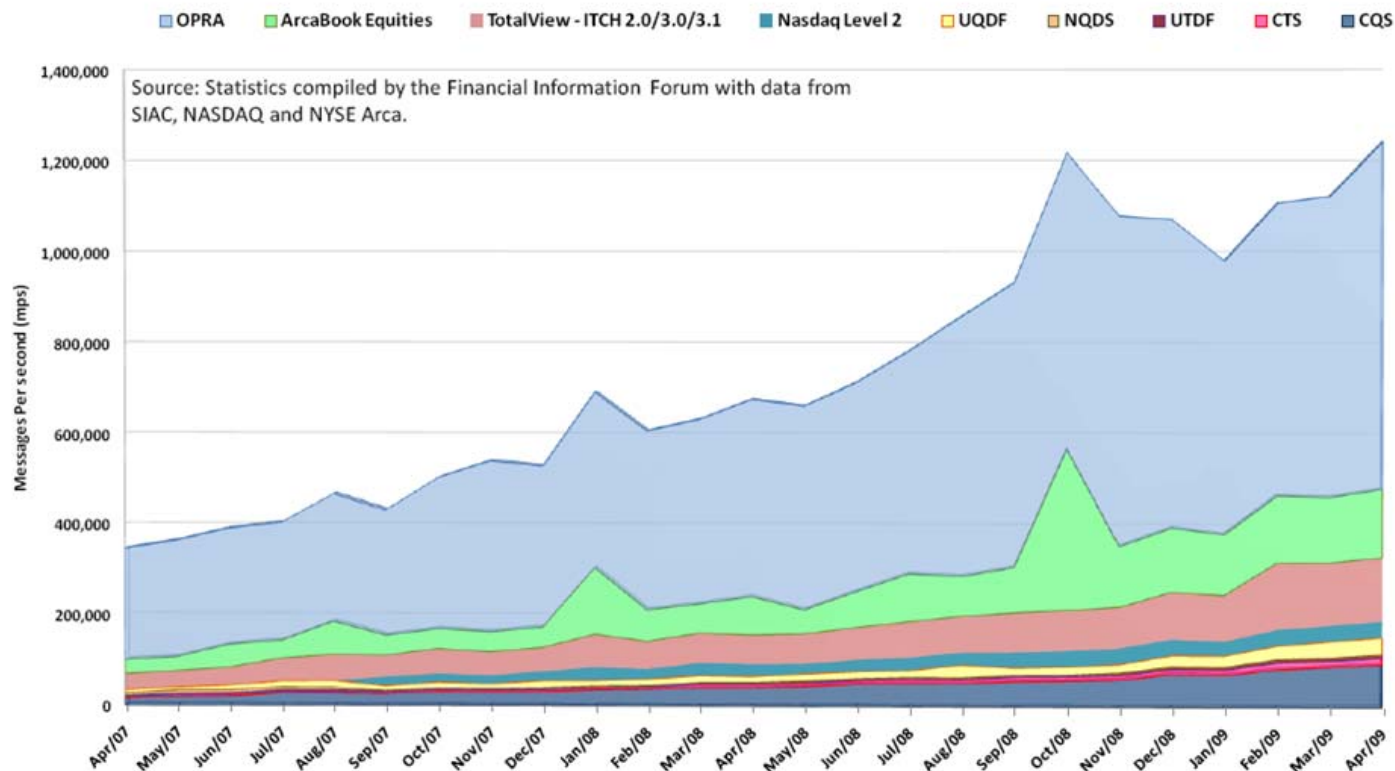


**Nagui Halim, IBM Director and Research  
Scientist**  
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# Explosive growth in market data

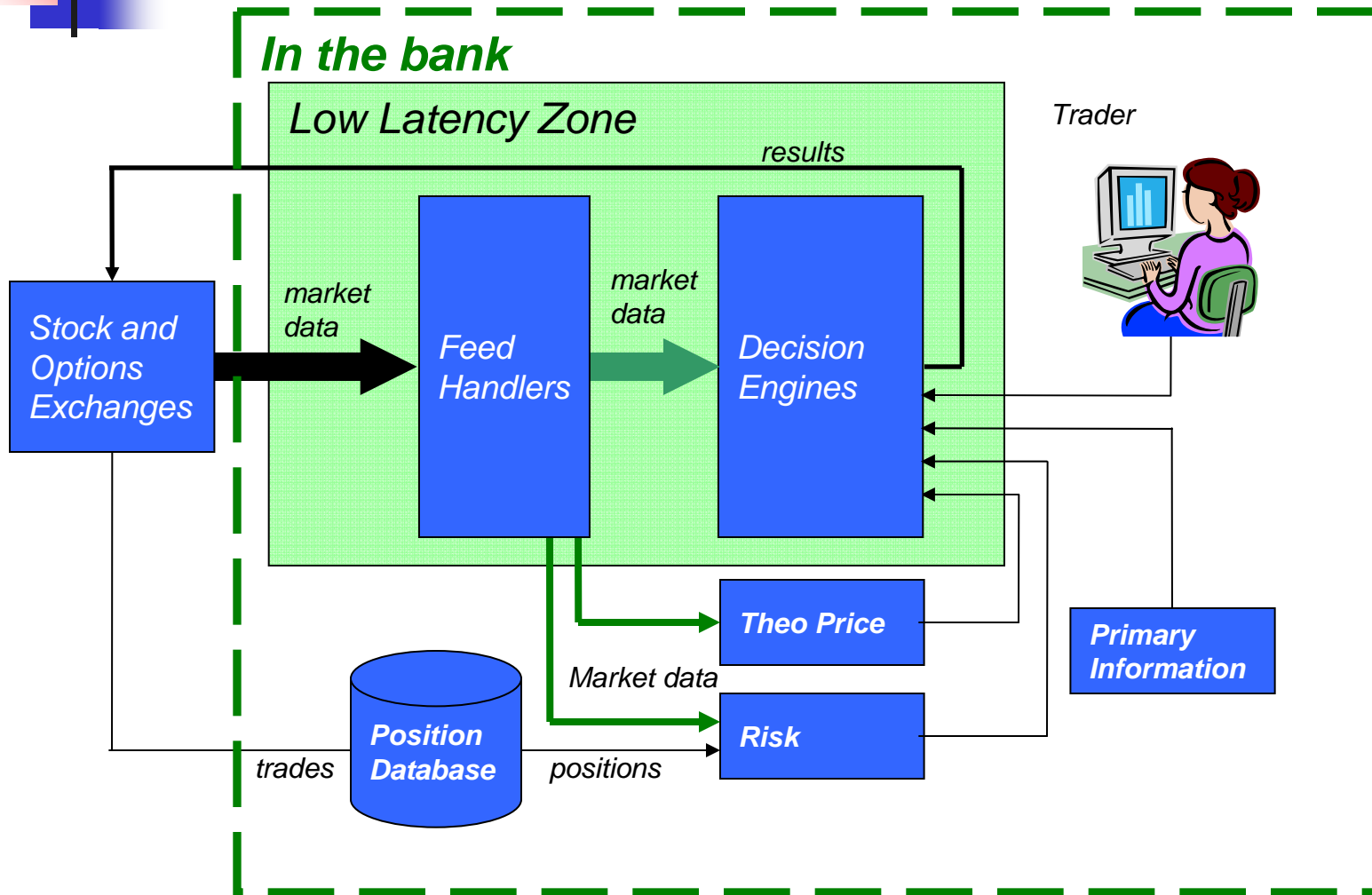
## Consolidated Equity Feeds and OPRA Capacity Statistics OPRA & Consolidated Equities 5 Second Peak Rates



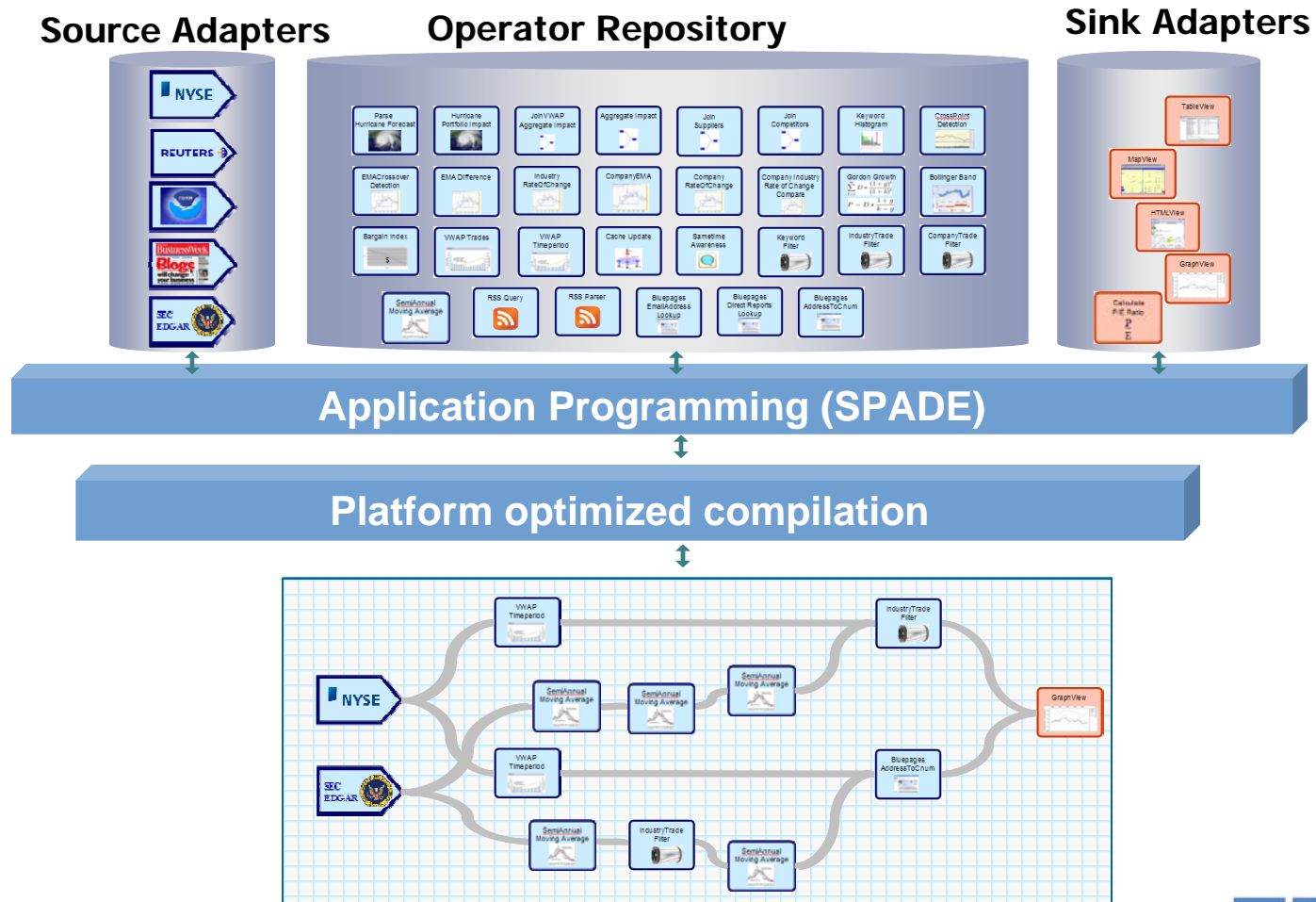
Note: TotalView data is based on: TotalView ITCH 2.0 shown from Apr 2007 to May 2007; TotalViewITCH 3.0 Shown from June 2007 to March 2009. TotalView ITCH 3.1 shown from April 2009 onwards. TotalView ITCH 2.0 has been discontinued in 2009. TotalView Legacy has been discontinued since June 2007.



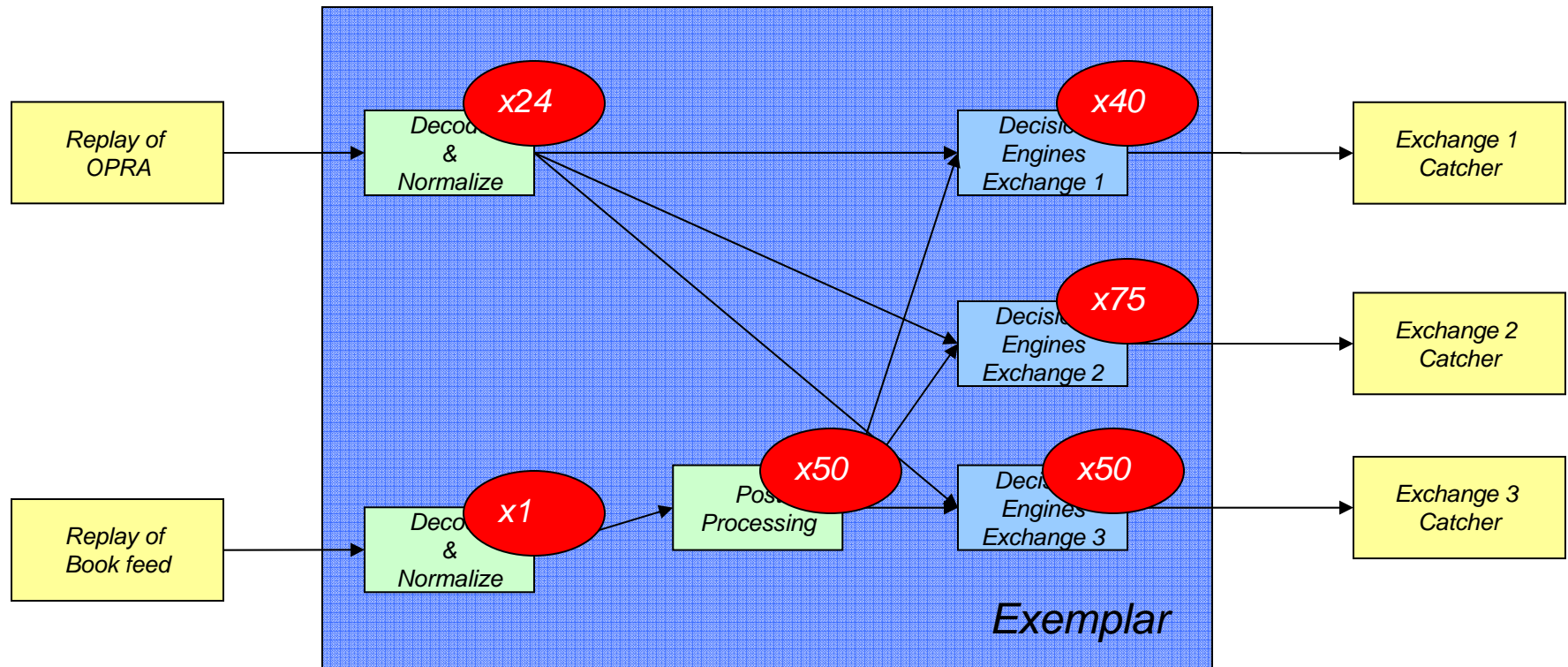
# Typical algo-trading logical view



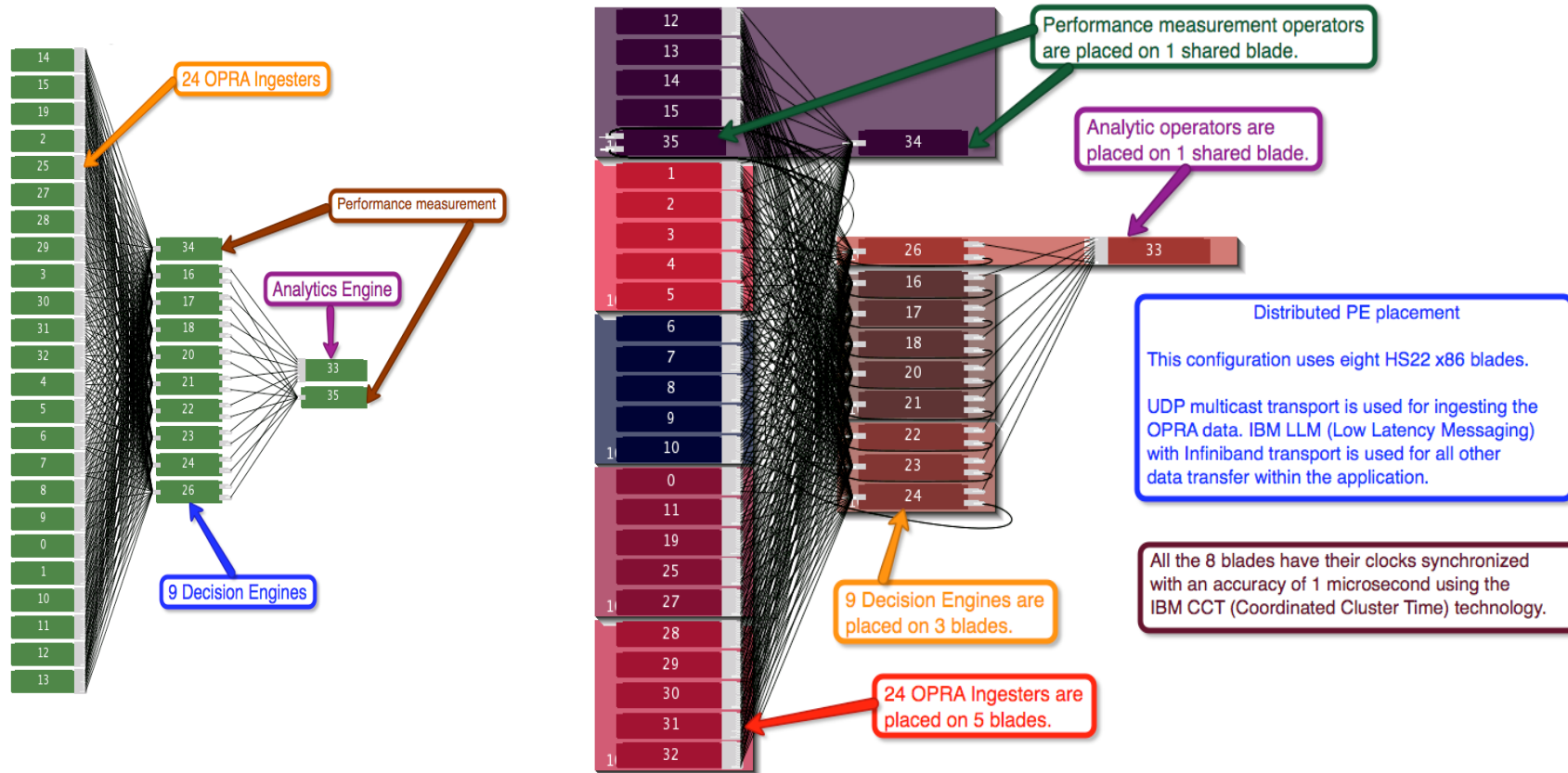
# InfoSphere Streams Programming Model



# Topologies that are built to scale



# X86 8 node topology: 8 ingesters, 3 analytics (Infiniband interconnect)



# Sustained OPRA ingestion at lower latencies

