

# GPS & precision timing's role in the financial services sector

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# Agenda

The FSS who we are

The business challenges

The need for precision timing

The risks and challenges ahead



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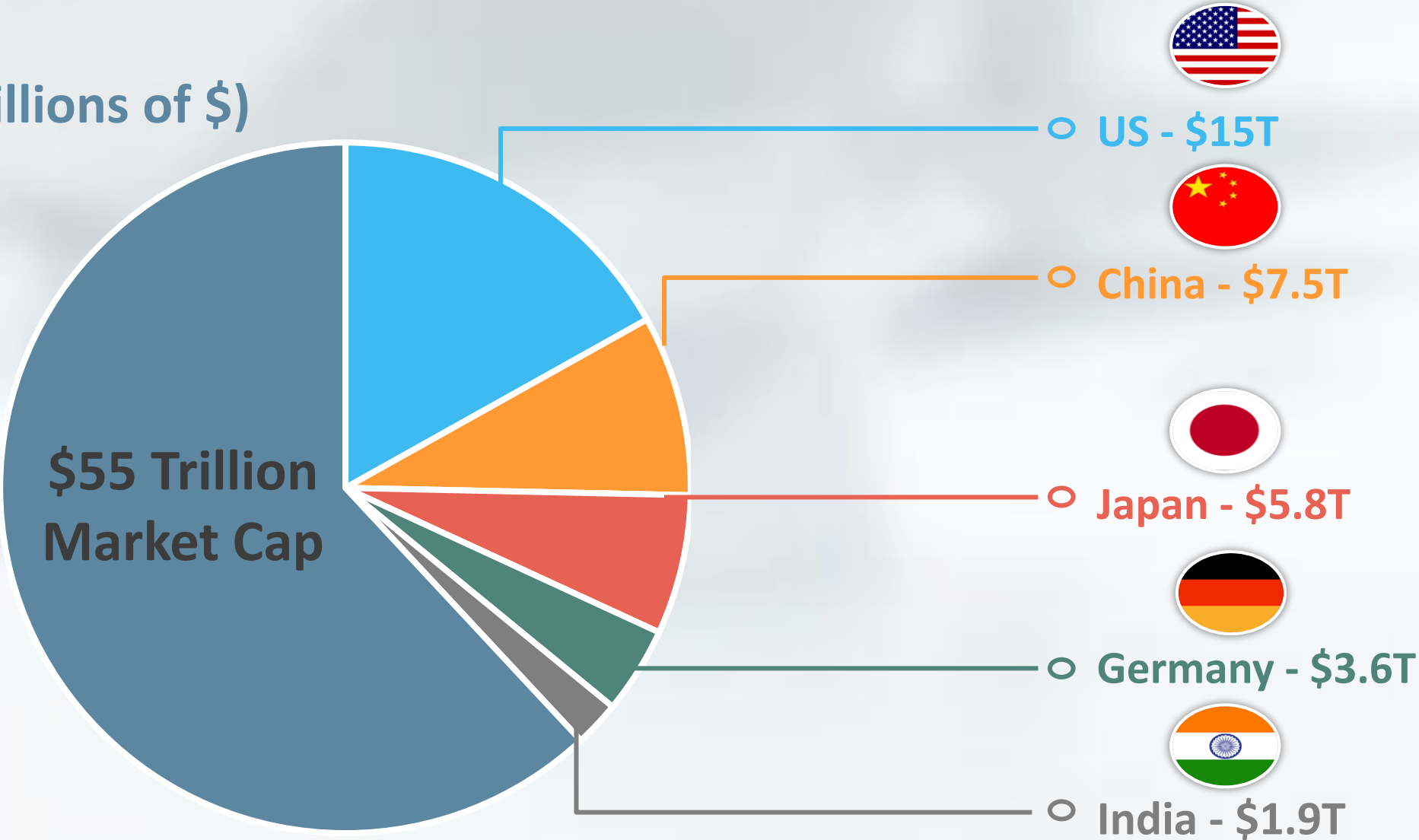
The risks and challenges ahead



# Scale of the business

- The total market cap of all listed companies is over **\$55 Trillion....**  
...Compared to country GDPs, that would make the sector the largest economy in the world.

Largest Economies by GDP (in Trillions of \$)



# Real money



- **DTCC clears, settles over:**
  - \$24 quadrillion dollars per year
  - $24 \times 10^{15}$  or  
\$24,000,000,000,000,000
  - One US bank alone transacts over  
\$35 Trillion dollars a day
  - NYSE averages over \$15B  
in the first 2 minutes after  
the open





# 400+ years of rapid technology adoption

And a rich history of technology innovation in markets

- First stock ticker to disseminate data (1867)
- First telephones on the trading floors (1878)
- First electronic ticker display board (1966)
- Wireless handheld devices on Trading floors 15 years before iPad invented (1995)
- Industry's first private network offering global connectivity
- Industry's private network exceeds 1TbS

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# FSS challenges

## Regulatory Model is Driving Change

- Requirement for long term retention of data
- Requirement to archive meta data
- Real time risk management is now required
- Requirement for precision timing
- Increasing focus on cyber security

## FSS is Evolving to a Commodity Industry

- Time to market must be faster
- Product life time is shorting
- Margins are reducing driving OPEX reduction
- Regulation is increasing the cost of business

## Technology Adoption is Accelerating to Meet Accelerating Business Needs

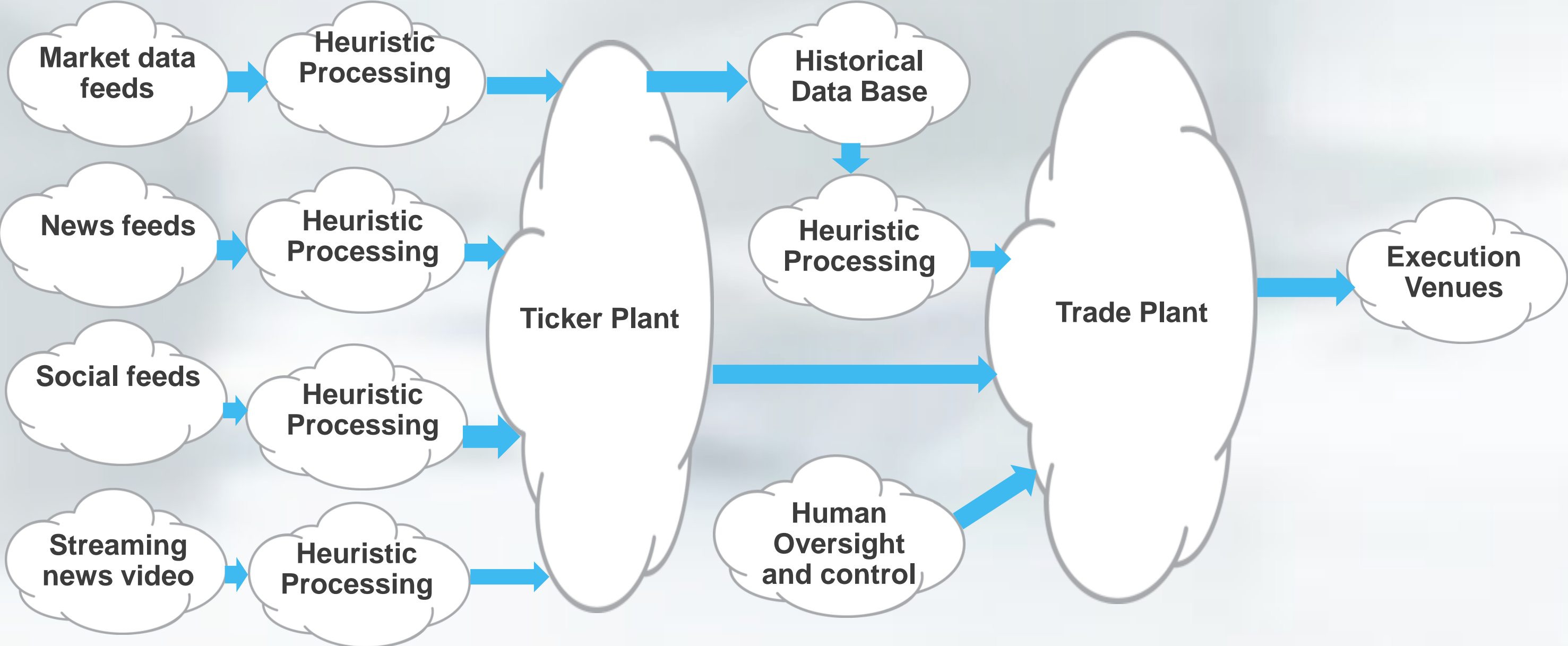
- Technology is a strategic weapon
- Fueling the race to the triple crown of technology (0 cost, 0 latency, 0 time to market); Bandwidth demand continues to grow at 30% - 50% per year.
- Comprehensive management and orchestration of the data center

## Business model continue to evolve

- Exchange trading floors continue to fade away
- Machine assisted trading dominates
- Heuristic trading based on hyper-contextual information is growing



# Next challenge – Heuristic based trading



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# A few use cases

- Elimination of a out of band timing plant
  - Transitioning from classic BITS to in band timing distribution
  - Driven by the need for components in the DC to have accurate time
  - Cost savings
- Precision operational analytics
  - Key to reliable operations
  - Core to all data center KPI's
- Trading algorithms
  - Need vast sums of information but also when the information was created
- Market transparency
  - Did all market participants have fair and equal access
  - Are all the markets seeing information at nearly the same time
- Regulatory compliance
  - Now requiring time stamping of ALL financial transactions



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# Technology challenges

- Developing a timing solution accurate to  $1\mu\text{S}$  per transaction across a data center
- Developing a uniformed epoch across the industry
- Developing the ability to time stamp every transaction
- Developing analytics to measure the performance of the transaction environment at 100's millions transaction per second
- Securing the authoritative timing references

# Solutions ahead

- Transitioning from BITS to in band timing distribution
- PTP replaces NTP
- Secure and stable GPS augmented by terrestrial base timing references will be developed.



# Thank You!

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