



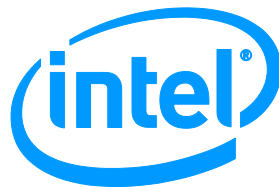
# STAC<sup>®</sup> Summit

**May 20, 2014**

Doors open: 8:00am  
Meeting starts: 8:30am

**Conference Center at UBS Tower  
2<sup>nd</sup> Floor, Michigan Ballroom  
One North Wacker Drive  
Chicago, IL**

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# AGENDA

Note: Times are approximate.

## Morning welcome

- Peter Lankford, Founder & Director, STAC

## IIT Mini-Symposium on Algo Trading Management.

The Center for Financial Markets at the IIT Stuart School of Business conducts research into important aspects of high-frequency trading by combining technical and quantitative expertise with foundational concepts of modern business. In this mini-symposium, IIT researchers will present three new studies of interest to quants, technologists, and managers in the financial markets as well as other researchers.

- *Implementing Real Time Control in Algorithmic Trading*, by Ben Van Vliet, Assistant Professor. In principle, the obligation is on the trading firm to ensure its trading systems run in control at all times. But what does it mean for a trading system to run in control? We are looking to define signals that indicate there is a probability that the trading strategy is not running according to expectations. We review the ways in which reference distributions of expected performance of critical characteristics can be defined. We develop a simple model for real time statistical process control that allows for market state-varying performance. If supervisory mechanisms audit compliance with a principle-based standard that mandates control, our model should satisfy both market safety and institutional flexibility. Both regulators and the markets will be better off by harmonizing regulation around such an international standard of control. [\[slides\]](#)

- *Does HFT benefit LFT?*, by Ernie Li, Adjunct Faculty. We examine how high-frequency trading (HFT) affects low-frequency trades (LFT) and the fundamental information they transmit to prices. We find that HFT enhances the flow rate of fundamental information by increasing the size and decreasing the waiting time of LFT limit orders, and increasing the size and frequency of LFT market orders. HFT serves as an intermediary by transporting liquidity to LFT orders, thus replacing market makers as the primary source of liquidity. By examining the interaction effects between market and limit orders, we find that low-frequency market orders take liquidity and lower the flow rate of low-frequency limit orders, and vice versa. This interaction effect shows that the major source of liquidity loss is not high frequency trading but rather low-frequency trading. [\[slides\]](#)

- *Performance Attribution in Automated Trading*, by Rick Cooper. Performance attribution is an important component of monitoring trading strategies. We present an intuitive absolute-return-based attribution framework for the volatility and information ratio. The results are valid for strategies at high frequencies given the appropriate selection of measurement and decision frequencies. Derivatives positions are integrated into the attribution primarily by breaking their return into effects due to movements in the underlying equities and arbitrage effects. For derivative positions held longer, a time effect is also introduced. [\[slides\]](#)

## Innovation Roundup – Round 1

<b>“Static code analysis: Finding flaws as they’re typed”</b> <a href="#">[slides]</a>	Scott Lasica, VP, Field Technical Services, Rogue Wave
<b>“Getting the most out of multi-year and multi-source trading history”</b> <a href="#">[slides]</a>	Michael Chazot, Director, Strategic Accounts, DataDirect Networks

## STAC Update - Tick data and backtesting [\[slides\]](#)

- Peter Lankford, Founder & Director, STAC

Peter will summarize the latest STAC Benchmark Council activities in areas relating to backtesting and tick data, including research on flash storage.

### ***Point of View: A faster way to get strategies to market*** [\[slides\]](#)

- *Bryan Lewis, Chief Data Scientist, Paradigm4*

Trading firms today require faster cycle times for development and backtesting of trading strategies. Bryan believes that a key to this is finding more agile and less code-intensive approaches using high-productivity languages like R and Python. He believes the other key is to use shared-nothing architectures on the back end that exploit hundreds or thousands of commodity hardware nodes in a cloud or local cluster. The crucial design imperative for large data is to minimize data movement by moving computation to the data. Many SQL and Hadoop solutions fall short when trying to perform strategy development and backtesting directly in the database. Even good distributed SQL databases often end up largely requiring ETL to an analytics environment like R or Python because of lack of in-database analytics. And Hadoop solutions typically sacrifice powerful data management concepts like join. As a consequence, developers are compelled to learn and use multiple toolsets, losing considerable time moving data among them. Taking the open source SciDB database as an example, Bryan will argue that it's possible to use an array language like R with inexpensive, scale-out hardware to create a single environment for tick storage, strategy development and backtesting.

### ***Point of View: Putting the Big Data ecosystem to work for tick data*** [\[slides\]](#)

- *Michel Debiche, Financial Services Practice Lead, ThinkBig Analytics*

As a quantitative trader for over 20 years, Michel built one backtesting platform after another for a series of trading firms. Each time, the requirements were essentially the same. And each time, the platform had to be built largely from scratch. With the advent of "Big Data" technologies like Hadoop, he suddenly felt liberated. In his view, combing through huge volumes of historical data to search for signals and backtest trading strategies is a natural match for these new platforms. Not only because the map-and-reduce paradigm is a close fit to requirements, but also because these tools make it easy to integrate a huge range of content, from market data and news to fundamental data, research reports, and more. He believes that such scalable, open source tools also open up analytic opportunities for groups outside the front office. Risk, compliance, technology, and security groups are among those who must test assumptions and scenarios, and then use the intelligence gleaned from historical research to effectively monitor developments in real time across many dimensions. In this talk, Michel will start from first principles to explain how the "Big Data" ecosystem maps to requirements. He will then address some of the key questions for quants and engineers: what's it like for the developer? how does it scale for different sorts of backtests? when does it make sense to combine "Big Data" with "Cloud Computing" in financial services?

### ***Non-volatile RAM: An insider perspective*** [\[slides\]](#)

- *James Myers, Director of SSD Solutions Architecture and Engineering, Intel*

The non-volatile memory industry is changing rapidly. The cost of NAND flash memory continues to drop. Vendors are packaging flash in a wide range of form factors and interfaces, from rackable arrays to PCIe cards and even DIMMs. New standards based programming models are emerging, such as NVMe and the NVM Programming Model. New scale-out file systems are replacing traditional SAN and NAS architectures in enterprise IT. Meanwhile, new technologies on the horizon have some pundits predicting a convergence of memory and storage that will overturn the very Von Neumann computing model itself. At Intel, James runs a team responsible for making non-volatile memory solutions work for customers. In this talk, he will sort out the space for us and provide some pointers for architects and application developers. What are the key locations on the cost-vs-performance graph? How can performance-critical applications best take advantage of flash today (memory channel? kernel bypass? NoFTL?)? How can solution designers best prepare for the future?

### ***Networking Luncheon***

### ***Financial technologists: Be proud. Be proactive.*** [\[slides\]](#)

- *Peter Nabicht, Senior Advisor, Modern Markets Initiative*

HFT and other forms of automated trading have become favorite whipping boys for the media. Most trading firms, quiet by design, avoid the debate. Today the Modern Markets Initiative has taken up the task of explaining to the public the crucial role that computerized decisions play in providing fair prices to investors. Peter will argue that automated traders-as well as the technologists who enable them-should be proud of the important functions they perform. But he will also argue that everyone in a trading firm has a role to play in how the industry is perceived and how it evolves. After reviewing key issues in our complex market structure and how tools like MIDAS may shape the way that regulators view those issues, Peter will suggest things that technologists can do to promote a bright future for automated trading.

### ***STAC Update - Compute-bound workloads*** [\[slides\]](#)

- *Peter Lankford, Founder & Director, STAC*

Peter will review the latest STAC activities in areas such as options pricing.

### ***Practical Parallelization in C++*** [\[slides\]](#)

- *Arch Robison, Senior Principal Engineer, Intel*

Parallelization continues to be a focal point for C++ programmers in finance. Some have not yet achieved parallelism in their code, while others debate the best ways to do so. As the original architect of Intel's Threading Building Block (TBB) library, Arch understands the challenges, benefits, and tradeoffs of parallelization. In this talk, Arch will provide new data on the benefits of parallelism in financial applications, as well as recent insights on best practices in parallelizing specific financial computations.

### ***Accelerating Stochastic Volatility Model Calibration in R Using GPUs*** [\[slides\]](#)

- *Matthew Dixon, Assistant Professor of Analytics, University of San Francisco*

The R statistical software environment is popular with quants partly because it facilitates application design space exploration. However, despite offering a rich set of native numerical and statistical functionality that is useful for options-related analytics, a typical R based implementation of a stochastic volatility model calibration on a CPU does not meet the performance requirements for sub-minute level trading, i.e. mid- to high-frequency trading. Calculations rely on native optimization packages that are difficult to precisely replicate outside of R but are bottlenecked on computationally intensive kernels that can easily be replicated. In this talk, Matthew will present a new R library that that dramatically accelerates options-related calculations by offloading the most computationally intensive part of the volatility model calibration to a GPU via an easy-to-use map-reduce interface. He will provide evidence that the new R-based implementation performs comparably to GPU-based calibration code written in C/C++.

### ***STAC Update - Low latency research*** [\[slides\]](#)

- *Peter Lankford, Founder & Director, STAC*

Peter will review the latest STAC activities in areas such as low-latency networking and order routing.

## ***Innovation Roundup – Round 2***

<b>“Start Fast &amp; Stay Fast: Priming Java for Market Open with ReadyNow!”</b> <a href="#">[slides]</a>	<i>Gil Tene, CTO, Azul Systems</i>
<b>“MetaConnect: Proven performance.”</b> <a href="#">[slides]</a>	<i>Dave Snowdon, Founder, co-CTO, Metamako</i>
<b>“Trading Without a Switch/Trading Within a Switch”</b> <a href="#">[slides]</a>	<i>Robert Walker, CTO, xCeler</i>
<b>“Achieving ultra low latency with the Exablaze ExaNIC network card family”</b> <a href="#">[slides]</a>	<i>Dr. Matthew Chapman, CTO, Exablaze</i>

## ***Not Just Server Consolidation: Virtualization for Big and Fast Workloads*** [\[slides\]](#)

- *Matthew Knight, Marketing Director Financial Services , Solarflare*

While virtualization dominates the enterprise data center, it has been unrealistic for Tier 1 financial applications due to performance limitations. That may be about to change. In this talk, Matthew will examine some emerging cases in which applications achieve near-native performance by leveraging the latest virtualization technologies such as SR-IOV, multiple PFs and VFs, PCI passthrough, and a preview of Linux containerization that clears a path toward more elegant integration of 10/40GbE, Linux and KVM into OpenStack Clouds. As part of this, he will show how running IEEE 1588 (PTP) in a VM and leveraging ingress and egress time stamping enables real-time latency measurements without external equipment.

## ***Innovation Roundup – Round 3***

<b>“New Developments in Exchange Latency Management”</b> <a href="#">[slides]</a>	<i>Tony Pettipiece, Global Head of Sales and Marketing, Cape City Command</i>
<b>“Where global business and growth connect”</b> <a href="#">[slides]</a>	<i>Henrique Hablitschek, Business Development Manager, Equinix</i>
<b>“Tackling 'big data' capture challenges”</b> <a href="#">[slides]</a>	<i>Mohammad Darwish, VP Sales, Fiberblaze</i>

## ***OpenSPL - A new way of thinking about FPGA*** [\[slides\]](#)

- *Ryan Eavy, Executive Director, Enterprise Architecture, CME Group*

The benefit of FPGAs for certain tasks in financial markets is now widely accepted. But as we've discussed at many STAC Summits, one of the challenges slowing FPGA adoption is programmer productivity. A consortium of firms led by the CME, Chevron, and Juniper have set out to change that with a programming framework called the Open Spatial Programming Language, or OpenSPL. OpenSPL is an effort to standardize a "spatial programming" approach for FPGAs and other computing technologies. Whereas traditional programming techniques focus on execution in just one dimension (time), a spatial programmer thinks of execution in two dimensions: time and space. In this talk, Ari will provide a brief overview of OpenSPL, illustrating how it eases programming of devices like FPGA.

## ***Networking Reception***

## Speaker Biographies

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**Rick Cooper, Illinois Institute of Technology.** Ricky “Rick” Cooper is Assistant Professor of Finance at IIT Stuart School of Business. Throughout his academic career, Dr. Cooper has taught all aspects of financial theory, investments, and corporate finance at Wayne State University, Harvard University, and Vanderbilt University. Dr. Cooper began his professional career with State Street Global Advisors in Boston, MA, where he quickly rose from Active International Portfolio Manager, to co-founder of the Enhanced Index Group, to co-founder and Associate Director of the Advanced Research Center. He worked as Senior Partner and Director of Analytics for Harris Investment Management. He currently serves as a research consultant and Director of Risk Management for Xambala, Inc.'s proprietary high frequency trading systems. Dr. Cooper's research has been published in The Journal of Futures Markets, The Financial Analyst's

Journal, The Journal of Financial Economics, and several other books and journals. Dr. Cooper has been a speaker at numerous conferences, and has been quoted in both the Wall Street Journal and Crain's Chicago Business.

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**Michel Debiche, Financial Services Practice Lead, ThinkBig Analytics.** Michel earned M.S. and Ph.D. degrees in Geophysics from Stanford and Princeton Universities. He has been involved in all aspects of quantitative trading since 1991. He worked in proprietary trading groups at Credit Suisse and Daiwa Securities America before creating the Global Equity Statistical Arbitrage desk at CIBC World Markets in New York. In 2002, Michel formed Quantia Capital, an investment advisor that has been involved in building several systematic trading operations. He has also consulted to financial services firms as well as their vendors in the areas of quantitative analysis, algorithmic trading, high-performance systems development, Complex Event Processing systems and enterprise risk management platforms. After a stint as Head of Quantitative Technology at First New York, a proprietary trading shop. Michel joined Think Big Analytics in 2013. Michel sees

the rise of the Big Data ecosystem as a golden opportunity to apply the lessons learned in quantitative trading, a quintessential data driven business, to help large enterprises move towards driving greater business value from their growing data streams.

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**Matthew Dixon, Ph.D., FRM, Assistant Professor of Analytics, University of San Francisco.** Matthew is an Assistant Professor in the School of Management at the University of San Francisco and specializes in financial modeling, machine learning and high performance computing. Matthew began his career as a quantitative developer at Lehman Brothers in London before pursuing academics and consulting for financial institutions in quantitative risk modeling. Matthew is a chartered financial risk manager and currently serves as consulting director of risk at HedgeFacts. He holds a Ph.D. in Applied Mathematics from Imperial College (2007), a Master of Science in Parallel and Scientific Computation with distinction from the University of Reading (2002) and has held postdoctoral and visiting professor appointments at Stanford University and

UC Davis respectively. He has published several academic papers at the intersection of financial modeling and high performance computing, chairs the workshop on high performance computational finance at SC and is co-founder of the Thalesians.

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**Ryan Eavy, Executive Director, Enterprise Architecture, CME Group.** Ryan leads the Emerging Technology function as part of the Enterprise Architecture team at the CME Group. He is responsible for ensuring the company's technology is aligned with business strategy through application research and development, technical solution assessment and systems roadmap definition. Among Ryan's many other accomplishments, he has recently led the design and implementation of the Exchange's ultra-low-latency middleware strategy and common abstract middleware layer. Prior to this, he most recently served as a Senior Application and Security Architect for the Chicago Board of Trade. Before joining the CBOT in 2003, Ryan worked as a Senior Applications Developer at Quotes Plus where he designed and developed trading analysis

software and as a Senior Applications Engineer at Dewpoint. Ryan earned a bachelor's in computer science from the University of Michigan and is currently pursuing a master's in Computational Finance from DePaul University.

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**Matthew Knight, Marketing Director Financial Services, Solarflare.** Before joining Solarflare in January 2014, Matthew was the Company President of Accensus, a company building an ultra-low-latency hybrid software/FPGA trading platform. Prior to that he worked at DRW Trading in Chicago in the role of Head of Labs focused on ultra-low-latency technology and before that he worked at STAC Research in its early days following almost a decade at Reuters.



**Peter Lankford, Founder & Director, Securities Technology Analysis Center.** Peter leads STAC<sup>®</sup>, which provides hands-on technology research and testing tools to the finance industry and facilitates the STAC Benchmark Council<sup>™</sup>, a group of leading financial institutions and vendors that engages in technical dialog and specifies standard ways to assess technologies used in finance. Prior to STAC, Peter was SVP of Information Management Solutions at Reuters, where he led the \$240M market data systems business. Peter's team led Reuters into the business of low-latency direct exchange feeds and catalyzed the widespread adoption of Linux on Wall Street by making the Reuters Market Data System (RMDS) the first major product for the securities industry on that platform. Prior to Reuters, Peter held management positions at Citibank, First Chicago Corp., and operating-system maker IGC. Peter has an MBA, Masters in International

Relations, and Bachelors in Chemistry from the University of Chicago.



**Bryan Lewis, Chief Data Scientist, Paradigm4.** Bryan is is Paradigm4's Chief Data Scientist and creator of SciDB-R. Bryan pioneered the concept of "Personal Supercomputing," introducing the first integrated desktop cluster system as co-founder of Rocketcalc LLC. He is the author of a number of R packages and was also the founding Director of Engineering at Revolution Computing (now Revolution Analytics), working on many performance-related aspects of R, especially related to parallel computing. His research areas are in iterative methods for inverse problems and numerical analysis.



**Ernie Li, Illinois Institute of Technology.** Kun Li is Adjunct Faculty at IIT Stuart School of Business as well as a Finance Ph.D. candidate at IIT Stuart. His research focuses on High-frequency trading and capital markets. Li is also a researcher for Smart Grid Regional Innovation Cluster, where he designs business strategic plans and financial models of sustainability, and connects innovative units in the Cluster to market opportunities and capital funding. In addition, Li worked as a quant researcher at CME Group on derivatives.



**James Myers, Director of SSD Solutions Architecture and Engineering, Intel Corporation.** James is a catalyst in the computing and storage industries with a passion for driving adoption of innovative technologies. James leads Intel's efforts to drive pervasive adoption of NVM technologies. His team architects, develops, and helps customers deploy SSD based solutions, enabling world class solution performance, increased IT efficiency, and cost savings across enterprises. The team also work closely with industry partners and customers to enable emerging disruptive NVM technologies. James has a BS in Electrical Engineering from Michigan Technological University, holds one patent, is a published standards developer and was previously on the SATA-IO Board of Directors. Prior to joining Intel, James influenced emerging technologies and drove business at global HDD companies Seagate and Maxtor, an optical networking start-up, Picolight, and computing giant IBM.

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**Peter Nabicht, Senior Advisor, Modern Markets Initiative.** Peter worked for Allston Trading, a leading low latency algorithmic trading firm, from 2004 - 2013. During that time Peter has had experiences in all technical aspects of the company. In his first two years he started the automation of back office processes and built a state of the art real-time operations desk that supported trading activities across all asset classes on 50+ endpoints. After being the Technical Lead on the Money Market, Fixed Income and Energy desks, Peter became the CTO of Allston Trading in September of 2008. In January of 2011, he was named Executive Vice President of Allston and ran Business Development and the on-boarding of new trade teams and strategies. During this time Peter oversaw the coordination between trading and technology. Peter also has collaborated with a variety of industry organizations, including the FIA PTG, and has spent time working with and educating regulatory bodies on the practices and benefits of electronic markets. Peter is currently serving as a Senior Advisor to the Modern Markets Initiative and consults with a variety of firms on market structure and technology.

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**Arch Robison, Senior Principal Engineer, Intel.** Arch Robison was the original architect of Intel Threading Building Blocks. He recently contributed SIMD improvements to the Julia language project. Arch is one of the authors of the book Structured Parallel Programming. He was the lead developer for KAI C++, and previously worked at Shell on massively parallel codes for seismic imaging. Arch holds a Ph.D. in computer science from the University of Illinois, 16 software patents, 4 winning entries in the International Obfuscated C Code Contest, and an Erdős number of 3.

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**Ben Van Vliet, Assistant Professor of Finance, IIT.** Ben is an Assistant Professor at the Illinois Institute of Technology's Stuart School of Business (IIT), where he also serves as the Associate Director of the M.S. Finance program. At IIT he teaches courses in quantitative finance, C++ and .NET programming, and automated trading system design and development. He serves also as series editor of the Financial Markets Technology series for Elsevier/Academic Press. Ben consults extensively in the financial markets industry, primarily on topics related to the mathematics, technology and management of trading systems. Ben is the author of three books on trading/investment: Quality Money Management with Andrew Kumiega, Modeling Financial Markets with Robert Hendry, Building Automated Trading Systems. He has also published several articles in the finance and technology, and presented at several academic and professional conferences.

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