Michael C. Brogioli, Ph.D.

Contact Information

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Expertise

Software Analysis, Software Architecture, Embedded Computing, Microprocessor Designs, Software Based Simulation, Computer Hardware Design, Computer Networks, Computer and Network Based Gaming Platforms, High Performance Computing, Digital Signal Processing.

Education

Rice University, Houston, Texas USA

Ph.D., Electrical and Computer Engineering, 2007

- Dissertation Topic: "Reconfigurable Heterogeneous DSP/FPGA Based Embedded Architectures for Numerically Intensive Embedded Computing Workloads."
- Advising Committee: Dr. Joseph R. Cavallaro, Dr. Keith D. Cooper, Dr. Scott Rixner

Rice University, Houston, Texas USA

M.S., Electrical and Computer Engineering, 2003

- Dissertation Topic: "Dynamically Reconfigurable Data Caches in Low Power Computing."
- Advising Committee: Dr. Keith D. Cooper, Dr. Scott Rixner, Dr. Robert Jump

Rensselaer Polytechnic Institute, Troy, New York USA

B.S., Electrical Engineering, Cum Laude, 1999

- Advisor: Dr. William Pearlman

Certificates

Harvard Business School, Boston, Massachusetts, USA

Certificate in Investment Portfolios with Alternate Investments, 2022

- Venture Capital, Growth Equity, Distress Investing, Private Debt, Hedge Funds, Portfolio Construction.

Professional Experience

Polymathic Consulting, TX USA
Managing Director **2011 - Present**
Founder and managing director of Polymathic Consulting, servicing clients ranging from early stage technology start-up endeavors to Fortune 100 and beyond. Clients turn to Polymathic for expansive, proven engineering, research and development, intellectual property and technical leadership to effectively advance their real world business needs.

IEEE and ACM Design Automation Conference, USA
Steering Committee
Conference Chair, Embedded Systems and Software Track **2016 - Present**
Design Automation Conference is the premiere technical conference and trade show specializing in Hardware, Software, Internet of Things, Embedded Systems and related Design Methodologies. Conference chair, responsible for the review, critique, and acceptance of academia and industry based publications in the areas of embedded systems, embedded software, and embedded system design.

Rice University, TX USA
Adjunct Professor, Electrical and Computer Engineering **2009 - Present**

Professor of Ph.D. candidate level courses in wireless telecommunications, embedded computing software, embedded computing hardware, and software/hardware optimization in modern computing systems utilizing modern high level programming languages. Advisor of senior and graduate student based projects revolving around multi-core heterogeneous systems as they pertain to wireless telecommunications, medical and video.

University of Texas, Austin, TX USA
Guest Lecturer, School of Engineering **2021 - Present**
Guest lecturer in "Legal Issues and Technology Management", on subjects relating to technology, management, financial and fund raising matters, technology transfer, and certain legal issues. Students are primarily comprised of those with existing degrees, and a number of years of industry experience.

RISC-V Foundation, Berkeley, CA USA
Technical Committee **2018 - Present**
RISC-V is an open CPU instruction set architecture (ISA) based on established reduced instruction set computing (RISC) principles. The RISC-V Foundation is a non-profit consortium chartered to standardize, protect, and promote the free and open RISC-V instruction set architecture together with its hardware and software ecosystem for use in all computing devices.

Freescale Semiconductor, TX USA
Chief Architect, Senior Member Technical Staff **2009 - 2011**
Technical architect of Freescale's DSP compilers and related technology. Responsible for management of technology, engineering roadmaps, design lead on compiler infrastructure and optimizations (high level and low level), next generation ABI definitions and next generation architecture solutions. Technical lead on multi-year engagement with processor architects in design of next generation DSP cores. Developed software infrastructure for migrating OEM competitor software stacks to Freescale solutions, tools generation, software packages, migration strategies and white papers. Technical lead on Tier-1 OEM customer relationships, evaluations of 3rd party technologies for potential partnerships and acquisitions, led various university research collaborations on behalf of Freescale. Development and deployment of internal software engineering policies and practices.

Freescale Semiconductor, TX USA
Senior Compiler Engineer V
High Performance Compiler Design, Processor Architecture **2007 - 2009**
Team leader on compiler engineering effort to provide intuitive, interactive end user experience for DSP compiler tool suite. Designed a framework to guide users in achieving highly optimized compiled VLIW code. Assembly listing reports for optimization failure advice, porting advice when migrating from competitor architectures, advice on code modifications for optimization enablement. Lead designer, engineering effort director, project planning and scoping, release schedule, and drafting of specification. Development of various compiler optimizations for VLIW processing as well as software emulation layers for running competitor software solutions on Freescale silicon.

Advising of next-gen DSP core architecture team in creating a highly orthogonal, compiler targetable multi-clustered VLIW based digital signal processor architecture. Work with future basestation architecture teams on designing next-gen basestation architecture for 4G LTE incorporating control and data plane processing with appropriate programming models.

Method Seven, MA USA
Technical Co-Founder
High Performance Software and Hardware Systems Architecture **2006 - 2007**
Founded Method Seven, a financial engineering company applying biologically inspired machine learning to financial market analysis. Principal software systems architect and hardware systems architect for both research and deployment platforms. Led research and development of platform

for scans and overlays covering the NASDAQ, NYSE, and AMEX markets using proprietary technologies.

Texas Instruments, TX USA
Advanced Architecture and Chip Technologies
Microprocessor and Systems Architecture **2005**
System modelling and architectural exploration of Davinci^{TM}system-on-chip (SOC) architecture designed for embedded video processing. SystemC based simulation models of on–chip crossbars, bus arbitration and bridge technology, as well as on–chip and off–chip memory controllers within application specific heterogeneous SOC architectures.

Fulbright and Jaworski LLP, TX USA
Scientific Advisor, Intellectual Property
Electrical, Computer Engineering and Computer Science **2005 - 2007**
Intellectual property consultant and technology advisor on litigation and prosecution work including, but not limited to: CDMA2000 3G wireless standards, wireless communications systems, embedded computing, and large scale modular software systems. Reverse engineering of source code varying from VHDL to high level object oriented applications, as well at patent prosecution and litigation work.

Intel Corporation, CA USA
Microprocessor Research Labs
Compiler Engineering **2000**
Implemented speculative multi–threading support in Intel's IA–64 compiler. Developed new program analysis and back end code generation phases to support speculatively launching threads at runtime. Analyzed the performance potentials of SPEC95 benchmarks with respect to speculatively multi–threaded execution.

Rice University, TX USA
Computer Architecture and Circuit Design (Instructor) **2000 - 2003**
Graduate instructor of graduate and undergraduate curriculum in the areas of Electrical and Computer Engineering, specifically relating to Computer Architecture and Circuit Design. Advised student projects, instructed classes and led laboratory work.

Vicarious Visions, NY USA
Lead Software Engineer **1999**
Principal engineer on Activision's "AMF Extreme Bowling" for Nintendo's Color Gameboy gaming console. Developed PC based audio and graphics development tools suite for use with Color Gameboy game production. Coded innovative, highly optimized assembly routines for real time speech and full motion video on the console's limited Zilog Z80 processor resources.

Stratus Computer, MA USA
Hardware Engineering **1997 - 1998**
Debugged locked step CPU operation and memory management issues in Stratus' fault tolerant UNIX release 3.4. Qualified Hewlett Packard PA–8000 series CPU modules under Stratus' proprietary OS release, VOS 14.0, during alpha and beta test phases. Wrote C code and UNIX shell scripts for recreating documented system failures, and to automate remote kernel updates and OS installs as well as data logging.

Rensselaer Polytechnic Institute, NY USA
Digital Microelectronics Design (Instructor) **1997 - 1998**
Undergraduate instructor of undergraduate courses in digital microelectronics and circuit design. Instructed weekly lessons, computer design labs, graded exams and problem sets.

Rensselaer Electric Motor Sports, NY USA
Hardware and Software Engineering **1995 - 1997**
This project was funded by, and led by, General Motors Corporation and Honda of America. Hardware and software co-design of embedded operating system and hardware platform for electrical vehicle prototypes, running on 16-bit Motorola 68K dual processor platform. Designed power engineering test platform for dynamometers, including hardware and user interface software.

Appointed Conference Committees and Organizations

IEEE International Conference on Communications, USA
Technical Review Committee, Machine Learning for Communications Track **2021 - Present**
Technical committee member responsible for the review, critique, and acceptance of academia and industry based publications and research in the areas of machine learning for communications systems.

IEEE International Symposium on Circuits and Systems, USA
Technical Review Committee **2021 - Present**
Technical committee member responsible for the review, critique, and acceptance of academia and industry based publications and research in the areas of computing, including energy aware systems, multicore processing, and adaptive computing.

IEEE and ACM Design Automation Conference, USA
Technical Steering Committee, Embedded Computing Track **2019 - Present**
Technical Steering Committee member responsible for the review, critique, and acceptance of academia and industry based publications and research in the area of embedded computing and related systems, including embedded hardware, embedded software, firmware and tools.

IEEE and ACM Design Automation Conference, USA
Co-chair, Program Committee, Embedded Systems and Software Track **2014 - 2019**
Co-chair and Program Committee member responsible for the review, critique, and acceptance of academia and industry based publications in the areas of embedded systems, embedded software, and embedded system design. Design Automation Conference is an annual technical conference and trade show specializing in electronic systems.

IEEE and ACM Design Automation Conference, USA
Program Committee, Designer and User Track **2011 - Present**
Program Committee member responsible for the review, critique, and acceptance of academia and industry based publications in the areas of automated system design, both of hardware, software, and system analysis. Design Automation Conference is an annual technical conference and trade show specializing in electronic systems.

ACM Great Lakes Symposium on VLSI, Stresa-Lago Maggiore, Italy
Program Committee **2007**
Reviewer and committee member in the area of system-on-chip architectures, VLSI design, and compiler driven architecture design space exploration.

IEEE International Symposium on Personal Indoor and Mobile Radio Communications, Helsinki, Finland
Program Committee **2006**
Reviewer and committee member in the area of personal and mobile area radio communications and related systems.

ACM International Conference on Parallel Architectures and Compilation Techniques, Charlottesville, VA, USA
Program Committee **2002**
Reviewer and committee member in the area of parallel computer architectures, programming lan-

guages and related compiler technologies.

Books and Contributed Chapters

Brogioli, Michael C., and Kraeling, Mark B., *Internet of Things - A Synopsis of the Internet of Things, its History, Application, Technology, Architecture, and Challenges Moving Forward*, Software Engineering for Embedded Systems - Methods, Practical Techniques and Applications, 2nd Edition, Elsevier Publishing, 2019.

Brogioli, Michael C., *Software and Compiler Optimization for Microcontrollers, Embedded Processors and DSPs*, Software Engineering for Embedded Systems - Methods, Practical Techniques and Applications, 2nd Edition, Elsevier Publishing, 2019.

Brogioli, Michael C., *Embedded and Multicore System Architecture - Design and Optimization*, Software Engineering for Embedded Systems - Methods, Practical Techniques and Applications, 2nd Edition, Elsevier Publishing, 2019.

Leotescu, Florin, and Cristian, Marius and Brogioli, Michael C., *Performance Analysis using NXP's i.MX RT1050 Crossover Processor and the Zephyr Real-Time Operating System*, Software Engineering for Embedded Systems - Methods, Practical Techniques and Applications, 2nd Edition, Elsevier Publishing, 2019.

Wu, Michael and Sun, Yang and Wang, Guohui and Brogioli, Michael C. and Cavallaro, J. R., *Implementation of a High Throughput 3GPP Turbo Decoder on GPU Architectures*, Software Development for Networking Applications – Expert Guides Series, Elsevier Publishing, Atlanta, GA, 2018.

Brogioli, M. C., *On The C++ Programming Language for Embedded Software, Systems, and Platforms*, Software Engineering for Embedded Systems – Expert Guides Series, Elsevier Publishing, Atlanta, GA, 2013.

Brogioli, M. C., *Software Optimizations for Memory Performance in Embedded Systems*, Software Engineering for Embedded Systems – Expert Guides Series, Elsevier Publishing, Atlanta, GA, 2013.

Invited Co-Author, *Signal Processing Systems Handbook, Second Edition*, Springer Publishing Company, 11 West 42nd Street, New York, NY, 2012.

Brogioli, M. C., *Software Programmable DSP Architectures*, Expert Guide DSP for Embedded and Real-Time Systems, pp. 63-75, Elsevier Publishing, Atlanta, GA, 2012.

Brogioli, M. C., *The DSP Hardware / Software Continuum*, Expert Guide DSP for Embedded and Real-Time Systems, pp. 103-113, Elsevier Publishing, Atlanta, GA, 2012.

Brogioli, M. C., *DSP Optimization - Memory Optimization*, Expert Guide DSP for Embedded and Real-Time Systems, pp. 217-241, Elsevier Publishing, Atlanta, GA, 2012.

Brogioli, M. C. and Dew, Stephen, *Optimizing DSP Software - High level Languages and Programming Models*, Expert Guide DSP for Embedded and Real-Time Systems, pp. 167-179, Elsevier Publishing, Atlanta, GA, 2012.

Sun, Yang, Amiri, Kiarash, Brogioli, Michael, Wang, Guohui, and Cavallaro, Joseph R., *DSP Hardware Accelerator Architectures for Communication Applications*, Springer Publishing, New York, NY, Spring 2012.

Sun, Yang, and Amiri, Kiarash, and Brogioli, Michael C., and Cavallaro, Joseph, *Application-Specific Accelerators for Communications*, Springer Publishing Company, 11 West 42nd Street, New York,

NY, 2010.

Invited Co-Author, *Signal Processing Systems Handbook, First Edition*, Springer Publishing Company, 11 West 42nd Street, New York, NY, 2010.

Publications and Invited Papers

Brogioli, Michael, C., and Games, William, and Moats, Richard, *Current and Future Challenges in Internet of Things (IoT) Development Silos (Part I)*, Embedded Computing Design Magazine, USA, 2020.

Brogioli, Michael, C., and Games, William, and Moats, Richard, *On Solving the IoT Development Silo Problem* IEEE Real-Time and Embedded Technology and Applications Symposium, Tools and Demos Session, Montreal, Canada, 2019.

Moats, Richard, and Games, Bill, and Brogioli, M. C., *Arch - A New Language For The Next Wave of Network-Connected Embedded Development*, Design Automation Conference, Austin, Texas, 2017.

Moats, Richard, and Games, Bill, and Brogioli, M. C., *Network Native - The Next Wave of Connected Embedded Development*, Network Native Inc., Austin, Texas, 2017.

Invited Paper, Arokia I, Brogioli, Michael, Jain, Nitjin and Garg, Umang, *LTE Layer 1 Software Design on Heterogeneous Multicore DSP Platforms*, IEEE 45th Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, 2011.

Kyriakopoulous, Konstantinos, Brogioli, Michael C., and Zhang, Ruihao, *Improving Software Systems Quality through Well Defined Development Methodologies*, 2011 Test Methodology and Efficiency Symposium, Freescale Semiconductor, Austin, TX, USA, 2011.

Brogioli, Michael C., and Cavallaro, J.R., *Compiler Driven Architecture Design Space Exploration for Embedded DSP Workloads: A Study in Software Programmability Versus Hardware Acceleration*, IEEE 43rd Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, 2009.

Brogioli, Michael C., and Zhang, Ruihao, *Compiler Feedback: Guiding Performance of Compiled C Code*, Freescale Semiconductor White Paper, Austin, TX, 2009.

Brogioli, M.C., and Cavallaro, J., *RISD: A Retargetable Compiler Infrastructure for Scalable Multi-Clustered VLIW DSP Architectures*, IEEE 5th Dallas Circuits and Systems Workshop, Dallas, TX, 2007.

Brogioli, Michael C., Radosavljevic, P., and Cavallaro, J., *A General Hardware/Software Codesign Methodology for Embedded Signal Processing and Multimedia Workloads*, IEEE 40th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, 2006.

Brogioli, Michael C., Radosavljevic, P., and Cavallaro, J., *Hardware/Software Co-design Methodology for DSP/FPGA Partitioning: A Case Study for Meeting Real-Time Processing Deadlines in 3.5G Mobile Receivers*, 49th IEEE International Midwest Symposium on Circuits and Systems, San Juan, Puerto Rico, 2006.

Brogioli, Michael C., Willmann, P.D., and Rixner, S., *Parallelization Strategies for Network Interface Firmware*, IEEE/ACM 4th Annual Workshop on Optimizations for DSP and Embedded Systems (In Conjunction with IEEE/ACM International Symposium on Code Generation and Optimization), Manhattan, NY, 2006.

Brogioli, Michael C., Gadhiok, M., and Cavallaro, J., *Design and Analysis of Heterogeneous DSP/FPGA Based Architectures for 3GPP Wireless Systems*, IEEE Real-Time and Embedded Technology and

Applications Symposium Work-in-Progress Sessions, San Jose, CA, 2006.

Brogioli, Michael C., and Cavallaro, J., *Modelling Heterogeneous DSP-FPGA Based System Partitioning with Extensions to the Spinach Simulation Environment*, IEEE 39th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, 2005.

Joseph R. Cavallaro, Michael C. Brogioli, Alexandre de Baynast, and Predrag, Radosavljevic, *Reconfigurable Architectures for Wireless Systems: Design Exploration and Integration Challenges*, Wireless World Research Forum, Toronto, CA, 2004.

Brogioli, Michael C., Pai, V.S., Willmann, P.D., *Spinach: A Liberty–Based Simulator For Programmable Network Interface Architectures*, ACM SIGPLAN/SIGBED Conference on Languages Compilers and Tools for Embedded Systems, San Diego, CA, 2004.

Brogioli, Michael C., *Dynamically Reconfigurable Data Caches in Low Power Computing*, Masters Thesis, Rice University, Houston Texas, 2002.

Brogioli, Michael C., and Jones, Bryan, *Dynamically Configurable Caches in Low Power Computing*, Internal White Paper, Rice University, Houston Texas, 2001.

Patents

Gregory D. Chiocco and Michael C. Brogioli, *Systems and Methods for Obtaining Location Data*, U.S. Patent Application 18/080,411, filed December 2022. Patent Pending.

Donald W. Games, Michael C. Brogioli Ph.D., Richard Moats, *System And Method for Holistic Application Development and Deployment in a Distributed Heterogeneous Computing Environment*, U.S. Patent Application 17/745,792, filed May 2022. Patent Pending.

Gregory D. Chiocco and Michael C. Brogioli, *Systems and Methods for Traversing A Three Dimensional Space*, U.S. Patent No. 11,526,180.

Gregory D. Chiocco and Michael C. Brogioli, *Systems and Methods for Aggregating Harvest Yield Data*, U.S. Patent No. 11,354,757.

Gregory D. Chiocco and Michael C. Brogioli, *Systems And Methods For Communication in GNSS Based Autonomous Vehicle Deployment*, U.S. Patent Application 17/060,625, filed March 2021. Patent Pending.

Michael C. Brogioli and Gregory D. Chiocco, *Systems and Methods for Connected Computation in Network Constrained Systems*, U.S. Patent No. 11,354,757.

Donald W. Games, Michael C. Brogioli Ph.D., Richard Moats, *System And Method for Holistic Application Development and Deployment in a Distributed Heterogeneous Computing Environment*, U.S. Patent No. 11,340,887.

Michael C. Brogioli, Ph.D., Cesar Taylor M.D., and Howard Roberts, *Location Agnostic Platform for Medical Condition Monitoring and Prediction and Method of Use Thereof*, Patent No: 147145.010100/US, 2014.

Cesar Taylor M.D., and Michael C. Brogioli Ph.D., and Howard Roberts, *System for Holistic Pain Monitoring and Prediction and Method of User Thereof*, Patent No: 147145.010200/US, 2014.

Cesar Taylor M.D., and Michael C. Brogioli Ph.D., and Howard Roberts, *System for Prevention of Narcotic Diversion and Method of Use Thereof*, Patent No: 147145.010300/US, 2014.

Howard Roberts, Cesar Taylor M.D., and Michael C. Brogioli Ph.D., *Magnetometer Breathing Sensor and Method of User Thereof*, Patent No: 147145.010400/US, 2014.

Leadership and Board Membership

Tandem Motion Company FL, USA
Advisory Board **2021 - 2023**
Advisory board member on intellectual property strategy, fundraising, finance and select technologies. Tandem is building hybrid solutions for heavy duty internal combustion engine vehicles.

AgCompute CA USA
Advisory Board, Co-Inventor **2019 - Present**
Advisory board and co-inventor of patent pending technology for the advancement of Agriculture Technology in areas of low network connectivity and adverse conditions. Innovative sensor, edge and cloud computing solutions for in-field real time asset management.

MIT MassChallenge USA
Mentor, Speaker **2017 - Present**
MassChallenge is a global startup accelerator with a focus on high-impact, early-stage entrepreneurs. Through its global network of accelerators in Boston, London, Mexico City, Geneva, Jerusalem and Texas, coupled with unrivaled access to our corporate partners, MassChallenge has driven growth and created value the world over. To date, MassChallenge has raised over $2B in funding, generated over $900M in revenue, and created over 65,000 jobs.

ScribeSense, TX USA
Board of Directors **2017**
ScribeSense is a *patented* cloud-based grading platform for schools and the only solution for grading free-form paper tests. ScribeSense automatically grades handwritten tests with 99% accuracy. Teachers scan and upload their own tests using a standard school scanner. ScribeSense's visual analytics enables data-driven decision making so schools can improve student learning and retain top teacher talent.

Southwest Angel Network for Social Impact, TX USA
Board of Directors **2015 - 2019**
The Southwest Angel Network for Social Impact (SWAN Impact) is a community of like-minded investors who enjoy working together to *Make the world a better place, one company at a time.* We believe that we can have the most significant impact by funding for-profit start-up companies who are building sustainable businesses.

Network Native, TX USA
Board of Directors, Co-Founder, Interim CTO **2015 - Present**
Board member and co-inventor, advising in the areas of Internet of Things technologies, specifically related to product developer solutions, programming languages and platforms, security and infrastrucure. Business development, marketing, and fund raising. Have held various roles, including but not limited to interim CTO.

NewCrew, TX USA
Advisory Board **2015 - 2016**
Board member advising in the areas of mobile computing, social computing, and geofencing technologies. Business development, marketing, and fund raising.

AngelSpan, TX USA
Advisory Board **2015 - 2016**
Board member advising in the areas of professional investor relations to start-ups, resource allocation, and a platform for increased efficiency and valuation of early stage companies and venture capital portfolios.

Student Loan Genius (now Vault), TX USA
Advisory Board, Interim CTO **2013 - 2014**
Advisory board member and interim CTO advising in the areas of financial transactions systems and enterprise software, as they pertain to solving the student loan debt crisis for early stage science, technology, engineering and medicine (STEM) employees. Technology, recruiting, fund raising.

HealthBits, TX USA
Board Member, Co-Inventor **2013 - 2014**
Board member advising in the areas of large scale enterprise software systems, real-time computing and medical sensing devices across complex event processing systems.

Osmek, TX USA
Interim CTO, Advisory Board **2012 - 2014**
Interim CTO and board member advising in the areas of large scale cloud based content management software systems. Providing innovative media content management for heterogeneous web enabled devices with geolocational services, primarily using PHP and Python programming languages.

Academia

Rice University, Houston, Texas USA
DSP Compiler Design **2005 - 2009**
Developed *RISD*, a retargetable compiler infrastructure for clustered VLIW DSP architectures. By taking pre-existing code schedules and binaries for existing DSP applications, RISD takes a flexible machine definition for which the code should be recompiled. Users can specify the number of VLIW clusters, functional units per VLIW cluster, functional unit mix per VLIW cluster, register file sizes, cluster interconnect topology (point-to-point versus 2d mesh network), multi-cluster scheduling algorithms, and inter-cluster cross-register file bandwidth and latencies.

Compiler framework was used to perform compiler driven design space exploration of massively multi-clustered VLIW based architectures versus FPGA and ASIP implementations of software kernels. RISD was used in studies comparing tradeoffs in computational throughput versus gates required to implement programmable DSP cores containing many register files and VLIW compute clusters, versus FPGA efficiency when including routing overhead for large scale problems.

Rice University, Houston, Texas USA
DSP/FPGA Based System-On-Chip Architectural Simulator Design **2004 - 2009**
Developed *Spinach DSP-FPGA*, a modular and composable simulator design infrastructure for programmable and reconfigurable embedded SOC architectures. Designed and developed modular and composable software modules to bit-true, cycle accurately simulate Texas Instruments C62x and C64x DSPs and MIPS style processors. Additionally, designed and developed support for SRAM and DRAM style memories, heterogeneous memory systems, heterogeneous clock domains, as well as runtime reconfigurable Xilinx Virtex II based FPGA computing elements, cache and memory controllers, bus arbiters, and on-chip interconnect fabric.

System was validated against compiled code DSP firmware from Texas Instruments' Code Composer Studio running on the simulator versus actual hardware benchmarks. Simulation platform was used to investigate highly heterogeneous multi-processor DSP based SOC architectures containing one or more Xilinx style FPGA based hardware coprocessors. Studies in 3.5G wireless telecommunications as well as H.26x video processing were performed to gain insight into overall system bottlenecks, hardware and software partitioning strategies, and tradeoffs of overall system design.

Rice University, Houston, Texas USA
Programmable Network Interface Architecture Simulator Design **2002 - 2004**
National Science Foundation Grant Nos. CCF-0532448 and CNS-0532452
Developed *Spinach*, a simulator design toolset for modelling programmable network interface architectures. Spinach models system components common to all programmable environments (ALUs,

control and data paths, register files, instruction processing), as well as components specific to embedded computing (software controlled SRAM scratchpad memory, hardware assists for DMA and medium access control). Spinach is a simulator design infrastructure, rather than a simulator per se. As such, the same underlying C code framework is used to model a uniprocessor Gigabit network interface, a multi-processor Gigabit network interface, or a 10 Gigabit multi-processor network interface with highly heterogeneous memory systems. Only a small number of lines of high level scripting language code is required to describe each of the various systems.

Spinach was validated by modeling the Tigon-2 programmable Ethernet controller by Alteon Websystems, running actual compiled code Ethernet processing firmware and by comparing the reported results to actual hardware benchmarks. Spinach was also used to obtain new insights into the performance of Gigabit and 10 Gigabit network interfaces both in terms of hardware architecture and firmware parallelization strategies. *Public Website: https://sourceforge.net/projects/spinach/*

Rice University, Houston, Texas USA
Software Engineering and Consulting **2000**
Implemented instruction selection and register allocation optimizations in UHFFT, an adaptive and portable software library for the Fast Fourier Transform. Performed in depth analysis of register pressure, compiler generated spill code, memory hierarchy utilization, and instruction selection for non–trivially sized FFT matrices running on commercially available hardware platforms. Utilized reverse Cuthill–McKee technique to achieve near optimal computation orderings and minimize live data set sizes, as well as optimize register allocation and instruction selection phases of compilation.

Select Expert Witness, Consultant Engagements

Daedalus Prime LLC* v. Samsung Electronics Co., Ltd. et. al
Bluepeak Law Group LLP, NY, USA
Expert Witness in Dynamic Power Management **2023**
Case Subject Matter - Dynamic power management of multicore processors, memory systems and related domains.
Work Performed - Expert consulting.

Certain Semiconductors and Devices and Products Containing the Same, Including Printed Circuit Boards, Automotive Parts, and Automobiles, Inv. No. 337-TA-1332
Daedalus Prime LLC*
Reichman Jorgensen LLP, CA, USA
Expert Witness in Dynamic Power Management **2022**
Case Subject Matter - Dynamic power management of multicore processors, memory systems and related domains.
Work Performed - Expert consulting.

Definitive Holdings LLC v. Powerteq LLC*
Proskauer Rose LLP, NY, USA
Expert Witness in Embedded Software and Hardware **2022 - Present**
Case Subject Matter - Automotive engine control software and hardware systems.
Work Performed - Expert consulting, declarations (to date).

Aire Technology Ltd.* v. Apple Inc.
Aire Technology Ltd.* v. Google LLC
Aire Technology Ltd.* v. Samsung Electronics Co., Ltd. et. al
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Computer Hardware Design **2022**
Case Subject Matter - Computer hardware design as it relates to Near Field Communication.
Work Performed - Expert consulting, declarations, deposition testimony.

WSOU Investments, LLC* v. ZTE Corporation et. al

Kasowitz Benson Torres LLP, NY, USA
Expert Witness in Video and Telecommunications Computing **2022 - 2023**
Case Subject Matter - Expert Witness in hardware and software design as it relates to video and telecommunications processing.
Work Performed - Expert consulting and expert declaration.

Robert Zeidman* v. Lindell Management LLC
Bailey Glasser LLP, Washington DC, USA
Expert Witness in Computer Software and Networking **2022 - 2023**
Case Subject Matter - Expert Witness in computer software and networking as it pertains to voting information related to the United States 2020 Presidential Election.
Work Performed - Expert consulting, expert reports, testimony at hearing.

Netlist, Inc.* v. Samsung Electronics Co., Ltd. et. al
Irell & Manella LLP, CA, USA
Expert Witness in Computer Memory Architecture **2022 - Present**
Case Subject Matter - Expert Witness in computer memory architecture, including performance and power related issues.
Work Performed - Expert consulting, expert reports, trial testimony (to date).

Samsung Electronics Co., Ltd v. Netlist, Inc*
Irell & Manella LLP, CA, USA
Expert Witness in Computer Memory **2022 - Present**
Case Subject Matter - Expert Witness in computer memory module architecture, including DRAM and related technologies.
Work Performed - Expert consulting, IPR declarations, depositions (to date).

Maxell Ltd* v. Lenovo Group Ltd., et. al
Mayer Brown LLP, Washington D.C., USA
Expert Witness in Power Management **2022 - 2023**
Case Subject Matter - Expert Witness in the area of mobile devices, microprocessors and power management.
Work Performed - Expert consulting.

Q Technologies, Inc.* v. Walmart, Inc.
Q Technologies, Inc.* v. Neutron Holdings, Inc. d/b/a/ LIME
Kane Russell Coleman & Logan PC, TX, USA
Expert Witness in Mobile Payments Systems **2021 - Present**
Case Subject Matter - Expert Witness in the area of mobile payments processing systems.
Work Performed - Expert consulting, expert reports, depositions (to date).

Samsung Electronics Co., Ltd v. Netlist, Inc*
Gibson Dunn & Crutcher LLP, CA, USA
Expert Witness in Computer Memory **2021 - 2022**
Case Subject Matter - Expert Witness in computer memory module architecture, including DRAM and related technologies.
Work Performed - Expert consulting, IPR declarations, deposition.

Sonrai Memory Limited* v. Oracle Corporation
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Memory and Compression Technology **2021 - 2022**
Case Subject Matter - Memory controllers, memory technology and data compression technology.
Work Performed - Expert consulting, claim construction, declarations, depositions.

Certain Laptops, Desktops, Servers, Mobile Phones, Tablets, and Components Thereof, Inv. No. 337-TA-1280
Sonrai Memory Limited*
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Low Power Systems **2021 - 2022**
Case Subject Matter - System on chips, operating systems and system components related power consumption in computing devices.
Work Performed - Expert consulting, claim construction declarations, expert reports, depositions.

Future Link Systems LLC* v. Advanced Microdevices, Inc.
Future Link Systems LLC* v. Apple, Inc
Future Link Systems LLC* v. Broadcom, Inc; Broadcom Corp.
Future Link Systems LLC* v. Qualcomm, Inc.; Qualcomm Technologies
Future Link Systems LLC* v. Realtek Semiconductor Corp.
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Circuit Design, Interconnects and Test **2021 - 2022**
Case Subject Matter - Semiconductor circuit design and reuse, memory design and test, PCI Express and related interconnect technologies.
Work Performed - Expert consulting, claim construction, declarations, depositions.

Certain UMTS and LTE Cellular Communications Modules and Products and Products Containing the Same, Inv. No. 337-TA-1240
Philips RS North America LLC and Koninklijke Philips N.V.*
Foley & Lardner LLP, MA, USA
Expert Witness in Wireless Computing Technology **2020 - 2021**
Case Subject Matter - Embedded computing technology related to wireless mobile devices, including 3GPP standards based functionality.
Work Performed - Expert consulting, expert reports, deposition, trial testimony.

Acqis* v. Samsung Electronics Co., LTD
Robins Kaplan LLP, USA
Expert Witness in Mobile Devices and Interconnects **2021**
Case Subject Matter - Chip and chipset interconnect technology relating to mobile and non-mobile devices.
Work Performed - Expert consulting, expert reports, depositions.

Neodron Limited* v. Texas Instruments, Inc
Neodron Limited* v. Cypress Semiconductor Corp
Neodron Limited* v. Renesas Electronics Corp
Neodron Limited* v. ST Microelectronics N.V.
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Touch Screen Technology and Related Systems **2020 - 2021**
Case Subject Matter - Expert witness in hardware/software systems for touch screen technology, including analog and digital signaling and processing.
Work Performed - Expert consulting, declarations.

Qualcomm Inc. v. Monterey Research LLC*
Desmarais LLP, NY, USA
Expert Witness in Memory Systems Technology **2021**
Case Subject Matter - SRAM and DRAM technology, burst functionality and related matters.
Work Performed - Expert consulting, IPR declarations, depositions.

Advanced Micro Devices Inc. v. Monterey Research LLC*
Desmarais LLP, NY, USA

Expert Witness in Memory Systems, Interconnects **2021**
Case Subject Matter - SRAM and DRAM technology, multi-ported memory systems, boot technology and related technologies.
Work Performed - Expert consulting, IPR declarations, depositions.

Analog Devices Inc. v. Xilinx Inc.*
Morrison & Foerster LLP, CA, USA
Expert Witness in FPGAs and Configurable Computing **2020 - 2021**
Case Subject Matter - FPGAs and solutions related to crossbar interconnects, high speed transceivers, and configurable computing.
Work Performed - Expert consulting, IPR declarations, depositions.

TriOptima AB v. Quantile Technologies Limited*
Caldwalader Wickersham & Taft, New York, USA
Expert Witness in Source Code for FinTech Systems **2020**
Case Subject Matter - Technology implementations of financial services related to compression and derivatives markets.
Work Performed - Expert consulting, source code review.

Unified Patents LLC v. JustService.net LLC*
Sheridan Ross P.C., Colorado, USA
Expert Witness in Virtual Data Storage Systems **2020 - 2021**
Case Subject Matter - Web enabled virtual data storage systems for backup, storing and transferring of data.
Work Performed - Expert consulting, declarations, depositions.

Karya Property Management, LLC* v. ResMan, LLC
Baker Botts LLP, Houston, Texas, USA
Expert Witness in Distributed Software Systems **2020 - 2021**
Case Subject Matter - Expert witness in the areas of distributed software systems, including data base technologies, as they relate to property management software and related systems.
Work Performed - Expert consulting, claim construction, IPR declarations, CBM declarations, depositions, expert reports.

Certain Touch-Controlled Mobile Devices, Computers, and Components Thereof, Inv. No. 337-TA-1193
Neodron Limited*
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Touch Screen Technology and Related Systems **2020**
Case Subject Matter - Expert witness in hardware/software systems for touch screen technology in mobile devices.
Work Performed - Expert consulting.

VLSI Technology LLC* v. Intel Corporation
Irell & Manella LLP, Los Angeles, CA USA
Expert Witness in Computer Architecture **2020 - 2021**
Case Subject Matter - Expert witness in the area of computer architecture, microprocessors and power management.
Work Performed - Expert consulting and source code review, expert reports, depositions, trial testimony.

Optimum Imaging Technologies LLC* v. Canon Inc.
Ruyak Cherian LLP, Washington D.C., USA
Expert Witness in FPGA Based Image Processing Systems **2019 - 2021**

Case Subject Matter - Expert witness and consultant in the area of heterogeneous FPGA/DSP/CPU based systems as applied to image and video processing technology.
Work Performed - Expert consulting, claim construction declarations, expert reports, depositions, IPR declarations.

Dish Network, LLC v. Contemporary Display LLC*
Toler Law Group, P.C., Texas., USA
Expert Witness in Real Time Video Processing **2020**
Case Subject Matter - Expert Witness in real-time video processing technology over the Internet, including related user interfaces and quality of service.
Work Performed - Consulting, IPR declarations, deposition.

Dish Network, LLC v. Contemporary Display LLC*
Toler Law Group, P.C., Texas., USA
Expert Witness in Real Time Video Processing **2020**
Case Subject Matter - Expert Witness in real-time video processing technology over Internet, including related user interfaces and quality of service.
Work Performed - Consulting, IPR declarations, deposition.

Multimedia Content Management LLC* v. Dish Network LLC
Sheridan Ross P.C., Colorado, USA
Expert Witness in Real Time Video Processing **2019 - 2020**
Case Subject Matter - Expert Witness in Internet based real-time video processing set top boxes, and related content processing and distribution.
Work Performed - Expert consulting.

Exegy Inc. et al v. ACTIV Financial Systems, Inc.*
Wolf Greenfield & Sachs P.C., USA
Expert Witness High Speed Computing for Financial Services **2019 - 2021**
Case Subject Matter - Expert Witness in microprocessor and FPGA based system design for high speed financial services, high speed RDMA systems, etc.
Work Performed - Expert consulting, IPR declarations, depositions.

Certain Touch-Controlled Mobile Devices, Computers, and Components Thereof, Inv. No. 337-TA-1162
Neodron Limited*
Russ, August, and Kabat LLP, Los Angeles, CA, USA
Expert Witness in Touch Screen Technology and Related Systems **2019 - 2020**
Case Subject Matter - Expert witness in hardware/software systems for touch screen technology in mobile devices.
Work Performed - Expert consulting, claim construction declaration, expert reports, depositions.

Maxell, Ltd., et al.,* v. Apple Inc.
Mayer Brown LLP, Washington D.C., USA
Expert Witness in Embedded Computer Architecture **2019 - 2021**
Case Subject Matter - Expert witness and consulting engineer in low power computing and power management.
Work Performed - Expert consulting, claim construction declaration, claim construction deposition, expert reports, infringement and validity depositions.

Nuvoton Technology Corporation* v. Microchip Technology Inc.
Finnegan, Henderson, Farabow, Garrett & Dunner, Washington D.C., USA
Expert Witness in Embedded Computer Architecture **2019 - 2020**
Case Subject Matter - Expert witness in embedded memory system hardware, direct memory access

engines, memory controllers, and analog/digital and digital/analog ASICs.
Work Performed - Expert consulting, declarations, claim construction deposition, IPR declarations, deposition.

Shuttlewagon Inc.*, v. Innovative Quality Solutions, LLC
Stroz Friedberg, Massachusetts, USA
Expert Witness in Embedded Computing **2019**
Case Subject Matter - Expert witness in Programmable Logic Controllers (PLCs), IEC 61131 IE / CodeSys and real-time computing as it pertains to industrial equipment, as well as misappropriation of proprietary technology.
Work Performed - Expert consulting.

RDM, Inc. v. Citoc Inc.*
Citoc Incorporated, Texas, USA
Expert Witness in Cloud / Web Based Computing **2019**
Case Subject Matter - Expert witness cloud deployed, web based, infrastructure management software and best practices in deploying solutions to consumers. Work Performed - Expert consulting.

ResMan, LLC v. Karya Property Management, LLC et al.*
Beck Redden LLP, Texas, USA
Expert Witness in Software Design **2019 - 2021**
Case Subject Matter - Expert witness in trade secret matters related to design and architecture of consumer facing software products.
Work Performed - Expert consulting, expert reports, depositions, trial testimony.

Qualcomm* v. Apple Inc.
Case No. 3:17-cv-02398-DMS-MDD
Quinn Emanuel Urquhart & Sullivan, CA, USA
Expert Witness in Mobile Devices and Computer Architecture **2019**
Case Subject Matter - Expert witness in mobile devices, computer architecture, and software system design for wireless communications.
Work Performed - Expert consulting.

Vasu Networks Corporation*
Skiermont Derby, Texas, USA
Consulting Expert in Cellular Network Technologies **2019**
Case Subject Matter - Consulting expert in matters related to Single Radio Voice Call Continuity, Dual Radio Voice Call Continuity, and various heterogeneous wireless technologies and standards committees related to seamless connectivity.
Work Performed - Consulting expert.

Qualcomm* v. Apple Inc.
Case No. 37-2017-00041389-CU-BC-NC
Quinn Emanuel Urquhart & Sullivan, CA, USA
Expert Witness in Mobile Devices and Computer Architecture **2018 - 2019**
Case Subject Matter - Expert witness in mobile devices, computer architecture, and software system design for wireless communications.
Work Performed - Expert consulting.

Qualcomm* v. Apple Inc.
Inv No. 337-TA-1093
Quinn Emanuel Urquhart & Sullivan, CA, USA
Expert Witness in Mobile Devices and Computer Architecture **2017 - 2018**

Case Subject Matter - Expert witness in mobile devices, computer architecture, and software system design for wireless communications.
Work Performed - Expert consulting, expert reports, depositions, trial testimony.

Qualcomm* v. Apple Inc.
Quinn Emanuel Urquhart & Sullivan, CA, USA
Case No. 3:17-CV-1375-DMS-MDD
Expert Witness in Mobile Devices and Computer Architecture **2018 - 2019**
Case Subject Matter - Expert witness in wireless mobile devices, computer architecture, and software system design.
Work Performed - Expert consulting, expert reports, depositions, trial testimony.

Redzone Wireless LLC v. Netgear Inc.*
Bird Marella, CA, USA
Expert Witness in Wireless Hardware/Software Systems **2018 - 2019**
Case Subject Matter - Manufacturing of software and hardware used in wireless routers and base stations, including chipsets and software solutions.
Work Performed - Expert consulting, expert reports, depositions.

Nvidia* v. ZiiLabs Corporation
Quinn Emanuel Urquhart & Sullivan, NY, USA
Expert Witness in GPU Architecture, Computer Architecture **2018**
Case Subject Matter - Expert witness in the areas of Graphics Processor (GPU) architectures, memory systems architectures, and microprocessor design.
Work Performed - Expert consulting.

Acqis* v. EMC Corporation
Cooley LLP, CA, USA
Expert Witness in Computer Architecture **2017 - 2018**
Case Subject Matter - Expert witness in the areas of PCI, PCI-Express, system-on-chip technology, and computer memory technologies.
Work Performed - Expert consulting.

Qualcomm* v. Apple Inc.
Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof, Inv No. 337-TA-1065
Quinn Emanuel Urquhart & Sullivan, CA, USA
Expert Witness in Mobile Devices and Computer Architecture **2017 - 2018**
Case Subject Matter - Expert witness in mobile devices, computer architecture, and software system design.
Work Performed - Expert consulting, expert reports, depositions.

Network Management Solutions* v. AT&T Mobility et. al
IP Law Leaders, Washington DC, USA
Expert Witness in Cellular Network Management **2017**
Case Subject Matter - Expert witness in mobile devices, wireless technology, 3GPP standards, and alarm management.
Work Performed - Expert consulting.

Certain Memory Modules and Components Thereof, and Products Containing Same, Investigation No. 337-TA-1023
Netlist* v. S.K. Hynix
Mintz Levin Cohn Ferris Glovsky and Popeo PC, Boston, MA, USA
Expert Witness in Computer Architecture and Memory Systems **2016 - 2017**

Case Subject Matter - Expert witness in the area of JEDEC standards essential DRAM memory module technology, relating to DIMM, R-DIMM and LR-DIMM as it applies to server based computing.
Work Performed - Expert consulting, source code review, declarations, expert reports, depositions, ITC trial testimony.

Certain Audio Processing Hardware, Software, and Products Containing Same, Inv. No. 337-TA-1026
Andrea Electronics Corporation*
Pepper Hamilton, LLP, Washington, DC, USA
Expert Witness in Audio Processing Hardware and Software **2017**
Case Subject Matter - Expert witness in hardware/software based digital signal processing systems audio processing and noise cancellation technology.
Work Performed - Expert consulting.

Specialized Monitoring Solutions, LLC v. Lutron Electronics Co., Inc.*
Vinson & Elkins LLP, Texas USA
Expert Witness in Embedded and Distributed Software Systems **2017**
Case Subject Matter - Expert witness in embedded software and hardware systems, as well as distributed data storage and sensing.
Work Performed - Expert consulting, claim construction analysis.

Huawei Technologies Co., Ltd.*, v. Samsung Electronics America, Inc. et al
Sidley Austin LLP, California USA
Expert Witness in 4G and Legacy Cellular Technologies **2016 - 2017**
Case Subject Matter - Expert witness in 4G and legacy cellular technologies.
Work Performed - Expert consulting, affidavits, claim construction.

Godo Kaisha IP Bridge 1* v. Broadcom Limited et. al
Ropes & Gray LLP, New York USA
Expert Witness in Computer Architecture **2016 - 2017**
Case Subject Matter - Consultant in the area of ARM based embedded computing architecture and system on-chip technology. Reverse engineering of VHDL, Verilog and RTL based technologies, as it pertains to multicore system architectures.
Work Performed - Expert consulting, source code review, claim construction.

Huawei Technologies Co. Ltd.* v. T-Mobile US, Inc. and T-Mobile USA, Inc.
Fish & Richardson P.C., Texas USA
Expert Witness in 4G and Legacy Cellular Technologies **2016 - 2017**
Case Subject Matter - Expert witness in 4G and legacy cellular technologies.
Work Performed - Expert consulting, claim construction, affidavits.

ACI Worldwide Corp. v. Mastercard International Incorporated*
Armstrong Teasdale LLP, Missouri, USA
Expert witness regarding financial transaction systems **2016 - 2017**
Case Subject Matter - Expert witness in trade secret misappropriation as it pertains to middleware message passing systems and financial transaction networks.
Work Performed - Expert consulting, source code review, declarations, expert reports, depositions.

Sony Computer Entertainment America v. Rothschild Digital Media Innovations*
Carey Rodriguez Milian Gonya, LLP, Florida, USA
Expert witness regarding distributed multimedia systems **2016**
Case Subject Matter - Expert witness in the area of distributed computing systems and multimedia technologies.

Work Performed - Expert consulting, declarations, expert reports, deposition.

DTS, Inc., et al. v. Nero AG, et al.*
Glaser Weil Fink Jacobs Howard Avchen & Shapiro, Los Angeles CA, USA
Expert witness regarding distributed multimedia systems **2016**
Case Subject Matter - Expert witness in the area of software solutions for audio and video codecs.
Work Performed - Expert consulting, source code review, experimental analysis, expert reports, depositions.

Advanced Silicon Technologies*
Mintz Levin Cohn Ferris Glovsky and Popeo PC, Boston, MA, USA
Expert Consultant in Microprocessor Architecture, Intellectual Property **2015 - 2016**
Case Subject Matter - Consultant in the area of computer architecture and microprocessor technologies, specifically related to memory systems.
Work Performed - Expert consulting.

Certain Audio Processing Hardware and Software and Products Containing the Same, ITC Inv. No. 337-TA-949
Lenovo (United States), Inc.*
Toshiba Corp
Akin Gump Strauss Hauer & Feld LLP, Philadelphia, PA, USA
Expert Witness in Digital Signal Processing, Intellectual Property **2015 - 2016**
Case Subject Matter - Expert witness in hardware/software based digital signal processing systems tailored for noise cancellation technology.
Work Performed - Expert consulting, source code review, claim construction, expert reports, deposition.

Intel Corporation v. Future Link Systems*
Irell & Manella LLP, Los Angeles, CA USA
Expert Witness in Computer Architecture **2015 - 2018**
Case Subject Matter - Expert witness in the areas of PCI, PCI-Express, system-on-chip technology, and computer memory technologies.
Work Performed - Expert consulting, source code review, declarations, expert reports, deposition.

Advanced Touchscreen and Gesture Technologies, LLC* v. Samsung Electronics, America, Inc., et al.
Robins Kaplan LLP, Intellectual Property, Minnesota, USA
Expert Witness in Mobile Devices and User Interfaces **2015 - 2017**
Case Subject Matter - Expert witness in the analysis and reverse engineering of software systems pertaining to mobile devices, and human computer interfaces.
Work Performed - Expert consulting, declarations, expert reports.

Intellectual Ventures* v. Ericsson et al.
Dechert LLP, Los Angeles, CA, USA
Expert Witness in 3GPP standards and LTE Technologies, Intellectual Property 2014 - 2016
Case Subject Matter - Expert witness in 3GPP standards as they pertain to LTE cellular communications networks, in addition to system hardware and software design.
Work Performed - Expert consulting, source code review, declarations, claim construction, tutorials.

Papst Licensing GMBH & Co. KG.*
DiNovo & Price Ellwanger Hardy, Austin, TX USA
Expert Witness in FPGA Technologies, Intellectual Property **2014 - 2016**
Case Subject Matter - Consultant in FPGA computing platforms and design flow processes, prior

art, and infringement analysis.
Work Performed - Expert consulting, claim construction.

Locata LBS* v. Paypal Inc., et al.
Glaser Weil Fink Jacobs Howard Avchen & Shapiro, Los Angeles, CA, USA
Expert Witness in Geofencing Systems, Intellectual Property 2014 - 2015
Case Subject Matter - Expert witness in geofencing technology, geolocational technology, and systems architecture as it pertains to mobile cellular telecommunications and enterprise software systems.
Work Performed - Expert consulting, claim construction, expert reports, deposition testimony.

Cell and Network Selection LLC v. ZTE*
Pillsbury, Winthrop Shaw & Pittman, San Diego, CA, USA
Expert Witness in 3G/4G Cellular Technology, Intellectual Property 2014 - 2015
Case Subject Matter - Expert witness in technology pertaining to 3G, 3.5G, 3.75G and 4G wireless handset technology.
Work Performed - Expert consulting, claim construction, expert reports, deposition testimony.

CA Inc. D/B/A CA Technologies* v. AppDynamics, Inc.
Bracewell & Giuliani, Houston, TX, USA
Holland & Knight, Boston MA USA
Expert Witness in Enterprise Software Monitoring, Intellectual Property 2014 - 2015
Case Subject Matter - Expert witness in technology pertaining to dynamic runtime profiling of distributed software applications, specifically around Java and .NET technologies.
Work Performed - Expert consulting, source code review, declarations, expert reports, deposition testimony.

M Seven System Limited v. Leap Wireless International, Inc.* et al.
Glaser Weil Fink Jacobs Howard Avchen & Shapiro, Los Angeles, CA, USA
Expert Witness in 3G/4G Feature Phone Software Systems, Intellectual Property 2014
Case Subject Matter - Expert witness in the area of mobile telecommunications technology, particularly cellular handset hardware and software design.
Work Performed - Expert consulting, source code review.

Lunareye v. Passtime*.
Conley Rose, P.C., Austin, TX, USA
Expert Witness in GPS Tracking Solutions 2014
Case Subject Matter - Expert witness in the area of mobile GPS tracking solutions software and hardware systems.
Work Performed - Expert consulting.

Certain Wireless Devices With 3G and/or 4G Capabilities and Components Thereof, ITC Inv. No. 337-TA-868
Interdigital, Inc.*
Wilson, Sonsini, Goodrich & Rosati LLP, Austin, TX, USA
Expert Witness in 3G/4G Cellular Technology, Intellecutal Property 2013 - 2015
Case Subject Matter - Expert witness in software systems and hardware systems, as they pertain to 3G/4G cellular communications and standards.
Work Performed - Expert consulting, source code review, claim construction, declarations, expert report, depositions, ITC trial testimony.

Investment Technology Group* v. United States Internal Revenue Services
Expert Witness in Financial Services Technology 2013
Case Subject Matter - Expert witness in the area of high performance software systems targeting

financial market services.
Work Performed - Expert consulting, source code review, declarations, depositions, testimony at hearing.

Carrier Corporation v. Goodman Manufacturing*, et al.
Baker Botts LLP, Houston, TX USA
Expert Witness in Software and Hardware Systems, Intellectual Property 2013 - 2014
Case Subject Matter - Expert witness in the area of microprocessor based, serial distributed communications systems.
Work Performed - Expert consulting, source code review.

Gametek LLC* v. Facebook Inc. et al.
Collins, Edmonds, Porgorzelski, Schlather & Tower PLLC, Houston, TX USA
Expert Witness in Mobile Gaming Technologies, Intellectual Property **2013**
Case Subject Matter - Expert witness in internet based client-server software systems for mobile and web browser based gaming technology.
Work Performed - Expert consulting, source code review.

Ultimate Pointer LLC* v. Nintendo Co. LTD et al.
Conley Rose P.C., Houston, TX USA
Expert Witness in Console Based Video Game Technology, Intellectual Property 2013 - 2015
Case Subject Matter - Expert witness in hardware and software systems for console based video game technology.
Work Performed - Expert consulting, source code review, declarations, expert reports, deposition testimony.

Alliantgroup, L.P. v. Tax Point Advisors*
Jeffrey Feingold and Tax Point Advisors, Houston, TX USA
Expert Witness in Internet Technology **2013**
Case Subject Matter - Expert witness in IP based internet technology, packet spoofing and information systems.
Work Performed - Expert consulting, declarations.

Kerry T. Thibodeaux, M.D. v. American Lifecare Inc.*
Cox, Cox Filo, Camel & Wilson, Lake Charles, LA USA
Expert Witness in Medical Software Systems **2013**
Case Subject Matter - Expert witness in medical billing and expense recording enterprise software systems.
Work Performed - Expert consulting.

Opelousas General Hospital Authority et al v. Fairpay Solutions Inc*
Cox, Cox Filo, Camel & Wilson, Lake Charles, LA USA
Expert Witness in Medical Software Systems **2013**
Case Subject Matter - Expert witness in medical billing and expense recording enterprise software systems.
Work Performed - Expert consulting.

Wi-LAN USA, Inc. and Wi-LAN, Inc.* v. Alcatel-Lucent USA Inc.
Vinson Elkins LLP, Dallas, TX USA
Expert Witness in 3GPP LTE Technology, Intellectual Property **2012 - 2013**
Case Subject Matter - Reverse engineering, analysis and education of counsel in the 3GPP LTE specification, and related software and hardware systems.
Work Performed - Expert consulting, source code review, claim construction, expert declarations.

Wi-LAN USA, Inc. and Wi-LAN, Inc.* v. Ericsson Inc., and Telefonaktiebolaget LM Ericsson
Vinson Elkins LLP, Dallas, TX USA
Expert Witness in 3GPP LTE Technology, Intellectual Property 2012 - 2013
Case Subject Matter - Reverse engineering, analysis and education of counsel in the 3GPP LTE specification, and related software and hardware systems.
Work Performed - Expert consulting, source code review, claim construction, expert declarations.

E-Contact Technologies, LLC v. Dell Inc.*, et al.
Baker Botts LLP, Houston, TX USA
Expert Witness in Mobile Operating Systems, Intellectual Property 2012
Case Subject Matter - Reverse engineering and analysis of the Android operating system as it pertained to mobile and tablet computing devices. Source code reverse engineering, system architecture and related analysis.
Work Performed - Expert consulting, source code review.

CheckFree Corporation* and CashEdge, Inc.* v. Metavante Corporation and Fidelity National Information Services, Inc.
Paul, Weiss, Rifkind, Wharton & Garrison LLP, New York, NY USA
Expert Witness in Banking and Billing Software Systems, Intellectual Property 2012
Case Subject Matter - Software systems analysis and reverse engineering of large scale software based financial billing systems. Source code reverse engineering, claim chart generation, expert report generation and testimony.
Work Performed - Expert consulting, source code review.

Realtime Data, LLC v. NASDAQ*, Chase Bank*, Goldman Sachs* et al.
Proskauer Rose LLP, New York, NY USA
Expert Witness High Performance Software Systems, Intellectual Property 2012
Case Subject Matter - Expert witness for joint defense counsel in the matter of large scale high frequency financial data aggregation platforms.
Work Performed - Expert consulting, claim construction, technical tutorials, declaration, expert reports, deposition testimony.

Realtime Data, LLC v. Thomson Reuters* et al.
Vinson & Elkins LLP, Austin, TX USA
Consultant in High Performance Software Systems, Intellectual Property 2011 - 2012
Case Subject Matter - Expert witness for joint defense counsel in the matter of large scale high frequency financial data aggregation platforms.
Work Performed - Expert consulting, claim construction, technical tutorials, declaration, expert reports, deposition testimony.

General Electric Co.* v. Mitsubishi Heavy Industries Ltd.
Weil, Gotshal & Manges LLP, Dallas, TX USA
Expert Witness in Hardware/Software Analysis, Intellectual Property 2010 - 2011
Case Subject Matter - Reverse engineering of real-time embedded system software source code and hardware system architecture pertaining to variable speed wind turbines and FPGA based subsystems.
Work Performed - Expert consulting, declarations, source code review.

Atlantic Specialty Insurance et al v. AE Outfitters Retail Company*, et al
Smith Mazure Director Wilkins Young & Yagerman, P.C., NY USA
Expert Witness in Embedded Hardware/Software Systems 2011
Case Subject Matter - Hardware and software system analysis of real-time networked embedded computing systems as it pertains to fire alarm infrastructure and fault handling.

Work Performed - Expert consulting, technical tutorial, expert declarations.

Gamestop*, Inc v. Bexar Appraisal
Brusniak and Blackwell PC, Dallas, TX USA
Expert Witness in Software Analysis, Intellectual Property Litigation **2011**
Case Subject Matter - Expert witness on the tangibility of software as it pertains to embedded computing, networking, and gaming platforms.
Work Performed - Expert consulting, expert declarations.

Quality Analytic Systems, Inc. v. Zebec Data Systems*
Rymer, Moore, Jackson & Echols, P.C., Houston, TX USA
Expert Witness in Software Systems **2011**
Case Subject Matter - Reverse engineering and software analysis of enterprise level internet based medical billing software systems.
Work Performed - Expert consulting, source code review, declarations, arbitration.

Passlogix, Inc. v. 2FA Inc.*
Expert Witness in Smart Card Middleware Solutions, Trade Secret Exposure **2010**
Case Subject Matter - Trade secret analysis of software and systems architecture as it pertains to optimal selection of smart card middleware solutions on a given computer system.
Work Performed - Expert consulting, expert declarations.

Terra Nova Sciences*. v. JOA Oil and Gas, B. V. et al.
Abraham & Watkins et al. LLP, Houston, TX USA
Expert Witness in Software Systems, Intellectual Property Litigation **2010**
Case Subject Matter - Expert software analyst of algorithms and geomechanics modeling systems as they pertain to oil well reservoirs.
Work Performed - Expert consulting, source code review.

Paltalk Holdings, Inc.* v. Sony Computer Entertainment America Inc. et al.
Heim Payne & Chorush LLP, Houston, TX USA
Software Analysis Expert, Intellectual Property Litigation **2010**
Case Subject Matter - Reverse engineering of internet based client-server video game console and server software architecture.
Work Performed - Expert consulting, source code review, infringement analysis.

Technomedia International, Inc.* v. International Training Services, Inc., et al.
Bracewell & Giuliani, LLP, Houston, TX USA
Expert Witness in Software Analysis, Contract Dispute **2010**
Case Subject Matter - Web enabled teaching materials as it pertains to oil well drilling. Analysis of internet based audio and video content delivery mechanisms and related website architecture.
Work Performed - Expert consulting, expert reports.

Gamestop, Inc* v. Bexar Appraisal
Brusniak and Blackwell PC, Dallas, TX USA
Expert Witness in Software Analysis, Tax Dispute **2009 - 2010**
Case Subject Matter - On the tangibility of software as it pertains to embedded computing, networking, and gaming platforms.
Work Performed - Expert consulting, expert reports.

Whetstone Electronics, LLC* v. Epson America, et al.
DiNovo & Price Ellwanger Hardy, Austin, TX USA
Expert Witness in System Analysis, Intellectual Property Litigation **2009 - 2011**
Case Subject Matter - Embedded computing systems pertaining to printer technology and computer

hardware acceleration (microprocessors, DSP, FPGA and CPLD).
Work Performed - Expert consulting.

Whetstone Electronics, LLC* v. Xerox Corporation, et al
DiNovo & Price Ellwanger Hardy, Austin, TX USA
Expert Witness in System Analysis, Intellectual Property Litigation 2009 - 2011
Case Subject Matter - Embedded computing systems pertaining to printer technology and computer hardware acceleration (microprocessors, DSP, FPGA and CPLD).
Work Performed - Expert consulting.

General Electric, Inc.* v. Mitsubishi Heavy Industries, Inc.
Vinson & Elkins LLP, Austin, TX USA
Expert Witness in Hardware and Software Analysis, Intellectual Property 2008 - 2009
Case Subject Matter - Real time embedded computing and hardware/software designs for variable speed wind turbines, including digital signal processing DSP and FPGA based subsystems.
Work Performed - Expert consulting, source code review, technical tutorials, declarations, expert reports, depositions, ITC trial preparation.

ecording enterprise software systems.
Work Performed - Expert consulting.

Wi-LAN USA, Inc. and Wi-LAN, Inc.* v. Alcatel-Lucent USA Inc.
Vinson Elkins LLP, Dallas, TX USA
Expert Witness in 3GPP LTE Technology, Intellectual Property 2012 - 2013
Case Subject Matter - Reverse engineering, analysis and education of counsel in the 3GPP LTE specification, and related software and hardware systems.
Work Performed - Expert consulting, source code review, claim construction, expert declarations.

Wi-LAN USA, Inc. and Wi-LAN, Inc.* v. Ericsson Inc., and Telefonaktiebolaget LM Ericsson
Vinson Elkins LLP, Dallas, TX USA
Expert Witness in 3GPP LTE Technology, Intellectual Property 2012 - 2013
Case Subject Matter - Reverse engineering, analysis and education of counsel in the 3GPP LTE specification, and related software and hardware systems.
Work Performed - Expert consulting, source code review, claim construction, expert declarations.

E-Contact Technologies, LLC v. Dell Inc.*, et al.
Baker Botts LLP, Houston, TX USA
Expert Witness in Mobile Operating Systems, Intellectual Property 2012
Case Subject Matter - Reverse engineering and analysis of the Android operating system as it pertained to mobile and tablet computing devices. Source code reverse engineering, system architecture and related analysis.
Work Performed - Expert consulting, source code review.

CheckFree Corporation* and CashEdge, Inc.* v. Metavante Corporation and Fidelity National Information Services, Inc.
Paul, Weiss, Rifkind, Wharton & Garrison LLP, New York, NY USA
Expert Witness in Banking and Billing Software Systems, Intellectual Property 2012
Case Subject Matter - Software systems analysis and reverse engineering of large scale software based financial billing systems. Source code reverse engineering, claim chart generation, expert report generation and testimony.
Work Performed - Expert consulting, source code review.

Realtime Data, LLC v. NASDAQ*, Chase Bank*, Goldman Sachs* et al.

Proskauer Rose LLP, New York, NY USA
Expert Witness High Performance Software Systems, Intellectual Property 2012
Case Subject Matter - Expert witness for joint defense counsel in the matter of large scale high frequency financial data aggregation platforms.
Work Performed - Expert consulting, claim construction, technical tutorials, declaration, expert reports, deposition testimony.

Realtime Data, LLC v. Thomson Reuters* et al.
Vinson & Elkins LLP, Austin, TX USA
Consultant in High Performance Software Systems, Intellectual Property 2011 - 2012
Case Subject Matter - Expert witness for joint defense counsel in the matter of large scale high frequency financial data aggregation platforms.
Work Performed - Expert consulting, claim construction, technical tutorials, declaration, expert reports, deposition testimony.

General Electric Co.* v. Mitsubishi Heavy Industries Ltd.
Weil, Gotshal & Manges LLP, Dallas, TX USA
Expert Witness in Hardware/Software Analysis, Intellectual Property 2010 - 2011
Case Subject Matter - Reverse engineering of real-time embedded system software source code and hardware system architecture pertaining to variable speed wind turbines and FPGA based subsystems.
Work Performed - Expert consulting, declarations, source code review.

Atlantic Specialty Insurance et al v. AE Outfitters Retail Company*, et al
Smith Mazure Director Wilkins Young & Yagerman, P.C., NY USA
Expert Witness in Embedded Hardware/Software Systems 2011
Case Subject Matter - Hardware and software system analysis of real-time networked embedded computing systems as it pertains to fire alarm infrastructure and fault handling.
Work Performed - Expert consulting, technical tutorial, expert declarations.

Gamestop*, Inc v. Bexar Appraisal
Brusniak and Blackwell PC, Dallas, TX USA
Expert Witness in Software Analysis, Intellectual Property Litigation 2011
Case Subject Matter - Expert witness on the tangibility of software as it pertains to embedded computing, networking, and gaming platforms.
Work Performed - Expert consulting, expert declarations.

Quality Analytic Systems, Inc. v. Zebec Data Systems*
Rymer, Moore, Jackson & Echols, P.C., Houston, TX USA
Expert Witness in Software Systems 2011
Case Subject Matter - Reverse engineering and software analysis of enterprise level internet based medical billing software systems.
Work Performed - Expert consulting, source code review, declarations, arbitration.

Passlogix, Inc. v. 2FA Inc.*
Expert Witness in Smart Card Middleware Solutions, Trade Secret Exposure 2010
Case Subject Matter - Trade secret analysis of software and systems architecture as it pertains to optimal selection of smart card middleware solutions on a given computer system.
Work Performed - Expert consulting, expert declarations.

Terra Nova Sciences*. v. JOA Oil and Gas, B. V. et al.
Abraham & Watkins et al. LLP, Houston, TX USA
Expert Witness in Software Systems, Intellectual Property Litigation 2010
Case Subject Matter - Expert software analyst of algorithms and geomechanics modeling systems

as they pertain to oil well reservoirs.
Work Performed - Expert consulting, source code review.

Paltalk Holdings, Inc.* v. Sony Computer Entertainment America Inc. et al.
Heim Payne & Chorush LLP, Houston, TX USA
Software Analysis Expert, Intellectual Property Litigation **2010**
Case Subject Matter - Reverse engineering of internet based client-server video game console and server software architecture.
Work Performed - Expert consulting, source code review, infringement analysis.

Technomedia International, Inc.* v. International Training Services, Inc., et al.
Bracewell & Giuliani, LLP, Houston, TX USA
Expert Witness in Software Analysis, Contract Dispute **2010**
Case Subject Matter - Web enabled teaching materials as it pertains to oil well drilling. Analysis of internet based audio and video content delivery mechanisms and related website architecture.
Work Performed - Expert consulting, expert reports.

Gamestop, Inc* v. Bexar Appraisal
Brusniak and Blackwell PC, Dallas, TX USA
Expert Witness in Software Analysis, Tax Dispute **2009 - 2010**
Case Subject Matter - On the tangibility of software as it pertains to embedded computing, networking, and gaming platforms.
Work Performed - Expert consulting, expert reports.

Whetstone Electronics, LLC* v. Epson America, et al.
DiNovo & Price Ellwanger Hardy, Austin, TX USA
Expert Witness in System Analysis, Intellectual Property Litigation **2009 - 2011**
Case Subject Matter - Embedded computing systems pertaining to printer technology and computer hardware acceleration (microprocessors, DSP, FPGA and CPLD).
Work Performed - Expert consulting.

Whetstone Electronics, LLC* v. Xerox Corporation, et al
DiNovo & Price Ellwanger Hardy, Austin, TX USA
Expert Witness in System Analysis, Intellectual Property Litigation **2009 - 2011**
Case Subject Matter - Embedded computing systems pertaining to printer technology and computer hardware acceleration (microprocessors, DSP, FPGA and CPLD).
Work Performed - Expert consulting.

General Electric, Inc.* v. Mitsubishi Heavy Industries, Inc.
Vinson & Elkins LLP, Austin, TX USA
Expert Witness in Hardware and Software Analysis, Intellectual Property 2008 - 2009
Case Subject Matter - Real time embedded computing and hardware/software designs for variable speed wind turbines, including digital signal processing DSP and FPGA based subsystems.
Work Performed - Expert consulting, source code review, technical tutorials, declarations, expert reports, depositions, ITC trial preparation.

Paltalk Holdings, Inc.* v. Microsoft Corporation
Heim Payne & Chorush LLP, Houston, TX USA
Technical Expert, Intellectual Property Litigation **2007 - 2008**
Case Subject Matter - Internet based client server console gaming architecture for real time experience.
Work Performed - Expert consulting, source code review, technical tutorials.

Paltalk Holdings, Inc.* v. Microsoft Corporation

Heim Payne & Chorush LLP, Houston, TX USA
Technical Expert, Intellectual Property Litigation **2007 - 2008**
Case Subject Matter - Internet based client server console gaming architecture for real time experience.
Work Performed - Expert consulting, source code review, technical tutorials.

SuperSpeed Software, LLC* v. IBM Corporation
Heim Payne & Chorush LLP, Houston, TX USA
Technical Expert in Software Analysis, Intellectual Property Litigation **2007 - 2008**
Case Subject Matter - Computer database technology, parallel file systems and clustered computing.
Work Performed - Expert consulting, technical tutorial, source code review.

QPSX Developments 5 Pty Ltd.* v. Juniper Networks, Inc.
Fulbright and Jaworski LLP, Houston, TX USA
Technical Consultant, Intellectual Property Litigation **2006 - 2007**
Case Subject Matter - Data transmission algorithms for computer networks.
Work Performed - Consulting, claim construction, claim chart preparation, technical tutorials.

Commonwealth Scientific and Indus. Research Org.* v. Buffalo Tech. Inc.
Fulbright and Jaworski LLP, Houston, TX USA
Technical Consultant, Intellectual Property Litigation **2006 - 2007**
Case Subject Matter - High speed data rate network for wireless local area networks.
Work Performed - Consulting, claim construction, claim chart preparation, technical tutorials.

Microsoft Corporation v. Commonweatlh Scientific and Indus. Research Org.*
Fulbright and Jaworski LLP, Houston, TX USA
Technical Consultant, Intellectual Property Litigation **2006 - 2007**
Case Subject Matter - High speed data rate communications for wireless local area networks.
Work Performed - Consulting, claim construction, claim chart preparation, technical tutorials.

Tantivy Communications, Inc.* v. Lucent Technologies, Inc.
Fulbright and Jaworski LLP, Houston, TX USA
Technical Consultant, Intellectual Property Litigation **2004 - 2005**
Case Subject Matter - CDMA2000 based cellular networks, including data retransmission algorithms at multiple layers.
Work Performed - Consulting, claim construction, claim chart preparation, technical tutorials.

Volunteer Organizations

Rice Alliance for Technology and Entrepreneurship Austin, Texas, USA
Executive Committee **2009 - Present**
The Rice Alliance for Technology and Entrepreneurship strives to improve the entrepreneurial ecosystem of Central Texas by: helping entrepreneurs successfully found, fund, grow and exit new companies, helping investors successfully identify and engage with promising new ventures, and showcasing emerging technologies and business models to further educate and engage the community.

Capital Factory, TX USA
Mentor **2014 - Present**
Mentor, advisor and investor in one of the most successful start-up accelerators in the United States.

OwlSpark - Rice University, Houston, Texas, USA
Mentor **2014**
Mentor and advisor to university based early stage technology companies within Rice University's accelerator program.

Incubation Station, TX USA

Mentor **2013**

Incubation Station is an accelerator that brings together a consortium of Austins notable entrepreneurs, investors and advisors for the purpose of mentoring high-potential, market-validated consumer product companies to more effectively manufacture, distribute, market and grow their products and services.

Honors and Awards

Texas Instruments Fellowship Recipient
Nokia Grant Recipient
National Science Foundation Grant Recipient
Rice University Fellowship Recipient
Rensselaer Alumni Scholarship Recipient
Linear Tech / Mueller Scholarship Recipient
Rensselaer Polytechnic Institute: Graduated Cum Laude, Deans List All Semesters
Eta Kappa Nu - National Electrical and Computer Engineering Honors Society
IEEE Member - Institute of Electrical and Electronics Engineers
ACM Member - Association For Computing Machinery