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Profile

Hands-on consulting in wireless product architecture, design, system analysis, simulation, system integration, hardware and firmware development, intellectual property, integration with engineering teams

Expert witness for patent infringement, invalidity, technical damages, alternative technologies, prior art, evidence of use, code review Software, hardware, Verilog, RTL, VHDL, claim charts, IPR declarations, technical contract disputes and licensing.

Technology areas include wireless data, voice and video, WLAN, WWAN, WiMax, Cellular, Wi-Fi including 802.11a/b/g, 802.11n, 802.11ac, 3G, 4G, LTE, interference management, MIMO, OFDM, SC-FDMA, Space-time processing, Single Carrier, SC-FDE, spatial multiplexing,beamforming, multi-user MIMO, ARQ, transmit precoding, antennas, modulations (QAM, FSK, PSK, PPM, PCM, etc.), and other narrowband and spread spectrum technologies (FH, DSSS, CDMA, UWB), FEC, interleaving, wireless sensor networks, RFID (passive, BAP, Active, UHF, HF, and NFC), RTLS and asset tracking.

Technical expertise spans analog, digital, and RF circuit and filter design, antenna design, complex modulation and demodulation, signal processing, microcontrollers, multiprocessing, firmware, digital interfaces, C, Verilog, RTL, HDL, air protocol and MAC design, wireless networking, security and authentication, asset tracking, real time location, multipath processing, signal processing, homologation, regulatory agency and standards issues.

Expert witness experience includes more than 35 cases split across plaintiff and defendant, IPRs, contract disputes, and licensing.

Key Career Work & Achievements

- ☐ Co-Patented foundation technology in 802.11b (used in over 800 Million WiFi chipsets sold/year)
- ☐ Co-chair of RFID EPC Gen2 Working Group; participated in harmonizing ISO 18000-6C standard with EPC Gen2; multiple industry and end user groups
- ☐ Developed industry leading multi-protocol WLAN, cellular backhaul and bridging products
- ☐ Products and systems designed and commercialized throughout vertical industries ranging from retail and manufacturing to healthcare to government and defense
- ☐ Six years at MIT Lincoln Lab developing high bandwidth signal processing for advanced packet radio networks, including RF, analog, digital, and microcontroller support circuits

Summary
Broad experience in electronic communications with major innovations and contributions to the wireless LAN, backhaul and RFID industries

- ▪ Consulted for over 15 companies in a variety of technologies

- ▪ Five years driving signal processing architecture and systems engineering for Fastback Networks

- Five years as Chief RF Architect at industry-leading Reva Systems developing scalable RFID systems

- IP development and analysis, over five years as an expert witness in more than 35 cases of patent and contract litigation

- Three years at Proxim, developing circuits and chips for industry leading multi-protocol WLAN and bridging products

- Fifteen years at MICRILOR during the inception of the Wireless LAN industry, developing multiple products and co-patenting technology that is the basis for the current 802.11b standard

- Six years at MIT Lincoln Lab developing high bandwidth signal processing for advanced packet radio networks

Range of work:

Worked on all forms of analog, digital, and RF hardware designs for communications systems and general circuits from baseband to 7 GHz operation and millimeter wave design issues.Designed antennas, developed innovative physical layer and MAC layer designs, worked on five ASICs, built microcontroller and microprocessor based systems, wrote firmware, modeled in MATLAB, did ASIC system engineering, designed RF channel probes for analyzing multipath, MIMO signal processing, millimeter wave systems, designed protocols, ran standards groups, worked with regulatory agencies, set up long range terrestrial radio installations, developed entire systems flow and worked closely with customers to solve process and implementation problems, generate sales, understand markets, help them through pilot programs to get to sales, and overcome technical hurdles to get to a sellable position.

Worked with the FCC, ETSI, IC, Anatel and MIC in developing rules for RFID, WLAN, Radar compatibility, and fixed radio operation.

Participated in 802.11 working groups, co-Chaired the RFID Gen2 working group, participated in several other groups including Data Protection, ISO 18000-6, Item Level tagging technology group, and was designated Referee in the EPC Global Item Level Tagging technology bakeoff among 200 companies.

Experience

Feb. 2009 - Present   Independent Consultant, Boston, MA

Consulting:
- Patent litigation on 35 cases including 6 IPR
- HF data transfer, non-standard wireless links for audio, production environment for Wi-Fi based commercial products
- Matlab simulation of wireless sensor system
- Lead a systems team in developing the signal processing and control architecture an advanced backhaul radio.
- Lead a homologation group developing hitless DFS operation in unlicensed bands
- Printed-electronics tag design and applications
- Near-Field Communications tags and readers
- Optimizing an RFID installation for a DoD installation
- Authentication for RFID systems. Design of a highly-secure battery assisted passive RFID tag system

- High performance design for an RF pulse generator for a DARPA contractor
- Development of a miniaturized long range communications link for networked video transmission in a small unmanned air vehicle system (SUAS)
- 802.11n consumer product, 3x3 MIMO including spatial multiplexing, diversity, and beam-forming; antenna design investigations and performance measurements in real environments
- Extensive circuit, software, and algorithm development on a long range MIMO product
- Cell phone front end RF-circuit
- Analysis of in-home technology approaches for wireless sensor systems for a major corporation

Patent Litigation:
Expert reports on infringement, invalidity rebuttal, claim declaration, IPR (declarations for petitioner, patent owner responses, and motion to amend), prior art research and analysis, claim charts, code review (C and RTL)
Worked for both plaintiff and defendant sides
Tore down hundreds of products and made field measurements on products for evidence of use
Code review of C and Verilog for many products and code bases
Wrote numerous analysis comparing alternative technologies
Worked closely with attorneys to develop technology understanding and formulate theories

Dec. 2003 - Feb. 2009   Reva Systems, Chelmsford, MA

Chief RF Architect

- As the second employee of Reva Systems, the leading RFID infrastructure company, I served as the Chief RF Architect for 5 years.
- Contributed to early stage technical value analysis of product positioning and helped develop company IP portfolio.
- Worked with customers to field pilots in manufacturing, distribution, retail sites, and asset management. Completed numerous successful deployments.
- Analyzed, implemented, and documented, RF and process techniques for aggregation and verification of goods using RFID, leading to customer successes.
- Built up an RF lab for evaluating partner RFID reader and tag products and performed numerous empirical studies on tag and reader performance to determine how to optimize operation specific to each reader brand.
- Designed methods to reduce interference among multiple readers, analyze location information, precisely control reader operation, and mine the data generated from fields of tags obtained by fixed readers, handhelds, and forklift readers.
- Created analysis and algorithms in MATLAB for planning RFID coverage, coordinating and combining data from multiple readers, locating tags, and isolating ambient tags from tags of interest; managed software team members in translating these into implementations in various embedded languages.

- **Standards and Regulatory Work**
    - Co-Chaired and contributed to the Gen2 Working Group for four years as well as several ad hoc groups and requirements committees in an effort to help the RFID industry take hold. Participated in parallel ISO work.
    - Worked with ETSI to create new RFID regulations in Europe and worked closely with the FCC to craft the 900 MHz RFID measurements required in the US that would allow mass deployment of RFID tags**.**

Oct. 2002 - Nov 2003   Independent Consultant / Chief Architect
Boston, MA

- Drove RF and system architecture roadmap, product requirements, IP and business cases for two groups trying

Analyzed customer business models and worked on partner arrangements. Began investigation of RFID technology.

- Worked on varied problems in physical and MAC layers for customer's radio systems
- Architectural design and assistance in design of company products; and performance analysis of product concept in MATLAB.
- Technical diligence teams for technology or company acquisition including analysis of patent portfolios, MATLAB analysis of technical claims, regulatory agency diligence, and customer capability diligence.

Jan. 2000 – Oct. 2002   Proxim Corporation (Boston Design Center)   Wakefield, MA

In January, 2000, MICRILOR, an internally funded company that Mr. Fischer was part owner of, was purchased by Proxim, inc., based in Sunnyvale, CA, and the MICRILOR team became the Boston Design Center for Proxim.

Systems Architect for Advanced Development Group Reporting to CTO

- Responsible for system design, RF chip analysis in MATLAB, and overall design issues involved in development of a 4 million gate, multi-protocol, baseband/MAC chip to do 802.11a/b/g/h/e/i and 802.16a, as well as proprietary modes.
- Responsible for the mixed signal section of the multi-protocol chip, and created novel schemes for reliable low-power detection of multiple incoming signals, a unique AGC method required for supporting the ultra-wide dynamic range, and uncovered significant performance issues with existing 802.11a detection methods.
- Worked with IP core vendors to define mixed-signal requirements, and with a major mixed-signal chip company to help define the converter requirements for future WLAN business.
- Made or influenced buy vs. build decisions.

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Technical Project Lead for the Stratum MP

- Designed the MAC protocol, digital board and firmware operation of the StratumMP, the highest throughput radio in the point-to-multipoint unlicensed class.
- Integrated SNMP, an http server, and an HTML interface for internet control of the Stratum MP radios.
- Interfaced with customers to understand their performance requirements as determined by actual applications (WISP, VOIP, etc.) and developed fine tuning adjustments to the MAC protocol to optimize performance.
- Established network testing to simulate customer situations. Pushed product through the field trials and production phase.
- Patent infringement support of cases based on the 802.11b technology patented while at MICRILOR resulting in over $50MM of remuneration.

Oct. 1986 – Jan. 2000   MICRILOR   Wakefield, MA
MICRILOR was a small internally funded company formed by former MIT Lincoln Laboratory employees to work on RADAR, communications, and instrumentation problems. In 1994 MICRILOR teamed with a major Japanese company to develop the first 10 Mbps spread spectrum radio which was based on technology patented at MICRILOR, and which formed the basis for the 802.11b standard used in WiFi.

Senior Engineer and Technical Project Lead for Numerous Projects

- Drove the development of the first 10 Mbps wireless LAN product to pass FCC approval for unlicensed transmission. The $6 Million product development was funded by a multi-billion dollar Japanese company that moved an engineering team to MICRILOR.
- Fundamental system definition, design of the signal processing and control logic, design and debug of the

- Management of the firmware and hardware engineering team, and daily management and coordination of much of the program including budgeting, expenditures, development tool and equipment purchases.

- Designed and brought to production four chips using back-end support companies. Did much of the circuit design, Verilog synthesis, timing simulation, test vector generation, and qualification for these developments.

- Served as customer interface in the effort to bring the product to the OEM market.

- Co-patentee with Dr. John Cafarella on four patents relating to the 10 Mbps technology, which formed a basis for the now current 802.11b IEEE standard. These patents teach the combination of orthogonal signaling with direct-sequence spread-spectrum to achieve high data rates while maintaining the processing gain needed to combat multipath and interference in a practical deployment. They became very lucrative for Proxim and the techniques are still being used in the wireless industry.

- Worked with the technical branch of the FCC to help them converge on fundamental definitions and specifications needed for the emerging spread spectrum equipment.

- Member of working groups for IEEE 802.11a and 802.11b standards committee. Interfaced with many companies and promoted the MICRILOR modulation techniques. All 802.11b wireless LAN equipment made today is based upon this modulation technology.

- Developed a low-cost, high throughput multipoint network-radio bridge. This product achieved 9 Mbps throughput from a 10 Mbps payload rate radio network; a PHY and MAC efficiency that set a new benchmark in the unlicensed bands.

- Architecture, digital circuit design, FPGA design, ASIC circuit design, Verilog design, analog and RF circuit design, antenna and transducer design and impedance matching, protocol design and multi-processor firmware design and coding. Designed many phase-locked loop, AGC, and unique normalization and tracking loops. Designed numerous baseband, RF, and microwave filters. Designed channel probing tests to measure propagation and multipath characteristics. Noise figure and other RF measurements. Processing gain and performance measurements.

- Taken products from concept and tradeoff analysis, through design, prototyping, in-house testing, field trials, regulatory testing (national and international), production, packaging, and customer follow-up.

- Worked on a variety of military communications systems and signal-processing subsystems including an underwater spread-spectrum acoustic data link, a chirp-transform-based transceiver, RFID reader/tag system, and a superconducting-component satellite communications processor.

- Product architecture and circuit design for a variety of commercial product developments including a cordless telephone, early wireless LANs for AppleTalk, zero-net, and token ring. Simulated various performance capabilities and spread spectrum coding schemes in multipath, interference, and noise.

- Managed large circuit and product efforts including incoming test of components, qualifying components purchased outside, environmental and EMI testing and debugging. Managed product and circuit board design for numerous developments.

- Invented new modulation circuits including a digital generation of MPSK and a dense bits/Hz on-off-keying technique.

- Drove the development of a commercial 19.2 Kbps, high processing gain direct-sequence spread-spectrum, dual-processor software-based modem, with high multipath immunity.

- Conceived of, explored market, and designed, built and tested a line of low-cost FSK radio modules that were used for control, sensing, and telemetry. Created advertising, interfaced with customers, and provided applications support for this product line.

- Made low-cost commercial and industrial grade unlicensed RF devices, including message generators, encoders and repeaters using various modulation methods and RF parameters.

- Created unique in-house test fixtures and equipment when outside sources were not available.

June 1980 – Oct. 1986   Massachusetts Institute of Technology, Lincoln Laboratory   Bedford, MA

Staff Member, Analog Device Technology Group

- Development of signal processing algorithms, architectures and circuits for the application of advanced analog signalprocessing devices.

- Development of the most advanced SAW convolver based direct sequence spread spectrum (DSSS)

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