

BOSTON



THE REFLECTOR

ISSUE #9
SEPTEMBER 2017

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KNOW TO AVOID-
PROBLEMS!

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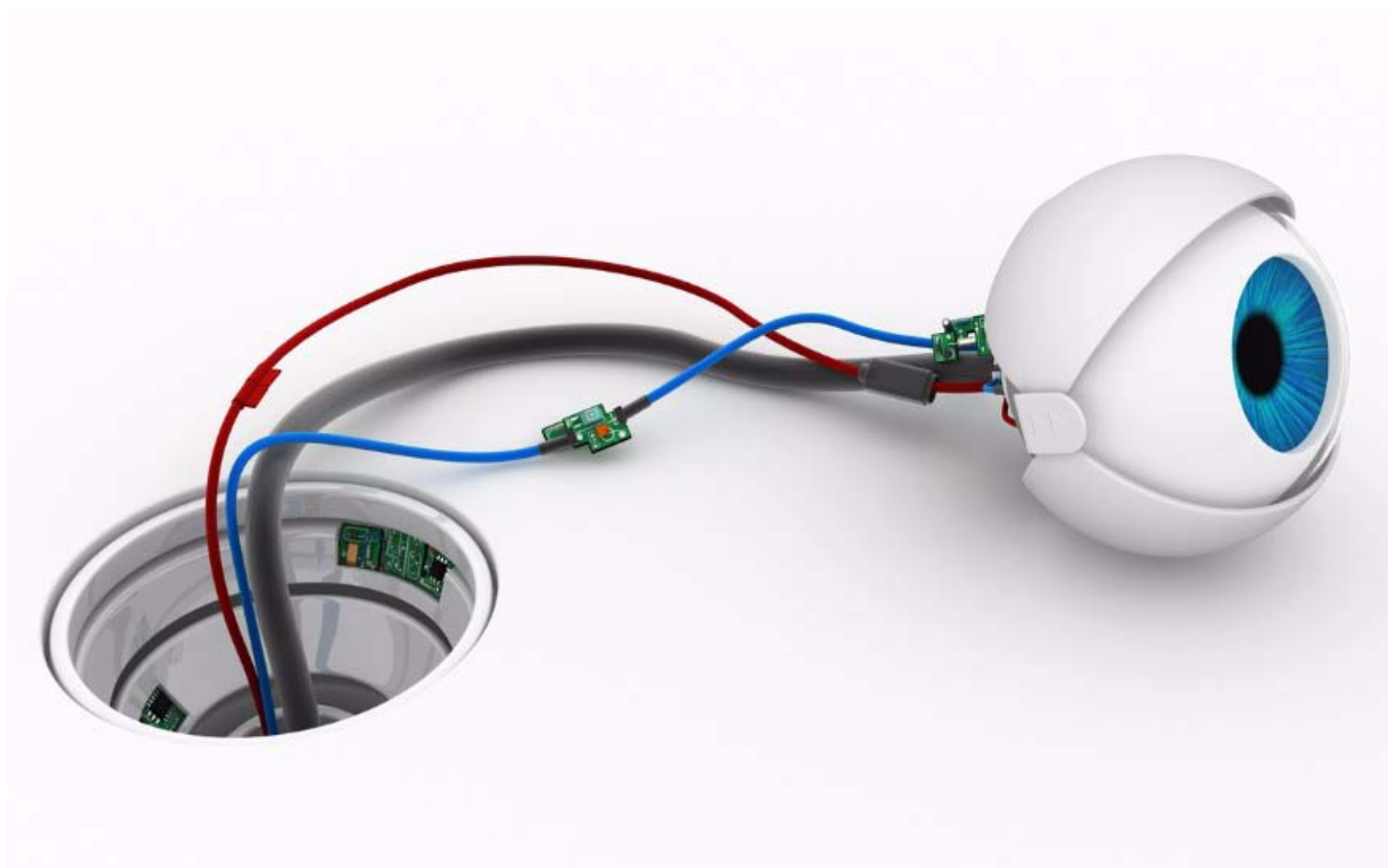


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Sometimes You Have to Roll the Hard Six

Fausto Molinet, Publications Committee Chair

I'm a Battlestar Galactica tv series fan. One phrase I always remember is the human fleet commander saying, "sometimes you have to roll the hard six" as a metaphor for "we just have to win it", in a risky defensive move against aliens.

Now, without getting too deep in the odds of dice games, a hard six is rolling two dice, each with a three. The odds against this are pretty high, but it pays off well. Unless you cheat, not a wise or healthy thing in the gambling community, there is not much you can do to make them higher. So, what has this got to do with us as engineers?

Well, the metaphor is really about high risk, high payoff activities, which most of us are engaged in all the time. We are a little lucky though, there are ways we can influence the outcome a bit, if we don't get complacent and assume everything will come out all right. Knowledge, skill and diligence do a lot to make the odds better, and they aren't cheating, which brings in ethics.

These are all things we learned about in engineering school, on the job and in the IEEE. And because nothing stands still, things we have to keep on learning and relearning. Our careers, our businesses and our success depend on it.

The skills part is the easiest. There are many programs we can enroll in, offered by community colleges, universities and IEEE, the Boston Section in particular, that can help us keep our skills sharp. They take some time, effort and money, but even the juggling of our resources to do it enhances our life skills.

I think knowledge is more difficult, as it takes a bit more understanding and is always evolving. As an example,

we only recently learned that Einstein's predicted gravity waves exist, so we can factor that in to our knowledgebase, until someone overturns the conclusion. And that's what knowledge is about, always changing. You can only get it by reaching out and reading and listening to others because they always know stuff you don't and they learn from you as well. The papers on IEEE Xplore are available as well as free meetings, IEEE Chapter meetings, conferences and networking events. You should take advantage of them.

Diligence is harder yet. That takes exerting ourselves, balancing our tasks and committing to doing what we need to in order to finish the job. We practice that every day. Those who need more practice can try volunteering in some other outside activities, like community service and IEEE volunteer activities. Sorry for the commercial here, but we always need more help from committed people and there are lots of things that can make the best use of your knowledge and skills.

Ethics is the most challenging. We usually know ethical behavior when we see it. When we're faced with a very difficult situation, there are often a number of alternative courses open. Not all of them will be equally responsible. We shouldn't simply convince ourselves that, in this case, a little deviation is acceptable, because "we just have to win it". But, sticking to a strictly ethical course can have negative short-term consequences. It's not always clear cut and a little study, knowledge and reflection are called for. You have to choose.

By the way, those humans didn't live on earth, the commander's name was William Adama, and they did win (season 1, episode 10). Go ahead and reach for the stars.

Call for Papers and Posters

2018 IEEE International Symposium on Technologies for Homeland Security

2 – 3 May 2018 DoubleTree Hotel, Crystal City, VA

<http://ieee-hst.org/>



Sponsor:



Call for Papers & Posters

The 18th annual IEEE Symposium on Technologies for Homeland Security (HST '18), will be held 2 – 3 May 2018, in the greater Washington D.C. area. This symposium brings together innovators from leading academic, industry, businesses, Homeland Security Centers of Excellence, and government agencies to provide a forum to discuss ideas, concepts, and experimental results.

Produced by IEEE with technical support from DHS S&T, IEEE, IEEE Boston Section, and IEEE-USA and organizational support from MIT Lincoln Laboratory, Raytheon, and MITRE, this year's event will once again showcase selected technical papers and posters highlighting emerging technologies to:

Secure Cyberspace

Enhance Biometrics & Forensics

Secure Land and Maritime Borders

Prevent Terrorism & Manage Incidents

We are currently seeking technical paper and poster session submissions in each of the areas noted above. Papers examining the feasibility of transition to practice will also be considered. *This year, papers focused on DHS high-priority technology gaps will be of particular interest.* All areas will cover the following common topics:

- Strategy and threat characterization, operational concepts, risk analysis;
- Modeling, simulation, experimentation, and exercises & training; and
- Testbeds, standards, performance and evaluations.

Contact Information

For more detailed information on the Call for Papers and Posters, as well as Sponsorship and Exhibit Opportunities, visit the website <http://ieee-hst.org/> or email: information@ieee-hst.org. Submissions should be made at the following website: <https://cmt3.research.microsoft.com/HST2018>

Important Dates

Paper Extended Abstract and Poster Abstract Deadline:	October 16, 2017
Paper, Poster Acceptance Notification	December 15, 2017
Final Paper Submission Deadline:	March 30, 2018

All deadlines are by midnight Eastern Time.

Organizing Committee

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Call for Articles

Now that the Reflector is all electronic, we are expanding the content the publication. One of the new features we will be adding are technical and professional development articles of interest to our members and the local technology community. These will supplement the existing material already in our publication.

Technical submissions should be of reasonable technical depth and include graphics and, if needed, any supporting files. The length is flexible; however, a four to five page limit should be used as a guide. An appropriate guide may be a technical paper in a conference proceeding rather than one in an IEEE journal or transaction.

Professional development articles should have broad applicability to the engineering community and should not explicitly promote services for which

a fee or payment is required. A maximum length of two to three pages would be best.

To ensure quality, technical submissions will be reviewed by the appropriate technical area(s). Professional articles will be reviewed by the publications committee for suitability. The author will be notified of the reviewers' decision.

The Reflector is published the first of each month. The target submission deadline for the articles should be five weeks before the issue date (e.g., June 1st issue date; article submission is April 27). This will allow sufficient time for a thorough review and notification to the author.

We are excited about this new feature and hope you are eager to participate!

Submissions should be sent to;
ieeebostonsection@gmail.com

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Guest Article

Inventorship – What You Need to Know to Avoid Problems

Authors: Peter C. Lando and David S. Andreasen

The concept of inventorship appears simple to some, but in many situations it can be difficult to properly determine who, among the individuals contributing to an invention, qualifies as an inventor. The question of inventorship has been a challenging issue since the first patent laws were enacted. It is an important question to get right, because misnaming inventors in a patent application may render a resulting patent unenforceable.

To better understand inventorship, there are three basic principles to know:

1. One must first identify the “invention” to be able to identify the “inventors.”
2. The “invention” is defined by the patent claims.
3. An “invention” requires conception and reduction to practice.

An invention is any new and useful process (way of doing or making things), machine, manufacture, design, or composition of matter, or any new and useful improvement thereof, or any variety of plant, which is or may be patentable under the patent laws of the United States. To be a named inventor, one must have contributed to the conception of an invention, and the contribution must be more than routine engineering skill or supervision.

Joint inventors may apply for a patent jointly even if (a) they did not physically work together or at the same time, (b) each did not make the same type or amount of contribution, and/or (c) each did not make a contribution to the subject matter of every claim in the patent application.

Conception

A contribution to the conception of an invention is the touchstone of inventorship. Conception is the completion of the mental part of invention. To know who conceived an invention one must know what conception is – which can get pretty muddy in practice. Conception of an invention requires two steps: it must exist and it must be complete. Persons involved in both steps are inventors.

1. Existence – when a definite and permanent idea of an operative invention including every feature of the subject matter sought to be patented is known.
2. Completeness – when one of ordinary skill in the art could construct the apparatus, perform the process, or make the composition without unduly extensive research or experimentation.

Note that conception may exist and be complete even though experimentation continues, for example when a concept is proven yet modifications are still being made, e.g., for optimization. On the other hand, conception may not exist where the viability of the concept is yet uncertain. In some instances, however, corroborating evidence apart from the mind of the inventor may be useful in distinguishing whether the conception is complete.

Reduction to Practice

After conception, invention is deemed to have occurred when the inventor(s) have reduced it to practice. Reduction to practice occurs in one of two ways: actual or constructive reduction to practice.

1. Actual – sufficiently developing and testing the invention to show that it will work for its intended purpose.
2. Constructive – filing of a patent application describing and claiming the invention sufficiently to teach one of skill in the art how to practice the invention.

It should be noted that participation in the reduction to practice of the invention, without more, does not make an individual an inventor. Mere technicians, lab workers, software developers, and the like, are not inventors if they are only following the direction of others who conceived of the complete conception. On the other hand, if a technician conceives of a breakthrough solution during the reduction to practice, and if the breakthrough becomes part of the invention as reflected in the claims, then the technician is a properly named inventor. In other words, someone participating in the reduction to practice must also contribute to the final, complete conception to be an inventor.

As a final note, if a date of invention is important, U.S. patent practice holds that the date of invention is the date of conception only if the inventor(s) diligently work toward a reduction to practice. Otherwise, the date of invention is the date of reduction to practice, whether actual or constructive.

Conclusion

The touchstone of being an inventor is in contributing to the conception of an invention. One who applies ordinary skill to test, optimize, make a prototype, or manage the invention is not an inventor unless he/she contributed to its conception.

It is of utmost importance to identify the proper inventors, as any patent without proper inventorship may be at risk of being unenforceable. It is not often clear at the outset of invention how things will progress, and human memory gets fuzzy. Thus it is important to keep good records – of individuals' contributions along the way, and of efforts and diligence to reduce the invention to practice – for later reference in determining the proper inventorship.

The boundaries of inventorship are often unclear, and in many cases it is desirable to seek the opinion of qualified intellectual property counsel in determining who are the properly named inventors.

Peter Lando is a founding partner of Lando & Anastasi, LLP, located at 1 Main Street, Cambridge, Massachusetts 02142. He can be reached at PLANDO@LALAW.COM or 617.395.7000. David S. Andreasen is an associate at Lando & Anastasi, LLP. He can be reached at DANDREASEN@LALAW.COM or 617.395.7077.

About Lando & Anastasi, LLP

Lando & Anastasi, LLP headquartered in Cambridge, Massachusetts, partners with clients to protect their innovations through effective intellectual property strategies. This partnership complements an emphasis on creative and strategic solutions guided by a solid understanding of each client's business imperatives. Well versed in a wide range of industries including life sciences, software, cleantech, medical devices, chemical and electrical engineering, L&A attorneys counsel clients ranging from individuals to early-stage and venture-backed start-ups to small and large national and global corporations.

IEEE Boston Section Online Courses:

(Students have 90 day access to all online, self-paced courses)

Verilog101:Verilog Foundations

Full course description and registration at ,
<http://ieeeeboston.org/verilog-101-verilog-foundations-online-course/>

System Verilog 101: Design Constructs

Full course description and registration at ,
<http://ieeeeboston.org/systemverilog-101-sv101-design-constructs-online-course/>

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Full course description and registration at ,
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High Performance Project Management

Full course description and registration at ,
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Introduction to Embedded Linux Part I

Full course description and registration at ,
<http://ieeeeboston.org/introduction-to-embedded-linux-part-i-el201-online-course/>

Embedded Linux Optimization - Tools and Techniques

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Fundamental Mathematics Concepts Relating to Electromagnetics

Full course description and registration at ,
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Reliability Engineering for the Business World

Full course description and registration at ,
<http://ieeeeboston.org/reliability-engineering-business-world-line-course/>

Entrepreneurs' Network - 6:30PM, Tuesday, 5 September

Case Studies in Extremely Successful Startups

Meeting location – Constant Contact, 1601 Trapelo Road, 3rd Floor, Great Room, Waltham, MA.

PRE-MEETING DINNER at 5:15 PM (sharp) at Bertucci's, Waltham.

ENET kicks off its 27th year with an evening of learning from successful entrepreneurs. The meeting will feature case studies from at least two and perhaps three extremely successful startups.

We will hear from Raj Aggarwal, founder of Localytics. This software company, No. 279 on the Inc. 5000, provides an analytics and marketing platform to help its clients understand and predict user engagement. Making more than \$9 million in sales in 2014, the site is used by a number of successful companies, including Microsoft, Salesforce.com, and The New York Times. Led by CEO Raj Aggarwal, Localytics saw a growth rate of more than 1,600 percent between fiscal years 2011 and 2014. Under Raj's leadership, Localytics has become the leading and most powerful analytics and marketing platform for apps and secured key partnerships with some of the world's most well-known brands, including Microsoft and The New York Times.

We will hear from Raj Aggarwal, founder of Localytics. This software company, No. 279 on the Inc. 5000 in 2015, provides an analytics and marketing platform to help its clients understand and optimize mobile engagement. The platform is used by a number of successful companies, including ESPN, CVS Pharmacy, The New York Times, Comcast and Weather Channel. Led by CEO Raj Aggarwal, Localytics saw a growth rate of more than 1,600 percent between fiscal years 2011 and 2014.

We will next hear from Ralph Folz, CEO of WordStream. WordStream is software as a service (SaaS) company which helps small and medium businesses acquire customers via paid digital media (paid search and paid social). WordStream's 20

Minute Work Week facilitates more effective paid media campaigns across Google, Yahoo, Bing, and Facebook, resulting in more leads and more customers. Think of WordStream as a TurboTax for digital marketing. WordStream manages over half a billion dollars of advertising spend on the major ad platforms and has grown to over 230 employees. The company is based in Boston's Back Bay. WordStream has been named a Boston Business Journal Best Places to Work for three years in a row and has been included in the Inc. 5000 list of fastest growing private companies for four years in a row.

Finally, we will hear from Janet Kosloff, Co-Founder and CEO of InCrowd, a provider of high-quality, real-time market intelligence to life sciences and healthcare firms. Today 19 of the top 20 global pharmaceutical firms, as well as other life science, healthcare organizations, and the agencies that serve them, rely on InCrowd's solution to gain high-quality, timely insights to market questions and from them, make more informed business decisions. The company has grown to more than \$10 million in revenues and 50 employees. In 2017, Janet Kosloff was named a Boston SmartCEO 2017 Future 50 Award winner by SmartCEO magazine. The program recognizes the region's 50 fastest-growing mid-sized companies and 10 small emerging growth companies, based on a combined three-year average of revenue and employee growth.

The attrition rate for startup companies is high. According to the US Bureau for Labor Statistics, 50 percent of all new business make it to their fifth year and one third make it to their tenth year. A study from Harvard Business School stated that three out of every four ventured-backed companies failed overall. Yet many do succeed. Among the reasons often cited for startup success are:

Focus - Keeping focus on the company's core competencies and continuing to build and improve on them.

Team - Building a strong team, compatible with complimentary competencies

Customer Validation / Feedback - Get your product and service out into the market and listening to your customers, to customize your product or services to meet the real needs of your clientele or customer base

Pivoting - Learning from your mistakes and being able to pivot quickly to get back on track.

On September 5, you will get to hear from the leaders of at least two extremely successful startups – and how perhaps their success and lessons learned might be useful to you, and also ask them questions during our Q and A. Hope to see you for ENET's kickoff meeting for our 2017-2018 program year.

Agenda:

630-730 PM - Registration & networking

730-740 PM - ENET Chairman's announcements

740-755 PM - E Minute - Up to 3 Startup companies' presentations

755-845 PM - 3 expert speakers on the night's topic

845-900 PM - Audience / Speakers Q & A

900-930 PM - Final networking including meeting speakers

Speakers:



Ellen Clark, Entrepreneur & CEO, Advent Technologies, Dakota Mining and Connecticut Index Funds

Ellen Clark ran a consulting and staffing agency for many years, originally specializing in IT professionals, then expanding the company to staffing IT, Engineering, science and math specialists (including hedge guys), management in "STEM" industries and specialized manufacturing. Most of the industries we dealt with were in pharma/medical device, structural engineering and widget engineering. Six years ago I began working with startups in these areas, and now we do staffing, benefits, business development and small time searching for grant and angel money. My vision is to have three companies when

I finish my working career - Advent Technologies ("blue state" science and tech), Dakota Mining and Engineering (structural engineering for extractables in "red states") and Connecticut Index Funds. I am doing sideline advocacy for small business and job creation in the US. I graduated from Nyack College undergraduate, got my masters at Manhattanville College in New York, and attended Duke University.



Raj Aggarwal, Co-Founder, Localytics. As CEO from its founding in 2009 until 2017, Raj succeeded in creating the leading mobile engagement platform that is used by many of the world's top brands. Prior to Localytics, Raj spent 12 years building a variety of technology companies.

He was a management consultant focused on mobile with Bain & Company and Adventis. At Adventis, Raj worked alongside Steve Jobs at Apple to develop the business framework for the iPhone and led the formation of the multi-billion dollar Disney Mobile venture in Japan. Previously, Raj held sales and marketing leadership positions at Proco Machinery and Requisite Technology. Raj completed his MBA with Honors from the Ivey School of Business and London Business School.



Ralph Folz is WordStream's Chief Executive Officer. Folz joined WordStream's board in August 2009 and was elected the company's CEO by the Board of Directors in August 2010. He has an extensive background in the digital marketing space, including founding and

subsequently selling Molecular Inc., an interactive Web design and marketing agency, to Isobar. Folz spent two years as Global Chief Operating Officer of Isobar, one of the largest digital marketing agencies in the world (part of the Dentsu Aegis network). Folz spends time mentoring and advising venture backed startups in the Boston area and spent four years as a Board Director for Backupify, prior to its sale to Datto. Folz currently sits on the Board of Codeship, a SaaS company funded by Sigma Prime and Ascent Venture Partners. Folz has been

named “one of the 10 most influential leaders in e-commerce” by the Massachusetts Electronic Commerce Association, and Molecular was recognized by Deloitte & Touche as the highest-ranking Internet professional services firm in the New England region. In 2004, he was named to the Boston Business Journal’s list of “40 Under 40” and recognized as a Mass High Tech All-Star in the Internet category. He has served as President of MITX, the Massachusetts Innovation & Technology Exchange.



Janet Kosloff, CoFounder and CEO, InCrowd. Janet was born into a family of entrepreneurs; both her parents and grandparents were small business owners. I guess you could say it was in her genes to one day start her own business. After completing a Masters in Healthcare Business,

Janet’s entrepreneurial spirit steadily grew as she held founding management roles with several successful startups. As rewarding as this was, she knew it was only a matter of time before she ventured out on her own. Janet got the idea for InCrowd while cruising in her Mini Cooper, top down, sun shining, ideas flying (ironically, she sold that car to help fund the company). Having worked in healthcare market research and understanding the challenges faced by life sciences companies, Janet saw an opportunity to disrupt an industry that hadn’t evolved for more than 50 years by applying technology to automate and simplify the market research process and providing fast and rigorous results. Ask her what it’s like to start a company and Janet will tell you, at no other point in her career, has she ever been more challenged or had more fun.

Moderator:



Robert Adelson, business and tax attorney, partner at Boston law firm of Engel & Schultz LLP, and Chairman of The Boston Entrepreneurs’ Network. Rob has been an attorney for over 30 years specialized in business, tax, stock and options, em-

ployment, contracts, financings, trademarks and intellectual property. Rob began as an associate at major New York City law firms before returning home to Boston in 1985 where he has since been a partner in small and medium sized firms before joining his present firm in 2004. Rob represents entrepreneurs, start-ups and small companies, independent contractors and employees and executives. Rob is a frequent speaker on business law topics and author of numerous articles published in Boston Business Journal, Mass High Tech and other publications. He has been named among the “Top 20 Boston Startup Lawyers” by Chubby-Brain.com, a website that provides tools for entrepreneurs. Rob has been on the ENET Board since 2002 and Chairman since 2009 and is also a Co-Founder and Board member of the 128 Innovation Capital Group (2004 -2015). He holds degrees from Boston University, B.A., summa cum laude, Northwestern University (Chicago), J.D., Law Review, and New York University, LL.M. in Taxation. His website - www.ExecutiveEmploymentAttorney.com

E-Minute Presentations will be given at the start of the meeting. These very short presentations enable young startup entrepreneurs to gain experience in presenting their summary business plans to expert panels and audiences.

Directions: Constant Contact is adjacent to RT 128 / 95 at Exit 28B.

See: <http://www.constantcontact.com/about-constant-contact/office-location-waltham.jsp>

Reservations: ENET Constant Contact meetings are free to ENET members and \$20 for non-members. No reservations are needed for the premeeting dinner. To expedite sign-in for the meeting, we ask that everyone -- members as well as non-members -- pre-register for the meeting online. Pre-registration is available until midnight the day before the meeting. If you cannot pre-register, you are welcome to register at the door.

*Communications, and Consumer Electronics Societies –
7:00PM, Thursday, 7 September*

Automotive Radar Technology and Trends

Speaker: Jeff Millar, Valeo Radar Systems

Automotive Radar appears on a modern car in support of functions such as automated cruise control, blind spot warning, and cross traffic alert. International regulatory agencies have allocated 200 MHz of bandwidth at 24 GHz and recently up to 4 GHz of bandwidth at 77 GHz. Radar hardware must be very low cost and uses a minimum number of highly integrated chips. Radar production volume of millions per year encourage close working relationships between chip manufacturers and radar sensor manufacturers. Radar and algorithms currently support Advanced Driver Assistance Systems (ADAS). New algorithms will merge radar data with ultrasonic, vision, or laser systems to implement active safety systems. Challenges for the future include continuous cost reduction, mutual interference, and the challenges of autonomous vehicles.

Jeff Millar is the manager of systems and algorithms for Valeo Radar Systems in Hudson NH. In previous jobs, he has led project development teams in the area of cellular distributed antenna systems, multi-function RF avionics, and image processing. Although he has a master's degree from RPI in electrical engineering, most of his career has been writing software or leading multidisciplinary development teams.

Please circulate to interested parties.

Venue Note: This is our venue at the new Verizon Technology Center Campus in Waltham.

The meeting begins at 7 PM at the new meeting auditorium at the Verizon Technology Center. The ad-

dress is 60 Sylvan Road, Waltham, MA 02451. The entrance is by the far corner – with the picnic tables out front – and not the tower or the new building. It is most easily reached by the West Street entrance.

Important Note: Verizon Technology Center requests the names of the meeting attendees in advance of the meeting. If you plan to attend, please send a note via e-mail with your name to John Nitzke at nitzke@sprynet.com by Wednesday, September 6th.

The meeting is preceded by dinner at Bertucci's, 475 Winter St, Waltham at 5:30 PM. The speaker will be joining us at dinner.

Directions to Bertucci's restaurant in Waltham: Take Exit 27B on I95/128, heading west on Winter Street. After exiting, stay all the way to the right and take the first right turn into the shopping plaza. Please let Bob Malupin know if you plan to attend the dinner at Bertucci's. Bob can be contacted at Robert.Malupin@VerizonWireless.com.

Directions to Verizon Technology Center (old Verizon Labs location), 60 Sylvan Rd. campus, Waltham, MA 02451: Take Exit 27B on I95/128, heading west on Winter Street. Stay all the way to the right. Verizon Technology Center is 1/2 mile ahead. At the second traffic light, turn left onto WEST ST. and then take the first right (at the Verizon sign) which leads into the Verizon campus. Take the first left. The building and entrance for the meeting are on your right. Note that the entrance to the auditorium area is by the far corner – with the picnic tables out front – and not the tower or the new building.

Robotics and Automation Society, co-sponsored by Robotics and Automation Society New Hampshire Chapter – 6:15PM, Tuesday, 12 September

High Speed Reactive Obstacle Avoidance And Aperture Traversal Using A Monocular Camera

Dr. N. Andrew Browning, Deputy Director of Research and Development at SSCI

Flight in cluttered indoor and outdoor environments requires effective detection of obstacles and rapid trajectory updates to ensure successful avoidance. We present a low-computation, monocular-camera based solution that rapidly assesses collision risk in the environment through the computation of Expansion Rate, and fuses this with the range and bearing to a goal location (or object), in a Steering Field to steer around obstacles while flying towards the goal. The Steering Field provides instantaneous steering decisions based on the current collision risk in the environment, Expansion Rate provides an automatically-speed-scaled estimate of collision risk. Results from recent flight tests will be shown with flights at up to 20m/s around man-made and natural obstacles and through 5x5m apertures.

MEDIA

Flight Videos (YouTube Playlist): https://www.youtube.com/playlist?list=PLS01G8CWzRStocqEP-MnYfG_NbpjrlXrDv

SPEAKER'S BIOGRAPHY

Dr. N. Andrew Browning, Deputy Director of Research and Development at SSCI

Dr. N. Andrew Browning obtained his PhD in Computational Neuroscience from Boston University with a thesis on how primates and humans process visual information for reactive navigation, the resulting neural model was built into a multi-layer convolutional neural network (called ViSTARS) and demonstrated, in simulation, to generate human-like trajectories in cluttered reactive navigation tasks. Following his PhD, applied post-doctoral research, and a brief stint as a Research Assistant Professor at BU, Dr. Browning started a research group at Scientific Systems Company Inc. (SSCI) to develop Active Perception and Cognitive Learning

(APCL) systems as applied to autonomous robotic systems. The APCL lab at SSCI has developed into a global leader in the development of applied perception and autonomy solutions for small UAVs. Dr. Browning is now Deputy Director of Research and Development at SSCI with a broad remit across the areas of advanced controls, single vehicle and collaborative autonomy, visual perception, acoustic perception, and vision-aided GNC.

ABOUT THE LOCATION

The New England Robotics Validation and Experimentation (NERVE) Center at the University of Massachusetts Lowell is a dedicated research, testing, and training facility. The mission of the NERVE Center is to improve the development of robotic systems by both academic researchers and corporations by facilitating evaluation throughout the design cycle.

The NERVE Center houses replicas of the National Institute of Standards and Technology's (NIST) Standard Test Methods for Robots, water test areas designed in collaboration with the Army, an indoor rain area, NERVE-specific apparatuses, and the ability to simulate a variety of operational scenarios and experiment set-ups. The indoor arenas allow for year-round testing of robot systems with water, sand, and other features difficult to maintain outdoors in New England. Nine thousand square feet is dedicated to test courses and apparatuses. Each course is outfitted with a video recording system to capture robot testing sessions throughout the entire facility. NERVE Center employees are available to aid with testing and adjust apparatus settings.

The center is conducting research to continue the development of standard methods for evaluating

robots. For example, there are few validation methods that have been developed for fully autonomous robot systems, an area with a great deal of current research and development. Feedback on new metrics is solicited from NERVE Center members.

UNSPONSORED DINNER

Pho 88
1270 Westford Street
Lowell, MA 01851
Doors open: 6:15 P.M.; Presentation: 6:45 P.M.
Dinner: 8:00 P.M.

Meeting Location: UMass Lowell NERVE Center,
1001 Pawtucket Boulevard, Lowell, MA 01854

Have more questions? Want to share a drink with the speaker? Want to network with fellow engineers and professionals? Just want to chat about the current goings-on in Robotics, or technology in general? Join us for dinner, where you can talk about Robotics in a more casual setting!

GENERAL INFORMATION

This and other RAS meetings are open to the general public. For more information about the RAS Boston Chapter, contact Chapter Chair Sripati Sah at chair@robotics-boston.org or visit <http://www.robotics-boston.org/>.

Computer Society, Young Professionals, and GBC/ACM – 7:00PM, Wednesday, 13 September

The TileDB Array Storage System

Stavros Papadopoulos

In this talk I will present a new system for scientific data storage called TileDB. Contrary to most traditional data management systems, TileDB models data natively as multi-dimensional arrays, which can be either dense (where every array element stores a value) or sparse (where the majority of elements are empty). I will initially present the array model and the internal mechanics of the TileDB array storage manager. I will then focus on two of the many applications of TileDB, specifically, a genomics customization, called GenomicsDB, and a geo-spatial use case. Finally, I will outline our future vision for commercializing TileDB, namely the way we envision to perform high performance analytics in a massively distributed, scalable fashion.

Dr. Stavros Papadopoulos is the Founder and CEO of TileDB, Inc. Before entering the start-up world, he was a Senior Research Scientist at the Intel Parallel Computing Lab, and a member of the Intel Science and Technology Center for Big Data at MIT CSAIL for three years. Prior to joining Intel, he spent about two years as a Visiting Assistant Professor at the

Department of Computer Science and Engineering of the Hong Kong University of Science and Technology (HKUST). Stavros received his PhD degree in Computer Science at HKUST under the supervision of Prof. Dimitris Papadias, and did a postdoc at the Chinese University of Hong Kong with Prof. Yufei Tao.

This joint meeting of the Boston Chapter of the IEEE Computer Society and GBC/ACM will be held in MIT Room 32-G449 (the Kiva conference room on the 4th floor of the Stata Center, building 32 on MIT maps). You can see it on this map of the MIT campus.

Up-to-date information about this and other talks is available online at <http://ewh.ieee.org/r1/boston/computer/>. You can sign up to receive updated status information about this talk and informational emails about future talks at <http://mailman.mit.edu/mailman/listinfo/ieee-cs>, our self-administered mailing list.

Reliability Society – 5:30PM, Wednesday, 13 September

Creating Reliable and Manufacturable RF Designs

Chandra Gupta, Ph.D., MBA



Electronic system demands for smaller size, lighter weight, lower power consumption and lower cost (also known as SWAP-C) are being met through design, development and production of heterogeneous high density packages, system in package (SIP), and system on chip (SOC). Complex monolithic chips

containing high number of semiconductor devices present unique challenges when it comes to determining reliability.

Reliability is designed in by taking numerous device physics properties into account. Many of the effects such as activation energy, electro migration, hot carrier injection, dissimilar metals and whisker growth need to be taken in consideration when designing RF systems and for that matter any other electronic systems. The production considerations incorporate overall the best value, manufacturability, quality, parts obsolescence, supply chain and support through the life of the systems. These issues will be covered and show that implementing these measures leads to overall value, higher reliability and a lower total cost ownership

Chandra Gupta, Ph.D., MBA of Communications and Power Industries (CPI)

Dr. Chandra Gupta, Ph.D.(EE) and MBA has over thirty years of experience in RF and microwave industry. He

has designed, developed, managed and produced a wide range of RF, microwave and millimeter wave components, integrated microwave assemblies and custom assemblies with cutting edge technologies for commercial and defense applications.

He has held positions ranging from IPT Manager at BAE Systems, VP of Operations and Engineering at Herley Industries, General Manager at Aeroflex and Director at Hittite. He is now a Senior Engineering Program Manager at Communications & Power Industries (CPI) at Beverly, MA developing and producing High Power Amplifiers. Dr. Gupta is a Senior Member of Institute of Electrical and Electronics Engineers. Email: c.gupta@ieee.org

Agenda

This meeting will be held on Wednesday, September 13, 2017 at 3 Forbes Road, Lexington, MA.

5:30-6:00 PM: Sign in, refreshments, and personal networking

6:00-6:10 PM: Chapter Chair greetings and announcements

6:10-7:45 PM: Presentation, Chandra Gupta, Communications and Power Industries (CPI)

7:45-7:55 PM: Q&A session, meeting adjourns

Meeting Location: MIT Lincoln Laboratory, 3 Forbes Rd, Lexington, Massachusetts

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

Facebook: <https://www.facebook.com/IEEEBoston>

YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Entrepreneurs' Network Cambridge Meeting - 6:00PM, Tuesday, 19 September

Innovation Navigation: Road Map from Idea to a Successful Company

The ENET meeting on September 19, 2017 is on mapping from an idea to a successful company. What is innovation? How is the success defined? Where to start, which steps to pursue, is there a specific process?

How to create value? How to start an entity and how to commercialize & grow it? How to go plan an exit?

Innovation is a process of matching market needs to technological capabilities and conducting research during product conception, design, manufacturing & marketing. Commercial success depends on users' cost & performance requirements.

Technological innovation is the act of developing and putting to use new product, processes & services. Innovation requires that these be adopted by users. Many inventions are never put into practice because they are technologically infeasible or fail the commercialization process.

You have a great novel idea and you can put it to great use while generating sizable revenue, but do not know where to start or how to go about it. Our commercialization and marketing experts are here to help.

AGENDA:

- 6:00 -7:00 pm - Networking
- 7:00 -7:10 pm - Announcements
- 7:10 -7:25 pm - E Minute - Up to 3 Startup companies' presentations
- 7:25 -8:15 pm - 3 expert speakers on the night's topic
- 8:15 -8:30 pm - Q & A
- 8:30 -9:00 pm - Networking including meeting speakers

Below please meet the panel of accomplished ex-

ecutives and experts and our moderator, who was also the meeting organizer.

SPEAKERS:



Eugene Buff, MD, PhD - Dr. Eugene Buff is a Registered Technology Transfer Professional (RTTP) and Certified Licensing Professional (CLP) with over twenty years of combined scientific, consulting and management experience. He has substantial expertise in a wide variety of industries, including but not limited

to healthcare, biotechnology, medical devices, consumer products, materials and chemical manufacturing.

Dr. Buff is a Founder and President of Primary Care Innovation Consulting (PCIC), a new type of innovation management and business development firm supporting companies' growth through open innovation. PCIC provides technology strategy consulting for both large and small companies globally and has unique access to cutting edge innovation at universities, incubators and accelerators worldwide. Its signature product, Innovation Navigator™ offers comprehensive business development support by combining known theories (such as Lean Start Up, "Jobs-To-Be-Done" and Disruptive Innovation) with years of successful consulting practices. Dr. Buff also designed and teaches "Customer Driven Technical Innovation for Engineers", a core course for Entrepreneurship Minor at Northeastern University, Boston.

Dr. Buff earned his Master degree in Biochemistry as well as his Medical Doctor degree from Russian State Medical University. He is a Ph.D. in Genetics and is a coauthor of 14 papers in peer reviewed

international journals. Eugene is an active member of the Licensing and Technology Transfer community and serves on several committees and task forces at AUTM and LES. He is a member on many consulting and professional network organizations and often mentors and presents on issues of Entrepreneurship, Intellectual Property, Innovation and Technology Transfer both in US and internationally.



Susu Wong - Susu Wong is the Founder and Principal of Tomo360, a marketing agency that helps small to medium-sized businesses and nonprofits in their digital marketing and online promotions. She was an Adjunct Professor in Marketing at University of Massachusetts Lowell, and a frequent speaker/instructor at entrepreneur

and small business centers.

Susu has twenty years of experience in marketing, business development and technology licensing for Fortune 500, high-tech, biotech, higher education, and healthcare organizations. She was formerly the Associate Director of Business Development and Technology Transfer at Addgene, where she focused on developing marketing programs to enhance communications with academia and life science companies.

Before joining Addgene, Susu was a Business Strategy Manager in the Innovation Office at Partners Healthcare, where she created successful marketing campaigns for high profile, multi-million dollar medical research portfolios at Massachusetts General Hospital. She also spearheaded their social media strategies and email marketing campaigns. Earlier in her career, Susu was a Product Program Manager at IBM. She was involved in the creation of their e-business vision that integrated IBM's software products.

Susu is an advocate for helping women advance their careers. She is a co-founder of Women Accelerators (formerly de la Femme), a nonprofit organization that provides networking, mentoring and

educational programs to help women in advancing their career goals. She holds an Masters of Science in IT Management from Lesley University, and earned certificates in digital marketing from Northeastern University and in website design from Georgetown University.

Using her diverse business experience, Susu and her team have successfully helped business owners and entrepreneurs with their marketing strategies -- integrating branding, website designs, social media, search engine optimization, and email marketing.



Regina Au - Regina Au is Principal, New Product Planning/Strategic Commercial Consultant at BioMarketing Insight with 25+ years experience in the biotechnology, pharmaceutical, medical device, diagnostic and healthcare industries. She helps companies to maximize the benefits of their technology by conducting

the business due diligence early in product development to de-risk the process and increase commercial success. This ensures that the technology is the right product for the right market in meeting a critical unmet need and that the market opportunity for the product meets the business goals of the company. She will translate these unmet needs into a target product profile (TPP) or commercial profile. Ms. Au then develops marketing strategies to ensure market access and product adoption.

She is a member of the Advisory Board for Regis College Master of Regulatory and Clinical Research Management Program. Ms. Au also serves as an advisor for the Massachusetts Technology Transfer Center Platform Meetings, Advisory Board member for an entrepreneur team at the Martin Trust Center for Entrepreneurship at MIT, an Executive Judge for Entrepreneurship at Suffolk University and NHHTC Entrepreneur Forum, and a mentor for The Boston Club, AWIS and Women Accelerators. Regina has written and published numerous articles on market and technology trends in the industry. She is a member of the Editorial Board for

the International Journal of Clinical Pharmacology & Pharmacotherapy and Industry Advisor for the European BioPharmaceutical Review Journal. Her expertise is in numerous therapeutic areas such as cardiology, interventional cardiology, infectious disease, immunology, surgery, gastroenterology, pulmonology and oncology.

Prior to BioMarketing Insight she worked for companies such as Merck & Co., Genzyme Corp., NMT Medical, and Radi Medical (St. Jude Medical) in various positions of increasing responsibility in new product planning, marketing and sales. She had P&L responsibility in managing six multimillion dollar product lines and has experience in upstream and downstream marketing including strategic marketing, product development, market development, product launches, and product management.

MODERATOR: - Dr. Nathalie Goletiani, M.D.

Dr. Nathalie Goletiani, M.D., inventor, founder and CEO of POWERFEM Therapeutics; Instructor in Psychiatry at McLean Hospital, Harvard Medical School.



Dr. Goletiani is the Founder and Chief Executive Officer of POWERFEM Therapeutics, a company devoted to novel, networked treatment methods for the care of those suffering from substance abuse and mental illness. Her extensive clinical research into the hormonal effects of nicotine, opioid and cocaine use lead her to new concepts and mechanisms in understanding and treating psychiatric disorders, in particular, disorders experienced by underserved female populations. At Harvard's McLean Hospital, she was charged with rebuilding and responsible for all the operations of Clinical Research Program, including simultaneously running multiple clinical trials. Based on her patented work, she founded POWERFEM Therapeutics, an independent company devoted to creating new treatments and healthcare solutions. POWERFEM in-

corporates novel disease concepts and treatments to design cost-effective, integrated mental and substance abuse care solutions across multiple provider networks. Dr. Goletiani has received numerous national and international awards including most recently the Harvard Livingston Award for the investigation of complex underlying mechanisms in the neurobiology of women. She also received a Harvard University Zinberg Fellowship specifically to support her research on alcohol and drug use disorders. Her research provides a valuable basis for psychotherapeutic public policy decision making on issues of substance abuse and the integrated treatment of mental illness. She has extensively published the results of her research in peer reviewed journals. Nathalie completed basic and clinic fellowships at the Harvard School of Public Health and at Harvard Medical School. In addition, she has been trained at and conducted medical research at Tbilisi State Medical University, University of Amsterdam and King's College in London.

PUBLIC TRANSPORTATION: Is accessible by public transportation, to the Kendall Square stop on the Red Line.

LOCATION: Pivotal Labs, 255 Main St., 6th FL, Cambridge. This building is in Kendall Square, just a couple doors down from the Cambridge Marriott heading toward Boston.

REFRESHMENTS: Pizza & soft drinks

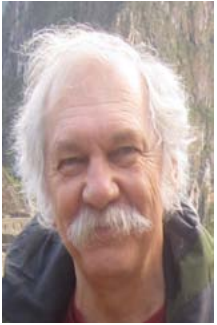
COST AND RESERVATIONS: Free to ENET members and \$10 for non-members. Members & non-members, pre-register for the meeting online, until midnight the day before the meeting. Go to – www.boston-enet.org If you cannot pre-register, you are welcome to register and pay at the door.

PARKING: The nearest parking garage is at One Broadway. The fee is \$10 after 5pm, you need to be out by 10pm. Details at: <https://www.parkme.com/lot/115647/one-broadway-garage-cambridge-ma>

Life Members – 3:30PM, Wednesday, 20 September

Significant New Directions in Medical Ultrasound

Thomas L. Szabo, Biomedical Engineering, Boston University, IEEE Life Senior Member



In the last decade, several remarkable technological developments have made possible new applications in medical ultrasound. Miniature phased arrays have been in use for over thirty years enabling real-time diagnostic ultrasound imaging of the body as well as the visualization of blood flow. New

inventions and Moore's law have made possible two-dimensional or matrix arrays for real-time imaging with thousands of elements. New piezoelectric single domain crystals with extraordinary bandwidth enable multiple frequency and harmonic operation. Shear wave elastography generates higher contrast images than before. Continued innovation produces pocket and wireless ultrasound which in turn are opening up new global applications and transforming the way ultrasound can be used. Therapeutic ultrasound is enabling knifeless surgery. Finally, reconfigurable ultrasound research systems with open software are spawning new applications and start-ups.

Dr. Thomas Szabo is a research professor in the biomedical engineering department, College of Engineering, Boston University. Previously he worked in research and development of diagnostic ultrasound imaging systems at Hewlett Packard and Agilent Technologies for nearly twenty years. Before that he did research on surface acoustic wave devices and ultrasonic nondestructive evaluation

at Air Force Cambridge Research Laboratories/Rome Air Development Center. Dr. Szabo is also a convenor of a working group in the International Electrotechnical Commission which develops standards on high intensity therapeutic ultrasound and focusing. He has published over one-hundred articles and book chapters. He is author of *Diagnostic Ultrasound Imaging: Inside Out*, a widely used textbook and reference which has been cited over 1000 times. Professor Szabo's research goals are overcoming present limitations of imaging the body using ultrasound and other imaging modalities and finding new ways of extracting diagnostically useful information about tissue structure, health and function noninvasively.

The meeting will be held at the Lincoln Lab Cafeteria, 244 Wood Street, Lexington, MA at 4:00 PM.
Refreshments: 3:30 PM

Talk: 4:00PM – 5:00PM

Registration is in the main lobby.

Foreign national visitors to Lincoln Lab require visit requests.

Please pre-register by e-mail to reception@ll.mit.edu and indicate your citizenship. Please use the Wood Street Gate entrance. For directions go to <http://www.ll.mit.edu/> For other information, contact Len Long at (781)894-3943, or l.long@ieee.org, Paul H. Carr at (603) 413 6566 or paulcarr@alum.mit.edu

Consultants Network – 6:30PM, Tuesday, 26 September

Professional Engineer Licensing ...

Why would you want it.

Larry Nelson, P.E.

So you graduated with an engineering degree ... are you now an engineer? Depends on who you ask. Most states issue professional engineer license that may be required depending on what you want to do. This talk focuses on why to obtain such certification and how to go about it in Massachusetts.

Larry Nelson has been a consultant since 1980 with a wide variety of clients across many industries. He holds a PE License in Massachusetts and has many years of industrial experience. He is a Platinum Level Master Consultant for Microchip and has created and presented training classes for them. He has served as an Expert Witness in many different cases. In his consulting practice, Nelson Research, he specializes in Electronics design for many different industries. He has taught at the college level about Electronics, Microprocessors, Machine Electrification, Troubleshooting, Robotics and Computers. He has spoken on various topics for local, regional, national, and international audiences and is currently Chairman of the AICN.

PLEASE NOTE: The meeting is open to the public. No charge for Consultants Network members or employees of Constant Contact; \$5 entrance fee for all others. Casual dress. Registration (no registration required).

The Consultants' Network meeting starts at 6:30 PM. The meeting will take place at Constant Contact, Reservoir Place - 1601 Trapelo Road, Waltham, MA 02451. A no host, PRE-MEETING DINNER will take place at 5:15 PM (sharp) at Bertucci's, 475 Winter Street, Waltham, MA 02451 (exit 27B, Rte 128).

Driving Directions

To Bertucci's:

Follow I-95/route 128 to Winter St in Waltham. Take exit 27B from I-95/Route 128. Turn left on Wyman S, then left on Winter St. Bertucci's is the 1st right after crossing the bridge over I 95/Route128.

To Constant Contact:

Follow I-95/route 128 to Trapelo Rd in North Waltham, Waltham. Take exit 28 from I 95/route 128. Constant Contact is the 1st right after crossing the bridge over I 95/Route128.

Consultants' Network meetings generally take place on the fourth Tuesday of each month, but are not held during the summer months. Check the Consultants' Network website for meeting details and last-minute information.

For more information, e-mail or chairman@boston-consult.com

2017 IEEE WIE USA EAST FORUM Call for Participation

November 30 – December 2, 2017 Baltimore, MD



Presentation Topics

- Mentoring the next generation of female leaders
- Strategies for increasing equity in power and decision making
- Women as leaders in education, industry, and government
- Development: communication skills in written and spoken word, effective dialog
- Cross-cultural aspects of leadership
- What it takes to be a great leader - qualities that all successful leaders share
- Shaping the future by female leaders
- Training vs inherent skills: can leadership be learned?
- Work-Life balance: family systems traditions and changes
- Leadership development for women: overcoming stereotypes
- The design, implementation, and evaluation of leadership from a structural perspective
- Helping girls and young women become leaders - motivating to empower, empowering to motivate
- Exploring the attrition gap - why do women leave the engineering field and what can be done to prevent it

Not a WIE member?

Our active community of female and male engineers is involved in career building, networking, and community outreach.

Join Now

Submission Deadline

Presentation topic abstract suitable for program (up to 150 words), and extended abstract for evaluation (up to 2 pages) due 24 July 2017.

For more information, visit:

<http://sites.ieee.org/wie-forum-usa-east/calls-for-participation/>





New Submission Deadlines

Paper: July 31st, 2017

Poster and Lightning Talk: September 3rd, 2017

To submit: <https://ieee-r1-studentconference.myreviewroom.com>

Envisioning a technical conference targeted towards undergraduate students all over the globe, the MIT IEEE Student Branch in 2015 inaugurated the IEEE MIT Undergraduate Research Technology Conference. This year we are organizing it again with the goal to make the conference a venue where undergraduate students can meet to present, discuss, and develop solutions advancing technology for humanity. Participants can attend a rich program with renowned speakers, technical sessions, a student design competition, exhibits, networking, and social activities, presenting a great opportunity for students to interact with leading industry experts.

The conference theme is “Meet Innovative Technology”, and the six fields of focus are:

1. Machine Learning / Artificial Intelligence (AI)
2. Biological and Biomedical Engineering and Technology (BioEECS)
3. Robotics and Automation Technology
4. Systems and Networking
5. Embedded Technologies
6. Innovative Technologies and Others

Authors may submit content in the form of a technical paper, poster, or lightning talk.

All submissions must be written in English. Paper submissions must be no longer than 4 pages, single-spaced, with a minimum font of 10 point, and submissions may include figures, illustrations, and graphs. Abstract submissions for the poster and lightning talk are limited to 500 words.

- New notification of paper acceptance by August 27, 2017.
- New notification of poster and lightning talk acceptance by September 24, 2017.
- Those who have made their submissions by the original deadline of June 30, 2017 will still receive the notification of acceptance by August 4, 2017.

Please join the mailing list (MIT-Conference@ieee.org) for more information and updates on submission, the technical program, registration, and accommodation.

A conference proceeding of all the accepted papers that have been presented at the conference may be published and included in the IEEE Xplore journal. Electronic and online media containing all accepted submissions will be distributed to all registered attendees.

Meet Innovative Technology

Sponsored by MIT IEEE Student Branch and IEEE Boston Section

<http://ieee.scripts.mit.edu/conference>

Digital Signal Processing (DSP) for Wireless Communications - Under the Hood

Time and Dates: 6 - 9PM, Wednesdays, October 18, 24, November 1, 8, 14
(Note: Oct. 24 and Nov. 14 are Tuesdays) This is a date change!

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Dan Boschen, Microsemi

Course Summary:

This course is a fresh view of the fundamental concepts of digital signal processing most applicable to practical real world problems and applications in radio communication systems. This course will build an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and real world applications in GPS and mixed signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges in both the analog and digital domains, and not a tutorial on working with specific DSP processor hardware.

Target Audience:

All engineers involved in or interested in signal processing applications. Engineers with significant experience with DSP will also appreciate this opportunity for an in depth review of the fundamental DSP concepts from a different perspective than that given in a traditional introductory DSP course.

Benefits of Attending/ Goals of Course:

Attendees will build a stronger intuitive understanding of the fundamental signal processing concepts involved with digital filtering and mixed signal communications system design. With this, attendees will be able to implement more creative and efficient signal processing architectures in both the analog and digital domains

Topics / Schedule:

Class 1:

Correlation
Fourier Transform
Laplace Transform

Class 2:

Sampling and A/D Conversion
Z –transform
D/A Conversion

Class 3:

IIR and FIR Digital filters
Direct Fourier Transform

Class 4:

Windowing, Digital Filter Design
Fixed Point vs Floating Point

Class 5:

Fast Fourier Transform
Multirate Signal Processing
Multi-rate Filters

Speaker's Bio:

Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 20 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave de

signing and developing transceiver hardware from baseband to antenna for wireless communications systems. Dan is currently at Microsemi (formerly Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/danboschen>

**Decision (Run/Cancel) Date for this Course is
Monday, October 9, 2017**

Payment received by October 6

IEEE Members \$325

Non-members \$360

Payment received after October 6

IEEE Members \$360

Non-members \$425

<http://ieeeboston.org/digital-signal-processing-dsp-course-fall-2017>

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically diverse sections of the IEEE. We have over 20 active chapters and affinity groups.

If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/>

Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- Honoraria can be considered for course lecturers
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course)
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Embedded Linux Optimization - Tools and Techniques (*Online Edition*)

**New
Online
Course**

Students have access to this self-paced course for 90 days!!

Registration fee: \$250

Summary - This video course provides advanced training in the debugging, testing, profiling and performance optimization of Embedded Linux software. The first part of the course focuses on advanced debugging, testing and profiling in an Embedded Linux context with a focus on using Eclipse, Backend Debuggers, JTAG and In-Circuit Emulators as well as Kernel Logging capabilities and Kernel Hacking. The latter part of the course covers performance measurement and optimization affecting boot, memory, I/O and CPU performance and key performance optimization tools for Embedded Linux software including the perf tool, advanced cache usage and compiler-based optimization.

Who Should Attend - The course is designed for real-time engineers who are developing high-performance Linux applications and device drivers using Embedded Linux distributions. It is also targeted at experienced developers requiring a refresher course on Advanced Embedded Linux optimization.

Course Objectives

- To understand debugging, profiling and testing high performance Embedded Linux software.
- To provide an overview of Linux application performance measurement and optimization.
- To understand the tools used for performance optimization of Embedded Linux software.

- To give students the confidence to apply these concepts to their next Embedded Linux project.

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. He has held a variety of software engineering positions at LynuxWorks, Embedded Planet, Wind River Systems and Lockheed Sanders. RTETC, LLC provides real-time embedded training and consulting to many embedded systems companies. RTETC focuses on real-time operating systems (RTOS), Linux and Android solutions for the embedded systems market.

Getting Started with Embedded Linux

Embedded Linux Training Overview

Terminology

Linux Versioning

The GPL

Building the Kernel Source Code

Embedded Linux Kernels

BSPs and SDKs

Linux References (Books and Online)

A Development Cycle Focused on Performance

A Basic Optimization Process

Basic Debugging Review

Embedded Applications Debug

GDB, GDB Server and the GDB Server Debugger

Other Debuggers

An Eclipse Remote Debug Example

Debugging with printk, syslog, syslogd and LTTng

System-Level Debug

System-Level Debug Tools

The /proc and /sys Filesystems

- Basic Logging
- KDB and KGDB
- Crash Dumps and Post-Mortem Debugging
 - Debugging Embedded Linux Systems
- Backend Debuggers
- In-Circuit Emulators
- Hardware Simulators
- Analyzers
- Requirements Development
- Performance Requirements
- Derived Requirements
- Testability and Traceability
- Reviewing Requirements
- Designing for Performance
- Design for Test (DFT)
- Agile Software Design
- Software and Linux Decomposition
- Memory Management
- CPU and OS Partitioning
- Design Reviews
- Coding for Performance
- Coding Standards and Consistency
- Languages, Libraries and Open Source Components
- Learning Magic Numbers
- Letting Compilers Work For You
- Global, Static and Local Variables
- Code Reviews

- Software Testing
 - Unit-Level Testing
 - System-Level Testing
 - Code Coverage Tools
 - gcov
 - Automated Testing
 - Some Embedded Linux Test Recommendations
 - DebugFS
 - Configuring DebugFS
 - DebugFS Capabilities
 - Advanced Logging
 - LogFS
 - Using Logwatch and Swatch
 - Using syslogd and syslog-ng
 - Tracing
 - ptrace and strace

- New Tracing Methods
- SystemTap
- Ftrace, Tracepoints and Event Tracing
- Tracehooks and utrace
 - Profiling
- Basic Profiling
- gprof and Oprofile
- Performance Counters
- LTTng
- Another DDD Example
 - Manual Profiling
- Instrumenting Code
- Output Profiling
 - Timestamping
- Addressing Performance Problems
 - Types of Performance Problems
 - Using Performance Tools to Find Areas for Improvement
- Application and System Optimization
- CPU Usage Optimization
- Memory Usage Optimization
- Disk I/O and Filesystem Usage Optimization
 - Measuring Embedded Linux Performance
 - Some Ideas on Performance Measurement
- Common Considerations
- Uncommon Considerations
- Using JTAG Methods
- BootLoader Measurements
- Boot Time Measurements
 - The Perf Tool
 - Origins of Perf
 - The Perf Framework
 - Perf Commands and Using Perf
 - Listing Events
 - Counting Events
 - Profiling with Perf
 - Static Tracing with Perf
 - Dynamic Tracing with Perf
 - Perf Reporting
 - Performance Tool Assistance
- Recording Commands and Performance
- System Error Messages and Event Logging
- Dynamic Probes
- Jprobes and Return Probes
- Kernel Probes

Kexec and Kdump	Improving System Memory Performance
Improving Boot Performance	Memory Performance Statistics
Boot Time Optimization	Linux Performance Tools for Memory
The Linux Fastboot Capability	Process-Specific Memory Performance Tools
Building a Smaller Linux	More Stupid Cache Tricks
Building a Smaller Application	Improving I/O and Device Driver Performance
Filesystem Tips and Tricks	Disk, Flash and General File I/O
Some Notes on Library Usage	Improving Overall Performance Using the Compiler
Improving Kernel Performance	Basic Compiler Optimizations
Kernel Hacking	Architecture-Dependent and Independent Optimization
CONFIG_EMBEDDED	Code Modification Optimizations
Configuring printk	Feedback Based Optimization
Test Code	Application Resource Optimization
Configuring Kernel and IO Scheduling	The Hazard of Trust
	An Iterative Process for Optimization
Improving CPU Performance	Improving Development Efficiency
Run Queue Statistics	The Future of Linux Performance Tools
Context Switches and Interrupts	Some Final Recommendations
CPU Utilization	
Linux Performance Tools for CPU	
Process-Specific CPU Performance Tools	
Stupid Cache Tricks	

<http://ieeeboston.org/embedded-linux-optimization-tools-techniques-line-course/>

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

Facebook: <https://www.facebook.com/IEEEBoston>

YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Software Development for Medical Device Manufacturers *(Online Edition)*

**New
Online
Course**

Students have access to this self-paced course for 90 days!! Registration Fee : \$125

Course Description This course provides an introduction to the development of medical device software. The course is comprised of 4 modules that range from 30-45 minutes in duration. The focus is on complying with FDA Design Controls and IEC 62304 requirements.

This course is intended for software developers who are actively involved in developing medical device software.

Module 1

- Medical Device Definitions: FDA and European Union (EU)
- Regulatory Roadmap
- FDA/EU Device Classifications
- FDA QSR Regulation
- FDA Guidance Documents that pertain to medical device software

Module 2

- International Standards that pertain to medical device software
- Types of Software Regulated by FDA
- Quality System basics: Procedures, Work Instructions and Records
- ALL Software is Defective...

Module 3:

- Design Control Overview
- General Requirements
- Design and Development Planning
- Software Development Models
- Design Input
- About Requirements...
- Design Output

- Design Reviews

Module 4:

- Design Control (continued)
- Design Verification
- Software Verification Process
- Testing Overview
- Design Validation
- Software Validation Process
- Design Changes
- Design Transfer
- Design History File
- Course Summary

Speaker Bio:

Steven R. Rakitin has over 40 years experience as a software engineer including 25 years of experience in the medical device industry. He has worked with over 85 medical device manufacturers worldwide, from startups to Fortune 100 corporations. He has written several papers on medical device software risk management as well as a book titled: *Software Verification & Validation for Practitioners and Managers*.

He received a BSEE from Northeastern University and an MSCS from Rensselaer Polytechnic Institute. He earned certifications from the American Society for Quality (ASQ) as a Software Quality Engineer (CSQE) and Quality Auditor (CQA). He is a Senior Life member of IEEE and a member of MassMEDIC. He is on the Editorial Review Board for the ASQ Journal Software Quality Professional.

As President of Software Quality Consulting Inc., he helps medical device companies comply with FDA regulations, guidance documents, and international standards in an efficient and cost-effective manner.

<http://ieeeboston.org/software-development-medical-device-manufacturers-line-course/>

Fundamental Mathematics Concepts Relating to Electromagnetics (*Online Edition*)



**New
Online
Course**

Students have access to this self-paced course for 90 days!!

Registration Fee: 150

Course Summary This course is designed for people wishing to refresh or to learn the fundamental mathematical concepts that are used to describe electromagnetic wave behavior. The modules address all of the basic math concepts covered in a traditional undergraduate electromagnetics course in an ECE curriculum. These concepts include Vector Basics, Integral Vector Calculus, Differential Vector Calculus, Fundamental Coordinate Systems and Complex Numbers. After completing these modules, a person should have sufficient math skills to pursue graduate studies in electromagnetics and/or be able to decipher the math presented in an upper-level text on the subject.

Target audience: This course is designed for people wishing to refresh or to learn the fundamental mathematical concepts that are used to describe electromagnetic wave behavior.

Course chapters

1. Vector Basics
2. Dot Product

3. Cross Product
4. Contour Integration
5. Vector Algebra
6. Surface Integration
7. Metric Coefficients
8. Coordinate Systems
9. Vector Coordinate Conversion
10. Del Operator and the Gradient
11. The Curl
12. Divergence
13. Stokes Theorem
14. Divergence Theorem
15. Laplacian
16. Complex Numbers

Instructor's Bio:

Dr. Kent Chamberlin is the Chair and a Professor in the Department of Electrical and Computer Engineering. In his more than thirty-five years in academia, he has performed research for more than twenty sponsors, including the National Science Foundation. He has received two Fulbright awards, including the prestigious Fulbright Distinguished Chair, which he served in Aveiro, Portugal. He has also served as an Associate Editor for the Institute for Electrical and Electronics Engineers, and he continues to be active in performing and publishing in a range of research areas.

<http://ieeeboston.org/fundamental-mathematics-concepts-relating-electromagnetics-line-course/>

Reliability Engineering for the Business World *(Online Edition)*



Students have access to this self-paced course for 90 days!!

Registration Fee: 320

Course Description

This course is about becoming a leader in reliability engineering. While statistics are the tools of reliability engineering, it takes knowledge not only of these tools but also of the business. Developing knowledge of the business, from sales, engineering, customer service, to supply chain management can determine how effective you can be in improving reliability.

Never take anything for granted, even some rules of thumb in reliability can be misleading, this course will show you how to prove what truly happens in the real world and how to effect change in any part of the business where it is needed. We will explore the balance sheet, organizational structure, customers, service, and high volume manufacturing. It's not just about how often things fail, it is also about where the defect came from, what is the financial effect, the recovery, when should a business take field action, effect of human error, failure analysis/material science, reliability testing, and much more. I will also discuss how you develop executive buy in for change. The course assumes a basic knowledge in reliability statistics. There are 12 sessions that cover the following topics.

Course Outline

Basics – Measurements
Business Model
Design Model (HW and SW)

HALT/RDT/Predictions
Manufacturing Model
Early Life Failures
Wear Out and Mid Life Crisis
Advanced Reliability

Course Objective

To teach you how to become the go to person in your business for objective business sensed reliability answers and requirements.

Instructor's Bio

Kevin is an innovative leader in reliability methodologies with more than 30 years experience in the storage industry. In his latest role as Director of Engineering, he developed a top down reliability/availability management process for design organizations developing mission-critical storage systems. Kevin previously directed the most extensive HALT/HASS operation in the industry, with over 300 chambers worldwide. He has written several papers, consulted with many companies, 3 patents awarded and 2 pending related to systems reliability and test.

His most recent work has been performing system architectural analysis to optimize system availability, serviceability and costs. Providing guidance to development to maximize system reliability and reduce service costs. He has provided consultation to many large companies such as EMC, CISCO, AT+T, HP, Seagate and many others. His position and experience has enabled him to perform extensive field studies and design of experiments. Kevin has developed many

<http://ieeeboston.org/reliability-engineering-business-world-line-course/>

Introduction to Embedded Linux

(Online Edition)



**New
Online
Course**

Students have access to this self-paced course for 90 days!! Registration Fee: 350

Course Summary:

This first of a 2-part series introduces the Linux Operating System and the use of Embedded Linux Distributions. The course focuses on the development and creation of applications in an Embedded Linux context using the Eclipse IDE. The first part of the course focuses on acquiring an understanding of the basic Linux Operating System, highlighting areas of concern for Embedded Linux applications development using Eclipse. The latter part covers the methods for booting Embedded Linux distributions including embedded cross-development and target board considerations.

Who Should Attend:

The course is designed for real-time engineers who are building Embedded Linux solutions. It is also targeted at experienced developers requiring a refresher course on Embedded Linux. This course will clearly demonstrate both the strengths and weaknesses of the Linux Operating System in Embedded Systems.

Course Objectives:

To provide a basic understanding of the Linux OS and the Eclipse IDE framework.

To gain an understanding of the complexities of Embedded Linux Distributions and their use in embedded systems.

To give students confidence to apply these concepts to their next Embedded Linux project

Hardware and Software Requirements

The student should have a working Linux desktop environment either directly installed or in a virtualization environment. The desktop Linux should have the GNU compiler and binary utilities (binutils) already installed. A working Eclipse C/C++ instal-

lation or prior knowledge of C-based Makefiles is useful for completion of lab exercises. Lab solutions are also provided with the course. An Embedded Linux target hardware platform is useful but not absolutely required for this course.

Additional Reference Materials

Linux Kernel Development by Robert Love
Linux System Programming by Robert Love
Linux Debugging and Performance Tuning by Steve Best

Optimizing Linux Performance by Phillip G. Ezolt
Embedded Linux Primer by Christopher Hallinan
Pro Linux Embedded Systems by Gene Sally
Embedded Linux Development Using Eclipse by Doug Abbott

Linux Device Drivers by Jonathan Corbet et al
Essential Linux Device Drivers by Sreekrishnan Venkateswaran

Course Downloadable Content:

Video Lecture
Hands-On Lab Instructions
Hands-On Lab Solutions
Additional Related Materials

The Basics

Linux Terminology, History and Versioning
The Linux Community: Desktop & Embedded
The GPL
Linux References (Books and Online)

Getting Started

Kernel Source Code
Building the Kernel
Embedded Linux Kernels
Linux 2.6

Basic Kernel Capabilities

Process and Threads Management
Signals and System Calls

Synchronization, IPC and Error Handling
Timing and Timers
Memory Management and Paging
The I/O Subsystem: A Tale of Two Models
Modularization

Debugging

Process-Level and System-Level Debug
GDB and KGDB
GDB Server and Remote Debugging

An Eclipse Debug Example

Other Debug and Test Tools

Other System-Level Debug Approaches

Process & Threads Management

What are Processes and Threads?
Virtual Memory Mapping
Creating and Managing Processes and Threads
Thread-Specific Data (TSD) POSIX
The Native POSIX Threading Library (NPTL)
Kernel Threads

Signals

System Calls

Scheduling

Linux 2.4 and 2.6 Scheduling Models
The O(1) Scheduler
The Completely Fair Scheduler (CFS)

Synchronization

Via Global Data
Via Semaphores, Files and Signals

Inter-Process Communications (IPC)

Message Queues
Semaphores Revisited
Shared Memory
Pipes, FIFOs and Futexes
Remote Procedure Calls
Networking

Error Handling

errno and perror
strerror and strerror_r
oops, panics and Segmentation Faults

Timing

How Linux Tells Time
Kernel, POSIX and Interval Timers
High-Resolution Timers (HRTs)

Memory Management and Paging

Demand Paging and Virtual Memory
Allocating User and Kernel Memory
Mapping Device Memory
The Slab Allocator
The OOM Killer
Memory in Embedded Systems

Modularization

Creating a Module and Module Loading
Dependency Issues
In Embedded Systems

Shared Libraries

A Shared Library Example
Static and Dynamic Libraries

The I/O Subsystem: A Tale of Two Models

The Original Device Driver Model
The Standard I/O Interface
The New Device Driver Model and Kernel Object
Classes
Initialization
Platform Devices, Busses, Adapters and Drivers
Comparing the Two Models

Embedded Linux Trends

Development, Monitoring and Testing

Some Final Recommendations

Lecturer:

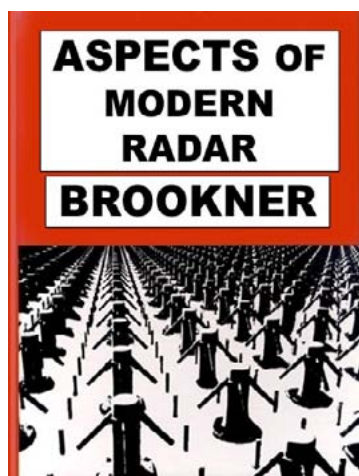
Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. A 20-year electronics veteran, he has held various positions at Tlera, Embedded Planet, Wind River Systems, Lockheed Sanders, Stratus Computer and Apollo Computer. RTETC, LLC is a provider of Eclipse-based development tools, training and consulting for the embedded systems market.

Radar Basics and Amazing Recent Advances

Date & Time: 6 – 9PM, Mondays, Nov. 6, 13, 20, Dec. 4, Jan. 8, 22, 29, Feb. 5
(If needed snow/makeup days Feb. 12, 26)

Location: Location: MITRE Corporation, 202 Burlington Rd., Bedford, MA
(Rt 3, Exit 26 , 2.3 mi from Rt 128/95)

Speaker: Dr. Eli Brookner, Raytheon Company (Retired)



The following book plus over 15 paper reprints are provided FREE with your registration:

1. "Aspects of Modern Radar", Dr. Eli Brookner (Editor), Artech House, Hardcover, 432 pages, 1988, List price: \$159. The 1st chapter gives the best easy to read introduction to radar. It covers all aspects of radar: transmitters, receiver, antennas, signal processing, tracking, clutter derivation of radar equation in easy terms and definition of dB. The 2nd chapter gives detailed descriptions of different radar systems like: Cobra Dane, Pave Paws, BMEWS, Series 320 3D radar, OTH radars and dome antenna. The book has a catalog giving the detailed parameters for over 200 radars from around the world. The remaining chapters cover AEGIS SPY-1, Hybrid and MMIC circuits, ultra low sidelobe antennas (ULSA), mmw, radar cross section and Doppler weather radars. The material in the book is easy to access and as a result the text serves as a handy reference book.

All Attendees of the class will receive a trial license of MATLAB, Phased Array System Toolbox, and Antenna Toolbox from MathWorks in addition to a set of examples which help demonstrate the key radar concepts covered in the course material. MathWorks will also give a radar demonstration.

This course is an updated version of the Radar Technology course given previously. Those who have taken the Radar Technology previously should find it worthwhile taking this revised version. New material includes latest on solid state devices and transmitters including GaN, SiC, SiGe; Breakthroughs in Radar — \$10 T/R module, Digital Beam Forming (DBF), Packaging, Disruptive Technology, Metamaterials, radar on a chip, 256 element phased array on a chip, Memristors, Graphene. Also covered are radar height-range coverage diagram using the powerful SPAWAR's AREPS program. AREPS

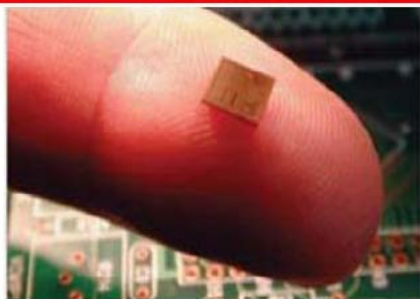
provides coverage for arbitrary propagation conditions (ducts [evaporation, surface, or elevated], subrefraction and superrefraction) and terrain conditions based on DTED map data. AREPS now accounts for surface roughness scattering and evaluates sea and land clutter backscatter versus range. Attendees will be told how to obtain AREPS FREE. Valued at over \$7,000. Also new is coverage of Anomalous Propagation and what to do about it. Finally also covered is the new Multiple-Input Multiple-Output (MIMO) explained in simple physical terms.

Updated course is framed around FREE book described above. Also given out free are supplementary notes consisting of copies of >800 slides plus over 15 paper reprints by Dr. Brookner.

For the beginner, basics such as the radar equation,

MTI (Moving Target Indicator), pulse doppler processing, antenna-scanning techniques, pulse compression, CFAR, RAC and SAW devices, dome antenna, CCDs, BBDs, SAW, SAW monolithic convolvers, microstrip antennas, ultra-low antenna sidelobes (<-40 dB), stacked beam and phased array systems, (1-D, 2-D, Limited Field of View [LFOV]), Moving Target Detection (MTD) are all explained in simple terms. For both the novice and experienced covered are tracking, prediction and smoothing in simple terms (mystery taken out of GH, GHK and Kalman filters); the latest developments and future trend in solid state, tube and digital processing technologies; synthetic aperture radar (SAR); Displaced Phase Center Antenna (DPCA); Space-Time Adaptive Processing (STAP); digital beam forming (DBF); Adaptive-Adaptive Array Processing for jammer suppression with orders of magnitude reduction in computation; RECENT AMAZING RADAR BREAKTHROUGHS

SINGLE CHIP 77GHz RADAR



(G. KLARI, ET AL., "SINGLE CHIP MM RADAR", MICROWAVE J., 1-14-15;
R. J. Evans et al., "Consumer Radar," *Int. Radar Conf.*, Adelaide, 9/2013, pp. 21-26)

and Far Field Defined, Phased Steering, Subarraying, Array Weighting, Monopulse, COBRA DANE slide tour (10 story building).

FUNDAMENTALS OF Radar: Radar equation derived. FREQUENCY TRADEOFFS: Search vs Track, Range and Doppler Ambiguities, Detection in Clutter. Blind Velocity region, range eclipsing, Environmental Factors, Dependence of clutter model on grazing angle and size radar resolution cell discussed, Weibull clutter, Polarization Choice.

Lecture 2, Nov. 13

FUNDAMENTALS of Radar: Part 2: Antenna Pattern Lobing in Elevation due to multipath, Detection of Low Flying Low Cross-Section targets, Ground Multipath Elevation Angle Error Problem and ways to cope with it, e.g., use of an even difference pattern Off-Axis Monopulse,

Lecture 1, Nov. 6

FUNDAMENTALS OF Radar: Part 1: Very brief history of radar, major achievements since WWII: PHASED ARRAYS: Principles explained with COBRA DANE used as example. Near

GOOGLE RADAR IN SMART WRIST WATCH

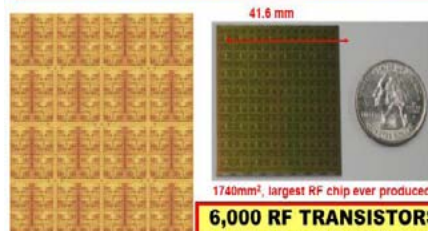
**FITS ON PINKY TOE NAIL
4 ANTENNAS; 0.05W DC POWER**



<http://spendergast.blogspot.com/2016/05/googles-project-soli-demos-mmwave-micro.html>
<http://www.theverge.com/2016/5/20/11720876/google-soli-smart-watch-radar-atap-io-2016>

surface-based ducts, evaporation ducts. Determination of radar coverage using new AREPS program. ANTENNA SCANNING SYSTEMS: Fixed Beam System: Wake Measurement Radar; 2-D Radars, 3-D Radars: Stacked Beam: Marconi Martello, Smart-L, SMART-ELLO, ARSR-4; 1-D Frequency Scanning: ITT Series 320; 1-D Phased Scanning: TPS-59, GE-592, RAT-31DL; Phased-Frequency Scanners: Raytheon Fire Finder and Plessey AR320.

256 (16X16) - ELEMENT SINGLE CHIP 60 GHZ TX/RX PHASED ARRAY



**6,000 RF TRANSISTORS
100K FOR BIAS/CONTROL**

S. ZINIR & G. M. REBEIZ, IEEE IMS, MAY, 2016

IEEE WSC: Millimeter-wave Systems

Lecture 3, Nov. 20

FUNDAMENTALS of Radar: Part 4: ULTRA LOW ANTENNA SIDELOBES (40 dB down or more). MOVING TARGET INDICATOR (MTI): Two-Pulse Cancellor, Pulse Doppler Process-

ing; MOVING TARGET DETECTOR (MTD); Optimum Clutter Cancellor, Space-Time Adaptive Processing (STAP), Airborne MTI (AMTI), Displaced Phase Center Antenna (DPCA).

Lecture 4, Dec. 4

SIGNAL PROCESSING: Part 1: What is PULSE COMPRESSION? Matched Filters; Chirp Waveform Defined; ANALOG PROCESSING: Surface Acoustic Wave (SAW) Devices: Reflective Array Compressor (RAC), Delay Lines, Bandpass Filters, Oscillators, Resonators;

Complex Monopulse, Two Frequency Radar Systems: Marconi L- and S-band S631, Signaal/Thales

(Holland), Flycatcher X and Ka System; Tube and Solid State OTH. PROPAGATION: standard, superrefraction, subrefraction,

**USING TUBES \$35 STICK WOULD:**

- COST \$130B (\$1/TUBE)
- REQUIRE 130 GW (1W/TUBE) OR 130 NUCLEAR POWER PLANTS
- WOULD STACK TO 9X DISTANCE TO THE MOON

ECHODYNE RADARS USING METAMATERIAL ARRAYS

MESA-D-DEV K-BAND RADAR: FACILITY/BORDER PROTECTION

RANGE >500M FOR MAN TARGET
± 60° AZ, ± 40° EL

MESA-DAA K-BAND RADAR: UAV DETECTION &

RANGE 3KM
± 60° AZ, ± 40° EL

(ECHODYNE WEB PAGE)

STEALTH DEFEATING QUANTUM RADAR

- MAKES USE OF QUANTUM ENTANGLEMENT
- DETECTION OF SINGLE PHOTON
- CAN BE USED TO DETECT CANCER CELLS
- ELECTRONICS TECHNOLOGY GROUP CORPORATION (CETC) OF CHINA
- TECHNOLOGY USED IN CHINA QUANTUM SATELLITE



HTTPS://WWW.RT.COM/NEWS/358664-CHINA-QUANTUM-RADAR-TEST/

IMCON Devices; Analog Programmable Monolithic SAW Convolver; BBD/CCD. What are they?

Lecture 5, Jan. 8

SIGNAL PROCESSING: Part 2: DIGITAL PROCESSING: Fast Fourier Transform (FFT); Butterfly, Pipeline and In-Place Computation

explained in simple terms; Maximum Entropy Method (MEM) Spectral Estimate; State-of-the-art of A/Ds, FPGAs and Memory; Signal Processor Architectures: Pipeline FFT, Distributed, Systolic; Digital Beam Forming (DBF). Future Trends.

Lecture 6, Jan. 22

SYNTHETIC APERTURE RADAR (SAR): Strip and Spotlight SAR explained in simple terms.

TUBES: Basics given of Magnetron, Cross Field Amplifiers, Klystrons, Traveling Wave Tubes, Gyro Tubes.

TREND TOWARD SOLID STATE PHASED-ARRAY TRANSMITTERS: Discrete All Solid State PAVE PAWS and BMEWS radars; advantages

over tube radars; MMIC (Monolithic Microwave Integrated Circuitry; integrated circuitry applied to microwave components): THAAD, SPY-3, IRIDIUM, XBR, JLENS. Solid State 'Bottle' Transmitters: ASR -11/ DARS, ASR-23SS, ASDE-X. Extreme MMIC.

Breakthroughs and Trends in Radar and Phased-Arrays: Radar on a chip, 258 element phased array on a chip, new revolutionary metamaterial for electronically scanned arrays and target stealthing, Moore's Law marches forward, quantum anti-stealth radar, you have heard of orthogonal H and V polarization which can double channel data rate, there are an infinite other polarizations called orbital angular momentum (OAM).

SS* AIR TRAFFIC CONTROL RADARS

*SS=SOLID STATE
**J. WANG,
E. BROOKNER,
RAYTHEON US PATENT
2009/0096662 A1

**Lecture 7, Jan. 29**

TRACKING, PRE-DICTION AND SMOOTHING: $\alpha\beta\gamma$ (GHK) Filter; Kalman Filter. All explained in simple physical terms.

Lecture 8, Feb. 5

HOW TO LOOK LIKE A GENIUS IN DE-

TECTION WITHOUT REALLY TRYING: Simple procedure for determining detection. Covered are beam shape, CFAR, mismatch losses.

The Following is Included in Your Registration:

	Value
Textbook	\$159
15 Reprints	\$300
Over 800 Vugraphs	\$120

Decision (Run/Cancel) Date for this Course is Friday, October 27, 2017

Payment received by October 24

IEEE Members	\$300
Non-members	\$340

Payment received after October 24

IEEE Members	\$340
Non-members	\$370

Modern Wireless System Design: From Circuit to Web-based Apps.

Date & Time: 9AM - 4:30PM, Thursday & Friday, October 26 & 27

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Henry Lau Lexiwave Technologies

Overview:

Nowadays, as the features of wireless communication products and systems are getting more in number and sophisticated to stay competitive, the products have to contain both hardware and software. It is thus beneficial for an engineer or manager to acquire a broad understanding on how a modern wireless communication product or system works with both hardware and software components. This course is aimed to provide an opportunity for participants to acquire technical insights on the vital aspects of Modern Wireless System Design from an industry and practical perspective. It is an introductory level for circuit, software, system engineers and managers who would like to acquire an overview on the vital aspect and design considerations on complete wireless system design. Various functional blocks of wireless systems and products will be discussed and analyzed with practical examples on commercial products. The software development will also be addressed to provide a comprehensive understanding of the development of complete wireless systems. The course will be conducted by a wireless design expert with rich industrial experience. Interactive and open discussions between speaker and participants are encouraged and facilitated to make the whole course more interesting and thought stimulating.

Audience:

System engineers, wireless product designers, software engineers, RF and microwave circuit design engineers, field application engineers, business development engineers and managers involved in wireless products and systems.

Benefits:

Upon completion of this course, participants should be able to:

1. understand the key functional blocks of Modern Wireless Products/Systems and their characteristics and specifications
2. understand how the key component blocks interact and the implications on overall system performance
3. compare and evaluate different types of receiver and transmitter architectures
4. comprehensive understanding on the embedded software development as well as web-based and app-based software development
5. acquire practical design techniques from case studies on commercial wireless products

Course Content:

Receiver

System Characteristics

Signal and Noise

Noise temperature, noise bandwidth, noise figure, sensitivity

Linearity

Dynamic Range, one dB compression point, intermodulation

Critical Circuit blocks

LNA, local oscillator, mixer, IF amplifier, demodulator, baseband amplifier

System Architectures and design considerations

Heterodyne, Direct Conversion, Image-reject and Low-IF Receiver

Sample Receiver Designs

Transmitter

Circuit blocks: oscillator, modulator, buffer amplifier, frequency multiplier, power amplifier, output filter

Major issues: power gain, power efficiency, harmonic prevention and suppression

Wireless Modules

Types: GPS, Bluetooth, GSM/GPRS, Wifi
Applications
Electrical parameters

Miniature Antennas for Portable electronics

Antenna Fundamentals
Radiation mechanism
Source of radiation
Characteristic of radiation
Parameters and specifications
Radiation pattern, antenna efficiency, aperture concept, directivity and gain
Types of antenna and performance
Dipole
Monopole
Loop
miniature antennas – patch, inverted-L, inverted-F, meandered line
Practical design considerations and techniques for portable electronics

Software Development

Embedded device
Type of MCU
Characteristics, functions and features
Design considerations
Web database development
MySQL
Website development
Software - HTML, Javascript and PHP
Web server

Smartphone Apps Development
Android development tool
Phonegap
IOS

Expertise:

Henry Lau received his M.Sc. and MBA degrees from UK and USA respectively. He has more than 25 years of experience in designing wireless systems, products and RFICs in both Hong Kong and US. He worked for Motorola and Conexant in US as Principal Engineer on developing RFICs for cellular phone and silicon tuner applications. Mr Lau holds five patents and has one patent pending, all in RF designs. He is currently running Lexiwave Technology, a wireless company in Hong Kong and US designing and selling RFICs, RF modules and wireless solutions. He has also been teaching numerous RF-related courses internationally.

Decision (Run/Cancel) Date for this Course is Tuesday, October 17, 2017

Payment received by October 13

IEEE Members	\$405
Non-members	\$435

Payment received after October 13

IEEE Members	\$435
Non-members	\$455

notes, lunch and coffee breaks included with registration

<http://ieeeboston.org/modern-wireless-system-design-circuit-web-based-apps-fall-2017>

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

Facebook: <https://www.facebook.com/IEEEBoston>

YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Practical RF PCB Design: Wireless Networks, Products and Telecommunications

Date & Time: Thursday & Friday, December 14 & 15; 9AM - 4:30PM

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Henry Lau, Lexiwave Technology

Overview: One of the most demanding consumer products in the market is the wireless telecommunication product. A well-designed Radio Frequency Printed Circuit Board (RF PCB) contributes significantly to the success of any wireless product as the layout of the PCB greatly affects the performance, stability and reliability of the product. In today's highly competitive wireless products market with increasingly compressed development time-frame, there is a strong demand for RF professionals who possess the knowledge and experience to design top-performing RF PCBs in less number of iterations. What matters is whether your level of competence is up to the required standard to meet such demand.

Audience: RF Designers, Wireless Product Designers, Field Application Engineers, Design Managers and related professionals.

Benefits: This course aims to provide participants with an insightful training on RF PCB design from a practical, industrial perspective. Participants will be led through a systematic, theoretical presentation with case studies on commercial products in the training. The course will be conducted by an RF expert with rich industrial experience. It is suitable for RF professionals who want to keep up-to-date their skills and knowledge in RF PCB design and stay competitive.

OUTLINE

1. Printed circuit board design for RF circuits

From product design, circuit design to PCB design
Layer stack-up assignment
Grounding methods and techniques
Interconnects and I/O
Bypassing and decoupling
Partitioning methods

2. Printed circuits board design for other circuits

Clock circuits
Base-band circuits
Audio circuits
Power supplies
Impedance-controlled circuits

3. PCB design for EMC/EMI compliance

EMC/EMI compliance
Grounding methods
Decoupling methods
Shielding methods

4. Additional Design Techniques

Production concerns
Systematic product design approach
RF Modules
Evaluation boards
Other RF concerns
Casing design

5. Case studies

Expertise:

Henry Lau received his M.Sc. and MBA degrees from UK and USA respectively. He has more than 25 years of experience in designing RF systems, products and RFICs in both Hong Kong and US. He worked for Motorola and Conexant in US as Principal Engineer on developing RFICs for cellular phone and silicon tuner applications. Mr Lau holds five patents all in RF designs. He is currently running Lexiwave Technology, a fables semiconductor company in Hong Kong and US designing and selling RFICs, RF modules and RF solutions. He has also been teaching numerous RF-related courses internationally.

*notes, lunch and coffee breaks
included with registration*

**Decision (Run/Cancel) Date for this Courses is
Monday, December 4, 2017**

Payment received by November 29

IEEE Members \$405

Non-members \$435

Payment received after November 29

IEEE Members \$435

Non-members \$455

<http://ieeeboston.org/practical-rf-pcb-design-wireless-networks-products-telecommunications-fall-2017>

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically divers sections of the IEEE. We have over 20 active chapters and affinity groups.

If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/>

Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- Honoraria can be considered for course lecturers
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Patenting Outside of the U.S.

Date & Time: 6 – 9PM, Monday, October 23

Location: Tufts University, Halligan Hall, Room TBD., 161 College Ave, Medford, MA

Speaker: Christine Kuta, Kuta Intellectual Property Law, LLC

Course Overview: Most countries in the world have a patent office where one can apply for protection of inventive ideas. There is, however, no global patent that provides rights everywhere. Operating in the global economy, though, requires some patent protection beyond the U.S. borders. Therefore, understanding the systems and strategies for determining how and where to apply for protection outside the U.S. is critical for operating in the global economy. This class will provide information about systems and strategies for obtaining patent protection outside the U.S.

Description: The class will provide an overview of the laws and requirements, and explain the procedures in obtaining foreign patent rights. International treaties such as the Patent Cooperation Treaty (PCT) will be discussed. The PCT enables the applicant to begin the patent process in most of the world's countries simultaneously. The European Union (EU) unitary patent, the first multinational patent, and unified patent court will also be discussed. The EU unitary patent and the unified court have been in development for a number of years and is about to launch despite delays caused by Brexit. Foreign filing rights are easy to lose and costs can be difficult to contain, however, the class will also provide some strategies for effective foreign filing in spite of the difficulties.

Target Audience: Engineers in large and small companies with new ideas, inventors, entrepreneurs seeking to develop a patent strategy, anyone interested in learning about patents and how to obtain a patent outside the U.S.

Benefits of attending: Understanding the process and requirements for obtaining a foreign patent;

information about how to leverage U.S. patents rights in the foreign application process; understanding the procedures in order to make effective business decisions and contain costs. Course will include handouts including a list of resources.

Course outline:

- I. Patents
 - A. Quick overview of what patents protect and why patent protection should be pursued.
 - B. High level view of process
 - C. Foreign filing license
- II. Foreign patents
 - A. Basis for foreign patent protection
 - B. Representation
 - C. Differences in the process as compared to U.S.
 - i. Patent eligibility
 - ii. Inventorship
 - iii. Patent Types
 - iv. Process
 - v. Fees
- III. International applications – i.e., starting the foreign application process in many countries at once
 - A. Patent Cooperation Treaty
 - B. Regional applications
- IV. The Unitary Patent and Unified Patent Court -- new developments in the Old World
 - A. What it is and how it works
 - B. Proposed dates of implementation
 - C. Filing options
- V. Protection strategies
- VI. A few words about enforcement

Christine Kuta is an Intellectual Property lawyer. Her practice includes Intellectual Property strategy, portfolio development and management, and patent and trademark prosecution, search and opinions. Ms. Kuta counsels clients in a wide variety of technical areas including computer systems and software applications, medical devices, lighting systems, optics, materials and manufacturing processes, complex data management systems, electronics, energy management systems and energy storage including fuel cells, mechanical devices and consumer products including clothing and accessories.

**Decision (Run/Cancel) Date for this Course is
Monday, October 16, 2017**

Payment received by October 12

IEEE Members \$50

Non-members \$60

Payment received after October 12

IEEE Members \$60

Non-members \$70

<http://ieeeboston.org/patenting-outside-u-s-fall-2017>

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<http://ieeeboston.org/course-proposals/> .

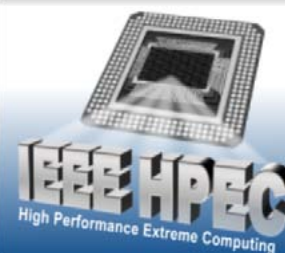
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- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
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- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.



2017 IEEE High Performance Extreme Computing Conference (HPEC '17) *Twenty-first Annual HPEC Conference*

12 - 14 September 2017
Westin Hotel, Waltham, MA USA



HPEC 2017

[Register Now!](#)

[Preliminary Agenda Preview](#)

HPEC is the largest computing conference in New England and is the premier conference in the world on the convergence of High Performance and Embedded Computing. We are passionate about performance. Our community is interested in computing hardware, software, systems and applications where performance matters. We welcome experts and people who are new to the field.

Highlights Include:

Keynote Speakers

Dr. Ivan Sutherland (ACM Turing Award; IEEE John von Neumann Medal; NAE Fellow; NAS Fellow; ACM Fellow) - Clockless Computing
Mr. Andreas Olofsson (Program Manager - DARPA MTO) - Intelligent Design Automation, System Optimization, and Open Hardware

Invited Speakers

Mr. Trung Tran (Program Manager - DARPA MTO) - Machine Learning, Data Analytics, and Non-Conventional Computer Architecture
Dr. Merri Sanchez (AIAA Fellow; Chief Science and Technical Advisor - Air Force Space Command)
Prof. Barry Shoop (2016 IEEE President; Electrical Engineering Chair - United States Military Academy) - Innovation as an Ecosystem
Prof. Saman Amarasinghe (MIT Computer Science & AI Laboratory) - Making Sparse Fast
Prof. David Bader (IEEE Fellow; AAAS Fellow; Georgia Tech - Chair School of Computational Science and Engineering) - Massive-Scale Streaming Analytics
Dr. John Feo (Director - Northwest Institute for Advanced Computing) - HAGGLE - Hybrid Attributed Generic Graph Library Environment
Mr. John Goodhue (Executive Director - Massachusetts Green High Performance Computing Center)
Dr. Jeremy Kepner (MIT Lincoln Laboratory Fellow; Founder Lincoln Laboratory Supercomputing Center) - Convergence of Machine Learning, Big Data, and Supercomputing
Dr. Mark Ritter (Distinguished Research Staff - IBM Physical Sciences) - Heuristic Quantum Variational Algorithms on a Small Quantum Computer
Dr. Michael Vai (MIT Lincoln Laboratory Secure, Resilient Systems & Technology) - Bridging System Functionality and Cybersecurity

Special Events

GraphBLAS forum to define standard building blocks for graph algorithms; organizers: Dr. Aydın Buluç (Lawrence Berkeley National Laboratory); Dr. Scott McMillan (CMU Software Engineering Institute); Dr. Marcin Zalewski (Pacific Northwest National Laboratory) Massachusetts and Exascale Computing; organizers: Dr. Chris Hill (Principal Research Engineer - MIT) & Prof. Patrick Dreher (North Carolina State)
Integrating Quantum Computing with High Performance Classical Computing; organizers: Dr. Tim Braje (MIT Lincoln Laboratory) & Dr. John Cortese (MIT Lincoln Laboratory)
Secure and Resilient Computing; organizers: Dr. Michael Vai (MIT Lincoln Laboratory Secure Resilient Systems & Technology) & Dr. George Kalb (JHU Information Security Institute)
OpenSuperComputing BoF; organizer: Mr. Kurt Keville (MIT ISN)

Tutorials

BigDAWG Big Data Working Group Tutorial; organizers: Dr. Vijay Gadepally (MIT Lincoln Laboratory Supercomputing Center), Kyle O'Brien (MIT Lincoln Laboratory Intelligence and Decision Technologies)
Introduction to CUDA and Machine Learning; Dr. Larry Brown (Solutions Architect - NVidia)
OpenMP programming; Dr. Tim Mattson (Principal Engineer - Intel)
Mathematics of Big Data: Spreadsheets, Databases, Matrices, and Graphs; organizer: Dr. Jeremy Kepner (MIT Lincoln Laboratory Supercomputing Center)

Presentations will be represented in the following topics:

High Performance Data Analysis
Machine Learning
Advanced Multi-core Software Technologies
Case Studies and Benchmarking of Applications
Automated Design Tools
Mapping and Scheduling of Parallel and Real-Time Applications
Computing Technologies for Challenging Form Factors
ASIC and FPGA Advances
Open System Architectures
Data Intensive Computing
Big Data and Distributed Computing
Interactive and Real-Time Supercomputing
Graph Analytics and Network Science
Fault-Tolerant Computing
Embedded Cloud Computing
Digital Front Ends
General Purpose GPU Computing
Advanced Processor Architectures

Quick Links:

- [HPEC Home Page](#)
- [Committee](#)
- [Preliminary Program](#)
- [Conference Registration](#)
- [Conference Venue](#)



Advanced Embedded Linux Optimization

Time & Date: 6 - 9PM, Mondays, Jan. 8, 15, 22 & 29, 2018 (12 hours of instruction!)

Location: Woburn, MA area near to Rt. 95/128

Speaker: Mike McCullough, RTETC, LLC

Course Summary - This 4-day technical training course provides advanced training in the debugging, testing, profiling and performance optimization of Embedded Linux software. The first part of the course focuses on advanced debugging, testing and profiling in an Embedded Linux context with a focus on using Eclipse, Backend Debuggers, JTAG and In-Circuit Emulators as well as Kernel Logging capabilities and Kernel Hacking. The latter part of the course covers performance measurement and optimization affecting boot, memory, I/O and CPU performance and key performance optimization tools for Embedded Linux software including the perf tool, advanced cache usage and compiler-based optimization.

Who Should Attend - The course is designed for real-time engineers who are developing high-performance Linux applications and device drivers using Embedded Linux distributions. It is also targeted at experienced developers requiring a refresher course on Advanced Embedded Linux optimization.

Course Objectives

- To understand debugging, profiling and testing high performance Embedded Linux software.
- To provide an overview of Linux application performance measurement and optimization.
- To understand the tools used for performance optimization of Embedded Linux software.
- To give students the confidence to apply these concepts to their next Embedded Linux project.

Course Schedule Day 1

Getting Started with Embedded Linux
 Embedded Linux Training Overview
 Terminology
 Linux Versioning
 The GPL
 Building the Kernel Source Code
 Embedded Linux Kernels
 BSPs and SDKs
 Linux References (Books and Online)
 A Development Cycle Focused on Performance
 A Basic Optimization Process
Basic Debugging Review
 Embedded Applications Debug
 GDB, GDB Server and the GDB Server Debugger
 Other Debuggers
 An Eclipse Remote Debug Example
 Debugging with printk, syslog, syslogd and LTTng
System-Level Debug
 System-Level Debug Tools
 The /proc and /sys Filesystems
 Basic Logging
 KDB and KGDB
 Crash Dumps and Post-Mortem Debugging
Debugging Embedded Linux Systems
 Backend Debuggers
 In-Circuit Emulators
 Hardware Simulators
 Analyzers

Course Schedule Day 2

Requirements Development

Performance Requirements
 Derived Requirements
 Testability and Traceability
 Reviewing Requirements
 Designing for Performance
 Design for Test (DFT)
 Agile Software Design
 Software and Linux Decomposition
 Memory Management
 CPU and OS Partitioning
 Design Reviews
 Coding for Performance
 Coding Standards and Consistency
 Languages, Libraries and Open Source
 Components
 Learning Magic Numbers
 Letting Compilers Work For You
 Global, Static and Local Variables
 Code Reviews

 Software Testing
 Unit-Level Testing
 System-Level Testing
 Code Coverage Tools
 gcov
 Automated Testing
 Some Embedded Linux Test Recommendations
 DebugFS
 Configuring DebugFS
 DebugFS Capabilities
 Advanced Logging
 LogFS
 Using Logwatch and Swatch
 Using syslogd and syslog-ng
 Tracing
 ptrace and strace
 New Tracing Methods
 SystemTap
 Ftrace, Tracepoints and Event Tracing
 Tracehooks and utrace
 Profiling
 Basic Profiling
 gprof and Oprofile
 Performance Counters
 LTTng

Another DDD Example
 Manual Profiling
 Instrumenting Code
 Output Profiling
 Timestamping

Course Schedule Day 3

Addressing Performance Problems
 Types of Performance Problems
 Using Performance Tools to Find Areas for
 Improvement
 Application and System Optimization
 CPU Usage Optimization
 Memory Usage Optimization
 Disk I/O and Filesystem Usage Optimization
 Measuring Embedded Linux Performance
 Some Ideas on Performance Measurement
 Common Considerations
 Uncommon Considerations
 Using JTAG Methods
 BootLoader Measurements
 Boot Time Measurements
 The Perf Tool
 Origins of Perf
 The Perf Framework
 Perf Commands and Using Perf
 Listing Events
 Counting Events
 Profiling with Perf
 Static Tracing with Perf
 Dynamic Tracing with Perf
 Perf Reporting
 Performance Tool Assistance
 Recording Commands and Performance
 System Error Messages and Event Logging
 Dynamic Probes
 Jprobes and Return Probes
 Kernel Probes
 Kexec and Kdump
 Improving Boot Performance
 Boot Time Optimization
 The Linux Fastboot Capability
 Building a Smaller Linux
 Building a Smaller Application
 Filesystem Tips and Tricks

Some Notes on Library Usage

Course Schedule Day 4Improving Kernel Performance

Kernel Hacking

CONFIG_EMBEDDED

Configuring printk

Test Code

Configuring Kernel and IO Scheduling

Improving CPU Performance

Run Queue Statistics

Context Switches and Interrupts

CPU Utilization

Linux Performance Tools for CPU

Process-Specific CPU Performance Tools

Stupid Cache Tricks

Improving System Memory Performance

Memory Performance Statistics

Linux Performance Tools for Memory

Process-Specific Memory Performance Tools

More Stupid Cache Tricks

Improving I/O and Device Driver

Performance

Disk, Flash and General File I/O

Improving Overall Performance Using theCompiler

Basic Compiler Optimizations

Architecture-Dependent and Independent Optimization

Code Modification Optimizations

Feedback Based Optimization

Application Resource Optimization

The Hazard of Trust

An Iterative Process for Optimization

Improving Development Efficiency

The Future of Linux Performance Tools

Some Final Recommendations

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. He has held a variety of software engineering positions at LynuxWorks, Embedded Planet, Wind River Systems and Lockheed Sanders. RTETC, LLC provides real-time embedded training and consulting to many embedded systems companies. RTETC focuses on real-time operating systems (RTOS), Linux and Android solutions for the embedded systems market.

**Decision (Run/Cancel) Date for this Course is
Thursday, December 28, 2017**

Payment received by December 26**IEEE Members \$395****Non-members \$415****Payment received after December 26****IEEE Members \$415****Non-members \$435**

<http://ieeeboston.org/advanced-embedded-linux-optimization-2>

IEEE Boston Section Social Media Links:**Twitter:** <https://twitter.com/ieeeboston>**Facebook:** <https://www.facebook.com/IEEEBoston>**YouTube:** <https://www.youtube.com/user/IEEEBostonSection>**Google+:** <https://plus.google.com/107894868975229024384/>**LinkedIn:** <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Introduction to Embedded Linux

Time & Date: 6 - 9PM, Mondays, Oct. 16, 23, 30, Nov. 6 (12 hours of instruction!)

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Mike McCullough, RTETC, LLC

Course Summary - This 4 day course introduces the Linux Operating System and Embedded Linux Distributions. The course focuses on the development and creation of applications in an Embedded Linux context using the Eclipse IDE. The first part of the course focuses on acquiring an understanding of the basic Linux Operating System, highlighting areas of concern for Embedded Linux applications development using Eclipse. The latter part of the course covers testing, booting and configuring of Embedded Linux systems including embedded cross-development and target board considerations.

Who Should Attend - The course is designed for real-time engineers who are building Embedded Linux solutions. It is also targeted at experienced developers requiring a refresher course on Embedded Linux. This course will clearly demonstrate both the strengths and weaknesses of the Linux Operating System in Embedded Systems.

Course Objectives

- To provide a basic understanding of the Linux OS and the Eclipse IDE framework.
- To understand the complexities of Embedded Linux Distributions in embedded systems.
- To learn how to configure, boot and test Embedded Linux distributions and applications running on Embedded Linux target systems.
- To give students the confidence to apply these concepts to their next Embedded Linux project

Hardware and Software Requirements - The student should have a working Linux desktop environment either directly installed or in a virtualization environment. The desktop Linux should have the GNU compiler and binary utilities (binutils) already installed. A working Eclipse C/C++ installation or prior knowledge of C-based Makefiles is useful for completion of lab exercises. Lab solutions are also provided with the course. An Embedded Linux target hardware platform is useful but not absolutely required for this course.

Additional Reference Materials

- Linux Kernel Development by Robert Love
- Linux System Programming by Robert Love
- Embedded Linux Primer by Christopher Hallinan
- Pro Linux Embedded Systems by Gene Sally
- Embedded Linux Development Using Eclipse by Doug Abbott
- Linux Device Drivers by Jonathan Corbet et al
- Essential Linux Device Drivers by Sreekrishnan Venkateswaran

Course Schedule Day 1

Embedded Development Basics

Embedded Systems Characteristics

Embedded Real-Time Systems

Embedded Linux Systems and the Internet of Things (IOT)

Embedded Linux Basics

Embedded Linux Training Overview

Linux Terminology, History and Versioning

The Linux Community: Desktop & Embedded Linux and the GPL

Linux References (Books and Online)

Getting Started in Embedded Linux

Kernel Source Code
 Building the Kernel
 Embedded Linux Kernels
 Linux 2.6, 3.x and 4.x
Embedded Linux Kernel Overview
 Process and Threads Management
 Signals and System Calls
 Synchronization, IPC and Error Handling
 Timing and Timers
 Memory Management and Paging
 The I/O Subsystem: A Tale of Two Models
 Modularization
Debugging
 Process-Level and System-Level Debug
 GDB, GDB Server and the GDB Server Debugger
 Other Debug and Test Tools
 An Eclipse Remote Debug Example
 Advanced Debug with printk, syslogd and LTTng

System-Level Debug

System-Level Debug Tools
 The /proc Filesystem
 Advanced Logging Methods
 KGDB and KDB
 Crash and Core Dumps

Course Schedule Day 2

Process & Threads Management

What are Processes and Threads?
 Virtual Memory Mapping
 Creating and Managing Processes and Threads
 Thread-Specific Data (TSD)
 POSIX
 The Native POSIX Threading Library (NPTL)
 Kernel Threads

Signals in Embedded Linux

System Calls in Embedded Linux

Scheduling

Linux 2.4 and 2.6 Scheduling Models
 The O(1) Scheduler
 The Completely Fair Scheduler (CFS)

Synchronization

Via Global Data
 Via Semaphores, Files and Signals
 Condition and Completion Variables
 Mutexes and Futexes

Inter-Process Communications (IPC)

Message Queues
 Semaphores Revisited
 Shared Memory
 Pipes and FIFOs
 Remote Procedure Calls
 Networking

Course Schedule Day 3

Memory Management and Paging

Linux, Demand Paging and Virtual Memory
 Allocating User and Kernel Memory
 Mapping Device Memory
 The Slab Allocator
 The OOM Killer
 Managing Aligned Memory
 Anonymous Memory Mappings
 Debugging Memory Allocations
 Locking and Reserving Memory
 Huge Pages
 Memory in Embedded Systems

Error Handling

errno and perror
 strerror and strerror_r
 oops, panics and Segmentation Faults

Timing

How Linux Tells Time
 Kernel, POSIX and Interval Timers
 High-Resolution Timers (HRTs)

Sleeping

Sleep Waiting and Spinlocks
 Using Timers
 Embedded Recommendations for Timing

Modularization

Creating and Building a Module
 A Simple Kernel Module
 Module Loading
 Module Dependencies
 Module Licensing

Shared Libraries

A Shared Library Example

Static and Dynamic Libraries

Interrupt and Exception Handling

Bottom Halves and Deferring Work

Course Schedule Day 4

The I/O Subsystem: A Tale of Two Models

The UNIX Device Driver Model

The Standard I/O Interface

Major and Minor Numbers

Configuring the Device Driver

The Evolution of the New Device Driver Model

The Initial Object-Oriented Approach

Platform Devices, Busses, Adapters and Drivers

A Generic Subsystem Model

The Generic Subsystem Model in Detail

Subsystem Registration

The Probe and Init Functions

The Show and Store Functions

User Access via the /sys Filesystem

Configuring the New Device Driver

The udev Linux Application

Comparing the Two Driver Models

Advanced I/O Operations

Standard UNIX I/O Operations

Scatter-Gather and Asynchronous I/O

Poll/Select and Epoll

Memory-Mapped I/O

File Advice

I/O Schedulers and inotify

The Linux Boot Process

The Root Filesystem

Desktop Linux Boot

Bootloaders and U-Boot

Embedded Linux Boot Methods

Building and Booting from SD Cards

Managing Embedded Linux Builds

Configuring and menuconfig

Oldconfig, menuconfig, xconfig and gconfig

Building Custom Linux Images

Target Image Builders

The Open Embedded Project and the Yocto Project

System Architecture Design Approaches

Deploying Embedded Linux

Choosing and Building the Root Filesystem

Module Decisions

Final IT Work

Embedded Linux Trends

Development Trends

Monitoring Trends

Testing Trends

Some Final Recommendations

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. He has held a variety of software engineering positions at LynuxWorks, Embedded Planet, Wind River Systems and Lockheed Sanders. RTETC, LLC provides real-time embedded training and consulting to many embedded systems companies. RTETC focuses on real-time operating systems (RTOS), Linux and Android solutions for the embedded systems market.

**Decision (Run/Cancel) Date for this Course is
Friday, October 6, 2017**

Payment received by October 2

IEEE Members \$400

Non-members \$430

Payment received after October 2

IEEE Members \$430

Non-members \$455

<http://ieeeboston.org/introduction-embedded-linux-fall-2017>

Embedded Linux Board Support Packages and Device Drivers

Date & Time: 6 - 9PM; Mondays, Nov. 13, 27, Dec. 4, 11 & 18 (15 hours of instruction!)

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Mike McCullough, RTETC, LLC

Course Summary - This 5-day technical training course provides advanced training in the development of Embedded Linux Board Support Packages (BSPs) and Device Drivers. The first part of the course focuses on BSP and Software Development Kit (SDK) development in an Embedded Linux context with a focus on application performance measurement and improvement. The latter part of the course covers Embedded Linux Device Driver development including key device driver decisions and deployment considerations for Embedded Linux BSPs.

Who Should Attend - The course is designed for real-time engineers who are developing Embedded Linux BSPs and Device Drivers for Embedded Linux distributions. It is also targeted at experienced developers requiring a refresher course on Linux BSP and Device Driver development.

Course Objectives

- To gain an understanding of the complexities of BSP and SDK development and their uses in Embedded Linux systems.
- To provide a basic understanding of the Linux I/O Subsystem and the Device Driver Models provided with Embedded Linux distributions.
- To gain an in-depth understanding of character-based device drivers in Embedded Linux
- To understand key device driver subsystems including relatively slow I/O interconnects such as I2C, SPI and USB as well as high-speed interfaces such as Ethernet, USB 3.0 and PCIe

- To give students the confidence to apply these concepts to their next Embedded Linux project.

Course Schedule Day 1

Getting Started with Embedded Linux

Embedded Linux Training Overview
Linux Terminology, History and the GPL
Building the Kernel Source Code
Embedded Linux Kernels
BSPs and SDKs
Linux References (Books and Online)
BSP Requirements
U-Boot and Bootloader Development

Embedded Linux BSP Development Basics

Basic BSP Development
Files and Filesystem Support
The I/O Subsystem: Talking to Hardware
Memory Management and Paging
Error Handling in Embedded Linux BSPs
Timing and Timers
Interrupt and Exception Handling in BSPs
BSP Deployment Issues and Practices

Embedded Linux SDK Basics

The 3 Pieces of an SDK
Embedded Linux Distributions and the GNU Compiler Collection (GCC)
Other Embedded Linux Development Tools

Library Support, Glibc and Alternatives
SDK Deployment and Support

Course Schedule Day 2

Debugging

GDB, GDB Server and the GDB Server Debugger
Other Debug and Test Tools
An Eclipse Remote Debug Example
Advanced Debug with printk and syslogd

System-Level Debug

System-Level Debug Tools
The /proc and sys Filesystems
Advanced Logging Methods
KGDB and KDB
Crash Dumps

Debugging Embedded Linux Systems

Configuring Embedded Linux

Config Methods
Config Syntax
Adding Code to the Linux Kernel

Bootting Embedded Linux

Processor Startup
Initial Functions
The initcalls
Using __init Functions
NFS Booting

Root File Systems

RAMdisk Booting with initrd
RAMdisk Booting with initramfs
initrd vs initramfs
Root File System Development
Busybox Development
Building a RAMdisk for an initrd
Building a RAMdisk for an initramfs
Flash File System Development

Course Schedule Day 3

Testing and Debug of Embedded Linux BSPs

Kernel Debug and Kernel Probes
Kexec and Kdump
The Linux Test Project (LTP)
Performance Tuning Embedded Linux BSPs
Virtualization

Measuring Embedded Linux BSP Performance

Common Considerations
Uncommon Considerations
BootLoader Optimizations
Boot Time Measurements
Effective Memory and Flash Usage
Filesystem Performance Measurement
Some Ideas on Performance Measurement

The Original UNIX Device Driver Model

The fops and file structs
The inode and dentry structs
Major and Minor Numbers
Embedding Channel Information
Deferring Work
The /proc Filesystem
Configuring the Device Driver
A Simulated Device Driver
Modularization Revisited

Course Schedule Day 4

The Evolution of a New Driver Model

The Initial Object-Oriented Approach
Platform Devices and Drivers
A Generic Subsystem Model

The Generic Subsystem Model in Detail

Subsystem Registration
The Probe and Init Functions
The Show and Store Functions
User Access via the /sys Filesystem
Configuring the New Device Driver

The udev Linux Application

Comparing the Two Driver Models

The Flattened Device Tree (FDT)
openBoot and its Effect on Embedded Linux
The Device Tree Script (dts) File
The Device Tree Compiler (dtc)
The Device Tree Blob (dtb) File
Building a dtb File

Hybrid Device Drivers

Other fops Functions
The Need for ioctl

Linux Device Driver Subsystems

Direct Connect Device Drivers
Serial/Console Drivers, I2C & SPI
Real-Time Clocks and Watchdogs
GPIO and the Pinmux
Flash MTDs and Direct Memory Access
USB, Power and CPU Management
Video and Audio
PCI and VME
Block Devices
RAMdisk and Flash Filesystems
MMCs and SD Cards

Network Device Drivers

MAC and PHY Device Drivers
net_device and net_device_stats
Network Device Initialization
Device Discovery and Dynamic Initialization
Network Interface Registration
Network Interface Service Functions
Receiving and Transmitting Packets
Notifier Chains and Device Status Notification

Course Schedule Day 5

Unwired Device Drivers

Wireless Device Drivers (WiFi, WLAN)
Bluetooth and BlueZ
Infrared and IrDA
Cellular from 2G to 5G
Drivers in User Space
Accessing I/O and Memory Regions
User Mode SCSI, USB and I2C
UIO
High-Speed Interconnects
PCIe
iSCSI
Infiniband
FibreChannel
Debugging Device Drivers
kdb, kgdb and JTAG
Kernel Probes
Kexec and Kdump
Kernel Profiling
User Mode Linux
Performance Tuning Device Drivers

Some Final Recommendations

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. A 20-year electronics veteran, he has held various positions at LynuxWorks, Tilera, Embedded Planet, Wind River Systems, Lockheed Sanders, Stratus Computer and Apollo Computer. RTETC, LLC is a provider of Eclipse-based software development tools, training and consulting services for the embedded systems market.

**Decision (Run/Cancel) Date for this Course is
Friday, November 3, 2017**

Payment received by November 1

IEEE Members	\$450
Non-members	\$490

Payment received after November 1

IEEE Members	\$490
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