

The Digital
Reflector

PUBLISHED BY THE BOSTON SECTION OF THE
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, 8,000 MEMBERS STRONG!

<http://www.ieeeboston.org>

Free Technical Meetings

Paper Reviewed Conferences!

State-of -the -Art Professional Development Courses

TABLE OF CONTENTS

Spring Social and Awards Reception / Boston Section Social Media Links	Page 3
March Editorial, "Old People", Karen Panetta, Reflector Editor	Page 4
Call for Course Speakers/Organizers / Local Conference Listing.....	Page 6
Entrepreneurs' Network	Page 7
Reliability Society	Page 8
Photonics Society	Page 10
Entrepreneurs' Network	Page 11
Computer Society, and Society for Social Implications Of Technology	Page 12
Power and Energy Society	Page 13
Life Members and Aerospace and Electronic Systems Society	Page 14
Consultants' Network	Page 16
Data Interoperability Using JSON and JSON Schema.....	Page 17
IEEE Boston Section Awards - Call for Nominations	Page 18
Making You a Leader - Fast Track!	Page 20
Defining and Writing Business Requirements	Page 22
Basics of Software Defined Networks	Page 23
Introduction to Embedded Linux	Page 25
Call for Course Speakers and Organizers	Page 27
Optical Sensors Workshop	Page 28
2016 IEEE High Performance Extreme Computing Conference (HPEC), Call for Papers	Page 29
Modern Wireless System Design: From Circuits to Web-based Apps	Page 30
QA Testing in the Digital World	Page 32
Introduction to Network Function Virtualization (NFV)	Page 33
Advanced Embedded Linux Optimization	Page 35
Flexible Electronics - Packaging Design, and Materials Analysis for Aerospace, Military, Medical and High-end Consumer Products	Page 37
Phased-Array and Adaptive-Array Fundamentals and their Recent Advances	Page 38
Software Development for Medical Device Manufacturers	Page 43
Antennas and Propagation for Wireless Communications	Page 45
2016 IEEE International Symposium on Technologies for Homeland Security	Page 48

IEEE Boston Spring Social and Awards

The 2016 IEEE Boston Section Spring Social and Awards Reception will be held on **Sunday, June 12, 2016 from 1 - 4PM at the Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA.**

At this reception, we will recognize and/or present awards of all IEEE levels from Fellows to section awards to all Boston Section recipients. Members of the section and their families and friends are invited to attend.

Look for more details on the Boston Section website (ieeeboston.org) and in upcoming issues of the paper and digital Reflector (please sign up for the digital Reflector if you do not currently allow electronic communications from the section) as this will be our main publicity outlet after the May 2016 paper Reflector issue.

You can sign up at this link, <http://ieeeboston.org/notifications-of-next-digital-reflector/>

(NOTE: IF YOU ARE A MEMBER OF THE BOSTON SECTION AND YOU ARE ALREADY RECEIVING THE DIGITAL REFLECTOR, YOU DO NOT NEED TO SIGN UP AS IT WILL BE AUTOMATICALLY SENT TO YOU. NON-MEMBERS CAN SIGN UP AS WELL USING THE SAME LINK ABOVE!)

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>



Old People

Karen Panetta, Reflector, Editor

In 1977, Artist Randy Newman released a song called “Short People.” The lyrics go on a litany of negative character traits of short

people and the chorus chants “don’t want any short people around here.” Some of the character traits depicted in the song imply short people are liars and are out to get you. If the song were released today, the artist would most likely have to go into hiding to avoid death threats.

The artist’s intent was to choose a random physical characteristic of people and show how ridiculous it was to associate personality traits that have absolutely no correlation to a person’s height. His song most likely would have evoked the same reaction if he had replaced the words “short people” with “blue eyed people” or “people who open their eggs at the small end.” The point was, he was trying to say that attributing character traits to people based on some random discriminating factor was stupid.

I bring this up because we keep hearing about the shortage of qualified engineers in the U.S. and yet, there are thousands of well-qualified engineers out there and out of work. What’s wrong with these unemployed engineers that no one wants to hire them you ask? They are old.

Now, what exactly is old? That depends on who you ask. For most of the situations I have been observing lately, old means someone older than the person singing the tune “don’t want any old people around here.” So let’s say the the person singing is

44 years old, then by that standard, 50 is considered old and 60 means you should just climb in the box and close the lid. To these small minded boobs, a person over 60 is elderly and useless. You may have met a few of these “old people lives don’t matter” types in meetings using statements like, “we expect retirements in the department soon,” believing they are being tactful in pushing the oldest group members out the door right, while the “old” people are sitting in the same meeting.

After all, these experienced older individuals are known for their ability to point out naïve and stupid decisions that will make the project fail. Now, who wants someone around like that? Quick! Find some icebergs and let’s float them all out to sea!

Every time I encounter a person singing, “Don’t want any old people around here”, I want to send them off to an IEEE Life Member meeting. The Life members are not the decrepit walking dead that older people have been stereotyped as, and more importantly, they are brilliant. Many of the Life Members are successful entrepreneurs and many are still working because they really are not “old.” They do not sit around in their meetings discussing the status of their hemorrhoids. They discuss complex global challenges facing humanity and yes, they are not shy about voicing their opinions, proposing solutions and identifying promising technologies of the future. Hearing them discuss the history of technology and how we got to where we are today, is a bonus. They invite promising young engineers to give talks and are eager to help students flourish.

Some of my greatest mentors are now Life members. Their candid advice, wisdom and encourage-

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

ment has been the best value I received from my IEEE membership.

I do amaze my students with tales of the first electrified railway, the first wireless voice transmission, and my dinners with famous engineers and scientists. How many people can say they got to brainstorm designing new signal processing algorithms to dampen background noise in large ballrooms with the late Ray Dolby?

In sports training, we are told to train with someone who is a stronger player than you are to help improve your game. Well, I believe it is the same for your brain. I find “brain training” with Life Members to be the equivalent. And all it takes is that people stop singing “don’t want any old people” and put on a miracle ear and start to listen. Only then, will they understand what a wonderful resource our Life members are.

It will be many, many, many more decades before I am eligible for Life Membership, but that’s okay. To my 20-year-old students, anyone over the age of 26 is considered old, so by their standard, I am eligible to be put on an iceberg and floated out to sea.

But I will let you in on a secret. All the older engineers floating together on that iceberg are really prototyping new propulsion systems and testing novel wave power renewable energy sources!

A person is eligible to become a life fellow after turning 65 years young. Becoming an IEEE Life Member is based on the number of years a person has been an IEEE member plus her/his age. If that number is greater than or equal to 100, you can be a life fellow and not pay any more IEEE dues. Visit ieeeboston.org/life-members-affinity-group/ to learn more!

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>

Locally held IEEE Conferences

Save the travel costs and participate in these IEEE conferences held locally.

2016 IEEE High Performance Extreme Computing Conference
September 13 - 15 2016
www.ieee-hpec.org
(Abstract submission deadline is May 16, 2016)

2016 IEEE Symposium on Technologies for Homeland Security
May 10 -12 2016
www.ieee-hst.org

Hotel and Conference Registration is Now Open!!!

2016 IEEE International Symposium on Phased Array Systems & Technology
October, 18 - 21 2016
www.array2016.org

As always, the views expressed in our editorials are those of the author and not necessarily those of the IEEE Boston

Letters to the editor can be sent to,
["sec.boston@ieee.org"](mailto:sec.boston@ieee.org)

IEEE prohibits discrimination, harassment and bullying.
 For more information visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>

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 sec.boston@ieee.org 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.

Entrepreneur's Network – 6:30PM, Tuesday, 1 March

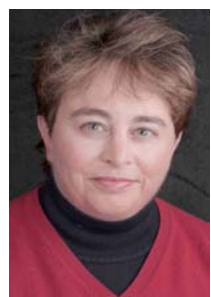
Succeeding with the Lean Startup Model

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

Meeting Location – Constant Contact, 1601 Trape-lo Road, 1st Floor, InnoLoft, Waltham, MA

Since the lean start-up movement began in 2008, there has been an explosion of interest and adoption of the methodology. Recent economic events, technological change and the rapid dissemination of information have highlighted the importance of the lean start-up principles, how it can streamline a start-up's work-flow and quantify results.

Learn how Lean Startup principles can help accelerate your business from entrepreneurs who put it to use everyday. Want to meet and network with Lean Startup entrepreneurs and venture capitalists? Are you eager to find out what works and what doesn't in the Lean Startup world? Then join us on March 1st.



Moderator: Stacey Arbetter, Co-founder & CEO of Mutt Maps, Inc., <http://muttmaps.com>

Stacey is a Serial Entrepreneur of several successful startups including the leading supplier in North America of an industrial product for the transportation industry and, previously, the

largest independent exporter of automobiles in the U.S. Excels at identifying market opportunities. She is motivated by new challenges where complex, innovative problem-solving skills and business strategy can bring direct and immediate value to an enterprise. Stacey latest startup is Mutt Maps. Mutt Maps is a web app developing a community for pet owners that delivers community-reviewed, geolocated, pet-friendly places, services and products.

Organizer: Dr. Karthik Ganesan, Program Direc-



tor, Cognizant Technology Solutions, <http://www.cognizant.com/>

Dr. Karthik Ganesan is the American Program Director for Business Consulting and Enterprise IT at Cognizant Technology Solutions, a NASDAQ listed, Fortune 500 US corporation. He manages a multimillion

dollar portfolio of services for corporate customers, leading globally distributed teams to provide domain knowledge and technical services.

Dr. Ganesan's experience spans applying optimization and domain knowledge skills to manufacturing, supply chain, logistics and retail operations in large corporations. As a domain leader, he manages teams spread across the USA, Latin America, Europe and India for delivering business and IT projects. He focuses on solving logistics operations and supply chain management and manufacturing problems faced by his customers. He is responsible for leading the business center in implementing full-life cycle solutions to his customers within competitive, time constrained contractual terms. His responsibility extends to internal and external team management, customer satisfaction and securing repeat business for his group. Prior to taking this industry position, he spent over a decade in graduate level teaching and research in both engineering and business schools.

Karthik was granted a Young Scientist Award by the Department of Science and Technology of the Government of India. He was elected a Fellow of the Institution of Engineers (FIE), India, is a member of American Society of Engineering Education (ASEE) and of the Institute of Electrical and Electronics Engineers (IEEE). He is a postdoctoral fellow from The Ohio State University, Columbus. He holds Graduate and Doctoral degrees in Industrial Engineering and Management from the Indian In-

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

stitute of Science and an undergraduate degree in Mechanical Engineering from Anna University.

Pre-meeting Dinner at 5:15 PM (sharp) at Bertucci's, Waltham, (Exit 27B, Route 128). 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. Check for Updates at: Boston Entrepreneurs' Network Website at (<http://www.boston-enet.org>)

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.

Reliability Society – 6:00 PM, Wednesday, 9 March

Reliability Physics based On Dynamic causal nEtworks (RAPSODE)

Dr Simone Bortolami, Draper Laboratory



Complex one-of-a-kind systems are usually built to stringent performance and/or reliability requirements. Nevertheless, they remain vulnerable to catastrophic events that are often a combination of individually nonfatal events and/or processes. Also, the reliability of

such systems does not commonly involve catastrophe, but rather an unexpected degradation of performance affecting the cost of maintenance and/or ownership. Thus, reliability does not necessarily mean loss of the use of a system, but also a costly decay of performance below a set threshold.

For many years to date, Physics of Failure (PoF) has been the practice in several fields of engineering primarily involved with their design for life expectancy, e.g., fracture mechanics, fatigue, corrosion, etc. More recently, new simulation-based

approaches have been used to address mission reliability by evaluating the impact of single failures to the key outputs of the system during its operation.

RAPSODE is a proposed approach that uses behavioral models of the system's dynamics and embedded PoF models to evaluate the outcome of all combinations of failure and/or degradation sources, which are different for different environments and mission goals. RAPSODE uses causal networks to identify all possible failure/degradation states. At the design stage, RAPSODE can help isolate, among all critical paths, the ones with the highest influence on mission reliability, thereby driving targeted laboratory tests and fault-tolerant design. RAPSODE can also help analyze complex systems with a human-in-the-loop. Attendees will find this presentation useful in understanding the novel methodology adopted by RAPSODE in delivering powerful DfR solutions for complex systems.

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Simone Bortolami, Ph.D. has extensive experience in research and development with focus on disruptive solutions. Throughout his career, he has generated and executed projects for a variety of industry and government applications. Presently, he is a lead scientist at Draper in Cambridge, MA, focusing on instrumentation and algorithms for inertial navigation, guidance, and control. From 2009 to 2012, he was director and head of three rotorcraft research centers for AgustaWestland, a multinational conglomerate with 13K+ employees and the third largest helicopter manufacturer in the world.

From 2005 to 2009, he was a principal at Draper, focused on dynamics and control of spacecraft, reliability, and gravity gradiometry. From 1997 to 2005, he was senior scientist on the faculty of Brandeis University, Waltham, MA, focused on computational human neurophysiology and human space orientation. From 1994 to 1997, he was a fellow at the Harvard Medical School and an adjunct assistant professor at the Massachusetts General Hospital focused on neurophysiology and biomechanics. From 1992 to 1994, he carried out his Ph.D. research at the Radio and Geo-astronomy division of the Harvard-Smithsonian Center for Astrophysics, Cambridge, MA in and Spacecraft Dynamics and Control.

Dr. Bortolami also holds a Master of Science in Mechanical Engineering from the University of Padua, Italy, 1990, and he is a certified PE in Mechanical, Industrial, and Environmental Engineering. He is the author of 40+ international publications on both human neurophysiology and spacecraft dynamics and control, which have been referenced 300+ times internationally. He has been a reviewer for several international journals in human physiology as well as subject matter expert for government agencies in aerospace engineering.

This meeting will be held on Wednesday, March 9, 2016 at MIT Lincoln Laboratory, Lexington, MA (Forbes Road location). It will begin with personal networking at 5:30 PM. The presentation will follow at 6:00 PM. Refreshments, compliments of the Reliability Chapter, will be available.

You do not need to belong to IEEE to attend this event; however we welcome your consideration of IEEE memberships as career enhancing technical affiliations. We request that you register to attend by Friday, March 4, so we can plan the refreshments.

You can register on-line by visiting the Reliability Chapter website at <http://www.ieee.org/bostonrel>

MIT Lincoln Laboratory's Forbes Road Facility is located at 3 Forbes Road in Lexington, MA 02420.

Driving Directions to MIT Lincoln Laboratory (Forbes Road Facility): (from Interstate-95 / Route 128)

Take Route 128 / I-95 to Exit 30B, Route 2A westbound. At the first traffic light, turn left onto Forbes Road. Go to the end of the street. At the traffic circle, turn right. Go halfway around the traffic circle and turn into the parking lot for MIT Lincoln Laboratory. The main entrance is straight ahead, shared with "agenus". Have a valid driver's license to present to security.

Web map link:

<https://www.ll.mit.edu/about/mapForbesRoad.html>

Photonics Society – 6:30PM, Thursday, 10 March

Ultrafast Laser and Adaptive Optical Devices

Professor Juliet T. Gopinath, Department of Electrical, Computer and Energy Engineering,
University of Colorado at Boulder



I will discuss my research interests in ultrafast diode lasers, nonlinear chalcogenide devices, and electrowetting adaptive optics. Specifically, I will describe a new application of a stochastic parallel gradient descent algorithm to fast active phase control in a Fourier synthesis system.

Additionally, I will report on a new chalcogenide materials platform for integrated nonlinear waveguide devices for the mid-infrared. Finally, I will discuss electrowetting adaptive optical devices for imaging, wavefront correction, and communications.

Juliet Gopinath holds a B.S. degree in electrical engineering from the University of Minnesota and S.M. and Ph.D. degrees from MIT in electrical engineering.

From 2005 to 2009, she worked as a member of technical staff at MIT Lincoln Laboratory. Her work included wavelength-beam combining of eyesafe diode arrays, cryogenic Yb:YAG lasers/amplifiers, modelocked semiconductor optical waveguide lasers (SCOWLs), high power eyesafe laser sources, and Raman spectroscopy. She is now an assistant professor at the University of Colorado-Boulder in the Electrical, Computer, and Energy Engineering department. Her research interests include integrated and nonlinear optics, ultrafast lasers, semi-

conductor lasers, wavelength beam combining, spectroscopy, mid-infrared sources, and adaptive optics. Dr. Gopinath is the recipient of the National Science Foundation Graduate Fellowship (1998-2001) and an R&D 100 Award (2012). She has authored and co-authored 33 journal papers and over 42 conference proceedings and is an associate editor for the IEEE Photonics Society Journal.

This meeting begins at 6:30 PM Thursday, February March 10th, MA, 02420. The meeting is free and open to the public. All are welcome. Prior to the seminar there will be social time and networking from 6:30 – 7:00PM. Dinner will also be provided. The seminar will begin at 7:00PM. For more information contact Jade Wang, Boston IEEE Photonics Society Chapter chair at jpwang@ll.mit.edu, or visit the Boston IEEE Photonics Society website at www.bostonphotonics.org.

Directions to Forbes Rd Lincoln Laboratory: (from interstate I-95/Route 128) Take Exit 30B onto Marrett Rd in Lexington – Merge into left lane. Make the first Left onto Forbes Rd.. Proceed straight through the small rotary and enter the parking lot. The entrance is on your right.

To assist us in planning this meeting, please pre-register at, <http://www.ieeeboston.org/Register/>.

Entrepreneur's Network Cambridge Meeting - 6:00PM, Tuesday, 15 March

So you want to start a life sciences company?

Pointers to succeed

Meeting location – Microsoft Technology Center, One Cambridge Center (Kendall Square, next to Marriott Hotel), Cambridge, MA.

There are lots of ways to fund and launch a life sciences start-up. The work is always interesting, often with the potential to change the lives of patients suffering from an underserved medical condition. Yes, there are lots of ways to get the job done, but none of them are easy.

ENET has assembled a distinguished panel of experienced entrepreneurs who have accepted the life sciences start-up challenge, each having taken a very different path. Join us to hear their stories and engage them in discussion.

For more information and updates, visit www.boston-enet.org

Moderator: Dr. Roger Frechette is the Co-Founder and Principal of New England PharmAssociates, a consultancy offering on-demand executive and business advisory services to life sciences enterprises.



He is also the US East Coast Ambassador for Medicon Valley Alliance, a life sciences cluster organization based in Copenhagen. Previously, he was a Co-Founder of Frontiera Therapeutics, a startup developing therapeutics for vascular leaks. He is a volunteer adviser and mentor with several Boston area biotech incubators and startup mentoring programs. Previously, Dr. Frechette was Co-Founder of MaxThera, an antibacterial drug discovery company. MaxThera was sold in 2010 to Biota Holdings Limited, a Melbourne Australia anti-infectives company.

Prior to starting MaxThera, Dr. Frechette was a drug discovery and life-sciences consultant following his role as Project Director at Paratek Pharmaceuticals (Boston). At Paratek he led the team that discovered PTK0796 (currently in Phase III clinical trials) with strategic partner Glaxo-Wellcome, and the pre-clinical development program that was carried out with a multinational team of consultants and contractors.

Previously, he was Associate Director of Chemistry at RiboGene (Hayward, CA), where he built the chemistry department and managed two drug discovery programs in collaboration with strategic partner Dainippon Pharmaceuticals. He began his career as a medicinal chemist at the R.W. Johnson Pharmaceutical Research Institute (J&J, Raritan, NJ). Dr. Frechette was a Post-Doctoral Fellow at Yale University, earned his PhD in Organic Chemistry from Wesleyan University and his BA in Chemistry from College of the Holy Cross.



Organizer: Andrew Snyder, Ph.D. is a Research Scientist at the Broad Institute of MIT and Harvard. In his current role, he focuses on finding novel therapeutics for cardiovascular disease in collaboration with Bayer Healthcare.

Prior to working at the Broad, Andy worked at Targanox, Inc, a biotech focused on discovering targeted therapeutics to offset the effects of reactive oxygen species. As part of the initial startup team, Andy was responsible for setting up the biology laboratory, co-developing the proteomics platform and conducting screening assays to identifying targets and inhibitors.

Andy completed his post-doctoral training in cancer biology at the Wistar Institute in Philadelphia, PA and was a NRSA NIH/NCI individual award recipient. Andy holds a Ph.D. (Molecular and Cell Biology) and a M.S. degree (Environmental Molecular Biology) from the University of Maryland at Baltimore and a B.S. in microbiology from the University of Maryland at College Park. Andy began volunteering with ENET in 2014.

Where: Microsoft Technology Center, One Cambridge Center, Cambridge, MA. 02142 Phone: (781) 487-6400 The One Cambridge Center **GENERAL ENTRANCE** is on 255 Main Street, Cambridge, across from the Kendall Square Post Office. Exit Kendall Square T Station to Main Street. Once you exit the station, head down the Marriott side of Main Street going in the direction of Boston/the Longfellow Bridge. The One Cambridge Center entrance is located next to the Boston Properties entrance. Enter through the glass revolving door and proceed to the Microsoft facilities on the second floor.

Note: There is also a direct Microsoft entrance across from the rotary at the confluence of Main Street and Broadway. See also: http://www.microsoft.com/en-us/mtc/locations/boston_directions.aspx

Note: There is also a direct Microsoft entrance across from the rotary at the confluence of Main Street and Broadway.

PUBLIC TRANSPORTATION: Travel Mass RT 2 East from RT 128 Exit 29A directly to the Alewife MBTA garage. Park at the Alewife Garage (\$7.00) on the MBTA subway Red Line. Take the inbound train (the only one available there) for 15 minutes to Kendall / MIT. The entrance to the Microsoft Technology Center is directly across the street from the station.

Admission: General admission is \$10. Free to ENET members. Free Pizza and soft drinks will be served. Advanced registration is requested

Computer and Social Implications of Technology Societies and GBC/ACM – 7:00PM, Wednesday, 16 March

Auditability and Verification of Elections

Prof. Ronald L. Rivest, MIT



Broad Institute Auditorium (corner of Vassar & Main Streets, Cambridge)

Democracy requires that elections have credible results---otherwise the winner lacks a political mandate and the supporters of losing candidates react with anything from protests to revolution. Yet (U.S.) elections have become larger and increasingly complex, and politics seems more polarized. Software-based voting systems inspire little trust.

Voting systems purchased with funds allocated after the 2000 U.S. presidential election fiasco are rapidly becoming obsolete.

How can good definitions, statistics, and cryptography help?

We present the notion of software independence, describe several methods for effective auditing of paper ballots, and give an overview of “end-to-end” cryptographic voting systems that allow voters to confirm that their votes were counted exactly as intended, without violating voter privacy or enabling

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

vote-selling. We close with a (pessimistic) assessment of the prospects for “voting over the internet”.

Professor Rivest is an Institute Professor at MIT, a member of its Department of Electrical Engineering and Computer Science, a member of MIT’s Computer Science and Artificial Intelligence Laboratory (CSAIL), a member of that lab’s Theory of Computation Group and a leader of its Cryptography and Information Security Group.

He received a B.A. in Mathematics from Yale University in 1969, and a Ph.D. in Computer Science from Stanford University in 1974. His research interests include cryptography, computer and network security, algorithms, and voting system security.

Rivest is a co-inventor of the RSA public-key cryptosystem, has extensive experience in cryptographic design and cryptanalysis. He is also a founder of RSA Data Security and of Verisign. Together with Adi Shamir and Len Adleman, he has received the 2002 ACM Turing Award and the 2009 NEC C&C Award. He is also well-known as a co-author of the text, “Introduction to Algorithms” (with Cormen, Leiserson, and Stein). He is a member of the National Academy of Engineering and the National Academy of Sciences, and is a Fellow of the Association for

Computing Machinery, the International Association for Cryptographic Research, and the American Academy of Arts and Sciences. He is on the Advisory Board for the Electronic Privacy Information Center and on the board of Verified Voting.

This joint meeting of the Boston Chapters of the IEEE Computer and Social Implications of Technology Societies and the GBC/ACM will be held in the main auditorium on the 1st floor of the Broad Institute, corner of Main and Vassar Streets in Cambridge.

<http://whereis.mit.edu/map-jpg?zoom=level4;centerx=711791;centery=495971>>

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.

To assist us in planning this meeting, please pre-register at, <http://www.ieeeboston.org/Register/>.

Power and Energy Society – 6:00PM, Tuesday, 22 March (Refreshments start at 6PM, talk commences at 6:30PM)

Cyber-Security Innovations for Next Generation Photo-Voltaic (PV) inverters

Speaker: Brian Dow, Director of Engineering at Yaskawa, Solectria Solar



With increasing connectivity being designed into PV inverters, security weaknesses may be exposed without strong cyber-security emphasis during design and validation. • Yaskawa, Solectria Solar is developing

industry leading, highly secured web enabled PV inverters, and will discuss:

- o The typical applications/need for web connectivity in PV Inverter applications.
- o Cyber-Security challenges for web connected PV inverters and other controls equipment.
- o Web security design fundamentals, types

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

of threats, attacks, and countermeasures for PV inverters. o A next generation PV inverter communications system prototype will be shown and security aspects of the design will be discussed.

Brian Dow is the Director of Engineering at Yas-kawa, Solectria Solar. His current research and development activities focus on Next Generation Photo-Voltaic (PV) Inverter designs including: High performance DSP controllers, Advanced Inverter Communications systems, and software security, safety, and reliability of PV inverters. Before joining Solectria Renewables in 2008, Mr. Dow worked at Cadence Design Systems where he held positions as Senior and Lead Systems Engineer. Mr. Dow has created several families of next generation tension control amplifiers and controllers featuring: low cost, very long life, and very high accuracy and sta-

bility. His circuit designs and embedded software are at the core of over 25 commercially successful products.

He has been an engineering leader in various capacities since 2004. Mr. Dow received a Bachelor of Science degree in Electrical Engineering from Norwich University, the Military College of Vermont.

Meeting Location: National Grid, 40 Sylvan Road, Waltham, MA 02451 (Rooms: Valley A&B)

Free and Open to the Public – Visit the IEEE PES Chapter website for further details –

<http://www.ieeepestboston.org/>

To assist us in planning this meeting, please pre-register at,

<http://www.ieeeboston.org/Register/>.

Life Members and Aerospace and Electronic Systems Society – 4:00PM, Wednesday, 23 March

Breakthroughs in Phased-Arrays and Radars – An Update

Dr. Eli Brookner. Raytheon Co. (retired)

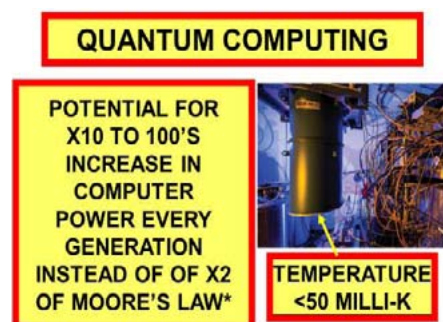


Covered will be recent developments and breakthroughs in Active Electronically Steered Arrays (AESAs) and radar including Extreme MMIC, graphene, digital beam forming. Potential continuation of Moore's Law:

1. via Spintronics - which could revolutionize computer architecture away from John von Neumann model, 2. via Memristor – which potentially allows one to do what human brain does in a shoe box instead of a computer the size of a city requiring a nuclear power plant, 3. via Graphene which has potential for THz clock speed transistors, or 4. via Quantum Computing - which has the potential of orders of magnitude advance in computation power per 2 years. New Kymeta Meta-

material Antenna finally explained in simple terms. Shown to be a thinned array with pseudo-random thinning. Does not use holography. MIMO (Multiple Input Multiple Output): Explained in simple physical terms instead of with heavy math; where it makes sense to use and how conventional arrays can do

as well. Printed Electronics: Low cost 1.6 GHz printed diodes achieved (goal 2.4 GHz). Electrical and Optical Signals on Same Chip; IR transparent in silicon. Biodegradable Arrays of Transistors



*VERN BROWNELL, GIGAOM STRUCTURE DATA CONF., 2014)
PHOTO COURTESY RAYTHEON BBN

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

MEMRISTOR

CAN DO WHAT THE BRAIN DOES IN SHOEBOX
INSTEAD OF COMPUTER THE SIZE OF CITY
REQUIRING NUCLEAR PLANT

HUMAN BRAIN:
2-3 LBS, ~20W



(R. S. WILLIAMS, IEEE SPECTRUM, 12/08; E. BROOKNER, ARRAY-2010)



SHOE
BOX

or LEDs: Imbedded under skin for detecting cancer or low glucose. Quantum Radar: See stealth targets. Will include latest Photos from Travels to Turkey, China and Africa. Talk given

so that lay person can appreciate.

Dr. Eli Brookner Bio: MEE & DrSc Columbia Un '55 & '62; BEE CCNY, '53. Raytheon 1962-2014 (retired); Principal Engineering Fellow; worked on radars for air traffic control, military defense, space & navigation: on ASDE-X, ASTOR RADARSAT II, AGRB, major Space Based Radar programs, NAVSPASUR, COBRA DANE, PAVE PAWS, MSR, COBRA JUDY Replacement, THAAD, SIVAM, SPY-3, Patriot, BMEWS, UEWR, SRP, Pathfinder, Upgrade for >70 ARSRs, AMDR, Space Fence, 3DELRR. Before Raytheon: Columbia Un Electronics Research Lab. [now RRI], Nicolet, & Rome AF Lab; Awards: IEEE 2006 Dennis J. Picard Medal for Radar Technology & Application; IEEE '03 Warren White Award; Journal of Franklin Institute Premium Award best paper, 1966; IEEE Wheeler Prize for Best Applications Paper, 1998. Fellow: IEEE, AIAA, & MSS. 4 books:

Tracking, Phased Arrays & Radar. >10,000 attended courses in 25 countries. Banquet & keynote speaker 13 times. > 230 publications. > 100 invited. 6

papers in Books of Reprints. 9 patents.

The meeting will be held at the Lincoln Lab Auditorium, 244 Wood Street., Lexington, MA at 4:00 PM. Refreshments will be served at 3:30 PM. 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. For directions go to <http://www.ll.mit.edu/>; for other information, contact Steve Teahan, Chairman, at (978)763-5136, or Steve.F.Teahan@raytheon.com

To assist us in planning this meeting, please pre-register at <http://www.ieeeboston.org/Register/>.

**NUMBER OF TRANSISTORS
MADE IN 2014*: 2.5X10²⁰**

**USING VACUUM
TUBES WOULD
COVER EARTH
SURFACE & BE
~8 MILES HIGH****



(*IEEE SPECTRUM: <http://spectrum.ieee.org/computing/hardware> transistor production has reached astronomical scales)

**ASSUMED EACH TUBE OCCUPIED 1X1X2 IN³

Consultants Network – 6:30PM, Wednesday, 23 March

Don't tell your customers to read the bleeping manual!

Steven Greffenius

Constant Contact, 1601 Trapelo Road, Great Room South, First Floor, Waltham, MA 02451

Companies recognize that if they cannot manage their digital content effectively, they cannot communicate with their customers, prospective customers, partners, or employees. A lot rests on the processes and tools a company employs to manage digital information.

As a consultant, you cannot influence how your clients manage their content. You have to accept what they have in their place. So what happens when you discover your client has patched together a management system that does not work all that well? The company still expects you to adapt your methods to their house: you are not going to reorganize the kitchen for them, or change the way they prepare their meals. All the documents related to your project will go through their system.

This talk offers practical ideas to help you and your clients meet the challenges of effective content management, when you have to adapt to systems you did not create.

In business since 1997 as a writer, editor, and publisher for technical and business documents, Steven has been a past chair of Boston CNET and active in the Society of Professional Communications. Contact his website Puzzle Mountain Digital for document management services of all kinds.

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, in the Great Room on the First Floor.

Driving Directions: Follow I-95/route 128 to Trapelo Rd in North Waltham, Waltham. Take exit 28 from I-95/route 128. (<https://goo.gl/maps/tvn3l>)

Consultants Network meetings generally take place on the fourth Wednesday of each month, but are not held during the summer months. Check the Consultants Network website for meeting details and last-minute information. <http://www.boston-consult.com/calendar.php>

For more information, e-mail cn.boston@ieee.org or chairman@boston-consult.com; or contact the chairman Heinz Bachmann, at 978-637-2070. The Consultants Network website is at www.boston-consult.org.

Data Interoperability using JSON and JSON Schema

Date & Time: Tuesday & Wednesday; May 3 & 4; 8AM - 4PM
Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA
Speaker: Roger Costello, MITRE

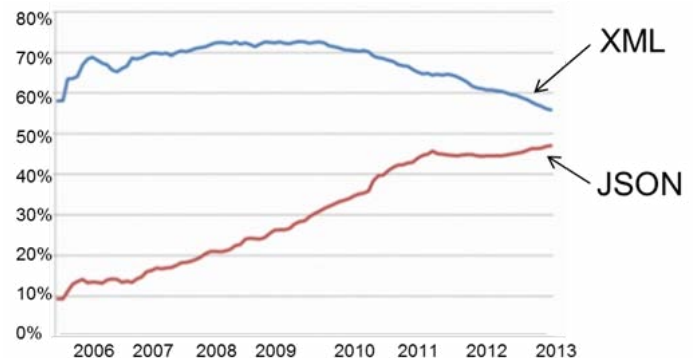
Description/Overview:

JSON is a very popular data format. It is heavily used in data exchanges between browsers and web servers but its usage has expanded well beyond browser-server data exchanges. This class covers all parts of the JSON data format. Upon completion the student will be able to create JSON documents of arbitrary complexity. JSON Schema is a powerful language for specifying the allowable content of JSON documents. JSON Schema is often used as a contract between machines exchanging JSON data. To ensure conformance to the contract JSON documents are validated against a JSON Schema using a JSON Schema validator. Roughly 2/3 of the first day is spent on JSON. The remaining time is spent on JSON Schema (which is considerably more complex than JSON). Security risks of JSON and JSON Schema and how to mitigate the risks will be emphasized.

This is an packed class, lots of excellent information is covered. The instructor created a tutorial on JSON and JSON Schema, consisting of over 300 Powerpoint slides, 100 examples, and 16 lab exercises. The class is a hands-on course. Over the 2 days the student will have ample opportunity to test their understanding of the material, as he/she works on 16 lab exercises. A zip file will be provided containing the complete tutorial. The student must bring a laptop and have internet access (we will be using an on-line JSON Schema validator).

Target audience:

This class is for anyone dealing with data: exchange-



Based on directory of 11,000 web APIs listed at Programmable Web, December 2013

ing data, manipulating data, creating data. No programming experience required. Experience with HTML and/or XML is useful.

Benefits of attending or goals of course: You will understand the JSON data format and be able to create JSON documents of arbitrary complexity. You will understand how to specify the format of JSON documents using JSON Schema and how to validate JSON documents against a JSON Schema.

Outline:

- Comparison of JSON to other data formats (e.g., XML)
- JSON – 7 types of values: object, array, string, number, true, false, null
- JSON Schema – we will cover all the keywords for specifying schemas, such as type, minimum, maximum, multipleOf, pattern, maxLength, items, maxItems, properties, and many others

Materials included with registration: Course notes. A zip file will be provided containing the complete tutorial. The student must bring a laptop and have internet access (we will be using an on-line JSON Schema validator).

Speaker Bio: Roger Costello has a Ph.D. in computer science from Ohio State University. His specialty is data formats. For 15 years he was immersed in the XML suite of technologies and has written dozens of articles on various aspects of XML. For the last three years he has focused on the JSON technologies. He has taught the JSON, JSON Schema class at his company to standing-room only classes.

Decision (Run/Cancel) Date for this Courses is Friday, April 22, 2016

Payment received by April 19

Members \$395

Non-members \$435

Payment received after April 19

IEEE Members \$435

Non-members \$475

<http://ieeeboston.org/event/data-interoperability-using-json-and-json-schema-spring-2016/>

IEEE Boston Section Awards- Call for Nominations

IEEE BOSTON SECTION AWARDS

The Boston Section presents awards annually to distinguished members of the Section. The award nominations are due by January 31st and the awards are presented in May. The description, requirements, and eligibility for those awards are listed below.

DISTINGUISHED MEMBER AWARD

Description: The purpose of this award is to recognize distinguished long-term service to the Boston Section of the IEEE and significant contributions in an IEEE field of interest.

Eligibility: Individuals nominated for this award must have been members of the Boston Section for at least the previous ten (10) years. Individuals nominated for this award must currently be members of the Boston Section and members of the IEEE. The award is based upon evidence of distinction in long-term service to the Boston Section and for contributions to the fields of interest to the IEEE. Selection criteria include leadership roles

and leadership quality, innovative and important contributions to the Boston Section, service and dedication to the Boston Section, and technical achievements in the fields of interest to the IEEE.

DISTINGUISHED SERVICE AWARD

Description: The purpose of this award is to honor an IEEE Boston Section member who has made exceptional and distinguished contributions to the Boston IEEE Section. **Eligibility:** Individuals nominated for this award must be members of the Boston Section and the IEEE. The award is based upon evidence of distinguished service to the Boston Section. Selection criteria include leadership roles and leadership quality, innovative and important services/contributions to the Boston Section.

STUDENT ACHIEVEMENT AWARD

Description: The purpose of this award is to recognize a college student who demonstrates the potential to become a distinguished leader and outstanding contributor in an IEEE field of interest.

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Eligibility:

Individuals nominated for this award must be a student, in good standing, at an institution of higher education located in the Boston Section or be a legal resident within the Boston Section who is attending an institution of higher education outside the Section. The nominee may be a student pursuing an undergraduate or graduate degree. The nomination must be submitted by, or endorsed by, the student's major advisor. All nominees' major field of study must be in an IEEE field of interest. The award is based upon evidence of distinguished leadership, accomplishment, and/or outstanding contributions that further the aims of the IEEE.

Presentation: All awards will be presented at the Boston Section's annual event.

IEEE fields of Interest

Engineering
Computer Sciences and Information Technology
Physical Sciences
Biological and Medical Sciences
Mathematics
Technical Communications
Education
Management
Law and Policy.

IEEE BOSTON SECTION AWARDS NOMINATION FORM

Application deadline February 20th
Applications should be sent to
susan.murphy@ieee.org

Nominee information

Please provide the following: name, address, telephone number, email address, and IEEE member number for the candidate.

Award for which candidate should be considered:

Distinguished Member Award

In recognition of the outstanding long-term service (10-years or more) of an IEEE Boston Section member to the Boston Section of the IEEE and significant contributions in an IEEE field of interest

Distinguished Service Award

In recognition of exceptional and distinguished contributions to the IEEE Boston Section by an IEEE Boston Section member

Student Achievement Award

In recognition of a college student who demonstrates the potential to become a distinguished leader and outstanding contributor in an IEEE field of interest

Citation Wording

Please provide 3 lines of suggested wording for the award plaque (not more than 25 words).

Nominee background

Please provide the follow information for the nominee: Resume; Short biography (not more than 500 words) including: Years of experience, years of active IEEE membership, positions held within IEEE, and society and affinity group membership(s) within IEEE

Endorsement

Please provide a letter of endorsement for the nominee. Include a summary of the contribution(s) you believe warrants this nomination (not more than 250 words).

Nominator information

Please provide the following: name, address, telephone number, email address, and IEEE member number for the nominator.

Making You a Leader - Fast Track

Date & Time: Wednesday, April 27; 8:30AM - 5:00PM

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

Speaker: Robin Goldsmith, President, GoPro Management

We do projects to make change. Yet, change will not occur without leadership, and leaders are rare. Leaders make others want to do what the leader wants done. Leaders cause ordinary people to achieve extraordinary things. Managing is not the same as leading, and titles do not make leaders. Seminars can teach you to manage, but they cannot teach you to be a leader. Rather, making a leader takes special techniques—such as our personal development clinics—that can change deep-seated behaviors learned over a lifetime. However, since clinics usually last about ten weeks, this mini-clinic was devised as a more convenient alternative. This format places responsibility upon the participant to carry out an extended informal follow-on program after completion of the formal seminar workshop session. During the follow-on period, the participant uses time-condensed methods that simulate the lifetime learning which makes a leader. Therefore, commitment to carrying out these exercises is essential for successful transformation.

Participants will learn:

- Leadership characteristics and practices that are essential for project and personal success.
- Differences between management and leadership, how they conflict, and why leaders are so rare.
- Behaviors leaders use to influence others, up and down, to want to do what the leader wants them to do
- Special techniques personal development clinics use to change lifetime learning and make leaders.
- How to employ those special techniques in a fol-

low-on mini-clinic to develop the leadership skills they need to make their projects successful.

WHO SHOULD ATTEND: This course has been designed for business and systems professionals who want to improve their ability to lead and influence other people.

OUTLINE

LEADERSHIP CHARACTERISTICS & ROLE

How leadership looks and feels
Management vs. leadership
Leadership components of project success
Basic leadership practices; power sources
Real change leaders in organizations

TEAMS AND LEADERSHIP

Everyone feels leadership is lacking
Everyone thinks s/he is a leader
Results, not actions or intent
Workgroups, teams, and leaders
Situational leadership styles
Coaching and sports analogies to projects

INSPIRING AND MOTIVATING

Gaining commitment to project success
Communicating that influences others
Addressing negativism and groupthink
Conscious and unconscious messages
Greatest management principle
Hierarchy of needs effects on projects
Hygiene factors vs. motivators
Helping project players get their rewards
Influencing up and down without authority

Inspiring the extra efforts projects need
Energizing the project team

SHARED VISIONS

Relating values and vision to projects
Getting others to embrace one's vision
Developing a motivating project vision

WHERE AND HOW LEADERS ARE MADE

Born or made? How do we know?
Habits of thought that affect project success
Overcoming self-limiting lifetime learning
Leader's critical success factors
Traditional education doesn't make leaders
Special way—personal development clinics

SETTING AND ACCOMPLISHING GOALS

S.M.A.R.T. goals for self and project
Action plans to achieve your goals
Visualizing and emotionalizing

DEFINING THE FOLLOW-ON PROGRAM

Clarifying project leadership objectives
Breaking into prioritized subgoals
Establishing rewarding daily achievements
Special techniques to change habits

CARRYING OUT THE MINI-CLINIC

Working with a follow-up support structure
Mapping results regularly to goals
Objectively recording leadership changes
Self-leadership through the process

Speaker's Bio:

Robin F. Goldsmith, JD is an internationally recognized authority on software development and acquisition methodology and management. He has more than 30 years of experience in requirements definition, quality and testing, development, project management, and process improvement. A frequent featured speaker at leading professional conferences and author of the recent Artech House book, *Discovering REAL Business Requirements for Software Project Success*, he regularly works with and trains business and systems professionals.

**Decision (Run/Cancel) Date for this Courses is
Monday, April 18, 2016**

Payment received by April 13

Members	\$220
Non-members	\$245

Payment received after April 13

IEEE Members	\$245
Non-members	\$265

<http://ieeeboston.org/event/making-you-a-leader-fast-track-fall-2015/>

Defining and Writing Business Requirements

Date & Time: Monday & Tuesday, April 25 & 26; 8:30AM - 5:00PM

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

Speaker: Robin Goldsmith, President, GoPro Management

Discovering and documenting business requirements for projects always has been the weakest link in systems development. Up to 67 percent of maintenance and 40 percent of development is wasted rework and creep attributable to inadequately defined business requirements. Too often projects proceed based on something other than what the business people really need; and traditional methodologies commonly focus mainly on the format for writing requirements. This interactive workshop also emphasizes how to discover content, why to build it and what it must do to produce value for the customer/user. Using a real case, participants practice discovering, understanding, and writing clear and complete business/user requirements that can cut creep, speed project delivery, reduce maintenance, and delight customers

Participants will learn:

- Avoiding creep--role and importance of defining business requirements accurately and completely.
- Distinctions between the user's (business) requirements and the system's (design) requirements.
- How to gather data, spot the important things, and interpret them meaningfully.
- Using the Problem Pyramid™ tool to define clearly problems, causes, and real requirements.
- Formats for analyzing, documenting, and communicating business requirements.
- Techniques and automated tools to manage requirements changes and traceability.

WHO SHOULD ATTEND: This course has been designed for systems and business managers, project

leaders, analysts, programmer analysts, quality/testing professionals, auditors, and others responsible for assuring business requirements are defined adequately.

OUTLINE

REQUIREMENTS ROLE AND IMPORTANCE

Sources and economics of system errors
How requirements produce value
Business vs. system requirements
Survey on improving requirements quality
Software packages and outsourcing
How we do it now vs. what we should do

DISCOVERING "REAL" REQUIREMENTS

Do users really not know what they want?
How the "real" requirements may differ
Aligning strategy, management, operations
Technology requirements vs. design
Problem Pyramid™ tool to get on track
Understanding the business needs/purposes
Horizontal processes and vertical silos
Customer-focused business processes
Who should do it: business or systems?
Joint Application Development (JAD) limits
Management/supervisor vs. worker views

DATA GATHERING AND ANALYSIS

Surveys and questionnaires
Research and existing documentation
Observing/participating in operations
Prototyping and proofs of concept
Planning an effective interview
Controlling with suitable questions

FORMATS TO AID UNDERSTANDING

Business rules, structured English
 E-R, data flow, flow, organization diagrams
 Data models, process maps
 performance, volume, frequency statistics
 Sample forms, reports, screens menus

DOCUMENTATION FORMATS

IEEE standard for software requirements
 Use cases, strengths and warnings
 7 guidelines for documenting requirements
 Requirements vs. implementation scope
 Iterating to avoid analysis paralysis
 Conceptual system design solutions
 Detailing for clarity, clarifying quality

GETTING MORE CLEAR AND COMPLETE

Stakeholders and Quality Dimensions
 Addressing relevant quality factor levels
 Standards, guidelines, and conventions
 Detailing Engineered Deliverable Quality
 Simulation and prototyping
 Defining acceptance criteria

MANAGING THE REQUIREMENTS

Supporting, controlling, tracing changes
 Automated requirements management tools
 Measuring the “proof of the pudding”

Speaker's Bio:

Robin F. Goldsmith, JD is an internationally recognized authority on software development and acquisition methodology and management. He has more than 30 years of experience in requirements definition, quality and testing, development, project management, and process improvement. A frequent featured speaker at leading professional conferences and author of the recent Artech House book, *Discovering REAL Business Requirements for Software Project Success*, he regularly works with and trains business and systems professionals.

**Decision (Run/Cancel) Date for this Courses is
 Friday, April 15, 2016**

Payment received by April 12

Members	\$415
Non-members	\$430

Payment received after April 12

IEEE Members	\$430
Non-members	\$455

<http://ieeeboston.org/event/making-you-a-leader-fast-track-fall-2015/>

Basics of Software Defined Networking (SDN)

Date & Time: Saturdays, April 23 & 30; 9AM - 12 noon; Monday May 3, 6-9PM (optional)

Location: TBD (along Rt. 128 between Lexington and Woburn)

Speaker: Dr. Bhumip Khasnabish, ZTE (TX) Inc.

Introduction: This is an introductory level course on Software Defined Networking (SDN). Motivations for SDN and architectures of SDN will be discussed. Network migration and transformation for supporting SDNized organic and over the top (OTT) services will be also covered. We'll use IEEE and

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

other journal/magazine publications and published standards specifications as reference materials for this course. Hands-on assignments will help the students initiate and complete exercises using open source platforms and test beds. We'll also discuss novel techniques for solving the emerging real-life/-operator challenges related to (i) cost-effective network infrastructure development, and (ii) networked services and security management.

Outline of Topics to be covered:

- What is SDN and Why do we need SDN?
- SDN Architecture Overview
- Review of Open Source SDN and related Projects
- North- and South-bound Interfaces of SDN Controller
- East- and West-bound Interfaces of SDN Controller
- Review of Open Source SDN Tools and (Virtual) Labs
- Migration to SDN and Integration with Legacy Networks
- Hands-on works/assignments suggestions using open source test beds

Target Audience:

The course is designed for network and network software/system designers who are considering to gain introductory knowledge about SDN.

Benefits of Attending the Course:

This is an introductory level course on Software Defined Networking (SDN). The students will learn about motivations for and architectures of SDN as applicable to the mobile and multimedia networks for both organic and over the top (OTT) services.

The assignments will help the students initiate and complete exercises using open source platforms and test beds.

Materials included in the course:

A summary of the slides, and a list of useful web resources including a few white papers.

Speaker Bio:

Dr. Bhumi Khasnabish works in the Strategy Planning and Standards Development division of ZTE (TX) Inc., USA. Previously, he worked at Verizon/GTE Laboratories (Waltham, MA, USA) and at Bell-Northern Research (BNR) Ltd. (Ottawa, Ontario, Canada). His research interests include network and system virtualization, network coding, open networks and systems, and software-defined networking and services. Bhumi initiated cloud and data center activities in the IETF, co-chaired the ATIS IPTV Interoperability Forum (IIF), and founded and chaired both the ATIS NG-CI task force and the MSF Services WG. In addition, he is a member of the DMTF and ONF leadership teams. As an ONF member, Bhumi contributed to the development of: Migration Use Cases and Methods, Migration Tools and Metrics, and SDN Migration Considerations.

Decision (Run/Cancel) Date for this Courses is Friday, April 14, 2016

Payment received by April 11

Members	\$235
Non-members	\$255

Payment received after April 11

IEEE Members	\$255
Non-members	\$275

<http://ieeeboston.org/event/basics-of-software-defined-networking-sdn-spring-2016/>

Introduction to Embedded Linux

*Last Notice Before Course Begins,
Please Register Now !!!!*

Time & Date: 6 - 9PM; Mondays, March, 7, 14, 21, 28

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

Speaker: Mike McCullough, RTETC, LLC

Overview - 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

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, Tiler, 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.

OUTLINE

Course Schedule Day 1

The Basics

Linux Terminology, History and Versioning

The Linux Community: Desktop & Embedded Linux and the GPL

Linux References (Books and Online)

Getting Started

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Building the Kernel Source Code
Embedded Linux Kernels
Linux 2.6 and 3.x
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, 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
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
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
Demand Paging and Virtual Memory
Allocating User and Kernel Memory
Mapping Device Memory
The Slab Allocator
The OOM Killer
Memory in Embedded Systems
Advanced Memory Operations
Linux and Memory
Managing Aligned Memory
Anonymous Memory Mappings
Debugging Memory Allocations
Locking and Reserving Memory
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)
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
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
Comparing the Two Driver Models

Course Schedule Day 4

Advanced I/O Operations
 Standard I/O Operations
 Scatter-Gather and Asynchronous I/O
 Poll, Select and Epoll
 Memory-Mapped I/O
 File Advice
 I/O Schedulers
 Interrupt and Exception Handling
 Bottom Halves and Deferring Work
 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
 Building Custom Linux Images
 Target Image Builders

LTIB and Yocto
 System Architecture Design Approaches
 Deploying Embedded Linux
 Choosing and Building the Root Filesystem
 Useful Embedded Filesystems
 Module Decisions
 Final IT Work
 Embedded Linux Trends
 Some Final Recommendations

**Decision (Run/Cancel) Date for this Courses is
 Friday, February 26, 2016**

Payment received by Feb. 23

Members \$400

Non-members \$430

Payment received after Feb. 23

IEEE Members \$430

Non-members \$455

To Register, <http://ieeeboston.org/event/introduction-embedded-linux-spring-2016>

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 sec.boston@ieee.org 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.

IEEE Photonics Society
Boston Chapter Presents:



Optical Sensors Workshop

Wednesday, April 6, 13, 20, 27, May 4, 2016, 7:00–9:30 PM

Located at MIT Lincoln Laboratory – 3 Forbes Road, Lexington, MA, 02420, USA

Optical sensing is ubiquitous in science and technology, and is becoming prevalent in our daily lives. These sensors cover a wide range of complexity, from the simple clip-on oxygen monitoring devices in our local doctor's office, to the miniature CCD arrays in our smart phone cameras, to the high-sensitivity optical gyroscopes navigating the planes we occupy when flying. This proliferation of optical sensors is due to the wide availability of varied optical sources and detectors, which are enabled by new materials, a better understanding of the physics of environmental optical perturbations, and the wide availability of custom designed optical fibers, as well as powerful software codes linking it all together. One advantage of optical sensors is that they can have unprecedented precision - for example optical clocks (femto-seconds) and super-resolution optical microscopy (nano-meters). Other uses include, Light Imaging Detection and Ranging (LIDAR) - for remote sensing, environmental monitoring, and bio-sensor detection of biologically active substances for food safety. This workshop will bring together leading experts to discuss the status and performance of these optical sensors and many more, and the remaining hurdles to overcome for achieving an even larger deployment of them all.

Wednesday April 6, 2016	Exploring the Warped Side of the Universe: The Search for Gravitational Waves Prof. Nergis Mavalvala, Massachusetts Institute of Technology, Cambridge, MA Transiting Exoplanet Survey Satellite (TESS): Designing a Sensor for Full Sky Mapping Exoplanet Detection Ms. Kristin Clark, MIT Lincoln Laboratory, Lexington, MA
Wednesday April 13, 2016	Searching For Applications With A Fine Toothed Frequency Comb Dr. Nathan R. Newbury, NIST, Boulder, CO Optical Fiber Interferometry At The Extremes: From Crack Detection To Shock Detection Dr. Geoffrey A. Cranch, Naval Research Laboratory, Washington, DC
Wednesday April 20, 2016	Integrated Photonic Devices for Inertial Sensing Dr. Suraj Bramhavar, MIT Lincoln Laboratory, Lexington, MA Superconducting Gravity Gradiometers for Precision Tests of Gravitation, Planetary Gravity Mapping and Gravitational Wave Detection Prof. Ho Jung Paik, University of Maryland, College Park, MD
Wednesday April 27, 2016	Opening Up 3D Phase Space for Optical Measurements Using CMOS Fast Wave-form Sampling and Large-area Sub-50-psec-resolution Planar Photodetectors Prof. Henry Frisch, University of Chicago, Chicago, IL From Quantum Transduction to Inertial Navigation Using Optoelectromechanics Prof. Jacob Taylor, University of Maryland & NIST, College Park, MD
Wednesday May 4, 2016	Ultra-Precise Metrology Employing Fast Light: Rotation Sensing, Accelerometry and Gravitational Wave Detection Prof. Selim Shahriar, Northwestern University, Evanston, IL Novel Optical Sensor configurations for Super-Resolution and Compressive Sensing Imaging Dr. Robin Dawson, Charles Stark Draper Laboratory, Cambridge, MA

Advance registration and fee required (Open to all IEEE members as well as non-members)

\$75/\$85 (IEEE Member/Non-Member) early registration fee for ten 1-hour talks over 5 nights; cost includes coffee and cookies each night, as well as downloadable copies of speakers slides. Early registration deadline April 1st, 2016.

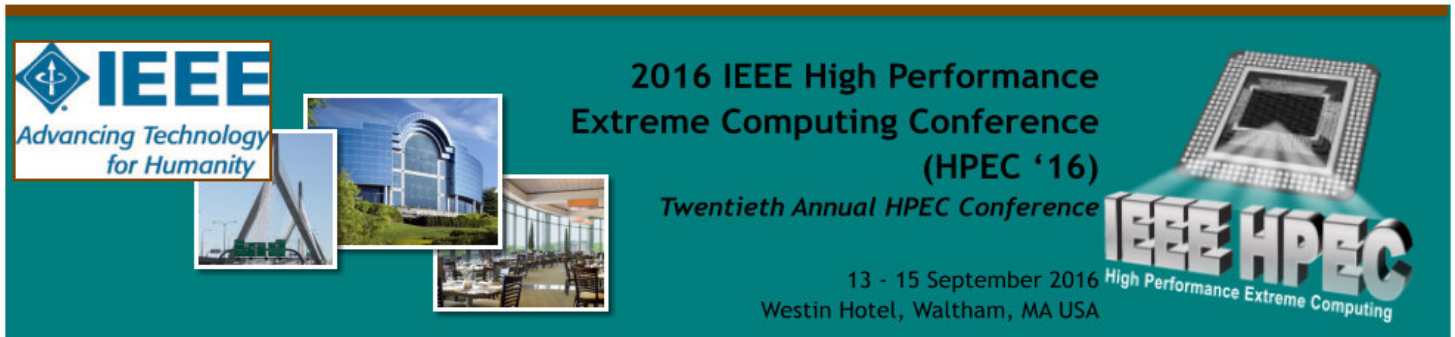
\$85/\$95 (IEEE Member/Non-Member) post deadline fee.

Registration form, abstracts, speaker's bios at: <http://www.bostonphotonics.org/workshops/OS16/>

For more information contact:

- 1) Farhad Hakimi, (fhakimi@ieee.org), Optical Sensors Workshop Co-Chair
- 2) Bill Nelson, (w.nelson@ieee.org), Optical Sensors Workshop Co-Chair
- 3) Ajay Garg, (ajay.sinclair.garg@ieee.org), Optical Sensors Workshop Co-Chair
- 4) Jade Wang (jpwang@ll.mit.edu), Boston Photonics Society Chair

CALL FOR PAPERS



2016 IEEE High Performance Extreme Computing Conference (HPEC '16)
Twentieth Annual HPEC Conference
 13 - 15 September 2016
 Westin Hotel, Waltham, MA USA

www.ieee-hpec.org

Committees

Senior Advisory Board Chair

Mr. Robert Bond
 MIT Lincoln Laboratory

Senior Advisory Board

Prof. Anant Agarwal
 MIT CSAIL

Dr. Richard Games
 Chief Engineer, MITRE
 Intelligence Center

Mr. John Goodhue
 Director, MGHPC

Dr. Richard Linderman
 Chief Scientist, Air Force
 Research Laboratory
 Information Directorate

Mr. David Martinez
 Associate Division Head MIT
 Lincoln Laboratory

Dr. John Reynders
 CIO Moderna

Dr. Michael Stonebraker
 Co-founder SciDB and Vertica;
 CTO VoltDB and Paradigm4

Chairman & SIAM Liaison

Dr. Jeremy Kepner
 Fellow, MIT Lincoln Laboratory

Publicity Co-Chairs

Dr. Albert Reuther
 MIT Lincoln Laboratory
 Mr. Dan Campbell
 GTRI

CFP Co-Chairs

Dr. Patrick Dreher
 MIT
 Dr. Franz Franchetti
 CMU

Publications Chair

Prof. Miriam Leeser
 Northeastern University

Administrative Contacts

Mr. Robert Alongi
 IEEE Boston Section

The IEEE High Performance Extreme Computing Conference (HPEC '16) will be held in the Greater Boston Area, Massachusetts, USA on 13 – 15 September 2016. The HPEC charter is to be the premier conference in the world on the confluence of HPC and Embedded Computing.

The technical committee seeks new presentations that clearly describe advances in high performance extreme computing technologies, emphasizing one or more of the following topics:

- Advanced Multicore 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
- Secure Computing & Anti-Tamper Technologies
- New Application Frontiers

HPEC accepts two types of submissions:

1. Full papers (up to 6 pages, references not included), and
2. Extended abstracts (up to 2 pages, references included).

Preference will be given to papers with strong, quantitative results, demonstrating novel approaches or describing high quality prototypes. Authors of full papers can mark their preference for a poster display or an oral presentation. Presenters who wish to have hardware demonstrations are encouraged to mark their preference for a poster display. Accepted extended abstracts will be displayed as posters.

All paper and extended abstract submissions need to use the approved IEEE templates. Full paper submissions with the highest peer review ratings will be published by IEEE in the official HPEC proceedings available on IEEE eXplore. All other accepted submissions and extended abstracts are published on ieee-hpec.org. Vendors are encouraged to sign up for vendor booths. This will allow vendors to present their HPEC technologies in an interactive atmosphere suitable for product demonstration and promotion.

We welcome input (hpec@ieee-hpec.org) on tutorials, invited talks, special sessions, peer reviewed presentations, and vendor demos. Instructions for submitting will be posted on the conference web site shortly.

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

Date & Time: 9:00AM - 4:30PM, Thursday & Friday, June 9 & 10, 2016

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

Speaker: Henry Lau, Lexiwave Technology

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

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

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
- Smartpone 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 Courses is Tuesday, May 31, 2016

Payment received by May 25

IEEE Members	\$395
Non-members	\$435

Payment received after May 25

IEEE Members	\$435
Non-members	\$455

<http://ieeeboston.org/event/modern-wireless-system-design-from-circuit-to-web-based-apps/>

QA Testing in the Digital World

Date & Time: 9:00AM - 4:00PM, Saturday, May 7, 2016
Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA
Speaker: Rajkumar J. Bhojan, Wipro Technologies

Overview: As we are entering an era of digital transformation, software organizations across industry sectors are challenged to adopt QA and software Testing in digital technologies coupled with organizational, operational, and business model innovations. Mobile technology is growing at rapid speed. Companies need quick, agile and technology driven organizations to provide an incessant delivery model. Academicians and testing experts have to come up with effective verification techniques to ensure reliability of these mobile applications.

This 6 hours course (lecture/lab) will address the following questions: How to create new ways of adopting QA and testing in their core software. Are we able to deliver better product using existing testing methodologies? Do we have a better solution for verifying and validating IOT devices with real time data? What is the role of test automation in DevOPs environment? During the lab portion of the agenda, a laptop will be required and all software will be made available to participate in the lab exercises.

Target Audience: IT Professionals Students both UG and PG with Computer Knowledge Researchers (IT)

OUTLINE

- * Introduction to Digital QA Transformation
- * Test Automation in DevOPs environment - Tools and Testing Strategies - ATDD and BDD in Agile Projects
- * Hands-on Session on Mobile Test Automation
- * Role of CI and CD in Testing space
- * Mobility Testing and its automation
- * Cloud based solution for Mobile test automation

Goals/benefits of Attending:

1. Will get knowledge of software industry trending in QA
2. Latest technologies used in Software Testing
3. Participants can directly implement the taught methodologies in their software projects
4. Research can enhance in Digital transformations

Notes / printouts will be distributed during the session

Speaker bio: Rajkumar J.Bhojan is a Lead Architect (TA), Wipro Technologies, Boston, MA, USA. He has over two decades of professional experience in both IT and Academics. He holds M.Sc., (Phy), MCA, M.Phil (CS) and currently he pursues Ph.D. in Computer Science. He has executed IT projects in diverse geographies including India, Australia, China & USA. He has worked as a QA Manager, Corporate Trainer and Principal Consultant in reputed organizations. He has presented many technical papers at International conferences, Journals and IEEE forums. He is a Certified Scrum Master and has rich experience in Agile/scrum Methodologies. He is a member in IEEE and ACM. http://sites.ieee.org/sem/files/2013/07/May_2014-WL_Rev1.pdf <http://www.atagg.agiletestingalliance.org/speakers.html>

Decision (Run/Cancel) Date for this Courses is Thursday, April 28, 2016

Payment received by April 25

IEEE Members	\$235
Non-members	\$255

Payment received after April 25

IEEE Members	\$255
Non-members	\$275

<http://ieeeboston.org/event/qa-and-testing-in-the-digital-world-spring-2016/>

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Introduction to Network Function Virtualization (NFV)

Date & Time: Saturdays, May 14 & 21; 9AM - 12 noon

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

Speaker: Dr. Bhumip Khasnabish, ZTE (TX) Inc.

Introduction:

This is an introductory level course on NFV. Motivations for and implementations of (a) network functions like routers and switches, and (b) service functions like firewalls, load balancers, and quality-of-service managers using virtual machines (VMs) and virtual network functions (VNFs) will be discussed. The use cases, requirements, and frameworks as published by the organizations like ETSI/NFV, ONF and DMTF will be reviewed. Suggestions for a few hands-on assignments using open source NFV test-bed will be also included in this course.

OUTLINE

- Definitions of NFV and SFV (Service Function Virtualization)
- Motivations for NFV and SFV
- DMTF and ETSI/NFV Use cases
- Overview of Information and Data Modeling
- Logical Functional Block Subsidiary Management
- Cross-Domain Identity Management of Resources and Users
- Suggestions for Hands-on Assignments (OPNFV-Arno)

Benefits of Attending:

This is an introductory level course on NFV. The students will learn how the use of virtualization of network and service functions can save both network/

service infrastructure development (CapEx) and operations (OpEx) costs. The use of virtualization and automation are expected make the assignment of resources to services as seamless as practically feasible, as will be demonstrated via discussions of use cases and projects like CORD (Central Office Redesigned using Datacenter).

Materials included in the course:

May provide a summary of the slides, and a list of useful web resources including a few white papers.

Speaker Bio:

Dr. Bhumip Khasnabish works in the Strategy Planning and Standards Development division of ZTE TX Inc., USA as a Senior Specialist/Director. Previously, he worked at Verizon/GTE Laboratories (Waltham, MA, USA) and at Bell-Northern Research (BNR) Ltd. (Ottawa, Ontario, Canada). His research interests include network and system virtualization, network coding, open networks and systems, and software-defined networking and services. Bhumip initiated cloud and data-center activities in the IETF, co-chaired the T&I committee of ATIS IPTV Interoperability Forum (IIF), and founded and chaired both the ATIS NG-CI task force and the MSF Services WG. In addition, he is a member of the leadership teams of both DMTF and ONF.

As an ONF member, Bhumip contributed to the development of: Migration Use Cases and Methods,

Migration Tools and Metrics, SDN Migration Considerations and Use Cases, and SDN Migration Prototype and Demo Proposals. He initiated cost-performance analyses for migrating to OpenFlow-based networks, and participated in SPRING-OpenFlow® activities. As the Chair of DMTF NSM WG, Bhumip initiated and completed several network service and virtualization profile works, and liaison work with ETSI/ISG NFV. Bhumip authored several books, book chapters, and journal and conference papers. He is also an inventor in 31 US patents.

**Decision (Run/Cancel) Date for this Courses is
Thursday, May 5, 2016**

Payment received by May 2

IEEE Members \$195

Non-members \$215

Payment received after May 2

IEEE Members \$215

Non-members \$245

<http://ieeeboston.org/event/introduction-to-network-function-virtualization-nfv-spring-2016/>

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>

Advanced Embedded Linux Optimization

Time & Date: 6 - 9PM, Mondays, April 4, 11, 18, 25

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

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 methods for debugging, profiling and testing 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.

OUTLINE

Course Schedule Day 1

Getting Started with Embedded Linux
Linux and the GPL
Building the Kernel Source Code
Embedded Linux Kernels
BSPs and SDKs

Linux References (Books and Online)

Basic Debugging Review
Embedded Applications Debugging
GDB, GDB Server and the GDB Server Debugger
An Eclipse Remote Debug Example
Debugging with printk and LTTng
System Logs
Other Debuggers
System-Level Debug
System-Level Debug Tools
The /proc and /sys Filesystems
Basic Logging
KGDB and KDB
Crash Dumps and Post-Mortem Debugging
Debugging Embedded Linux Systems
Backend Debuggers
JTAG and In-Circuit Emulators
Hardware Simulators
Analyzers
Debugging Device Drivers
Kernel Probes
Kexec and Kdump
Kernel Profiling

Course Schedule Day 2

Testing
Design for Test
Agile Software Design
Unit-Level Testing
System-Level Testing
Code Coverage Tools
gcov
Automated Testing
DebugFS
Configuring DebugFS
DebugFS Capabilities
Advanced Logging
LogFS
Using Logwatch and Swatch
Using syslog and syslog-ng

- Kernel Hacking
- Configuring Kernel Hacking
- Kernel Hacking Capabilities
- Tracing
- ptrace and strace
- New Tracing Methods
- SystemTap
- Ftrace, Tracepoints and Event Tracing
- Tracehooks and utrace

Course Schedule Day 3

- Profiling
- Basic Profiling
- gprof and Oprofile
- Performance Counters
- LTTng
- Another DDD Example
- Manual Profiling
- Instrumenting Code
- Output Profiling
- Timestamping
- Measuring Embedded Linux Performance
- Some Ideas on Performance Measurement
- Common Considerations
- Uncommon Considerations
- Using JTAG Methods
- BootLoader Optimizations
- Boot Time Measurements
- Effective Memory and Flash Usage
- Filesystem Choices
- Addressing Performance Problems
- Types of Performance Problems
- Using Performance Tools to Find Areas for Improvement
- Application and System Optimization
- Device Driver Optimization
- CPU Usage Optimization
- Memory Usage Optimization
- Disk I/O and Filesystem Usage Optimization
- The Perf Tool
- 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
- Performance Tool Assistance
- Recording Commands and Performance
- System Error Messages and Event Logging
- Dynamic Probes
- User Mode Linux and Virtualization

Course Schedule Day 4

- 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 the Compiler
- 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 Bio – 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 25-year electronics veteran, he has held various positions at LynuxWorks, Tilera, Embedded Planet, Wind River Systems, Lockheed Sanders, Stratix Computer and Apollo Computer. RTETC, LLC is a provider of Eclipse-based development tools, training and consulting for the embedded systems market.

**Decision (Run/Cancel) Date for this Courses is
Friday, March 26, 2016**

Payment received by March 23

IEEE Members	\$395
Non-members	\$435

Payment received after March 23

IEEE Members	\$435
Non-members	\$470

To Register, <http://ieeeboston.org/event/advanced-embedded-linux-optimization-spring-2016>

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Flexible Electronics - Packaging Design, and Materials Analysis for Aerospace, Military, Medical & High end Consumer Products

Time & Date: 8AM - 5PM; Thursday, March 31, 2016

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

Speaker: Tina Barclay, , Chief Technical Officer, TAS Consulting

***Last Notice Before Course Begins,
Please Register Now !!!!***

Prerequisites:

Assume Student can read schematics, understand component usages and has some basic thermal analysis capability.

Class Summary:

This is a one-day session focusing on the advanced packaging needed for a flexible board design. This course will not cover schematic layout and circuit design. It will cover what you do with the completed schematic. It will address layout issues to avoid and what components work best in a flexible design. It will show what methods are available and almost available to package the flexible circuit board.

What materials work best for which industry?

What analysis should be performed to assure the design will work in the intended environment?

Who should attend?

This course is designed for Engineers involved in the above design elements of a project. This course will demonstrate the work needed to review the materials and environment for designs using flexible circuits.

Course Objectives:

- Understand circuit board layout changes for flexible electronics
- Show how to remove Heat in a flexible board.

- Review, Show, Typical Analysis needed for Reliability concerns
- Review electronics Packaging Issues and How to handle them
- Introduce Solder Fatigue concepts and what to do about it
- Review different Industry needs and show the key indicators for each.

Course Schedule:

1. Review student backgrounds and industries – course will be pushed toward the industries represented. (1/2 hr.)
2. Basic background on flexible boards (1/2 hr.)
3. Review schematic layouts – what works and what doesn't – this will be industry specific. (1/2 hr.)
4. Review analysis needed: structural, thermal, reliability, solder fatigue (1 hr.)
5. Walk through analysis for each of the above. (1 hr.)
6. Show issues of each of the analysis types, work-arounds, show stoppers, and realistic answers to some industry concerns. (1 ½ hr.)
7. Review solder fatigue differences for different solders. (1/2 hr.)
8. Review any additional industry needs specific to student's industries and questions. (1 hr.)
9. Lab Time- Students to work on project – can bring one or work on one provided. (1 ½ hr.)

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Instructor:

Tina Barclay has over 30 years of experience in electronic packaging, testing, and analysis (BS Engineering – Thermal and Materials and MS – Systems Engineering and program management. Tina worked for aerospace companies (ITT, TRW, Perkin Elmer, Goodrich and Aerojet), NASA (Marshall Space Flight Center), automotive (both Ford and Chrysler), military black boxes (Singer Librascope, Army, Navy and Air Force modules) as well as high end medical and commercial (Spectracom, MKS, Kodak, etc.). She has run and created testing labs, procedures, designs, fixes for designs, and the first BGA used in high temperature environments. Tina has R&D experience, proposal experiences, and program management experience in all the above industries. She has 21 US patents — all in electronics packaging, materials, and thermal. . Her experience has included all levels of

parts reliability for systems ranging from 6-month to 10-year reliabilities. She is a frequent speaker at industry-specific conferences like IMAPS (International Microelectronics and Packaging Society) and ASE (Automotive Society of Engineers) and is on the IPC (IPC - Association Connecting Electronics Industries) Specification Review Panel.

Decision (Run/Cancel) Date for this Courses is Wednesday, March 16, 2016

Payment received by March 14

IEEE Members	\$235
Non-members	\$260

Payment received after March 14

IEEE Members	\$260
Non-members	\$285

To Register, <http://ieeeboston.org/event/flexible-electronics-spring-2016>

Phased - Array and Adaptive-Array Fundamentals and their Recent Advances

Time & Date: 6 - 9PM; Mondays, March 14, 21, 28, April, 4, 25, May 9, 16, 23, June 6, 13

Location: MITRE Corporation, 202 Burlington Road, Bedford, MA (tentative)

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

***Last Notice Before Course Begins,
Please Register Now !!!!***

**PRACTICAL
PHASED ARRAY
ANTENNA SYSTEMS**



ELI BROOKNER

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

Text: “Practical Phased Array Antenna Systems”, Dr. Eli Brookner, Editor, Artech House, 1991 Hardcover, 258 pages, List Price \$179, Hardcover, 258 pages. Covers array fundamentals: phase and time-delay steering; grating lobes for 1- and 2-dimensional arrays; effects of errors and failures on gain, sidelobes and angle accuracy; array weighting, thinning, blindness, mutual coupling, elements, phase-shifters and feeds; limited field of view (LFOV) arrays; SPY-1; example design.

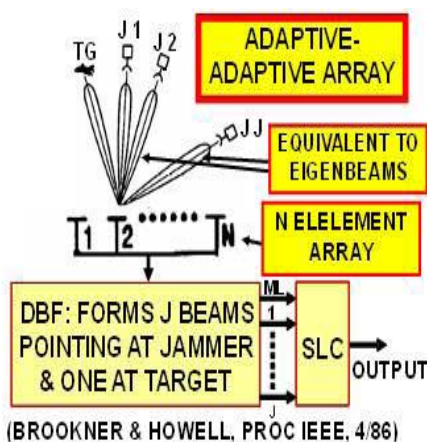
Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

This course is based on the book entitled Practical Phased Array Antenna Systems by Dr. Eli Brookner. The book covers array basics and fundamentals which do not change with time. The course, the book and the notes will provide an ideal introduction to the principles of phased array antenna design and adaptive arrays. The course material and notes cover in addition recent developments in phased arrays updated to 2016.

With the explicitly tutorial approach the course and book offers a concise, introductory-level survey of the fundamentals without dwelling on extensive mathematical derivations or abstruse theory. Instead a physical feel will be given. The book provides extensive curves, tables and illustrative examples.

Covered in easy terms will be sidelobe cancellation, full adaptive array processing without suffering its computation complexity (through the use of adaptive-adaptive array processing also called beam-space processing and eigenbeam processing). Finally, Space-Time Adaptive Array (STAP) for airborne platforms will be explained and related to the displaced phase center antenna (DPCA).

This course is intended for the engineer or scientist not familiar with phased-array antennas as well as the antenna specialist who wants to learn about other aspects of phased-array antenna systems. The major emphasis will be on the system aspects of phased-array systems.



Lecture #1. Monday March 14; Phased Array Fundamentals: Fundamental Principles of Electronically Scanned Array (ESA) explained with tube COBRA DANE used as example. Covered will be: Near and Far Field Definitions, Phased Steering, Switched-Line Phase Steering; Time Delay Steering, Subarraying, Array Weight-

ing, Monopulse, Duplexing, Array Thinning, Embedded Element, dual polarized circular waveguide element, advantage of triangular lattice over square lattice, Tour of COBRA DANE (6 stories high) via color slides.

PATRIOT UPGRADES

- 2012: \$400 M UPGRADE MADE IT 2012 STATE-OF-THE-ART; US ARMY FIELDING TO 2048*
- 2015: GaN AESA; 360° COV.**

- >200 BUILT
- 13 NATIONS
- 5000 EL PER/FACE
- C-BAND

(*FEB. 19, 2015/PRNEWSWIR1520E; **MICROWAVE&RF, AUG 2015, P. 24)

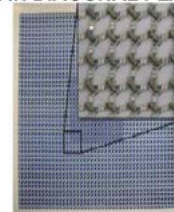


Lecture #2. Monday March 21; Linear Array Fundamentals: Conditions for no grating lobes; beamwidth vs scan angle; sine space; Array Factor; sidelobe level vs antenna beamwidth; directivity; antenna efficiency

factors; array weightings; array frequency scanning; array bandwidth.

TIGHTLY COUPLED DIPOLE ARRAY (TCDA)

- BANDWIDTH: 1:20
- THICKNESS: $\lambda/40$ AT LOWEST FREQ.
- DUAL POLARIZATION
- COLOCATED PHASE CENTERS
- GOOD POLARIZATION IN DIAGONAL PLANE
- WAIM STRUCTURE

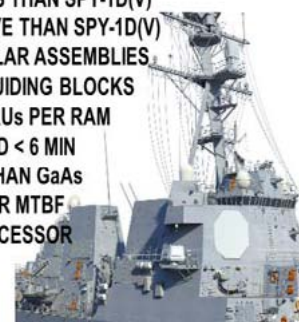


Lecture #3. Monday March 28; Planar Arrays: Array Factor; array separability; sine-space ($\sin\alpha\text{-}\sin\beta$ space, T-space); grating lobes location for triangular and rectangular lattice; directivity; very useful bell curve approximation; array

thinning system issues.

AIR & MISSILE DEFENSE RADAR (AMDR)

- S-BAND: AIR & MISSILE DEFENSE
 - X-BAND: HORIZON SEARCH
 - ADAPTIVE DIGITAL BEAM FORMING
 - 30X > TARGETS THAN SPY-1D(V)
 - 30X > SENSITIVE THAN SPY-1D(V)
 - RADAR MODULAR ASSEMBLIES (RAMs) ARE BUILDING BLOCKS
 - 4 TYPES OF LRUs PER RAM
 - LRU REPLACED < 6 MIN
 - GaN 34% < \$ THAN GaAs
 - GaN HAS 10^8 HR MTBF
 - COTS x86 PROCESSOR
 - SCALABLE
- PICTURE COURTESY RAYTHEON



Lecture #4. Monday April 4; Array Errors: Effects of element phase and amplitude element errors and element failures; simple physical derivation of error effects; paired echo theory; subarray errors; quantization errors; examples.

Lecture #5. Monday April 25; Radiating Elements: Waveguide; dipole; slotted waveguide; microstrip patch; stacked patch; notch (wideband); spiral; matching (wide-angle); waveguide simulator; practical limitations, mutual coupling and array blindness; scattering matrix; design procedure; polarization mismatch loss.

Lecture #6. Monday May 9; Active Phased Arrays: 2nd generation solid state hybrid active electronically scanned array (AESAs) covered using PAVE PAWS as example, T/R Module Introduced, Cross Bent Dipole Element, Mutual Coupling, Array Blindness, Tour of PAVE PAWS (6 stories) via color slides. 3rd Generation AESAs: THAAD, SPY-3, IRIDIUM, F-15 APQ-63(V)2, APG-79, XBR, AMDR and upgraded Patriot GaAs and GaN microwave integrated circuits (Monolithic Microwave Integrated Circuit, MMIC).

CJR TEAM CELEBRATE A
SUCCESSFUL FIRST LIVE-LAUNCH



PHOTO COURTESY RAYTHEON

Lecture #7. Monday May 16; Array Feeds: Corporate and space fed; Reactive (lossless) and matched (Wilkinson); even/odd mode analysis. Serial; Ladder; Lopez; Blass; Radial, Butler matrix; microstrip/stripline;

Rotman Lens; SLQ-32; PATRIOT space-fed array; reflectarray. System Considerations: sequential detection, beam shape loss; receiver and A/D dynamic range; polarization mismatch loss; array noise figure and system temperature taking into account array mismatch. Phase Shifters: Diode switched-line, hybrid-coupled, loaded-line; ferrite phase-shifters: non-reciprocal latching; diode vs ferrite; MEMS (Micro-Electro-Mechanical Systems) and its potential for a low cost ESA.

Lecture #8. Monday May 23; Limited Scan (Limited Field of View [LFOV]) Arrays: Explained using simple high school optics for TPS-25, 1st Electronically Scanned Array (ESA) put in production. Fundamental Theorem specifying minimum number of

phase shifters needed for a specified scan angle. Method for realizing this minimum using overlapped array antenna elements as with HIPSAT lens array system and Microwave Landing System (MLS); reflector; randomized oversized elements; use of sum and difference patterns; use of spatial filters to reduce grating lobes and sidelobes. Hemispherical Coverage Dome Antenna.

X-BAND 25K ELEMENT AESA AN/TPY-2



8 DELIVERED, 3 MORE ON ORDER.

PHOTO COURTESY RAYTHEON

Lecture #9. Monday June 6; Phased Array Amazing Advances and Breakthroughs -- Part 1: Systems: Patriot now has GaN active electronically scanned array (AESA) providing 360° coverage, now a 2015 state-of-the-art AESA

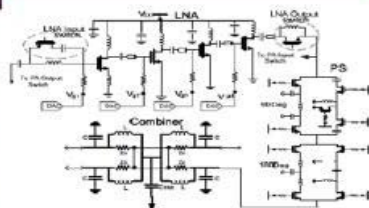
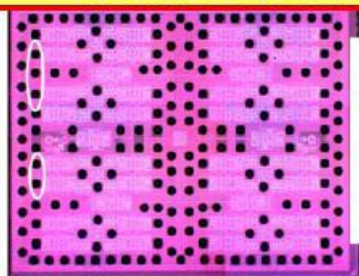
radar system; S/X-band AMDR provides 30 times the sensitivity and number of tracks as SPY-1D(V); JLENS aerostat radar system now deployed over Washington DC; 3, 4, 6 faced "Aegis" radar systems developed by China, Japan, Australia, Netherlands, USA; Low Cost, Low Power Extreme MMIC (Moore's law at Microwave and mm-waves): 4 T/R modules on single chip at X-band costing ~\$10 per T/R module; Intel single chip 32-Element 60 GHz Tx/Rx Phased Array, full phased array on wafer at 110 GHz; on-chip built-in-self-test (BIST), will be used in the internet-of-things and in cell phones which by 2020 is expected to number 50 billion, expect such single chip arrays to cost only few dollars in future; All the RF circuitry for mm-wave automobile radars at 25 GHz and 77 GHz are being put on a chip with some believing that such arrays and radars will soon be produced for just a few dollars; Valeo Raytheon (now Valeo Radar) developed low cost, \$100s, car 25 GHz 7 beam phased array radar; about 2 million sold already, more than all the radars ever built up to a very few years ago. Digital Beam Forming (DBF): Israel, Thales and Australia AESAs have under development array with an A/D for every element channel; Raytheon develop-

ing mixer-less direct RF A/D having >400 MHz instantaneous bandwidth, reconfigurable between S and X-band; Radio Astronomers looking at using arrays with DBF. Materials: GaN can now put 5X to 10X the power of GaAs in same footprint, 38% less costly, 100 million hr MTBF, Raytheon invested \$150 million to develop GaN; SiGe for backend, GaN for front end of T/R module. MIMO (Multiple Input Multiple Output): Where it makes sense; contrary to what is claimed MIMO array radars do not provide 1, 2 or 3 orders of magnitude better resolution and accuracy than conventional array radars; MIMO does not provide better barrage-noise-jammer, repeater-jammer or hot-clutter rejection than conventional array radars; contrary to claims MIMO

tion. Methods for calculating this optimum weight are given using the Sample Matrix Inversion (SMI) algorithm, the Applebaum-Howells adaptive feedback loop method, a recursive method, and Gram-Schmidt, Givens and Householder orthonormal transformations developed for the tracking problem and for the MSLC. The use of eigenvector beams and a whitening filter will also be developed. It will be shown how the latter reduces the transient response. Methods for obtaining the benefits of a fully adaptive array without its high computation and large transient time disadvantages are given. These are the adaptive-adaptive array processing procedures, the use of eigenbeam space, and the method of finding the largest eigenvalues and in turn their eigenbeams. The STAP algorithm will be introduced.

Phased Array Amazing Advances and Breakthroughs -- Part 2: Metamaterials: Material custom made (not found in nature): using 20 and 30 GHz metamaterial electronically steered antennas about the size of a laptop developed for transmission to satellites and back was demonstrated December 2013, goal is \$1K per antenna, remains to prove low cost and reliability, how this antenna works explained for first time; 2-20GHz stealthing by absorption simulated using <1 mm coating; target made invisible over 50% bandwidth at L-band; Focus 6X beyond diffraction limit at 0.38 μm ; 40X

INTEL 32-ELEMENT SINGLE CHIP 60 GHZ TX/RX PHASED ARRAY



EXTREME MMIC

- Based on work with UCSD (we helped them a lot)
- Flip-chip packaging – CMOS from TSMC.
- Does not contain baseband circuitry for Gbps communications

PROF. GABRIEL M. REBEIZ
IEEE Phased Array Symposium Short Course, October 2013 – © UCSD and IEEE

19

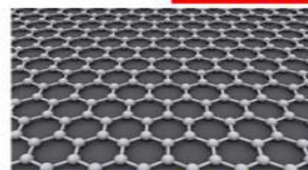
should not provide better minimum detectable velocity for airborne radars.

Sidelobe Cancellers (SLC): The simple single-loop, feed-forward canceller is introduced in easy terms. This is followed by a discussion of the simple single-loop feedback canceller with and without hard limiting. The normalized feedback SLC will also be covered. Presented will be their performance; transient response and cancellation ratio. Next the multiple-loop SLC (MSLC) will be covered. Applied to the MSLC will be the Gram-Schmidt, Givens and Householder orthonormal transformation methods. Systolic array implementations will be given.

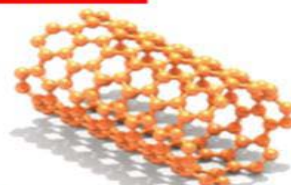
Lecture #10. Monday June 13; Fully Adaptive Arrays: The optimum weight for a fully adaptive array is developed using a very simple deriva-

GRAPHENE & CARBON (C) NANOTUBES (CNT): HOPE FOR MOORE'S LAW CONTINUATION

THZ CLOCK SPEED



GRAPHENE: 1 ATOM THICK C CRYSTAL; STRONGEST MATERIAL



CNT: MANUFACTURE ON COMOS DEMO'D

T. SIMONITE, MIT TECHNOLOGY REVIEW, SEPT-OCT, 2014, p. 17; ALSO E. BROOKNER, "RECENT ACHIEVEMENTS", IEEE ARRAY-2013; E. BROOKNER, "BREAKTHROUGHS IN PHASED ARRAYS & RADAR", IEEE ARRAY-2010.

diffraction limit, $\lambda/80$, at 375 MHz; In cell phones provides antennas 5X smaller ($1/10\text{th } \lambda$) having 700 MHz-2.7 GHz bandwidth; The Army Research Laboratory in Adelphi MD has funded the develop-

ment of a low profile metamaterial 250-505 MHz antenna having a $\lambda/20$ thickness; Provides isolation between antennas with 2.5 cm separation equivalent to 1 m separation; used for phased array WAIM; n-doped graphene has negative index of refraction, first such material found in nature; Digital Processing and Moore's Law: Not dead yet; Slowed down but has much more to go; Expect increase in transistors density by about a factor of ~ 50 in the next 30 years and reduction in signal processing power consumption by factor of ~ 75 ; and then there is graphene which has potential for terahertz transistor clock speeds, manufacture on CMOS demonstrated, could allow Moore's law to march forward using present day manufacturing techniques; there is also spintronics which could revolutionize the computer architecture away from the John von Neumann model; and there is finally doing computation the way the brain efficiently and amazingly does perhaps by using synaptic transistors and/or memristors, remember the brain only weighs about 2-3 pounds and uses only ~ 20 W, we have a long way to go; Low Cost Packaging: Raytheon funding development of low cost flat panel X-band AESA using COTS type printed circuit boards (PCBs); Rockwell Collins doing it for airborne AESA; Lincoln-Lab./MA-COM developing low cost S-band flat panel array using PCBs, overlapped subarrays and a T/R switch instead of a circulator; SAR/ISAR: Principal Components of matrix formed from prominent scatterers track history used to determine target unknown motion and thus compensate for it to provide focused ISAR image. Technology and Algorithms: A dual polarized, low profile, ($\lambda/40$), wideband (1:20) antenna can be built using tightly coupled dipole antennas (TCDA); Lincoln Lab increases spurious free dynamic range of receiver plus A/D by 40 dB; MEMS: reliability reaches 300 billion cycles without failure; Has potential to reduce the T/R module count in an array by a factor of 2 to 4; Can provide microwave filters 200 MHz wide tun-

able from 8-12 GHz; MEMS Piezoelectric Material = piezoMEMS: Enables flying insect robots; Printed Electronics: Low cost 1.6 GHz (goal 2.4 GHz) diodes printed with Si and NbSi₂ particles; Electrical and Optical Signals on Same Chip: IR beams could be used for transporting on computer chips digital information at the speed of light; COSMOS: DARPA revolutionary MMIC program: Allows integration of III-V, CMOS and opto-electronics on one chip without bonded wires leading to higher performance, lower power, smaller size, components; Graphene and Carbon Nanotube (CNT): potential also for non-volatile memory, flexible displays and camouflage clothing, self-cooling, IBM producing 200 mm wafers with RF devices; Superconductivity: We may still achieve superconductivity at room temperature; Superconductivity recently obtained for first time with iron compounds; Biodegradable Array of Transistors or LEDs: Imbedded for detecting cancer or low glucose; can then dispense chemotherapy or insulin; Quantum Radar: See stealth targets; New polarizations: OAMs, (Orbital Angular Momentum) unlimited data rate over finite band using new polarizations?? Bio: Biodegradable array of transistors or LEDs for detecting cancer or low glucose, can then dispense chemotherapy or insulin; Can now grow functioning non-rejecting kidney and heart for rats.

**Decision (Run/Cancel) Date for this Courses is
Wednesday, March 7, 2016**

Payment received by March 3

IEEE Members \$300

Non-members \$340

Payment received after March 3

IEEE Members \$340

Non-members \$370

Your registration includes:

1 textbook

15 reprints

copies of over 800 vugraphs

To Register, <http://ieeeboston.org/event/phased-array-and-adaptive-array-fundamentals-and-their-recent-advances-spring-2016>

Please take this short survey, <https://www.surveymonkey.com/r/B8R2DYL>

Software Development for Medical Device Manufacturers - An intensive two-day course

Time & Date: 8:30AM - 4:30PM; Wednesday & Thursday, March 30 & 31, 2016

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

Speaker: Steven Rakitin, Quality Software Consulting

SUMMARY:

Developing software in compliance with FDA, EU regulations and international standards is challenging. This two-day intensive course provides practical guidance and suggestions for developing software that complies with applicable FDA and EU regulations, guidance documents and international standards such as IEC 62304 and ISO 14971. The focus of this course is interpreting Design Controls for software. Each section of the Design Controls regulation (820.30) is discussed from the software perspective. Corresponding requirements from IEC 62304 are woven into the flow.

In-depth discussion of critical topics such as Requirements, Software Verification & Validation, Risk Management and Fault Tree Analysis are included. In addition, techniques for validating software development tools and software used in Manufacturing and Quality Systems are also discussed. Interactive group exercises are included to facilitate discussion and learning.

WHO SHOULD ATTEND

Software and firmware engineers, software managers, RA/QA staff, validation engineers, and project managers. Anyone interested in learning how to develop medical device software in compliance with regulations, standards and guidance documents.

COURSE OUTLINE

• Introduction

- Medical Device Definitions – FDA and EU
- Regulatory Roadmap and FDA/EU Device Classification Schemes
- FDA Regulations and Guidance Documents for Software
- Standards – ISO 13485, IEC 62304, ISO 14971, EN-14971, IEC 60601, and IEC 62366-1
- All Software is Defective

• Interpreting Design Controls for Software

- Software Development Models
- Design and Development Planning
- Design Inputs
 - About Requirements...
 - Requirements Exercise
- Design Outputs
- Design Reviews
- Design Verification
 - Software Verification Techniques
- Design Validation
 - Software Validation Process
 - Validation Exercise
- Design Transfer
- Design Changes
- Design History File

• Validation of...

- Software Tools used to develop Medical

Device Software

- Software used in Manufacturing
- Software used in Quality Systems

• Risk Management

- Standards and Regulations
- Terms and Concepts
- Risk Management Process
- Risk Management Tools and Techniques
 - Fault Tree Exercise
- Data Collection and Analysis
- Documentation Requirements

• Summary

• Comprehensive reference materials included

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 Life Senior 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.

Speaker Bio:

Steven R. Rakitin has over 40 years experience as a software engineer and software quality manager. He helped write the first IEEE Software Engineering Standard (IEEE-STD-730 Standard for Software Quality Assurance Plans) as well as the current revision IEEE 730-2014. He is also a member of the working group writing IEEE Standard 1012 (System Verification & Validation). He has written several papers on medical software risk management as well as a book titled: Software Verification & Validation for Practitioners and Managers.

Decision (Run/Cancel) Date for this Courses is Monday, March 21, 2016

Payment received by March 3

IEEE Members	\$465
Non-members	\$495

Payment received after March 3

IEEE Members	\$495
Non-members	\$545

To Register, <http://ieeeboston.org/event/software-development-for-medical-device-manufacturers-spring-2016>

Antennas and Propagation for Wireless Communications

Time & Date: 6:30 - 9PM; Tuesdays, March 22, 29, April 12, 19, 26, May 3, 10, 17

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

Speaker: Dr. Steven R. Best, MITRE Corporation

*Last Notice Before Course Begins,
Please Register Now !!!!*

Summary: This course provides participants with comprehensive coverage of a wide variety of antenna and propagation topics. The course provides an understanding of basic antenna property definitions, antenna design fundamentals and considerations, numerous antenna types and RF propagation fundamentals. The course also provides an overview of how antenna properties and propagation characteristics affect communication system performance. Topics covered include fundamental antenna performance properties, antenna specifications and data sheets, basic antenna types, elementary antennas, electrically small antennas, wireless device antennas, medical device antennas, low profile antennas, aperture and reflector antennas, circular polarized antennas, antenna arrays, propagation channel characteristics, antenna diversity and MIMO, and an overview of different antennas used in today's wireless communication systems and markets.

Learning Objectives:

Upon completing the course, the participant will be able to:

- Understand the concepts associated with antenna performance, operation and classification.
- Understand, evaluate and define antenna performance specifications.
- Describe and understand a broad spectrum of antenna types.
- Illustrate antenna operating principles with a factual knowledge of antenna theory.

- Understand the basic performance trade-offs associated with antenna design.
- Understand how to design basic antenna elements.
- Understand basic principles associated with the implementation of antenna arrays.
- Understand and describe how antenna performance and the RF propagation environment impact wireless communication system performance.
- Understand the basic types of antennas that are used in today's wireless communications markets.

Target Audience: Anyone working within the field of general RF systems, wireless, cellular and microwave systems will benefit from this comprehensive coverage of antenna properties and design. The course is well suited for design engineers and program managers who require an understanding of antenna principles and design concepts. Basic mathematical and computing skills are a prerequisite for this course. An electrical engineering background or equivalent practical experience is recommended but not required.

Outline:

Part 1:

Basic RF Concepts

- Review of fundamental RF Concepts • Basic design and performance requirements of a wireless

communication system

Basic Antenna Concepts

• Definitions of basic antenna properties: impedance, VSWR, bandwidth, directivity, gain, radiation patterns, polarization, etc.

Types of Antennas

• Resonant antennas • Traveling wave antennas • Frequency Independent antennas • Aperture antennas • Phased arrays • Electrically small antennas • Circularly polarized antennas

Classification of Antenna Types

• By frequency • By size • By directivity

Fundamental Antenna Elements

• The monopole • The dipole • The loop • The folded dipole • The slot

Microstrip Antennas

• Element types • Microstrip element design • Design trade-offs • Designing and 802.11 microstrip patch

Baluns

Ground Plane Considerations

• Vertically polarized antennas • horizontally polarized antennas • The impact of the surrounding environment on antenna performance

Part 2:

Circularly Polarized Antennas

• Achieving circular polarization • The helix antenna • The crossed dipole antenna • The microstrip patch • The quadrifilar helix

Aperture Antennas

• Aperture design concepts • The horn antenna • The reflector antenna • The corner reflector

Impedance Matching

• Impedance matching networks

Broadband Antennas

• Monopole configurations • Feed considerations • Dipole configurations • Bandwidth improvement techniques

Frequency Independent Antennas

• The log-periodic antenna • The spiral antenna

Electrically Small Antennas

• Impedance, bandwidth and quality factor of antennas • Defining electrically small • Fundamental

performance limitations • The small dipole • The small loop • Design and Optimization of small antennas

Part 3:

Antenna Arrays

• Fundamental array theory • Types of antenna arrays • Feed network design considerations • Beam steering and shaping concepts • Performance trade-offs • Microstrip patch arrays • Dipole element arrays

Friis Equation and Link Budget

• The communication link • Understanding and calculating path loss • Receiver Sensitivity and antenna noise figure • Link budget calculations

Receiving Properties of Antenna

• How does an antenna capture power • Aperture area and efficiency • Coupling between antennas

Fractal Antennas

• Fractal antenna types • Performance properties of fractal antennas

RFID Antennas

• RFID system basics • Performance properties of RFID antennas

Ultra Wideband (UWB) Antennas

• Time domain considerations in antenna design • Antenna performance requirements in UWB systems

Low Profile Antennas

• The inverted L and inverted F antennas • The planar inverted F antenna (PIFA)

Device Integrated Antennas

• Antennas commonly used in wireless device applications

Part 4:

Propagation Channel Considerations

• RF path loss • Reflection, multipath and fading • Noise and interference • Polarization distortion • Diversity implementation • MIMO

Types of Antennas used in Communications Systems

• Wireless base station antennas • Wireless handset and portable device antennas • GPS antennas • HF, UHF and VHF communication antennas • Earth station and satellite communication antennas

Numerical Modeling of Antennas

• Software packages • Comparison with measurements

Antenna Design and Simulation Examples Using Commercial Antenna Design Software

Speaker Bio: Steven R. Best is a Senior Principal Sensor Systems Engineer with the MITRE Corporation in Bedford, MA. He received the B.Sc. Eng and the Ph.D. degrees in Electrical Engineering in 1983 and 1988, respectively, from the University of New Brunswick in Canada. Dr. Best has over 28 years of experience in business management and antenna design engineering in both military and commercial markets. Prior to joining MITRE, Dr. Best was with the Air Force Research Laboratory (AFRL) at Hanscom AFB, where his research interests included electrically small antennas, wideband radiating elements, conformal antennas, antenna arrays and communications antennas. Prior to joining AFRL, he was President of Cushcraft Corporation in Manchester, NH from 1997 to 2002. He was Director of Engineering at Cushcraft from 1996 to 1997. Prior to joining Cushcraft, he was co-founder and Vice President and General Manager of Parisi Antenna Systems from 1993 through 1996. He was Vice President and General Manager of D&M/Chu Technology, Inc. (formerly Chu Associates) from 1990 – 1993. He joined Chu Associates as a Senior Electrical Engineer in 1987.

Dr. Best is the author or co-author of 3 book chapters and over 100 papers in various journal, conference and industry publications. He frequently presents a three-day short course for the wireless industry titled “Antennas and Propagation for Wireless Communication”, he is the author of a CD-ROM series on antenna theory and design, and he has presented several Webinars on antenna topics. He has also authored an IEEE Expert Now module on electrically small antennas. Dr. Best is a former Distinguished Lecturer for IEEE Antennas and Propagation Society (AP-S), a former member of the AP-S AdCom, a former Associate Editor for the IEEE Transactions on Antennas and Propagation, and Senior Past Chair of the IEEE Boston Section. He is also a former Editor-in-Chief for AP-S Electronic Communications. Dr Best is a Fellow of the IEEE and a Past-President of the IEEE Antennas and Propagation Society.

Decision (Run/Cancel) Date for this Courses is Friday, March 11, 2016

Payment received by March 8

IEEE Members	\$425
Non-members	\$455

Payment received after March 8

IEEE Members	\$455
Non-members	\$475

To Register, <http://ieeeboston.org/event/antennas-and-propagation-for-wireless-communications>

Call for Participants!!

2016 IEEE International Symposium on Technologies for Homeland Security

10 – 12 May Westin Hotel, Waltham, MA

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



Co-sponsors:



Call for Participants

The 15th annual IEEE Symposium on Technologies for Homeland Security (HST '16), will be held 10 – 12 May, in the Greater Boston, Massachusetts area. This symposium brings together innovators from leading academic, industry, business, Homeland Security Centers of Excellence, and government programs 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, Battelle, and MITRE, this year's event will once again showcase selected technical paper and posters highlighting emerging technologies in the areas of:

Cyber Security

Biometrics & Forensics

Land and Maritime Border Security

Attack and Disaster Preparation, Recovery and Response

We are currently reviewing and finalizing the technical paper, poster and tutorial session submissions in each of the areas noted above. Accepted papers will focus on technologies with applications available for implementation within about five years. All areas will cover the following common topics:

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

Contact Information

For more detailed information on the Technical Program, as well as Sponsorship and Exhibit Opportunities, visit the website: <http://ieee-hst.org/> or email: information@ieee-hst.org. We expected the technical program to be posted online no later than March 1, 2016

Organizing Committee

General Chair:	James Flavin, MIT Lincoln Laboratory
Deputy Chair:	Fausto Molinet, Matrix Internationale
Technical Co-Chair:	Gerald Larocque MIT Lincoln Laboratory
Tutorials Chair:	Anthony Serino, Raytheon
Business Program Chair:	Andrea Marsh, Battelle
Local Arrangement Chair:	Bob Alongi, IEEE Boston
Marketing Chair:	Jessica Patel, Raytheon
Publications Chair:	Adam Norige, MIT Lincoln Laboratory
Sponsorship/Exhibits Chair:	Fausto Molinet, Matrix Internationale
Special Advisor to the Chair:	Lennart Long, EMC Consultant
Registration Chair:	Karen Safina, IEEE Boston

Technical Program Committee Chairs

Attack and Disaster Preparation, Recovery and Response

Lance Fiondella, UMass, Dartmouth
Kenneth Crowther, MITRE

Biometrics & Forensics

Eric Schwoebel, MIT Lincoln Laboratory
James L. Wayman, San Jose State University

Land and Maritime Border Security

Karen Panetta, Tufts University
Rich Moro, Raytheon
John Aldrige, MIT Lincoln Laboratory

Cyber Security

David Balenson, SRI International
Emily Frye, MITRE