

BOSTON



THE REFLECTOR

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JUNE 2018

2019 IEEE RADAR
CONFERENCE -
CALL FOR PAPERS

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2019 IEEE PHASED
ARRAY SYMPOSIUM
CALL FOR PAPERS

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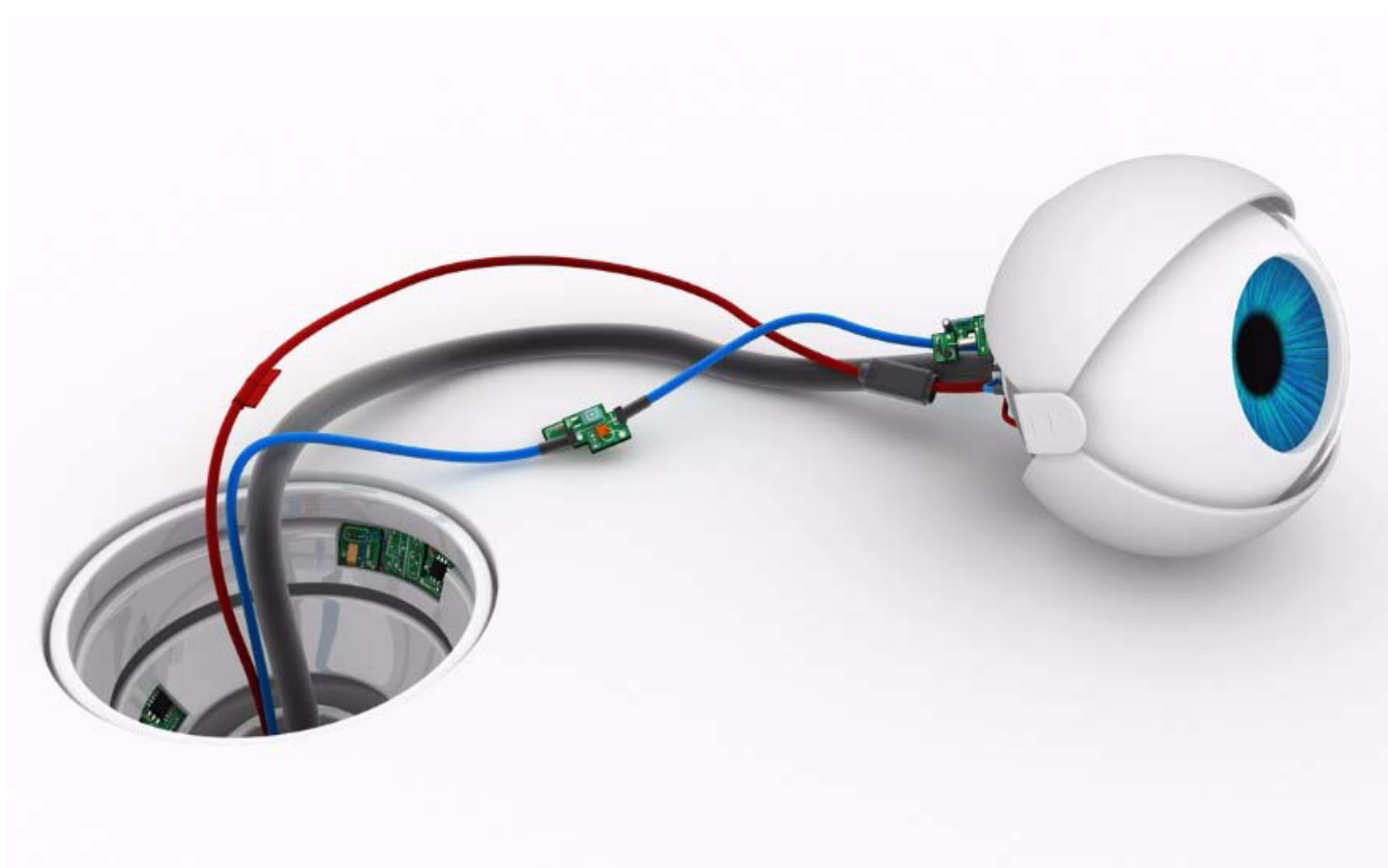


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Not so Virtual Anymore: Virtual Reality in the Workplace

Kevin Flavin, Chair, IEEE Boston Section Electronic Communications Team

Not to be confused with Augmented Reality, Virtual Reality is defined by the Oxford Dictionary as “The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.”

The difference between Virtual Reality (VR) and Augmented Reality (AR) is clear by their definition - VR is a completely virtual experience to our senses, and AR is the act of layering a complex environment over the actual sensory environment. Next month, I’ll discuss AR in greater depth.

One of the most promising uses of VR is applying simulations to training for new workers. A Harvard Business Review article stresses the use of cognitive computing and simulations in VR to training new surgeons on the latest techniques. AI and AR are already being used in areas of diagnostics; and applying technology to the education of the next cohorts of surgeons is a practical next step.

The federal initiative, Precision Medicine Initiative, which began in 2015, has helped to prompt leaders of agencies to collaborate between biomedical research and health care and public health.

There are a number of real developments and initiatives springing from this work, namely the proposition of an Internet of Medical Things, as well as the wearable sensors, so common today that you can choose among half a dozen of these in every Apple store.

These initiatives either support the disruption we are observing in the healthcare industry, or are enabling the disruption - possibly both!

Harvard Business Review published research from Accenture recently, that defines the level of vulnerability to technological disruption. No surprise, the Health Care Sector was scored with the highest vulnerability with the lowest level of current disruption - which means massive disruption is highly likely in that sector.

VR applications are increasingly used in compliance training, also. WIRED reports in the June 2018 issue that a startup has taken compliance training from the dull slide-decks and “schlocky video” to an immersive Virtual Reality experience. The training that the article highlights is the critical and necessary on-the-job harassment training.

1. <https://www.youtube.com/watch?v=akveRNY6UIw>
2. https://en.oxforddictionaries.com/definition/virtual_reality
3. <https://hbr.org/2018/03/decades-ago-pilots-learned-to-fly-by-instruments-doctors-need-to-do-the-same>
4. <https://jamanetwork.com/journals/jama/article-abstract/2289153>
5. <https://hbr.org/2018/01/how-likely-is-your-industry-to-be-disrupted-this-2x2-matrix-will-tell-you>

The impressive leap from the standards to the new form of VR started with the founder, Morgan Mercer, re-thinking the current models available, digging into learning programming, even participating in hack-a-thons, to launch her new compliance training in VR company, Vantage Point.

Whether your firm decides to hire a VR developer to

convert your existing programs, or if you're assigned to develop it in house, there are some tools that you will need before you start.

First, acquire a VR headset and related accessories. Facebook purchased a leader in this space, Oculus Rift, many years ago, probably hoping that VR would take off much faster than it has. However, even after the purchase, Oculus Rift is still a major player, if not the leader in the VR tools space, but there are many VR systems now.

Second, get some experience using it first. Beyond the YouTube videos that can give you a sense of VR, there are companies trying to develop communities through Virtual Reality. For example, Altospace VR is one company that lists free events to join if you have a VR system.

This reminds me a little bit like Second Life, but with VR, the interfacing is a lot smoother, though the visuals are similar.

Third, there are some basic rules to consider in any strategy to launching a VR initiative:

Rules that every VR experience must not Break .

1. Don't Make a VR solution for everything - some things don't need to VR.
2. Don't make the human sick - motion sickness is real in VR
3. Be safe - VR participants become immersed into the world, have a spotter to prevent them from hurting themselves.

If your company decides to look at VR, let us know, we'd like to share your experiences in the future Digital Reflectors.

6. <https://www.wired.com/story/vr-sexual-harassment-training/>
7. <https://www.wired.com/story/oculus-connect-virtual-reality-progress/>
8. <https://www.wired.com/story/3-secrets-to-designing-primo-virtual-reality/>

IEEE Boston Section Social Media Links:

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

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



The Institute of Electrical and Electronic Engineers, Inc.

Spring 2018 Professional Development and Education Program

www.ieeeboston.org

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

Dates and Time: Eight Monday Evenings,
March, 19, 26, April 2, 9, 30, May 7, 14, 21
(Snow/make-up dates) June 4 or 11
6:00PM - 9:00PM

MITRE Corporation, Bedford, MA

Fundamentals of Real-Time Operating Systems

Dates and Time: Mondays, March 19, 26, April 2, 9
6:00PM - 9:00PM

More Digital Signal Processing for Wireless Communications

Dates and Time: Wednesdays, March 28, April 4, 11, 18 and 25
6:00PM - 9:00PM

Software Development for Medical Device Manufacturers

Dates and Time: Wednesday, April 11 and Thursday, April 12
8:30AM - 4:30PM

Embedded Linux BSPs and Device Drivers

Dates and Time: Mondays, April 16, 23, 30 and May 7
6:00PM - 9:00PM

Making You A Leader Fast Track - Become the Leader You Want and Need

Date and Time: Monday, June 18
8:30AM - 5:00PM

Writing Agile User Story & Acceptance Test Requirements - Cut Creep Overruns, Disappointment, and Embarrassment

Date and Time: Tuesday, June 19
8:30AM - 5:00PM

Determining and Communicating Project Value Return On Investment (ROI) - Communicate Right, Reliable, and Responsible REAL ROI Business Cases

Date and Time: Wednesday, June 20
8:30AM - 5:00PM

Proactive User Acceptance Testing - Confident Competence - The Testing Users Need to Be Confident the Software they Depend on Works

Date and Time: Thursday, June 21
8:30AM - 5:00PM

Developing Reusable Test Designs - Be an Instant Expert-Run More, and More Thorough, Tests in Less Time

Date and Time: Friday, June 22
8:30AM - 5:00PM

Online Courses

(Each Online Course - 90 day access for registrants!!!)

- Verilog 101: Verilog Foundations
- Systems Verilog 101 (SV101) Design Construct
- Systems Verilog 102 (SV102) Verification Constructs
 - High Performance Project Management
 - Introduction to Embedded Linux
 - Fundamentals of Real-Time Operating Systems
- Software Development for Medical Device Manufacturers
 - Reliability Engineering for the Business World
- Fundamental Mathematical Concepts Relating to Electromagnetics
 - Embedded Linux Optimization
 - Embedded Linux BSPs and Device Drivers
 - Design Thinking for Technical Work

All Courses are being held at the Hilton Woburn, 2 Forbes Road, Woburn unless otherwise noted. For more information on these courses and other local IEEE activity see our website at www.ieeeboston.org, email: ieeebostonsection@gmail.com, or call 781-245-5405

Entrepreneur's Network – 6:30PM, Tuesday, 5 June

Exit Strategies & Techniques for Entrepreneurs

LOCATION: Constant Contact, Inc., Reservoir Place, 3rd Floor Great Room, 1601 Trapelo Rd., Waltham, MA

When you're just starting an entrepreneurial venture, it's not always easy to know how you're going to get out of it. We may have grand expectations or modest desires and sometimes real worries about whether or not we'll succeed. Everything we do on day one will affect us in some way on the last day that venture exists. How successful we feel on that last day will be the result of planning and preparation and re-planning and re-preparation, repeated many times. On June 5 we will have two speakers who will help us prepare for that journey.

Stever Robbins <https://www.steverrobins.com>

Stever is a veteran of four IPOs, entrepreneurial coach, and co-designer of the Harvard Business School "Foundations" curriculum. He will talk to us about the options available to entrepreneurs and how we can shape our venture to take maximum advantage

of them.

Ian Smith, Ex-CEO, COO, CFO, and Investment Banker

<http://portfoliopartnership.com>

Ian is the author of The Acquirer's Playbook and The Exit Playbook and founder of The Portfolio Partnership and will speak on how we can build businesses buyers love to buy.

This promises to be a very thought provoking evening. It will raise many questions for which we need to seek answers that apply to our specific situation and will supply some guidance on how we can resolve them.

A networking session will precede the meeting, and a question and answer session will follow the panelists' presentations.

Moderator, Fausto Molinet www.celeriss.com



Fausto is currently a co-founder for Celeriss, Inc., developing solutions for crosstalk suppression in wireline communications. He is a retired USAF Lt. Col, former senior manager at ITEK, and President of Matrix Internationale, a strategic planning consultancy. He has an MSEE and is the co-founder of ENet.

Agenda:

5:15 pm - Pre-meeting Dinner at Bertucci's in Waltham
 6:30-7:30 pm - Networking
 7:30-7:40 pm - Announcements
 7:40-7:45 pm - E Minute presentation
 7:45-8:25 pm - Stever Robbins
 8:25-8:45 pm - Ian Smith
 8:45-9:10 pm - Q & A
 9:10-9:30 pm - Networking including meeting speakers
 9:30 – Must clear meeting room. Networking may continue outside the meeting room.

E-Minute Presentations: These 90-second presentations enable startup entrepreneurs to gain experience in presenting their summary to expert panels and audiences.

Refreshments: Cheese, crackers, chips, cookies, soft drinks & juice. Reservations: Free to ENET members and \$20 for non-members. No reservations required for the pre-meeting dinner.

Members & non-members, please pre-register for the meeting online, until midnight the day before the meeting. If you cannot pre-register, you are welcome to register at the door.

Pre-Meeting Dinner: Join us for a pre-meeting networking dinner (self-pay) at Bertucci's in Waltham before the start of this meeting. Dinner at 5:15 sharp.

Constant Contact is adjacent to RT 128 / 95 at Exit 28B. See: <http://www.constantcontact.com/about-constant-contact/office-location-waltham.jsp>
 Organizer: Fausto Molinet, Celeriss, Inc.

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

Reliability Testing and Analysis with Intent

Adam Bahret, Apex Ridge Reliability Consulting



Product development programs execute reliability test and analysis methods such as HALT, Accelerated Life Tests, DFMEA's, and System Life tests. Often the results of these initiatives have a compromised impact on the final product due to a disconnect with the overall product development process. This disconnect is a progression from an initial program plan that

identified specific reliability tools to aid program decisions and improve the design to isolated initiatives that do not influence the product or program as intended.

Maintaining reliability initiatives by concrete connection points to the program can ensure this progression of disconnection does not occur. The proposed method for maintaining this program integrity, "Intent Anchoring" is the creation and monitoring of two points of connection for each individual reliability tool to the program. The first is a connection point called "Intent." This point ensures the tool was selected to answer a fundamental product program question or goal pertaining to measurement or improvement. An example is if program specifications require a demonstrated 80% confidence in the 98% reliability goal at release. A Reliability Growth program would be initiated at the Alpha phase for this metric in the high level program plan.

The second connection point is "Delivery." This connection point ensures a point of insertion for the analysis or test results back to the program at the point of greatest impact on decisions and design features. For example, HALT test with have a "Delivery" point at R&D Prototype. This will ensure that recommended robustness improvements from test results can be incorporated be-

fore design freeze. The intent methodology ensures the two critical connection points maintain integrity throughout the program.

Author Bio: Adam is the founder of Apex Ridge Reliability Consulting Services. He is a Mechanical and Electrical Systems Reliability expert with 20 years of experience in product development across many industries. He has worked extensively with reliability program strategy, accelerated testing methods HALT/HASS/QALT/ALT, system reliability measurement and improvement, predictive analysis, education programs, and organizational culture and practices. He has specialized experience in medical, robotics, consumer electronics/appliances, Ion Implantation, and Diesel Systems.

Adam has an MS in Mechanical Engineering from Northeastern University, is an ASQ nationally certified reliability engineer and a member of IEEE. More information on Adam and Apex Ridge Reliability can be found at www.apexridge.com

Meeting Location: MIT Lincoln Laboratory, 3 Forbes Rd, Lexington, Massachusetts, 02421

Registration: <http://ewh.ieee.org/r1/boston/rl/events.html>

Directions to 3 Forbes Road, Lexington, MA:

- 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".

Microwave Theory and Techniques Society – 5:30PM, Monday, 18 June

Energy Efficient Future Wireless Communications

Speaker: Professor Nuno Carvalho - University of Aveiro



The energy needs for wireless systems is limiting the evolution of most of the IoT and 5G future solutions. In this talk an overview of the energy problem in wireless communication systems will be presented, either from a mobile network point of view, but also from a IoT point of view. The main objective is to discuss future wireless paradigms that

will be changing soon with 5G and beyond, those include the spread of a distributed mobile network by using Cloud Radio Access Networks, with its associated Software Defined Radio approaches, but also the issue of battery-less wireless devices, combining wireless power transmission and backscatter communications. The talk starts first with a general overview of the energy needs for a future XG networks, and then presents in an integrated way both approaches of C-RAN and IoT wireless design. The presentation will cover topics like the hardware part of the SDR and design of battery-less wireless sensors networks. Issues like characterization of mixed-signal devices, designing of C-RAN SDR approaches, design of passive backscatter sensors will be discussed, according to the audience.

Agenda:

5:30-6:00 - Social

6:00-8:00 – Meeting/Talk

Nuno Borges Carvalho (S'97–M'00–SM'05–F'15) was born in Luanda, Angola, in 1972. He received the Diploma and Doctoral degrees in electronics and telecommunications engineering from the University of Aveiro, Aveiro, Portugal, in 1995 and 2000, respectively.

He is currently a Full Professor and a Senior Research Scientist with the Institute of Telecommunications, Uni-

versity of Aveiro and an IEEE Fellow. He coauthored *Intermodulation in Microwave and Wireless Circuits* (Artech House, 2003), *Microwave and Wireless Measurement Techniques* (Cambridge University Press, 2013) and *White Space Communication Technologies* (Cambridge University Press, 2014). He has been a reviewer and author of over 200 papers in magazines and conferences. He is associate editor of the *IEEE Microwave Magazine* and *Cambridge Wireless Power Transfer Journal* and former associate editor of the *IEEE Transactions on Microwave Theory and Techniques*.

He is the co-inventor of six patents. His main research interests include software-defined radio front-ends, wireless power transmission, nonlinear distortion analysis in microwave/wireless circuits and systems, and measurement of nonlinear phenomena. He has recently been involved in the design of dedicated radios and systems for newly emerging wireless technologies.

Dr. Borges Carvalho is the chair of the IEEE MTT-20 Technical Committee and the past-chair of the IEEE Portuguese Section and MTT-11 and also belong to the technical committees, MTT-24 and MTT-26. He is also the vice-chair of the URSI Commission A (Metrology Group). He was the recipient of the 1995 University of Aveiro and the Portuguese Engineering Association Prize for the best 1995 student at the University of Aveiro, the 1998 Student Paper Competition (Third Place) of the IEEE Microwave Theory and Techniques Society (IEEE MTT-S) International Microwave Symposium (IMS), and the 2000 IEE Measurement Prize.

Meeting Location: MIT Lincoln Laboratory, 3 Forbes Road, Lexington, MA 02421

Consultant's Network - 6:30PM, Tuesday, 26 June

Messaging is a Verb: How to Speak Artfully

Greg Stone, President, Stone Communications

Communications strategist Greg Stone will show you how to tell a compelling, colorful story about your business — with the help of a few sumptuous visuals of masterpieces. You will also learn how to apply the villain-victim-hero format, under the theory that “scoundrels” are your best friends when it comes to presentations.

Media strategist Greg Stone began his career as a writer at Time Inc. in New York and later worked as a TV reporter in Minneapolis, Boston, and on PBS. His professional honors include three Emmy nominations.

Turning down an offer to anchor at CNN, Greg founded Stone Communications in 1989. Since then he has conducted media and presentation skills workshops for high-level executives for a broad range of clients including Fidelity, IBM, Osram, 3M, the World Wide Web Consortium and many deans at Harvard University. He is also the “official media trainer” for the faculty at Harvard Business School.

Greg is the author of the acclaimed book *Artful Business: 50 Lessons from Creative Geniuses* and the forthcoming *Villains, Victims and Heroes*:

Harnessing the Power of Messages and Stories For Business and Career Success (to be published by Praeger this year). He holds an AB from Harvard University and two master's degrees from Columbia Uni-

versity in journalism and business.

Meeting Location: Constant Contact, Great Room South, 3rd Floor 1601, Trapelo Rd. Waltham, MA 02451

Registration: No registration required.

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.

A no host, PRE-MEETING DINNER will take place at 5:15 PM (sharp) at Bertucci's, 475 Winter Street, Waltham, MA (exit 27B, Rte. 128)

Driving Directions to Constant Contact 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 Tuesday of each month, but are not held during most summer months.

For more information, e-mail cn.boston@ieee.org or chairman@boston-consult.com; or contact the chairman Frederick Beihold at (508) 405-0499.

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>



2018 MIT IEEE Undergraduate Research Technology Conference

Call for Submissions



CONFERENCE: Oct 5-7, 2018 | Massachusetts Institute of Technology, Cambridge MA, USA

SUBMISSION DEADLINE: June 30th, 2018

SUBMIT TO: <https://ieee-r1-studentconference.myreviewroom.com>

Envisioning a technical conference targeted towards undergraduate students all over the globe, the MIT IEEE Student Branch in 2015 inaugurated the IEEE MIT Undergraduate Research Technology Conference. This year we are organizing it again with the goal to make the conference a venue where undergraduate students can meet to present, discuss, and develop solutions advancing technology. Participants can attend a rich program with renowned speakers, technical sessions, a student design competition, exhibits, networking, and social activities, as well as a great opportunity for students to interact with leading industry experts. Our 2017 conference had 267 attendees, including several internationals and students from across the US, with a technical paper acceptance rate of 38%.

The conference theme is “Meet Innovative Technology,” and the eight technical tracks include:

1. Machine Learning and Artificial Intelligence
2. Security and Communications
3. Human-Computer Interaction and Graphics
4. Robotics and Controls
5. BioEECS and Applied Physics
6. Computer Systems
7. Circuits, Materials, and Nanotechnologies
8. Theoretical Computer Science and Mathematics



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

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

All submissions will be peer-reviewed by faculty, graduate students, and industry professionals. Submissions are online, with a deadline of June 30th, 2018. Notification of acceptance will be sent via email by August 4th, 2018.

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

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

MEET INNOVATIVE TECHNOLOGY

Sponsored by the MIT IEEE Student Branch and IEEE Boston Section

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



Call for Articles

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

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

Professional development articles should have broad applicability to the engineering community and should not explicitly promote services for which a fee or payment is required. A maximum length of two to three pages would be best.

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

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

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

Submissions should be sent to;
ieeebostonsection@gmail.com

Call for Course Speakers/Organizers

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

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

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

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

<http://ieeeboston.org/course-proposals/>. Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

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



CALL FOR PAPERS

2019 IEEE International Symposium on Phased Array Systems and Technology

Revolutionary Developments in Phased Arrays



Sponsors

Platinum

Westin Waltham Hotel, Greater Boston, Massachusetts, USA

www.array2019.org

Gold

Silver

Bronze

15–18 October 2019

About the Symposium

Phased array systems continue to be a rapidly evolving technology with steady advances motivated by the challenges presented to modern military and commercial applications. This symposium will present the most recent advances in phased array technology and provide a unique opportunity for members of the international community to interact with colleagues in the field of Phased Array Systems and Technology.



Suggested Topics

- System Architecture
- Aperture Design
- Antenna Elements
- Beamforming Techniques
- T/R Modules
- Signal Processing for Arrays
- Array Measurements
- Advanced Materials
- Packaging and Manufacturing Techniques
- Applied Computational Electromagnetics
- 5 G
- Metamaterials
- Radio Astronomy

See website: www.array2019.org for details

Special Sessions

Please provide suggestions for special sessions to the Technical Program Chair at info@array2019.org

Paper Template and Submission Procedures

Template and submission procedures are available at www.array2019.org/call-for-papers

General Paper Submission Information

All paper submissions will be peer reviewed and must be received in PDF format via the symposium web site on or before Friday, 15 March 2019. This is a firm deadline. Papers will not be accepted after this date. Papers must be in IEEE dual-column format and must be 2 pages (minimum) to 8 pages (maximum) in length including figures. Additional instructions are on the website www.array2019.org/call-for-papers

Technical Program Schedule

Please note: Our submission process and dates have been streamlined – plan accordingly.

15 March 2019 – Full paper submission deadline

- Submitted paper must be final and in IEEE dual-column format, not an abstract
- Submitted paper must be 2–8 pages in length including figures

30 April 2019 – Author notification of paper acceptance

1 Sept. 2019 – Conference registration deadline for accepted authors

Conference Committee

Conference Chair:

Jeffrey S. Herd, MIT LL

Vice Chair:

William Weedon, Applied Radar

Technical Program Chair:

Alan J. Fenn, MIT LL

Technical Program Vice Chair:

David Mooradd, MIT LL

Honorary Chair:

Eli Brookner, Raytheon (retired)

Secretary:

Duane J. Matthiesen, Technia

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Glenn Meurer, MITRE
Don McPherson, SRC, Inc.

Publications:

Raoul Ouedraogo, MIT LL
Mark McClure, STR

Plenary Session:

Bradley T. Perry, MIT LL
Eli Brookner, Raytheon (retired)

Tutorials:

Will Moulder, MIT LL
Wajih Elsallal, MITRE

Student Program:

Justin Kasemodel, Raytheon
Honglei Chen, The MathWorks

International Liaison:

Alfonso Farina, Selex (retired)
Alberto Moreira

Sponsorships

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Social Media:

Andrew Zai, Humatics Inc.

Special Sessions:

Sean Duffy, MIT LL

Web page:

Kathleen Ballos, Ballos Associates, Kenneth E. Kolodziej, MIT LL

5G Advisors:

Jonathan Williams, Teradyne Tony Fischetti, MACOM

Exhibits Chair:

Matt Facchine, NGC

Local Arrangements/Finance:

Robert Alongi, IEEE Boston

Poster Session:

Pierre Dufilie, MIT LL

Advisors:

Greg Charvat, Humatics Inc.,
Greg Arlow, Lockheed Martin

Technical
Co-Sponsors



Our Blog



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

Determining and Communicating Project Value Return on Investment (ROI)

ROI Value Modeling™ for Decision Making

Date & Time: Wednesday, June 20; 8:30AM - 5:00PM (Note new date!)

Speaker: Robin Goldsmith, President, GoPro Management

Location: TBD, Woburn - Burlington, MA Area

Companies are demanding reliable financial measures of proposed projects' value. Yet, project managers often don't know how to identify, calculate, or communicate a project's REAL ROI™ (Return on Investment). Traditional ROI calculations increasingly are being criticized for telling only part of the necessary story. The difficulty afflicts all types of projects but often is greatest in areas like IT, where benefits may seem intangible and frequent overruns impact estimates' credibility. This interactive workshop reveals 22 pitfalls that render common ROI determinations meaningless and shows instead how to identify full-story key effects on revenue and expense variables, reliably quantify tangible and intangible costs and benefits, and convincingly communicate the business value of project investments. Exercises enhance learning by allowing participants to practice applying practical techniques to a real case.

PARTICIPANTS WILL LEARN:

- * The financial information that business decision makers need and demand.
- * ROI and related calculations, strengths, weaknesses, and common pitfalls.
- * Using ROI Value Modeling™ and Problem Pyramid™ to fully identify relevant costs and benefits.

* Quantifying intangibles, risk, flexibility, and opportunity.

* Professionally presenting credible business value measurements so people pay attention.

WHO SHOULD ATTEND: This course has been designed for business, systems, and project managers as well as analysts, implementers, users, and others who must know the return on project investments.

OUTLINE

WHAT MONEY HAS TO DO WITH IT

Project Manager role with regard to ROI
 Situations demanding ROI, their issues
 Difficulty of making convincing arguments
 Linking ROI to the business case
 Value Modeling™ Relationship Diagram
 Investment vs. expense
 Justification vs. objective analysis
 Meanings of "It costs too much"
 Total Cost of Ownership (TCO)
 Factors other than cost to be considered
 Costs and benefits, revenues vs. expenses
 Return on Investment (ROI) calculations
 Net present value, discounted cash flow
 Payback period, annualized return
 Internal rate of return (IRR), hurdle rate
 'Telling the story' not just ROI calculations

Failing to quantify 'intangibles' and risk
 Scenario approach to showing benefits
 Mistakenly thinking ROI does not apply

DETERMINING MEANINGFUL BENEFITS

Why it's important to find the benefits first
 Treacy's model of 5 revenue categories
 Problem Pyramid™ to find requirements
 Decision variable clarification chain
 Putting a dollar value on intangibles
 Opportunity, innovation, and flexibility
 Mandates, project with no apparent benefits

ESTIMATING CREDIBLE COSTS

Problem Pyramid™ ties costs to value
 Basing costs on implementation of design
 Business case framework
 Basic formula for estimating costs
 Main causes of poor estimates
 Top-down vs. bottom-up techniques
 Risks that afflict ROI calculations
 Three measurable ways to address risks
 Best-, worst-, most-likely-case scenarios
 Sources of parameter sizing assumptions
 Defining a reasonable scenario for success
 Getting reliable cost and revenue amounts

REPORTING AND MONITORING

Single vs. multiple scenario presentation
 Applying apples vs. apples, when you can't
 Scenario assumptions and parameters
 No change vs. proposed scenarios' ROIs
 Measuring intangibles' monetary effects
 Continual, step-wise, and one-time changes

Percentage-likelihood impact adjustments
 Presenting with spreadsheets
 ROI Value Dashboard™ modeling tool
 Caution about commercial ROI calculators
 Using value modeling to improve decisions
 Dashboard and scorecard-type notification
 Capturing, calibrating with project actuals
 Adjusting appropriately during project

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
 Wednesday, June 13, 2018**

Payment received by June 6

IEEE Members	\$235
Non-members	\$260

Payment received after June 6

IEEE Members	\$260
Non-members	\$280

<http://ieeeboston.org/determining-communicating>

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

Making You a Leader - Fast Track

Date & Time: Monday, June 18; 8:30AM - 5:00PM (Note new date!)

Location: Hilton Hotel 2 Forbes Road, Woburn, MA

Speaker: Robin Goldsmith, President, GoPro Management

Location: TBD, Woburn - Burlington, MA Area

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 follow-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.

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, June 11, 2017**

Payment received by June 4

IEEE Members	\$235
Non-members	\$260

Payment received after june 4

IEEE Members	\$260
Non-members	\$280

<http://ieeeboston.org/event/making-leader-fast-track-leader-want-need/>

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

Proactive User Acceptance Testing™ -- Confident Competence

The Testing Users Need to be Confident the Software they Depend on Works

Date & Time: Thursday, June 21; 8:30AM - 5:00PM (Note new date!)

Speaker: Robin Goldsmith, President, GoPro Management

Location: TBD, Woburn - Burlington, MA Area

Projects aren't complete until users/customers are sure the systems they depend on actually meet business requirements, work properly, and truly help them do their jobs efficiently and effectively. However, users seldom are confident or comfortable testing system acceptability. Project Managers and Testing professionals need to know how to guide and facilitate effective acceptance testing without usurping the user's primary role. This intensive interactive seminar shows what users need to know to confidently make the best use of their time planning and conducting acceptance tests that catch more defects at the traditional tail-end of development, while also contributing in appropriate ways to reducing the number of errors that get through the development process for them to catch in UAT. Exercises give practice using practical methods and techniques.

PARTICIPANTS WILL LEARN:

- * Appropriate testing roles for users, developers, and professional testers; and what each shouldn't test.
- * How Proactive Testin™ throughout the life cycle reduces the number of errors left to find in UAT.
- * Key testing concepts, techniques, and strategies that facilitate adaptation to your situation.
- * Systematically expanding acceptance crite-

ria to an acceptance test plan, test designs, and test cases.

* Supplementing with requirements-based tests, use cases, and high-level structural white box tests.* Techniques for obtaining/capturing test data and carrying out acceptance tests.

WHO SHOULD ATTEND: This course has been designed for business managers and system users responsible for conducting user acceptance testing of systems they must depend on, as well as for system and project managers, analysts, developers, quality/testing professionals, and auditors.

ROLE OF USER ACCEPTANCE TESTING

Why users may resist involvement
 Making users confident about testing
 Objectives, types, and scope of testing
 Acceptance testing as user's self-defense
 Why technical tests don't catch all the errors
 Essential elements of effective testing
 CAT-Scan Approach™ to find more errors
 Proactive Testing™ Life Cycle model
 Separate technical and acceptance
 test paths
 Place of UAT in overall test structure
 Making sure important tests are done first
 Developer/tester/user test responsibilities

DEFINING ACCEPTANCE CRITERIA

Defining acceptance test strategy up-front
 Source and role of acceptance criteria

5 elements criteria should address
 Functionality the user must demonstrate
 How much, how often user must test
 Determining system quality
 Who should carry out acceptance tests
 How acceptance tests should be performed
 Added benefit, revealing requirements errors

DESIGNING ACCEPTANCE TEST PLANS

Expanding the acceptance criteria
 Allocating criteria to system design
 Refining the design to catch oversights
 Checklist of common problems to test
 Equivalence classes and boundary values
 Making quality factors (attributes) testable
 Structural testing applicable to users
 GUI features that always need to be tested
 Defining requirements-based tests
 Constructing use cases
 Cautions about use case pitfalls
 One- and two-column use case formats
 Turning use cases into tests
 Consolidating tests into efficient test scripts

CARRYING OUT ACCEPTANCE TESTS

Differentiating test cases and test data
 Traps that destroy value of acceptance tests
 Warning about conversions
 Documentation, training, Help tests
 Configuration, installation, localization
 Security, backup, recovery tests

Suitability of automating acceptance testing
 Performance, stress, load testing
 Issues on creating test conditions, data
 Capturing results, determining correctness
 User's defect tracking and metrics

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
 Thursday, June 14, 2018**

Payment received by June 7

IEEE Members	\$235
Non-members	\$260

Payment received after June 7

IEEE Members	\$260
Non-members	\$280

<http://ieeeboston.org/proactive-user-acceptance>

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

Writing Agile User Story and Acceptance Test Requirements

Date & Time: Tuesday, June 19; 8:30AM - 5:00PM (Note new date!)

Speaker: Robin Goldsmith, President, GoPro Management

Location: TBD, Woburn - Burlington, MA Area

Everyone complains that poor requirements are the major cause of project problems. Yet, like the weather, nobody does much about it, at least not effectively. Traditional approaches advocate writing voluminous requirements documents that too often don't seem to help much and may even contribute to difficulties. Agile goes to the opposite extreme, relying on brief requirements in the form of three-line user stories that fit on the front an index card and a few user story acceptance criteria that fit on the card's back. Surprise, as Mark Twain noted, in some ways it's even harder to write Agile's brief requirements effectively. This interactive workshop reveals reasons user stories and their acceptance tests can fall short of their hype, explains critical concepts needed for effectiveness, and uses a real case to provide participants guided practice writing and evaluating user stories and their acceptance criteria/tests.

PARTICIPANTS WILL LEARN:

- * Major sources of poor requirements that cause defects, rework, and cost/time overruns.
- * How Agile user stories and their acceptance criteria/tests address these issues.
- * Difficulties that still afflict requirements in Agile projects and why they persist.
- * Writing more effective user stories and acceptance criteria/tests.

- * What else is necessary to produce working software that provides real value.

WHO SHOULD ATTEND:

This course has been designed for product owners, analysts, developers, and other Agile (and other) project team members who are or should be involved in defining requirements.

AGILE, USER STORY FUNDAMENTALS

Agile Manifesto's relevant points
 Characterization of traditional approaches
 Waterfall and big up-front requirements
 Agile's sprints and backlogs alternative
 Agile project team roles
 User story "As a <role>..." (Card)
 User story acceptance criteria (Confirmation)
 Estimating user story size
 Splitting and refining
 Prioritizing and allocating to backlogs/sprint
 Constructing/implementing (Conversations)
 Reviewing, retrospectives
 Grooming backlog and reprioritizing
 Exercise: Write Needed User Stories
 Exercise: Define their Acceptance Criteria
 Exercise: Review Your User Stories/Criteria

REQUIREMENTS ARE REQUIREMENTS—OR MAYBE NOT

User stories are backlog items, features
 Chicken and egg relation to use cases
 Issues and inconsistencies
 Business vs. product/system requirements

“Levels Model” of requirements
 Other mistaken presumptions
 Requirements overview
 Where user stories should fit, do fit instead
 Conversation conundrum

WRITING MORE SUITABLE USER STORIES

Problem Pyramid™ tool to get on track
 Exercise: Using the Problem Pyramid™
 Exercise: Business Requirement
 User Stories
 Issues identifying requirements
 Product owner and business analyst roles
 Project team participation
 Dictating vs. discovering
 Data gathering and analysis
 Planning an effective interview
 Controlling with suitable questions
 Then a miracle occurs...

AND USER STORY ACCEPTANCE TESTS

Missed and unclear criteria
 Turning criteria into tests, issues
 How many tests are really needed
 Test design techniques
 Checklists and guidelines
 Decision trees, decision tables
 Boundary testing
 Testing is main means to control risk
 Defects and new user stories
 Testing that user story focus misses

Reactive vs. proactive risk analysis
 Given, when, then format

Exercise: Write User Story Acceptance Criteria
 Exercise: Design their Tests
 Exercise: Review Your User Stories/Tests

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
 Tuesday, June 12, 2018**

Payment received by June 5

IEEE Members	\$235
Non-members	\$260

Payment received after June 5

IEEE Members	\$260
Non-members	\$280

<http://ieeeboston.org/writing-agile-user-story>

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

Developing Reusable Test Designs

Be an Instant Expert--Run More, and More Thorough, Tests in Less Time

Date & Time: Friday, June 22; 8:30AM - 5:00PM (Note new date!)

Speaker: Robin Goldsmith, President, GoPro Management

Location: TBD, Woburn - Burlington, MA Area

Would you like to be an instant testing expert, able to start testing effectively in new situations without delay? And would you like to spend more of your time running tests and less of your time creating the tests? Reusable test designs are a little-known but powerful test planning/design tool that make it possible for you to run more effective test cases in less time. This interactive seminar workshop shows you how to apply a systematic structured Proactive Testing™ approach that first enables you to design much more thorough tests than traditional methods. Then, you'll discover how to convert your test designs into reusable test designs that you can apply instantly in new situations. You'll develop several reusable test designs in class and be ready to add more to your toolkit back on the job. Exercises enhance learning by allowing participants to practice applying practical techniques to an actual case.

Participants will learn:

- How test designs fit into the overall test planning structure and provide special advantages
- Systematic reliably repeatable methods for identifying test designs to test a given system.
- Checklists and guidelines that enable you to spot the conditions traditional methods overlook.
- Converting your project-specific test designs

into reusable test designs you can use for other systems.

- Applying reusable test designs to jumpstart your testing with instant expertise and effectiveness.
- Quickly and reliably selecting the subset of test cases suitable for scale and risk.

WHO SHOULD ATTEND: This course has been designed for testers, managers, analysts, designers, programmers, auditors, and users who plan, oversee, and/or carry out testing of software products.

PROACTIVE TEST DESIGN BENEFITS

Proactive vs traditional reactive testing
 Proactive Testing™ Life Cycle advantages
 IEEE Standard for Test Documentation
 Often-overlooked key to proper prioritizing
 Systematic drill-down strategy
 Master and detailed test plans
 Test design specifications
 Test case specifications
 How taking time to structure saves time
 Structuring to make test sets manageable
 Facilitating reconstruction of test data
 Taking off the blinders to allow selectivity
 Re-using instead of rebuilding test designs
 Instant expertise for testing new situations

IDENTIFYING NEEDED TEST DESIGNS

- Functional (black box) testing
- Three-level approach to functional testing
- Keys for thoroughness
- Breaking down to manageable pieces
- Functionality Matrix technique
- Use case perspective
- Technical software actions
- Test design specifications that are needed

DESIGNING TESTS MORE THOROUGHLY

- How designing adds thoroughness
- Traditional test design still misses a lot
- Focused brainstorming for a better start
- Checklists and guidelines to fill the gaps
- Tests based on data formats
- Coverage of data and process models
- Decision trees and tables
- Concerns common to all types of testing
- Equivalence classes and partitioning
- Ranges and boundary testing
- GUI and navigation issues
- Often-overlooked other dimensions to test
- Formal/informal test design specifications
- Extracting the reusable elements
- Enhancing with system-specific tests
- Link to driving effective automated tests

SPECIFYING (REUSABLE) TEST CASES

- Translating test designs into test cases
- Selecting scaled subset based on risk

- Reusable test case specifications
- Other essential test case component
- Finding and creating test data
- Test script and matrix formats
- Simple and sophisticated automation

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, June 15, 2018**

Payment received by June 8

IEEE Members	\$235
Non-members	\$260

Payment received after June 8

IEEE Members	\$260
Non-members	\$280

<http://ieeeboston.org/developing-reusable-test-designs>

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Radar Conference 2019

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About the Conference

22-26 April 2019

Westin Waterfront Hotel
Boston, Massachusetts, USA

www.radarconf19.org

A radar revolution is underway, made possible by the rapid evolution of digital electronics, and powered by new innovative architectures, advanced components, novel waveforms and sophisticated processing techniques. Please join us in historic Boston, birthplace of the original American Revolution, as we continue this new revolution in radar technology. The beautiful Westin Waterfront hotel, located in the heart of Boston's seaport district, will make the perfect venue for the international community as we meet to share the latest advances in radar. The conference will include three days of parallel technical sessions, and two days of tutorials with ample opportunity to interact with international radar experts from around the world.

Tutorials and Special Sessions

Please submit suggestions for tutorial topics or special sessions to the Technical Program Chair at info@radarconf2019.org

Suggested Topics

- Radar phenomenology
- Antenna technology
- Radar Electronics
- Over the horizon radar (OTHR)
- Bistatic, multistatic & passive radar
- Networked & distributed radar
- Commercial radar
- mm-wave & THz radar
- Environmental Sensing
- Airborne & space based
- SAR and ISAR imaging
- ATR and classification
- Tracking
- Cognitive methods
- Waveform diversity
- Spectrum sharing
- Electronic warfare
- Emerging Systems and Technology

Paper Submission Procedures

See website for details

Important Dates	
Special Session Proposals Due	17 Aug 2018
Tutorial Submissions Due	30 Aug 2018
Paper Submissions Due	17 Oct 2018
Notification of Acceptance	14 Jan 2019
Paper Submission Due	25 Feb 2019

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Fundamentals of Real-Time Operating Systems (*Online Edition*)



**New
Online
Course**

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

Registration Fee: \$350

Course Summary - This course introduces the basics of Real-Time Operating Systems (RTOSes) using VxWorks and Linux as examples. The course focuses on the primary principles of RTOSes including determinism, real-time scheduling, interrupt latency and fast context switching as well as time and space partitioning in hard real-time environments. The first part of the course focuses on acquiring an understanding of microkernel and memory architectures for Real-Time including scheduling, signals, system calls, synchronization, inter-process communications and interrupt handling. The latter part of the course covers considerations for timing, memory management, device drivers, booting, debugging and deployment of Real-Time embedded systems.

Who Should Attend - The course is designed for real-time engineers who are using or intending to use a Real-Time Operating System. It is also targeted at experienced developers requiring a refresher course on RTOSes. This course will clearly demonstrate both the strengths and weaknesses of Real-Time Operating Systems used in Embedded Systems.

Course Objectives

- To provide a basic understanding of Real-Time Requirements and Design Decisions
- To understand the complexities of RTOS scheduling and synchronization
- To learn how to configure, boot, test and deploy Real-Time embedded systems
- To give students the confidence to apply these concepts to their next RTOS project

Lecturer – Mike McCullough is President and CEO of

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

Hardware and Software Requirements - The student should have a working Linux desktop environment either directly installed or in a virtualization environment or have access to a development environment for a Real-Time Operating System such as VxWorks. An Embedded Linux or VxWorks target hardware platform is useful but not absolutely required for this course.

Embedded Development Basics

Embedded Systems Characteristics
Embedded Real-Time Systems
Real-Time Enough
Embedded Linux and Real-Time

Real-Time Operating System Basics

Microkernel Architecture
Microkernel Scheduling
Determinism
Rate Monotonic Analysis and Fixed Priority Scheduling
Latency and Latency Measurements
Fast Context Switching
Real-Time Memory Architectures
Time and Space Partitioning and ARINC
Multiprocessor Basics
Amdahl's Law

RTOS Kernel Overview

Real-Time Scheduling and Task Management
Signals and System Calls
Synchronization

Inter-Process Communications (IPC)
Interrupt Handling
Error Handling
Timing and Timers
Real-Time Memory Management

Real-Time Scheduling

OS Scheduling Types
Pre-emptive Multitasking
Typical Scheduling Issues
Linux Scheduling
VxWorks Scheduling
VxWorks Tasks
VxWorks Real-Time Processes (RTPs)
Linux Threads
Task and Thread-Specific Data (TSD)
Measuring Task and Thread Performance

Signals in Embedded RTOSes

System Calls in Embedded RTOSes

Synchronization

Via Global Data
Via Semaphores, Files and Signals
Condition and Completion Variables in Linux
Mutexes in VxWorks and Linux
Linux Futexes
Software Watchdog Timers

Inter-Process Communications (IPC)

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

Interrupts and Exception Handling

Basic Interrupt Process
VxWorks intLib and exLib
Routines You Can Call From Interrupt Context

Interrupt Service Routines (ISRs)

VxWorks and Linux ISRs

Bottom Halves in Linux

Deferring Work

Tasklets and Work Queues in Linux
Helper Tasks

Error Handling

Error Handling Approaches in OS Design

Error Handling in VxWorks

Error Handling in Tasks and Interrupts
Error Number Format
Using errnoSet, errnoGet and printErrno
Creating Your Own Errors

Error Handling in Linux

Standard Error Defines
errno and perror
strerror and strerror_r
Resets, OOPS, Panics and Segmentation Faults

Error Logging Approaches

Timing and Timers

How RTOSes Tell Time
VxWorks tickLib and timerLib
Linux Kernel, POSIX and Interval Timers
Linux High-Resolution Timers (HRTs)
VxWorks taskDelay
Linux Sleeping, Sleep Waiting and Spinlocks
VxWorks Watchdog Timers (wdLib)
Periodic Execution Example
Deadline Miss Detection
Embedded Recommendations for Timing

Memory Management and Paging

The VxWorks Memory Model
Real-Time Memory Algorithms
VxWorks memLib and memPartLib
Linux, Memory and Demand Paging
Mapping Device Memory in Linux
The Slab Allocators in Linux
The Linux /proc Filesystem
Memory Barriers
The Linux OOM Killer
Reserving and Locking Memory
Memory in Embedded Systems

Device Drivers in VxWorks

File Descriptors
The VxWorks IO Subsystem
VxWorks ioLib, fioLib and iosLib

The 5 Basic Device Driver Types

- Char, Block and Network Drivers
- Virtual Drivers and Basic I/O Drivers
- Other Device Drivers
- The VxBus in VxWorks

Device Drivers in Linux

- File Descriptors in Linux
- The UNIX Device Driver Model
- Major and Minor Numbers
- The New Device Driver Model

The VxWorks Boot Process

- VxWorks Boot Example
- Configuration Files
- Application Startup
- VxWorks 7

The Linux Boot Process

- The Root Filesystem in Linux
- Bootloaders and U-Boot
- Configuring Linux
- Embedded Linux Boot Methods
- Building and Booting from SD Cards and eMMC
- Yocto and Poky

Debugging Basics

- How Software Debuggers Work
- Debuggers and Intrusion
- Types of Debugging Approaches
- Process-Level vs System-Level Debug

Process-Level Debug

- GDB, GDB Server and the GDB Server Debugger
- The VxWorks Debug Agent (WDB)
- Other Debug Tools for Linux and VxWorks
- A Remote Debug Example
- Printing and Logging

System-Level Debug

- LTTng and the VxWorks Systems Viewer (Windview)
- System-Level Debug Tools
- The /proc and /sys Virtual Filesystems in Linux
- Linux Kernel Debug
- Linux Crash Dumps

Deploying VxWorks Systems

- VxWorks Systems Customization and Configuration
- VxWorks Field Upgrades

Deploying Embedded Linux Systems

- Linux Systems Customization and Configuration
- Choosing and Building the Root Filesystem
- Module Decisions
- Final IT Work
- Final deployment of Embedded Linux Field Systems

RTOS Trends

Some Final Recommendations

- Getting Help
- Measuring Performance
- Managing Memory
- Things To Remember

<http://ieeeboston.org/fundamentals-of-real-time-operating-systems-rt201-on-line-course/>

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Embedded Linux Board Support Packages and Device Drivers *(Online Edition)*



**New
Online
Course**

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

Registration Fee: \$350

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

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

Course Objectives

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

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

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

Course Schedule

Getting Started with Embedded Linux

Embedded Linux Training Overview
 Linux Terminology, History and the GPL
 Building the Kernel Source Code
 Embedded Linux Kernels
 BSPs and SDKs
 Linux References (Books and Online)
 BSP Requirements
 U-Boot and Bootloader Development
 Embedded Linux BSP Development Basics
 Basic BSP Development
 Files and Filesystem Support
 The I/O Subsystem: Talking to Hardware
 Memory Management and Paging
 Error Handling in Embedded Linux BSPs
 Timing and Timers
 Interrupt and Exception Handling in BSPs
 BSP Deployment Issues and Practices
 Embedded Linux SDK Basics
 The 3 Pieces of an SDK
 Embedded Linux Distributions and the GNU Compiler

Collection (GCC)	BootLoader Optimizations
Other Embedded Linux Development Tools	Boot Time Measurements
Library Support, Glibc and Alternatives	Effective Memory and Flash Usage
SDK Deployment and Support	Filesystem Performance Measurement
Debugging	Some Ideas on Performance Measurement
GDB, GDB Server and the GDB Server Debugger	
Other Debug and Test Tools	The Original UNIX Device Driver Model
An Eclipse Remote Debug Example	The fops and file structs
Advanced Debug with printk and syslogd	The inode and dentry structs
System-Level Debug	Major and Minor Numbers
System-Level Debug Tools	Embedding Channel Information
The /proc and sys Filesystems	Deferring Work
Advanced Logging Methods	The /proc Filesystem
KGDB and KDB	Configuring the Device Driver
Crash Dumps	A Simulated Device Driver
Debugging Embedded Linux Systems	Modularization Revisited
Configuring Embedded Linux	The Evolution of a New Driver Model
Config Methods	The Initial Object-Oriented Approach
Config Syntax	Platform Devices and Drivers
Adding Code to the Linux Kernel	A Generic Subsystem Model
Booting Embedded Linux	The Generic Subsystem Model in Detail
Processor Startup	Subsystem Registration
Initial Functions	The Probe and Init Functions
The initcalls	The Show and Store Functions
Using __init Functions	User Access via the /sys Filesystem
NFS Booting	Configuring the New Device Driver
Root File Systems	The udev Linux Application
RAMdisk Booting with initrd	Comparing the Two Driver Models
RAMdisk Booting with initramfs	The Flattened Device Tree (FDT)
initrd vs initramfs	openBoot and its Effect on Embedded Linux
Root File System Development	The Device Tree Script (dts) File
Busybox Development	The Device Tree Compiler (dtc)
Building a RAMdisk for an initrd	The Device Tree Blob (dtb) File
Building a RAMdisk for an initramfs	Building a dtb File
Flash File System Development	Hybrid Device Drivers
	Other fops Functions
Testing and Debug of Embedded Linux BSPs	The Need for ioctl
Kernel Debug and Kernel Probes	Linux Device Driver Subsystems
Kexec and Kdump	Direct Connect Device Drivers
The Linux Test Project (LTP)	Serial/Console Drivers, I2C & SPI
Performance Tuning Embedded Linux BSPs	Real-Time Clocks and Watchdogs
Virtualization	GPIO and the Pinmux
Measuring Embedded Linux BSP Performance	Flash MTDs and Direct Memory Access
Common Considerations	USB, Power and CPU Management
Uncommon Considerations	Video and Audio

PCI and VME
 Block Devices
 RAMdisk and Flash Filesystems
 MMCs and SD Cards
 Network Device Drivers
 MAC and PHY Device Drivers
 net_device and net_device_stats
 Network Device Initialization
 Device Discovery and Dynamic Initialization
 Network Interface Registration
 Network Interface Service Functions
 Receiving and Transmitting Packets
 Notifier Chains and Device Status Notification
 Unwired Device Drivers
 Wireless Device Drivers (WiFi, WLAN)
 Bluetooth and BlueZ
 Infrared and IrDA
 Cellular from 2G to 5G

Drivers in User Space
 Accessing I/O and Memory Regions
 User Mode SCSI, USB and I2C
 UIO
 High-Speed Interconnects
 PCIe
 iSCSI
 Infiniband
 FibreChannel
 Debugging Device Drivers
 kdb, kgdb and JTAG
 Kernel Probes
 Kexec and Kdump
 Kernel Profiling
 User Mode Linux
 Performance Tuning Device Drivers
 Some Final Recommendations

<http://ieeeboston.org/embedded-linux-bsps-device-drivers-line-course/>

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

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

Registration fee: \$250

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

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

Course Objectives

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

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

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

Getting Started with Embedded Linux

Embedded Linux Training Overview

Terminology

Linux Versioning

The GPL

Building the Kernel Source Code

Embedded Linux Kernels

BSPs and SDKs

Linux References (Books and Online)

A Development Cycle Focused on Performance

A Basic Optimization Process

Basic Debugging Review

Embedded Applications Debug

GDB, GDB Server and the GDB Server Debugger

Other Debuggers

An Eclipse Remote Debug Example

Debugging with printk, syslog, syslogd and LTTng

System-Level Debug

System-Level Debug Tools

The /proc and /sys Filesystems

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

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

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

Kexec and Kdump

- Improving 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
- Improving Kernel Performance

Kernel Hacking

CONFIG_EMBEDDED

Configuring printk

Test Code

Configuring Kernel and IO Scheduling

Improving CPU Performance

Run Queue Statistics

Context Switches and Interrupts

CPU Utilization

Linux Performance Tools for CPU

Process-Specific CPU Performance Tools

Stupid Cache Tricks

Improving System Memory Performance

Memory Performance Statistics

Linux Performance Tools for Memory

Process-Specific Memory Performance Tools

More Stupid Cache Tricks

Improving I/O and Device Driver Performance

Disk, Flash and General File I/O

Improving Overall Performance Using 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

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

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Software Development for Medical Device Manufacturers (Online Edition)

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

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

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

Module 1

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

Module 2

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

Module 3:

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

- Design Reviews

Module 4:

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

Speaker Bio:

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

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

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

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

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

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

Registration Fee: \$150

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

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

Course chapters

1. Vector Basics
2. Dot Product

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

Instructor's Bio:

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

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

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

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

Registration Fee: \$320

Course Description

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

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

Course Outline

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

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

Course Objective

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

Instructor's Bio

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

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

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

Introduction to Embedded Linux

(Online Edition)

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

Course Summary:

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

Who Should Attend:

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

Course Objectives:

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

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

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

Hardware and Software Requirements

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

Linux Debugging and Performance Tuning by Steve Best

Optimizing Linux Performance by Phillip G. Ezolt

Embedded Linux Primer by Christopher Hallinan

Pro Linux Embedded Systems by Gene Sally

Embedded Linux Development Using Eclipse by Doug Abbott

Linux Device Drivers by Jonathan Corbet et al

Essential Linux Device Drivers by Sreekrishnan Venkateswaran

Course Downloadable Content:

Video Lecture

Hands-On Lab Instructions

Hands-On Lab Solutions

Additional Related Materials

The Basics

Linux Terminology, History and Versioning

The Linux Community: Desktop & Embedded

The GPL

Linux References (Books and Online)

Getting Started

Kernel Source Code

Building the Kernel

Embedded Linux Kernels

Linux 2.6

Basic Kernel Capabilities

Process and Threads Management

Signals and System Calls

Synchronization, IPC and Error Handling

Timing and Timers

Memory Management and Paging
The I/O Subsystem: A Tale of Two Models
Modularization

Debugging

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

An Eclipse Debug Example

Other Debug and Test Tools

Other System-Level Debug Approaches

Process & Threads Management

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

Signals

System Calls

Scheduling

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

Synchronization

Via Global Data
Via Semaphores, Files and Signals

Inter-Process Communications (IPC)

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

Error Handling

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

Timing

How Linux Tells Time

Kernel, POSIX and Interval Timers
High-Resolution Timers (HRTs)

Memory Management and Paging

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

Modularization

Creating a Module and Module Loading
Dependency Issues
In Embedded Systems

Shared Libraries

A Shared Library Example
Static and Dynamic Libraries

The I/O Subsystem: A Tale of Two Models

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

Embedded Linux Trends

Development, Monitoring and Testing

Some Final Recommendations

Lecturer:

Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. A 20-year electronics veteran, he has held various positions at Tileria, 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.

Design Thinking for Today's Technical Work



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

Registration Fee: \$160

Course Description:

This course covers the principles of Design Thinking; the steps commonly used; how it enhances the likelihood of success in a wide variety of applications; and, in particular, how to apply it to technical work. Examples of its application to technical work are presented along with the successes that followed.

Design Thinking has garnered much attention in recent years mainly as a way to design consumer products that engage users, such as Apple's iPhone. But its use is spreading to situations ranging from how to provide medical care to planning one's career. This course explains what Design Thinking is about, but, most important, explains how an individual can apply Design Thinking to their own technical work. Care has been taken to focus the course content on using Design Thinking as a structured, practical process for the daily work of technical professionals. A specific technical example is carried through the teaching of the five stages of Design Thinking. The course covers applying Design Thinking to the range of tasks performed during a technical project, including design of: technical functions; user interactions (if applicable); factors for business success; solutions to problems that arise; and project presentations and reports to influence adoption of project outcomes, funding approval, and hiring for consulting. The content applies to employees of large to small companies, start-ups, consultants and contract work, and government organizations. The course is focused on an individual worker employing Design Thinking.

Course Objectives

Provide an understanding of Design Thinking and how an individual can apply it to their technical work:

- Understand the steps of Design Thinking (Understand, Define, Ideate, Prototype, and Test)
- Learn how to apply Design Thinking in technical work
- Understand where Design Thinking can be applied in project activities.

Who Would Benefit from this Course

Anyone who works on solutions to problems or designs hardware, software, products, services, and processes. This includes technical professionals, project managers, and organizational managers. Also, anyone who wants to learn what Design Thinking is about in a practical sense.

Course Modules

- Module 1 – How Design Thinking Can Help Technical Work (60 minutes)
- Module 2 – Understand: Explore the Problem (44 minutes)
- Module 3 – Define: Synthesize What Is Needed (23 minutes)
- Module 4 – Ideate: Generate Solutions (26 minutes)
- Module 5 – Prototype: Build Versions to Test (23 minutes)
- Module 6 – Test: Examine and Learn (28 minutes)
- Module 7 – Design Thinking for Presenting and Writing (23 minutes)

- Module 8 – Getting Started with Design Thinking (30 minutes)

Speaker biography

Speaker: James L. Poage, President/Owner JLP Performance Consulting

Dr. James L. Poage has been designing future concepts for Air Traffic Control for 25 years, first with the Volpe National Transportation Systems Center and then for the past dozen years as an independent consultant (JLP Performance Consulting). He has taught short courses on Benefit-Cost analysis to the FAA and NASA, as well as spoken at conferences and published in professional journals. Over the past 15 years, Dr. Poage has been applying Design Thinking to his project work; to marketing

his consulting services; and to planning briefings, reports, and courses. His clients have included FAA, NASA, BAE Systems, Engility, Georgia Tech University, San Jose State University, and Saab Sensis. Dr. Poage has co-authored the book, *Flair: Design Your Daily Work, Products, and Services to Energize Customers, Colleagues, and Audiences* (Maven House Press, 2016), with his daughter, Jennifer Poage who works in fashion design. Dr. Poage has a Ph.D. in applied mathematics from the Harvard University School of Engineering and Applied Sciences and a M.S. and B.S. in electrical engineering from Stanford University.

Note: Course participants will receive a copy of the book, *Flair*.

Call for Course Speakers/Organizers

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

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

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

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

<http://ieeeboston.org/course-proposals/>. Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- Honoraria can be considered for course lecturers
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System Verilog 101: Design Constructs

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

System Verilog 102: Verification Constructs

Full course description and registration at ,
<http://ieeeeboston.org/systemverilog-102-sv102-verification-constructs-online-course/>

High Performance Project Management

Full course description and registration at ,
<http://ieeeeboston.org/high-performance-project-management-online-course/>

Introduction to Embedded Linux Part I

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

Embedded Linux Optimization - Tools and Techniques

Full course description and registration at ,
<http://ieeeeboston.org/embedded-linux-optimization-tools-techniques-line-course/>

Embedded Linux Board Support Packages and Device Drivers

Full course description and registration at ,
<http://ieeeeboston.org/embedded-linux-bsps-device-drivers-line-course/>

Software Development for Medical Device Manufacturers

Full course description and registration at ,
<http://ieeeeboston.org/software-development-medical-device-manufacturers-line-course/>

Fundamental Mathematics Concepts Relating to Electromagnetics

Full course description and registration at ,
<http://ieeeeboston.org/fundamental-mathematics-concepts-relating-electromagnetics-line-course/>

Reliability Engineering for the Business World

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

Design Thinking for Today's Technical Work

<http://ieeeeboston.org/design-thinking-technical-work-line-course/>

Fundamentals of Real-Time Operating Systems

Registration will be available by April 15

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