BOSTON

THE REFLECTOR

ISSUE #8
AUGUST 2017

IEEE
Advancing Technology for Humanity

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Sometimes You Have to Roll the Hard Six

Fausto Molinet, Publications Committee Chair

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

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

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

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

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

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

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

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

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

Call for 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

IEEE Boston Section Online Courses:

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

Verilog101:Verilog Foundations

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

System Verilog 101: Design Constructs

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

System Verilog 102: Verification Constructs

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

High Performance Project Management

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

Introduction to Embedded Linux Part I

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

Embedded Linux Optimization - Tools and Techniques

Full course description and registration at ,
http://ieeeboston.org/embedded-linux-optimization-tools-techniques-line-course/ NEW Online course

Software Development for Medical Device Manufacturers

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

Fundamental Mathematics Concepts Relating to Electromagnetics

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

Reliability Engineering for the Business World

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

2017 IEEE WIE USA EAST FORUM

Call for Participation

November 30 – December 2, 2017 Baltimore, MD

Presentation Topics

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

Submission Deadline

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

For more information, visit:
http://sites.ieee.org/wie-forum-usa-east/calls-for-participation/

IEEE WIE FORUM USA EAST 2017 IEEE IEEE-USA

New Submission Deadlines

Paper: July 31st, 2017
Poster and Lightning Talk: September 3rd, 2017

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

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

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

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

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

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

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

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

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

Meet Innovative Technology

Sponsored by MIT IEEE Student Branch and IEEE Boston Section

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

Massachusetts Institute of Technology

IEEE BOSTON SECTION

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

Time and Dates: 6 - 9PM, Wednesdays, October 18, 25, November 1, 8, 14
(Note: Nov. 14 is a Tuesday)

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

Speaker: Dan Boschen, Microsemi

Course Summary:

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

Target Audience:

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

Benefits of Attending/ Goals of Course:

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

Topics / Schedule:

Class 1:
Correlation
Fourier Transform
Laplace Transform

Class 2:
Sampling and A/D Conversion
Z –transform
D/A Conversion

Class 3:
IIR and FIR Digital filters
Direct Fourier Transform

Class 4:
Windowing, Digital Filter Design
Fixed Point vs Floating Point

Class 5:
Fast Fourier Transform
Multirate Signal Processing
Multi-rate Filters

Speaker's Bio:

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

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

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

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

Payment received by October 6
IEEE Members $325
Non-members $360

Payment received after October 6
IEEE Members $360
Non-members $425

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

Call for Course Speakers/Organizers

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

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

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

If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is **http://ieeeboston.org/course-proposals/** . Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gamil.com or 781 245 5405.

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

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

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/

IEEE Boston Section Social Media Links:

Twitter: https://twitter.com/ieeeboston

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

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

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

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

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

New Online Course

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

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

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

Module 1

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

Module 2

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

Module 3:

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

Module 4:

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

Speaker Bio:

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

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

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

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

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

New Online Course

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

Registration Fee: 150

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

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

Course chapters

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

Instructor's Bio:

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

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

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

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

Registration Fee: 320

Course Description

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

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

Course Outline

Basics – Measurements
Business Model
Design Model (HW and SW)
HALT/RDT/Predictions
Manufacturing Model
Early Life Failures
Wear Out and Mid Life Crisis
Advanced Reliability

Course Objective

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

Instructor's Bio

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

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

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

Introduction to Embedded Linux
(Online Edition)

New Online Course

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

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

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

Course Objectives:
To provide a basic understanding of the Linux OS and the Eclipse IDE framework.
To gain an understanding of the complexities of Embedded Linux Distributions and their use in embedded systems.
To give students confidence to apply these concepts to their next Embedded Linux project
Hardware and Software Requirements

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

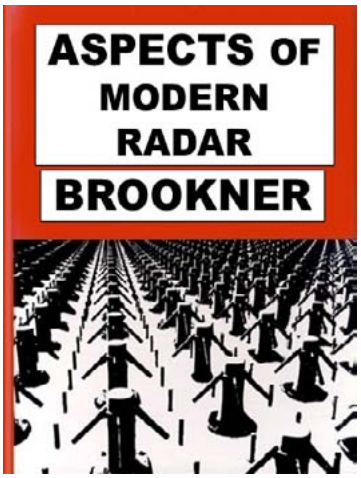
http://ieeeboston.org/introduction-to-embedded-linux-part-i-el201-online-course/

Radar Basics and Amazing Recent Advances

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

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

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



The following book plus over 15 paper reprints are provided FREE with your registration:
1. "Aspects of Modern Radar", Dr. Eli Brookner (Editor), Artech House, Hardcover, 432 pages, 1988, List price: $159. The 1st chapter gives the best easy to read introduction to radar. It covers all aspects of radar: transmitters, receiver, antennas, signal processing, tracking, clutter derivation of radar equation in easy terms and definition of dB. The 2nd chapter gives detailed descriptions of different radar systems like: Cobra Dane, Pave Paws, BMEWS, Series 320 3D radar, OTH radars and dome antenna. The book has a catalog giving the detailed parameters for over 200 radars from around the world. The remaining chapters cover AEGIS SPY-1, Hybrid and MMIC circuits, ultra low sidelobe antennas (ULSA), mmw, radar cross section and Doppler weather radars. The material in the book is easy to access and as a result the text serves as a handy reference book.

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

This course is an updated version of the Radar Technology course given previously. Those who have taken the Radar Technology previously should find it worthwhile taking this revised version. New material includes latest on solid state devices and transmitters including GaN, SiC, SiGe; Breakthroughs in Radar — $10 T/R module, Digital Beam Forming (DBF), Packaging, Disruptive Technology, Metamaterials, radar on a chip, 256 element phased array on a chip, Memristors, Graphene. Also covered are radar height-range coverage diagram using the powerful SPAWAR's AREPS program. AREPS provides coverage for arbitrary propagation conditions (ducts [evaporation, surface, or elevated], subrefraction and superrefraction) and terrain conditions based on DTED map data. AREPS now accounts for surface roughness scattering and evaluates sea and land clutter backscatter versus range. Attendees will be told how to obtain AREPS FREE. Valued at over $7,000. Also new is coverage of Anomalous Propagation and what to do about it. Finally also covered is the new Multiple-Input Multiple-Output (MIMO) explained in simple physical terms.

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

For the beginner, basics such as the radar equation,

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

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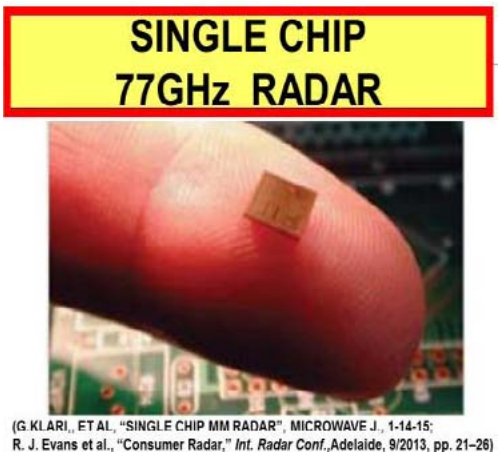

Lecture 1, Nov. 6

FUNDAMENTALS OF Radar: Part 1: Very brief history of radar, major achievements since WWII: PHASED ARRAYS: Principles explained with COBRA DANE used as example. Near and Far Field Defined, Phased Steering, Subarraying, Array Weighting, Monopulse, COBRA DANE slide tour (10 story building).

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

Lecture 2, Nov. 13

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

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

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

Lecture 3, Nov. 20

FUNDAMENTALS of Radar: Part 4: ULTRA LOW ANTENNA SIDELOBES (40 dB down or more). MOVING TARGET INDICATOR (MTI): Two-Pulse Canceller, Pulse Doppler Processing; MOVING TARGET DETECTOR (MTD); Optimum Clutter Canceller, Space-Time Adaptive Processing (STAP), Airborne MTI (AMTI), Displaced Phase Center Antenna (DPCA).

Lecture 4, Dec. 4

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

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

Lecture 5, Jan. 8

SIGNAL PROCESSING: Part 2: DIGITAL PROCESSING: Fast Fourier Transform (FFT); Butterfly, Pipeline and In-Place Computation explained in simple terms; Maximum Entropy Method (MEM) Spectral Estimate; State-of-the-art of A/Ds, FPGAs and Memory; Signal Processor Architectures: Pipeline FFT, Distributed, Systolic; Digital Beam Forming (DBF). Future Trends.

Lecture 6, Jan. 22

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

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

TREND TOWARD SOLID STATE PHASED-ARRAY TRANSMITTERS: Discrete All Solid State PAVE PAWS and BMEWS radars; advantages over tube radars; MMIC (Monolithic Microwave Integrated Circuitry; integrated circuitry applied to microwaves components): THAAD, SPY-3, IRIDIUM, XBR, JLENS. Solid State 'Bottle' Transmitters: ASR -11/DASR, ASR-23SS, ASDE-X. Extreme MMIC.

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

Lecture 7, Jan. 29

TRACKING, PREDICTION AND SMOOTHING: αβγ (GHK) Filter; Kalman Filter. All explained in simple physical terms.

Lecture 8, Feb. 5

HOW TO LOOK LIKE A GENIUS IN DETECTION WITHOUT REALLY TRYING: Simple procedure for determining detection. Covered are beam shape, CFAR, mismatch losses.

The Following is Included in Your Registration:

	Value
Textbook ……..	$159
15 Reprints	$300
Over 800 Vugraphs	$120

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

Payment received by October 24
IEEE Members $300
Non-members $340

Payment received after October 24
IEEE Members $340
Non-members $370

http://ieeeboston.org/radar-basics-recent-amazing-advances-fall-2017

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

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

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

Speaker: Henry Lau Lexiwave Technologies

Overview:

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

Audience:

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

Benefits:

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

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

Course Content:

Receiver

System Characteristics
- Signal and Noise
  Noise temperature, noise bandwidth, noise figure, sensitivity

Linearity
- Dynamic Range, one dB compression point, intermodulation

Critical Circuit blocks
- LNA, local oscillator, mixer, IF amplifier, demodulator, baseband amplifier

System Architectures and design considerations
- Heterodyne, Direct Conversion, Image-reject and Low-IF Receiver

Sample Receiver Designs

Transmitter

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

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

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

Miniature Antennas for Portable electronics
Antenna Fundamentals
- Radiation mechanism
- Source of radiation
- Characteristic of radiation

Parameters and specifications
- Radiation pattern, antenna eficiency, aperture concept, directiviy and gain

Types of antenna and performance
- Dipole
- Monopole
- Loop
- miniature antennas – patch, inverted-L, inverted-F, meandered line

Practical design considerations and techniques for
- portable electronics

Software Development
Embedded device
- Type of MCU
- Characteristics, functions and features
- Design considerations

Web database development
- MySQL

Website development
- Software - HTML, Javascript and PHP
- Web server

Smartpone Apps Development
- Android development tool
- Phonegap
- IOS

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

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

Payment received by October 13
IEEE Members $405
Non-members $435

Payment received after October 13
IEEE Members $435
Non-members $455

notes, lunch and coffee breaks included with registration

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

IEEE Boston Section Social Media Links:

Twitter: https://twitter.com/ieeeboston

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

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

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

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

Practical RF PCB Design: Wireless Networks, Products and Telecommunications

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

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

Speaker: Henry Lau, Lexiwave Technology

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

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

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

OUTLINE

1. Printed circuit board design for RF circuits
From product design, circuit design to PCB design
Layer stack-up assignment
Grounding methods and techniques
Interconnects and I/O
Bypassing and decoupling
Partitioning methods

2. Printed circuits board design for other circuits
Clock circuits
Base-band circuits
Audio circuits
Power supplies
Impedance-controlled circuits

3. PCB design for EMC/EMI compliance
EMC/EMI compliance
Grounding methods
Decoupling methods
Shielding methods

4. Additional Design Techniques
Production concerns
Systematic product design approach
RF Modules
Evaluation boards
Other RF concerns
Casing design

5. Case studies

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

notes, lunch and coffee breaks included with registration

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

Payment received by November 29
IEEE Members $405
Non-members $435

Payment received after November 29
IEEE Members $435
Non-members $455

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

Call for Course Speakers/Organizers

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

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

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

If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is **http://ieeeboston.org/course-proposals/** . Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gamil.com or 781 245 5405.

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

Patenting Outside of the U.S.

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

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

Speaker: Christine Kuta, Kuta Intellectual Property Law, LLC

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

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

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

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

Course outline:

I. Patents

A. Quick overview of what patents protect and why patent protection should be pursued.

B. High level view of process

C. Foreign filing license

II. Foreign patents

A. Basis for foreign patent protection

B. Representation

C. Differences in the process as compared to U.S.

- i. Patent eligibility
- ii. Inventorship
- iii. Patent Types
- iv. Process
- v. Fees

III. International applications – i.e., starting the foreign application process in many countries at once

A. Patent Cooperation Treaty

B. Regional applications

IV. The Unitary Patent and Unified Patent Court -- new developments in the Old World

A. What it is and how it works

B. Proposed dates of implementation

C. Filing options

V. Protection strategies

VI. A few words about enforcement

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

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

Payment received by October 12
IEEE Members $50
Non-members $60

Payment received after October 12
IEEE Members $60
Non-members $70

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

Call for Course Speakers/Organizers

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- 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.

Register at mwscas2017.org

Register before July 6 for special rates

The 60th IEEE International Midwest Symposium on Circuits and Systems will be held on the Medford/Somerville campus of Tufts University, August 6 - 9, 2017. MWSCAS 2017 will include oral and poster sessions, student paper contest, tutorials given by experts in circuits and systems topics. Visit the conference website for full details.

Sessions

- Analog and Mixed-signal Circuits & Systems
- Digital Circuits and Systems
- Circuits & Systems for Communications
- RF and Wireless Circuits and Systems
- Technologies for Smart Sensors
- Sensor Fusion
- Converter Circuits and Systems
- Image & Multi-dimensional Signal Processing
- Biomedical and Life Science Circuits & Systems
- Photonics & Nanoelectronics
- MEMS/NEMS
- Energy Harvesting & Power Management
- Trust & Authenticity
- System Security Architecture
- Reconfigurable Circuits & FPGA Applications

Keynote Speakers:

- Dr. Linton Salmon, DARPA
- Dr. Donhee Ham, Harvard University
- Dr. Jesse Wheeler, Draper

Tutorials

- Supercapacitor Based Embedded Energy Harvesters
- IC Power Management Circuits and Systems with Emphasis for Portable Devices
- Switching Noise Mitigation for Integrated DC-DC Converters
- Hybrid Microfluidic CMOS Systems for Life Science Applications
- Ultra-low Power/Energy SRAM Design for Internet-of-Things
- Signal Integrity Challenges in Emerging DDR Technologies
- Synthesis of BTI Reliable CMOS VLSI Systems in Nanometer Technologies
- Neuromorphic and Compressing Computing Circuits and Systems

Special Sessions

- Internet of Things: Sensors to Cybersecurity
- Emerging Neuromorphic Circuits for Enabling Deep Neural Networks
- Analog and Digital Circuit Design for the Internet of Everything
- Emerging Bio-interface Technologies for Life Science Applications

2017 IEEE High Performance Extreme Computing Conference (HPEC '17)

Twenty-first Annual HPEC Conference

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

HPEC 2017!

Register Now! **Preliminary Agenda Preview**

SAVE THE DATES!

The IEEE High Performance Extreme Computing Conference (HPEC 17) will be held in the Greater Boston Area, Massachusetts, USA on 12 - 14 September 2017. The HPEC charter is to be the premier conference in the world on the confluence of HPC and Embedded Computing.

Conference Registration is now open!

Register now and save with the early-bird discount! Ends August 20, 2017!

Keynote Speakers:

Dr. Ivan Sutherland (ACM Turing Award; IEEE John von Neumann Medal; NAE Fellow; NAS Fellow; ACM Fellow) - Clockless Computing

Mr. Andreas Olofsson (Program Manager - DARPA MTO) Intelligent Design Automation, System Optimization, and Open Hardware

Invited Speakers

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

Special Events

GraphBLAS forum to define standard building blocks for graph algorithms; organizers: Dr. Aydın Buluç (Lawrence Berkeley National Laboratory); Dr. Scott McMillan (CMU Software Engineering Institute); Dr. Marcin Zalewski (Pacific Northwest National Laboratory)
Integrating Quantum Computing with High Performance Classical Computing; organizers: Dr. Tim Braje (MIT Lincoln Laboratory) & Dr. John Cortese (MIT Lincoln Laboratory)
OpenSuperComputing BoF; organizer: Mr. Kurt Keville (MIT ISN)
IEEE/DARPA/Amazon Graph Challenge; Organizer: Dr. Jeremy Kepner (MIT)

Tutorials

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

Quick Links:

- **HPEC Home Page**
- **Committee**
- **Preliminary Program**
- **Conference Registration**
- **Conference Venue & Lodging**

Presentations will be represented in the following topics:

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

Advanced Embedded Linux Optimization

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

Location: TBD

Speaker: Mike McCullough, RTETC, LLC

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

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

Course Objectives

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

Course Schedule Day 1

Getting Started with Embedded Linux

Embedded Linux Training Overview
Terminology
Linux Versioning
The GPL
Building the Kernel Source Code
Embedded Linux Kernels
BSPs and SDKs
Linux References (Books and Online)
A Development Cycle Focused on Performance
A Basic Optimization Process

Basic Debugging Review

Embedded Applications Debug
GDB, GDB Server and the GDB Server Debugger
Other Debuggers
An Eclipse Remote Debug Example
Debugging with printk, syslog, syslogd and LTTng

System-Level Debug

System-Level Debug Tools
The /proc and /sys Filesystems
Basic Logging
KDB and KGDB
Crash Dumps and Post-Mortem Debugging

Debugging Embedded Linux Systems

Backend Debuggers
In-Circuit Emulators
Hardware Simulators
Analyzers

Course Schedule Day 2

Requirements Development

Performance Requirements
Derived Requirements
Testability and Traceability
Reviewing Requirements

Designing for Performance

Design for Test (DFT)
Agile Software Design
Software and Linux Decomposition
Memory Management
CPU and OS Partitioning
Design Reviews

Coding for Performance

Coding Standards and Consistency
Languages, Libraries and Open Source Components
Learning Magic Numbers
Letting Compilers Work For You
Global, Static and Local Variables
Code Reviews

Software Testing

Unit-Level Testing
System-Level Testing
Code Coverage Tools
gcov
Automated Testing
Some Embedded Linux Test Recommendations

DebugFS

Configuring DebugFS
DebugFS Capabilities

Advanced Logging

LogFS
Using Logwatch and Swatch
Using syslogd and syslog-ng

Tracing

ptrace and strace
New Tracing Methods
SystemTap
Ftrace, Tracepoints and Event Tracing
Tracehooks and utrace

Profiling

Basic Profiling
gprof and Oprofile
Performance Counters
LTTng
Another DDD Example

Manual Profiling

Instrumenting Code
Output Profiling
Timestamping

Course Schedule Day 3

Addressing Performance Problems

Types of Performance Problems
Using Performance Tools to Find Areas for Improvement
Application and System Optimization
CPU Usage Optimization
Memory Usage Optimization
Disk I/O and Filesystem Usage Optimization

Measuring Embedded Linux Performance

Some Ideas on Performance Measurement
Common Considerations
Uncommon Considerations
Using JTAG Methods
BootLoader Measurements
Boot Time Measurements

The Perf Tool

Origins of Perf
The Perf Framework
Perf Commands and Using Perf
Listing Events
Counting Events
Profiling with Perf
Static Tracing with Perf
Dynamic Tracing with Perf
Perf Reporting

Performance Tool Assistance

Recording Commands and Performance
System Error Messages and Event Logging
Dynamic Probes
Jprobes and Return Probes
Kernel Probes
Kexec and Kdump

Improving Boot Performance

Boot Time Optimization
The Linux Fastboot Capability
Building a Smaller Linux
Building a Smaller Application
Filesystem Tips and Tricks

Some Notes on Library Usage

Course Schedule Day 4

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

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

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

Payment received by December 26
IEEE Members $395
Non-members $415

Payment received after December 26
IEEE Members $415
Non-members $435

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

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

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

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

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

Introduction to Embedded Linux

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

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

Speaker: Mike McCullough, RTETC, LLC

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

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

Course Objectives

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

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

Additional Reference Materials

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

Course Schedule Day 1

Embedded Development Basics

Embedded Systems Characteristics
Embedded Real-Time Systems
Embedded Linux Systems and the Internet of Things (IOT)

Embedded Linux Basics

Embedded Linux Training Overview
Linux Terminology, History and Versioning
The Linux Community: Desktop & Embedded
Linux and the GPL

Linux References (Books and Online)

Getting Started in Embedded Linux

Kernel Source Code
Building the Kernel
Embedded Linux Kernels
Linux 2.6, 3.x and 4.x

Embedded Linux Kernel Overview

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

Debugging

Process-Level and System-Level Debug
GDB, GDB Server and the GDB Server Debugger
Other Debug and Test Tools
An Eclipse Remote Debug Example
Advanced Debug with printk, syslogd and LTTng

System-Level Debug

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

Course Schedule Day 2

Process & Threads Management

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

Signals in Embedded Linux

System Calls in Embedded Linux

Scheduling

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

Synchronization

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

Inter-Process Communications (IPC)

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

Course Schedule Day 3

Memory Management and Paging

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

Error Handling

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

Timing

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

Sleeping

Sleep Waiting and Spinlocks
Using Timers
Embedded Recommendations for Timing

Modularization

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

Shared Libraries

A Shared Library Example

Static and Dynamic Libraries

Interrupt and Exception Handling

Bottom Halves and Deferring Work

Course Schedule Day 4

The I/O Subsystem: A Tale of Two Models
The UNIX Device Driver Model
The Standard I/O Interface
Major and Minor Numbers
Configuring the Device Driver

The Evolution of the New Device Driver Model
The Initial Object-Oriented Approach
Platform Devices, Busses, Adapters and Drivers
A Generic Subsystem Model

The Generic Subsystem Model in Detail
Subsystem Registration
The Probe and Init Functions
The Show and Store Functions
User Access via the /sys Filesystem
Configuring the New Device Driver
The udev Linux Application

Comparing the Two Driver Models

Advanced I/O Operations
Standard UNIX I/O Operations
Scatter-Gather and Asynchronous I/O
Poll/Select and Epoll
Memory-Mapped I/O
File Advice
I/O Schedulers and inotify

The Linux Boot Process
The Root Filesystem
Desktop Linux Boot
Bootloaders and U-Boot
Embedded Linux Boot Methods
Building and Booting from SD Cards

Managing Embedded Linux Builds
Configuring and menuconfig
Oldconfig, menuconfig, xconfig and gconfig
Building Custom Linux Images
Target Image Builders
The Open Embedded Project and the Yocto Project

System Architecture Design Approaches

Deploying Embedded Linux
Choosing and Building the Root Filesystem
Module Decisions
Final IT Work

Embedded Linux Trends
Development Trends
Monitoring Trends
Testing Trends

Some Final Recommendations

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

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

Payment received by October 2
IEEE Members $400
Non-members $430

Payment received after October 2
IEEE Members $430
Non-members $455

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

Embedded Linux Board Support Packages and Device Drivers

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

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

Speaker: **Mike McCullough, RTETC, LLC**

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

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

Course Objectives

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

Course Schedule Day 1

Getting Started with Embedded Linux

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

Embedded Linux BSP Development Basics

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

Embedded Linux SDK Basics

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

Library Support, Glibc and Alternatives
SDK Deployment and Support

Course Schedule Day 2

Debugging

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

System-Level Debug

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

Debugging Embedded Linux Systems

Configuring Embedded Linux

Config Methods
Config Syntax
Adding Code to the Linux Kernel

Booting Embedded Linux

Processor Startup
Initial Functions
The initcalls
Using __init Functions
NFS Booting

Root File Systems

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

Course Schedule Day 3

Testing and Debug of Embedded Linux BSPs

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

Measuring Embedded Linux BSP Performance

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

The Original UNIX Device Driver Model

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

Course Schedule Day 4

The Evolution of a New Driver Model

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

The Generic Subsystem Model in Detail

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

The udev Linux Application

Comparing the Two Driver Models

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

Hybrid Device Drivers

Other fops Functions
The Need for Ioctl

Linux Device Driver Subsystems

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

Network Device Drivers

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

Course Schedule Day 5

Unwired Device Drivers

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

Some Final Recommendations

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

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

Payment received by November 1
IEEE Members $450
Non-members $490

Payment received after November 1
IEEE Members $490
Non-members $525

http://ieeeboston.org/embedded-linux-board-support-packages-device-drivers-fall-2017