2017 IEEE/ACM TCF Information Technology Professional Conference (TCF-ITPC)
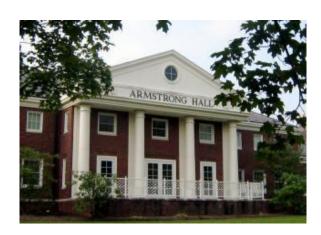
Program Book

Date: Friday, March 17, 2016 to Saturday, March 18, 2016
Time: 8:30AM to 5:00PM
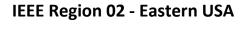Location: The College of New Jersey, Ewing, NJ

Sponsors:

Princeton / Central Jersey Chapter of the IEEE Computer Society

Princeton Chapter of the Association for Computing Machinery

IEEE Region 01 - Northeastern USA

IEEE Region 02 - Eastern USA

Princeton / Central Jersey Section of the IEEE

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IEEE Region 2 Director: Kate Duncan

TCF Chair   Al Katz

Thank you to our Sponsors, Speakers, Volunteers and Participants!

Also, thank you to the Trenton Computer Festival and the College of New Jersey.

Conference Logistics

Dear Participants,

Welcome to the **2017 12th Annual IEEE/ACM Information Technology Professional Conference at TCF**! We have an exciting program this year and are looking forward to seeing you.

Schedule:

The ITPC Conference program schedule is posted on our web site at: http://princetonacm.acm.org/tcfpro/pc2017.html.

Our conference presentations are scheduled to at **begin 8:30 AM to 5:00 PM on Friday, March 17, 2016** and include **extended sessions at 10:15 AM to 5:00 PM on Saturday, March 18, 2016** combined with the Trenton Computer Festival.

Registration:

Registration is in **Armstrong Hall on Friday at 8:15 AM in the Reception area near Room 154**. Your badge will be good for both Friday and Saturday sessions. Your registration also includes general admission to the Trenton Computer Festival.

On Friday, a continental breakfast will be available from **8:15 AM until 9:00**, prior to the start of the presentations in **Armstrong Hall near the registration area**.

Presentations:

All *Friday* presentations will be given in **Armstrong Hall rooms AR-154, AR-148, and AR-144.** All *Saturday* presentations will be given in the **Education Building**. The talks will be in classrooms equipped with a projector with a VGA style connector. We will also have a spare projector, just in case of a failure. Each presentation is 50-55 minutes and the audience averages 30 people including a diverse mix of practicing professionals, educators, interested engineers and students.

Lunch:

Lunch will be served on **Friday, March 17, 2016**, at **12:00 PM to 1:30 PM** in Armstrong Hall room AR-136. Our lunch will include a facilitated networking session as well as some door prizes.

TCF Keynote:

The TCF keynote featured speaker, Dr. Raj Rajkumar from Carnegie Mellon University. He was co-director of the lab that created the Autonomous Cadillac, which completed 33-miles through high-traffic suburban thoroughfares and two interstate highways. Dr. Rajkumar will deliver a talk on autonomous vehicles on **Saturday, 3:40 PM to 4:35 PM** in the **Education Building, ED115**.

Banquet:

There is a **Banquet on Saturday evening at 6:00 PM** and you are invited! We hope to see you there! The keynote at the banquet will be given by Greg Olsen, the third private citizen astronaut and world famous entrepreneur.

Advanced reservations are requested. The cost for the banquet $30. Payments are accepted and required at registration. Please make your reservation as soon as possible by sending an email to: Al Katz alkatz@tcnj.edu.

Posted Presentations:

Some of the presentations may be posted on the website: http://princetonacm.acm.org/tcfpro/

Maps:

The **TCNJ Campus** map can be found at: http://tcnj.pages.tcnj.edu/about/campus-info/campus-map/

The **Education Building (ED)** floor plan will be provided at the TCF registration desk on Saturday.

Parking:

Parking for Friday, March 17, 2015 is in **Lots 1 and 2**, which are the closest to Armstrong hall, but you are free to use any other open parking lot on the campus. Parking for Saturday is **in Lots 17 and 18** by the Education Building (ED).

Lodging:

Please refer to the TCF website: http://tcnj.pages.tcnj.edu/about/campus-info/hotels/ for more information. There is a group discount for "The College of New Jersey Conference."

TCF:

The **42th Annual Trenton Computer Festival** will be held at The College of New Jersey, Ewing Township, NJ on Saturday, March 18, 2015 between 9 am and 5 pm. This year's theme is "Autonomous Vehicles". The program includes over 50 panel sessions, workshops, tutorials, demonstrations, educational events and a Flea market. For more information go to: www.tcf-nj.org.

Thank you for your participation,

David Soll

Conference Chair

IEEE Information Technology Professional Conference
http://princetonacm.acm.org/tcfpro/

TCNJ Campus Map

Armstrong Hall Map

Armstrong — Entry from Upper Garage (LOT 1)

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Armstrong Entry →

ARMSTRONG GARAGE
LOT 1 - Upper Garage Lot
LOT 2 - Lower Garage Lot

← Entry from Armstrong Lower Garage (LOT 2)

114

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ARMSTRONG HALL

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Ⓡ Registration
Ⓜ Men's Restroom
Ⓦ Women's Restroom

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2014-03-03, rev-02a-P

Presentation Schedule

	Development\n\nAR-154	Technology & Security\n\nAR-148	Professional Development & Management\n\nAR-144
	Friday, March 17, 2016 Information Technology Professional Conference		
8:00 AM	R E G I S T R A T I O N		
9:00 AM	Rebooting Software Development\nBy Andrew Murren	Software Security Assurance – The Good, The Bad, The Ugly\nBy Cindy Cullen	The DBA and The Long Game - Seeing (and moving) Into The Future!\nBy Ziaul Mannan
10:00 AM	Building Realtime Access to Data Apps with Speedment\nBy Michael Redlich	Datacenter Design Trends\nBy Steven Shapiro	An Enterprise of One: Career Management for the Technical Professional\nBy Joe Levy
11:00 AM	How We Get Agile Transformations Wrong By Trying to Do It All So Right\nBy Howard Deiner	A Software-Defined Network Honeypot with Geolocation and Analytic Data Collection\nBy Casimer DeCusatis	You Graduated from a cyber security higher education program: so what?\nBy Lori Stroud
12:00 PM	L U N C H & F A C I L I T A T E D N E T W O R K I N G S E S S I O N		
1:40 PM	Design Patterns Beyond the Gang of Four\nBy Dennis Mancl	Deploying the ScienceDMZ Everywhere\nBy Scott Valcourt	The Actor Model and Queues or "Batch is the New Black"\nBy Brad Whitehead
2:40 PM	Acceptance Test Driven Development: Benefits, Challenges, Optimized Approach\nBy Sujatha Dantuluri	The Smart Home – Technologies, Trends and Challenges\nBy Ping-Tsai Chung	Framework for developing effective IT Strategies\nBy Cherif Amirat
3:40 PM	Reacting to Real-Time Events with Functions - The growing importance of functional reactive computing\nBy Enzo Alda & Monica Figuera	Challenges of Integrating Ubiquitous Industrial Internet-of-Thing (IIoT) in Enablement of Multiple Clouds\nBy Vikas Shah	Emerging Technologies and Ethical Issues\nBy Donna Schaefer\n& Patrick Olson

9:00 AM Sessions

Rebooting Software Development

By Andrew Murren

SQL Injection attacks first appeared in 1998 and yet in 2016 new software vulnerable to this attack is still being developed. The fundamental reason for the persistence of poor and insecure code being developed is because it is easier to develop poor insecure code than it is to develop good secure code. A fundamental change in philosophy and direction by researchers, academics, language developers, and development tool vendors is needed so that it is harder to write poor code than to write good code. This presentation will discuss ways to make it easier and more cost effective to develop good code than to continuing to develop poor code.

About Andrew Murren

Andrew Murren, CISSP, CSSLP, is a Senior Cyber Security Engineer with Sila Solutions Group with 20 years of experience in Information Security. He specializes in secure application development and secure networking. He has conducted and led, source code reviews, security assessments, and audits of systems ranging from embedded devices for the Department of Defense to networks for multinational corporations. Andy is the chair of the Open Source Software Institute's (OSSI) Governance Committee which is developing solutions and materials to help organizations manage Open Source Software. In 2013 Andy retired from the US Army Reserves as a Lieutenant Colonel. His last duty assignment was as a Planning Officer with US Cyber Command.

Software Security Assurance –The Good, The Bad, The Ugly

By Cindy Cullen, CISM, CISSP, CCSK, SSBB, ITILv3, MsCSC
Chief Cyber-Security Strategist, ESP
Hewlett-Packard Enterprise Company

With over 80% of all breaches happening via applications Software Security Assurance (SSA) is essential. However, SSA can be daunting for an organization especially with agile development methodologies and expanding pervasiveness of applications including mobile & IOT. This talk will address why software security is hard, how changing methodologies are making it even more challenging, how to address SSA in DevOps and lessons learned from the trenches. Techniques on how to demonstrate the value of a program will also be shared.

About Cindy Cullen:

Cindy Cullen is a Chief Cyber-Security Strategist within the Enterprise Security Product business unit at HPE. In this role, Ms. Cullen is responsible for driving strategic initiatives for the ESP Security Strategy group and providing thought leadership and insight regarding the ever changing global threat landscape.

Ms. Cullen has over 20 years of experience leading cybersecurity and information risk programs. Cindy is President of the NJ Chapter of (ISC)2, is an ICIT Fellow advising congress and staff on cybersecurity issues, was CISO at Telcordia/Bellcore, VP of IS at Citi, CTO at SAFE BioPharma and designed an S-SDLC process for Bristol Myers Squibb. She served on the Bridgewater-Raritan Regional School Board for 9 years include as VP and President. Cindy is an in demand speaker with experience at national & international venues (i.e. NIST, OWASP, RSA, …)

She received the Digi Award for industry leadership for the pioneering use of interoperable digital identities by National Cancer Institute, Bristol Myers Squibb and Sanofi, reducing the cost and time required to get critical medicines to market more quickly. Cindy's leadership and innovation were recognized by the White House initiative on National Strategy for Trusted Identities in Cyber Space (NSTIC) winning the Computer World's Computer Laureate Award 2012.

The DBA and The Long Game - Seeing (and moving) Into the Future!

By Ziaul H. Mannan

Data is one of the most important assets of any business. As gatekeeper of this asset, the Database Administrators (DBA) right in the middle of business processes, end users and technology, has an often under-appreciated potential as enabler and information hub - with what we see as opportunity to lead beyond the defined parameters of their role. Working from this premise the session discusses this importance of how a DBA needs to transform over time by incorporating the traits and virtues of a leader. We believe DBA's can positively impact their organizations and opening themselves out to new opportunities by progressing into leadership roles. In this session we will examine and explore a possible growth path for Database Administrators in their career.

About Ziaul H. Mannan:

Ziaul H. Mannan is currently the Database Architect for Yale New Haven Health System (YNHH), based in New Haven Connecticut, USA. Zia joined YNHH in 2002. Prior to that he worked in Bangladesh, New Zealand and Australia.

As a database specialist with over 18 years of experience, Zia enjoys designing and architecting systems in fast paced 24x7 environments. As database architect he oversaw development of critical clinical systems at Yale School of Medicine, Yale New Haven Health System and Yale Medical. He continues to be involved in projects centered around clinical innovation and breakthroughs within these institutions. Clearly with emersion a big data, lot of his projects these days are around Internet of Things (IoT), data analytics, data warehousing and data interchange.

Zia got involved in charity work early in his life through Leo Clubs. Zia is a dedicated activist for' child rights and sight' around the globe. He is actively involved in charities that aim to provide quality education and healthcare to underprivileged children. Zia has been an avid fan of Science. He sits on the board for a foundation in Connecticut (CT STEM Foundation) that promotes the study of STEM among high school students. He is the fair director for the largest regional STEM fair in Connecticut.

10:00 AM Sessions

Building Realtime Access to Data Apps with Speedment

By Michael Redlich

Speedment, is a Java 8 toolkit and runtime for accelerated SQL database applications. A portmanteau blend of "speed" and "development," Speedment accelerates development speed and makes database programming easy and fun! When Speedment Open Source is used for database querying, you do not have to learn a new API or use complex (object-relational mapping) ORMs. Everything is standard Java 8 and works out of the box. This seminar will provide a brief overview of Speedment and demonstrate how to build a small database application in real time.

About Michael Redlich:

Michael Redlich is currently a Senior Research Technician at ExxonMobil Research & Engineering in Clinton, New Jersey (views are his own) with experience in developing custom scientific laboratory and web applications. He also has experience as a Technical Support Engineer at Ai-Logix, Inc. (now AudioCodes) where he provided technical support and developed telephony applications for customers.

Mike has been a member of the Amateur Computer Group of New Jersey (ACGNJ) since 1996 and currently serves on the Board of Directors as President. He has also been facilitating the ACGNJ Java Users Group since 2001. Mike's technical expertise includes object-oriented design and analysis, relational database design and development, computer security, C/C++, Java, and other programming/scripting languages. His latest passions include Meteor and MongoDB. Mike currently serves as a Java Community news editor for InfoQ and has co-authored nine (9) articles with Barry Burd for Java Boutique (now jGuru). He has presented at venues such as Emerging Technologies for the Enterprise (ETE), Trenton Computer Festival (TCF), TCF IT Professional Conference, Capital District Java Developers Network, and Princeton Java Users Group. Mike also serves on the steering committees of ETE 2017 and TCF 2017. Mike is a member of Toastmasters International and is also involved in volunteer efforts such as United Way of Hunterdon County and his company's local Science Ambassador Program. He is also an avid marathon runner and cyclist. Mike holds a Bachelor of Science in Computer Science from Rutgers University.

Datacenter Design Trends

By Steven Shapiro

This presentation will review the latest design trends associated with increased reliability and energy efficiency for the data center.

New and updated cooling technologies are now making their way into the data center. Applying these technologies requires advanced control and monitoring to ensure that these systems operate properly, alarm properly and work within the proper tolerances required by client service level agreements. We will explore the application of outside air, water and other liquids in the cooling of the data center.

Clean and continuous power has been a requirement in the data center forever. Now, depending on the business, efficiency trumps reliability. We will look at the various needs for stable power, energy storage and reliable UPS configurations to clearly define the good, bad and ugly of the discussion.

About Steven Shapiro:

Steven Shapiro has 30 years of experience providing adept services in the study, reporting, design, commissioning, development and management of reliable electrical distribution, emergency power, lighting and fire protection systems for critical facilities across North America and internationally. With over 4.5 million square feet of raised floor experience, 200 MW of UPS experience and 400 MW of generator experience, Steven's efforts to share his knowledge and engage the industry has led to his authoring numerous technical articles and seminars as well as being invited as a regular speaker at major industry technical conferences.

An Enterprise of One: Career Management for the Technical Professional

By Joe Levy

Whatever your job, whoever your employer, you have a side gig as a career manager.

"Career Management" is not a fancy term for job hunting. Career Management is what goes on between job hunts. As an IT professional, you are a service provider. It does not matter if you call the recipient your "customer" or your "employer". Your agenda includes the need to keep your service relevant.

In this talk, I will promote the inclusion of Career Management considerations in your professional life. We will discuss the importance of topics including:

- Setting goals
- Self-assessment
- Continuing education
- Maintaining your professional network
- Evolution of your role over time
- Awareness of industry trends
- Awareness of corporate trends
- The value of mentors

You may not have learned this in college. But these soft skills are just as important to your career as the hard skills you did learn.

About Joe Levy:

Joe Levy is a management consultant and business analyst, with particular focus on requirements definition for IT projects. He also leads the NJ JobSeekers support group, which provides job hunting and career management support, education, and networking to people in transition in the Princeton area.

11:00 AM Sessions

How We Get Agile Transformations Wrong By Trying to Do It All So Right

By Howard Deiner

Sorry to say it guys, but Agile has gone limp over the last few years. As we get more and more coaches into the mix, both external as well as internal, organizations somehow have forgotten that it's software that we're trying to produce. Not great stand-ups.

Technical practices matter. In fact, if we could dispense with ALL process and still create the valuable quality software that is needed, we should do that. From a Lean perspective, process adds no customer facing value. But getting rid of all process is crazy talk. Even Fred George, who promoted "Programmer Anarchy" several years ago never got away from all process. In reality, his movement was premised on driving business decision making directly into technical decision making, and completely empowering teams to "be" the company. He premised the concept of "Programmer Anarchy" on using the best and brightest developers out there, and trusting that if they could do something as difficult as create great code that they could do the business decision making as well.

But perhaps we don't have the absolute best talent out there. Perhaps it's hard to lure people away from Google and Facebook because of the money and the chance to get great work environment and unbelievable work challenges (change the world, anyone?) Does that mean that we have to go back into the Fredrick Winslow Taylor world view of "The One Best Way"? With that way becoming making a choice between Scrum, SAFe, Lean/Kanban, and other development processes?

I'd like to convince you that what's going to work for your organization and your employees is something in the middle. I, of course, lean into the "better technical practices will yield better outcomes" frame of mind. You may as well. But when Garrison Keillor said, on "A Prairie Home Companion" (a long running radio show on National Public Radio in the States), "Well, that's the news from Lake Wobegon, where all the women are strong, all the men are good looking, and all the children are above average", that was satire! And the same is true of your organization. It can't logically be true that all organizations' developers are all above average. But we can hold people to an acceptable level of technical practices that will yield in writing better code than merely having a process that talks about writing better code. This session will speak to the specifics of the whats and whys.

About Howard Deiner:

Howard is a software consultant and educator who specializes in Agile process and practices. He has a varied background spanning well over forty years in the industry, with extensive experience in commercial software, aerospace, and financial services. He has played many of the roles in the development arena, such as developer, analyst, team lead, architect, and project manager. He has applied the principles of Agile, Lean, and XP development in teams both large and small, in various environments. Howard has educated dozens of teams, and is a long-standing member of the ACM and IEEE.

Howard has had numerous recent speaking engagements throughout the United States, London, and India.

A Software-Defined Network Honeypot with Geolocation and Analytic Data Collection

By Dr. Casimer DeCusatis

Software defined networks (SDN) are being widely adopted in cloud computing environments. However, there is a strong need for improved cybersecurity in SDN cloud networks, specifically an approach which protects critical assets such as the SDN controller. We describe a new SDN controller honeypot, known as Dolos, which mimics a real SDN controller and records data on attempted cyberattacks (including IP address, duration of the attack, operating system and browser used in the attack). This data is compatible with an attack pattern classifier which we have written, called LongTail (details of LongTail's operation have been published previously). We have also written an open source Python script which works in tandem with Dolos to provide geolocation data (including country, subdivision, city, postal code, latitude, longitude, and host ISP information). Experimental data is presented showing that Dolos fingerprints as a real SDN controller, and demonstrating the accuracy of geolocation based on data collected from Dolos. We also present performance testing results using the Apache Benchmarking tool while performing mock attacks against this new honeypot.

About Dr. Casimer DeCusatis:

Dr. Casimer DeCusatis is an Assistant Professor in the Department of Computer Science and Mathematics, Marist College, Poughkeepsie, NY. His research with the New York State Center of Excellence for Cloud Computing and Analytics includes optical data networks, cybersecurity, and software-defined data center architectures. An IBM Distinguished Engineer Emeritus, he is also an IBM Master Inventor with over 150 patents, and recipient of several industry awards, including the IEEE Kiyo Tomiyasu Award, the Sigma Xi Walston Chubb Award for Innovation, the EDN Innovator of the Year Award, the Mensa Research Foundation Copper Black Award for Creative Achievement, the Penn State Outstanding Scholar Alumnus Award and Mark Luchinsky Memorial Lecture, and the IEEE/HKN Outstanding Young Electrical Engineer award (including a citation from the President of the United States and an American flag flown in his honor over the U.S. Capitol). He is co-author of more than 200 technical papers, book chapters, and encyclopedia articles, and editor of the Handbook of Fiber Optic Data Communication (now in its 4rd edition). He is a member of the IBM Academy of Technology and co-leader of the Academy study "Innovation Ecosystems". Dr. DeCusatis received the M.S. and Ph.D. degrees from Rensselaer Polytechnic Institute (Troy, N.Y.) in 1988 and 1990, respectively, and the B.S. degree magna cum laude in the Engineering Science Honors Program from the Pennsylvania State University (University Park, PA) in 1986. He is a Fellow of the IEEE, Optical Society of America, and SPIE (the international optical engineering society), a member of the Order of the Engineer, Tau Beta Pi, Eta Kappa Nu, Mensa, and various other professional organizations and honor societies (http://www.decusatis.net/casimer/); he was recognized as one of Sigma Xi's Distinguished Members during their 125th anniversary celebration, and is a Cisco Distinguished Speaker. He is also Founder and Director of Hudson Valley FIRST Lego League (http://www.facebook.com/HudsonValleyFLL) which offers over 1,000 students each year the opportunity to pursue their interest in science and technology. His discussions on data networking are available on Twitter (@Dr_Casimer) or his monthly blog for the OFC Conference (http://www.ofcconference.org/en-us/home/about/ofc-blog/).

You Graduated from a cyber security higher education program: so what?

By Lori Stroud

Earning a "cyber" degree from a shiny university may get you an interview, but there are many other bases to cover when preparing to enter the information security job market.

This presentation will describe numerous ways you can curate the competitive advantage against the crowd of cyber-graduates pouring out of universities today.

- MOOC (Massive Open Online Courses): Coursera, EDx, Code Academy
- Coding! Data science! Advanced Math! C++, HTML, Java, Python, PHP, R, cryptography
- Make apps! GitHub! create something! get your name out into the community!
- Network/intern! Become involved in college-prep programs, mentoring current students, join and participate in professional tech organizations. Approach companies with missions you want to grow into and intern!
- Get cleared! Military, agencies.
- Level-Up! Industry and technical certifications!

About Lori Stroud:

Lori Stroud is a senior cyber analyst currently working for Dark Matter LLC in Abu Dhabi, United Arab Emirates. She is a US veteran, former agency analyst, and security consultant. She is an avid student of analytic modernization and data science. She loves to inspire curiosity about cyber academics and mentor within the information security field.

She holds professional memberships within:

- Women in Technology International: Empowering women worldwide to achieve unimagined possibilities and transformations through technology, leadership and economic prosperity.
- IEEE: The world's largest technical professional organization dedicated to advancing technology for the benefit of humanity
- National Education Association: Enabling children to achieve academically and learn the skills to be successful and productive citizens.

1:40 PM Sessions

Design Patterns beyond the Gang of Four

By Dennis Mancl

Design patterns are useful software design ideas that are used by both novice and expert programmers to build efficient and flexible software systems. In the 1990s, the first collection of 23 patterns appeared in print (the famous Design Patterns book, often called the "Gang of Four" book because of its four authors). Many developers are familiar with these basic patterns, but newer patterns are just as important for today's software developers. This presentation will show several more recent design patterns that should be in every developer's bag of tricks -- some data patterns, some reliability patterns, and some communications patterns.

About Dennis Mancl:

Dennis Mancl is a New Jersey-based software process and software design expert. He worked as a Distinguished Member of Technical Staff at Alcatel-Lucent, where he has been involved in object oriented designs, design patterns, software architecture, and agile development practices for over 20 years. Dennis has M.S. and Ph.D. degrees in computer science from University of Illinois.

Deploying the ScienceDMZ Everywhere

By Scott Valcourt
University of New Hampshire
Durham, NH 03824

Over the span of the last decade, large research institutions have developed and deployed a network structure to move large amounts of digital data from one location to another quickly and safely called the ScienceDMZ. The design achieves near line-rate data movement across a wide-area network (WAN) link between two sites while adding security mechanisms and procedures that do not require a firewall. As part of this presentation, we propose to show how the ScienceDMZ differs from the traditional network configuration, to highlight the benefits realized in using the ScienceDMZ model, and to theorize on the use of the ScienceDMZ in organizations that are small or medium-sized or focused on data beyond that of science.

About Scott Valcourt:

Scott Valcourt serves as the Director of IT Strategic Technology and a PhD candidate at the University of New Hampshire and is the chief visionary for UNH's investment in cyberinfrastructure. Named "one of the most powerful people in networking" by NetworkWorld Magazine in 2001, Scott has been part of the development process for over a dozen networking technologies as a consortium manager and second director of the UNH InterOperability Laboratory from 1993-2004 and as a Research Project Manager in the UNH Computer Science department. Scott has been the principal investigator (PI) of Network NH Now, a collaboration of public and private partners that constructed critically needed broadband expansion across NH through more than 750 miles of new and existing fiber and microwave technologies, as well as the co-PI of the New Hampshire Broadband Mapping and Planning Program that continues to focus on broadband mapping statewide. Scott is currently constructing ScienceDMZ networks for UNH and Saint Anselm College to move research data faster, easier and safer. Scott has won and managed over $100 million in grant funds focused on the creation of next generation infrastructure and applications utilizing broadband across the region.

The Actor Model and Queues or "Batch is the New Black"

By Brad Whitehead

In 1974, Carl Hewitt published his paper on the Actor model. In computing, an Actor is a computer program that uses information fed to it in messages to 1) create new Actors, 2) send messages to other Actors, and 3) make limited, often binary, decisions. Just as the binary on-off state of a single transistor can be built into the 2.6 billion(!) transistor Intel i7 Haswell Complex Instruction Set Computer (CISC), Actors can be built into the most complex processing systems. If the Actor model sounds familiar, it's because it is the basis for Microservices, one of the hottest new topics in cloud computing. Just another example that "…what has been will be again, what has been done will be done again; there is nothing new under the sun"

The Actor Model is only half of the solution. The key to using Actors to build infinitely scalable real-world systems is how you connect them together. Typically, in Microservices, you send or "push" messages from one Microservice to another. When you reach the throughput of a Microservice instance, you clone a few more instances. When you reach the CPU or memory utilization limits of the virtual machine, you fire up more VMs. The key is that you "push" messages. This however, is the wrong approach. We all know what happens when you push something hard enough - it will fall over. Think of the classic scene from the "I Love Lucy" television program where Lucille Ball is wrapping chocolate candies on a conveyer belt (https://www.youtube.com/watch?v=8NPzLBSBzPI). This graphically demonstrates that the "push" model is the wrong approach.

In Douglas Adam's "The Hitchhiker's Guide to the Galaxy", the quote is "We'll be saying a big hello to all intelligent lifeforms everywhere and to everyone else out there, the secret is to bang the rocks together, guys." To paraphrase Mr. Adams, the secret to scalable processing systems is really to "pull", not "push" messages between Actors. Rather than send messages directly between Actors, the messages are deposited into queues from which Actors can "pull" messages. As each Actor becomes available, it pulls the next message out of the queue and processes it. This has a number of advantages over "pushing" messages, such as increased Actor process stability, load balancing, predictive monitoring, and transparent redundancy.

Actors are computer programs and as such they aren't lazy. An Actor will process messages as fast as its execution environment permits. If messages begin to back up in a queue, then you know, long before it becomes critical, that more Actor processes are required. As these new Actor processes become available, there is no need to add them to a load balancer. Each new Actor connects to the same queue and starts asynchronously removing and processing messages. Similarly, when queues become empty, redundant Actors can be terminated. Finally, by using network routing, it's possible to route messages to redundant queues. If the primary queue fails, Actors can "failover" to a redundant queue and continue processing without message loss. While the Actor model is 42 years old, the queue data structure was originally described by Alan Turing 70 years ago, in a paper published in 1947!

While these two "ancient" computing paradigms form the basis for modern, infinitely scaling systems, there are a number of details that must be dealt with, including how to handle work lost when Actors fail; how to maintain state or context; how to handle long-running processes; how to handle "split brain" network failures in light of redundant messages queues; synchronization of redundant message queues, etc. This presentation will discuss these issues. The goal of the presentation is to outline for

software developers, the framework they can use to develop highly scalable, highly resilient processing systems.

About Brad Whitehead:

Brad Whitehead is Chief Scientist for Formularity, an electronic forms company dedicated to the secure collection and processing of personal information. Formerly, he was a Partner and Master Technology Architect with Accenture. Brad has architected and implemented several national-scale information processing systems based on the Actor model and queues. One such system processes billions of biometric transactions per day for the Republic of India, while another handles millions of biometric transactions each day while safeguarding the borders of the United States. He has served as a security advisor to several Federal agencies. Brad holds a BS from Carnegie Mellon University and an MS from the University of Liverpool. He can be reached at brad.whitehead@formularity.com.

2:40 PM Sessions

Acceptance Test Driven Development: Benefits, Challenges, Optimized Approach

By Sujatha Dantuluri

Agile development methodology captures the software/system requirements from user perspective in user story. A User story has a scenario based acceptance criteria which explains what the user is expecting from that story/functionality. Acceptance test driven development is headway for test driven development where Test scripts are written first to meet the acceptance criteria and then implementation is done to ensure test scripts pass. We will discuss the benefits, challenges and how it is successfully implemented.

About Sujatha Dantuluri:

Background:

- Solution architect/Technical Lead, managing cross functional teams and oversaw solution rollout for GSA's prestigious Formatted Product Tool Phase 1
- Extensive 14 years' Experience in Architecting and implementing JAVA/J2EE and BPM Solutions.
- Expertise in delivering high performing and scalable applications in timely fashion and within budget
- Extensive knowledge of enterprise architecture framework - Togaf
- Extensive experience designing big data OLTP systems
- Enable continuous improvement (CI) by optimizing business processes through BPM and EA solutions
- Acquisition domain knowledge
- Member of IEEE
- IEEE Standards committee member for active working group - P2301 : Intercloud Working Group
- 3.93 GPA holder in Masters Project Management and has good understanding of estimating time and resources, creating the project baseline, controlling the baseline and optimization techniques for resource allocation, and earned value management.
- Experience implementing the solutions both with waterfall and Agile methodologies
- Excellent team building skills helping with project quality and delivery
- Strong experience of SOA governance tools.

CERTIFICATIONS:

- SOA Certified Architect
- AWS Certified Solution Architect- Associate
- PMI-Agile Certified Professional (ACP)
- ITIL Foundation certified
- Sun Certified Java Professional

The Smart Home – Technologies, Trends and Challenges

By Ping-Tsai Chung
Long Island University, Brooklyn, New York

Smart home networking platform is a family of results, the trend in computer technology, automation technology and communication technology. New trend of smart home involve a range of Internet of Things (IoT) devices that can communicate each other and be controlled, remote monitored and accessed through user interfaces and through automatic interactions to provide a more comfortable, safe, convenient, energy efficient living environment services to enhance human's quality of life. Gartner Predicted that there could be over 500 connected devics in the home by 2022, Smart devices may involve Smart meters, Security systems, Alarms, Sensors, Appliances, Audio/Visual entertainment, Lighting, Heat and Power, Communication.

With the IoT, the smart home market will move to the "ubiquitous smart home" – where sophisticated systems learn user behaviour/lifestyle and respond accordingly. There are a set of IEEE Standards for a connected smart home; they will enable smart devices to talk to each other. In this presentation, I will examine Smart Homes Technologies, Trends and Challenges. Also, I will address the recent IT developments on Robots in the Home and 3D Home Monitoring System.

About Ping-Tsai Chung:

Prof. Ping-Tsai Chung is a Professor of Computer Science with Long Island University, Brooklyn. His research interests are Network Computing, Databases, Knowledge Discovery, Expert Systems and Health Informatics (i.e., Intelligent Computing, Systems and Applications for the above areas.) Earlier, he has worked with Bell Labs in U.S.A. for developing High Speed Network Management Systems. Dr. Chung received his Ph.D. degree in Computer Science from NYU Polytechnic School of Engineering. He is also an Adjunct Professor with NYU since 2013. Dr. Chung is a senior member of IEEE. He is the Founding Chair of the New York Chapter of IEEE Systems, Man, & Cybernetics (SMC) Society and is serving Chair of Education Committee of IEEE New York Section. His website is http://myweb.brooklyn.liu.edu/pchung/

Framework for developing effective IT Strategies

By Dr. Cherif Amirat
Chief Information Officer at IEEE
Part Time Lecturer at Rutgers University MSIS Department

The potential opportunities created by the evolution of Information Technologies (IT) are missed by most companies and organizations. The majority of companies value their IT organization only for their contributions in ensuring reliable operations through IT services and cost cutting through automation. IT organizations in these companies are not considered as strategic enablers and sources for value creation. This paper addresses the key elements needed to position IT to deliver value while solving both business and technical problems. The paper also provides a roadmap for establishing IT organizations as business strategic partners and a framework for developing an Information Technology strategy that is aligned with business goals and drives value through the enablement of growth.

About Dr. Cherif Amirat:

Dr. Cherif Amirat is currently the Chief Information Officer (CIO) at IEEE. Prior to joining IEEE, Dr. Amirat was a Senior Director of Business Technology at Pfizer Inc. with global responsibility for IT teams across the Emerging Markets where he directed digital marketing strategies and solutions. Cherif has also worked in finance, management consulting, and as a Member of Technical Staff at Bell Laboratories. Dr. Amirat was an Adjunct professor in various colleges and universities and is currently a part time lecturer at Rutgers University teaching "Information Technology Strategy" course for graduate students. Cherif holds a Masters and PhD in Electrical Engineering and Computer Science from Steven Institute of Technology and an MBA from Wharton Business School, University of Pennsylvania.

3:40 PM Sessions

Reacting to Real-Time Events with Functions - The growing importance of functional reactive computing

By Enzo Alda   and   Monica Figuera
Principal and Founder   Student
Lakebolt Research   University Simón Bolívar

Robotic systems, particularly complex ones like autonomous cars, require performing continuous calculations in response to streams of events generated by multiple sensors. Likewise, mobile apps, asynchronously updated Websites, and connected Internet of Things appliances, have become primary examples of the increasing need to perform real time computations in reaction to asynchronous events.

It is no coincidence that, as the world experiences an exponential growth in the amount of real time generated data, event driven functional programming paradigms, like Amazon Lambda, as well as stream processing platforms, like Apache Storm and Apache Kafka, are becoming increasingly popular. The IT world has been consistently shifting from the client-server, request-response, processing paradigm, to one of continuously processing pipelines. Moreover, data rates, volumes, and latency requirements keep getting more stringent, as vendors compete to deliver a better consumer experience.

The talk will first provide a general introduction to the theoretical foundations of functional programming, stream processing, and functional reactive computing, with a mandatory nod to parallel processing. It will then provide an overview of a few enabling technologies, readily available, which make possible to build advanced processing pipelines. Finally, the talk will showcase some of the concepts and technologies mentioned, with a live demonstration of a Web enabled functional reactive system, performing real time calculations and rendering transformations over high rate data streams.

About Enzo Alda:

Enzo Alda is the principal and founder of Lakebolt Research, a technology firm focused on parallel computing and real time quantitative data analysis. Before founding Lakebolt Research, he worked at Google, contributing to Google Spreadsheets, and Bloomberg LP, where he conceived and implemented the engine that powers real-time calculations in the Bloomberg terminal. Mr. Alda formerly lectured courses in compiler construction and programming language design. He holds B.S. and M.S. degrees in Software Engineering and Computer Science respectively, as well as an MBA from The Wharton School of Business. Mr. Alda joined the IEEE in 1999.

About Monica Figuera:

Monica Figuera is a Software Engineering candidate at University Simón Bolívar (Venezuela) specializing in the areas of Web Technologies and Distributed Databases. Ms. Figuera's research focuses on reactive, rule based, rendering of real time data and navigation of continuously updated databases that support nested data structures described by post-relational schemas.

Challenges of Integrating Ubiquitous Industrial Internet-of-Thing (IIoT) in Enablement of Multiple Clouds

By Vikas S. Shah

Organizations are connecting complex, physical machines with progressive analytics to unleash a wealth of new insights and connected ecosystem during globalization of products and services. IIoT promises to generate a new wave of technological innovation that is set to permanently redefine the current digital landscape enabling multiple cloud environments. Subsequently, enterprises are looking to leverage the IIoT to reduce unplanned downtime, dramatically increase efficiency, and ultimately open up a new era of economic growth and competitiveness. Ubiquitous IIoT could create a number of new "smart" paradigms, such as smart power grids and smart healthcare, as well as lead to the development of new manufacturing ecosystems that are driven by self-aware, autonomic machines.

Devices that can connect to one another and over the across multiple clouds potentially threatens Industrial Control Systems. To realize the full potential of the IIoT in multiple clouds and advantages of globalization, businesses and governments needs to overcome a numerous hurdles. Today's operational technology systems work largely in silos. However, a fully functional ubiquitous IIoT under multiple clouds demands seamless data communication and control flows between devices, sensors, actuators, mobile users, service providers, vendors, and partners from diversified manufacturers' supply-chain. The drive towards multiple clouds is further complicated by the long life span of typical industrial equipment, which would require costly retrofitting or replacement to work with the latest technologies including Industry 4.0 standardization, communication technologies, security, and data privacy.

We provide an analysis of the challenges and open research questions that must be addressed to achieve goals of implementing ubiquitous IIoT in the multiple clouds. Enriching ubiquitous IIoT in multiple clouds provide actionable information and knowledge from devices and more efficient way of enabling progression of IIoT initiative to keep pace with advancements in manufacturing supply-chain. We illustrated the benefits utilizing explicit case studies and proven process to streamline the integrity among multiple clouds.

About Vikas S. Shah:

Vikas S. Shah received M.Sc. degree in computer science from Worcester Polytechnic Institute, MA, USA in 1998 and Bachelor of Engineering in Computer Engineering from Conceicao Rodrigues college of engineering, University of Mumbai, India. Currently, he is Chief Architect in Connected Enterprise Services (CES) group at Wipro Technologies, NJ, USA. He has published 15+ papers in integration architecture, real-time enterprises, architecture methodologies, and management approaches. He headed multiple enterprise architecture initiatives and research ranging from startups, global organization, to consulting firms. Besides software architecture research and initiatives, he is extensively supporting pre-sales solutions, risk management methodologies, cloud strategy assessment, IoT implementation, and Big Data product selection.

Emerging Technologies and Ethical Issues

By Dr. Donna M. Schaefer

We present an interactive talk where we describe several emerging technologies, including Drones, 3D Printing, and Autonomous Vehicles. These technologies are hot topics in current media, and some applications are for the social good, such as e-Nable, a non-profit that 3D prints prosthetic hands for children who cannot afford traditional prosthetics. But there are ethical issues to think about in terms of privacy, using the technology for questionable ends (e.g., printing 3D guns), and the moral responsibility of artificial intelligence for decision making. The ACM and the IEEE, along with professional associations in a variety of fields, have Codes of Ethics. Codes of Ethics provide guidelines for making decisions and set expectations for consistent professional behavior. When computer scientists and engineers design whole systems, it is fairly easy to identify ethical impacts. But today, we are designing components that may be put together in unknown ways tomorrow. How can computer scientists and engineers build systems in an ethical way, when we may not know the end use or application? How can consumers make sure they use products in an ethical way? Technology will improve our society, but we need moral guidelines.

About Dr. Donna M. Schaefer:

Dr. Donna M. Schaeffer is Professor of Information Technology at Marymount University in Arlington, VA. She received her PhD in the Management of Information Systems from Claremont Graduate University in Claremont, CA in 1996.

About Dr. Patrick C. Olson

Dr. Patrick C. Olson is Professor in the School of Engineering and Technology at National University in San Diego, CA. He holds a PhD in the Management of Information Systems from Claremont Graduate University in Claremont, CA and a Master of Systems Science from University of Southern California. Together, they have published over 50 articles, book chapters, and conference papers. They enjoy technology and have many gadgets!