

2019 IEEE/ACM TCF Information Technology Professional Conference (TCF-ITPC)

Program Book

Date: Friday, March 22, 2019 to Saturday,
March 23, 2019
Time: 8:30AM to 5:00PM
Location: Education Building
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

REGION 1



IEEE Region 01 - Northeastern USA



IEEE Region 02 - Eastern USA



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Conference Committee

Conference Chair:	David Soll
Program Chair (honorary):	Annette Taylor
Conference Treasurer:	Dennis Mancl
Princeton Chapter of the ACM Chair:	Dennis Mancl
IEEE PCJS Computer Society Chapter Chair:	Rebecca Mercuri
Princeton / Central Jersey Section Of the IEEE Chair:	Francis O'Connell
IEEE Region 1 Director:	Babak Beheshti
IEEE Region 2 Director:	Wolfram Bettermann
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 **2019 14th 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/pc2019.html>.

Our conference presentations are scheduled to at **begin 8:30 AM to 5:00 PM on Friday, March 22, 2019** and include **extended sessions at 10:15 AM to 5:00 PM on Saturday, March 23, 2019** combined with the Trenton Computer Festival.

Registration:

Registration is in the **Education Building on Friday at 8:15 AM in the Reception area near Room 112.**

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 **Education Building near the registration area.**

Presentations:

All *Friday* presentations will be given in **Education Building rooms 109, 110, and 111.** All *Saturday* presentations will also 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 no more than 30 people including a diverse mix of practicing professionals, educators, interested engineers and students.

Lunch:

Lunch will be served on **Friday, March 22, 2019, at 12:00 PM to 1:30 PM** in the Education Building room 113. Our lunch will include a facilitated networking session as well as some door prizes.

TCF Keynote:

The TCF keynote featured speaker, Tony Sager, talking on cybersecurity. Tony is a Senior Vice President and Chief Evangelist for CIS (The Center for Internet Security). He leads the development of the CIS Controls, a worldwide consensus project to find and support technical best practices in cybersecurity. Tony also serves as the Director of the SANS Innovation Center, a subsidiary of The SANS Institute.

Banquet:

There is a **Banquet on Saturday evening at 6:00 PM** in room 212 and you are invited! We hope to see you there!

Advanced reservations are requested. The cost for the banquet \$32. 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 22, 2019 is in **Lots 17 and 18**, which are the closest to the Education Building, 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 **43rd Annual Trenton Computer Festival** will be held at The College of New Jersey, Ewing Township, NJ on Saturday, March 23, 2019 between 9 am and 5 pm. This year's theme is Cybersecurity. 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

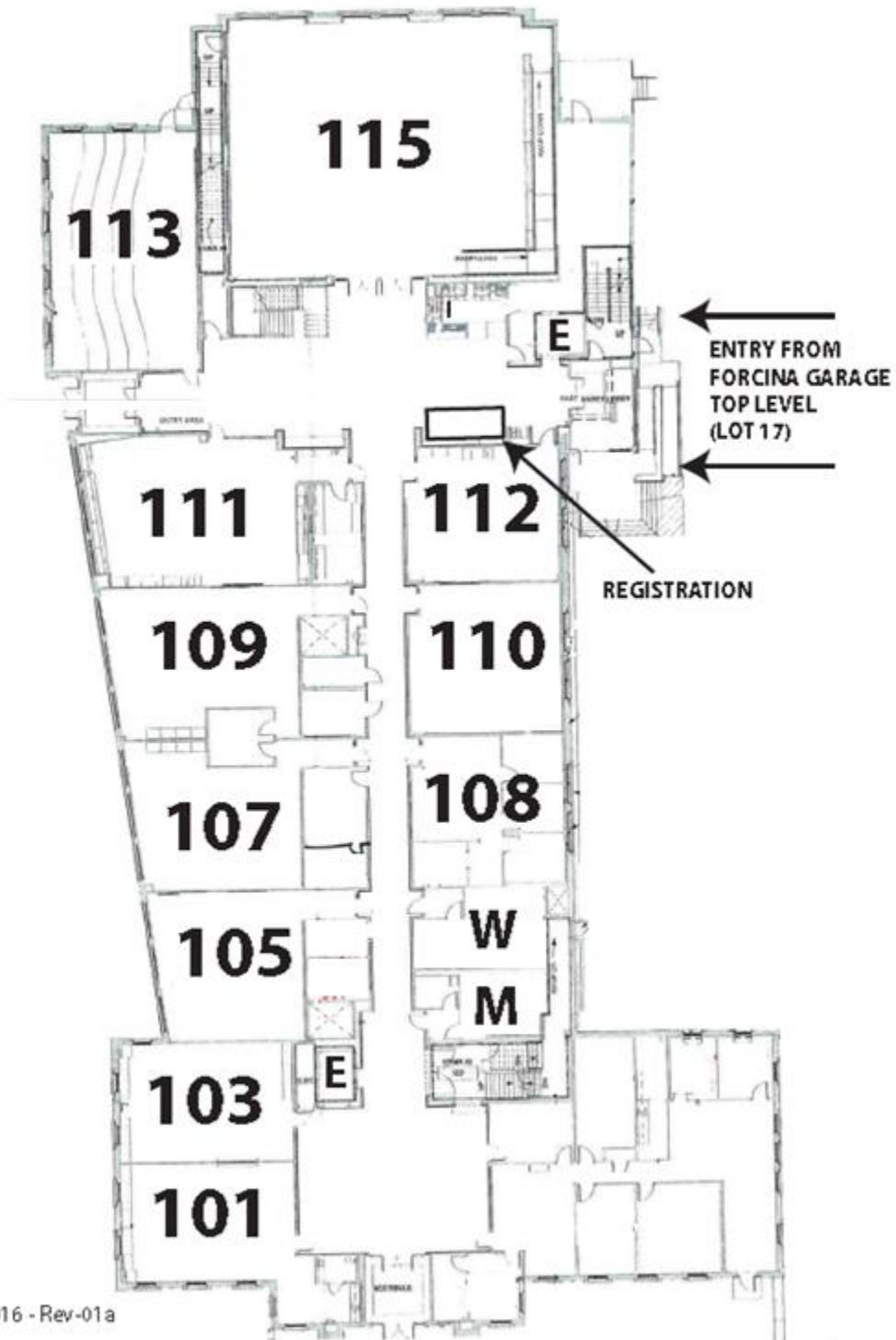
Conference Chair

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

TCNJ Campus Map



Education Building Map



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EDUCATION BUILDING - FIRST FLOOR

Presentation Schedule

Friday, March 22, 2019 Information Technology Professional Conference			
	Track 1	Track 2	Track 3
	ED-109	ED-110	ED-111
8:00 AM	REGISTRATION		
9:00 AM	Requirements Engineering for contract-based systems By Brian Berenbach	Building Microservices with Micronaut, A Full-Stack JVM-Based Framework By Michael Redlich	A Bachelor's Degree in Cybersecurity By Donna Schaeffer and Patrick Olson
10:00 AM	ZenSheet By Enzo Alda & Javier Lopez	Software Design Heuristics By Dennis Mancl	Super Containers: Unikernels and Virtual Machines By Brad Whitehead
11:00 AM	Digital Forensics and Your Business By Rebecca Mercuri	DevOps for Large Monolithic Tightly Coupled Software Architectures By Richard Eng	Robotic Process Automation By Jyothi Salibindla
12:00 PM	LUNCH & FACILITATED NETWORKING SESSION		
1:40 PM	Bitcoin, Blockchain, Cryptocurrency better than Gold? By Donald Hsu	The Potential and Risks of Working with Conversation Agents By Biplav Srivastava	Building a cloud-based serverless Space Invaders game By Fabian Martins
2:40 PM	Residents Aware Network for Intelligent Assistance to Enable Aging-in-Place By Ramana Reddy	Transforming IBM Research Application Development By Mike Sava	Homes sold the blockchain way - Future of mortgage origination By Dev Bhattacharyya
3:40 PM	The 5 Phases of Penetration Testing By Randall Cole	Current IT Issue Sharing A networking & sharing session Lead by David Soll	

9:00 AM Sessions

Requirements Engineering for contract-based systems

By Brian Berenbach

Room ED-109

Requirements elicitation and management for contract-based projects is significantly more complex than for product or product line development. For example, many practitioners are unaware of the fact that the traditional “V” model for requirements tracing may not work where there is a legal contract describing project deliverables; nearly every aspect of requirements engineering is more challenging, from elicitation to risk analysis and compliance management. This talk will describe in some detail contract issues that are typically not discussed in requirements texts and courses. The talk is a condensed version of a tutorial frequently given at conferences.

About Brian Berenbach:

Brian retired from Siemens in 2013 after working for over 40 years as a software and systems engineer. After retiring, he joined Georgia Tech as a part time instructor, mentoring graduate systems engineering students. He is an IEEE senior member, an INCOSE ESEP and an ACM Distinguished Engineer. He has published widely on systems and requirements engineering, including a text book “Software and Systems Requirements Engineering: In Practice” published by McGraw-Hill.



Building Microservices with Micronaut, A Full-Stack JVM-Based Framework

By Michael Redlich
Room ED-110

Micronaut, introduced in early 2018 by Object Computing, is a full-stack JVM-based framework for creating microservices-based, cloud-native and serverless applications that may be written in Java, Groovy and Kotlin. This seminar will provide a brief introduction and overview of Micronaut followed by a live demonstration on an application written in Java, Groovy and Kotlin.

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 Past 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 also 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 served on the TCF 2019 steering committee.

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.

A Bachelor's Degree in Cybersecurity

By Donna Schaeffer
Room ED-111

It is widely discussed that Cybersecurity is extremely important for our society, and that there is a critical need for professionals in this domain of work. This requires a response and support from the higher education community. That response has generally been in the form of programs for professional master's degrees. However, are the needs so great that there should be undergraduate programs? If so, what sort of programs should these be? National University is in the third year of offering a Bachelor of Science in Cybersecurity. The program has been well received by both students and the community of practice, particularly those responsible for the National Centers for Academic Excellence. This paper will document the discussion and considerations that went into selecting a complete undergraduate program in this area. It will also look at how valid or invalid the assumptions made in this discussion were. Finally, the paper will also look at how higher education has generally chosen to respond to these challenges. The intended outcome is a documentation of the issues encountered for this curricular effort. This paper/documentation is intended to help two major groups. First, other colleges and universities who are considering programs will have this documentation which that can consider in their efforts. Second, this will provide the first steps toward a more well thought out means of advising undergraduates on the implications of the choices they will make in this area. This intended audience for this paper is other members of this curricular domain including faculty, students, and staff. It is also intended for those members of the community of practice (cybersecurity) who provide input to colleges and universities on their needs.

About Donna M. Schaeffer, PhD:

Dr. Donna M. Schaeffer is a Professor and leads the Cybersecurity program at Marymount University. She has taught in the United States, Germany, and Korea and worked in the telecommunications field. She has won awards for outstanding teaching three times in her academic career. She earned her PhD in the Management of Information Systems from The Claremont Graduate University, an MBA with a specialty in Quantitative Methods and Operations Management, and BA with a dual major in Business and International Relations from Florida International University. Dr Schaeffer has published over 50 articles, book chapters, and papers on a variety of technology-related subjects. She currently serves as Editor of The Journal of Service Science. She is a member of, and has held leadership positions, in several professional computing and civic associations including the ACM, the Decision Sciences Institute, the IEEE, and Women's High-Tech Coalition.



About Patrick C. Olson, PhD:

Patrick C. Olson, PhD is a Professor of Computer Science, Information and Media Systems at National University. He earned his PhD in MoIS at the Claremont Graduate University in 1999 - with a cognate minor in Higher Education. He has an MS from USC in Systems Management with a minor in MIS. His undergraduate degree is from the University of Montana. He has been the CIO at Menlo College in where he developed, directed, and implemented enterprise-wide IP Telephony in 2000 (which included Gigabit ethernet, cabling, etc.) He



has held faculty positions in MIS at the University of Nevada and Cal Poly, Pomona. He started his career in the data center at Hughes Aircraft Company in the 1980s.

10:00 AM Sessions

ZenSheet

By Enzo Alda and Javier Lopez

Room ED-109

Visicalc, the first spreadsheet available to the general public, appeared in May 1979 and instantly became the killer app that ignited the personal computing revolution: it defined the core spreadsheet functionality, and the notation, that is prevalent to this day. Forty years later, spreadsheets still are a fundamental productivity tool, loved for their visual interactive nature, and vilified for the many shortcomings that not only make them error prone, but set a ceiling on what can be accomplished without "breaking paradigm". Indeed, adjunct general programming environments, like VBA or Javascript, are not seamless generalizations of the core spreadsheet functionality, and therefore are not conducive to gradual learning. We show how the ZenSheet project has unified spreadsheets and general programming in a useful as well as theoretically sound manner: functional abstraction, data composition, and other important programming language concepts are achieved without clashing with core spreadsheet functionality. The presentation will end with a live Monte Carlo simulation, based on a user-defined stochastic model with additional input from the audience.

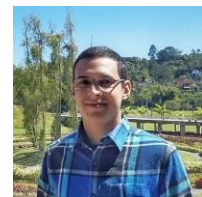
About Enzo Alda:

Enzo Alda is the principal and founder of Lakebolt Research, a Connecticut technology incubator focused on quantitative data analysis. Prior to founding Lakebolt Research, Mr. Alda worked at Google (Google Spreadsheets), and Bloomberg LP, where he conceived and implemented the engine that powers real-time calculations in the Bloomberg terminal. Before coming to the United States, Mr. Alda was lecturing 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 Javier Lopez:

Javier Lopez is a software engineer, and compiler design lead, at Lakebolt Research. He is a graduate of University Simón Bolívar (Venezuela) where he specialized in programming language design and implementation. Mr. Lopez is proficient in OCaml, Javascript, and many other programming languages. His main research interests are functional programming, compiler construction, and VM design.



Software Design Heuristics

By Dennis Mancl
Room ED-110

Software design is critical to making good quality software -- but in the design process, there are often difficult arguments over design details. One good way to improve software your designs is to use a set of design heuristics in the design process and in your design reviews. This talk gives an overview of a set of heuristics from the classic book by Arthur Riel: "Object Oriented Design Heuristics". Arthur's set of 61 rules of thumb is a good guide to avoiding common design mistakes. In this talk, we will talk about encapsulation, good public interfaces, distribution of responsibilities, containment hierarchies, and proper use of inheritance in object oriented systems. These design heuristics can be applied to many kinds of software design in many different programming languages.

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 design techniques, design patterns, software architecture, and agile development practices for over 20 years. Dennis is now an independent writer and researcher on software engineering topics.



Super Containers: Unikernels and Virtual Machines

By Brad Whitehead
Room ED-111

“Faster than a speeding RKT container! More secure than SELinux! Able to run thousands of microservices on a single server! It’s Super Containers! Combining the strengths of unikernels with light virtual machines, Super Containers are more secure and more cost effective than mere normal containers. When used in data centers, Super Containers fight the never-ending battle for security, scalability and the Devops way!”**

** With apologies to the producers of “The Adventures of Superman”, an American television show from 1952-1958 (<https://www.imdb.com/title/tt0044231/quotes>)

No, the name is not really “Super Container”, but what adjective would you use to describe a container that is 1400 times more secure than a well-configured Docker container, can be managed by Kubernetes, boots 37 times faster than that Docker container, and you can run 10 times more microservices on the same physical hardware?

What is this incredible new technology? It’s a unikernel image running on a lightweight virtual machine hypervisor.

What’s a unikernel? – The Linux kernel has over 14 million lines of source code (SLOC), but the average microservice’s execution path only traverses about 10,000 of these SLOC. We all know that you can reduce vulnerability by reducing attack surface. What if we could reduce our attack surface to just the 10,000 lines of kernel code we actually need? Not only that, but think how much faster that reduced kernel would boot, and how much less resources (CPU and memory) it would require? That’s what a unikernel is. It’s a library of privileged kernel code that is statically linked into our microservice image. We only pull the functions out of the library that we actually need to use to run our microservice. Additionally, since we are linking our application code with the kernel code, we have a single address space and we eliminate the high time costs of system calls. Consequently, not only do unikernels boot faster, they also run significantly faster. In this presentation, we’ll dive deeper into how this works and the benefits and drawbacks of unikernels

Unikernels are only half the answer to small, fast, secure containers. The other half are lightweight virtual machines. Docker-type container technology was, in part, developed to enjoy the benefits of the security and isolation of virtual machines without the heavy resource and performance penalties of virtual machines. Docker containers boot faster and run with fewer resources than traditional virtual machines. The namespace, capability, and control group (cgroup) features built into the Linux kernel, in conjunction with policy enforcement modules such as SELinux and AppArmor have made Docker-type containers almost as security as virtual machines. However virtual machine technology has not stood still. Recent optimizations to both the Xen and Linux Kernel-based Virtual Machine (KVM) hypervisors significantly reduce both the start-up time of a virtual machine and the performance-robbing overhead. Combined with unikernels, these lightweight VMs (“lightVMs”) can launch microservices in as little as 4 milliseconds. This is comparable to the Linux kernel’s exec/fork times of approximately 1 millisecond and significantly faster than a Docker-type container’s start-up time of 150 milliseconds. Additionally, the reduced footprint of the unikernel requires only about 1/10th the kernel memory of a Docker-type container running on a Debian kernel. Since memory is quite often the limiting factor in properly

designed microservices, this means that 10 times more unikernels/lightVM microservice instances can be run on the same class physical hardware.

While Xen and KVM are widely used in production environments, unikernels have, until recently, been the province of laboratories and research projects. This has changed as unikernel technology has matured. Today, there are a number of production quality unikernel libraries available, as well as cross-kernel build tools such as UniK and UniKraft. To demonstrate to the attendees how easy it is to use unikernels and lightVMs, a simple microservice will be compiled into a unikernel image and several instances will be started and managed by Kubernetes.

In addition to the information provided in the talk regarding how unikernels and virtual machines have better security and performance than conventional containers, while still being managed through Kubernetes and other workload management systems, a practical demonstration will be provided. During this demonstration, a microservice will be compiled into a unikernel and multiple copies will be instantiated on a LightVM platform.

A list of references to open source unikernel build tools and lightweight virtual machine hypervisors on GitHub will be part of the slides, allowing interested attendees to immediately start prototyping the use of unikernels with their own applications, in their own environments.

The goal is to pique the audience's interest in unikernel/lightVM containers and to point them to the resources they need in order to build and use unikernel-based solutions. In this day and age of computer hacking, we need to use every silver bullet in our holsters.

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. 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.



11:00 AM Sessions

Digital Forensics and Your Business

By Rebecca Mercuri

Room ED-109

Digital forensics is a rapidly expanding field where practitioners apply scientific techniques in order to investigate and draw conclusions about evidence, with the goal of presenting findings in courtroom settings.

The manner in which the forensics expert is required to perform their work is greatly influenced by court rulings and public policies.

Examples from Dr. Rebecca Mercuri's casework, along with some newsworthy events, will be used to raise awareness to certain types of litigation risks that can potentially be avoided or minimized in the business setting. Some ways in which a forensics expert can provide guidance for IT staff in best practices for evidence preservation, before, during and after an incident, will also be described.

About Rebecca Mercuri:

Dr. Rebecca Mercuri, Ph.D. is the lead forensic expert at Notable Software, Inc. <www.notablessoftware.com>, the company she founded in 1981. Her caseload has included matters involving contraband, child endangerment, murder, computer viruses and malware, wrongful work termination, class-action suits, copyright and patent infringement, and election recounts (most notably Bush vs. Gore). Dr. Mercuri has provided formal testimony and comment to the House Science Committee, the U.S. Commission on Civil Rights, the Election Assistance Commission, the National Institute of Standards and Technologies, the U.K. Cabinet, and numerous state legislatures and municipal bodies. She is a senior life member of the Association for Computing Machinery, where she authored the Security Watch feature and numerous guest columns of Inside Risks for Communications magazine. Rebecca is a past chair of the Princeton / Central Jersey Section of the IEEE and currently serving as chair of the Section's Computer Society, which is a joint professional chapter with the Princeton ACM.



DevOps for Large Monolithic Tightly Coupled Software Architectures

By Richard Eng
Room ED-110

Software literature provides examples of the successful use of DevOps to improve the software delivery pipeline. Typically, case studies are based on small, loosely coupled software architectures—web-based applications implemented on cloud computing platforms. The challenge is how to achieve DevOps benefits when the application is based on a large, monolithic, tightly coupled software architecture. Techniques are presented for reaping the benefits of DevOps when dealing these architectures.

About Richard Eng:

Richard F. Eng is an adjunct professor at Monmouth University in the Computer Science and Software Engineering Department. Richard worked previously for Noblis and Lucent Technologies. He focuses on using data science and software engineering to create innovative solutions to solve real world problems. Richard is an ASQ CSQE, CRE, and CQE. He is a PRINCE2 Practitioner and a PMP.



Robotic Process Automation

By Jyothi Salibindla
Room ED-111

Robotic process automation is a software robot that mimics human actions, to automate and standardize repeatable business processes. Software robots mimic human activities by interacting with applications in the same way that a person does. Designing a robot is easier than redesigning a process with a complex process tool like business process management (BPM). Business Process Management (BPM) automates the business processes to achieve efficiency, effectiveness, productivity, and agility, to boost quality and speed up delivery in order to improve customer satisfaction. RPA, on the other hand, is designed to operate processes as a human would, so it exists on a more surface level. It's faster to implement, ready to use with almost any software, and easily altered or updated to adapt to the changing world. RPA and BPM are not in conflict with each other. They both have the same goal with different implementation strategies. I have worked on integrating BPM with Robotic Process Automation to achieve the dynamic regulation changes using Class of Service approach for managing different kinds of processes in an agency in different ways. This allows users to change the approval process with minimum coding. I am going to present this Class of Service approach.

About Jyothi Salibindla:

Jyothi Salibindla and is currently a Java/J2EE and BPM lead for Karsun Solutions LLC. She has 16 years of experience in the Information Technology industry, specializing in Analysis, Design, Development, Implementation and Testing of enterprise applications using Java/J2EE, BPM, RPA technologies. Jyothi has played a critical role in the success of several Agile BPM implementations and have extensive expertise in all facets of the J2EE/BPM lifecycle. She has spearheaded complex cloud to cloud integration strategies and solution architecture touching several existing, internal, and external systems. I volunteer in IEEE and mentor in Women in Technology in Washington DC area, in addition to working as a reviewer for Manning Publications, IJERT international Journal. Jyothi enjoys learning new technologies and spending time in researching and solving the problems.



1:40 PM Sessions

Bitcoin, Blockchain, Cryptocurrency better than Gold?

By Donald Hsu

Steve Wozniak Apple Co-Founder believes Bitcoin is better than gold. There are only 21 million Bitcoin being mined, the price is highly volatile from \$19000 to \$6500 lately. This talk will discuss Cryptocurrency, Bitcoin, Ethereum, Blockchain technology, digital transaction, mining in China, software wallet, security issues, payment providers, major US or European banks adopting Bitcoin, investment options, venture capital firms, risk, benefits, volatility, academia research and industry trends.

About Donald Hsu:

Donald Hsu, PhD., Professor Dominican College, Dissertation Chair University Phoenix, and President Chinese American Scholars Association (CASA). He trained/taught 70 subjects - Accounting to Unix 13,000+. Clients/students work at Amazon, AT&T, Bank America, Facebook, Goldman Sachs, Google, IBM, JPMChase, Mercedes Benz, Microsoft, Morgan Stanley, New York Presbyterian, Oracle, Salesforce, Siemens, Sony, Toyota, UPS, Verizon and other Fortune 500 firms. CASA ran 25 successful E-Leader conferences in Asia and Europe, <http://www.g-casa.com>. He traveled to 88 countries in Africa, Asia, and Europe for international business. Don's profile is here, with 7,900+ partners/clients on LinkedIn: <https://www.linkedin.com/in/dohsu>.



The Potential and Risks of Working with Conversation Agents

By Biplav Srivastava
Room ED-110

From the very start of Artificial Intelligence (AI), performing natural conversation has been a key pursuit of AI research and development. Their most recent form, chatbots, which can engage people in natural conversation and are easy to build in software, have been in the news a lot lately. There are many platforms to create dialogs quickly for any domain, based on simple rules. Further, there is a mad rush by companies to release chatbots to show their AI capabilities and gain market valuation. However, beyond basic demonstration, there is little experience in how they can be designed and used for real-world applications that need decision making under constraints (e.g., sequential decision making), work with groups of people and deal with dynamic data. Further, users expect systems to adapt their functionality to their users' individual needs, convincingly explain their suggestions and decision-making behavior, and maintain highest ethical standards. This talk will summarize the area of task-oriented conversation agents and highlight key considerations while selecting, designing, building, deploying and maintaining them. The talk will be agnostic to any company's offering and will be relevant to professionals building user-facing data-driven decision-support technologies.

About Biplav Srivastava:

Dr. Biplav Srivastava is a presently Distinguished Data Scientist and Master Inventor at IBM's Chief Analytics Office. With over two decades of research experience in Artificial Intelligence, Services Computing and Sustainability, most of which was at IBM Research, Biplav is also an ACM Distinguished Scientist and Distinguished Speaker, and IEEE Senior Member.



Biplav usually works with open data, APIs and AI-based analytics to create decision-support tools. In AI, his focus is on promoting goal-oriented, ethical, human-machine collaboration via natural interfaces using domain and user models, learning and planning. He applies these techniques in areas of social as well as commercial relevance with focus for developing countries (e.g., transportation, health and governance). Biplav's work has led to many science firsts and high-impact commercial innovations (\$B+), 100+ papers and 40+ US patents issued, and awards for demos and hacks. He has interacted with commercial customers, universities and governments, been at standard bodies, and assisted business leaders on technical issues.

More details about him are at:

<http://researcher.watson.ibm.com/researcher/view.php?person=us-biplavs>

Building a cloud-based serverless Space Invaders game

By Fabian Martins

Room ED-111

The advent of Cloud Computing changed completely the way we approach the development of distributed systems. The possibility of spinning up thousands of servers and containers in an automated and programmed way provided mechanisms to reduce the heavy lifting in procuring and managing IT infrastructure, allowing us to keep focused in the development of software solutions. The recent years brought a new trend, the Serverless approach for building systems, leveraging many platform-as-a-service offerings from cloud providers. To experience this concept, in this presentation you are invited to play and compete over a serverless, contest-based version of Space Invaders built on AWS (Amazon Web Services). After playing, we will discuss and present the possible architectures, technologies, and tricks for the implementation of such system. The source code will be shared with attendees. You're required to bring your own computer to play.

About Fabian Martins:

T-shaped professional with specialization in systems architecture, M.Sc. degree in information processing and MBA in management, strong expertise in software and business processes/systems design, project and product definition/management, IT Compliance and information security. Experienced in the payments market (including mobile payments). Experienced in IT compliance projects (PCI/DSS, SOx, Insurance). Creative and innovative. Since 1996 teaching on degree and post-degree programs in Information Systems and Computer Sciences. Currently working as Solutions Architect for Amazon Web Services (AWS).



Since 1993 working on software architecture, product management, business processes definition/improvement, SDLC methodology definition/adaptation, project management, information security and IT Governance guidelines definition, including SOx/Basel II/COBIT for enterprises like CTBC (www.ctbc.com.br, telephony market), AlgarTech (www.algartech.com, contact center market), Tribanco (www.tribanco.com.br, banking & finance market), American Express (credit card market), Bradesco (banking & finance market), Peixoto (www.peixoto.com.br, wholesales market), Scopus (www.scopus.com.br, IT, Bradesco group).

Since 1996 has been working as professor and professional trainer for companies in subjects like UML, Java, Information Security, IT Governance, Public Cloud. Experienced as professor and coordinator on graduate and post-graduate programs on Information Systems and Computers Sciences, being responsible for adoption of UML and Java/JavaEE in two universities.

2:40 PM Sessions

Residents Aware Network for Intelligent Assistance to Enable Aging-in-Place

By Ramana Reddy

Room ED-109

In the United States, by 2020 it is expected that there will be only three and half working people for every retiree. This is expected to fall further to two and half by 2060. Similar trends may hold true for most of the countries of the world. The social costs associated with providing institutional care (assisted for this population will stretch the budgets of most counties. In the US, the average cost of assisted living in an institution exceeds \$10,000 per month, which is unaffordable to a vast majority of seniors. As technologists, we are challenged to address this important societal problem. Aging-in-Place has been advanced as the solution for addressing this social challenge. Recent developments in Artificial Intelligence, Natural Language Understanding, Internet of Things (IoT), Robotics, Virtual and Augmented Reality, and User Interfaces show promise that an economically viable technical solution can be found to directly address this issue. A house equipped with these technologies can mitigate many challenges faced by seniors with declining faculties such as forgetfulness, confusion, tendency to fall, and social isolation. At West Virginia University (USA), an interdisciplinary team of engineers, healthcare professionals and social workers have set out to create a real-world testbed to demonstrate the feasibility of technology-assisted Aging-in-Place. We have also created a Google Group known as AiPTec (Aging-in-Place Technology Collaboratory) to promote the exchange of technological advances from around the world. In this paper, we will provide a brief description of a number of projects that are currently underway. These will be integrated and showcased in a 400 sq. ft. apartment known as RANIA HOUSE – a residence that is aware of the challenges faced by its inhabitants and will provide intelligent assistance as necessary. In this talk, I will briefly describe overall architecture of the RANIA System and some of its applications such as fall detection and monitoring, medication administration and tracking, robot as a companion and many more.

About Ramana Reddy:

Dr. Y. V. Ramana Reddy is a Professor of Computer Science and Director of the Concurrent Engineering Research Center at West Virginia University. He has worked on a number of research areas with the central theme of enabling technologies for improvement of collaborative processes involving widely distributed teams. The areas of research include Artificial Intelligence, Knowledge Based Simulation, Concurrent Engineering, Medical Informatics, Telemedicine, Distance Learning, and Intelligent Decision Support.



Professor Reddy's research was funded by both by Government and Industry. The sponsors include, Defense Advanced Research projects Agency (DARPA), Strategic Defense Initiative (SDI), National Institutes of Health (NIH), national Institute for Occupational Safety and Health (NIOSH), General Electric, Bell Atlantic, Bellcore, DEC, HP, Hitachi and many other organizations. During the last fifteen years, Professor Reddy directed externally supported research totaling more than US\$50 Million. Professor Reddy's research resulted in more than 50 publications. He was a keynote/plenary speaker at numerous national and international conferences in UK, France, Germany, Belgium, Netherlands, Russia, Japan, Thailand, Australia and India.

Professor Reddy pioneered several key concepts. These include Knowledge Based Simulation (KBS), Knowledge Representation using C, Concurrent Engineering, and the use of the Web Browser for distributed multimedia patient records (prior to the creation of Netscape). The last area was featured on the ABC World News with Peter Jennings, Wall Street Journal and many newspapers around the world including Le Monde in Paris.

Professor Reddy's work on Knowledge Representation (Laser) was the basis for formation of a new company, Bell Atlantic Knowledge Systems (BAKS) in 1987. He served as the Chief Scientist for BAKS. His work on Medical Informatics led to the formation of CareFlow Net (CFN) funded by a Wall Street Investment Banking firm. CFN is one of the largest suppliers of technology for Internet based medical transcriptions in US. Professor Reddy serves as the Chief Scientist for CareFlow|Net and also served as one of the founding directors.

Professor Reddy now teaches a highly popular course on Internet Technology covering a number of topics including the Protocols, Security, XML and Web enabled application development.

Transforming IBM Research Application Development

By Mike Sava
Room ED-110

IBM Research has 12 laboratories around the world with over 3,000 IBM employees. IBM Research has produced many world class technologies and solutions including the IBM Watson, IBM Quantum computer, the recent IBM Project Debater. In the first part, I will present how over the last several years we moved IBM Research to the IBM Cloud addressing all the security and compliance requirements outlined in the IBM Corporate Information Technology (IT) standards. I will describe how the solution developed made it seem, to the IBM Research employees, like the resources in the cloud were sitting in the IBM Research site's data center. In the second part, I will present how we lead the IBM Research application development from the traditional multi-tier architecture including backend, middleware, and front-end to utilize the IBM Cloud Platform as a Service including Kubernetes, Enterprise github, Travis, microservices architecture, Agile development and DevOps.

About Mike Sava:

Mike Sava, IBM Research Division, Thomas J. Watson Research Center, Yorktown Heights, NY 10598 USA (msava@us.ibm.com). Mike is a Senior IT Specialist, Software Engineer, and Mentor. In the course of his 20+ years with IBM Mike has developed applications with a wide array of technologies and solutions ranging from Domino to J2EE to Node.js.



Currently, Mike is leading on two initiatives within the Research Division: DevOps and Move To Cloud. These initiatives are driving application developer to take advantage of the IBM Cloud Platform, including deployment speed, continuous deployment and security. This has freed the Research teams up to focus more on innovation than process and administration.

Homes sold the blockchain way - Future of mortgage origination

By Dev Bhattacharyya
Room ED-111

This paper is about initial thought, design and implementation of a mortgage loan processing and underwriting through a Fannie Mae overlay, all in the distributed ledger world. In essence, this article lends to a real design and implementation.

A model driven design in essence explains the reasons why Hyperledger Fabric was chosen as the key architecture. As of writing this paper and porting the code to GitHub, I will provide a transfer of transactional processor scripts and the model to a Solidity contract. In the home selling use case, fetched is data from different sources on the borrower and the property (home), bringing the two together through a loan product to arrive at a Fannie Mae/Freddie Mac ULDD construct. The regulatory body of MISMO (Mortgage Industry Standards Maintenance Organization), a subsidiary of MBA (Mortgage Banker's Association) defines the specifications required for a standardized residential loan.

Those familiar with loan originations will know loan processing + underwriting comprises the bulk of work, often exceeding 80 percent of the load. Funding and closing, though part of a mortgage loan process are more proprietary and discretionary.

Transferring assets is the core functionality of a blockchain. How people buy, sell or barter goods in a business network with no governing body or policy makes blockchain an invaluable power-tool. Mortgage, conventional or unconventional loan is a party to such transfers of assets. In the highly regulated world of banking, blockchain provides a different flavor of such transfers, much different from the present.

With Hyperledger as the blockchain of choice, we address a typical separation of concerns.

- Business application (the source of engagement)
- Hyperledger composer (the digitization of resources, roles, functions, events and transactions)
- Hyperledger fabric or blockchain – the systems integration, the source of truth
- The above structure also lends itself to what a typical consulting engagement in blockchain would entail.

Exploratory phase

- Engage, discuss and agree on the Block chain technology
- Digitization phase
- Define and design the structure, roles, and policies
- Disruption phase
- Explore the functions. Iterate and build
- Scale and deploy
- Re-engineer, refactor and integrate.

Hyperledger construct of a model is analogous to UML. Designed are static and structural models to portray participants, assets, transaction and events. Transactions and events get expressed in the

behavioral scripts. Digitization of access rules and other policies get stored in access control rule-files. A distinct “namespace” sets the business-network apart from the rest.

Yes, Hyperledger composer lets the parties define their “business network”, a closely guarded social gathering of people and machines whose goal is to serve the ledger. The business network owes its definition to the artifacts and rules, which are compiled and digitized for different deployments. Several participants access the “business network” that belong to this network; some even undertake to maintain it. The maintainer of the network runs many hardware “peer nodes”, sustaining the system. To prevent a crash, Hyperledger fabric replicates the distributed ledger across these peer nodes.

A smart-contract modeling language expresses the domain model of the business network. The model, once constructed, allows developers to capture “smart contracts” as ‘executable transaction processor functions’, written in JavaScript or Go-Lang.

Little different in the Ethereum world, the “smart contract” is an object-oriented definition of everything that happens in a distributed ledger. The contract uses ‘struct’ as in languages C and Pascal to define the class-objects and functions to define the functional-interface. In both Hyperledger and Ethereum, the construct is semantically JavaScript, thus reducing the learning curve.

In a nutshell, a good knowledge of UML helps in writing the models and contracts in the different blockchain modeling language and knowing server-side JavaScript helps define the scripts that express the structure of the transactions. Mocha and Chai are invaluable in testing against the Node.JS embedded engine. Microsoft’s VS-Code is another invaluable editor and lint tool in managing all that parsing and syntax.

The paper deals with Real Estate or Mortgage standards body to ensure style and naming are adherent to the open standards. Overlaying of property listings, search queries, loan parameters, ULDD/URLA can be prepared easily from the standardized styles.

About Dev Bhattacharyya:

Dev Bhattacharyya also known as ‘Dev Bradshaw’ is software engineer by day and an author, astrologer, lifestyle consultant in the afterhours. A trusted IT architecture transformation leader, responsible for executing technology roadmap to meet long-term business strategy and goals. IT professional with track record of success in leveraging architecture and technology to optimize performance and meet business objectives in both corporate and consulting environments across diverse industries.



- Effective problem solver, skilled in discerning user needs and architecting / deploying solutions that enhance operations
- Leader, who keeps abreast of rapidly changing technology to ensure top performance and revenue growth
- Persuasive communicator, who is able to convey technology benefits and gain support of business partners.

Proficiencies in: Architecture, Methodology, and Industry

3:40 PM Sessions

[The Five Phases of Penetration Testing](#)

By Randall Cole

Room ED-109

The purpose of this lecture is to give people an understanding of the 5 phases of penetration testing. This lecture includes a live demonstration interwoven into the lecture. The demo is in a non-network, self-contained, virtual environment.

About Randal Cole:

Randall is the Vice President of Information Technology for Vertical Screen (background check company). More than 20 years and specializes in enterprise networking and security. He manages the Information Technology department including IT personnel, software systems, network infrastructure, Help Desk operations, and security. Microsoft Certified Systems Engineer (MCSE), Certified Project Management Professional (PMP), ITIL Certified and Certified Information Systems Security Professional (CISSP), Certified Information Privacy Professional / Europe (CIPP/E) and Certified Ethical Hacker (CEH). Randall is an alumnus us Pennsylvania State University, Temple University, and Harvard University.

Current IT Issue Sharing - A networking & sharing session

Lead by David Soll
Room ED-110

This session is an experiment to see how a “sharing” session might work out for the participants. The idea is to discuss current IT issues, solutions, techniques, etc. among the attendees in an effort to share experiences with your IT colleagues from the various organizations. This is a participation session, not a lecture session.

About David Soll:

David Soll is the Chief Technology Officer (CTO) of Omicron Development, LLC. And its parent company, Pimsoft Inc. He is responsible for the overall technical direction and technology solution set provided by the companies.



David received a BS in Electrical Engineering from Drexel University and has been working in Information Technology for over 30 years, more than 20 of them with Omicron. He is the Past Chair of the Princeton / Central Jersey Section of the IEEE as well as a past chair of the section’s Computer Society Chapter and is a senior member of the IEEE. David is also the past Chairman of the Princeton chapter of the ACM and a senior member of the ACM. In 2004 and 2018, David received the prestigious Region 1 award from the IEEE. He also is the founder and current chairman of the IEEE/ACM Information Technology Professional Conference at TCF as well as a member of TCF’s steering committee.