Presentation Abstracts

and

Speaker Biographies

for

Saturday, October 13th, 2012

Presentation Abstracts and Speaker Biographies for Saturday, October 13th, 2012

9:00 – 9:45 a.m.

White Pines North Conference Room (Capacity: 51 people)

Randy Iliff, *IceCube as an Engineering Case Study*

The South Pole is home to IceCube, the world's largest and arguably most unusual telescope. The neutrino particles it "sees" are invisible, and virtually undetectable, except in the extraordinary rare event of a collision with the nucleus of an atom. IceCube occupies roughly a cubic kilometer of ice, and the thousands of devices within that ice must perform at spacecraft reliability levels. IceCube presented the design team with many unique challenges due to construction and development taking place in one of the most difficult working environments imaginable. This presentation will share a true insider's view of how the power of Systems Engineering, uniquely tailored for this application, enabled the successful execution of the IceCube project.

Randy Iliff is the Vice President of InSight Services at Bjorksten | bit 7. He has over 30 years of experience working on projects ranging in size from a few thousand to well over a billion dollars. He earned his B.S. in Engineering / Industrial Design from Michigan State University, an M.S. in Systems Management, Research, and Development from the University of Southern California. He has worked at McDonnell-Douglas, Martin-Marietta, and Motorola. He is a charter member of INCOSE and has been a great supporter of the INCOSE Chicagoland Chapter.

White Pines South Conference Room (Capacity: 51 people)

Andrew Mueller, *Aeronautical Decision Making for Engineers*

This presentation explores decision-making for pilots and applies it toward engineers. Some of the conditions and problems for pilots may not translate to an engineer working on a problem, but there may be more similarities than we like to admit. There may not be the immediate risks that pilots face, but there are still lessons that can be learned. Assessing risk as an organization is probably familiar, but how does an individual assess risk and make decisions? The FAA asserts that good judgment can be taught. How is good judgment taught, encouraged, reinforced (or not) in your organization? This introduction to ADM is for systems engineers and managers. Until the machines become self-aware, engineering is still a human practice. Managers, leaders and systems engineers will benefit from learning ADM techniques and applying them in their teams and projects. This material can be used to help identify personal and organizational attitudes, roadblocks, and problems. Based on the FAA's training and antidotes, learn to develop strategies to avoid pitfalls and change attitudes so that your projects have less risk.

Andrew Mueller is a systems engineer for GE Aviation Systems LLC. He has worked several programs for military aircraft systems. Mr. Mueller has a less-traditional background for a systems engineer, with a background in science education (high school and science center) prior to becoming a systems engineer. Mr. Mueller has been a member of INCOSE since becoming a systems engineer.

Maple Conference Room (Capacity: 31 people)

Raymond Jorgensen, *Architecting Fundamentals: Integrated Modular Solution Architectures*

The Integrated Modular Solution Architecture (IMSA) approach to systems architecting considers several dimensions of systems architecture, and challenges traditional top-down conventional thinking. Through this approach, we will examine different views of systems architecture that include multiple perspectives to paint a complete picture of product architecture, including: hierarchy, abstraction, and realization views; logical, software, electrical, and mechanical systems views; capability, service, and support views; sequential, transactional, and allocation views. Additionally, interface definitions with similar architectural abstractions are shown aligned with the architectural views. This presentation is a summary of an 8-hr interactive tutorial on Architecting Fundamentals currently being deployed at Rockwell Collins.

Mr. Raymond W. Jorgensen serves as a Rockwell Collins Systems Engineering Knowledge Architect, advocating system engineering excellence and continued improvements in process, practices, tools, and training. His mission is to improve the effectiveness, efficiency, and communication of the discipline and practice of systems engineering – exploring practice improvements, revealing wasteful behaviors, encouraging appropriate use of tools & techniques, and improving the overall experience of each practicing system engineer. Ray has served in several project leadership and development roles at Rockwell Collins for Flight Management Systems and enterprise processes, advocating processes that maximize commonality of product definition between projects while enabling customization to fit unique customer needs. Ray has been an active member in the International Council on Systems Engineering (INCOSE) for 15 years, serving regularly on working groups, chapter and member leadership, and training roles. Ray currently serves as the Sector Director of the Americas, providing oversight of INCOSE chapter and member services for North and South America. Ray has a BSEE from Michigan Technological University and a Masters of Systems Engineering from Iowa State University.

Willow Conference Room (Capacity: 12-15 people)

Edward DeVilliers, Dr. Shahram Sarkani, & Dr. Thomas Mazzuhi, *Using Cost as a Key Parameter for Operational Requirements Generation of DoD Weapon Systems*

Within both the Systems Engineering and Program Management disciplines, most literature does not include cost as a key factor in determining the generation of initial operational requirements in the early phase of project planning. This may lead to programs costing much more than initially expected. The issue is particularly relevant to DoD weapon systems. Cost growth has been a key concern for many years. To address the problem of cost growth, the concept of "Cost as an Independent Variable" (CAIV) was introduced to provide program managers some trade-space within requirements and design while meeting Key Performance Parameters (KPPs). The research to be presented looks at DoD programs, especially the recent requirements generation process for the Amphibious Combat Vehicle (ACV), to provide a case study analysis of the use of cost, as well as schedule and programmatic criteria, in developing operational requirements.

Edward DeVilliers is a PhD Candidate in the area of Systems Engineering at The George Washington University. He is currently a Chief Systems Engineer at TASC, Inc in Stafford, VA. He has over 15 years of experience in the military and commercial industry within the areas of systems and software engineering and engineering management, Command and Control (C2), combat vehicles, and enterprise architecture development. Mr. DeVilliers has been a member of INCOSE since 2006.

Shahram Sarkani, Ph.D., P.E., is Professor of Engineering Management and Systems Engineering, and Director of EMSE Off-Campus Programs, at The George Washington University. He designs and administers graduate programs that enroll over 1,000 students across the U.S. and abroad. In over 150 technical publications and in sponsored research with NASA, NIST, NSF, AID, and Departments of Interior, Navy, and Transportation, his research has application to risk analysis, system safety, and reliability.

Thomas A. Mazzuchi, D.Sc., is Professor of Engineering Management and Systems Engineering at The George Washington University. His research interests include reliability, life testing design and inference, maintenance inspection policy analysis, and expert judgment in risk analysis. He served as Research Mathematician at Royal Dutch Shell, and has conducted research for the U.S. Air Force, Army, and Postal Service; for NASA, and for the Port Authority of New Orleans, among others.

White Pines North Conference Room (Capacity: 51 people)

Randy Iliff, *Powerful New Ways to Apply the n-Squared Diagram on Commercial Systems Engineering Projects*

The n-Squared diagram holds a special place within the formidable array of SE tools. It is superbly suited to interface control tasks, and when SE practitioners encounter the n-Squared diagram it is usually in this context. Most don't realize how universal the logic engine within the tool actually is. For a variety of reasons general knowledge and use within the SE community seems to be declining. Following a quick overview of the n-Squared logic and typical applications, we'll share the unique ways we've been applying the n-squared diagram (and a proprietary derivative we've developed called the Zen2 Matrix) on commercial projects. Some uses are logical extensions of SE methods, but many others are believed to be unprecedented within the SE community. Opportunity identification, product and technology road-mapping, market segmentation, distribution planning, co-development strategy, and even FMEA all benefit strongly from use of the n-Squared diagram and its derivatives. Perhaps the greatest benefit in the Commercial Sector is simply the ability to uncover the true complexity of the development task and therefore make more realistic budget and schedule decisions. Whether you work in traditional SE settings or the brave new world of Commercial SE, we think you'll gain a profound new respect for the n-Squared diagram and the role it can play in your success.

Randy Iliff is the Vice President of InSight Services at Bjorksten | bit 7. He has over 30 years of experience working on projects ranging in size from a few thousand to well over a billion dollars. He earned his B.S. in Engineering / Industrial Design from Michigan State University, an M.S. in Systems Management, Research, and Development from the University of Southern California. He has worked at McDonnell-Douglas, Martin-Marietta, and Motorola. He is a charter member of INCOSE and has been a great supporter of the INCOSE Chicagoland Chapter.

White Pines South Conference Room (Capacity: 51 people)

Greg Gorman and Michelle Specht, *Tackling the increasing complexity of systems lifecycle data*

Systems engineering projects are becoming more complex. This presentation will discuss how to use engineering data to more effectively manage the complexity of systems engineering projects.

At IBM Greg leads both the strategy and development of both the Rational Solution for System and Software Engineering and Rational's Product Line Engineering Solution. Greg joined IBM through the Telelogic acquisition in 2008, where he served in several positions ranging from field engineer to sales executive to Vice President of Product Management over his 20 year history. Prior to joining Telelogic, Greg was with McDonnell-Douglas and then Honeywell Air Transport, where he led a software and systems team creating crew station displays for fighter aircraft and commercial jetliners. Greg is a graduate of The University of Missouri and is a Certified Product Manager, AIPMM. Greg also serves as one of IBM Rational's thought leaders in the areas of complex systems development and is IBM's Corporate Advisory Board Representative to the International Council on Systems Engineering (INCOSE). He is also active in Scouting (and is an Eagle Scout), mentors a FIRST Robotics team and serves as INCOSE's Associate Director of K-12 Youth Outreach.

Michelle Specht joined IBM through the Telelogic acquisition in 2008, where he was VP of Product Management. Previously Greg worked at McDonnell-Douglas and Honeywell Air Transport in Systems Engineering. Greg graduated from the University of Missouri and is a Certified Product Manager, AIPMM. Greg is IBM's Corporate Advisory Board Representative to the International Council on Systems Engineering (INCOSE).

Maple Conference Room (Capacity: 31 people)

Raymond Jorgensen, *Challenges in Engineering Complex Systems: INCOSE SE Vision 2020 and Beyond*

This presentation will explore the challenges being faced in the engineering of complex systems – today and potentially tomorrow. How might the future of the engineering of complex systems be envisioned for the future? Consider how the landscape of systems engineering practices and tools might be transformed to address our current challenges and future opportunities. We will examine the INCOSE Systems Engineering Vision 2020 – where were we when this was written, where are we now, what was the vision for 2020, and what's next on the horizon to attain this vision.

Mr. Raymond W. Jorgensen serves as a Rockwell Collins Systems Engineering Knowledge Architect, advocating system engineering excellence and continued improvements in process, practices, tools, and training. His mission is to improve the effectiveness, efficiency, and communication of the discipline and practice of systems engineering – exploring practice improvements, revealing wasteful behaviors, encouraging appropriate use of tools & techniques, and improving the overall experience of each practicing system engineer. Ray has served in several project leadership and development roles at Rockwell Collins for Flight Management Systems and enterprise processes, advocating processes that maximize commonality of product definition between projects while enabling customization to fit unique customer needs. Ray has been an active member in the International Council on Systems Engineering (INCOSE) for 15 years, serving regularly on working groups, chapter and member leadership, and training roles. Ray currently serves as the Sector Director of the Americas, providing oversight of INCOSE chapter and member services for North and South America. Ray has a BSEE from Michigan Technological University and a Masters of Systems Engineering from Iowa State University.

Willow Conference Room (Capacity: 12-15 people)

Jayneel Patel, Dr. Shahram Sarkani, & Dr. Thomas Mazzuchi, *Multi-objective Design Methodology Using Time-expanded Decision Networks for Complex Cost Efficient Data Centers*

A multi-objective energy efficient and flexible data center design has been of interest for all industries that are familiar with its costs. A survey of 416 CIO's conducted by the CIO Data Center Strategies Survey, suggested that the data center operating costs at still steady at 25% of the entire IT budget. Much of this cost is directly attributed to constant scaling of datacenter for addressing constant demands. Furthermore, growing complexity of the system adds to the enhancement costs. Many of the existing data center enhancement strategies include unilateral addition of physical servers & switches, virtualization of servers, and intelligent task scheduling. However, there have been very few data center design frameworks that accommodate multiple objectives and forecasting for future enhancements governed around complete cost. The objective of this research is to design a framework using decision networks that can help create and enhance cost effective data centers.

Jayneel Patel is concurrently pursuing a doctorate degree in Systems Engineering at the George Washington University and a MBA at Pennsylvania State University. He currently is also a technical leader at the Vanguard Group Inc. designing and developing investment banking systems. While at Vanguard, Jayneel also worked as a software engineer developing strategic solutions during which time he also pursued and attained his Master's degree in Software Engineering from Pennsylvania State University. Wanting to expand his knowledge on mission and performance critical production solutions, Jayneel accepted a position at Vanguard's Production Center of Excellence in their elite Rapid Response Team where he later became a technical leader. Jayneel received his bachelor's degree in computer engineering from Pennsylvania State University. After graduation he worked at IBM for two years creating solutions for data center enhancements and virtualization using mainframe solutions for some of the industry's leading financial companies.

Shahram Sarkani, Ph.D., P.E., is Professor of Engineering Management and Systems Engineering, and Director of EMSE Off-Campus Programs, at The George Washington University. He designs and administers graduate programs that enroll over 1,000 students across the U.S. and abroad. In over 150 technical publications and in sponsored research with NASA, NIST, NSF, AID, and Departments of Interior, Navy, and Transportation, his research has application to risk analysis, system safety, and reliability.

Thomas A. Mazzuchi, D.Sc., is Professor of Engineering Management and Systems Engineering at The George Washington University. His research interests include reliability, life testing design and inference, maintenance inspection policy analysis, and expert judgment in risk analysis. He served as Research Mathematician at Royal Dutch Shell, and has conducted research for the U.S. Air Force, Army, and Postal Service; for NASA, and for the Port Authority of New Orleans, among others.

White Pines North Conference Room (Capacity: 51 people)

Randy Iliff, *Systems Engineering Offers the World a Different Kind of Green Innovation*

When one hears the term "Green Innovation", it is nearly always in reference to a traditional innovation effort conducted with the intent of delivering a more responsible product or service outcome. A worthy goal, no doubt, but why not hold the innovation process itself to a much higher social accountability standard? Surely the lives and talent of the professionals involved represent a valuable, limited resource worthy of responsible application and stewardship. The opportunity to radically improve the efficiency of the innovation process itself exists at every level of scale- from individual entrepreneur to multi-national corporation- and has enormous potential to improve the world our children will inherit. All progress requires an informed and constructive dissatisfaction with the status quo. It is time for those of us in SE to hold the innovation process, and those who run it on our behalf, to much higher standards of efficiency and results!

Randy Iliff is the Vice President of InSight Services at Bjorksten | bit 7. He has over 30 years of experience working on projects ranging in size from a few thousand to well over a billion dollars. He earned his B.S. in Engineering / Industrial Design from Michigan State University, an M.S. in Systems Management, Research, and Development from the University of Southern California. He has worked at McDonnell-Douglas, Martin-Marietta, and Motorola. He is a charter member of INCOSE and has been a great supporter of the INCOSE Chicagoland Chapter.

White Pines South Conference Room (Capacity: 51 people)

Max Whitfield, Dr. Shahram Sarkani, & Dr. Thomas Mazzuchi, *Dynamic Modeling of a Healthcare Knowledge Management System Identifying Social Media (CoP) as Part of the Healthcare Knowledge Ecosystem*

The Healthcare System is complex and ever changing, whether due to technology or policy. Add to all the constant changes and integration of needed or desired systems and technology and healthcare can be easily identified as a healthcare knowledge ecosystem. With recent medical and government studies indicating a definite need for Clinical Decision Support Systems (CDSS) and Knowledge Management Systems (KMS) in order to increase efficiency and quality, only adds to the complexity on what is the best method of integrating these systems into the healthcare knowledge ecosystem. This presentation will use system dynamic modeling to illustrate the integration and the use of social media in the healthcare knowledge ecosystem as a knowledge transfer tool. The outcomes that system dynamic modeling produce will translate and encourage the use of systems thinking to help further the acceptance of systems engineering as a tool to understand healthcare knowledge management and the healthcare knowledge ecosystem.

Max Whitfield has 30 plus years of global diverse business and engineering experience. His technical career began with the U.S. Coast Guard as an Electronics Technician specializing in navigation and communications with 4.5 years of foreign duty service. He completed Nuclear Power Plant Electrical Systems School with the U.S. Civil Service/ DON. Max resigned from the U.S. Civil Service to pursue a career in motorsports, where he won S.C.C.A. National and Regional Championships. Max worked in Industrial distribution as an Application Engineer and Manager supporting Fortune 500 industrial manufacturers. Max re-entered the U.S. Civil Service as an Administrative Fellow at the National Institutes of Health with the National Institute of Nursing Research (NINR) and currently is the NINR Ethics Coordinator and Technical Advisor to the NINR Office of the Director. Max is a Ph.D. Candidate in Systems Engineering at The George Washington University. He holds a Master of Science Engineering & Technology Management, Oklahoma State University and a Bachelor of Science Management, National-Louis University.

Shahram Sarkani, Ph.D., P.E., is Professor of Engineering Management and Systems Engineering, and Director of EMSE Off-Campus Programs, at The George Washington University. He designs and administers graduate programs that enroll over 1,000 students across the U.S. and abroad. In over 150 technical publications and in sponsored research with NASA, NIST, NSF, AID, and Departments of Interior, Navy, and Transportation, his research has application to risk analysis, system safety, and reliability.

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Maple Conference Room (Capacity: 31 people)

Gary Degregorio, *Using a Decision Framework to Drive Alignment across Critical Business and Engineering Roles*

Currently enterprises of all sizes have no framework from which to organize and manage all the decisions across the business and/or its roles. This makes it extremely difficult to understand how any one decision sits in context with other decisions. In addition, there is an inability to manage the consequences of key decisions across the enterprise and over time, therefore making strategic alignment nearly impossible. Strategy development, business planning, portfolio management and system engineering are key application areas that should be focused on for long-term business success. Improvements in decision management will drive superior results in the individual roles as well as the alignment and leverage of work across the business and engineering roles.

Gary DeGregorio is CTO and co-founder of Decision Innovation, Inc. which is focused on providing services, tools and techniques for more effective engineering & business decision making. As a career executive with Motorola, Gary served as Lead Architect for the Mobile Experience Delivery Platform, and led the Strategic Decision Management/Enterprise Knowledge Collaboration initiative within Motorola Labs. He has worked in the field of business system and software applied research for over fifteen years with a focus on decision management, and collaboration frameworks. With a strong focus on innovation, Gary created an approach for creating knowledge in the context of a decision framework.

Willow Conference Room (Capacity: 12-15 people)

Ruma Das, Dr. Shahram Sarkani, & Dr. Thomas Mazzuchi, *Software System Selection Based on Quantitative Security Risk Assessment Mode*

When selecting an off-the-shelf or open software system (OSS), multiple criteria are used for assessment. Security must be one such criterion since an unsecure system or component can reduce the security level of the entire environment in which it is installed. With an OSS, since the system engineers have no control over design and build phase, 'security-by-design' practices cannot be implement. The problem that system engineers need to address in this situation is how to evaluate and compare the potential security risks of the different open source systems before adoption. Having a quantitative security risk assessment model provides objective criteria for comparison between different systems. This study proposes a method for software system comparison and selection using such a quantitative security risk assessment model. Our goal is to utilize prior research in quantitative security risk assessment based on empirical data from national vulnerabilities database (NVD) and estimate the security risk of system evaluated. Such method could help practitioners evaluate and compare off-the-shelf or OSS software product to ensure that it is safe and secure enough to be installed in their environment. We are evaluating the application of topic modeling to build such security risk assessment framework.

Ruma Das is a PhD candidate in Engineering Management and Systems Engineering (EMSE) department at the George Washington University. She holds a MSE (Master of Science in Engineering) degree in Computer Science from Johns Hopkins University. She completed her undergraduate training in computer engineering from India and worked in IT field for 15 years. She holds an MBA from the University of Baltimore. She is certified as a Project Management Professional (PMP) and Scrum Master.

Shahram Sarkani, Ph.D., P.E., is Professor of Engineering Management and Systems Engineering, and Director of EMSE Off-Campus Programs, at The George Washington University. He designs and administers graduate programs that enroll over 1,000 students across the U.S. and abroad. In over 150 technical publications and in sponsored research with NASA, NIST, NSF, AID, and Departments of Interior, Navy, and Transportation, his research has application to risk analysis, system safety, and reliability.

Thomas A. Mazzuchi, D.Sc., is Professor of Engineering Management and Systems Engineering at The George Washington University. His research interests include reliability, life testing design and inference, maintenance inspection policy analysis, and expert judgment in risk analysis. He served as Research Mathematician at Royal Dutch Shell, and has conducted research for the U.S. Air Force, Army, and Postal Service; for NASA, and for the Port Authority of New Orleans, among others.

White Pines North Conference Room (Capacity: 51 people)

Bill Schindel & Troy Petersen, *What We Have Learned About the Benefits of Pattern-based Systems Engineering (PBSE)*

This presentation summarizes a project exploring benefits of Pattern-Based Systems Engineering (PBSE), using a specific domain illustration suitable for educational use. A half-day long practitioner's workshop on this example and the PBSE approach is offered separately at this conference as another session. This summary presentation is intended for general awareness of capabilities. INCOSE thought leaders have discussed the need to address 10:1 more complex systems with 10:1 reduction in effort, using people from a 10:1 larger community than the "systems expert" group INCOSE currently reaches. The PBSE Project enables achievement of such order-of-magnitude improvements. Projects using PBSE get a "learning curve jumpstart" from an existing Pattern, gaining the advantages of its content, and improve that pattern with what they learn, for future users. The major aspects of PBSE have been defined and practiced some years across a number of enterprises and domains, but with limited INCOSE community awareness.

Bill Schindel is president of ICTT System Sciences (www.ictt.com), a systems engineering company. His 40-year engineering career began in mil/aero systems with IBM Federal Systems, Owego, NY, included service as a faculty member of Rose-Hulman Institute of Technology, and founding of three commercial systems-based enterprises. Schindel earned the BS and MS in Mathematics. At the 2005 INCOSE International Symposium, he was recognized as the author of the outstanding paper on Modeling and Tools, and currently co-leads a research project on the science of Systems of Innovation within the INCOSE System Science Working Group. Bill is an INCOSE CSEP, and president of the Crossroads of America INCOSE chapter.

Troy Peterson is a Senior Associate at Booz Allen Hamilton and his expertise is in strategy, systems engineering and management. Troy obtained a BS in Mechanical Engineering from Michigan State University, a MS in Business and Technology Management from Rensselaer Polytechnic Institute and completed advanced graduate studies at Massachusetts Institute of Technology in System Design and Management. Troy is also the Past President of the INCOSE Michigan Chapter and an INCOSE CSEP, PMI PMP, and ASQ CSSBB.

White Pines South Conference Room (Capacity: 51 people)

Michael Vinarcik, *Systems Engineering Education: Integrating Mini-case Studies and Model-based Systems Engineering into Graduate Studies*

Effective systems engineering is a key factor in the success of any complex system, whether it is a singular example (like NASA's Galileo probe) or a mass-produced commodity (like automobiles, military vehicles, or consumer electronics). However, successful systems engineering execution is not only predicated on robust processes but on competent, skilled systems engineers. A capable systems engineer must have a broad range of experience and knowledge as well as significant depth in key areas, including knowledge of systems engineering best practices and methods. The International Council on Systems Engineering recognizes this and requires varying amounts of experience for each of its certification levels, with increased demonstrated depth and breadth required for each higher level of certification. This presentation will cover how to effectively integrate systems engineering into graduate curricula at colleges and universities.

Michael J. Vinarcik is a Lead Associate (Senior Systems Engineer) at Booz Allen Hamilton and an adjunct professor at the University of Detroit Mercy. He has over twenty years of automotive and defense engineering experience. He received a Bachelor of Science (Metallurgical Engineering) from the Ohio State University, an MBA from the University of Michigan, and a Master of Science (Product Development) from the University of Detroit Mercy. He holds a number of certifications, including an ESEP-Acq, is a Fellow of the Engineering Society of Detroit, and is the current President of the INCOSE Michigan Chapter.

Maple Conference Room (Capacity: 31 people)

Jim Ulmes, *Making System Models Useful*

"All models are wrong. Some are useful." - George Box. How can a model be useful to the systems engineer creating it? And, just as importantly, how can the model be useful to the specialized technologists (mechanical, electrical, optical engineers) who also need to use it? This presentation will examine two different methodologies: the Systems Modeling Language (SysML) and the Object-Process Method (OPM). SysML has wide exposure in the INCOSE community and needs no explanatory brief. The Object-Process Method was developed by Dr. Dov Dori of Technion and MIT, and is gaining increasing exposure to the systems engineering community through papers published in the *Systems Engineering* journal and through professional development short courses at MIT. This presentation will consider how each method approaches the world.

Jim Ulmes is a Director of Engineering at Fenwal Blood Technologies. He has been responsible for establishing systems engineering procedures in Fenwal and for developing systems engineering skills and knowledge in the engineers at Fenwal. He has experience previous to Fenwal in a defense contractor responsible for military optical systems. His undergraduate degree is from Stevens Institute of Technology and his Master of Science degree is in Mechanical Engineering from Illinois Institute of Technology. He is a member of INCOSE, the American Society of Mechanical Engineers, and the American Association of Blood Banks.

Willow Conference Room (Capacity: 12-15 people)

Muhammad Islam, Shahram Sarkani, & Thomas Mazzuchi, *A Quantitative Risk Analysis Framework for Cloud/Distributed Computing Security*

Cloud architectures offer largely scalable and reliable network computing features utilizing internet technologies. Due to the distributed nature of hardware and software resources and shared tenancy by multiple consumers, security constraints must be thoroughly assessed before adoption of cloud based services. Security risks and their management approaches may vary based on the type of cloud service and deployment models. Cloud environments need constant monitoring by both providers and consumers in order to reduce security incidents while ensuring optimal resource allocation for risk mitigation. In this presentation, a quantitative framework for evaluating and monitoring risks in cloud and distributed computing environments is described. Vulnerabilities associated with risks are identified at first and then analyzed based on available information. In order to quantify the risk and select the best mitigation approach, Monte Carlo simulation is performed to construct a range of scenarios. Since the vulnerabilities in cloud environments involve uncertainties and are dynamic in nature, decision making based on the expected value (EV) of the risk might not be the best choice.

Muhammad Faysal Islam received his B.S. in Electrical and Computer Engineering from West Virginia University Institute of Technology and M.S. in Electrical Engineering from the University of South Alabama. He is currently pursuing the Ph.D. degree in Systems Engineering at the George Washington University. Mr. Islam is a certified Project Management Professional and Scrum Master currently working with the City of New York government. He was a graduate research assistant at the University of South Alabama working on DoD funded research projects on optical pattern recognition, automatic target detection and hyperspectral image processing. He served as the secretary of IEEE and Eta kappa Nu chapters at the WVU Institute of Technology. Mr. Islam is a member of IEEE, INCOSE, PMI and SPIE. He is the technology and communications administrator of PMI New York City chapter and a contributing member of the NIST cloud computing security workgroup.

Shahram Sarkani, Ph.D., P.E., is Professor of Engineering Management and Systems Engineering, and Director of EMSE Off-Campus Programs, at The George Washington University. He designs and administers graduate programs that enroll over 1,000 students across the U.S. and abroad. In over 150 technical publications and in sponsored research with NASA, NIST, NSF, AID, and Departments of Interior, Navy, and Transportation, his research has application to risk analysis, system safety, and reliability.

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White Pines North Conference Room (Capacity: 51 people)

Vincent Spena, *Application of Agile and Lean Methods to Hardware Product Development*

The presentation describes how certain Lean and Agile principles can be used to improve the quality of "first time" development, by defining incremental prototype targets and measuring the achieved results against those expected targets. The measurement methodology can be made flexible enough to compare common aspects of different product types. The discussion is directed towards complex products that require teams to work concurrently and collaborate with common aspects of separate deliverables. Management of such effort is difficult. However, the described techniques allow those efforts to be achieved with improved cycle time and quality. The techniques add some overhead to the development process so the most benefit will be achieved when the methods are applied to complex efforts.

Vincent Spena is a Hardware Development Process Engineer for Motorola Professional and Commercial Radio Group in Schaumburg. In his current role, he applies practices that are rooted in Systems Engineering, Lean, Six Sigma, and other methodologies to improve Hardware Development efficiency. Vincent is has been with Motorola (now Motorola Solutions) for 24 years. Vincent has authored a number of internal documents including systems design documents and department process documents. Vincent Spena has a BSEE from New Jersey Institute of Technology.

White Pines South Conference Room (Capacity: 51 people)

Dale Brown, Russell Kubycheck, & Shane Kemper, *Panel Discussion on Lessons Not Learned*

Three panelists from different industries to compare experiences and root causes for "lessons" not learned. What are the culture issues which lead organizations to repeat failures? Are there other issues at play which cross corporate or industry boundaries? It is simply human nature which allows a corporation to forget the consequences of activities which led to poor outcomes?

Dale Brown is a Systems and Electrical Engineer (Licensed) with extensive design, management and business development experience. He has acquired expertise in embedded control of specialty equipment, mining, heavy construction, military and rail vehicles throughout the US, Canada, South America and Europe. Specific industry experiences include: Electro-Motive Diesel (Systems Engineering – Locomotive Control), GE Transportation Systems (Section Manager - Controls and I-Based), IMAX Corporation (Director of Hardware Technology), Alcatel Transportation Automation Systems (Hardware Design Manager – Vehicle Controls), Rovehn Engineering Corporation (President & Founder), Alford International (Senior Consulting Engineer), GM LAV (Senior R&D Engineer), General Motors Locomotive Group (Senior Test Engineer), and GM Terex (Project Engineer). He has more than 30 years of professional accomplishments, including proven skills in electronics design, team management, Six-Sigma Black Belt, customer service, coaching and team building.

Russell Kubycheck is a systems engineer for Electro Motive Diesel. He has over twenty years of multi-industry experience. His primary focus areas are safety critical real-time embedded system design, architecture, and management of development teams. He is serving as the current Chapter President of the INCOSE Chicagoland Chapter.

Shane Kemper is a systems-orientated innovator, implementer, and explorer. Shane is currently developing the next generation of environmental friendly green locomotives after spending years working in the space/aerospace industry. Shane is a bit of a policy wonk, and is actively promoting public policy, education and outreach within the engineering and space exploration community. Shane has helped in the creation, development, and management of non-profit organizations. Shane has enthusiastically created, developed, and edited bids and proposals for industry and non-profits.

Maple Conference Room (Capacity: 31 people)

Karl Koenig, *Prototype to Production: An Alternative Development Cycle*

The classic development cycle presented in the INCOSE handbook starts with a statement of a need. Then requirements are defined with the help of an array of stakeholders, these requirements are used to define a system concept, and following agreement on the requirements and concept the project moves to the development stage. However, the last two major projects I worked followed a different path in which a developer works his concept into a prototype without a requirement statement, and then some marketing types promote the idea until a customer/sponsor can be found. With the prototype in hand, the project moves into the development stage. At this point the users' stakeholders join the project and bring in their requirements, frequently unknown to the original developer. Also, about this point the project manager invites the system engineer in to codify the requirements into a specification – while preserving the prototype, of course. All the while the stakeholders who saw a working prototype probably do not appreciate the development remaining to get the prototype to meet the full set of requirements. My presentation discusses this cycle of working from a prototype and some lessons learned for systems engineers based on my experience, without going into details of either project.

Karl Koenig graduated from the US Naval Academy with a degree in Aero Engineering and followed with a master's degree in Aero Systems Engineering from the University of West Florida in Pensacola. He served 11 years in the Navy in a variety of aircraft maintenance positions, and 15 years in the Navy Reserve performing a range of Naval aviation engineering support tasks. Karl worked 7 years for BDM Corporation as a test engineer and 22 years for Boeing as a test engineer, aircraft structural designer, system integrator, and project lead engineer. He also earned a master's in business from Webster University and currently holds CSEP certification from INCOSE. He is currently a contract engineer with Yoh Engineering Services.

Willow Conference Room (Capacity: 12-15 people)

Irv Badr, *Managing Safety and Cyber-security in Safety Critical Systems*

When integrating and delivering software-intensive systems for the nuclear industry, engineering teams should make use of a secure, requirements driven, software development life cycle, ensuring security compliance and optimum return on investment. Reliability protections, data loss prevention, and privacy enforcement provide a strong case for installing strict cyber security policies**.** Industry-wide security standards such as IEC61850 can be effectively applied to Energy and Utilities through formal requirements and process management. A new breed of project management solutions such as Rational Team Concert and Rational Method Composer enable engineering teams to implement the latest cyber-security best practices defined by NRC, NERC, and CIP.

Irv Badr has nearly twenty years of experience in developing software architecture and marketing complex systems. He works at IBM's Chicago office, as a Go-To-Market Manager focusing on Energy, Utilities, and Communication Service Providers in Rational Software division. Irv was chief systems architect for a complex, multi-processor medical device, and has worked as lead software engineer in medical robotics industry. He received an M.B.A. from Northwestern University and a B.S. in electrical engineering and physiology from the University Of Illinois. In addition to his role at IBM, Irv serves as Adjunct Professor of Technology Management at the Loyola University Graduate School of Business in Chicago. He has written many papers on medical devices from an FDA compliance perspective combined with agile development methods.

White Pines North Conference Room (Capacity: 51 people)

Loyd Baker, *Tollgate Time Reduction Through Model-based Systems Engineering*

This presentation will highlight the business benefit gained by reducing the time a project must spend in approvals through the use of MBSE and data driven review cycles. Organizations traditionally develop, review, edit, review and ultimately approve the content of a document describing the state of a project. While the document is in the development and approval process, all engineering work should stop or risk being inaccurate due to changes made while the document is approved (most organizations plow ahead and adjust later). By utilizing modeling to depict the use case, process, functions, architecture and the like on a project, communication and item level discussions can occur as a design develops verses waiting for a document to be produced. Systems engineers, program managers, process managers and project managers will all benefit from real world examples of projects which reduced the time spent on documentation and approvals. The goal of MBSE is to improve communication about and accuracy of the engineering design, ultimately increasing the likelihood of a project delivered on time and right the first time.

Loyd Baker is 3SL's VP of Technology directly developing and influencing product development and utilization by 3SL customers. A former INCOSE Huntsville chapter president and NASA Silver Snoopy award recipient, Loyd's knowledge of systems engineering and successful implementation on a broad variety of projects are well recognized. His experience spans from lunar programs to aircraft carriers, nuclear power plants and missile defense systems, to the more recent focus on systems engineering consulting for companies developing and expanding formal systems engineering programs and transitioning to MBSE.

White Pines South Conference Room (Capacity: 51 people)

Russell Kubycheck, *Genetic Algorithm Overview*

This presentation includes a quick overview on Genetic Algorithms. A genetic algorithm is a search heuristic that mimics the process of natural evolution. The concepts of genetic representation, reproduction, mutation, and fitness will be presented. The translation to a computer modeling environment over trivialized the inspiring biology but it does yield point solutions that may have otherwise not been intuitive or difficult to undercover by other means. This technique was used in the development of a prototype product. A comparison of product performance between existing, new engineered design and the genetic algorithm optimal design will be sited. In this comparison, the three point solutions were analyzed for their performance. The relative performance of each of these solutions will be presented. Some of the lessons learned will be high-lighted as well.

Russell Kubycheck is a systems engineer for Electro Motive Diesel. He has over twenty years of multi-industry experience. His primary focus areas are safety critical real-time embedded system design, architecture, and management of development teams. He is serving as the current Chapter President of the INCOSE Chicagoland Chapter.

Maple Conference Room (Capacity: 31 people)

Jason Sherey & Stephen Lewis, *The Systems Engineering Process as a Fractal Generator*

One of the most common criticisms of systems engineering is that it requires too much effort to understand a complex system enough to reliably minimize problems later in that system's life cycle. This notion assumes that a process that develops a system must be more complex than the system being produced. This presentation for process owners, lead systems engineers, and engineering managers proposes to change this assumption by using lessons learned from the study of fractals.

Jason J. Sherey is a Principal Systems Engineer for ICTT Systems Sciences. During his 12 years at ICTT, he has practiced, documented, taught, helped develop, and mentored others in the Systematica™ Methodology, which enables efficient systems engineering across entire product lines or system families. He has modeled patterns for a variety of systems, including engines, tractors, trucks, software, business processes, manufacturing systems, medical devices, and guidance systems. Jason has earned an M.S. in Systems Engineering and an M.S. in Engineering Management from Southern Methodist University. He also has a B.S. in Electrical Engineering from Rose-Hulman Institute of Technology. He is a past-president of the INCOSE Crossroads of America Chapter.

Stephen Lewis is a Systems Engineer at ICTT Systems Sciences in Terre Haute, Indiana, where has worked since 2008. He has modeled patterns for systems including drug delivery devices, manufacturing facilities, and packaging lines. Stephen is currently pursuing a J.D. from Indiana University Robert H. McKinney School of Law. He also has a M.S. in Engineering Management and a B.S. in Applied Biology from Rose-Hulman Institute of Technology.

Willow Conference Room (Capacity: 12-15 people)

Irv Badr, *Requirements Management's Key Role in Safety Critical Industries*

When building and maintaining new generation of safety critical systems, it is vital to automate the management of both requirements and operational processes. The goal is to meet, safety, modular design, production/maintenance cost, technology transfer, and design certification. Through automated tooling for both requirements and process management, project managers and systems engineers can revise their existing enterprise architecture, businesses process and technical architecture to meet safety, security and environmental protection goals. We will use the nuclear power plant as case study.

Irv Badr has nearly twenty years of experience in developing software architecture and marketing complex systems. He works at IBM's Chicago office, as a Go-To-Market Manager focusing on Energy, Utilities, and Communication Service Providers in Rational Software division. Irv was chief systems architect for a complex, multi-processor medical device, and has worked as lead software engineer in medical robotics industry. He received an M.B.A. from Northwestern University and a B.S. in electrical engineering and physiology from the University Of Illinois. In addition to his role at IBM, Irv serves as Adjunct Professor of Technology Management at the Loyola University Graduate School of Business in Chicago. He has written many papers on medical devices from an FDA compliance perspective combined with agile development methods.

White Pines North Conference Room (Capacity: 51 people)

Steve Lindo & Kayla (Corcoran) Spata, *Modeling Human Behavior for Product Development*

Model-based systems engineering (MBSE) has emerged as a powerful tool for product development. At the same time, the emergence of user-centered products from Apple and others has led to greater customer expectations for intuitive products. Much of the momentum for MBSE to date has centered on modeling system responses to system or user interactions. MBSE enables a greater level of complexity for developing electromechanical systems. However, all too often, insufficient effort is applied to predict how users will respond to the complex set of screens, alarms, and other user interfaces presented by the product.

With widespread adoption of touch screens, voice guidance, and automated control systems ranging from ATMs to automobiles, more products are becoming systems of systems. These inevitably contain a human component to interact with the system. In addition, safety-critical legacy devices, such as medical devices, often require software or hardware changes to improve the risk profile of the human-device interaction. Often, the human element plays an important role in ensuring any design change is able to achieve desired risk reductions or performance targets. This presentation explores techniques to model human interactions with complex systems of systems to accurately predict system responses.

The next step in MBSE evolution is a marriage of modeling system responses with predictive modeling for user interactions to make accurate estimates for the adoption, use, and effectiveness of user interface design. This presentation demonstrates the use of statistics and Monte Carlo simulations to model multi-variant human-system behavior to improve the human factors aspects of product designs.

Steve Lindo is the founder and CEO of SIM Solutions, Inc. He previously held a variety of positions for defense and medical device corporations, including R&D, mechanical design, instrumentation and controls, and systems engineering. He holds a BS in Aerospace Engineering from the University of Oklahoma, and a MS in Mechanical Engineering from Southern Methodist University. Steve is active in the Chicagoland chapter of INCOSE, formerly serving as the chapter's Secretary and Director-at-Large.

Kayla Spata previously worked for a large medical device corporation in systems engineering prior to joining SIM Solutions in 2011. Her experience includes requirements development, use cases, risk management, human factors, design history file development, and usability studies for new product development. She has expertise in hardware and disposables development. Kayla holds a BS in Biomedical Engineering from Marquette University.

White Pines South Conference Room (Capacity: 51 people)

Jacob Stadler, *Effective Failure Modes and Effects Analysis (FMEA) Process*

Failure Modes and Effects Analysis (FMEA) is an effective way to identify and mitigate potential problems within the design of a system. One of the common pitfalls in conducting FMEA is starting to populate an FMEA table or form as the first step in the FMEA process. This often leads to the FMEA being performed at either too low or too high of a level. Too low of a level (e.g., to the source code level in a software system or the component level on a circuit board) may result in a FMEA process that takes undue time, while too high of a level (e.g., showing only the major subsystem level or high-level software architecture) may result in a superficial analysis. Ensuring the FMEA process includes necessary pre-work and system definition helps to set an appropriate scope for the analysis and ensure the focus is on actionable design improvements.

Jacob Stadler is a Senior Reliability Engineer for the General Electric Company's Healthcare division. He has worked in reliability and safety engineering roles supporting the development of a wide range of products including life support equipment, patient monitoring devices, infant warmers, and diagnostic imagining systems. He is primarily focused on Design for Reliability (DFR) and the integration of reliability in the engineering process. He is a senior member of ASQ and a Certified Reliability Engineer.

Maple Conference Room (Capacity: 31 people)

Pradeep Mendonza & John Fitch, *Integrating System Models around Decisions*

Decisions are the primary future-creating human thinking process. Every system or product in existence today is the direct result of a network of interdependent decisions that have been framed, analyzed, made and implemented. As such, a decision model is ideally suited to serve as the integrative framework for Systems Engineering. This presentation will describe the relationships between these models as implemented within the ASEC framework. The role of each model in informing decisions to improve decision speed, confidence, quality, execution and reuse will be explained. Challenges to seamless integration will be highlighted based on the lessons learned from recent TARDEC pilots.

Pradeep Mendonza has over 20 years of combined industry and government experience in Systems Engineering (SE), Concurrent Engineering and product life-cycle engineering management. He currently serves as the Team Lead (Acting) for the SE Policy, Process and Tools Development team in the Systems Engineering Group (SEG) at US Army – TARDEC in Warren, MI. He holds a Bachelor degree (BS) in Mechanical Engineering and a Masters in Business Administration (MBA). Additionally, he is a SPRDE Level III certified Systems Engineer and a certified Black Belt. He has consulted for various automotive OEM's and Tier 1's in concurrent engineering and variation management. He is currently involved in efforts to enhance SE effectiveness by augmenting the performance of SE capabilities.

John Fitch has over 30 years of experience in Systems Engineering, engineering management and methods consulting. He is a leading innovator in the field of Requirements Management, Decision Management and Strategic Roadmapping methods and tools and an INCOSE Expert Systems Engineering Professional (ESEP). John joined SAIC in 2008; he is currently mentoring the U.S. Army's TARDEC Systems Engineering team at TACOM in Warren, MI.

White Pines North Conference Room (Capacity: 51 people)

Chris Unger & Daniel Gannat, *Requirements Management Process in a Multinational Healthcare Organization*

The presentation will describe our requirements management model. While the INCOSE requirements guide, and our guide as well, focuses on writing requirements, the entire lifecycle covers eliciting, communicating, and using/archiving/revising requirements (where using includes linkages to verification). Our future plans include extensions to the full requirements lifecycle
Pilots of the self-assessment tool have taken a systems engineer about four hours to apply, and useful reproducibility of the results has been demonstrated. The process has helped teams reduce the requirements load by up to 50-70%, while also increasing requirements quality.

Chris Unger graduated with a B.S. in Mathematics and B.S. in Philosophy from M.I.T. and a Ph.D. in Physics from Boston University. He has worked as a systems engineer in the defense and medical fields for 28 years, and is an expert in systems engineering and medical imaging. He is a certified Master Black Belt and has eight issued patents and seven patents applied for.

Daniel Gannat is Principal Systems Engineer in GEHC's Detection and Guidance Systems Business, a $1.5B business with engineers in over fifteen locations. Daniel has worked in systems for over 20 years.

White Pines South Conference Room (Capacity: 51 people)

Caleb Chidebell, *Understanding the Effectiveness of Lessons Learned in Product Design*

Few organizations and project managers (PM) are comfortable with detail discussions that address failures experienced during a project design and development cycle. This at times is driven by the need to feel or desire to be exceptional engineers or designers in their domain of specialization, or sometimes could be a good intention to boost employee morale. The goal any project is to have a successful delivery, however, a follow up question should be is how do we define programmatic success? Within this pre-set framework, is this appropriate for a leadership team to feel at a disadvantage during a projects developmental phase? Furthermore, what tools would aid mitigating such project risks and be vital in project planning considerations? How should a program lead respond to project short comings and what strategies can be integrated into planning process to help mitigate the re-occurrence encountered risks? Another important item is how to address customers in the event of an unforeseen risk that greatly impacts the project? All of these questions should be fed into the lessons learned and serve as a "guideline" for future projects. *First-fail* principle states, "*To succeed, try first where you are most likely to fail*"…

Caleb Chidebell is a software verification lead on the Airbus A400M project at Astronautics Corporation of America. His career started in 2002 with an avionics firm based in Connecticut. He completed a bachelor degree in Avionics from Vaughn College of Aeronautics and Technology. He earned a master degree in Electrical Engineering at the Manhattan College of New York. His earned a master degree in Systems Engineering with the Iowa State University. He has worked for Rockwell Collins, Honeywell Aerospace, Duncan Aviation, and Jersey Central Power and Light.

Maple Conference Room (Capacity: 31 people)

Tom August & Bob Parro III, *Innovative Requirements Management and Document Publishing Approaches Result in Dramatically Improved Cost and Schedule across the Enterprise*

Westinghouse (Nuclear) has employed the use of advanced requirements management and document publishing tools and methods resulting in a huge payoff in product development process efficiencies as the new generation AP1000 common power plant platform (gravity-fed shutdown) is deployed all over the world. Using smart automation beginning at the transformation of customer needs and requirements into structured DOORS modules, to automatic visualization and/or export of changes, to advanced tool menus displayed in the context of the user's role, to 'single-click' publishing of large numbers of documents for multiple customers, the positive impact on the development process has been remarkable.

Thomas August, Principal Engineer, DOORS Administrator, and DOORS Trainer with Westinghouse Electric Company has twelve years of experience with Rational DOORS. Tom initiated the effort to use RPE at Westinghouse Electric Company. He led the effort at moving from CMMI level 2 to level 3. Tom's engineering experience includes improvement to the electronic surveillance systems on Minuteman Missile system while in the USAF, working on medical products, imaging equipment and Thermal Analyzers while at DuPont, and working railway systems and people movers while at Bombardier. Tom implemented ISO 9001, and was the internal Quality Auditor at TA Instruments.

Bob Parro III, a Senior Product Development Process and Tools Consultant with River North Solutions, has nine years' experience with requirements management, modeling and document publishing tools in the aerospace, medical device, telecom, energy and transportation industries. Having used Rational Publishing Engine (RPE) since its beta stage, Bob has an in-depth knowledge of RPE's out-of-the-box capabilities, their practical applications, and deployment and use best practices. He has developed a wide range of innovative, high value-added publishing solutions for clients using RPE. A number of these will be presented in this paper. Bob has also developed a variety of cooperative DXL customizations.

White Pines North Conference Room (Capacity: 51 people)

Pat Gustafson, Daniela Popovic, & Brian Yarger, *A Requirements Management Architecture in a Multi-dimensional, Highly Regulated Product Development Environment*

There are several industries that are highly regulated. Certain industries face a multi-dimensional challenge of having state-by-state and country-by-country regulations and standards. In fact certain regulated regions have multiple jurisdictional authorities within each region. The desire to produce (nearly) common products that address multiple sets of rules, regulations, and requirements indeed face many issues to bring products to market. At the beginning of those challenges lies the ability to identify, analyze, decompose, and interpret the multiple source input requirements to dozens and dozens of projects filled with cutting edge innovations. This presentation presents this problem set and a couple of requirements management approaches in attempt to optimize the effort and reduce duplication in developing and maintaining requirements in this environment.

Patrick Gustafson has 6 years gaming experience in both systems engineering and software testing. He has 10 years' experience in the telecommunications industry working on GSM and UMTS switching systems, concentrating on E911, location based services, and call intercept. He is a veteran of the US Navy, and a BSEET degree from DeVry Institute of Technology. Patrick was also a Journeyman carpenter.

Daniela Popovic has 10 years of gaming experience in both systems engineering and software testing. She has 5 years of experience in the telecommunications industry. Her education includes a Masters in Engineering, Telecommunications and Electronics, University of Novi Sad, Serbia.

Brian Yarger has 4 years in gaming experience in systems engineering. He has nearly 7 years of experience in avionics in systems engineering, and 20 years in systems engineering and software engineering in the telecommunications industry. Brian is a former Director of the Michigan chapter of INCOSE. He has a BS Eng. Computer Science degree from the University of Illinois and a MS degree from Roosevelt University.

White Pines South Conference Room (Capacity: 51 people)

William Day, *System-of-Systems Use Cases*

The INCOSE Systems Engineering Handbook 3.2.2 defines “Systems-of-Systems” (SoS) as systems-of-interest whose system elements are themselves systems; typically these entail large-scale inter-disciplinary problems involving multiple, heterogeneous, distributed systems. These interoperating collections of component systems usually produce results unachievable by the individual systems alone. This presentation will discuss system-of-systems (SoS) engineering principles using use cases as an example paradigm. The discussion will cover the practical relationships of a use-case driven SoS requirements model, inter-device interfaces, 2-tier change practices, decomposition and allocation, V&V, status management, life-cycle controls, and views. Clear mechanics using DOORS for managing the relationships between the SoS layer and the device layer will be shown.

William Day currently holds the title Senior R&D Fellow at Hospira, Inc. in Lake Forest, IL. He is responsible for Hospira's IV Clinical Integration system-of-systems concepts. Prior to this Bill has worked as a medical device engineering consultant and held multiple previous positions including Director of Systems Engineering at Baxter’s Renal Division, Director of Product Development at McKesson, and Director of Engineering at Siemens Medical Systems. Bill is a graduate of the University of Illinois with a BS in Computer Engineering.

Maple Conference Room (Capacity: 31 people)

Sarah Sheard & Ali Mostashari, *Measuring Complexity*

This presentation discusses measurement of complexity for systems engineering. The objective is to clarify the science of complexity as it applies to systems engineering, and propose a set of steps a project can take to developing an applicable complexity measurement that will be predictive of success and can be used as one weapon in a risk management arsenal. This presentation reviews the aspects of complexity that can and should be measured in order to predict improved program outcomes. One must consider the system being built, the project developing the system, and the environment, both technical and political. A composite measure can be built up from variables addressing different aspects of complexity, including structural, dynamic, and socio-political aspects.

Dr. Sarah Sheard is an INCOSE Fellow and the 2002 INCOSE Founder's Award recipient. Dr. Sheard has published over 40 papers, led INCOSE's Communications committee and the Measurement technical committee, and currently leads the Complex Systems working group. She has also served as program chair and director of the Washington Metropolitan Area chapter and is an INCOSE-certified Systems Engineering Professional (CSEP). Dr. Sheard has been working in systems engineering, process improvement, and curriculum development and implementation for over 20 years. Dr. Sheard teaches courses in the application of the sciences of complex systems to systems engineering. She also consults with private companies and government agencies regarding processes for systems engineering, systems engineering curriculum, managing complexity, and systems-of-systems. Dr. Sheard earned her Ph.D. in Enterprise Systems at the Stevens Institute of Technology, her MS from the California Institute of Technology and her BA from the University of Rochester.