INCOSE
International Council on Systems Engineering

IBM Rational Systems and Software Engineering Symposium
Sponsored by Enchantment Chapter—August 16—Free

IBM offers this all-day multiple-track event at no fee to the systems engineering community, with a reception following. Most of the presenters are INCOSE members, and the symposium has been given around the world. The Albuquerque venue has not yet been set. Look for an email notice from the Chapter soon, with a complete agenda that will include abstracts of the various sessions. A speaker from the Chapter will provide opening and closing remarks.

Attendees will include IBM customers as well as Enchantment Chapter members—an opportunity to mix with the larger system-interested community and expose INCOSE and Chapter membership benefits.

To the right is a sample agenda to provide an idea of what to expect. They draw some speakers from the local community. ∞

Time	Customized for Huntsville in April – Albuquerque will be customized differently		
8:00 – 8:30	Registration and Breakfast		
8:30-8:40	Symposium Welcome and Intro - Huntsville		
8:40-8:50	INCOSE Chapter Welcome		
8:50-9:20	Smarter Products - Essential capability for a Smarter Planet		
9:20- 9:40	Designing for Innovation: Systems Engineering in the Ecosystem		
9:40-10:15	On the Critical Need for Utilizing Model-Based System Development Methods & Tools for the Development of Complex Army & DoD Systems		
10:15-10:30	Break		
10:30-11:10	Aerospace and Defense Roadmap and the Rational Engineering Solution Platform	Managing the Real-Time Risks in Embedded Systems and Networks	Satisfying DO-178B/C
11:15-11:55	The Rational Solution for Systems and Software Engineering; demo	Maximizing the cost benefit using Portfolio and Performance management	Future Airborne Capability Environment (FACE) Overview
11:55-12:40	Lunch		
12:40-13:20	Agile Development of Safety Critical Systems		
13:25-14:05	UPDM, DoDAF, and SysML, and how they are Supported by IBM Rational Tool	Product Line Engineering for Systems and Software	Implementing integrated ALM at Redstone Arsenal
14:10-14:50	Rational's Process Solution - RMC and RTC		Examples and Successes of Systems Engineering and Requirements Analysis using DOORS and RPE
14:50-15:05	Break		
15:05-15:45	DOORS for Requirements Management - Today and in the Future	Streamlining the Development of Complex Systems through Model-based Systems Engineering	
15:50-16:30	Advanced Systems Engineering and Model Philosophy		
16:35-17:15	End of Embedded Software As We Know It		
17:15-19:00	INCOSE & Customer Reception		

System Security Engineering IS12 Live Meeting Workshop

Tuesday July 10, 2012 – 14:00-18:00 Rome Time (14:00 Rome = 06:00 MDT)

14:00   Introductions & WG and workshop positioning, Rick Dove

14:45   Project: Handbook Security Revision – Status and next steps, Beth Wilson

15:00   Section 9.16 status and discussion, Paul Popick

15:45   Project: INSIGHT 2013Q2 Essays – Status and discussion, Rick Dove

16:15   Project: IS13 Security Track – status and discussion, Beth Wilson

16:45   SEBoK needs security document references – discussion, Paul Popick

17:00   International SSE-WG involvement – let's get some! what does it take?

17:30   Closing wrap-up and other news, Rick Dove

18:00   Adjourn

Live Meeting URL:
https://www.livemeeting.com/cc/incose/join?id=83FZ59&role=attend&pw=WB%24c%25%7D%3D%3E7   **Audio connection:** 800- 375-2612 , **Participant code:** 186939   ∞

Chapter Mascot

Presidential Words *Chapter President Woody Weed, Sandia National Labs*

The heat of summer is upon us and the climate system is taking its toll. I hope all of you are finding a cool and content place in your work. Our Chapter's mission is to foster the definition, understanding and best practices of systems engineering in industry, academia, and government. We are fortunate to have good participation from all three domains in our region. And we continue to look for opportunities for collaboration and synergy between the domains to improve the practice of systems engineering. The monthly Chapter meeting is our flagship forum for this interaction. Most of us have many responsibilities and activities competing for our time, including some in late afternoon on the second Wednesday of the month. If you haven't attended a meeting for a while, I encourage you to come to ATA for a meeting or two (or three) this summer. I think you will find the topics intriguing and the company engaging. I invite you to contact me at jwweed@sandia.gov.   ∞

The Tutorial You Missed: Complex Systems for the Systems Engineer

Mary Compton, Sandia National Labs

On May 10, 2012 Sarah Sheard, Principal at Third Millennium Systems, taught a tutorial entitled "Complex Systems for the Systems Engineer " for the Enchantment Chapter.

The goal of the tutorial was to explore systems engineering using the sciences of complex systems. To achieve this goal, systems engineers need to be able to explain how the science of complex systems can improve how systems are engineered, contrast characteristics of complex adaptive systems with characteristics of decomposable systems, recognize risks related to systems that are more complex than previously acknowledged, and define principles of complex adaptive systems that systems engineers can use.

A Brief Overview of Complexity and Complex Systems

Contributing to the complexity of systems are factors like having many pieces, emergent properties, nonlinearity, chaotic adaptation, tight coupling, self-organizing, decentralization, politics, multi-scale, and porous boundaries. Systems possessing these objective complexities can also possess subjective complexities, such as uncertainty, difficulty in understanding, unpredictability, uncontrollability, instability, increasing costs, taking too long to build, or lack of reparability or maintainability.

Modern systems are made up of multiple complex systems. Systems must be compartmentalized to understand the components and how they interact. Today's systems are also dynamic; what is true today may no longer be true tomorrow. Complex Systems Science can help us learn to better engineer complex systems.

Complex systems are often self-organizing. If the system can adapt then the system is a complex adaptive system (CAS) and order will emerge. Complex systems exhibit nonlinear behavior; they are not predictable, and explaining why they exhibit certain behaviors is nearly impossible. The behavior of a complex system can be on many different scales, and behavior on a fine scale can affect behavior on a large scale. It may be difficult to figure out how complex the system is. A CAS is made up of agents that are semi-autonomous building blocks that follow rules. These agents compete for resources and evolve in a complex manner. The system as a whole becomes more capable as it becomes more complex.

Contrasting Systems of Systems Principles with Complex Systems Principles

System of systems (SoS) is an engineering, acquisition, and development view. A system of systems requires principles for managerial and operational independence. A system of systems may be composed of few components. In contrast, complex systems is a science and mental models view. Complex systems are in need of principles for non-decomposable systems. A complex system may contain tiny components.

To engineer a system of systems some traditional systems engineering practices need to be extended, including the systems engineering Vee model. The emerging Principles of SoS include:

- Addressing both organizational and technical issues in making systems engineering trades and decisions.
- Acknowledging different roles and relationships between systems engineering done at the system level versus systems engineering at the SoS level.
- SoS design should be based on open systems and loose coupling.
- Design strategies and trades need continual attention.
- Technical management of SoS involves transparency, trust, and active participation with systems engineers at the system level; the SoS system engineer cannot participate in all aspects.

Engineering complex systems involves combining the fundamental systems engineering problem solving principles and heuristics with the lessons learned from the extension of traditional systems engineering practices applied to SoS; and applying additional practices, such as focusing on resilience rather than optimization, and employing analysis techniques from Complex Systems Science.

Complex Systems Engineering principles include:

- Systems architecting: recognize the system as a CAS or emergent system; define the system's current architecture; model the system to understand current performance; set a goal to improve specific properties; suggest changes that will achieve improved performance; model changes and watch for undesirable interactions; select at least one promising intervention; implement changes, verify their effects, and evolve the system rather than designing it.
- Problem Space: presume the system is complex until proven otherwise; look for aspects of the problem space that can be explained by complexity.
- Systems Analysis: create mental models of the problem space; model as needed multi-agent behavior to determine the best set of rules and avoid oversimplifying the systems.
- Coordination: connect people and groups together as much as possible and get people (developers, users, customers, etc.) to work together.
- Management: understand how to use incentives; build capable organizations; make the rules of interaction explicit; find and use experts as needed; and base decisions on data obtained through analysis.

When to Use Complex Systems Practices

Sheard recommends using traditional systems engineering tools if your system involves the creation of small to moderate size objects, your program challenges are technological rather than social, you are tweaking known programs and challenges, and the processes you are using work. In other words, your system can be engineered using a traditional systems engineering approach.

Sheard also recommends incorporating complex system practices if your program is unprecedented in size or interconnections. For example: multiple agents voluntarily cooperate; evolution of your system is a dominant factor; and attempting to use traditional tools is not working. Complex system practices augment the traditional set of practices used to engineer a complex system; they do not replace the traditional set of systems engineering practices. ∞

Two From the Chapter Start Agile Systems Engineering WG

Rick Dove and Ron Lyells have submitted a charter for an Agile Systems Engineering Working Group.

Purpose—The purpose of this working group is to identify and develop a body of knowledge that will inform systems engineering and related processes which require agile system capability. Agile systems of interest to this working group include both systems engineering processes and systems-engineered systems.

This working group views agility as a sustainable system capability, enabled and constrained fundamentally by system architecture. This architecture delivers agile capability as reconfiguration, augmentation, and evolution of system functionality, after deployment; enabling the system to respond to new and immediate situational requirements effectively. Effectiveness of response is measured in response time, response cost, response quality, and response scope sufficient to sustain the system's functional intent.

Need—The need to understand sustainably agile system design and project management concepts exists on multiple fronts:

- Agile Systems-Engineering development processes have become of interest to the CAB companies, and they are asking that INCOSE develop appropriate guidance.
- Defense organizations have an interest in how agile system concepts might inform agile acquisition processes.
- Quick Reaction Capability (QRC) has been a defense acquisition need for some time and would benefit from an agile response capability by suppliers, yet generally QRC is achieved today by the employment of costly and error-prone overtime work and the increased risk of relaxing formal Systems Engineering processes.
- Both commercial and governmental organizations are finding that the pace of technology and growing user expectations are reducing the effective life time of deployed systems.

Confusion exists in the relevance of agile software development processes to more general systems development processes, and in the relationship of lean concepts to agile concepts. This confusion needs clarifying perspective.

- A large body of experience and a variety of beneficial process approaches now exists in the area of Agile Software Development (ASD). In the growing interest for more general agile system project management processes these ASD processes appear to many to be a model for more general systems engineering development; but they are tailored to the specifics of the software development environment, and exist in a variety of different approaches more akin to brand-specific practice – such as Scrum and XP.
- In a very general interpretation, Lean values efficiency of operation and achieves this mainly through process principles; Agile values effective response ability and achieves this mainly through architectural principles. To be sure, both are concerned with operational effectiveness. Since the two have a different means for achieving different ends they are not necessarily in one-or-the-other conflict – but can be. When efficiency dominates the requirements, a lean Concept of Operations (ConOps) should dominate; taking additional value from Agile if and only if Lean requirements (as required by stakeholders) are not adversely compromised, and stakeholder requirements recognize some value from Agility. Vice versa, when an Agile ConOps is called for by stakeholder requirements, the design focus goes to architecture; streamlining process with Lean principles if and only if dominating Agile requirements are not adversely compromised. A useful set of requirements will make the nature of Lean vs. Agile design tradeoff clear, when tradeoff is unavoidable. In general, an Agile design should be as efficient as possible, and a Lean design should be as Agile as possible; but focus and values are found in the requirements.

Scope—The primary focus of this WG is on fundamentally necessary and sufficient architectural concepts and concept-employment principles that enable any system or process to be agile, and to show how these architectural concepts and principles are or might be applied advantageously to a variety of INCOSE-relevant systems and processes of interest. These examples will be directed at the application of necessary and sufficient agility-enabling concepts and principles, avoiding prescriptive interpretation and disclosure of organization-specific competitive-advantage differentiation. Application examples will include, for instance, systems engineering and management processes, Quick Reaction Capability, and acquisition processes, to name only a few.

Goals—

- Goal: Fundamental System Engineering concepts and principles supported with application examples that enable an Agile Systems -Engineering development processes.
- Goal: Fundamental System Engineering concepts and principles supported with application examples that can inform agile acquisition processes.
- Goal: Fundamental System Engineering concepts and principles supported with application examples that can inform supplier design of Quick Reaction Capability (QRC).
- Goal: Fundamental System Engineering concepts and principles that can inform the design of Agile systems which must respond effectively to the pace of technology and growing user expectations.

Next steps—Under the assumption that the working group will be approved during IS12, organizational activity will occur during the remainder of this year, in preparation for an IW13 kick-off workshop. This will include the creation and population of a Share-Point site, recruitment of WG members from both INCOSE membership and external sources, development of an opt-in announcements mailing list, and an agenda for the IW13 Jacksonville, FL January 26-29 kick-off workshop. To get on the announcements mailing list indicate that desire to rick.dove@parshift.com, and include any thoughts you may have. ∞

Just Thinking

The SE Code of Conduct?

Regina Griego, Sandia National Labs

Some people may know that INCOSE has a Code of Ethics, http://www.incose.org/about/ethics.aspx, as do many Engineering Professional Organizations. I wonder how many people can paraphrase the contents of the INCOSE code.

Over the last year, since Denver, I have been communicating with a fellow Fellow, Avigdor Zonnenshain about developing a Code of Conduct for all Systems Engineers. This was prompted by a presentation that John Thomas, INCOSE President, made to the Fellows at IS11 on Systems Engineers as leaders. We discussed that fact that a code of ethics gave us detailed behavioral rules and that a code of conduct would be more like an honor code of what we embody or strive to embody as Systems Engineers.

As we studied various organizational Codes of Ethics and a couple Codes of Conduct, we concluded that we wanted something simple and personal. In the Leadership Coaching world, we have a term, "declaration". A declaration is something you make as a leader that begins to form how you navigate and create in the world. My training in Leadership Coaching at Georgetown culminated in a declaration about my commitment as a coach (mentor). If you ask me some time, I might be willing to share.

This is the SE Code of Conduct we are proposing to John Thomas and the Fellows in Rome at the IS12. It is our first draft and I would welcome your feedback. More importantly, I would be very interested in your somatic response if you dare to say this code out loud to yourself in the mirror.

"As a Systems Engineer:
I embrace responsibility to my customers,
my stakeholders, my team, and the outcome to which we are striving.
I embrace responsibility for the impacts of my activities on society and the environment.
I personify integrity, a commitment to ethical standards, a collaborative spirit, and creative vision.
I look for opportunities to invest a portion of my time and abilities for the betterment of the community.
I am a catalyst, remove barriers, and solve problems to achieve the desired outcomes by:
- Accounting for nuances and complex relationships with technology, the system, and the people
- Judiciously pushing technology, the systems effort, and the people
- Facilitating communication that engenders understanding and participation"

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System Security Engineering at IS13

This call-for-papers is for a track devoted to Systems Security Engineering at IS13 – and is issued by the INCOSE System Security Engineering Working Group. IS13 will be held in Philadelphia, June 24-27, 2013.

The objective is multiple 3-paper security sessions composing a track of 9-or-more papers. Papers, of course, will be submitted to, reviewed by, and selected through the usual INCOSE International Symposium submission and review process, and not by the System Security Engineering Working Group – though we will be among the reviewers for whatever security-related papers are submitted. Though a date has not yet been published by

INCOSE, papers for IS13 would typically be due for submission about November 1, 2012.

This is a momentous opportunity: IS13 will occur at the same time that the newly revised INCOSE SE Handbook is anticipated for publication. This revised Handbook will indicate new responsibilities for Security in the Systems Engineering processes; and will include a new-but-short Specialty Engineering section 9.16, outlining the *general* nature of security responsibilities.

With responsibility acknowledged, a need for information and knowledge must be filled. IS13 papers can begin to fill this void.
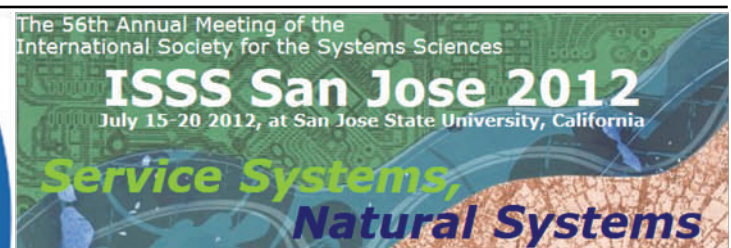
Food for thought:
- What does the System Engineer need to know about Security Engineering and Systems Security?
- What kinds of questions should the Systems Engineer ask of the Security Engineer?
- How can Security Engineers engage with Systems Engineers and Systems Engineering Processes effectively?

If you plan to submit a paper for this track please drop a note to rick.dove@parshift.com, chair of the System Security Engineering WG.

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Enhancing Interoperability of Systemists: a Sunday, 7/15 pre-conference workshop. with exercises to increase your a) degree of mutual understanding, b) readiness for knowledge exchange and c) ability to foster similar interoperability in your local environment. More Info: Jack Ring at jring7@gmail.com   ∞

Recent Meetings

Heather Kraemer, Sandia National Labs

April 2012—On April 11th, Kathy Hansen, Chief Operations Officer for the Arrowhead Center at New Mexico State University (NMSU) gave a brief overview of the Center and its many programs. The center emphasizes regional economic development by providing jobs and workforce development, developing real estate, providing advice to start-ups, conducting research to support regional industries, and creating and convene alliances or coalitions between discipline-specific research centers, economic development organizations, government entities, and industry groups.

The focus of the talk was on the multi-disciplinary program Launch, involving science, engineering, business, and entrepreneurship. Arrowhead Center's Launch program seeks to expedite the transfer of technologies from campuses to commercial venues. It provides researchers and technologists business mentoring, market analysis, product and systems engineering expertise, and demonstration-validation services, as well as access to investment networks. Launch allows work on techno-logical innovation and commercialization to occur on multiple fronts. The Launch proof of concept model greatly reduces the time it takes for an invention or innovation to move from university laboratory/development settings to markets. A copy of the presentation is on the Enchantment Chapter website: http://www.incose.org/enchantment/library.aspx

May 2012—On May 9th, Sarah Sheard presented her recently-completed doctoral dissertation work, in which she surveyed 75 programs from the last 20 years, asking questions about the size, connectivity, dynamics, and socio-political aspects of systems, programs, and the system's environment. She presented the thirty-nine complexity measurements that were compared to program outcomes such as cost overrun, schedule delay, and performance shortfall and how three complexity variables predicted program cost and schedule and system performance and how about twenty others were congruent with (in the same direction as) these complexity variables and the outcomes.

Some interesting conclusions from the research, include:

- Complexity cannot be assessed in the abstract: is it the complexity of the system being built, the program doing the building, or the environment around the program or the system?
- Some complexity variables affect cost and schedule (program outcomes), some affect performance shortfall (system outcome) and some affect both.

June 2012—On June 13th, Dr. Josef Oehmen, a research scientist with MIT's Lean Advancement Initiative (LAI), presented an overview of the *Lean Enablers for Managing Engineering Programs*. The information was the result of a 1 year collaboration between subject matter experts from MIT, INCOSE and PMI. Josef discussed the 10 major challenges that engineering programs face, and how they can be overcome with the 40 Lean Enablers and 300 associated best practices the group identified. The findings were documented in the *Guide to Lean Enablers for Managing Engineering Programs*, which was shared with the group. The presentation can be located at: http://www.incose.org/enchantment/docs/12Docs/12Jun_Lean%20Enablers.pptx.   ∞

Next Meetings—*Heather Kraemer, Sandia National Labs*

July 11: Mechanical Design, Fabrication, Assembly, Test, Integration, and Launch of the ChemCam Instrument for the NASA Mars Science Laboratory Rover

John Bernardin, LANL's Lead SE on the Mars Rover Project

Abstract: This presentation will summarize the Mechanical Engineering Process used to design and build a Laser Induced Breakdown Spectroscopy Instrument for use aboard the NASA Mars Rover Curiosity, recently launched to Mars for a 3 year mission to the red planet to study its geology and search for signs of life.

August 8: The Parable of the Program Baseline

Regina Griego, Ph.D., Sandia National Laboratories, INCOSE Fellow

Abstract: Establishing the Program Baseline especially for government programs is an emergent process. The program baseline includes scope, schedule, and resources, but is paced and swayed by the timing of budget process and political maneuvering. How does a program team maintain integrity of right action on behalf of the nation in the ambiguity of establishing the program baseline? What is the role of requirements and the requirements process that most Systems Engineers know and love? This talk presents the story of the ambiguous nature of establishing a program baseline for a nuclear weapon program. Regina will present the hard questions that frame the conversation about nuclear weapons at the national level.

September 12: Something Wicked This Way Comes – Systems Engineering Responsibility for Systems Security

Rick Dove, CEO/CTO, Paradigm Shift International; Adjunct Professor, Stevens Institute of Technology

Abstract: Something momentous is happening: INCOSE recognition that system security is the responsibility of Systems Engineering is acknowledged – the next version of the Handbook will make this clear in its mid-2013 publication. That is simply a door opened – now the real work begins. What will the Handbook say? How will the responsibility be socialized, accepted, and deployed? How is effective System Engineering and Security Engineering engagement characterized? How will the SEBoK (Systems Engineering Body of Knowledge) support this responsibility? This presentation will review work in planning and process, including the logic and nature of SE responsibility; text to be distributed throughout the Handbook; a new System Security Engineering section 9.16; a call for INSIGHT 2013Q2 essays themed: The Buck Stops Here; a multi-session security track at IS13 call for papers; the NSA/NIST Systems Security Engineering document-in-process; the DoD Program Protection Plan; the IEEE Smart Grid Vision Project cyber-security work-in-process; and a formative-stage INCOSE Agile Systems Engineering working group with implications for systems security. Invitations for involvement are open.   ∞

New Chapter members *Francis Peter, Management Sciences*

The Enchantment Chapter now has 99 members. We would like to welcome the following new INCOSE members:

Michael D. Hahn	Independent
Arnold J. Peckjian	Lockheed Martin
Raymond B. Wolfgang	Sandia National Laboratories
Matthew R. Young	Los Alamos National Laboratory

The Enchantment Chapter sponsored Student Chapter of the University of Texas at El Paso is doing well with 8 active members—none new during 2nd quarter 2012.   ∞

Looking Ahead to IS2013
Heidi Hahn, Los Alamos National Lab

IS2013 will be held at the Philadelphia Marriott, June 24-27, 2013. Located in downtown Philadelphia, the Marriott is within walking distance of the Liberty Bell, Independence Hall, and numerous other historical and cultural sites, so attendees who need a break from Systems Engineering presentations will have plenty to choose from! Here's a web site where you can learn about what Philly has to offer: http://www.visitphilly.com/

The Enchantment Chapter has already received a call for volunteers to help with the 2013 International Symposium. I will serve as the Chapter's POC for the IS, so if you are interested in helping, please contact me at Hahn@lanl.gov and we can discuss opportunities for involvement. Also, look for a call for papers to be issued shortly after IS2012 finishes up later this month.

In the interest of full disclosure – I'm a native of Philadelphia, so if I seem overly enthusiastic about IS2013, you'll know why! Maybe they should call me Chief Cheerleader rather than POC.   ∞

Connect to Your Community of Practice

Chapter meetings with a focus on systems engineering are held monthly, usually the second Wednesday starting at 4:45pm, except in December. The December meeting is an annual social event, with mingling, dinner, and a speaker chosen for enjoyment by systems engineers and guests alike.

Monthly meetings feature speakers from out-of-town that are visiting the area for other reasons, and local (more or less) subject matter experts on topics of relevance.

On occasion special facility tours are arranged, sometimes as the monthly meeting, and other times on a separate schedule.

Chapter meetings begin at 4:45. After chapter news, announcements and introductions, the presentation and discussion generally lasts until 6:00, all carried live on Live Meeting for those who can't attend. Recordings are not made.

Tutorials with in-depth coverage on topics of interest are arranged approximately twice a year. Delivered by experts in the field, tutorials range from 1/2 day to day+ durations, and generally involve a tuition.

Mix with people who have the same professional interests as you do, but with a diversity of perspective beyond daily workmates. It comes in handy when you need help or answers to questions outside your accumulated experience, need a connection at another organization, or simply want some mind stretching thought.

Meeting and event notices routinely go to all INCOSE members within the Chapter's geographic territory; but Live Meeting connections, special notices, and collaborative opportunities are generally limited to registered Chapter members. Obtain chapter membership on the INCOSE web site by changing your profile or so selecting as you renew membership.   ∞