The Enchanted View
— Thinking About Systems —

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www.incose.org/enchantment

Connect to Your Community of Practice

Chapter meetings with a focus on systems engineering are held monthly, usually the second Wednesday of each month, 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 introduction, 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. ∞

Recent Meetings

Mary Compton, Sandia National Labs

January 2010—Dinesh Verma and Jennifer Bayuk presented a talk on the nation's first University Affiliated Research Center (UARC) focused on Systems Engineering. In 2008, at the end of a national competition, the Department of Defense awarded the UARC contract to Stevens Institute of Technology, as the Systems Engineering Research Center (SERC).

Though managed by Stevens, the SERC is a consortium of 17 universities. This presentation gave the audience a broad overview of the SERC, its research strategy, and a perspective into ongoing research.

As an example, the System Security research topic was discussed, to provide insight into how SERC will engage with thought leaders in the systems field. More information about SERC can be found at: http://www.sercuarc.org/.

February 2010—At the February chapter meeting Steve West presented "Risk Creep: Normalization of Deviance and How to Prevent It!" (Lessons Learned from The Challenger Accident: How to Become Zero Fault Tolerant and Not Even Know It). Risk Creep is very difficult to truly understand and manage.

NASA's Challenger disaster is an example where risk creep advanced through small steps leading to a catastrophic mishap. As a result of the mishap investigation, NASA coined a new phrase: Normalization of Deviance. This presentation took us through the events and actions leading up to the Challenger and Columbia accidents and brought those lessons home with illustrations of how easily Normalization of Deviance occurs in our every day professional lives. It concluded with some guidance to reduce and prevent risk creep.

March 2010—The March Chapter meeting was a report on the 2010 INCOSE International Workshop (IW). The heart of INCOSE's Technical Operations effort is its more than 30 Working Groups. The International Workshop is the event where attendees spend 4 days working alongside fellow systems engineers to engage in working sessions, learn in collaboration, and contribute their knowledge to take the discipline forward. The working group activities reported on included:

- Autonomous System Test & Evaluation (Tom Tenorio)
- Model Based Systems Engineering (Ron Lyells)
- Systems Security Engineering (Mark De Spain)

For information on INCOSE's Working Groups visit Technical Operations. ∞

Upcoming Meetings

Apr 14 Attacking the Growing System Security Gap – The Frontier of Systems Engineering (SSE Working Group activities), Rick Dove, System Security Engineering WG chair.

May 12 Turning Fuzzy Expectations Into Engineering Reality: Quality Function Deployment for Aerospace Systems. Pete McQuade, Stevens Institute of Technology.

Jun 09 DoD Roadmap for Unmanned /Autonomous System Testing, Tom Tenorio, White Sands Missile Range. ∞

Chapter Job Opening

Rodger Oetzel retires at year-end from his many years as the Chapter's treasured treasurer. He would like to ease in his successor, before year-end. Good experience to learn about operational finance with a simple start. The treasurer must be an elected Board member. Apprenticeship is open immediately. Contact Roger at rpoetzel@aol.com. ∞

Did You Know…?

Evolving Systems Trade Innovation for Robustness

Rick Dove, Paradigm Shift International

An article in New Scientist[1] reviews the thought-shaking work of microbiologist Carl Woese and physicist Nigel Goldenfeld. They have shown that rampant horizontal gene transfer (HGT) predated Darwinian evolution as a necessary precursor, and is responsible for the mysteries of how the genetic code became optimally resilient and universal to all organisms.

In Woese's words[2]: "*Vertically generated and horizontally acquired variation could be viewed as the yin and the yang of the evolutionary process. Vertically generated variation is necessarily highly restricted in character; it amounts to variations on a lineage's existing cellular themes. Horizontal transfer, on the other hand, can call on the diversity of the entire biosphere, molecules and systems that have evolved under all manner of conditions, in a great variety of different cellular environments. Thus, horizontally derived variation is the major, if not the sole, evolutionary source of true innovation."*

As cellular systems evolved more complexity, they eventually crossed what Woese calls the *Darwinian threshold*, where the preservation and strengthening of internal dependences becomes favored over the innovative but more risky incorporation of outside components.

What a concept! The systems species *Cell Phone* is still in early formative stages of HGT evolution, experimenting with elements of telephones, keyboards, PDAs, world wide web, social networking, personal computers, GPS, … just to name some starters, transient as they may be.

The well evolved systems species *Large Enterprise*, on the other hand, is familiar in fierce maintenance of operating culture, protection of organizational architectures, and rejection of disruptive innovation. A well-oiled machine not about to jeopardize that which it is.

Teams and collaborative groups innovate to the extent of their diversity. Horizontal meme transfer in action. We also know how hard it is to get a new idea accepted in an established "institution".

Horizontal and vertical system-evolution interplay is a new understanding hidden in plain site; and discovered by another team from a different angle: highly optimized tolerance, a very HOT idea.

Jean Carlson and John Doyle understand something about complex systems and the way they age that provides strong theoretical underpinnings for the behaviors observed in complex systems ranging from the Internet to the Immune system.

In theirwords[3]: "*Through design and evolution, HOT systems achieve rare structured states which are robust to perturbations they were designed to handle, yet fragile to unexpected perturbations and design flaws. As the sophistication of these systems is increased, engineers encounter a series of tradeoffs between greater productivity or throughput and the possibility of catastrophic failure. Such robustness tradeoffs are central properties of the complex systems which arise in biology and engineering.*"

Adding robustness initially or incrementally over time creates complexity within the system, preserving and protecting its essential functions and capabilities against known uncertainties. But at the same time, the system becomes increasingly fragile to unexpected threats and so-called Black Swans—unavoidably.

Highly readable and targeted at the systems engineer, Woese, Carlson, and Doyle back-to-back is the stuff of naked insight. A deafening click! There is small utility in just letting this explain the world around us. It should be put it to work in purposeful design.

Threads to Pull:

1. Buchanan, Mark. 2010. Horizontal and vertical: The evolution of evolution. New Scientist, Magazine issue 2744, 26 January. www.newscientist.com/article/mg20527441.500-horizontal-and-vertical-the-evolution-of-evolution.html
2. Woese, Carl. 2000. Interpreting the universal phylogenetic tree. PNAS. 97(15):8392-6. www.ncbi.nlm.nih.gov/pmc/articles/PMC26958/pdf/pq008392.pdf
3. Carlson, JM & J. Doyle. 2000. Phys. Rev. Lett. 84, 2529-2532. http://gabriel.physics.ucsb.edu/~complex/pubs/hot2.pdf

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Next Meetings

Mary Compton, Sandia National labs

April 14: Attacking the Growing System Security Gap – The Frontier of Systems Engineering. Rick Dove, Chair, INCOSE System Security Engineering Working Group.

Abstract: Current system security strategies are failing and cannot be fixed by security engineers alone. The reason for failure is evident: the attack community operates as an intelligent, multi-agent, self organizing, system-of-systems – with swarm intelligence, tight learning loops, fast evolution, and dedicated intent. INCOSE's working group on System Security Engineering believes the solution requires system thinking applied to whole-system concepts of operation and systems architecture. As a minimum, systems must be as agile as the adversary, and mirror their six key characteristics of self organization, adaptable tactics, resilient reaction, evolving strategies, proactive innovation, and harmonious operation. This discussion will show how the Working Group is attacking the challenge, show some successful architectural patterns already in practice, and show how these concepts are influencing the roadmaps of research and development. We will also discuss how working-group participants benefit as part of the vanguard.

May 12: Turning Fuzzy Expectations Into Engineering Reality: Quality Function Deployment. Peter D. McQuade, PhD, Distinguished Service Professor in the School of Systems and Enterprises, Stevens Institute of Technology.

Abstract: This presentation introduces the audience to the basics concepts of Quality Function Deployment (QFD) for aerospace systems. The presentation will discuss the philosophy and purpose behind QFD, and how QFD can be applied to help derive firm system requirements from "fuzzy" stakeholder expectations. They audience will be able to try their hand at building a QFD matrix for an intriguing problem. ∞

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News From the Front

Requirements Working Group (RWG) at IW10

Bill Bearden, Los Alamos National Labs

The RWG had a full schedule during IW2010. The principal activity was a review of the initial release of the *Guide to Writing Requirements*, an effort led by Jeremy Dick, former RWG chair. The guide addresses how to express textual requirements in a systems engineering context. A teleconference was held to discuss the current draft and approach. The guide will be structured using practical rules for writing requirements, along with the underlying objectives as to why the rules need to be applied.

Two members of the RWG are actively involved in the development of international standards. Bill Bearden presented the scope and status of Draft ISO/IEC 29148, *Software and systems engineering - Life cycle processes – Requirements engineering*. This draft standard is in final review stages. The latest committee draft is posted on the RWG website. The ballot results will be compiled at the Plenary meeting in May, and the standard released for registration as a Final Draft International Standard over the summer.

Ken Ptack briefed the status and plans for ISO/IEC 29110, *Software Engineering – Lifecycle Profiles for Very Small Entities (VSEs),* Parts 1-5. These are a series of technical reports and standards addressing the processes of adapting software engineering best practices to entities having up to 25 people. Much of the ongoing work in this area is in pilot projects. ∞

Other Announcements

Mary Compton, Sandia National labs

INCOSE Circle Awards: Many thanks to Heidi Hahn and Francis Peter for their work on the Chapter's submission. The Gold, Silver, and Bronze Circle awards are presented every year to chapters meeting INCOSE's goals and standards.

The Annual Planning Session was held by members of the Board on February 19th. More will be said as development efforts mature, but highlights include:

- Development of this year's Strategic Plan is led by Heidi Hahn.
- Development of the Membership Outreach Plan is led by Francis Peter.
- A quarterly newsletter will be initiated in Q1 with Rick Dove as the editor.
- We will experiment with joint society meetings, with Tana Lucy taking lead.
- We will experiment with an Open Space Meeting, with Ron Lyells taking lead.
- We will also experiment with lunch-time meetings and multi-day tutorials.
- Jorge Hernandez accepted the new position for Chapter IT leadership. ∞

Talk About Town

Santa Fe Institute public lectures, 7:30pm at James A. Little Theater, New Mexico School for the Deaf, Santa Fe:

May 5, Nathan Eagle –Big Data, Global Development, and Complex Systems.

June 16, Aaron Clauset - The Future of Terrorism. ∞

Conference News & Dates

Something new this year at the IEEE Systems Conference is a special 12-paper INCOSE track. Papers submitted for this track follow the INCOSE International Symposium submission guidelines, rather than IEEE guidelines. The principle differences are style and reviewer community.

2010 Q2 (near by or noteworthy)

Apr 05-06, San Diego, Annual IEEE Systems Conference, with INCOSE track.

Apr 12-14, Las Vegas, International Conference on Information Technology: New Generations.

Apr 12-15, Colorado Springs, National Space Symposium.

Apr 28-29, Phoenix, International Border Security.

May 19-20, Albuquerque, Technology Ventures Equity Capital Symposium.

May 23-27, Phoenix, Department of Defense Intelligence Information System (DoDIIS) Worldwide Conference.

Jun 17, Colorado Springs, Techexpo Top Secret Career Fair.

Jun 22-24, Colorado Springs, Fulfilling the Warfighter's Vision 2010.

Jul 11-15, Chicago, INCOSE International Symposium, IS10.

2011

Jan tbd, Mesa/Phoenix, INCOSE International Workshop IW11.

Jun 17-23, Denver, INCOSE International Symposium, IS11. ∞

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