29th Annual INCOSE international symposium

Orlando, FL, USA
July 20 - 25, 2019

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System Applications for Global Challenges

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Welcome to the 29th Annual INCOSE International Symposium

Annually since 1991, the INCOSE International Symposium has a rich history of delivering high-quality content focused on the future of systems engineering.

INCOSE's Annual International Symposium is the largest worldwide annual gathering of people who do systems engineering for four days of presentations, case studies, workshops, tutorials, and panel discussions. The program attracts an international mix of professionals at all levels, and includes practitioners in government and industry, as well as educators and researchers. The benefits of attending the Symposium include the opportunity to share ideas, network, build competency, pursue certification, contribute to the advancement of the profession through collaboration on tools, processes, and methodologies, learn about new offerings in training and education, and forge new partnerships.

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INCOSE Mission

Overview

The International Council on Systems Engineering (INCOSE) is a not-for-profit membership organization that promotes international collaboration in systems engineering practice, education and research.

Vision

A better world through a systems approach.

Mission

To address complex societal and technical challenges by enabling, promoting, and advancing systems engineering and systems approaches.

Strategic Objectives

Premier. INCOSE is the premier choice of systems engineers everywhere for their professional development needs.

Future. INCOSE leads the community in shaping the future of systems engineering.

Value. INCOSE delivers ever greater value to a growing and increasingly diverse membership.

50+
Working Groups

100+
Corporate Advisory Board Members

Vibrant Academic Community
Faculty, Curriculum, Research, Student Divisions, Youth Outreach

Chapters
70+ Chapters in over 35 Countries

For additional information about INCOSE,
Please come to our INCOSE Village in the Exhibit Hall
or visit our website **www.incose.org**
or contact us at **info@incose.org**

INCOSE Values

1 Systems Thinking
Thinking and acting to apply systems approaches to address complex challenges and thus to realize successful sustainable solutions.

2 Pioneering and Innovation
Taking opportunities ourselves or with partners to evolve systems approaches to meet future challenges.

3 Learning and Development
Life-long learning with a changing world through education and continuing professional development, covering both technical and leadership competencies.

4 Respect, Diversity, Collaboration
Building and maintaining respectful relationships internally and externally in order to enable effective collaboration across the diverse community.

5 Individuals
The importance of people, their intellect and influencing skill, to support complex decisions and to deliver enduring change.

6 Volunteerism
Volunteers and staff working together to achieve our objectives and to deliver benefit to our members, individuals and society.

INCOSE Principles

Our values represent **who** we are. Our vision and mission represent **what** we are trying to achieve. Our principles represent **how** we pursue our vision / mission within the bounds of our values.

1 Impact
INCOSE assesses its impact based on the delivery of value to members and other stakeholders.

2 Partnership
INCOSE builds and disseminates products and services jointly with others to maximize our impact.

3 Holism
INCOSE emphasizes the whole over the individual parts in our creation of an integrated global technical network.

4 Differentiation
INCOSE recognizes the unique value of those who choose to affiliate with us, prioritizing direct affiliation and active participation over indirect or passive connection.

5 Volunteers
INCOSE is led by volunteers who set our fundamental direction.

INCOSE Certification

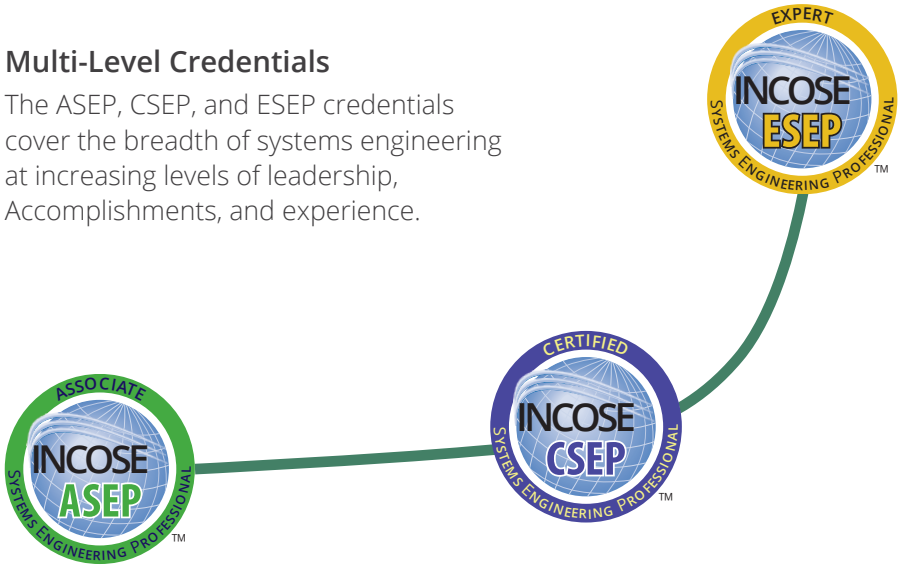
The International Council on Systems Engineering established a multi-level Certification Program to provide a formal method for recognizing the knowledge and experience of Systems Engineering Professionals (SEPs), regardless of where they may be in their career.

3000+ Certified

30+ Countries

Multi-Level Credentials

The ASEP, CSEP, and ESEP credentials cover the breadth of systems engineering at increasing levels of leadership, Accomplishments, and experience.



What is Certification?

Certification is a formal process whereby a community of knowledgeable, experienced, and skilled representatives of an organization, such as INCOSE, provides confirmation of an individual's competency (demonstrated knowledge, education, and experience) in a specified profession. Certification differs from licensing in that licenses are permissions granted by a government entity for a person to practice within its regulatory boundaries. Certification also differs from a "certificate" that documents the successful completion of a training or education program, in that it is not guaranteed simply by paying a fee, and certification must be maintained.

www.incose.org/certification

Notes

General Information

PLEASE WEAR YOUR NAME BADGE AT ALL TIMES. IT IS REQUIRED FOR ENTRY TO ALL SESSIONS, EVENTS AND MEALS.

Symposium venue

The Symposium venue, registration, technical sessions, business meetings, exhibits, receptions and lunches are all held at the:

Hyatt Regency Grand Cypress

One Grand Cypress Blvd. - Orlando, FL - USA

Emergency messages can be taken by the hotel switchboard **+1 407 239 1234**

Messages

Messages will be posted regularly on a board near the Registration Desk. The daily modifications of the schedule are announced at plenary sessions and will be posted on the information boards near the Registration Desk.

Badges

Green ..... *Speakers*

Orange ..... *Exhibitors*

White ..... *Full Registration*

Yellow ..... *Day attendance*

Purple ..... *Guests*

Cyber C@fé

Location: Portico Foyer – Ground Level

Saturday to Thursday ..... *0700 – 1700*

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APP

Flash the QR code below or connect to the symposium website with your smartphone or tablet and you will receive instructions how to download the app for Apple or Android devices.

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Registration & Information Hours

Location: Portico Foyer - Ground floor

Friday ..... *0800 - 1700*

Saturday ..... *0700 – 1700*

Sunday ..... *0700 – 1900*

Monday - Wednesday ..... *0700 – 1700*

Thursday ..... *0700 – 1200*

QR Code

All badges will contain a QR Code.

Definition: A QR Code (quick response code) is a type of 2D bar code that is used to provide easy access to information through a smartphone or tablet. The QR Code may be used as a way to quickly and easily share your contact information with our exhibitors. Your QR Code includes your name, company, state and country and the email address that you entered during the registration process. You also may share your contact information with others, but at no time are you obliged to do so.

Internet Access

A free Wireless Internet network is available in the Cyber Café, Exhibition and Lunch areas.

Connect to Wireless Network **IS2019**. Then enter the password: **INCOSE2019**. Click on Connect.

Speakers and Session Chairs' Breakfast

Location: Magnolia – Ground Level

Saturday to Thursday ..... *0700 – 0745*

Speakers' Ready Room Hours

Location: Magnolia AB – Ground Level

Saturday to Wednesday ..... *0745 – 1700*

Thursday ..... *0745 – 1330*

Exhibit Hall Hours

Location: Regency Hall – Ground Level

Monday ..... *0930 – 1930*

Tuesday ..... *0930 – 1800*

Wednesday ..... *0930 – 1700*

Thursday ..... *0930 – 1330*

General Information

Meals

Continuing the long tradition of lunch in the Exhibit Hall, this year lunches, Monday - Thursday will consist of food items that you can easily eat while strolling through the Hall. Plan to enjoy this extra opportunity to learn more about symposium exhibitors and sponsors.

Tickets

Additional tickets can be purchased, at the registration desk for the following (subject to availability).

- Ice Breaker Reception for guests and day attendee
- Exhibitors' Reception for guests and day attendee
- INCOSE Island Night

eProceedings

Connect to the e-proceedings using Symposium URL:

www.is2019eproceedings.com

Enter the email address used to register to the Symposium and the confirmation number included in your confirmation e-mail. Then you can navigate through the program to download individual papers or all papers.

INCOSE Business Meetings

Working groups and other committees also meet during the symposium. The room assignments and information about these meetings can be found on the APP, and website, under Business Meetings. Announcements about additional meetings or room changes will be posted on the information boards. This is an opportunity to learn about or become more involved in the business of INCOSE.

Key Reserve Papers

All posters will be available to view all week in the **Portico area**. Papers for all key reseve papers can be found in the symposium proceedings.

INCOSE Village

Learn more about the services and products provided by INCOSE at the village. Meet members of the support team and discover ways to get more involved.

New Products

Be the first to get copies of the newest INCOSE products by visiting the village. As an added bonus – Meet the experts who developed those new products!

Upcoming Events

Learn more about upcoming events from the event organizers at the INCOSE Village.

Website

Do you have questions about the new website? Get your questions answered at the village.

Award Presentations

Best papers were selected by Technical Operations prior to the Symposium and are indicated in the program.

Monday Opening Plenary – July 22

Awards for Best Symposium Papers

Tuesday Plenary – July 23

Pioneer Award

INCOSE Fellows

Founders Award

Outstanding Service Awards

Annual SE Journal Best Paper

Annual INSIGHT Best Paper

ISEF Prize

INCOSE Foundation Stevens Doctoral Award for Promising Research in Systems Engineering and Integration

INCOSE Foundation JHU Alexander Kossiakoff Award for Promising Applied Systems Engineering Research

Wednesday Plenary – July 24

The Chapter Circle Awards

The Director's Award for the Most Improved Chapter

The President's Award for the Most Outstanding Chapter

The Chapter Good Neighbor Awards

Social Events

Corporate Advisory Board Dinner (By invitation only)

Saturday, July 20 .....*1900-2200*

Cuba Libre
9101 International Dr, Pointe Orlando,
Orlando, FL 32819

Welcome Lunch for New Members

Monday, July 22 .....*1210-1330*

La Coquina – Ground Level

New to INCOSE? Find out how to make the most of INCOSE and the symposium as you enjoy a buffet lunch. Take advantage of this special opportunity and have some fun as you make new connections across the systems engineering community. Learn from INCOSE leaders and seasoned systems practitioners who will share how INCOSE can help advance your career.

Ice Breaker Reception

Monday, July 22 .....*1800 - 1930*

Exhibit Hall, Regency hall - Ground Level

Recharge and reconnect at the annual Ice Breaker Reception! Enjoy beverages and canapéswhileyouconnectwithnewacquaintances and those you may see only occasionally during the year. This evening provides a chance to gather with your colleagues in a relaxed setting in our elegant Exhibit Hall.

Sponsored by BOEING

The Exhibitors' Reception

Tuesday, July 23 .....*1700 - 1800*

Exhibit Hall, Regency Hall - Ground Level

Mix business with pleasure as you meet exhibitors, chat with friends, and sample drinks with light snacks in an informal reception surrounded by the latest in technology, poster papers, and research.

Certification Reception

(ASEP, CSEP, ESEP only)

Tuesday, July 23.....*1800 – 1900*

La Coquina – Ground Level

Empowering Women Networking Event

Wednesday, July 24 .....*1715-1815*

Trellises Lounge – 18th Floor

Members and Supporters of Empowering Women as Leaders in Systems Engineering (EWLSE), please join us at the Trellises Lounge on the 18th Floor for a one hour networking event. There will be light snacks, and one drink ticket per attendee including your guest, and a chance to network with INCOSE and EWLSE leaders. During the conference, keep a look out for those wearing an EWLSE button to find out more about.

INCOSE Island Night

Wednesday, July 24

Grand Cypress Ballroom – Ground Level

Doors open at *2000*
Music and dancing begin at.....*2030*

Join us for the INCOSE Island Night.

In lieu of a formal banquet this year, please join your INCOSE friends and colleagues for a night of Floridian fun. Enjoy live island music, dancing, tropical drinks, and Caribbean-inspired desserts.

Dress is resort casual (or whatever you are comfortable in).

Sponsored by AEROSPACE

Networking Reception

Thursday, July 25.....*1530 - 1630*

Portico Foyer – Ground Level

This event is the moment for the final networking, exchange of business cards, arrangements for the next meeting, or just a relaxing respite at the end of the symposium.

Notes

Keynote Speakers

MONDAY

Dr Wanda Austin
Interim President, University of Southern California

Keynote Title:
Interdisciplinary Systems Engineering inspired by da Vinci

Prashant Dhawan
Co-Founder, Biomimicry India

Keynote Title:
Biomimicry - A Bioinspired approach to Systems Thinking

TUESDAY

WEDNESDAY

Capt. Winston Scott
Director, Environmental, Tectonics Corporation

Keynote Title:
To the Stars. The Sky Is No Longer the Limit

Grant Begley
CEO, Rocket Crafters

Keynote Title:
The Underway Global Unmanned Systems and Robotics Revolution

THURSDAY

Please read the day tabs for more information about each speaker.

Embarking on a Grand Challenge .....*Mon, 1000-1210*

Grand Cypress Ballroom GH - Ground Floor

Moderator(s):

Kerry Lunney (*Thales Group*)

Panellist(s):

Serge Landry (*Anacle Systems*)

Patrick Godfrey (*Systems Thinking*)

Michael Pennotti (*Stevens Institute of Technology*)

Hillary Sillitto

Abstract. Grand challenges (GCs) "represent the greatest obstacles to attaining universal well-being" (Ref: Wikiversity). They are "ambitious but achievable goals that harness science, technology and innovation to solve important national or global problems, and that have the potential to capture the public's imagination" (Ref: White House). One such GC is Clean Water that everyone can relate to. Focusing on this one GC will enable INCOSE to participate at a global level on a complex systems problems that we can apply a systems approach, engage with a variety of stakeholder groups with a similar purpose and embark on a collaborative, learning journey. What better way can INCOSE demonstrate its vision of "a better world through a systems approach".

This session will kick off with a presentation and discussion on possible heuristics principles for such complex problems and associated mental models/filters to be considered. This is the start of a cyclic learning journey that embraces "all industries and members with an interest in systems". It should itself help us all in making sense of the complexity we face in our own industries and contexts.

With these principles in mind, an interactive phase will follow, focusing on the Grand Challenge, Clean Water. During this phase we will probe for ideas, concepts, exacting and balancing science, processes and practices with holism and passion.

Information and material gathered in this session will contribute to our initiative in GCs and support our endeavours in advancing a systems approach to a GC, in particular Clean Water, collaborating with external teams on this complex problem. We invite all those who appreciate the need to join us in this journey.

What is Systems Thinking and how do I do it?

AI in Systems Engineering .....*Thu, 1000-1210*

Grand Cypress Ballroom I - Ground Floor

Moderator(s):

Thomas Shortell (*Lockheed Martin*)

Panellist(s):

John Artus (*Lockheed Martin*)

Tom McDermott (*Stevens Institute*)

Abstract. As Artificial Intelligence and Autonomy change the world, Systems Engineering will change but the true question is whether AI/Autonomy is bringing doomsday to the world or will AI/Autonomy work and positively affect humans in the world? This session will debate the insertion of AI and Autonomy into Systems Engineering considering both systems of interest and how systems engineers use the the life cycle processes. The debaters will discuss many engineering, ethical, and legal questions of the use of AI and autonomy in SE including autonomous cars, defense systems, medical systems, and critical infrastructure and cyber security. The debate will include whether the current set of mindsets, methods, processes, and tools are equipped for the use of AI and autonomy in today's world. The debaters will debate questions requested by the audience as time permits.

Invited Panels

FuSE, SE Transformation, and Digital Engineering .....*Thu, 1000-1210*

Grand Cypress Ballroom C - Ground Floor

Moderator(s):

Bill Miller (*Stevens Institute of Technology*)

Panellist(s):

Troy Peterson (*System Xi*)

Kevin Robinson (*Shoal Group*)

Heinz Stoewer (*Space Associates*)

Monica Nogueira (*SAE International*)

Abstract. Digital Engineering poses opportunities and challenges to be an enabler for Systems Engineering Transformation and the Future of Systems Engineering. As Digital Engineering matures, the opportunities and challenges are ...

- Systems community being able to determine what is needed for the Systems Engineers of the future to perform Digital Engineering
- Digital Engineering providing an adequate foundation for the Future of Systems Engineering
- Development, integration, and use of models adequately informing enterprise and program decision making; and embracing models as the basis of engineering
- Digital Engineering providing an enduring, authoritative source of truth; managing data as an asset
- Digital Engineering providing sufficient technological innovation to facilitate the transformation of the engineering practice
- Systems Engineering establishing a supporting infrastructure and environments to perform Digital Engineering activities, collaboration, and communication across stakeholders
- Limits of a "Digital Twin"
- Culture and workforce adopting and supporting Digital Engineering across the lifecycle
- Ability to manage the modeling environment (models, data, interfaces, etc.) in a changing, dynamic environment (change of models, systems and stakeholder interactions)

Panelists will provide perspectives on their uses and needs for Digital Engineering and their beliefs on whether it is sufficient to meet future needs. "Are we currently on a path to provide digital engineering for yesterday rather than for tomorrow?"

Grand Cypress Ballroom C - Ground Floor

The Systems Engineering Competency Framework .....*Mon, 1000-1040*

Cliff Whitcomb, Mimi Heisey

Abstract. In 2014, INCOSE leadership tasked the Competency Working Group to develop an INCOSE systems engineering competency framework (ISECF). The INCOSE Competency Framework was released as a technical product in July 2018. The ISECF can be used to produce competency models tailored to the needs of the customer organizations. The ISECF is not a competency model – it is meant to be used as a guide to the creation and development of competency models used by organizations. The ISECF was developed based on a number of existing competency models, including the INCOSE UK Systems Engineering Competency Model, the DoD Better Buying Power 3.0 Implementation Plan, the Defense Acquisition University Competency Model, the US Navy Systems Engineering Career Competency Model, the INCOSE Systems Engineering Handbook Fourth Edition, and the Systems Engineering Professional Certification Program. The ISECF is now being followed up by the development of a systems engineering assessment guide that is based on the ISECF. The assessment guide is to be used as a basis for organizations to develop assessment plans for systems engineers. This presentation will summarize the ISECF, explain the development of the companion assessment guide, and describe the way forward for future work in the competency area.

What makes a competent System of Systems engineer? .....*Mon, 1045-1125*

Alan Harding, Beth Wilson

Abstract. Systems of Systems (SoS) are now an established part of our systems engineering vocabulary - referring to that class of system where its elements have varying degrees of managerial or operational autonomy (Maier 1988). While a SoS is itself a system, it is recognised that this reduction in control over their development and operation requires different methods to realise and operate them, and to participate in them. In July 2019 INCOSE published its Systems Engineering Competency Framework. This framework, based on earlier work in UK, covers all of the competencies that are generally required across the discipline of systems engineering. The collected experience of the INCOSE SoSWG suggests that the activity of engineering/managing a system of systems, or of engineering/managing a system in a SoS context does require different competencies in the systems engineers who are involved. This presentation will explore three perspectives (typical SoS Engineering (SoSE) roles; what review of the SoSE pain points tells us about competencies for SoSE; and the insights we can gain from the maturing ISO standard ISO/IEC/IEEE DIS 21840 (guidelines for the utilization of ISO/IEC/IEEE 15288 in the context of System of Systems (SoS)). This presentation will summarise these three inputs, synthesise them into an overview view of competency for the application of systems engineering to SoS, and an indication of future work in the area.

Systems Engineering: Cracking the Code of Digital Transformation ....*Mon, 1130-1210*

Troy Pedersen

Abstract. While complex systems transform the landscape, the Systems Engineering discipline is also experiencing a transformation to a model-based discipline. In alignment with this, the International Council on Systems Engineering (INCOSE) is seeking to strategically accelerate this transformation. The approach is to build a broad community that promotes and advances model-based methods to manage unprecedented change, empower digital transformation and prepare companies for what's next to speed innovation. More specifically, to leverage the discipline of Systems Engineering and practice of model based systems engineering (MBSE) as the core capability to digitally transform for advantage.

From Apollo to the Space Shuttle and All Industries: The Trace-Elements of the Transformation of Systems Engineering .....*Mon, 1330-1410*

Dr. Larry Kennedy (*CEO Quality Management Institute, Co-Founder Systems Engineering Quality Management Working Group*)

Abstract. Fifty years ago, Apollo Astronauts first set foot on the lunar surface with the declaration that it was "one giant leap for mankind." It certainly was a leap forward in technologies as well as the public awareness of the prowess of systems engineering when it functioned in sync with the objectives of the mission. So, since then, what have we done, what have learned and what have we lost?

The quality of Systems Engineering has both improved and deteriorated even though the problems of development and deployment are relatively the same as always - people and processes that are supported by the tools of the discipline, etc. - all with the demand of satisfying a set of requirements described by a customer or customers. There have been triumphant announcements regarding the advancement of our ability to make outcomes more certain and our processes more measurable. And there has also been an increased emphasis on time to market, responsiveness and opportunism. But the statistics too-often do not support the promised results.

In this session, we'll discuss the "trace-elements" of the transformation of systems engineering culture over the past fifty years and the "lessons learned." We'll examine the efficacy of list-managing software, analytics and AI. And, we'll envision a promising future by building upon our competencies with carefully crafted "intelligent systems."

Smart Cities Panel .....*Mon, 1415-1455*

Ken Kapchar, Ken Crowder

PM-SE Integration Workshop.....*Mon, 1530-1655*

Tina Srivastava, Randy Iliff

Abstract. This is an interactive workshop to internalize some of the key principles arising from research into integrating the disciplines of program management and systems engineering to achieve improved program outcomes. Development effort is "different" than production. That difference arises any time "new" requirements must be added to the effort and creates a unique set of technical and management constraints. This powerful activity reveals the essential interaction between definition (SE) and execution (PM) of work, as well as providing insight into the unique nature of development effort. The workshop will also highlight key activities of the INCOSE-PMI Alliance and the PM-SE Integration Working Group.

Invited Technical Operation Content

SE Fundamentals Sessions

Poinciana - Ground Floor

Systems Engineering Complexity in Context .....*Mon, 1000-1040*

Sarah Sheard (*Carnegie Mellon University Software Engineering Institute*)

Abstract. Complexity is often blamed for systems engineering problems, but rarely with a precise definition of complexity. A paper cataloging complexity for the purpose of adjusting systems engineering cost estimates (Young, Farr, and Valerdi, 2010) identified more than 30 relevant types. Which of these types should systems engineers consider?

This talk defines complexity and identifies what entities within systems engineering problem spaces can be complex. It shows where in the system space these many varied types of complexity can arise. The presentation describes how a system being developed, the project developing the system, the environment, and cognitive challenges interact and can result in complexity.

The systems engineer should be able to recognize complexity, bring together various tools to identify and manage it, and measure the remaining risks to the project.

What is Systems Thinking and how do I do it? .....*Mon, 1045-1125*

Duncan Kemp (*UK Ministry of Defence*)

Abstract. This presentation will explain the fundamentals of Systems Thinking and how to apply it. Duncan will explain why Systems Thinking is critical to effective systems engineering. Using personal examples from Defence, Rail, Information Services and Business Transformation, he will introduce a series of simple yet powerful techniques. These will include: how to understand situations from multiple perspectives; how to understand the interactions between different elements; how basic systems concepts can be used to predict behaviour; and, the relationship between systems thinking, systems engineering, critical thinking and basic numeracy. Finally Duncan will help participants understand how to start their journey as System Thinkers.

Framing (and modeling) the Problem: Eliciting needs and deriving requirements .....*Mon, 1130-1210*

Alejandro Salado (*Virginia Tech*)

Abstract. Correctly framing the problem to be solved is a necessary condition to perform rational engineering. Without a proper formulation of the problem to be solved, success in engineering becomes a game of pure chance. Identifying preferences, eliciting needs, and deriving requirements are some vehicles by which systems engineers can unveil what the true problem or opportunity is. With such explicit framing of the problem, predictions on the success of the engineering endeavor using verification and validation become possible. Unfortunately, formulating engineering problems is arguably amongst the most difficult tasks in engineering. Yet, an engineer often completes his/her education without being formally exposed to these concepts. This introductory talk on problem formulation will cover fundamental concepts in problem formulation and problem modeling, will provide a few tricks to clearly distinguish between needs and requirements, as well as between verification and validation, and will point to methods that are effective in supporting the activities of need elicitation and requirement derivation.

SE Fundamentals Sessions

An Approach for Implementing MBSE in Aerospace Organizations.....*Mon, 1330-1410*

Chris Schreiber (*Lockheed Martin Space*)

Abstract. For the last 10+ years, Lockheed Martin Space has been pursuing the use of model-based techniques for use executing systems engineering process. Over that timeframe, we have collected a number of observations and learned a number of lessons that have shaped our approach to supporting the practice of model-based systems engineering (MBSE) across our enterprise. This presentation will take a look those observations and lessons, describe how they've impacted our approach to implementing across our organization, and have impacted our future directions for MBSE.

Introduction to Systems of Systems .....*Mon, 1415-1455*

Mike Ryan (*University of New South Wales*)

Abstract. This presentation will provide a brief introduction to the nature of system-of-systems (SoS), as distinct from the nature of systems(-of-elements). Based on the INCOSE SoS Primer and the final draft of ISO/IEC/IEEE 21839, the presentation provides definitions of SoS and of systems, and then goes on to explain the four main types of SoS: directed, acknowledged, collaborative, and virtual. The presentation makes some observations regarding the differences and similarities in design of SoS and design of systems. In particular, an appropriate design perspective (a systems-centric perspective) is shown to be useful in designing SoS.

Being Agile: Systems Engineering for Continuous Lifecycles.*Mon, 1530-1610*

Tom McDermott (*Stevens Institute of Technology*)

Abstract. "Continuous development and deployment" at the "speed of relevance" should be a core tenet of all systems today and the enterprises that acquire provide them. This presentation discusses the relationships between systems engineering, agile practices, and continuous lifecycles for development and operations (DevOps). "Traditional" systems engineering is often characterized as too slow and inefficient while many agile programs are said to fail due to lack of good systems engineering. How do traditional and agile system engineering practices converge? What do systems engineers need to know in the adoption of agile and DevOps practices? These questions are rooted in the foundations, history, and emergence of systems and software engineering as separate disciplines. We will explore this history and the paths to convergence necessary to make continuous development and deployment a natural aspect of systems engineering.

How to talk about SE without scaring people.....*Mon, 1615-1655*

Courtney Wright (*V1 Decisions*)

Abstract. Courtney Wright is INCOSE's Certification Program Manager, an instructor of SE professional development courses for non-engineers, and the recipient of many eye rolls from her teenaged children. All three audiences have heard her talk extensively about systems engineering, with varied levels of interest. She is not scary.

MBSE Lightning Round

Grand Cypress Ballroom C - Ground Floor

Building on last year's MBSE Lightning Round 1, leading MBSE practitioners and researchers will gather for fast-paced/TED-like presentations on a variety of Model-Based Systems Engineering topics--distilling MBSE lessons, critical implementation issues, and future directions into a series of 18 minute talks with in depth Q&A/discussions on the topics following the presentations.

Using System Architecture Models to Populate Structured Requirements..... *Tue, 1545-1605*

Ron Carson

Abstract. How good do you want your requirements to be when they are created? When they mature and are being verified? How can we ensure high-quality, verifiable requirements when they are first written? In this presentation we explain how to use a system architecture model to populate and analyze structured requirements templates so as to help ensure high-quality, verifiable requirements from the beginning. Elements of an architecture model are mapped to a requirements template. Then simulation and analysis of the model is used to validate the model and requirements. Using an industry requirements quality measurement model we show that this can enable higher quality and more valid requirements compared with not using the system architecture model.

Using the Viable System Model to Focus on the Human Aspects of Problems. ..... *Tue, 1605-1625*

Bob Kenley

Abstract. There once was a university course full of engineers who were assigned to teams and asked to develop system solutions for complex organizational problems that were chock full of human considerations. The earnest students had somewhat low empathy quotients and relatively high systemizing quotients. They and their project partners discovered to their amazement that there is a formal systems model that allows even the most geeky among us to uncover and appreciate the human context of an organizational situation before taking the deep dive to come up with system solutions.

MBSE—a Major Force for Enabling Digital Enterprises ..... *Tue, 1625-1645*

Heinz Stoewer

Abstract. MBSE has advanced well beyond pilot projects, enabling new perspectives. These could involve the "integration" of all engineering disciplines and the simultaneous "correlation" with advanced PLM methodologies. Provided a holistic set of databases and a set of "end-to-end" seamless supporting tools can be realized these three elements together could become the backbone for digital enterprises of the future.

This presentation will outline options and hurdles for such a journey. It is in part based upon a panel discussion held at the January 2019 "Fourth MBSE Symposium and Workshop" at NASA JPL, Pasadena

MBSE Lightning Round

Enhancing the Value of Architecture Models ..... *Tue, 1645-1705*

James Martin

Abstract. It is not uncommon to have spent considerable effort in creating a number of architecture models that end up spending most their time on the shelf. How can we ensure that this does not end up being the case? This talk will focus on how to do "problem framing" up front to identify the intended uses and users of the models, the questions that these models can help to answer, and the views that will help convey the answers that the models can provide to better understand the architectural trade space. This Problem Framing approach has been shown to greatly increase the value of architecture models and resulting in greater appreciation of the architecture being pursued.

Pratitioner's Challenge

Applying Digital Engineering, Architecture, and Modular Open Systems Approach (MOSA) to help solve a Mission Level Sociotechnical problem.

The 2019 International Symposium Project Team is pleased to announce the **4th Annual Practitioner's Challenge**. The purpose of the Challenge is to engage Symposium participants in a collaborative manner to demonstrate how systems engineering can be used to address and support solutions to global, sociotechnical issues. For the 2019 Practitioner's Challenge, the focus will be on the application of Digital Engineering, Architecture, and Modular Open Systems Approach (MOSA) methods to a major mission- level challenge.

What is the Practitioner's Challenge?

A well-attended part of the International Symposium (IS) that offers practitioners a practical problem to solve and to demonstrate their capabilities. This year's challenge provides participants an opportunity to explore an interesting problem in Digital Engineering, Architecture, and MOSA, and demonstrate the solutions to a wide audience.

Why should I participate?

The primary objectives for participants of the Practitioner's Challenge are:

- Let participants collaborate on a sociotechnical problem;
- Demonstrate the value of applying Digital Engineering, Architecture, and MOSA to a defined problem;
- Gain new insights into the applications of Digital Engineering, MOSA by interacting with a wide variety of systems engineers: new INCOSE members, members from defense, aerospace, and a range of other domains; and
- Create a series of artifacts that can be used by participants and INCOSE to demonstrate the value of important systems engineering approaches.

What Do I Need to Do?

- Register for the challenge when you register for the International Symposium.
- Attend a webinar prior to the conference on June 14th, 2019 to learn more about the challenge.
- Join fellow participants during a few sessions of the conference technical track (there is flexibility here).

For more information on the Practitioner's Challenge contact
Frank Salvatore (*frank.salvatore@saic.com*)

Platinum Sponsor

LOCKHEED MARTIN

www.lockheedmartin.com

Sponsor-exhibitor track: Tue 23, Jul 14:15-14:45 *(Regency 5-Ground Level)*
Sponsor-exhibitor track: Wed 24, Jul 14:15-14:45 *(Regency 5-Ground Level)*

Headquartered in Bethesda, Maryland, Lockheed Martin is a global security and aerospace company that employs approximately 100,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. The Corporation's net sales for 2017 were $51 billion.

Gold Sponsors

www.boeing.com

The Boeing Company is the world's largest aerospace company and leading manufacturer of commercial jetliners, defense, space and security systems, and service provider of aftermarket support. Boeing products and tailored services include commercial and military aircraft, satellites, weapons, electronic and defense systems, launch systems, advanced information and communication systems, and performance-based logistics and training.

Silver Sponsor

www.aerospace.org

Sponsor-exhibitor track: Tue 23, Jul 11:30-12:00 *(Regency 6-Ground Level)*

In an era of dynamic change in space, Aerospace is addressing a generation of complex challenges. We operate the only federally funded research and development center (FFRDC) committed exclusively to the space enterprise. Our technical experts span every discipline of space-related science and engineering.

Bronze Sponsors

www.ibm.com

Sponsor-exhibitor track: Mon 22, Jul 13:30-14:00 *(Regency 5-Ground Level)*
Sponsor-exhibitor track: Tue 23, Jul 16:15-16:45 *(Regency 6-Ground Level)*

Booth: 27-28

IBM's Watson IoT division unlocks your Engineering Lifecycle Management process with IoT and AI. As everything from cars to various devices gets created and connected, IoT is changing the way businesses operate. IBM's Engineering portfolio can make running your enterprise easier while reinventing how you interact with the physical world.

www.aras.com

Sponsor-exhibitor track: Wed 24, Jul 10:45-11:15 *(Regency 5-Ground Level)*

Booth: 30

Aras enables the world's leading manufacturers of complex, connected products to transform their product lifecycle processes and gain a competitive edge. Aras' open, flexible, scalable, and upgradable PLM platform and applications connect users in all disciplines and functions to critical product information and processes across the extended enterprise. Visit www.aras.com to learn more.

Bronze Sponsors

MID
the modeling company

www.smartfacts.com

Sponsor-exhibitor track: Mon 22, Jul 11:30-12:00 *(Regency 6-Ground Level)*

Booth: 6

MID spcializes on model based solutions and presents smartfacts, collaboration platform for modeling tools, TOOLBUS, a model migration framework and Innovator a SysML modeling tool suite.

SIEMENS

www.siemens.com/plm

Booth: 14

Siemens PLM Software is a world-leading provider of product lifecycle management (PLM) software. We help thousands of companies make great products by optimizing their lifecycle processes, from planning and development through manufacturing and support. Visit www.siemens.com/plm to learn more about our products.

WPI

online.wpi.edu

Sponsor-exhibitor track: Tue 23, Jul 10:45-11:15 *(Regency 6-Ground Level)*

Booth: 11

Worcester Polytechnic Institute is a renowned engineering and research university in Worcester, Massachusetts. Their expertise in systems engineering is ingrained in programs that range from general awareness in SE training, INCOSE certification boot camp, and graduate level certificates and a master of science degree with a focus on leadership.

Exhibitors

Exhibition Hours
Regency Hall - Ground Level

Monday ..... 0930 - 1930
Tuesday ..... 0930 - 1800
Wednesday ..... 0930 - 1700
Thursday ..... 0930 - 1330

Corporate

30 - Aras Corporation ..... *www.aras.com*
Aras Corporation is a bronze sponsor - please see the sponsors pages for more information.

23 - BigLever Software ..... *www.biglever.com*

Sponsor-exhibitor track: Tue 23, Jul 14:15-14:45 *(Regency 6-Ground Level)*

BigLever Software is the long-standing leader in Product Line Engineering (PLE). BigLever's onePLE solution delivers the leading-edge technology, methodology, business strategy and organizational change needed to establish a successful PLE practice. Some of the world's largest forward-thinking organizations are leveraging BigLever's PLE solution to engineer their competitive advantage through order-of-magnitude improvements in productivity, time-to-market, portfolio scalability, and quality.

13 - Capella ..... *www.polarsys.org/capella/*

Sponsor-exhibitor track: Tue 23, Jul 13:30-14:00 *(Regency 6-Ground Level)*

Capella is an Open Source Model-Based Systems Engineering workbench that helps engineers formalize systems specifications and master their architectural design. Sustainable and adaptable, Capella is a solution that has already been successfully deployed in a wide variety of industrial contexts (aerospace, communication, transportation, etc.).

31-32 - CATIA - No Magic ..... *www.nomagic.com*

Sponsor-exhibitor track: Mon 22, Jul 14:15-14:45 *(Regency 5-Ground Level)*
Sponsor-exhibitor track: Tue 23, Jul 13:30-14:00 *(Regency 5-Ground Level)*

MagicDraw is the award-winning business process, architecture, software, and system modeling tool with teamwork support. Designed for Business Analysts, Software Analysts, Programmers, QA Engineers, and Documentation Writers, this dynamic and versatile development tool facilitates analysis and design of Object Oriented (OO) systems and databases. It provides the industry's best code engineering mechanism (with full round-trip support for Java, C++, C#, CL (MSIL) and CORBA IDL programming languages), as well as database schema modeling, DDL generation and reverses engineering facilities.

26 - ClearObject ..... *www.clearobject.com*

Sponsor-exhibitor track: Tue 23, Jul 10:45-11:15 *(Regency 5-Ground Level)*

ClearObject is a digital transformation company highly specialized in IoT Engineering, Analytics and Connected Product Development. As a certified Google Cloud Partner and IBM business partner, we're experts at developing and implementing targeted data analytics strategies based on your company's unique needs. Additionally, we can deploy, migrate and manage serverless cloud solutions, including AI tools and end-to-end machine learning models, so you're free to focus on what matters most: getting value from your data.

Exhibitors

27-28 - IBM ..... *www.ibm.com*
IBM is a gold sponsor - please see the sponsors pages for more information.

16 - Institute for Process Excellence..... *www.ipxhq.com*

Sponsor-exhibitor track: Mon 22, Jul 13:30-14:00 *(Regency 6-Ground Level)*

For over 30 years we have helped organizations modernize and integrate their legacy processes, systems, people, and data. We provide industry leading training and services that establish a culture of excellence throughout your enterprise. Our global training sector is the premier worldwide educational resource for enterprise excellence and high-performance culture training with courses offered in seven languages. Our global services sector ensures our clients achieve operational excellence through the revolutionary True North Enterprise Calibration™ maturity model and services.

2 - InterCAX ..... *www.intercax.com*

Sponsor-exhibitor track: Tue 23, Jul 10:00-10:30 *(Regency 6-Ground Level)*

Intercax is a pioneer and trusted global innovator in the field of model-based systems engineering (MBSE). Our breadth of experience, market knowledge and technology solutions are unsurpassed in the industry. Our MBSE interoperability platform, Syndeia, is a software environment for integrated model-based systems engineering, connecting high-level architecture in SysML to PLM, CAD, databases and more.

17 - Jama Software ..... *www.jamasoftware.com*
Jama Software provides the leading platform for requirements, risk and test management. With Jama Connect and industry-focused services, teams building complex products, systems and software improve cycle times, increase quality, reduce rework and minimize effort proving compliance. Representing the forefront of modern development, Jama's growing customer base of more than 600 organizations includes SpaceX, Boston Scientific, Lyft, Deloitte, Alight, Samsung and Caterpillar.

22 - Maplesoft ..... *www.maplembse.com*

Sponsor-exhibitor track: Mon 22, Jul 10:45-11:15 *(Regency 6-Ground Level)*

Maplesoft is the leading provider of high-performance software tools for engineering, science, and mathematics. Maplesoft Engineering Solutions provide advanced tools and services for system simulation, calculation management, and systems engineering, helping organizations maximize the power of their engineering knowledge so they can complete their projects quickly and successfully. The Maplesoft product suite includes Maple™, for technical computing and calculation management, MapleSim™, the advanced system-level modeling and simulation tool, and MapleMBSE, which supports a model based systems engineering approach to requirements management.

8 - Method Park Software AG..... *www.methodpark.de*
Method Park at a Glance Method Park has been a specialist for software & system development in the safety and security-critical environment of medical devices and automotive technology since being founded in 2001.Method Park provides consultation services in the optimization of development processes and the fulfillment of industry-specific standards and legal regulations. Method Park supports its clients in specific development projects and offers seminars on current issues of software engineering. With "Stages", Method Park has developed a process management tool that facilitates definition, implementation and monitoring of development and business processes. Method Park has approximately 170 employees at locations in Erlangen, Frankfurt/Main, Hannover, Munich and Stuttgart, as well as in Detroit, Miami and Pittsburgh in the USA. Method Park (Group) posted operating revenue of 16,4 million euros in 2017.

Exhibitors

6 - MID AG ..... *www.smartfacts.com*
MID AG is a bronze sponsor - please see the sponsors pages for more information.

9-10 - Northrop Grumman Corporation ..... *www.northropgrumman.com*
Northrop Grumman is a leading global security company providing innovative systems, products and solutions in autonomous systems, cyber, C4ISR, space, strike, and logistics and modernization to customers worldwide.

5 - Phoenix Integration..... *www.phoenix-int.com*

Sponsor-exhibitor track: Wed 24, Jul 10:00-10:30 *(Regency 5-Ground Level)*

Phoenix Integration's ModelCenter® is the environment for Model Based Engineering. ModelCenter® is a vendor-neutral software framework for creating and automating multi-tool workflows, optimizing product designs, and enabling Model Based Systems Engineering (MBSE). It is used by leading organizations worldwide to reduce development costs, improve engineering efficiency, stimulate innovation, and design more competitive products. Successful applications can be found in multiple industries, including aerospace, automotive, defense, electronics, energy, heavy industry, and shipbuilding.

21 - Project Management Institute..... *www.pmi.org*
Founded in 1969, PMI delivers value for more than 2.9 million professionals working in nearly every country in the world through global advocacy, collaboration, education and research.

4 - Project Performance International ..... *www.ppi-int.com*

Sponsor-exhibitor track: Wed 24, Jul 10:45-11:15 *(Regency 6-Ground Level)*

Project Performance International (PPI) empowers engineers worldwide and improves the performance of their companies. This is made possible through insightful, experience-based training delivered by our world experts. PPI is the world's largest provider of systems engineering training, having run courses in 40 countries in almost every imaginable sector.

29 - pure-systems..... *www.pure-systems.com*

Sponsor-exhibitor track: Mon 22, Jul 15:30-16:00 *(Regency 6-Ground Level)*

pure-systems provides Model-Based Product Line Systems Engineering, PLE and Variant Management solutions for Complex Systems and software. pure::variants integrates Requirements Engineering and MBSE tools like Capella, DOORS, DOORS Next Generation, Rhapsody, MagicDraw, Simulink, Polarion. pure::variants uniquely supports PLE Co-Evolution of Platforms and Variants, and integrates with IBM JAZZ Global Configuration Management.

15 - Raytheon ..... *jobs.raytheon.com*

Sponsor-exhibitor track: Mon 22, Jul 10:45-11:15 *(Regency 6-Ground Level)*

Raytheon Company is a technology and innovation leader specializing in defense, civil government and cybersecurity solutions. Founded in 1922, Raytheon provides state-of-the-art electronics, mission systems integration, C5I™ products and services, sensing, effects and mission support services. Raytheon is headquartered in Waltham, Massachusetts.

Exhibitors

1 - Scaled Agile .....*www.scaledagile.com*

Sponsor-exhibitor track: Mon 22, Jul 14:15-14:45 *(Regency 6-Ground Level)*

Scaled Agile, Inc., is the provider of SAFe®, the world's leading framework for enterprise agility. Through learning and certification, a global partner network, and a growing community of over 400,000+ trained professionals Scaled Agile helps enterprises improve business outcomes.

14 - Siemens PLM Software .....*www.siemens.com/plm*
Siemens PLM Software is a bronze sponsor - please see the sponsors pages for more information.

7 - Sodius-Willert .....*www.sodius.com*
Sodius is the global leader in enterprise integration technology and automation flow. Currently used in highly complex engineering environments, including aerospace, defense and automotive, our software solutions are proven, standards-based tools that allow faster time-to-market, lower product development costs, sharing and formal review, traceability, compliance, increased quality and higher profit.

12 - SPEC Innovations | Innoslate .....*www.innoslate.com*

Sponsor-exhibitor track: Mon 22, Jul 10:00-10:30 *(Regency 6-Ground Level)*

SPEC Innovations' flagship software product, Innoslate, is the first web-based full lifecycle systems engineering tool. Innoslate provides an all in one solution to perform requirements management, process modeling, simulation, testing, and more. Innoslate supports the entire product lifecycle from cradle to grave. This cloud or on-premise application simplifies product development while reducing time-to-market, cost, and risk. Implement model-based systems engineering on any device anywhere with Innoslate's easy user interface. Visit innoslate.com to learn more or sign up for a free trial.

25 - THE REUSE COMPANY .....*www.reusecompany.com*

Sponsor-exhibitor track: Tue 23, Jul 15:30-16:00 *(Regency 6-Ground Level)*

The REUSE Company is an organization specialized in the application of Semantic Representation and Analysis Technologies to a wide range of industries (Aerospace, Defense, Automotive, Naval, Health, Industrial machinery...). Our customers are usually (but not limited to) safety oriented organizations. Our main focus is on System/Software Reuse, Traceability and Quality applied to all types of work-products throughout the whole SE lifecycle (requirements, SysML Models, physical models, tests cases, data results, manuals, natural language descriptions, fault trees,etc). The integration of tools and technology from The REUSE Company facilitates the representation, analysis and exploitation of knowledge allowing for a knowledge-centric systems engineering approach. Our mission is to promote system/software and knowledge reuse within any organization, by offering processes, methods, tools and services that make it possible. We offer technology that is fully integrated within the organization's production chain.

20 - Tom Sawyer Software .....*www.tomsawyer.com*

Sponsor-exhibitor track: Wed 24, Jul 13:30-14:00 *(Regency 6-Ground Level)*

Tom Sawyer Software is the leading provider of graph and data visualization software for Systems Engineering. Our MBSE solution, built with Tom Sawyer Perspectives, transforms diagram creation, navigation, and customization into an automated process with interactive web-based and desktop views.

Exhibitors

18 - TUS Solution LLC .....*tussolution.mn/en/*

Sponsor-exhibitor track: Wed 24, Jul 15:30-16:00 *(Regency 6-Ground Level)*

TUS Solution LLC offers management consulting and digitalization services with an aim to fix system deficiencies in organization by transforming it into a healthy system that is capable of generating quality data. TUS Solution was founded in 2016 by Gund Investment LLC. While TUS Solution LLC may be relatively young, it is already providing services to leading companies and promising SME's of Mongolia.

3 - Vitech Corporation .....*www.vitechcorp.com*

Sponsor-exhibitor track: Wed 24, Jul 10:00-10:30 *(Regency 6-Ground Level)*

Vitech provides systems engineering solutions to help solve the world's complex problems. GENESYS and CORE, its flagship model-based systems engineering tools, guarantee completeness and consistency to help engineering teams achieve desired solutions that cost less, save time, reduce risk, and avoid waste.

19 - Wiley .....*www.wiley.com*
Wiley, a global company, helps people and organizations develop the skills and knowledge they need to succeed. Our online scientific, technical, medical, and scholarly journals, combined with our digital learning, assessment and certification solutions help universities, societies, businesses, governments, and individuals increase the academic and professional impact of their work.

11 - Worcester Polytechnic Institute - WPI .....*online.wpi.edu*
Worcester Polytechnic Institute - WPI is a bronze sponsor - please see the sponsors pages for more information.

Academic

A10 - FAMU-FSU College of Engineering.....*www.eng.famu.fsu.edu*

Sponsor-exhibitor track: Wed 24, Jul 13:30-14:00 *(Regency 5-Ground Level)*

The most diverse college of engineering and the only joint college in the nation! We bring innovative solutions to real-world challenges with world-class researchers and a vibrant student community. The FAMU-FSU College of Engineering offers graduate programs in biomedical, chemical, civil, electrical, industrial and mechanical engineering. These programs are offered at the master's non-thesis, master's thesis and doctoral level in each discipline. We also offer a M.S. non-thesis in systems engineering (industrial), M.S. non-thesis in engineering management (industrial) and M.S. thesis in sustainable energy (mechanical).

A3 - Georgia Tech Reasearch Institute .....*gtri.gatech.edu*
Georgia Tech Research Institute (GTRI) develops advanced technological solutions and large-scale system prototypes to address the most difficult problems in national security, economic development and overall human betterment. Core research areas include complex and agile systems engineering, sensor design and integration, information management and cyber security, and defense technology development.

A5 - Johns Hopkins University, Whiting School of Engineering.....*ep.jhu.edu*
Johns Hopkins University's Whiting School of Engineering offers 20 online/part-time Masters programs. Our expert instructors impart cutting-edge knowledge and skills in collaborative, interactive learning environments. Programs include: Systems Engineering, Healthcare Systems Engineering, Information Systems Engineering, Space Systems Engineering, and Engineering Management.

A7 - Missouri S&T .....*global.mst.edu*

Sponsor-exhibitor track: Tue 23, Jul 10:00-10:30 *(Regency 5-Ground Level)*

Missouri S&T is an active leader in systems engineering and architecting education, research and professional activities. It is the only university to have four Stevens Doctoral Award recipients. Through its distance programs, S&T meets the needs of working professionals and has one of the top distance graduate engineering programs in the nation.

A8 - Polytechnic University of Puerto Rico.....*www.pupr.edu*

Sponsor-exhibitor track: Mon 22, Jul 10:00-10:30 *(Regency 5-Ground Level)*

Higher Education Institution providing STEM Program.

A9 - SE Scholar .....*www.se-scholar.com*

Sponsor-exhibitor track: Wed 24, Jul 14:15-14:45 *(Regency 6-Ground Level)*

SE Scholar is a company dedicated to helping Systems Engineers get their INCOSE SEP certification. Our goal is to reach all Systems Engineers with affordable, high-quality instruction no matter where they live or work!

Exhibitors

A2 - Stevens Institute of Technology and Systems Engineering Research Center..
.....*sercuarc.org*
The Systems Engineering Research Center (SERC) is a University-Affiliated Research Center (UARC) of the US Department of Defense operated through the School of Systems and Enterprises (SSE) at Stevens Institute of Technology. SERC consists of a network of over 22 prominent research institutions and has engaged over 400 researchers from across the nation focused on enhancing the nation's knowledge and capability in the area of systems engineering thinking to address critical global issues.

A4 - The University of Connecticut UTC Institute for Advanced Systems Engineering .....*utc-iase.uconn.edu*

Sponsor-exhibitor track: Tue 23, Jul 16:15-16:45 *(Regency 5-Ground Level)*
The University of Connecticut founded the UTC Institute for Advanced Systems Engineering with financial support from the United Technologies Corporation. The UTC-IASE trains engineers in the methods of cyber-physical systems (CPS) design through its online education programs and performs CPS research advancing the field of systems engineering.

A6 - University of Maryland .....*eng.umd.edu*
.....*isr.umd.edu*
The University of Maryland's Institute for Systems Research (ISR) is an internationally recognized leader in systems research. The ISR offers an M.S. in Systems Engineering that emphasizes advanced strategies for high-level synthesis and analysis of complex, multidisciplinary engineering systems, using model-based systems engineering techniques.

A1 - University of Southern California, Viterbi School of Engineering .....
.....*viterbigradadmission.usc.edu*
The University of Southern California, Viterbi School of Engineering offers a variety of master's degrees, graduate certificates and executive education programs on campus and online via DEN@Viterbi. Academic programs include a master's and graduate certificate in Systems Architecting and Engineering.

INCOSE

INCOSE Village - INCOSE .....*www.incose.org*
Learn more about the services and products provided by INCOSE at the village. Meet members of the support team and discover ways to get more involved.
New Products. Be the first to get copies of the newest INCOSE products by visiting the village. As an added bonus – Meet the experts who developed those new products!
Upcoming Events. Learn more about upcoming events from the event organizers at the INCOSE Village.
Website. Do you have questions about the new website? Get your questions answered at the village.

Sponsor/Exhibitor Track #1

Regency 6 - Ground Level

Monday July 22

SPEC Innovations | Innoslate (12) 10:00-10:30

Maplesoft (22) 10:45-11:15

MID AG (6) 11:30-12:00

Institute for Process Excellence (16) 13:30-14:00

Scaled Agile (1) 14:15-14:45

pure-systems (29) 15:30-16:00

Tuesday July 23

InterCAX (2) 10:00-10:30

Worcester Polytechnic Institute - WPI (11) 10:45-11:15

The Aerospace Corporation 11:30-12:00

Capella (13) 13:30-14:00

BigLever Software (23) 14:15-14:45

THE REUSE COMPANY (25) 15:30-16:00

IBM (27-28) 16:15-16:45

Wednesday July 24

Vitech Corporation (3) 10:00-10:30

Project Performance International (4) 10:45-11:15

Tom Sawyer Software (20) 13:30-14:00

SE Scholar (A9) 14:15-14:45

TUS Solution LLC (18) 15:30-16:00

Sponsor/Exhibitor Track #2

Regency 5 - Ground Level

Monday July 22

Polytechnic University of Puerto Rico (A8) 10:00-10:30

Raytheon (15) 10:45-11:15

IBM (27-28) 13:30-14:00

CATIA - No Magic (31-32) 14:15-14:45

Tuesday July 23

Missouri S&T (A7) 10:00-10:30

ClearObject (26) 10:45-11:15

CATIA - No Magic (31-32) 13:30-14:00

Lockheed Martin 14:15-14:45

The University of Connecticut UTC Institute for Advanced Systems Engineering (A4) 16:15-16:45

Wednesday July 24

Phoenix Integration (5) 10:00-10:30

Aras Corporation (30) 10:45-11:15

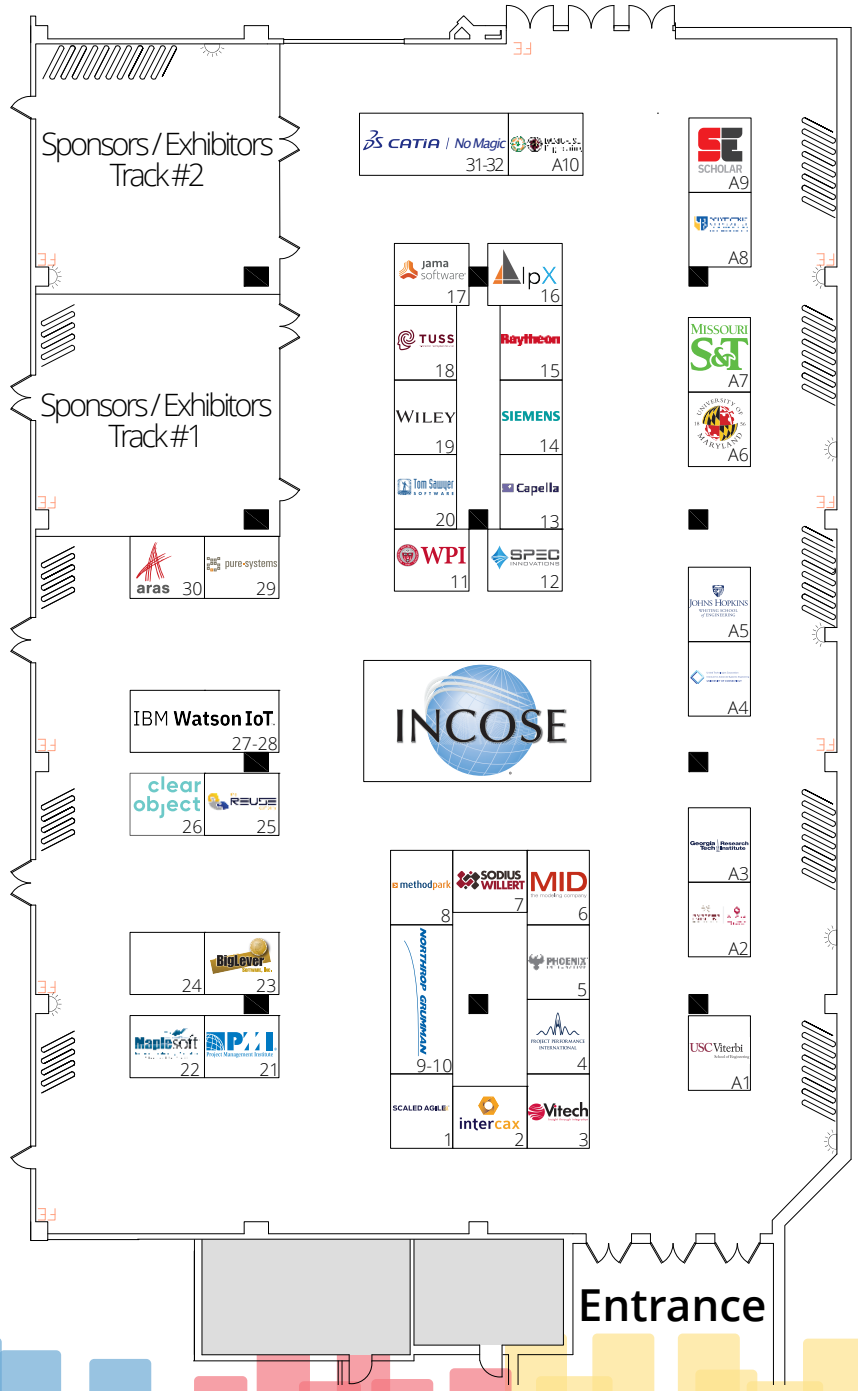
FAMU-FSU College of Engineering (A10) 13:30-14:00

Lockheed Martin 14:15-14:45

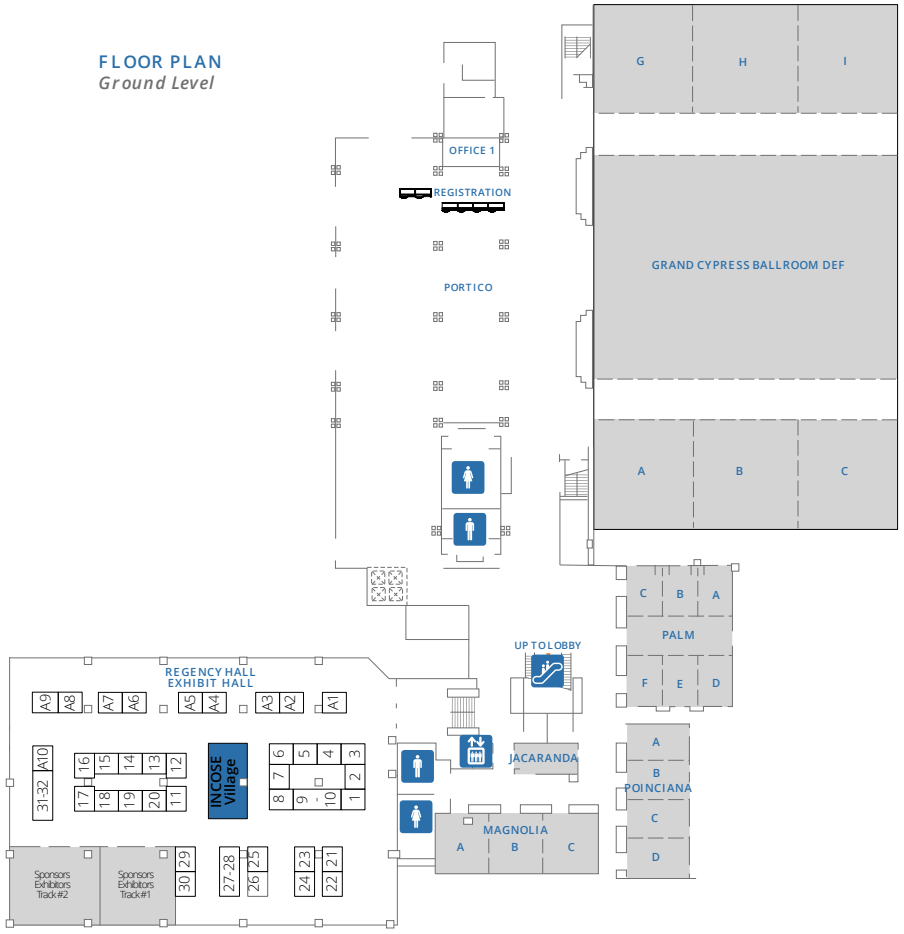
Exhibit Hall Map

Regency Hall - Ground Level

Ax: Academic booth

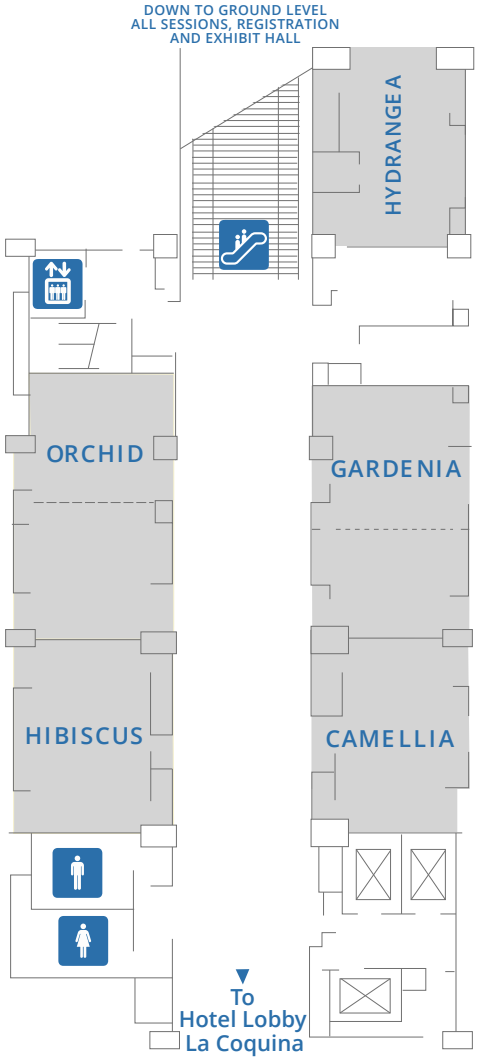


Ground Level



Lobby Level

LOBBY LEVEL MEETING ROOMS



Saturday

Please see detailed program for all sessions and Working Group meetings.

Overall Schedule

Symposium Registration (0700-1700) *Location: Portico – Ground Level*

Cyber C@fé (0700-1700) *Location: Portico – Ground Level*

Speakers' Ready Room (0745-1700) *Location: Magnolia AB – Ground Level*

Speakers/Session Chairs' Breakfast (0700-0745) *Location: Magnolia AB – Ground Level*

07			
08	Corporate Advisory Board Meeting (0800-1500)	Tutorials & Workshops	Working Group Meetings
09			
10	**Break** (0930-1000) *Location: Portico – Ground Level*		
11		Tutorials & Workshops	Working Group Meetings
12			Technical Operations Assistant Directors Meeting
13	**Lunch** (1200 - 1330) *Location: Portico – Ground Level*		TechOps AD & Chair Lunch Meeting
14		Tutorials & Workshops	Working Group Meetings
15	**Break** (1500-1530) *Location: Portico – Ground Level*		
16	Joint Corporate Advisory Board / Tech Ops / IOB/ Academia Meeting Sessions	Tutorials & Workshops	Working Group Meetings
17			
18			
19			
20	**Corporate Advisory Board Dinner** *(By invitation only)* (1930-2200) *Location: Cuba Libre, 9101 International Dr, Pointe Orlando, Orlando, FL 32819*		
21			
22			

Saturday

Tutorials

A.1: Getting Ready for Industry 4.0 and IoT with Model-Based Systems Engineering.....0800-1700

Dov Dori *(Technion, Israel & MIT, USA)*

Grand Cypress Ballroom C - Ground Level (Ticket required)

A.2: Correcting Misperceptions of Systems Engineering Practices 0800-1200

Ronald Carson (Seattle Pacific University)

Grand Cypress Ballroom GH - Ground Level (Ticket required)

A.3: Introduction to Systems Security Engineering.....0800-1700

Mark Winstead, Michael McEvilley, Daryl Hild *(The MITRE Corporation)*

Magniola BC - Ground Level (Ticket required)

A.4: Why the SEMP is not Shelfware: How to write a SEMP to ensure it delivers value to all. 0800-1200

Ian Presland *(Charterhouse Systems Ltd.);* Becky Reed *(Reed Integration Inc.)*

Palm AB - Ground Level (Ticket required)

A.5: Developing Verification Requirements to Assure Project Success.....0800-1200

Mark Powell *(Attwater Consulting)*

Grand Cypress Ballroom I - Ground Level (Ticket required)

C.2: Systems Engineering MBSE implementation in your organization.....1330-1700

Mark Sampson *(Siemens)*

Grand Cypress Ballroom GH - Ground Level (Ticket required)

C.4: A Practical Guide to Determine the Readiness of Systems - Innovative Methods, Metrics and Tools for the Systems Engineer 1330-1700

Donald York *(Engility Corp.)*

Palm AB - Ground Level (Ticket required)

C.5: An Introduction to Systems Thinking, Modelling & Simulation focused on the Acquisition and Sustainment of M&S Systems ...1330-1700

Jawahar Bhalla *(CAE Australia)*

Grand Cypress Ballroom I - Ground Level (Ticket required)

Workshop

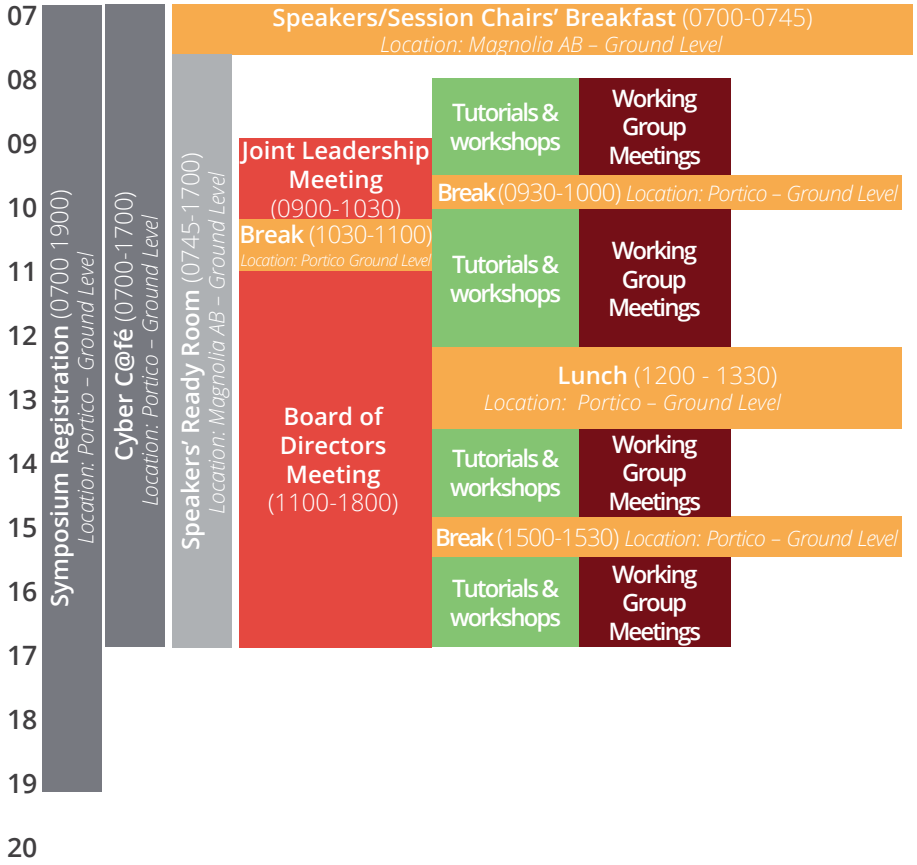
Helix Workshop 0900-1700

Poinciana AB - Ground Level (By invitation only)

Sunday

Please see detailed program for all sessions and Working Group meetings.

Overall Schedule



Sunday

Tutorials

E.1: Back to Basics: Fundamentals for Systems Engineering Success 0800-1200

David Long, Zane Scott *(Vitech Corporation)*

Palm AB - Ground Level (Ticket required)

E.2: Master your Product Lines and yield greater benefits through an integrated Model-Based Product Line Systems Engineering approach 0800-1700

Hugo Guillermo Chalé Gongora, Stephane Bonnet, Juan Navas *(Thales)*

Palm DE - Ground Level (Ticket required)

E.3: Quantitative Risk Assessment 0800-1200

Mark Powell *(Attwater Consulting)*

Grand Cypress Ballroom GH - Ground Level (Ticket required)

E.4: The power of influence - how to lead without authority 0800-1700

Jennifer Nash Phd *(Nash Consulting & Associates)*

Magniola BC - Ground Level (Ticket required)

E.5: Overview of the INCOSE SE Handbook Version 4.0 0800-1700

John Clark *(Old Dominion University)*

Grand Cypress Ballroom I - Ground Level (Ticket required)

G.1: Inserting Systems Engineering into a Resistant Organization 1330-1700

David Walden *(Sysnovation, LLC)*

Palm AB - Ground Level (Ticket required)

G.3: Tactical Strategies for Overcoming Systems Engineering Dysfunction 1330-1700

Heidi Davidz *(Aerojet Rocketdyne)*; Eileen Arnold *(ConsideredThoughtfully.com)*; Dale Thomas *(University of Alabama in Huntsville)*

Grand Cypress Ballroom GH - Ground Level (Ticket required)

Workshop

Systems Literacy Workshop 0800-1700

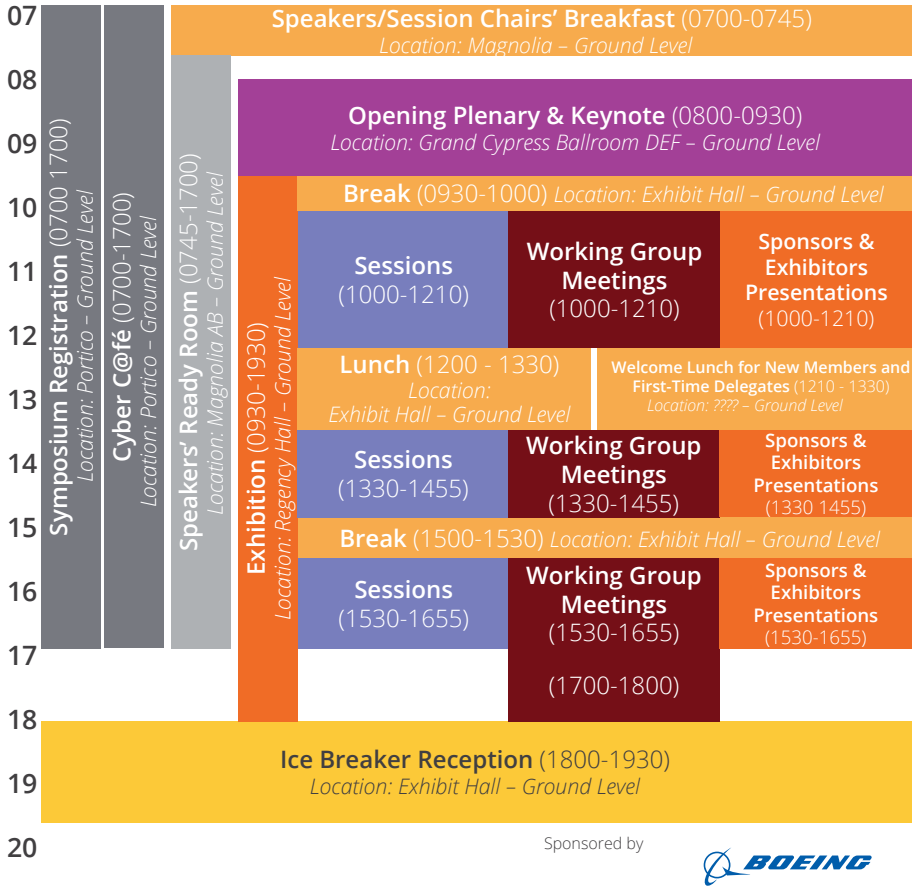
Peter Tuddenham *(president of the International Society of Systems Sciences)*; James Martin *(chair of Systems Science Working Group)*

Grand Cypress Ballroom C - Ground Level (Ticket required)

Monday

Please see detailed program for all sessions and Working Group meetings.

Overall Schedule



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Notes

Keynote Speaker

Dr Wanda Austin

Interim President,
University of Southern California

Keynote Title:

Interdisciplinary Systems Engineering inspired by da Vinci

Biography. Dr. Austin is the former president and chief executive officer of The Aerospace Corporation, a leading architect for the nation's national security space programs. The Aerospace Corporation has nearly 4,000 employees and annual revenues of more than $850 million. She assumed this position on January 1, 2008 and retired from this position 2016. She is internationally recognized for her work in satellite and payload system acquisition, systems engineering, and system simulation. Austin served on President Obama's Review of Human Spaceflight Plans Committee in 2009, and in 2010 was appointed to the Defense Science Board.

Austin is a fellow of the AIAA, and is a member of the Defense Science Board, the National Academy of Engineering, the International Academy of Astronautics, and the American Academy of Arts and Sciences. She also serves on the Board of Directors of the Space Foundation, and on the Board of Trustees for the University of Southern California and the National Geographic Society.

Among her numerous awards and citations. are the National Intelligence Medallion for Meritorious Service, the Air Force Scroll of Achievement, and the National Reconnaissance Office Gold Medal. In 2010 she received the AIAA von Braun Award for Excellence in Space Program Management, and is a recipient of the 2012 Horatio Alger Award and the 2012 NDIA Peter B. Teets Industry Award.

Austin is committed to inspiring the next generation to study the STEM disciplines and to make science and engineering preferred career choices. Under her guidance, the corporation has undertaken a number of initiatives in support of this goal, including participation in MathCounts, US FIRST Robotics, and Change the Equation. Austin was among the first CEOs to commit to Change the Equation.

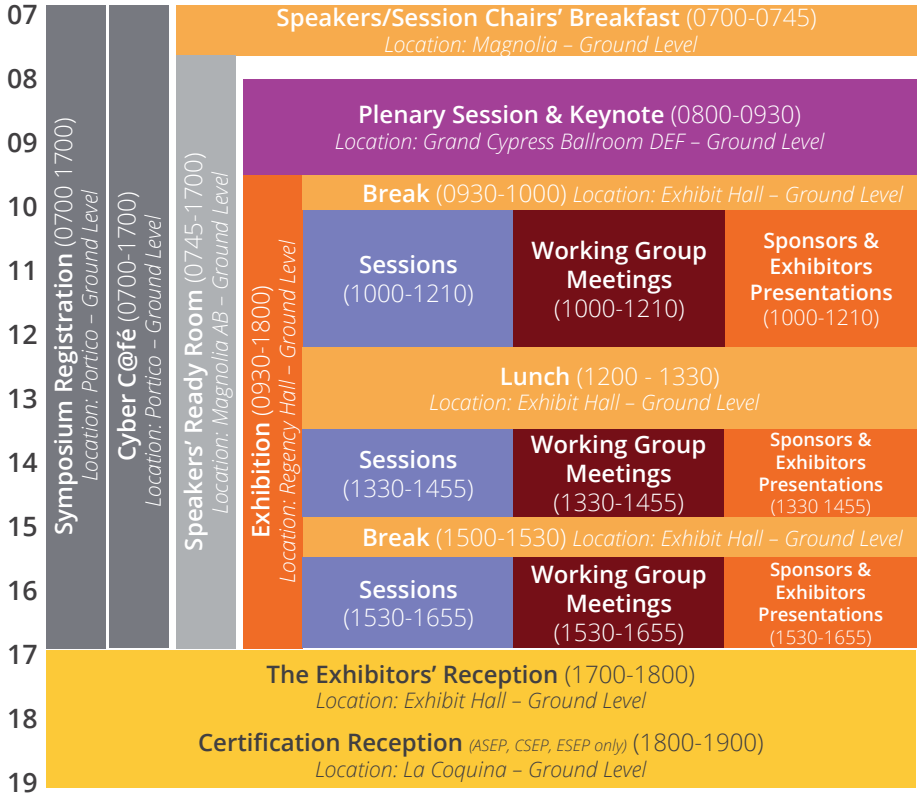
Abstract. Throughout history, humans have always had a desire to use technology to extend their reach, solve problems and explore the universe. As systems engineers we accomplish impossible tasks that are helping to solve the most complex global problems including leadership.

Notes

Tuesday

Please see detailed program for all sessions and Working Group meetings.

Overall Schedule



Notes

Keynote Speaker

Prashant Dhawan

Co-Founder, Biomimicry India

Keynote Title:

Biomimicry - A Bioinspired approach to Systems Thinking

Biography. Prashant Dhawan is the Co-founder of the Biomimicry India Network. He holds a degree in MS (Master of Science) in Biomimicry from the Arizona State University, U.S.A and Biomimicry Professional Certification from Biomimicry 3.8, USA. He also holds a degree in Architecture from SPA Delhi, and an MBA from ISB Hyderabad.

Prashant has conducted Biomimicry workshops and talks in various forums and educational institutes which include IIT Gandhinagar, Centre for Environmental Planning and Technology University (CEPT University in Ahmadabad), NIT (Trichy), NID (Bangalore, Vijayawada & Kurukshetra), NIFT (Hyderabad & Delhi), Ahmedabad University, RVCA, BMSCE, BMSIT and Shristi school of Art, Design and Technology (Bangalore) amongst others. He has also conducted Biomimicry workshops for corporates and these include a full day workshop for senior executives of Mahindra & Mahindra (Mumbai) and Axis Bank.

Prashant prefers to call himself an amateur researcher of issues related to sustainable happiness.

Abstract. The systems that exist in living nature have evolved over a period of 3.8 billion years under operating conditions, limits and boundaries that apply to all that exists on our planet including the human species. If we look at nature's systems , for example an ancient forest, we find there is zero waste, zero pollution and nothing akin to a crisis of 'unemployment' in the billions of plant and animal species.

At the current time, humanity is grappling with problems of pollution, waste, endemic poverty, unemployment and an impending ecological disaster. It appears that these are unintended consequences and indicators that the human systems are far from perfect and misaligned to the ecological health of the planet. Evidence from living nature suggests that systems in nature are among the most time tested solutions that we can learn from and have a lot to offer in terms of ideas that can change our world for the better.

But how do we translate the systems and processes that work so well in living nature into usable solutions for our problems? Can and should everything in nature be mimicked?

And that is where biomimicry comes into the picture. The talk introduces 'Biomimicry' - a multidisciplinary and systems based approach, that helps us look at nature, not just as a source of raw materials, but as a source of ideas and solutions/advanced technologies. Biomimicry has now made available a formal structure and methodology to learn from nature. Biomimicry is relevant and applicable across sectors and at various scales, whether it be learning from additive zero waste manufacturing in nature, selforganisation, self-healing, self-assembly to urban scale systems/smart cities that mimic forest ecosystems.

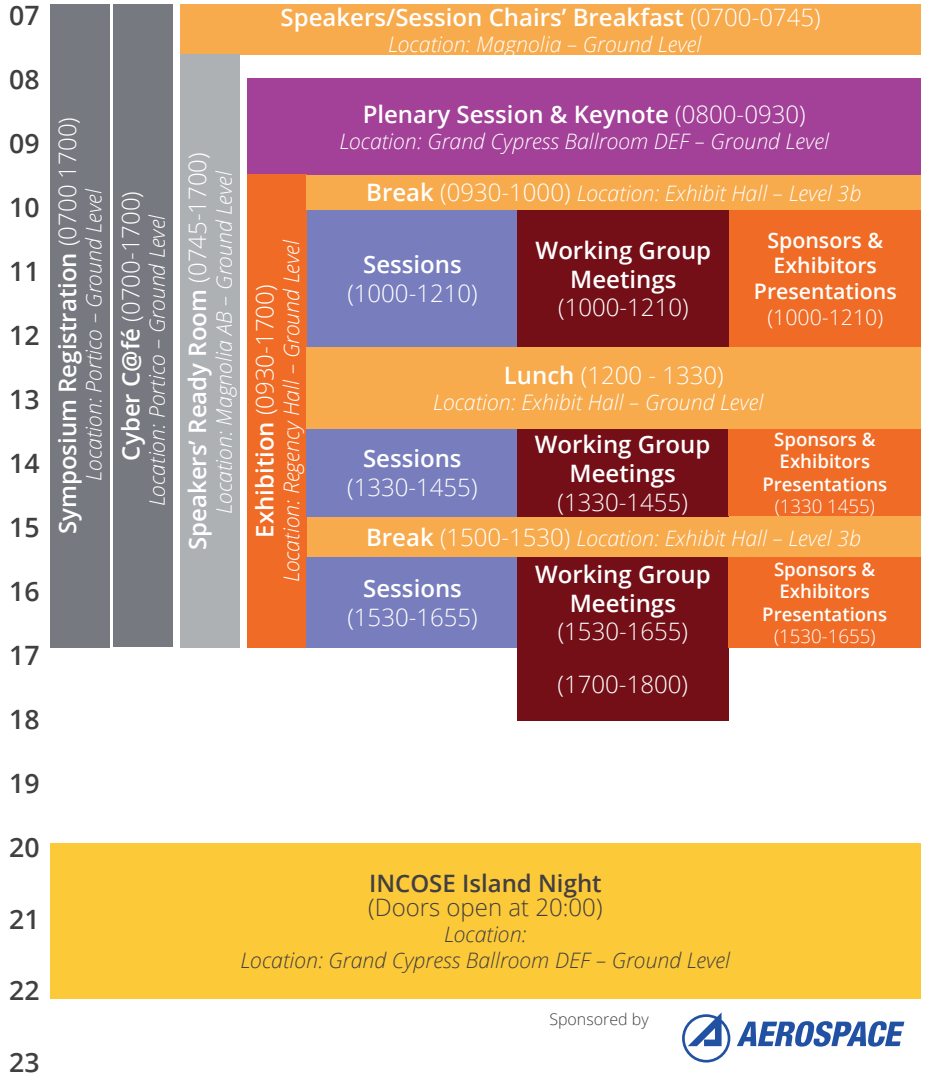
The talk will also include a few examples and case studies of biomimicry based projects and design explorations from the workshops conducted by the speaker (in India).

Notes

Wednesday

Please see detailed program for all sessions and Working Group meetings.

Overall Schedule



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Notes

Keynote Speaker

Capt. Winston Scott

Director, Environmental, Tectonics Corporation

Keynote Title:

To the Stars. The Sky Is No Longer the Limit

Biography. Mr. Scott is a retired U. S. Navy Captain and former NASA Astronaut and currently serves as Dean of the College of Aeronautics of the Florida Institute of Technology. His professional experience includes significant industry and academic positions as well as a 27-year career in the U. S. Navy. During his Navy career, Mr. Scott accumulated more than 5,000 hours of flight time in 20 different military and civilian aircraft and more than 200 shipboard landings. Mr. Scott was selected by NASA for their Astronaut program in March 1992. He served on two space shuttle missions, logging more than 24 days in space including three spacewalks totaling over 19 hours. Mr. Scott's civilian experience includes serving as the Vice President for Student Affairs for Florida State University, an Associate Dean and Adjunct Instructor position at FSU College of Engineering, Executive Director of the Florida Space Authority, and as Vice President and Deputy General Manager of the engineering and science contract group for Jacobs Engineering in Houston, Texas. Mr. Scott holds a B.A. in Music from Florida State University, a M.S. in aeronautical engineering from the U.S. Naval Postgraduate School, and honorary doctorates from Florida Atlantic University and Michigan State University. Mr. Scott belongs to the American Institute of Aeronautics & Astronautics, Aircraft Owners and Pilots Association, Experimental Aircraft Association, and Bronze Eagles Association of Texas. Since 2003. Mr. Scott has served as a director of Gulf Power Company, a subsidiary of The Southern Company, a public company which is traded on NYSE. Mr. Scott also serves as a Director for a non-profit entity (the Astronaut Memorial Fund).

Abstract. Winston Scott's journey to the starts as a NASA astronaut is a testament to the power of perseverance and vision. Raised in Miami, Scott's largely segregated education provided little access to resources but his own determination, combined with the dedication of his family and his teachers, set him on an inspiring path of achievement. Scott's work in space is now regarded as a case study in leadership and expert communications, qualities most clearly exhibited in the much-publicized manual capture of the Spartan satellite in the 1997 Columbia mission. Join Scott as he thrills the audience with expert descriptions and actual footage of his experiences in space. Join him as he takes the audience to the stars!

Notes

Thursday

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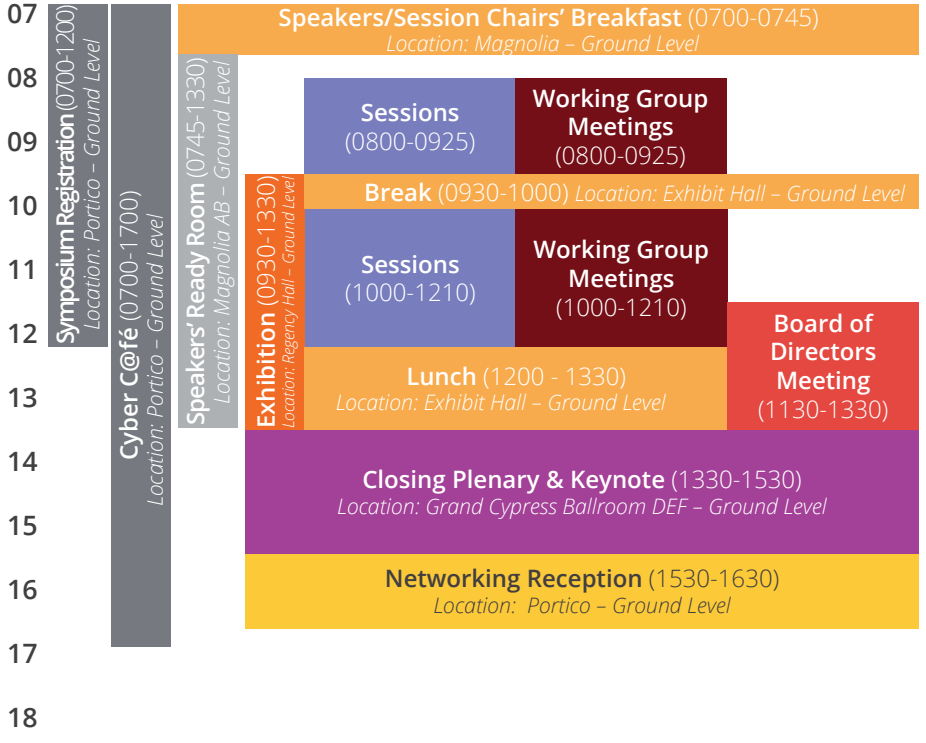
Overall Schedule



Notes

Keynote Speaker

Grant Begley

CEO, Rocket Crafters

Keynote Title:

The Underway Global Unmanned Systems and Robotics Revolution

Biography. Grant Begley is an aerospace, unmanned systems and robotics leader, manager and consultant enabling next generation capabilities. An accomplished initiator, developer and implementer of strategic planning, change management, and resource development to achieve compelling products, dramatic future capabilities and enterprise successes.

Mr. Begley is a public speaker, author and moderator and participant of expert panels, on the Global Robotics Revolution. Mr. Begley was Corporate Senior Vice President for Alion Science and Technology, developing and implementing the $1B annual revenue Business Development Enterprise, including unmanned systems, ahead of schedule. Prior to Alion, Mr. Begley served as Pentagon Senior Advisor to the Office of the Under Secretary of Defense, for Unmanned Systems, advising on critical issues and leading development of DoD's 2011 Unmanned Systems Roadmap. Mr. Begley's career includes Defense Industry leadership positions for the development of advanced capabilities with Raytheon and Lockheed Martin where he initiated and led cross-corporation unmanned systems and robotics successes.

Mr. Begley served in the United States Navy for 26 years, to include operational assignments flying fighter aircraft, designated Top Gun, followed by acquisition assignments for the development and management of next generation manned and unmanned aircraft systems, weapon systems and joint

executive acquisition assignments. Mr. Begley holds master's degrees in Aerospace and Aeronautic Engineering from the Naval Post-Graduate School and a bachelor's degree in General Engineering from the U.S. Naval Academy.

Abstract. Grant will revisit and update his 2014 INCOSE keynote and associated forecasts. During Grant's 2014 INCOSE keynote, he forecast that unmanned systems and robotics will become ubiquitous to our everyday lives. He asserted to INCOSE participants their professional opportunity and responsibility to significantly contribute to the underway global unmanned systems and robotics revolution. Unmanned systems and robotics are rapidly expanding across ground, maritime, airborne and space systems providing a superb opportunity for systems engineers to provide a better world through a systems approach. Systems Engineers contributions, implemented responsibly and ethically, will provide new capabilities at a systems level for the benefit of humankind.

Notes

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INCOSE

HSI2019
Human Systems Integration Conference

Biarritz, France
September 11 - 13, 2019

A scientific and industrial event

Save the Date
11-13 September, 2019
Le Bellevue Conference Center, Biarritz, France

Learn more at www.incose.org/hsi2019

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Preliminary
Technical Program

3 Days, 3 Tracks, 4 Keynotes,
40+ Presentations, Panels, and More!

40 Papers & Posters on Human Systems Integration
Wednesday - Friday

4 Inspiring Keynote Speakers

Guy André Boy CentraleSupélec and ESTIA Institute of Technology, Chair of INCOSE HSI WG
Mica Endsley Former US Air Force Chief Scientist, President of SA Technologies
General Frédéric Parisot French Air Force State Staff
David Sirkin Stanford University

14 Countries Represented in Papers

Australia - Austria - Belgium - Canada - France - Germany Hong Kong - India - Israel - Norway - Romania - Slovenia United Kingdom - United States

18 Application Domains

Top Domains
Adaptive Systems, Aeronautics, Automotive, Air Traffic Management, C2, Defense, Healthcare, Manufacturing, Maritime, Medicine, Nuclear, Oil & Gas, Public Safety & Security, Social Media, Space, Tangibility, Training, UAV

19 Topics Represented

Top Topics
Agile Development, Artificial Intelligence, Certification, Cognitive Engineering, Complexity Analysis, Decision Making, Design Thinking, Digital Human Modeling, Human Centered Design, HCI, Human Factors & Ergonomics, Human Machine Teaming, Machine Learning, MBSE, Modeling & Simulation, Organization Design & Management, Performance Monitoring, Situation Awareness, Systems of Systems

3 Panels

With Global Leaders in Human Systems Integration
- **Technological and Organizational Situation Awareness for Public Security & Safety**
- **Do We Need to Develop a New Discipline of Human Systems Integration?**
- **HSI Implications of Adaptive Human-Machine Teaming**

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Cape Town, South Africa
July 18 - 23, 2020

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July 18 - 23, 2020

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3. Put a spotlight on your organization's competency in Systems Engineering
4. Be associated with the highest culture of professionalism and innovation
5. Demonstrate organizational support to INCOSE's mission
6. Develop sustainable business relationships

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- Access to the latest thinking relevant to the practice of Systems Engineering
- Put a spotlight on your organization's competency in Systems Engineering
- Develop sustainable business relationships

16 642 SQ FT

4 DAYS

2 SOCIAL EVENTS

11 BREAKS & LUNCHES

Lots of possibilities to interact with systems engineering communities

Visit **www.incose.org/symp2020** and contact us **TODAY** - The IS2020 Organizing Team

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2019 INCOSE Leadership

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President Elect (President in 2020)
Kerry Lunney, *Thales Australia*

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Kayla Marshall, *Lockheed Martin Corporation*

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Ariela Sofer, *George Mason University*

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Lisa Hoverman, *HSMC Group*

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Art Pyster, *George Mason University*

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Tony Williams, *Jacobs Engineering*

Director, Asia-Oceania Sector
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Director, EMEA Sector
Paul Schreinemakers, *How2SE*

Deputy Technical Director (*)
Gretchen Peacock, *Lockheed Martin Corporation*

Corporate Advisory Board Co-Chair (*)
Don York, *Engility*

Chief of Staff (COS) (*)
Andy Pickard, *Rolls Royce Corporation*

(*) non voting position

Past presidents

Alan Harding	2016-2017	Donna H. Rhodes	2000
David Long	2014-2015	Kenneth Ptack	1999
John Thomas	2012-2013	William Schoening	1998
Samantha Robitaille	2010-2011	Eric Honour	1997
Pat Hale	2008-2009	Ginny Lentz	1996
Paul Robitaille	2006-2007	James Brill	1995
Heinz Stoewer	2004-2005	George Friedman	1994
John Snoderly	2002-2003	Brian Mar	1993
John Clouet	2001	Jerome Lake	1992

IS2019 Team

Technical Program
John Wilcox, *Northrop Grumman Corporation*

Plenary and Keynote Sessions
Nicole Hutchison, *Stevens Institute of Technology*

Technical Operations Liaison
Eric Belle, *SpaceX*

Master of Ceremonies
Ricardo Valerdi, *University of Arizona*

Marketing & Communications
Rachel LeBlanc, *Worcester Polytechnic Institute*

Local Chapter liaisons
Michael Goodman, *Space Cost Chapter*
Macaulay Osaisai, *Orlando Chapter*
Ed Smith, *Orlando Chapter*

New Member Functions
Donna Long, *Vitech Corporation*

Practitioner's Challenge Chair
Frank Salvatore, *SAIC*

Symposium Management
KMD Events

Website / Publications
NC Lab

Mark Your Calendar

Join us for

30th Annual INCOSE international symposium

Cape Town, South Africa
July 18 - 23, 2020

Submission date for papers, tutorials and panels:
8th November 2019

Future events

September 2019

HSI 2019 - Human Systems Integration
September 11-13, 2019
Biarritz, France

Western States Regional Conference
September 13-15, 2019
Los Angeles, CA, USA

October 2019

EMEA Workshop 2019
October 10-11, 2019
Utrecht, Netherlands

AOSEC 2019
October 17-18, 2019
Bangalore/Pune, India

Great Lakes Regional Conference
October 21-25, 2019
Cleveland, OH, USA

November 2019

The Annual Systems Engineering Conference 2019
November 19-20, 2019
Leeds, UK

January 2020

Annual INCOSE International Workshop 2020
January 25-28, 2020
Torrance, CA, USA

January 2021

Annual INCOSE International Workshop 2021
January 29-31, 2021
Seville, Spain

July 2021

Annual INCOSE International Symposium 2021
July 17-22, 2021
Honolulu, HI, USA