Western Regional States Conference 2023 Program
As of 7/25/23, Subject to change

Wednesday, September 13

Tours
Wednesday, September 13 * 8:15 AM - 10:30 am
LIGO Tour
Although it is considered one observatory, LIGO comprises four facilities across the United States, including one of two gravitational wave detectors (the interferometers) right in Hanford. Tour the LIGO Hanford Observatory to review its critical work in the search for gravitational waves.

Wednesday, September 13 * 11:45 am - 3:45 pm
The B Reactor National Historic Landmark
The B Reactor National Historic Landmark is the world's first full-scale plutonium production reactor and part of the Manhattan Project National Historical Park administered by the U.S. Department of Energy and the National Park Service. Learn more about the people, events, science, and engineering that led to the creation of the atomic bombs that helped bring an end to World War II.

Thursday, September 14

Tours
Thursday, September 14 * 8:15 am – 10:15 am
PNNL Energy Tour

Thursday, September 14 * 1:00 PM - 3:00 PM
PNNL Energy Science Center tour

Tutorials
Thursday, September 14 * 8:00 am – 12:00 pm
Tutorial: PLC-Based Cyber Attack Defensive Programming Techniques – Tutorial Demonstration
Instructors: Matthew Scott and Tyler Lentz, Sound Transit
This tutorial is a demonstration of programmable-logic controller-based (PLC) defensive programming techniques using the Siemens Simatic PLC platform. Historical exploits of PLC vulnerabilities within critical infrastructure demonstrate the need for defensive PLC programming. The authors employ model-based techniques built upon previously published research by Scott (2023) presenting secure coding practices for the protection of industrial control system (ICS) software. An overview of high-profile ICS exploits will be presented, the common PLC component and the secure development lifecycle from Scott (2023) within which defensive programming takes place. Reference models and enumerations employed in defensive programming will be reviewed as well as the specific software tools employed in the demonstration. The three steps in defensive programming will be presented including establishing the code environment, defining rule sets, and verifying the initial code. Software development elements of these steps will be demonstrated with the following learning objectives:
• Develop five (5) secure PLC code models
• Manage a secure code library
• Retrieve, test and verify PLC firmware
• Confirm logic equivalence with secure models

• Deploy secure models in VFD control program
Results provided, defensive PLC programming process and five (5) hard copy examples of Siemens PLC secure code models. Tutorial demonstration conducted within live ICS environment.
Attendees are not required to have any prerequisites. Both novice and expert audiences will find value in the demonstration.

Thursday, September 14 * 8:00 am – 12:00 pm
Tutorial: Automated Architectural Trade Studies
Instructor: Saulius Pavalkis, Dassault Systemes
In this hands-on live tutorial, discover how to architect a satellite by going through series of systems engineering decisions. During the process, emphasize a need for architectural trade studies and methodology to accomplish them in SysML, as well as go through the end-to-end process covering:
* Defining the objectives of the evaluation
* Selecting criteria
* Selecting the solutions to be evaluated
* Delivering expected results, justifications, and recommendations

Discuss possible variability points in system:
*Components variability – selection of a component out of an existing library
*Topological variability – selection of which components are connected to which
*Geometrical variability – selection of specific location for each component
*Relational variability – selection of specific components based on the existence or non-existence of others

Answer trade study specific questions:
*How would I model alternatives?
*Should I modify my design just for the analysis?
*Where parameters values come from?
*Should I keep all alternatives in my model?
*How would I define my custom criteria and evaluation method?
*How would I evaluate my alternative part in the context of full system behavior?
*How would I record evaluation results and document my choice and design decision?

Tutorial method:
Live hands-on with actual SysML modeling software. We will give installation files and licenses.

Thursday, September 14 * 8:00 am – 12:00 pm
Tutorial: Introducing the INCOSE SE Handbook Fifth Edition
Instructor: David Walden, Sysnovation, LLC
The objective of the International Council on Systems Engineering (INCOSE) Systems Engineering Handbook (SEH) is to describe the state-of-the-good-practice for Systems Engineering (SE). It also serves as the basis for the INCOSE certification examination. The Fifth Edition of the INCOSE SEH was released in conjunction with the 2023 INCOSE International Symposium.

The objective of this half-day tutorial is to provide a top-level overview of the latest edition of the SEH. Participants are introduced to key SE terminology, concepts, and principles in the handbook. Each student will receive a complete set of lecture notes and an annotated bibliography but will not be provided with a copy of the handbook. Note: this tutorial is an overview of the handbook and does not

include the level of detail typically presented in an INCOSE Systems Engineering Professional (SEP) preparation course.

Thursday, September 14 * 1:00 pm – 5:00 pm

Tutorial: System Architecture Simulation in the Loop of Multiphysics Analysis and Design

Instructors: Saulius Pavalkis and Jyothi Matam, Dassault Systèmes

SysML is OMG, ISO and de facto industry standard for system architecture modelling and analysis. Being model based it enables semantically rich collaboration between system architecture, analyses and design. Now we can specify mapping, automate interchange and enable analysis in the loop of multiple disciplines. Modelica is one of the most popular open standard for multiphysics simulation and design covering hydraulics, electrical, and other types of analysis.

In this fundamental live hands-on tutorial, we demonstrate system architecture in SysML integration and simulation with high fidelity multiphysics models in Modelica. We follow best in class strategic collaboration defined by Modelica, SysML and interchange standard SysPhS creators. We will cover following steps:

1. Modelica libraries import and usage for system architecture refinement for interchange with Modelica.
2. Model shell export form SysML to Modelica using OMG SysPhS standard
3. Model refinement and simulation in Dymola
4. SysML and Dymola simulation integration for requirements verification and trade study analysis

Primary Learning Objectives

1. Key principals of SysML and Modelica application and collaboration
2. Key principles of system architecture trade studies and requirements compliance.2.
3. Key principles of SysML-Modelica model transformation through OMG SysPhS standard.

Thursday, September 14 * 1:00 pm – 5:00 pm

Tutorial: Leveraging Unified Architecture Framework (UAF) in Engineering Management

Instructor: Ron Kratzke, Dassault Systèmes

As a systems engineering manager, you are required to manage the system engineering organization and the support provided to system development projects. In an enterprise architecture context, you can utilize Unified Architecture Framework (UAF) to document and plan project support.

This hands-on tutorial will provide an overview of UAF 1.2 standard, as well as a deep dive into several aspects of the UAF grid. First, document the organization, staffing, competencies, and training needs for a project. Second, develop the strategic goals, team capabilities and value to the project. Then, examine resources needed for the organization and any security architecture needed to support it. As the architecture is developed, risks to the current and future architecture will be documented. Finally, in summary, this tutorial will explore ways to develop customized views of risks, and capture overall architecture needs to a particular engineering project.

Learning objectives:

1. Understand the changes and organization to UAF for Version 1.2
2. Apply Strategic Views to address Mission, Vision, Objective and Strategic Planning.
3. Apply Personnel Views for Organizational Management
4. Apply Resource Views to document and analysis the resources need to support the Organization
5. Apply Security Views to document and show the security concerns for the organization.
6. Apply cross-cutting viewpoints to examine the dependencies of the views for organizational growth.

Topical Outline:
I. Introduction to UAF 1.2
II. Mission and Strategic View development
III. Personnel View development
IV. Resource View development
V. Security View development
VI. Risk and other custom Viewpoint development
VII. Summary and Conclusion

Thursday, September 14 * 1:00 pm – 5:00 pm
Tutorial: Back to Basics: Thinking Like a Systems Engineering Practitioner
Instructor: David Walden, Sysnovation, LLC
Are you new systems engineering practitioner? Congratulations! Perhaps you were previously a lead software or hardware engineer in your organization. Perhaps you are starting your career with a graduate degree in systems engineering. Perhaps you don't even have an engineering background. Now what?

The objective of this half-day tutorial is to provide top-level guidance to new systems engineering practitioners on how to shift their mindset into one that will enable them success in their new position. We will focus our discussions on the following concepts:
• You need to look up, out, and down
• The lines are just as important as the boxes
• Think about the end before the beginning
• Form follows function follows purpose
• Balance requires trade-offs
• Systems engineering is a team sport
• The journey is just as important as the destination
• It is not enough to be right; people have to accept that you are right
• It always depends
• So what?

Due to the duration of this tutorial, each of these topics will be covered at a high level. However, each student will receive an annotated bibliography to pursue topics of interest in more detail. The tutorial follows the terminology and conventions of the INCOSE Systems Engineering Handbook (SEH), ISO/IEC/IEEE 15288, the INCOSE Systems Engineering Competency Framework (ISECF) and the Guide to the Systems Engineering Body of Knowledge (SEBoK). As part of this tutorial, each participant will be encouraged to develop an initial Personal Action Plan to guide their future development plans.

Thursday, September 14 * 5:30 pm – 6:30 pm
Social Event - Wine Science Center (Washington State University)

Friday, September 15

Friday, September 15 * 8:00 am – 9:00 am
Breakfast

Friday, September 15 * 9:00 am – 9:15 am
Welcome and Introduction

Friday, September 15 * 9:15 am – 10:00 am
Keynote Address
Presenter: Puesh Kumar, Office of Cybersecurity, Energy Security, and Emergency Response, U.S. Department of Energy

Friday, September 15 * 10:10 am – 11:00 am * *Case Studies Stream: Innovation*
A Rocket Scientist's Approach to Continuous Innovation and Improvement
Presenter: Andy Inkeles, ManTech
How do you innovate and drive revolutionary change in an organization that has a long history of successfully delivering National Security Space (NSS) assets on-orbit for the United States Space Force's (USSF)? The answer is application of a well thought out change management approach.

During the past two years, the NSS Launch (NSSL) Program has implemented a Continuous Innovation and Improvement (CI2) framework to proactively identify and capture innovation and improvement project ideas, assess each candidate project's validity and benefit, develop and approve implementation plans, and validate each project's completion. Key elements of the CI2 Framework include
- well-defined process that incorporates key governance activities,
- JIRA/Confluence based facilitating tool,
- Leadership Steering Team and dedicated support staff, and
- communication model that socializes project status and successes to stakeholders.

This presentation will share our change management journey to successfully operationalize CI2 across the NSSL Program. Areas addressed will include the following:
- An explanation of the change management framework we applied in defining and implementing the CI2 framework.
- Identification of the need to change.
- Specifics of our stakeholder analysis approach and how that shaped our CI2 implementation plan.
- The CI2 Process and how our CI2 JIRA project and Confluence page facilitate each process step.
- Our CI2 Governance model and approach to sustain each change.

It may not take a rocket scientist to innovate and drive revolutionary change, but in this case it didn't hurt.

Friday, September 15 * 10:10 am – 11:00 am * *Systems Engineering/Education Stream*
Get your ESEP!
Presenter: Renee Steinwand, Booz Allen Hamilton
Are you interested in the process to become an INCOSE Expert Systems Engineering Professional (ESEP)? Attend this presentation to learn more about the ESEP application requirements, process, application, and references. Understand how to put together your application and timeframe for submission. This session will serve as a workshop for attendees to assemble the necessary information and points of contact to develop the ESEP package.

Friday, September 15 * 10:10 am – 11:00 am * *Cyber Security Stream*
Eliciting Cybersecurity Goals for Cyber Physical Systems in Conceptual Design
Presenter: Martin Span, Colorado State University

Delivering secure functionality by designing secure complex cyber-physical systems requires a systems approach utilizing best practices from Systems Thinking and Systems Engineering. Security design is commonly delegated to IT focused personnel implementing a checklist approach to security applied too late in the system development lifecycle. Systems Engineers must lead in furthering a holistic design effort that includes cybersecurity considerations on equal footing with functionality and safety.

Main Points:

- Cybersecurity requirements should be elicited early in the system design. This begins with elicitation of security goals as predecessors to security requirements. These goals are formed from stakeholder input and an initial system context and CONOPS.
- A systems-thinking approach to security goals elicitation provides better system security requirements. It facilitates sound requirements traceable to mission needs and impacts. This method will demonstrate elicitation of holistic cybersecurity goals derived from key mission functionality. This approach includes the use of MBSE to elaborate a preliminary system architecture focused on understanding the system concept and high-level functionality to further elicit system goals. While this approach is primarily applicable to large scale system design and development, it can be tailored to levels of complexity based on the stakeholder needs and acceptable risk level for system implementation.
- The presentation will demonstrate implementation of this methodology for complex cyber physical systems relevant to aviation, weapons system, and vehicle design and development.

Take Aways:

- The audience will be exposed to an emerging best practice for a top-down systems approach to security goals elicitation. The utility of MBSE in an iterative approach to security goals and requirements will be demonstrated.
- Cybersecurity requirements can and should be mission and functionality driven to result in secure system design and implementation.
- Related Industries:
- This presentation will be applicable to a wide range of industries. Anyone who develops complex cyber physical systems will find the work applicable. This work is most relevant to those working on the security design for these systems, but should be applicable to all engineers and program leadership responsible for system design and development in conceptual design.

Friday, September 15 * 10:10 am – 11:00 am * *Operations Technology Stream*

Legacy System Evolution into an Enterprise

Presenter: Sian Terry, Peraton

This presentation will focus on an increasingly problematic and complex issue in the aerospace community, the evolution of legacy systems into an enterprise. According to Rebovich and White, “complexity arises from interdependence of piece parts.” One way to curtail this complexity is to create a model of the target system, which is an enterprise in this case. Causal loop diagrams (CLDs) were chosen to aid in the definition of the target system. These types of diagrams were chosen for several reasons. Firstly, they can be used to create a reductive and holistic view of enterprise systems by visualizing three key components in systems thinking (the system of interest (SOI), context, and enabling systems). Information and material flows can be depicted at various levels of abstraction to better understand the interdependence of multiple elements in the enterprise. Allowing the systems engineer (and other stakeholders) to see how the piece parts interact. These elements may include the stakeholder’s needs, the associated requirements, and the workforce needed to implement the desired solution. Secondly, CLDs do not have the same dependence on linear depiction that other models, such as the Vee model,

are restrained by. As such, CLDs can be used to better understand the nonlinear cause and effect relationship of the system elements.

This model, known as the enterprise lifecycle model (ELM), was created using peer-reviewed and published works, such as the INCOSE Systems Engineering Handbook. This presentation will provide an overview of this model and its creation. The main takeaways are that current efforts to evolve legacy systems into an enterprise have not had the desired effect. Additional research is needed in this area to bolster the academic and industry efforts to define an enterprise system and how to create/maintain one. One way to do so is through the use of CLDs and systems thinking. This presentation will describe the advantages and disadvantages of this approach. The ELM is academically sound; however, this is only the first step of the systems dynamics process. The next step is to compare the ELM to operational systems. This will be done via systems dynamics analysis and qualitative interviews. This presentation will conclude by defining the types of systems that are needed for this additional research (operational aerospace ground systems) and ask the audience for help with this task. As many systems as possible must be interviewed if a model to support the definition of an enterprise is to be created.
It should be noted that this presentation does not directly involve all the topics of interest to this conference. What is does is create a model to better understand system evolution into the enterprise. This model has a systems-engineering focus and is still in its early stages of research and development, making it ideal for this conference.

Friday, September 15 * 10:10 am – 4:00 pm
AI Lightning Rounds
The AI Lightning Rounds will pack as much information into succinct, engaging presentations on a variety of Artificial Intelligence topics. Designed to inspire and provoke further conversations, each 18 minute segment will end with a Q&A with the audience.

Hear about research that advances artificial intelligence. This includes machine learning, natural language processing, computer vision, data mining, knowledge representation, human-in-the-loop AI, search, planning, reasoning, robotics and perception, and ethics.

Friday, September 15 * 11:10 am – 12:00 pm * *Case Studies Stream: Sustainability*
Evaluating Environmental Impacts when Designing Systems
Presenter: Stephane Lacrampe, INCOSE
This presentation aims to showcase the results of the EcoPlex R&D project (https://www.ecoplex.fr/index_en.html) by presenting a methodological approach and software solution that integrates life cycle assessment (LCA) with the design of systems architectures. The objective of the EcoPlex project was to develop a comprehensive approach that would allow for the evaluation of the environmental impacts of a system throughout its entire lifecycle.

By enriching system models with information such as the life expectancy of components, materials used, consumptions, and emissions, it becomes possible to generate an inventory of the flows from and to nature for which the system is responsible. This inventory enables a precise LCA that identifies the types of impacts a system has, from the extraction of raw materials to its end-of-life phase.

We will illustrate these concepts and processes using a use case in the naval domain, specifically two boats that will collect plastics from the seas, namely the Mobula 8 and 10. We will demonstrate the use of the Ecodesign for Capella add-on and its integration with the OpenLCA tool, an open-source Life Cycle Assessment software.

Friday, September 15 * 11:10 am – 12:00 pm * *Systems Engineering/Education Stream*

A Bridge Blueprint to Span the Chasm Between Research and Engineering - A Framework for Systems Engineering in Early-Stage R&D (ESRD)

Presenters: Ann Hodges, Sandia National Laboratories (ret) and INCOSE Enchantment Chapter, and Arno Granados, Boeing and INCOSE Enchantment Chapter

Researchers and funding organizations often do not understand the value of systems engineering in Early-Stage projects (TRL 1-5), during which SE may be viewed as an unnecessary cost, and as a process heavy effort applicable only for mature technologies. This may result in a relative lack of engineering rigor and lack of understanding of innovation context which often contributes to failures in the "Valley of Death" between fundamental research and applied development (Anton 2022).

We argue there is more than one pathway for crossing the Valley of Death, and that relevant application of systems engineering implemented at an appropriate level of rigor provides a foundation for transition and use of technical innovation. This article discusses the principles and foundational elements necessary for development and use of a Framework for systems engineering applicable in ESRD, including tailoring considerations associated with TRL and stakeholder roles. Associated Framework metrics are suggested to enable evaluation and practical implementation of the Framework for SE innovation management at this phase of technology development.

Friday, September 15 * 11:10 am – 12:00 pm* *Digital Transformation Stream*

INCOSE's Digital Transformation: Where We've Been, Where We're Going, and How We're Getting There

Presenters: Molly Kovaka, INCOSE / KOVAX, and Alexandra Kowalski, INCOSE / UMS

INCOSE is a global, member-driven, professional engineering organization with much of the activity powered largely by a set of cloud-based, asynchronous communication and collaboration tools. In a few short years, we've made a paradigm shift from reliance on a small set of legacy collaboration tools, to implementing a new and modern set of interconnected and distributed capabilities. We call the rollout of these tools to INCOSE members the Community Transformation Project. Launched in May 2022, the Project aims to engage, inform, educate, and empower INCOSE members to fully utilize the suite of tools and platforms that are included in the value of membership. This presentation will provide an overview of INCOSE IT's Community Transformation Project and details on the specific collaboration tools and platforms that are available to INCOSE members. Attendees will leave with an understanding of the Community Transformation roadmap and with actionable steps to take to enhance their engagement with the INCOSE systems engineering community.

Friday, September 15 * 11:10 am – 12:00 pm * Cross-Domain Solutions Stream

A Demonstration of MBSEsec Applied to Securing J1939 Protocols on Heavy Vehicle Networks

Presenter: Jeremy Daily, Colorado State University

Security risk mitigation and defense for cyber-physical systems (CPS) is a critical step in secure system development. As technology continues to rapidly advance, vehicle security is becoming a prominent and important factor in the cybersecurity domain. The automotive and heavy trucking industries rely heavily on secure CPS design, in which systems engineering plays a key role. The Systems Engineering community has come to favor Model-Based Systems Engineering (MBSE) as an effective tool for designing complex systems, especially in the early stages of system development. MBSEsec is a method used for designing secure systems through SysML by outlining activities and guidelines necessary for developing the system architecture.

The cyber-physical component of heavy vehicles primarily lies within vehicle networks. Vehicle network transport protocols are a set of rules and procedures that govern the communication between different devices within a vehicle network. These protocols are responsible for ensuring that messages are transmitted and processed reliably and efficiently between senders and receivers. The SAE J1939 protocol implemented on a Controller Area Network (CAN) is the most common communication method for Electronic Control Units (ECUs) in heavy vehicles. The discovery and validation of new exploits that take advantage of vulnerabilities in the data-link layer of the protocol present an opportunity to enhance the architecture's security.

This paper addresses the three pillars of MBSE to secure network architecture. We review and apply Languages, Tools, and methods for security architecture to the transport layer protocol. We also detail five transport protocol vulnerabilities that have been validated and exploited. In this paper, we apply the MBSEsec methodology using SysML to generate security requirements, identify system assets, model threats, and risks, and generate security controls for the J1939 transport protocol. Based on the zero trust architecture principles, we recommend adding a new stereotype 'attacker' to the MBSEsec profile as specified by NIST 800-207. This addition, as well as a detailed threat analysis through attack modeling, enables the generation of more accurate, complete, and effective security requirements for preexisting systems. The structure of the MBSEsec methodology facilitates an iterative development of more precise and holistic security requirements that lead to the effective design of security controls.

Friday, September 15 * 1:40 pm – 2:30 pm * *Case Studies Stream: MBSE*
Creating and Using Templates for MBSE Modeling in Capella
Presenters: Sushim Koshti and Orlando Trejo, Applied Materials, and Tony Komar, Siemens
Model-Based Systems Engineering is an effective approach to designing complex systems, and Capella is a popular tool for creating MBSE Models. The increase in adoption of MBSE across a variety of industries has led to an influx of new users who want to create models for complex and highly integrated systems. Creating and maintaining these models can be time-consuming and error-prone, especially for new users working on multiple projects. To address this challenge, we propose using templates to provide a consistent starting point for creating MBSE models in Capella. Model templates have the potential to allow new, and current users, to create more accurate models in less time by enabling reuse and standardization. Templates are also an effective tool for scaffolding – a teaching technique in which teachers model or demonstrate how to solve a problem, and then step back, offering support as needed. Standard templates also offer the potential to automate creation and verification of models in the future.

This presentation outlines a method for improving the efficiency and consistency of MBSE models using templates in the Capella tool. Our method involves defining standard Capella objects, such as entities, actors, functions, and more, and choosing a standard set of Capella diagrams that are applicable to your product development needs and then defining a standard layout to present the objects in these diagrams. The presentation then details how to create template diagrams with applicable objects and layouts, along with instructions on how to use these templates to create new models and reuse layouts from template diagrams. The instructions include using the Capella tool to import and modify templates, as well as creating new models from the templates.

Friday, September 15 * 1:40 pm – 2:30 pm * *Systems Engineering/Education Stream*
Systems of Systems Engineering in Practice
Presenter: Judith Dahmann, INCOSE Fellow and SoSE Working Group Chair

In today's networked world, very few systems, if any, stand alone. This is clearly the case with information technology (IT) systems and applications, as it is with most military, air traffic control, and other cyber-physical systems. In fact, there are those who argue that systems engineers need to realize that when they are developing systems, they are developing components or modules of larger systems, or "systems of systems" (SoS) and when they address issues facing larger enterprises, they need to consider the enterprise from the perspective of an SoS. As defined in ISO/IEC/IEEE 21839 (2019), an SoS is defined as "a set of systems or system elements that interact to provide a unique capability that none of the constituent systems can accomplish on its own."

An SoS is typically composed of existing 'constituent' systems that are evolving at their own pace, under their own authorities. Each constituent system is a useful system by itself, often having its own management, goals, and resources, but coordinates within the SoS to provide the unique capability of the SoS. Since the constituent systems can themselves be complex systems, the SoS can be large, complex, and dynamic with many emergent behaviors, both predicted and unpredicted. These factors all contribute to the challenges facing systems engineering in a SoS context.

In the decade since the formation of the INCOSE SoSE Group, the community has moved from 'admiring the problem' to characterizing the challenges or 'pain points' facing systems engineering of SoS to developing and applying approaches to SoSE implementation. ISO standards have been adopted which provide commonality across domains in terminology and best practices for SoSE. And SoSE has adopted model-based, digital engineering approaches to represent and manage SoS complexity and dynamics. By providing an unambiguous, standards-based description of the systems in a SoS including key behaviours and their interfaces, and of the way these systems interact to address SoS capabilities, SoSE models can provide a shared representation of the SoS architecture along with a computational base for analysis of SoS measures of performance, effectiveness, and outcomes.

While originally associated with Defense, SoS are found across domains – transportation, health care, telecommunications, energy, water resources and more. They include purely technical SoS but increasingly include large 'socio technical' SoS where the constituents are groups or organizations. Recently there is a movement towards what has been termed 'mission engineering' where focus has shifted from the performance of the SoS to the impact of the SoS on broader mission objectives.

This presentation will review basic tenets of SoSE and key SoSE community resources to provide a foundation for understanding the dimensions and basic principles of SoSE. Using this as a basis, the presentation will review several examples of SoSE practice, to illustrate SoSE challenges and opportunities.

Friday, September 15 * 1:40 pm – 2:30 pm * *Digital Transformation Stream*
Using the Big Pen: How to be the Webmaster for your INCOSE Chapter or Working Group
Presenters: Molly Kovaka, INCOSE / KOVAX, and Alexandra Kowalski, INCOSE / UMS
INCOSE Chapters and Working Groups are provided with their own webpages, both public and intranet (iNet) pages, on the INCOSE.org website. These pages are the public face of each community, allowing chapters and working groups to share their purpose, goals, events, achievements, publications, and collaborations both inside and outside of INCOSE membership. As part of the INCOSE IT Community Transformation Project, each community webpage is getting an updated look and feel. Designated community "webmasters" are also getting enhanced editing abilities that we're calling The Big Pen. This tutorial will teach interested INCOSE members the basics of being a Big Pen holder (website editor) for their working group or chapter. Topics covered will include website platform basics, requesting and

accessing Big Pen permissions, a tour of the editing interface, content and layout and widget basics, how to load and use images and documents on your webpages, and how to save or publish your webpage edits. Attendees will leave with an understanding of the Big Pen webmaster role and the ability to make basic edits and updates to their own community webpages with confidence.

Friday, September 15 * 1:40 pm – 2:30 pm * *Operational Technology Stream*
A Tailored-System Approach for a Simple System with a Complex Implementation
Presenter: Sean Bumgarner, Colorado State University
The purpose of this work is to present a tailored Systems Engineering (SE) approach in the heavy-duty trucking industry to optimize effectiveness, increase speed to implementation, and minimize cost in a product development effort. Often a traditional SE approach is critiqued as too extensive to apply to a simpler product development in an operationally dominant industry. Commonly in these industries, such as trucking, engineers select existing products as solutions without considering the complexity of implementation and integration into large scale fleet operations, often with adverse impacts to operational effectiveness. In this case of buying commercial off the shelf (COTS) products, advanced development and engineering design are often not considered due to a reliance on the selected vendors design process. While the use of COTS products is an industry best practice, the omission of concept development and engineering development creates significant risk and often gaps in the solution implementation for an operational fleet. This work demonstrates the value of applying a tailored approach including traditional SE processes to support product development including COTS products. Furthermore, it presents the benefits of maintaining this SE approach for a simpler product solution implementation in a complex operational environment.

To demonstrate this tailored life cycle, we will use a rollout of a forward-facing camera system into a heavy vehicle freight system using this tailored system engineering (SE) approach. This approach is derived from Alexander Kossiakoff's "System Engineering Principals and Practices," 2020, focusing on the concept development, engineering development phase, and post development stage. A significant focus is placed on tailored requirements gathering, concept exploration, concept definition, risk mitigation, advanced development, engineering design, and integration, and evaluation steps. Furthermore, this work focuses on the post development lifecycle considerations for system design including production and operation maintenance adapted for long duty cycles, in excess of nine years.

This work illustrates examples of SE considerations applied to engineering development including requirements elicitation, wiring harness design, and mounting hardware design. Post Development considerations include reliability, availability, and maintainability analyses impact on generating risks to the design and implementation.
Potential Artifacts presented will include:
1. Detailed camera objective tree structure
2. Functional block diagram
3. Functional subsystem allocation matrix
4. Alternative functional analysis
5. Formulating preliminary functional requirements
6. Preliminary analysis of performance
7. Operational requirement analysis
8. Subsystem analysis
9. Feasibility of installation and maintenance analysis
10. Refined requirements analysis
11. Analysis of alternatives with a focus on scoring

12. Subsystem analysis with a focus on scoring
13. Definition of functional and physical architecture
14. Match function to requirement
15. Define concept hardware
16. Functional to subsystem allocation matrix
17. Synthetization of functional and environmental testing
18. Subsystem changes and modifications
19. Risk Assessment
20. Risk cube display
21. SysML deployment model

The purpose for applying this tailored SE lifecycle is due to the complexity of the observed operating environment, the complexity of the software and hardware interactions, the scale of the rollout, but not necessarily due to the complexity of the camera system itself. Identifying these complexities, interactions and impacts on operation have added to the rigor of the process and matured the overall camera system prior to full deployment, but do not over-complicate, delay, or confuse stakeholders. This maturation occurs through optimizing time, resources, and cost. This camera system is an ideal system to illustrate the utility of applying a tailored SE lifecycle as the designed solution is relatively simple as a mostly COTS product. However, its implementation and post development considerations are complex and justify and demonstrate the utility of applying SE processes to the design, development, and employment of the system.

Presentation Takeaways

The audience should take away the ability to apply this tailored SE approach to simpler system design with complex implementations. This presentation will provide insight into similar projects across other operation-based systems. Furthermore, this work presents a system of systems approach with a limited lifecycle visibility as the SE approach did not specify tractor or the camera, rather all of the interactions between these platforms.

Friday, September 15 * 3:10 pm – 4:00 pm * *Case Studies Stream: System Development*

Speed to Market - An Incremental Approach to System Development

Presenter: Marshall Mattingly, INCOSE

In the current acquisition and development environment, customers are under significant pressure to obtain system capabilities, often in a time frame much shorter than historical supplier contracts. The suppliers as well are under pressure to deliver capability to the field that often requires innovative technologies to be conceived, developed, integrated, and qualified for use in the field. The time and expense to develop, integrate, and qualify these products utilizing traditional methods often leads to late capability delivery, early obsolescence, and substantial cost commitments that can be impossible to obtain in the current budget environment. This can result in capabilities too late to be of use to the customer community, as the threats to the customer from competition continue to evolve at ever faster rates.

Explore how the acquisition community in our industry has evolved, moving from a single point product solution to a platform/capability solution, which allows significant continuing capability development once a platform is in place. We discuss how our company has moved toward an incremental approach in platform development, to speed initial capability to market while paving the way for many years of capability enhancement of the delivered platform.

The presentation will consider in detail one example of this product development strategy. The customer community required new capability to counter new threats, needed the capability delivered quickly, and had limited money to make it happen. Our company accepted the challenge for this program, deciding to utilize the Scaled Agile Framework (SAFe) to achieve both the cost efficiency required and the ability to deliver capability quickly. In earlier developments, our company and the acquisition community tended toward a solution that both contained all the capabilities in the statement of work and had little ability to implement new capabilities without significant or complete redesign of the system.

Success on the program required many unfamiliar ways of working:
- Development of a framework to develop capabilities incrementally. This framework allowed all aspects of the program – hardware developers and their suppliers, software developers, and the integration and test facilities – to understand the incremental maturity required in each area to achieve each incremental capability.
- Development and implementation of an architectural runway, as outlined in the SAFe framework, enabling incremental capability without causing major hardware or software rework as new capabilities were added to the system.
- Implementation of and adherence to the tenets of agile development, including scrum, sprint planning and reviews, continuous improvement, and increment planning. Critical decisions were made during regular sprint reviews that sped incremental hardware builds, aligned on required maturity of a piece of test equipment, or allowed early completion of test or analysis activities when the required knowledge was demonstrated.
- Agreement with the customer community that the program as originally planned – a single set of system tests demonstrating the contracted capability – contained significant risk against the schedule needs. This agreement paved the way for system tests that included incremental capabilities, allowing the follow-on capabilities to be in development while earlier capabilities were in integration or in system testing.
- Acknowledgement and understanding by both the customer and our company that we were truly moving toward our product as a platform upon which capability could be developed for years into the future. While the primary capabilities were developed and implemented between 2015 and 2019, the intervening years have seen the development and implementation of multiple software updates that have provided significant capability to fielded systems.
- Alignment across all functions. Any company function not aligned with the direction of the program became friction. Our program teams worked closely with counterparts in other business functions, including supply chain, quality, security, and information technology to align processes to minimize this friction and allow the teams to work both flexibly and with speed.

In the end, the customer has been able to take product delivery in time to support its initial fielding needs, and the program team has continued to complete development, integration, and qualification of the follow-on capabilities to allow the product to meet and exceed the original customer needs. Further, the program is positioned to continue to increase its performance as new threats emerge, and the product includes the ability to take advantage of upgrades to customer systems, which were envisioned at the start of the program, though were not scheduled to come online until years after completion of our initial product deliveries.

Our program has been an example of the trend to view our products not as a single point solution to a customer challenge but rather a platform upon which capabilities can be added as the needs of the customer evolve. In our case, assess the potential future needs of the customer in order to size the processing and sensing elements of our system, then incrementally develop the platform to include

those elements, enabling our customer to better understand the evolving landscape before committing funding.

Takeaways

- While use of capability frameworks, SAFe development, architecture runways, and product as platform/capability has been described here in an example from one industry, the same concepts hold true across any industry that requires significant development time and expense.
- With the incremental development of a product, the time to market shrinks, allowing the customer to get initial capability to the field quickly and provide feedback as to the next priorities, rather than hope that the original estimates of the evolving threats is good enough.
- This methodology of incremental development encourages the alignment of all functions in the organization, focusing attention on the key challenges and cross-function handoffs required for program success. Everything not aligned is friction that needs to be eliminated or intentionally managed.
- Proper use of sprint reviews in the scrum process allows program and product stakeholders to quickly see where decisions can be made to speed development, especially of incremental capabilities.
- Systems engineering takes on a different role, remaining actively engaged in the product development cycle, guiding the incremental architecture and capability development of the program.

Friday, September 15 * 3:10 pm – 4:00 pm * *Systems Engineering/Education Stream*

Open Standards SysML and Modelica Integration Strategy

Presenters: Saulius Pavalkis and Jyothi Matam, Dassault Systèmes

This presentation demonstrates how to accelerate system design by leveraging systems engineering and simulation together. Examine linking simulation assets into the system architecture by integrating two major open standards SysML & Modelica, and maintaining a single source of truth, ensuring consistency and traceability. It is an MBSE approach to provide automated synchronization between the architecture definition derived from stakeholder requirements, and system design by translating SysML models into Modelica multi-physical simulation models. To ensure continuity and consistency, model interfaces are decomposed between the different abstraction levels. Through the inheritance concepts, supported by the Modelica standard, different system variants are easily assigned and evaluated. This integrated and synchronized approach allows for faster early validations, taking advantage of the broader scope of system definition and characteristics. With this whenever the requirements of a system change, the architecture and design are synchronized, and system-level impact analysis is provided by the dynamic simulations.

Friday, September 15 * 3:10 pm – 4:00 pm * *Cyber Security Stream*

Digital Twin-Based Cyber Attack Detection for Process Control Systems

Presenter: Jeremy Daily, Colorado State University

Despite the importance of Process Control Systems (PCSs) and their vital role in ensuring smooth and reliable operation, they are generally designed from an operational perspective with low focus on cybersecurity, which is a safety concern that requires the implementation of add-in protective functionalities within the PCSc. This paper presents a Digital Twin (DT) based Technique for improving the Cybersecurity of PCSs, that has the capability to detect cyber attacks and Network faults.

A Digital Twin is used to simulate the Process Control System and to collect process response-related data and abnormal information. The sub-component of the DT is the cyber-attack detector, which is based on a Statistical Machine Learning (ML) mechanism. Real time Monitoring and Alarming is achieved

by the use of a Statistical Process Control (SPC) Chart. It is expected that the proposed solution will improve the plant's operational efficiency and lower its failure rate. Moreover, it will enhance the accuracy of fault detection by avoiding nuisance alerts and false alarms. To demonstrate the effectiveness of the proposed technique, an illustrative case study on a Coupled-Tank Level Control System is presented.

Friday, September 15 * 3:10 pm – 4:00 pm * *Cross-Domain Solutions Stream*
Application of Ride-Sharing Assignment Solutions to the Weapon-Target Assignment Problem
Presenters: Theodore Hromadka, Thomas Mazzuchi and Shahram Sarkani, George Washington University
The Weapon-Target Assignment (WTA) problem seeks to assign a set of weapons to a set of targets such that the overall target survival probability is minimized. The original WTA problem has evolved into multiple variants, such as scenarios where the weapon launch platforms are also mobile. At sufficiently long range, the problem is extended to include geospatial partitioning. In this study, we extend the basic WTA problem for mobile weapon launchers at extreme long ranges from the targets and apply the order dispatch queue and hexagonal grid systems developed for commercial ride-sharing assignment solutions. We provide experimental results of Monte Carlo simulations and a comparative evaluation with a branch-and-bound technique. These results can be applicable to similar assignment and tasking problems.

Friday, September 15 * 5:30 pm – 7:00 pm
Dinner/Winery – Terra Blanca Winery

Saturday, September 16

Saturday, September 16 * 7:00 am – 9:00 am
SEP Exam
Alternative: Morning Hike

Saturday, September 16 * 7:30 am – 8:30 am
Breakfast

Saturday, September 16 * 8:30 am – 8:45 am
Final Plenary - Introduction

Saturday, September 16 * 8:45 am – 9:30 am
Keynote Address
Presenter: Ian Milgate, Deputy Area Manager for the High-Level Waste Facility, Bechtel

Saturday, September 16 * 10:00 am – 10:50 am * *Case Studies Stream: System Resiliency*
The Relationship Between Complexity and Resilience
Presenter: Ken Cureton, University of Southern California
In this globally interconnected world, people and systems increasingly demand resilient operation when facing adverse conditions, along with an increasing need for operational flexibility and adaptability to unknown future conditions. This involves system interactions (both external & internal, and at different levels-- ranging from System-of-Systems level down to interactions between subsystems), including

systems of people (organizations), as well as interactions of people with aspects of systems. Such interactions are typically categorized as simple, complicated, and complex in nature. In this session, examine and characterize the bi-directional relationships of complexity (including emergent behavior) and resilience for various types of systems. In addition, explore potential heuristics, modeling methods, metrics, and empirical studies for evaluating such relationships as part of Systems Engineering practices.

Saturday, September 16 * 10:00 am – 10:50 am * *Cross-Domain Solutions Stream*

How Much Autonomy is Enough? Applying Systems Engineering Methodology to Autonomy in Modern Systems

Presenter: John Hearing, California Institute of Technology

Many have labelled the future as "autonomous"— INCOSE predicts that Systems Engineering will involve autonomy in many forms. Many companies are moving to capture the new autonomous marketspace, but is this all a good thing? Recently, a young man was playing chess against an autonomous chess robot, when it reached out and crushed his hand. This raises a major question: did the young man cause this problem or was the autonomous system in the wrong? Or perhaps the ultimate question: Is every place appropriate for autonomy?

- Necessary

Systems Engineering starts with stakeholder needs, capturing requirements to derive functions, then synthesizing Systems solutions. SE Book of Knowledge reminds us that System requirements are the requirements at the system level that describe the functions which the system as a whole should fulfill to satisfy the stakeholder needs. SEBOKwiki describes requirements characteristics, including NECESSARY: an essential capability, characteristic, constraint, and/or quality factor. Where do autonomous systems fit as "Necessary"? Historically autonomous systems have been used for "Dull, Dirty, and Dangerous" jobs.
- Dull: repetitive or long tasks that humans don't have the endurance or attention for.
- Dirty: tasks that are particularly messy or challenging for humans to deal with e.g. cleaning up reactor meltdowns.
- Dangerous: where danger is one of the key characteristics e.g. carrying warheads to their target

- Appropriate environment

Another requirement is an environment that is appropriate for autonomy. Autonomous solutions don't work well in chaotic, noisy, or unruly environments. Ex: robotic vacuum cleaners find extreme chaos in households challenging. Autonomous systems may be criticized for committing worse offenses than not cleaning well. Robot vacuums run into dog feces; robotic cars create accidents; and airplane autonomy contributes to crashes. In most of these cases, behavior by a human contributed to, but the environment that the autonomous solution was placed in may have been inappropriate.
Despite advances, AI is still not as capable dealing with chaos:
- A ball rolls out from between two cars—human drivers slow down because we anticipate that the next action will be a child or a dog chasing that ball into the street, even if we can't see the child.
- A person pulls their arm back, while another reaches her hands into the sky. We abstract that the two are playing catch and if the receiver misses, the ball may fly out into the street.

- Abstract Thought

Humans are able to anticipate alternatives like the ones described above because we can think abstractly — considering and postulating alternative outcomes even though a full set of data is missing.
Worse is when the data being fed to the autonomous system is false — sensors fail to correctly describe the environment. Ex: Air France 447 sensors froze over despite anti-icing measures, autopilot took actions based on this information, which actually worsened the problem, so the autopilot disconnected. Sadly, pilots then took wrong actions which led to the fatal crash. More recent examples with similar root causes are found with the crashes of the 737Max.

Saturday, September 16 * 10:00 am – 10:50 am * *Information Communications Technology (ICT) Stream*
Understanding the Emergency Communications Ecosystem
Presenter: William Chapman, State of Oregon
Every day, approximately 600,000 9-1-1 calls are made in the United States. Many of these calls trigger a chain of events that summons one or more highly trained, professional first responders to the scene who is able to mitigate the hazard, treat and transport any sick or injured victims, or restore the peace. This system functions nearly flawlessly, every time. Our emergency response system is capable of addressing nearly every emergency situation that our nation faces and is scalable to address a minor fender bender or the largest hurricanes and forest fires. But how do we manage these emergency responses? How do we communicate across disparate organizations under austere conditions reliably time and time again in order to save lives?

This presentation will explore how the National Incident Management System (NIMS) coupled with our nation's endeavor to invest in and create an interoperable emergency communications ecosystem made up of multiple system of systems has not only increased the resiliency of our infrastructure, but led to more efficient and effective use of public investments, driven innovation, and created more effective responses to emergencies and disasters, ultimately saving lives and protecting first responders.

Participants will walk away with an understanding of the fundamental principles of the National Incident Management System, including the application of the Incident Command System, and key concepts such as Unity of Command, Unified Command, Resource Typing, Span of Control, Common Terminology (Plain Language), and Management by Objective. They will also be able to recognize the components of the emergency communications ecosystem including public safety broadband, land mobile radio, 911 and dispatch, and emergency alerts and warnings. Participants will gain an understanding of the principals of interoperability, the driving factors to achieve a system of systems architecture that enables mutual aid and effective coordination of public safety resources, and be introduced to the SAFECOM Interoperability Continuum, the National Emergency Communications Plan, and the role of the Statewide Interoperability Coordinator.

A key part of the presentation will be an emphasis on the fact that although each component of the emergency communications ecosystem is in and of itself, a complex system, through the application of systems engineering principals, systems thinking, and the enforcement of standards-based technology, interoperability is ultimately achieved through strong, people centric and collaborative governance models.

Saturday, September 16 * 10:00 am – 10:50 am * *Systems Engineering and Agile Stream*
Becoming More Agile – Hybrid Plan-Driven and Agile Systems Engineering
Presenter: Ronald Giachetti, Naval Postgraduate School
Agile methods have shown their value in the software domain and are now the dominant approach to software development. Many of us developing systems would like to reap similar benefits of customer satisfaction while being on time and within budget. Yet, adopting agile methods to larger scale programs as well as programs involving both hardware and software remains fraught with difficulty, and we lack guidance on how to tailor these methods. This presentation compares plan-driven approaches and agile approaches, as well as analyzing the pros and cons of each in a given environment. We show how a hybrid approach merging plan-driven approaches at the macro level and agile principles at the micro level can be adopted by many organizations. An important enabler of agility is seen as model-based systems engineering. The tutorial illustrates the development method using the example of developing a

microgrid for a military base. Discuss the merits of combining the approach and why it is suitable for many systems engineering projects.

Learning Objective:
1. Participants will be able to distinguish between the characteristics of plan-driven and agile development methods and tailor those methods to the needs of a particular project.
2. Participants will understand the role of digital engineering and model-based systems engineering in enabling agility.
3. Participants will be able to describe the limitations of applied agility to hardware systems.
4. Participants will be able to describe the characteristics of a hybrid plan-driven and agile approach including continuous verification, continuous integration, etc.

Tutorial Outline:
1. Traditional plan-driven development
2. Challenges in system development environment
3. Agile development in the software industry
4. Comparison of plan-driven and agile development
5. Hybrid plan-driven and agile development
6. Digital Engineering and MBSE as enabler of agility
7. Planning in the process
8. Agility in the process
9. Illustration of method with microgrid design and development
10. Observations

Saturday, September 16 * 11:00 am – 11:50 am * *Case Studies Stream: Human Factors*
Collaboration, Communications and Culture in Systems Engineering: A Pathway to Smoother Projects
Presenter: Raymond Wolfgang, Sandia National Labs
Are you on a project where parts of the Systems Engineering are not "in flow"? For instance, is the elicitation of needs or development of requirements a struggle? Or for many critical infrastructure programs – is there a wildly diverse set of stakeholders and project participants, that technical and risk discussions are lost in the translation between the culture and vocabulary of different sectors? This presentation will show how a focus on the collaboration involved – or lack thereof – could get to the root of the problem. Projects are made up of human beings, and sometimes a gap in communication, unclear roles, or some other flaw in the flow of information can slow down even hard working, dedicated and emotionally intelligent team members. Three areas for troubleshooting are described: Collaboration, Communications, and Culture. The INCOSE Needs and Requirements Manual (NRM) will serve as the basis for exploring the role of collaboration and propose a team structure that will help identify if there is a role gap or broken link. Next, we present a communications model in the context of systems engineering that reminds us it is ONLY how the message is received that counts. Finally, the third part will introduce how a Collaborative Systems-Thinking Culture (CSTC), can help these new changes stick, long term. Fixing issues around collaboration, communications, or culture is not easy, nor often quick; if these are the root of the problems, then there is no substitute action (deploying MBSE for instance) that will let project performance improve. Not only is this achievable, but the project work we propose will be more satisfying along the way – leading to a much better product or system for your customer.

Saturday, September 16 * 11:00 am – 11:50 am * *Cross-Domain Solutions Stream*
SE & Photography
Presenter: Greg Bulla, INCOSE

What does it take to get good, even great photographs? Like systems engineering, a disciplined approach. While there are many examples of how SE has been used to successfully develop technical systems such as satellites and software, can systems engineering principles really be applied to more creative endeavors, such as photography?

Photography is a combination of technical skill and artistic vision, but there are also many processes involved, which are based on questions:
- What do you want to photograph?
- What are the conditions?
- What are your tools, and do you know them well enough to use them effectively?
- What are the challenges, and how will you overcome them?

As with systems engineering, taking the right approach in photography can put you in the best position for success. This presentation will discuss the fundamentals of successful modern day digital photography and how they align with SE practices.

Saturday, September 16 * 11:00 am – 11:50 am * *Information Communications Technology (ICT) Stream*
Introducing the Communications Primer: A Systems Engineer's Guide to Communications Networks: Modelling Networks as Systems
Presenters: Susan Ronning and Jianmin Fong, INCOSE Information Communications Technology (ICT) Working Group
As systems become more interconnected, they are becoming more complex in nature. At the same time, society is becoming increasingly dependent on Communications Networks (CNs). Some examples include the need for the financial sector to operate continuously and without interruption, for transportation systems to distribute people and goods around the world, for emergency services to respond reliably and with urgency, for power generation centers to reliably transport electricity, and even for militaries to succeed on the battlespace. These examples are all considered examples of Critical Infrastructure (CI), defined as those systems which are vital for society to function. Presidential Policy Directive/PPD-21 - Critical Infrastructure Security and Resilience identified "energy and communications systems as uniquely critical due to the enabling functions they provide across all critical infrastructure sectors."

Despite the increased importance of communications, there is still very little guidance on how to take a systems approach when designing and supporting systems that include, or that rely upon, CNs for their successful operation. The Information and Communication Technology (ICT) working group is actively drafting a Communications Network Primer that would greatly aid entry level and experienced SEs by empowering them with enough information to understand how to apply the systems engineering body of knowledge (SeBOK) to systems where the System of Interest (SOI) includes, or relies upon, CNs, and to know when to engage the right subject matter experts.

Saturday, September 16 * 11:00 am – 11:50 am * *Systems Engineering and Agile Stream*
Agile Systems Engineering Requirements Analysis
Presenter: Phyllis Marbach, INCOSE-LA
It is not well understood how to perform Systems Engineering tasks in an iterative, incremental way when a team is expected to implement Agile principles and practices. The Systems Engineering Body of Knowledge (SEBoK) contains not only Systems Engineering best practices, but also Systems Engineering Implementation Examples. A Systems Engineering and Agile Implementation example will be presented where requirements analysis of a prototype system was done using an iterative, incremental (or agile) approach in order to prepare documentation needed to conduct a formal review and approval of the

prototype for use in populated areas. This presentation will summarize the material to be added to the SEBoK that will show an Agile SE Implementation Example including the digital tools used to manage the information.

Audience Take Away: How do systems engineers really work in an agile way to produce engineering documentation required to meet customer expectations.

Saturday, September 16 * 12:00 pm – 1:30 pm
Poster Sessions/Lunch/Networking

- **Poster: Systems Engineering Design of a "Mass E" Service Station Facility**
  - ***Timothy Coburn, Colorado State University***
- **Poster: In-Line Inspection Tool for Hydrogen Transmission Pipelines**
  - ***Timothy Coburn, Colorado State University***

Saturday, September 16 * 1:30 pm – 2:15 pm
Concluding Remarks/WSRC 2024 Preview