



12th Annual

SYSTEM OF SYSTEMS ENGINEERING CONFERENCE



12th Annual System of Systems Engineering Conference



Conference Theme:

"Internet of Things as System of Systems"

June 18-21, 2017

Waikoloa, Hawaii, USA



SUNDAY



3:30p Registration
@Kona Promenade



5:00p Reception
@Grand Staircase

6:00p

MONDAY

07:45 Registration
@Kona Promenade

08:40 Welcome @Kona IV

09:00 Keynote @Kona IV

 Mr. Alan Harding†
Global Challenges for Systems
Engineering and the vital role
of SOS Engineering

10:00 Break @Kona Promenade

10:30 MAX @Kona IV

Session
MA*


Robotic Systems,
UAVs, ROVs,
Drones, etc. (A)

MAY @Kona I

Special Session -
Systems
Governance and
Policy

11:30 Lunch

1:00p Keynote @Kona IV

 Garry Roedler†
& Judith Dahmann†
The Future of Systems of
Systems – Or is the future here
today? Or are we back to the
future?

2:00p Break @Kona Promenade

2:30p MPX @Kona IV

Session
MP*

Robotic Systems,
UAVs, ROVs,
Drones, etc. (P)

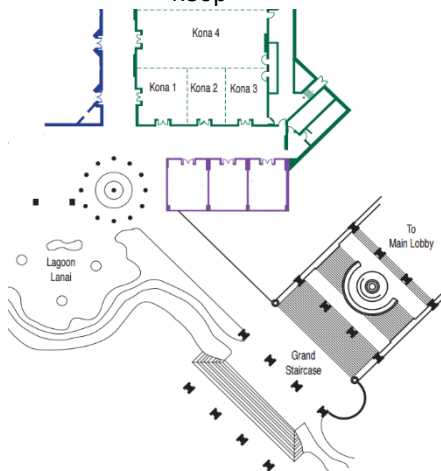
SoSE Simulation,
Modeling and
Analysis Methods

3:30p MLX @Kona IV

Session
ML*

Robotic Systems,
UAVs, ROVs,
Drones, etc. (L)

4:30p



† INCOSE Members

TUESDAY

07:45 **Registration**
@Kona Promenade

08:00 **Panel I @Kona IV**
Garry Roedler (Moderator)
Reggie Cole†, Dr. Stephen Cook,
Dr. Judith Dahmann†, Alan Harding†,
Dr. Mike Yokell

9:00



Keynote @Kona IV
Dr. Mark E. Davis
Review of LPWA standards and
systems

10:00 **Break @Kona Promenade**

10:30 Keynote @Kona IV
Dr. John Fumo
Implementation of distributed
sensing in loosely coupled fabrics



11:30 **Lunch**

1:00p Keynote @Kona IV
Prof. Ian Gibson
How 3D Printing may change
the manufacturing world as we
know it



2:00p **Break @Kona Promenade**

TPX @ Kona IV	TPY @ Kona I	TPZ @ Kona III
Big Data Anal., Cloud Comp., Svc. Oriented Arch	SoSE Arch., Design and V & V Methods	Internet of Things / Control

Session
TP*

TLX @Kona IV	TLY @Kona I	TLZ @ Kona III
Big Data Anal., Cloud Comp., Svc. Oriented Arch. / Enterprise & Business. Arch.	SoSE Arch., Design and V & V Methods	Defense, Space, National Security

Session
TL*

4:30p 4:30p 4:15p

7:00p **Banquet @Lagoon Lanai**
9:00p

WEDNESDAY

07:45 **Registration**
@Kona Promenade

08:00 **Panel II @Kona IV**
Mo Jamshidi (moderator)
Gary Langford†,
Kristin Giammarco†,
Timothy LJ Ferris†,
Paul C. Hershey

9:00

Session
WA*

WAX @ Kona IV	WAY @Kona I
Misc. (Energy, Smart Grid Technologies, SoSE Availability, Maintainability, Reliability, Resilience, Safety, etc.)	Special Session - Alternative Research Proposals for Engineering Emergence

10:00 **Break**

10:30 Keynote @Kona IV
**Prof. Micheal
Henshaw†**
Modeling and
Simulation for Cyber-
Physical Systems



11:30 **Lunch**

1:00p Keynote @Kona IV
Prof. Imre J. Rudas
Internet of Anything as
a Pillar of Intelligent
System of Systems



2:00p **Break**

WPX @ Kona IV	WPY @Kona I
Automotive	Misc. (Human Centered, etc.)

Session
WP*

3:00p Keynote @Kona IV
**Prof. Francois
Coallier**
SoSE Challenges in IoT
based Systems



4:00p **Future SoSE planning**
4:30p

KEYNOTES

MONDAY



MR. ALAN HARDING†

President of INCOSE

Global Challenges for Systems Engineering and the vital
role of SOS Engineering

9:00am

chair: Garry Roedler†



GARRY ROEDLER†

INCOSE President-Elect, Lockheed Martin Senior Fellow

JUDITH DAHMANN†

Senior Principal Systems Engineer at MITRE

The Future of Systems of Systems – Or is the future
here today? Or are we back to the future?

1:00pm

chair: Mo Jamshidi

TUESDAY



DR. MARK E. DAVIS

Vice President of Platform Engineering Group and Chief
Technology Officer of CDMA Products and Development,
Intel Corporation

Review of LPWA standards and systems

9:00am

chair: Ted Shaneyfelt



DR. JOHN FUMO

Kona Scientific, Hawaii USA

Implementation of distributed sensing in loosely
coupled fabrics

10:30am

chair: Ted Shaneyfelt

KEYNOTES

TUESDAY (CONTINUED)

IAN GIBSON

Professor of Industrial Design & Head of School
and School of Engineering Deakin University, Australia

How 3D Printing may change the manufacturing
world as we know it

1:00pm

chair: Matthew Joordens



WEDNESDAY

PROF. MICHAEL HENSHAW†

Loughborough University, UK

Modeling and Simulation for Cyber-Physical Systems

10:30am

chair: Mo Jamshidi



PROF. IMRE J. RUDAS

Óbuda University, Budapest, Hungary

Internet of Anything as a Pillar of Intelligent System of
Systems

1:00pm

chair: Ferat Sahin



PROF. FRANCOIS COALLIER

Ecole de Technologie Supérieure, Canada

SoSE Challenges in IoT based Systems

3:00pm

chair: Paul Hershey



KONA IV ROOM MONDAY JUNE 19TH SESSION MAX CHAIR: KUMAR		
Robotic Systems, UAVs, ROVs, Drones, etc. (1 of 3)	10:30am	<p>A Novel 3D printed leg design for a Biped Robot Matthew Haywood and Ferat Sahin (Rochester Institute of Technology, USA)</p> <p>Session MAX</p> <p>Paper #1570346575 Room Kona IV</p>
	10:45am	<p>A Novel Hexapod Robot Design with Flight Capability Mark Pitonyak and Ferat Sahin (Rochester Institute of Technology, USA)</p> <p>Session MAX</p> <p>Paper #1570345434 Room Kona IV</p>
	11:00am	<p>A Framework for an Adaptive Human-Robot Collaboration approach through Perception-based Real-Time adjustments of robot behavior in industry Shitij Kumar and Ferat Sahin (Rochester Institute of Technology, USA)</p> <p>Session MAX</p> <p>Paper #1570345503 Room Kona IV</p>
	11:15am	<p>Quadruped Implementation Using Parallel Jointed Leg Architecture Steven Giewont and Ferat Sahin (Rochester Institute of Technology, USA)</p> <p>Session MAX</p> <p>Paper #1570345421 Room Kona IV</p>
KONA IV ROOM MONDAY JUNE 19TH SESSION MPX CHAIR: EROL		
Robotic Systems, UAVs, ROVs, Drones, etc. (2 of 3)	2:30pm	<p>Multi-Pursuer Pursuit-Evasion Games Under Parameters Uncertainty: A Monte Carlo Approach Shahriar Talebi and Marwan A. Simaan (University of Central Florida, USA)</p> <p>Session MPX</p> <p>Paper #1570340685 Room Kona IV</p>
	2:45pm	<p>A Deep Vision Landmark Framework for Robot Navigation Abhijith Ravikumar Puthussery, Karthik Haradi, Patrick J Benavidez, Berat A. Erol, Paul Rad and Mo Jamshidi (University of Texas at San Antonio)</p> <p>Session MPX</p> <p>Paper #1570345652 Room Kona IV</p>
	3:00pm	<p>Improved Route Optimization for Autonomous Ground Vehicle Navigation Ibrahim Mohammed, Berat A. Erol, Ikram Mohammed, Patrick J Benavidez and Mo Jamshidi (University of Texas at San Antonio)</p> <p>Session MPX</p> <p>Paper #1570345584 Room Kona IV</p>
	3:15pm	<p>Development of Robot Operating System (ROS) Compatible Open Source Quadcopter Flight Controller and Interface Abhijit Majumdar, Nicholas Gamez, Patrick J Benavidez and Mo Jamshidi (University of Texas at San Antonio)</p> <p>Session MPX</p> <p>Paper #1570347307 Room Kona IV</p>

KONA I ROOM MONDAY JUNE 19TH SESSION MAY CHAIR: HOFFENSON

Special Session - Systems Governance and Policy	10:30am	Emergence as Innovation in Systems of Systems - a Three Systems Model Thomas A McDermott, Jr† (Georgia Tech Research Institute & Georgia Tech Sam Nunn School of International Affairs, USA); Molly Nadolski (Georgia Institute of Technology, USA) Session MAY	Paper #1570345612 Room Kona I
	10:45am	Incentivising the Dissemination of Truth Versus Fake News in Social Networks Abbas Ehsanfar and Mo Mansouri† (Stevens Institute of Technology, USA) Session MAY	Paper #1570347637 Room Kona I
	11:00am	Sustainability policy-making as a dynamic, agent-based system of systems Steven Hoffenson (Stevens Institute of Technology, USA) Session MAY	Paper #1570348363 Room Kona I
	11:15am	Applying Social Network Analysis to Systems of Systems: The Case of the 2016 Puerto Rico Power Outage James Enos, Mo Mansouri† and Roshanak Nilchiani (Stevens Institute, USA) Session MAY	Paper #1570339409 Room Kona I

KONA I ROOM MONDAY JUNE 19TH SESSION MPY CHAIR: COLE

SoSE Simulation, Modeling and Analysis Methods	2:30pm	Identifying Decision Patterns Using Monterey Phoenix John Quartuccio, Kristin Giammarco † and Mikhail Auguston (Naval Postgraduate School, USA) Session MPY	Paper #1570341093 Room Kona I
	2:45pm	Deriving Stochastic Properties from Behavior Models Defined by Monterey Phoenix John Quartuccio, Kristin Giammarco † and Mikhail Auguston (Naval Postgraduate School, USA) Session MPY	Paper #1570345214 Room Kona I
	3:00pm	Data Dependency Network Analysis in SoS Reggie Cole† (Lockheed Martin Corporation, USA) Session MPY	Paper #1570338483 Room Kona I
	3:15pm	Modeling Human-Technology Interaction as a Sociotechnical System of Systems Jessica Turnley (Galisteo Consulting Group Inc, USA); Amanda Wachtel , Karina Munoz, Matthew Hoffman, John Gauthier, Ann Speed and Robert Kittinger (Sandia National Laboratories, USA) Session MPY	Paper #1570339824 Room Kona I
	3:30pm	System of Systems Architecture Feasibility Analysis to Support Tradespace Exploration Ronald Giachetti, Eugene Paulo, Paul Beery and Alejandro Hernandez (Naval Postgraduate School, USA); Stephen Gillespie (United States Military Academy & United States Army, USA) Session MPY	Paper #1570340877 Room Kona I

KONA IV ROOM MONDAY JUNE 19TH SESSION MLX CHAIR: CHAMPION		
Robotic Systems, UAVs, Drones, etc. (3 of 3)	3:30pm	Design and Development of a Low-Cost Autonomous Surface Vehicle Benjamin Champion (Deakin University, Australia); Van Thanh Huynh (Colleague, Australia); Gokul Thirunavukkarasu, Lachlan Patrick, Lloyd Hock Chye Chua and Matthew Joordens (Deakin University, Australia) Paper #1570345550 Room Kona IV
	3:45pm	Eye Sensor for Swarm Robotic Fish Nnamdi Elege, Suhasini Solapurkar and Matthew Joordens (Deakin University, Australia) Paper #1570344806 Room Kona IV
	4:00pm	Implementation of Automated Vanilla Pollination Robotic Crane Prototype Tuan Giang, John Kuroda and Ted Shaneyfelt (University of Hawaii at Hilo, USA) Paper #1570331183 Room Kona IV
	4:15pm	A Research Framework on Mission Planning of the UAV Swarm Xin Zhou, Weiping Wang, Xiaobo Li , Tao Wang and Zhifei Li (National University of Defense Technology, P.R. China) Paper #1570352258 Room Kona IV
KONA IV ROOM TUESDAY JUNE 20TH SESSION TPX CHAIR: BENAVIDEZ		
Big Data Analytic, Cloud Computing, Service Oriented Archi. (1 of 2)	2:30pm	The Internet of Simulation: Enabling Agile Model Based Systems Engineering for Cyber-Physical Systems Stephen Clement and David McKee and Richard Romano and Jie Xu (Leeds University, United Kingdom); Jose Lopez (Simware Solutions, Spain); David Battersby (Jaguar Land Rover, United Kingdom) Paper #1570340957 Room Kona IV
	2:45pm	Model-based Assessment of QoS Adaptation in Complex Networked Systems Kaliappa Ravindran, Yassine Wardei and Michael Iannelli (City University of New York, USA) Paper #1570344848 Room Kona IV
	3:00pm	Pedestrian Detection System Using Deep Convolutional Neural Networks Jonathan Lwowski, Prasanna Kolar, Patrick J Benavidez, Paul Rad, John J Prevost and Mo Jamshidi (University of Texas at San Antonio) Paper #1570345515 Room Kona IV
	3:15pm	Deep Voice Identification Andrew Boles and Paul Rad (University of Texas San Antonio, USA) Paper #1570345545 Room Kona IV

KONA I ROOM TUESDAY JUNE 20TH SESSION TPY CHAIR: GIACHETTI

SoSE Architecture, Design and V & V Methods	2:30pm	Quality metrics for descriptive models in model based systems engineering Ronald Giachetti (Naval Postgraduate School, USA)	Paper #1570340808 Room Kona I
	2:45pm	Architecture Modeling Software Analytics: Model quality and maturity assessment using automated tools Kristin Giammarco [†] (Naval Postgraduate School, USA)	Paper #1570345349 Room Kona I
	3:00pm	Comprehensive Use Case Scenario Generation: An Approach for Modeling System of Systems Behaviors Kristin Giammarco [†] , Clifford Whitcomb [†] and Kathleen Giles (Naval Postgraduate School, USA)	Paper #1570341061 Room Kona I
	3:15pm	Red Teaming in the Age of IOT: Thoughts on Framing the Next Generation of Technical Vulnerability Assessment Richard Craft, II (Sandia National Labs, USA)	Paper #1570341050 Room Kona I

KONA III ROOM TUESDAY JUNE 20TH SESSION TPZ CHAIR: KELLEY

Internet of Things / Control	2:30pm	An IoT Self Organizing Network for 5G Dense Network Interference Alignment Anil Kumar Yerrapragada and Brian T Kelley (University of Texas at San Antonio, USA)	Paper #1570345200 Room Kona III
	2:45pm	Software Architecture of Self-Organizing Systems-of-Systems for the Internet-of-Things with SosADL Flavio Oquendo (IRISA (UMR CNRS) - University of South Brittany, France)	Paper #1570344966 Room Kona III
	3:00pm	Using a Systems of Systems modeling approach for developing Industrial Internet of Things applications Aurelijus Morkevicius [†] (Kaunas University of Technology & No Magic Europe, Lithuania); Lina Bisikirskiene (Kaunas University of Technology, Lithuania); Graham Bleakley [†] (IBM UK Ltd, United Kingdom)	Paper #1570340827 Room Kona III

KONA IV ROOM TUESDAY JUNE 20TH SESSION TLX CHAIR: RAD		
Big Data Analytic, Cloud Computing, Svc. Oriented Arch. (2 of 2) / Enterprise and Business Architecture	3:30pm	A Deep Learning Approach for Mapping Music Genres Sharaj Panwar, Arun Das, Mehdi Roopaei and Paul Rad (University of Texas at San Antonio, USA) Session TLX Paper #1570345535 Room Kona IV
	3:45pm	Autonomous Decision Making for a Driver-less Car Nicholas Gamez and Nicolas Gallardo (University of Texas at San Antonio, USA); Paul Rad (Rackspace, USA); Mo Jamshidi (University of Texas at San Antonio, USA) Session TLX Paper #1570341909 Room Kona IV
	4:00pm	Enabling Design of Agile Security in the IOT with MBSE Barry Papke† (No Magic Inc, USA) Session TLX Paper #1570340698 Room Kona IV
	4:15pm	Systems Engineering Competencies for Enterprise Transformation Rabia Khan†, Clifford Whitcomb† and Ronald Giachetti (Naval Postgraduate School, USA) Session TLX Paper #1570341069 Room Kona IV
KONA III ROOM TUESDAY JUNE 20TH SESSION TLZ CHAIR: ENOS		
Defense, Space, National Security	3:30pm	Defining an Enterprise Lead Systems Integration (LSI) Framework Warren K. Vaneman† (Naval Postgraduate School, USA); Ron Carlson (Stevens Institute of Technology, USA) Session TLZ Paper #1570340859 Room Kona III
	3:45pm	Using Social Network Analysis to Quantify Interoperability in a Large System of Systems James Enos and Roshanak Nilchiani (Stevens Institute, USA) Session TLZ Paper #1570339163 Room Kona III
	4:00pm	Trends in Large Scale Systems-of-Systems for Multi-National Missile Defense Tod Schuck (Lockheed Martin & Rowan University, USA); James Kilian (Lockheed Martin, USA) Session TLZ Paper #1570340879 Room Kona III

KONA I ROOM TUESDAY JUNE 20TH SESSION TLY CHAIR: OQUENDO

SoSE Architecture, Design and V & V Methods

3:30pm

Architecturally Describing the Emergent Behavior of Software-intensive System-of-Systems with SosADL

Flavio Oquendo (IRISA (UMR CNRS) - University of South Brittany, France)

Paper #1570340809

Session TLY

Room Kona I

3:45pm

A Novel Methodology for Retrofitting CNC Machines Based on the Context of Industry 4.0

Romulo Lins (Faculdade SENAI Mariano Ferraz, Brazil); Robert Schmitt (Laboratory for Machine Tools and Production Engineering WZL, Germany); Bruno Guerreiro (Fraunhofer Institute for Production Technology, Germany); Marcio Corazzim (Faculdade SENAI Mariano Ferraz, Brazil); Francis Silva (Thyssenkrupp, Brazil)

Paper #1570340951

Session TLY

Room Kona I

4:00pm

Evaluating a computational support tool for set-based configuration of production systems

Johannes Unglert, Sipke Hoekstra and Juan Jauregui-Becker (University of Twente, Faculty of Engineering Technology, Enschede, The Netherlands)

Paper #1570340786

Session TLY

Room Kona I

4:15pm

A Conceptual Model for Analyzing Information Quality in System-of-Systems

Mohamad Gharib, Paolo Lollini and Andrea Bondavalli (University of Florence, Italy)

Paper #1570340925

Session TLY

Room Kona I



Banquet 7pm at Lagoon Lanai

KONA IV ROOM WEDNESDAY JUNE 21 SESSION WAX CHAIR: GIAMMARCO

Misc. (Energy, Smart Grid Technologies/ SoSE Availability, Maintainability, Reliability, Resilience, Safety, etc.)	9:00am	Systems Architecture in Failure Analysis Stephen Rambikur (Naval Post Graduate School & Naval Undersea Warfare Center, USA); Kristin Giammarco† and Bryan O'Halloran (Naval Post Graduate School, USA)	Paper #1570345479 Room Kona IV
		Session WAX	
	9:15am	A Design Flow with Integrated Verification of Requirements and Faults in Safety-Critical Systems Wei Yan , Daniel Fontaine, Laurent Michel and John A Chandy (University of Connecticut, USA)	Paper #1570344409 Room Kona IV
		Session WAX	
	9:30am	Distributed Data Fusion in the Dempster-Shafer framework Orakanya Kanjanatarakul (Chiang Mai Rajabhat University, Thailand); Thierry Denoeux † (Université de Technologie de Compiègne, France)	Paper #1570344197 Room Kona IV
		Session WAX	
	9:45am	Developing the Stakeholder Requirements Definition Process - A Journey of Customization Simon Aasheim (HENT AS, Norway); Yang Yang Zhao (University College of Southeast Norway, Norway)	Paper #1570335723 Room Kona IV
		Session WAX	

KONA IV ROOM WEDNESDAY JUNE 21ST SESSION WPX CHAIR: STRAUB

Automotive	2:15pm	An Internetworked Self-Driving Car System of Systems Jeremy Straub, Wafaa Amer, Christian Ames, Karanam Dayananda, Andrew Jones, Goutham Miryala, Nathan Olson, Noah Rockenback, Franklin Sslaby, Santipab Tipparach, Samuel Fehringer, David Jedynak, Haiming Lou, Dakota Martin, Marc Olberding, Austin Oltmans, Alec Witte, Brady Goenner, Jessie Lee and Dylan Shipman (North Dakota State University, USA)	Paper #1570344839 Room Kona IV
		Session WPX	
	2:30pm	CyberSecurity Considerations for an Interconnected Self Driving Car System of Systems Jeremy Straub, John McMillan, Brett Yaniero, Mitchell Schumacher, Abdullah Almosalami, Kelvin Boatey and Jordan Hartman (North Dakota State University, USA)	Paper #1570345560 Room Kona IV
		Session WPX	
	2:45pm	A Cyber Energy System Design (CESD) for Electric Vehicle Applications K. Tehrani (ESIGELEC-IRSEEM, France)	Paper #1570345528 Room Kona IV
		Session WPX	

KONA I ROOM WEDNESDAY JUNE 21ST SESSION WAY CHAIR: JAMSHIDI

Special Session - Alternative Research Proposals for Engineering Emergence

9:00am The Making of a System of Systems: Ontology Reveals the True Nature of Emergence

Gary Langford[†] (Portland State University, USA); Teresa Langford (Portland Community College, USA)

Paper #1570340366

Session WAY

Room Kona I

9:15am Practical Modeling Concepts for Engineering Emergence in Systems of Systems

Kristin Giammarco[†] (Naval Postgraduate School, USA)

Paper #1570346500

Session WAY

Room Kona I

9:30am Emergence as a Subject of Research, Research Methods, and Engineering Knowledge and Practice

Timothy LJ Ferris[†] (Cranfield University, United Kingdom)

Paper #1570345407

Session WAY

Room Kona I

9:45am Multi-dimensional Information Filter for Space-Based Platforms (MIFS)

Paul C. Hershey (Raytheon, Inc., USA)

Paper #1570349685

Session WAY

Room Kona I

KONA I ROOM WEDNESDAY JUNE 21ST SESSION WPY CHAIR: SEONG

Misc. (Human Centered, etc.)

2:15pm A System of Systems Approach to Patient Treatment with the Left Ventricular Assist Device

Viswajith Vasudevan and **Marwan A. Simaan** (University of Central Florida, USA)

Paper #1570340231

Session WPY

Room Kona I

2:30pm Human Machine Interface in the Internet of Things (IoT)

Joseph Nuamah and **Younho Seong** (North Carolina A&T State University, USA)

Paper #1570347159

Session WPY

Room Kona I

2:45pm Towards an Approach for Analyzing Trust in Cyber-Physical-Social Systems

Mohamad Gharib, Paolo Lollini and Andrea Bondavalli (University of Florence, Italy)

Paper #1570340931

Session WPY

Room Kona I

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